PLATINUM®
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Technical information

Anti-islanding protection

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1 Topic

1.1 About this usage guide

This document briefly describes the island state and the anti-islanding protection requirements to be met. Finally, the anti-islanding protection implemented in the PLATINUM® inverters of PLATINUM GmbH is explained.

1.2 Application

The document refers to the inverters listed in the table below.

R3 family	TLD family
PLATINUM 16000 R3	**PLATINUM 22000 TLD**
PLATINUM 14000 R3	**PLATINUM 22001 TLD**
PLATINUM 11000 R3	**PLATINUM 19000 TLD**
PLATINUM 9000 R3	**PLATINUM 16000 TLD**
PLATINUM 8000 R3	**PLATINUM 13000 TLD**
PLATINUM 7000 R3	**PLATINUM 7200 TLD**
PLATINUM 5500 R3	**PLATINUM 6300 TLD**
	PLATINUM 5300 TLD
	PLATINUM 4800 TLD
	PLATINUM 4300 TLD
	PLATINUM 3800 TLD
	PLATINUM 3801 TLD

2 Island grids – island state

2.1 The island state

Inverters for grid-connected operation use the mains voltage and mains frequency as a reference and feed the energy as a power source into the supply grid. These inverters normally cannot supply the grid with a voltage source.

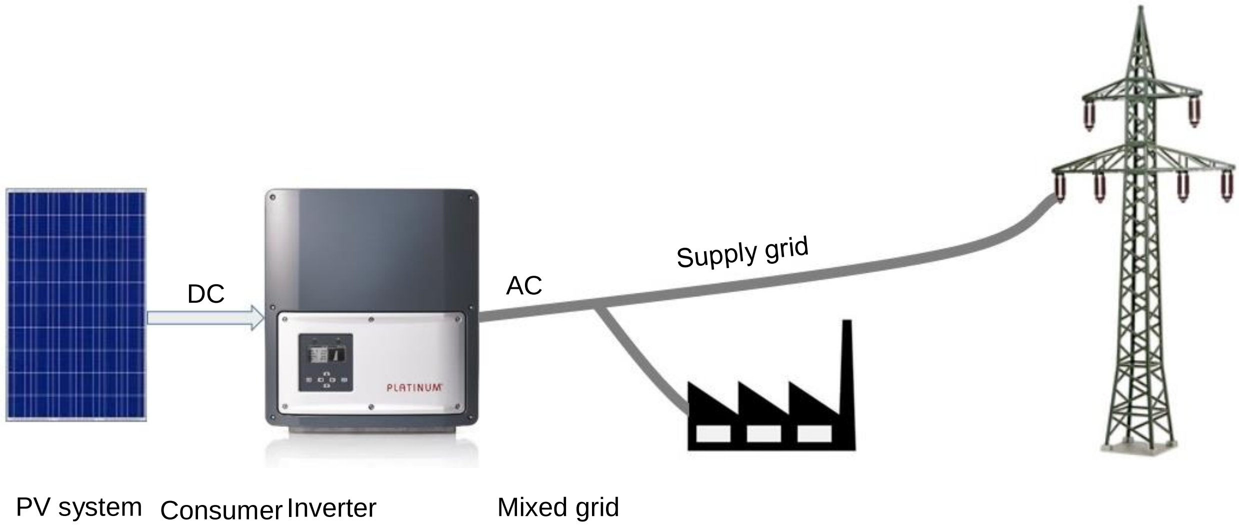

Figure 1: Normal operation of a grid-connected inverter

The island state is a grid-connected situation in which the inverter keeps on supply the grid with energy even though there is no more voltage available from the electricity supplier.

In IEC62116:2008-09, the island state is defined as follows:

Section 4.4 Island

a state in which a portion of the electric utility grid, containing load and generation, continues to operate isolated from the rest of the grid. The generation and loads may be any combination of customer-owned and utility-owned.

The island state arises when the grid exhibits resonant load behaviour due to a fault in the grid or a particular load situation in the grid. In such situations, resonance between the L-C component maintains the voltage on the inverter's output terminal even if the grid's voltage is no longer there. If the ohmic load corresponds to the energy generated by the inverter in this case, parallel operation is still possible and generates the island state. Without an island detection system, the inverter cannot distinguish this state from a grid-connected operation with a connected voltage supply grid.

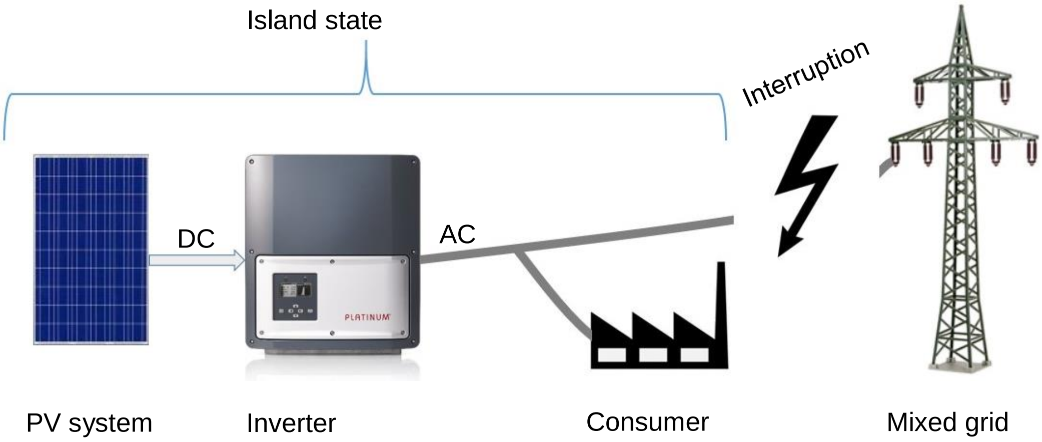

Figure 2: Display of the island state

The island state can be dangerous for four main reasons:

1. Safety considerations

   In the event of an island state, employees who are working on grid components, lines or systems can unexpectedly come into contact with life-threatening voltage.

2. Risk of danger to devices

   The customer's devices could theoretically be damaged if the operating parameters differ considerably from the standard. In this case, the supplier is liable for the damage.

3. Ending the failure

   Switching on again on an active island can cause problems with the supplier's devices or prevent grid operators' automatic re-activation systems from noticing the problem.

4. Damage to the inverter

   Switching on again on an active island can lead to damage to the inverters.

2.2 Anti-islanding protection – requirements and standards

For the above-mentioned reasons, PLATINUM® inverters are fitted with anti-island detection and protection mechanisms in order to prevent feeding into an island state. The applicable rules for detecting and interrupting island states vary from country to country.

Some standards are listed below together with the countries in which they apply.

Country	Anti-islanding standards
Australia	**AS4777.3**
Germany	**VDE-AR-N 4105**
Various countries	**IEC62116**
United Kingdom	**G83/2 & G59/3**

The different standards typically place different requirements for the time required to detect and switch off the island state and can define different test set-ups and test procedures. In addition, the standards prescribe different values for the Q-factor of the RLC resonance load.

IEC 62116:2008-09 defines Q = 1 and a switch-off time of < 2 s.

A sample test set-up for testing the inverter's island detection is shown below.

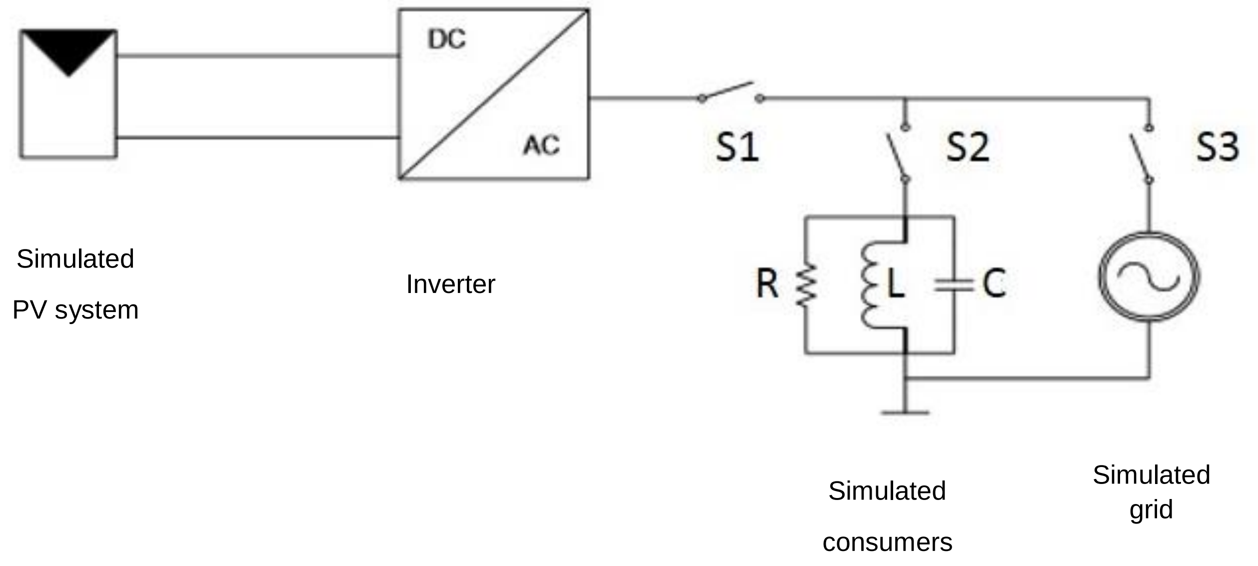

Figure 3: Typical test circuit

The test procedure requires the test to be repeated with different output powers of the inverter. More detailed information can be found in the standard applicable in the country in question.

3 The PLATINUM® range of inverters

3.1 Description of anti-islanding protection

All PLATINUM® inverters listed in Table 1 have integrated the same island detection mechanism. When the country code is selected (and the standard, if necessary), the inverters' parameters are set to the required values and comply with the anti-islanding protection requirements attested by the certificates.

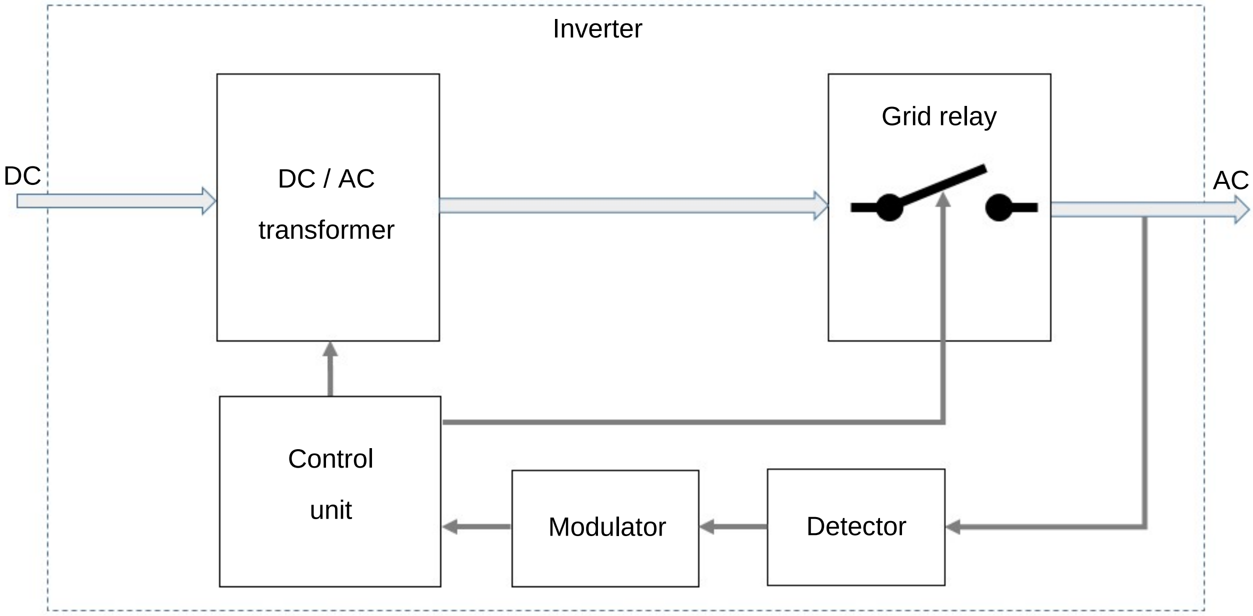

Figure 4: Block diagram in relation to anti-islanding protection

Function

The inverter modulates a periodic signal to the grid frequency. This causes a superimposed idle current to be fed into the grid. If the inverter is connected to the grid (island state not present), this idle current does not cause any changes to the mains frequency or mains voltage.

If an island state is present, this idle current causes a misalignment of the resonance frequency of the LC load. The detector measures this change and forwards it to the modulator as positive feedback. In an island state, this strengthens the modulated signal until the specified threshold values and times have been exceeded and the inverter is disconnected from the mains.

A restart is not possible until the supply grid applies a voltage and frequency that lie within the permitted limits.

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