

Compatibility between inverter and module technologies

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Due to the growing number of new module technologies (e.g. thin-film technology), it is becoming increasingly important to take special module and inverter features into account during the planning phase for a solar system. This document provides information on known restrictions and suitable combinations. On the last page you will find a list of combinations that have been approved by module manufacturers.

Inverters from Sunways AG

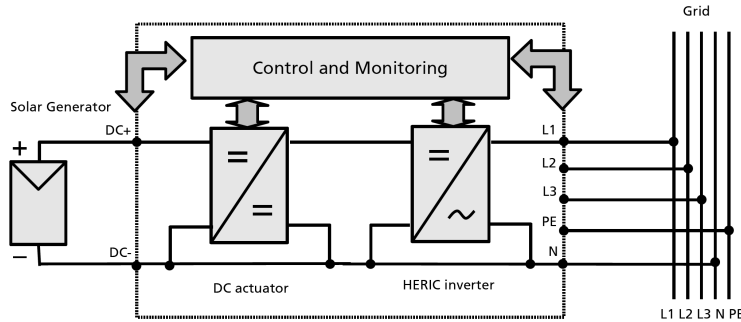
A key factor for deciding whether certain solar modules may be operated with a particular inverter is the voltage curve between the solar generator poles and the earth potential. This voltage curve is determined by the inverter circuitry. The following section contains a description of the individual inverter topologies including block diagrams and solar generator voltage curves.



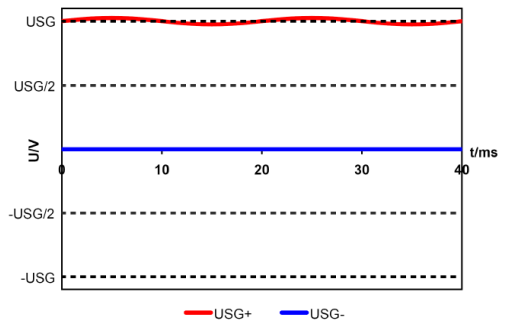
AT series

Consisting of a DC actuator with downstream HERIC inverter. The negative pole of the solar generator is connected to mains N. Single-phase feed, three-phase mains monitoring.

block diagram



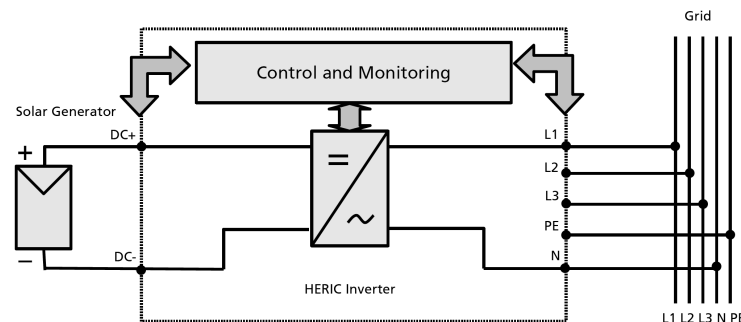
Voltage curve



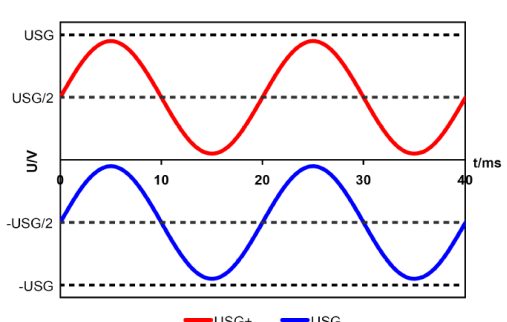
NT series

Consisting of a direct-feed HERIC inverter. Single-phase feed, three-phase mains monitoring. NT 8000 / NT 10000 consisting of three independently controlled inverters, with each power unit feeding to a separate phase.

block diagram



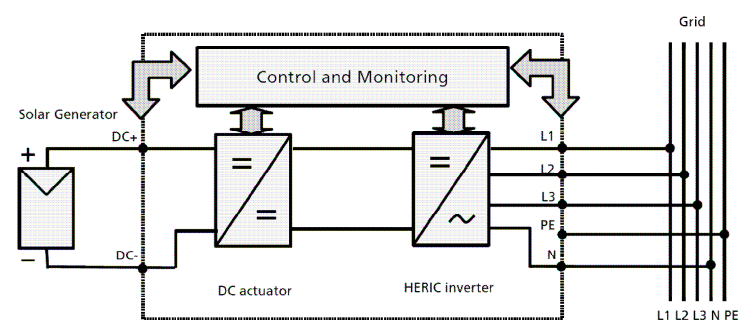
Voltage curve



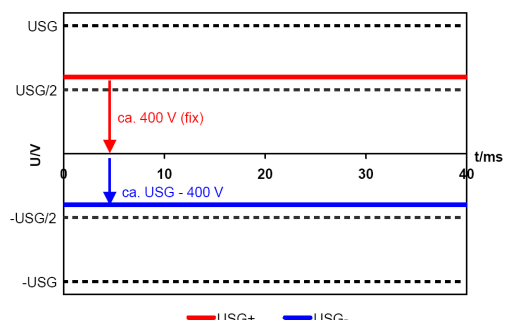
PT series

Consisting of a DC actuator with downstream HERIC inverter. The positive pole of the solar generator is always fixed at approx. 400 V. The voltage of the negative pole depends on the solar generator voltage (system voltage). Three-phase, symmetric feed, three-phase mains monitoring.

Block diagram



Voltage curve



Compatibility of inverter to solar module

If you are planning a PV system please ask your module manufacturer for the required solar generator voltage curve. Then determine the possible applications based on the following information.

This section describes the different module technologies and the associated inverter requirements. A distinction can be made between five basic cases:

- 1.) Conventional silicon-based solar modules generally have no special inverter requirements. In this case any Sunways solar inverters can be used.
- 2.) In some thin-film or silicon modules the output may be reduced when negative voltages are present on the solar generator. Depending on the module technology, this degradation can be permanent or reversible. Modules of this type require earthing of the negative solar generator pole, as is the case in the AT series.
- 3.) With Sunpower cell technology reversible power degradation may occur as a result of positive solar generator voltages. Modules with this cell type require earthing of the positive solar generator pole. In this case a positively earthed transformer unit should be used. Sunways AG currently does not offer a suitable inverter for this configuration.
- 4.) Certain solar modules generate high leakage currents in the presence of alternating voltage on the generator side, which may lead to the inverter shutting down. These leakage currents are primarily caused by metallic back panels and alternating voltage on the solar generator. In this case the AT series can be used.
- 5.) If the module manufacturer insists on an inverter with galvanic isolation (transformer), please ask for the underlying voltage curve specified by the manufacturer for the module. In addition, the module manufacturer should specify which solar generator pole should be earthed where required.

Solar module manufacturer requirement	Suitable Sunways inverter technology
1.) No requirement	AT series, NT series, PT series
2.) No negative voltages on solar generator	AT series
3.) No positive voltages on solar generator	None
4.) No alternating voltage on solar generator	AT series, PT series
5.) Only transformer unit	Possibly AT series ^{fn}

Approval list

Sunways AG is currently in discussions with several module manufacturers with a view of obtaining general approvals for use of the AT, NT or PT series with the respective modules. Once approvals are granted they will be listed in this document.

Please note that any module/inverter combination must be approved by the module manufacturer.

Combinations approved by module manufacturers:

Company	Solar module	Approved	Additional information
Schott Solar	ASI-F90	AT series	See Schott Solar approval list of 15 June 2007
Evergreen Solar	ES-xxx-RL-T ES-xxx-SL-K (xxx = 170 to 195)	AT series	See Evergreen Solar Application Guide, Edition 1, October 2007
Evergreen Solar	ES-xxx-RL-TU ES-xxx-SL-KU (xxx = 170 to 195)	NT or AT series	Additional identification on the "U" rating plate is required. See document "Evergreen introduces polarisation-free modules", January 2008
First Solar	FS-260 FS-262 FS-265 FS-267 FS-270 FS-272 FS-275	AT series NT series PT series (individual approvals)	Project-specific approvals are granted via SDAs submitted by the First Solar customer.
Uni-Solar	PVL-68 PVL-124 PVL-136	AT series	Earthing of the DC side is not allowed. Assembly system, substrates and conductive material near the PV generator must be earthed. The DC cables must not form loops. Please note the initial module values for DC voltage (+11%), DC current (+4%) and DC power (+15%). See document "Operation of Sunways Transformer-less Inverters with United Solar Ovonic PV Modules and Laminates" of 12 June 2008

If you are a module manufacturer and require additional information please contact Mr Christian Buchholz (+49 7531 99677-211)

If you are a planner or system owner, our Technical Hotline will be happy to answer any questions you may have on +49 7531 99677-577.

Processed by:
Christian Buchholz
Direct line phone +49 7531 99677211
Direct line fax +49 7531 99677444
Email: christian.buchholz@sunways.de

Sunways AG Macairestraße 3-5 D-78467 Constance,
Germany
Telephone +49 7531 996770 Telefax +49 7531 9967710
info@sunways.de www.sunways.de

Registered in the District Court Commercial Register
Freiburg HRB 381661 Registered office: Constance, Germany
Chairman of the Supervisory Board: Otto Mayer
Managing Board: Roland Burkhardt (Chairman), Jörg von Strom, Michael Wilhelm