



Certification and Reliability of UBNT Microinverter SM-MI-250

Certification

UBNT SM-MI-250, a solar inverter with 250W maximum power output have complied with:

1. UL1741/ IEEE1547, the safety and grid connection regulations, which refers to ETL Number: 5000750.
 - 1.1. These requirements cover inverters, converters, charge controllers, and interconnection system equipment (ISE) intended for use in stand-alone (not grid-connected) or utility-interactive (grid-connected) power systems. Utility-interactive inverters, converters, and ISE are intended to be operated in parallel with an electric power system (EPS) to supply power to common loads.
 - 1.2. For utility-interactive equipment, these requirements are intended to supplement and be used in conjunction with the Standard for Interconnecting Distributed Resources With Electric Power Systems, IEEE 1547, and the Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems, IEEE 1547.1.
 - 1.3. These requirements cover AC modules that combine flat-plate photovoltaic modules and inverters to provide AC output power for stand-alone use or utility-interaction, and power systems that combine other alternative energy sources with inverters, converters, charge controllers, and interconnection system equipment (ISE), in system specific combinations.
 - 1.4. These requirements also cover power systems that combine independent power sources with inverters, converters, charge controllers, and interconnection system equipment (ISE) in system specific combinations.
 - 1.5. The products covered by these requirements are intended to be installed in accordance with the National Electrical Code, NFPA 70.
2. FCC Part 15 Class B, the RF and EMC requirement, which refers to FCC ID: SWX-SMMI250WA
 - 2.1. PART 15 (B)— Radio Frequency Devices, Unintentional Radiators



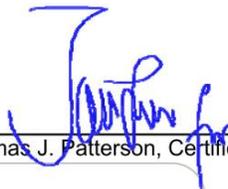
AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant:	Ubiquiti Networks International Limited	Manufacturer:	Lite-On Network Communication (Dongguan) Litmited
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Email:	ted.hsiao@ubnt.com	Email:	Johnny.Chen@liteon.com
Party Authorized To Apply Mark:	Same as Manufacturer		
Report Issuing Office:	Intertek Tesing Service Taiwan Ltd.		

Control Number: 5000750

Authorized by:  _____
Thomas J. Patterson, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

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Standard(s):	Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (UL 1741, Second Edition, Dated January 7, 2015) and General Use Power Supplies (CSA C22.2 No.107.1-01, Third Edition, Dated September 2001, Reaffirmed 2011).
Product:	Micro Inverter
Brand Name:	
Models:	SM-MI-250

Reliability

Reliability test is intended to demonstrate, with some degree of assurance, that a specimen will survive and perform under specified environmental conditions, either by simulating the real environmental conditions or by reproducing their effects such as listing in below table.

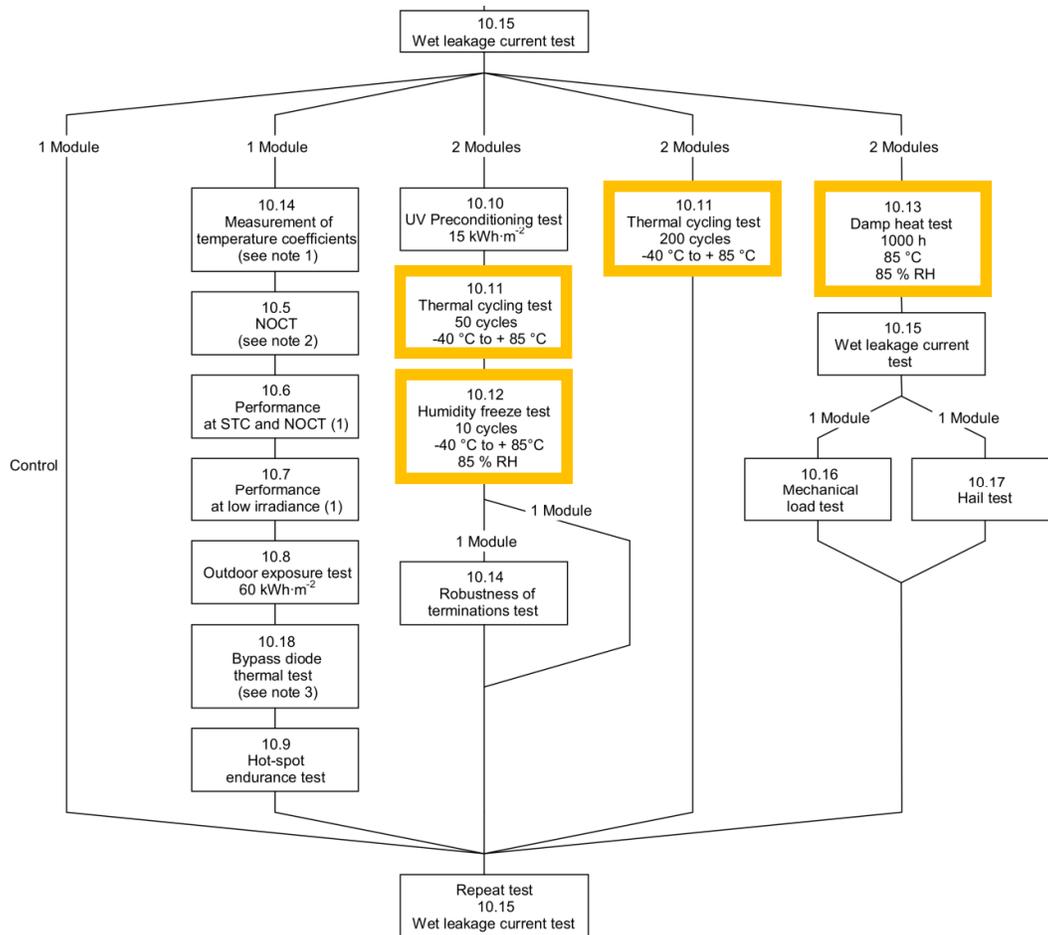
Environmental parameters	Principal effects	Typical failure resulting
High Temperature	Thermal ageing, oxidation, cracking, chemical reactions softening, melting, sublimation Viscosity reduction, evaporation, expansion	Insulation failure, mechanical failure, increased mechanical stress, increased wear on moving parts due to expansion, or, loss of lubricant properties
LOW temperature	Embrittlement, Ice formation Increased viscosity and solidification loss of mechanical strength Physical contraction	Insulation failure, cracking, mechanical failure, Increased wear on moving parts due to contraction or loss of mechanical strength and to loss of lubricant properties, seal and gasket failure
High relative humidity	Moisture absorption or adsorption Swelling, Loss of mechanical strength, Chemical reactions: corrosion electrolysis Increased conductivity of insulators	Physical breakdown, insulation failure, mechanical failure
Rapid change of Temperature	Temperature shock Differential heating	Mechanical failure, cracking, seal damage, leaks

Reliability

IEC61215 is a set of well-defined accelerated stress tests developed out of a reliability testing program. These tests incorporate strict pass/fail criteria. Such tests are used by customers to qualify modules for purchase and by manufacturers as a means of demonstrating a degree of product reliability.

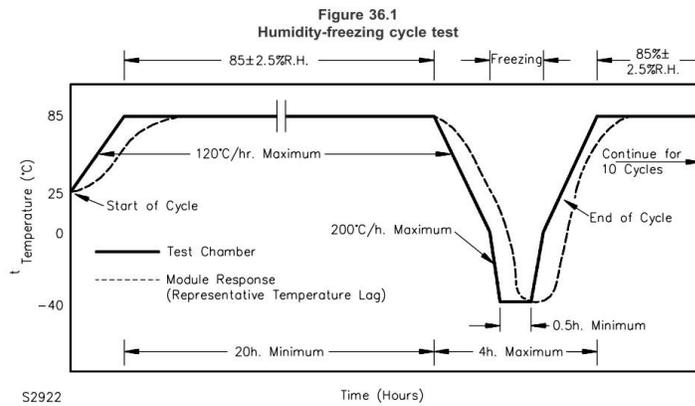
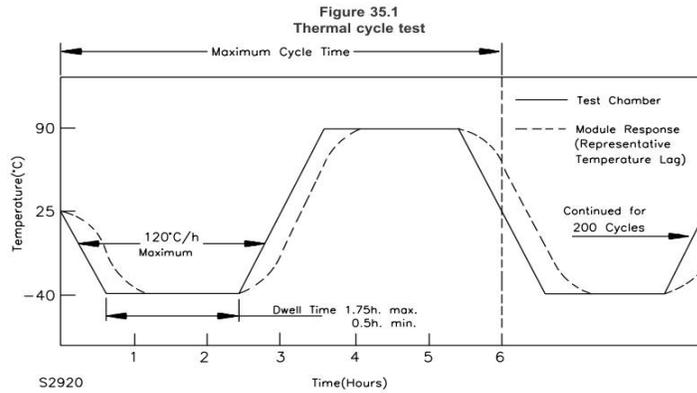
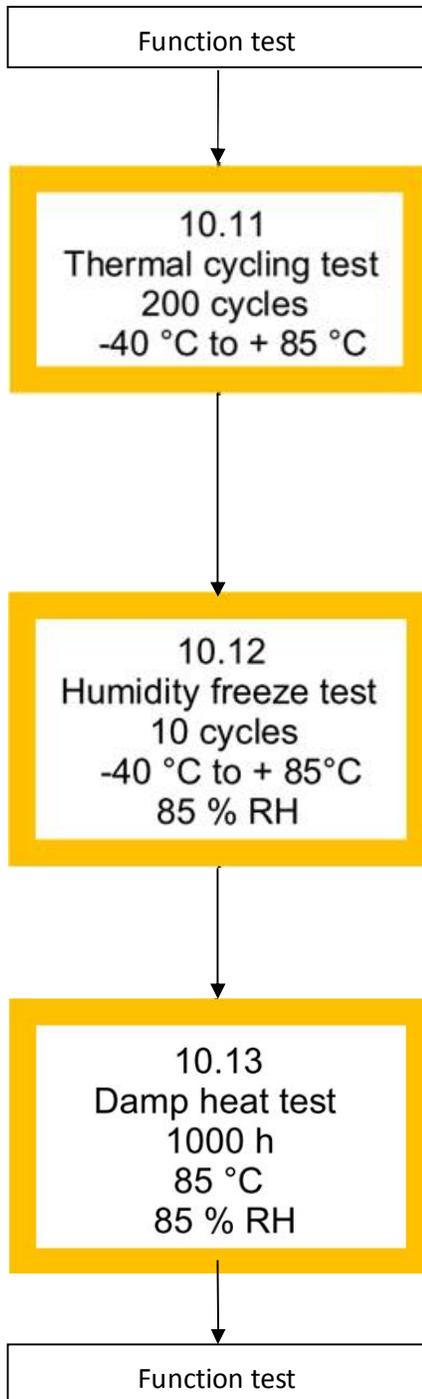
IEC 61215 and UL 1703 are both regulations for PV module not for PV inverter, but because the surrounding environment of microinverter, in a real world, is quite similar with PV module. Thus, microinverter manufacturing usually perform the reliability test according to the same reliability test condition and procedure.

The yellow block is the reliability test condition in IEC 61215 in which suitable for microinverter. The other black blocks are performance tests for PV module only, but unsuitable for microinverter.



Reliability

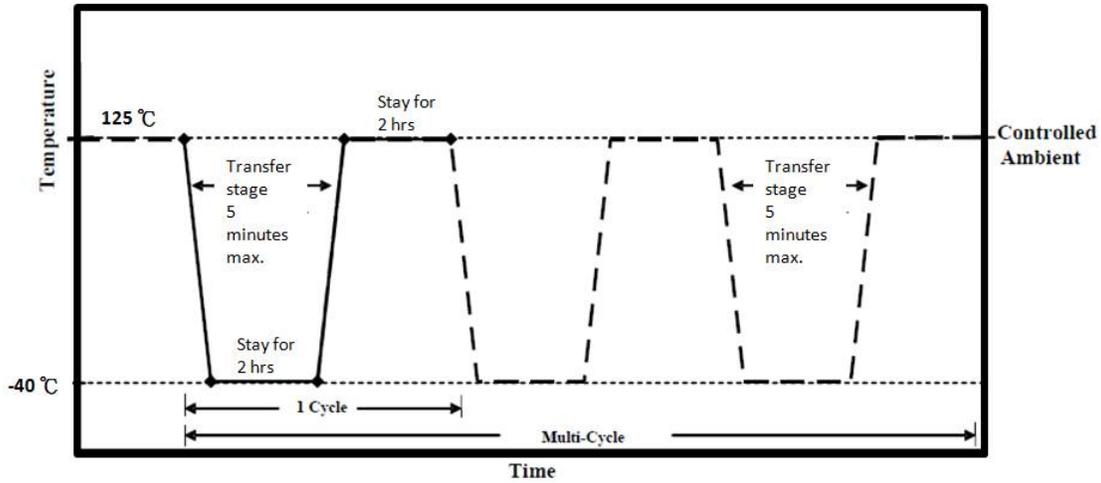
UBNT SM-MI-250 try to implement the test even harsher than the procedure in IEC 61215. We rearrange all the reliability procedure in a series of test as below, and after the test procedure, all the function and regulation requirement for microinverter should still working properly.



Damp heat
 Test temperature: 85 °C ± 2 °C
 Relative humidity: 85 % ± 5 %
 Test duration: 1,000 h. = 41.6 days

Reliability

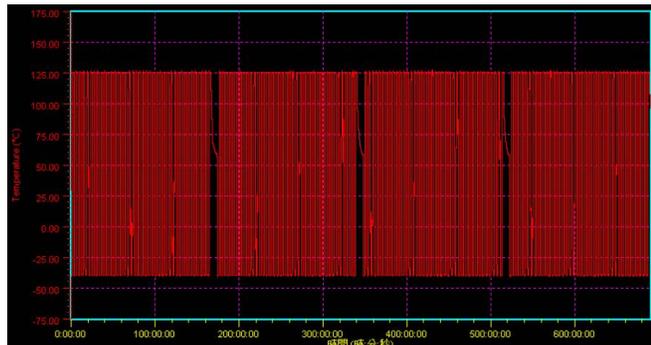
Extreme temperature exchange is also another problem leading to a crack failure between different material combination. Thus, SM-MI-250 have been tested in a rapid exchanging temperature as below condition.



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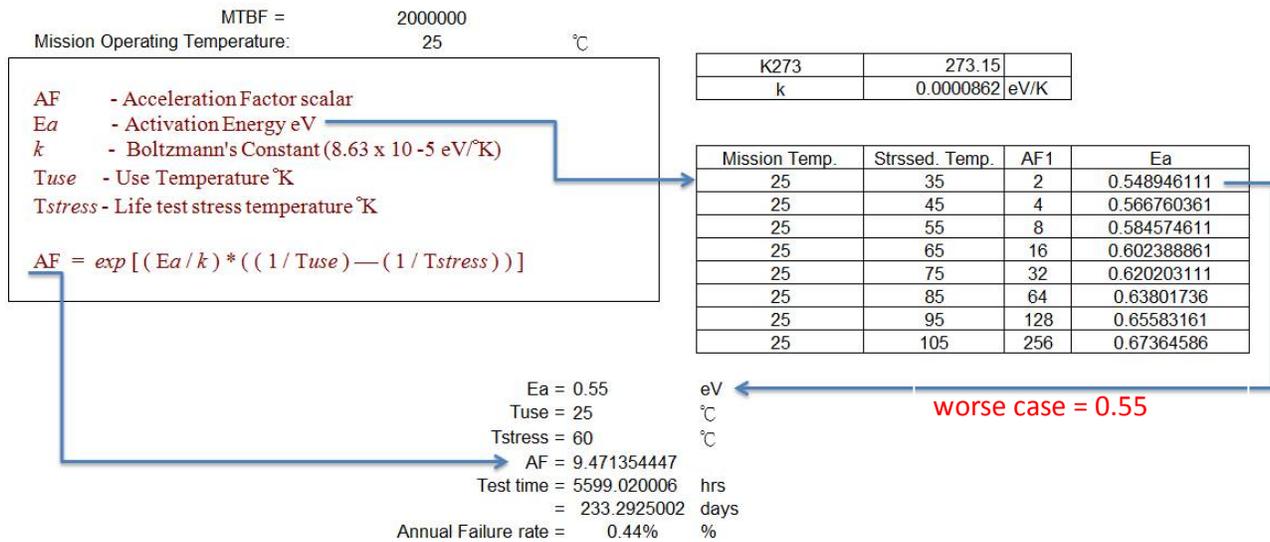
Thermal shock test condition :

- a. State: Non-operation
- b. Cold temperature: -40°C and keep 2 hrs.
- c. High temperature: 125°C and keep 2 hrs.
- d. Change time: 5 minutes
- e. Test cycles: 160cycles
- f. Check function test for each 20cycles



Reliability

For long life operation test, SM-MI-250 implement a high temperature run-in test which is based on the Arrhenius acceleration model. UBNT define the MTBF should be 2 million hours, that means a real full loading run-in test at 60 degree C for 233 days.



In the mean time of full loading operation at 65 degree C, the temperature of all components inside of SM-MI-250 also have to be check and controlled under spec requirement of different components.

