Enertech UPS Pvt. Ltd.

PROJECT NUMBER: 4787286290

T1431, T1432, T2215,
T2216, T2233, T2234

Location (a)
UL India Lab,
UL India Pvt Limited,
Laboratory building,
Kalyani Platina
Campus, Sy.no.129/4,
EPIP Zone, Phase II,
Whitefield,
Bangalore – 560 066

General details

Customer	Enertech UPS Pvt. Ltd.		
Manufacturer	Enertech UPS Pvt. Ltd., S.No.399/1-2, Bhare, P.O. Ghotawade, Near Pirangut, Taluka-Mulshi, Pune , Maharashtra 412115		
Program	Others		
Test Lab Location	(a) UL Bangalore	**Refer to Cover page for the Location address**	
Item Under Test	5KVA/120V Solar PCU with 10KW MPPT Charger		
Type / Model	Sun Magic 5KVA/120V		
Number of samples	2		
Sample Identification	Inverter-2nos (144188-1, -2), 84AH Battery -10nos (148120-1 to -10)		
Serial Number (If any)	201511257		
Condition of IUT on receipt	Good		
Date of Receipt	18 January 2016		
Applicable Standard	*Environmental Tests done as per Customer requirement		
Date of Testing (Start date)	22 January 2016	**End Date**	10 February 2016
Lab general* ambient condition	**Temperature in °C**		°C
	Relative humidity in %		%
Date of Reporting	13 February 2016		
Test In-charge	Pradeep N		

**Note: See in Test Results Section of this report.*

Vishnu Kumar Project Engineer Associate	Sriparn Saurabh Sr. Project Engineer
Reviewed by	**Authorized signatory**

Disclaimer

*The results of testing in this report apply only to the sample product/item, which was tested. UL Lab has not participated in the sample selection. This Test report shall not be reproduced except in full or partial without the written approval of the Lab. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. *The applicable standard ambient condition supersedes the lab general ambient conditions.*

General Remarks

Description of Item under Test (IUT)

Models	Nominal AC output Power (KVA)	Operational Voltage (V)	Operational Frequency (Hz)	Battery Voltage (V)	Ingress Protection	Dimension W x D x H (mm)	Weight (Kg)
Sun Magic 5KVA	5	230±2%	50±5%	120	-	NA	110

Test methodology adopted

Environmental Tests done as per Customer requirement below,

a) Dry Heat Test: 50°C±2°C for 16 hours

b) Damp Heat Test (Steady state): 40°C, 95% RH for 4 days

c) Damp Heat Test (Cyclic): 40°C, 93% RH for 6 cycles (duration of one cycle shall be 24hrs)

d) Cold Test: 0°C for 16 hours

e) Change of temperature Test: -10°C to 50°C for 3 cycles (rate of change in temperature shall be 3^{o}C per minute)

During each testing, the EUT is loaded with 5KW Resistive load and MPPT charger with 84AH-10nos of battery (load) for last 30min during testing.

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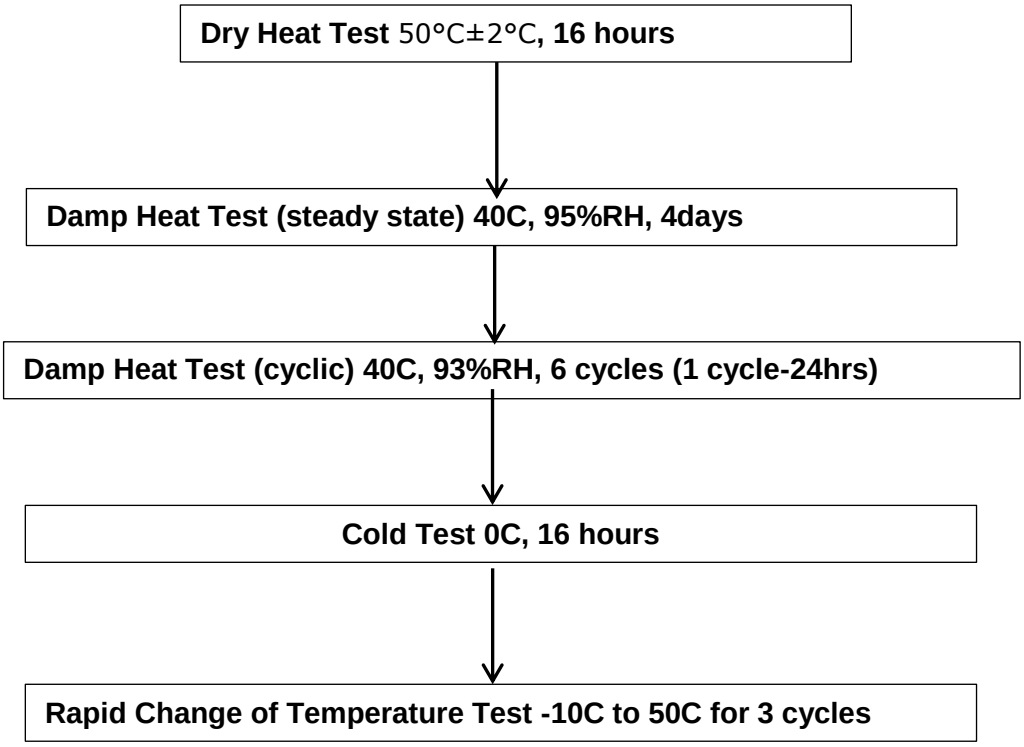
Test Plan:



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Equipment and Calibration details

Inst. ID No.	Instrument Type	Make	Function / Range	Last Cal. Date	Next Cal. Date
HPM03	Power Analyzer	HIOKI	1000V,50A	03/16/2015	03/16/2016
H21	Temperature & Humidity Recorder	Newport	16 -40Deg C,30-90 %RH	01/28/2016	01/28/2017
ECC01	Climatic chamber	Espec	-65 deg to 150 deg 35 RH to 95 RH	05/01/2016	05/01/2017
ECC04	Climatic chamber	Espec	-65 deg to 150 deg 35 RH to 95 RH	06/01/2016	06/01/2017
RT03	Insulation Resistance Tester	Fluke	0.01MΩ TO 10GΩ	28/11/2015	28/11/2016
VDC01	Variable DC power supply	Magna Power Electronics	0-1000V/0-100A	Support Equipment	
RLB01	Resistive Load	Enarka Instruments	240V AC,50KW	Support Equipment	

Test Results

P: Meets the requirements **F: Does not meet the requirement** **NA: Not applicable**

Reviewed by signature:

Test results/Summary:

ENVIRONMENTAL TEST FOR 5 KVA/120V PCU		
a.	Environmental Testing on Sample No: 144188.1 Dry Heat Test: 50°C±2°C for 16 hours	Observation Equipment functioning Pass ☒ Fail ☐ Initial Insulation Resistance: Pass ☒ Fail ☐ __550__ Mohm Insulation Resistance Post Dry Heat: _550_ Mohm Pass ☒ Fail ☐
b.	Damp Heat Test (Steady state): 40°C, 95% RH for 4 days	Equipment functioning Pass ☒ Fail ☐ Initial Insulation Resistance: Pass ☒ Fail ☐ _550_ Mohm Insulation Resistance Post Damp Heat Test: _550_ Mohm Pass ☒ Fail ☐
c.	Damp Heat Test (Cyclic): 40°C, 93% RH for 6 cycles (duration of one cycle shall be 24hrs)	Equipment functioning Pass ☒ Fail ☐ Initial Insulation Resistance: Pass ☒ Fail ☐ _550_ Mohm Insulation Resistance Post Pass ☒ Fail ☐ Damp Heat Test: _130_ Mohm

Reviewed by signature:

d.	Cold Test: 0°C for 16 hours	Equipment functioning Pass ☒ Fail ☐ Initial Insulation Resistance: Pass ☒ Fail ☐ _550_ Mohm Insulation Resistance Post Pass ☒ Fail ☐ Cold Test: _550_ Mohm
e	Change of temperature Test: -10°C to 50°C for 3 cycles (rate of change in temperature shall be 3oC per minute)	Equipment functioning Pass ☒ Fail ☐ Initial Insulation Resistance: Pass ☒ Fail ☐ _550_ Mohm Insulation Resistance Post Pass ☒ Fail ☐ Change of Temperature Test: _550_ Mohm

Remark: During each testing, the EUT is loaded with 5KW Resistive load and MPPT charger with 84AH-10nos of battery (load) for last 30min during testing.

Reviewed by signature:

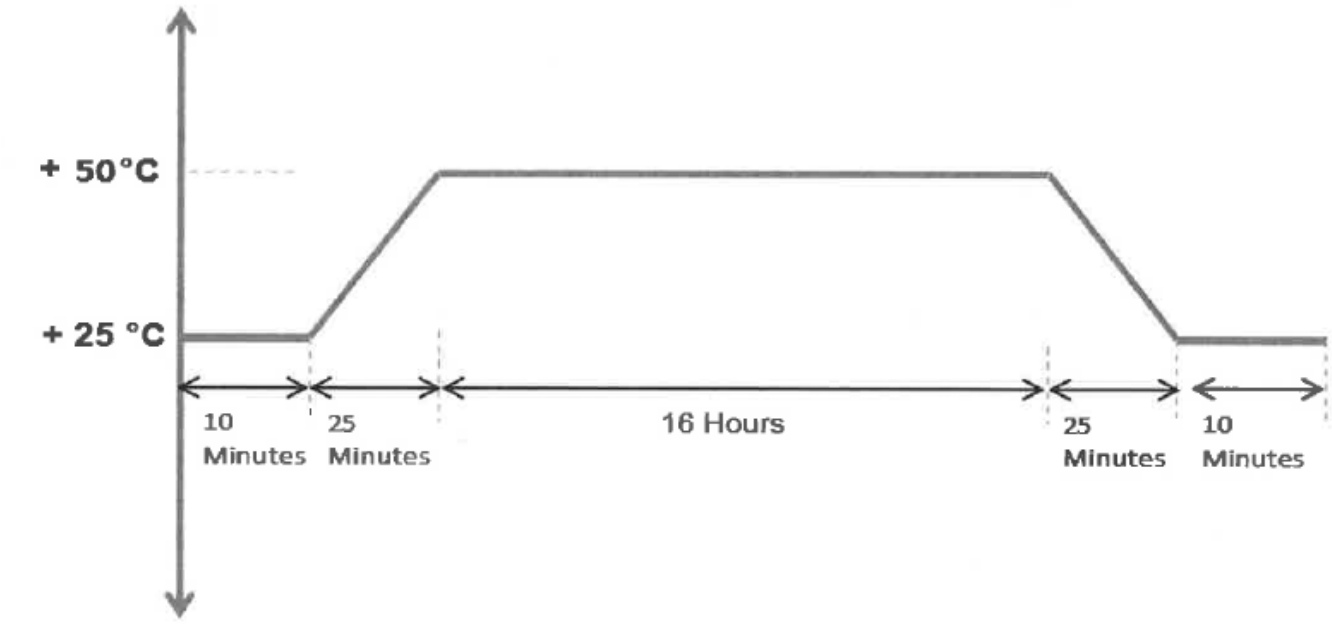
a) Dry Heat Test 50C, 16 hours

Visual Inspection:

1.3.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
144188.1	No visual defects	P

Method of Testing/Graphical representation:

Dry Heat Test: 50°C±2°C for 16 hours



Result –

1.3.b.	TABLE: Dry Heat Test - 1 Cycle	RESULT
Test Date (MM/DD/YYYY) start/end..:	02/04/2016 to 02/05/2016	
Type of test	**Dry Heat Test - 1 Cycle**	
Maximum Temperature maintained	+50°C ± 2°C	
Hour of Exposure..... :	16 Hrs. **(Last 30 min full load to be applied to inverter and full battery power to be applied to the charge controller)**	
Sample #	Visible Defect	—

Reviewed by signature:

144188.1	No visual defects	
Supplementary information:		

Enter appropriate comments for the notations below in the table above:

The samples ~~[did]~~ [did not] exhibit broken, cracked, bent, misaligned or torn external surfaces.

The samples ~~[did]~~ [did not] exhibit external faulty interconnections or joints.

The samples ~~[did]~~ [did not] exhibit visible corrosion of any part of active circuit visible externally.

The samples ~~[did]~~ [did not] exhibit visible corrosion of output connections.

The samples ~~[did]~~ [did not] exhibit visible corrosion of enclosure surface.

The samples ~~[did]~~ [did not] exhibit cracked or damaged wire or cable.

The samples ~~[did]~~ [did not] exhibit faulty terminals, exposed, energized electric parts.

The samples ~~[did]~~ [did not] exhibit exposed live electrical parts.

The samples ~~[did]~~ [did not] exhibit any other conditions which may affect functioning, performance or safety.

After 1Hr:

Sample functionality test after Dry Heat Test:

Functionality test has to be conducted for the sample after Dry Heat test to ascertain whether it is capable of functioning normally.

Post Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional	Remarks
144188.1	5	130	230	40	20	Functional	

Post Insulation Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	5	550	550	50	pass

Pass Criterion: **Insulation Resistance at 500V DC will be 50MΩ**

Reviewed by signature:

b). Damp heat Steady state (40C, 95%RH, 4days)

Visual Inspection:

1.4.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
144188.1	No visual defects	P

Initial Functional Test:

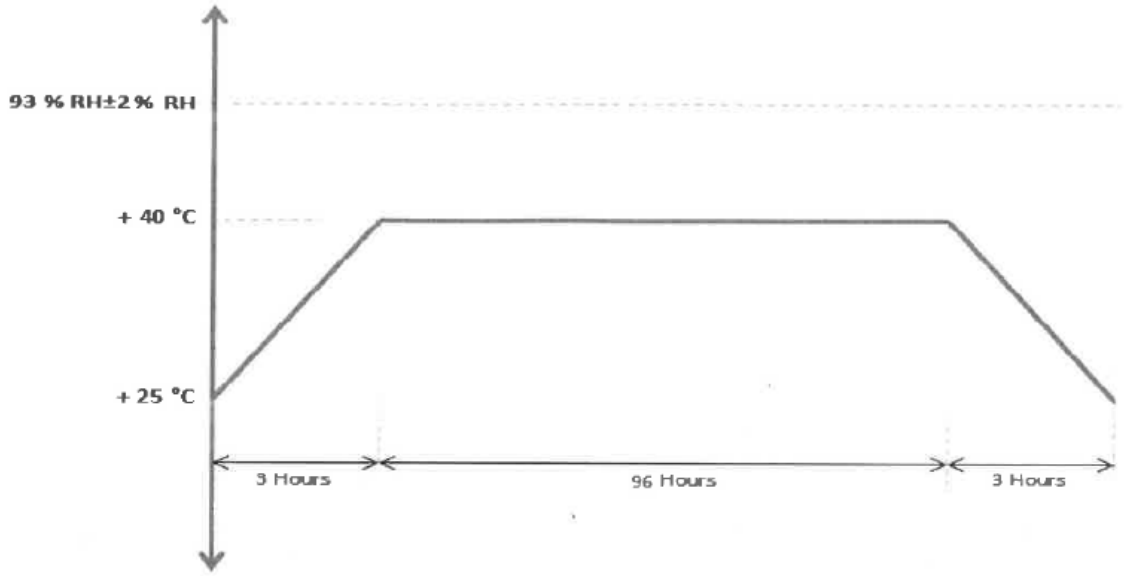
Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional
144188.1	**5**	**120**	**230**	**40**	**20**	**Functional**

Initial Insulation Resistance Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	**5**	**550**	**550**	**50**	**Pass**

Method of Testing/Graphical representation:

Damp Heat Test (Steady state): 40°C, 95% RH for 4 days



Reviewed by signature:

Result –

1.4.b.	**TABLE: Damp Heat Test**	RESULT
Test Date (MM/DD/YYYY) start/end..... :	01/23/2016 to 01/27/2016	
Type of test	**Damp Heat Test-steady state**	
Test condition Temperature	40C	
Test condition Humidity	95% RH	
No. of Cycles ..... :	4 days **(Last 30 min full load to be applied to inverter and full battery power to be applied to the charge controller)**	
Sample #	Visible Defect	—
144188.1	No visual defects	
Supplementary information:		

Enter appropriate comments for the notations below in the table above:

The samples ~~[did]~~ **[**did not**]** exhibit broken, cracked, bent, misaligned or torn external surfaces.

The samples ~~[did]~~ **[**did not**]** exhibit external faulty interconnections or joints.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of any part of active circuit visible externally.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of output connections.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of enclosure surface.

The samples ~~**[did]**~~ **[**did not**]** exhibit cracked or damaged wire or cable.

The samples ~~**[did]**~~ **[**did not**]** exhibit faulty terminals, exposed, energized electric parts.

The samples ~~**[did]**~~ **[**did not**]** exhibit exposed live electrical parts.

The samples ~~**[did]**~~ **[**did not**]** exhibit any other conditions which may affect functioning, performance or safety

After 30mins or unless otherwise specified by manufacturer:

Sample functionality test after Damp Heat Test:

Functionality test has to be conducted for the sample after damp heat test to ascertain whether it is capable of functioning normally.

Post Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional	Remarks
144188	**5**	**120**	**230**	**40**	**20**	**functional**	

Reviewed by signature:

Post Insulation Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	5	550	550	50	

c). Damp Heat Cyclic Test (cyclic) 40C, 93%RH, 6 cycles (1 cycle-24hrs)

Visual Inspection:

1.4.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
144188.1	No visual defects	

Initial Functional Test:

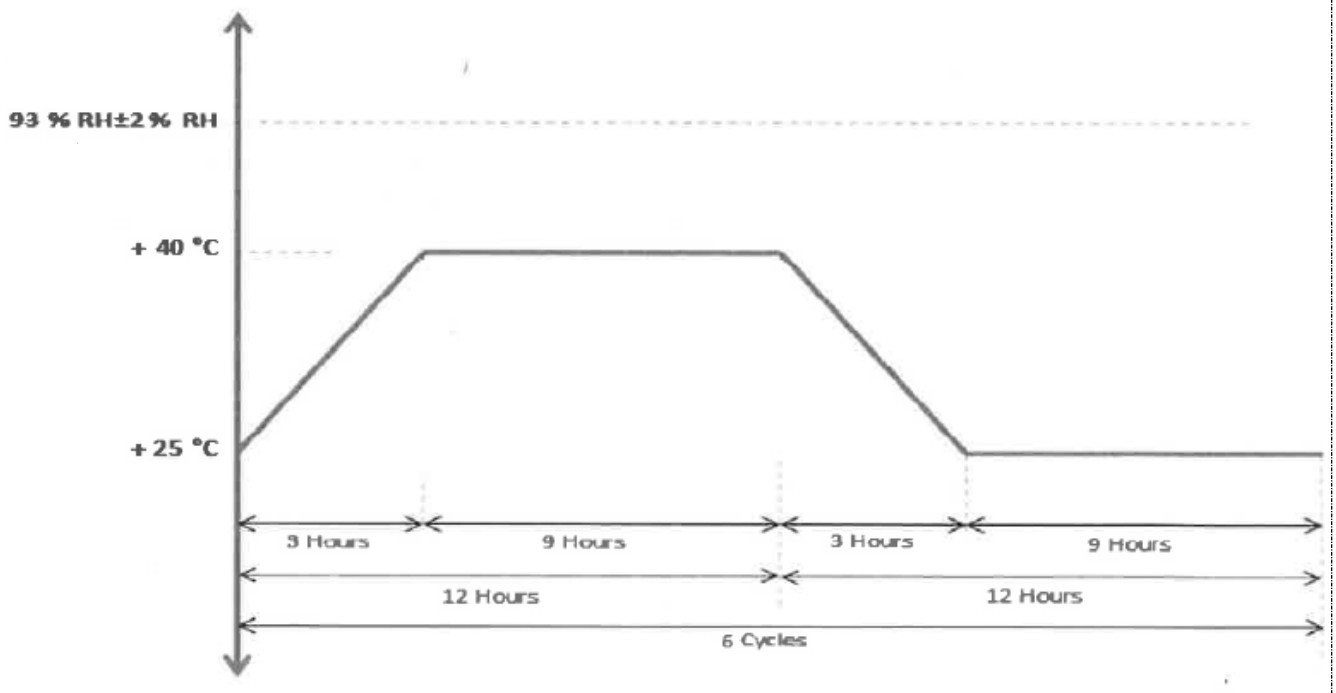
Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional
144188.1	5	120	230	40	20	Functional

Initial Insulation Resistance Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	5	550	550	50	Pass

Reviewed by signature:

Method of Testing/Graphical representation:



Result –

1.4.b.	**TABLE: Damp Heat Test**	RESULT
Test Date (MM/DD/YYYY) start/end..... :	01/27/2016 to 02/02/2016	
Type of test	**Damp Heat Test- Cyclic**	
Test condition Temperature	40°C,variant 24Hrs cycle	
Test condition Humidity	93 ± 3% RH	
No. of Cycles ..... :	6 **(Last 30 min of last cycle, full load to be applied to inverter and full battery power to be applied to the charge controller)**	

Sample #	Visible Defect	—
144188.1	No visual defects	
Supplementary information:		

Enter appropriate comments for the notations below in the table above:

The samples ~~[did]~~ **[**did not**]** exhibit broken, cracked, bent, misaligned or torn external surfaces.

The samples ~~[did]~~ **[**did not**]** exhibit external faulty interconnections or joints.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of any part of active circuit visible externally.

Reviewed by signature:

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of output connections.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of enclosure surface.

The samples **~~[did]~~ [**did not**]** exhibit cracked or damaged wire or cable.

The samples **~~[did]~~ [**did not**]** exhibit faulty terminals, exposed, energized electric parts.

The samples **~~[did]~~ [**did not**]** exhibit exposed live electrical parts.

The samples **~~[did]~~ [**did not**]** exhibit any other conditions which may affect functioning, performance or safety.

After 30mins or unless otherwise specified by manufacturer:
Sample functionality test after Damp Heat Test:
Functionality test has to be conducted for the sample after damp heat test to ascertain whether it is capable of functioning normally.

Post Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional	Remarks
144188.1	5	120	230	40	20	Functional	

Post Insulation Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188	5	130	130	50	Pass

Pass Criterion: **Insulation Resistance at 500V DC will be 50MΩ**

Enter appropriate comments for the notations below in the table above:

The samples **~~[did]~~ [**did not**]** exhibit any shorting of live terminals / live parts or cables.

The samples **~~[did]~~ [**did not**]** exhibit any sparking on live terminals / live parts or cables.

The samples **~~[did]~~ [**did not**]** exhibit any smoking.

The samples **~~[did]~~ [**did not**]** Stopped functioning.

Reviewed by signature: T.S. Vishnu

d). Cold Test (zero degrees, 16 hours)

Visual Inspection:

1.1.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
144188.1	No visual defects	

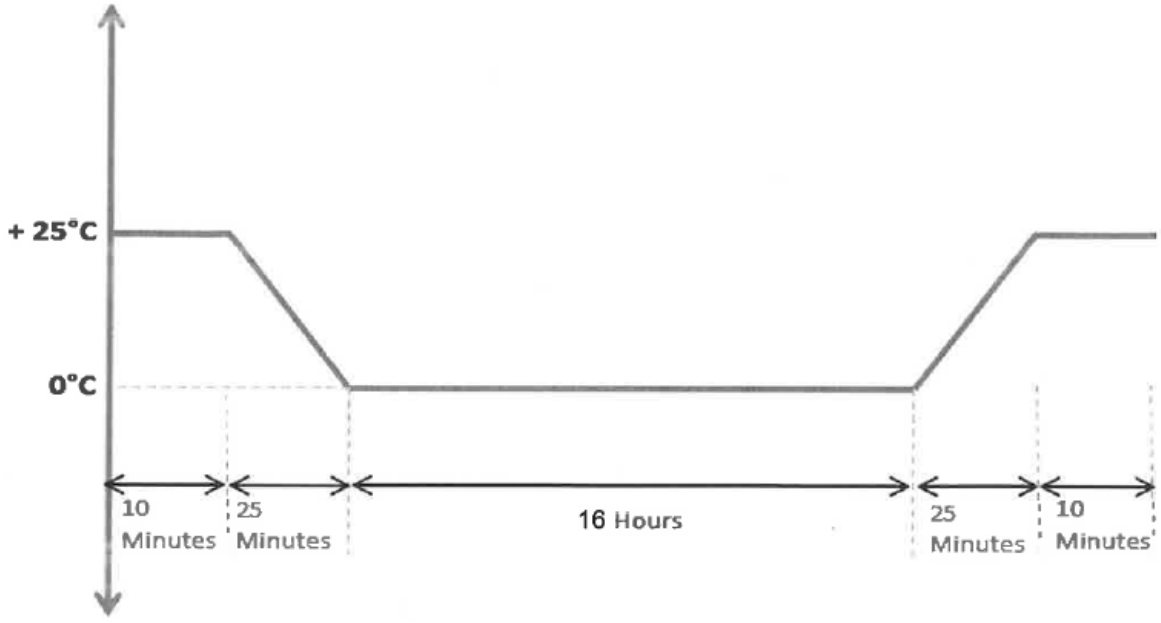
Initial Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional
144188.1	**5**	**120**	**230**	**40**	**20**	**Functional**

Initial Insulation Resistance Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	**5**	**550**	**550**	**50**	**Pass**

Method of Testing/Graphical representation:



Result –

Reviewed by signature:

1.1.b.	TABLE: Cold Test - 1 Cycle	
Test Date (MM/DD/YYYY) start/end..:	02/05/2106 to 02/06/2016	
Type of test	**Cold Test - 1 Cycle**	
Temperature maintained	0°C	
Duration:	16 Hrs. **(Last 30 min full load to be applied to inverter and full battery power to be applied to the charge controller)**	
Supplementary information:		

Enter appropriate comments for the notations below in the table above:

After 1Hr:
Sample functionality test after cold test:
Functionality test has to be conducted for the sample after cold test to ascertain whether it is capable of functioning normally. Checked with reference to table below-

Post Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional	Remarks
144188.1	**5**	**120**	**230**	**40**	**20**	**Functional**	

Post Insulation Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	**5**	**550**	**550**	**50**	**Pass**

Pass Criterion: **Insulation Resistance at 500V DC will be 50MΩ**

Post Cold test:

Enter appropriate comments for the notations below in the table above:

The samples ~~[did]~~ **[**did not**]** exhibit any shorting of live terminals / live parts or cables.

The samples ~~[did]~~ **[**did not**]** exhibit any sparking on live terminals / live parts or cables.

Reviewed by signature:

The samples ~~[did]~~ [did not] exhibit any smoking.

The samples ~~[did]~~ [did not] Stopped functioning.

e). Rapid Change of Temperature Test (-10C to 50C for 3 cycles)

Visual Inspection:

1.2.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
144188.1	No visual defects	

Initial Functional Test:

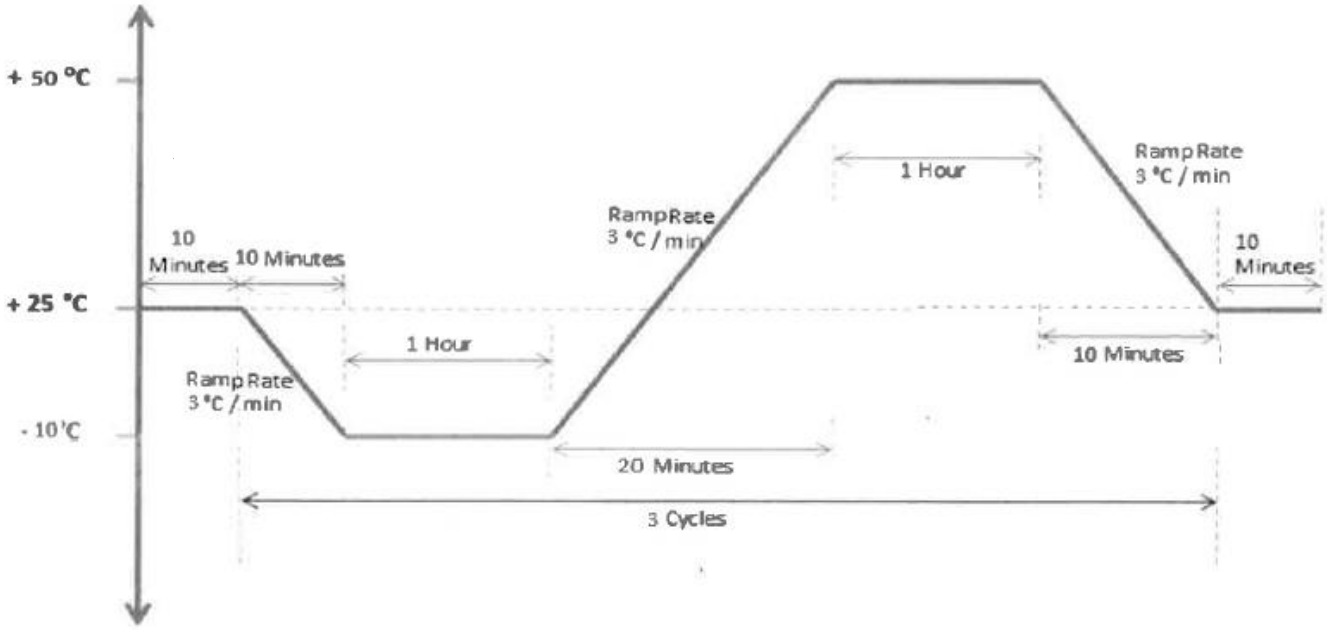
Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional
144188.1	**5**	**120**	**230**	**40**	**20**	**Functional**

Initial Insulation Resistance Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	**5**	**550**	**550**	**50**	**Pass**

Reviewed by signature:

Method of Testing/Graphical representation:



Result –

1.2.b.	**TABLE: Rapid Change of Temperature**	RESULT
Test Date (MM/DD/YYYY) start/end..:	02/08/2016	
Maximum Temperature (T_B)	+50°C	
Minimum Temperature (T_A)	-10 °C	
Total Cycles (3) ..... :	3 **(Last 30 min of each cycle full load to be applied to inverter and full battery power to be applied to the charge controller)**	
Duration at each Temperature	1	

Sample #	Visible Defect	—
144188	No visual defects	

Supplementary information:	

Enter appropriate comments for the notations below in the table above:

The samples ~~[did]~~ **[**did not**]** exhibit broken, cracked, bent, misaligned or torn external surfaces.

The samples ~~[did]~~ **[**did not**]** exhibit external faulty interconnections or joints.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of any part of active circuit visible externally.

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of output connections.

Reviewed by signature: T.S. Nkhumise

The samples ~~[did]~~ **[**did not**]** exhibit visible corrosion of enclosure surface.

The samples **~~[did]~~ [**did not**]** exhibit cracked or damaged wire or cable.

The samples **~~[did]~~ [**did not**]** exhibit faulty terminals, exposed, energized electric parts.

The samples **~~[did]~~ [**did not**]** exhibit exposed live electrical parts.

The samples **~~[did]~~ [**did not**]** exhibit any other conditions which may affect functioning, performance or safety.

After 1Hr or more as specified by Manufacturer:
Sample functionality test after Rapid change of temperature test:
Functionality test has to be conducted for the sample after Rapid change of temperature test to ascertain whether it is capable of functioning normally. Checked with reference to table below-

Post Functional Test:

Sample Number	Inverter Ratings KVA	Input Voltage (DC)	Output voltage (AC)	Input Current (DC)	Output Current (AC)	Functional/Non Functional	Remarks
144188.1	**5**	**120**	**230**	**40**	**20**	**Functional**	

Post Insulation Test:

Sample Number	Inverter Ratings KVA	Observed Insulation Resistance MΩ		Required Insulation Resistance MΩ	Pass/Fail
		B/W GND to I/P (AC)	B/W GND to O/P (AC)		
144188.1	**5**	**550**	**550**	**50**	**Pass**

Pass Criterion: **Insulation Resistance at 500V DC will be 50MΩ**

Post Rapid Change of temperature test:

Enter appropriate comments for the notations below in the table above:

The samples **~~[did]~~ [**did not**]** exhibit any shorting of live terminals / live parts or cables.

The samples **~~[did]~~ [**did not**]** exhibit any sparking on live terminals / live parts or cables.

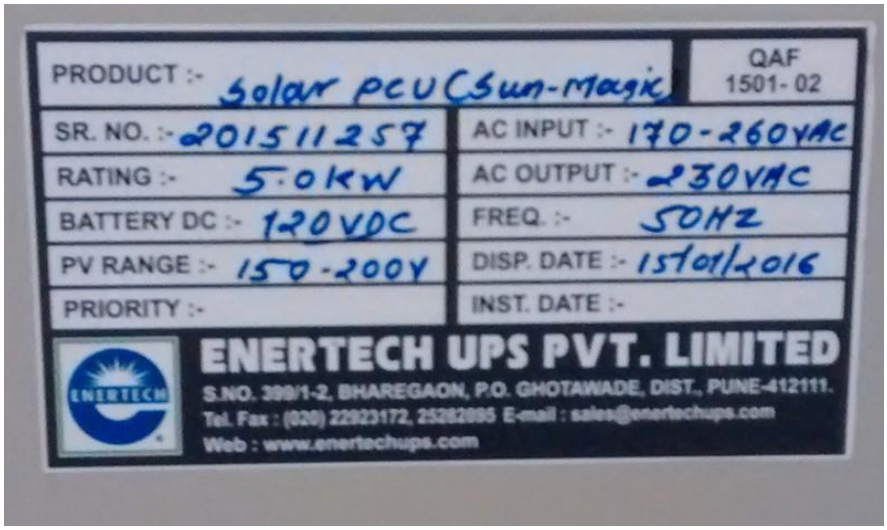
The samples **~~[did]~~ [**did not**]** exhibit any smoking.

The samples **~~[did]~~ [**did not**]** Stopped functioning.

Reviewed by signature:

Appendix

Appendix A: Photographs



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