



Certificate No: T-1432



# UL Verification Test Report

Type: INVERTER (1KVA 48V SOLAR INVERTER)

Name and Address of Applicant: **MG SOLAR POWERTRONICS**  
KHANNA ESTATE, L.B.S. MARG.  
VIKHROLI WEST, MUMBAI, MH 400079  
INDIA.

Scope of Work: 1) Test protocol - TESTING of INVERTER which has reference to test standard **IEC-61683**  
2) Test protocol – ENVIRONMENTAL TESTING of INVERTER which has reference to test standard **IEC-60068-2-(1, 2, 14, 30)**

Model Number: 1KVA / 48 VDC PCU

Serial Number & UL Sample Number: MGPT/PCU/1229 & 1578131

Number of samples Tested: 1

Date(s) of Test(s):


Date	Status
28/02/2013	Samples Received
28/02/2013	Project Open
15/03/2013	Project Completed

Sampling Plan: 01 (One) Sample was submitted for testing


Test Results: See test report.

Enclosure: Annexure A: Efficiency & Climate Test Results  
Annexure B: Figures  
Annexure C: Informative  
Annexure D: Photos  
Annexure E: Instrument Calibration Details

Test Engineer

  
Prathap.R

Authorized signatory

  
Mahesh.V

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## Annexure A

### Efficiency Test Results

**SAMPLE – 1KVA / 48V**  
Resistive Load

Reference test load (Resistive)	Unit	limit	10%		25%		50%		75%		100%	
			I/P	O/P	I/P	O/P	I/P	O/P	I/P	O/P	I/P	O/P
Voltage	<b>V</b>	-	48	230.10	48.03	230.09	48.03	230.92	48.03	230.85	48.03	230.39
Current	<b>A</b>	-	3.47	0.620	5.15	0.959	10.30	1.978	15.27	2.93	20.60	3.94
Freq.	<b>Hz</b>		-	50	-	50	-	50	-	50	-	50
Power	<b>Watts</b>	-	166.56	142.66	247.4	220.98	494.7	456.85	733.42	678.4	989.42	909.8
P.F.	-	-	-	1	-	1	-	1	-	1	-	1
THD	<b>%</b>	<5	-	2.30	-	2.45	-	2.03	-	1.74	-	1.69
<b>Efficiency</b>	<b>%</b>	-	-	<b>85.65</b>	-	<b>89.32</b>	-	<b>92.35</b>	-	<b>92.50</b>	-	<b>91.95</b>
Voltage regulation	<b>%</b>	-	0.74									

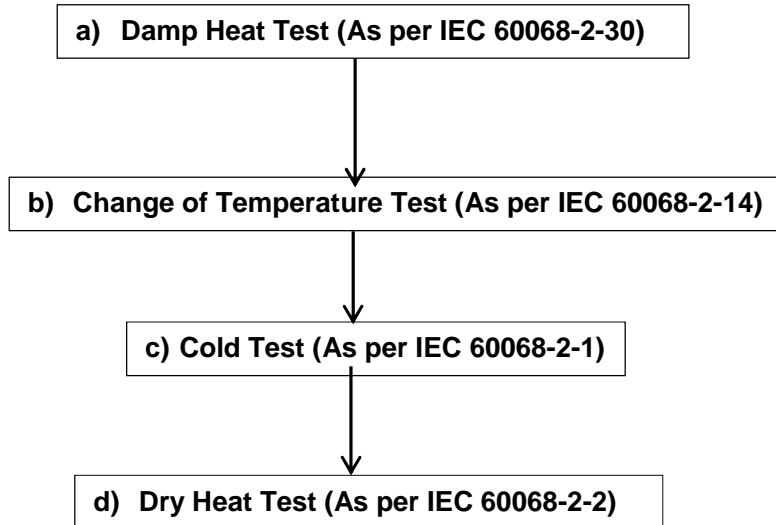
Note: The values being measured after stabilization, on an average, the time for stabilization is 3 minutes.

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## Climate Test Results

SAMPLE – 1KVA / 48V

Sequence of Tests:



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**a) Damp Heat Test (As per IEC 60068-2-30)**

**Visual Inspection:**

1.4.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
1578131	No visual defects observed	Satisfactory

**Result –**

1.4.b.	TABLE: Damp Heat Test	RESULT
Test Date (MM/DD/YYYY) start/end .....	03/05/2013	
Type of test	[ X ] Db	
Test condition Temperature	25°C to 55°C±2°C,variant 1 ,12+12Hrs cycle	
Test condition Humidity	93 ± 3% RH	
No. of Cycles..... :	2	
Sample #	Visible Defect	—
1578131	No visual defects observed	Satisfactory
Supplementary information:	NA	

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.

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**Sample functionality test after Damp Heat Test:**

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

Functional Test	YES/NO	Remarks
Inverter functioning	Yes	Satisfactory

**Insulation Test:**

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

**Measured: 1890 MΩ**

**Remarks: Satisfactory**

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.

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**b) Rapid Change of Temperature Test (As per IEC 60068-2-14)**

**Visual Inspection:**

1.2.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
1578131	No visual defects observed	Satisfactory

**Result –**

1.2.b.	TABLE: Rapid Change of Temperature	RESULT
Test Date (MM/DD/YYYY) start/end..:	03/08/2013	
Maximum Temperature (T <sub>B</sub> )	+55°C ± 3°C	
Minimum Temperature (T <sub>A</sub> )	-5 °C	
Total Cycles (5) .....	5	
Duration at each Temperature	1Hr	
Sample #	Visible Defect	—
1578131	No visual defects observed	Satisfactory
Supplementary information:	NA	

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.

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**Sample functionality test after Rapid change of temperature 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-

Functional Test	YES/NO	Remarks
Inverter functioning	Yes	Satisfactory

**Insulation Test:**

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

**Measured: 1450 MΩ**

**Remarks: Satisfactory**

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.

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**c) Cold Test (As per IEC 60068-2-1)**

**Visual Inspection:**

1.1.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
1578131	No visual defects observed	Satisfactory

**Result –**

1.1.b.	TABLE: Cold Test - 1 Cycle	RESULT
Test Date (MM/DD/YYYY) start/end..:	03/11/2013	
Type of test	[ ] Ab, [X] Ad, [ ] Ae	
Temperature maintained	-10°C ± 3°C	
Duration at each Temperature	2Hr	
Sample #	Visible Defect	—
1578131	No visual defects observed	Satisfactory
Supplementary information:	NA	

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.

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**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-

Functional Test	YES/NO	Remarks
Inverter functioning	Yes	Satisfactory

**Insulation Test:**

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

**Measured: 1380 MΩ**

**Remarks: Satisfactory**

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.

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**d) Dry Heat Test (As per IEC 60068-2-2)**

**Visual Inspection:**

1.3.a.	TABLE: Initial Visual Inspection	
Initial examination		
Sample #	Nature and position of initial findings – comment	RESULT
1578131	No visual defects observed	Satisfactory

**Result –**

1.3.b.	TABLE: Dry Heat Test - 1 Cycle	RESULT
Test Date (MM/DD/YYYY) start/end..:	03/13/2013	
Type of test	[ ] Bb, [ X ] Bd, [ ] Be	
Maximum Temperature maintained	+55°C ± 2°C	
Hour of Exposure .....	16 Hrs.	
Sample #	Visible Defect	—
1578131	No visual defects observed	Satisfactory
Supplementary information:	NA	

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.

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**Sample functionality test after Dry Heat Test:**

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

Functional Test	YES/NO	Remarks
Inverter functioning	Yes	Satisfactory

**Insulation Test:**

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

**Measured: 1610 MΩ**

**Remarks: Satisfactory**

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.

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## Annexure B

### Figures

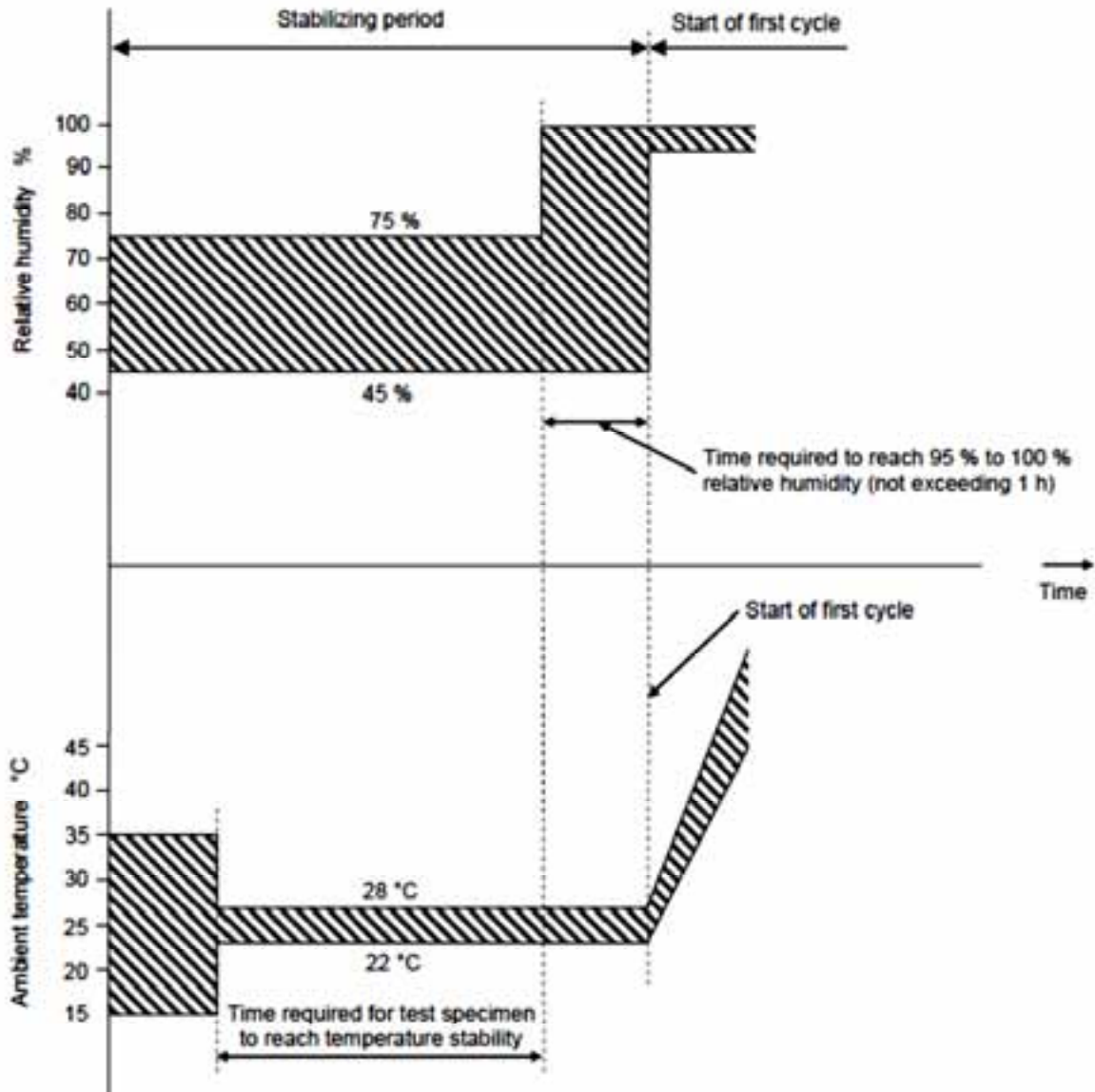


Figure 1 – Test Db – Stabilizing period

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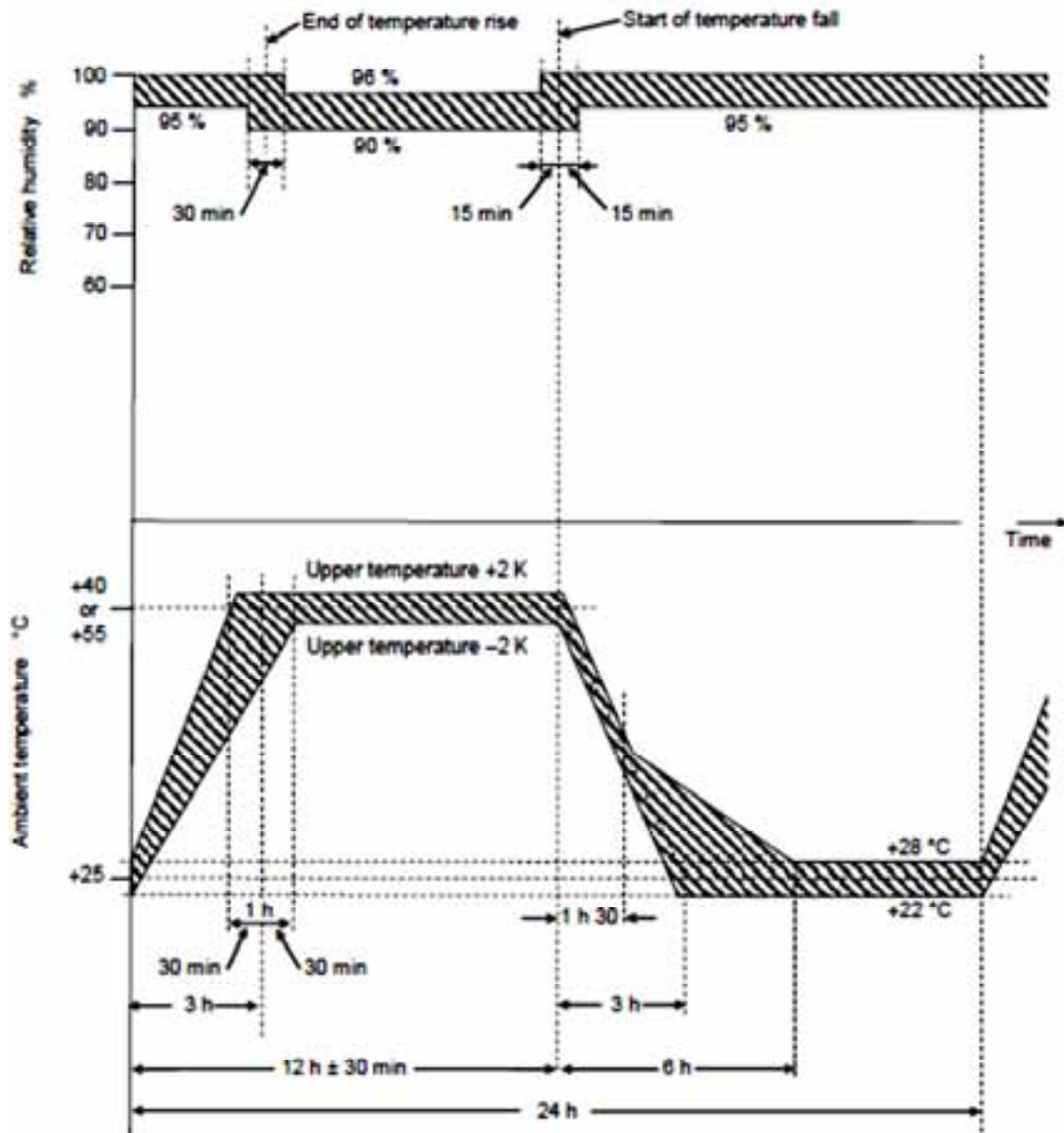


Figure 2 – Test Db – Test Cycle – Variant 1

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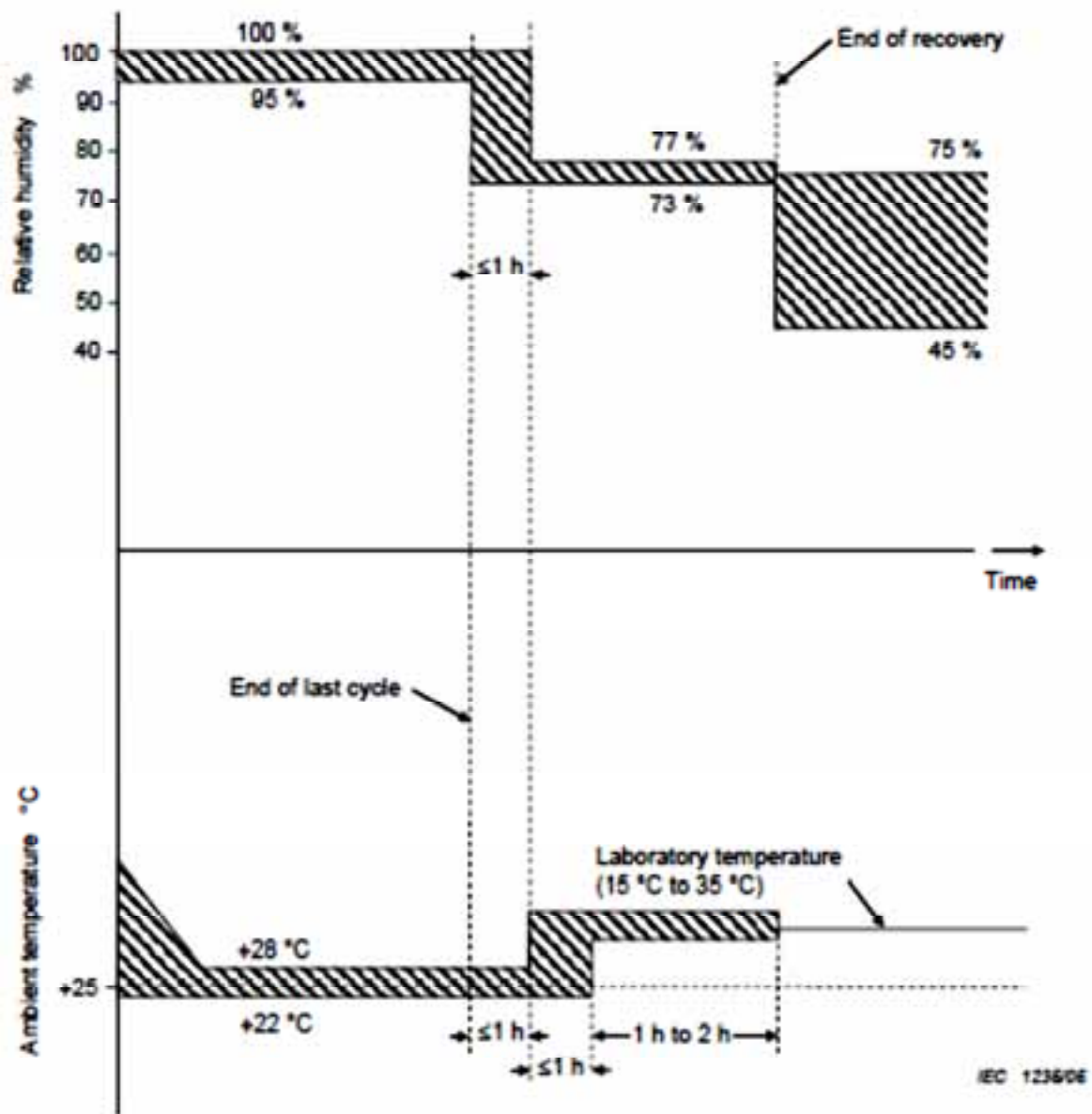


Figure 3 – Test Db – Recovery at controlled conditions

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## Annexure C

### (Informative)

#### **Selection of variant for the temperature-fall period – Guidance**

In this test two variants are included for the temperature-fall period.

**Variant 1**, where the rate of temperature fall shall be closely controlled during the first 90 minutes and the relative humidity shall be not less than 95 % except for the first 15 min when it shall be not less than 90 %. This variant requires specially designed chambers.

**Variant 1** is particularly suitable for specimens where moisture may penetrate due to the breathing effect for example, specimens which include hollow spaces where condensation may occur on internal surfaces.

**Variant 2** gives satisfactory reproducibility for all other types of specimens.

*Further information on the application of damp heat tests including a comparison of steady state and cyclic tests can be found in IEC 60068-3-41.*

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## Annexure D

### Photos



**Power Analyzer**



**Resistive Load Bank**

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## Annexure E

### Instrument Calibration Details

Local ID	Equipment Type	Test Title	Last Cal	Next Cal
ECC02	CLIMATIC CHAMBER	COLD TEST	07/06/2012	07/06/2013
ECC06	CLIMATIC CHAMBER	DRY HEAT TEST	01/02/2013	01/02/2014
EDC02	DAMP HEAT CHAMBER (PV LAB)	DRY HEAT TEST	01/27/2012	01/27/2013
H11	Temperature & Humidity Recorder (PV LAB)	EFFICIENCY TEST	05/22/2012	05/22/2013
PA09	Power Analyzer	EFFICIENCY TEST	01/09/2013	01/09/2014
PA09	Power Analyzer	EFFICIENCY TEST	01/09/2013	01/09/2014
SPS36	DC Power Supply	EFFICIENCY TEST	06/20/2012	06/20/2013
MM03	Multimeter	EFFICIENCY TEST	01/19/2013	01/19/2014
SPS09	DC Power Supply	EFFICIENCY TEST	12/05/2012	12/05/2013
SPS10	DC Power Supply	EFFICIENCY TEST	12/05/2012	12/05/2013
SW05	Stop Watch (PV LAB)	EFFICIENCY TEST	12/08/2012	12/08/2013
ECC02	CLIMATIC CHAMBER	RAPID CHANGE	07/06/2012	07/06/2013
EDC02	DAMP HEAT CHAMBER (PV LAB)	RAPID CHANGE	04/27/2012	04/27/2013

----- END OF THE TEST REPORT -----

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