Test Report

ICON SOLAR-EN POWER TECHNOLOGIES PRIVATE LIMITED

REPORT NUMBER: 4789049279 - NABL-S1

PROJECT NUMBER: 4789049279

ULR NUMBER : TC616819100000780F

12-LO-F0851 Issue: 12.0

TC-6168, TC-6221,
TC-8159

Location (A)
UL India Pvt Limited,
Laboratory building,
Kalyani Platina Campus,
Sy.no.129/4, EPIP Zone,
Phase II, Whitefield,
Bangalore – 560 066
P:91-80-41384400

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Location (B)
UL India Pvt Limited,
A-12, Sector 34, Infocity
Phase 1, Gurgaon – 122001

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Location (C)
UL India Pvt Limited,
Site: UL Jain Fire
Laboratory, Jain University
Campus, Jakkasandra,
Kanakpura Taluk,
Ramanagara Dist. – 562112

Report No. 4789049279-NABL-S1
ULR NO. TC616819100000780F

TEST DISCIPLINE: ELECTRONICS

PRODUCT GROUP : SOLAR PANEL

General details

Customer / Applicant	Icon Solar-En Power Technologies Private Limited PH No. 09, Gram-Dighari, Mandir Hasaud, Teh Arang, Raipur 492001, Chhattisgarh, India		
Manufacturer	Icon Solar-En Power Technologies Private Limited PH No. 09, Gram-Dighari, Mandir Hasaud, Teh Arang, Raipur 492001, Chhattisgarh, India		
Program	NABL		
Test Lab Location	(a) UL Bangalore	**Refer to Cover page for the UL address**	
Item Under Test	Poly-Crystalline Photovoltaic Module		
Model	72 Cell Series:- ISEN350 to ISEN150, 144 Cell Series : ISEN335X to ISEN200X 66 Cell Series :- ISEN 300N, ISEN295 to ISEN280 , 60 Cell Series :- ISEN275 to ISEN250 , 120 Cell Series :- ISEN250Y, 54 Cell Series :- ISEN250N, ISEN245 to ISEN225 , 48 Cell Series :- ISEN220 TO ISEN200 , 44 Cell Series :- ISEN200N , ISEN195, ISEN190, 40 Cell Series :- ISEN185 TO ISEN170 , 36 Cell Series:- ISEN165 to ISEN10 , 18 Cell Series ISEN5 , ISEN3		
Number of Samples	3 No's		
UL Sample Identification	2241966, 2241967, 2241968	**Refer Summary of Test results for multiple samples**	
Manufacturer Serial Number (if any)	ICON32036A0504102001, ICON32036A0504102003, ICON32036A0504102006		
Condition of IUT on receipt	Good		
Date of Receipt	22 May 2019		
Applicable Standard	IEC 61215: 2005-04 Second edition (Clause 10.2)		
Date of Testing (Start date)	27 June 2019	**End Date**	01 August 2019
UL general^ ambient condition	**Temperature in °C**		23 ±5°C
	Relative humidity in %		<70 %
Date of Reporting	13 August 2019		
Test In-charge	Ashuthosh B V		

Prathap R Senior Project Handler	Sriparn Saurabh Engineering Manager
Reviewed by	**Authorized signatory**

Fill in the rows with information or add hyphen (-)

General Remarks (If any)

1) *The below got results in this report will relate only to the items tested.*

2) *This Report shall not be reproduced except in full, without the written approval of the testing laboratory.*

3) *The test report covers models of all modules mentioned in this report.*

4). Aluminum Frame Details:

1. Frame Manufacturer:- ALOM EXTRUSIONS LTD.
2. Anodizing Process :- Matte finished Sliver Anodizing
3. *Anodizing thickness (thickness of Aluminum coating in microns): 15 MICRON*

Description of Item under Test (IUT)

POLYCRYSTALLINE PV MODULES

Enclosure:

Annexure A: Sample Identification

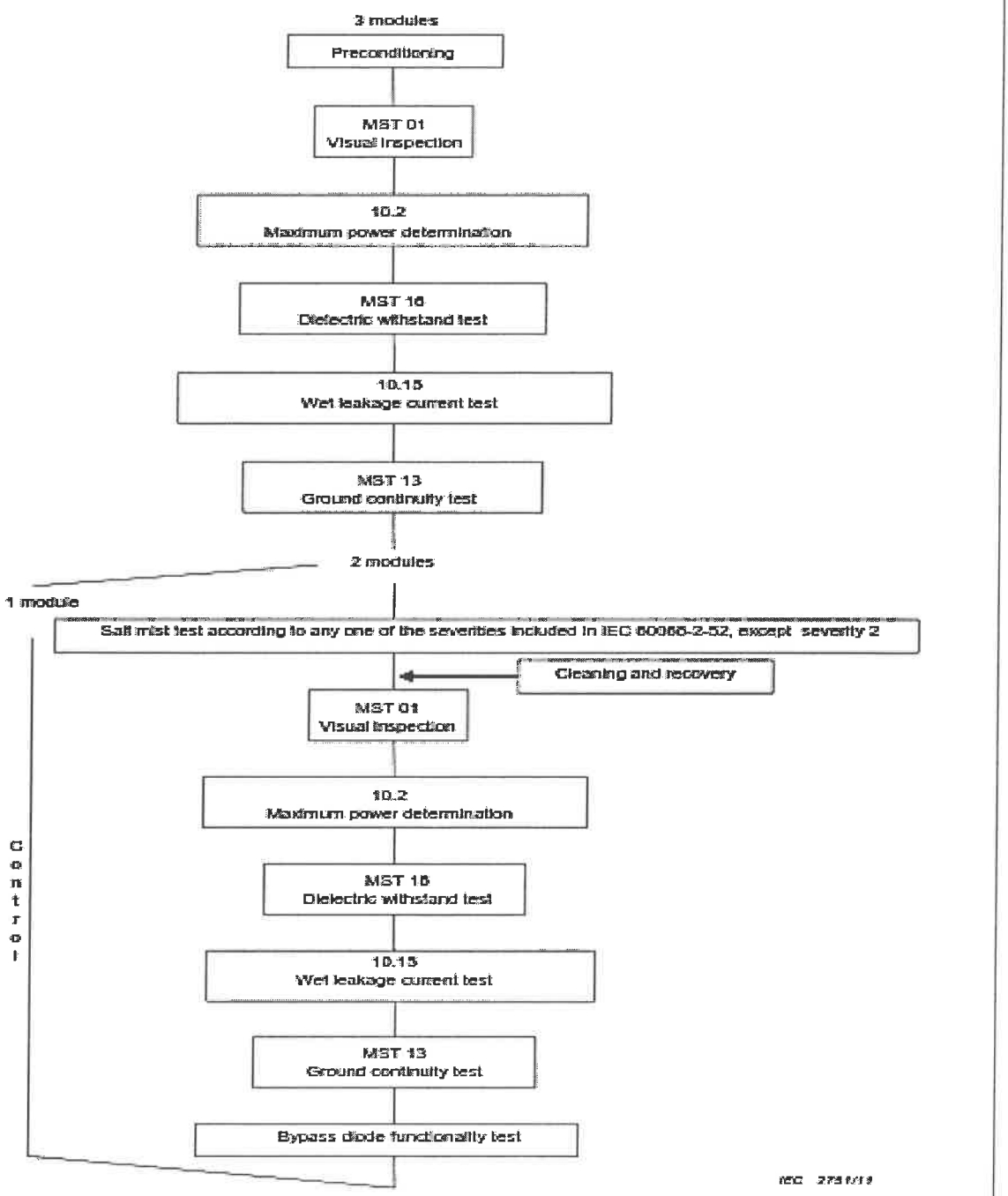
Annexure B: Summary of test results

Annexure C: Test Methods and Results

Annexure D: Instrument Calibration Details

Annexure E: BOM Declaration Details

Annexure F: PIV Graphs, PV Module components list & Photos



NOTE 1 Preconditioning and tests 10.2 and 10.15 are taken from IEC 61215. Tests MST 01, MST 13 and MST 16 are taken from IEC 61730-2.

NOTE 2 The control module should be used as a check every time the test modules are measured to evaluate the effect of the salt mist test.

Figure 1 – Salt mist corrosion testing sequence for crystalline silicon PV modules

ANNEXURE A

Sample Identification List

Sample Identification				
UL Sample No.	**Identification in Report**	**Sample Serial Number**	**Date Received**	**Product Description**
2241966	1	ICON32036A0504102001	2019/05/22	SOLAR PV MODULES, ISEN320
2241967	2	ICON32036A0504102003	2019/05/22	SOLAR PV MODULES, ISEN320
2241968	3	ICON32036A0504102006	2019/05/22	SOLAR PV MODULES, ISEN320

Reviewed by signature:

Annexure B

Summary of test results

Test No.	Test Name	Results
1	Preconditioning	All the samples were preconditioned for 5.5 kwhr
2	Visual Inspection Test (Before Salt Mist Test)	No visual defects were observed
3	Maximum Power Determination (Before Salt Mist Test)	Maximum power obtained: 1) 2241966- 327.56 W 2) 2241967- 326.47W 3) 2241968- 327.42 W
4	Dielectric withstand Test (Before Salt Mist Test)	No Dielectric Breakdown
5	Wet leakage current Test (Before Salt Mist Test)	No Dielectric Breakdown
6	Ground Continuity Test (Before Salt Mist Test)	All the resistances measured were within 0.1 Ohm.
7	**Salt Mist Test (Severity 1)**	**Test conducted on 2 samples**
8	Visual Inspection Test (After Salt Mist Test)	No visual defects were observed
9	Maximum Power Determination (After Salt Mist Test)	Maximum power obtained: 1) 2241966- 325.08W 2) 2241967- 325.11W
10	Dielectric withstand Test (After Salt Mist Test)	No Dielectric Breakdown
11	Wet leakage current Test (After Salt Mist Test)	No Dielectric Breakdown
12	Ground Continuity Test (After Salt Mist Test)	All the resistances measured were within 0.1 Ohm.
13	Bypass diode functionality test	All the bypass diodes remain Operational
14	Maximum Power Determination (After Bypass diode Test)	Maximum power obtained: 1) 2241966- 324.08W 2) 2241967- 323.97W

ANNEXURE C

TEST METHODS AND RESULTS

Preconditioning

All test samples shall be preconditioned with either global or direct normal sunlight (natural or simulated) according to the specifications given in the applicable design qualification and type approval IEC Standard applicable to the PV module technology considered, i.e., IEC 61215 for crystalline silicon.

(Before conducting preconditioning -> short visual inspection)

Before beginning testing, all modules, including the control, shall be exposed to sunlight (either real or simulated) at an irradiation level of 5 kWh/m 2 to 5.5 kWh/m2 while open-circuited.

Apparatus:

The following equipment is required to perform Preconditioning in natural sunlight:

a) A PV reference device (in accordance with IEC 60904-2) such as a reference cell, a reference module or a pyranometer.

b) A suitable mount for supporting the test specimen and the reference device (A two-axis tracking system capable of tracking the sun is recommended in order to reduce testing time to a minimum, but it is not required).

c) A system for collecting continuous short circuit data from the reference device. Data points should collected at minimum intervals of 1 minute apart. If the data collection system is not capable of recording and displaying the cumulative Amp-Hour (Ah) output from the reference device, the cumulative Amp-Hour (Ah) output shall be determined by calculation from the raw data file.

Procedure (in natural sunlight):

If natural sunlight is used the exposure should be scheduled to take place during mid-day, so as to have peak solar irradiance take place during roughly the middle of the exposure period. To complete the exposure in 1 workday the test should be scheduled for a day when the solar irradiance is at least 700 W/m2 (average over 8 hours)

Before starting calculate an estimated amount of time for the required exposure using table 1: Estimated Duration Calculation.

Determine the Ah output of the reference device that equates to the solar Irradiation level of 5.0 kWh/m2, using the rated values provided for the reference. Using table 2: Cumulative Ah Calculation.

Procedure (all types):

With the test specimen and the reference device mounted co-planar on the mounting system expose the specimen to the irradiance, and begin collecting the cumulative Amp-Hour (Ah) output data from the reference device

Immediately upon completion the test specimen shall be removed from exposure to the irradiance.

If the data collection system is not able to automatically signal completion, the recorded data shall be checked periodically as needed to ensure that the total irradiation does not exceed 5.5 kWh/m2.

If the data collection system is not capable of recording and displaying the cumulative Amp-Hour (Ah) output from the reference device, the cumulative Amp-Hour (Ah) output shall be determined by calculation and checked periodically as needed to ensure that the total irradiation does not exceed 5.5kWh/m2.

If a calibrated automatic system is used the following calculations may be used only if needed.

TABLE 1: Estimated Duration Calculation

Estimated average irradiance level	1.0	kW/m^2
Required Irradiation level	5 - 5.5	kWh/m^2
Estimated Duration	5.0	h

$$EstimatedDuration = \frac{\text{irradiation level}(kW * h/m2)}{\text{irradiance level}(kW/m2)}$$

TABLE 2: Cumulative Ah Calculation

Reference device rating	--	$A/kW/m^2$ or $(A{\cdot}m^2/kW)$
Required Irradiation level	5 – 5.5	kWh/m^2
Required Ah output	--	Ah

$$Cumulative-Ah = [DeviceRating(A \cdot m^2 / kW)] * [5.0(kW \cdot h / m^2]$$

Test Date: 06/27/2019

TABLE 3: Final Results

Duration of exposure	5.21	h
Irradiance level	990	W/m^2
Cumulative Ah output	-	Ah
Irradiation level	5.15	kWh/m^2

[X] All of the modules were exposed to the required irradiance.

Visual inspection (Before Salt Mist Test) (MST 01)

Test samples

Three samples of the solar module were submitted for testing.

Test conditions

Carefully inspect each sample under an illumination of not less than 1000 lux for the following conditions:

1. No mechanical deterioration of module components which would significantly impair their

Function during their intended life.

2. No mechanical corrosion of module components which would significantly impair their

Function during their intended life.

Compliance Criteria – The Visual inspection before Salt mist test shall not exhibit any mechanical deterioration or corrosion on solar modules which would significantly impair their function during their intended life.

Result –

Test Date: 06/28/2019

Sample No.	Visual Inspection (10.1.)	P/F
2241966	No Visual defects was Found	P
2241967	No Visual defects was Found	P
2241968	No Visual defects was Found	P
Remarks: NA		

Maximum Power Determination (10.2) (Before Salt Mist Test)

Test samples

Three samples of the solar module after Visual Inspection were subjected to Maximum Power determinations (Before Salt Mist Test).

Test configuration

The following equipment was used to perform I-V characteristic measurements in simulated sunlight (solar simulator):

a) Class A solar simulator in accordance with IEC 60904-9. The designated test area was greater than the area that is spanned by the test specimen.

b) A PV reference solar module in accordance with IEC 60904-2 was used to calibrate the sun simulator

c) The means for monitoring the temperature of the test specimen and the reference device to an accuracy of ±1 °C and repeatability of ±0.5 °C.

d) An irradiance sensor that tracks the instantaneous irradiance was placed in the test plane. This irradiance sensor was linear in the range of irradiances over which the measurements were taken.

e) The temperature of the reference device and the specimen was measured using instrumentation with accuracy of ±1 °C with repeatability of ±0.5 °C.

f) Equipment for measuring the current of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

g) Equipment for measuring the voltage of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

Compliance Criteria –

The Solar modules underwent the Maximum power determination test before Salt Mist Test, in order to record the Electrical data (Maximum Power) which was compared and analyzed for Percentage degradation after performing Salt Mist Test.

Result –

Test Date: 06/28/2019

10.2	TABLE: Maximum Power Determination (Initial)				
Cell temperature (°C) :	25	—			
Irradiance (W/m²) :	1000	—			
Initial examination					
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
2241966	46.13	37.79	9.13	8.67	327.56
2241967	46.16	37.91	9.13	8.61	326.47
2241968	46.15	37.87	9.14	8.65	327.42
Remarks: Refer PIV graphs for FF value.					

Dielectric Withstand Test (Before Salt Mist Test) (MST 16)

This test is identical with test Insulation Test (10.3) from IEC61215/IEC61646 with test levels depending on the application class and the maximum system voltage.

Sample Requirements

Same Solar modules from Maximum power determination test were submitted for this test.

Test configuration

a) Connect the shorted output terminals of the module to the positive terminal of a d.c. insulation tester with a current limitation.
b) Connect the exposed metal parts of the module to the negative terminal of the tester
c) Increase the voltage applied by the tester at a rate not exceeding 500 V./sec. to a maximum equal to the maximum test voltage(The maximum test voltage shall be equal to 2000V plus four times the maximum system voltage for application-class A and equal to 1000V plus two times the maximum system voltage for application-class B). Maintain the voltage at this level for 1 min.
d) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.
e) Remove the short circuit.

f) Increase the voltage applied by the test equipment at a rate not to exceed 500 V/sec. to the maximum test voltage. Maintain the voltage at this level for 2 min. Then determine the insulation resistance.
g) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.
h) Remove the short circuit and disconnect the test equipment from the module.

Compliance Criteria –

For modules with an area greater than 0.1 m^2, there shall not be any dielectric breakdown or arc-over during Dielectric withstand test, and the measured insulation resistance shall not be less than __20.6__Mega Ohms.

Sample #	Length m	Width m	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
2241966	1.966	0.986	1.938	20.6
2241967				
2241968				

Results –

Test Date: 06/28/2019

MST 16	**Table: Dielectric Withstand Test**		
Module maximum system voltage rating (V, DC) :		1500	—
Potential applied (V, DC) :		IR = 1500 DWT = 8000	—
Initial Tests			
Sample #	Measured (GΩ)	Result	
2241966	1.68	P	
2241967	1.88	P	
2241968	8.87	P	
Remarks: NA			

For modules with an area greater than 0.1 m^2, there [was] [~~was not~~] no indication of dielectric breakdown or arc-over during Dielectric Withstand Test, and the measured insulation resistance [~~was~~] [was not] less than _20.6_Mega Ohms.

Lab Condition:- Temp: 25.3°C, Humidity: 44.0%

Reviewed by signature:

Wet leakage current test (Before Salt Mist Test) (10.15)

Sample Requirements

Same Solar modules from Dielectric Withstand Test were submitted for this test.

Test configuration

a) Immerse the module in the tank of the required solution (with resistivity 3500Ω.cm or less, surface tension 0.03N.M^{-1} or less, temperature 22°C±3°C) to a depth sufficient to cover all surfaces except junction box entries not designed for immersion. The cable entries shall be thoroughly sprayed with solution. If the module is provided with a mating connector, the connector should be immersed during the test.

b) Connect the shorted output terminals of the module to the positive terminal of the test equipment. Connect the liquid test solution to the negative terminal of the test equipment using a suitable metallic conductor.

c) Increase the voltage applied by the tester at a rate not exceeding 500 V./sec. to a maximum equal to 1000 V , maintain the voltage at this level for 2 min. Then determine the insulation resistance.

d) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.

Compliance Criteria –

For modules with an area greater than 0.1 m^2, the measured insulation resistance shall not be less than 20.6 Mega Ohms.

Sample #	Length m	Width m	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
2241966	1.966	0.986	1.938	20.6
2241967				
2241968				

Result-

Test Date: 06/28/2019

10.15	**TABLE: Wet leakage current test (Initial)**		
Test voltage applied [V] .....:		1500	—
Module maximum system voltage rating (V, DC) :		1500	—
Solution resistivity [Ω cm], < 3,500 Ω cm at 22 ± 3 °C :		2180 Ω cm at 21.8°C	—
Sample No.	Measured [GΩ]	Limit [MΩ]	Result
2241966	4.75	20.6	P
2241967	3.22	20.6	P
2241968	3.54	20.6	P
Remarks: NA			

Ground Continuity Test (Before Salt Mist Test) (MST 13)

Sample Requirements

Same Solar modules from Wet leakage current test t were submitted for this test.

Test configuration

a) Select the manufacturer's designated grounding point and recommended grounding connection. Attach to one terminal of the constant current supply.

b) Select an adjacent(connected) exposed conductive component with the greatest physical displacement from the grounding point, and attach to the other terminal of the current supply.

c) Attach the voltmeter to the two conductive components attached to the current supply in proximity to the current leads.

d) Apply a current 2.5 times ±10% of the maximum over-current protection rating of the module for a minimum of 2 min.

e) Measure the applied current and the resultant voltage drop

f) Reduce the current to zero.

g) Repeat the test on one additional frame component.

Compliance Criteria –

The resistance between the selected exposed conductive component and each other conductive component of the module shall be less than 0.1Ω.

Result-

Test Date: 06/28/2019

MST 13	**Ground Continuity Test (Initial)**			
	Maximum over-current protection rating (A) :	15		—
	Current applied (A) :	2.5x15=37.5		
	Location of designated grounding point :	Along the grounding holes		—
	Location of second contacting point :	Along the grounding holes		—
Sample No.	**Position in test sequence:**	**Voltage (V)**	**Resistance (milli Ω)**	**P/F**
2241966	Initial examination	0.30	8.00	P
	Final examination	0.32	8.53	P
2241967	Initial examination	0.26	6.93	P
	Final examination	0.26	6.93	P
2241968	Initial examination	0.45	12.00	P
	Final examination	0.48	12.80	P
Remarks: NA				

Salt Mist Test (Severity 1)

Test samples

Two samples from Ground Continuity Test (Before Salt Mist Test) were submitted for this test.

Test configuration

The chamber for this test was constructed of such materials that would not influence the corrosive effects of the salt mist. The detailed construction of the chamber, including the method of producing the mist is as follows:

a) The conditions in the chamber were within the limits specified;

b) A sufficiently large volume with constant, homogeneous conditions (not affected by turbulence) is Available

c) No direct spray impinges upon the specimens under test;

d) Drops of liquid accumulating on the ceiling, the walls or other parts did not drip on the specimens;

e) The chamber was properly vented to prevent pressure build-up and allow uniform distribution of salt fog. The discharge end of the vent was protected from squalls which can cause strong air currents in the chamber.

f) During testing the face of the PV module normally exposed to solar irradiance shall be inclined 15° to 30° from vertical inside the salt mist chamber.

Atomizer (s)

The atomizer(s) used were of such a design and construction as to produce a finely divided, wet, dense mist. The atomizer(s) was made of material that is non-reactive to the salt solution.

Salt solution Concentration

The salt used for the test was of high quality sodium chloride (NaCl) when dry, not more than 0.1% sodium iodide and not more than 0.3% of total impurities.

The salt solution concentration was 5 ± 1% by weight.

pH value

The pH value of the solution was 7.01 at a temperature of 35±2 degree C.

Severity (1)

For severities (1)

by the combination of the number of spray periods and the duration of the storage under humid conditions following each spray period.

Severity (1): four spray periods, each of 2 h, with a humidity storage period of seven days after each.

NOTE – The humidity storage period should be suitably reduced so that the spray period plus storage period is seven days.

9 Testing

9.1 The specimen shall be placed in the salt mist chamber, and sprayed with the salt solution, for a period of 2 h at a temperature between 15 °C and 35 °C.

9.2 The salt mist conditions shall be maintained in all parts of the exposure zone, that a clean collecting receptacle with a horizontal collecting area of 80 cm^2, placed at any point in the exposure zone, shall collect between 1,0 ml and 2,0 ml of solution per hour, averaged over the collecting period. A minimum of two receptacles shall be used. The receptacles shall be placed such that they are not shielded by the specimen and so that no condensate from any source shall be collected.

NOTE – When calibrating the spray rate of the chamber, a minimum spray period of 8 h should be used, for accurate measurement purposes.

9.3 *Severities (1)*

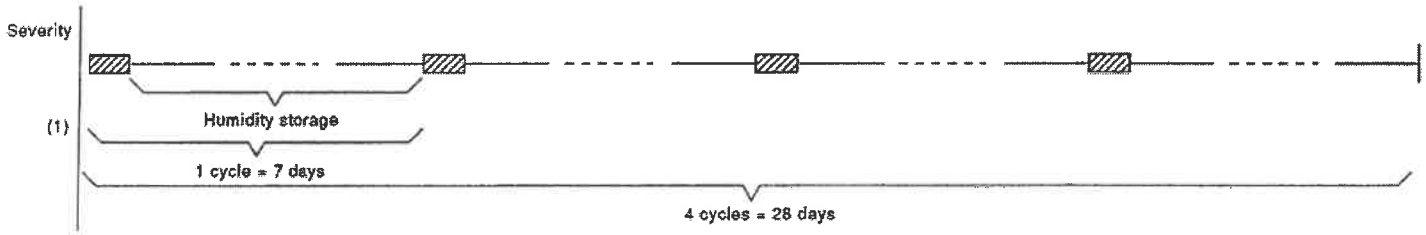
At the end of the spray period, the specimen shall be transferred to the humidity chamber and stored at a temperature of 40 °C ± 2 °C and a relative humidity of (93^{+2}_{-3}) % in accordance with IEC 68-2-3.

The spraying with salt solution as in 9.1 and the storage as in this subclause constitutes one cycle.

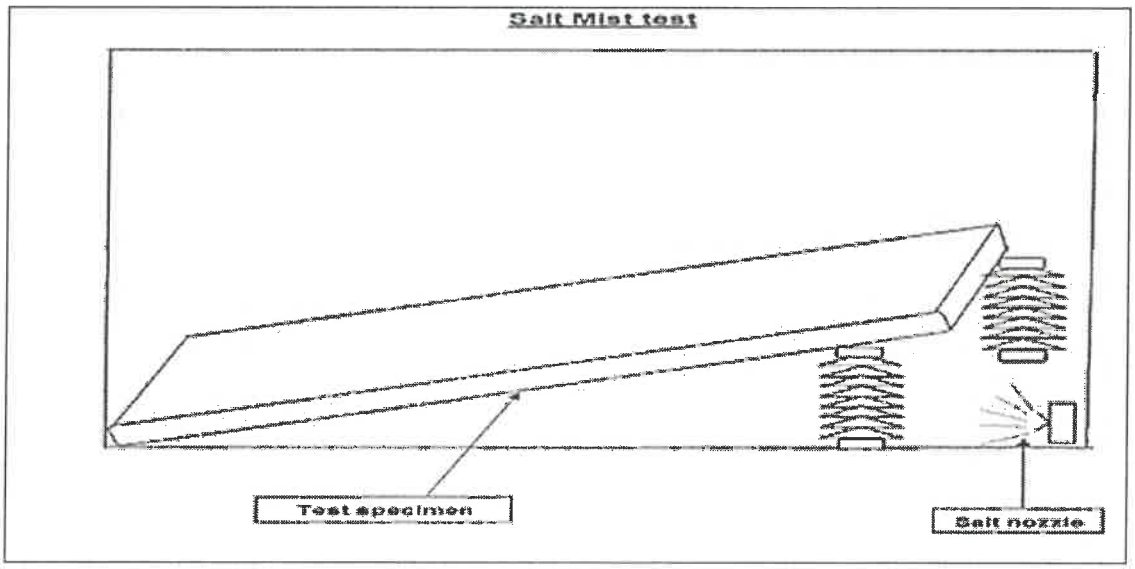
10 Recovery (at the end of testing)

The relevant specification shall state whether or not the specimen shall be washed. If the specimen is to be washed, it shall be washed in running tap water for 5 min, rinsed in distilled or demineralized water, shaken by hand or subjected to air blast to remove droplets of water, then dried for 1 h at 55 °C ± 2 °C and allowed to cool under controlled recovery conditions (IEC 68-1, 5.4.1) for not less than 1 h and not more than 2 h.

The relevant specification shall specify, if needed, other methods to be used for washing and drying the specimen. It shall be stored under controlled recovery conditions (IEC 68-1, 5.4.1) for not less than 1 h and not more than 2 h. The temperature of the water used for washing shall not exceed 35 °C.



Total test time is around 28 days (Approximate).



Compliance Criteria –

a) No mechanical deterioration or corrosion of module components which would significantly impair their function during their intended life.

b) The electrical performance (maximum power) shall not decrease by more than 5 % of the initial value.

c) The requirements of the insulation test shall meet.

Result –

Test Date: 06/28/2019 to 07/31/2019

There ~~[was]~~ [was no] mechanical deterioration or corrosion of module components after test.

Sample No.	Temperature (°C)	Humidity (%)	Starting Time & Date	End Time & Date
2241966	40	93	3pm - 06/28/2019	2pm - 07/31/2019
2241967	40	93	3pm - 06/28/2019	2pm - 07/31/2019
Remarks: NA				

Test Date: 07/31/2019

Visual inspection (After Salt Mist Test) (MST 01)

Test samples

Two samples of the solar module after Salt mist test were visually inspected.

Test conditions

Carefully inspect each sample under an illumination of not less than 1000 lux for the following conditions:

1. No mechanical deterioration of module components which would significantly impair their

Function during their intended life.

2. No mechanical corrosion of module components which would significantly impair their

Function during their intended life.

Revie ved by signature:

Compliance Criteria – The Visual inspection before Salt mist test shall not exhibit any mechanical deterioration or corrosion on solar modules which would significantly impair their function during their intended life.

Result –

Sample No.	Visual Inspection (10.1)	P/F
2241966	No visual defects was found	P
2241967	No visual defects was found	P
Remarks: NA		

Maximum Power Determination (10.2) (After Salt Mist Test)

Test samples

Two samples of the solar module after Visual Inspection were subjected to Maximum Power determinations.

Test configuration

The following equipment was used to perform I-V characteristic measurements in simulated sunlight (solar simulator):

a) Class A solar simulator in accordance with IEC 60904-9. The designated test area was greater than the area that is spanned by the test specimen.

b) A PV reference solar module in accordance with IEC 60904-2 was used to calibrate the sun simulator

c) The means for monitoring the temperature of the test specimen and the reference device to an accuracy of ±1 °C and repeatability of ±0.5 °C.

d) An irradiance sensor that tracks the instantaneous irradiance was placed in the test plane. This irradiance sensor was linear in the range of irradiances over which the measurements were taken.

e) The temperature of the reference device and the specimen was measured using instrumentation with accuracy of ±1 °C with repeatability of ±0.5 °C.

f) Equipment for measuring the current of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

g) Equipment for measuring the voltage of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

Compliance Criteria –

The Solar modules underwent the Maximum power determination test before Salt Mist Test, in order to record the Electrical data (Maximum Power) which was compared and analyzed for Percentage degradation after performing Salt Mist Test.

Result –

Test Date: 07/31/2019

10.2	TABLE: Maximum Power Determination				
Cell temperature (°C) :			25		—
Irradiance (W/m²) :			1000		—
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
2241966	45.83	37.54	9.14	8.66	325.08
2241967	45.87	37.55	9.15	8.66	325.11
Remarks: refer PIV graphs for FF values.					

Calculation of Pmp degradation as a result of Salt mist test:

100 * (Pmp after test – Pmp before test) / Pmp before test				
Sample	**Pmp before test [W]**	**Pmp after test [W]**	**Result of calculation [%]**	**Result**
2241966	327.56	325.08	**-0.75**	P
2241967	326.47	325.11	**-0.41**	P

The degradation of maximum output power **[~~did~~] [did not]** exceed 5 % of the initial value measured.

Dielectric Withstand Test (After Salt Mist Test) (MST 16)

This test is identical with test Insulation Test (10.3) from IEC61215 with test levels depending on the application class and the maximum system voltage.

Sample Requirements

Same Solar modules from Maximum power determination test were submitted for this test.

Test configuration

a) Connect the shorted output terminals of the module to the positive terminal of a d.c. insulation tester with a current limitation.

b) Connect the exposed metal parts of the module to the negative terminal of the tester

c) Increase the voltage applied by the tester at a rate not exceeding 500 V./sec. to a maximum equal to the maximum test voltage(The maximum test voltage shall be equal to 2000V plus four times the maximum system voltage for application-class A and equal to 1000V plus two times the maximum system voltage for application-class B). Maintain the voltage at this level for 1 min.

d) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.

e) Remove the short circuit.

f) Increase the voltage applied by the test equipment at a rate not to exceed 500 V/sec. to the maximum test voltage. Maintain the voltage at this level for 2 min. Then determine the insulation resistance.

g) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.

h) Remove the short circuit and disconnect the test equipment from the module.

Compliance Criteria –

For modules with an area greater than 0.1 m^2, there shall not be any dielectric breakdown or arc-over during Dielectric withstand test, and the measured insulation resistance shall not be less than ____Mega Ohms.

Sample #	Length m	Width M	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
2241966	1.966	0.986	1.938	20.6
2241967				

Results –

Reviewed by signature:

Test Date: 08/01/2019

MST 16	**Table: Dielectric Withstand Test**		
Module maximum system voltage rating (V, DC) :		1500	—
Potential applied (V, DC) :		DWT = 8000 IR = 1500	—
Sample #	Measured (GΩ)	Result	
2241966	4.27	Pass	
2241967	3.82	Pass	
Remarks: NA			

For modules with an area greater than 0.1 m^2, there [was][~~was not~~] no indication of dielectric breakdown or arc-over during Dielectric Withstand Test, and the measured insulation resistance [was] [~~was not~~] less than _20.__Mega Ohms.

Lab Condition:- Temp: 25.8°C, Humidity: 47.9%

Wet leakage current test (After Salt Mist Test) (10.15)

Sample Requirements

Same Solar modules from Dielectric Withstand Test were submitted for this test.

Test configuration

a) Immerse the module in the tank of the required solution(with resistivity 3500Ω.cm or less, surface tension 0.03N.M^{-1} or less, temperature 22°C±3°C) to a depth sufficient to cover all surfaces except junction box entries not designed for immersion. The cable entries shall be thoroughly sprayed with solution. If the module is provided with a mating connector, the connector should be immersed during the test.

b) Connect the shorted output terminals of the module to the positive terminal of the test equipment. Connect the liquid test solution to the negative terminal of the test equipment using a suitable metallic conductor.

c) Increase the voltage applied by the tester at a rate not exceeding 500 V./sec. to a maximum equal to 1000 V , maintain the voltage at this level for 2 min. Then determine the insulation resistance.

d) Reduce the applied voltage to zero and short-circuit the terminals of the test equipment to discharge the voltage build-up in the module.

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Compliance Criteria –

For modules with an area greater than 0.1 m^2, the measured insulation resistance shall not be less than _20.6_Mega Ohms.

Sample #	Length M	Width m	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
2241966	1.966	0.986	1.938	20.6
2241967				

Result-

Test Date: 08/01/2019

10.15	**TABLE: Wet leakage current test**		
Test voltage applied [V] .....:		1500	—
Module maximum system voltage rating (V, DC) :		1500	—
Solution resistivity [Ω cm], < 3,500 Ω cm at 22 ± 3 °C :		1850	—
Solution Temperature ^{0}C		24.4	
Sample No.	Measured [GΩ]	Limit [MΩ]	Result
2241966	3.44	20.6	P
2241967	2.92	20.6	P
Remarks: NA			

Ground Continuity Test (After Salt Mist Test) (MST 13)

Sample Requirements

Same Solar modules from Wet leakage current test t were submitted for this test.

Test configuration

a) Select the manufacturer's designated grounding point and recommended grounding connection. Attach to one terminal of the constant current supply.

b) Select an adjacent (connected) exposed conductive component with the greatest physical displacement from the grounding point, and attach to the other terminal of the current supply.

c) Attach the voltmeter to the two conductive components attached to the current supply in proximity to the current leads.

d) Apply a current 2.5 times ±10% of the maximum over-current protection rating of the module for a minimum of 2 min..

e) Measure the applied current and the resultant voltage drop

f) Reduce the current to zero.

g) Repeat the test on one additional frame component.

Compliance Criteria –

The resistance between the selected exposed conductive component and each other conductive component of the module shall be less than 0.1Ω.

Result-

Test Date: 06/19/2019

MST 13	Ground Continuity Test			
	Maximum over-current protection rating (A) :	15		—
	Current applied (A) :	2.5x15=37.5		
	Location of designated grounding point :	Along the grounding holes		—
	Location of second contacting point :	Along the grounding holes		—
Sample No.	**Position in test sequence:**	**Voltage (V)**	**Resistance (milli Ω)**	**P/F**
2241966	Initial examination	0.36	9.60	P
	Final examination	0.36	9.60	P
2241967	Initial examination	0.38	10.13	P
	Final examination	0.40	10.66	p
Remarks: NA				

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Bypass diode functionality test (After Salt Mist Test)

Sample Requirements

Same Solar modules from Ground Continuity Test (After Salt Mist Test) were submitted for this test.

Test configuration

This procedure can be conducted in any ambient within 25°C±10°C. During the test the sample shall not be subjected to illumination.

a) Electrically short any blocking diodes incorporated to the test sample

b) Determine the rated STC short-circuit current of the test sample from its label or instruction sheet.

c) Connect the DC power source's positive output to the test sample negative lead, and the DC power source's negative output to the test sample positive lead by using wires of the manufacturer's minimum recommended wire gauge. Follow the manufacturer's recommendations for wire entry into the wiring compartment. With this configuration the current shall pass through the cells in the reverse direction and through the diode(s) in the forward direction.

NOTE some modules have overlapping bypass diode circuits; in this case it may be necessary to install a jumper cable to ensure that all the current is flowing through one bypass diode.

d) Apply a current equal to of 1.25 times (±5%) the STC short-circuit current of the test samples for a period of 1 h.

Compliance Criteria –

After the 1 h of current flow check that the bypass diode(s) remains operational / non-operational.

Check for below Table for results.

Result-
Test Date: 08/01/2019

TABLE: Bypass diode functionality test		
Sample No.	2241966	—
Module temperature [°C] :	25°C±10°C	—
Number of diodes in junction box :	3	—
Diode manufacturer :	Panjit Semiconductor	—
Diode type designation :	Schottky Diodes	—

Rated STC short-circuit current [A] :	9.12			—
Current flow (1.25 * Isc) [A] :	11.40			—
Test duration (hour)	1			
	D1	D2	D3	Result
Diode functional? yes/no :	Yes	Yes	Yes	Pass
Remarks: NA				

Test Date:08/01/2019

TABLE: Bypass diode functionality test				
Sample No.	2241967			—
Module temperature [°C] :	25°C±10°C			—
Number of diodes in junction box :	3			—
Diode manufacturer :	Panjit Semiconductor			—
Diode type designation :	Schottky Diodes			—
Rated STC short-circuit current [A] :	9.12			—
Current flow (1.25 * Isc) [A] :	11.40			—
Test duration (hour)	01			
	D1	D2	D3	Result
Diode functional? yes/no :	Yes	Yes	Yes	Pass
Remarks: NA				

Maximum Power Determination (10.2) (After Bypass Diode Test)

Test samples

Two samples of the solar module after Bypass Diode test were subjected to Maximum Power determinations.

Test configuration

The following equipment was used to perform I-V characteristic measurements in simulated sunlight (solar simulator):

a) Class A solar simulator in accordance with IEC 60904-9. The designated test area was greater than the area that is spanned by the test specimen.

b) A PV reference solar module in accordance with IEC 60904-2 was used to calibrate the sun simulator

c) The means for monitoring the temperature of the test specimen and the reference device to an accuracy of ±1 °C and repeatability of ±0.5 °C.

d) An irradiance sensor that tracks the instantaneous irradiance was placed in the test plane. This irradiance sensor was linear in the range of irradiances over which the measurements were taken.

e) The temperature of the reference device and the specimen was measured using instrumentation with accuracy of ±1 °C with repeatability of ±0.5 °C.

f) Equipment for measuring the current of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

g) Equipment for measuring the voltage of the test specimen and reference device to an accuracy of ±0.2 % of the reading.

Compliance Criteria –

The Solar modules underwent the Maximum power determination test before Salt Mist Test, in order to record the Electrical data (Maximum Power) which was compared and analyzed for Percentage degradation after performing Salt Mist Test.

Result –

Test Date: 08/01/2019

10.2	**TABLE: Maximum Power Determination**				
Cell temperature (°C) :			25		—
Irradiance (W/m^2) :			1000		—
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
2241966	46.02	37.58	9.16	8.62	324.08
2241967	45.58	37.55	9.16	8.63	323.97
Remarks: refer PIV graph for FF values.					

ANNEXURE D

INSTRUMENT CALIBRATION DETAILS

Sl. No	Test Name	Id Number	Description	Expiration Date
1	Pre conditioning	69889	PYRANOMETER (PV LAB)	2022-AUG-23
2	Pre conditioning	70817	Datalogger	2020-MAY-07
3	Pre conditioning	71790	CONTINOUS SIMULATOR	NA
4	Visual Inspection	80703	Light Meters & Sensors	2020-MAR-25
5	Visual Inspection	160912	Fixture, For Testing, Table	NA
6	Visual Inspection	76645	Magnifying Lens, Without Ruler	NA
7	Maximum Power Determination	70683	Thermometer, Infrared	2020-FEB-11
8	Maximum Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
9	Maximum Power Determination	70472	FLASH SOLAR SIMULATOR	NA
10	Maximum Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
11	Dielectric Withstand Test	65675	Datalogger, RH & Temperature	2020-FEB-06
12	Wet leakage current test	177913	Meter, pH, Digital or Analog	2020-MAR-04
13	Wet leakage current test	167776	Fixture, For Testing, Water Tank	
14	Wet leakage current test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
15	Wet leakage current test	67918	Indicator, Temperature	2020-JAN-10
16	Wet leakage current test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
17	Ground Continuity Test	127260	EARTH CONTINUITY TESTER	2019-NOV-22
18	Ground Continuity Test	68612	Datalogger, RH & Temperature	2019-SEP-14
19	Ground Continuity Test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
20	Insulation resistance test	68600	Apparatus, Insulation Resistance Test	2020-APR-22
21	Insulation resistance test	68612	Datalogger, RH & Temperature	2019-SEP-14
22	Insulation resistance test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
23	Salt Mist Test	70752	Chamber, Conditioning, Salt Fog	2020-FEB-02
24	Salt Mist Test	68611	Datalogger, RH & Temperature	2020-FEB-06
25	Salt Mist Test	69891	Gauge, Inclinometer, Digital or Analog	2019-AUG-04
26	Salt Mist Test	67909	Indicator, Temperature	2020-JUN-06
27	Salt Mist Test	178001	Gauge, Force, Digital or Analog	2020-MAR-26
28	Salt Mist Test	71546	Chamber, Climatic, Temp and RH	2020-JAN-09
29	Salt Mist Test	67124	Meter, pH, Digital or Analog	NA
30	Salt Mist Test	70752	Chamber, Conditioning, Salt Fog	2020-FEB-02
31	Salt Mist Test	68611	Datalogger, RH & Temperature	2020-FEB-06
32	Salt Mist Test	69891	Gauge, Inclinometer, Digital or Analog	2019-AUG-04
33	Salt Mist Test	67909	Indicator, Temperature	2020-JUN-06
34	Salt Mist Test	178001	Gauge, Force, Digital or Analog	2020-MAR-26
35	Salt Mist Test	71546	Chamber, Climatic, Temp and RH	2020-JAN-09

36	Salt Mist Test	67124	Meter, pH, Digital or Analog	NA
37	Salt Mist Test	70752	Chamber, Conditioning, Salt Fog	2020-FEB-02
38	Salt Mist Test	68611	Datalogger, RH & Temperature	2020-FEB-06
39	Salt Mist Test	69891	Gauge, Inclinometer, Digital or Analog	2019-AUG-04
40	Salt Mist Test	67909	Indicator, Temperature	2020-JUN-06
41	Salt Mist Test	178001	Gauge, Force, Digital or Analog	2020-MAR-26
42	Salt Mist Test	71546	Chamber, Climatic, Temp and RH	2020-JAN-09
43	Salt Mist Test	67124	Meter, pH, Digital or Analog	NA
44	Salt Mist Test	70752	Chamber, Conditioning, Salt Fog	2020-FEB-02
45	Salt Mist Test	68611	Datalogger, RH & Temperature	2020-FEB-06
46	Salt Mist Test	69891	Gauge, Inclinometer, Digital or Analog	2019-AUG-04
47	Salt Mist Test	67909	Indicator, Temperature	2020-JUN-06
48	Salt Mist Test	178001	Gauge, Force, Digital or Analog	2020-MAR-26
49	Salt Mist Test	71546	Chamber, Climatic, Temp and RH	2020-JAN-09
50	Salt Mist Test	67124	Meter, pH, Digital or Analog	NA
51	Visual Inspection	180089	Meter and/or Sensor, Light	2020-JUN-15
52	Visual Inspection	160912	Fixture, For Testing, Table	NA
53	Visual Inspection	76645	Magnifying Lens, Without Ruler	NA
54	Maximum Power Determination	70683	Thermometer, Infrared	2020-FEB-11
55	Maximum Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
56	Maximum Power Determination	70472	FLASH SOLAR SIMULATOR	NA
57	Maximum Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
58	Dielectric Withstand Test	65675	Datalogger, RH & Temperature	2020-FEB-06
59	Wet leakage current test	177913	Meter, pH, Digital or Analog	2020-MAR-04
60	Wet leakage current test	167776	Fixture, For Testing, Water Tank	NA
61	Wet leakage current test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
62	Wet leakage current test	67918	Indicator, Temperature	2020-JAN-10
63	Wet leakage current test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
64	Ground Continuity Test	127260	EARTH CONTINUITY TESTER	2019-NOV-22
65	Ground Continuity Test	68612	Datalogger, RH & Temperature	2019-SEP-14
66	Ground Continuity Test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
67	Insulation resistance test	68600	Apparatus, Insulation Resistance Test	2020-APR-22
68	Insulation resistance test	68612	Datalogger, RH & Temperature	2019-SEP-14
69	Insulation resistance test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
70	Bypass diode functionality test	72925	Power Supply, DC	2020-JUN-05
71	Bypass diode functionality test	78719	Multimeter, Digital, Handheld	2020-JAN-10
72	Bypass diode functionality test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11

73	Maximum Power Determination	70683	Thermometer, Infrared	2020-FEB-11
74	Maximum Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
75	Maximum Power Determination	70472	FLASH SOLAR SIMULATOR	NA
76	Maximum Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04

ANNEXURE E

BOM Declaration

Electrical parameters of En-Icon modules to be covered Salt Mist.

PV Module Model Name	Wattage (Wp)	Maximum System Voltage (V dc)	Open Circuit Voltage @ STC, (Voc)	Rated Voltage @ STC/Vmp (V dc)	Rated Current @ STC/Imp (A)	Short Circuit Current @ STC/Isc (A)	Rated Maximum Power at STC, (Watts)	Maximum Series Fuse, (A)
ISEN350	350	1500	46.78	37.14	9.43	9.69	350.2	15
ISEN345	345	1500	46.66	37.04	9.32	9.59	345.2	15
ISEN340	340	1500	46.52	36.97	9.20	9.50	340.1	15
ISEN335	335	1500	45.40	36.87	9.09	9.41	335.1	15
ISEN330	330	1500	45.26	36.80	8.97	9.31	330.1	15
ISEN325	325	1500	45.14	36.69	8.86	9.23	325.1	15
ISEN320	320	1500	45.00	36.58	8.76	9.12	320.2	15
ISEN315	315	1500	44.86	36.52	8.63	9.02	315.2	15
ISEN310	310	1500	44.70	36.43	8.51	8.93	310.0	15
ISEN305	305	1500	44.59	36.33	8.40	8.83	305.2	15
ISEN300	300	1500	44.46	36.18	8.30	8.75	300.3	15
ISEN260	260	1500	44.46	36.18	6.92	7.28	250.4	15
ISEN250X	250	1500	44.46	36.18	6.92	7.28	250.4	15
ISEN200	201	1500	44.41	36.18	5.56	5.85	201.2	15
ISEN160	150	1000	44.46	36.22	4.15	4.37	150.3	15
ISEN335X	335	1500	46.40	36.87	9.09	9.41	335.1	15
ISEN330X	330	1500	46.26	36.80	8.97	9.31	330.1	15
ISEN325X	325	1500	46.14	36.69	8.86	9.23	325.1	15
ISEN320X	320	1500	46.00	36.58	8.76	9.12	320.2	15
ISEN300X	300	1500	44.46	36.18	8.30	8.75	300.3	15
ISEN300X	300	1500	88.90	72.36	4.15	4.376	300.3	15
ISEN250X	250	1500	89.19	72.56	3.45	3.83	250.3	16
ISEN225X	225	1500	91.01	73.81	3.06	3.16	225.2	17
ISEN220X	220	1500	90.8	73.32	3	3.11	220.0	17
ISEN200X	200	1500	88.69	72.36	2.77	2.92	200.4	17
ISEN300N	300	1500	41.43	33.67	8.92	9.26	300.3	15
ISEN295	295	1500	41.30	33.57	8.79	9.16	295.1	15
ISEN290	290	1500	41.16	33.48	8.67	9.06	290.3	15
ISEN285	285	1500	41.05	33.36	8.55	8.97	285.2	15
ISEN280	280	1500	40.93	33.26	8.42	8.85	280.0	15
ISEN275	275	1500	37.71	30.62	8.98	9.31	275.0	15
ISEN270	270	1500	37.58	30.56	8.84	9.19	270.3	15
ISEN265	265	1500	37.46	30.48	8.71	9.08	265.3	15
ISEN260	260	1500	37.30	30.38	8.57	9.01	260.2	15
ISEN255	255	1500	37.18	30.27	8.43	8.84	255.2	15
ISEN250	250	1500	37.06	30.12	8.31	8.75	250.3	15
ISEN260Y	260	1500	74.10	60.24	4.18	4.38	250.3	15
ISEN250N	250	1500	34.01	27.62	9.06	9.38	250.2	15
ISEN245	245	1500	33.89	27.52	8.91	9.24	245.2	15
ISEN240	240	1500	33.75	27.44	8.75	9.17	240.1	15
ISEN235	235	1500	33.61	27.31	8.61	8.98	235.1	15
ISEN230	230	1500	33.49	27.22	8.46	8.89	230.3	15
ISEN225	225	1500	33.31	27.13	8.3	8.75	225.2	15
ISEN220	220	1500	30.18	24.51	8.98	9.31	220.1	15
ISEN215	215	1500	30.06	24.42	8.81	9.17	215.1	15
ISEN210	210	1500	29.9	24.32	8.64	9.04	210.1	15
ISEN205	205	1500	29.76	24.23	8.46	8.89	205.0	15
ISEN200	201	1500	29.64	24.14	8.31	8.74	200.6	15
ISEN200N	200	1500	27.62	22.43	8.93	9.37	200.3	15
ISEN195	195	1500	27.49	22.33	8.74	9.07	195.2	15
ISEN190	190	1500	27.36	22.25	8.55	8.96	190.2	15
ISEN185	185	1000	25.21	20.46	9.05	9.37	185.0	15
ISEN180	180	1000	25.05	20.37	8.84	9.22	180.1	15
ISEN175	175	1000	24.89	20.23	8.65	9.01	175.0	15
ISEN170	170	1000	24.81	20.17	8.44	8.89	170.2	15
ISEN165	165	1000	22.65	18.4	8.99	9.38	165.4	15
ISEN160	160	1000	22.5	18.29	8.75	9.12	160.0	15
ISEN155	155	1000	22.37	18.21	8.54	8.95	155.5	15
ISEN150	150	1000	22.23	18.11	8.31	8.74	150.5	15
ISEN135	135	600	22.68	18.33	7.37	7.47	135.1	10
ISEN130	130	600	22.2	18.05	7.21	7.59	130.4	10
ISEN125	126	600	22.2	18.09	6.94	7.31	125.5	10
ISEN110	110	600	22.42	18.23	6.05	6.33	110.3	10
ISEN100	101	600	22.2	18.09	5.56	5.86	100.6	10
ISEN80	81	600	22.10	18.02	4.47	4.73	80.5	10
ISEN75	75	600	22.18	18.07	4.16	4.34	75.2	10
ISEN60	60	600	22.13	18.04	3.34	3.53	60.3	10
ISEN50	50	600	22.2	18.09	2.77	2.9	50.1	10
ISEN40	40	600	22.18	18.07	2.24	2.36	40.4	10
ISEN20	21	600	22.08	18	1.14	1.2	20.5	10
ISEN10	11	600	22	18	0.59	0.64	10.6	10
ISEN5	6	48	11.06	9.02	0.61	2.84	5.2	5
ISEN3	3	48	11.06	9.02	0.37	0.39	3.3	5

Reviewed by signature:

BOM-BIS/CB/PID/SALT MIST

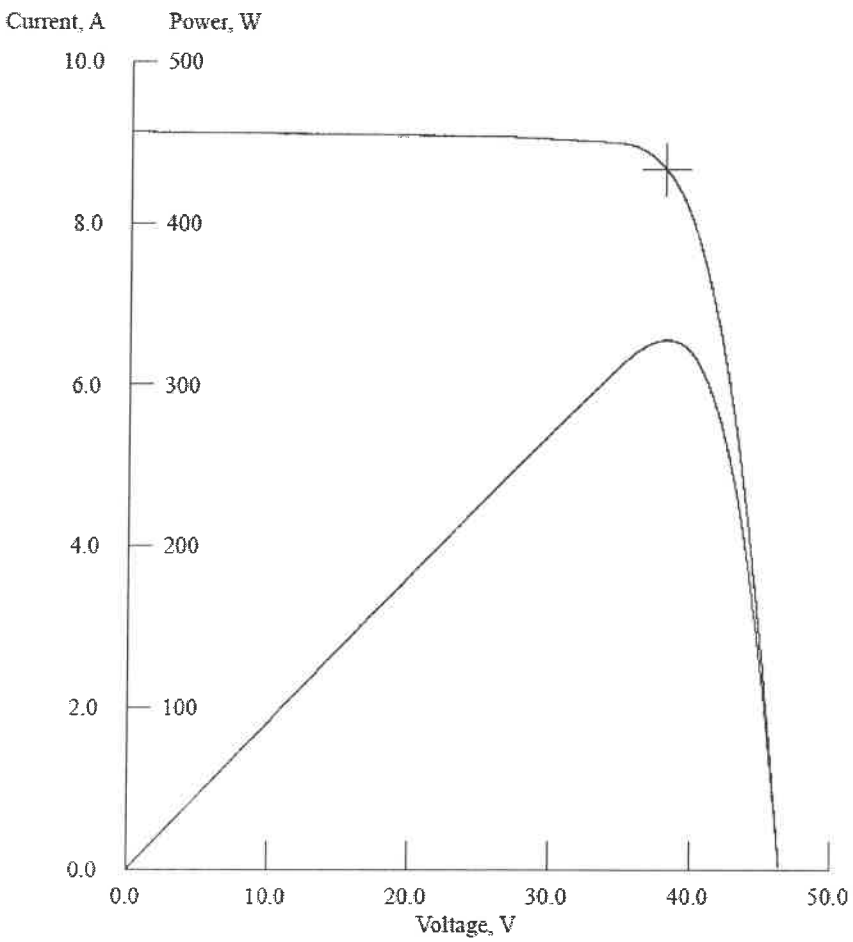
Item Description	Material / Rating	Supplier / Manufacturer
SOLDER WIRE	SN63 PB37 1.0mm ANS-J-STD-006C, 92-6337-8846	KESTER
Cell Interconnects	SnPb 60/40	TELISON
Bus Bars	SnPb 60/40	TELISON
Al Frame	Alloy 6063 T6 15µ Anodized (35 x 30 x 1.3 mm)& (22 x 24 x 1.3 mm)	ALOM EXTRUSIONS LTD.
PV Junction Box	PV-CY802-D , 4-RAIL DIODE 30SQ45 -1500V QC SOLAR QC102032, 3-RAIL DIODE 20SQ45 -1000V	ZJCY & QC SOLAR
Junction box cables	PV 4 1500 VDC 30 A	ZJCY
Junction box connectors	PV 4 1500 VDC 30 A	ZJCY
Aluminium corner Key/ screws	Alloy 6063 T6 (40.2 x 40.2 x 1.5)	ALOM EXTRUSIONS LTD.
EVA ENCAPSULANT	Conserve P360-14FC	RENEWSYS INDIA PVT. LTD.
BACKSHEET	Preserve A 125 WN / A 275WN	RENEWSYS INDIA PVT. LTD.
CELL Mono/MULTI	156.75 x 156.75 Multi Si_Cys	YINGFA
Sealant	HT906Z	HUITIAN
GLASS	Tempered Glass 3.2 ± 0.2mm 1958x 980 mm	GUJARAT BOROSIL LTD
JB SEALANT -JB FIXING	HT906Z	HUITIAN
FLUX	952S	KESTER

ANNEXURE E

SALT MIST PIV GRAPHS

Note: Refer to all PIV Curves attached in "Annexure E" provided as a separate attachment along with this Report.

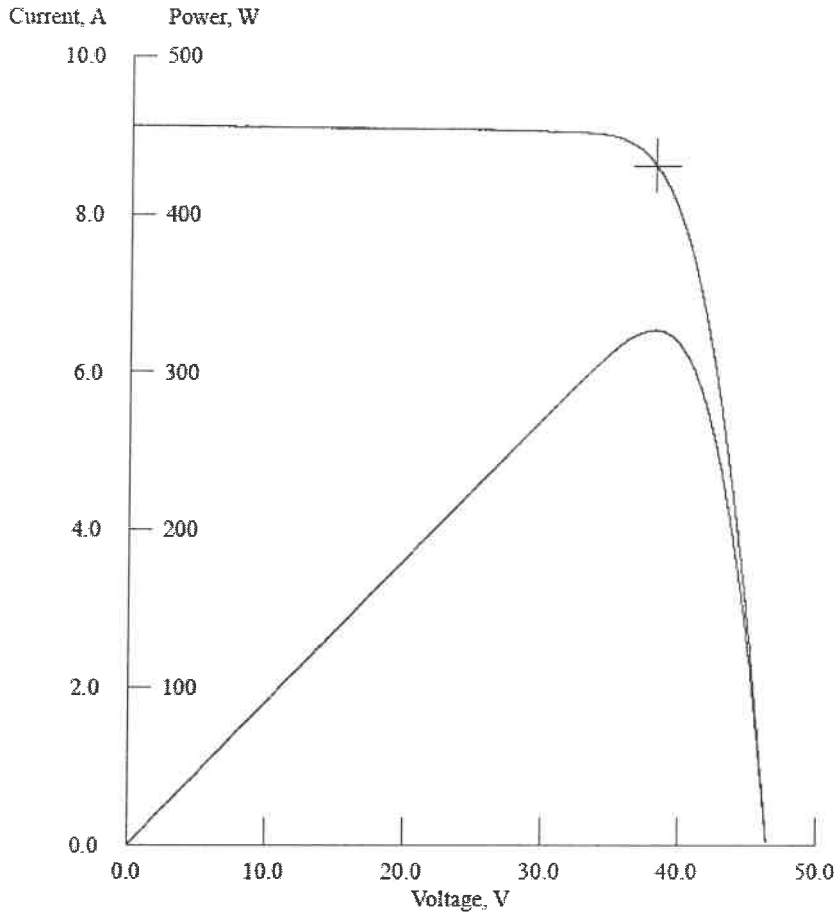
PV MODULE COMPONENTS LIST



SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241966 (ICON32036A0504102001)
10:38:55 6/28/2019
Measured Temperature = 25.2°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.13V
Isc = 9.13A
Pmax = 327.56W
Vpm = 37.79V
Ipm = 8.67A
FF = 0.78
Eff,m = 16.91%
Eff,c = 18.69%
Rs = 0.47 Ohm
Rsh = 351.58 Ohm

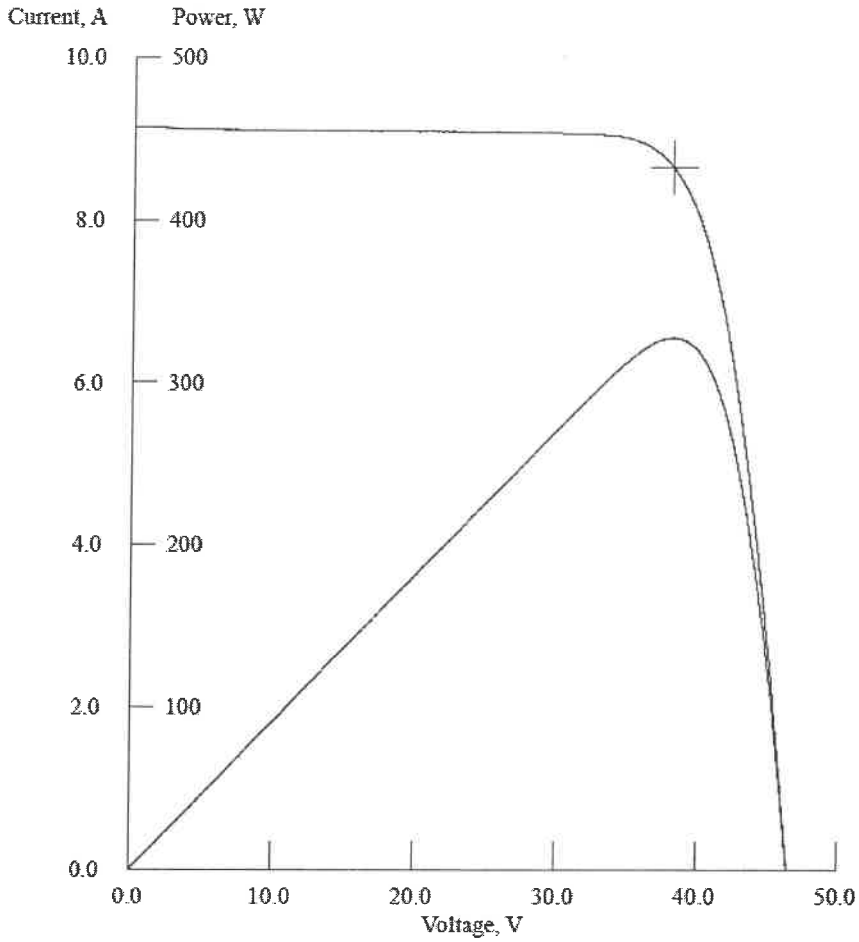
Load Voltage: 6.300 V
IV Points: 3667



SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241967 (ICON32036A0504102003)
10:26:41 6/28/2019
Measured Temperature = 25.1°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.16V
Isc = 9.13A
Pmax = 326.47W
Vpm = 37.91V
Ipm = 8.61A
FF = 0.77
Eff,m = 16.85%
Eff,c = 18.63%
Rs = 0.50 Ohm
Rsh = 385.27 Ohm

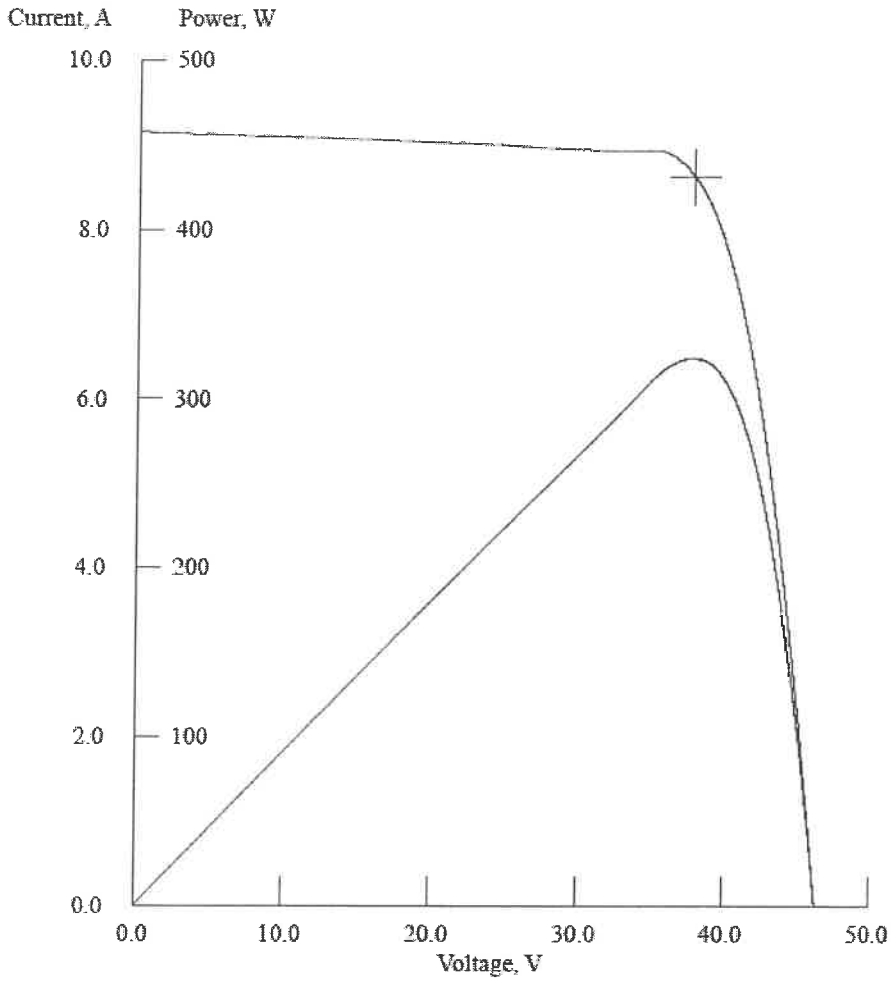
Load Voltage: 6.300 V
IV Points: 3660



SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241968 (ICON32036A0504102006)
10:34:37 6/28/2019
Measured Temperature = 25.1°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.15V
Isc = 9.14A
Pmax = 327.42W
Vpm = 37.87V
Ipm = 8.65A
FF = 0.78
Eff,m = 16.90%
Eff,c = 18.69%
Rs = 0.50 Ohm
Rsh = 193.52 Ohm

Load Voltage: 6.300 V
IV Points: 3678

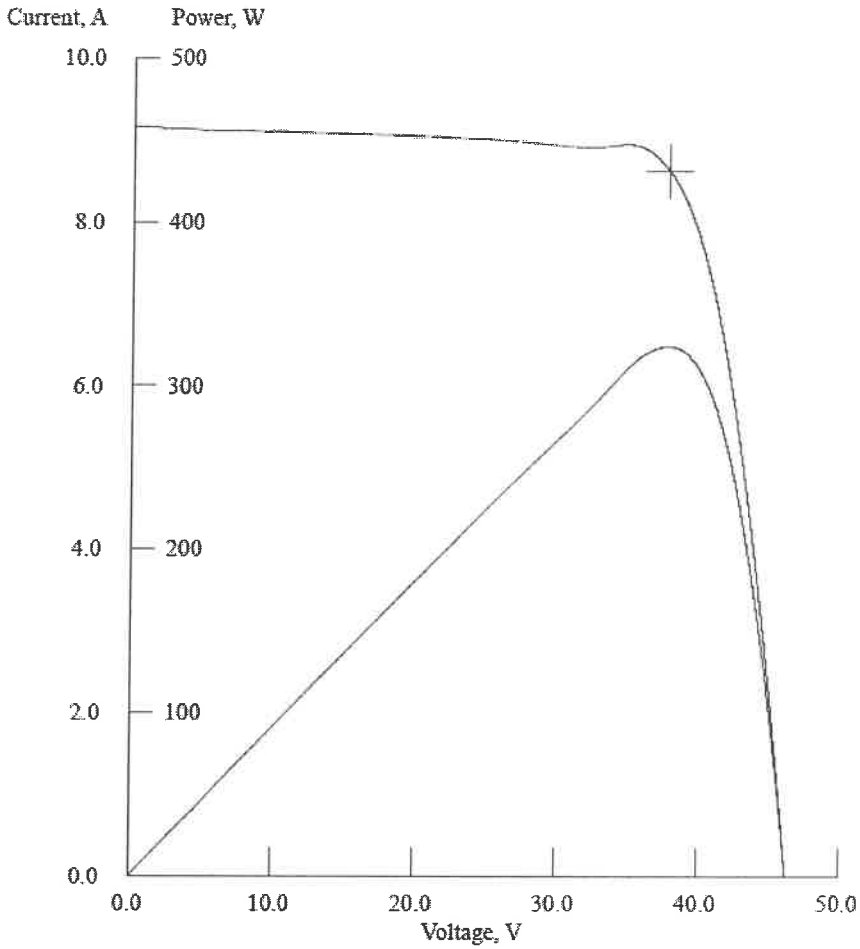


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST BYPASS
ID: 2241966
14:53:33 8/1/2011
Measured Temperature = 24.6°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.02V
Isc = 9.16A
Pmax = 324.08W
Vpm = 37.58V
Ipm = 8.62A
FF = 0.77
Eff,m = 16.73%
Eff,c = 18.50%
Rs = 0.52 Ohm
Rsh = 128.18 Ohm

Load Voltage: 6.200 V
IV Points: 3676

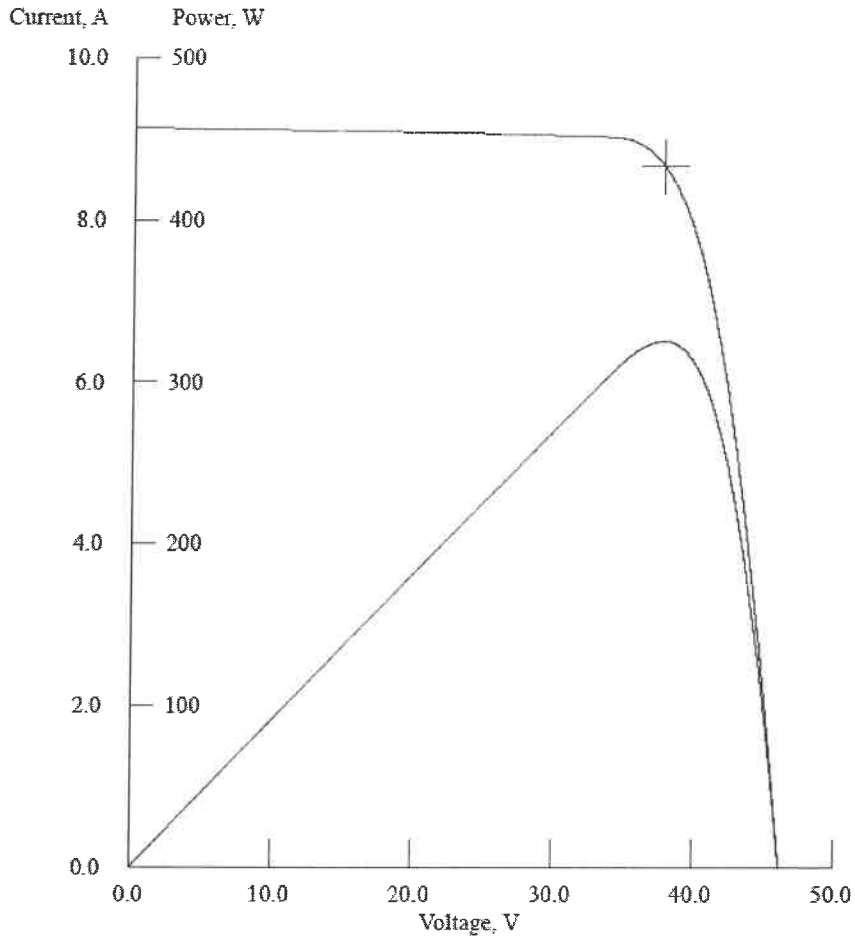
Reviewed by signature:



SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST BYPASS
ID: 2241967
14:50:57 8/1/2011
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.98V
Isc = 9.16A
Pmax = 323.97W
Vpm = 37.55V
Ipm = 8.63A
FF = 0.77
Eff,m = 16.72%
Eff,c = 18.49%
Rs = 0.55 Ohm
Rsh = 121.16 Ohm

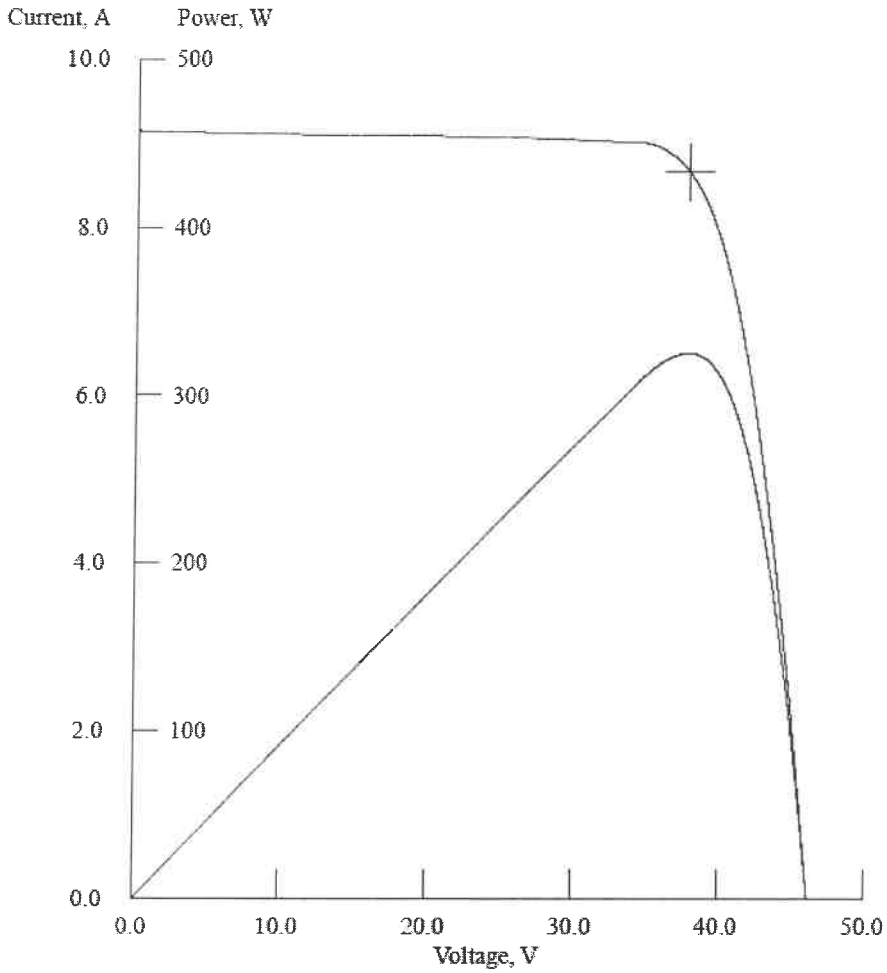
Load Voltage: 6.200 V
IV Points: 3677



SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST SALT
ID: 2241966
15:25:28 7/31/2019
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.83V
Isc = 9.14A
Pmax = 325.08W
Vpm = 37.54V
Ipm = 8.66A
FF = 0.78
Eff,m = 16.78%
Eff,c = 18.55%
Rs = 0.52 Ohm
Rsh = 268.05 Ohm

Load Voltage: 6.300 V
IV Points: 3586



SPI-Sun Simulator 4600 SLP

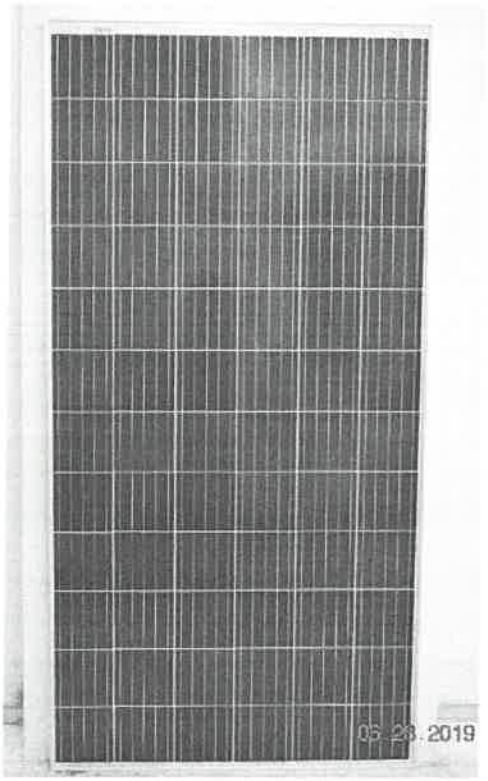
Title: ICON EN POWER
Comment: POST SALT
ID: 2241967
15:21:38 7/31/2019
Measured Temperature = 24.6°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.87V
Isc = 9.15A
Pmax = 325.11W
Vpm = 37.55V
Ipm = 8.66A
FF = 0.77
Eff,m = 16.78%
Eff,c = 18.55%
Rs = 0.50 Ohm
Rsh = 228.37 Ohm

Load Voltage: 6.300 V
IV Points: 3593

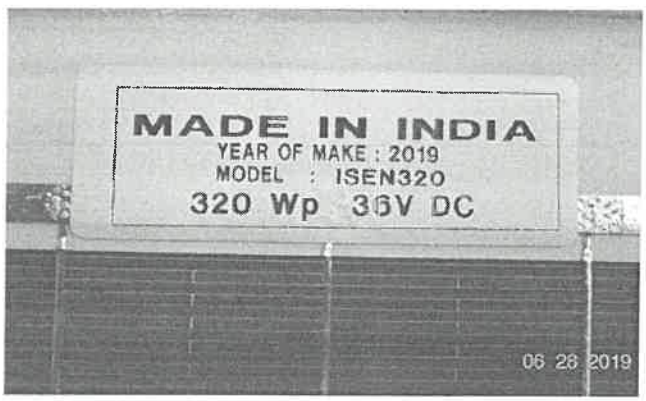
Note: As Declared by PV Module Manufacturer.

PHOTOGRAPHS

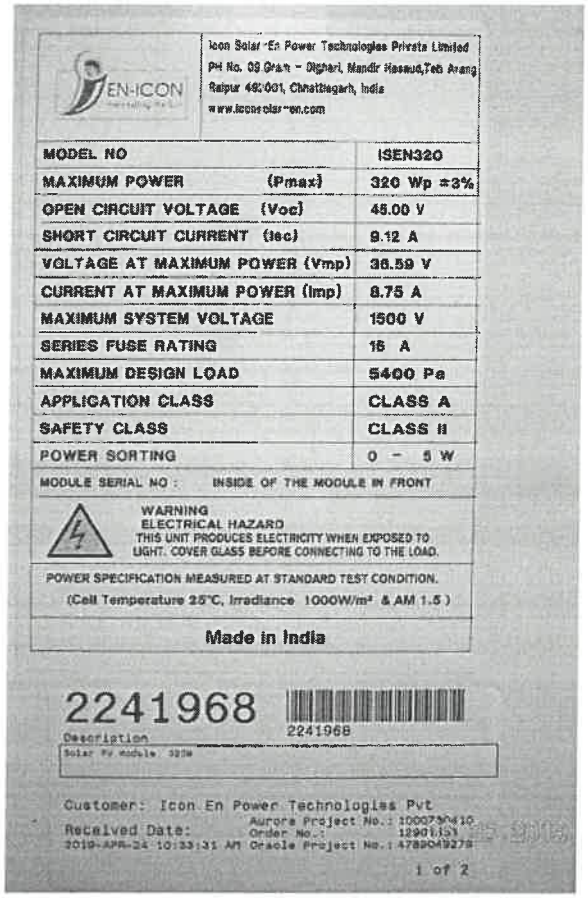
MODULE FRONT /BACK SIDE



MARING PLATE INSIDE LAMINATE



BACK LABEL



EN-ICON

Icon Solar En Power Technologies Private Limited
PH No. 09 Gram - Dighari, Mandir Hasaud,Teh Arang
Raipur 492 001, Chhattisgarh, India
www.iconsolar-en.com

MODEL NO	ISEN320
MAXIMUM POWER (Pmax)	320 Wp ±3%
OPEN CIRCUIT VOLTAGE (Voc)	45.00 V
SHORT CIRCUIT CURRENT (Isc)	9.12 A
VOLTAGE AT MAXIMUM POWER (Vmp)	36.59 V
CURRENT AT MAXIMUM POWER (Imp)	8.75 A
MAXIMUM SYSTEM VOLTAGE	1500 V
SERIES FUSE RATING	15 A
MAXIMUM DESIGN LOAD	5400 Pa
APPLICATION CLASS	CLASS A
SAFETY CLASS	CLASS II
POWER SORTING	0 - 5 W

MODULE SERIAL NO : INSIDE OF THE MODULE IN FRONT

WARNING
ELECTRICAL HAZARD
THIS UNIT PRODUCES ELECTRICITY WHEN EXPOSED TO LIGHT. COVER GLASS BEFORE CONNECTING TO THE LOAD.

POWER SPECIFICATION MEASURED AT STANDARD TEST CONDITION.
(Cell Temperature 25°C, Irradiance 1000W/m² & AM 1.5)

Made in India

2241968

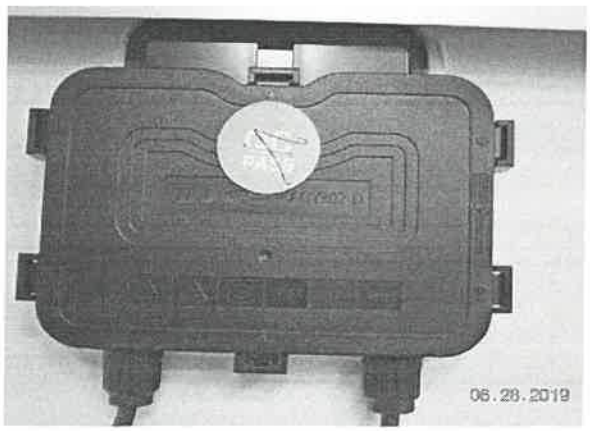
2241968

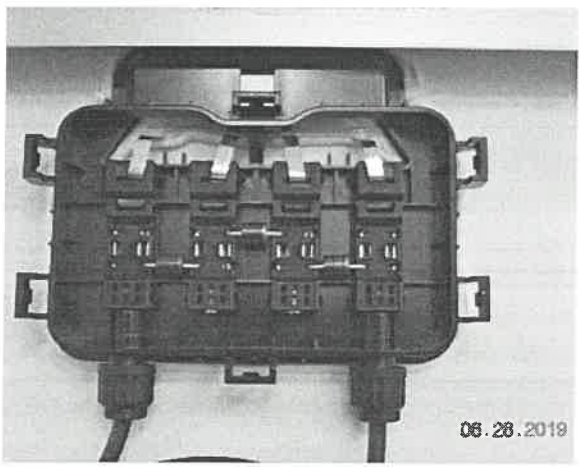
Description
Solar Pv module 320W

Customer: Icon En Power Technologies Pvt
Aurora Project No.: 1000790410
Received Date: Order No.: 12901151
2019-APR-24 10:33:31 AM Oracle Project No.: 4789049279

1 of 2

JUNCTION BOX





******End of Report******

Reviewed by signature: