Test Report

RITIKA SYSTEMS PVT LTD

REPORT NUMBER: 4789404159-NABL-S1

PROJECT NUMBER: 4789404159

ULR NUMBER: TC616820100000496F

TC- 6168

Select the applicable test locations:

☒**LOCATION 1:**

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

☐**LOCATION 2:**

UL India Private Limited,
Oak building, Kalyani Platina Campus, Sy.No.129/4,
EPIP Zone, Phase II, Whitefield,
Bangalore, Karnataka – 560 066

☐**LOCATION 3:**

UL India Private Limited, 30/A, I Stage, Vishveshwarya Industrial Estate, Doddanekkundi Industrial Area, Bangalore - 560048

TEST DISCIPLINE: ELECTRONICS
PRODUCT GROUP: SOLAR PANEL

General details

Customer / Applicant	Ritika Systems Pvt Ltd G-166, Industrial Area Neemrana- II, Alwar, Rajasthan, 301705, IN		
Manufacturer	Ritika Systems Pvt Ltd G-166, Industrial Area Neemrana- II, Alwar, Rajasthan, 301705, IN		
Program	NABL		
Item Under Test	Poly-Crystalline Photovoltaic Module		
Model	Submitted for testing : RSPL24P330J Models covered : Please refer General remarks table for models covered.		
Number of Samples	3 No's		
UL Sample Identification	3160658,3160660, 3160661	**Refer Summary of Test results for multiple samples**	
Manufacturer Serial Number (if any)	HBKC2000108, HBKC2000112, HBKC2000114		
Condition of IUT on receipt	Good		
Date of Receipt	30 June 2020		
Applicable Standard	IEC 61701 - Crystalline Silicon Terrestrial Photovoltaic (PV) Modules Salt Mist Corrosion Testing – Edition 2 - Issue Date 2011/12/01, Severity Level 1		
Date of Testing (Start date)	27 July 2020	**End Date**	1 September 2020
UL general^ ambient condition	**Temperature in °C**		23 ±5°C
	Relative humidity in %		<70 %
Date of Issue	30 September 2020		
Test In-charge	Manjunath Kumbar		

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

Prathap R Digitally signed by Prathap R Date: 2020.09.30 14:55:00 +05'30' Prathap R Senior Project Handler	Srimathy N Digitally signed by Srimathy N Date: 2020.09.30 15:18:44 +05'30' N. Srimathy Project Engineer
Reviewed by	**Authorized signatory**

General Remarks (If any)

1) *The below got results in this report will relate only to the models mentioned below which is having same BOM except frame dimensions.*

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

Models Covered:

Family Name (144 Cut cell)
RSPL24CP320J, RSPL24CP325J, RSPL24CP330J, RSPL48CP320J, RSPL48CP325J, RSPL48CP330J
Family Name (72 cell)
RSPL24P300J, RSPL24P305J, RSPL24P310J, RSPL24P315J, RSPL24P320J, RSPL24P325J, RSPL24P330J
Family Name (60 Cell)
RSPL18P230J, RSPL18P240J, RSPL18P245J, RSPL18P250J, RSPL18P255J, RSPL18P260J, RSPL18P265J, RSPL18P270J
Family Name (54 Cell)
RSPL54P210J, RSPL54P215J, RSPL54P220J, RSPL54P225J, RSPL54P230J, RSPL54P235J, RSPL54P240J, RSPL54P245J, RSPL54P250J, RSPL54P255J, RSPL54P260J
Family Name (48 Cell)
RSPL48P200J, RSPL48P205J, RSPL48P210J, RSPL48P215J, RSPL48P220J, RSPL48P225J, RSPL48P230J
Family Name (36 Cell)
RSPL12P150J, RSPL12P155J, RSPL12P160J, RSPL12P165J, RSPL12P170J, RSPL12P175J
Family Name (36 Cut Cell)
RSPL12CP24J, RSPL12CP25J, RSPL12CP28J, RSPL12CP30J, RSPL12CP35J, RSPL12CP37J, RSPL12CP40J, RSPL12CP45J, RSPL12CP50J, RSPL12CP55J, RSPL12CP60J, RSPL12CP65J, RSPL12CP70J, RSPL12CP74J, RSPL12CP75J, RSPL12CP85J, RSPL12CP90J, RSPL12CP100J, RSPL12CP110J, RSPL12CP115J, RSPL12CP120J, RSPL12CP125J, RSPL12CP130J, RSPL12CP135J, RSPL12CP140J, RSPL12CP145J
Family Name (72 Cut Cell)
RSPL24CP155J, RSPL24CP160J, RSPL24CP165J, RSPL24CP170J, RSPL24CP175J, RSPL24CP180J, RSPL24CP190J, RSPL24CP200J, RSPL24CP220J, RSPL24CP225J, RSPL24CP230J, RSPL24CP240J, RSPL24CP245J, RSPL24CP250J, RSPL24CP255J, RSPL24CP260J, RSPL24CP270J, RSPL24CP275J, RSPL24CP280J, RSPL24CP285J, RSPL24CP290J, RSPL24CP295J, RSPL24CP300J, RSPL72CP40J, RSPL72CP50J, RSPL72CP60J, RSPL72CP75J, RSPL72CP100J, RSPL72CP110J, RSP72CP115J, RSPL72CP120J, RSPL72CP125J, RSPL12CP150J, RSPL12CP155J, RSPL12CP160J, RSPL12CP165J, RSPL12CP170J, RSPL12CP175J, RSPL12CP200J, RSPL12CP250J, RSPL12CP300J, RSPL12CP230J

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Description of Item under Test (IUT)

POLYCRYSTALLINE PV MODULES

Enclosure:

Annexure A: Sample Identification

Annexure B: Test Methods and Results

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

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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) 3160658- 325.18 W 2) 3160660- 326.27 W 3) 3160661- 325.91 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) 3160660- 323.62 W 2) 3160661- 323.50 W
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) 3160660- 322.87 W 2) 3160661- 322.58 W

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Master Equipment and Calibration details

Serial No.	Test Equipment	UL Equipment ID	Calibration status (Valid up to)(mm/dd/yyyy)
1	PYRANOMETER (PV LAB)	69898	2021-07-03
2	Datalogger	168531	2021-02-21
3	OUTDOOR EXPOSURE RACK	175794	
4	PYRANOMETER (PV LAB)	69898	2021-07-03
5	Datalogger	168531	2021-02-21
6	OUTDOOR EXPOSURE RACK	175794	
7	Meter and/or Sensor, Light	180089	2021-06-16
8	Fixture, For Testing, Table	160912	
9	Datalogger, RH & Temperature	68611	2021-01-28
10	Magnifying Lens, Without Ruler	76645	
11	FLASH SOLAR SIMULATOR	70472	
12	Reference Standard, Voltage or Current	196333	2021-09-05
13	Datalogger, RH & Temperature	65675	2021-01-28
14	Thermometer, Infrared	148434	2021-01-28
15	Measuring Tool, Rigid Ruler	177815	2021-01-30
16	Apparatus, Dielectric Strength Test	169917	2021-05-16
17	Datalogger, RH & Temperature	68611	2021-01-28
18	Meter, pH, Digital or Analog	177914	2021-02-25
19	Fixture, For Testing, Water Tank	167776	
20	Stopwatch, Digital or Analog	159551	2020-09-11
21	Indicator, Temperature	67918	2020-12-30
22	Apparatus, Dielectric Strength Test	169917	2021-05-16
23	Alconox Liquinox Critical-Cleaning Liquid Detergent, Liqui-Nox CC1171	474566	2021-08-26
24	Power Supply, DC	147770	2021-01-25
25	Power Supply, DC	70971	2021-06-16
26	Multimeter, Digital, Handheld	68602	2020-10-31
27	Stopwatch, Digital or Analog	159551	2020-09-11
28	Chamber, Conditioning, Salt Fog	70752	2021-03-01
29	Chamber, Conditioning, Salt Fog	74401	2021-02-20
30	Chamber, Conditioning, Salt Fog	71886	2021-05-25
31	Chamber, Conditioning, Salt Fog	76420	2021-05-25
32	Chamber, Conditioning, Salt Fog	76421	2021-05-25
33	Chamber, Conditioning, Salt Fog	76419	2021-05-25
34	Chamber, Climatic, Temp and RH	71546	2021-03-06
35	Chamber, Conditioning, Salt Fog	70752	2021-03-01
36	Chamber, Conditioning, Salt Fog	74401	2021-02-20

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37	Chamber, Conditioning, Salt Fog	71886	2021-05-25
38	Chamber, Conditioning, Salt Fog	76420	2021-05-25
39	Chamber, Conditioning, Salt Fog	76421	2021-05-25
40	Chamber, Conditioning, Salt Fog	76419	2021-05-25
41	Chamber, Climatic, Temp and RH	71546	2021-03-06
42	Meter and/or Sensor, Light	180089	2021-06-16
43	Fixture, For Testing, Table	160912	
44	Datalogger, RH & Temperature	68611	2021-01-28
45	Magnifying Lens, Without Ruler	76645	
46	FLASH SOLAR SIMULATOR	70472	
47	Reference Standard, Voltage or Current	196333	2021-09-05
48	Datalogger, RH & Temperature	65675	2021-01-28
49	Thermometer, Infrared	148434	2021-01-28
50	Measuring Tool, Rigid Ruler	177815	2021-01-30
51	Apparatus, Dielectric Strength Test	169917	2021-05-16
52	Datalogger, RH & Temperature	68611	2021-01-28
53	Meter, pH, Digital or Analog	177914	2021-02-25
54	Fixture, For Testing, Water Tank	167776	
55	Stopwatch, Digital or Analog	159551	2020-09-11
56	Indicator, Temperature	67918	2020-12-30
57	Apparatus, Dielectric Strength Test	169917	2021-05-16
58	Alconox Liquinox Critical-Cleaning Liquid Detergent, Liqui-Nox CC1171	474566	2021-08-26
59	Power Supply, DC	147770	2021-01-25
60	Power Supply, DC	70971	2021-06-16
61	Multimeter, Digital, Handheld	68602	2020-10-31
62	Stopwatch, Digital or Analog	159551	2020-09-11
63	Chamber, Climatic, Temp	70192	2021-05-13
64	Power Supply, DC	88430	2021-01-25
65	Power Supply, DC	147758	2021-01-25
66	Datalogger	80536	2021-02-06
67	FLASH SOLAR SIMULATOR	70472	
68	Reference Standard, Voltage or Current	196333	2021-09-05
69	Datalogger, RH & Temperature	65675	2021-01-28
70	Thermometer, Infrared	148434	2021-01-28
71	Measuring Tool, Rigid Ruler	177815	2021-01-30

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ANNEXURE A

Sample Identification List

Sample Identification				
UL Sample No.	**Identification in Report**	**Serial Number**	**Date Received**	**Product Description**
3160658(Control)	3160658	RSPLE20-297131	30-06-2020	Solar PV Module 330W, Model No: RSPL24P330J
3160660	3160660	RSPLE20-297130	30-06-2020	Solar PV Module 330W, Model No: RSPL24P330J
3160661	3160661	RSPLE20-297129	30-06-2020	Solar PV Module 330W, Model No: RSPL24P330J

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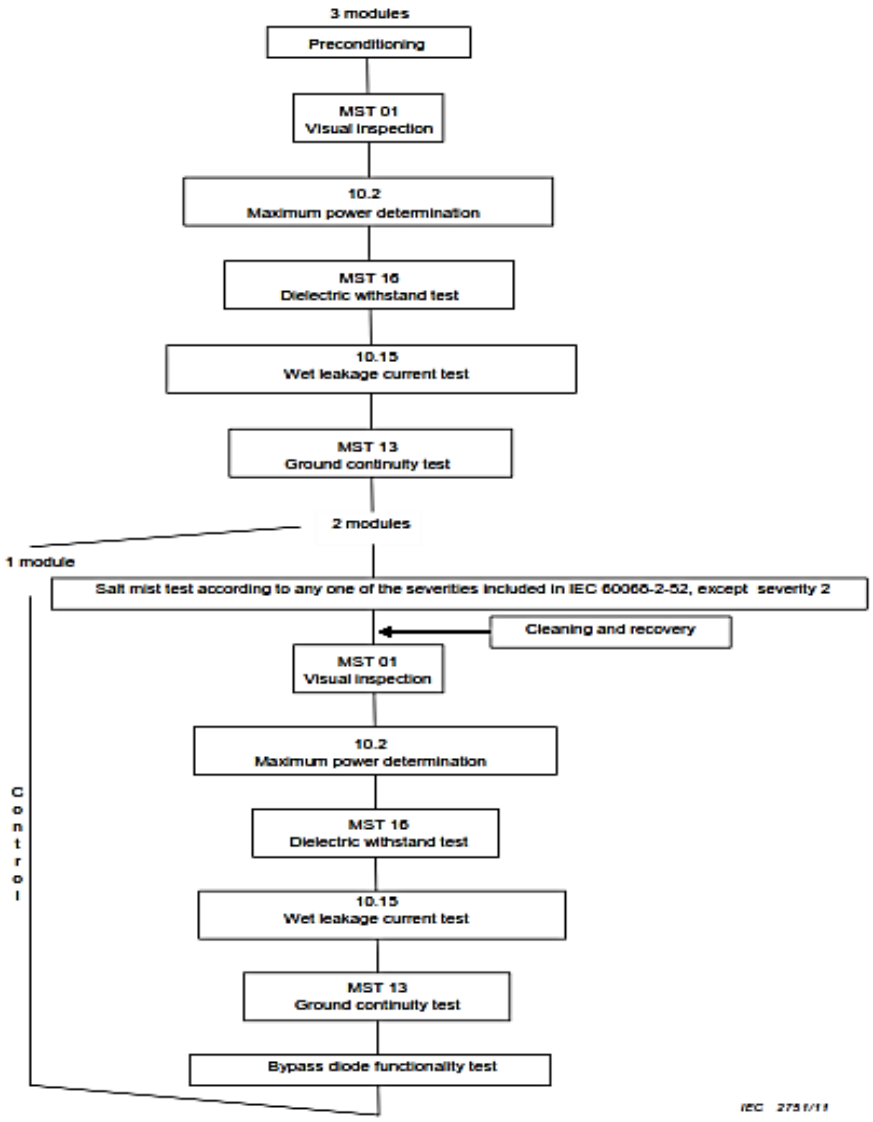
Test methodology adopted



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

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ANNEXURE B

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.

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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		kW/m^2
Required Irradiation level	5 - 5.5	kWh/m^2
Estimated Duration	--	h

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

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

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

Test Date(dd/mm/yyyy): 27/07/2020 and 28/07/2020

TABLE 3: Final Results

Duration of exposure	7	h
Irradiance level	768	W/m^2
Cumulative Ah output	-	Ah
Irradiation level	5.37	kWh/m^2

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

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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(dd/mm/yyyy): 29/07/2020

Sample No.	Visual Inspection (10.1.)	P/F
3160658 (Control)	No visual defects was found	P
3160660	No visual defects was found	P
3160661	No visual defects was found	P
Remarks: NA		

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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.

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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(dd/mm/yyyy): 29/07/2020

10.2	**TABLE: Maximum Power Determination (Initial)**				
Cell temperature (°C) :	25	—			
Irradiance (W/m^2) :	1000	—			
Initial examination					
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
3160658 (control)	45.35	37.53	9.18	8.67	325.18
3160660	45.29	37.49	9.14	8.70	326.27
3160661	45.35	37.38	9.18	8.72	325.91
Remarks: Refer PIV graphs for FF value.					

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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 20.83 Mega Ohms.

Sample #	Length (m)	Width (m)	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
3160658	1.961	0.991	1.94	20.61
3160660				
3160661				

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Results –

Test Date(dd/mm/yyyy): 29/07/2020

MST 16	**Table: Dielectric Withstand Test**			P
Module maximum system voltage rating (V, DC)	:	1000		—
Potential applied (V, DC)	:	3000		—
Initial Tests				
Sample #	Measured (GΩ)	Limit(MΩ)	Result	
3160658 (control)	3.86	20.61	P	
3160660	3.82	20.61	P	
3160661	3.23	20.61	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 _20.61_Mega Ohms.

Lab Condition:- Temp: 25.1°C, Humidity: 48.3%

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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
3160658 (Control)	1.961	0.991	1.94	20.61
3160660				
3160661				

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Result-

Test Date(dd/mm/yyyy): 29/07/2020

10.15	**TABLE: Wet leakage current test (Initial)**		P
Test voltage applied [V] ……..:		1000	—
Module maximum system voltage rating (V, DC) :		1000	—
Solution resistivity [Ω cm], < 3,500 Ω cm at 22 ± 3 ℃ :		1894 Ω cm at 23.1 ℃	—
Sample No.	Measured [GΩ]	Limit [MΩ]	Result
3160658 (Control)	2.25	20.61	P
3160660	2.95	20.61	P
3160661	2.21	20.61	P

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.

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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(dd/mm/yyyy): 29/07/2020

MST 13	**Ground Continuity Test (Initial)**			P
	Maximum over-current protection rating (A) :	15		—
	Current applied (A) :	2.5x15=37.5		
	Location of designated grounding point :	grounding holes on frames		—
	Location of second contacting point :	grounding holes on opposite frames		—
Sample No.	**Position in test sequence:**	**Voltage (V)**	**Resistance (milli Ω)**	**P/F**
3160658	Initial examination	0.027	0.00072	P
	Final examination	--	--	--
3160660	Initial examination	0.032	0.00085	P
	Final examination	--	--	--
3160661	Initial examination	0.022	0.00058	P
	Final examination	--	--	--
Remarks: NA				

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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.

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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.

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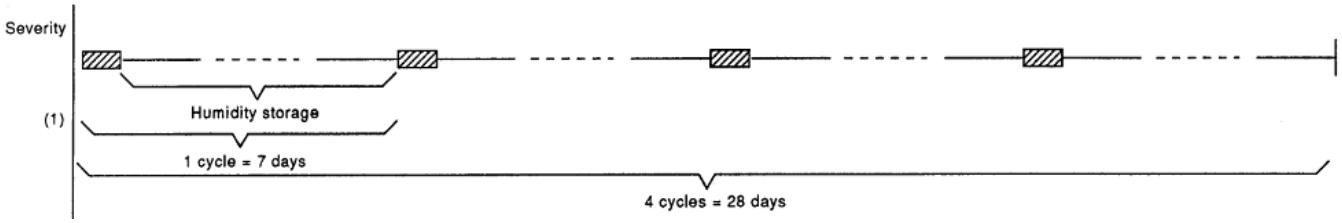
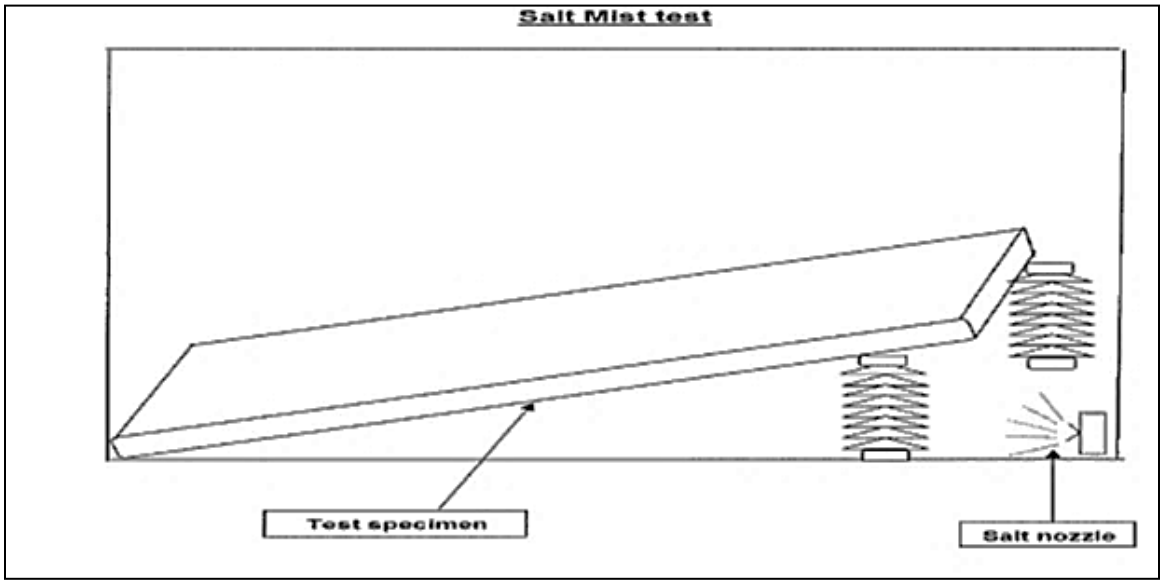
10 Recovery (at the end of testing)

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 –

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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(dd/mm/yyyy): 31/07/2020 to 28/08/2020

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

Sample No.	Temperature (℃)	Humidity (%)	Starting Time & Date	End Time & Date
3160660	40	93	2:00 & 31/07/2020	2:00 & 28/08/2020
3160661	40	93	2:00 & 31/07/2020	2:00 & 28/08/2020
Remarks: NA				

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.

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 –

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Test Date(dd/mm/yyyy): 28/08/2020

Sample No.	Visual Inspection (10.1)	P/F
3160660	No visual defects found	P
3160661	No visual defects 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 –

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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(dd/mm/yyyy): 28/08/2020

10.2	**TABLE: Maximum Power Determination**				P
Cell temperature (°C)	:	25			—
Irradiance (W/m^2)	:	1000			—
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
3160658 (control)	45.46	37.44	9.17	8.68	325.04
3160660	45.40	37.33	9.06	8.67	323.62
3160661	45.37	37.41	9.09	8.65	323.50
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**
3160660	326.27	323.62	-0.81	**Pass**
3160661	325.91	323.50	-0.73	**Pass**

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

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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.

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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 _20.61_Mega Ohms.

Sample #	Length (m)	Width (m)	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
3160660	1.961	0.991	1.94	20.61
3160661				

Results –

Test Date(dd/mm/yyyy): 28/08/2020

MST 16	**Table: Dielectric Withstand Test**			P
Module maximum system voltage rating (V, DC) :			1000	—
Potential applied (V, DC) :			3000	—
Sample #	Measured (GΩ)	Limit(MΩ)	Result	
3160660	1.62	20.61	P	
3160661	1.20	20.61	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 _20.61__Mega Ohms.

Lab Condition:- Temp: 24.9°C, Humidity: 51.3%

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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.

Compliance Criteria –

For modules with an area greater than 0.1 m^2, the measured insulation resistance shall not be less than _20.61_Mega Ohms.

Sample #	Length (m)	Width (m)	Area (L x W) m^2	Minimum Resistance 40 Mohm*m^2/Area
3160660	1.961	0.991	1.94	20.61
3160661				

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Result-

Test Date(dd/mm/yyyy): 28/08/2020

10.15	**TABLE: Wet leakage current test**		P
Test voltage applied [V] ……..:		1000	—
Module maximum system voltage rating (V, DC) :		1000	—
Solution resistivity [Ω cm], < 3,500 Ω cm at 22 ± 3 ℃ :		1834 Ω cm at 23.9 ℃	—
Sample No.	Measured [GΩ]	Limit [MΩ]	Result
3160660	1.3	20.61	P
3160661	1.1	20.61	P

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.

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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(dd/mm/yyyy): 28/08/2020

MST 13	Ground Continuity Test		P
	Maximum over-current protection rating (A) :	15	—
	Current applied (A) :	2.5x15=37.5	
	Location of designated grounding point :	grounding holes on frames	—
	Location of second contacting point :	grounding holes on opposite frames	—

Sample No.	Position in test sequence:	Voltage (V)	Resistance (milli Ω)	P/F
3160660	Initial examination	--	--	--
	Final examination	0.024	0.00064	P
3160661	Initial examination	--	--	--
	Final examination	0.028	0.00074	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.

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Result-
Test Date(dd/mm/yyyy): 31/08/2020

TABLE: Bypass diode functionality test				P
Sample No.	3160660			—
Module temperature [°C] :	25°C±10°C			—
Number of diodes in junction box :	03			—
Diode manufacturer :	Silan microelectronics			—
Diode type designation :	SBT20UL45AR6			—
Rated STC short-circuit current [A] :	9.23			—
Current flow (1.25 * Isc) [A] :	11.53			—
Test duration (hour)	1			
	D1	D2	D3	Result
Diode functional? yes/no :	Yes	Yes	Yes	P
Remarks: NA				

Test Date(dd/mm/yyyy): 31/08/2020

TABLE: Bypass diode functionality test				P
Sample No.	3160661			—
Module temperature [°C] :	25°C±10°C			—
Number of diodes in junction box :	03			—
Diode manufacturer :	Silan microelectronics			—
Diode type designation :	SBT20UL45AR6			—
Rated STC short-circuit current [A] :	9.23			—
Current flow (1.25 * Isc) [A] :	11.53			—
Test duration (hour)	1			
	D1	D2	D3	Result
Diode functional? yes/no :	Yes	Yes	Yes	P
Remarks: NA				

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

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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.

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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(dd/mm/yyyy): 31/08/2020

10.2	**TABLE: Maximum Power Determination**				P
Cell temperature (°C)	:	25			—
Irradiance (W/m^2)	:	1000			—
Sample No.	Voc (V)	Vmp (V)	Isc (Amps)	Imp (Amps)	Pmp (W)
3160660	45.24	37.24	9.11	8.67	322.87
3160661	45.28	37.10	9.12	8.69	322.58
Remarks: refer PIV graph for FF values.					

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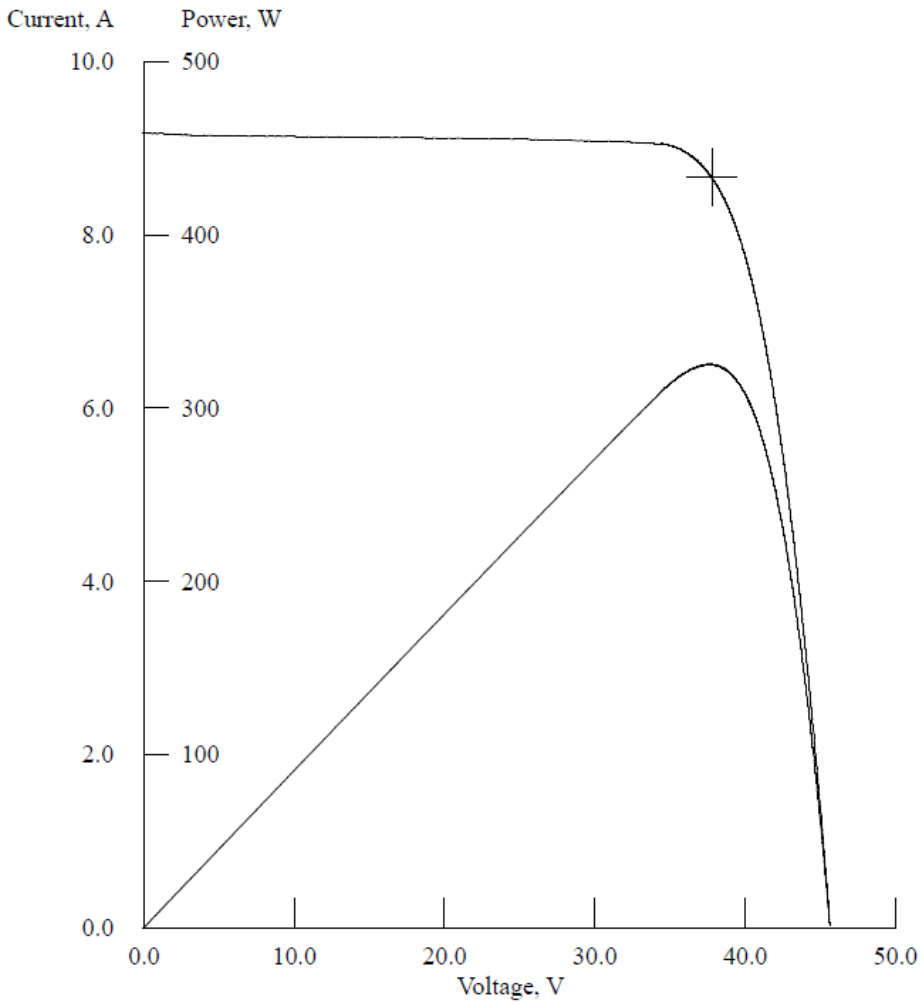
ANNEXURE C

PIV GRAPHS INITIAL

Sample no. 3160658



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: PIV MEASUREMENT
ID: 3160658 (RSPLE20-297131)
15:29:21 7/29/2020
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.35V
Isc = 9.18A
Pmax = 325.18W
Vpm = 37.53V
Ipm = 8.67A
FF = 0.78
Eff,m = 16.67%
Eff,c = 18.56%
Rs = 0.48 Ohm
Rsh = 114.65 Ohm

Load Voltage: 6.300 V
IV Points: 3654

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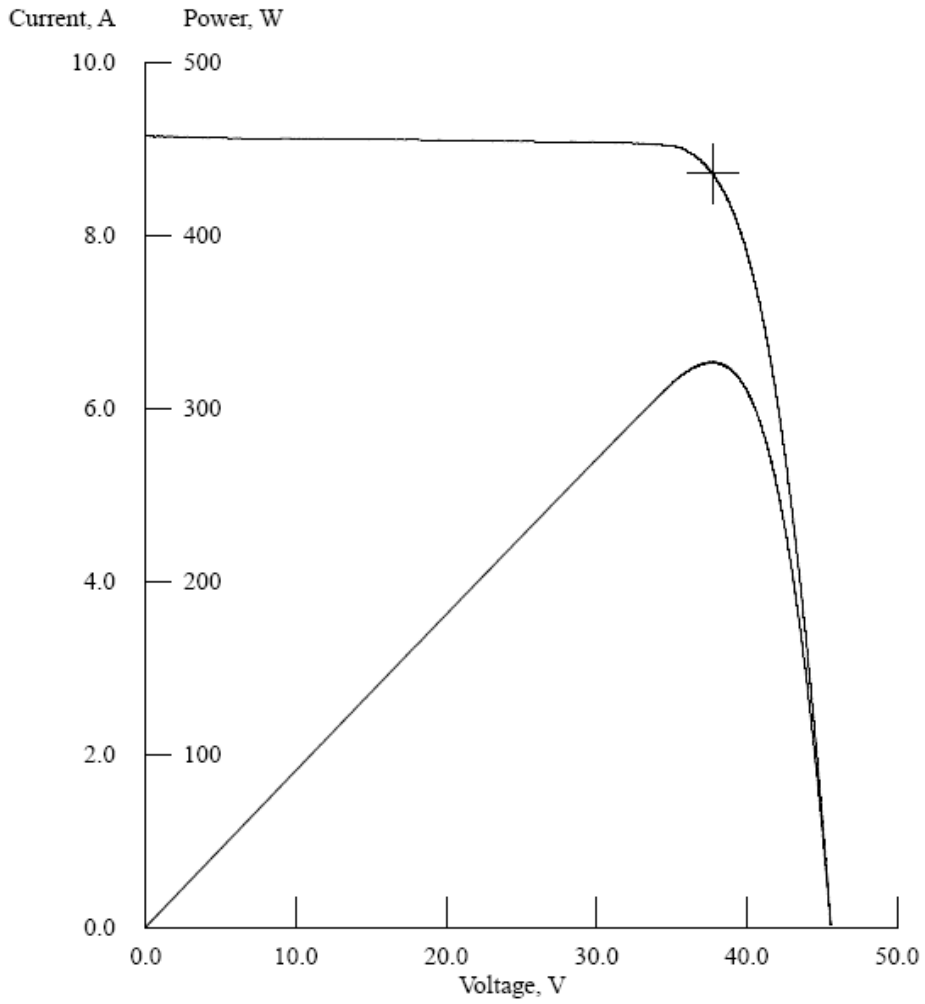
CIN: U74200KA1997PTC023189

Sample no. 3160660



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: PIV MEASUREMENT
ID: 3160660 (RSPLE20-297130)
15:31:09 7/29/2020
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.29V
Isc = 9.14A
Pmax = 326.27W
Vpm = 37.49V
Ipm = 8.70A
FF = 0.79
Eff,m = 16.73%
Eff,c = 18.62%
Rs = 0.45 Ohm
Rsh = 204.98 Ohm

Load Voltage: 6.300 V
IV Points: 3634

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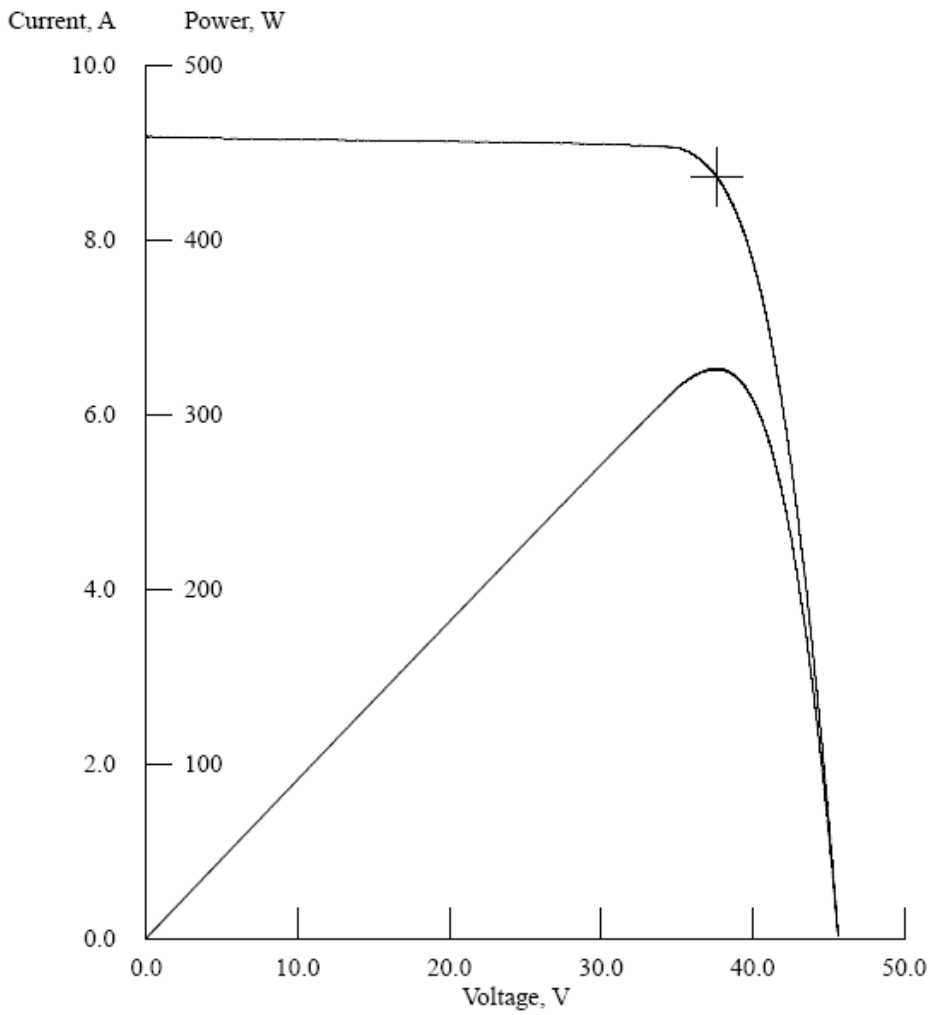
CIN: U74200KA1997PTC023189

Sample no. 3160661



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: PIV MEASUREMENT
ID: 3160661 (RSPLE20-297129)
15:22:42 7/29/2020
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.35V
Isc = 9.18A
Pmax = 325.91W
Vpm = 37.38V
Ipm = 8.72A
FF = 0.78
Eff,m = 16.71%
Eff,c = 18.60%
Rs = 0.49 Ohm
Rsh = 204.60 Ohm

Load Voltage: 6.300 V
IV Points: 3654

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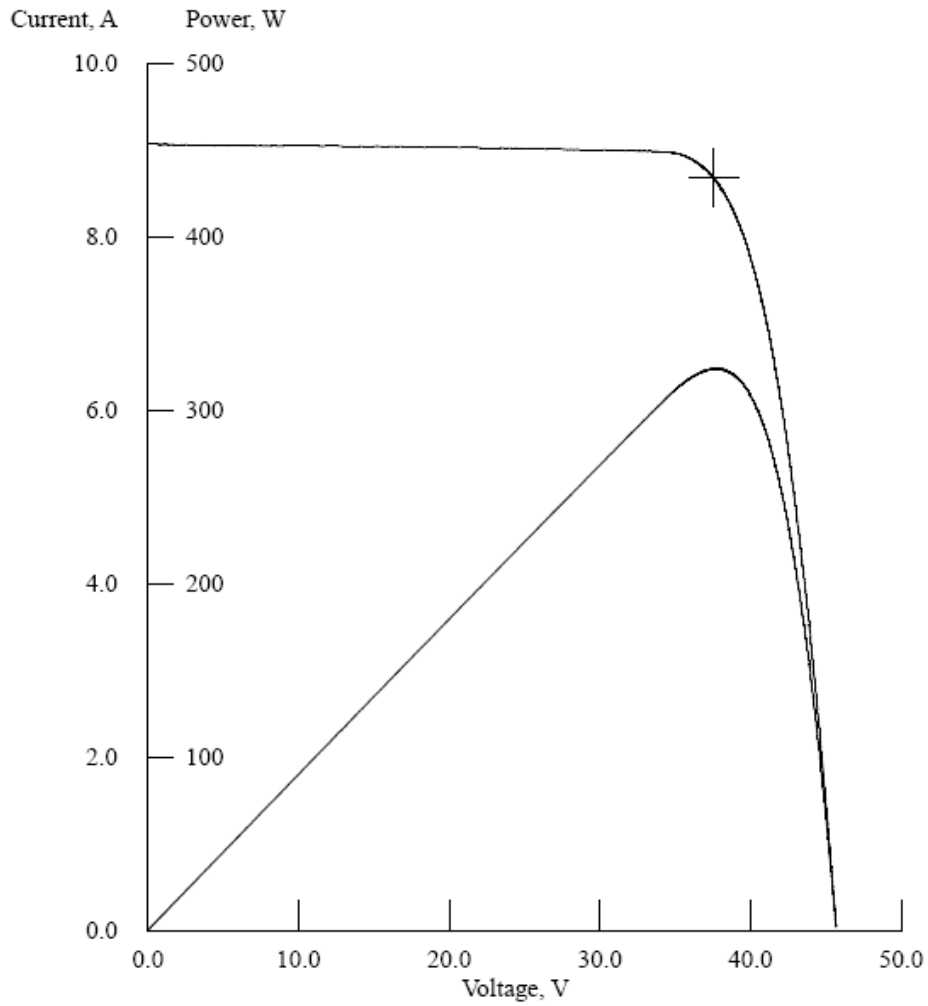
PIV GRAPHS POST SALT MIST

Sample no. 3160660



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: POST SALT
ID: 3160660
15:22:48 8/28/2020
Measured Temperature = 24.3°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.40V
Isc = 9.06A
Pmax = 323.62W
Vpm = 37.33V
Ipm = 8.67A
FF = 0.79
Eff,m = 16.71%
Eff,c = 18.47%
Rs = 0.46 Ohm
Rsh = 200.25 Ohm

Load Voltage: 6.300 V
IV Points: 3549

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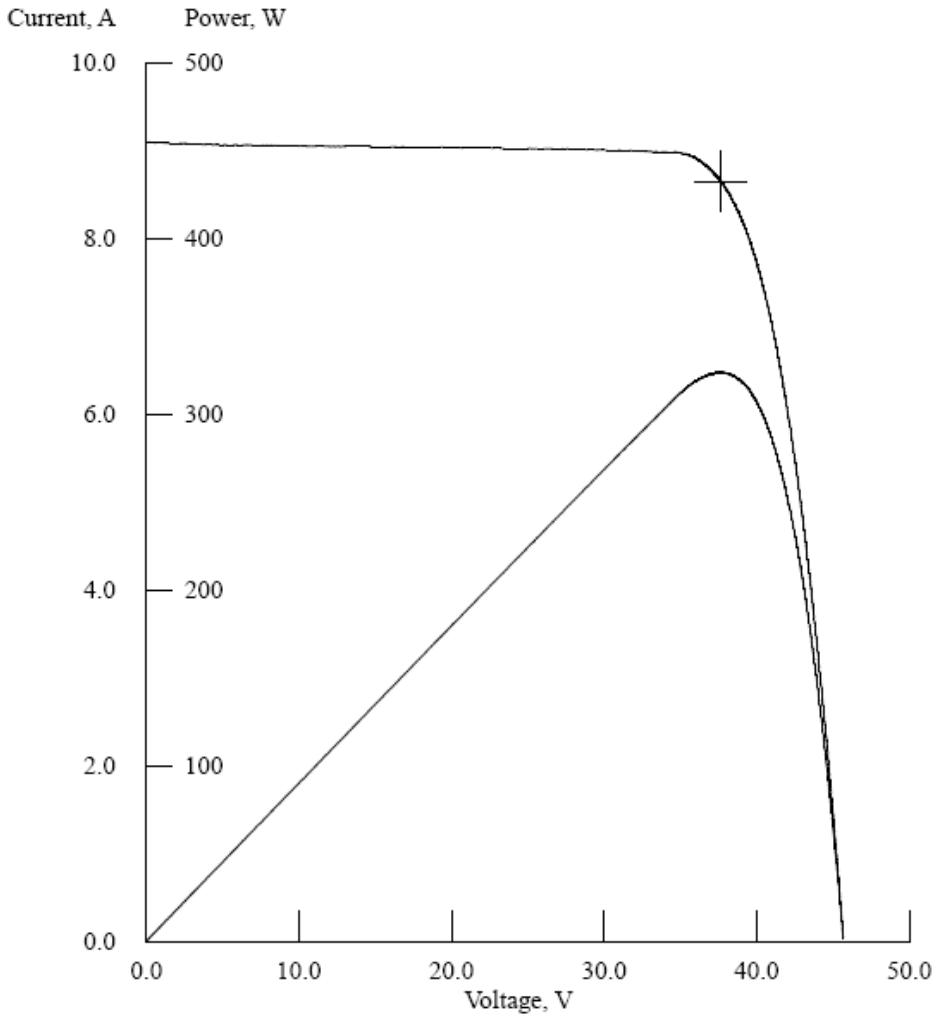
Sample no. 3160661



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: POST SALT
ID: 3160661
15:24:11 8/28/2020
Measured Temperature = 24.2°C
Corrected Temperature = 25.0°C

Irr Meas =	100.0mW/cm²
Irr Corr =	100.0mW/cm²
Voc =	45.37V
Isc =	9.09A
Pmax =	323.50W
Vpm =	37.41V
Ipm =	8.65A
FF =	0.78
Eff,m =	16.71%
Eff,c =	18.46%
Rs =	0.46 Ohm
Rsh =	128.43 Ohm

Load Voltage: 6.300 V
IV Points: 3577

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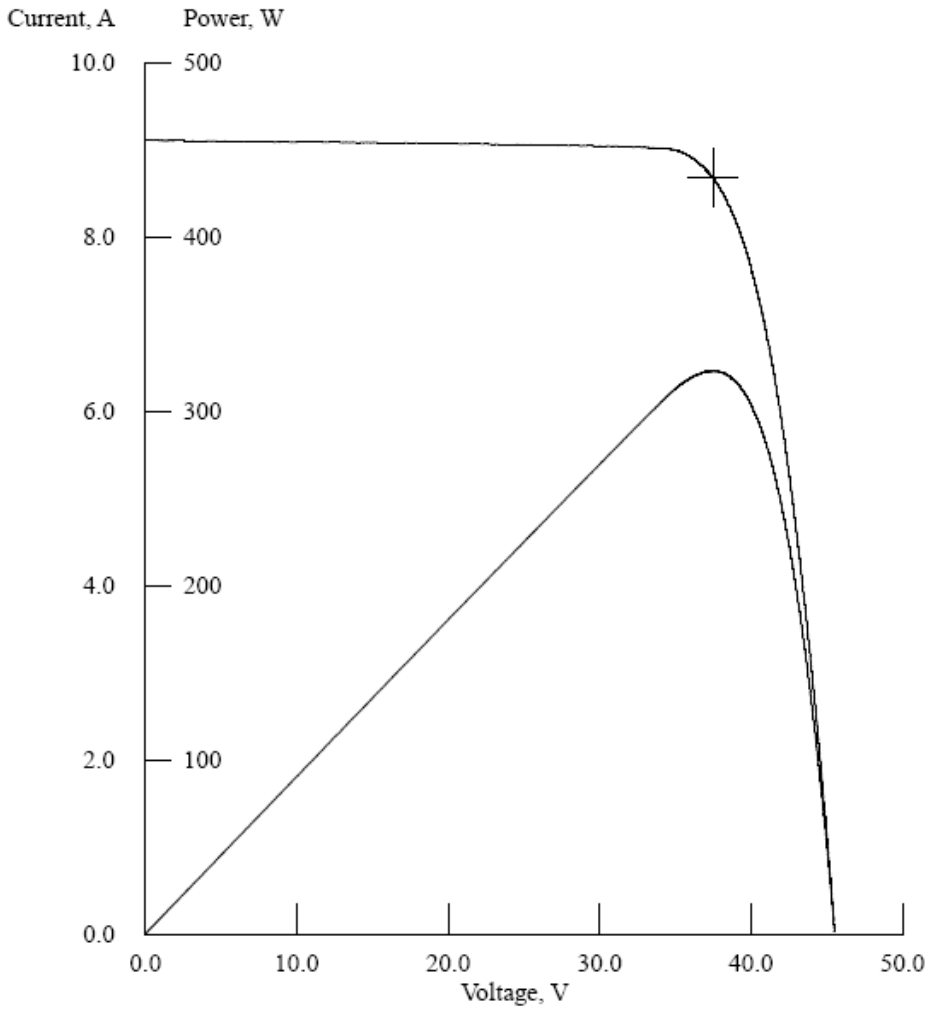
PIV Graphs Post Bypass

Sample no. 3160660



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: POST BYPASS
ID: 3160660
14:58:00 8/31/2020
Measured Temperature = 24.8°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.24V
Isc = 9.11A
Pmax = 322.87W
Vpm = 37.24V
Ipm = 8.67A
FF = 0.78
Eff,m = 16.56%
Eff,c = 18.43%
Rs = 0.45 Ohm
Rsh = 230.80 Ohm

Load Voltage: 6.300 V
IV Points: 3597

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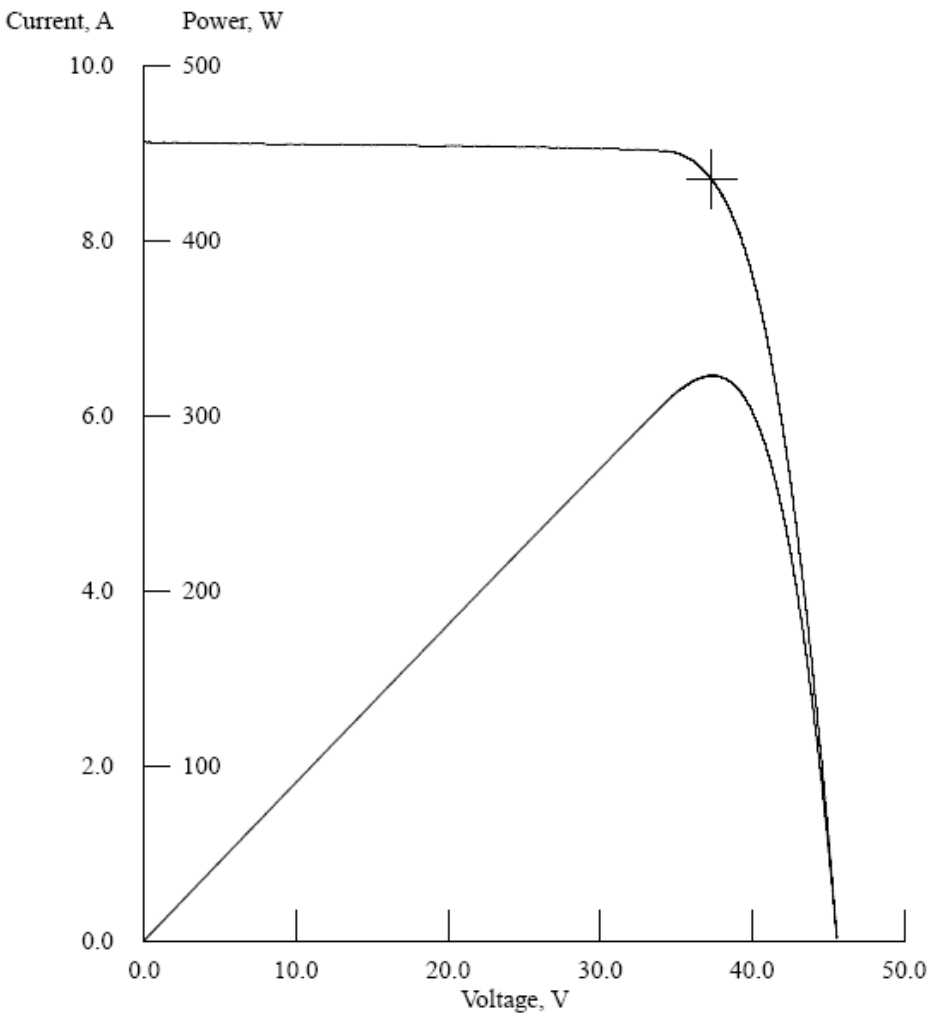
CIN: U74200KA1997PTC023189

Sample no. 3160661



SPI-Sun Simulator 4600 SLP

Title: RITIKA
Comment: POST BYPASS
ID: 3160661
14:59:59 8/31/2020
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.28V
Isc = 9.12A
Pmax = 322.58W
Vpm = 37.10V
Ipm = 8.69A
FF = 0.78
Eff,m = 16.54%
Eff,c = 18.41%
Rs = 0.50 Ohm
Rsh = 768.34 Ohm

Load Voltage: 6.300 V
IV Points: 3611

PV MODULE COMPONENTS LIST(*As Declared by PV Module Manufacturer.)*

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PRODUCT SUBMITTAL INFORMATION SHEET – BIS

PV Module Family Bill of Material (BOM):

Sl. No.	Item Description	UOM	Material / Rating	Primary Supplier / Manufacturer	Alternate Supplier/Manufacturer
1	SOLDER WIRE	Kgs	SWG 18mm Sn:Pb::60:40	Cooksun	Khosla Engineering Pvt Ltd/Shri Arihant Metal Corporation
2	Cell Interconnects	Kgs	Sn/Pb: 60:40 1.0(+/- 0.25 mm) x 0.25 MM, 1.1 X 0.18MM , 1.2 x 0.16 MM or equivalent	Sukriti Vidyut Udyog Pvt Ltd	Tamra Dhatu Udyog Pvt Ltd/ Luvata Malaysis Sdn Bhd/ Luvata Suzhou Ltd / A B Industries(Neo Cab PV)/ Xian Telison New Materials Co Ltd/ G and G Cables and Wires India Pvt Ltd/Velop Products LLP/ Ferron Industries/Bruker Spalek Solar Technology (Taicang Company Limited)/Taicang Juren PV Material Company Ltd/PV Connect/Shanghai SunBy Solar Technology Co., Ltd/Ferron Industries
3	Bus Bars	Kgs	5(+/-.2mm) X 0.3 (+/- 0.15mm)	Sukriti Vidyut Udyog Pvt Ltd	Tamra Dhatu Udyog Pvt Ltd/ Luvata Malaysis Sdn Bhd/ Luvata Suzhou Ltd / A B Industries(Neo Cab PV)/ Xian Telison New Materials Co Ltd/ G and G Cables and Wires India Pvt Ltd/Velop Products LLP/ Ferron Industries/Bruker Spalek Solar Technology (Taicang Company Limited)/Taicang Juren PV Material Company Ltd/PV Connect/Shanghai SunBy Solar Technology Co., Ltd/Ferron Industries

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PRODUCT SUBMITTAL INFORMATION SHEET – BIS

4	Al Frame	Kgs	6063-T6 35 mm 40 mm	Shipai Industries	SV Frames/Indygreen Technlogies Pvt Ltd/Adcom Fabricators/JIANGYIN CITY JULONG RENEWABLE ENERGY Co.,Ltd/Sunshine Technology Co Ltd / RV Enterprises
7	PV Junction Box	Nos	DSJB01 (4 Rail)	DhaSh PV Technologies Private Limited	For 3 and 2 Rail JBs for Panels Upto 180 Wp: Sinotech ST 612
8	Junction box cables	Nos	H1Z2Z2K(UNICAB)	APAR INDUSTRIES LIMITED	DhaSh PV Technologies Private Limited
9	Junction box connectors	Nos	TT01	TAIZHOU CHUANGDA ELECTRONIC CO LTD	NA
10	Double sided adhesive tape	Mtr	1 x 18-24 mm 57005/SolarBond v7700	Lohmann Adhesive Tapes India Pvt Ltd	St Gobain Performance Plastics
11	Aluminium corner Key/ screws	kgs	40 x 40 mm or as required 6063 T6	Shipai Industries	SV Frames/Indygreen Technlogies Pvt Ltd//Adcom Fabricators/JIANGYIN CITY JULONG RENEWABLE ENERGY Co.,Ltd/Sunshine Technology Co Ltd / RV Enterprises
12	EVA ENCAPSULANT	Sqmtrs	CONSERV P 360-14FC	Renewsys	
13	BACKSHEET	Sqmtrs	Preserv A 125WN	Renewsys	
14	Solar Cell Mono	Nos	156.75 x 156.75 mm or as per technology available (157 X 157/157.75X157.75/158.75X158.75) Multi Crystalline- 5BB	Indian Cell : Jupiter Energy(JIL)	

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PRODUCT SUBMITTAL INFORMATION SHEET – BIS

15	Sealant	Ltrs	White color- 1527	Tonsan	NA
16	GLASS	Nos	3.2mm Toughened glass with acceptable tolerance	Gujarat Borosil Ltd	Xinyi Solar Malaysia SDN BHD/Shaanxi Topray Solar Co Ltd/Tg Fujian Photovoltaic Glass Limited/CNBM New Energy Resources Co Ltd/Henan Ancai Hi Tech Co Ltd
17	JB SEALANT - JB FIXING	Grams	White color- 1527	Tonsan	NA
18	LABEL BACK MODULE	nos	4 inch X 6 inch	Abacus Printers	NA
19	LABEL INTERNAL	Nos	50 X 20 mm	Abacus Printers	NA
20	FLUX	Ltrs	952-S	Kester	Henkel Adhesive Technologies India Pvt Ltd

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PHOTOGRAPHS

MODULE FRONT SIDE

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MODULE BACK SIDE

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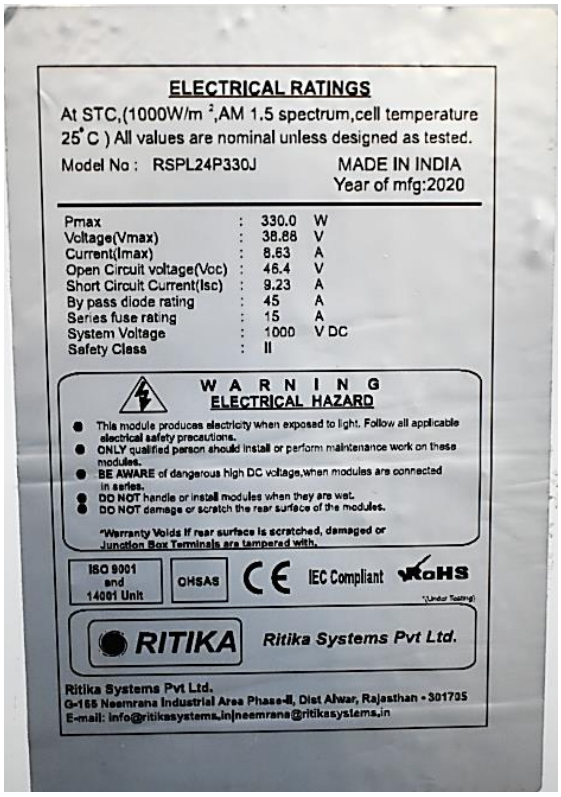
BACK LABEL



JUNCTION BOX

UL India Private Limited
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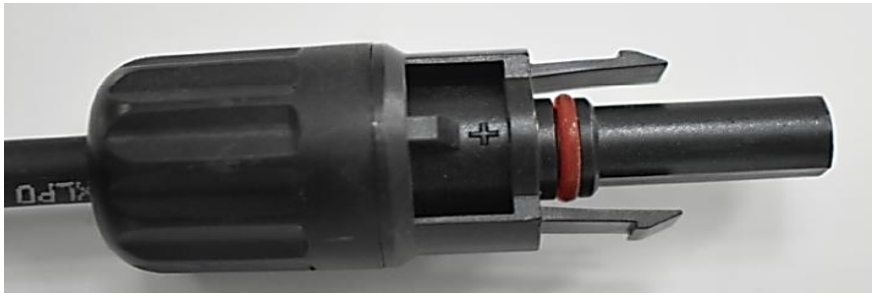
CIN: U74200KA1997PTC023189

CONNECTORS



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

UL India Private Limited
Registered Office: Kalyani Platina - Block I, 3rd Floor
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TEST REPORT

SGS-CSTC
Standards Technical Services
(Shanghai) Co., Ltd.
No.588 West Jindu Road,
Songjiang District,
Shanghai, China

Report reference no. .....:	SHES141000531205
Date of issue.....:	May. 06, 2015
Total number of pages .....:	10
Testing laboratory .....:	SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
Address .....:	No.588 West Jindu Road, Songjiang District, Shanghai, China
Applicant's name.....:	M/S. Ritika Systems Pvt Ltd
Address .....:	C-22/18 Sector-57, Noida, Distt. Gautam Budh Nagar, Uttar Pradesh - 201301 India
Test specification .....:	IEC 61701:1995
Test item description .....:	Photovoltaic (PV) module(s)
Trade mark .....:	RITIKA
Manufacturer .....:	M/S. Ritika Systems Pvt Ltd G-166 Neemrana Industrial Area Phase-II, Distt Alwar – 301705, Rajasthan, India.
Model/Type reference .....:	RSPL24P280
Ratings .....:	Refer to page 3

Monica Liu

Signature

Tested by: Monica Liu

Erin Lin

Signature

Approved by: Erin Lin

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
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Summary of testing	
The submitted samples are tested according to IEC 61701:1995 in this test report. The samples have been tested and found to comply with the above-mentioned standard's requirements.	
Tests performed (name of test and test clause): IEC 61701:1995 Salt mist corrosion testing of photovoltaic(PV) modules	**Testing location:** Wuxi Institute of Supervision and Testing for Product Quality (National Center of Supervision and Inspection on Solar Photovoltaic Products Quality) Suite A-10F, Innovation & Creation Science Park, No.5 Xinhua Road, WND, Wuxi, Jiangsu, China

Copy of marking plate / device under test:

Marking plate

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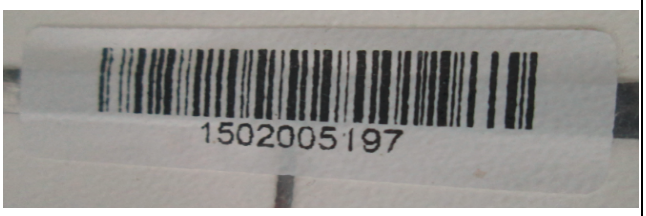
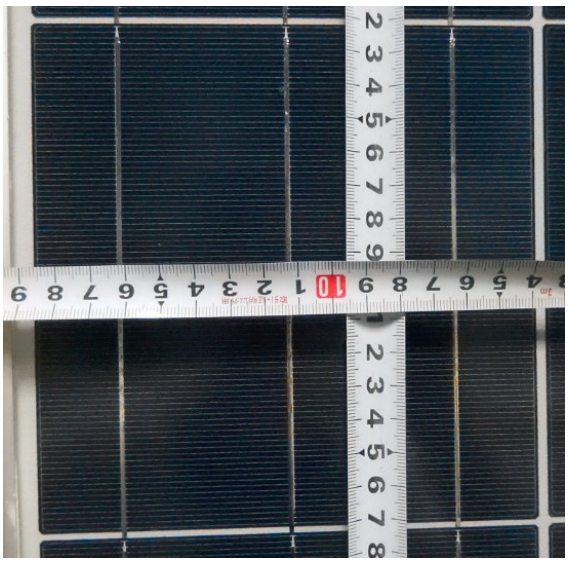
Front view of sample

Rear view of sample



Serial number labels



Detail view of cell

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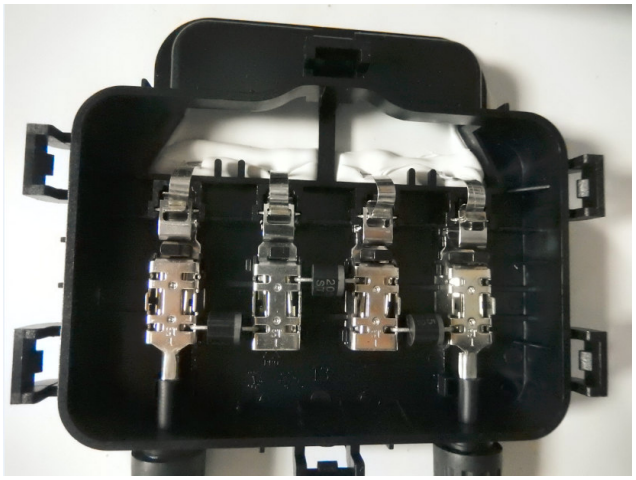
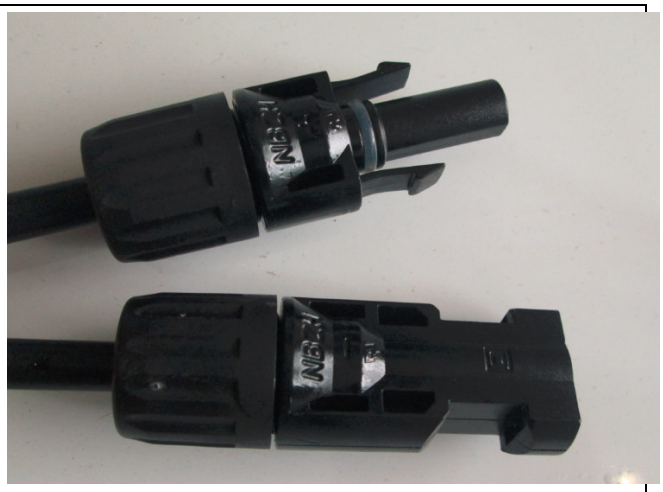
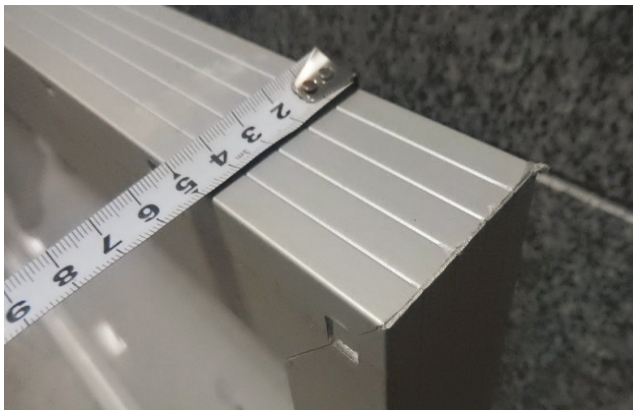


Detail view of opened junction box

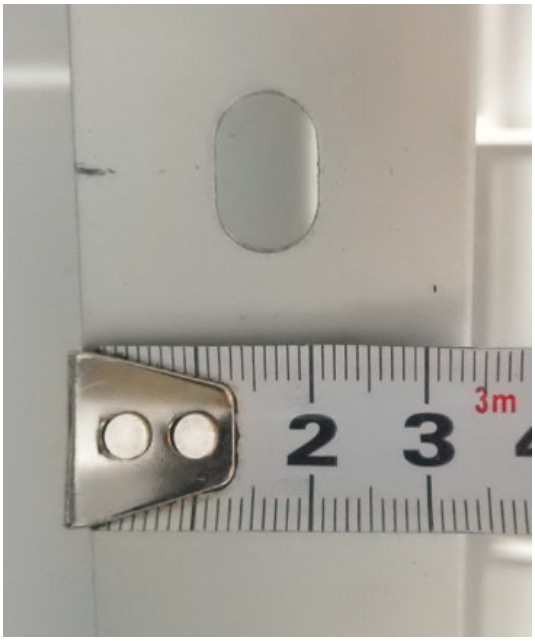


Detail view of connectors

Detail view of cable



Detail view of frame



Detail view of mounting hole

Detail view of grounding hole

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Possible test case verdicts	
- Test case does not apply to the test object..... :	N/A
- Test object does meet the requirement ..... :	Pass (P)
- Test object does not meet the requirement ..... :	Fail (F)

General remarks

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

List of test equipment must be kept on file and available for review.

General product information

The product is photovoltaic (PV) module.

RSPL24P280 is polycrystalline silicon module with 72 pieces of 156mm-side-length cell.

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Description of module construction: **(Manufactories and part numbers, unless otherwise specified)**	
Module Type/s	RSPL24P280
Front Cover.....:	Gujarat Borosil Limited
Rear Cover .....:	Renewsys
Encapsulation material .....:	Renewsys, 0.295mm, EVA,
Frame.....:	Superfine group of industries & Various
Dimensions (l x w x h) [mm].....:	1961 x 983 x 50
Module area [m²].....:	1.93
Cell	
Cell (include type).....:	Tainergy Tech (Kunshan) Co., Ltd.
Cells (l x w) [mm] .....:	156×156
Cell thickness [µm].....:	200±20
Cell area [cm²] .....:	243.36
Number of cells.....:	72
Components and other	
Cells per bypass diode .....:	24
Type of bypass diode.....:	20SQ045
No. of bypass diodes .....:	3
Cell- and string connectors.....:	Gebauer & Griller
Junction box .....:	Zhonghuan (Sunter) electronic technology Co., Ltd.
Cable .....:	Zhonghuan (Sunter) electronic technology Co., Ltd.
Connectors .....:	Zhonghuan (Sunter) electronic technology Co., Ltd.
Adhesives (frame).....:	PV804, Dow Corning
Adhesives (junction box).....:	PV804, Dow Corning
Potting material (junction box) .....:	N/A
Mounting system.....:	N/A
Others .....:	N/A

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1. Test samples

Sample #	Model	Sample S/N
21	RSPL24P280	1407002880
22	RSPL24P280	1502005197

2. Test specification and test result

Initial Measurements						
10.1	**TABLE: Visual inspection**					P
Test Date [MM/DD/YYYY] ..... :	04/02/2015					—
Sample #	Nature and position of initial findings – comments or attach photos					Verdict
21	No visual defects					P
22	No visual defects					P
Supplementary information:						
10.2	**TABLE: Maximum Power Determination**					—
Test Date [MM/DD/YYYY] ..... :	04/02/2015					—
Radiant source	☒ Solar simulator, ☐ Natural sunlight					—
Module temperature [℃]..... :	25.0					—
Irradiance [W/m^2]..... :	1000					—
Sample #	Voc [V]	Isc [A]	Vmp [V]	Imp [A]	Pmp [W]	FF [%]
21	45.30	8.499	36.82	7.970	293.5	76.22
22	44.80	8.347	36.11	7.836	283.0	75.69
Supplementary information:						
10.3	**TABLE: Insulation test**					P
Test Date [MM/DD/YYYY] ..... :	04/02/2015					—
Test Voltage applied [V, DC] ..... :	3000/1000					—
Sample #	Measured [MΩ]	Required [MΩ]	Dielectric breakdown, Yes (description) or No			Verdict
21	>1000	≥20.8	No			P
22	>1000	≥20.8	No			P
Supplementary information: Size of module [m^2] 1.93						

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Test Ka: Salt mist test	
Test date [MM/DD/YYYY] :	04/10/2015 to 04/14/2015
Salt solution concentration[weight %] :	5
pH value :	7.0
Temperature [℃] :	30
Durations [hour] :	96

Final Measurements						
10.1	**TABLE: Visual inspection**					P
Test Date [MM/DD/YYYY] ..... :	04/15/2015					—
Sample #	Nature and position of initial findings – comments or attach photos					Verdict
21	No visual defects					P
22	No visual defects					P
Supplementary information:						
10.2	**TABLE: Maximum Power Determination**					—
Test Date [MM/DD/YYYY] ..... :	04/15/2015					—
Radiant source	☒ Solar simulator, ☐ Natural sunlight					—
Module temperature [℃]..... :	25.0					—
Irradiance [W/m^2]..... :	1000					—
Sample #	Voc [V]	Isc [A]	Vmp [V]	Imp [A]	Pmp [W]	FF [%]
21	45.37	8.482	36.79	7.971	293.2	76.21
22	44.83	8.296	36.10	7.760	280.1	75.31
Pmp degradation after this test [%] ≤5% :	0.10, 1.02					P
Supplementary information:						
10.3	**TABLE: Insulation test**					P
Test Date [MM/DD/YYYY] ..... :	04/15/2015					—
Test Voltage applied [V, DC] ..... :	3000/1000					—
Sample #	Measured [MΩ]	Required [MΩ]	Dielectric breakdown, Yes (description) or No			Verdict
21	>1000	≥ 20.8	No			P
22	>1000	≥ 20.8	No			P
Supplementary information: Size of module [m^2] 1.93						

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3. List of measurement equipments

Description	Identification #	Calibration expire date
Steel tap	LS21-05	09/04/2015
Temperature and humidity recorder	TT21-44	05/11/2015
	TT21-45	05/11/2015
	TT21-47	05/26/2015
Vernier caliper	LS06-025	11/04/2015
Luminometer	OI20-02	05/11/2015
Pulsed solar simulator	EV20-53	04/20/2015
Multi-function recorder	TT21-56	08/06/2015
Withstanding voltage/Insulation resistance tester	EV20-35	11/04/2015
Salt spray test box	TT20-17	06/06/2015

4. Statement of the estimated uncertainty of the test results

The estimated uncertainty fulfils the requirements from the CTL decision sheet DSH 251B / 2009.

----- End of Test Report -----

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