



Test Report

Rayzon Solar Private Limited

REPORT NUMBER: 4791153693.2.1-NABL-S1

PROJECT NUMBER: 4791153693.2.1

ULR NUMBER: TC616824000000161F

LOCATION:

UL India Private Limited,
Kalyani Platina Campus,
Sy.no.129/4, EPIP Zone, Phase II,
Whitefield,
Bangalore - 560 066

QR code-





Report Number: 4791153693.2.1-NABL-S1
ULR Number: TC61682400000161F



TEST DISCIPLINE: ELECTRONICS
PRODUCT GROUP: SOLAR PANEL

General details

Customer / Applicant	Rayzon Solar Private Limited Block no 94/1/1F,94/1/3,102/1,103,104,105,109,110,118,119,120 Kim Mandvi Road, Nr. Hariya Talav B/H Aron Pipe, Karanj, Surat, Gujarat-394110, INDIA.		
Manufacturer	Rayzon Solar Private Limited Block no 94/1/1F,94/1/3,102/1,103,104,105,109,110,118,119,120 Kim Mandvi Road, Nr. Hariya Talav B/H Aron Pipe, Karanj, Surat, Gujarat-394110, INDIA.		
Program	NABL		
Item Under Test	Crystalline PV modules		
Model	RSB550WC		
Number of Samples	04 (Four)		
UL. Sample Identification	6809221 6809222 6809223 6809224	Refer Summary of Test results for multiple samples	
Manufacturer Serial Number (if any)	6809221- RSCB2M0030124000034 6809222- RSCB2M0030124000020 6809223- RSCB2M0030124000029 6809224- RSCB2M0030124000030		
Condition of IUT on receipt	Good		
Date of Receipt	8 January 2024		
Applicable Standard	IEC 61853-1 Edition 1.0, 2011-01- Photovoltaic (PV) module performance testing and energy rating –Part 1: Irradiance and temperature performance measurements and power rating.		
Date of Testing (Start date)	25 January 2024	End Date	22 February 2024
UL general ambient condition	Temperature in °C		(23 ±5)°C
	Relative humidity in %		<70 %
Date of Issue	29 February 2024		
Test In-charge	Manjunath Kumbar		



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Kantha Raju H S Senior Project Engineer	N Srimathy Project Engineer
Reviewed by	Authorized signatory

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General Remarks (If any)

- 1) The below got test 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) "Clause 6.j. - any deviations from, additions to or exclusions from the calibration or test method, and any other information relevant to a specific calibration" – There is no such deviation in the report.

Description of Item under Test (IUT)

Mono crystalline PV modules of (RSB550WC) 550Wp were tested for IEC 61853-1. Out of 4 samples, 3 samples considered as test samples and 1 sample considered as control.

Sample No.	Sample Identification Number	Date Received	Test Date	Product Description	Serial Number
1	6809221 (Control)	2024-01-08	Refer individual test table	Solar PV Module 550W, (RSB550WC)	RSCB2M0030124000034
2	6809222				RSCB2M0030124000020
3	6809223				RSCB2M0030124000029
4	6809224				RSCB2M0030124000030

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Summary of Test Results

No.	Item	Result
1	Visual Inspection as Received	No visual defects were found
2	Stabilization	Average degradation is less than 1%.
3	Performance at STC after stabilization	Average Pmax = 551.01 Minimum Pmax = 550.35 Maximum Pmax = 551.45
4	Performance according to IEC 61853-1	Refer individual test table for details.
5	Measurement of temperature coefficients	$\alpha(I_{sc}) = 0.02\%/^{\circ}\text{C}$ $\beta(V_{oc}) = -0.23\%/^{\circ}\text{C}$ $\delta(P_{mp}) = -0.32\%/^{\circ}\text{C}$

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

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Master Equipment and Calibration details

Test Name	UL Equipment ID	Description	Calibration status (Valid up to) (YYYY-MM-DD)
Visual Inspection	180089	Meter and/or Sensor, Light	2024-03-23
Visual Inspection	160912	Fixture, For Testing, Table	NA
Visual Inspection	68611	Datalogger, RH & Temperature	2025-01-02
Visual Inspection	76645	Magnifying Lens, Without Ruler	NA
Performance at STC before initial stabilization	199796	Apparatus, Solar Simulator	2024-06-28
Performance at STC before initial stabilization	199638	Thermometer, Infrared	2024-04-06
Performance at STC before initial stabilization	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance at STC before initial stabilization	64832	Datalogger, RH & Temperature	2024-09-05
Performance at STC before initial stabilization	244251	Reference Standard, PV Cell	2024-12-18
Initial Stabilization Starts	54584	Apparatus, Pyranometer, Solar Diffuse Radiance	2025-08-26
Initial Stabilization Starts	71520	Datalogger	2024-09-07
Initial Stabilization Starts	175795	Fixture, For Testing, Metal Plate	NA

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Test Name	UL Equipment ID	Description	Calibration status (Valid up to) (YYYY-MM-DD)
Initial Stabilization Ends	54584	Apparatus, Pyranometer, Solar Diffuse Radiance	2025-08-26
Initial Stabilization Ends	71520	Datalogger	2024-09-07
Initial Stabilization Ends	175795	Fixture, For Testing, Metal Plate	NA
Performance at STC after 1st stabilization	199796	Apparatus, Solar Simulator	2024-06-28
Performance at STC after 1st stabilization	199638	Thermometer, Infrared	2024-04-06
Performance at STC after 1st stabilization	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance at STC after 1st stabilization	64832	Datalogger, RH & Temperature	2024-09-05
Performance at STC after 1st stabilization	244251	Reference Standard, PV Cell	2024-12-18
Initial Stabilization Starts	54584	Apparatus, Pyranometer, Solar Diffuse Radiance	2025-08-26
Initial Stabilization Starts	71520	Datalogger	2024-09-07
Initial Stabilization Starts	175795	Fixture, For Testing, Metal Plate	NA
Initial Stabilization Ends	54584	Apparatus, Pyranometer, Solar Diffuse Radiance	2025-08-26
Initial Stabilization Ends	71520	Datalogger	2024-09-07

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TC-6168

Test Name	UL Equipment ID	Description	Calibration status (Valid up to) (YYYY-MM-DD)
Initial Stabilization Ends	175795	Fixture, For Testing, Metal Plate	NA
Performance at STC after 2nd stabilization	199796	Apparatus, Solar Simulator	2024-06-28
Performance at STC after 2nd stabilization	199638	Thermometer, Infrared	2024-04-06
Performance at STC after 2nd stabilization	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance at STC after 2nd stabilization	64832	Datalogger, RH & Temperature	2024-09-05
Performance at STC after 2nd stabilization	244251	Reference Standard, PV Cell	2024-12-18
Visual Inspection	180089	Meter and/or Sensor, Light	2024-03-23
Visual Inspection	160912	Fixture, For Testing, Table	NA
Visual Inspection	68611	Datalogger, RH & Temperature	2025-01-02
Visual Inspection	76645	Magnifying Lens, Without Ruler	NA
Performance according to IEC 61853-1 Starts	199796	Apparatus, Solar Simulator	2024-06-28
Performance according to IEC 61853-1 Starts	199638	Thermometer, Infrared	2024-04-06
Performance according to IEC 61853-1 Starts	177816	Measuring Tool, Rigid Ruler	2024-12-29

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Test Name	UL Equipment ID	Description	Calibration status (Valid up to) (YYYY-MM-DD)
Performance according to IEC 61853-1 Starts	64832	Datalogger, RH & Temperature	2024-09-05
Performance according to IEC 61853-1 Starts	244251	Reference Standard, PV Cell	2024-12-18
Performance according to IEC 61853-1 Starts	70192	Chamber, Climatic, Temp	2024-04-11
Performance according to IEC 61853-1 Ends	199796	Apparatus, Solar Simulator	2024-06-28
Performance according to IEC 61853-1 Ends	199638	Thermometer, Infrared	2024-04-06
Performance according to IEC 61853-1 Ends	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance according to IEC 61853-1 Ends	64832	Datalogger, RH & Temperature	2024-09-05
Performance according to IEC 61853-1 Ends	244251	Reference Standard, PV Cell	2024-12-18
Performance according to IEC 61853-1 Ends	70192	Chamber, Climatic, Temp	2024-04-11
Performance at STC and NOCT	199796	Apparatus, Solar Simulator	2024-06-28
Performance at STC and NOCT	199638	Thermometer, Infrared	2024-04-06
Performance at STC and NOCT	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance at STC and NOCT	64832	Datalogger, RH & Temperature	2024-09-05

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Test Name	UL Equipment ID	Description	Calibration status (Valid up to) (YYYY-MM-DD)
Performance at STC and NOCT	244251	Reference Standard, PV Cell	2024-12-18
Performance at STC and NOCT	70192	Chamber, Climatic, Temp	2024-04-11
Performance at Low irradiance	199796	Apparatus, Solar Simulator	2024-06-28
Performance at Low irradiance	199638	Thermometer, Infrared	2024-04-06
Performance at Low irradiance	177816	Measuring Tool, Rigid Ruler	2024-12-29
Performance at Low irradiance	64832	Datalogger, RH & Temperature	2024-09-05
Performance at Low irradiance	244251	Reference Standard, PV Cell	2024-12-18

Test methodology adopted

As per standard IEC 61853-1 - Photovoltaic (PV) Module Performance Testing and Energy Rating – Part 1: Irradiance and Temperature Performance Measurements And Power Rating – Edition.1- 2011-01

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Test Observation (If any)

Test Results:

3.1 Visual Inspection

Description and Setup

Samples were visually inspected according to IEC 61215-2, First Edition, 2016.

Result:

10.1	TABLE: Visual inspection (Initial)	P
Test Date [MM/DD/YYYY]	01/25/2024	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No visual defects were found	P
2	No visual defects were found	P
3	No visual defects were found	P
4	No visual defects were found	P
Supplementary information: NA		



3.2 Performance at STC before stabilization

Description and Setup

The performance at STC according to IEC61215-2 has been determined by use of a class A pulsed sun simulator according to IEC 60904-9 and a photovoltaic reference device according to IEC 60904-2 of the same technology as the sample under test.

- Before each test the photovoltaic reference device was placed on the pulsed sun simulator to adjust the test equipment and assure the correctness of the measurement.
- After adjusting the pulsed sun simulator, the sample under test was placed on the test area and hold at a temperature of 25°C +/-1°C.
- The current-voltage characteristics were measured and recorded at an irradiance of 1000 W/m².

Result:

10.2	TABLE: Maximum Power Determination at STC – Before Preconditioning					
Test Date (MM/DD/YYYY) start/end	01/25/2024					
Cell temperature (°C)	25					
Irradiance (W/m ²)	1000					
Sample #	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmp (W)	FF (%)
1(Front)	49.96	42.56	13.55	12.99	553.00	82.00
1(Rear)	49.51	45.72	9.47	8.25	377.21	80.00
2(Front)	50.03	42.36	13.57	13.06	553.29	82.00
2(Rear)	49.41	45.78	9.35	8.17	373.97	81.00
3(Front)	49.97	42.64	13.56	12.98	553.51	82.00
3(Rear)	49.32	45.63	9.49	8.33	379.93	81.00
4(Front)	49.79	42.54	13.55	12.99	552.54	82.00
4(Rear)	49.37	45.83	9.45	8.16	374.05	80.00
Supplementary information:	NA					



The STC bifaciality coefficient

Sample #	The measured STC bifaciality coefficient			The nameplate STC bifaciality coefficient including tolerance			Result
	ϕ_{Isc}	ϕ_{Voc}	ϕ_{Pmax}	$\phi_{Voc(NP)}$	$\phi_{Isc(NP)}$	$\phi_{Pmax(NP)}$	
1	69.89%	99.10%	68.21%	100%± 5%	75%± 10%	75%± 10%	P
2	68.90%	98.76%	67.59%	100%± 5%	75%± 10%	75%± 10%	P
3	69.99%	98.70%	68.64%	100%± 5%	75%± 10%	75%± 10%	P
4	69.74%	99.16%	67.70%	100%± 5%	75%± 10%	75%± 10%	P

3.3 Stabilization:

Description and Setup:

The module was exposed to a total irradiance according to IEC 61215-2, First Edition, 2016.

The following formula shall be taken as the criterion to assess whether a module has reached its stabilized electrical power output:

$$(P_{max} - P_{min}) / P_{average} < x$$

Where x is defined in the technology specific parts of this standard, x=0.01 for c-Si modules.

Result:

TABLE 02.2: MQT 19.1: Initial Stabilization procedure							P
Light exposure method							
<input type="checkbox"/> Simulator <input checked="" type="checkbox"/> Natural sunlight							
Abbreviation: Regarding light source "S" for Solar simulator and "N" for Natural sunlight							
Stabilization criterion x per IEC 61215-1-1 :					0.01 (1%)		
Sample #	1	Test Date (YYYY-MM-DD) start/end			2024-01-25 to 2024-02-01		



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Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	Pmax (W) at the end of cycle	(Pmax – Pmin) / Paverage (%)	Stable (Yes/No)
Initial	—	—	—	—	553.00	—	—
1	5.01	763.62	32.83	3.2	551.55	—	—
2	5.10	738.97	32.88	3.2	551.07	0.350	Yes
Sample #	2	Test Date (YYYY-MM-DD) start/end		2024-01-25 to 2024-02-01			
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	Pmax (W) at the end of cycle	(Pmax – Pmin) / Paverage (%)	Stable (Yes/No)
Initial	—	—	—	—	553.29	—	—
1	5.01	763.62	32.83	3.2	552.51	—	—
2	5.10	738.97	32.88	3.2	551.19	0.380	Yes
Sample #	3	Test Date (YYYY-MM-DD) start/end		2024-01-25 to 2024-02-01			
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	Pmax (W) at the end of cycle	(Pmax – Pmin) / Paverage (%)	Stable (Yes/No)
Initial	—	—	—	—	553.51	—	—
1	5.01	763.62	32.83	3.2	552.67	—	—
2	5.10	738.97	32.88	3.2	551.45	0.373	Yes
Sample #	4	Test Date (YYYY-MM-DD) start/end		2024-01-25 to 2024-02-01			
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	Pmax (W) at the end of cycle	(Pmax – Pmin) / Paverage (%)	Stable (Yes/No)
Initial	—	—	—	—	552.54	—	—
1	5.01	763.62	32.83	3.2	551.06	—	—
2	5.10	738.97	32.88	3.2	550.35	0.397	Yes

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3.4 Visual Inspection after Stabilization

Description and Setup:

Samples were visually inspected according to IEC 61215-2, First Edition, 2016.

Result:

10.1	TABLE: Visual inspection (after Stabilization)	P
Test Date [MM/DD/YYYY]	02/01/2024	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No visual defects were found	P
2	No visual defects were found	P
3	No visual defects were found	P
4	No visual defects were found	P
Supplementary information: NA		



3.5 Performance at STC after stabilization

Description and Setup:

The performance at STC according to IEC61215-2 has been determined by use of a class A pulsed sun simulator according to IEC 60904-9 and a photovoltaic reference device according to IEC 60904-2 of the same technology as the sample under test.

- Before each test the photovoltaic reference device was placed on the pulsed sun simulator to adjust the test equipment and assure the correctness of the measurement.
- After adjusting the pulsed sun simulator, the sample under test was placed on the test area and hold at a temperature of 25°C +/-1°C.
- The current-voltage characteristics were measured and recorded at an irradiance of 1000 W/m².

Result:

10.2 TABLE: Maximum Power Determination at STC – After stabilization						
Test Date (MM/DD/YYYY) start/end			02/01/2024			
Cell temperature (°C)			25			
Irradiance (W/m ²)			1000			
Sample #	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmp (W)	FF (%)
1	50.03	42.27	13.54	13.04	551.07	81.00
2	49.97	42.53	13.55	12.96	551.19	81.00
3	49.94	42.36	13.56	13.02	551.45	81.00
4	49.92	42.58	13.54	12.92	550.35	81.00
Supplementary information:		Note: Measured STC power agrees with the manufacturer's rated power range within the test laboratories measurement uncertainty.				



3.6 Performance according to IEC61853-1: 2011-01, ED 01, Clause 7.2 to 7.6 Summary of reference power condition (at AM 1.5)

10.6	TABLE: Performance at STC and NOCT						P
Test Date [MM/DD/YYYY].....:	02/22/2024						—
Sample.....:	1						—
Wind velocity [m/s]high/low	--						—
Test method..... :	<input checked="" type="checkbox"/> indoor <input type="checkbox"/> outdoor						—
Ambient air temperature [°C] high/low..... :	--						—
Irradiance [W/m ²]high/low	STC: 1000 / NOCT: 800						—
Module temperature [°C] high/low	STC: 25 /NOCT: 45						—
Data corrected to the STC Standard Reference Environment (SRE)							—
Condition	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	
STC	49.88	42.37	13.54	12.99	550.58	82.00	
NOCT (44.28)	46.92	39.38	10.88	10.42	410.49	80.00	
Supplementary information: NA							

10.7	TABLE: Performance at low irradiance						P
Test Date [MM/DD/YYYY].....:	02/22/2024						—
Sample.....:	1						—
Investigation wind velocity (m/s).....:	--						—
Ambient air temperature [°C]	--						—
Irradiance [W/m ²](200 W/m ²)	200						—
Module temperature [°C]..... :	25						—
Test method	<input type="checkbox"/> Data corrected to a 25°C cell temperature and 200 W/m ² irradiance <input checked="" type="checkbox"/> Directly measured						—
Data corrected to a 25°C cell temperature and 200 W/m ² irradiance							



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Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
1	46.96	41.57	2.73	2.63	109.25	85.00
Supplementary information: NA						

TABLE: PERFORMANCE AT HIGH TEMPERATURE CONDITION						P
Test Date [MM/DD/YYYY].....:	02/22/2024					—
Sample.....:	1					—
Investigation wind velocity (m/s).....:	--					—
Ambient air temperature [°C]	--					—
Irradiance [W/m ²].....:	1000					—
Module Cell temperature [°C].....:	75					—
Test method	<input checked="" type="checkbox"/> Directly measured					—
Data corrected to a 75°C cell temperature and 1000 W/m ² irradiance						
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
1	44.14	35.79	13.68	12.91	462.02	77.00
Supplementary information: NA						

TABLE: PERFORMANCE AT LOW TEMPERATURE CONDITION						P
Test Date [MM/DD/YYYY].....:	02/20/2024					—
Sample.....:	1					—
Investigation wind velocity (m/s).....:	--					—
Ambient air temperature [°C]	--					—
Irradiance [W/m ²].....:	500					—
Module Cell temperature [°C].....:	15					—
Test method	<input checked="" type="checkbox"/> Directly measured					—
Data corrected to a 15°C cell temperature and 500 W/m ² irradiance						
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
1	49.97	43.84	6.73	6.51	285.45	85.00
Supplementary information: NA						

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3.7 Performance according to IEC61853-1: 2011-01, Ed 01, Clause 8.2

Description and Setup:

The measurements were taken according to IEC 61853-1 1st edition rev. date 2011-01 clause 8.2 with a Class A pulsed solar simulator.

Matrices of module performance with respect to temperature and irradiance were measured and separate tables for Isc, Voc, Vmax and Pmax were generated using sufficient data to assure statistical validity to the measurements (see clause 8.3.11 and 8.5.11 of IEC 61853-1).

After generating the matrix of parameters, the modules were remeasured at STC to verify that the performance is stable.

Result:

Test Table: Performance according to IEC61853-1: 2011-01, Ed 01, Clause 8.2

Sample: (2) 6809222							
Irr (W/m ²)	Tc (°C)	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmax (W)	FF
100	15	47.09	42.84	1.36	1.29	55.44	87.00
	25	45.70	41.16	1.37	1.31	53.87	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
200	15	48.29	43.22	2.71	2.60	112.50	86.00
	25	47.04	42.09	2.73	2.62	110.48	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
400	15	49.72	44.61	5.41	5.18	231.08	86.00
	25	48.31	43.14	5.44	5.18	223.57	85.00
	50	45.12	38.52	5.46	5.23	201.43	82.00
	75	NA	NA	NA	NA	NA	NA
600	15	50.47	44.21	8.11	7.83	346.19	85.00
	25	49.05	42.85	8.14	7.84	335.84	84.00



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	50	46.05	39.06	8.18	7.78	303.74	81.00
	75	43.33	36.01	8.23	7.74	278.78	78.00
800	15	50.81	44.27	10.80	10.40	460.55	84.00
	25	49.59	42.85	10.85	10.39	445.16	83.00
	50	46.57	39.26	10.90	10.34	405.85	80.00
	75	44.00	36.09	10.96	10.40	375.22	78.00
1000	15	51.26	44.21	13.49	12.95	572.58	83.00
	25	49.99	42.43	13.57	12.98	550.88	81.00
	50	46.98	38.93	13.65	12.99	505.84	79.00
	75	44.27	35.98	13.73	12.91	464.49	76.00
1100	15	NA	NA	NA	NA	NA	NA
	25	50.16	42.52	14.92	14.21	604.26	81.00
	50	47.10	38.88	15.00	14.20	551.98	78.00
	75	44.36	35.66	15.09	14.17	505.38	75.00

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Sample: (3) 6809223

Irr (W/m ²)	Tc (°C)	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmax (W)	FF
100	15	47.07	43.04	1.36	1.29	55.70	87.00
	25	45.66	41.60	1.37	1.30	54.11	87.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
200	15	48.39	43.26	2.71	2.63	113.76	87.00
	25	46.95	42.74	2.73	2.59	110.77	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
400	15	49.72	44.22	5.41	5.23	231.10	86.00
	25	48.32	43.06	5.44	5.22	224.61	85.00
	50	45.12	38.73	5.46	5.21	201.97	82.00
	75	NA	NA	NA	NA	NA	NA
600	15	50.32	44.53	8.10	7.76	345.45	85.00
	25	49.06	43.06	8.15	7.82	336.95	84.00
	50	45.96	38.79	8.16	7.81	303.12	81.00
	75	43.18	35.96	8.21	7.74	278.49	79.00
800	15	50.76	44.13	10.80	10.42	459.98	84.00
	25	49.57	42.83	10.86	10.43	446.86	83.00
	50	46.52	39.09	10.91	10.37	405.20	80.00
	75	43.97	36.46	10.96	10.34	377.11	78.00
1000	15	51.22	44.03	13.49	13.02	573.23	83.00
	25	49.95	42.39	13.55	13.00	551.26	81.00
	50	46.90	38.98	13.58	12.93	503.95	79.00
	75	44.37	35.87	13.64	13.00	466.15	77.00
1100	15	NA	NA	NA	NA	NA	NA
	25	50.12	42.44	14.91	14.26	605.16	81.00
	50	47.06	38.79	14.98	14.21	551.07	78.00
	75	44.37	36.12	15.08	14.05	507.55	76.00

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Sample : (4) 6809224

Irr (W/m ²)	Tc (°C)	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmax (W)	FF
100	15	47.04	42.89	1.37	1.30	55.77	87.00
	25	45.64	40.77	1.37	1.31	53.61	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
200	15	48.44	43.64	2.71	2.60	113.59	86.00
	25	46.96	41.85	2.72	2.62	109.86	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
400	15	49.54	44.09	5.41	5.23	230.48	86.00
	25	48.24	42.76	5.43	5.22	223.29	85.00
	50	45.06	38.67	5.46	5.27	203.74	83.00
	75	NA	NA	NA	NA	NA	NA
600	15	50.36	44.49	8.09	7.76	345.46	85.00
	25	48.96	42.72	8.14	7.83	334.71	84.00
	50	45.89	39.05	8.19	7.76	302.89	81.00
	75	43.16	36.23	8.24	7.71	279.39	79.00
800	15	50.73	44.23	10.79	10.39	459.67	84.00
	25	49.53	42.99	10.84	10.37	445.63	83.00
	50	46.51	39.24	10.88	10.34	405.77	80.00
	75	43.93	36.13	10.94	10.38	375.21	78.00
1000	15	51.21	44.05	13.47	12.98	571.57	83.00
	25	49.92	42.56	13.55	12.93	550.44	81.00
	50	46.87	38.68	13.60	12.99	502.30	79.00
	75	44.32	36.19	13.68	12.84	464.78	77.00
1100	15	NA	NA	NA	NA	NA	NA
	25	50.13	42.51	14.89	14.21	604.23	81.00
	50	47.02	38.88	14.98	14.18	551.20	78.00
	75	44.33	35.72	15.07	14.17	506.07	76.00

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Average of Samples: 2 to 4

Irr (W/m ²)	Tc (°C)	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmax (W)	FF
100	15	47.07	42.92	1.36	1.29	55.64	87.00
	25	45.67	41.18	1.37	1.31	53.86	86.33
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
200	15	48.37	43.37	2.71	2.61	113.28	86.33
	25	46.98	42.23	2.73	2.61	110.37	86.00
	50	NA	NA	NA	NA	NA	NA
	75	NA	NA	NA	NA	NA	NA
400	15	49.66	44.31	5.41	5.21	230.89	86.00
	25	48.29	42.99	5.44	5.21	223.82	85.00
	50	45.10	38.64	5.46	5.24	202.38	82.33
	75	NA	NA	NA	NA	NA	NA
600	15	50.38	44.41	8.10	7.78	345.70	85.00
	25	49.02	42.88	8.14	7.83	335.83	84.00
	50	45.97	38.97	8.18	7.78	303.25	81.00
	75	43.22	36.07	8.23	7.73	278.89	78.67
800	15	50.77	44.21	10.80	10.40	460.07	84.00
	25	49.56	42.89	10.85	10.40	445.88	83.00
	50	46.53	39.20	10.90	10.35	405.61	80.00
	75	43.97	36.23	10.95	10.37	375.85	78.00
1000	15	51.23	44.10	13.48	12.98	572.46	83.00
	25	49.95	42.46	13.56	12.97	550.86	81.00
	50	46.92	38.86	13.61	12.97	504.03	79.00
	75	44.32	36.01	13.68	12.92	465.14	76.67
1100	15	NA	NA	NA	NA	NA	NA
	25	50.14	42.49	14.91	14.23	604.55	81.00
	50	47.06	38.85	14.99	14.20	551.42	78.00
	75	44.35	35.83	15.08	14.13	506.33	75.67



TC-6168

3.8 Measurement of temperature coefficients

Description and Setup:

The measurements were taken according to IEC 61853-1 1st edition rev. date 2011-01 with a Class A pulsed solar simulator.

The purpose is to determine the following temperature coefficients:

- Short Circuit current (α)
- Open circuit voltage (β)
- Peak (max) power (δ)

The coefficients so determined are valid at the irradiance at which the measurements were made.

- The current-voltage characteristics were measured and recorded at an irradiance of 1000 W/m².
- The original data is from "Performance measurements according to IEC61853-1"

Results:

Average Measurement of Temperature coefficients

Sample No.	α [%/°C]	β [%/°C]	δ [%/°C]
2	0.03	-0.23	-0.32
3	0.02	-0.23	-0.32
4	0.02	-0.23	-0.32
Average	0.02	-0.23	-0.32



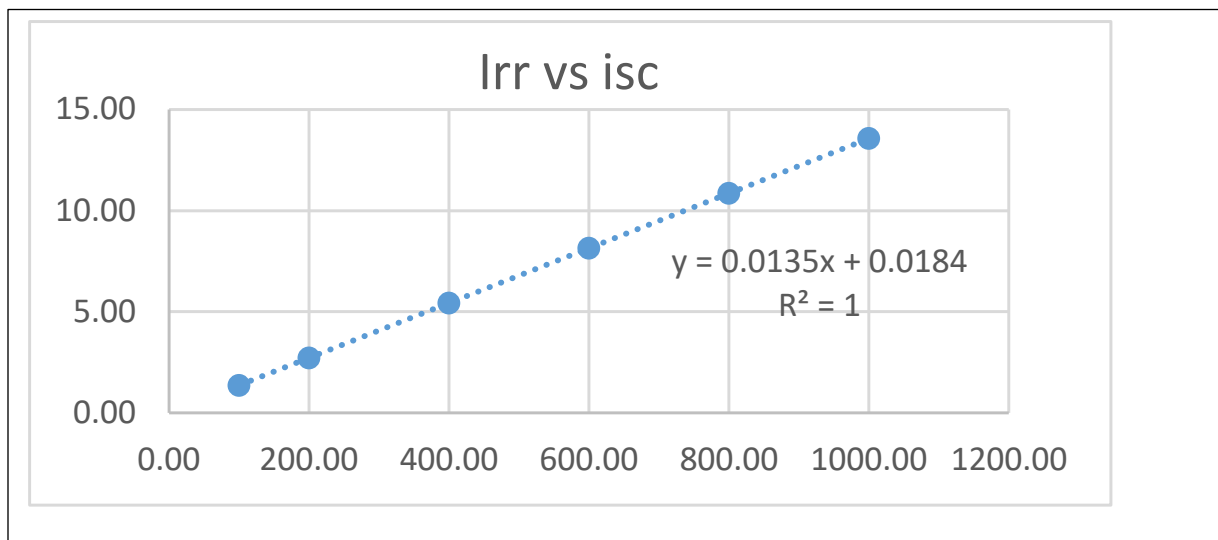
Statement of uncertainty:

Expanded measurement uncertainty statement for Maximum power measurement:

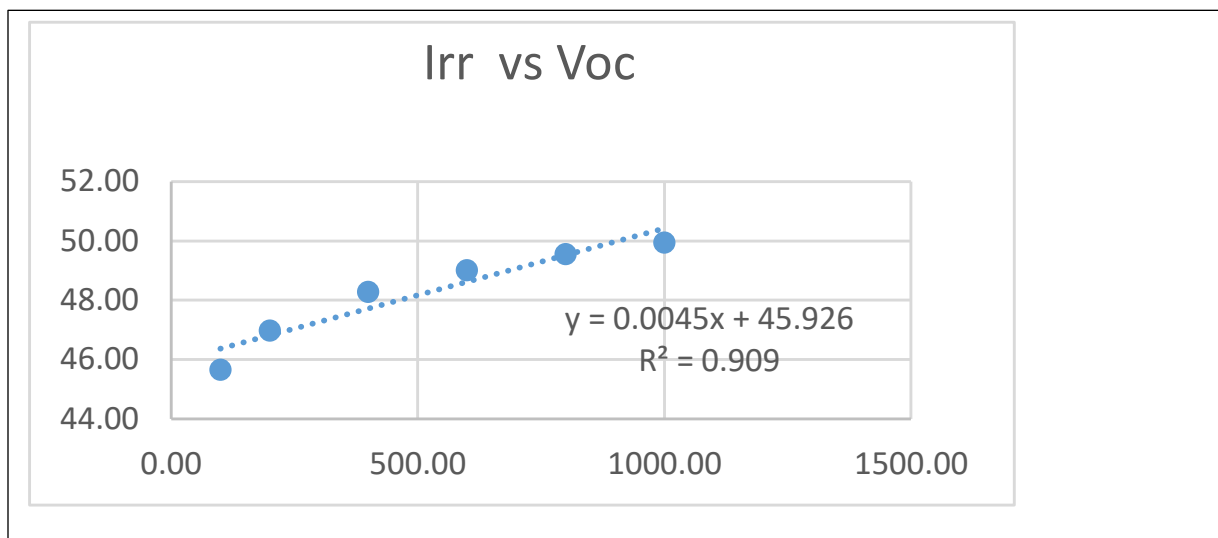
U(Pmp): ±1.7%, U(ISC): ±1.7%, U(Voc): ±1.4%.

The expanded measurement uncertainty resulting from the standard measurement uncertainty multiplied with a factor $k=2$ is specified, denoting the deviations of the measurement value within a probability of 95%.

Interpolation of Isc with respect to irradiance (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)

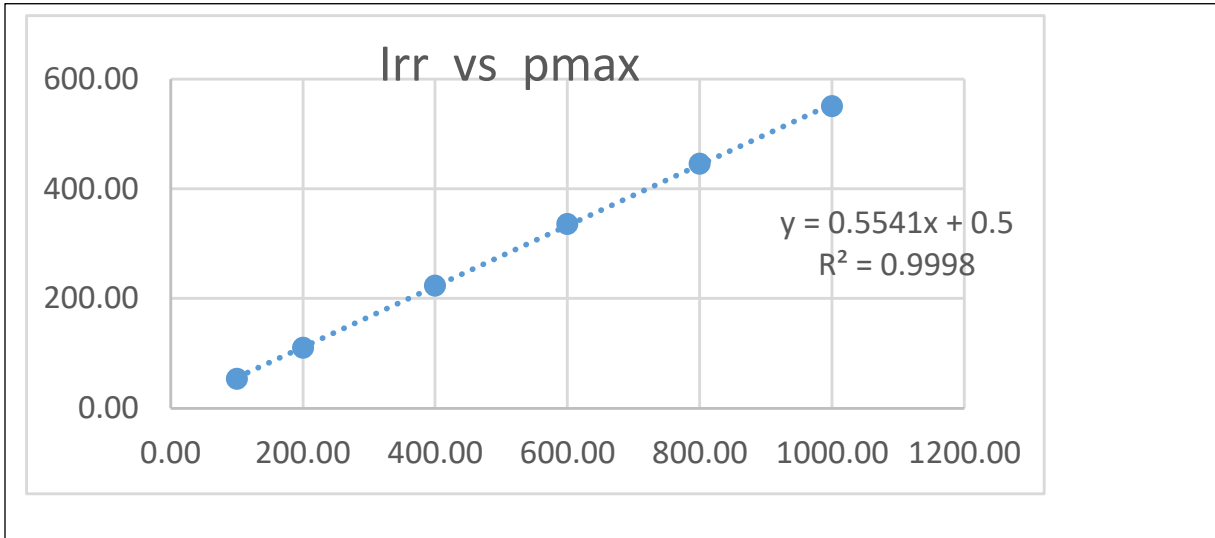


Interpolation of Voc with respect to irradiance (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)

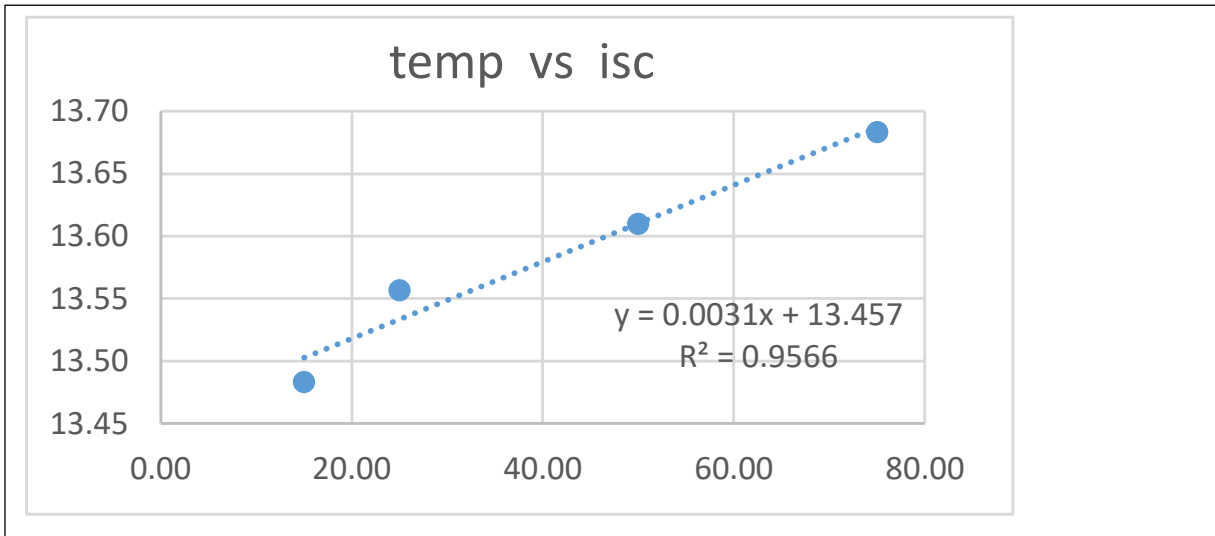




Interpolation of Pmax with respect to irradiance (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)

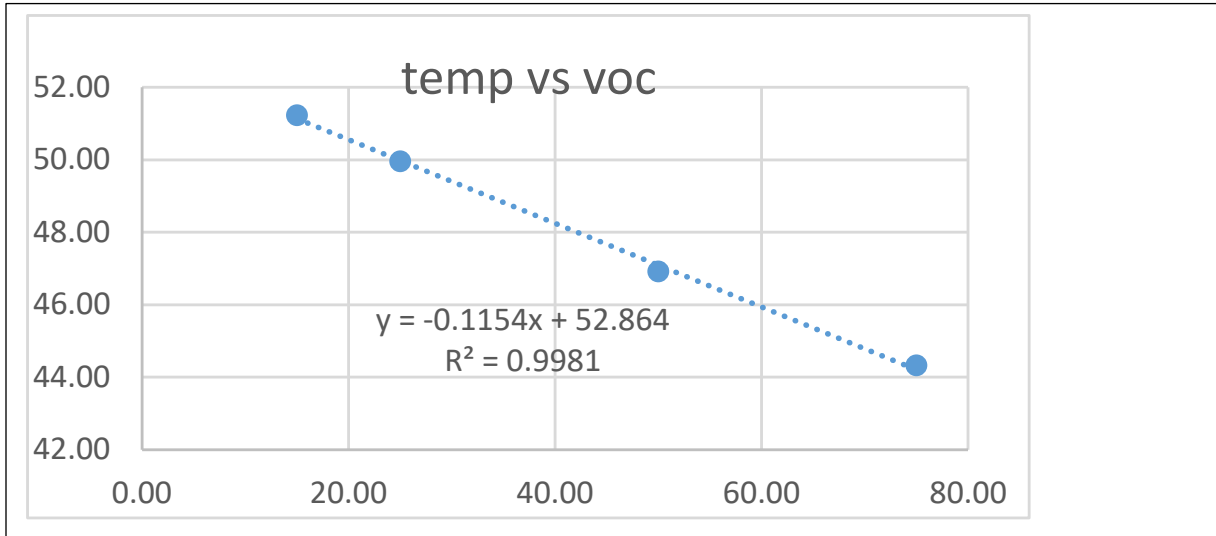


Interpolation of Isc with respect to temperature (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)

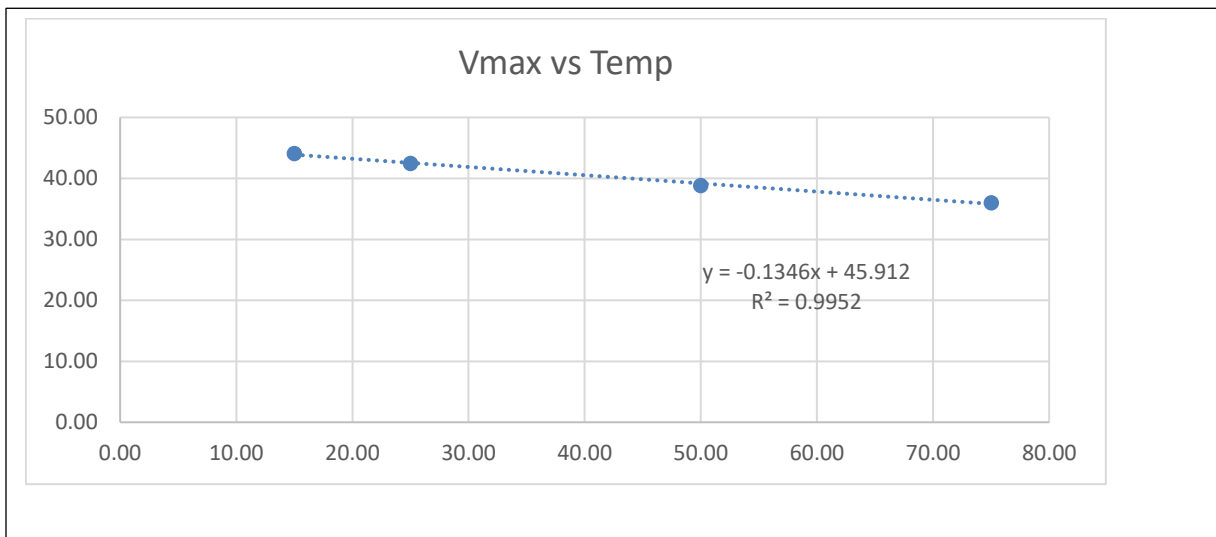




Interpolation of Voc with respect to temperature (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)

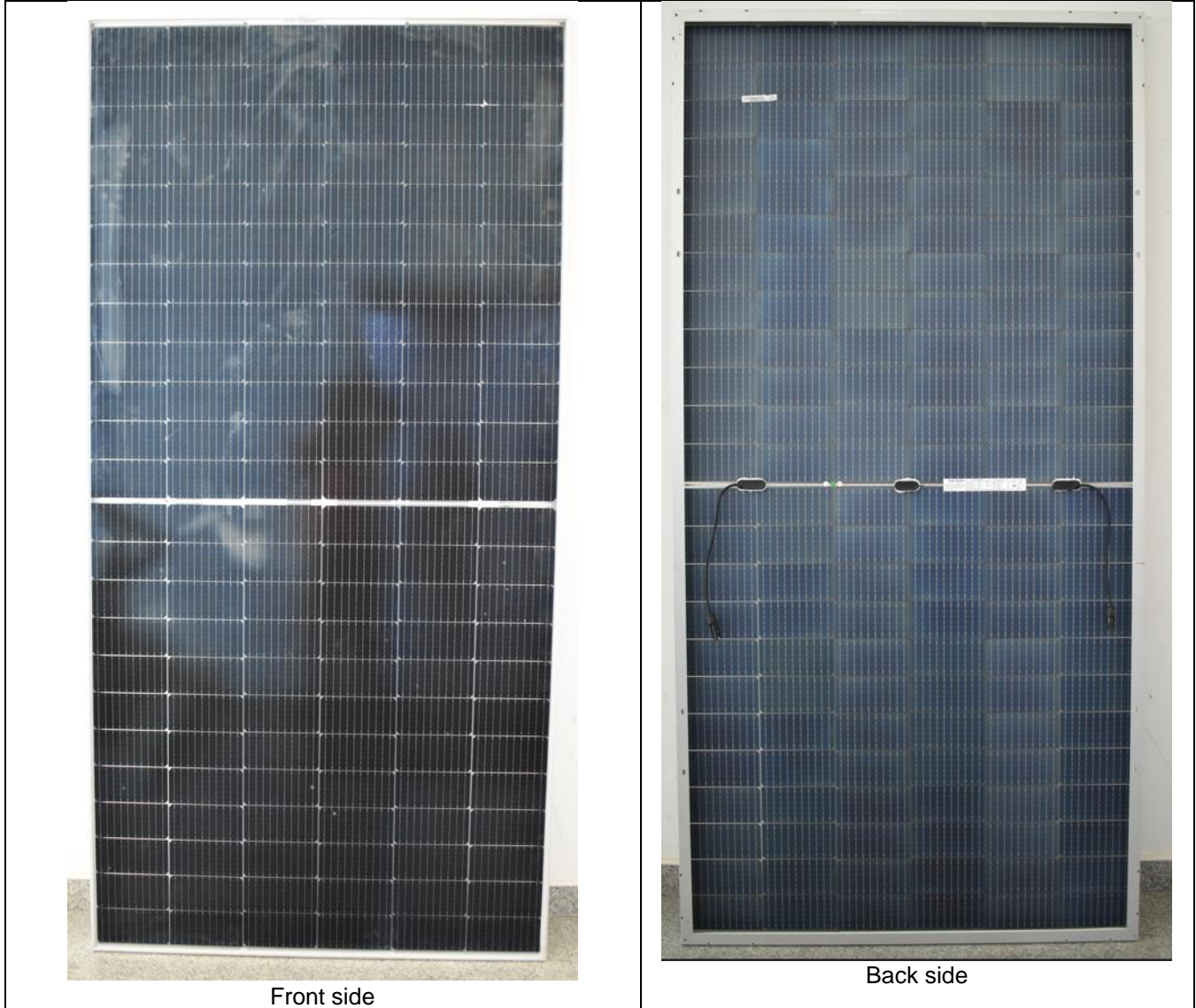


Interpolation of Vmax with respect to temperature (IEC 61853-1:2011-01. Ed.1.0 Clause 9.1)





Appendix:
Photographs: - PV Module – RSB550WC



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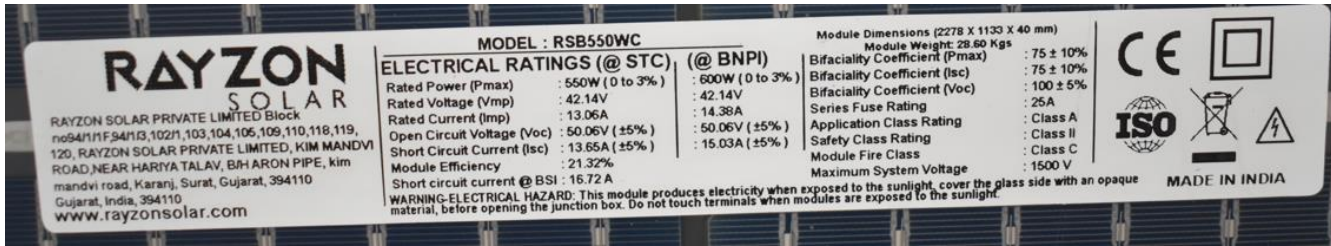
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TC-6168



Back label & inside laminate marking



Junction Box



Connectors

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Bill of Materials Details (as declared by the Manufacturer): PV Module – RSB550WC

Sl. No.	Item Description	BOM Spec	Supplier / Manufacturer/Spec
1	Cell Connector	Dimensions [mm]: (φ0.30,0.32) mm & Composition of alloy: SnPb-60/40	
2	String Connector	Dimension [mm]: 5.x0.4 mm, 6x0.35 mm, 4x0.30 mm, Thickness [μm]: 400 ± 40, 350 ± 35, 300 ± 30, Coating Sn60%Pb40%	TaiCang JuRen PV Material Co., Ltd (Juren)
3	Al Frame & Aluminium corner Key	Material /Coating: Silver Anodised, Anodizing thickness- (>15μm), Composition– 6005-T6	Vishakha Metal Pvt. Ltd (VISHAKHA)
4	PV Junction Box	DSJB12b, Max. voltage [V]: 1500VDC, Max. current [A]: 25Amps, IP68	Dhash PV Technologies Private Limited (DHASH)
5	Junction box cables	IEC 131 1x4 mm ²	
6	Junction box connectors	DS-01, Max. voltage [V]: 1500VDC, Max. current [A]: 35Amps, IP68	
7	Bypass diode	MK5054, 50A, 45 V	Taizhou Chuangda Electronic Co. Ltd.
8	EVA Encapsulant	Front Side - Type: CONSERV P UVT-14FC, Thickness: 0.45 - 0.65 mm, RTI:50, Colour :NC Rear Side - Type: CONSERV P 360-14FC, Thickness:0.45-0.65mm, HWI=4, HAI=0, RTI:50, Color : NC	Manufactured by: RenewSys India Pvt Ltd. (RENEWSYS)
9	Backsheet	Type: FFC-JW30(plus), multilayer backsheet material (FFC/PET/FFC), transparent, overall thickness: 0.315mm, RTI: 125°C, CTI:600V	Manufactured by: Jollywood (Suzhou)Sunwatt Co., Ltd., (Jollywood)
10	Cell	Type: M10 P-Type Bifacial Mono PERC solar cell	Manufactured by: Solar Space Technology (Laos) Sole Co. Ltd (Solar Space),
11	Adhesive for JB & Frame	HT906Z	Shanghai Huitian New Material Co Ltd. (HUITIAN)
12	Glass	Type: AR Coated Low iron, Tempered glass, Thickness:3.2mm	Manufactured by: BOROSIL Renewables Limited (BOROSIL)
13	Junction box potting material	5299W-S	Shanghai Huitian New Material Co Ltd. (HUITIAN)

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