



Test Report

CITIZEN SOLAR PRIVATE LIMITED

REPORT NUMBER: 4791205189-OTHER-S1

PROJECT NUMBER: 4791205189

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

☒ **Other:**

**(#Refer Page no. for Test lab
location)**



TEST DISCIPLINE: ELECTRONICS
PRODUCT GROUP: SOLAR PANEL

General details

Customer / Applicant	Citizen Solar Private Limited New Survey No.966, Village: Indrad, Chhatral Kadi Road, Ta.Kadi, Dist. Mehsana, Gujarat-382715		
Manufacturer	Citizen Solar Private Limited New Survey No.966, Village: Indrad, Chhatral Kadi Road, Ta.Kadi, Dist. Mehsana, Gujarat-382715		
Program	OTHER		
Item Under Test	Mono-crystalline Photovoltaic module		
Model	Representative sample of Model: CSPL-144MHC-TF-545		
Number of Samples	03		
UL Sample Identification	Refer Page no.6	Refer Summary of Test results for multiple samples	
Manufacturer Serial Number (if any)	Refer Page no.6		
Condition of IUT on receipt	Good		
Date of Receipt	25 April 2024		
Applicable Standard	IEC 62716 Edition 1.0, 2013-06- Photovoltaic PV modules ammonia corrosion testing.		
Date of Testing (Start date)	18 June 2024	End Date	16 July 2024
UL general ambient condition	Temperature in °C		23 ±5C
	Relative humidity in %		70 %
Date of Issue	26 July 2024		
Test In charge	Fuqiang Qiao		

M. Jaydeshmi Engineering Project Associate Reviewed by	N. Srimathy Senior Project Engineer Authorized signatory
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CIN: U74200KA1997PTC023189

**General Remarks (If any)**

#Test lab location (Other than UL India Private Limited)

Test Laboratory/Location	
[X] UL or Affiliate [X] Subcontract Lab	
Company Name	China Telecommunication Technology Labs
Location	CuiHu Cloud Center, No. 1 Gaolizhang Road, Wenquan Town, Haidian District, Beijing

Test witnessed by: Jason You (Senior Project Engineer, UL China)

Description of Item under Test (IUT)

Mono Crystalline modules. A total of 2 samples were tested. 1 sample was a control sample.

Series model covered under this report:

Below listed models covered in this test report, on basis of having same construction, design and BOM as declared by manufacturer. No testing was considered necessary to cover the listed models below. The only changes are the electrical ratings, number of cells and overall dimension from the tested model.

Models covered	Models Covered Under this report: <u>With Transparent Backsheet:</u> 144 Half Cut Cell Series (182mm) CSPL-144MHC-TF-560, CSPL-144MHC-TF-555, CSPL-144MHC-TF-550, CSPL-144MHC-TF-545, CSPL-144MHC-TF-540, CSPL-144MHC-TF-535, CSPL-144MHC-TF-530, CSPL-144MHC-TF-525, CSPL-144MHC-TF-520 132 Half Cut Cell Series(182mm) CSPL-132MHC-TF-495, CSPL-132MHC-TF-490, CSPL-132MHC-TF-485, CSPL-132MHC-TF-480 120 Half Cut Cell Series(182mm) CSPL-120MHC-TF-450, CSPL-120MHC-TF-445, CSPL-120MHC-TF-440, CSPL-120MHC-TF-435 108 Half Cut Cell Series (182mm) CSPL-108MHC-TF-405, CSPL-108MHC-TF-400, CSPL-108MHC-TF-395, CSPL-108MHC-TF-390
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Summary of Test Results

After the ammonia exposure test there is no evidence of major visual defects as described in IEC 61730-2:2004 Also including no mechanical deterioration or corrosion of module components.

After the ammonia exposure test the maximum power was not decreased by more than 5 % of the initial value. All the test results fulfil the requirements of standard: IEC 62716 edition 1.0, dated 2013-06. Photovoltaic (PV) modules – Ammonia corrosion testing.

Test No.	Test Item	Standard references, clause	Result
1	Preconditioning	IEC 61215 second edition, dated 2005-04.	P
2	Visual inspection	IEC 61215 second edition, dated 2005-04, clause 10.1.	P
3	Maximum power determination	IEC 61215:2005-04, Ed-2, 10.2	P
4	Dielectrics withstand test	IEC 61215 second edition, dated 2005-04, clause 10.3	P
5	Wet leakage current test	IEC 61215 second edition, dated 2005-04, clause 10.15.	P
6	Ground continuity test	IEC 61730-2 first edition, dated 2004-10, clause 10.4.	P
7	Ammonia corrosion test	IEC 62716 edition 1.0, dated 2013-06, clause 7.	P
8	Visual inspection after Ammonia corrosion test	IEC 61215 second edition, dated 2005-04, clause 10.1.	P
9	Maximum power determination after Ammonia corrosion test	IEC 61215:2005-04, Ed-2, 10.2	P
10	Dielectrics withstand test after Ammonia corrosion test	IEC 61215 second edition, dated 2005-04, clause 10.3	P
11	Wet leakage current test after Ammonia corrosion test	IEC 61215 second edition, dated 2005-04, clause 10.15.	P
12	Ground continuity test after Ammonia corrosion test	IEC 61730-2 first edition, dated 2004-10, clause 10.4.	P
13	Bypass diode functionality test after Ammonia corrosion test	IEC 61701 edition 2.0, dated 2011-12, clause 4.2	P

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

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Abbreviations used in this report:

Pmax – Maximum power
 Vmp – Maximum power voltage
 Imp – Maximum power current
 Isc – Short circuit current
 Voc – Open circuit voltage
 FF – Fill factor
 N/A – not apply to the object

Master Equipment and Calibration details

Inst. ID No.	Instrument Type	Test Number, Test Title or Conditioning	Range used	Last Cal. Date [YYYY-MM-DD]	Next Cal. Date [YYYY-MM-DD]
CTTL-09517	Solar simulator	3/9/13	1000W/m2	2024-02-18	2025-02-17
CTTL-09579	Light Meter	2/8	200□20000 lx	2024-03-12	2025-03-11
CTTL-090□5	Steel tape	2/8	0□2500mm	2024-02-27	2025-02-2□
CTTL-10325	Reference PV module	3/9/13	/	2023-08-14	2024-08-13
CTTL-02□00	Pyranometer	1	1000W/m2	2023-12-20	2024-12-19
CTTL-09093	Outdoor test system	1	1000W/m2	2023-10-09	2024-10-08
CTTL-07599	Dielectrometer	4/5/10/11	0□□□V□ 1000V	2023-10-09	2024-10-08
CTTL-07□00	Withstand voltage tester	4/10	0□15□V□ 10mV	2023-10-09	2024-10-08
CTTL-02□98	Conductivity meter	5/11	0□9999Ωcm	2023-09-08	2024-09-07
YD0004185	Power supply	□/12	100A/100V	2023-10-09	2024-10-08
CTTL-09003	Multimeter	□/12	500mV	2024-01-1□	2025-01-15
CTTL-02□11	DC Clamp Meters	□/12	100A	2023-07-20	2024-07-19

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CTTL-09157	Ammonia corrosion chamber	7	26~60℃； 70~98%	2024-02-29	2025-02-28
CTTL-09349	Panel Gas Flowmeter	7	0~10L/min	2023-07-13	2024-07-12
CTTL-02728	Stopwatch	7	0~1800s	2023-07-10	2024-07-09
CTTL-02728	Stopwatch	7	0~1800s	2024-07-08	2025-07-07
CTTL-09578	□n□rare□ thermometer	3/9/13	-10~135℃	2024-03-14	2025-03-13
CTTL-08577	Temperature an□ humi□it□ meter	1~13	0~30℃； 0~80%	2023-09-13	2024-09-12

Remarks: Urine testing and measurements no equipment out of calibration

□□ Test sample description

Sampling Procedure

All the sample[s] were selected by an independent client of L LLC. I do not select the sample[s] to determine whether the sample[s] was representative of production samples, witness the production of the test sample[s], nor were we provided with information relative to the formulation or identification of component materials used in the test sample[s].

☐ ☐ ☒ ☐ ample general information

Manufacturer: QienSolar Private Limited								
Electrical Ratings:								
Module Model	Module Type	Series Code	Power /Tolerance	Imp Current	Imp Power	Max System Voltage	Max Open-Circuit Voltage	Dimension mm
CSPL-144HC-TF-545	4906	1309	545	4109	1300	1500	25A	2278 × 1133

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1.3. Sample identification:

Sample card No.	Date Received [YYYY-MM-DD]	Sample No.	Product Identification	Type/Model
7153890 Control	2024-05-29	1	Solar PV Module 585W SI No: CSPL24040033	CSPL-144MHC-TF-545
7153891	2024-05-29	2	Solar PV Module 585W SI No: CSPL24040034	CSPL-144MHC-TF-545
7153892	2024-05-29	3	Solar PV Module 585W SI No: CSPL24040035	CSPL-144MHC-TF-545

See the others sample information in appendix 1 and 2.

2. Testing

Test program:

Overview of test items for test sample: The table below is provided to establish correlation of sample numbers to test numbers.

Test No.	Samples No.		
	1	2	3
Control	☐		
1□□□ 8□12	☐	☐	☐
7		☐	☐
13		☐	☐

2.1. Preconditioning

Test procedure: Reference to ☐EC ☐1215 second edition☐ dated 2004.

Humidity ☐ RH	N ☐	Ambient ☐ C	N ☐
Tested by	Fulling Rao	Test date ☐ - ☐ - ☐	2024-0 ☐ -18
Table 1: Preconditioning			
Sample No.	1□3		
Load	Open circuit		
Test date	Average irradiance during exposed time ☐ W ☐ m ☐	Exposed time ☐ h	Irradiation integration ☐ Wh ☐ m ☐
2024-0 ☐ -18	855	5.8	5
Supplementar ☐ information: N ☐			

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2.2 Visual inspection

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause10.1.

Humidity [%RH]	45.8	Ambient [°C]	25.1
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-06-19

Table 2: Visual inspection [Initial]		
Sample No.	Nature and position of initial findings – comments or attach photos	Critical [Yes or No]
1 (control)	No major finding N	o
2	No major finding N	o
3	No major finding N	o
Supplementary information: N/A		

Results: The samples-did not show any critical visual defect.



2.2. Maximum power determination

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.2.

Humidity [%RH]	46.1	Ambient [°C]	25.1
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-06-19

Table 3: Maximum power determination [Initial]								
Light source				[X] Simulator [] Natural sunlight				
Sample No.	Voc [V]	Isc [A]	Pmax [W]	Vmp [V]	Imp [A]	FF [%]	Tmod [°C]	Irradiance [W/m²]
1-F(control)	50.176	13.252	533.589	42.674	12.504	80.25	25.0	1000.03
1-R(control)	49.601	9.961	388.832	42.839	9.077	78.70	25.1	1000.02
3-□(control)	50.303	14.518	583.686	42.792	13.640	79.93	25.1	1000.03
2-F	50.062	13.269	535.712	42.600	12.575	80.65	25.1	1000.03
2-R	49.505	9.897	387.370	42.759	9.059	79.06	25.0	1000.01
2-□	50.243	14.547	587.366	42.742	13.742	80.36	24.9	1000.02
3-F	50.121	13.254	534.385	42.630	12.535	80.45	25.1	1000.03
3-R	49.585	10.019	389.830	42.827	9.103	78.47	25.1	1000.02
3-□	50.291	14.511	585.550	42.780	13.687	80.24	24.9	1000.03
Supplementary information: N/A								

Results: The IV curve did not show any □ in □ or other unusual characteristic.

Difference [%] compared to nameplate stated □ alue					
Sample No.	Voc	Isc	Pmax	Vmp	Imp
1-F (control)	0.84	-4.66	-2.09	1.85	-3.96
2-F	0.61	-4.54	-1.70	1.67	-3.42

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Difference [%] compared to nameplate stated value					
Sample No. V	oc I	sc P	max	Vmp	Imp
3-F	0.73 -	4.65 -	1.95 1	.74	-3.73

3. Dielectrics withstand test

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.3.

Humidity [%RH]	54.6	Ambient [°C]	25.8
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-06-20

Table 4: Dielectric withstand test [Initial]					
Test voltage applied [V DC]		1500	Test voltage applied [V DC]		8000
Sample No.	Dielectric breakdown	Module area [m²]	Required resistance [MΩ]	Dielectric breakdown	
				Yes [description] N	o
1 (control)	> 10000	2.58 1	5.50	No dielectric breakdown	
2	> 10000			No dielectric breakdown	
3	> 10000			No dielectric breakdown	
Supplementary information: The maximum calibrated resistance measurement range is 10000MΩ.					

Results: For modules with an area greater than 0.1 m²:

There was no indication of dielectric breakdown during the test.

There was no indication of surface tracking during the test.

The measured insulation resistance was/was not less than 15.50 megohms.

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**3.1. Wet leakage current test**

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.15.

Humidity [%RH]	54.6	Ambient [°C]	25.8
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-06-20

Table 5: Wet leakage current test [Initial]			
Solution temperature [°C]	23.6	Solution resistivity [Ω cm]	2192
Test Voltage applied [V, dc]	1500		
Sample No.	Measured resistance [MΩ]	Module area [m²]	Required resistance [MΩ]
1 (control)	1740	2.58 1	5.50
2	2310		
3	1890		
Supplementary information: N/A			

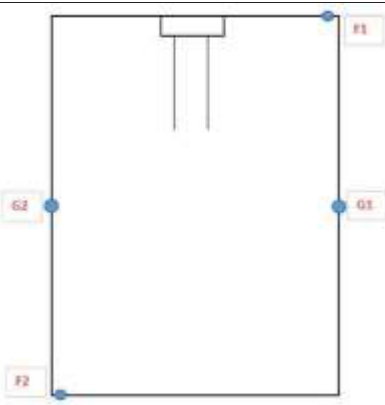
Results: For modules with an area greater than $0.1 m^2$, the measured insulation resistance was not less than 15.50 megohms.



3.2. Ground continuity test

Test procedure: Reference to IEC61730-2 first edition, dated 2004-10, clause 10.4.

Humidity [%RH]	54.6	Ambient [°C]	25.8
Tested by	Fuqiang Jiao T	est Date [YYYY-MM-DD]	2024-06-20

Table 6: Ground continuity test			
Maximum over-current protection rating [A]		25	
Current applied [A DC]		62.5	
Location of designated grounding point and accessible point on conductive components of the PV module			
			
G1, G2: Designated point for equipotential bonding			
F1, F2: Conductive point of the PV module			
Sample No.	Test point	Voltage dropped [V DC]	Resistance [Ω]
1	G1 to G2 0	.374 0	.0060
2	G1 to G2 0	.336 0	.0054
3	G1 to G2 0	.389 0	.0062
Supplementary information: The resistance were calculated from the applied current and the resulting voltage drop measured at the connection points of the PV module [e.g. frame].			

Results: The resistance between the selected exposed conductive component and other conductive components of the PV module was less than 0.1 Ω .

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3.3. Ammonia corrosion test

Test procedure: Reference to IEC 62716 edition 1.0, dated 2013-06, clause 7.

Humidity [%RH]	22.5~48.2	Ambient [°C]	26.1~36.8
Tested by	Fuqiang Jiao T	est Date [YYYY-MM-DD]	2024-06-21-2024-07-11

Table 7: Ammonia corrosion test			
Sample No.		2, 3	
Cycles	1 test section	Hours [h]	8 (including heating up)
		NH ₃ -concentration [ppm]	6667
		Temperature [°C]	60±2
		Relative humidity [%RH]	98±2
	2 test section	Hours [h]	16 (including cooling)
		NH ₃ -concentration	0
		Temperature [°C]	26±2
		Relative humidity [%RH]	70±2
Duration		20 cycles (480 h)	
Supplementary information: After measurement, the volume in the ammonia corrosion chamber is 10.924m ³ , Set the gas flowmeter as 8L / min and inject ammonia for 9.1 minutes. After calculation, the NH ₃ concentration in the ammonia corrosion chamber is 6667ppm.			

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3.4. Visual inspection after Ammonia corrosion test

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.1.

Humidity [%RH]	46.4	Ambient [°C]	25.3
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-07-12

Table 8: Visual inspection after Ammonia corrosion test

Sample No.	Nature and position of initial findings – comments or attach photos	Critical [Yes or No]
1 (control)	No major finding	No
2	No major finding	No
3	No major finding	No
Supplementary information: N/A		

Results: The samples did not show any critical visual defect.

3.5. Maximum power determination after Ammonia corrosion test

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.2.

Humidity [%RH]	46.9	Ambient [°C]	25.1
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-07-12

Table 9: Maximum power determination after Ammonia corrosion test

☒ Light source				☐ Simulator ☐ Natural sunlight				
Sample No.	Voc [V]	Isc [A]	ma [mA]	Vmp [V]	Imp [A]	FF [%]	Tmod [°C]	Irradiance [mW/m²]
1-F(control)	50.175	13.246	533.288	42.683	12.494	80.24	25.1	1000.04
1-R(control)	49.637	9.938	388.071	43.090	9.006	78.67	25.1	1000.01
3-□(control)	50.361	14.474	584.183	42.841	13.636	80.14	25.0	1000.02
2-F	50.168	13.191	533.926	42.686	12.508	80.68	25.1	1000.03

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2-R	49.613 9	.859 3	85.983 4	3.065	8.963	78.91	25.0	1000.01
2-B	50.347 1	4.453	585.184	42.817 1	3.667	80.42	25.0	1000.04
3-F	50.224 1	3.179	532.606	42.722 1	2.467	80.47	25.1 1	000.02
3-R	49.677 9	.970 3	86.371 4	3.126	8.959	78.01	25.0	1000.03
3-B	50.392 1	4.429	583.818	42.865 1	3.620	80.29	25.0	1000.02

Supplementary information: N/A

Results:

Degradation [%] compared to initial test value					
Sample No.	Voc	Isc	Pmax V	mp I	mp
1-F (control)	0.00 -	0.05 -	0.06 0	.02	-0.08
2-F	0.21 -	0.59 -	0.33 0	.20	-0.53
3-F	0.21 -	0.57 -	0.33 0	.22	-0.54

Results: The IV curve did not show any kink or other unusual characteristic.

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3.6. Dielectric withstand test after Ammonia corrosion test

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.3.

Humidity [%RH]	54.2	Ambient [°C]	25.9
Tested by	Fuqiang Jiao	Test Date [YYYY-MM-DD]	2024-07-15

Table 10: Dielectric withstand test after Ammonia corrosion test					
Test voltage applied [V DC]		1500	Test voltage applied [V DC]		8000
Sample No.	Measured resistance [MΩ]	Module area [m²]	Required resistance [MΩ]	Dielectric breakdown	
				Yes [description]	No
1	> 10000	2.58	15.50	No dielectric breakdown	
2	> 10000			No dielectric breakdown	
3	> 10000			No dielectric breakdown	
Supplementary information: The maximum calibrated resistance measurement range is 10000 MΩ.					

Table 10: Dielectric withstand test after Ammonia corrosion test					
Test voltage applied [V DC]		1500	Test voltage applied [V DC]		8000
Sample No.	Measured resistance [MΩ]	Module area [m²]	Required resistance [MΩ]	Dielectric breakdown	
				Yes [description]	No
1 □control□	□10000	2.58	15.50	No dielectric breakdown	
2	□10000			No dielectric breakdown	
3	□10000			No dielectric breakdown	
Supplementary information: The maximum calibrated resistance measurement range is 50000 MΩ.					

Results: For modules with an area greater than 0.1 m²:
There was no indication of dielectric breakdown during the test.
There was no indication of surface tracking during the test.
The measured insulation resistance was not less than 15.50 megohms.

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3.7. Wet leakage current test Ammonia corrosion test

Test procedure: reference to IEC 61215 second edition, dated 2005-04, clause 10.15.

Humidity [%RH]	54.2	Ambient [°C]	25.9
Tested by	Fuqiang Jiao T	est Date [YYYY-MM-DD]	2024-07-15

Table 11: Wet leakage current test after Ammonia corrosion test			
Solution temperature [°C]	23.4	Solution resistivity [Ω cm]	2347
Test Voltage applied [V, dc]	1500		
Sample No.	Measured resistance [MΩ]	Module area [m²]	Required resistance [MΩ]
1 (control)	2310	2.58 1	5.50
2	1690		
3	1730		
Supplementary information: N/A			

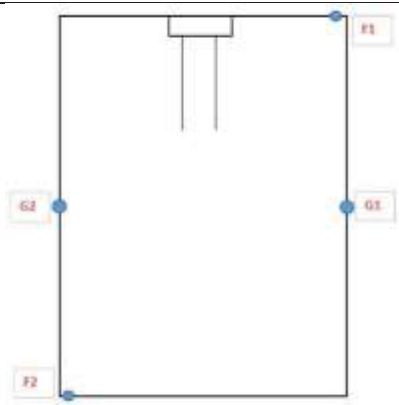
Results: For modules with an area greater than 0.1 m², the measured insulation resistance was not less than 15.50 megohms.



3.8. Ground continuity test after Ammonia corrosion test

Test procedure: Reference to IEC61730-2 first edition, dated 2004-10, clause 10.4.

Humidity [%RH]	54.2	Ambient [°C]	25.9
Tested by	Fuqiang Jiao T	est Date [YYYY-MM-DD]	2024-07-15

Table 6: Ground continuity test			
Maximum over-current protection rating [A]		25	
Current applied [A DC]		62.5	
Location of designated grounding point and accessible point on conductive components of the PV module			
			
G1, G2: Designated point for equipotential bonding			
F1, F2: Conductive point of the PV module			
Sample No.	Test point	Voltage dropped [V DC]	Resistance [Ω]
1	G1 to G2 0	.361 0	.0058
2	G1 to G2 0	.398 0	.0064
3	G1 to G2 0	.374 0	.0060
Supplementary information: The resistance were calculated from the applied current and the resulting voltage drop measured at the connection points of the PV module [e.g. frame].			

Results: The resistance between the selected exposed conductive component and other conductive components of the PV module was less than 0.1 Ω.

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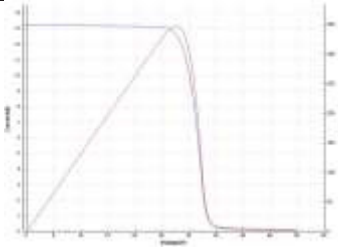
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3.9. Bypass diode functionality test after Ammonia corrosion test

Test procedure: Reference to IEC 61701 edition 2.0, dated 2011-12, clause 4.2

Humidity [%RH]	47.4	Ambient [°C]	25.0
Tested by	Fuqiang Jiao T	est Date [YYYY-MM-DD]	2024-07-16

Table 13: Bypass diode functionality test after Ammonia corrosion test						
Sample No. 2			, 3			
Number of diodes in junction box 3						
STC short-circuit current [A]			13.90			
Current flow (1.25 * Isc) [A]			17.38			
Test duration (hour) 1						
Diode functional? Yes/No			Diode 1	Diode 2	Diode 3	
			Yes	Yes	Yes	
Diode function test (verify I-V curve)						
Sample No.2						
Test Diode No.	Voc [V]	Isc [A] P	max [W]	Vmp [V]	Imp [A] F	F [%]
1	49.941 1	3.184	350.682	27.916 1	2.562	53.26
2	49.857 1	3.227	351.158	27.944 1	2.567	53.25
3	49.915 1	3.228	351.263	27.988 1	2.551	53.20
I-V Curve for cell shaded under diode 1						

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I-V Curve for cell shaded under diode 2						
I-V Curve for cell shaded under diode 3						
Sample No.3						
Test Diode#	Voc [V] I	sc [A] P	max [W]	Vmp [V]	Imp [A]	FF [%]
1	49.993 1	3.155	348.662	28.041 1	2.434	53.01
2	49.908 1	3.204	349.870	28.082 1	2.459	53.09
3	49.972 1	3.208	348.732	28.057 1	2.430	52.84
I-V Curve for cell shaded under diode 1						

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I-V Curve for cell shaded under diode 2	
I-V Curve for cell shaded under diode 3	



Appendix1 – Product pictures



Module front view



Module rear view



Junction box

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Connectors

Appendix2 – Product nameplate label

CITIZEN SOLAR PVT LTD New Survey No. 166, Village: Koladi, Chhatrapati Sambhaji To: Kailash, Dist. Maharashtra, Gujarat 382715 Email: info@citizensolar.com Customer Care No: 0000111222 950 90012015 950 140012015 950 450012019 MODEL: CSPL-144MHC-TF-545 NOTE: For serial number refer front side of the module Before installation, please refer Citizen Module Installation Manual & Citizen Standard Warranty documents. * All documents are available on company website www.citizensolar.com	<table><thead><tr><th>Electrical Parameters</th><th>STC</th><th>BMPT</th></tr></thead><tbody><tr><td>Rated Power (P_{max})</td><td>545 W (±2%)</td><td>420 W (±2%)</td></tr><tr><td>Open Circuit Voltage (V_{oc})</td><td>85.76 V ± 2%</td><td>85.48 V ± 2%</td></tr><tr><td>Short Circuit Current (I_{sc})</td><td>13.50 A ± 2%</td><td>13.34 A ± 2%</td></tr><tr><td>Voltage at Max. Power (V_{mp})</td><td>61.50 V</td><td>61.55 V</td></tr><tr><td>Current at Max. Power (I_{mp})</td><td>13.52 A</td><td>14.44 A</td></tr></tbody></table> Power measured at STC: in 1000W/m², Temp 25°C, AM 1.5 Power measured at BMPT: 1101.20W/m², Temp 25°C, AM 1.5 Warning: Electrical Hazard. The unit produces electricity if exposed to light. (Don't connect the plug under load). Dispose of the module as per regulations after the end of its working life.	Electrical Parameters	STC	BMPT	Rated Power (P _{max})	545 W (±2%)	420 W (±2%)	Open Circuit Voltage (V _{oc})	85.76 V ± 2%	85.48 V ± 2%	Short Circuit Current (I _{sc})	13.50 A ± 2%	13.34 A ± 2%	Voltage at Max. Power (V _{mp})	61.50 V	61.55 V	Current at Max. Power (I _{mp})	13.52 A	14.44 A	Maximum System Voltage: 1000 V Efficiency coefficient (P_{max}): 75 ± 10% Efficiency coefficient (I_{sc}): 100 ± 10% Efficiency coefficient (V_{oc}): 75 ± 10% Module Weight: 28.85 Protection against Electric Shock: Class II Application Class: A Fire Safety Class: E Maximum Series Fuse Rating: 25A Module Dimensions (L x W x H) (mm): 2275x1135x35  CITIZEN SOLAR SOLAR ENERGY SOLUTIONS 
Electrical Parameters	STC	BMPT																		
Rated Power (P _{max})	545 W (±2%)	420 W (±2%)																		
Open Circuit Voltage (V _{oc})	85.76 V ± 2%	85.48 V ± 2%																		
Short Circuit Current (I _{sc})	13.50 A ± 2%	13.34 A ± 2%																		
Voltage at Max. Power (V _{mp})	61.50 V	61.55 V																		
Current at Max. Power (I _{mp})	13.52 A	14.44 A																		

Model-CSPL-144MHC-TF-545

Appendix3 - Statement of uncertainty

Expanded measurement uncertainty statement for Maximum power measurement:

Isc	Voc	Imp	Vmp	Pmp
2.3% 1	.0%	2.3% 1	.0%	2.4%

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%.

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Appendix 5

Bill of Material As declared by customer.

<u>Module Model:</u>	CSPL-144MHC-TF-545
Front Cover.....:	High transmission low iron tempered AR coated glass, Thickness 3.2 mm, Textured, High Transmission (>94% for ARC), Manufacturer By: Borosil Renewables Ltd. India
Rear Cover.....:	Manufacturer By: Renewsys India Pvt Ltd, Bangalore Model: PRESERV-1-300WD (For White) Total Thickness: 395 µm Model: PRESERV-1-300 TF (For Transparent) Total Thickness: 360 µm Model: PRESERV – 1 300 K2D (for black) Total Thickness: 360 µm
Encapsulation material.....:	Manufacturer By: Renewsys India Pvt Ltd, Bangalore Model No: Conserve P UVT 14FC (Front) 600GSM & Conserve P 360-14FC (Back) 550GSM
Frame.....:	Anodized Aluminium Alloy- 6063 -T6, 15 - 20 micron. Manufacturer By: Vinitech Metal Private Limited
Dimensions (l x w x h) [mm].:	2279mm x1133 mm x35 mm
Module area [m ²]: 2	.58 [m ²]
PV Cell: M	Manufacturer By: United Renewable Energy Co. Ltd Mono-crystalline PERC Bifacial Solar half cut cell- M10, cell size /Format: 182 mm x 182 mm ± 0.5 mm, Thickness: 175 µm±17.5 µm
Cell- and string connectors: M	Manufacturer By: Shanghai Sunby Solar Technology Co Ltd, China Tin coated copper wire Top & bottom 0.35*4mm, JB connector 0.35*6mm.
Junction box:	Manufacturer By: DhaSh PV Technologies Private Limited Bangalore. Model: DSJB12Y Type: Split Type Rated voltage: 1500 VDC, IP68, Class II, Application Class A, PD1, Flammability class: UL-94 V0, 5VA
Adhesive for frame:	Manufacturer By: Shanghai Huitian New Material Co Ltd Silicone sealant Model-HT906Z IN H AI = 0, H WI = 3 , Flame class HB75(WT)
Adhesive for junction box: M	Manufacturer By: Shanghai Huitian New Material Co Ltd Silicone sealant Model-HT906Z IN H AI = 0, H WI = 3 , Flame class HB75(WT)
Tape M	Model 7946, Manufacturer By: TESA TAPES INDIA PVT.LTD
Bypass diode:	Diode Type/ Number MK5045, Standard: IEC 62790:2020, 25A Max rated current Manufacturer By: Taizhou Chuangda Electronics Co. Ltd

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

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