



Test Report

Report No.: SHG2307006002

Applicant :



Sample Name :

Photovoltaic Modules

Report Date :

2023-9-5



英格尔检测技术服务(上海)有限公司



Applicant : HR SOLAR SOLUTION PRIVATE LIMITED

Address : Raghudebpur, NH-6, Panchla, Block-Uluberia-II, Howrah - 711 322, West Bengal, India

Website : www.hrsolarsolution.com

Sample information:

Sample Name : Photovoltaic Module

Sample No. : Please see the page 4

Sample Amount : 1

Manufacture : /

Sample acquisition : Sent by client

Sample Received Date : 2023-07- 07

Sample test date : 2023-07-07 ~2023-09-04

Test content:

Test specification : Salt mist corrosion test Lv.6

Test standard : IEC61701: 2011 Salt mist corrosion testing of photovoltaic (PV) modules

Test results : Please see the report for details

Test location : 155 Pingbei Road Minhang District, Shanghai, China

Test Engineer : 牛群

Remark : /

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Sample information

Sample#	Serial Number	Module Type	Remarks /Constructional Characteristics	Major Test Items
1	23065400200041	H540M144 (2279x1134x35)	Photovoltaic Module	Salt mist corrosion test Lv.6
2	23065400200043			
Supplementary information: /				

Test results

Preconditioning

Test date [YYYY-MM-DD]	2023.07.07
Sample #	1#, 2#
Irradiance [kWh/m ²]	5.0 - 5.5
Supplementary information: /	

Visual inspection (10.1) - Initial

Test date [YYYY-MM-DD]	2023.07.07	
Sample #	Description	Result
1	No visual defects	Pass
2	No visual defects	Pass
Supplementary information: /		

Maximum power determination (10.2) - Initial

Test date [YYYY-MM-DD]	2023.07.07					
[W/m ²]Irradiance	1500					
Temperature[°C]	25 ±1					
Sample#	Pmpp[W]	Voc[V]	Isc[A]	Vmpp[V]	Impp [A]	FF [%]
1	550.96	49.45	13.904	41.73	13.203	80.1
2	548.66	49.67	13.849	41.72	13.152	79.8
Supplementary information: /						



Insulation test (10.3) - Initial

Test Date [YYYY-MM-DD]		2023.07.07			
[V _{DC}]Maximum system voltage		1500			
[V _{DC}]High voltage applied		4000			
[V _{DC}]Resistance of measured insulation		1500			
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1	15215	15.5	/	No	Pass
2	24222	15.5	/	No	Pass
Supplementary information: Module area 2.58[m ²]					

(MQT 15) Wet leakage current test (Initial)

Test date [YYYY-MM-DD]		2023.07.07			
[V _{DC}]Maximum system voltage		1500			
[V _{DC}]Resistance of measured insulation		1500			
[Ω•cm]Solution resistivity		≤3500			
[°C]Solution temperature		22± 2			
Sample #	Measured resistance[MΩ]	Area [m ²]	[MΩ m ²]		
1	455.6	2.58	1175.5		Pass
2	645.7	2.58	1665.9		Pass
Supplementary information: Minimum requirement according to the standard is 40 MΩ• m ² .					



(MST 13) Ground continuity test (Initial)

Test date [YYYY-MM-DD]		2023.07.07		
[A]Maximum over current protection		30		
Applied current[A]		75		
Sample#	Test position	Voltage [mV]	Resistance [mΩ]	Result
1	Point of nearest distance	2.1	0.028	Pass
	Point at any distance	14.2	0.189	Pass
	Point of most distance	29.9	0.399	Pass
2	Point of nearest distance	1.4	0.019	Pass
	Point at any distance	4.7	0.063	Pass
	Point of most distance	18.5	0.247	Pass
Supplementary information: Maximum requirement according to the standard is 0.1Ω				

Salt mist corrosion test

Test date [YYYY-MM-DD]	2023.07.07 / 2023.09.01	—
Severity level	6	—
Test days [D]	56	P
Total cycles	8	—
Salt-mist spray solution concentration [%]	5	P
Temperature of salt-mist spray period [°C]	35 ± 2	P
Temperature of humidity storage period [°C]	40 ± 2	P
Humidity of humidity storage period [%]	93 ± 3	P
Sample #	Open circuit (Yes / No)	—
1	No	P
2	No	P
Supplementary information: 1. Severity (1): one test cycle is seven days. One cycle shall consist of spraying the specimen with a salt solution at 35 °C ± 2K for 2h, followed by the humid condition at 40 °C ± 2K, 93% ± 3% RH for six days and 22h. The required number of cycles is eight (56 days).		



Visual Inspection (MST 01) - After Salt mist corrosion test

Test date [YYYY-MM-DD]	2023.09.02	
Sample #	Description	Result
1	No visual defects	Pass
2	No visual defects	Pass
Supplementary information: /		

Maximum Power Determination (10.2) - After Salt mist corrosion test

Test date [YYYY-MM-DD]	2023.09.02						
Irradiance [W/m ²]	1000						
Temperature [°C]	25 ± 1						
Sample #	Pmpp [W]	Voc [V]	Isc [A]	Vmpp [V]	Impp [A]	FF [%]	Degradation [%]
1	543.36	49.344	13.821	41.551	13.077	79.67	-1.38
2	540.96	49.675	13.652	41.683	12.978	79.77	-1.40
Supplementary information: /							

(MQT 15) Wet leakage current test - After Salt mist corrosion test

Test date [YYYY-MM-DD]	2023.09.02			
[V _{DC}]Maximum system voltage	1500			
[V _{DC}]Resistance of measured insulation	1500			
[Ω•cm]Solution resistivity	≤3500			
[°C]Solution temperature	22± 2			
Sample #	Measured resistance[MΩ]	Area [m ²]	[MΩ m ²]	
1	312.3	2.58	805.7	Pass
2	244.7	2.58	631.3	Pass
Supplementary information: Minimum requirement according to the standard is 40 MΩ• m ² .				



(MST 13) Ground continuity test- After Salt mist corrosion test

Test date [YYYY-MM-DD]		2023.09.02		
[A]Maximum over current protection		30		
Applied current[A]		75		
Sample#	Test position	Voltage [mV]	Resistance [mΩ]	Result
1	Point of nearest distance	4.0	0.0533	Pass
	Point at any distance	15.6	0.2084	Pass
	Point of most distance	26.4	0.3513	Pass
2	Point of nearest distance	1.1	0.0140	Pass
	Point at any distance	9.6	0.1275	Pass
	Point of most distance	20.6	0.2741	Pass
Supplementary information: Maximum requirement according to the standard is 0.1Ω				

Bypass diode functionality test - After Salt mist corrosion test

Test Date [YYYY-MM-DD]		2023.09.02			
Test method		Method B			
Sample #	—	Diode 1	Diode 2	Diode 3	Result
1	Pmax after shading (W)	360.25	364.57	360.21	—
	Decay rate [%]	33.7	32.9	33.7	Pass
2	Pmax after shading (W)	357.60	355.96	359.19	—
	Decay rate [%]	33.9	34.2	33.6	Pass
Supplementary information: /					

Test Uncertainty

The total measuring uncertainty of Pmpp is $\leq 3.09\%$ (k=2)

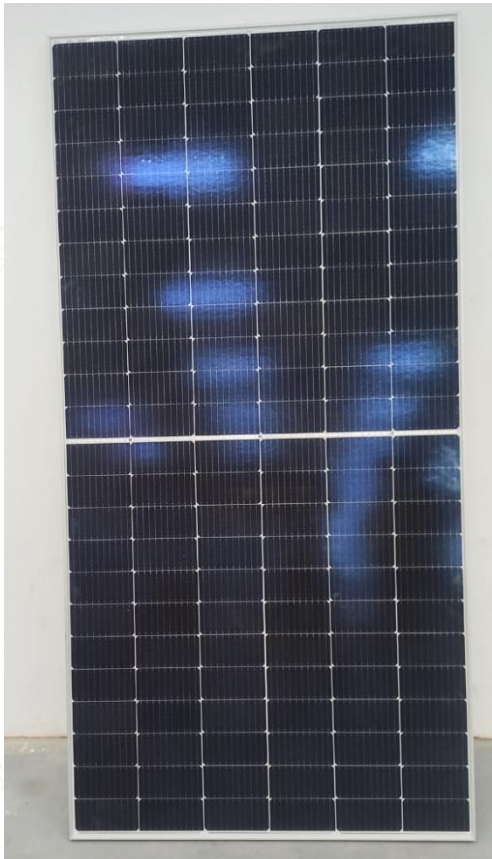
The total measuring uncertainty of Isc is $\leq 2.18\%$ (k=2)

The total measuring uncertainty of Voc is $\leq 1.35\%$ (k=2)



***Module Photos**

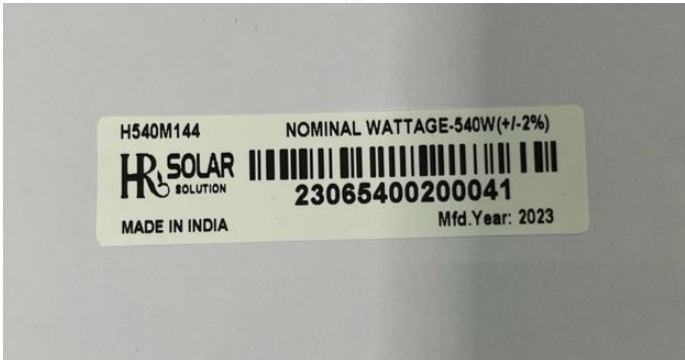
H540M144



Front view of test sample



Rear view of test sample



Serial number of test sample



Label



Module family list

Model type: H540M144

No.	Model Name	System Voltage [V]	Electrical Ratings.				
			Pmpp[W]	Voc[V]	Isc[A]	Vmpp[V]	Impp[A]
1	H545M144	1500	545	49.5	13.73	42.51	12.83
2	H540M144	1500	540	49.4	13.66	42.37	12.75
3	H535M144	1500	535	49.3	13.58	42.22	12.68
4	H530M144	1500	530	49.1	13.50	42.05	12.61
5	H525M144	1500	525	49	13.42	41.89	12.54
6	H520M144	1500	520	48.9	13.36	41.74	12.47
7	H515M144	1500	515	48.7	13.29	41.58	12.39
8	H510M144	1500	510	48.6	13.21	41.44	12.31
9	H505M144	1500	505	48.5	13.14	41.29	12.24
10	H500M144	1500	500	48.3	13.07	41.13	12.16



Equipment List

NO.	Equipment	Serial number	Expiry date	remark
1	Pulsed solar simulator measurement	E-108-01PV	2023/08/07	The STC re-flashing is Class AAA
2	Die electric tester	E-089-01PV	2024/08/17	/
3	We leakage tester	E-011-01PV	/	/
4	Conductivity meter	E-022-01PV	2024/03/03	/
5	EL camera	E-048-01PV	/	/
6	PID tester	E-033-01PV	2024/08/17	/

Photos are limited used in this Report

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

Report additional information:

1. Without permission of the test center this test report is not permitted to be duplicated in extracts.
2. Informing the test center in 15 days since you receive the report when you don't agree, otherwise it is not accepted.
3. The test center is not responsible for the confirmation of the sample/manufacture information provided by the client.
4. The entrust inspection is responsible for the received sample only.
5. The test report has been partially written in English.