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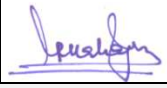
TEST REPORT
IEC TS 62804-1: 2015
Photovoltaic (PV) modules – Test methods for the detection of potential-induced degradation – Part 1: Crystalline silicon

Report Number. .....:	**CE-JOB-MUM-20-000723-004**
Date of issue .....:	7th August 2020
Total number of pages.....:	24 pages
Name of Testing Laboratory preparing the Report.....:	Intertek India Private Limited. 'F Wing', Tex Centre, Chandivali Farm Road, Andheri (E). Mumbai-400072, Maharashtra. India.
Applicant's name.....:	RenewSys India Private Limited.
Address .....:	Plot No. 06, Survey # 114/P,Srinagar Village,Maheshwaram Mandal Rangareddy Dist. – 501359, Telangana, India.
Manufacturer`s name.....:	Same as above.
Manufacting locations .....:	Same as above.
Testing location .....:	Same as above.
Test specification:	
Standard.....:	IEC TS 62804-1:2015 Ed.1.0
Test procedure .....:	Interek standard testing procedure.
Non-standard test method .....:	N/A

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Test item description .....:	Crystalline Silicon terrestrial photovoltiac(PV) modules.(Poly-Crystalline)
Trade Mark.....:	RenewSys
Manufacturer.....:	RenewSys India Private Limited.
Model/Type reference.....:	DESERV 3S6H-380 72 cells module: DESERV 3M6H-XXX, XXX stands for power range from 375~400, in step of 5 W
Ratings.....:	See copy of Marking Plate on page No:4

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☐	**Testing Laboratory:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☒	**Testing procedure:**		
Testing location/ address ..... :		RenewSys India Private Limited. Plot No. 06, Survey # 114/P,Srinagar Village,Maheshwaram Mandal Rangareddy Dist. – 501359, Telangana, India.	
Tested by (name, function, signature) ..... :		Vaibhav Sahane Techncial Manager	
Approved by (name, function, signature) .. :		Gokul Mahajan Dy. General Manager	
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature)..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

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Clause	Requirement + Test	Result - Remark	Verdict

List of Attachments (including a total number of pages in each attachment):

- Annex 1: Construction Data Form (CDF)
- Annex 2: Photographs

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Summary of testing:

According to the application, the potential- induced degradation testing was performed in accordance with IEC TS 62804-1:2015. The modules type DESERV 3S6H was selected for testing and were only tested with high voltage terminal of power source connected to the grounding hole of the frame.

All tests were successfully completed. For the component's information, please refer to test report for more details.

Tests performed (name of test and test clause):

Cl. No.	Tests
	Preconditioning
MST 01	Visual Inspection(Initial and Final)
10.2	Maximum Power Determination(Initial and Final)
10.3	Insulation test
10.15	Wet Leakage test
MST 13	Ground Continuity Test
PID Stress	Test according to IEC TS 62804 -1:2015 with following severities
	Climatic Conditions : 85° C and 85 % RH
	Duration:96 Hours

Testing location:

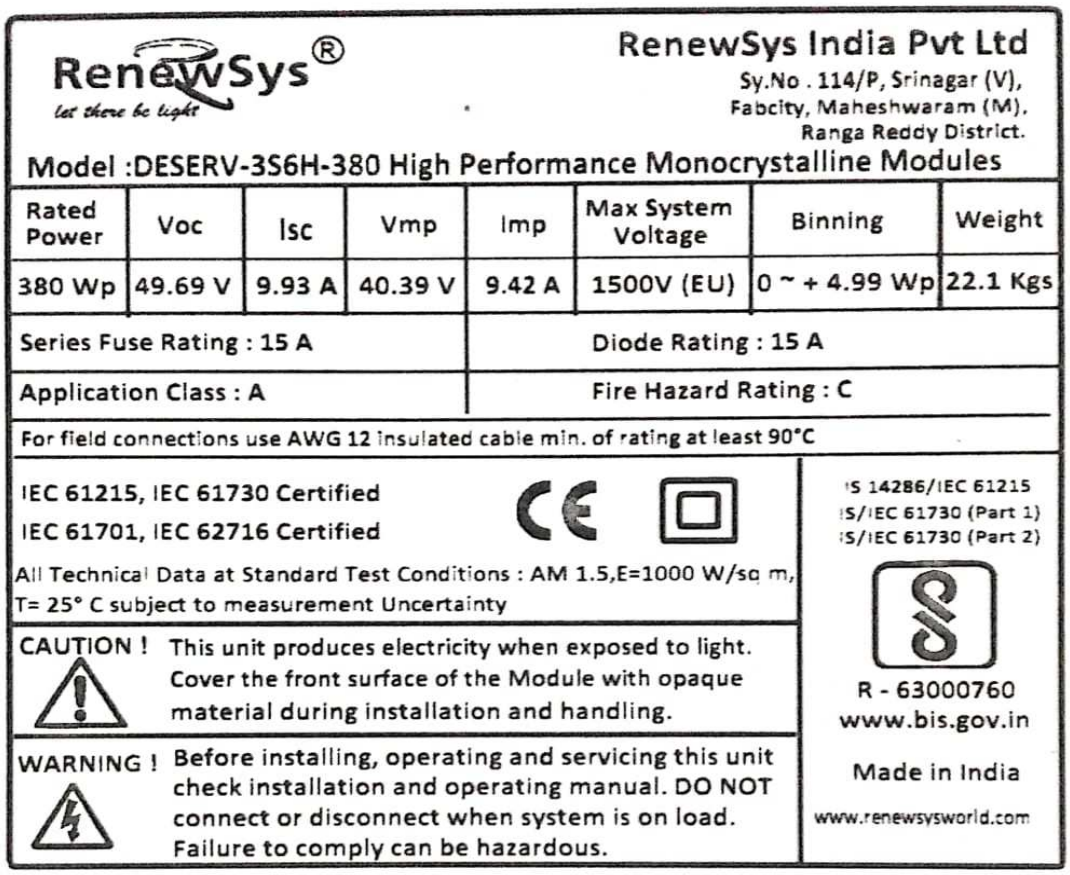
RenewSys India Private Limited.
Plot No. 06, Survey # 114/P,Srinagar Village,Maheshwaram Mandal Rangareddy Dist. – 501359, Telangana, India.

Summary of compliance with National Differences (List of countries addressed): N/A

☐ **The product fulfils the requirements of** IEC TS 62804-1:2015

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Copy of marking plate:



RenewSys®
let there be light

RenewSys India Pvt Ltd
Sy.No . 114/P, Srinagar (V),
Fabcity, Maheshwaram (M),
Ranga Reddy District.

Model :DESERV-3S6H-380 High Performance Monocrystalline Modules

Rated Power	Voc	Isc	Vmp	Imp	Max System Voltage	Binning	Weight
380 Wp	49.69 V	9.93 A	40.39 V	9.42 A	1500V (EU)	0 ~ + 4.99 Wp	22.1 Kgs

Series Fuse Rating : 15 A | Diode Rating : 15 A

Application Class : A | Fire Hazard Rating : C

For field connections use AWG 12 insulated cable min. of rating at least 90°C

IEC 61215, IEC 61730 Certified
IEC 61701, IEC 62716 Certified

All Technical Data at Standard Test Conditions : AM 1.5,E=1000 W/sq m, T= 25° C subject to measurement Uncertainty

CAUTION ! This unit produces electricity when exposed to light. Cover the front surface of the Module with opaque material during installation and handling.

WARNING ! Before installing, operating and servicing this unit check installation and operating manual. DO NOT connect or disconnect when system is on load. Failure to comply can be hazardous.

IS 14286/IEC 61215
IS/IEC 61730 (Part 1)
IS/IEC 61730 (Part 2)

R - 63000760
www.bis.gov.in

Made in India

www.renewsysworld.com

General Product information :

Description of module construction :

Model No.	Cell technology	Size of cells (mm)	No. of cells	Module dimension (mm)
R1000028203511211	Monocrystalline	158.75x158.75mm	72x	1985x1000
R1000028203511434	Monocrystalline	158.75x158.75mm	72x	1985x1000

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

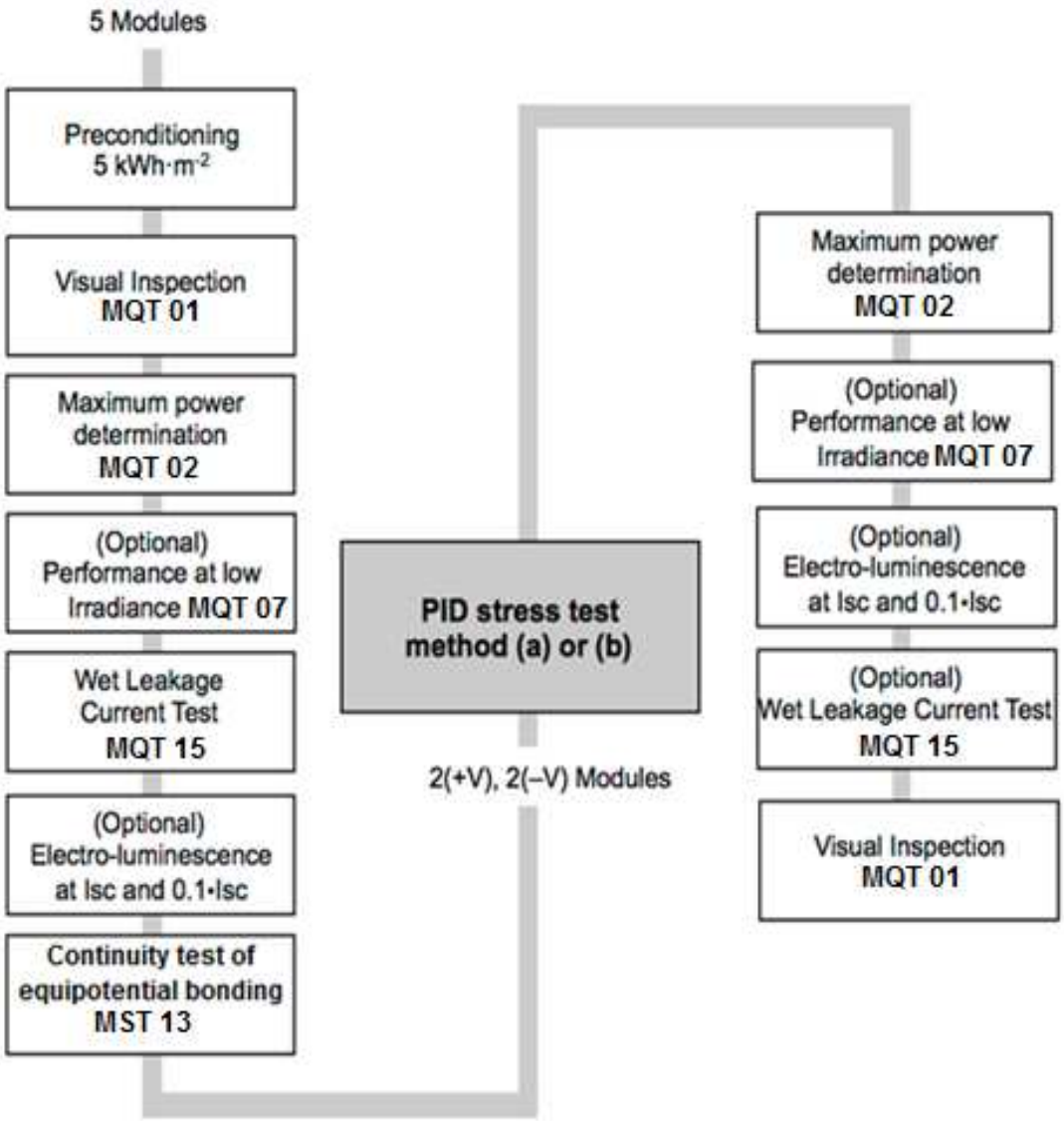
Product Electrical Rating :						
Model No.	Voc (V)	ISc (A)	Pmp (W)	Vmp (V)	Imp (A)	Maximum series Fuse rating (A)
R1000028203511211	49.69	9.93	380	40.39	9.42	15
R1000028203511434	49.69	9.93	380	40.39	9.42	15

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict
4.0	**MARKING**		P
-	Name, monogram or symbol of manufacturer	Printed on nameplate	P
-	Type or model number	Printed on nameplate	P
-	Serial number	WS02209009665471 and WS02209009665469	P
-	Polarity of terminals or leads	Marked with color	P
-	Maximum system voltage	1500 VDC	P
-	The date and place of manufacture	Traceable from serial number	P
-	Initial examination	All modules	P
-	Preconditioning	Performed by manufacturer	P
MST01	Visual inspection	See table MST01	P
10.2	Maximum power determination	See table 10.2	P
10.3	Insulation test	See table 10.3	P
10.15	Wet leakage current test	See table 10.15	P
MST 13	Ground continuity test	See table MST13	P

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 1

Figure 1 – PID test flow



IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

-	**List of test samples**	
-	**Module type: Poly-crystalline**	
Sample No.	Sample S/N	Remarks / constructional characteristics
1	R1000028203511211	- Tongwei : 5BB Monocrystalline – 158.75x158.75mm - Borosil : AR Coated 3.2mm - RenewSys : PRESEVE 1 300WD - Top EVA:- RenewSys : CONSERV A 360.2 14 FC - Bottom EVA :- RenewSys : CONSERV A 360.2 14 FC - Aluminum Frame:- JIANGYIN YUANSHUO METAL TECHNOLOGY CO., LTD. (YS Metal) : 40x35mm - Adhesive:- Tonson TS 1547 - Inter-connecting copper :- Telison : 1.0mm x 0.25mm - Bussing copper :- Telison : 6mm x 0.4mm - Junction Box:- Dhash PV Technologies Private Limited - DSJB03
2	R1000028203511434	

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.2	Visual inspection (Initial)	
Test date [DD/MM/YYYY]	20/07/2020	—
Sample No.	Nature and position of initial findings	—
R1000028203511211	No visual defects was found	P
R1000028203511434	No visual defects was found	P
Supplementary information: N/A		

6.3	Maximum power determination (Initial)					
Test date [DD/MM/YYYY]			20/07/2020			—
Module temperature [°C] .....:			Corrected to 25			
Irradiance [W/m²] .....:			1000			
Sample No.	Pmax [W]	Vmpp [V]	Impp [A]	Voc [V]	Isc [A]	FF [%]
R1000028203511211	382.38	39.46	9.69	48.24	10.06	0.79
R1000028203511434	383.21	39.48	9.71	48.35	10.10	0.78
Supplementary information: N/A						

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.4	**EL-images (Initial)**	
Test date [DD/MM/YYYY]	20/07/2020	—
Current applied ..... :	Isc ± 5% 10.52Amps	—

Sample No.	Remarks	—
R1000028203511211	No EL Cracks	P
R1000028203511434	No EL Cracks	P
Supplementary information: Refer to annex 3: EL-images in the appendix for details.		

6.5	**Wet leakage current test (Initial)**			
Test date [DD/MM/YYYY]	20/07/2020			—
Insulation resistance measured at [V_{DC}] ..... …..:	1500			—
Solution resistivity [Ω cm] ....:	< 3,500			P
Solution temperature [°C] ..... …..:	22 ± 3			P
Sample No.	Measured	Area	Result*	—
	MΩ	m²	MΩ * m²	
R1000028203511211	5210	1.99	10341.85	P
R1000028203511434	5670	1.99	11254.95	P
* Minimum requirement acc. to the standard is 40 MΩ*m²				
Supplementary information: N/A				

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.6	**Performance at low irradiance (Initial)**					
Test date [DD/MM/YYYY]			N/A			—
Ambient air temperature [°C] ..... :			N/A			—
Irradiance [W/m²] ..... :			200			—
Module temperature [°C] ..... :			25			—
Test method ..... :			☒ Indoor direct measurement ☐ Outdoor corrected data			—
Sample No.	Pmpp [W]	Vmpp [V]	Impp [A]	Voc [V]	Isc [A]	FF [%]
1	N/A					
2	N/A					
Supplementary information: Optional test.						

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.8	**Ground continuity test (Initial)**			
Test date [DD/MM/YYYY]		20/07/2020		—
Maximum over-current protection rating [A]		15		—
Current applied [A]		37.5		—
Location of designated grounding point		At the centre of longer side		—
Location of second contacting point		Adjacent side with greatest distance from the grounding point; At the centre of another longer side; At the centre of another shorter side		—
Sample No		Voltage [mV]	Resistance [mΩ]	—
R1000028203511211		226.3	15	P
R1000028203511434		241.5	19	P
Supplementary information: N/A				

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.9.2	**Potential Induced Degradation test**		
Test date [DD/MM/YYYY]		20/07/2020 to 01/08/2020	—
Test Condition ……..:		Method A	—
Sample No.		—	—
R1000028203511211		-1500V	P
R1000028203511434		-1500V	P
Supplementary information: N/A			

6.3	**Maximum power determination after PID test**							
Test date [DD/MM/YYYY]				04/08/2020				—
Module temperature [°C]				corrected to 25				
Irradiance [W/m²]				1000				
Sample No.	P_{max} [W]	V_{mpp} [V]	I_{mpp} [A]	V_{oc} [V]	I_{sc} [A]	FF [%]	Degradation [%]	
R1000028203511211	376.25	39.65	9.49	48.48	9.87	0.79	1.82	P
R1000028203511434	372.41	39.83	9.35	48.87	9.72	0.78	2.82	P
3								
4								
5								
Supplementary information: Maximum allowable P_{max} degradation after PID test is 5 %.								

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.4	**EL-images after PID test**		
Test date [DD/MM/YYYY]		04/08/2020	—
Current applied ..... :		Isc ± 5% 10.48Amps	—
Sample No.	Remarks		—
R1000028203511211	No darking of cells		P
R1000028203511434	No darking of cells		P
Supplementary information: Optional test.			

6.5	**Wet leakage current test after PID test**			
Test date [DD/MM/YYYY]	04/08/2020			—
Insulation resistance measured at [V_{DC}] ..... :	1500			—
Solution resistivity [Ω cm] ..... : :	< 3,500			P
Solution temperature [°C] ..... :	22 ± 3			P
Sample No.	Measured	Area	Result*	—
	MΩ	m^2	MΩ * m^2	
R1000028203511211	1150	1.99	2282.75	P
R1000028203511434	1140	1.99	2262.9	P
* Minimum requirement acc. to the standard is 40 MΩ*m^2				
Supplementary information: N/A				

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

6.6	Performance at low irradiance after PID test						
Test date [DD/MM/YYYY]							—
Ambient air temperature [°C] ..... :							—
Irradiance [W/m²] ..... :							—
Module temperature [°C] ..... :							—
Test method ..... :			☒ Indoor direct measurement ☐ Outdoor corrected data				—
Sample No.	Pmpp [W]	Vmpp [V]	Impp [A]	Voc [V]	Isc [A]	FF [%]	
Supplementary information: Optional test							

6.2	Final visual inspection	
Test date [DD/MM/YYYY]	04/08/2020	—
Sample No.	Nature and position of initial findings	—
R1000028203511211	No visual defects was found	P
R1000028203511434	No visual defects was found	P
Supplementary information: N/A		

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 1: Construction Data Form (CDF)

1.1	SOLAR CELL FOR MONO-CRYSTALLINE PV MODULE	
	Cell type reference .....:	Tongwei : 5BB Monocrystalline
	Cell dimensions L x W (mm) .....:	158.75x158.75mm
	Cell thickness (µm) ..... :	180 ± 30 **µm**

1.2	IDENTIFICATION OF MATERIALS	
	Front cover .....:	Borosil : AR Coated 3.2mm
	Rear cover ..... :	RenewSys : PRESEVE 1 - 300WD
	Encapsulant ..... :	Top EVA:- RenewSys : CONSERV P UVT 14 FC Bottom EVA :- RenewSys : CONSERV P 360 14 FC
	Frame ..... :	JIANGYIN YUANSHUO METAL TECHNOLOGY CO., LTD. (YS Metal) 40x35mm
	Adhesive for frame ..... :	Tonson : TS 1547
	Internal wiring ..... :	Inter-connecting copper :- Telison 1.0mm x 0.25mm Bussing copper :- Telison 6mm x 04mm
	Other .....:	N/A

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

1.3	IDENTIFICATION OF COMPONENTS	
	Junction box .....:	Dhash PV Technologies Private Limited - DSJB03
	Adhesive for junction box ..... :	Tonson : TS 1547
	Cable ..... :	APAR Industries Limited : H1Z2Z2-K
	Connector ..... :	Jiangsu Haitian Microelectronics corp : PV-HT03
	Bypass diode ..... :	Sangdest Micro Electronics - 20SQ045

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

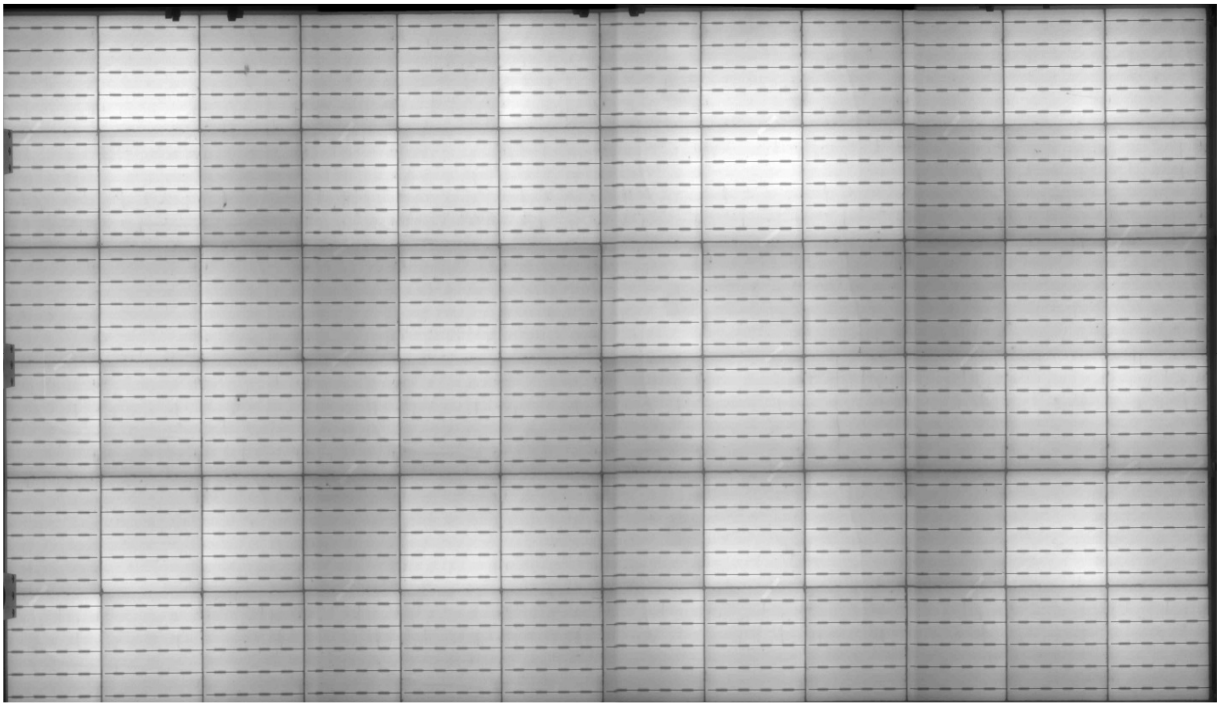
Test equipment list

No.	Equipment	Make	Model	Cal date	Cal due date
1	PID Chamber	ESPEC	EW5270WS	08/07/2020	07/07/2021
2	High Voltage DC Power supply	MEGGER	MIT 1020/2	21/12/2019	21/12/2020
3	Dielectric Analyzer	CHANGZHOOYANGZ	YD9860D	20/07/2020	19/07/2021
4	Ground Resistance Tester	CHANGZHOOYANGZ	YD9860D	20/07/2020	19/07/2021
5	Solar Simulator	SPI-SUN SIMULATOR	5100SLP BLUE	29/02/2020	29/08/2020

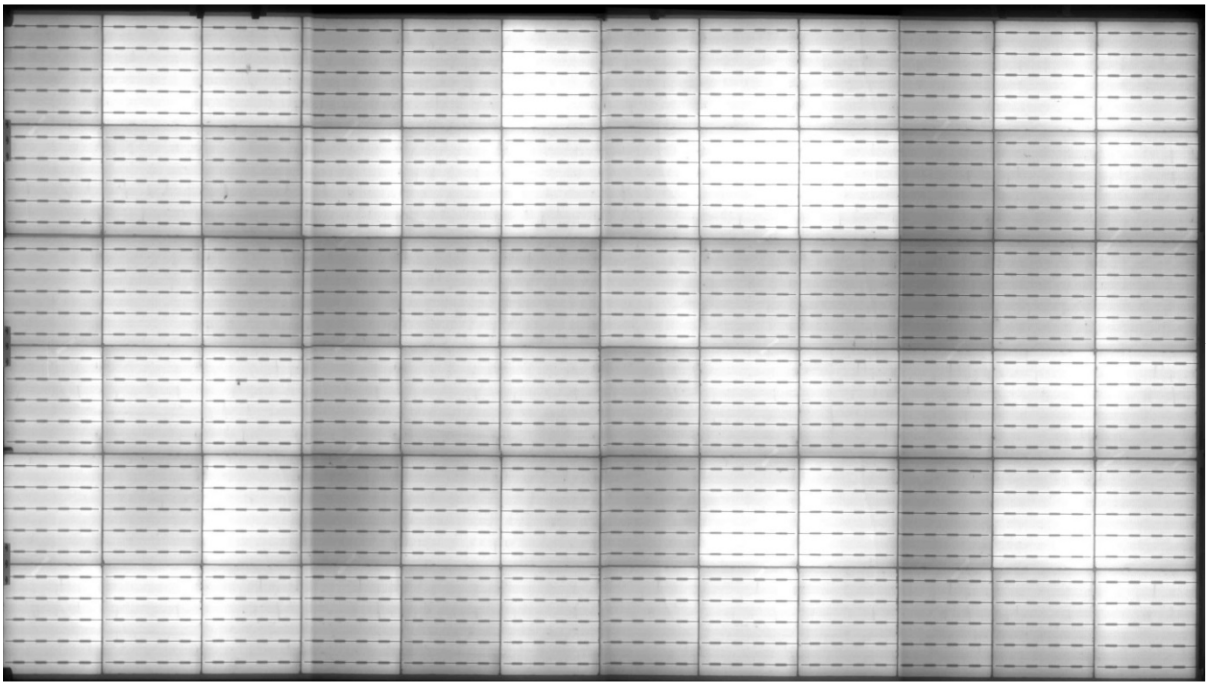
IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 2: Photographs

EL Images of Sample-1 and Sample:2

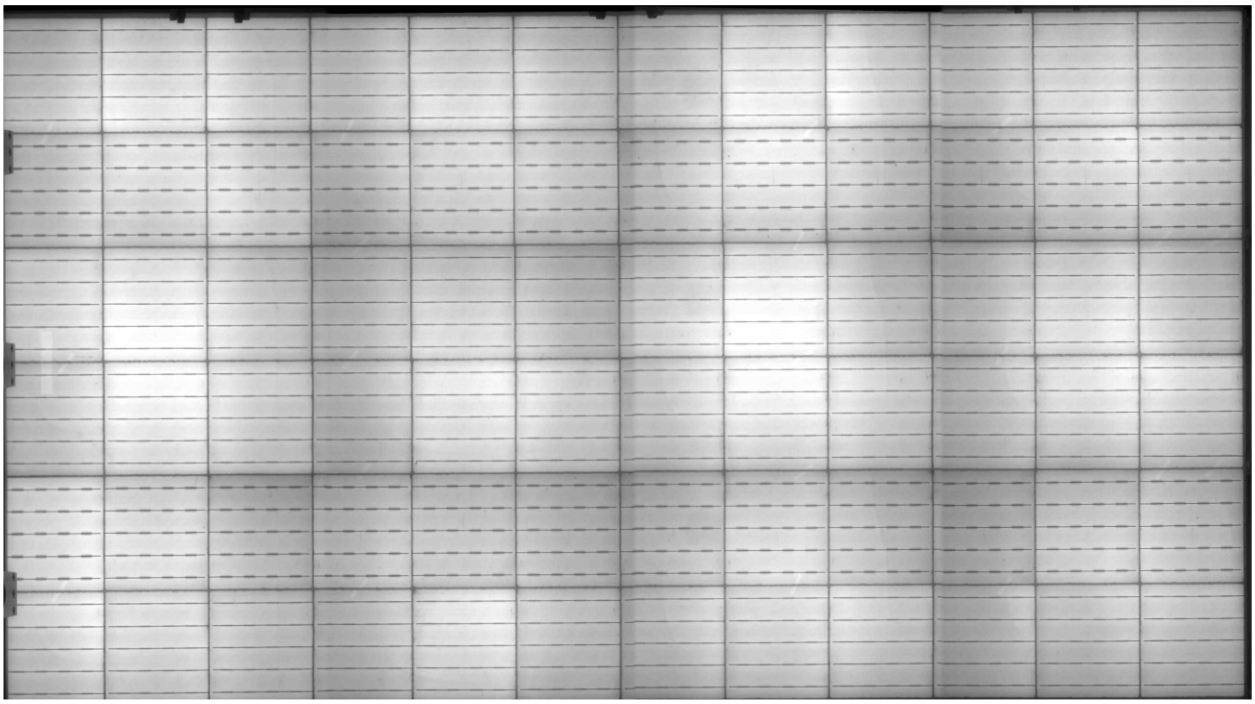


Sample:1(Before PID Test)

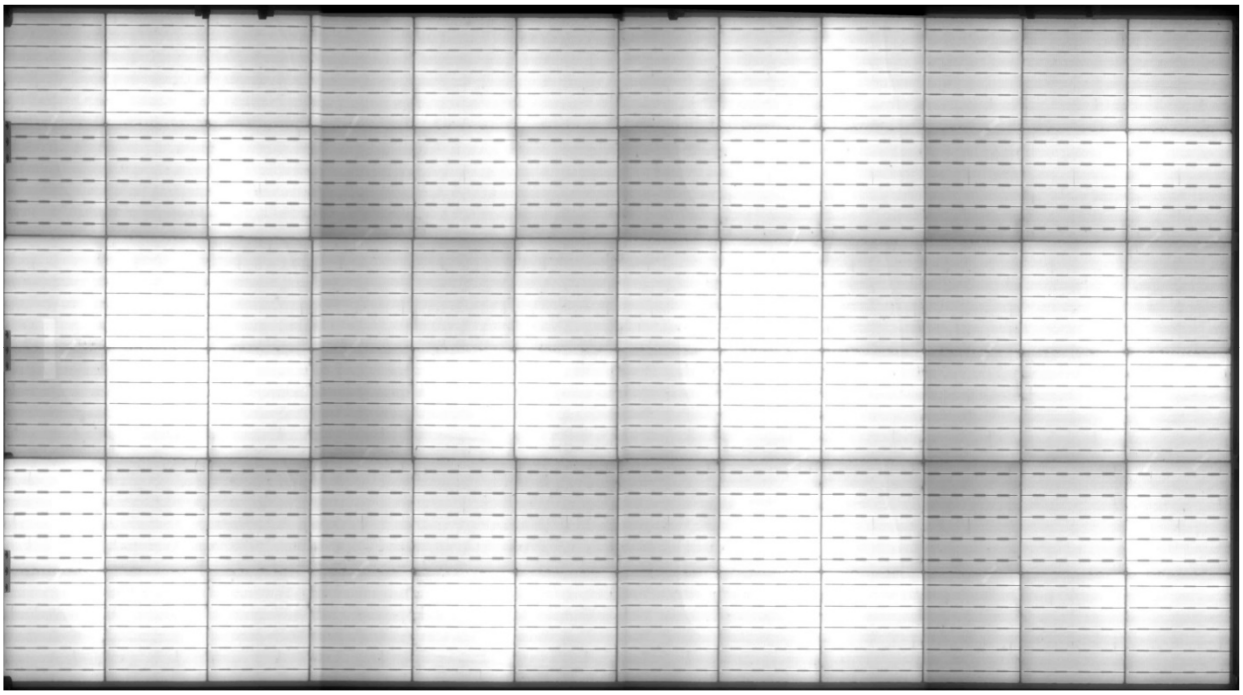


Sample:1(After PID Test)

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

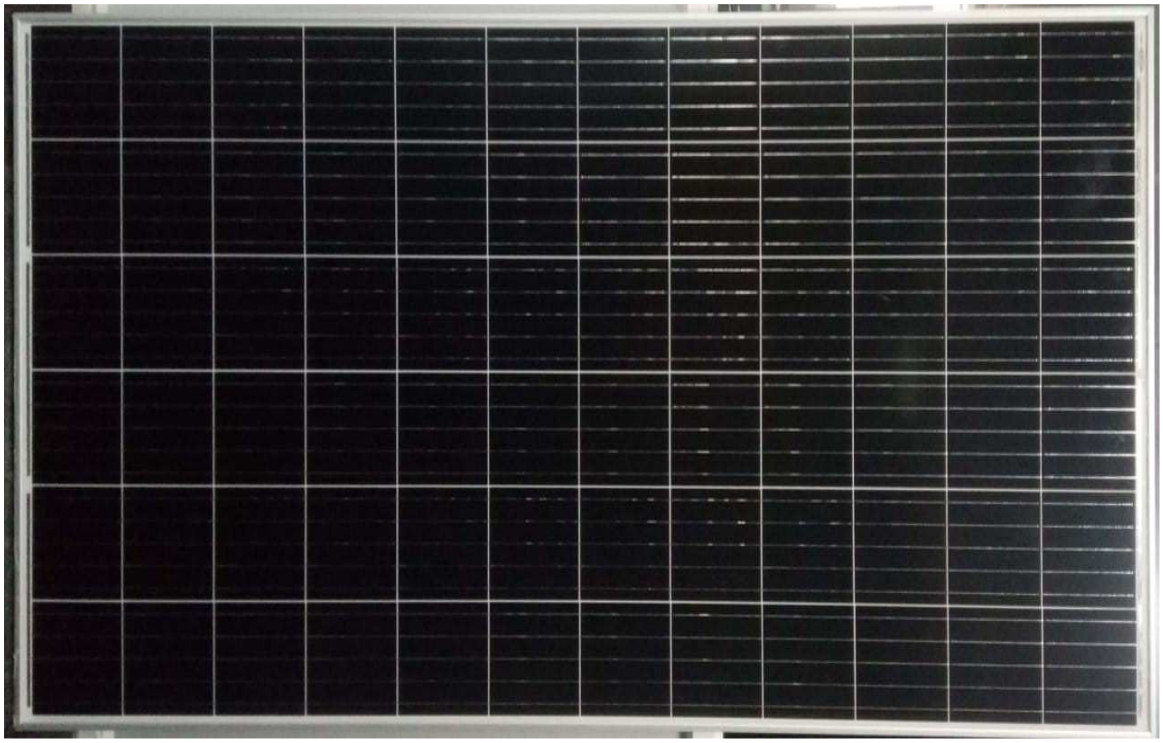


Sample:2 (Before PID Test)

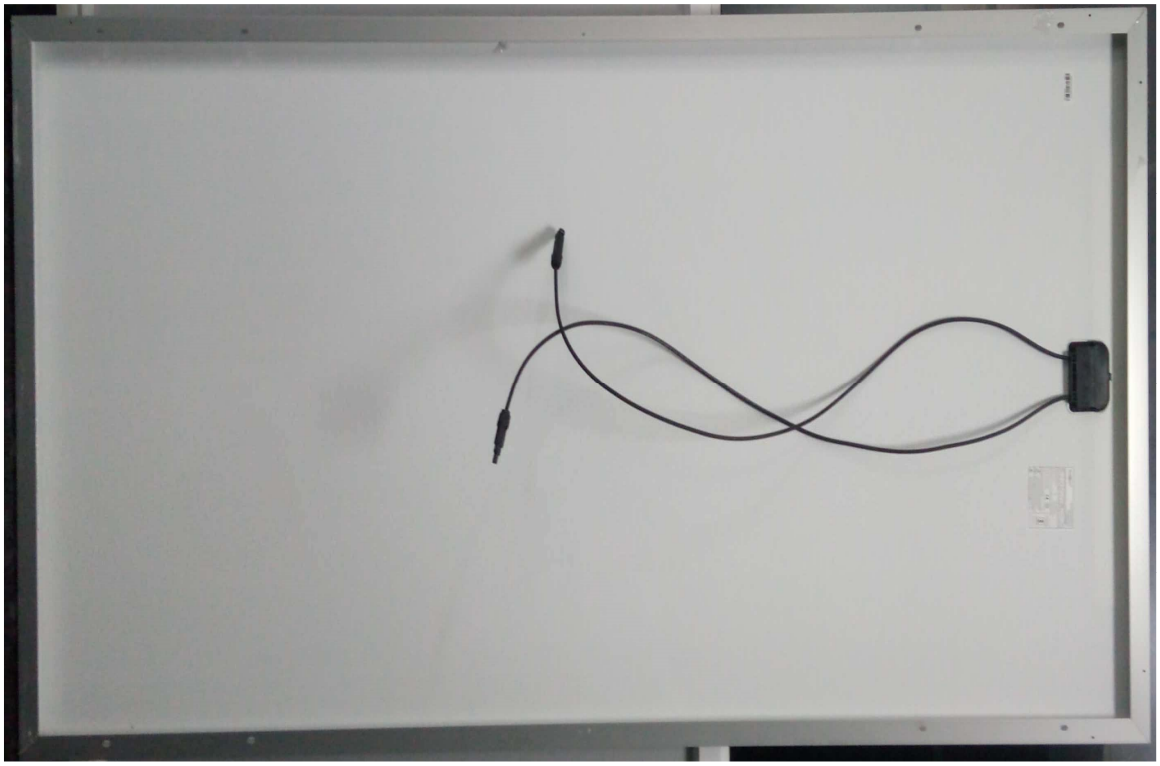


Sample:2 (After PID Test)

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict



Front View



Back View

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Grounding Symbol

Junction Box Close View

Junction Box Open View

IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Connector Front View

Connector Back View

Frame View

Frame View

--------END OF TEST REPORT------