Intertek India Private Limited
'F' Wing, Tex Centre,
Chandivali Farm Road, Andheri (E),
Mumbai- 400072, India.
Telephone:+91-22-4245022
Facsimile : +91-22-42450229
www.intertek.com

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-20-000723-003**
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 3M6H-340 72 cells module: DESERV 3M6H-XXX, XXX stands for power range from 315~345, 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) :			

IEC TS 62804-1: 2015			
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 3M6H 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.

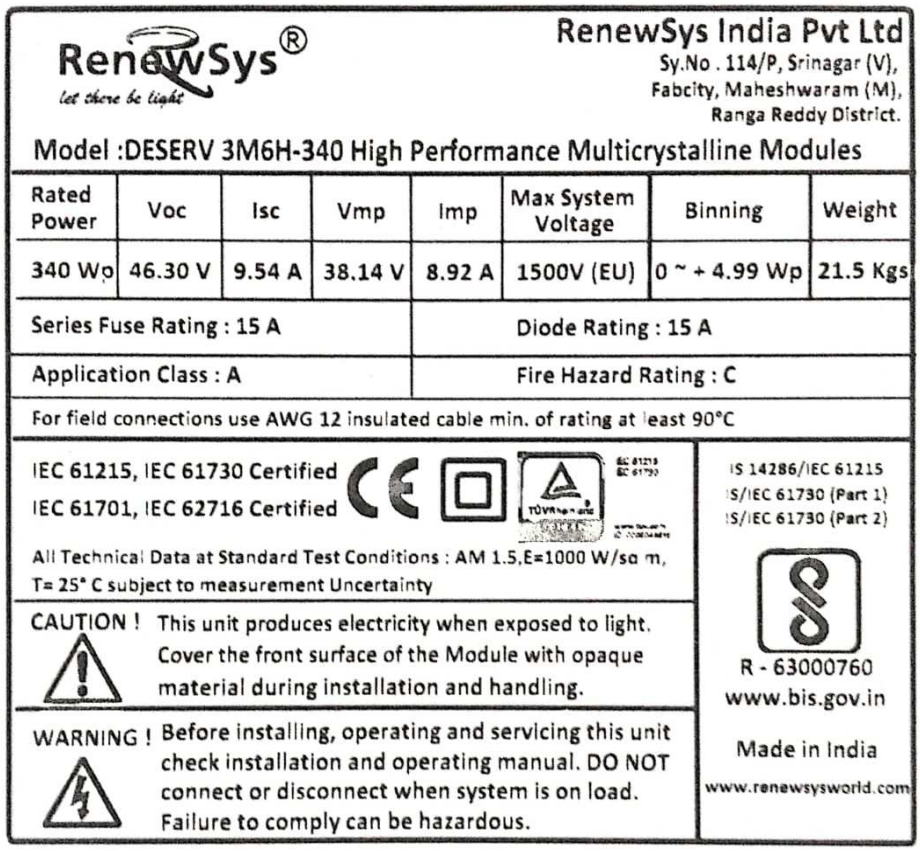
Plot No. 06, Survey # 114/P,Srinagar Village,Maheshwaram Mandal Rangareddy Dist. – 501359, Telangana, India.

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:



General Product information :

Description of module construction :

Model No.	Cell technology	Size of cells (mm)	No. of cells	Module dimension (mm)
R1000028203515850	Multicrystalline	157x157mm	72x	1958x987
R1000028203515855	Multicrystalline	157x157mm	72x	1958x987

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

Product Electrical Rating :

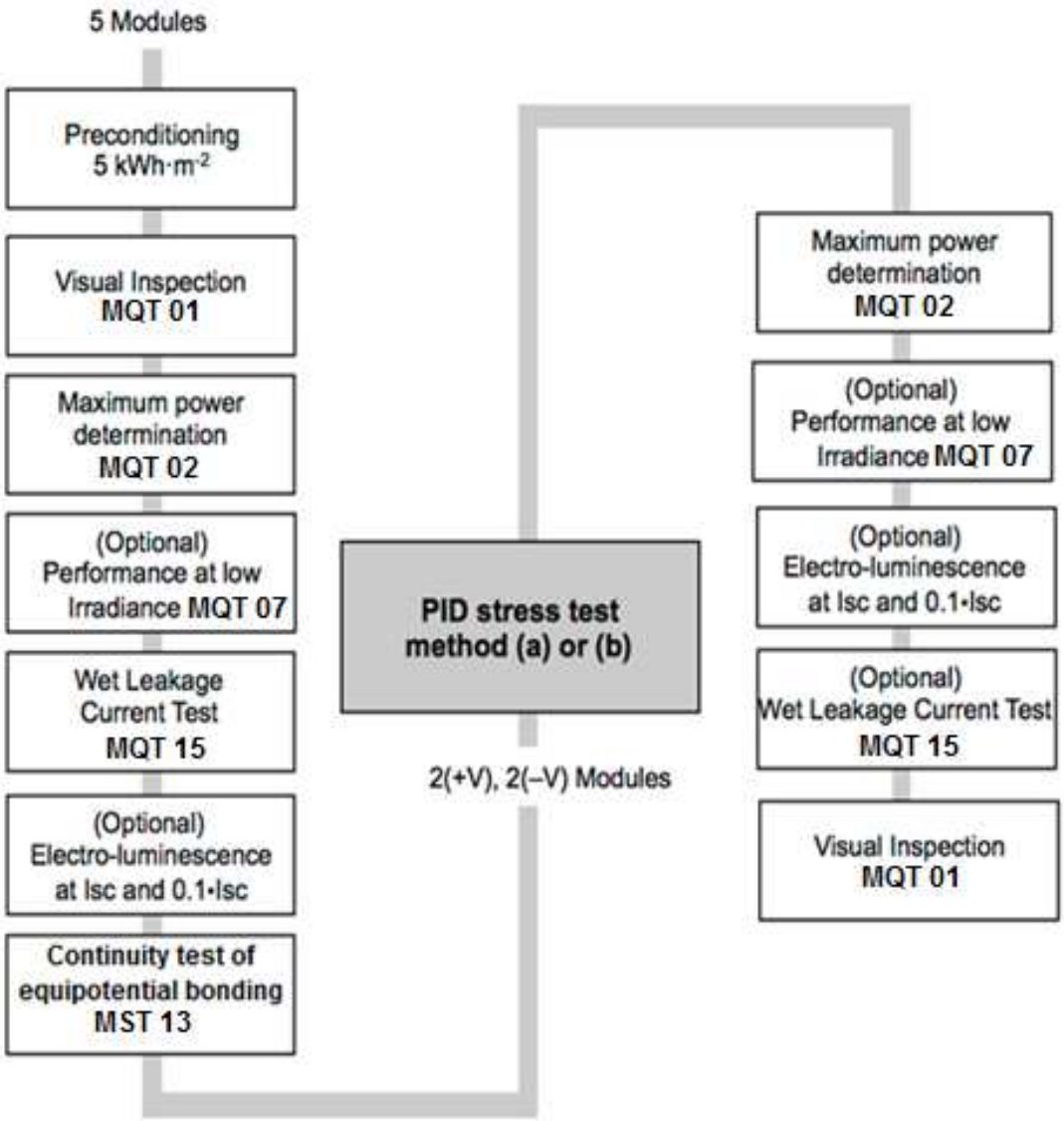
Model No.	Voc (V)	ISc (A)	Pmp (W)	Vmp (V)	Imp (A)	Maximum series Fuse rating (A)
R1000028203515850	46.30	9.54	340	38.14	8.92	15
R1000028203515855	46.30	9.54	340	38.14	8.92	15

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	R1000028203515850	- RESERV : 5BB Multicrystalline - 157x157mm - DONGGUAN CSG: 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:- (Jiaxing Taihe New Energy) : 40x35mm - Adhesive:- HUITIAN : HT906Z - Inter-connecting copper :- Luvata : 1.0mm x 0.25mm - Bussing copper :- Luvata : 6mm x 0.4mm - Junction Box:- Zhejiang zhonghuan sunter pv technology : PV-ZH011-3D
2	R1000028203515855	

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	—
R1000028203515850	No visual defects was found	P
R1000028203515855	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 [%]
R1000028203515850	336.86	38.35	8.78	45.91	9.21	0.80
R1000028203515855	336.19	38.12	8.82	45.81	9.26	0.79
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% 9.52Amps	—

Sample No.	Remarks	—
R1000028203515850	No EL Cracks	P
R1000028203515855	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	
R1000028203515850	2510	1.93	4844.3	P
R1000028203515855	2810	1.93	5423.3	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]	—
R1000028203515850		248.2	18	P
R1000028203515855		239.6	15	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.	—	—
R1000028203515850	-1500V	P
R1000028203515855	-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 [%]	
R1000028203515850	327.09	38.13	8.58	46.02	9.19	0.77	2.71	P
R1000028203515855	327.90	38.24	8.57	46.14	9.15	0.78	2.66	P
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% 9.52Amps	—
Sample No.		Remarks	—
R1000028203515850		No Darking of Cells	P
R1000028203515855		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	
R1000028203515850	714	1.93	1378.02	P
R1000028203515855	415	1.93	870.43	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	—
R1000028203515850	No visual defects was found	P
R1000028203515855	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 .....:	RenewSys : RESERV 5BB Multicrystalline
	Cell dimensions L x W (mm) .....:	157x157mm
	Cell thickness (µm) .....:	200 ± 20 µm

1.2	IDENTIFICATION OF MATERIALS	
	Front cover .....:	DONGGUAN CSG : AR Coated 3.2mm
	Rear cover ..... :	RenewSys : PRESEVE 300WD
	Encapsulant .....:	Top EVA:- RenewSys : CONSERV P UVT 14 FC Bottom EVA :- RenewSys : CONSERV P 360 14 FC
	Frame ..... :	Jiaxing Taihe New Energy : 40x35mm
	Adhesive for frame ..... :	HUITIAN : HT906Z
	Internal wiring ..... :	Inter-connecting copper :- Luvata 1.0mm x 0.25mm Bussing copper :- Luvata 6mm x 0.4mm
	Other .....:	N/A

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

1.3	IDENTIFICATION OF COMPONENTS	
	Junction box .....:	ZHEJIANG ZHONGHUAN SUNTER PV TECHNOLOGY PV-ZH011-3D
	Adhesive for junction box ..... :	HUITIAN : HT906Z
	Cable ..... :	ZHEJIANG ZHONGHUAN SUNTER PV TECHNOLOGY H1Z2Z2-K
	Connector ..... :	ZHEJIANG ZHONGHUAN SUNTER PV TECHNOLOGY PVZH202B
	Bypass diode ..... :	ZHEJIANG ZHONGHUAN SUNTER PV TECHNOLOGY 20SQ045

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

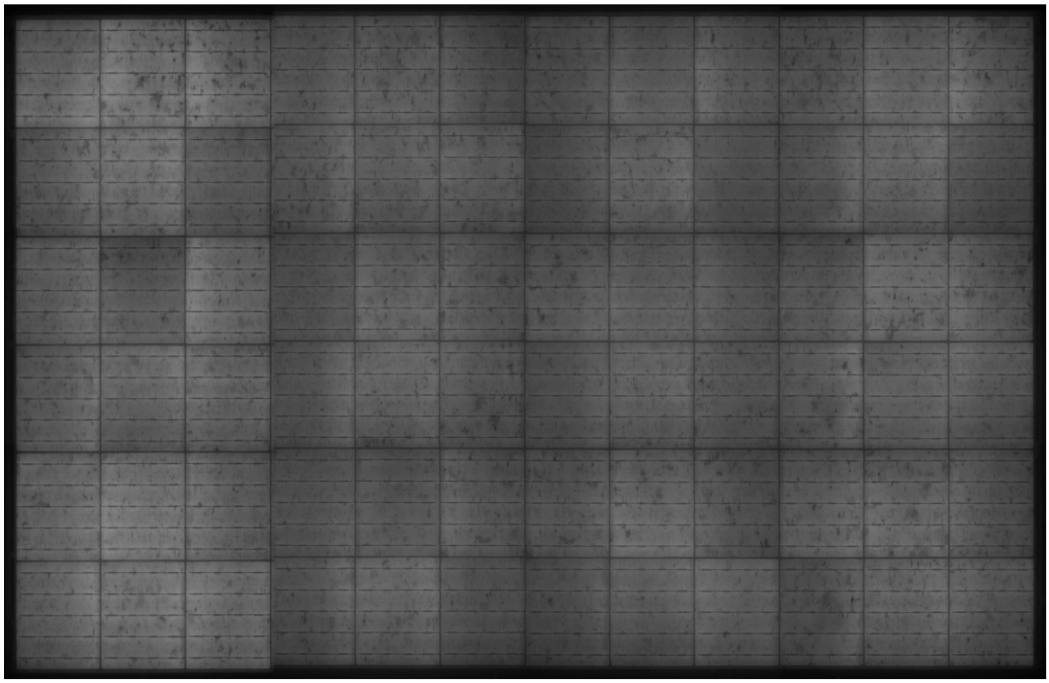
Test equipment list

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

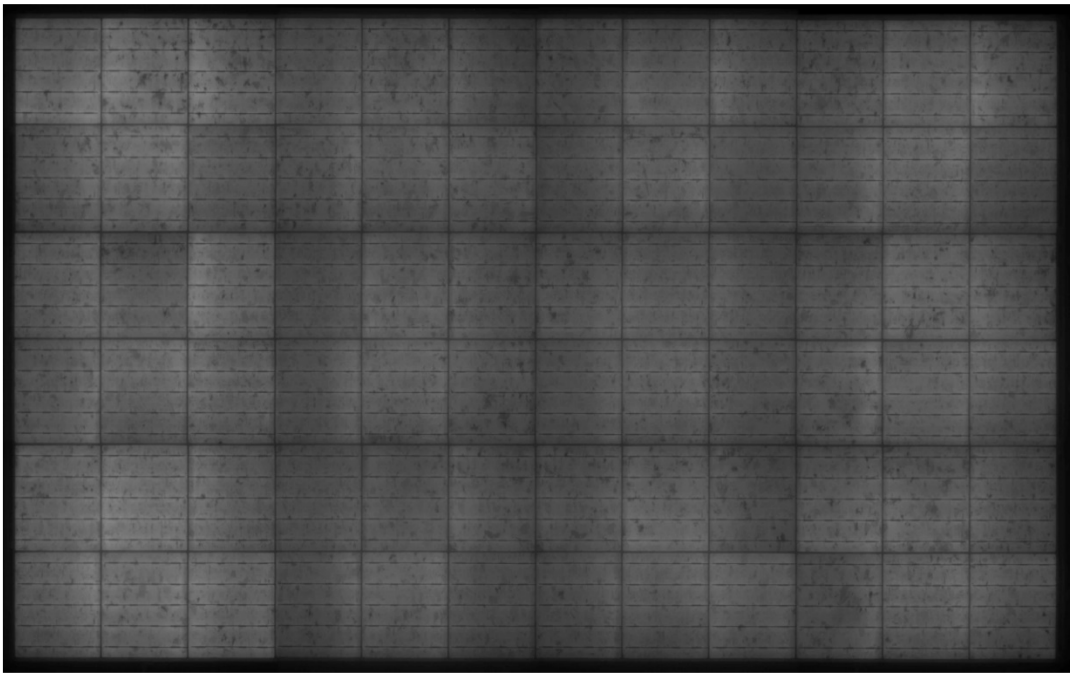
IEC TS 62804-1: 2015			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 2: Photographs

EL Images of Sample-1 and Sample:2

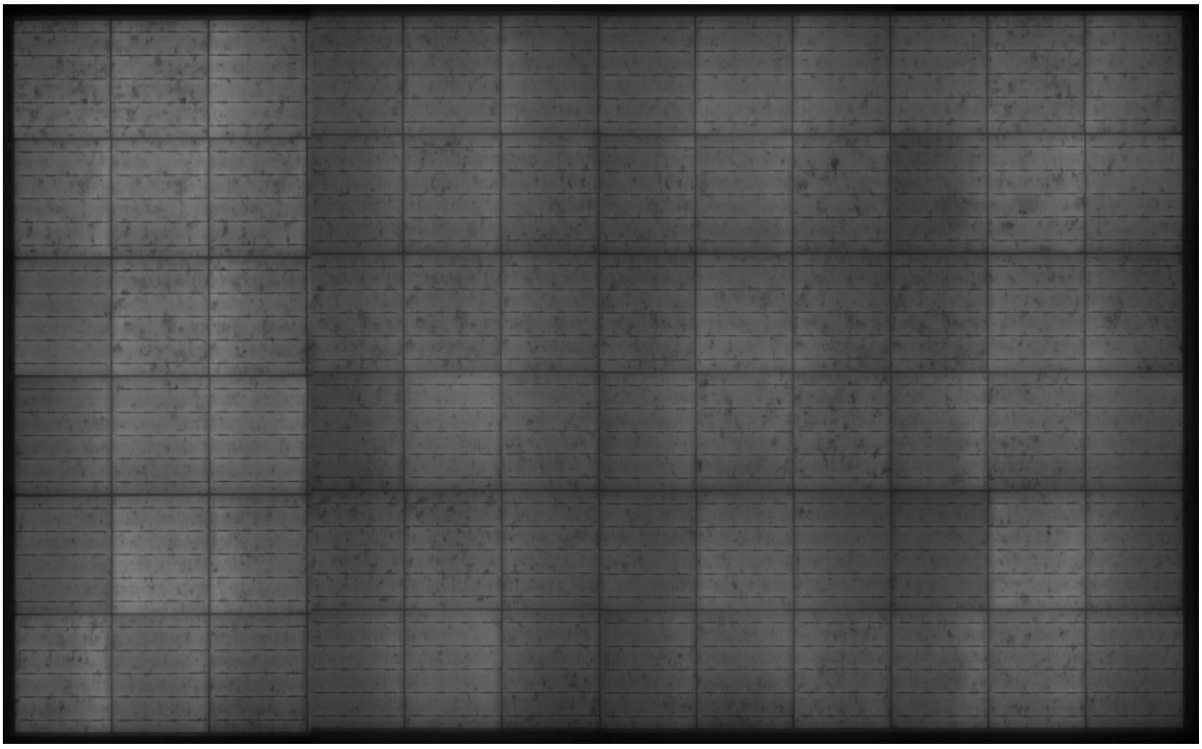


Sample:1(Before PID Test)

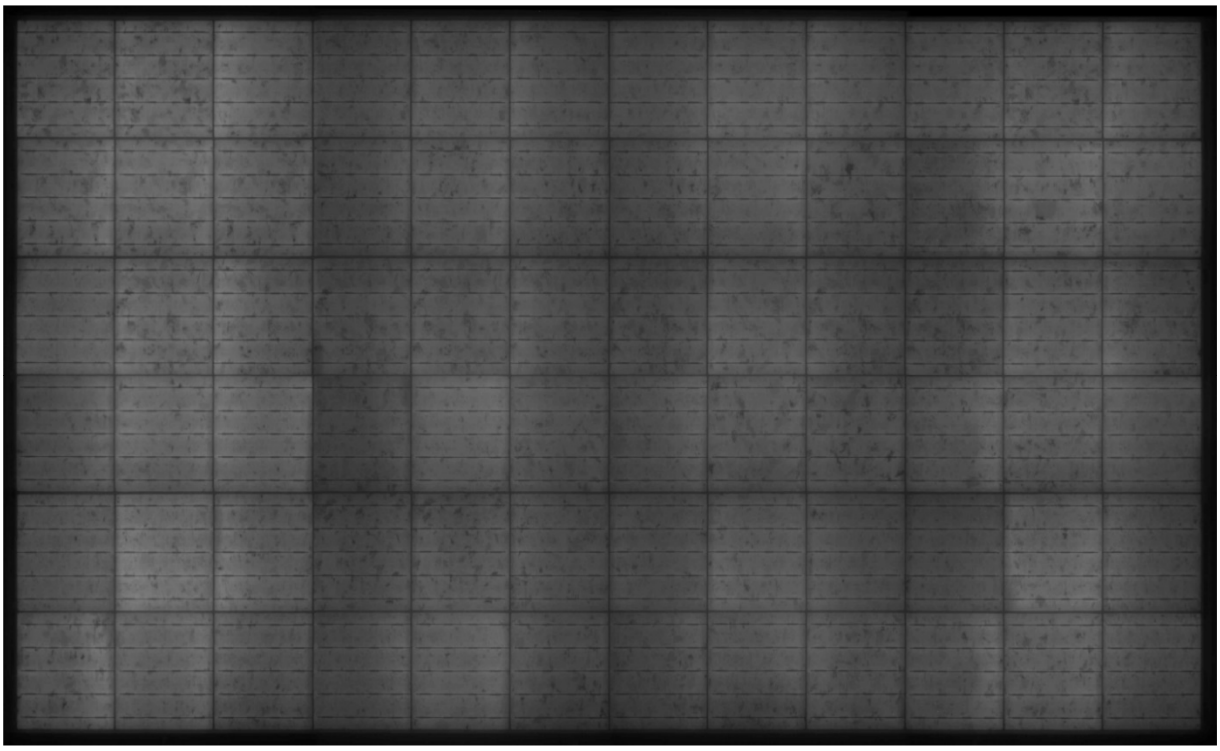


Sample:1(After PID Test)

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

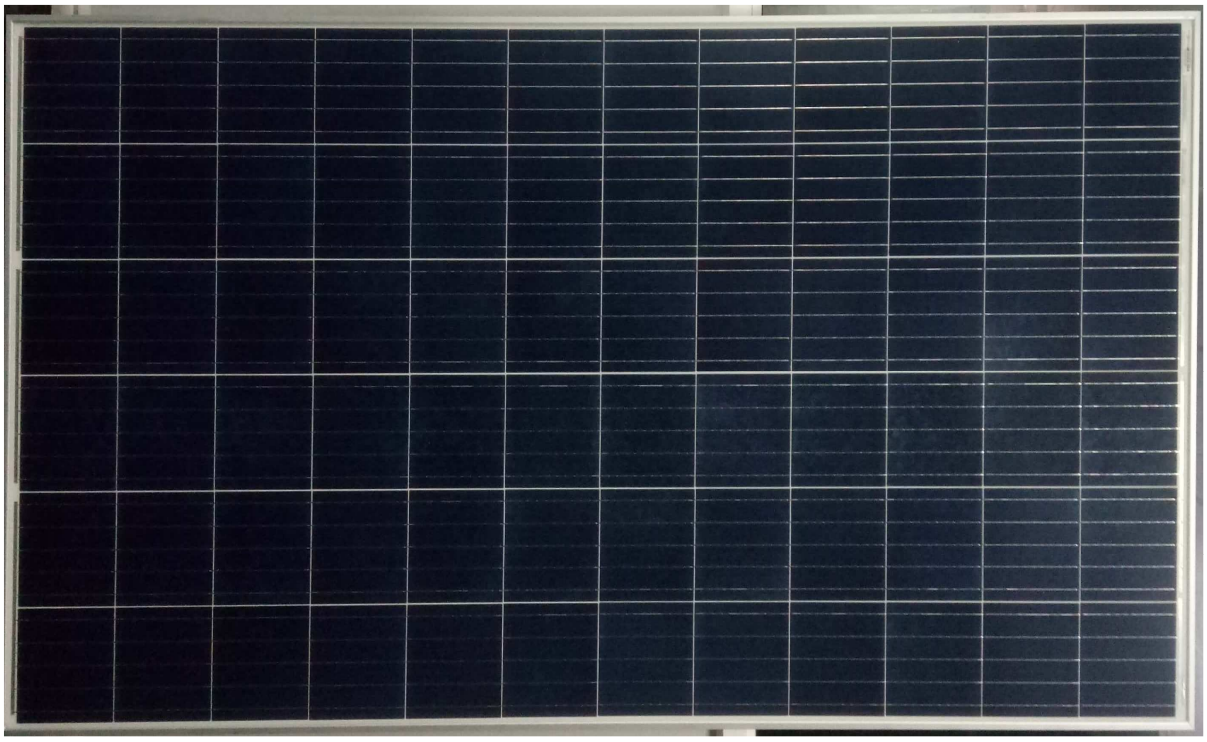


Sample:2 (Before PID Test)

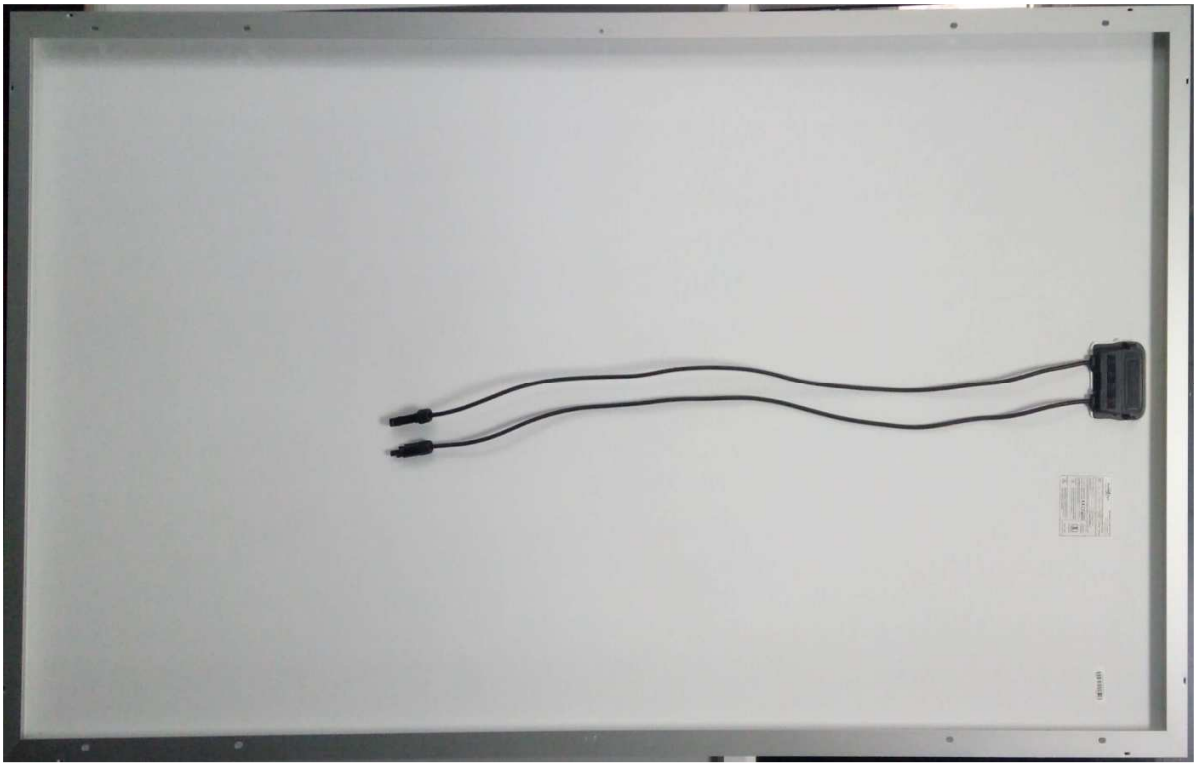


Sample:2 (After PID Test)

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------