

| 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. |
| Manufacturing 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 |
| An independent organization testing for safety, performance, and certification. | |
| <p>This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.</p> | |

| IEC TS 62804-1: 2015 | | | |
|--|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| Test item description : Crystalline Silicon terrestrial photovoltaic(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): | | | |
| <input type="checkbox"/> Testing Laboratory: | | | |
| Testing location/ address : | | | |
| Tested by (name, function, signature) : | | | |
| Approved by (name, function, signature) .. : | | | |
| <input checked="" type="checkbox"/> 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 Technical Manager | | | |
| Approved by (name, function, signature) .. : Gokul Mahajan Dy. General Manager | | | |
| <input type="checkbox"/> Testing procedure: CTF Stage 2: | | | |
| Testing location/ address : | | | |
| Tested by (name + signature)..... : | | | |
| Witnessed by (name, function, signature) . : | | | |
| Approved by (name, function, signature) .. : | | | |
| <input type="checkbox"/> Testing procedure: CTF Stage 3: | | | |
| <input type="checkbox"/> 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) : | | | |

Total Quality. Assured.

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

Total Quality. Assured.

| 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): | | Testing location: |
|---|--|---|
| Cl. No. | Tests | RenewSys India Private Limited. Plot No. 06, Survey # 114/P, Srinagar Village, Maheshwaram Mandal Rangareddy Dist. – 501359, Telangana, India. |
| | 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 | |

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 India Pvt Ltd Sy.No . 114/P, Srinagar (V), Fabcity, Maheshwaram (M), Ranga Reddy District. | | | | | |
|---|---------|---|---------|------------------------|--------------------|--|----------|
| Model :DESERV 3M6H-340 High Performance Multicrystalline Modules | | | | | | | |
| Rated Power | Voc | Isc | Vmp | Imp | Max System Voltage | Binning | Weight |
| 340 Wp | 46.30 V | 9.54 A | 38.14 V | 8.92 A | 1500V (EU) | 0 ~ + 4.99 Wp | 21.5 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 | | | | | | IS 14286/IEC 61215 S/IEC 61730 (Part 1) S/IEC 61730 (Part 2) | |
| All Technical Data at Standard Test Conditions : AM 1.5, E=1000 W/so 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. | | | | | | | |
| | | | | | | 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) |
|-------------------|------------------|--------------------|--------------|-----------------------|
| R1000028203515850 | Multicrystalline | 157x157mm | 72x | 1958x987 |
| R1000028203515855 | Multicrystalline | 157x157mm | 72x | 1958x987 |

Total Quality. Assured.

| 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 |

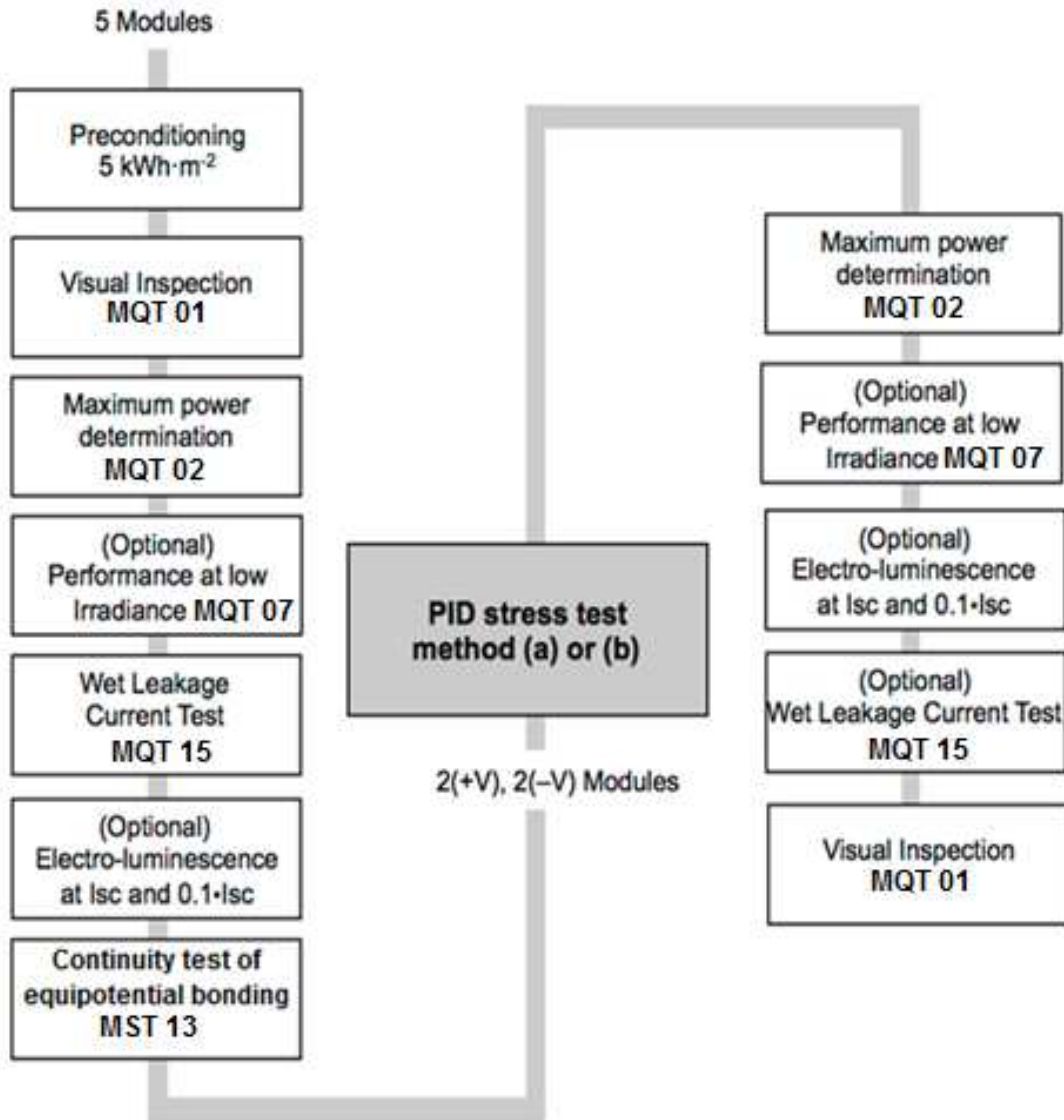
Total Quality. Assured.

| 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 | <ul style="list-style-type: none"> - 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 | <ul style="list-style-type: none"> - 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 | |

| 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/m ²] | 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 | | Verdict |
| 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* | Verdict |
| | MΩ | m ² | MΩ * m ² | |
| R1000028203515850 | 2510 | 1.93 | 4844.3 | P |
| R1000028203515855 | 2810 | 1.93 | 5423.3 | 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 (Initial) | | | | | | |
|--|----------|--|----------|---------|---------|--------|
| Test date [DD/MM/YYYY] | | N/A | | | — | |
| Ambient air temperature [°C] : | | N/A | | | — | |
| Irradiance [W/m ²] : | | 200 | | | — | |
| Module temperature [°C] : | | 25 | | | — | |
| Test method : | | <input checked="" type="checkbox"/> Indoor direct measurement <input type="checkbox"/> 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/m ²] | 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/m ²] | | | | | | | — |
| Module temperature [°C] | | | | | | | — |
| Test method | | <input checked="" type="checkbox"/> Indoor direct measurement | | | | | — |
| | | <input type="checkbox"/> 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 |

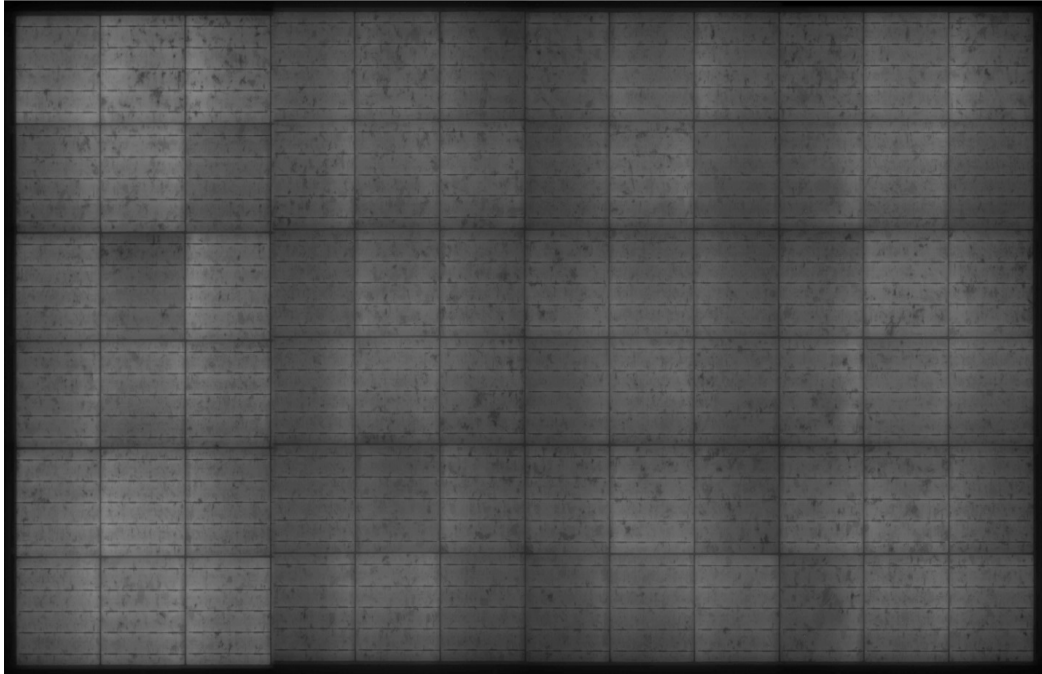
Test equipment list

| 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 | CHANGZHOORYANGZ | YD9860D | 20/07/2020 | 19/07/2021 |
| 4 | Ground Resistance Tester | CHANGZHOORYANGZ | YD9860D | 20/07/2020 | 19/07/2021 |
| 5 | Solar Simulator | SPI-SUN SIMULATOR | 5100SLP BLUE | 29/02/2020 | 29/08/2020 |

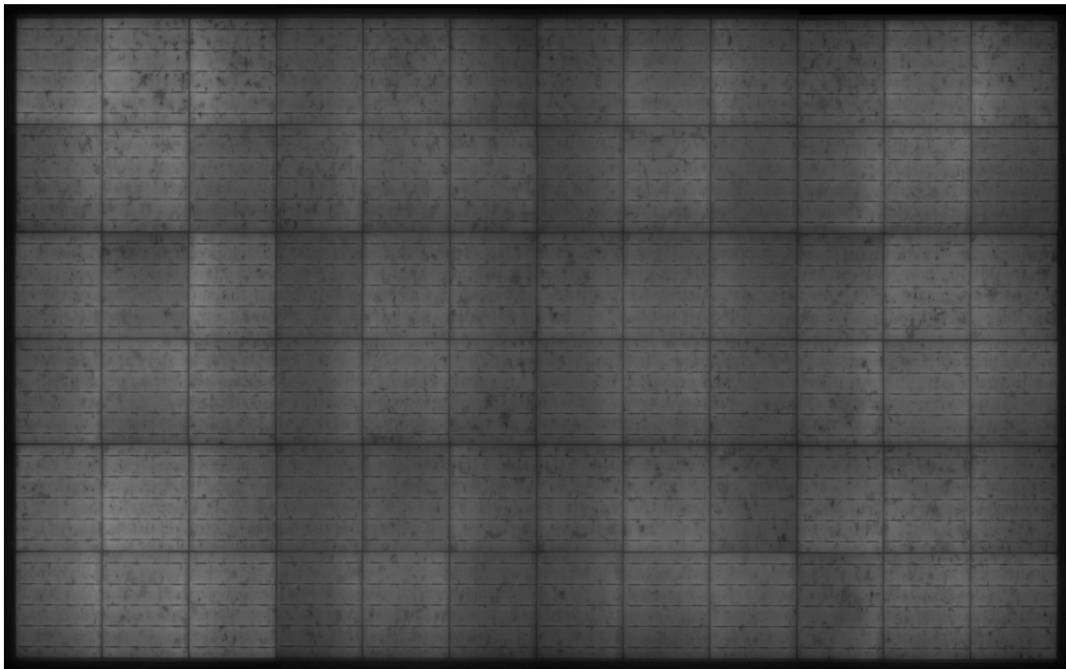
| IEC TS 62804-1: 2015 | | | |
|----------------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

Annex 2: Photographs

EL Images of Sample-1 and Sample:2



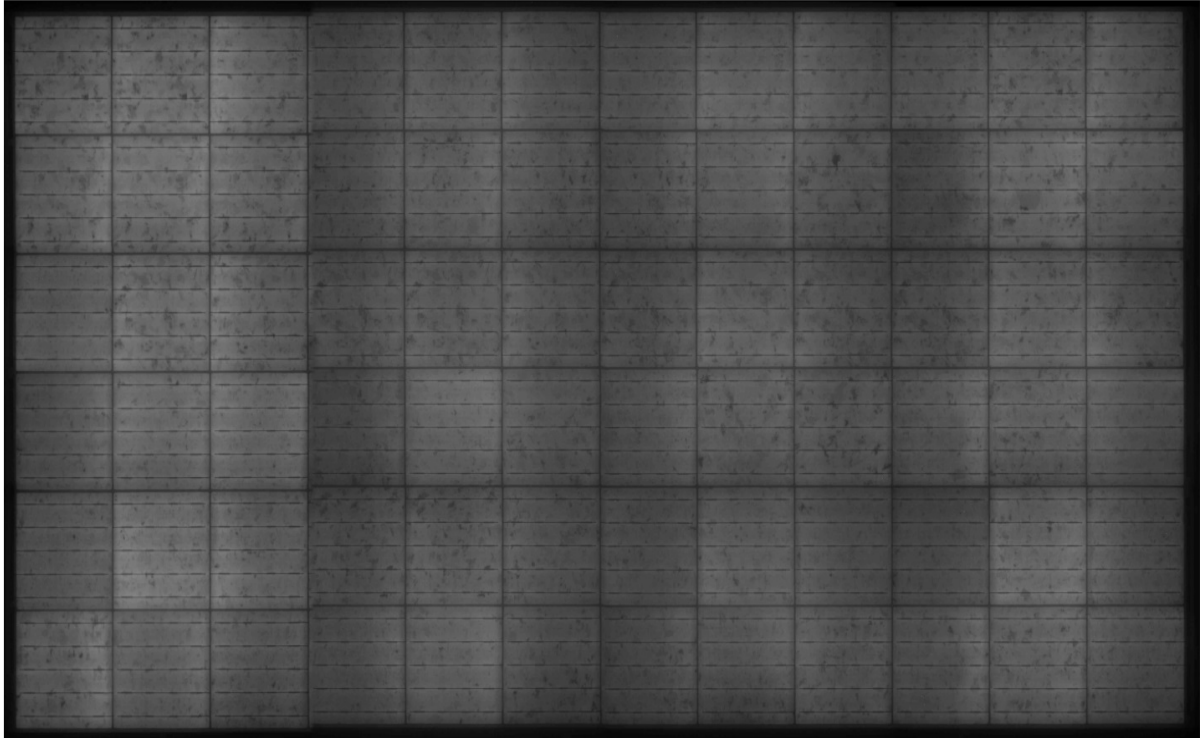
Sample:1(Before PID Test)



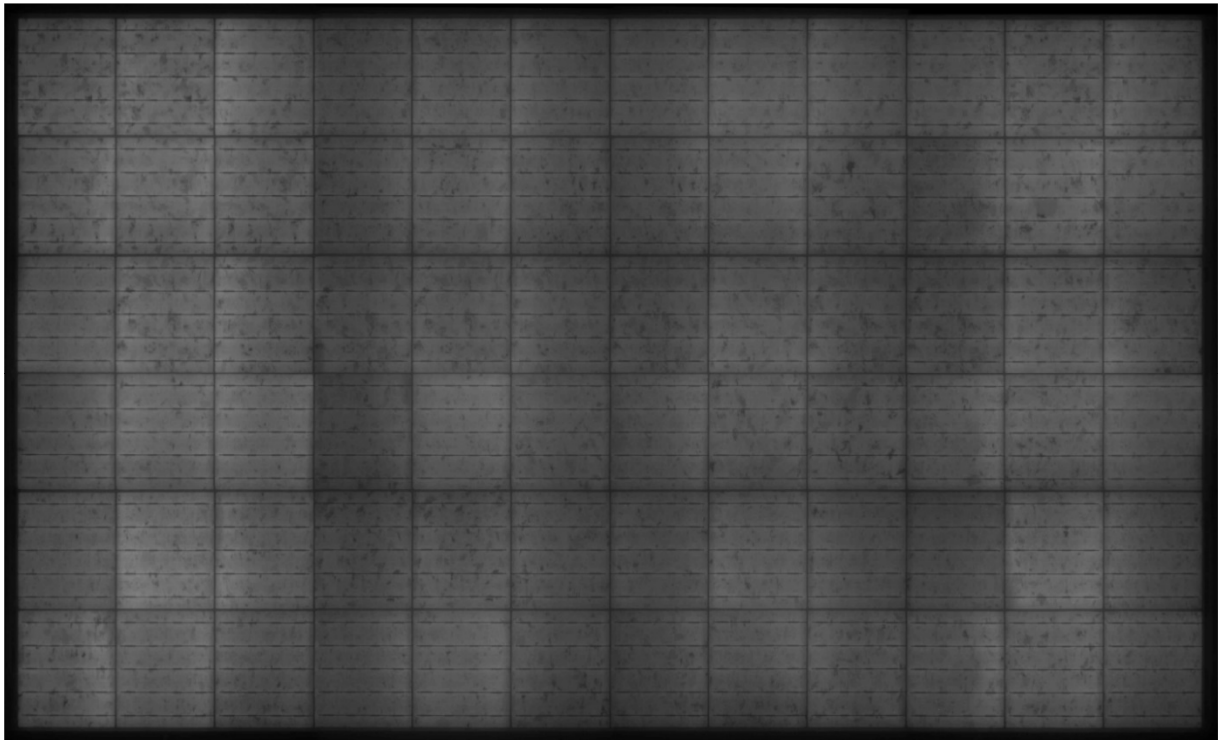
Sample:1(After PID Test)

IEC TS 62804-1: 2015

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

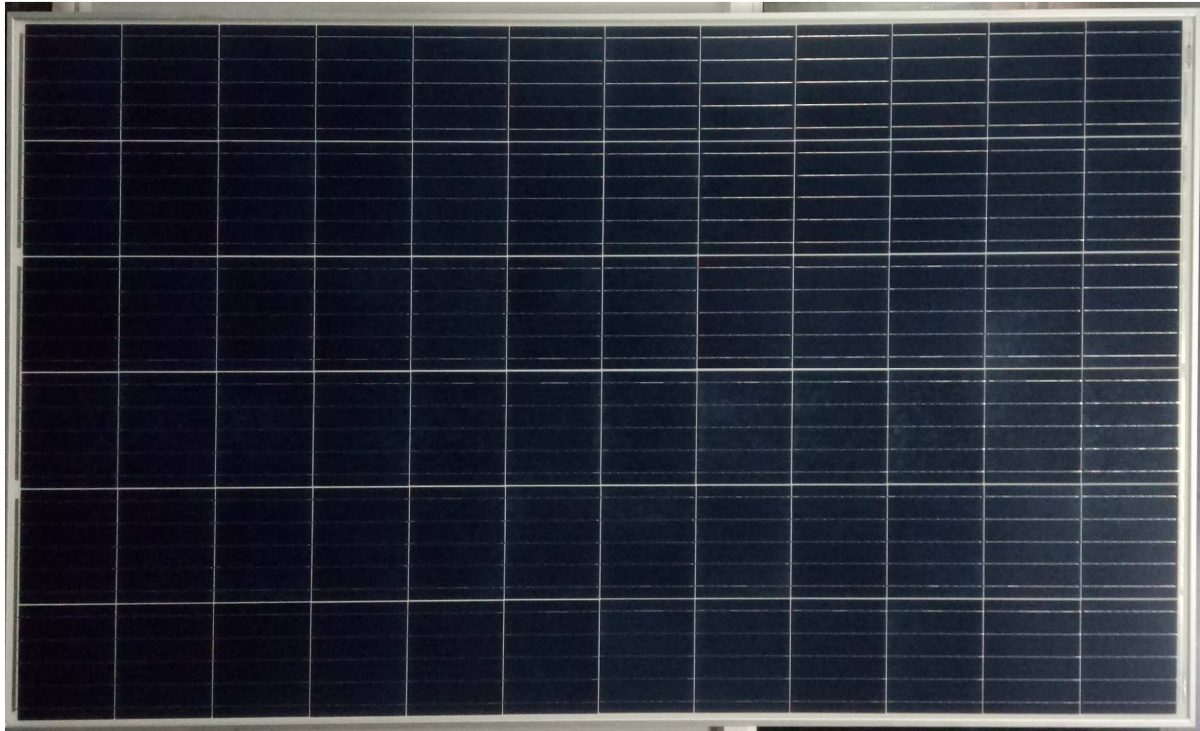


Sample:2 (Before PID Test)

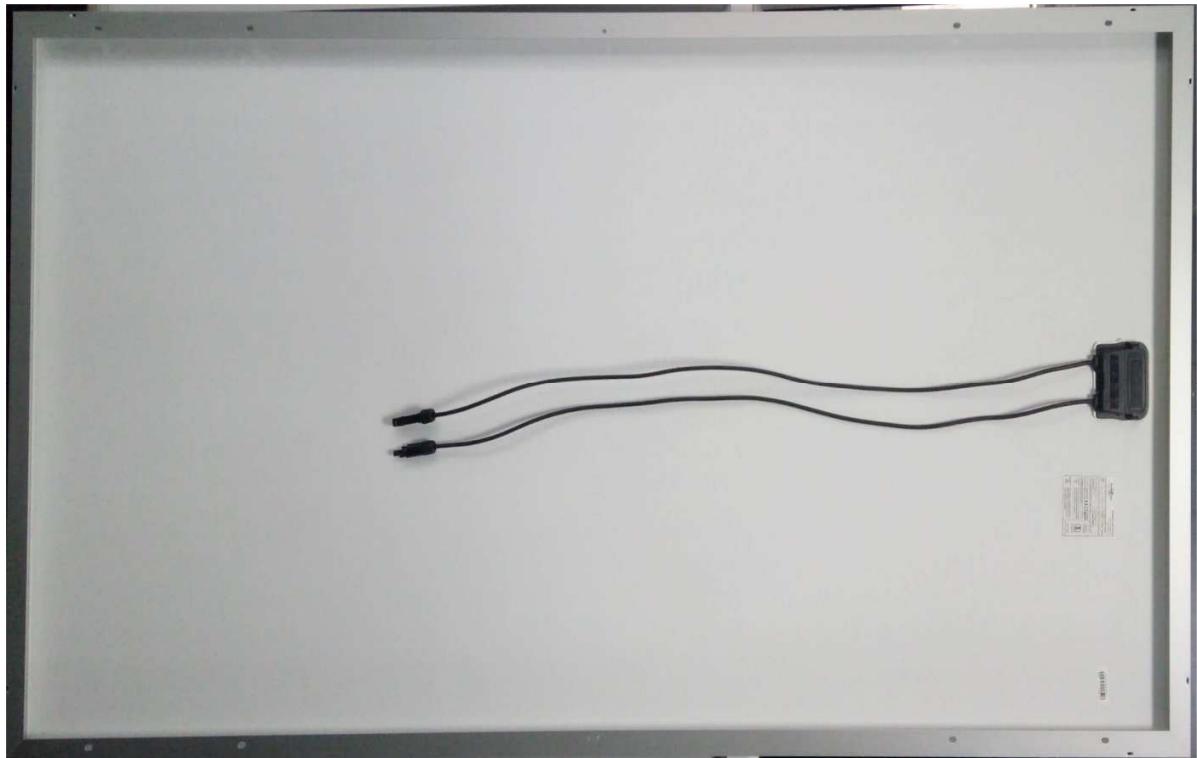


Sample:2 (After PID Test)

| 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

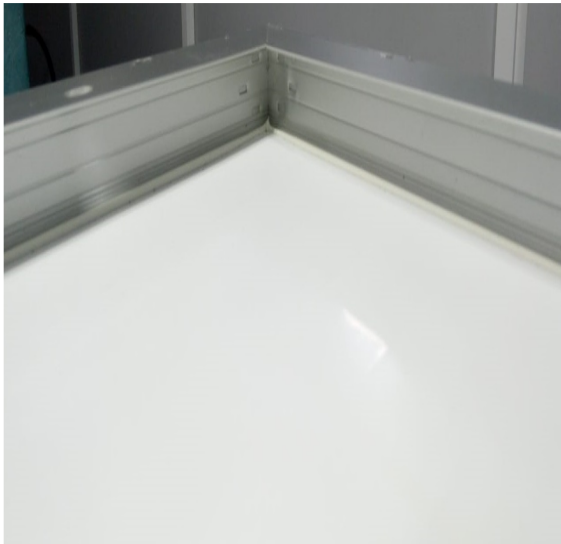
| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|



Connector Front View



Connector Back View



Frame View



Frame View

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