





Test Report issued under the responsibility of:



<b>TEST REPORT</b> <b>TS IEC 62804-1:2015</b> <b>Photovoltaic (PV) Modules - Test Methods for the detection of potential-induced degradation</b> <b>Part 1: Crystalline silicone</b>	
<b>Test Report Reference No.</b> .....	TRPVM-2017-40085-1
<b>Date of issue (YYYY/MM/DD)</b> .....	2017/03/30
<b>Total number of pages</b> .....	13
<b>CB Testing Laboratory</b> .....	National Center of Supervision & Inspection on solar Photovoltaic Products Quality - China PV Test Center 
<b>Address</b> .....	No.5 Xinhua Road, New District, 214028 WUXI CITY, Jiangsu, CHINA
<b>Testing location/procedure</b> .....	CBTL <input checked="" type="checkbox"/> RMT <input type="checkbox"/> CTF <input type="checkbox"/> stage 1 <input type="checkbox"/> stage 2 <input type="checkbox"/> stage 3 <input type="checkbox"/>
<b>Address</b> .....	No.5 Xinhua Road, New District, 214028 WUXI CITY, Jiangsu, CHINA
<b>Applicant's name</b> .....	Sunman (Hong Kong) Limited
<b>Address</b> .....	Room 1401, 14/F., World Commerce Centre, Harbour City, 7-11 Canton Road, Tsimshatsui, Kowloon, Hong Kong, P.R. China
<b>Test specification</b> .....	:
<b>Standard</b> .....	IEC 62804-1:2015
<b>Test procedure</b> .....	CB- Scheme <input type="checkbox"/> VDE-scheme <input checked="" type="checkbox"/>
<b>Non-standard test method</b> .....	<b>See page 3</b>
<b>Test Report Form No.</b> .....	IEC62804A
<b>Test Report Form Originator</b> .....	VDE
<b>Master TRF</b> .....	Dated 2016-01
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<b>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</b>	
<b>Test item description</b> .....	Photovoltaic (PV) Module(s)
<b>Trade Mark</b> .....	
<b>Model/Type reference</b> .....	SMD310M-6X12 (representative types under testing, see page 5 for details)
<b>Manufacturer</b> .....	Sunman (Hong Kong) Limited
<b>Ratings</b> .....	See page 4

Testing procedure and testing location:	
<input checked="" type="checkbox"/>	<p><b>CB Testing Laboratory:</b>                  Testing location/ address.....: See page 1</p> <p><input type="checkbox"/> <b>Associated CB Test Laboratory:</b>                  Testing location/ address.....:</p> <p style="margin-left: 40px;">Tested by (name + signature) .....: Chaojun Huai                  (Authorization of Test Report)</p> <p style="margin-left: 40px;">Approved by (+ signature).....: Dan Hu</p>
<input type="checkbox"/>	<p><b>Testing procedure: CTF stage 1</b>                  Tested by (name + signature) .....:                  Approved by (+ signature).....:                  Testing location/ address.....:</p>
<input type="checkbox"/>	<p><b>Testing procedure: CTF stage 2</b>                  Tested by (name + signature) .....:                  Witnessed by (+ signature) .....:                  Approved by (+ signature).....:                  Testing location/ address.....:</p>
<input type="checkbox"/>	<p><b>Testing procedure: CTF stage 3</b>                  Tested by (name + signature) .....:                  Approved by (+ signature).....:                  Supervised by (+ signature) .....:                  Testing location/ address.....:</p>
<input type="checkbox"/>	<p><b>Testing procedure: RMT</b>                  Tested by (name + signature) .....:                  Approved by (+ signature).....:                  Supervised by (+ signature) .....:                  Testing location/ address.....:</p>






<b>Summary of testing:</b>		
<b>Tests performed (name of test and test clause):</b>		<b>Testing location:</b>
<p>On the manufacturers request the following tests have been performed on 1 group samples.</p> <p>PID test was performed on the module type SMD310M-6X12, the test results is also applicable for similar type SMAXXM-6X12 with different frame.</p>		See page 1
<b>Testing procedure</b>		
<p>10.2 Initial Maximum power determination with EL imaging, insulation test and wet leakage current test.</p> <p>10.13 Damp heat test (85°C/85%RH) for 192 h. The module was short circuited and a potential of -1000 V were applied between the cells and the frame of the module.</p> <p>10.2 Final maximum power determination with EL imaging, insulation test and wet leakage current test.</p> <p>See page 8 for details.</p>		
<b>Testing</b>		
Date of receipt of test item : 2017/03/16		
Date (s) of performance of tests : 2017/03/16 - 2017/03/24		
<b>Module group assignment:</b>		
Sample #	Sample Group ID	Sample S/N
1	A	SMS 140016125210024275
2	E1	SMS 140016125210024269
3	E1	SMS 140016125210024270

<b>Test item particulars:</b>		
Accessories and detachable parts included in the evaluation .....		--
Options included .....		--
Possible test case verdicts:		
- test case does not apply to the test object .....		N/A
- test object does meet the requirement.....		Pass (P)
- test object does not meet the requirement.....		Fail (F)
Abbreviations used in the report:		
HF – Humidity Freeze		TC – Temperature Cycling
DH – Damp Heat		Vmp – Maximum power voltage
Imp – Maximum power current		Voc – Open circuit voltage
Isc – Short circuit current		FF – Fill Factor
Pmp – Maximum power		$\alpha$ – Current temperature coefficient
NOCT – Nominal Operating Cell Temperature		$\beta$ – Voltage temperature coefficient
STC – Standard Test Conditions		$\delta$ – power temperature coefficient
<p>General remarks:</p> <p><b>“This report is not valid as a CB Test Report unless appended to a PV-CB Conformity Assessment Certificate issued by a NCB, in accordance with IEC 61215-1 and IEC 61215-2”.</b></p> <p>“(See Enclosure #)” refers to additional information appended to the report.</p> <p>“(See table)” refers to a table appended to the report.</p> <p>Throughout this report a point is used as the decimal separator.</p> <p>The tests results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> <p>List of test equipment must be kept on file and available for review.</p>		
<p><b>Summary of compliance with National Differences:</b></p> <p><b>N/A</b></p>		
<p><b>General product information and considerations:</b></p> <p><b>Product Electrical Ratings:</b></p>		
<b>Module type</b>	<b>SMD310M-6X12</b>	
<b>Voc (Vdc)</b>	<b>45.5</b>	
<b>Vmp (Vdc)</b>	<b>37.6</b>	
<b>Imp (A<sub>dc</sub>)</b>	<b>8.25</b>	
<b>Isc (A<sub>dc</sub>)</b>	<b>8.75</b>	
<b>Pmp (W)</b>	<b>310</b>	
<b>Maximum system voltage (V)</b>	<b>600</b>	
<b>Series Fuse Rating (A)</b>	<b>20</b>	

<b>Description of module construction: (Manufactories and part numbers, unless otherwise specified)</b>			
Sample :	Random sampling from production <input checked="" type="checkbox"/> Prototype submitted by client <input type="checkbox"/>		
<b>Module</b>	SMDXXXM-6X12 SMDXXXM-6X10 SMDXXXM-6X06	SMDXXXM-4X12 SMDXXXM-4X10 SMDXXXM-4X09 SMDXXXM-4X06 SMDXXXM-4X04	SMDXXXM-2X12 SMDXXXM-2X10 SMDXXXM-2X06 SMDXXXM-2X04
Front Cover :	Type: ETFE Fluoropolymer Film, 50µm Supplier: Saint-Gobain Solar Gard Specialty Films Co., Ltd.		
Rear Cover :	Cynagard 215A, Cybrid Technologies Inc.		
Encapsulation material :	SV-15296P, above cells, Changzhou Sveck Photovoltaic New Material Co., Ltd. Acrylic with fiber glass reinforced, US-160(400µm below the ETFE), US-300(600µm below the cell), Supplier: Sunman (Shanghai) Co., Ltd.		
Frame :	Aluminum, 6063T5		
Dimensions l x w x h [mm] :	1979x1019x5.6 1662x1019x5.6 1027x1019x5.6	1979x689x5.6 1662x689x5.6 1503x689x5.6 1027x689x5.6 709x689x5.6	1979x369x5.6 1662x369x5.6 1027x369x5.6 709x369x5.6
Module area [m <sup>2</sup> ] :	2,02 1.69 1.05	1.36 1.15 1.04 0.71 0.49	0.73 0.61 0.38 0.26
Minimum distance between current-carrying parts and module edge [mm]	> 8,4		
<b>Cell</b>			
Cell type :	Type: Mono-Si,DMTD4B157-205, 4BB, Supplier: Hengdian Group Dmegc Magnetics Co., Ltd.		
Cell dimensions l x w [mm] :	156x156		
Cell thickness [µm] :	210+/-30		
Cell area [cm <sup>2</sup> ] :	243.36		
Number of cells :	72 60 36	48 40 36 24 16	24 20 12 8

<b>Components and other</b>			
Cells per bypass diode	:	24 24 20 12	24 20 12 8
Type of bypass diode	:	TL2045, Tonglin for TL-BOX029S	TL2045, Tonglin
No. of bypass diodes	:	3	1
Cell- and string connectors	:	Cell connector 0.25x1.3mm, Jiangsu Sun Group Co., Ltd. bus ribbon 0.3x6mm, Wuxi Sveck Technology Co., Ltd.	
Junction box	:	TL-029S, TL-029S-1, Jiangsu Tonglin Electric Co., Ltd.	TL-BOX029S-4, Jiangsu Tonglin Electric Co., Ltd.
Cable	:	PV1-F, 4mm <sup>2</sup> /2.5 mm <sup>2</sup> , Suzhou Baohing Electric Wire & Cable Co., Ltd.	
Connectors	:	TL-Cable01, Jiangsu Tonglin Electric Co., Ltd.	
Adhesives (frame)	:	1527, TONSAN Adhesive, Inc.	
Adhesives (junction box)	:	1527, TONSAN Adhesive, Inc.	
Potting material (junction box)	:	1521, TONSAN Adhesive, Inc.	
Others	:	Adhesive: Tonsan 1527, Adhesion for the color steel roofing.	

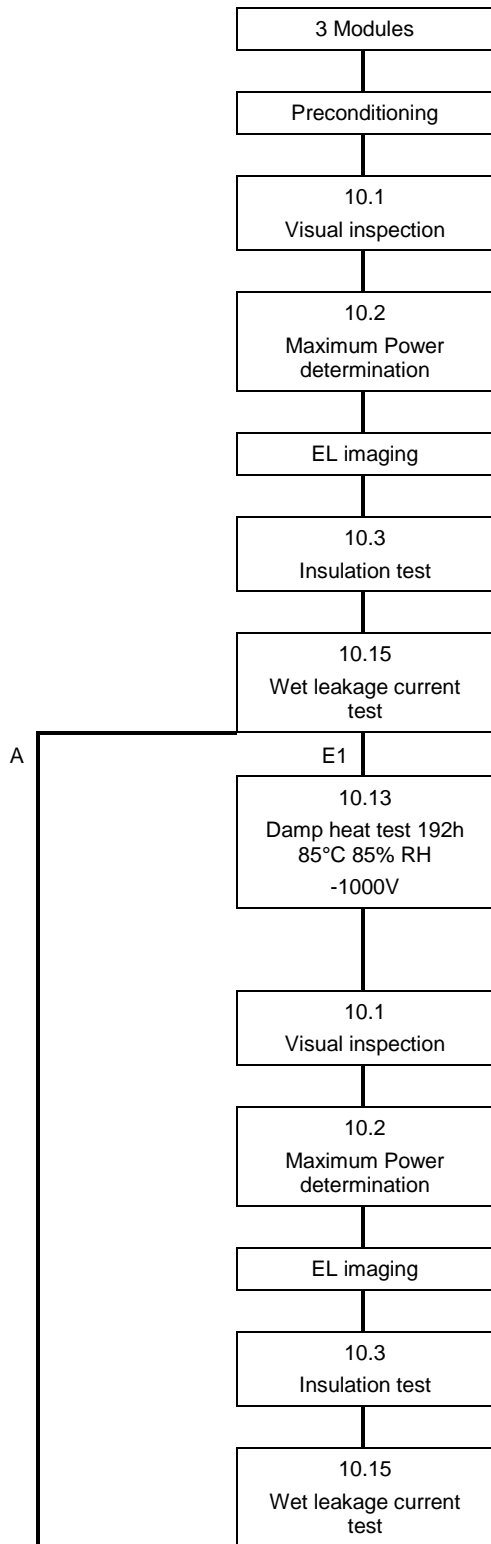
**Copy of marking plate:**

<b>SUNMAN</b>	
Model Number	SMD310M-6X12
Rated Maximum Power (P <sub>max</sub> )	310 W
Output Tolerance	0/+5 W
Current at P <sub>max</sub> (I <sub>mp</sub> )	8.25 A
Voltage at P <sub>max</sub> (V <sub>mp</sub> )	37.6 V
Short-Circuit Current (I <sub>sc</sub> )	8.75 A
Open-Circuit Voltage (V <sub>oc</sub> )	45.5 V
Nominal Operating Cell Temp. (T <sub>NOCT</sub> )	45°C ± 2°C
Weight	7.7 kg
Dimension	1979mm×1019mm×5.6mm
Maximum System Voltage	600 V
Maximum Series Fuse Rating	20 A
Cell Technology	mono-Si
Application Class	A
All technical data at standard test condition AM=1.5 E=1000W/m <sup>2</sup> T <sub>c</sub> =25°C	
 <b>WARNING</b>  Hazardous electricity can shock, burn or cause death. Do not touch terminals.	
  	
Sunman (Hong Kong) Limited Add: Room 1401, 14/F., World Commerce Centre, Harbour City, No. 7-11 Canton Rd., Tsim Sha Tsui, Hong Kong Customer Service Hot Line: 400 969 2800 Fax: +86 21 39881933 MADE IN CHINA	

**Photos of the module (front and back):**




<b>10</b>	<p><b>TEST PROCEDURES (if it is not a full test, strikethrough non-performed test)</b></p> <p>Note: Deviations from test sequence are possible but must be documented.</p>
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TS IEC 62804			
Clause	Requirement + Test	Result - Remark	Verdict

<b>4</b>	<b>MARKING</b>		P
	Name, monogram or symbol of manufacturer ..... :		P
	Type or model number..... :	SMDXXM-6X12 SMDXXM-4X12 SMDXXM-2X12	P
	Serial number ..... :	SMSXXXXXXXXXXXXXXXXXX	P
	Polarity of terminals or leads ..... :	+/-	P
	Maximum system voltage ..... :	600 V	P
	The date and place of manufacture ..... :	Traceable by serial number	P

	<b>Initial examination</b>	All modules	P
10	Preconditioning ..... :	5KWh/m <sup>2</sup>	P
10.1	Visual inspection ..... :	See table 10.1 Int	P
10.2	Maximum power determination..... :	See table 10.2 Int	P
11.0	EL-image	See table EL-Int	P
10.3	Insulation test..... :	See table 10.3 Int	P
10.15	Wet leakage current test	See table 10.15 Int	P

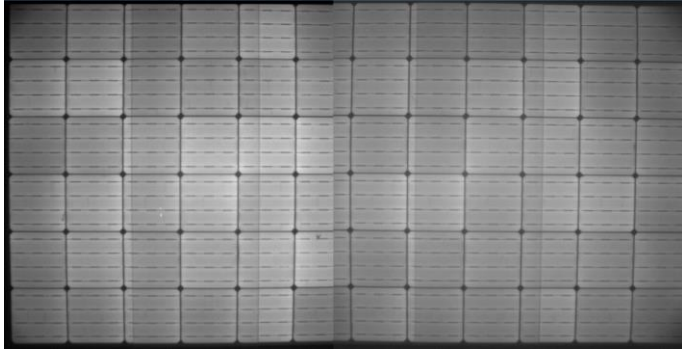
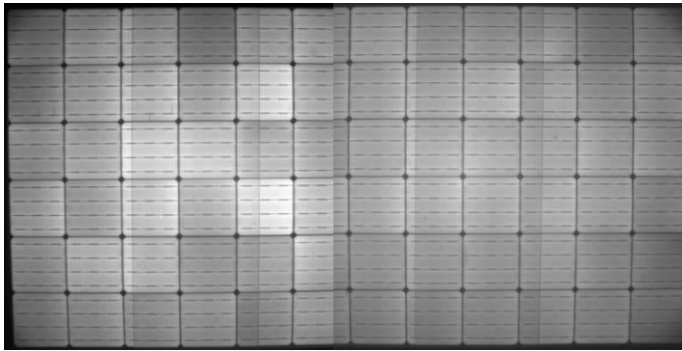
<b>Group A</b>	Control Module	Sample Group ID A	P
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<b>Group E1</b>	2 Modules	Sample Group ID E1	P
10.13	Damp heat test..... :	192h, -1000 V	P
10.1	Visual inspection		P
10.2	maximum power determination..... :	See table 10.13E1	P
11.0	EL-image		P
10.3	Insulation test		P
10.15	Wet leakage current test		P

	<b>Final measurement</b>	All modules	P
10.2	Maximum power determination (final)	See table 10.2 F	P

<b>10.1 Int</b>	<b>TABLE: Visual inspection (Initial)</b>		—
Test Date (YYYY/MM/DD).....:	2017/03/16		—
Sample #	Nature and position of initial findings – comments or attach photos		—
1	No findings		P
2	No findings		P
3	No findings		P
Supplementary information:			

<b>10.2 Int</b>	<b>TABLE: Maximum power determination (initial)</b>						—
Test Date (YYYY/MM/DD).....:	2017/03/16						—
Module temperature (°C).....:	25						—
Irradiance (W/m <sup>2</sup> ).....:	1000						—
Sample #	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmp (W)	FF (%)	
1	46.13	38.45	8.55	8.16	313.79	79.5	
2	45.79	37.97	8.52	8.15	309.29	79.3	
3	45.90	37.99	8.70	8.28	314.69	78.8	
Supplementary information:							

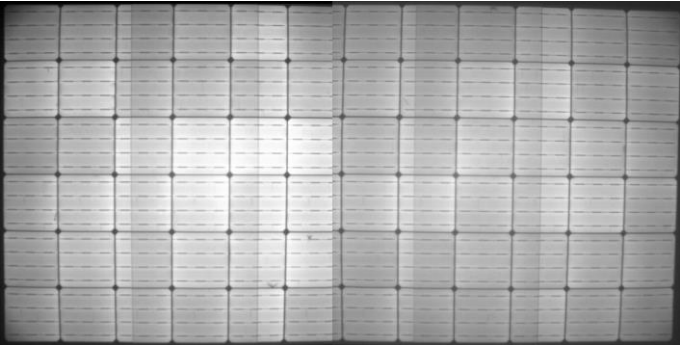
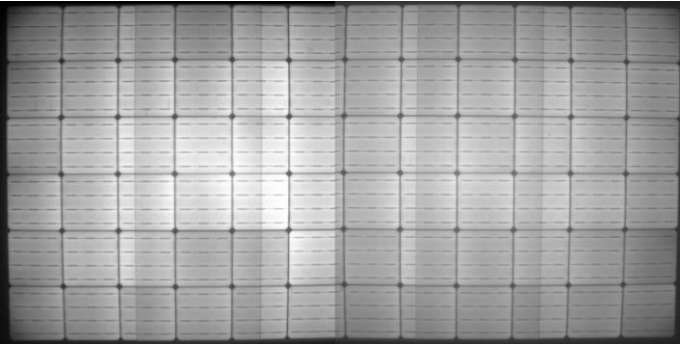
<b>EL-Int</b>	<b>TABLE: EL-image (Initial)</b>		—
Test Date (YYYY/MM/DD).....:	2017/03/16		—
Sample #	Nature and position of initial findings – comments or attach photos		—
2			P
3			P
Supplementary information:			

10.3 Int		Table: Insulation test (initial)			—
Test Date (YYYY/MM/DD) .....		2017/03/16			—
Test Voltage applied (V, DC) .....		1000/ 6000			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1	>500	19.8	--	X	P
2	>500	19.8	--	X	P
3	>500	19.8	--	X	P
Supplementary information: Size of module 2.02 m <sup>2</sup>					

10.15 Int		TABLE: Wet leakage current test (Initial)			—
Test Date (YYYY/MM/DD) .....		2017/03/16			—
Test Voltage applied (V, dc).....		1000			—
Solution resistivity (Ω cm) .....		< 3500 Ω cm at 22 ± 3°C			—
Surface tension (Nm <sup>-2</sup> ) .....		< 0.03 Nm <sup>-2</sup> at 22 ± 3°C			—
Solution temperature (°C) .....		22			—
Sample #	Measured (MΩ)		Limit (MΩ)		Result
1	>500		19.8		P
2	>500		19.8		P
3	>500		19.8		P
Supplementary information: Size of module 2.02 m <sup>2</sup>					

<b>10.13 E1</b>	<b>TABLE: Damp heat 192h test.</b>		P
Test Date (YYYY/MM/DD) start/end .....	2017/03/16 - 2017/03/24		—
Total hours (192) .....	192h, -1000V		—
Supplementary information:			
<b>(10.1 Visual inspection after damp heat 192h test)</b>			—
Test Date (YYYY/MM/DD).....	2017/03/24		—
Sample #	Nature and position of findings – comments or attach photos		—
2	No findings		P
3	No findings		P
Supplementary information:			

<b>(10.2 Maximum power determination after damp heat 192h test)</b>								—
Test Date (YYYY/MM/DD).....		2017/03/24						—
Module temperature (°C).....		25						—
Irradiance (W/m <sup>2</sup> ).....		1000						—
Sample #	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmp (W)	FF (%)	Degradation (%)	Limit (%)
2	45.71	38.02	8.49	8.07	306.91	79.1	0.77	5
3	45.87	38.07	8.59	8.21	312.41	79.3	0.72	5
Supplementary information:								

<b>10.13E1 (EL-Fin, EL imaging after damp heat 192h test)</b>			
Sample #	Nature and position of findings – comments or attach photos		—
2			P
3			P
Supplementary information:			

10.13E1 (10.3 Insulation test after damp heat 192h test)					—
Test Date (YYYY/MM/DD) .....		2017/03/24		—	
Test Voltage applied (V, DC) .....		1000 / 6000		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
2	>500	19.8	--	X	P
3	>500	19.8	--	X	P
Supplementary information: Size of module 2.02 m <sup>2</sup>					

10.13E1 (10.15 Wet leakage current test after damp heat 192h test)					—
Test Date (YYYY/MM/DD) .....		2017/03/24		—	
Test Voltage applied (V, dc).....		1000		—	
Solution resistivity (Ω cm) .....		< 3500 Ω cm at 22 ± 3°C		—	
Surface tension (Nm <sup>-2</sup> ) .....		< 0.03 Nm <sup>-2</sup> at 22 ± 3°C		—	
Solution temperature (°C) .....		23		—	
Sample #	Measured (MΩ)		Limit (MΩ)		Result
2	>500		19.8		P
3	>500		19.8		P
Supplementary information: Size of module 2.02 m <sup>2</sup>					

10.2 F	TABLE: Maximum power determination (final)							—
Test Date (MM/DD/YYYY) .....		Several					—	
Module temperature (°C) .....		25					—	
Irradiance (W/m <sup>2</sup> ) .....		1000					—	
Sample #	Voc (V)	Vmp (V)	Isc (A)	Imp (A)	Pmp (W)	FF (%)	Degradation (%)	Limit (%)
1	46.05	38.18	8.58	8.17	312.00	79.0	0.57	+/-1
2	45.71	38.02	8.49	8.07	306.91	79.1	0.77	5
3	45.87	38.07	8.59	8.21	312.41	79.3	0.72	5
Supplementary information:								

-- END OF REPORT --