





Test Report issued under the responsibility of:



TEST REPORT TS IEC 62804-1:2015 Photovoltaic (PV) Modules - Test Methods for the detection of potential-induced degradation Part 1: Crystalline silicone	
Test Report Reference No.	TRPVM-2017-40085-1
Date of issue (YYYY/MM/DD)	2017/03/30
Total number of pages	13
CB Testing Laboratory	National Center of Supervision & Inspection on solar Photovoltaic Products Quality - China PV Test Center 
Address	No.5 Xinhua Road, New District, 214028 WUXI CITY, Jiangsu, CHINA
Testing location/procedure	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"/>
Address	No.5 Xinhua Road, New District, 214028 WUXI CITY, Jiangsu, CHINA
Applicant's name	Sunman (Hong Kong) Limited
Address	Room 1401, 14/F., World Commerce Centre, Harbour City, 7-11 Canton Road, Tsimshatsui, Kowloon, Hong Kong, P.R. China
Test specification	:
Standard	IEC 62804-1:2015
Test procedure	CB- Scheme <input type="checkbox"/> VDE-scheme <input checked="" type="checkbox"/>
Non-standard test method	See page 3
Test Report Form No.	IEC62804A
Test Report Form Originator	VDE
Master TRF	Dated 2016-01
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Test item description	Photovoltaic (PV) Module(s)
Trade Mark	
Model/Type reference	SMD310M-6X12 (representative types under testing, see page 5 for details)
Manufacturer	Sunman (Hong Kong) Limited
Ratings	See page 4






Summary of testing:		
Tests performed (name of test and test clause):		Testing location:
<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
Testing procedure		
<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>		
Testing		
Date of receipt of test item : 2017/03/16		
Date (s) of performance of tests : 2017/03/16 - 2017/03/24		
Module group assignment:		
Sample #	Sample Group ID	Sample S/N
1	A	SMS 140016125210024275
2	E1	SMS 140016125210024269
3	E1	SMS 140016125210024270

Test item particulars:		
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		α – Current temperature coefficient
NOCT – Nominal Operating Cell Temperature		β – Voltage temperature coefficient
STC – Standard Test Conditions		δ – power temperature coefficient
<p>General remarks:</p> <p>“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”.</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>Summary of compliance with National Differences:</p> <p>N/A</p>		
<p>General product information and considerations:</p> <p>Product Electrical Ratings:</p>		
Module type	SMD310M-6X12	
Voc (Vdc)	45.5	
Vmp (Vdc)	37.6	
Imp (Adc)	8.25	
Isc (Adc)	8.75	
Pmp (W)	310	
Maximum system voltage (V)	600	
Series Fuse Rating (A)	20	

Description of module construction: (Manufactories and part numbers, unless otherwise specified)			
Sample :	Random sampling from production <input checked="" type="checkbox"/> Prototype submitted by client <input type="checkbox"/>		
Module	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 ²] :	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		
Cell			
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 ²] :	243.36		
Number of cells :	72 60 36	48 40 36 24 16	24 20 12 8

Components and other			
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 ² /2.5 mm ² , 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.	

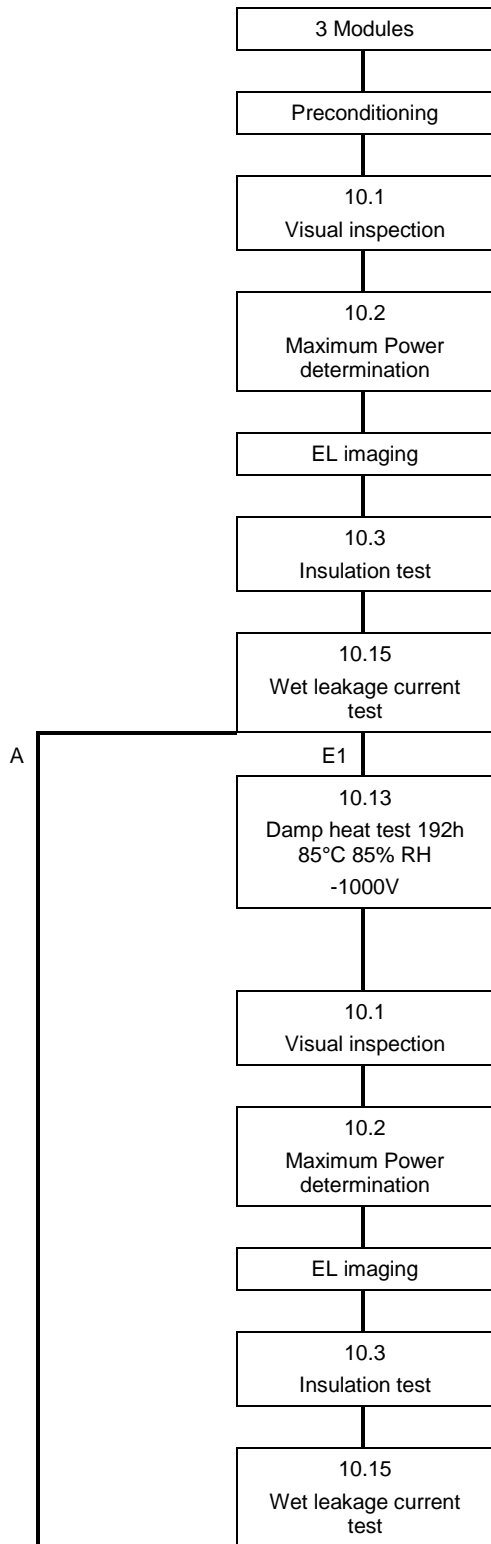
Copy of marking plate:

SUNMAN	
Model Number	SMD310M-6X12
Rated Maximum Power (P _{max})	310 W
Output Tolerance	0/+5 W
Current at P _{max} (I _{mp})	8.25 A
Voltage at P _{max} (V _{mp})	37.6 V
Short-Circuit Current (I _{sc})	8.75 A
Open-Circuit Voltage (V _{oc})	45.5 V
Nominal Operating Cell Temp. (T _{NOCT})	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 ² T _c =25°C	
 WARNING  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):



10	<p>TEST PROCEDURES (if it is not a full test, strikethrough non-performed test)</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

4	MARKING		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

	Initial examination	All modules	P
10	Preconditioning	5KWh/m ²	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

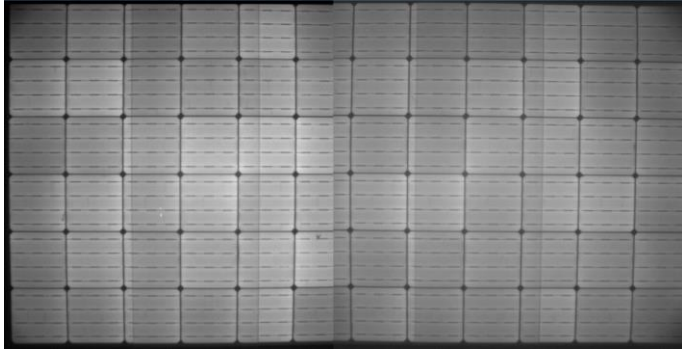
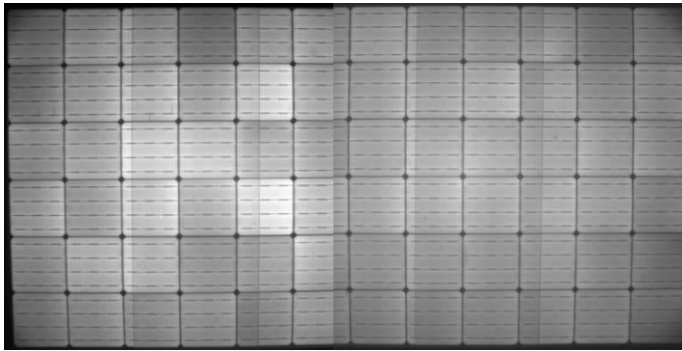
Group A	Control Module	Sample Group ID A	P
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Group E1	2 Modules	Sample Group ID E1	P
10.13	Damp heat test.....	192h, -1000 V	P
10.1	Visual inspection		P
10.2	maximum power determination.....	See table 10.13E1	P
11.0	EL-image		P
10.3	Insulation test	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

	Final measurement	All modules	P
10.2	Maximum power determination (final)	See table 10.2 F	P

10.1 Int	TABLE: Visual inspection (Initial)		—
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:			

10.2 Int	TABLE: Maximum power determination (initial)						—
Test Date (YYYY/MM/DD).....:	2017/03/16						—
Module temperature (°C).....:	25						—
Irradiance (W/m ²).....:	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:							

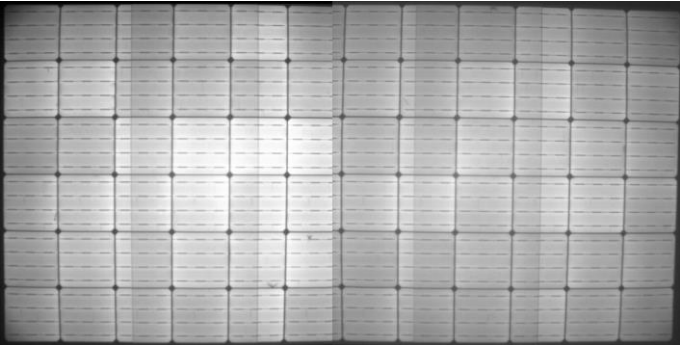
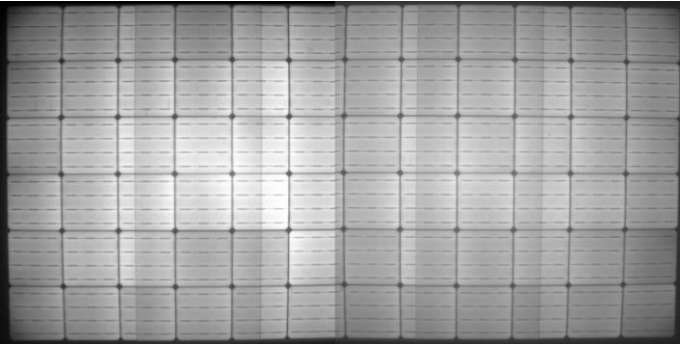
EL-Int	TABLE: EL-image (Initial)		—
Test Date (YYYY/MM/DD).....:	2017/03/16		—
Sample #	Nature and position of initial findings – comments or attach photos		—
2			P
3			P
Supplementary information:			

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 ²					

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 ⁻²)		< 0.03 Nm ⁻² 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 ²					

10.13 E1	TABLE: Damp heat 192h test.		P
Test Date (YYYY/MM/DD) start/end	2017/03/16 - 2017/03/24		—
Total hours (192)	192h, -1000V		—
Supplementary information:			
(10.1 Visual inspection after damp heat 192h test)			—
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:			

(10.2 Maximum power determination after damp heat 192h test)								—
Test Date (YYYY/MM/DD).....		2017/03/24						—
Module temperature (°C).....		25						—
Irradiance (W/m ²).....		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:								

10.13E1 (EL-Fin, EL imaging after damp heat 192h test)			
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 ²					

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 ⁻²)		< 0.03 Nm ⁻² 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 ²					

10.2 F	TABLE: Maximum power determination (final)							—
Test Date (MM/DD/YYYY)		Several					—	
Module temperature (°C)		25					—	
Irradiance (W/m ²)		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 --