




TEST REPORT IEC TS 62804-1:2015 Photovoltaic (PV) Modules - Test Methods for the detection of potential-induced degradation Part 1: Crystalline silicone	
Test Report Reference No.	TRPVM-2021-40733-4
Date of issue (YYYY-MM-DD)	2021-10-25
Total number of pages	23
Name of Testing Laboratory preparing the Report	TAIER LABS (JIAXING) CO., LTD. 
Applicant's name	Zhejiang Beyondsun Green Energy Technology Co., Ltd.
Address	No.888, Zhili Section of G318 Zhili Town, Huzhou City, Zhejiang province, China.
Test specification	
Standard	IEC TS 62804-1:2015
Test procedure	VDE-scheme <input checked="" type="checkbox"/>
Non-standard test method	N/A
Test Report Form No.	IEC62804_B
Test Report Form Originator	VDE Testing and Certification Institute
Master TRF	Dated 2019-10
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Test item description	Crystalline Photovoltaic (PV) Module(s)	
Trade Mark		
Manufacturer	Zhejiang Beyondsun Green Energy Technology Co., Ltd.	
Model/Type reference	TSHM530-144HV, TSHM650-132HS	
Ratings	See page 4	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	TAIER LABS (JIAXING) CO., LTD 
Testing location/ address.....		Building 7, 3556 Linggongtang Road, Nanhu, District, Jiaxing, Zhejiang
Tested by (name, function, signature)		Guangyuan Chen Testing Engineer (Authorization of test report) 
Approved by (name, function, signature)		Chengying Shi Technical certification officer 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address.....		
Tested by (name, function, signature)		
Approved by (name, function, signature)		
<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)		

Summary of testing:			
Tests performed (name of test and test clause):			Testing location:
Test method a) <input checked="" type="checkbox"/> modified (85°C/85%RH) for 192 h (+/-1500V) Test method b) <input type="checkbox"/> Pass fail criteria has been set to max. 5% degradation for power at STC. For the electrical insulation tests the limits from IEC 61730-2:2016 have been used. The modules are tested as representative for BA) TSHMXXX-144HV BB) TSHMXXX-132HV BC) TSHMXXX-120HV BD) TSHMXXX-108HV BE) TSHMXXX-96HV BF) TSHMXXX-72HV BM) TSHMXXX-132HS BN) TSHMXXX-120HS BO) TSHMXXX-108HS			See page 2
Testing procedure			
<input checked="" type="checkbox"/> New module type <input type="checkbox"/> Modifications (if yes, please choose the applicable modification according to the Retesting Guideline) to Basic Test Report: <input type="checkbox"/> Change in cell technology <input type="checkbox"/> Modification to encapsulation system <input type="checkbox"/> Modification to superstrate <input type="checkbox"/> Increase in module size <input type="checkbox"/> Modification to backsheet/ substrate <input type="checkbox"/> Modification to frame and/ or mounting structure <input type="checkbox"/> Modification to junction box/ electrical termination <input type="checkbox"/> Change in cell interconnect materials or technique <input type="checkbox"/> Change in electrical circuit of an identical package <input type="checkbox"/> Higher or lower power output (by 10%) in the identical package including size and using the identical cell process <input type="checkbox"/> Qualification of a frameless module after the design has received certification as a framed module <input type="checkbox"/> Change in bypass diode or number of diodes			
Testing			
Date of receipt of test item: 2021-08-19			
Date (s) of performance of tests: 2021-10-06 / 2021-10-23			
Module group assignment:			
Sample #	Sample Group ID	Sample S/N	Module Type
M1	A	921617200300014	TSHM530-144HV
M2	B1	921617200300015	TSHM530-144HV
M3	B1	921617200300016	TSHM530-144HV
M4	B2	921617200300017	TSHM530-144HV
M5	B2	921617200300013	TSHM530-144HV
M6	A	021618120700011	TSHM650-132HS
M7	B1	021618120700012	TSHM650-132HS
M8	B1	021618120700013	TSHM650-132HS
M9	B2	021618120700014	TSHM650-132HS
M10	B2	021618120700015	TSHM650-132HS

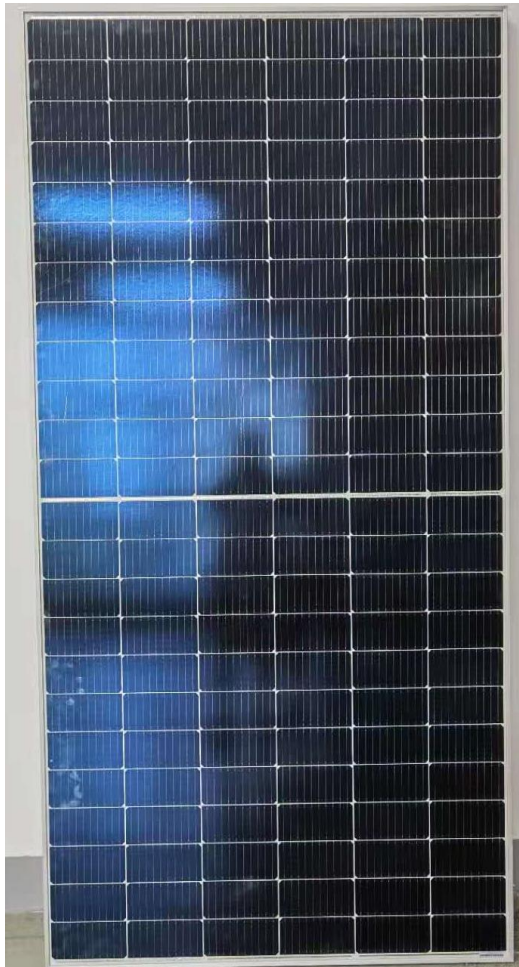
Test item particulars:				
Accessories and detachable parts included in the evaluation :				
Options included				
Possible test case verdicts:				
- test case does not apply to the test object			N/A	
- test object does meet the requirement			Pass (P)	
- test object does not meet the requirement			Fail (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 IEC60082-1 and IEC60082-2".</p> <p>"(See Enclosure #)" refers to additional information appended to the report. "(See table)" refers to a table appended to the report. Throughout this report a point is used as the decimal separator. The tests results presented in this report relate only to the object tested. This report shall not be reproduced except in full without the written approval of the testing laboratory. List of test equipment must be kept on file and available for review. Summary of contents provided on the last page of this report.</p> <p>Conformity statement: Conformity statement is decided in accordance with IEC Guide 115, Procedure 2 (Accuracy method).</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	TSHM530-144HV	TSHM650-132HS		
Voc [V]	49.16+/-3%	45.02+/-3%		
Vmp [V]	41.31	37.93		
Imax [Adc]	12.83	17.14		
Isc [Adc]	13.72+/-4%	18.38+/-4%		
Pmp [W]	530+/-3%	650+/-3%		
Maximum system voltage [V]	1500	1500		
Maximum Over-Current Protection Rating [A]	25	25		

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	TSHM530-144HV (M1, M2, M3, M4, M5)	TSHM650-132HS (M6, M7, M8, M9, M10)
Front Cover	: 3.2mm, AR coated tempered glass, Flat glass	3.2mm, AR coated tempered glass, Flat glass
Rear Cover	: KPF Cynagard 205A(R), Cybrid.	KPF Cynagard 205A(R), Cybrid.
Encapsulation material	: F406P&F806P, First	F406P&F806P, First
Frame	: 6063-T5, Huzhou Beisheng	6063-T5, Huzhou Beisheng
Dimensions l x w x h [mm]	: 2256 x 1134 x 35	2384 x 1303 x 35
Module area [m ²]	: 2.1	3.11
Minimum distance between current-carrying parts and module edge [mm]	> 11	
Cell		
Cell type	: 182S-10BB, 10BB PERC Mono-Si, Zhejiang Beyondsun	210S-12BB, 12BB PERC Mono-Si, Zhejiang Beyondsun
Cell dimensions l x w [mm]	: 182 x 91	210 x 105
Cell thickness [μm]	: 190 ± 30	190 ± 30
Cell area [cm ²]	: 165.075	220.5
Number of cells	: 144	132
Components and other		
Cells per bypass diode	: 48	44
Type of bypass diode	: FMK5040D, Renhe	FMK3040P
No. of bypass diodes	: 3	
Cell- and string connectors	: Cell connector: diameter 0.3 mm, String connector: 4x 0.4mm, Changzhou Greateen	
Junction box	: FT50xy, Zhejiang Renhe	
Cable	: H1Z2Z2-K, 4.0mm ²	
Connectors	: 05-8, Zhejiang Renhe	RHC2xyzu, Zhejiang Renhe
Adhesives (frame)	: HT906Z, Shanghai Huitian	
Adhesives (junction box)	: HT906Z, Shanghai Huitian	
Potting material (junction box)	: 5299W-S, Shanghai Huitian	
Others	: /	

Copy of marking plate:



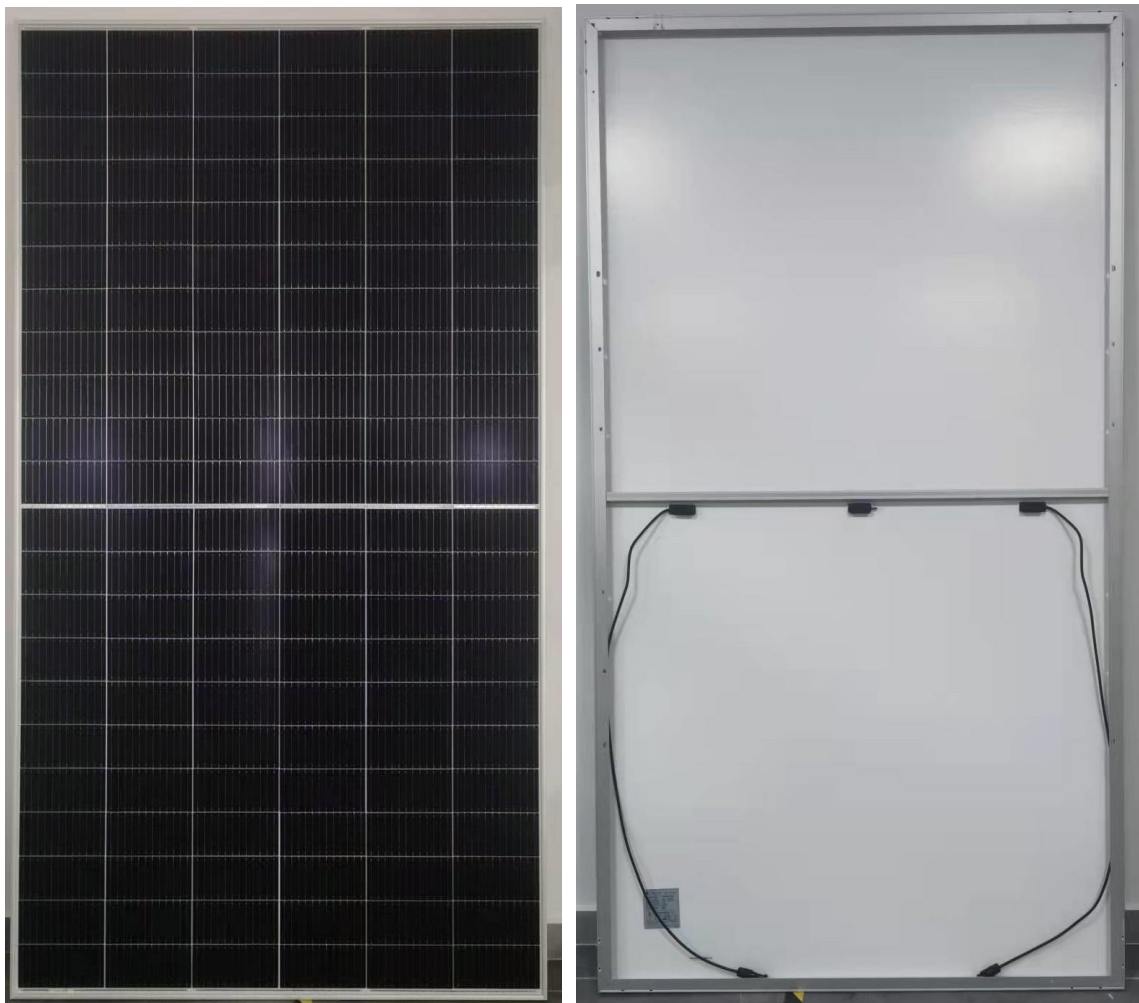
Photos of the module (front and back):



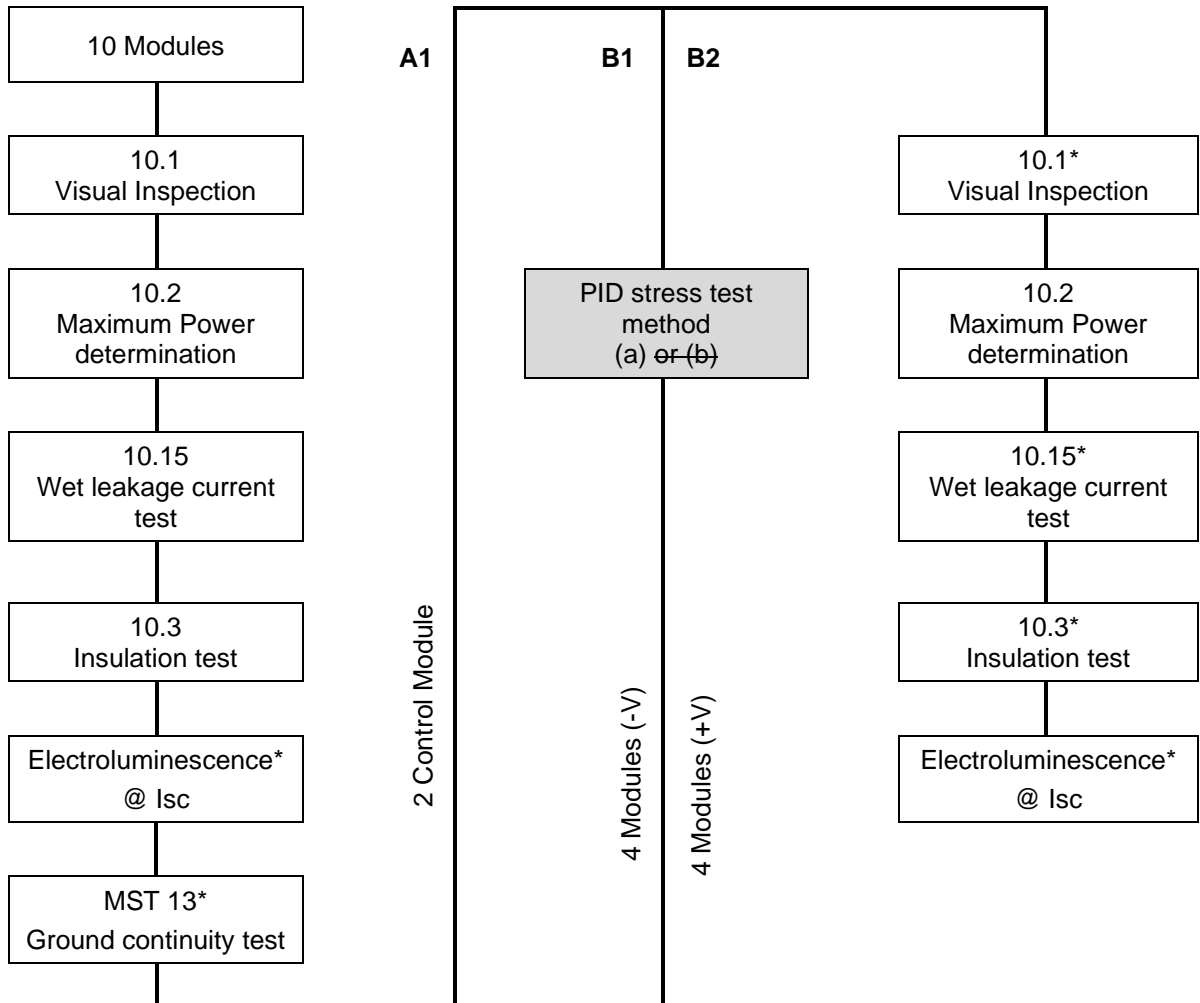
Copy of marking plate:



Photos of the module (front and back):




10	TEST - PROCEDURES (if it is not a full test, strikethrough non-performed test) Note: Deviations from test sequence are possible but must be documented.
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*Not for Control

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

4	MARKING		P
	Name, monogram or symbol of manufacturer :		P
	Type or model number..... :	TSHM530-144HV, TSHM650-132HS	P
	Serial number..... :	See nameplate	P
	Polarity of terminals or leads :	+/-	P
	Maximum system voltage :	1500V	P
	The date and place of manufacture :	Traceable by serial no.	P

	Initial examination	All modules	P
10	Preconditioning..... :	5 kWh/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	Electroluminescence- Measurement :	See table 11.0 Int	P
10.3	Insulation test..... :	See table 10.3 Int	P
10.15	Wet leakage current test..... :	See table 10.15 Int	P
MST13	Ground continuity test..... :	See table MST13 I	P

Group A	Control Module	Sample Group ID A1	P
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Group B	8 Modules	Sample Group ID B1 / B2	P
10.11	PID stress test :	192h, +/-1500V	—
	Final measurements :	See table 10.1 F – 11.0 F	P

	Final measurement	All modules	P
10.1	Visual inspection..... :	See table 10.1 F	P
10.2	Maximum power determination :	See table 10.2 F	P
11.0	Electroluminescence- Measurement :	See table 11.0 F	P
10.3	Insulation test..... :	See table 10.3 F	P
10.15	Wet leakage current test..... :	See table 10.15 F	P

10.1 Int	TABLE: Visual inspection (Initial)		P
Test Date (YYYY-MM-DD)	2021-10-06		—
Sample #	Nature and position of initial findings – comments or attach photos		—
M1	No findings		P
M2	No findings		P
M3	No findings		P
M4	No findings		P
M5	No findings		P
M6	No findings		P
M7	No findings		P
M8	No findings		P
M9	No findings		P
M10	No findings		P
Supplementary information:			

10.2 Int	TABLE: Maximum power determination (initial)						P
Test Date (YYYY-MM-DD)	2021-10-06						—
Module temperature (°C)	25						—
Irradiance (W/m ²)	1000						—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)	
M1	13.48	49.27	12.82	41.80	535.71	80.67	
M2	13.52	49.29	12.85	41.72	536.16	80.43	
M3	13.43	49.37	12.81	41.78	535.21	80.72	
M4	13.52	49.30	12.84	41.76	536.26	80.44	
M5	13.48	49.34	12.80	41.82	535.35	80.46	
M6	17.92	45.16	17.05	38.22	651.76	80.56	
M7	17.91	45.15	17.11	38.16	652.88	80.73	
M8	17.94	45.19	17.11	38.25	654.23	80.70	
M9	17.93	45.20	17.10	38.22	653.51	80.63	
M10	17.95	45.07	17.10	38.12	651.73	80.56	
Supplementary information:							

10.3 Int		Table: Insulation test (initial)			P
Test Date (YYYY-MM-DD)		2021-10-07			—
Test Voltage applied (V, DC)		1500 / 8000			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1	37800	>15.5	--	X	P
M2	42100	>15.5	--	X	P
M3	35400	>15.5	--	X	P
M4	31100	>15.5	--	X	P
M5	29200	>15.5	--	X	P
M6	24900	>12.86	--	X	P
M7	24700	>12.86	--	X	P
M8	21700	>12.86	--	X	P
M9	23600	>12.86	--	X	P
M10	21300	>12.86	--	X	P
Supplementary information: Size of module 2.58 m ² for M1, M2, M3, M4, M5, 3.11 m ² for M6, M7, M8, M9, M10.					

10.15 Int		TABLE: Wet leakage current test (Initial)			P
Test Date (YYYY-MM-DD)		2021-10-07			—
Test Voltage applied (V, dc)		1500			—
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	Limit		Result	
	(MΩ)	(MΩ)			
M1	2470	>15.5		P	
M2	2321	>15.5		P	
M3	2450	>15.5		P	
M4	3260	>15.5		P	
M5	3100	>15.5		P	
M6	4310	>12.86		P	
M7	20800	>12.86		P	
M8	10500	>12.86		P	
M9	3880	>12.86		P	
M10	7420	>12.86		P	
Supplementary information: Size of module 2.58 m ² for M1, M2, M3, M4, M5, 3.11 m ² for M6, M7, M8, M9, M10.					

11.0 Int	TABLE: EL- Measurement (initial)	P
Test Date (YYYY-MM-DD).....:	2021-10-07	—
Sample #	Nature and position of findings – comments or attach photos	—
M2	No findings	P



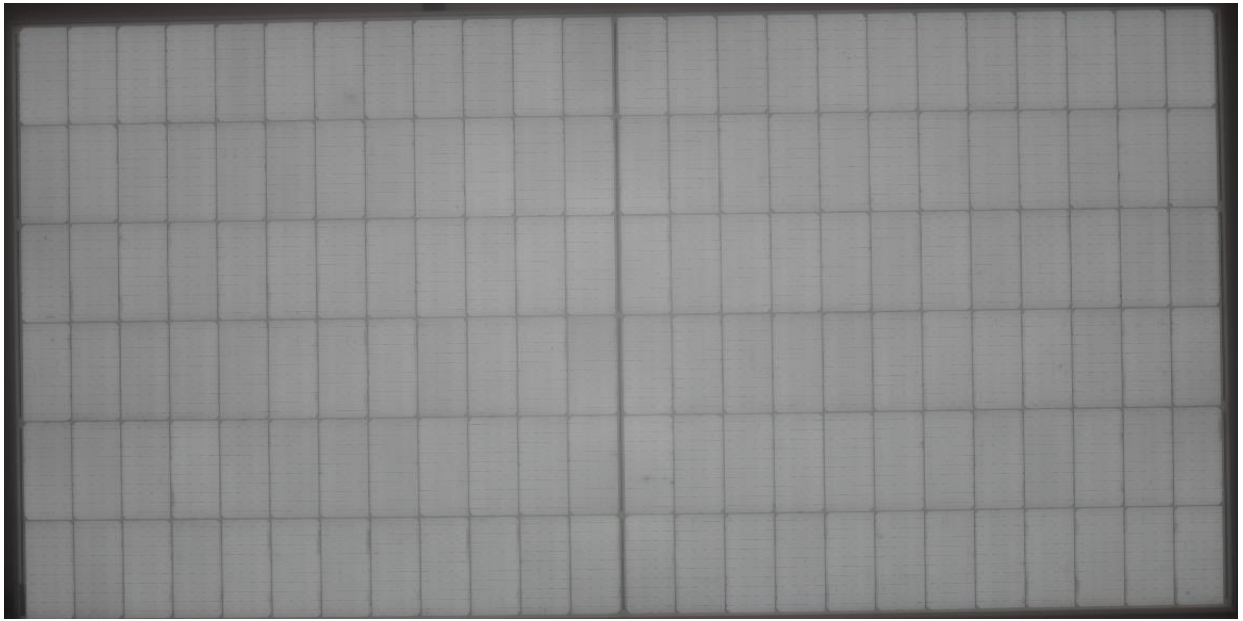
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M3	No findings	P



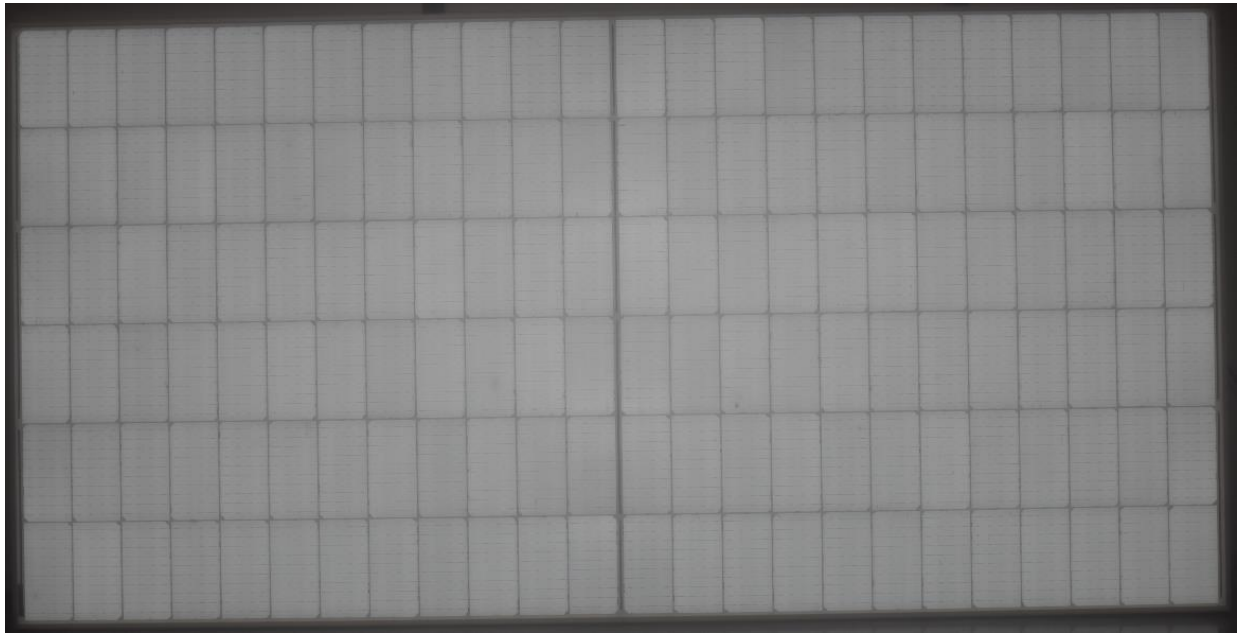
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M4	No findings	P



Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M5	No findings	P



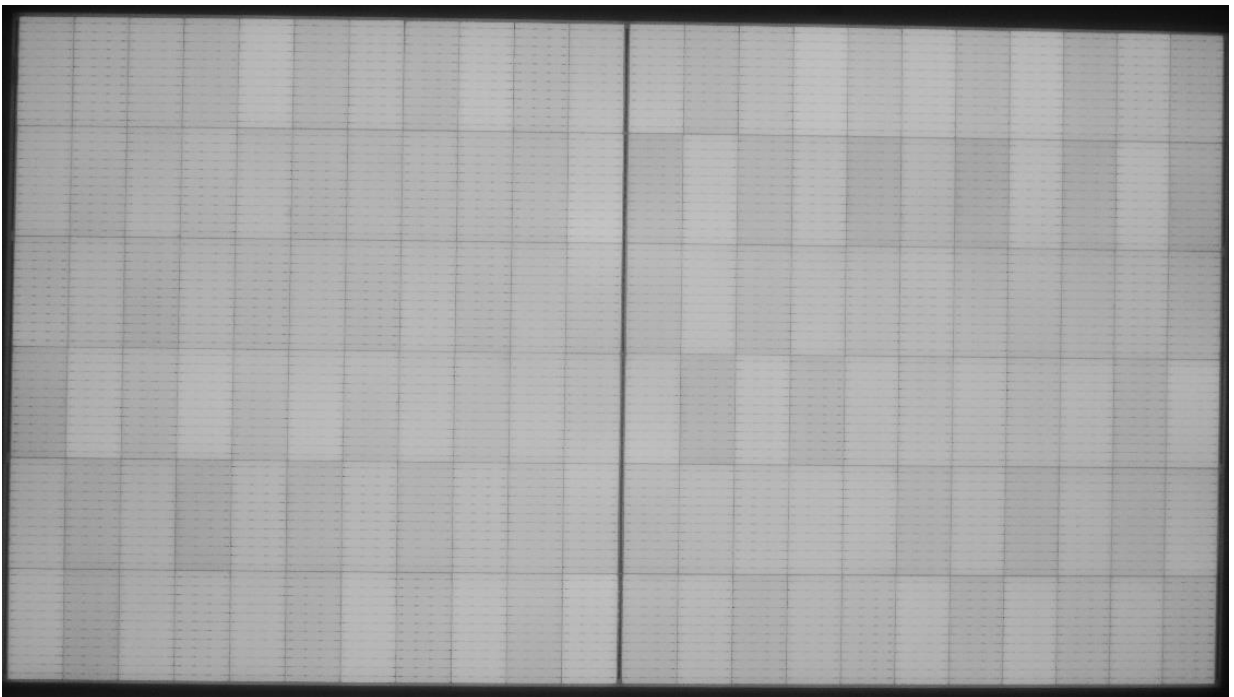
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M7	No findings	P



Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M8	No findings	P



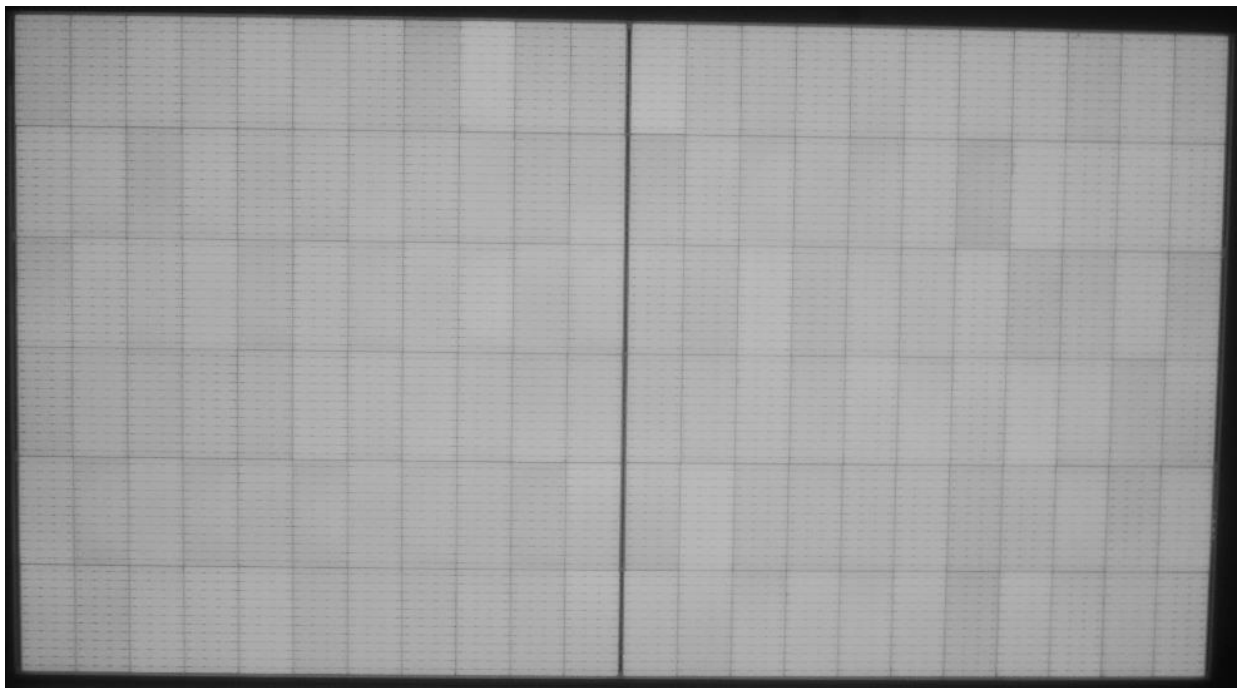
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M9	No findings	P



Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M10	No findings	P



Supplementary information:

TABLE MST13 I: Ground continuity test (Initial)					P
Test Date (YYYY-MM-DD).....:		2021-10-07		—	
Maximum over-current protection rating [A].....:		25		—	
Current applied [A]		62.5		—	
Location of designated grounding point		Grounding point of the long edge		—	
Location of second contacting point.....:		The greatest physical displacement of adjacent side		—	
Sample #	Position in test sequence:	Voltage [V]	Resistance [Ω]	Result	
M2	Initial examination	0.2482	0.0040	P	
M3	Initial examination	0.4323	0.0069	P	
M4	Initial examination	0.2164	0.0035	P	
M5	Initial examination	0.1571	0.0025	P	
M7	Initial examination	0.1657	0.0027	P	
M8	Initial examination	0.1445	0.0023	P	
M9	Initial examination	0.1332	0.0021	P	
M10	Initial examination	0.1581	0.0025	P	
Supplementary information:					

10.11 B		TABLE: PID stress test			P
Test Date (YYYY-MM-DD) start/end.....:		2021-10-07/ 2021-10-23			—
Test duration (hours)		192			—
Ambient temperature (°C).....:		85			—
Relative humidity (%).....:		85			—
Test Voltage applied (V, DC).....:		-1500V for M2, M3, M7, M8 +1500V for M4, M5, M9, M10			—
Sample #	Open circuits (yes/no)			—	
M2	No			P	
M3	No			P	
M4	No			P	
M5	No			P	
M7	No			P	
M8	No			P	
M9	No			P	
M10	No			P	
Supplementary Information:					

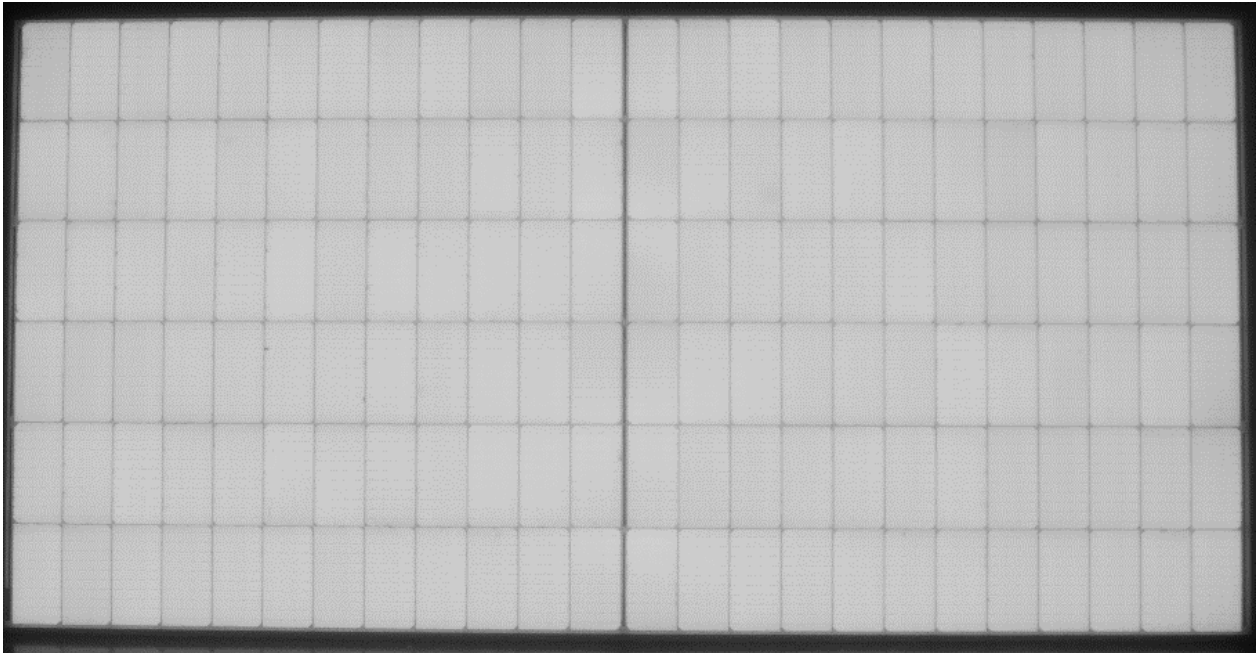
10.1 F	TABLE: Visual inspection after PID stress test (final)		P
Test Date (YYYY-MM-DD).....:	2021-10-23		—
Sample #	Nature and position of initial findings – comments or attach photos		—
M2	No findings		P
M3	No findings		P
M4	No findings		P
M5	No findings		P
M7	No findings		P
M8	No findings		P
M9	No findings		P
M10	No findings		P
Supplementary information:			

10.2 F	TABLE: Maximum power determination after PID stress test (final)								P
Test Date (YYYY-MM-DD).....:	2021-10-23								—
Module temperature (°C).....:	25								—
Irradiance (W/m ²).....:	1000								—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)	Degradation (%)	Limit (%)	
M1	13.41	49.34	12.76	41.92	535.09	80.86	0.12	± 1	
M2	13.46	49.28	12.80	41.77	534.55	80.61	0.30	5	
M3	13.41	49.36	12.80	41.82	535.14	80.85	0.01	5	
M4	13.49	49.29	12.80	41.81	535.35	80.49	0.17	5	
M5	13.39	49.27	12.73	41.87	533.23	80.84	0.40	5	
M6	17.85	45.10	17.02	38.26	651.08	80.88	0.10	± 1	
M7	17.87	45.10	17.02	38.15	649.57	80.60	0.51	5	
M8	17.90	45.17	17.08	38.26	653.43	80.82	0.12	5	
M9	17.76	45.14	16.96	38.31	649.60	81.03	0.60	5	
M10	17.79	44.99	16.97	38.03	645.31	80.63	0.99	5	
Supplementary information:									

10.3 F		Table: Insulation test after PID stress test (final)			P
Test Date (YYYY-MM-DD).....:		2021-10-23			—
Test Voltage applied (V, DC)		1500 / 8000			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M2	22400	>15.5	--	X	P
M3	25400	>15.5	--	X	P
M4	24800	>15.5	--	X	P
M5	26300	>15.5	--	X	P
M7	30600	>12.86	--	X	P
M8	31700	>12.86	--	X	P
M9	20100	>12.86	--	X	P
M10	19800	>12.86	--	X	P
Supplementary information: Size of module 2.58 m ² for M1, M2, M3, M4, M5, 3.11 m ² for M6, M7, M8, M9, M10.					

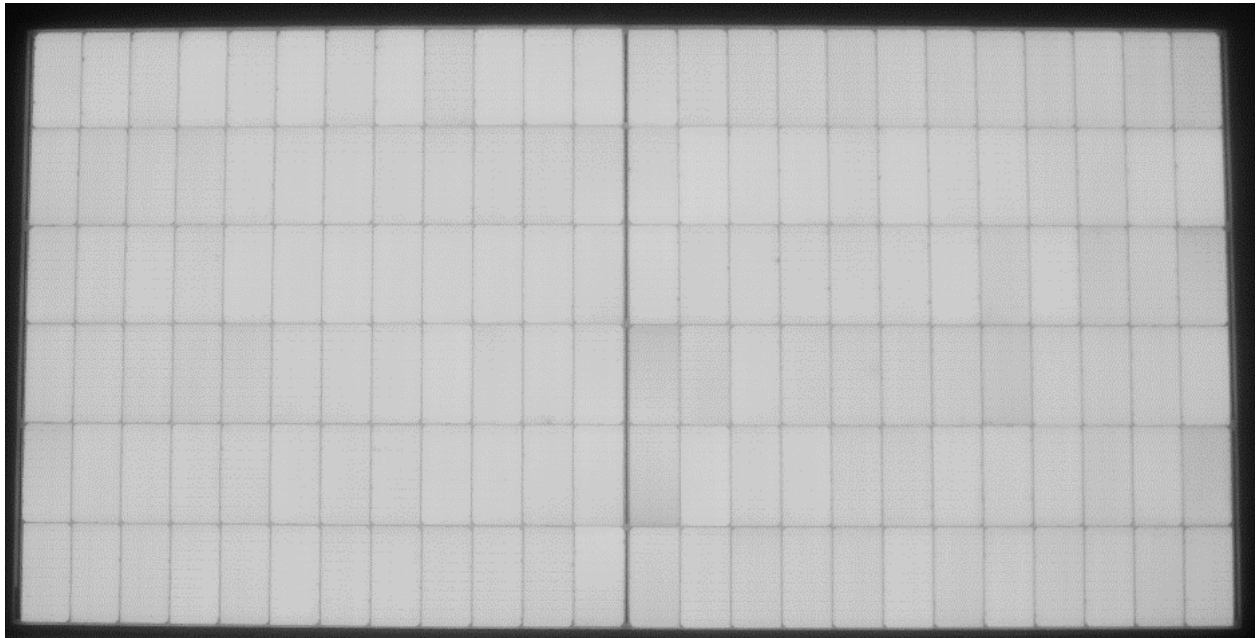
10.15 F		TABLE: Wet leakage current test after PID stress test (final)			P
Test Date (YYYY-MM-DD).....:		2021-10-23			—
Test Voltage applied (V, dc).....:		1500			—
Solution resistivity (Ω cm)		< 3500 Ω cm at 22 ± 3°C			—
Surface tension (Nm ⁻²)		< 0.03 Nm ⁻² at 22 ± 3°C			—
Solution temperature (°C)		22			—
Sample #	Measured	Limit		Result	
	(MΩ)	(MΩ)			
M2	2010	>15.5		P	
M3	1980	>15.5		P	
M4	2030	>15.5		P	
M5	2140	>15.5		P	
M7	8310	>12.86		P	
M8	6500	>12.86		P	
M9	3560	>12.86		P	
M10	4590	>12.86		P	
Supplementary information: Size of module 2.58 m ² for M1, M2, M3, M4, M5, 3.11 m ² for M6, M7, M8, M9, M10.					

11.0 F	TABLE: EL- Measurement (Final)	P
Test Date (YYYY-MM-DD)	2021-10-23	—
Sample #	Nature and position of findings – comments or attach photos	—
M2	No findings	P



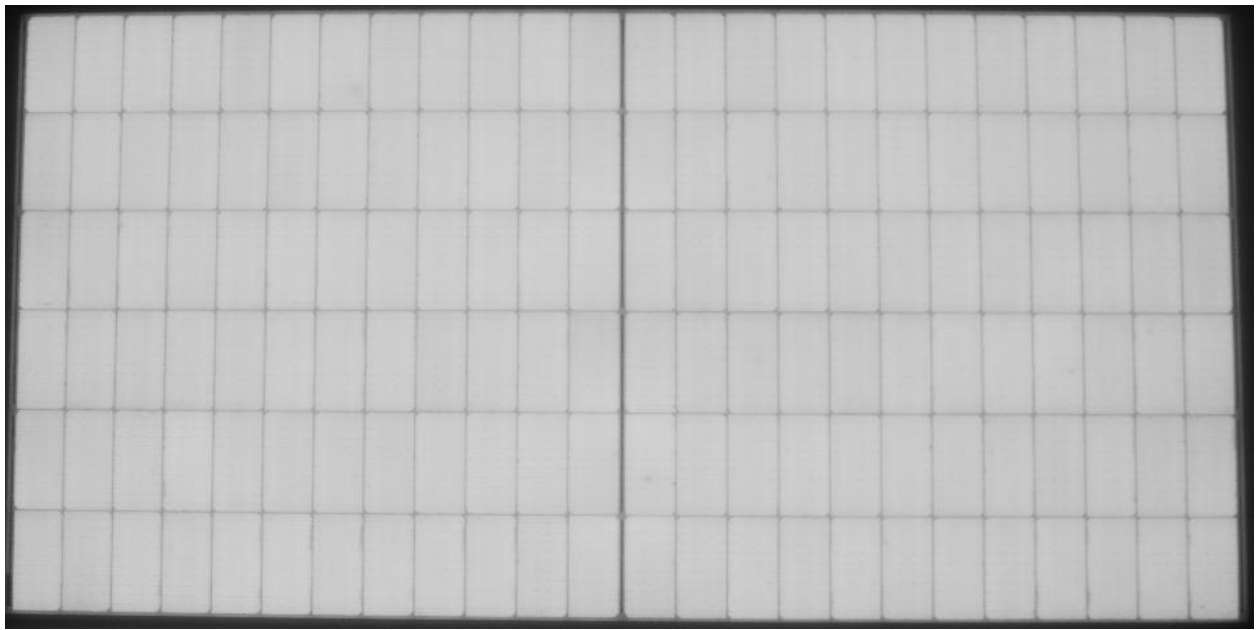
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M3	No findings	P



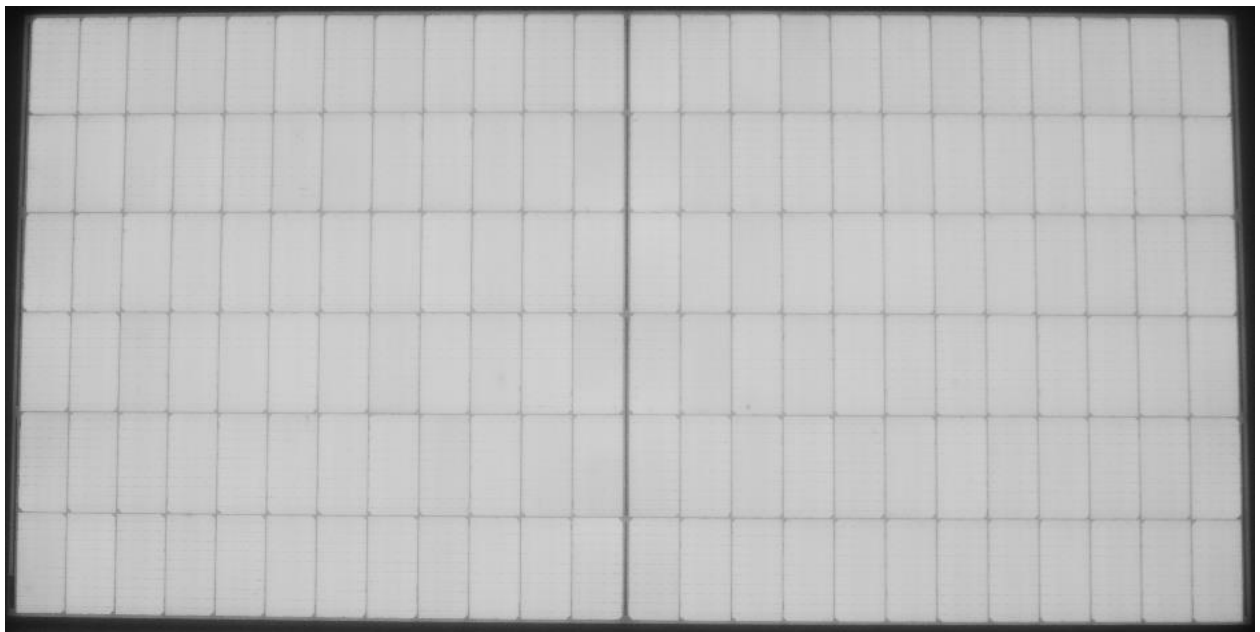
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M4	No findings	P



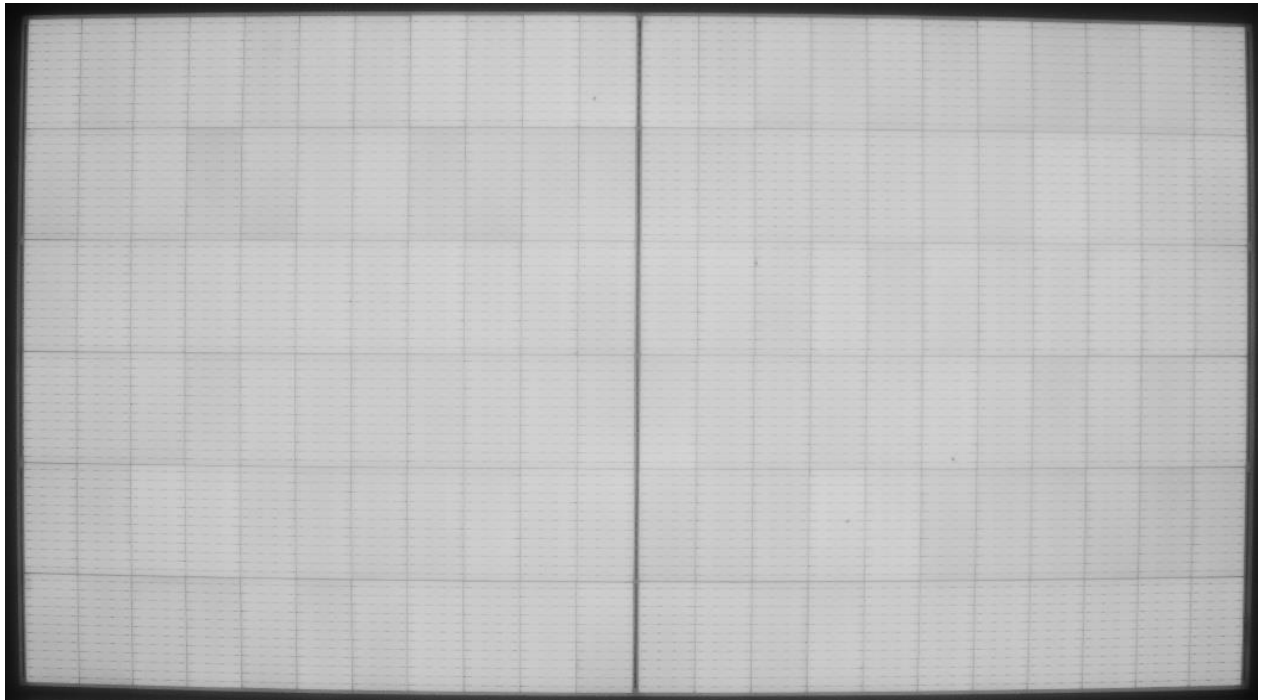
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M5	No findings	P



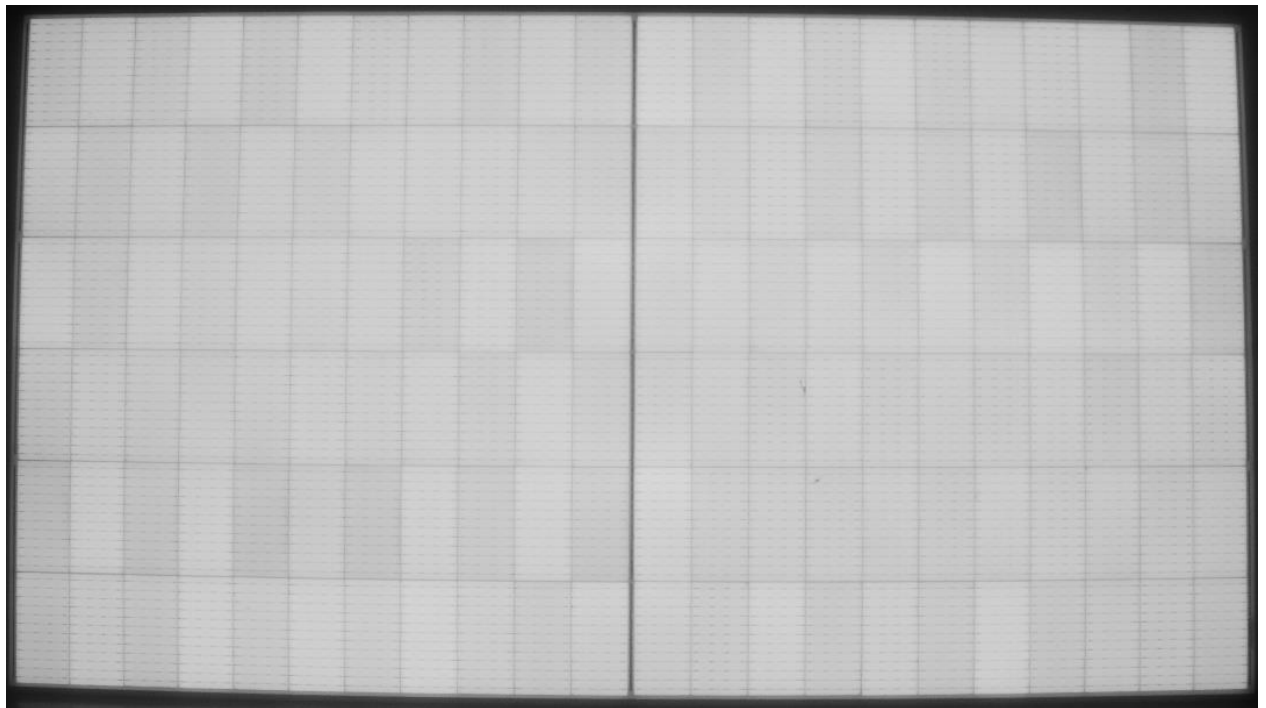
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M7	No findings	P



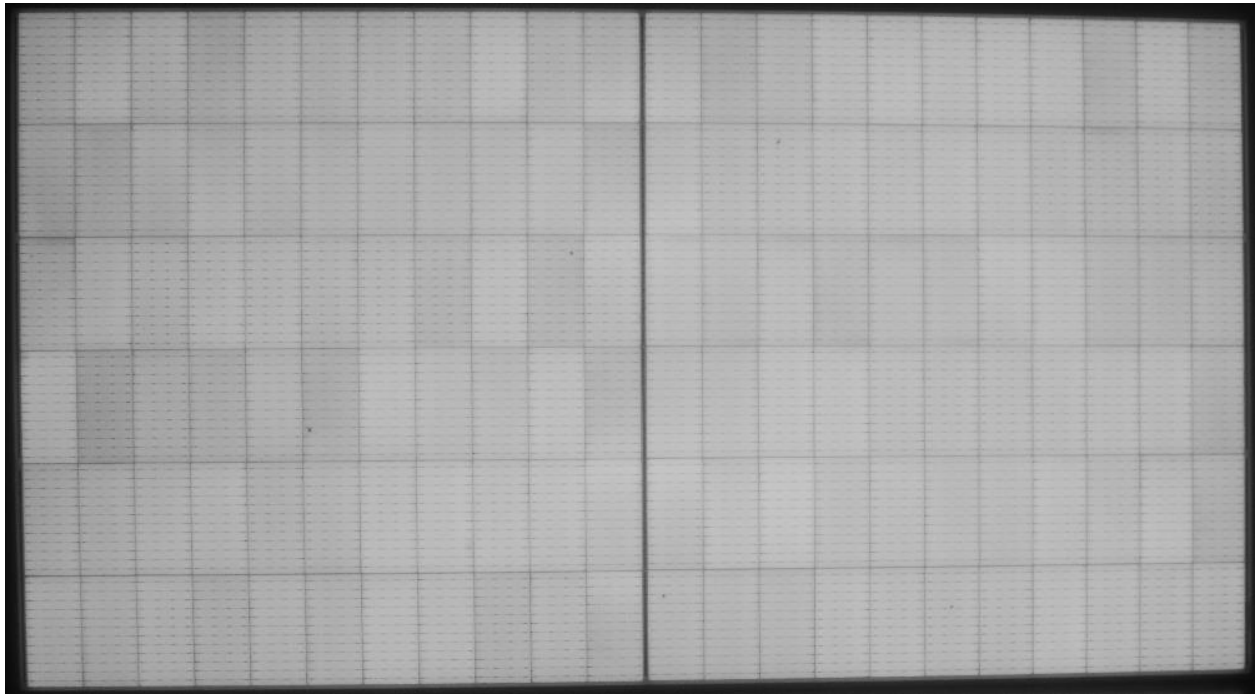
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M8	No findings	P



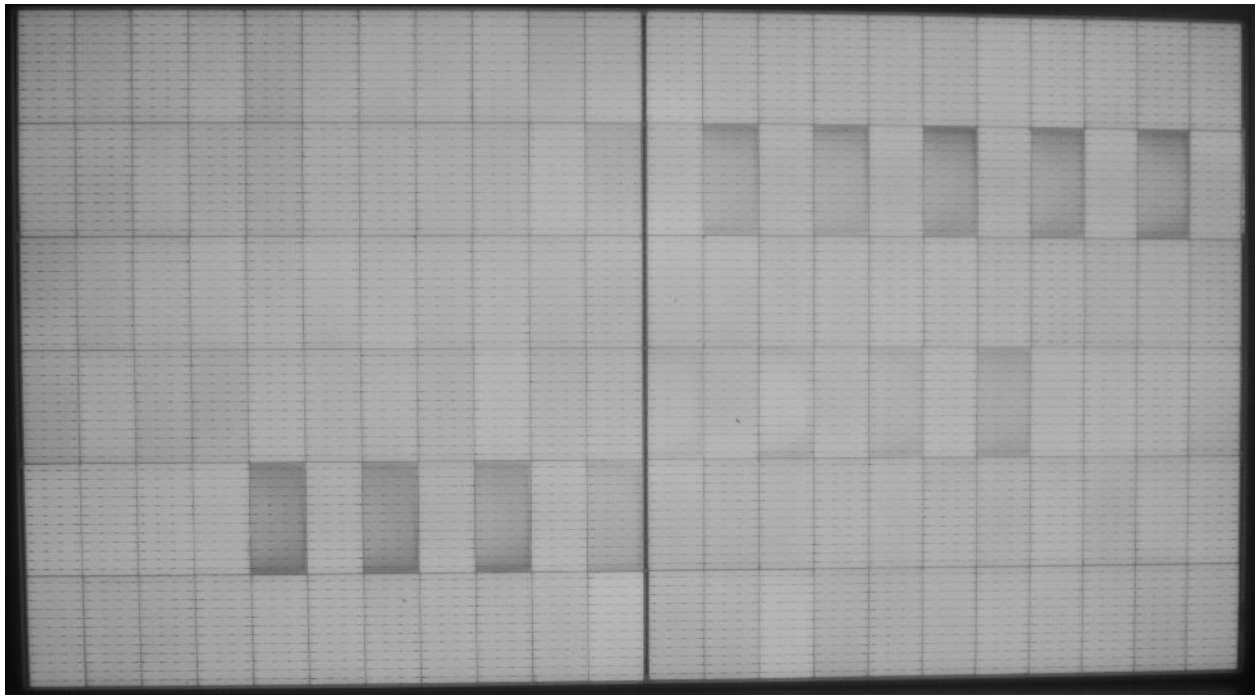
Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M9	No findings	P



Supplementary information:

Sample #	Nature and position of findings – comments or attach photos	—
M10	No findings	P



Supplementary information:

List of measurement equipment

Measurement / testing	Equipment Model	Equipment ID	Calibration due date
Solar Simulator	GIV-20A2616	JXYQ-043	2022.05.05
Hi-pot tester	ZW-DY1000	JXYQ-019	2022.04.28
Climatic Chamber	BTHW-14.4M3-C	JXYQ-041	2022.04.28
Wet Leakage Test	ZW-SJY01	JXYQ-007	2022.04.28
EL Test Device	LS-EL02	EGMT-E060	2022.03.13
Steady solar simulator	ZW-3C-4	JXYQ-030	2022.04.28
PID Test system	20131165	JXYQ-058	2022.05.05

Note: All measurement equipment has been provided with a valid calibration at the time of usage.

-- END OF REPORT --