Report No.: SIT260413199101SR

TEST REPORT

IEC 61215 SERIES:2021

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN QUALIFICATION AND TYPE APPROVAL

IEC 61730-2

PV MODULE SAFETY QUALIFICATION –

PART 1: REQUIREMENTS FOR CONSTRUCTION AND

PART 2: REQUIREMENTS FOR TESTING

Report Number.....:	SIT260413199101SR
Tested by (printed name and signature) ..... :	Jayden Li
Checked by (printed name and signature) ..... :	Morton Chen
Approved by (printed name and signature) ..... :	Kevin Sun
Date of issue.....:	2026-06-16
Total number of pages.....:	44 pages
Name of Testing Laboratory.....:	Shenzhen SIT Testing Technology Co., Ltd.
Testing location/ address.....:	Room 401, Building A2, The 2nd Industrial Zone of Zhu'ao, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
Applicant's name.....:	Shenzhen Longsheng Energy Technology Co., Ltd.
Address.....:	301, Building 1, AI Digital Valley, Taoyuan Community, Dalang Street, Longhua District, Shenzhen, China
Test specification:	
Standards.....:	IEC 61730-2:2023 in conjunction with IEC 61730-1:2023 ☒ IEC 61215-1:2021 ☒ IEC 61215-2:2021 ☒ IEC 61215-1-1:2021 ☐ IEC 61215-1-2:2021 ☐ IEC 61215-1-3:2021 ☐ IEC 61215-1-4:2021
Test procedure.....:	TEST REPORT
Non-standard test method.....:	N/A

General disclaimer:

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Test item description.....:	Foldable Solar Panel
Trade Mark.....:	LIONSHEE
Manufacturer.....:	Shenzhen Longsheng Energy Technology Co., Ltd. 301, Building 1, AI Digital Valley, Taoyuan Community, Dalang Street, Longhua District, Shenzhen, China
Model/Type reference.....:	LS-SP30F, LS-SP35F, LS-SP40F, LS-SP45F, LS-SP50F, LS-SP55F, LS-SP60F, LS-SP65F, LS-SP70F, LS-SP75F, LS-SP80F, LS-SP85F, LS-SP90F, LS-SP95F, LS-SP100F
Ratings.....:	See Copy of marking plate

List of Attachments:

Attachment No. 1: Product photographs.

Summary of testing:

Tests performed:	**Testing location:**
The submitted samples were found to comply with the requirements of: IEC 61730-2:2023 in conjunction with IEC 61730-1:2023; IEC 61215-1:2021; IEC 61215-2:2021; IEC 61215-1-1:2021.	Shenzhen SIT Testing Technology Co., Ltd. Room 401, Building A2, The 2nd Industrial Zone of Zhu'ao, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China

Summary of compliance with National Differences (List of countries addressed):

EU group.
Remark:No national difference for EU group was found within IECEE website.

☐ **The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**

Copy of marking plate:

- The artwork below may be only a draft.

- The under markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.

- Marking plates of other models are identical except only the model number.

Foldable Solar Panel

Module type	LS-SP30F
Voc [V] /Tolerance	24.51V±5%
Vmp [V]	20.43V±5%
Imp [A]	1.58A±5%
Isc [A] /Tolerance	1.65A±5%
Pmp [W] /Tolerance	0.8±10%
Maximum system voltage [V]	1500VDC
Maximum Over-Current Protection Rating [A]	3A

Shenzhen Longsheng Energy Technology Co., Ltd.
301, Building 1, AI Digital Valley, Taoyuan Community, Dalang Street, Longhua District, Shenzhen, China
Made in China

Possible test case verdicts:

- test case does not apply to the test object..... : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement.....: F (Fail)

Abbreviations used in the report:

Pmax – Maximum power	HF – Humidity Freeze
Vmp – Maximum power voltage	DH – Damp Heat
Imp – Maximum power current	TC – Thermal Cycling
Isc – Short circuit current	α – Current temperature coefficient
Voc – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m²)	
VFM – Measured diode(s) forward voltage	VFMrated – Rated diode(s) forward voltage
MQT – Module Quality Tests	NP – Nameplate
m_1 – the measurement uncertainty in % of laboratory for Pmax	m_2 – the measurement uncertainty in % of laboratory for Voc
m_3 – the measurement uncertainty in % of laboratory for Isc	t_1 – the manufacturer's rated lower production tolerance in % for Pmax
t_2 – the manufacturer's rated upper production tolerance in % for Voc	t_3 – the manufacturer's rated upper production tolerance in % for Isc
r – Pmax measurement reproducibility	
BNPI – Bifacial nameplate irradiance	BSI – Bifacial stress irradiance
G_{BNPI} – Equivalent bifacial nameplate irradiance	aBSI – Applied bifacial stress irradiance

φ – Bifaciality refers to the ratios between the main I-V characteristics of the rear side and the front side of a bifacial device, typically at Standard Test Conditions (STC) unless otherwise specified. It is quantified with reference to bifaciality coefficients, namely as φ.

φ_{Pmax} – Maximum power bifaciality coefficient	φ_{Voc} – Open-circuit voltage bifaciality coefficient
φ_{Isc} – Short-circuit current bifaciality coefficient	

Testing.....:

Date of receipt of test item.....: 2026-04-13

Date (s) of performance of tests..... : 2026-04-14 to 2026-06-16

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Name and address of factory (ies)..... :	Shenzhen Longsheng Energy Technology Co., Ltd. 301, Building 1, AI Digital Valley, Taoyuan Community, Dalang Street, Longhua District, Shenzhen, China

Product Electrical Ratings:	
Module type	LS-SP30F
Voc [V] /Tolerance	24.51V±5%
Vmp [V]	20.43V±5%
Imp [A]	1.58A±5%
Isc [A] /Tolerance	1.65A±5%
Pmp [W] /Tolerance	0.8±10%
Maximum system voltage [V]	1500VDC
Maximum Over-Current Protection Rating [A]	3A
Remarks:	

Product Safety Ratings	
Maximum systems voltage (Vsys).....:	1500 V
Maximum over-current protection rating.....:	3 A
Class in accordance with IEC 61140.....:	See clause 5.1
Intended use (list details).....:	See clause 5.5

General product information:

Modifications:

☐ Initial module design qualification

☐ Extension of module design qualification

☐ Original test report ref. no. .....:

Model differences and modification:

☐ Test programs for WBT PV modules (including c-Si)

- ☐ 4.2.1 Modification to frontsheet
- ☐ 4.2.2 Modification to encapsulation system
- ☐ 4.2.3 Modification to cell technology (specific to wafer-based technologies (WBT))
- ☐ 4.2.4 Modification to cell and string interconnect material (specific to WBT)
- ☐ 4.2.5 Modification to backsheet
- ☐ 4.2.6 Modification to electrical termination
- ☐ 4.2.7 Modification to bypass diode
- ☐ 4.2.8 Modification to electrical circuitry (specific to WBT)
- ☐ 4.2.9 Modification to edge sealing
- ☐ 4.2.10 Modification to frame and/or mounting structure
- ☐ 4.2.11 Change in PV module size
- ☐ 4.2.12 Higher or lower output power with the identical design and size and using the identical cell process
- ☐ 4.2.13 Increase of over-current protection rating
- ☐ 4.2.14 Increase of system voltage by more than 5%
- ☐ 4.2.15 Change in cell fixing or internal insulation tape (specific to WBT)

☐ Test programs for MLI thin-film PV modules

- ☐ 4.3.1 Modification to frontsheet
- ☐ 4.3.2 Modification to encapsulation system
- ☐ 4.3.3 Modification to front contact (e. g. TCO)
- ☐ 4.3.4 Modification to cell technology
- ☐ 4.3.5 Modification to cell layout
- ☐ 4.3.6 Modification to back contact
- ☐ 4.3.7 Modification to edge deletion
- ☐ 4.3.8 Modification to interconnect material or technique
- ☐ 4.3.9 Modification to backsheet
- ☐ 4.3.10 Modification to electrical termination
- ☐ 4.3.11 Modification to bypass diode
- ☐ 4.3.12 Modification to edge sealing
- ☐ 4.3.13 Modification to frame and/or mounting structure
- ☐ 4.3.14 Change in PV module size
- ☐ 4.3.15 Higher or lower output power with the identical design and size
- ☐ 4.3.16 Increase of over-current protection rating
- ☐ 4.3.17 Increase of system voltage
- ☐ 4.3.18 Change in labe material (external nameplate label)
- ☐ 4.3.19 Change from monofacial to bifacial module

	☐ 4.3.20 Changes to module operating temperature ☐ 4.3.21 Changes affecting compatibility with variants of the same model ☐ 4.3.22 Changes to documentation
NOTE: The clause references for modifications are excerpted from IEC TS 62915	

6 SAMPLING			
	☒ The modules tested (modules and laminate) were taken at random from a production batch and subjected to manufacturer's normal quality control and inspection for safety testing		P
	☐ The modules tested (modules and laminate) were prototypes of a new design and not taken from a production batch.		N/A
	☐ Preconditioning of test samples was performed within IEC 61215 performance testing		N/A
	☒ Preconditioning of test samples was performed separately from IEC 61215 performance testing		P
Supplementary information:			

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
5. MARKING AND DOCUMENTATION			P
5.1	**Name Plate**		P
	All electrical data shall be shown as relative to STC (1 000 W/m^2, 25 °C, AM1.5 according to IEC TS 61836), except for bifacial modules where two irradiance levels are required, 1 000 W/m^2 and BNPI (higher irradiance at which nameplate verification is performed for bifacial modules, corresponding to 1 000 W/m^2 on the module front and 135 W/m^2 on the module rear, applied in any method allowed by IEC TS 60904-1-2).		P
	International symbols are used where applicable.		P
	The module includes clear and indelible markings:		P
	a. Name, registered trade name or registered trade mark of manufacturer		P
	b. Type or model number designation		P
	c. Serial number (unless marked on other part of product)		P
	d. Date and place of manufacture, alternatively serial number allowing to trace the date and place of manufacture;		P
	e. Maximum system voltage		P
	f. Class of protection against electrical shock		P
	g. Voltage at open-circuit or V_{oc} including tolerances. For bifacial modules, open-circuit voltage shall be reported at two irradiance levels. The first required irradiance level is 1 000 W/m2. The second required irradiance is BNPI		P
	h. Current at short-circuit or I_{sc} including tolerances. For bifacial modules, short-circuit current shall be reported at two irradiance levels, defined in 5.1g		P
	i. Module maximum power or P_{max} including tolerances. For bifacial modules, P_{max} shall be reported at the two irradiance levels, defined in 5.1g		P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	j. For bifacial modules the following information including tolerances, shall be given on the nameplate: The values for the short-circuit current bifaciality coefficient φI_{sc}, the opencircuit voltage bifaciality coefficient φV_{oc}, and the maximum power bifaciality coefficient φP_{max}, measured at STC as defined in IEC TS 60904-1-2		N/A
	k. For flexible modules, the minimum radius of curvature		N/A
5.2	**Documentation**		P
5.2.1	Minimum requirements		P
	Modules are supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the module		P
	The documentation states the class of protection against electrical shock under which the module has been qualified and any specific limitations required for that class.		P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use, and maintenance of the PV modules.		P
5.2.2	Information given in the documentation		P
	a. All information required under 5.1 e) to i)		P
	b. Overcurrent protection device type and rating are e.g. given in IEC 60269-6		P
	Maximum series/parallel module configuration is recommended		P
	c. Manufacturer's stated tolerance for V_{oc}, I_{sc} and maximum power output under standard test conditions		P
	d. Temperature coefficient for voltage at open-circuit		P
	e. Temperature coefficient for maximum power		P
	f. Temperature coefficient for short-circuit current		P
	All electrical data mentioned above shown as relative to standard test conditions (1 000 W/m², 25 °C, AM 1,5 according to IEC TS 61836)		P
	g. Performance at low irradiance (MQT 07) is specified		N/A

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	International symbols used where applicable		P
	Compliance checked by inspection and MQT 04 through MQT 07		P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used		P
	h. The minimum cable diameters for modules intended for field wiring		P
	i. Any limitations on wiring methods and wire management that apply to the wiring compartment or box;		P
	j. The size, type, material and temperature rating of the conductors to be used		P
	k. Type of terminals for field wiring		N/A
	l. Specific PV connector model/types and manufacturer to which the module connectors are mated		P
	m. The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation		P
	n. The type and ratings of bypass diode to be used (if applicable)		P
	o. limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)		P
	p. A statement indicating the fire rating(s) and the applied standard and the limitations to that rating (e.g., installation slope, sub-structure or other applicable installation information)		P
	q. A statement indicating the design load per each mechanical means for securing the module as evaluated during the static mechanical load test according to MQT 16. At discretion of the manufacturer the test load and/or the safety factor γ_m may be noted, too		P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: *"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{SC} and V_{OC} marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."*		P
5.2.3	Assembly instructions		P
	Provided with a product shipped in subassemblies, detailed and adequate to the degree required to facilitate complete and safe assembly of the product		P
Supplementary information:			

7. PASS CRITERIA						P
7.2	**Power output and electric circuitry**					P
7.2.1	Verification of rated label values (Gate No. 1)					P
	Manufacturer's tolerances and Laboratory uncertainties					P
		t_1	t_2	t_3	t_4	—
	manufacturer's rated lower/upper production tolerance in %	-3	+3	+3	+3	
		m_1	m_2	m_3		
	measurement uncertainty in % of the laboratory	2.4	1.10	1.84		
	Laboratory reproducibility r.....:	0.26				
	After stabilization, each individual module meets the requirements					P
	P_{max}.....					P
	V_{oc}.....					P
	I_{sc}:.....					P
	After stabilization the arithmetic average $\bar{P}_{max}$ $\bar{P}_{max}$ of all modules meet the requirements.					P
7.2.2	Maximum power degradation during type approval testing (Gate #2)					P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	At the end of each test sequence or for sequence B after bypass diode test, each test sample meets the requirements for P_{max}		P
7.2.3	Electrical circuitry		P
	Samples do not exhibit an open-circuit during the tests		P
7.3	**Visual defects**		P
	There is no visual evidence of a major defect.		P
7.4	**Electrical safety**		P
	The insulation test (MQT 03) requirements are met at the beginning and the end of each sequence		P
	The wet leakage current test (MQT 15) requirements met at the beginning and at the end of each sequence		P
	Specific requirements of the individual tests are met		P
Supplementary information:			

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

4. TESTING OVERVIEW			P
	Initial examination	All modules	P
4.1	Visual inspection (MQT 01)) ..... :		P
4.19.5	Initial stabilization (MQT 19.1) ..... :		P
4.6	Performance at STC & BNPI (MQT 06.1)		P
4.3	Insulation test (MQT 03) ..... :		P
4.15	Wet leakage current test (MQT 15) ..... :		P

Sequence A	**1 Module**		P
4.7	Performance at low irradiance (MQT 07) ..... :		P
4.4	Measurement of temperature coefficients (MQT 04) ..... :		P

Sequence B	**1 Module**		P
4.8	Outdoor exposure test (MQT 08) ..... :		P
4.18.1	Bypass diode thermal test (MQT 18.1)		N/A
	Maximum allowed junction temperature ..... :		—
	Calculated junction temperature ..... :		—
	Final measurements ..... :		N/A
4.18.2	Bypass diode functionality test (MQT 18.2) ..... :		N/A
4.19.6	Final stabilization (MQT 19.2) ..... :		N/A
4.9	Hot spot endurance test (MQT 09) ..... :		P

Sequence C	**2 Modules**		P
4.10	UV preconditioning test (MQT 10) ..... :		P
4.20	Cyclic (dynamic) mechanical load test (MQT 20)		P
4.11	Thermal cycling test 50 cycles (MQT 11) ..... :		P
4.12	Humidity-freeze test (MQT 12) ..... :		P

Sequence C1	**1 Module**		P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.14.2	Retention of junction box on mounting surface (MQT 14.1) ..... :		P
4.14.3	Test of cord anchorage (MQT 14.2)		P
4.14.3.1	The junction box, separate from the module, shall be tested to IEC 62790 "Test of cord anchorage" and shall meet the requirements therein..... :		P
Sequence D	**2 Modules**		P
4.11	Thermal cycling test 200 cycles (MQT 11)..... :		P
Sequence E	**2 Modules**		P
4.13	Damp heat test (MQT 13)..... :		P
4.19.6	Final stabilization (MQT 19.2)..... :		P
Sequence E1	**1 Module**		P
4.16	Static mechanical load test (MQT 16)..... :		P
4.22	Bending test (MQT 22)..... :		P
Sequence E2	**1 Module**		P
4.17	Hail test (MQT 17)		P
Sequence F	**4 Modules**		P
4.21	Potential induced degradation test (MQT 21)		P
4.19.6	Final stabilization (MQT 19.2)..... :		P
	Final measurement		P
4.19.6	Final stabilization (MQT 19.2)..... :		N/A
4.6	Performance at STC&BNPI (MQT 06.1) ..... :		P
4.3	Insulation test (MQT 03)..... :		P
4.15	Wet leakage current test (MQT 15) ..... :		P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 01: MQT 01 ini: Initial Visual inspection		P
Sample #	Nature and position of initial findings – comments or attach photos	—
--	No major visual defects found	P
Supplementary information:		

TABLE 02: MQT 19.1 ini: Initial stabilization							P
TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (Front side)							P
Test method.....:	☒ Solar simulator		☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
--	1.683	25.000	1.627	21.043	34.245	81.39%	--
Supplementary information:							
TABLE 02.2: MQT 06.1 ini: Performance at STC before initial stabilization (Back side)							N/A
Test method.....:	☒ Solar simulator		☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
--	--	--	--	--	--	--	--
Supplementary information:							
TABLE 02.3: MQT 06.1 ini: Performance at BNPI (front side irradiance 1 000 W/m², back side irradiance 135 W/m², 25 °C, AM 1.5) before initial stabilization							P
Test method.....:	☒ Solar simulator		☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
--	1.881	28.677	1.833	22.882	41.937	77.75%	--
Supplementary information:							

TABLE 02.4: MQT 19.1: Initial Stabilization procedure							P
Light exposure method.....:	☒ Solar simulator		☐ Natural sunlight				
Stabilization criterion x per IEC 61215-1-x .....:	1						
Sample #							
Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} – P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	34.245	—	—
1	5	800~1000	50 ± 10	MPPT	34.197	—	—
2	5	800~1000	50 ± 10	MPPT	34.061	0.538	Yes
Supplementary information:							

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

☐ Other stabilization procedures	
Sample #	Test Date (YYYY-MM-DD) start/end
Test method description:	
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure	

TABLE 03.1: MQT 06.1 ini: Performance at STC after initial stabilization (Front side)		P
P_{max} lower limit (W) ..... :	See table below: P_{max} [W] – Min calc.	—
$\bar{P}_{max}$ (lab) lower limit (V) .....:	—	—
V_{oc}(lab) upper limit (V) ..... :	See table below: V_{oc} [V] Max. calc.	—
I_{sc} (lab) upper limit (A) .....:	See table below: I_{sc} [A] Max. calc.	—
Test method.....:	☒ Solar simulator ☐ Natural sunlight	—

Sample #	I_{sc} [A]		V_{oc} [V]		I_{mp} [A]	V_{mp} [V]	P_{max} [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
--	1.652	1.655	24.535	24.584	1.588	20.798	33.025	33.151	81.50%	--
Average	—						33.025	33.151	—	--

Supplementary information: The limit values are calculated considering manufacturer's tolerances ***t*** of rated nameplate values and laboratory measurement uncertainties ***m***.

TABLE 03.2: MQT 06.1: Performance at STC after initial stabilization (Back side)										N/A
Test method.....	☐ Solar simulator ☐ Natural sunlight									—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	φI_{sc}	φV_{oc}	φP_{max}	Result
Supplementary information:										

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 03.3: MQT 06.1: Performance at BNPI (front side irradiance 1 000 W/m², backside irradiance 135 W/m², 25 °C, AM 1.5) after initial stabilization		
P_{max} lower limit (W) ..... :	See table below: Pmax [W] – Min calc.	—
$\bar{P}_{max}$ (lab) lower limit (V) .....:	—	—
V_{oc}(lab) upper limit (V) ..... :	See table below: V_{oc} [V] Max. calc.	—
I_{sc} (lab) upper limit (A) .....:	See table below: I_{sc} [A] Max. calc.	—
Test method.....:	☒ Solar simulator ☐ Natural sunlight	—

Sample #	I_{sc} [A]		V_{oc} [V]		I_{mp} [A]	V_{mp} [V]	P_{max} [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
—	1.833	1.837	28.705	28.763	1.778	24.333	43.276	43.441	82.23%	—
Average	—						43.276	43.441	—	—

Supplementary information: The limit values are calculated considering manufacturer's tolerances ***t*** of rated nameplate values and laboratory measurement uncertainties ***m***.

TABLE 04: MQT 03: Initial Insulation test		P
Test Voltage applied [V] .....:	8000/1500	—
Size of module [m²]..... :	3.11	—
Required Resistance [MΩ].....:	12.88	—

Sample #	Measured	Dielectric breakdown		Result
	MΩ	Yes (description)	No	
--	>10000	No Dielectric breakdown	x	P

Supplementary information:

TABLE 05: MQT 15: Initial Wet leakage current test		P
Test Voltage applied [V].....:	1500	—
Solution temperature [°C].....:	22.2	—
Solution resistivity [Ω cm] .....:	2795	—
Size of module [m²].....:	3.11	—

Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
--	12.88	>10000	P

Supplementary information:

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 06.1: MQT 07 - Performance at low irradiance (Front side)			P
Test method...:	☐ Outdoor measurement		—
	Ambient air temperature [°C]:		
	Irradiance [W/m²]:		
	Module temperature [°C]:		
	☐ Data corrected to a 25°C cell temperature and 200 W/m² irradiance		
	☐ Directly measured		—

Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]
—	0.324	22.111	0.314	19.314	6.060	84.60%

Supplementary information:

TABLE 06.2: MQT 07 - Performance at low irradiance (Back side)			N/A
Test method...:	☐ Outdoor measurement		—
	Ambient air temperature [°C]:		
	Irradiance [W/m²]:		
	Module temperature [°C]:		
	☐ Data corrected to a 25°C cell temperature and 200 W/m² irradiance		
	☐ Directly measured		—

Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	φI_{sc}	φV_{oc}	φP_{max}

Supplementary information:

TABLE 07: MQT 04 - Measurement of temperature coefficients				P
Ambient air temperature [°C] high/low..... :		55/25		—
Irradiance [W/m²] high/low.....:		1000		—
Module temperature [°C] high/low.....:		55/25		—
Sample #	α [%/°C]	β [%/°C]	δ [%/°C]	—
—	0.0312	-0.3126	-0.2967	—

Supplementary information:

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 08: MQT 08 - Outdoor exposure test		P
Sample #	--	
Total irradiation dosage [kWh/m²]..... :	60	—
Angle of tilt the test module..... :	37°	—
Electrical load:	☒ Restive load ☐ MPPT	—
Supplementary information:		

Table 08.1: MQT 01: Visual inspection after outdoor exposure test		P
Sample #	Nature and position of initial findings – comments or attach photos	—
--	No major visual defects found	P
Supplementary information:		

Table 08.2: MQT 15: Wet leakage current test after outdoor exposure test			P
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C] ..... :	22.1		—
Size of module [m²]..... :	3.11		—
Solution resistivity [Ω cm]..... :	2786		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
--	>10000	12.88	P
Supplementary information:			

Table 08.3: MQT 02 - Maximum power determination after outdoor exposure test - Optional							N/A
Module temperature [°C]..... :							—
Irradiance [W/m²)..... :							—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	
Supplementary information:							

Table 08.4: MQT 03 - Insulation test after outdoor exposure test - Optional		N/A
Test Voltage applied [V] ..... :		—
Size of module [m²]..... :		—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

Required Resistance [MΩ].....:					—
Sample #	Measured	Required (MΩ)	Dielectric breakdown		Result
	(MΩ)	(MΩ)	Yes (description)	No	
Supplementary information:					

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
5 Classification, applications and intended use			
5.1 General			
	The module has been evaluated for the following Class (IEC 61140) ……:	Class II	—
5.5 Rating categories and special applications			
	PV modules are installed in the following special applications:		—
	Building attached PV (BAPV)		—
	Building integrated PV (BIPV)		—
	Applications in areas where snow and / or wind load exceeding loads as tested in IEC 61730-2		—
	other (please specify)		—
6 Requirements for design and construction			
6.1 General			—
	PV module suitable for operation in unprotected outdoor locations, exposed to direct and indirect (albedo) solar radiation and up to 100 % relative humidity as well as to rain.		P
	Product shipped from the factory as	completely assembled	—
	The provided assemblies of the product do not involve any action that is likely to affect compliance with the requirements of the IEC 61730 series.		P
	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form.		N/A
	Equipotential bonding continuity is not interrupted by installation		N/A
	Any adjustable or movable structural part is provided with a locking device		N/A
	PV modules have no accessible burrs, sharp edges or sharp points		P
	Parts are prevented from loosening or turning		N/A
6.2 Marking and documentation			
6.2.1	Instructions related to safety are in an official language of the country where the equipment is to be installed.		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.2.2 Marking			
6.2.2.1 General			
	Each PV module includes the following clear and indelible markings:		—
	a) Name, registered trade name, or registered trade mark of manufacturer		P
	b) Type or model number designation		P
	c) Serial number		P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture		P
	e) “Maximum system voltage” or ”V_{sys}”		P
	f) Class of protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023		P
	g) “Voltage at open-circuit” or “V_{OC}” including manufacturing tolerances. For bifacial modules, open-circuit voltage is reported at two irradiance levels as defined in IEC 61215-1.		P
	h) “Current at short-circuit” or “I_{SC}” including manufacturing tolerances. For bifacial PV modules, short-circuit current is reported at STC, BNPI and aBSI.		P
	i) “PV module maximum power” or “P_{max}” including manufacturing tolerances. For bifacial modules, P_{max} is reported at two irradiance levels as defined in IEC 61215-1		P
	j) For bifacial PV modules, clear indication of the front side, or if both are designed for prolonged exposure to direct sunlight (> 300 W/m^2)		N/A
	k) For flexible modules, the minimum radius of curvature		N/A
	l) Positive ("+" or downward) and negative ("−" or upward) design load ratings in pascal (Pa) excluding the test load safety factor, as verified in the static mechanical load test (MST 34)		N/A
	m) Maximum overcurrent protection rating		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	n) A module temperature rating of 70 °C, (or if tested to IEC TS 63126 Level1 or Level 2, 80 °C or 90°C)		N/A
	o) Connector manufacturer and model used; refer to manual for designated mating connectors		N/A
	p) a link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module		N/A
	Compliance of the nameplate is verified according to the visual inspection (MST 01) and the durability of markings (MST 05) of IEC 61730-2.		P
	International symbols are used where applicable.		P
	PV connectors or wiring are marked in accordance to IEC 62852 with a symbol ”Do not disconnect under load”.		N/A
	Symbol or warning notice are imprinted or labelled close to connector		N/A
	PV connectors are clearly marked indicating the terminal polarity.		N/A
	For Class II and Class 0 PV modules, the ⚠ (IEC 60417-6042: Caution, risk of electric shock) symbol is applied near the PV module electrical connection means.		P
	PV modules are marked to indicate the class	class II: ⧈	P
	PV modules provided with a functional earth connection (see section 6.2.2.2.2)		—
	PV modules with terminals for field wiring rated only for use with copper wire are marked, at or adjacent to the terminals, with the statement "Use copper wire only", "Cu only", or the equivalent.		N/A
	PV modules with terminals for field wiring rated only for use with a different specific wiring material are marked with a similar statement referring to the rated material.		N/A
6.2.2.2 Symbols			
6.2.2.2.1 Equipotential bonding			
	Bonding conductor for equipotential bonding is identified with:	☐ ⏚; ☐ ⏚	N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	No other terminal or location is identified in this manner		N/A
6.2.2.2.2 Functional earthing			
	Field installed functional earthing conductor is identified with the symbol:		N/A
6.2.3 Documentation			
6.2.3.1 General			
	Documentation describing electrical and mechanical installation is provided.		P
	The documentation states the class for protection against electrical shock under which the PV module was qualified and any specific limitations required for that class.		P
	The documentation assures that installers and operators receive appropriate and sufficient instructions for safe installation, use and maintenance of the PV modules that it accompanies.		N/A
	The documentation is supplied in at least one of the official languages of the country where the PV modules will be installed.		P
	Assembly instructions are provided with a product shipped in subassemblies, and are detailed and adequate to the degree required to facilitate complete and safe assembly of the product..		N/A
	Documentation is provided in paper form in each shipping unit or as an electronic link.		—
	– The web address is marked on the device or provided in an information sheet enclosed with each shipping unit.		N/A
	– The web address is in the form of a Uniform Resource Locator (URL – http://www.___.com/___/), or a Quick Response Code (QRcode).		N/A
	– The web address link takes the user to an internet page containing the required information or a direct link to the required information.		N/A
	– The file is in a file format that is commonly used and is downloadable.		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	The needs for maintaining and supporting information during the life cycle of the supported product is taken into account when planning the preparation of information for use as in IEC/IEEE 82079-1.		N/A
	The documentation contains the following information:		—
	– Name, registered trade name, or registered trade mark of manufacturer		P
	– Type or model number designation		P
	– "Maximum system voltage" or "V_{sys}"		P
	– Class of protection against electrical shock		P
	– "Voltage at open-circuit" or "V_{OC}" including manufacturing tolerances. For bifacial modules, open-circuit voltage is reported at two irradiance levels as defined in IEC 61215-1.		P
	– "Current at short-circuit" or "I_{SC}" including manufacturing tolerances. For bifacial PV modules, short-circuit current is reported at STC, BNPI and aBSI.		P
	– "PV module maximum power" or "P_{max}" including manufacturing tolerances. For bifacial modules, P_{max} is reported at two irradiance levels as defined in IEC 61215-1		P
	– For bifacial PV modules, clear indication of the front side, or if both are designed for prolonged exposure to direct sunlight (> 300 W/m^2)		N/A
	– For flexible modules, the minimum radius of curvature		N/A
	– Positive ("+" or downward) and negative ("−" or upward) design load ratings in pascal (Pa) excluding the test load safety factor, as verified in the static mechanical load test (MST 34)		N/A
	– Maximum overcurrent protection rating		P
	– A module temperature rating of 70 °C, (or if tested to IEC TS 63126 Level1 or Level 2, 80 °C or 90°C)		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	– Connector manufacturer and model used; refer to manual for designated mating connectors		N/A
	– a link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module		N/A
	– Recommended maximum series / parallel PV module configurations		N/A
	– Temperature coefficient for voltage at open-circuit		P
	– Temperature coefficient for maximum power		P
	– Temperature coefficient for short-circuit current		P
6.2.3.2 Suitable environmental and mounting conditions			
	The documentation states the environmental and mounting conditions for which the module has been qualified, including:		—
	The maximum rated altitude the PV module is designed for:		N/A
	Indication of the negative (upward) and positive (downward) design load ratings during the static mechanical load test according to MST 34		N/A
	For bifacial PV modules, the exposure side meets the following requirements:		N/A
	– Clear indication of which side(s) of the module have been tested for the front side exposure		N/A
	– The back side is restricted for use with indirect or limited direct sunlight (less than 300 W/m^2) unless tested as a front side		N/A
	– Each side meets the requirements for front side if both sides of a module are intended for use with prolonged exposure to direct sunlight (>300 W/m^2)		N/A
	Temperature range from a lower limit of environmental temperature of −40 °C to the upper limit set by a 98th percentile module operating temperature of 70 °C, (80 °C or 90 °C if tested to Level 1 or Level 2 conditions as described in IEC TS 63126)		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Guidance on geographic areas, mounting conditions and system design and installation factors where the anticipated 98th percentile module operating temperature will be greater than 70 °C (or 80°C or 90°C if tested to Level 1 or Level 2 conditions)		N/A
	Factors that can increase voltage or current beyond the STC values are given in the documentation, including the following or equivalent statements:		N/A
	– "A photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Factors to consider include module temperature and front side irradiance (and, for bifacial modules, ground or roof albedo, row spacing, and installation height). Accordingly, the values of V_{OC} and I_{SC} (or for bifacial modules, $I_{SC\text{-}aBSI}$) marked on this PV module should be multiplied by a factor of 1,25 when determining voltage and current ratings for components connected to the PV output."		N/A
	– "The safety factor of 1,25 given for the minimum voltage rating of the components in the example statement above may be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for V_{OC}. The safety factor of 1,25 given for conductor current ratings values for I_{SC} (or for bifacial modules, $I_{SC\text{-}aBSI}$) may be adjusted based on the maximum values of irradiance incident on the front side of the module (and the rear side for bifacial modules). To this purpose, a full simulation for the specific location and module orientation (and for bifacial modules, ground albedo, row spacing and installation height) is required. Further guidance for the choice of a safety factor other than 1,25 is given in IEC 62548."		N/A
	A statement advising that artificially concentrated sunlight producing a PV module's current above the value reported on the nameplate shall not be directed onto the front side or the back side of the PV module.		N/A
	Evaluation of the following standards:		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	– IEC 61701		N/A
	– IEC 62716		N/A
	– IEC 62109-3 (MIE Type A or B)		N/A
	– IEC TS 63126 (temperature Level 1 or 2)		
6.2.3.3 Mounting			
	The documentation includes adequate information and instructions for each mounting methods listed in the manufacturer's mounting instructions as well as:		—
	– A statement indicating the minimum mechanical means for securing the PV module evaluated during the mechanical load test (MST 34 of IEC 61730-2) and the conformity to the mechanical load requirements of the series IEC 61215		N/A
	– Limitations to the mounting situation (e.g.slope, orientation, mounting means, cooling, specific spacing and any other condition that can influence the safety of the PV module installation)		N/A
	– Type of adhesive and the allowable substrates if adhesives are used for mounting (i.e.flexible modules)		N/A
	– The manufacturer and unique part number of the adhesive, the required surface preparation, adhesive application process, and curing condition if adhesives are specified for use in the field to provide mechanical securement to specific roof coverings or mounting systems		N/A
6.2.3.4 Connectors/wiring			
	The documentation includes a detailed description of the following information related to the connectors and wiring method:		—
	– Minimum cable diameters, rated voltage, current and temperature of cables for PV modules intended for field wiring and compliance with IEC 62930, type 131 or type 133; or EN 50618		N/A
	– Limitations on wiring methods and wire management that apply to the junction box for the PV module		N/A
	– Statement that wiring to interconnect modules shall be rated for the application, and it is important that the user is aware of national installation codes.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Type of terminals for field wiring		N/A
	– Specific model / types together with the manufacturer name/brand of the PV connector(s) to which the PV module connectors can be mated		N/A
	– The bonding method(s) to be used, if applicable, is specified either all provided or specified hardware		N/A
	– The type and ratings of bypass diode to be used (if applicable)		N/A
6.2.3.5 Fire ratings			—
	– A statement indicating	☐ fire rating(s) and applied standards ☐ statement regarding resistance to external fire sources not evaluated	N/A
	– Limitations to the achieved ratings (e.g. installation slope, sub structure or other applicable installation information)		N/A
	– A statement indicating the minimum mechanical means for securing the PV module		N/A
	– A statement indicating the maximum altitude		N/A
	– For roof mounrting, specific parameter(s) are provided when the fire rating is dependent on a specific mounting structure , specific spacing, or specific means of attachment to the roof or structure.		N/A

6.3 Electrical components and insulation			
6.3.2 Internal wiring			
	Internal wiring has sufficient current carrying capacity for the relevant application.		P
6.3.3 External wiring and cables			
	External wires and cables fulfil the requirements of		N/A
6.3.4 Module overcurrent protection rating			
	Overcurrent protecting rating is determined according to IEC 60269-6.		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.5 Connectors			
	External DC connectors fulfil the requirements of IEC 62852 and additional requirements in 6.5.2.2.		N/A
	Connectors are marked in accordance with 6.2.2.		N/A
6.3.6 Junction boxes for PV modules			
	Junction boxes for PV modules fulfil the requirements of IEC 62790 and additional requirements in 6.5.2.2.3.		N/A
	Module level testing is performed to validate adhesion/connection of the junction box to the module and minimum clearance and creepage distances.		N/A
6.3.7 Frontsheets and backsheets			
	Frontsheet material:	☐ Glass ☒ Polymeric material ☐ Others.	—
	Backsheet material:	☐ Glass ☒ Polymeric material ☐ Others.	—
	Polymeric frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.		P
	Backsheets are restricted for use with indirect or limited direct sunlight equal to or lower than 300 W/m².		N/A
	The DTI requirements listed in Table 3 and Table 4 of IEC 61730-2 are fulfilled by single or multiple layers of RUI as described in IEC 62788-2-1	See Table 1	N/A
	Adhesion of frontsheet and backsheet toencapsulant or glass is appropriate.	Compliance is checked at module level by test sequences of IEC 61730-2 listed in this report.	P
6.3.8 Insulation barriers			
	Polymeric insulation barrier meets the relevant requirements of 6.5.2		P
	Barrier held in place while keeping its required electrical and mechanical properties		P
	Removal of barrier only possible by using a tool		P
6.3.9 Electrical connections			
6.3.9.1 General			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material. Compliance checked by MST 01		P
	Measures are taken to prevent connections becoming loose, e.g. by using a washer.		N/A
	End of a stranded conductor is not consolidated by soft soldering.		N/A
	Measures are taken to prevent contact stress impairing electrical conductivity.		N/A
6.3.9.2 Terminals for external cables and PV connector ribbons			
	Terminals for electrical connections are suitable for the type and range of conductor cross-sectional areas, and they meet the relevant requirements of IEC 62790 and additional RTE, RTI, and TI requirements of 6.5.2.2.3.		N/A
	Insulated terminals are designed to prevent a reduction of clearances and creepage distances by any possible displacement.		N/A
6.3.9.3 Splices and connections inside a PV module			
	Splices and connections are mechanically secured and provide electrical continuity.		P
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.		P
	A soldered or conductively adhered joint is additionally mechanically secured.		P
6.3.10 Encapsulants			
	Thermal properties are sufficient for intended application.	Compliance checked by IEC 61730-2:2023 tests for pollution degree 2 listed in this report.	P
	The insulation properties according to 6.5.2.2 are met, if applicable.	Compliance checked by IEC 61730-2:2023 tests for pollution degree 2 listed in this report.	P
6.3.11 Bypass diodes			
	Bypass diodes are rated to withstand the current and voltage for their intended use.		N/A
6.4 Mechanical and electromechanical connections			
6.4.1 General			
	Type of connection:		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Mechanical connections are durable to withstand the thermal, mechanical, and environmental stresses occurring in the application.		P
	Removable parts are only detachable with the aid of tools.		N/A
	Lids attached without screws have one or several detectable feature(s) to avoid damaging the lid or the feature(s).		N/A
	No contact of tools with the live parts when the lid is removed.		N/A
	No friction between surfaces as the sole means to inhibit the turning or loosening of a part, unless provisions to prevent unintended movement or rotation of the component is given.		N/A
6.4.2 Screw connections			
	Screws and mechanical connections withstand the mechanical stresses occurring in normal use.		N/A
	Screws are not made of a material which is soft or liable to creep.		N/A
	Screws used to provide mechanical stability and continuity for equipotential bonding withstand the mechanical stresses occurring in normal use.		N/A
	At least one screw per electrical- mechanical connection ensures the electrical connection between the metallic components.		N/A
	Screws used for mechanical and electrical connections with a nominal diameter of less than 3 mm are screwed into metal.		N/A
	For screws used for mechanical and electrical connections two full threads are engaged into the metal.		N/A
	Screwed and other fixed connections are in such a way that they do not come loose through torsion, bending stresses, vibration, etc.		N/A
6.4.3 Rivets			
	Rivets that have the double function of being concurrently electrical and mechanical connections are locked against loosening.		N/A
6.4.4 Thread-cutting screws			
	Thread-cutting and self-tapping screws are not used for interconnection of current-carrying parts made of a material which is soft or liable to creep.		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	No thread-forming or thread-cutting (self-tapping) screws (sheet metal screws) are used for the connection of current-carrying parts.		N/A
	Thread-cutting (self-tapping) screws are not used if they are likely to be operated by the user or installer.		N/A
	Thread-cutting and thread-forming screws, used to provide continuity for equipotential bonding, are such that it is not necessary to disturb the connection in normal use.		N/A
	For equipotential bonding one screw is permitted if two full threads engage the metal.		N/A
6.4.5 Form/press/ tight fit			
	Form/press/tight fits of metallic components which are not separately equipotentially bonded are electrically connected.		N/A
	Requirements of MST 01, MST 32 and MST 34 are met, continuity of equipotential bonding (MST 13) is performed before and after the MST 32 and MST 34 tests		N/A
6.4.6 Connections by adhesives			
	Compliance is checked by tets of IEC 61730-2:2023		N/A
	The specific substrate(s) that was (were) adhered to the flexible module in the tests are noted in the documentation.		N/A
	Adhesion of a polymer relied upon for insulation to another insulating layer is appropriate for the application.		N/A
	Requirements for adhesive materials are met		N/A
	Connection by adhesive which is considered as cemented joint fulfils the requirements of 6.6.4.3.		N/A
6.4.7 Other connections			
	Other connections such as, welded or soldered, as well as materials and processes for creating the connections are appropriate for the application and for the intended use.		N/A
	Other connections which are relied upon for equipotential bonding fulfil the requirements of (MST 13).		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.5 Materials			
6.5.2 Polymeric materials			
6.5.2.1 General			
	Polymeric materials are able to durably and safely withstand the electrical, mechanical, thermal, environmental, and corrosive stresses occurring in the application.		P
	Polymeric materials are resistant to electrical and mechanical property degradation.		P
	Components meet the requirements of the following standards on the component level:		P
	– IEC 62788-2-1 for frontsheets and backsheets		P
	– IEC 62790 for junction-boxes for PV modules		N/A
	– IEC 62852 for connectors for DC-application in PV systems		N/A
	– IEC 62930 (or EN 50618 for type 131) for electric cables for PV systems		N/A
6.5.2.2 Polymeric materials used as electrical insulation			
6.5.2.2.1 General			
	The material which serves as functional insulation is appropriate according to 6.6.4.4.		P
	The material relied upon for insulation in thin layers is appropriate for the application according to 6.6.4.2.		P
	Insulation is not impaired by short-term or long-term thermal stresses that can occur in manufacturing processes, transportation, and during normal operation by electrical stress and weathering to an extent that it does not comply with the requirements of IEC 61730-1 and IEC 61730-2.		P
6.5.2.2.2 Endurance to electrical stress			
	Materials used as electrical insulation are in compliance with the insulation coordination requirements		P
	Materials relied upon for insulation (RUI) have sufficient breakdown strength and comply with 6.6.4.2.		P
	The polymeric material which is part of a potential tracking path is resistant to surface tracking, in coordination with the design dimensions in 6.6.3.		P
6.5.2.2.3 Endurance to thermal stress			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Materials used as relied upon insulation have a minimum RTE, RTI or TI in accordance with IEC 60216-5 or IEC 60216-1 of at least 90 °C.		P
6.5.2.2.4 Endurance to environmental stress			
	The material's endurance to withstand simulated environmental stress is checked by compliance with IEC 61730-2 at module level.		P
	Components comply with the requirements in the individual applicable international Standards.		P
6.5.2.3 Flammability			
	BAPV and BIPV comply with specific fire-related safety requirements originating from national building codes.		N/A
	External polymeric parts of the PV module whose deterioration could impair the safety comply with all the following additional requirements:		—
	– minimum flammability class V-1		P
	– Ignitability test (MST 24) in final application (laminated or the PV module)		N/A
	– Polymeric parts which are not components of the laminate fulfil the requirements of ignitability test		N/A
	Polymeric materials between two parts of different potential that is recatogorized as described in 6.6.4.4, the encapulant(s) meet(s) the requirements:		N/A
	-flammability class minimum HB		N/A
	-or method to verify spacings is established in the production process		N/A
6.5.2.4 Rigid polymeric materials used for mechanical functions			
	Rigid polymeric materials used for mechanical functions pass the following tests:		P
	– Mechanical strength at lower temperatures, IEC 62790:2020, 5.3.8 followed by MST 01 (visual inspection) of IEC 61730-2.		P
	– Weather resistance test, IEC 62790:2020, 5.3.11 followed by MST 01 (visual inspection) of IEC 61730-2.		P
	– minimum flammability class V-1		P
	– RTI/RTE/TI (≥ 90 °C)		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.3 Metallic materials			
6.5.3.1 General			
	Metallic components withstand a minimum corrosion atmospheric category level C2 in ISO 9224:2012.		N/A
	Metal parts are not in contact to metal parts having a difference of their electrochemical potentials of more than 600 mV.		N/A
	Iron or mild steel is plated, painted, or enamelled for protection against corrosion.		N/A
	Corrosion protection is at least equivalent to a zinc coating of 0.015 mm thickness		N/A
6.5.3.2 Current carrying parts			
	Assessed parts:		N/A
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.		N/A
	Current-carrying materials are protected against corrosion.		N/A
	The coating for protective coated metal is capable of preventing corrosion according to either one of the listed standards.		N/A
	Coated metal not used if the current-carrying parts are stressed by abrasion.		N/A
6.5.4 Adhesives			
	Adhesives are appropriate for the application.		N/A
	Adhesive as part of the relied upon electrical insulation meets the requirements of 6.5.2.2.3		N/A
6.6 Protection against electric shock			
6.6.1 General			
	Adequate protection against contact with hazardous live parts is provided.		P
	Specimen poses no risk of electric shock.		P
6.6.2 Protection against accessibility to hazardous live parts			
6.6.2.1 General			
	Class of module	See safety ratings	—

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	For class 0 and Class II modules adequate protection against accessibility to hazardous live parts (> 35 V DC) provided.		P
	For Class 0 PV modules, accessible parts are separated from hazardous live parts by at least basic insulation.		N/A
	Class II PV modules are constructed and enclosed that only parts separated from hazardous live parts by double or reinforced insulation are accessible.		P
	For Class III PV modules, live parts of different polarity are separated by at least functional insulation.		N/A
	Polymeric Materials used for realizing protection against accessibility of hazardous live parts by means of enclosure, insulation barrier or relied upon insulation comply with the requirements of 6.5.2.		P
6.6.2.2 Protection by means of enclosures and insulation barriers			
	Enclosures or insulation barriers are so designed that, after mounting, the live parts are not accessible (even after possible deformation).		P
	Degree of protection of the housing is not impaired by any possible deformation.		P
	Parts of enclosures and insulation barriers that provide protection are not removable without the use of a tool.		P
	Lids which are attached without screws have one or several detectable features, e.g. recesses,		N/A
	Tool to open the lid do not come into contact with the live parts if lid is removed correctly.		N/A
	Insulation barriers are held in place and are not affected by influences expected during normal operation. Electrical and mechanical properties don't fall below the minimum acceptable values for the application.		N/A
	Parts are prevented from loosening or turning.		N/A
6.6.2.3 Protection by means of insulation of live parts			
	Insulation materials providing the sole insulation between a live part and an accessible metal part, or between uninsulated live parts not of the same potential, are of adequate thickness and of a material appropriate for the application in compliance with Table 2 of IEC 61730-1.		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.6.3 Insulation coordination			
6.6.3.1 General			
	Clearance and creepage distances fulfil the requirements in Table 3 and Table 4 of IEC 61730-1.	See Table 1 and Table 2.	P
6.6.3.2 Influencing factors			
6.6.3.2.1	Pollution degree	See Table 1 Compliance checked by the required tests in IEC 61730-2	P
6.6.3.2.2	Material group	See Table 1 and 6.6.4.3	—
6.6.3.3 Creepage distance			
	Minimum values for creepage distance are in accordance with Table 3 or Table 4 of IEC 61730-1. Compliance is checked by MST 57.	See Table 1	P
6.6.3.4 Clearance			
	Clearance values are met for air gaps between conductive parts. Compliance is checked by MST 57.	See Table 1	P
	Derating factor for altitude above 2000 m is considered.		N/A
	Minimum clearance distance requirements between live parts of different potential inside the junction box are verified according to Table 3 and Table 4 of IEC 61730-1 related to the relevant working voltage.	See Table 1	N/A
6.6.4 Distance through functional and replied upon insulation			
6.6.4.1 General			
	Polymeric materials for cemented insulation parts and insulation in thin layers withstand environmental, thermal, electrical and mechanical stresses as far as they occur.		N/A
	Distances through insulation (d.t.i.) of solid insulation comply with the minimum distance as required:		N/A
	System voltage…….:		—
	Distance through insulation req./meas. (mm):		N/A
	The insulation fulfils the material classification as given in IEC 60216-1, IEC 60216-2 and IEC 60216-5 (RTE/TI/RTI).		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
6.6.4.2 Thin layers – relied upon insulation			
	Relied upon insulation in thin layers is applied at	☐ Backsheet ☐ Front sheet ☐ insulation within laminate ☐ others	—
	Frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.		N/A
	Thickness of the other insulation materials used for RUI, except glass or ceramic materials, are verified by MST 04 (insulation thickness test) and MST 16 (insulation test) after MST 12 (cut susceptibility test).		N/A
	The thickness requirement (DTI) of row 4) of Table 3 and Table 4 is fulfilled.		N/A
	For a single-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:		—
	– Minimum thickness complies with thin-layers requirements in Table 3 or Table 4 of IEC 61730-2.		N/A
	– RTE/TI/RTI complies with 6.5.2.2.3.		N/A
	– Insulation provides sufficient dielectric strength. Test voltage (2000V + 4 times system voltage) …….: V		—
	For a multiple-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:		—
	–.....Each layer providing RUI meeth the following requirements:		—
	– RTE/TI/RTI complies with 6.5.2.2.3		N/A
	– One layer meets the dielectric strength requirements for reinforced insulation; or at least two layers each meet the dielectric strength requirements for basic insulation (1 000 V + 2 times the system voltage) ….: V		N/A
	– The full construction meets the following requirements:		—
	–.....The full multilayer construction meets the following requirements:		N/A

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	– DTI value is in compliance with values according to line 4) "DTI" of Table 3 and Table 4 of IEC 61730-1.		N/A
	– Test voltage for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage) …….: V		N/A
6.6.4.3 Cemented joints			
	Cemented joints were considered as	☐ Edge seal ☐ Interface between junction box and mounting surface ☐ Others ☐ No cemented joints	N/A
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4:		—
	System voltage…….:		N/A
	Distance along cemented joints, req./meas. [mm]:		N/A
	A distance between two rigid parts other than used for junction boxes is considered as cemented joint if following requirements are met:		—
	– Neither cracks nor voids in the insulating compounds have been occurred which either by themselves or in combination		N/A
	– No breakdown at MST 16 (initial and final tests) with a 1.35 times higher test voltage occurred.		N/A
	– No breakdown at MST 17 (initial and final tests) with a 1.35 times higher test voltage occurred.		N/A
	– The electrically insulating adhesive / sealant has a volume resistivity of bigger than 50 × 10^6 Ω cm (dry) / bigger than 10 × 10^6 Ω cm (wet)		N/A
	– Peel test (MST 35) was passed (rigid / flexible or flexible / flexible)		N/A
	– Lap shear strength test (MST 36) was passed (rigid / rigid)		N/A
	A distance between two rigid parts or rigid to flexible parts used for junction boxes is considered as cemented joint if following requirement is met:		—

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	– The measured distances through cemented joints at adhesive area of junction box do not fall below the minimum values listed in Tables 3 and 4.	Verified by MST 57	N/A
	Supplement information: Above mentioned tests have to be performed for each cemented joint. Also, the materials and their properties have to be listed in annex 2		
6.6.4.4 Distance through functional insulation			
	Distance through functional insulation meets the requirements described in line 3) a) of Table 3 and Table 4 of IEC 61730-1.	See Table 1	P
	The values in line 3) b) of Table 3 and Table 4 of IEC 61730-1 is used as the following requirements are met:		—
	– the MST 57 insulation thickness test is passed		N/A
	– ☐the encapsulant meets flammability requirements, minimum HB according to IEC 60695-11-10 ☐a method to verify spacings is included in the production process		N/A

Table 1	**Clearance and creepage distances (Clause 6.6.3.3 and 6.6.3.4 of IEC 61730-1:2023) and Evaluation of clearances, creepage distances and distance through functional insulation (MST 57 of IEC 61730-2:2023)**								
Sample no.			260528190101-1						
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage [V]	Clearance[a] cl & Creepage cr [mm]			
						Required	Design	Measured (initial)	Measured (final)
Live part to enclosure	1a	Reinforced	2	IIIa	1500VDC	Cl: 19.4	Cl: 19.5	Cl: 19.5	Cl: 19.5
						Cr: 30.0	Cr: 30.3	Cr: 30.3	Cr: 30.3
Supplementary information:									
[a] List relevant position and test voltage for each clearence which is verified by Impulse voltage test according to IEC 60664-1.									

Attachment No. 1: Product photographs.

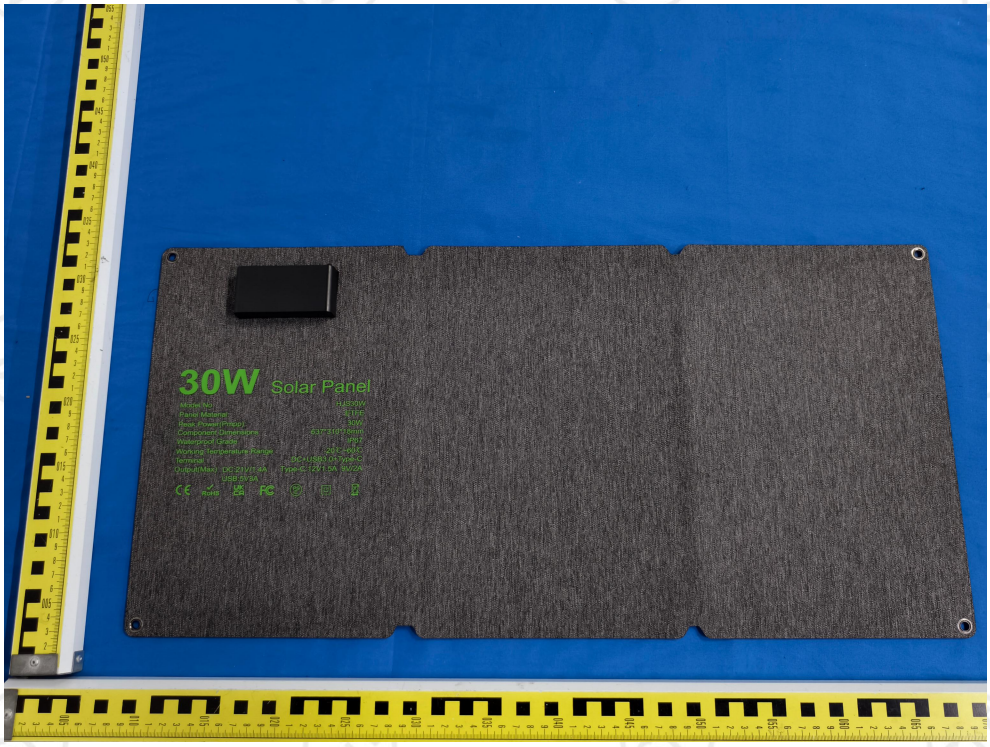

Fig.1 General View

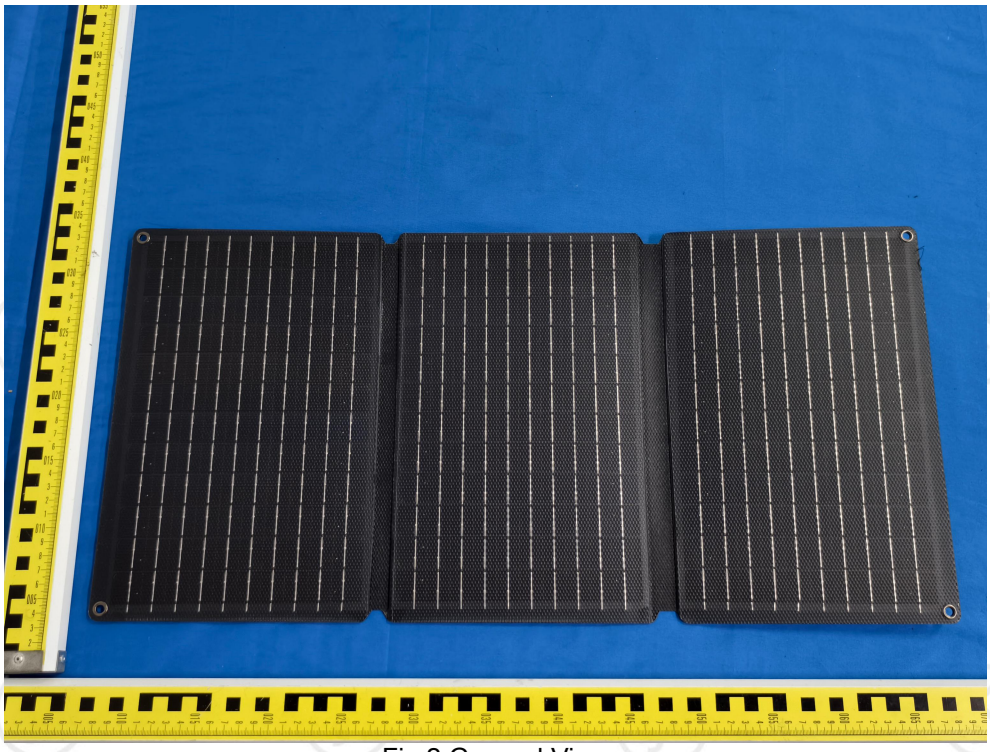

Fig.2 General View

Attachment No. 1: Product photographs.

Fig.3 General View

End of report