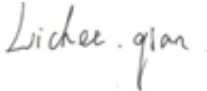




Test Report issued under the responsibility of:



TEST REPORT IEC 61730 series:2023 PV Module Safety Qualification – Part 1: Requirements for construction and Part 2: Requirements for testing	
Report Number..... :	GCTC2024WT0158-02-02
Date of issue..... :	2024-09-30
Total number of pages..... :	82
Name of Testing Laboratory preparing the Report	Guoce Testing Technology (Suzhou) Co., Ltd.
Applicant's name	PROMOD ENERJI URETIM SAN VE TIC A.S.
Address..... :	Kayseri O.S.B. Mah. 29. Cad. No.27 Melikgazi, KAYSERI, Türkiye.
Test specification:	
Standards	IEC 61730-2:2023 in conjunction with IEC 61730-1:2023
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No. :	IEC61730_2F
Test Report Form(s) Originator :	TÜV Rheinland LGA Products GmbH
Master TRF	Dated 2024-04
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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.	
This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02	
General disclaimer:	
The test 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 Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

Test item description	Photovoltaic (PV) Module(s)	
Trade Mark		
Manufacturer	PROMOD ENERJİ URETİM SAN VE TİC A.Ş.	
Address	Kayseri O.S.B. Mah. 29. Cad. No.27 Melikgazi, KAYSERİ, Türkiye.	
Model/Type reference	PRDxxx-120MTN (xxx=385-415, in steps of 5, 120 cells, 1/3 cut) PRDxxx-108MT (xxx=440-460, in steps of 5, 108 cells, 1/2 cut) PRDxxx-110MT (xxx=525-570, in steps of 5, 110 cells, 1/2 cut) PRDxxx-120MT (xxx=620-645, in steps of 5, 120 cells, 1/2 cut) PRDxxx-132MT (xxx=650-710, in steps of 5, 132 cells, 1/2 cut)	
Ratings	Max. System voltage: 1500V Maximum Over-Current Protection: 25A/30A/35A	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	CB Testing Laboratory:	Guoce Testing Technology (Suzhou) Co., Ltd.
Testing location/address		2/F., Building 11, No.18, YaoFeng East Road, Mudu, Wuzhong District, Suzhou, Jiangsu, China
☐	Associated CB Testing Laboratory:	
Testing location/address		
Tested by (name, function, signature)		Project Engineer Bin Cao 
Approved by (name, function, signature)		Reviewer Lichun Qian 
☐	Testing procedure: CTF Stage 1:	
Testing location/address		
Tested by (name, function, signature)		
Approved by (name, function, signature)		
☐	Testing procedure: CTF Stage 2:	
Testing location/address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)		

☐	Testing procedure: CTF Stage 3 or 4:		
Testing location/address:			
Tested by (name, function, signature):			
Witnessed by (name, function, signature):			
Approved by (name, function, signature):			
Supervised by (name, function, signature):			

List of attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual:	Attachment 1/ 18 pages
Drawings mechanical:	Attachment 2/ 4 pages
Circuit diagram:	/
Photographs:	Attachment 6 / 9 pages.
Component datasheets / certificates	Attachment 3: certificate of junction box, 1 page. Attachment 4: certificate of cable, 1 page. Attachment 5: certificate of connector, 1 page.
Others:	Annex 1 /List of test equipment used, 1 page. Annex 2 /Constructional details/ Bill of Material (BOM), 7 pages. Attachment 7: CDF No. GCTC2024WT0158.01, 9 pages
Summary of testing:	
Tests performed (name of test and test clause): IEC 61730-1: 2023 IEC 61730-2: 2023 All clauses were tested.	Test location: Except for the Fire Test (MST 23) and Ignitability Test (MST 24), all tests were performed in Guoce Testing Technology (Suzhou) Co., Ltd. Address:2/F., Building 11, No.18, Yao Feng East Road, Mudu, Wuzhong District, Suzhou, Jiangsu, China Fire Test (MST 23) and Ignitability Test (MST 24) were performed in National Centre of Supervision and Inspection on Solar Photovoltaic Products Quality (CPVT) at the following location: Suite A, 5 Xinhua Rd. WND 214028 Wuxi , Jiangsu, China.
Summary of compliance with National Differences (List of countries addressed): The text of IEC 61730-1:2023 was approved by CENELEC as EN 61730-1:2018 without any modification. The text of IEC 61730-2:2023 was approved by CENELEC as EN 61730-2:2018 without any modification.	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

(Note: The marking plate represents all models covered by this report except for difference in electrical ratings and model designation. See "General product information" for electrical ratings for all models. As there will be other lower wattages to be covered under same report which follows same back label format.)

PROMOD ENERJİ		Rated Max. Power (Pmax+3%)	415W	Dimensions	1755*1038*35 mm
Module type: PRD415-120MTN STC: E=1000 W/m2, AM 1.5 Tc: 25°C. 		Voltage at Pmax	36.23V	Weight	20 KG
		Current at Pmax	11.47A	Safety class	Class II
		Open-Circuit Voltage(Voc+3%)	43.27V	Standarts	IEC
		Short-Circuit Current(Isc+3%)	11.95A	 WARNING: This module produces electricity when exposed the light. Follow all applicable electrical safety precautions.	
		Maximum System Voltage	1500V		
		Maximum Overcurrent Protection Rating	25A		
PROMOD ENERJİ ÜRETİM SA. VE TİC. A.Ş. Add: Kayseri OSB mah. 29. Cad. no:27 Melikgazi / Kayseri /TÜRKİYE www.promodenerji.com					
MADE IN TURKEY					

PROMOD ENERJİ		Rated Max. Power (Pmax+3%)	550W	Dimensions	2278*1134*35 mm
Module type: PRD550-110MT STC: E=1000 W/m2, AM 1.5 Tc: 25°C. 		Voltage at Pmax	33.89V	Weight	27.5KG
		Current at Pmax	16.23A	Safety class	Class II
		Open-Circuit Voltage(Voc+3%)	40.42V	Standarts	IEC
		Short-Circuit Current(Isc+3%)	16.44A	 WARNING: This module produces electricity when exposed the light. Follow all applicable electrical safety precautions.	
		Maximum System Voltage	1500V		
		Maximum Overcurrent Protection Rating	25A		
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MADE IN TURKEY					

PROMOD ENERJİ		Rated Max. Power (Pmax+3%)	650W	Dimensions	2394*1303*35 mm
Module type: PRD650-132MT STC: E=1000 W/m2, AM 1.5 Tc: 25°C. 		Voltage at Pmax	38.00V	Weight	39.5KG
		Current at Pmax	17.11A	Safety class	Class II
		Open-Circuit Voltage(Voc+3%)	45.90V	Standarts	IEC
		Short-Circuit Current(Isc+3%)	17.99A	 WARNING: This module produces electricity when exposed the light. Follow all applicable electrical safety precautions.	
		Maximum System Voltage	1500V		
		Maximum Overcurrent Protection Rating	35A		
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MADE IN TURKEY					

PROMOD ENERJİ		Rated Max. Power (Pmax+3%)	670W	Dimensions	2394*1303*35 mm
Module type: PRD670-132MT STC: E=1000 W/m2, AM 1.5 Tc: 25°C. 		Voltage at Pmax	38.80V	Weight	39.5KG
		Current at Pmax	17.27A	Safety class	Class II
		Open-Circuit Voltage(Voc+3%)	46.70V	Standarts	IEC
		Short-Circuit Current(Isc+3%)	18.19A	 WARNING: This module produces electricity when exposed the light. Follow all applicable electrical safety precautions.	
		Maximum System Voltage	1500V		
		Maximum Overcurrent Protection Rating	35A		
PROMOD ENERJİ ÜRETİM SA. VE TİC. A.Ş. Add: Kayseri OSB mah. 29. Cad. no:27 Melikgazi / Kayseri /TÜRKİYE www.promodenerji.com					
MADE IN TURKEY					

PROMOD ENERJİ		Rated Max. Power (Pmax+3%)	710W	Dimensions	2394*1303*35 mm
Module type: PRD710-132MT STC: E=1000 W/m2, AM 1.5 Tc: 25°C. 		Voltage at Pmax	40.40V	Weight	39.5KG
		Current at Pmax	17.59A	Safety class	Class II
		Open-Circuit Voltage(Voc+3%)	48.30V	Standarts	IEC
		Short-Circuit Current(Isc+3%)	18.59A	 WARNING: This module produces electricity when exposed the light. Follow all applicable electrical safety precautions.	
		Maximum System Voltage	1500V		
		Maximum Overcurrent Protection Rating	35A		
PROMOD ENERJİ ÜRETİM SA. VE TİC. A.Ş. Add: Kayseri OSB mah. 29. Cad. no:27 Melikgazi / Kayseri /TÜRKİYE www.promodenerji.com					
MADE IN TURKEY					

Marking plates

Test item particulars..... :	
Accessories and detachable parts included in the evaluation	N/A
Mounting system used..... :	Refer to installation manual
Other options included..... :	
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)
P_{max} – Maximum power	HF – Humidity Freeze
V_{mp} – Maximum power voltage	DH – Damp Heat
I_{mp} – Maximum power current	TC– Thermal Cycling
I_{sc} – Short circuit current	α – Current temperature coefficient
V_{oc} – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m ²)	TCO – Transparent conductive oxide
MQT – Module Quality Tests	TRF – Test report form
VFM – Measured diode(s) forward voltage	VFM _{rated} – Rated diode(s) forward voltage
P_{max} (Lab) – the measured maximum power of each module	NP – Nameplate
$\bar{P}_{max}$ (Lab) – the arithmetic average of the measured maximum power of the modules	P_{max} (NP) – the minimum rated nameplate power of each module without tolerances
I_{sc} (Lab) – the measured maximum I_{sc}	V_{oc} (Lab) – the measured maximum V_{oc}
I_{sc} (NP) – the maximum rated nameplate I_{sc} without tolerances	V_{oc} (NP) – the maximum rated nameplate V_{oc} of each module without tolerances
m_1 – the measurement uncertainty in % of laboratory for P_{max}	P_{max4} (NP) – the maximum rated nameplate power of each lowest power class module, without tolerances
m_3 – the measurement uncertainty in % of laboratory for I_{sc}	m_2 – the measurement uncertainty in % of laboratory for V_{oc}
t_2 – the manufacturer's rated upper production tolerance in % for V_{oc}	t_1 – the manufacturer's rated lower production tolerance in % for P_{max}
r – P_{max} measurement reproducibility	t_3 – the manufacturer's rated upper production tolerance in % for I_{sc}
ϕV_{oc} - open-circuit voltage bifaciality coefficient	t_4 – the manufacturer's rated upper production tolerance in % for P_{max4} (NP)
ϕI_{sc} - the short circuit current bifaciality coefficient	ϕP_{max} - the maximum power bifaciality coefficient
BNPI - for bifacial modules, corresponding to 1 000 W/m ² on the module front and 135 W/m ² on the module rear	BSI - for stress on bifacial modules, corresponding to 1 000 W/m ² on the module front and 300 W/m ² on the module rear
aBSI - for stress on bifacial modules, corresponding to 1 000 W/m ² on the module front and more than 300 W/m ² or the manufacturer's claimed irradiance value on the module rear	RTE – Relative thermal endurance index
	RTI – Relative temperature index
	TI – Temperature index

$P_{\max}$	– Maximum power	HF – Humidity Freeze
Testing Dates (YYYY-MM-DD)		
Date of first test item received: 2024-05-21		
Dates of tests (beginning/end).....: 2024-05-21 / 2024-07-26		

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. The originator of this TRF acknowledges the contribution of CTL ETF-9, UL LLC, and VDE in creation of this TRF.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60060-2:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (factories)	PROMOD ENERJİ ÜRETİM SAN VE TİC A.Ş. Kayseri O.S.B. Mah. 29. Cad. No.27 Melikgazi, KAYSERİ, Türkiye.

02Error! Reference source not found.

PRODUCT ELECTRICAL RATINGS:					
Monofacial Module:					
Module type	PRD650-132MT	PRD670-132MT	PRD415-120MT	PRD550-110MT	PRD710-132MT
V_{oc} [V] /Tolerance $\pm 3\%$	45.90	46.70	43.27	40.42	48.30
V_{mp} [V]	38.00	38.80	36.23	33.89	40.40
I_{mp} [Adc]	17.11	17.27	11.47	16.23	17.59
I_{sc} [Adc] /Tolerance $\pm 3\%$	17.99	18.19	11.95	16.44	18.59
P_{max} [W] /Tolerance $\pm 3\%$	650	670	415	550	710
Maximum system voltage [V]	1500	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	35	35	25	25	35
Bifacial Module:					
	Module type	—	—	—	—
STC condition	P_{max} [W] /Tolerance	—	—	—	—
	V_{oc} [V] /Tolerance	—	—	—	—
	I_{sc} [Adc] /Tolerance	—	—	—	—
	V_{mp} [V]	—	—	—	—
	I_{mp} [Adc]	—	—	—	—
BNPI condition	P_{max} [W] /Tolerance	—	—	—	—
	V_{oc} [V] /Tolerance	—	—	—	—
	I_{sc} [Adc] /Tolerance	—	—	—	—
Bifaciality coefficient	ϕP_{max}	—	—	—	—
	ϕV_{oc}	—	—	—	—
	ϕI_{sc}	—	—	—	—
	Maximum system voltage [V]	—	—	—	—
	Maximum Over-Current Protection Rating [A]	—	—	—	—

Product Safety Ratings

Maximum systems voltage (V_{sys}) : 1500 V

Maximum over-current protection rating : 30 A

Class in accordance with IEC 61140 : See clause 5.1

Intended use (list details) : See clause 5.5

The modules are intended for a maximum operating altitude [meters above sea level] of : ≤ 2000 m

Recommended maximum series/parallel module configurations :

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 crystalline silicon PV modules | ☐ Test programs for thin-film PV modules |
| ☐ 4.2.1 Modification to frontsheet | ☐ 4.3.1 Modification to frontsheet |
| ☐ 4.2.2 Modification to encapsulation system | ☐ 4.3.2 Modification to encapsulation system |
| ☐ 4.2.3 Modification to cell technology (specific to WBT) | ☐ 4.3.3 Modification to front contact (e. g. TCO) |
| ☐ 4.2.4 Modification to cell and string interconnect material (specific to WBT) | ☐ 4.3.4 Modification to cell technology |
| ☐ 4.2.5 Modification to backsheet | ☐ 4.3.5 Modification to cell layout |
| ☐ 4.2.6 Modification to electrical termination | ☐ 4.3.6 Modification to back contact |
| ☐ 4.2.7 Modification to bypass diode | ☐ 4.3.7 Modification to edge deletion |
| ☐ 4.2.8 Modification to electrical circuitry (specific to WBT) | ☐ 4.3.8 Modification to interconnect material or technique |
| ☐ 4.2.9 Modification to edge sealing | ☐ 4.3.9 Modification to backsheet |
| ☐ 4.2.10 Modification to frame and/or mounting structure | ☐ 4.3.10 Modification to electrical termination |
| ☐ 4.2.11 Change in PV module size | ☐ 4.3.11 Modification to bypass diode |
| ☐ 4.2.12 Higher or lower output power with the identical design and size | ☐ 4.3.12 Modification to edge sealing |
| ☐ 4.2.13 Increase of over-current protection rating | ☐ 4.3.13 Modification to frame and/or mounting structure |
| ☐ 4.2.14 Increase of system voltage by more than 5% | ☐ 4.3.14 Change in PV module size |
| ☐ 4.2.15 Change in cell fixing tape or internal insulation tape (specific to WBT) | ☐ 4.3.15 Higher or lower output power with the identical design and size |
| ☐ 4.2.16 Change in label material (external nameplate label) | ☐ 4.3.16 Increase of over-current protection rating |
| ☐ 4.2.17 Change from monofacial to bifacial module | ☐ 4.3.17 Increase of system voltage |
| ☐ 4.2.18 Changes to module operating temperature | ☐ 4.3.18 Change in label material (external nameplate label) |
| ☐ 4.2.19 Changes affecting system compatibility with variants of the same model | ☐ 4.3.19 Change from monofacial to bifacial module |

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			N/A
	☒ The modules tested (modules and laminate) were prototypes of a new design and not taken from a production batch.			P
	☒ Preconditioning of test samples was performed within IEC 61215 performance testing			P
	☐ Preconditioning of test samples was performed separately from IEC 61215 performance testing			N/A
Supplementary information:				
Module group assignment:				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
13	Control	PRD670-132MT	482030I2611493	—
06	E	PRD670-132MT	482030I2612782	—
07	D	PRD670-132MT	482030I2612701	—
14	A	PRD670-132MT	482030I2610154	—
15	B	PRD670-132MT	482030I2610101	—
16			482030I2603772	
17	B1	PRD670-132MT	482029I2603879	—
18	C	PRD670-132MT	482030I2612782	—
19	F	PRD670-132MT	482030I2612701	MST22+26
47			481202I2601357	MST 26
20	G	PRD670-132MT	482028I2609409	MST 14
21	Fire test	PRD670-132MT	482029I2603422	MST 23
22	Fire test	PRD670-132MT	482029I2603380	MST 23
23	Fire test	PRD670-132MT	482029I2603623	MST 23
24	Module-Break	PRD670-132MT	482029I2603231	MST 32
25	Ignitability	PRD670-132MT	482029I2603990	MST 24
—	Peel-Reference	—	—	—
—	Lap shear	—	—	—
Remarks:—				

Note (1) Use the “General product information” field to give any information on model differences within a product type family covered by the test report and describe the range of electrical and safety ratings, if the TRF covers a type family of modules.

- Note (2)** Use Annex 2 to list the used materials and components of the module (manufacturer/supplier and type reference)
- Note (3)** The module numbers/identifiers are set in accordance to IEC 62915 Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification, Annex A3 of IEC 62915

IEC 61730 PART 1: REQUIREMENTS FOR CONSTRUCTION

5 CLASSIFICATION, APPLICATIONS AND INTENDED USE			
5.1 General			
	The module has been evaluated for the following Class (IEC 61140)	☐ Class 0 ☒ Class II ☐ Class III	—
	In relation to to this, the PV modules are marked in accordance with 6.2.2	 is marked on the external nameplate	P
5.2 PV modules of Class 0			
5.2.1 General			
	Class 0 PV modules have individual and/or system level electrical outputs at hazardous levels of voltage, current and power.	N/A	N/A
5.2.2 Insulation			
	These PV modules are provided with basic insulation only as provision for basic protection and with no provisions for fault protection. All conductive components that are not separated from hazardous live parts by at least basic insulation is treated as if they are hazardous live parts.	N/A	N/A
5.2.3 Application			
	Class 0 PV modules are intended for use in restricted access areas that are protected from public access by fences or other measures of the location that prevent general access. Such PV modules are only to be accessed by persons knowledgeable of the inherent hazards associated with their use and failure modes.	N/A	N/A
5.3 PV modules of Class II			
5.3.1 General			
	Class II PV modules have individual and/or system level electrical outputs at hazardous levels of voltage, current and power.	yes, V _{sys} 1500V	P
5.3.2 Insulation			
	These PV modules are provided with: • basic insulation as basic protection, and • supplementary insulation as precaution for fault protection, or • double insulation as basic and supplementary insulation, or reinforced insulation	Compliance is verified by successfully pass tests in IEC 61730-2	P

	Accessible conductive parts and accessible surfaces of insulation material are: • separated from hazardous live parts by double or reinforced insulation, or • designed with constructional measures which provide comparable protection	Compliance is verified by successfully pass tests in IEC 61730-2	P
	All conductive parts which are separated from hazardous live parts only by basic insulation or by constructional design means which provide comparable protection is separated from accessible surfaces by supplementary insulation. All conductive parts which are not separated from hazardous live parts at least by basic insulation shall be considered as hazardous live parts.	Compliant	P
5.3.3 Application			
	These PV modules are intended for installations where non-restricted access to the PV module and contact to insulated live parts can occur	Compliant	P
5.4 PV modules of Class III			
5.4.1 General			
	Class III PV modules do not have electrical ratings larger than: – 240 W for the maximum power point, – 35 V DC for the open-circuit voltage, and – 8 A for the short-circuit current, when tested under STC. The three maximum rating conditions shall apply concurrently	N/A	N/A
5.4.2 Insulation			
	Class III PV modules have inherently limited capability of electrical output. Based upon these electrical output limitations, no requirements for construction or insulation are given beyond functional insulation.	N/A	N/A
5.4.3 Application			
	These PV modules are intended for installations where non-restricted access to the PV module and contact to uninsulated live parts can occur. these PV modules are not combined in series strings operating at more than 35 V in Voc and do not have a system voltage rating above 35 V. These PV modules are not intended for use in parallel with other PV modules or energy sources unless their combination provides protection from reverse current and from overvoltage protection	N/A	N/A
5.5 Rating categories and special applications			
	PV modules are installed in the following special applications:		—

	Modules are intended for use in the temperature range from a lower environmental temperature of -40°C to the upper-limit set by a 98 th percentile module operating temperature of ☒ 70°C ☐ 80°C ☐ 90°C		—
	Building attached PV (BAPV)	☐ yes ☒ no	—
	Building integrated PV (BIPV)	☐ yes ☒ no	—
	Applications in areas where snow and / or wind load exceeding loads as tested in IEC 61730-2 are expected	☐ yes ☒ no	—
	For concentration levels above 3X, see IEC 62688.	☐ yes ☒ no	—
	Module-applied electronics (see IEC 62109-3).	☐ yes ☒ no	—
	other (please specify)	☐ yes, as follows: ☒ no	—
6 REQUIREMENTS FOR DESIGN AND CONSTRUCTION			
6.1 General			—
	PV module suitable for operation at a 98 th percentile module operating temperature of 70°C or less	Compliant	P
	Where applicable, materials and components comply with the safety requirements specified in the relevant IEC standards. However, compliance with the IEC standard relevant for the material and/or component does not necessarily ensure compliance with the requirements of this document	Compliance is further verified by successfully pass tests in IEC 61730-2	P
	All PV modules are suitable for operation in unprotected outdoor locations, i.e. exposed to direct and indirect (albedo) solar radiation and up to 100 % relative humidity as well as to rain.	Compliance is verified by successfully pass tests in IEC 61730-2	P
	PV modules are designed to withstand the electrical, mechanical, thermal and environmental (temperature, mechanical load, humidity, UV/weather, pollution, etc.) stresses occurring in their intended use. They do not present any danger to the user or to the environment.	Compliance is verified by successfully pass tests in IEC 61730-2 and by evaluation of materials, components' datasheets and certificates	P
	Product shipped from the factory as	☒ completely assembled ☐ subassemblies	—
	The provided subassemblies of the product do not involve any action that is likely to affect compliance with the requirements of the IEC 61730 series	No subassembly part is present.	N/A

	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form.	Yes	P
	All methods of PV module mounting and wiring that are specified in the installation instructions are evaluated for compliance with the IEC 61730 series.	Compliance is verified by successfully pass tests in IEC 61730-2	P
	The construction of a PV module is equipotential bonding continuity, and is not interrupted by installation.	IEC 61730-2, MST 13 was passed	P
	Any adjustable or movable structural part are provided with a locking device	No such part	N/A
	PV modules have no accessible burrs, sharp edges or sharp points	IEC 61730-2, MST06 was passed	P
	The parts of a PV module is prevented from loosening or turning	Compliance is verified, junction box has been qualified according to IEC 62790	P
	All electrical data to be reported in the marking or in the documentation accompanying a PV module is given for STC. For bifacial PV modules, all electrical data are shown as relative to STC, BNPI and aBSI on the front side of the module, plus bifaciality coefficients at STC	Compliance is check by MST 01 visula inspection.	P

6.2 Marking and documentation

6.2.1 General

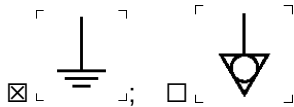
	Instructions related to safety are in an official language of the country where the equipment is to be installed.	Installation manual with English and / or Chinese.	P
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6.2.2 Marking

6.2.2.1 General

	Each PV module's nameplate includes the following clear and indelible markings together with their values, where applicable:		—
	a) Name, registered trade name, or registered trade mark of manufacturer	Written on the nameplate.	P
	b) Type or model number designation	Written on the nameplate.	P
	c) Serial number	Stuck beside the string connectors.	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	Traceable from serial number.	P
	e) "Maximum system voltage" or "V _{sys} "	Written on the nameplate.	P
	f) Class of protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Class II symbol marked on the nameplate.	P

	g) "Voltage at open-circuit" or "Voc" including manufacturing tolerances, for bifacial modules, open-circuit voltage at STC and BNPI	Written on the nameplate.	P
	h) "Current at short-circuit" or "Isc" including manufacturing tolerances, for bifacial modules, short-circuit current at STC, BNPI and aBSI	Written on the nameplate.	P
	i) "PV module maximum power" or "Pmax" including manufacturing tolerances, for bifacial modules, Pmax at STC and BNPI	Written on the nameplate.	P
	j) For bifacial modules, a clear indication which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight (> 300 W/m ²)	Monofacial module, not applicable, or Compliance is verified by MST 01 visual inspection	N/A P
	k) For flexible modules, the minimum radius of curvature	N/A or written on the nameplate	N/A P
	l) positive ("+" or downward) and negative ("- " or upward) design load ratings in pascal (Pa)	written on the nameplate	P
	m) "Maximum overcurrent protection rating"	Written on the nameplate.	P
	n) A module temperature rating of 70 °C	Written on the nameplate.	P
	o) Connector manufacturer and model used; refer to manual for designated mating connectors	Written on the nameplate.	P
	p) A link (website or QR code) to required documentation if a paper copy of the documentation required in 6.2.3 is not included with the module.	Written on the nameplate or A paper copy of the documentation required is included with the module	P N/A
	International symbols are used where applicable.	Compliance is verified by MST 01 visual inspection	P
	PV connectors or wiring are marked in accordance to IEC 62852 with a symbol "Do not disconnect under load".	Symbol and/or the warning notice is imprinted on the connector	P
	PV connectors are clearly marked indicating the terminal polarity.	The terminal polarity is imprinted on the PV connectors.	P
	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.	Written on the nameplate.	P
	PV modules are marked to indicate the class	☒ class II:  ☐ class III:  ☐ class 0: no symbol	P
	PV modules provided with a functional earth terminal shall be provided with a symbol (IEC 60417-5018:2011-07) 	No functional earth connection	N/A

	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.	Not required	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.	Not required	N/A
6.2.2.2 Symbols			
6.2.2.2.1 Equipotential bonding			
	Bonding conductor for equipotential bonding is identified with:		P
	No other terminal or location is identified in this manner	Compliance is verified by MST 01 Visual inspection	P
6.2.2.2.2 Functional earthing			
	Field installed functional earthing conductor is identified with the symbol:	No Functional earthing	N/A
6.2.3 Documentation			
6.2.3.1 General			
	Documentation concerning electrical and mechanical installation as well as their electrical, thermal, and mechanical ratings provided	Written in installation manual	P
	Class of protection against electric shock is stated, including specific limitations required for that Class.	Written in installation manual.	P
	Supplied in at least one of the official languages of the country where the PV modules will be installed.	English and/or Chinese	P
	International symbols shall be used where applicable	Compliance is verified by reviewing the documentation	P
	Assembly instructions shall be provided with a product shipped in subassemblies, and shall be detailed and adequate to the degree required to facilitate complete and safe assembly of the product.	Do not need to assemble	N/A
	The documentation contains the following information:		—
	– All information as required by 6.2.2.1 with exception of c) and d)	Written on the nameplate.	P
	– Recommended maximum series/parallel module configurations	Written on the installation manual	P
	– Temperature coefficient for open-circuit voltage	Written on module's datasheet	P
	– Temperature coefficient for maximum power	Written on module's datasheet	P
	– Temperature coefficient for short-circuit current	Written on module's datasheet	P
6.2.3.2 Suitable environmental and mounting conditions			

	The documentation shall state the environmental and mounting conditions for which the module has been qualified, which by default always include:		—
	– The maximum rated altitude the PV module is designed for; de-ratings may be applied;	Written in installation manual.	P
	– A statement indicating the negative (upward) and positive (downward) design load ratings for each mechanical means for securing the module as evaluated during the static mechanical load test according to MST 34.	Written in installation manual.	P
	– For bifacial modules, designation of which side(s) of the module have been tested for front side exposures.	Written in installation manual.	P
	– 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);	Written in installation manual and nameplate.	P
	– Guidance on geographic areas, mounting conditions and system design and installation factors where the anticipated 98 th 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)	Written in installation manual.	P
	– A statement about the factors that can increase voltage or current beyond the STC values given in the documentation.	Written in installation manual.	P
	– A statement 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.	Written in installation manual.	P
	– A statement if the the PV modules were evaluated according to the following standards, including which specific testing sequences were used.		—
	■ IEC 61701, Photovoltaic (PV) modules – Salt mist corrosion testing Include which test method used (based on corrosivity classification).	N/A	N/A
	■ IEC 62716, Photovoltaic (PV) modules – Ammonia corrosion testing Include test sequence 1 or 2 (crystalline Si or thin-film).	N/A	N/A
	■ IEC 62109-3, Safety of power converters for use in photovoltaic power systems – Part 3: particular requirements for electronic devices in combination with photovoltaic elements Include MIE Type A or B (depending on whether electronics can be tested separately from the module).	N/A	N/A

	IEC TS 63126, Guidelines for qualifying PV modules, components and materials for operation at high temperatures Include temperature Level 1 or 2 (based on selection of testing for combinations of deployment location and mounting configuration).	Level 1 or Level 2 evaluated, stated in installation manual Or Level 1 or 2 not evaluated, do not included in documentation	P
6.2.3.3. Mounting			
	Documentation shall include adequate information and instructions for each mounting method as listed in the manufacturer's mounting instructions, additionally:	Written in installation manual	P
	A statement indicating the minimum mechanical means for securing the PV module (as 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, as applicable	Written in installation manual	P
	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);	Written in installation manual	P
	if adhesives are used for mounting (i.e. for flexible modules), the type of adhesive and the allowable substrates;	Written in installation manual or No adhesives are used for mounting	P or N/A
	if adhesives are specified for use in the field to provide mechanical securement to specific roof coverings or mounting systems (such as flexible modules adhered to a roof membrane or modules adhered to metal rails), the manufacturer and unique part number of the adhesive, as well as the required surface preparation, adhesive application process, and curing conditions	Written in installation manual or No adhesives are used for mounting	P or N/A
6.2.3.4 Connectors/wiring			
	Documentation shall include a detailed description of the following information related to the connectors and wiring method:		—
	The minimum cable diameters, rated voltage, current and temperature rating of cables for PV modules intended for field wiring and that cables used need to comply with IEC 62930, type 131 or type 133; or EN 50618	Written in installation manual	P
	Any limitations on wiring methods and wire management that apply to the junction box for the PV module;	Written in installation manual	P
	A statement that wiring to interconnect modules shall be rated for the application	Written in installation manual	P
	Type of terminals for field wiring;	Written in installation manual	P

	– Specific model/types together with the manufacturer name/brand of the PV connector(s) to which the PV module connectors can be mated;	Written in installation manual	P
	– The bonding method(s) to be used (if applicable).	Written in installation manual	P
	– The type and ratings of bypass diode to be used (if applicable).	Written in installation manual	P
6.2.3.5 Fire ratings			
	– A statement indicating	☒ fire rating(s) and applied standards ☐ statement regarding resistance to external fire sources not evaluated	P
	– A statement shall also indicate the limitations to the achieved rating (e.g. installation slope, substructure or other applicable installation information)	Written in installation manual	P
	The documentation for roof mounting includes:		—
	– Specific parameter(s) when the fire rating is dependent on a specific mounting structure are provided e.g. specific spacing, or specific means of attachment to the roof or structure.	N/A or Written in installation manual	N/A P
6.3 Electrical components and insulation			
6.3.2 Internal wiring			
	Internal wiring has sufficient current carrying capacity for the relevant application.	See Table 34	P
6.3.3 External wiring and cables			
	External wires and cables fulfil the requirements of	☐ EN 50618 ☒ IEC 62930	P
6.3.4 Module overcurrent protection rating			
	Nominal fuse ratings (I_n) are typically equal to or larger than 1,4 times I_{sc} . For bifacial PV modules, the rating shall be evaluated for $I_{sc-aBSI}$	See Table 34, larger than 1.4 times I_{sc} or $I_{sc-aBSI}$	P
6.3.5 Connectors			
	External DC connectors fulfil the requirements of IEC 62852 and additional requirements in 6.5.2.2.	Connector was certified according to IEC 62852. See 6.5.2.2	P
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.	Junction box was certified according to IEC 62790. see 6.5.2.2.3	P
	Module level testing after installation and termination of the ribbons is required to validate adhesion/connection of the junction box to the module and minimum clearance and creepage distances.	See Table 27 See Table 35.1	P
6.3.7 Frontsheets and backsheets			
	Frontsheet:		—

	Material Frontsheet:	☒ Glass ☐ Polymeric material ☐ Others.	—
	Frontsheet construction (if polymeric material):	☒ single-layer constructions ☐ multilayer constructions ☐ Others.	—
	Polymeric frontsheets fulfil the requirements of IEC 62788-2-1, which includes:		—
	Breakdown voltage for complete frontsheet shall meet:		
	If a combined single-layer construction, the whole frontsheet has appropriate dielectric strength: ☐ $[V_{BD}]_{req}=1.0kV + 2 \times [V_{sys}]_{max}$ (basic insulation or Class 0 or Class III) ☒ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II)	$V_{BD}=XXX$ (complete frontsheet) Or frontsheet is glass, not applicable Or frontsheet is multilayer construction, not applicable	P or N/A
	If a multilayer construction, the adjusted value has appropriate dielectric strength: ☐ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II) ☒ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II)	$[V_{BD}]_{adj}=XXXX$ OR frontsheet is single-layer construction, not applicable OR frontsheet is glass, not applicable	P or N/A
	Each RUI layer has a thermal endurance rating via TI or RTE or RTI:		—
	For $T_{98} \leq 70^{\circ}C$, TI or RTE(RTI) $\geq 90^{\circ}C$	TI=xxx (air layer) TI=xxx (middle layer) TI=xxx (inner layer) Or frontsheet is glass, not applicable	P or N/A
	For $T_{98} \leq 80^{\circ}C$, TI or RTE(RTI) $\geq 100^{\circ}C$	n/a	n/a
	For $T_{98} \leq 90^{\circ}C$, TI or RTE(RTI) $\geq 110^{\circ}C$	n/a	n/a
	The sum of the thickness of all RUI layers (after the lamination protrusion test) shall meet: ☐ $T_{DTI}=0.15mm$ ($V_{sys}=1000V$) ☒ $T_{DTI}=0.30mm$ ($V_{sys}=1500V$)	$T_{DTI}=$ Front sheet is glass, not applicable.	P or N/A
	Adhesion to encapsulant or glass is appropriate	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
	Backsheet:		—
	Material Backsheet:	☐ Glass ☒ Polymeric material ☐ Others.	—
	Frontsheet construction (if polymeric material):	☒ single-layer constructions ☐ multilayer constructions ☐ Others.	—
	Polymeric backsheets fulfil the requirements of IEC 62788-2-1, which includes:		—
	Breakdown voltage for complete backsheet meets:		—

	If a combined single-layer construction, the whole frontsheet has appropriate dielectric strength: ☐ $[V_{BD}]_{req}=1.0kV + 2 \times [V_{sys}]_{max}$ (basic insulation or Class 0 or Class III) ☒ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II)	$V_{BD}=XXX$ (complete frontsheet) Or frontsheet is glass, not applicable Or frontsheet is multilayer construction, not applicable	P or N/A
	If a multilayer construction, the adjusted value has appropriate dielectric strength: ☐ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II) ☒ $[V_{BD}]_{req}=1.0kV + 4 \times [V_{sys}]_{max}$ (reinforced insulation or Class II)	$[V_{BD}]_{adj}=XXXX$ OR frontsheet is single-layer construction, not applicable OR frontsheet is glass, not applicable	P or N/A
	The complete sheet has a thermal endurance rating via TI or RTE or RTI:		—
	For $T_{98} \leq 70^{\circ}C$, TI or RTE(RTI) $\geq 90^{\circ}C$	☐ TI: ☐ RTI: ☐ RTE: Or backsheet is glass, not applicable	P or N/A
	For $T_{98} \leq 80^{\circ}C$, TI or RTE(RTI) $\geq 100^{\circ}C$	n/a	n/a
	For $T_{98} \leq 90^{\circ}C$, TI or RTE(RTI) $\geq 110^{\circ}C$	n/a	n/a
	The sum of the thickness of all RUI layers (after the lamination protrusion test) shall meet: ☐ $T_{DTI}=0.15mm$ ($V_{sys}=1000V$) ☒ $T_{DTI}=0.30mm$ ($V_{sys}=1500V$)	$T_{DTI}=$ backsheet is glass, not applicable.	P or N/A
	Adhesion to encapsulant or glass is appropriate	Compliance is checked 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	See 6.5.2	P
	Barrier held in place while keeping its required electrical and mechanical properties	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
	Removal of barrier only possible by using a tool	Tool is needed for removal of the insulation barrier.	P
6.3.9 Electrical connections			
6.3.9.1 General			
	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material.	Compliance is checked by MST 01	P
	Measures are taken to prevent connections becoming loose, e.g. by using a washer.	See Table 11 and Table 48	P
	End of a stranded conductor is not consolidated by soft soldering.	Relevant test of IEC 61730-2 was passed	P
	Measures are taken to prevent contact stress impairing electrical conductivity.	Relevant test of IEC 61730-2 was passed	P

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 meet the relevant requirements of IEC 62790.	Junction box set is certified according to IEC 62790.	P
	Terminals for electrical connections meet the requirements of TI, RTI or RTE: ☐ For $T_{98} \leq 70^{\circ}\text{C}$, TI or RTE(RTI) $\geq 90^{\circ}\text{C}$ ☐ For $T_{98} \leq 80^{\circ}\text{C}$, TI or RTE(RTI) $\geq 100^{\circ}\text{C}$ ☐ For $T_{98} \leq 90^{\circ}\text{C}$, TI or RTE(RTI) $\geq 110^{\circ}\text{C}$	Junction box ☐ TI: ☐ RTI: ☐ RTE:	P
	Insulated terminals are designed such that a reduction of clearances and creepage distances by displacement is prevented.	Junction box set is certified according to IEC 62790.	P
6.3.9.3 Splices and connections inside a PV module			
	Splices and connections are mechanically secured and provide electrical continuity.	No splice.	N/A
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.	Electrical connections are soldered and securely connected	P
	A soldered or conductively adhered joint is additionally mechanically secured.	A soldered is additionally mechanically secured by encapsulation	P
6.3.10 Encapsulants			
	Technical properties are sufficient for intended application.	Relevant test of IEC 61730-2 was passed.	P
	The insulation properties are able to maintain spacings	Relevant test of IEC 61730-2 was passed.	P
6.3.11 Bypass diodes			
	Bypass diodes are rated to withstand the current and voltage for their intended use.	See Table 31 and Table 46	P
6.4 Mechanical and electromechanical connections			
6.4.1 General			
	Type of connection:	☒ Connection within frame ☒ Mounting interfaces via adhesive ☒ frame to clamp a mounting system ☒ Equipotential bonding ☒ Attachment of junction box ☒ mechanical connections within the laminate:	P
	Mechanical connections are durable to withstand the thermal, mechanical, and environmental stresses occurring in the application.	See Table 38, Table 13 and Table 11	P
	Removable parts are only detachable with the aid of tools.		P

	Lids attached without screws have one or several detectable facilities for enabling tools.		P
	No contact of tools with the live parts when the lid is removed.		P
	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.	No friction between surfaces on tis own	P
6.4.2 Screw connections			
	Screws and mechanical connections withstand the mechanical stresses occurring in normal use.	No screw is used. Mechanical connections can withstand the mechanical stresses, compliance is verified by successfully past relevant tests in IEC 61730-2	P
	Screws are not made of a material which is soft or liable to creep.	No screw is used.	N/A
	Screws used to provide mechanical stability and continuity for equipotential bonding withstand the mechanical stresses occurring in normal use.	No screw is used.	N/A
	At least one screw per electrical- mechanical connection ensures the electrical connection between the metallic components	No screw is used.	N/A
	Screws used for mechanical and electrical connections with a nominal diameter of less than 3 mm are screwed into metal.	No screw is used.	N/A
	For screws used for mechanical and electrical connections two full threads are engaged into the metal.	No screw is used.	N/A
	Screwed and other fixed connections are in such a way that they do not come loose through torsion, bending stresses, vibration, etc.	No screw is used. Other fixed connections can prevent from loose from torsion, etc.	P
6.4.3 Rivets			
	Rivets which serve as electrical as well as mechanical connections are locked against loosening.	No rivets are used.	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.	No screw is used.	N/A
	No thread-forming or thread-cutting (self-tapping) screws (sheet metal screws) are used for the connection of current-carrying parts.	No screw is used.	N/A
	Thread-cutting (self-tapping) screws not be used if they are likely to be operated by the user or installer.	No screw is used.	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.	No screw is used.	N/A
	For equipotential bonding one screw is permitted if two full threads engage the metal	No screw is used.	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.	See Table 11	P
	Requirements of MST 32 and MST 34 are met, continuity of equipotential bonding (MST 13) is provided before and after the MST 32 and MST 34 tests	See Table 38, Table 39 and Table 11	P
6.4.6 Connections by adhesives			
	Type of connection by adhesive:	☒ mounting of junction box ☒ Mounting of backrails or frames ☒ fix of backsheet and/or frontsheet to edge seals ☒ fix of backsheet and/or frontsheet to the encapsulant ☒ fix of the module to a substrate relied upon for mounting	—
	Connections by adhesive for mounting means are sufficient.	See Table 38, Table 39 and Table 11	P
	Fixing of junction box by adhesive is sufficient.	See Table 27, and Table 10	P
	Adhesion of a polymer relied upon for insulation to another insulating layer is appropriate for the application.	No such part	N/A
	Requirements for adhesive materials are met	See 5.5.4	P
	Connection by adhesive which is considered as cemented joint fulfils the requirements of 5.6.4.2.	no cemented joints, not applicable	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.	See Table 6 and Table 43	P
	Other connections which are relied upon for equipotential bonding fulfil the requirements of (MST 13).	see Table 11	P
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.	compliance is verified by successfully passed tests in IEC 61730-2	P
	Polymeric materials are resistant to electrical and mechanical property degradation.	Test results see subsequent sections	P
	They comply with the requirements given in individual International Standards.	frontsheets and backseets meet requirement of IEC 62788-2-1; junction boxes are qualified according to IEC 62790 connectors are qualified according to IEC 62852 cables are qualified according to IEC 62930 or EN 50618	P
6.5.2.2 Polymeric materials used as electrical insulation			
6.5.2.2.1 General			
	Insulation function type polymeric materials serve as:	Insulation to external parts and insulation between ☒ internal live parts and accessible conductive parts ☒ live parts and accessible surfaces ☒ internal live parts at different potential	—
	A material which serves as functional insulation is appropriate according to 6.6.4.4	See 6.6.4.4	P
	A material relied upon for insulation in thin layers is appropriate for the application according to 6.6.4.2.	See 6.6.4.2	P
	Insulation do not be 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 in this document.	Relevant tests of IEC 61730-2 are passed	P
6.5.2.2.2 Endurance to electrical stress			
	Materials used as electrical insulation are able to withstand electrical stresses which occur in the application.	Relevant tests of IEC 61730-2 are passed (MST 16, MST 17, MST 14)	P
	Materials relied upon for insulation (RUI) have sufficient breakdown strength and comply with 6.6.4.2.	See 6.6.4.2 and 6.3.7	P
	A 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	Pollution degree 1 is demonstrated, materials groups are not relevant	P
6.5.2.3.3 Endurance to thermal stress – RTE (RTI) or TI (mechanical/electrical)			

	Materials used as relied upon insulation have a mechanical and electrical relative thermal endurance, relative thermal index or temperature index (RTE/RTI or TI) appropriate for the application, at least 90 °C.	see 6.3.7 and 6.3.9.2	P
6.5.2.2.4 Endurance to environmental stress			
	Polymeric materials are durable to environmental stresses occurring in the application.	Compliance is verified by successfully pass the tests of IEC 61730-2	P
	Components comply with the requirements in the individual applicable International Standards.	junction boxes are qualified according to IEC 62790 connectors are qualified according to IEC 62852 cables are qualified according to IEC 62930 or EN 50618	P
6.5.2.3 Flammability			
	PV modules are tested for their fire resistance against exposure to a fire source originating from outside the PV module	Fire class C according to UL790 has passed	P
	BIPV and BAPV are subject to specific fire-related safety requirements originating from national building codes	Not used as BIPV or BAPV	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	XXX for junction box Xxxx for frame adhesive	P
	- ignitability test in final application	See Table 37	P
6.5.2.4 Rigid polymeric materials used for mechanical functions			
	Rigid polymeric materials used for mechanical functions pass the following tests:		-
	- Mechanical strength at lower temperatures, IEC 62790:2020, 5.3.8 followed by MST 01 (visual inspection) of IEC 61730-2.	Pass or N/A	P OR N/A
	- Weather resistance test, IEC 62790:2020, 5.3.11 followed by MST 01 (visual inspection) of IEC 61730-2.	Pass or N/A	P OR N/A
	- Flammability class, IEC 60695-11-M10 (minimum V-1).	V-1 OR other level or N/A	P OR N/A
	- Ball pressure test, IEC 60695-10-2 (90 °C, < 2 mm diameter).	Pass or N/A	P OR N/A
	- RTI/RTE/TI (≥ 90 °C)	No such part or ☐ TI: ☐ RTI: ☐ RTE: (Polymeric frame)	N/A or P
6.5.3 Metallic materials			
6.5.3.1 General			

	Metallic components in PV modules are designed to withstand a minimum corrosion atmospheric category level C2 as specified in Table B.1 in ISO 9224:2012, Annex B		P
	Metal parts are not in contact to metal parts having a difference of their electrochemical potentials of more than 600 mV.		P
	Iron or mild steel are plated, painted, or enamelled for protection against corrosion.	no such part	N/A
	Corrosion protection is at least equivalent to a zinc coating of 0.015 mm thickness	no Iron or mild steel used	N/A
6.5.3.2 Current carrying parts			
	Assessed parts:	See Annex 1 product description sheet	—
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	See Table 34 See Table 11	P
	Current-carrying materials are protected against corrosion.	Relevant tests of IEC 61730-2 were passed.	P
	The coating for protective coated metal is capable of preventing corrosion according to either one of the listed standards.	☐ ISO 1456 ☐ ISO 1461 ☐ ISO 2081 ☒ ISO 2093	P
	Coated metal not used if the current-carrying parts are stressed by abrasion.	yes, compliance is verified by MST 01 visual inspection	P
6.5.4 Adhesives			
	Adhesives are appropriate for the application.	See Tables 40, Table 39, Table 27, Table 29, Table 12, and Table 10	P
	Adhesive as part of the relied upon electrical insulation meets the requirements of 6.5.2.3.3	no adhesive used as part of the relied upon electrical insulation	N/A
6.6 Protection against electric shock			
6.6.1 General			
	Adequate protection against contact with hazardous live parts provided	Relevant tests of IEC 61730-2 were passed.	P
	Specimen pose no risk of electric shock.	Relevant tests of IEC 61730-2 were passed.	P
6.6.2 Protection against accessibility to hazardous live parts			
6.6.2.1 General			
	Class of module	Class II	—
	For class 0 and Class II modules adequate protection against accessibility to hazardous live parts (> 35 V DC) provided.	See Table 12	P

Table 2 of 6.6.2.3	For Class 0 PV modules, accessible metal parts and accessible surfaces as well as live parts of different potential of the same circuit are separated by at least basic insulation.	Not applicable.	N/A
	For Class II PV modules construction provide separation between accessible parts or accessible surfaces and hazardous live parts by double or reinforced insulation.	Compliance is checked by visual inspection (MST 01) and by accessibility test (MST 11).	P
Table 2 of 6.6.2.3	For Class II PV modules, live parts of different potential of the same circuit are separated by double or reinforced insulation.	Compliant	P
	For Class III PV modules separation between accessible parts or accessible surfaces and hazardous live parts by functional insulation.	Not applicable.	N/A
Table 2 of 6.6.2.3	In Class III PV modules live parts of different polarity are separated by at least functional insulation.	Not applicable.	N/A
	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 due to their application.	See 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)	Relevant tests of IEC 61730-2 were passed.	P
	Degree of protection of the housing is not impaired by any possible deformation.	Relevant tests of IEC 61730-2 were passed.	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,	Compliance is verified by MST 01 visual inspection	P
	Tool to open the lid do not come into contact with the live parts if lid is removed correctly.		P
	Insulation barrier 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.	no insulation barrier	N/A
	Parts are prevented from loosening or turning.	Relevant tests of IEC 61730-2 were passed.	P
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.	See table 35.1	P

6.6.3 Insulation coordination			
6.6.3.1	A backsheet containing an aluminium layer is used	☐ yes ☒ no	—
	System voltage:	1500V DC	—
6.6.3.2 Influencing factors			
6.6.3.2.1	Pollution degree	I	—
6.6.3.2.2	Material group	I or II or III	—
6.6.3.3	Creepage distance (distance between internal live parts and outer accessible surface)	see table 1, 2, 3, 4	P
	Creepage distance (distance between live parts of different potential inside a PV module, if two different encapsulants used)	see table1, 2, 3, 4	P
6.6.3.4	Clearance (distance between internal live parts and outer accessible surface)	see table 1, 2, 3, 4	P
	Creepage distance (distance between live parts of different potential inside a PV module, if two different encapsulants used)	see table 1, 2, 3, 4	P
	Derating factor for altitude above 2000 m is considered	No	N/A
6.6.4 Distance through functional and relied upon insulation			
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	—
	Design requirements for frontsheets and backsheets are fulfill IEC 62788-2-1.	See 6.3.7	P
	Other materials which are used as relied upon insulation, the thickness is verified by insulation thickness test (MST 04) in the final application.	No other materials used as RUI	N/A
	Electric shock has been protected against in case of cutting stress	MST 16 insulation test after MST 12 cut susceptibility test is passed, See Table 41	P
	Polymeric materials for cemented insulation parts and insulation in thin layers shall withstand environmental, thermal, electrical and mechanical stresses as far as they occur.	See 5.5.2	P
	The thickness requirement (DTI) of row 4) of Table 3 and Table 4 is fulfilled.	See 6.3.7	P
	The RUI layers contributing to the DTI fulfil the following requirements:		—
	For a component with a single-layer construction:		—
	- RTE, RTI, or TI comply with 6.5.2.2.3.	See 6.3.7	P

	- Dielectric strength Class II (reinforced insulation): $2kV + 4 \times [V_{sys}]$ Class 0 (functional or basic insulation): $1kV + 2 \times [V_{sys}]$	Class II is applicable See 6.3.7	P
	- Minimum thickness comply with thin-layers requirements in Table 3 or Table 4 as applicable (no less than 0.3mm for 1500V DC)	See 6.3.7 See table 53.1	P
	For a component consisting of multiple layers, each layer providing RUI meet the following requirements:		—
	- RTE, RTI, or TI comply with 6.5.2.2.3.	See 6.3.7	P
	- At least one layer meets the dielectric strength requirements for reinforced insulation or at least two layers each meet the dielectric strength requirements for basic insulation	See 6.3.7	P
	For a component consisting of multiple layers, the full multilayer construction meets the following requirements:		—
	- The DTI value is in compliance with values according to line 4) "DTI" of Table 3 and Table 4.	See 6.3.7	P
	- The dielectric strength of the construction adjusted by taking the percentage of the measured value equal to the percentage of thickness of RUI layers making up the full thickness of the component; this adjusted value have appropriate dielectric strength according to Table 2: Class II (reinforced insulation): $2kV + 4 \times [V_{sys}]$; Class 0 or III (functional or basic insulation): $1kV + 2 \times [V_{sys}]$	See 6.3.7	P
6.6.4.3 Cemented joints			
	Cemented joints were considered as	☐ Edge seal ☐ Interface between Junction Box and mounting surface ☐ others No such part	N/A
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4:	No such part	N/A
	System voltage.....:	See safety ratings	N/A
	Distance along cemented joints req./meas. (mm):	N/A	N/A
	A distance can be 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 reduces the distances through the cemented joint below the required values.	N/A	N/A
	- No breakdown at MST 16 (initial and final test) with a 1,35 times higher tests voltage:	N/A	N/A

	Test voltage (V):	N/A	—
	No breakdown at MST 17 (initial and final test) with a 1,35 times higher tests voltage:	N/A	N/A
	Test voltage (V):	N/A	—
	The electrically insulating adhesive/sealant have a volume resistivity:	N/A	—
	- of greater than $50 \times 10^6 \Omega \text{ cm}$ (dry)	N/A	N/A
	- and greater than $10 \times 10^6 \Omega \text{ cm}$ (wet).	N/A	N/A
	☐ rigid / rigid: lap shear test MST 36 ☐ rigid / flexible: peel test MST 35	N/A	N/A
	A distance can be considered as cemented joint used for junction boxes if the following requirements is fulfilled:		—
	- distance through cemented joints at adhesive area of junction box	N/A	N/A
	Supplement information: Above mentioned tests must be performed for each cemented joint. Also, the materials and their properties have to be listed in Constructional Data Form (CDF) attached to this report with same file no.		
6.6.4.4	Distance through functional insulation		—
	functional insulation is applied at	☒ encapsulant ☐ others	—
	Type of encapsulants is used?	☒ two different encapsulants ☐ one encapsulant	—
	If one encapsulant is used, the minimum distance between live parts of different potential complies with the following requirements concerning thickness described in table 3 or 4 row 3 (minimum 0.2 mm)	See Table 1, Table 2 or N/A	P OR N/A
	If two different encapsulants are used, the minimum distance between live parts of different potential complies with the following requirements concerning thickness described in table 3 or 4 row 2 (Minimum 0.2mm (if pollution degree I))	See Table 1, Table 2 or N/A	P OR N/A

5.6.3.4: Clearance and creepage distances									
Table 1: Design evaluation									
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage	Clearance cl (mm)		Creepage cr (mm)	
						Required	Design ^a	Required	Design ^a
Position 1: Internal live parts and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500VDC	10.4	10.4	10.4	10.4
Position 2: Live parts of different potential inside a PV module	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	<35VDC	0.1	10.4	0.2	10.4
Position 3: DTFI	3	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	<35VDC	n/a	n/a	0.2	n/a
Position 4: Thin films	4	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	1500VDC	0.3	xx	0.3	xx
Position 5: Cemented joint	5	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	n/a	n/a	n/a	n/a	n/a
Supplementary information see photographs/drawings/illustrations on annex 4									
^a List relevant position and test voltage for each clearance which is verified by impulse voltage test according to IEC 60664-1:									

5.6.3.4: Clearance and creepage distances									
Table 2: PV module evaluation MST 01 initial									
Sample #:									
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3 or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage	Clearance cl (mm)		Creepage cr (mm)	
						Required	Meas. ^a / sample #	Required	Meas. ^a / sample #
Position 1: Internal live parts and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500VDC	10.4	10.4	10.4	10.4
Position 2: Live parts of different potential inside a PV module	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	<35VDC	0.1	10.4	0.2	10.4
Position 3: DTFI	3	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	<35VDC	n/a	n/a	n/a	n/a
Position 4: Thin films	4	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	1500VDC	0.3	xx	0.3	xx
Position 5: Cemented joint	5	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa	n/a	n/a	n/a	n/a	n/a
Supplementary information see photographs/drawings/illustrations on annex 4									
^a Report the smallest measured distance and sample #. List relevant position and test voltage for each clearance which is verified by impulse voltage test according to IEC 60664-1, Impulse voltage test (16kV) is conducted									

5.6.3.4: Clearance and creepage distances							
Table 3: PV module evaluation MST 01 final							
Sample #: 06,07,13,14,15,16,17,18,19,20,21,22,23							
Clearance (cl) and creepage distance	Line of table 3 or 4	Type of insulation	Pollution degree	CTI Material	Working voltage	Clearance cl (mm)	Creepage cr (mm)

(cr) at/of/between:				group		Required	Meas. ^a	Required	Meas.
Position 1:		☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500V	19.4	—	10.4	12.41
Position 2:		☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500V	11.0	—	5.2	1.42
Position 3:		☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500V	19.4	—	10.4	—
Position 4:		☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500V	3.5	—	3.5	—
		☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa					
		☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa					
		☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2 ☐ 3	☐ I ☐ II ☐ IIIa					

Supplementary information see photographs/drawings/illustrations on annex xxxx

^a List relevant position and test voltage for each clearance which is verified by impulse voltage test according to IEC 60664-1:

IEC 61730 PART 2: REQUIREMENTS FOR TESTING

8 TESTING
TEST SEQUENCES SEE IEC 61730-2
Deviations from test sequence are possible but must be documented. See also table 5-

10 TEST PROCEDURES			
10.1 General: Safety qualification testing included the following Module Safety Tests (MST) of IEC 61730-2			
Initial Testing			
10.2	MST 01 – Visual inspection	See appended Table 6	P
10.3	MST 02 - Performance at STC	See appended Table 7	P
10.4	MST 03 – Maximum power determination	See appended Table 8	P
10.13	MST 16 – Insulation test	See appended Table 9	P
10.14	MST 17 – Wet leakage current test	See appended Table 10	P
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test	See appended Table 12	P
Sequence A			
10.26	MST 37 – Materials creep test	See appended Table 13	P
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test	See appended Table 12	P
Sequence B			
10.30	MST 53 – Damp heat test 200h	See appended Table 14	P
10.31	MST 54 – UV test 60kWh/m ²	See appended Table 15	P
10.29	MST 52 – Humidity freeze test	See appended Table 16	P
10.31	MST 54 – UV test 60kWh/m ²	See appended Table 17	P
10.29	MST 52 – Humidity freeze test	See appended Table 18	P
Sequence B1			
10.32	MST 55 – Cold conditioning	See appended Table 19	P
10.33	MST 56 – Dry heat conditioning	See appended Table 20	P
10.29	MST 52 – Humidity freeze test	See appended Table 21	P
10.32	MST 55 – Cold conditioning	See appended Table 22	P
10.29	MST 52 – Humidity freeze test	See appended Table 23	P

Sequence C			
10.31	MST 54 – UV test 15kWh/m ² :	See appended Table 24	P
10.28	MST 51 – Thermal cycling 50 test..... :	See appended Table 25	P
10.29	MST 52 – Humidity freeze test :	See appended Table 26	P
10.27	MST 42 – Robustness of terminations test :	See appended Table 27	P
Sequence D			
10.30	MST 53 – Damp heat test :	See appended Table 28	P
10.23	MST 34 – Static mechanical load test :	See appended Table 29	P
Sequence E			
10.28	MST 51 – Thermal cycling 200 test..... :	See appended Table 30	P
Sequence F			
10.19	MST 25 – Bypass diode thermal test :	See appended Table 31	P
10.16	MST 22 – Hot-spot endurance Test :	See appended Table 33	P
10.20	MST 26 – Reverse current overload test..... :	See appended Table 34	P
Sequence G1			
10.12	MST 14 – Impulse voltage test..... :	See appended Table 35	P
Sequence G2			
10.34	MST 57 - Evaluation of insulation coordination	See appended Table 35.1	P
Other tests			
10.17	MST 23 – Fire Test..... :	See appended Table 36	P
10.18	MST 24 – Ignitability test :	See appended Table 37	P
10.21	MST 32 – Module breakage test :	See appended Table 38	P
10.24	MST 35 – Peel test..... :	See appended Table 39	N/A
10.25	MST 36 – Lap shear strength test :	See appended Table 40	N/A
Final Testing			
10.10	MST 12 – Cut susceptibility test :	See appended Table 41	P
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test :	See appended Table 12	P
10.4	MST 03 – Maximum power determination..... :	See appended Table 42	P
10.1	MST 01 – Visual inspection..... :	See appended Table 43	P
10.6	MST 05 – Durability of markings :	See appended Table 44	P
10.7	MST 06 – Sharp edge test :	See appended Table 45	P
10.8	MST 07 – Bypass diode functionality test :	See appended Table 46	P
10.22	MST 33a – General screw connections test :	See appended Table 47	N/A
10.22	MST 33b – Locking Screw connections test :	See appended Table 48	N/A

10.5	MST 04 – Insulation thickness test..... :	See appended Table 49	P
Supplementary information: None.			

Table 5: Overview of MST items for each test sample															
MST item	Sample No.														
	06	07	14	13	15	16	17	18	19	20	21	22	23	24	47
Control module				X											
MST 01 – Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MST 02 – Performance at STC				X											
MST 03 – Maximum power determination	X	X	X	X	X	X	X	X	X	X					X
MST 04 – Insulation thickness test					X	X									
MST 05 – Durability of markings	X	X		X	X	X	X	X	X						
MST 06 – Sharp edge test	X	X		X	X	X	X	X	X						
MST 07 – Bypass diode functionality test	X	X		X	X	X	X	X							
MST 11 – Accessibility test	X	X	X		X	X	X								
MST 12 – Cut susceptibility test	X	X			X	X	X	X							
MST 13 – Continuity test of equipotential bonding	X	X	X		X	X	X	X							
MST 14 – Impulse voltage test										X					
MST 16 – Insulation test	X	X	X		X	X	X	X	X	X					
MST 17 – Wet leakage current test	X	X	X		X	X	X	X	X						
MST 21 – Temperature Test															
MST 22 – Hot-spot endurance Test									X						
MST 23 – Fire Test											X	X	X		
MST 24 – Ignitability test															
MST 25 – Bypass diode thermal test									X						
MST 26 – Reverse current overload test									X						X
MST 32 – Module breakage test														X	
MST 33 – Screw connections test															
MST 34 – Static mechanical load test		X													
MST 35 – Peel test															
MST 36 – Lap shear strength test:															
MST 37 – Materials creep test:			X												

MST 42 – Robustness of terminations test								X							
MST 51 – Thermal cycling test 50								X							
MST 51 - Thermal cycling test 200	X														
MST 52 – Humidity freeze test					X	X		X							
MST 53 – Damp heat test 200 h					X	X									
MST 53 – Damp heat test 1000 h		X													
MST 54 – UV test 15 KWh/m ²								X							
MST 54 – UV test 60 KWh/m ²					X	X									
MST 55 – Cold conditioning						X	X								
MST 56 – Dry heat conditioning							X								
<u>Legend:</u> X Test performed,															

Table 6: MST 01 - Initial Visual inspection			
Test Date (YYYY-MM-DD)		2024-05-21	—
Sample # 06	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 07	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 13	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 14	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 15	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 16	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 17	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 18	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 19	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 20	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 21	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 22	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
	Findings	☐ Yes ☒ No	P

Sample # 23	Nature and position of findings – comments or attach photos	No visual defects found	—
Supplementary information: For creepage distances and clearances see Table 1, Table 2, Table 3 and Table 4			

Table 7: MST 02 - Performance at STC							
Sample..... :				13		—	
Test Date [YYYY-MM-DD]..... :				2024-05-22		—	
Irradiance (W/m2)..... :				1000		—	
Module temperature (°C)..... :				25		—	
Test method..... :				☒ Simulator ☐ Natural sunlight		—	
Rated Isc including manufacturing tolerances..... :				—		—	
Rated Voc including manufacturing tolerances ... :				—		—	
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
13	18.30	46.21	16.59	39.86	661.4	78.19	—
Supplementary information:—							

Table 8: MST 03 - Maximum power determination-Front							
Test Date [YYYY-MM-DD]..... :				2024-05-22		—	
Irradiance (W/m2)..... :				1000		—	
Module temperature (°C)..... :				25		—	
Test method..... :				☒ Simulator ☐ Natural sunlight		—	
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
06	18.30	46.19	16.51	39.96	659.6	78.04	—
07	18.31	46.29	16.60	40.02	664.3	78.37	—
14	18.30	46.18	16.62	39.84	662.3	78.34	—
15	18.30	46.18	16.65	39.84	663.2	78.48	—
16	18.38	46.19	16.64	39.84	663.1	78.09	—
17	18.31	46.16	16.63	39.82	662.4	78.37	—
18	18.29	46.23	16.62	39.88	662.7	78.38	—
19	18.32	45.80	16.71	39.53	660.5	78.71	—
47	18.44	46.02	17.10	39.75	679.6	80.11	—
20	18.35	46.08	16.62	39.80	661.5	78.22	—
21	18.25	45.76	16.65	39.48	657.3	78.70	—
22	18.23	45.78	16.62	39.49	656.2	78.64	—
23	18.32	45.80	16.70	39.51	659.7	78.64	—
24	18.30	45.75	16.64	39.47	656.7	78.46	—
25	18.31	45.81	16.66	39.51	658.3	78.49	—

Supplementary information: —

Table 8: MST 03 - Maximum power determination-Back							
Test Date [YYYY-MM-DD]			—				—
Irradiance (W/m2)			—				—
Module temperature (°C)			—				—
Test method			☐ Simulator ☐ Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: —							

Table 9: MST 16 - Initial Insulation test					
Test Date (YYYY-MM-DD)..... :			2024-05-23		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
06	33830	≥12.86	—	No	P
07	32150	≥12.86	—	No	P
14	25830	≥12.86	—	No	P
15	32070	≥12.86	—	No	P
16	21710	≥12.86	—	No	P
17	25090	≥12.86	—	No	P
18	27870	≥12.86	—	No	P
19	12390	≥12.86	—	No	P
Supplementary information: Size of module [m²]					

Table 10: MST 17 - Initial Wet leakage current test			
Test Date (YYYY-MM-DD)		2024-05-23	—
Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm)		< 3500 Ω cm at 22 ± 2°C	—
Solution temperature (°C)		22.7	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
06	5329	≥12.86	P
07	6233	≥12.86	P
14	7385	≥12.86	P
15	5797	≥12.86	P
16	5282	≥12.86	P
17	6392	≥12.86	P
18	5711	≥12.86	P
Supplementary information: Size of module [m²]			

Table 11: MST 13 - Continuity test of equipotential bonding		
Test Date Initial examination (YYYY-MM-DD)		2024-05-23
Test Date Final examination (YYYY-MM-DD)		2024-05-23 (06#,07#,14#-18#)
Maximum over-current protection rating (A)		30
Current applied (A)		75
Location of designated grounding point.....		At the side of longer side

Location of second contacting point		A:Adjacent (connected) exposed conductive component with the greatest physical displacement from the grounding point. B:Adjacent longer side grounding point. C:Adjacent shorter side grounding point.		—
Sample #	Position in test sequence:	Voltage [V]	Resistance [Ω]	
06	Initial examination	A:0.0347 B:0.0245 C:0.0225	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 51, MST 12	—	—	—
	Final examination	A:0.0346 B:0.0253 C:0.0224	A:0.0005 B:0.0003 C:0.0003	P
07	Initial examination	A:0.0352 B:0.0231 C:0.0218	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 53, MST 34, MST 12	—	—	—
	Final examination	A:0.0339 B:0.0255 C:0.0212	A:0.0005 B:0.0003 C:0.0003	P
14	Initial examination	A:0.0343 B:0.0262 C:0.0239	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 37	—	—	—
	Final examination	A:0.0341 B:0.0241 C:0.0223	A:0.0005 B:0.0003 C:0.0003	P
15	Initial examination	A:0.0339 B:0.0241 C:0.0225	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 53, MST 54, MST 52, MST 12	—	—	—
	Final examination	A:0.0351 B:0.0262 C:0.0231	A:0.0005 B:0.0003 C:0.0003	P
16	Initial examination	A:0.0341 B:0.0253 C:0.0239	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 53, MST 54, MST 52, MST12	—	—	—
	Final examination	A:0.0338 B:0.0258 C:0.0226	A:0.0005 B:0.0003 C:0.0003	P

17	Initial examination	A:0.0334 B:0.0247 C:0.0226	A:0.0004 B:0.0003 C:0.0003	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST 12	—	—	—
	Final examination	A:0.0342 B:0.0261 C:0.0229	A:0.0005 B:0.0003 C:0.0003	P
18	Initial examination	A:0.0362 B:0.0246 C:0.0221	A:0.0005 B:0.0003 C:0.0003	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12	—	—	—
	Final examination	A:0.0350 B:0.0256 C:0.0224	A:0.0005 B:0.0003 C:0.0003	P
Supplementary information:—				

Table 12: MST 11 - Accessibility test

Test Date Initial examination (YYYY-MM-DD)...		2024-05-23 (06#,07#,14-18#)	—
Test Date Final examination (YYYY-MM-DD)...		2024-07-20 (06#,07#,15-18#)	—
Sample #	Position in test sequence:		
06	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 51, MST 12	—	—
	Final examination, access?	☒ Yes ☐ No	P
07	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 53, MST 34, MST 12	—	—
	Final examination, access?	☒ Yes ☐ No	P
14	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 37	—	—
	Final examination, access?	☒ Yes ☐ No	P
15	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 53, MST 54, MST 52, MST 12	—	—
	Final examination, access?	☒ Yes ☐ No	P
16	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 53, MST 54, MST 52, MST12	—	—
	Final examination, access?	☒ Yes ☐ No	P
17	Initial examination, access?	☒ Yes ☐ No	P

	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST 12	—	—
	Final examination, access?	☒ Yes ☐ No	P
18	Initial examination, access?	☒ Yes ☐ No	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12	—	—
	Final examination, access?	☒ Yes ☐ No	P
Supplementary information:—			

SEQUENCE A			
Sample #	14		—
Table 13: MST 37 - Materials creep test			
Test Date (YYYY-MM-DD) start/end	2024-05-25 / 2024-06-01		—
Duration [h]	200		—
Applied temperature [°C]	105±5		—
MST 01: Visual inspection after materials creep test			—
Test Date (YYYY-MM-DD)	2024-06-01		—
Findings	☐ Yes ☒ No		P
Nature and position of findings – comments or attach photos	No visual defects found		—
Supplementary information: For clearance and creepage distances see table XYZ			
MST 16: Insulation test after materials creep test			—
Test Date (YYYY-MM-DD)	2024-06-01		—
Test Voltage applied (V, dc)	8000/1500		—
Sample #	Measured	Required	Dielectric breakdown
			Result

	MΩ	MΩ	Yes (description)	No	
14	29060	≥12.86	—	No	P
MST 17: Wet leakage current test after materials creep test					—
Test Date (YYYY-MM-DD)			2024-06-01		—
Test Voltage applied (V, dc)			1500		—
Solution resistivity (Ω cm)			< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C)			22.8		—
Sample #		Measured(MΩ)	Required (MΩ)		Result
14		6329	≥12.86		P
Supplementary information:—					

SEQUENCE B					
Sample #	15,16				—
Table 14: MST 53 - Damp heat test					
Test Date (YYYY-MM-DD) start/end		2024-05-24 / 2024-06-01			—
Duration [h]		200			—
MST 01: Visual inspection after Damp heat test					—
Test Date (YYYY-MM-DD)		2024-06-01			—
Findings		☐ Yes..... ☒ No			P
Nature and position of findings – comments or attach photos		No visual defects found			—
MST 16: Insulation test after Damp heat test					—
Test Date (YYYY-MM-DD)		2024-06-01			—
Test Voltage applied (V, DC)		8000/1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
15	21770	≥12.86	—	No	P
16	23519	≥12.86	—	No	P
Supplementary information:—					

Table 15: MST 54 - UV test					
Test Date (YYYY-MM-DD) start/end		2024-06-03/ 2024-06-19			—
Module temperature [°C]		60.2			—
Irradiation total [kWh/ m²]		60.0			—
Open circuits		☐ Yes ☒ No			P
MST 01: Visual inspection after UV test					—
Test Date (YYYY-MM-DD)		2024-06-19			—
Findings		☐ Yes..... ☒ No			P
Nature and position of findings – comments or attach photos		No visual defects found			—
MST 16: Insulation test after UV test					—
Test Date (YYYY-MM-DD)		2024-06-19			—
Test Voltage applied (V, DC)		1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
15	23880	≥12.86	—	No	P
16	21520	≥12.86	—	No	P
Supplementary information: —					

Table 16: MST 52 -Humidity freeze test					
Test Date (YYYY-MM-DD) start/end			2024-06-20/2024-06-30		—
Total cycles (10)			10		—
Open circuits			☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test					
Test Date (YYYY-MM-DD)			2024-06-30		—
Findings			☐ Yes..... ☒ No		P
Nature and position of findings – comments or attach photos			No visual defects found		—
MST 16: Insulation test after Humidity freeze test					
Test Date (YYYY-MM-DD)			2024-06-30		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
15	30760	≥12.86	—	No	P
16	28710	≥12.86	—	No	P
Supplementary information:—					

SEQUENCE B1					
Sample #	17				—
Table 19: MST 55 - Cold conditioning					
Test Date (YYYY-MM-DD) start/end			2024-05-24/2024-05-26		—
Temperature [°C] Duration [h]			-40 / 48		—
MST 01: Visual inspection after Cold conditioning					
Test Date (YYYY-MM-DD)			2024-05-26		—
Findings			☐ Yes..... ☒ No		P

Nature and position of findings – comments or attach photos			No visual defects found		—	
MST 16: Insulation test after Cold conditioning					—	
Test Date (YYYY-MM-DD)			2024-05-26		—	
Test Voltage applied (V, DC)			8000/1500		—	
Sample #	Measured	Required	Dielectric breakdown		Result	
	MΩ	MΩ	Yes (description)	No		
17	23210	≥12.86	—		No	P
Supplementary information: —						

Table 20: MST 56 - Dry heat conditioning					
Test Date (YYYY-MM-DD) start/end			2024-05-27/2024-06-04		—
Temperature [°C] Duration [h]			105±5/ 200		—
MST 01: Visual inspection after Dry heat conditioning					—
Test Date (YYYY-MM-DD)			2024-06-04		—
Findings			☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos			No visual defects found		—
MST 16: Insulation test after Dry heat conditioning					—
Test Date (YYYY-MM-DD)			2024-06-04		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
17	25970	≥12.86	—	No	P
Supplementary information:—					

Table 21: MST 52 - Humidity freeze test		
Test Date (YYYY-MM-DD) start/end	2024-06-05/2024-06-15	—
Total cycles (10)	10	—
Open circuits	☐ Yes ☒ No	P
MST 01: Visual inspection after Humidity freeze test		—
Test Date (YYYY-MM-DD)	2024-06-15	—
Findings	☐ Yes..... ☒ No	P
Nature and position of findings – comments or attach photos	No visual defects found	—
MST 16: Insulation test after Humidity freeze test		—
Test Date (YYYY-MM-DD)	2024-06-15	—

Test Voltage applied (V, DC): 8000/1500			—		
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
17	30280	≥12.86	—	No	P
Supplementary information:—					

Table 22: MST 55 - Cold conditioning

Test Date (YYYY-MM-DD) start/end.....:			2024-06-17/2024-06-19		—
Temperature [°C] / Duration [h]			-40 / 48		—
MST 01: Visual inspection after Cold conditioning					—
Test Date (YYYY-MM-DD)			2024-06-19		—
Findings			☐ Yes..... ☒ No		P
Nature and position of findings – comments or attach photos			No visual defects found		—
MST 16: Insulation test after Cold conditioning					—
Test Date (YYYY-MM-DD)			2024-06-19		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
17	31060	≥12.86	—	No	P
Supplementary information:—					

Table 23: MST 52 - Humidity freeze test

Test Date (YYYY-MM-DD) start/end.....:		2024-06-20/2024-06-30		—	
Total cycles (10)		10		—	
Open circuits		☐ Yes ☒ No		P	
MST 01: Visual inspection after Humidity freeze test					—
Test Date (YYYY-MM-DD)		2024-06-30		—	
Findings		☐ Yes..... ☒ No		P	
Nature and position of findings – comments or attach photos		No visual defects found		—	
MST 16: Insulation test after Humidity freeze test					—
Test Date (YYYY-MM-DD)		2024-06-30		—	
Test Voltage applied (V, DC)		8000/1500		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
17	25880	≥12.86	—	No	P

MST 17: Wet leakage current test after humidity freeze test			—
Test Date (YYYY-MM-DD)		2024-06-30	—
Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm)		< 3500 Ω cm at 22 ± 2°C	—
Solution temperature (°C).....		22.8	—
Sample #	Measured(MΩ)	Required (MΩ)	Result
17	9388	≥12.86	P
Supplementary information:—			

SEQUENCE C					
Sample #	18				—
Table 24: MST 54 - UV test					
Test Date (YYYY-MM-DD) start/end		2024-05-24/2024-05-28			—
Module temperature [°C]		60.2			—
Irradiation total [kWh/ m²]		15.0			—
Open circuits		☐ Yes ☒ No			P
MST 01: Visual inspection after UV test					—
Test Date (YYYY-MM-DD)		2024-05-28			—
Findings		☐ Yes..... ☒ No			P
Nature and position of findings – comments or attach photos		No visual defects found			—
MST 16: Insulation test after UV test					—
Test Date (YYYY-MM-DD)		2024-05-28			—
Test Voltage applied (V, DC)		8000/1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
18	22790	≥12.86	—	No	P
Supplementary information:—					

Table 25: MST 51 - Thermal cycling test					
Test Date (YYYY-MM-DD) start/end			2024-05-29/2024-06-06		—
Total cycles (50)			50		—
Applied current (A)			18.3 / 0.1		—
Limiting voltage (V)			—		—
Open circuits			☐ Yes ☒ No		
MST 01: Visual inspection after Thermal cycling test					—
Test Date (YYYY-MM-DD)			2024-06-06		—
Findings			☐ Yes ☒ No		P
Nature and position of findings – comments or attach photos			No visual defects found		—
MST 16: Insulation test after Thermal cycling test					—
Test Date (YYYY-MM-DD)			2024-06-06		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
18	24980	≥12.86	—	No	P
Supplementary information:—					

Table 26: MST 52 - Humidity freeze test					
Test Date (YYYY-MM-DD) start/end			2024-06-07/2024-06-17		—
Total cycles (10)			10		—
Open circuits			☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test					—
Test Date (YYYY-MM-DD)			2024-06-17		—
Findings			☐ Yes..... ☒ No		P
Nature and position of findings – comments or attach photos			No visual defects found		—
MST 16: Insulation test after Humidity freeze test					—
Test Date (YYYY-MM-DD)			2024-06-17		—
Test Voltage applied (V, DC)			8000/1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
18	21290	≥12.86	—	No	P
Supplementary information:—					
MST 17: Wet leakage current test after humidity freeze test					—
Test Date (YYYY-MM-DD)			2024-06-17		—

Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm)		< 3500 Ω cm at $22 \pm 2^\circ\text{C}$	—
Solution temperature ($^\circ\text{C}$)		22.9	—
Sample #	Measured($\text{M}\Omega$)	Required ($\text{M}\Omega$)	Result
18	7038	≥ 12.86	P
Supplementary information:—			

Table 27: MST 42 - Robustness of terminations test

Test Date (YYYY-MM-DD)		2024-06-18	—
MQT 14.1: Retention of junction box on mounting surface			
Supplementary information:			
MST 01: Visual inspection after retention of junction box on mounting surface			
Test Date (YYYY-MM-DD)		2024-06-18	—
Findings		☐ Yes..... ☒ No	P
Nature and position of findings – comments or attach photos		No visual defects found	—
MST 17: Wet leakage current test after retention of junction box on mounting surface			
Test Date (YYYY-MM-DD)		2024-06-18	—
Test Voltage applied [V]		1500	—
Solution resistivity (Ω cm)		< 3500 Ω cm at $22 \pm 2^\circ\text{C}$	—
Solution temperature ($^\circ\text{C}$)		23.1	—
Sample #	Measured($\text{M}\Omega$)	Required ($\text{M}\Omega$)	Result
18	8211	≥ 12.86	P
Supplementary information:—			

SEQUENCE D					
Sample #	07				—
Table 28: MST 53 - Damp heat test					
Test Date (YYYY-MM-DD) start/end		2024-06-04/2024-07-16			—
Total hours (1000)		1000			—
MST 01: Visual inspection after damp heat test					—
Test Date (YYYY-MM-DD)		2024-07-16			—
Findings		☐ Yes..... ☒ No			P
Nature and position of findings – comments or attach photos		No visual defects found			—
MST 16: Insulation test after damp heat test					—
Test Date (YYYY-MM-DD)		2024-07-16			—
Test Voltage applied (V, DC)		8000/1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
07	20760	≥12.86	—	No	P
Supplementary information:—					
MST 17: Wet leakage current test after damp heat test					—
Test Date (YYYY-MM-DD)		2024-07-16			—
Test Voltage applied (V, dc)		1500			—
Solution resistivity (Ω cm)		< 3500 Ω cm at 22 ± 2°C			—
Solution temperature (°C)		22.5			—
Sample #	Measured(MΩ)		Required (MΩ)		Result
07	8399		≥12.86		P
Supplementary information:—					

Table 29: MST 34 - Static mechanical load test				
Test Date (YYYY-MM-DD)		2024-07-17		—
Mounting method		Clamps mounting (4 points)		—
Design Load [Pa] / Safety factor γm.....		Front side: 2400/1.5 Back side: 1600/1.5		—
Load applied to.....		front side	back side	—
Mechanical load [Pa].....		3600	2400	—
First cycle time (start/end)		1h	1h	—
Intermittent open-circuit (yes/no)		No	No	
Second cycle time (start/end)		1h	1h	—
Intermittent open-circuit (yes/no)		No	No	

Third cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	
Supplementary information: Maximum bending at module centre xx mm.			
MST 01: Visual inspection after Static mechanical load test			—
Test Date (YYYY-MM-DD)	2024-07-17		—
Findings	☐ Yes ☒ No		P
Nature and position of findings – comments or attach photos	No major visual defects found		—
MST 16: Insulation test after Static mechanical load test			—
Test Date (YYYY-MM-DD)	2024-07-17		—
Test Voltage applied (V, DC)	8000/1500		—
Sample #	Measured	Required	Dielectric breakdown
	MΩ	MΩ	Yes (description) No
07	19830	≥12.86	— No P
MST 17: Wet leakage current test after Static mechanical load test			—
Test Date (YYYY-MM-DD)	2023-10-25		—
Test Voltage applied (V, dc)	1500		—
Solution resistivity (Ω cm)	< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C)	22.8		—
Sample #	Measured(MΩ)	Required (MΩ)	Result
07	7023	≥12.86	P
Supplementary information:—			

SEQUENCE E		
Sample #	06	—
Table 30: MST 51 - Thermal cycling test		
Test Date (YYYY-MM-DD) start/end	2024-06-04/2024-07-06	—
Total cycles (200)	200	—
Applied current (A)	18.3/ 0.1	—
Limiting voltage (V)	—	—

Open circuits		☐ Yes ☒ No		P	
MST 01: Visual inspection after Thermal cycling test					
Test Date (YYYY-MM-DD)		2024-07-06		—	
Findings		☐ Yes..... ☒ No		P	
Nature and position of findings – comments or attach photos		No visual defects found		—	
MST 16: Insulation test after Thermal cycling test					
Test Date (YYYY-MM-DD)		2024-07-06		—	
Test Voltage applied (V, DC)		8000/1500		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
06	28890	≥12.86	—	No	P
MST 17: Wet leakage current test after Thermal cycling test					
Test Date (YYYY-MM-DD)		2024-07-06		—	
Test Voltage applied (V, dc)		1500		—	
Solution resistivity (Ω cm)		< 3500 Ω cm at 22 ± 2°C		—	
Solution temperature (°C)		22.9		—	
Sample #	Measured(MΩ)	Required (MΩ)		Result	
06	7112	≥12.86		P	
Supplementary information:—					

SEQUENCE F					
Sample #	19				—
Table 31: MST 25 - Bypass diode thermal test					
Test Date [YYYY-MM-DD] start/end	2024-05-28				—
Module temperature [°C]	75				—
Number of diodes in junction box	3				—
Diode manufacturer	N/A				—
Diode type designation	N/A				—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet)	200				—
Step 1, Determination of VD versus TJ characteristic					—
Ambient temperature of the junction box [°C]	30 ± 2	50 ± 2	70 ± 2	90 ± 2	—
Pulsed current	18.30	18.30	18.30	18.30	—
Voltage drop [V]	0.408 0.411 0.407	0.403 0.405 0.401	0.398 0.400 0.396	0.395 0.395 0.394	—
VD versus TJ characteristic	$V_D = 0.4142 - 0.0002T_J$ $V_D = 0.4187 - 0.0003T_J$ $V_D = 0.4127 - 0.0002T_J$				—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet)	200				—
Step 2, Bypass diode thermal test					—
	Diode 1	Diode 2	Diode 3	Result	
Current flow applied [A]	18.30	18.30	18.30	18.30	—
Max. diode surface temperature allowed Tjmax [°C],	200	200	200	200	—
Voltage drop [V] after 1h	0.372	0.372	0.380	0.380	—
Calculated max. junction temperature Tjcalc [°C]	186.0	155.7	163.5	163.5	P
Tjcalc < Tjmax (test passed)? yes/no	Yes	Yes	Yes	Yes	P
Current flow (1.25 * Isc) [A]	22.79	22.79	22.79	22.79	—
Bypass diode remain(s) functional (yes/no)	Yes	Yes	Yes	Yes	P
Remarks: See Table 46 for the test details of bypass diode functionality test					
MST 01: Visual inspection after Bypass diode thermal test					
Test Date [YYYY-MM-DD]	2024-05-28				—
Findings	☐ Yes ☒ No				P
Nature and position of findings – comments or attach photos	No visual defects found				—
MST 16: Insulation test after Bypass diode thermal test					—
Test Date (YYYY-MM-DD)	2024-05-28				—

Test Voltage applied (V, DC).....:			8000/1500		—	
Sample #	Measured	Required	Dielectric breakdown		Result	
	MΩ	MΩ	Yes (description)	No		
19	23090	≥12.86	—		No	P
MST 17: Wet leakage current test after Bypass diode thermal test						—
Test Date [YYYY-MM-DD]:.....			2024-05-28		—	
Test Voltage applied [V]:.....			1500		—	
Solution resistivity [Ω cm)			< 3500 Ω cm at 22 ± 2°C		—	
Solution temperature [°C]			22.6		—	
Sample #	Measured(MΩ)		Required (MΩ)		Result	
19	8956		≥12.86		P	
Supplementary information:—						

Table 32: MST 21 - Temperature Test

Reference solar irradiance (W/m²)		1000 W/m²		—	
Reference ambient temperature (°C)		—		—	
Module at MPP					
Measuring location:		Component temperature T _{OBS} (°C)	Normalized temperature T _{CON} (°C)	Component temperature limit (°C)	—
PV module frontsheet above the centre cell		—	—	Glass	—
PV module backsheet below the centre cell		—	—	90	—
Terminal enclosure interior surface		—	—	90	—
Field wiring terminals		—	—	90	—
Insulation of the field wiring leads		—	—	90	—
External connector bodies		—	—	90	—
Bypass diode bodies		—	—	200	—
MST 01: Visual inspection after Temperature Test					—
Test Date (YYYY-MM-DD)		—			—
Findings		☐ Yes..... ☒ No			P
Nature and position of findings – comments or attach photos		No visual defects found			—
MST 16: Insulation test after Temperature Test					—
Test Date (YYYY-MM-DD)		—			—
Test Voltage applied (V, DC)		8000/1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	

	35210	≥12.86	—	No	P
MST 17: Wet leakage current test after Temperature Test					—
Test Date (YYYY-MM-DD)			—	—	
Test Voltage applied (V, dc)			1500	—	
Solution resistivity (Ω cm)			< 3500 Ω cm at 22 ± 2°C	—	
Solution temperature (°C)			22.9	—	
Sample #	Measured(MΩ)		Required (MΩ)		Result
	4906		≥12.86		P
Supplementary information:—					

Table 33: MST 22 - Hot-spot endurance test

Test Date (YYYY-MM-DD) start/end				2024-05-29 / 2024-05-31			—	
Cell interconnection circuit				☐ S ☒ SP ☐ PS			—	
Irradiance during each cycle				1000			—	
Module temperature at thermal equilibrium in each cycle [°C]				55.8			—	
Determination of worst case cell							—	
Maximum measured cell temperature in each cycle [°C]				D6:162 N2:155 U6:157 R3:161			—	
Shading rate [%] or number of cells shaded				55/50/55/55			—	
Test hours for each cycle.....				1			—	
MST 01: Visual inspection after hot-spot endurance test							—	
Test Date (YYYY-MM-DD)				2024-05-31			—	
Findings				☐ Yes..... ☒ No			P	
Nature and position of findings – comments or attach photos				No visual defects found			—	
MST 02: Maximum power determination after hot-spot endurance test							—	
Test Date [YYYY-MM-DD]				2024-05-31			—	
Module temperature [°C]				Corrected to 25			—	
Irradiance [W/m²].....				Corrected to 1000			—	
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]		
19	18.26	45.83	16.54	39.70	656.6	78.46		
MST 16: Insulation test after hot-spot endurance test							—	
Test Date (YYYY-MM-DD)				2024-05-31			—	
Test Voltage applied [V]				8000/1500			—	
Sample #	Measured	Required	Dielectric breakdown				Result	
	MΩ	MΩ	Yes (description)		No			

19	26710	≥12.86	—	No	P
MST 17: Wet leakage current test after hot-spot endurance test					—
Test Date (YYYY-MM-DD)			2024-05-31		—
Test Voltage applied [V]			1500		—
Solution resistivity [Ω cm)			< 3500 Ω cm at 22 ± 2°C		—
Solution temperature [°C]			22.8		—
Sample #	Measured(MΩ)		Required (MΩ)		Result
19	8079		≥12.86		P
Supplementary information:—					

Table 34: MST 26 - Reverse current overload test

Test Date (YYYY-MM-DD)..... :		2024-06-05		—	
Module over-current protection rating (A)		30		—	
Test current (A)		40.5		—	
Range of applied voltage (V)		52.8-50.2		—	
Test duration		2 hours		—	
Observations				Result	
☒ No flaming of the module				P	
☒ No flaming or charring of the cheesecloth					
☒ No flaming of the tissue paper					
☒ MST 17 requirements fulfilled (see appended Table MST17)					
Supplementary information: Max. measured temperature: xx°C					
MST 01: Visual inspection after Reverse current overload test				—	
Test Date (YYYY-MM-DD)		2024-06-05		—	
Findings		☐ Yes..... ☒ No		P	
Nature and position of findings – comments or attach photos		No visual defects found		—	
MST 16: Insulation test after Reverse current overload test				—	
Test Date (YYYY-MM-DD)		2024-06-05		—	
Test Voltage applied (V, DC)		8000/1500		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
19	22590	≥12.86	—	No	P
MST 17: Wet leakage current test after Reverse current overload test				—	
Test Date (YYYY-MM-DD)		2024-06-05		—	
Test Voltage applied (V, dc)		1500		—	

Solution resistivity (Ω cm).....:		< 3500 Ω cm at 22 ± 2°C	—
Solution temperature (°C).....:		23.1	—
Sample #	Measured(MΩ)	Required (MΩ)	Result
19	8028	≥12.86	P
Supplementary information:—			

SEQUENCE G					
Sample #:	20				—
Table 35: MST 14 - Impulse voltage test					
Test Date (YYYY-MM-DD)	2024-05-25				—
Maximum system voltage (V)	1500				—
Required Impulse voltage (V)	19680				—
Measured Impulse voltage (V)	20045				—
T ₁ (μs)	1.407				—
T ₂ (μs)	54.928				—
Thickness of conductive foil (mm)	0.05				—
Results					
☒ No evidence of dielectric breakdown or surface tracking observed					P
☒ No evidence of major visual defects (see table MST 01 below)					
MST 01: Visual inspection after Impulse voltage test					—
Test Date (YYYY-MM-DD)	2024-05-25				—
Findings	☐ Yes..... ☒ No				P
Nature and position of findings – comments or attach photos	No visual defects found				—
MST 16: Insulation test after Impulse voltage test					—
Test Date (YYYY-MM-DD)	2024-05-25				—
Test Voltage applied (V, DC)	8000/1500				—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
20	21710	≥12.86	—	No	P
Supplementary information:—					

OTHER TESTS					
Sample #:	21,22,23				—
Table 36: MST 23 - Fire test					
Test Date (YYYY-MM-DD)	2024-06-22				—
Module fire resistance class (A, B, C)	C				—
No. of modules provided to create the test assembly	1 for spread of flame test 1 for burning brand test				—
☒ The module complies with the requirements for the fire resistance class					P
Supplementary information: —					

Sample #:	25	—
Table 37: MST 24 - Ignitability test		
Test Date (YYYY-MM-DD)	2024-06-22	—
Flame application point.....	—	—
Surface exposure	☒ Yes ☐ No	—
Backsheet foil exposure.....	☐ Yes ☒ No	—
Frame adhesive exposure	☒ Yes ☐ No	—
Edge exposure	☐ Yes ☒ No	—
Junction box adhesive exposure	☒ Yes ☐ No	—
Type label exposure.....	☐ Yes ☒ No	—
Backrail adhesive exposure.....	☐ Yes ☒ No	—
Ignition occurs	☐ Yes ☒ No	—
Flame spread less as 150 mm	☒ Yes ☐ No	—
Length of destroyed area.....	—	—
Supplementary information: —		

Sample #:	22	—
Table 38: MST 32 - Module breakage test		
Test Date (YYYY-MM-DD)	2024-06-30	—
Weight of impactor (kg)	45	—
Thickness of sample (mm)	35	—
Mounting technique used	4 Pressing block	—
Module breakage	☒ No breakage	
	☐ No separation from frame or mounting structure	
	☐ Breakage occurred, no shear or opening large enough for a 76 mm diameter sphere to pass freely developed	
	☐ Breakage occurred, no particles larger than 65 cm ² ejected from sample	
	☐ Continuity of equipotential bonding provided, see table 10.11	
Nature and position of findings – comments or attach photos		Result
None		P
Supplementary information:		

Sample #:	—	—
Table 39: MST 35 - Peel test (only for cemented joints)		
Test Date (YYYY-MM-DD)		—
Location	☐ Flexible Frontsheet ☐ Flexible Backsheet ☐ Rigid Frontsheet ☐ Rigid Backsheet ☐ Other areas	—
Width of cemented joint	☐ ≤ 10 mm ☐ > 10mm	—

MST 01 Visual inspection after cut test					—
Test Date (YYYY-MM-DD)				2024-07-18	—
Sample # 06	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
Sample # 07	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
Sample # 15	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
Sample # 16	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
Sample # 17	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
Sample # 18	Findings		☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos		No visual defects found		—
MST 16: Insulation test after cut test					—
Test Date (YYYY-MM-DD)				2024-07-19	—
Test Voltage applied (V, DC)				8000/1500	—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
06	23780	≥12.86	—	No	P
07	31950	≥12.86	—	No	P
15	20620	≥12.86	—	No	P
16	28290	≥12.86	—	No	P
17	28290	≥12.86	—	No	P
18	22190	≥12.86	—	No	P

MST 17: Wet leakage current test after cut test					—
Test Date (YYYY-MM-DD)				2024-07-19	—
Test Voltage applied (V, dc)				1500	—
Solution resistivity (Ω cm)				< 3500 Ω cm at 22 ± 2°C	—
Solution temperature (°C)				22.5	—
Sample #	Measured (MΩ)		Required (MΩ)		Result
06	8021		≥12.86		P

07	7239	≥ 12.86	P
15	8388	≥ 12.86	P
16	6018	≥ 12.86	P
17	6201	≥ 12.86	P
17	7411	≥ 12.86	P
Supplementary information: —			

Table 42: MST 03 - Maximum power determination final

Test Date (YYYY-MM-DD)		2024-07-22				—
Module temperature (°C)		25				—
Irradiance (W/m ²)		1000				—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)
06	18.15	45.85	16.32	39.80	649.5	78.05
07	18.05	45.91	16.22	39.75	644.7	77.80
13	18.28	46.24	16.56	39.88	660.4	78.13
15	18.16	45.92	16.39	39.71	650.8	78.05
16	18.18	45.89	16.40	39.69	650.9	78.02
17	18.14	45.87	16.34	39.68	648.4	77.92
18	18.19	45.98	16.47	39.71	654.0	78.20
19	18.26	45.83	16.54	39.70	656.6	78.46
47	18.31	45.96	16.97	39.83	675.9	80.32
Supplementary information: —						

Table 43: MST 01 - Final Visual inspection

Test Date (YYYY-MM-DD)		2023-11-16		—
Sample # 06	Findings	☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos	No visual defects found		—
Sample # 07	Findings	☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos	No visual defects found		—
Sample # 13	Findings	☐ Yes ☒ No		P
	Nature and position of findings – comments or attach photos	No visual defects found		—
	Findings	☐ Yes ☒ No		P

Sample # 15	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 16	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 17	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 18	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 19	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Sample # 47	Findings	☐ Yes ☒ No	P
	Nature and position of findings – comments or attach photos	No visual defects found	—
Supplementary information: —			

Table 44: MST 05 - Durability of markings

Test Date (YYYY-MM-DD)		2024-07-23			—
Sample #	Markings legible	Not easily removable	No curling		Result
06	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
07	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
13	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
15	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
16	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
17	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
18	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
19	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes	☐ No	P
Supplementary information: —					

Table 45: MST 06 - Sharp edge test

Test Date (YYYY-MM-DD): 2024-07-24		—
Sample #	Accessible surfaces free of sharp edges, burrs etc.	Result
06	☒ Yes ☐ No	P
07	☒ Yes ☐ No	P
13	☒ Yes ☐ No	P

15	☒ Yes ☐ No	P
16	☒ Yes ☐ No	P
17	☒ Yes ☐ No	P
18	☒ Yes ☐ No	P
19	☒ Yes ☐ No	P
Supplementary information: —		

Table 46: MST 07 - Bypass diode functionality test

Test Date (YYYY-MM-DD)		2024-07-25		—		
☐ Method A					—	
Ambient temperature [°C]		—		—		
Current flow applied [A]		—		—		
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %		Result	
—	—	—	☐ Yes ☐ No		—	
—	—	—	☐ Yes ☐ No		—	
—	—	—	☐ Yes ☐ No		—	
—	—	—	☐ Yes ☐ No		—	
☒ Method B					—	
Sample #	IV curve after shading				Result	
	Diode 1 working properly		Diode 2 working properly			Diode 3 working properly
06	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
07	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
13	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
15	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
16	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
17	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
18	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
19	☒ Yes ☐ No		☒ Yes ☐ No		☒ Yes ☐ No	P
Supplementary information: —						

Table 47: MST 33a - Test for general screw connections

Test Date (YYYY-MM-DD) : —				—
Sample #	Thread diameter [mm]	Torque [Nm]		Result
—	—	—		—

—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
Supplementary information:			

Table 48: MST 33b - Test for locking screws			
Test Date (YYYY-MM-DD)		—	—
Sample #	Thread diameter [mm]	Torque [Nm]	Result
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—
Supplementary information:			

Table 49: MST 04 - Insulation thickness test		
Test Date (YYYY-MM-DD)	2024-07-26	—
Max. System voltage	1500	—
Thickness of insulation acc. datasheet	0.334	—
Required thickness of insulation.....	>0.3mm	—
Measurement uncertainty	± 2.2%	—
Location	Measured thickness (including uncertainty)	Result

Sample #	15	16	
A	0.336	0.333	P
B	0.334	0.331	P
C	0.333	0.332	P
D	0.334	0.334	P
E	0.334	0.331	P
F	0.333	0.334	P
G	0.333	0.333	P
H	0.334	0.333	P
I	0.335	0.333	P
J	0.337	0.334	P
K	0.333	0.335	P
L	0.335	0.332	P
Supplementary information:—			

ANNEX 1: LIST OF TEST EQUIPMENT USED:

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

ANNEX 2: CONSTRUCTIONAL DETAILS / BILL OF MATERIAL (BOM)

5.3.2 Internal wiring		
Cell connector		
Manufacturer:	Type:	Material:
Ulbrich Germany	Tinned Copper PV ribbon	Sn60%Pb40%
Thickness [mm]:	Dimension [mm]:	Coatings:
0,35 mm	—	—
Supplementary Information:		
String connector		
Manufacturer:	Type:	Material:
Ulbrich Germany	Tinned Copper BUS ribbon	Sn60%Pb40%
Thickness [mm]:	Dimension [mm]:	Coatings:
4/6	—	—
Supplementary Information:		
5.3.3 External wiring and cables		
Cables		
Manufacturer:	Type:	Material:
Zhejiang Twinsel Electronic Technology Co., Ltd.	H1Z2Z2-K PV Cable	—
Diameter [mm ²]:	Length [mm]:	Max. Temperature:
4	—	90°C
Certified: ☒ Yes / ☐ No	Standards:	Others:
Certifier and Cert. No. TUV SUD No. B0830730026 Rev. 00	☒ IEC 62930 ☐ EN 50618	
Supplementary Information:		
5.3.4 Connectors		
Manufacturer:	Type:	Class:
Zhejiang Twinsel Electronic Technology Co., Ltd.	PV-SY02 (MC Type)	A
Max. Voltage:	Max. Current:	Max. Temperature:
1500V	55	85°C
IP-rating:	Locked:	
68	☒ Yes / ☐ No	
Certified: ☐ Yes / ☐ No	Standards:	Others:
Certifier and Cert. No. TUV SUD No. B0830730011 Rev. 03	☒ IEC 62852	
Supplementary Information:		
5.3.5 Junction boxes		
Manufacturer:	Type:	Class:
Zhejiang Twinsel Electronic Technology Co., Ltd.	PV-SY030	A
IP-rating:	Dimensions (l x w x h) [mm ²]:	Weight [g]:
68	—	—
Max. Voltage:	Max. Current:	Max. Temperature:
1500	30	85°C
Electrical Termination cell side:	Electrical Termination cell side:	Number of Bypass Diodes
Soldered ☒	Soldered ☒	3
Crimped ☐	Crimped ☐	
Welded ☐	Welded ☐	
Screwed ☐	Screwed ☐	
Screwless ☐	Screwless ☐	

Potted:	Certified: ☒ Yes / ☐ No	Standards:
☒ Yes / ☐ No	Certifier and Cert. No. TUV SUD No. B0830730022 Rev. 06	☒ IEC 62790
Supplementary Information:		

5.3.6 Frontsheets and backsheets		
Frontsheet		
Used as: ☐ Basic Insulation ☒ Reinforced Insulation		
Total Dimensions (width x length) [mm]:		
Material:	Manufacturer:	Type:
Glass	Turkiye Sise Ve Cam Fabrikalari A.S.	Low iron solar textured tempered glass
Thickness [mm]: 3.2±0.2mm	Heat strength.: ☒ Yes / ☐ No	Coating: ☒ Yes / ☐ No
	☒ Tempered ☐ Heat strengthened ☐ Annealed	Description
Structured: ☐ Yes / ☒ No	Certified: ☐ Yes / ☒ No	Standards:
Description	Certifier and Cert. No.	
Supplementary Information:		
Single layer: ☐	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I
	☐ TI °C	☐ II
	☐ RTI °C	☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
Multi-layer ☐	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Total Thickness [mm]:	No of layers:	
Layer No. 1 (air side)	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I
	☐ TI °C	☐ II
	☐ RTI °C	☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. 2	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I
	☐ TI °C	☐ II
	☐ RTI °C	☐ III

Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. 3	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. n (Encapsulation side)	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
Backsheet		
Used as: ☐ Basic Insulation ☒ Reinforced Insulation		
Material:	Manufacturer:	Type:
Coating/PET/coating	Hanwha Solutions Advanced Materials Division	UFC – Ultra Face Cure
Thickness [μm]: 250μm ±55μm	Heat strength.: ☒ Yes / ☐ No	Coating: ☒ Yes / ☐ No
	☐ Tempered ☒ Heat strengthened ☐ Annealed	Description
Structured: ☐ Yes / ☒ No	Certified: ☐ Yes / ☒ No	Standards:
Description	Certifier and Cert. No.	
Supplementary Information:		
Single layer: ☐	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
Multi-layer ☐	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Total Thickness [mm]:	No of layers:	
Layer No. 1 (air side)	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:

	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. 2	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. 3	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Layer No. n (Encapsulation side)	Used as: ☐ Basic Insulation ☐ Reinforced Insulation	
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
5.3.7 Insulation barriers / Edge sealant		
Used as: ☐ Functional ☐ Basic Insulation ☒ Reinforced Insulation		
Total Dimensions (width x length) [mm]:		
Material:	Manufacturer:	Type:
Potting material	Suzhou Tonsan Adhesive Co., Ltd.	15..
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour: White	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
5.3.7 Insulation barriers / Edge sealant		
Used as: ☐ Functional ☐ Basic Insulation ☐ Reinforced Insulation		
Total Dimensions (width x length) [mm]:		
Material:	Manufacturer:	Type:
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I

	☐ TI °C ☐ RTI °C	☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
5.3.9 Encapsulants		
Used as: ☒ Basic Insulation ☐ Reinforced Insulation ☐ N/A		
Total Dimensions (width x length) [mm]:		
Material: (Frontsheet side)	Manufacturer:	Type:
EVA	Hanwha Solutions Advanced Materials Division	UFC – Ultra Face Cure
Thickness [μm]	Thermal Index:	Material Group:
520μm ±10%	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	

Material: (Backsheet side)	Manufacturer:	Type:
EVA	Hanwha Solutions Advanced Materials Division	UFC – Ultra Face Cure
Thickness [μm]	Thermal Index:	Material Group:
520μm ±10%	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
	Certifier and Cert. No.	
Supplementary Information:		
5.5.2.3 Polymeric materials used as electrical insulation		
Location:		
Application ☐ External part ☒ Support of live parts ☐ Mechanical functions		
Used as: ☐ Functional ☒ Basic Insulation ☐ Reinforced Insulation		
Material:	Manufacturer:	Type:
Potting material	Shanghai Huitian New Material Co., Ltd.	5299W-S
Flammability class:		
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C ☐ TI °C ☐ RTI °C	☐ I ☐ II ☐ III
Colour:	Certified ☐ Yes / ☐ No	Standards:
White	Certifier and Cert. No.	
Supplementary Information:		

5.3.10 Bypass Diodes		
Manufacturer:	Type:	
Yangzhou Yangjie Electronic Co., Ltd.	40SQ045	
Nominal current of diode I _F (A)	40	
R _{THJ-C} (K/W) / R _{THJ-L} (K/W)	—	
Max. T _J (°C)	200	

Max. V_F at I_F (V)	50	
Supplementary Information:		

5.4.2 / 5.4.4 Screws			
Application	Kind of screw:	Dimension (diameter/length)	Material
Supplementary Information:			

5.4.3 Rivets		
Application	Dimension (diameter/length)	Material:
Supplementary Information:		

5.4.6 Adhesives		
For Junction Boxes		
Manufacturer:	Type:	
Shanghai Huitian New Material Co., Ltd.	HT906Z	Color: White
Additional function as: ☐ Basic Insulation ☐ Reinforced Insulation ☐ N/A		
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I
	☐ TI °C	☐ II
	☐ RTI °C	☐ III
Supplementary Information:		
For Frames / Backrails		
Additional function as: ☐ Basic Insulation ☐ Reinforced Insulation ☐ N/A		
Manufacturer:	Type:	
Additional function as: ☐ Basic Insulation ☐ Reinforced Insulation ☐ N/A		
Thickness [mm]	Thermal Index:	Material Group:
	☐ RTE °C	☐ I
	☐ TI °C	☐ II
	☐ RTI °C	☐ III
Supplementary Information:		

5.5.3 Metallic Materials		
Frame / Corner joint / Backrail:		
Manufacturer:	Type:	Dimension
Arkat Aluminium San. Tic. A.S.	Anodized Aluminium Alloy:6063-T5	Thickness = 35mm
Supplementary Information:		
Others:		

Manufacturer:	Type:	Dimension
Supplementary Information:		

Cell		
Kind of cell	Manufacturer:	Type:
☒ cSi ☐ CdTe ☐ aSi ☐ CiGs	Hanwha Q CELLS Korea	Mono c-Si Bifacial cell
Thickness [μm]:	Dimension [mm]:	Number of busbars:
150±18um	210x105mm	
Supplementary Information:		

Cell fixing Tape						
No.	Material	Manufacturer	Type		Ratings	
1						
2						
3						