Test Report issued under the responsibility of:

TEST REPORT
IEC 61730-2
PV Module Safety Qualification – Part 1: Requirements for construction and Part 2: Requirements for testing

Report Number. ..... :	**6147751B.50B**
Date of issue..... :	**2023-02-18**
Total number of pages…….:	**100**
DEKRA Branch..... :	**DEKRA Testing and Certification (Shanghai) Ltd.**
Applicant's name ..... :	**Zhejiang ERA Solar Technology Co., Ltd.**
Address..... :	**(No.888,Huangjiao Road) Sihai Road, Huangyan Economic Development Zone 318020 Taizhou City Zhejiang, China**
Test specification:	
Standards ..... :	IEC 61730-2:2016 in conjunction with IEC 61730-1:2016 EN IEC 61730-1:2018 EN IEC 61730-1:2018/AC:2018-06 EN IEC 61730-2:2018 EN IEC 61730-2:2018/AC:2018-06
Test procedure ..... :	DEKRA Seal
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC61730_2E
Test Report Form(s) Originator .... :	CTL ETF 9
Master TRF ..... :	Dated 2017-12

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Test item description.....	Photovoltaic (PV) Module(s)
Trade Mark.....	ERA SOLAR
Manufacturer.....	Zhejiang ERA Solar Technology Co., Ltd.
Model/Type reference.....	**With maximum system voltage 1500V** **PV module with mono c-Si cells:** ESPSCxxx (xxx=370-415W, in steps of 5, 72 cells) ESPSCxxx (xxx=305-350W, in steps of 5, 60 cells) ESPSCxxx (xxx=185-205W, in steps of 5, 36 cells) ESPSCxxx (xxx=210-220W, in steps of 5, 72 cells) ESPSCxxx (xxx=150-180W, in steps of 5, 36 cells) ESPSCxxx (xxx=120W, 36 cells) ESPSCxxx (xxx=100W, 36 cells) ESPSCxxx (xxx=70-80W, in steps of 5, 36 cells) ESPSCxx (xx=50W, 36 cells) ESPSCxxx (xxx=30-40W, in steps of 5, 36 cells) ESPHSCxxx (xxx=430-455W, in steps of 5, 144 cells) ESPHSCxxx (xxx=360-380W, in steps of 5, 120 cells) ESPHSCxxx (xxx=385-420W, in steps of 5, 144 cells) ESPHSCxxx (xxx=320-350W, in steps of 5, 120 cells) ESPSAxxx (xxx=190-210W, in steps of 5, 72 cells) ESPSAxxx (xxx=100W, 36 cells) ERA-72HCxxxM (xxx=520-550W, in steps of 5, 144 cells) ERA-66HCxxxM (xxx=490-510W, in steps of 5, 132 cells) ERA-60HCxxxM (xxx=435-460W, in steps of 5, 120 cells) ERA-54HCxxxM (xxx=395-420W, in steps of 5, 108 cells) Eagle-66HCxxxM (xxx=650-670W, in steps of 5, 132 cells) Eagle-60HCxxxM (xxx=590-610W, in steps of 5, 120 cells) ESPHSCxxxW (xxx=520-550W. in steps of 5, 144 cells) ESPHSCxxx(BK) (xxx=395-420W, in steps of 5, 108 cells) ERA Pro-54HCxxxM (xxx=415-435W, in steps of 5, 108 cells) ERA Pro-54HCBxxxM (xxx=415-435W, in steps of 5, 108 cells) ERA Pro-54HCxxxM(BK) (xxx=415-435W, in steps of 5, 108 cells) ERA Pro-72HCxxxM (xxx=560-590W, in steps of 5, 144 cells) ERA Pro-72HCBxxxM (xxx=560-590W, in steps of 5, 144 cells) ERA Pro-72HCxxxM(BK) (xxx=560-590W, in steps of 5, 144 cells) ERA Pro-66HCxxxM (xxx=515-540W, in steps of 5, 132 cells) ERA Pro-66HCBxxxM (xxx=515-540W, in steps of 5, 132 cells) ERA Pro-66HCxxxM(BK) (xxx=515-540W, in steps of 5, 132 cells) ERA Pro-60HCxxxM (xxx=465-490W, in steps of 5, 120 cells) ERA Pro-60HCBxxxM (xxx=465-490W, in steps of 5, 120 cells) ERA Pro-60HCxxxM(BK) (xxx=465-490W, in steps of 5, 120 cells) ERA Pro-78HCxxxM (xxx=610-635W, in steps of 5, 156 cells) ERA Pro-78HCBxxxM (xxx=610-635W, in steps of 5, 156 cells) ERA Pro-78HCxxxM(BK) (xxx=610-635W, in steps of 5, 156 cells) ERA-54HCxxxM(BK) (xxx=395-420W, in steps of 5, 108 cells) ESPHSCXXX (xxx=520-555W, in steps of 5, 144 cells) ESPHSCXXX-M (xxx=520-555W, in steps of 5, 144 cells) **PV module with poly c-Si cells:** ESPMCxxx (xxx=310-355W, in steps of 5, 72 cells) ESPMCxxx (xxx=260-295W, in steps of 5, 60 cells) ESPMCxxx (xxx=155-175W, in steps of 5, 36 cells) ESPMCxxx (xxx=200-210W, in steps of 5, 72 cells)

	ESPMCxxx (xxx=100W, 36 cells) ESPMCxxx (xxx=70-80W, in steps of 5, 36 cells) ESPMCxxx (xxx=50W, 36 cells) ESPMCxxx (xxx=30-40W, in steps of 5, 36 cells) ESPHSAxxx (xxx=190-210W, in steps of 5, 72 cells) ESPHSAxxx (xxx=100W, 36 cells) **With maximum system voltage 1000V** PV module with mono c-Si cells: ESPSCxxxL (xxx=370-415W, in steps of 5, 72 cells) ESPSCxxxL (xxx=305-350W, in steps of 5, 60 cells) ESPSCxxxL (xxx=185-205W, in steps of 5, 36 cells) ESPSCxxxL (xxx=210-220W, in steps of 5, 72 cells) ESPSCxxxL (xxx=150-180W, in steps of 5, 36 cells) ESPSCxxxL (xxx=120W, 36 cells) ESPSCxxxL (xxx=100W, 36 cells) ESPSCxxxL (xxx=70-80W, in steps of 5, 36 cells) ESPSCxxL (xx=50W, 36 cells) ESPSCxxxL (xxx=30-40W, in steps of 5, 36 cells) ESPHSCxxxL (xxx=430-455W, in steps of 5, 144 cells) ESPHSCxxxL (xxx=360-380W, in steps of 5, 120 cells) ESPHSCxxxL (xxx=385-420W, in steps of 5, 144 cells) ESPHSCxxxL (xxx=320-350W, in steps of 5, 120 cells) ESPSAxxxL (xxx=190-210W, in steps of 5, 72 cells) ESPSAxxxL (xxx=100W, 36 cells) **PV module with poly c-Si cells:** ESPMCxxxL (xxx=310-355W, in steps of 5, 72 cells) ESPMCxxxL (xxx=260-295W, in steps of 5, 60 cells) ESPMCxxxL (xxx=155-175W, in steps of 5, 36 cells) ESPMCxxxL (xxx=200-210W, in steps of 5, 72 cells) ESPMCxxxL (xxx=100W, 36 cells) ESPMCxxxL (xxx=70-80W, in steps of 5, 36 cells) ESPMCxxxL (xxx=50W, 36 cells) ESPMCxxxL (xxx=30-40W, in steps of 5, 36 cells) ESPHSAxxxL (xxx=190-210W, in steps of 5, 72 cells) ESPHSAxxxL (xxx=100W, 36 cells)
Ratings	Refer to Annex 1 of report no. 6147751B.50A for details

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**DEKRA Branch:**	DEKRA Testing and Certification (Shanghai) Ltd.	
Testing location/address ..... :		3F #250, Jiangchangsan Road, Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Jing'an District, Shanghai, 200436, China	
☒	**Associated Testing Laboratory:**	Shanghai Institute of Quality Inspection and Technical Research	
Testing location/ address.....:		900 Jiangyue Rd., Shanghai, China	
Tested by (name, function, signature) .....:		Lee Huang	Lee Huang
Approved by (name, function, signature).....:		Kevin Lu	Kevin Lu
☐	Testing procedure: CTF Stage 1:		

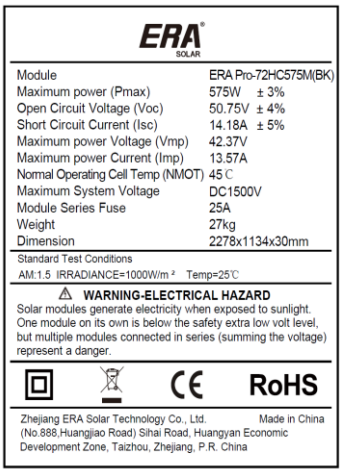
Testing location/address .....:		
Tested by (name, function, signature) .....:		
Approved by (name, function, signature).....:		
☐ Testing procedure: CTF Stage 2:		
Testing location/address .....:		
Tested by (name, function, signature) .....:		
Witnessed by (name, function, signature) .....:		
Approved 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) .....:		

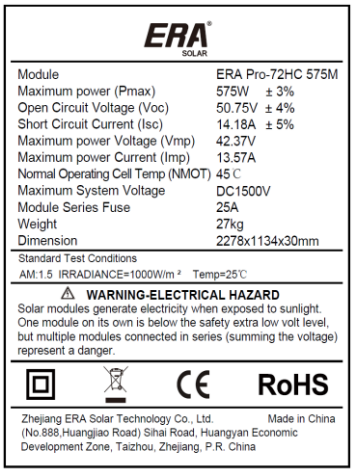
List of attachments (including a total number of pages in each attachment):	
	attachment number
Installation manual:	
Drawings mechanical:	
Circuit diagram:	
Photographs:	
Component datasheets / certificates	
Others:	
List of measurement equipment	Annex 1

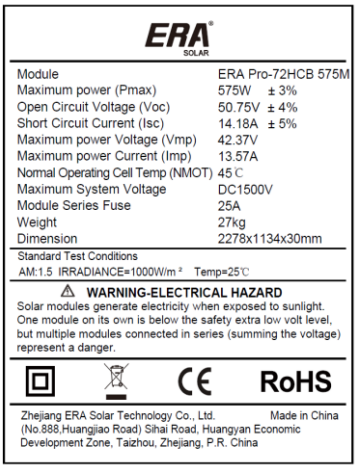
Summary of testing:	
Tests performed (name of test and test clause): Refer to the section listed as below	**Testing location:** Shanghai Institute of Quality Inspection and Technical Research Institute of Electronics & Household Appliances Quality Inspection (SQI_DZ) No. 900 Jiang Yue Roa, Shanghai, 201114, China
Summary of compliance with National Differences (List of countries addressed): N/A	

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.







Test item particulars..... :	
Accessories and detachable parts included in the evaluation ..... :	N/A
Mounting system used..... :	with default mounting method
Other options included..... :	N/A
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
Abbreviations used in the report:	
Pmax – Maximum power	HF – Humidity Freeze
Vmp – Maximum power voltage	DH – Damp Heat
Imp – Maximum power current	TC – Thermal Cycling
Isc – Short circuit current	α – Current temperature coefficient
Voc – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m²)	NMOT – Nominal Module Operating Temperature (20°C, 800 W/m²)
MQT – Module Quality Tests	VFMrated – Rated diode(s) forward voltage
VFM – Measured diode(s) forward voltage	NP – Nameplate
m_1 – the measurement uncertainty in % of laboratory for Pmax	m_2 – the measurement uncertainty in % of laboratory for Voc
m_3 – the measurement uncertainty in % of laboratory for Isc	t_1 – the manufacturer's rated lower production tolerance in % for Pmax
t_2 – the manufacturer's rated upper production tolerance in % for Voc	t_3– the manufacturer's rated upper production tolerance in % for Isc
r – Pmax measurement reproducibility	
Testing Dates (YYYY-MM-DD)	
Date of first test item received.....:	2022-09-29
Dates of tests (beginning/end).....:	2022-10-12 / 2023-01-17

General remarks:

Module type extension
ESPHSCxxx(BK) (xxx=395-420W, in steps of 5, 108 cells)
ERA Pro-54HCxxxM (xxx=415-435W, in steps of 5, 108 cells)
ERA Pro-54HCBxxxM (xxx=415-435W, in steps of 5, 108 cells)
ERA Pro-54HCxxxM(BK) (xxx=415-435W, in steps of 5, 108 cells)
ERA Pro-72HCxxxM (xxx=560-590W, in steps of 5, 144 cells)
ERA Pro-72HCBxxxM (xxx=560-590W, in steps of 5, 144 cells)
ERA Pro-72HCxxxM(BK) (xxx=560-590W, in steps of 5, 144 cells)
ERA Pro-66HCxxxM (xxx=515-540W, in steps of 5, 132 cells)
ERA Pro-66HCBxxxM (xxx=515-540W, in steps of 5, 132 cells)
ERA Pro-66HCxxxM(BK) (xxx=515-540W, in steps of 5, 132 cells)
ERA Pro-60HCxxxM (xxx=465-490W, in steps of 5, 120 cells)
ERA Pro-60HCBxxxM (xxx=465-490W, in steps of 5, 120 cells)
ERA Pro-60HCxxxM(BK) (xxx=465-490W, in steps of 5, 120 cells)
ERA Pro-78HCxxxM (xxx=610-635W, in steps of 5, 156 cells)
ERA Pro-78HCBxxxM (xxx=610-635W, in steps of 5, 156 cells)
ERA Pro-78HCxxxM(BK) (xxx=610-635W, in steps of 5, 156 cells)
ERA-54HCxxxM(BK) (xxx=395-420W, in steps of 5, 108 cells)
ESPHSCXXX (xxx=520-555W, in steps of 5, 144 cells)
ESPHSCXXX-M (xxx=520-555W, in steps of 5, 144 cells)

Maximum System Voltage: 1500 V; Protection Class: Class II; Pollution Degree: 1; Fire Rating: Class C according to UL 790.
Relevant tests were perfomed on module types: ERA Pro-72HCB 565M and ERA Pro-72HC 565M and ERA Pro-72HC565M(BK) separately.

Extend new materials listed as below:
Backsheet types:
FFC-JW30(plus) and FFC-JW3010(plus) from Jolywood (Suzhou) Sunwatt Co., Ltd.
Encapsulation system:
TF4 (between front cover and cells) + S806 (between cell and rear cover) from Hangzhou First Applied Material Co., Ltd.
Solar Cells:
182M-16 (16 busbar Mono Topcon c-Si cell) from Zhejiang ERA Solar Technology Co., Ltd.
Cell connectors:
Φ=0.29mm from NINGBO JIAMING METAL PRODUCTS CO., LTD.
Frame parts:
30mm thickness frame from Suzhou Sentong Photovoltaic Co., Ltd.
Relevant tests were perfomed on module types: ERA Pro-72HCB 565M and ERA Pro-72HC 565M separately.

Update the junction box combination of F303x; PV-HY01 and PV-HY02 refer to Annex 1 for detail information.

The original test report 6083067A.53A dated on 2022-06-07 and certificate no. 31-119173 REV.2 dated on 2022-06-16 was modified on 2023-02-18 to include the above changes.

This report is in conjunction with the report no. 6147751B.50B.

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

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

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
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) ..... :	Zhejiang ERA Solar Technology Co., Ltd. No.888, Huangjiao Road Sihai Road, Huangyan Economic Development Zone, 318020 Taizhou city Zhejiang, China

Product Electrical Ratings:				
Module type	ERA Pro-72HCB 565M	ERA Pro-72HC 565M	-	-
Voc [V] /Tolerance	50.45	50.45	-	-
Isc [Adc] /Tolerance	14.04	14.04	-	-
Pmp [W] /Tolerance	565	565	-	-
Maximum system voltage [V]	1500	1500	-	-
Maximum Over-Current Protection Rating [A]	25	25	-	-
Remarks: Further qualification for higher and/or lower output power see annex 1 of report 6147751B.50A				

Product Safety Ratings		
Maximum systems voltage (Vsys) ..... :	1500	V
Maximum over-current protection rating..... :	25	A
Class in accordance with IEC 61140 ..... :	See clause 4.1	
Intended use (list details) ..... :	See clause 4.5	
The modules are intended for a maximum operating altitude [meters above sea level] of ..... :	≤ 2000	m
Recommended maximum series/parallel module configurations ..... :	See manual	

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

- ☐ 4.2.1 Modification to frontsheet
- ☒ 4.2.2 Modification to encapsulation system
- ☒ 4.2.3 Modification to cell technology
- ☒ 4.2.4 Modification to cell and string interconnect material or technique
- ☒ 4.2.5 Modification to backsheet
- ☐ 4.2.6 Modification to electrical termination
- ☐ 4.2.7 Modification to bypass diode
- ☐ 4.2.8 Modification to electrical circuitry
- ☐ 4.2.9 Modification to edge sealing
- ☒ 4.2.10 Modification to frame and/or mounting structure
- ☐ 4.2.11 Change in PV module size
- ☐ 4.2.12 Higher or lower output power (by 10 % or more) with the identical design and size and using the identical cell process
- ☐ 4.2.13 Increase of over-current protection rating
- ☐ 4.2.14 Increase of system voltage
- ☐ 4.2.15 Change in cell fixing tape

☐ Test programs for thin-film PV modules

- ☐ 4.3.1 Modification to frontsheet
- ☐ 4.3.2 Modification to encapsulation system
- ☐ 4.3.3 Modification to front contact (e. g. TCO)
- ☐ 4.3.4 Modification to cell technology
- ☐ 4.3.5 Modification to cell layout
- ☐ 4.3.6 Modification to back contact
- ☐ 4.3.7 Modification to edge deletion
- ☐ 4.3.8 Modification to interconnect material or technique
- ☐ 4.3.9 Modification to backsheet
- ☐ 4.3.10 Modification to electrical termination
- ☐ 4.3.11 Modification to bypass diode
- ☐ 4.3.12 Modification to edge sealing
- ☐ 4.3.13 Modification to frame and/or mounting structure
- ☐ 4.3.14 Change in PV module size
- ☐ 4.3.15 Higher or lower output power (by 10 % or more) with the identical design and size
- ☐ 4.3.16 Increase of over-current protection rating
- ☐ 4.3.17 Increase of system voltage

NOTE: The clause references for modifications are excerpted from IEC TS 62915

Module group assignment:				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
1-1	Control	ERA Pro-72HCB 565M	ASA22181003002	N/A
1-2	F	ERA Pro-72HCB 565M	ASA22181003001	N/A
1-3	C	ERA Pro-72HCB 565M	ASA22181003007	N/A
1-4	D	ERA Pro-72HCB 565M	ASA22181003008	N/A
1-5	E	ERA Pro-72HCB 565M	ASA22181003023	N/A
1-6	A	ERA Pro-72HCB 565M	ASA22181003025	N/A
1-7	B	ERA Pro-72HCB 565M	ASA22181003031	N/A
1-8	B1	ERA Pro-72HCB 565M	ASA22181003029	N/A
1-9	G	ERA Pro-72HCB 565M	ASA22181003030	N/A
1-10	Ignitability	ERA Pro-72HCB 565M	ASA22181003033	N/A
1-11	Module-Break	ERA Pro-72HCB 565M	ASA22181003034	N/A
1-12	Fire	ERA Pro-72HCB 565M	ASA22181003037	N/A
1-13	Fire	ERA Pro-72HCB 565M	ASA22181003040	N/A
2-1	Control	ERA Pro-72HC 565M	ASA22181000013	N/A
2-2	F	ERA Pro-72HC 565M	ASA22181000022	N/A
2-3	C	ERA Pro-72HC 565M	ASA22181000015	N/A
2-4	D	ERA Pro-72HC 565M	ASA22181000014	N/A
2-5	E	ERA Pro-72HC 565M	ASA22181000020	N/A
2-6	A	ERA Pro-72HC 565M	ASA22181000019	N/A
2-7	B	ERA Pro-72HC 565M	ASA22181000017	N/A
2-8	B1	ERA Pro-72HC 565M	ASA22181000024	N/A
2-9	G	ERA Pro-72HC 565M	ASA22181000028	N/A
2-10	Ignitability	ERA Pro-72HC 565M	ASA22181000030	N/A
2-11	Module-Break	ERA Pro-72HC 565M	ASA22181000029	N/A
2-12	Fire	ERA Pro-72HC 565M	ASA22181000031	N/A
2-13	Fire	ERA Pro-72HC 565M	ASA22181000032	N/A
3-1	F	ERA Pro-72HC565M(BK)	ASA22181004042	N/A
Remarks: N/A				

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.

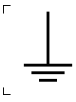
Note (2) Use Annex 2 to list the used materials and components of the module (manufacturer/supplier and type reference)

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

4 CLASSIFICATION, APPLICATIONS AND INTENDED USE			
4.1 General			
	The module has been evaluated for the following Class (IEC 61140)……:	☐ Class 0 ☐ Class II ☐ Class III	—
4.5 Intended use			
	PV modules are installed in the following special applications:		—
	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	—
	Applications at environmental temperature exceeding the limits indicated in of IEC 61730-1:2016	☐ yes ☒ no	—
	other (please specify)	☐ yes, as follows: ☐ no	—
5 REQUIREMENTS FOR DESIGN AND CONSTRUCTION			
5.1 General			—
	PV module suitable for operation in outdoor non-weather protected locations, exposed to direct and indirect (albedo) solar radiation, in an environmental temperature range of at least –40°C to +40°C and up to 100 % relative humidity as well as rain.	Yes	P
	Product shipped from the factory as	☒ completely assembled ☐ subassemblies	—
	The provided assemblies of the product do not involve any action that is likely to affect compliance with the requirements of the IEC 61730 series.	Yes	P
	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
	Equipotential bonding continuity is not interrupted by installation	Yes	P
	Any adjustable or movable structural part are provided with a locking device	Yes	P
	PV modules have no accessible burrs, sharp edges or sharp points	See Table 45	P

	Parts are prevented from loosening or turning	See Table 47 and 48	P
5.2 Marking and documentation			
5.2.1	Instructions related to safety are in an official language of the country where the equipment is to be installed.	Yes	P
5.2.2 Marking			
5.2.2.1 General			
	Each PV module includes the following clear and indelible markings:		—
	a) Name, registered trade name, or registered trade mark of manufacturer	Yes	P
	b) Type or model number designation	Yes	P
	c) Serial number	Yes	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	Yes	P
	e) Polarity of terminals or leads	Yes	P
	f) “Maximum system voltage” or ”Vsys”	Yes	P
	g) Class of protection against electrical shock, in accordance with Clause 4 of IEC 61730-1:2016	Yes	P
	h) “Voltage at open-circuit” or “Voc” including manufacturing tolerances	Yes	P
	i) “Current at short-circuit” or “Isc” including manufacturing tolerances	Yes	P
	j) “PV module maximum power” or “Pmax” including manufacturing tolerances	Yes	P
	k) “Maximum overcurrent protection rating”	See Table 34	P
	All electrical data are shown as relative to standard test conditions (STC) (1 000 W/m^2, (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	Yes	P
	International symbols are used where applicable.	Yes	P
	PV connectors or wiring are marked in accordance to IEC 62852 with a symbol „Do not disconnect under load”.	Yes	P
	Symbol or warning notice are imprinted or labelled close to connector	Yes	P
	PV connectors are clearly marked indicating the terminal polarity.	Yes	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.	Yes	P

	PV modules are marked to indicate the class	☒ class II: ⧈ ☐ class III: ◇III ☐ class 0: no symbol	P
	PV modules provided with a functional earth connection (see section 5.2.2.2.2)	—	—
	PV modules with terminals for field wiring rated only for use with copper wire are marked, at or adjacent to the terminals, with the statement "Use copper wire only", "Cu only", or the equivalent.	Yes	P
	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.	Yes	P
5.2.2.2 Symbols			
5.2.2.2.1 Equipotential bonding			
	Bonding conductor for equipotential bonding is identified with:	☒  ; ☐	P
	No other terminal or location is identified in this manner	Yes	P
5.2.2.2.2 Functional earthing			
	Field installed functional earthing conductor is identified with the symbol:		P
5.2.3 Documentation			
	Documentation concerning electrical and mechanical installation provided.	Yes	P
	Class (see 5.2.2.1) is stated, including specific limitations required for that Class.	Yes	P
	Environmental conditions to which the module has been qualified are stated.		—
	concerning temperature range, typically -40°C to +40°C	Yes	P
	concerning wind/snow load including safety factor	Yes	P
	Documentation for safe installation, use, and maintenance is available for installers and operators.	Yes	P
	The documentation contains the following information:		—
	– Name, registered trade name, or registered trade mark of manufacturer	Yes	P
	– Type or model number designation	Yes	P
	– “Maximum system voltage” or ”Vsys”	Yes	P
	– Class of protection against electrical shock	Yes	P
	– “Voltage at open-circuit” or “Voc” including manufacturing tolerances at STC	Yes	P

	– “Current at short-circuit” or “Isc” including manufacturing tolerances at STC	Yes	P
	– “PV module maximum power” or “Pmax” including manufacturing tolerances at STC	Yes	P
	– “Maximum overcurrent protection rating”	See Table 34	P
	– Recommended maximum series / parallel PV module configurations	Yes	P
	– Temperature coefficient for voltage at open-circuit	Yes	P
	– Temperature coefficient for maximum power	Yes	P
	– Temperature coefficient for short-circuit current	Yes	P
	All electrical data shall be shown as relative to standard test conditions (1 000 W/m^2, (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	Yes	P
	International symbols are used	Yes	P
	The electrical documentation includes a detailed description of the electrical installation wiring, including:		
	– Minimum cable diameters for PV modules intended for field wiring	Yes	P
	– Limitations on wiring methods and wire management that apply to the junction box for the PV module	Yes	P
	– Size, type, material, and temperature rating of the conductors	Yes	P
	– Type of terminals for field wiring	Yes	P
	– Specific PV connector model / types and manufacturer to which the PV module connectors can be mated	Yes	P
	– The bonding method(s), if applicable, is specified including all provided or specified hardware	Yes	P
	– The type and ratings of bypass diode to be used (if applicable)	Yes	P
	– Limitations to the mounting situation (e.g. slope, mounting means, cooling)	Yes	P
	– A statement indicating	☐ fire rating(s) and applied standards ☐ statement regarding resistance to external fire sources not evaluated	P
	– Limitations regarding fire ratings (e.g. installation slope, sub structure or other applicable installation information)	Yes	P

	– A statement indicating the minimum mechanical means for securing the PV module	See Table 14	P
	– A statement indicating the maximum altitude	Yes	P
	The documentation for roof mounting includes:		—
	– A statement indicating the minimum mechanical means for securing the PV module to the roof	See Table 14	P
	– 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.	Yes	P
	A statement concerning artificially concentrated sunlight	No	P
	Assembly instructions are provided with a product shipped in subassemblies, and are detailed and adequate to the degree required to facilitate complete and safe assembly of the product	Yes	P
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: *"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of ISC and VOC marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."*	Yes	P

5.3 Electrical components and insulation			
5.3.2 Internal wiring			
	Internal wiring has sufficient current carrying capacity for the relevant application.	See Table 34	P
5.3.3 External wiring and cables			
	External wires and cables fulfil the requirements of	☒ EN 50618 ☐ IEC 62930.	P
5.3.4 Connectors			
	External DC connectors fulfil the requirements of IEC 62852.	Yes	P
5.3.5 Junction boxes for PV modules			
	Junction boxes for PV modules fulfil the requirements of IEC 62790.	Yes	P
5.3.6 Frontsheets and backsheets			
	Frontsheet:		—

	Material Frontsheet:	☒ Glass ☐ Polymeric material ☐ Others.	—
	Polymeric frontsheets meet relevant requirements of section 5.5.2	See 5.5.2	P
	Polymeric frontsheets used as relied upon insulation fulfil requirements of		—
	-5.6.4.3 for insulation in thin layers	See 5.6.4.3	P
	-5.5.2.3 for electrical insulation	See 5.5.2.3	P
	Thermal index frontsheet (see also 5.5.2.3.3):	☐ TI : ☐ RTE : ☐ RTI :	—
	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.	—
	Polymeric backsheets meet relevant requirements of section 5.5.2	See 5.5.2	P
	Polymeric backsheets used as relied upon insulation fulfil requirements of		P
	-5.6.4.3 for insulation in thin layers	See 5.6.4.3	P
	-5.5.2.3 for electrical insulation	See 5.5.2.3	P
	Thermal index backsheet (see also 5.5.2.3.3):	☐ TI : ☐ RTE : ☒ RTI :	—
	Adhesion to encapsulant or glass is appropriate	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
5.3.7 Insulation barriers			
	Polymeric insulation barrier meets the relevant requirements of 5.5.2	See 5.5.2	P
	Barrier held in place while keeping its required electrical and mechanical properties	Yes	P
	Removal of barrier only possible by using a tool	Yes	P
5.3.8 Electrical connections			
5.3.8.1 General			
	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material. Compliance checked by MST 01	Yes	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.	Yes	P

	Measures are taken to prevent contact stress impairing electrical conductivity.	Yes	P
5.3.8.2 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.	Yes	P
	Insulated terminals are designed such that a reduction of clearances and creepage distances by displacement is prevented.	Yes	P
5.3.8.3 Splices and connections inside a PV module			
	Splices and connections are mechanically secured and provide electrical continuity.	Yes	P
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.	Yes	P
	A soldered or conductively adhered joint is additionally mechanically secured.	Yes	P
5.3.9 Encapsulants			
	Thermal properties are sufficient for intended application.	Yes	P
	The insulation properties according to 5.5.2.3 are met, if applicable.	See 5.5.2.3.2	P
5.3.10 Bypass diodes			
	Bypass diodes are rated to withstand the current and voltage for their intended use.	See Table 31 and Table 46	P
5.4 Mechanical and electromechanical connections			
5.4.1 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.	-	N/A
	Lids attached without screws have one or several detectable facilities for enabling tools.	-	N/A
	No contact of tools with the live parts when the lid is removed.	-	N/A

	No friction between surfaces as the sole means to inhibit the turning or loosening of a part, unless provisions to prevent unintended movement or rotation of the component is given.		N/A
5.4.2 Screw connections			
	Screws and mechanical connections withstand the mechanical stresses occurring in normal use.		P
	Screws are not made of a material which is soft or liable to creep.		P
	Screws used to provide mechanical stability and continuity for equipotential bonding withstand the mechanical stresses occurring in normal use.		P
	At least one screw per electrical- mechanical connection ensures the electrical connection between the metallic components		P
	Screws used for mechanical and electrical connections with a nominal diameter of less than 3 mm are screwed into metal.		N/A
	For screws used for mechanical and electrical connections two full threads are engaged into the metal.		N/A
	Screwed and other fixed connections are in such a way that they do not come loose through torsion, bending stresses, vibration, etc.		N/A
5.4.3 Rivets			
	Rivets which serve as electrical as well as mechanical connections are locked against loosening.		N/A
5.4.4 Thread-cutting screws			
	Thread-cutting and self-tapping screws are not used for interconnection of current-carrying parts made of a material which is soft or liable to creep.		N/A
	No thread-forming or thread-cutting (self-tapping) screws (sheet metal screws) are used for the connection of current-carrying parts.		N/A
	Thread-cutting (self-tapping) screws not be used if they are likely to be operated by the user or installer.		N/A
	Thread-cutting and thread-forming screws, used to provide continuity for equipotential bonding, are such that it is not necessary to disturb the connection in normal use.		N/A
	For equipotential bonding one screw is permitted if two full threads engage the metal		N/A

5.4.5 Form/press / tight fit			
	Form/press/tight fits of metallic components which are not separately equipotentially bonded are electrically connected.		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
5.4.6 Connections by adhesives			
	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.		P
	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.	See 5.6.4.2	P
5.4.7 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
5.5 Materials			
5.5.2 Polymeric materials			
5.5.2.1 General			
	Polymeric materials are able to durably and safely withstand the electrical, mechanical, thermal, environmental, and corrosive stresses occurring in the application.		P
	Polymeric materials are resistant to electrical and mechanical property degradation.	Test results see subsequent sections	P
	Polymeric parts which ensure either the electrical or mechanical safety of the PV module, or both, are resistant to electrical and mechanical property degradation.	Test results see subsequent sections	P
	They comply with the requirements of the materials creep test (MST 37) depending on their constructive function in the PV module.	See Table 13	P
	Polymeric material used as a part of a cemented joint fulfils additionally the requirements of 5.6.4.2.	See 5.6.4.2	N/A
5.5.2.2 Endurance to weathering stress			
	Polymeric materials of the module and its components are durable to weathering stress.	Test results see subsequent sections	P
5.5.2.3 Polymeric materials used as electrical insulation			

5.5.2.3.1 General			
	Material relied upon for insulation are of adequate thickness, as described in Tables 3 and 4.	See Table 49 and Annex 2 (BOM)	P
	The temperature limits of materials used as insulation are not less than the maximum measured operating temperature of the specific material in application, as measured during the temperature test (MST 21).	See Table 32	P
5.5.2.3.2 Endurance to electrical stress			
	Materials used as electrical insulation are in compliance with the insulation coordination requirements	See 5.6.3	P
5.5.2.3.3 Endurance to thermal stress			
	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.	☐ TI : ☐ RTE : ☒ RTI :	P
5.5.2.3.4 Polymeric insulating materials used as external parts			
	External polymeric parts of the PV module meet the following requirements:		P
	-flammability class minimum V-1		N/A
	-ball pressure test with a temperature of 75 °C		N/A
	-ignitability test in final application	See Table 37	P
	-peel test of cemented joints	See Table 39	N/A
	-lap shear strength test	See Table 40	N/A
5.5.2.3.5 Polymeric insulating parts supporting live parts			
	External parts of insulating material supporting live parts including connections, and parts of polymeric material providing supplementary insulation or reinforced insulation, are sufficiently resistant to heat.		P
	Polymeric parts which are not components of the laminate fulfil the requirements of ignitability test	See Table 37	P
	Other than elastomeric polymeric materials meet the following requirements:		
	-flammability class minimum HB		N/A
	-ball pressure test with a temperature of 125 °C		N/A
	-material creep test	See Table 13	N/A
5.5.2.4 Polymeric materials used for mechanical functions			
	Materials used for mechanical functions have a mechanical relative thermal endurance, relative thermal index or temperature index (RTE/RTI or TI) appropriate for the application, at least 90 °C.	☐ TI : ☐ RTE : ☒ RTI :	P
5.5.3 Metallic materials			
5.5.3.1 General			

	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.		N/A
	Corrosion protection is at least equivalent to a zinc coating of 0.015 mm thickness		N/A
5.5.3.2 Current carrying parts			
	Assessed parts:		P
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	See Table 32 See Table 34 See Table 11	P
	Current-carrying materials are protected against corrosion.		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	N/A
	Coated metal not used if the current-carrying parts are stressed by abrasion.		N/A
5.5.4 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 5.5.2.3.3	See 5.5.2.3.3	N/A
5.6 Protection against electric shock			
5.6.1 General			
	Adequate protection against contact with hazardous live parts provided		P
	Specimen pose no risk of electric shock.		P
5.6.2 Protection against accessibility to hazardous live parts			
5.6.2.1 General			
	Class of module	See safety ratings	—
	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 5.6.2.3	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.		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.		P

Table 2 of 5.6.2.3	For Class II PV modules, live parts of different potential of the same circuit are separated by double or reinforced insulation.		P
	For Class III PV modules separation between accessible parts or accessible surfaces and hazardous live parts by functional insulation.		N/A
Table 2 of 5.6.2.3	In Class III PV modules live parts of different polarity are separated by at least functional insulation.		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 5.5.2 due to their application.		P
5.6.2.2 Protection by means of enclosures and insulation barriers			
	Enclosures or insulation barriers are so designed that, after mounting, the live parts are not accessible (even after possible deformation)		P
	Degree of protection of the housing is not impaired by any possible deformation.		P
	Parts of enclosures and insulation barriers that provide protection are not removable without the use of a tool.		P
	Lids which are attached without screws have one or several detectable features, e.g. recesses,		N/A
	Tool to open the lid do not come into contact with the live parts if lid is removed correctly.		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.		P
	Parts are prevented from loosening or turning.		P
5.6.2.3 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.		P
	Requirements of Table 2	see 5.6.2.1 of this report	—
5.6.3 Insulation coordination			
5.6.3.1	Components comply with the requirements for their relevant standards	See Annex 2	P
5.6.3.2	Pollution degree	See Table 1, Table 2, Table 3	—
5.6.3.3	Material group	See Table 1, Table 2, Table 3	—
5.6.3.4	Clearance and creepage distance	See Table 1, Table 2, Table 3, Table 4	P

	Derating factor for altitude above 2000 m is considered		P
5.6.4 Distance through insulation (dti)			
5.6.4.1 General			
	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
	Distances through insulation (dti) of solid insulation comply with the minimum distance as required:		P
	System voltage…….:	See safety ratings	—
	Distance through insulation req./meas. (mm):		P
	The insulation fulfils the material classification as given in IEC 60216-1, IEC 60216-2 and IEC 60216-5 (RTE/TI/RTI).	See annex 2	P
5.6.4.2 Cemented joints			
	Cemented joints were considered as	☐ Edge seal ☐ Interface between Junction Box and mounting surface ☐ others	—
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4:		—
	System voltage…….:	See safety ratings	—
	Distance along cemented joints req./meas. (mm):		—
	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.		—
	-No breakdown at MST 16 (initial and final test)with a 1,35 times higher tests voltage:		—
	Test voltage (V):		—
	No breakdown at MST 17 (initial and final test)with a 1,35 times higher tests voltage:		—
	Test voltage (V):		—
	The electrically insulating adhesive/sealant have a volume resistivity:		—
	-of greater than 50 × 10^6 Ω cm (dry)		—
	-and greater than 10 × 10^6 Ω cm (wet).		—
	☐ rigid / rigid: lap shear test MST 36 ☐ rigid / flexible: Peel test MST 35	See Table 40 and Table 39	—
	Supplement information: Above mentioned tests have to be performed for each cemented joint. Also the materials and their properties have to be listed in annex 1		

5.6.4.3	**Insulation in thin layers**		
	Relied upon insulation in thin layers is applied at	☐ Backsheet ☐ Front sheet ☐ insulation within laminate ☐ others	—
	Initial Construction of Insulation in thin layers complies with requirements concerning thickness under consideration of figure 4 as described in table 3 or 4	See Annex 2	P
	Construction of Insulation in thin layers complies with requirements concerning RTE/TI/RTI	See Annex 2	P
	Insulation in thin layers provide sufficient dielectric strength:	See Annex 2	—
	Test voltage for single-layer sheet and for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage)…….:	See Annex 2	P
	Test voltage for each layer of a multi-layer providing relied upon insulation (1000V + 2 times system voltage)…….:	See Annex 2	P
	Informative parameter evaluated according to IEC 62788-2 are presented	See Annex 2	P
	Single-layer sheet as well as entire multi-layer sheet in final application comply with following:		—
	- Minimum thickness according to lines 1b) of Table 3 and Table 4, (not less than 30µm) req./meas. (mm),:	See Table 49	P
	- Dielectric strength for basic insulation is provided after cut susceptibility test (MST 12) (1000V + 2 times system voltage)	See Table 41	P
	Test voltage (V):	16000	—

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/m² .....:	See appended Table 15	P
10.29	MST 52 – Humidity freeze test .....:	See appended Table 16	P
10.31	MST 54 – UV test 60kWh/m² .....:	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/m² .....:	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
10.15	MST 21 – Temperature Test.....:	See appended Table 32	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 G			
10.12	MST 14 – Impulse voltage test .....:	See appended Table 35	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:			

Table 5: Overview of MST items for each test sample

MST item	Sample No.													
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Control module	X													
MST 01 – Visual inspection	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					
MST 04 – Insulation thickness test							X							
MST 05 – Durability of markings	X	X	X	X	X		X	X						
MST 06 – Sharp edge test	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						
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					
MST 17 – Wet leakage current test		X	X	X	X	X	X	X						
MST 21 – Temperature Test		X												
MST 22 – Hot-spot endurance Test		X												
MST 23 – Fire Test												X	X	
MST 24 – Ignitability test										X				
MST 25 – Bypass diode thermal test		X												
MST 26 – Reverse current overload test		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							
MST 53 – Damp heat test 1000 h					X									
MST 54 – UV test 15 KWh/m²			X											
MST 54 – UV test 60 KWh/m²							X							
MST 55 – Cold conditioning								X						
MST 56 – Dry heat conditioning								X						

Legend:

X ……Test performed,

Table 6: MST 01 - Initial Visual inspection			
Test Date (YYYY-MM-DD)....:		2022-10-28	—
Sample # 1-1	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-2	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-3	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-4	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-5	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-6	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-7	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-8	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-9	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-10	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-11	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-12	Findings ....:	☐ Yes.....☒ No	P
		No	—
Sample # 1-13	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings –	No	—

	comments or attach photos		
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.....			1-1			—
Test Date [YYYY-MM-DD].....			2022-11-03			—
Irradiance (W/m2)			1000			—
Module temperature (°C)			25			—
Test method.....			☒ Simulator ☐ Natural sunlight			—
Rated Isc including manufacturing tolerances.....			4%			—
Rated Voc including manufacturing tolerances ...			3%			—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
13.55	51.04	12.90	42.94	553.91	80.10	—
Supplementary information: N/A						

Table 8: MST 03 - Maximum power determination							
Test Date [YYYY-MM-DD].....				2022-11-03			—
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
1-2	13.56	51.06	12.92	42.95	554.75	80.11	—
1-3	13.58	51.00	12.93	42.93	555.21	80.17	—
1-4	13.60	51.01	12.95	42.94	555.83	80.14	—
1-5	13.59	51.01	12.94	42.94	555.77	80.17	—
1-6	13.53	51.41	12.92	43.18	557.95	80.22	—
1-7	13.58	51.02	12.92	42.93	554.68	80.07	—
1-8	13.58	50.95	12.92	43.04	556.24	80.38	—
1-9	13.56	51.00	12.91	42.94	554.22	80.16	—
Supplementary information: N/A							

Table 9: MST 16 - Initial Insulation test					
Test Date (YYYY-MM-DD).....			2022-11-04		—
Test Voltage applied (V, DC)			8000 /1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1-2	45700	15.5	-	No	P
1-3	41900	15.5	-	No	P
1-4	42050	15.5	-	No	P
1-5	45270	15.5	-	No	P
1-6	>50000	15.5	-	No	P
1-7	>50000	15.5	-	No	P
1-8	47140	15.5	-	No	P
1-9	>50000	15.5	-	No	P
Supplementary information: N/A					

Table 10: MST 17 - Initial Wet leakage current test			
Test Date (YYYY-MM-DD)		2022-11-04	—
Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm).....		2127	—
Solution temperature (°C).....		22.1	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
1-2	8010	15.5	P
1-3	8050	15.5	P
1-4	7886	15.5	P
1-5	8104	15.5	P
1-6	10200	15.5	P
1-7	9150	15.5	P
1-8	10700	15.5	P
Supplementary information: N/A			

Table 11: MST 13 - Continuity test of equipotential bonding		
Test Date Initial examination (YYYY-MM-DD)	2022-11-05	—
Test Date Final examination (YYYY-MM-DD)	2023-01-18	—
Maximum over-current protection rating (A)	25	—
Current applied (A)	62	—
Location of designated grounding point.....	The center of one longer side	—
Location of second contacting point	Adjacent side with greatest distance from the grounding point; At the center of another longer side; At the center of another shorter side.	—

Sample #	Position in test sequence:	Voltage [V]	Resistance [Ω]	
1-3	Initial examination	0.22 0.21 0.22	0.003 0.003 0.003	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12			—
	Final examination	0.39 0.40 0.38	0.006 0.006 0.006	P
1-4	Initial examination	0.23 0.22 0.23	0.003 0.003 0.003	P
	Preconditioning: MST 51, MST 12			—
	Final examination	0.39 0.39 0.39	0.006 0.006 0.006	P
1-5	Initial examination	0.21 0.19 0.20	0.003 0.003 0.003	P
	Preconditioning: MST 53, MST 34, MST 12			—
	Final examination	0.40 0.41 0.40	0.006 0.006 0.006	P
1-6	Initial examination	0.25 0.25 0.24	0.003 0.003 0.003	P
	Preconditioning: MST 37			—
	Final examination	0.41 0.41 0.42	0.006 0.006 0.006	P
1-7	Initial examination	0.23 0.24 0.24	0.003 0.003 0.003	P

	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, MST 12			—
	Final examination	0.40 0.39 0.39	0.006 0.006 0.006	P
1-8	Initial examination	0.24 0.25 0.25	0.004 0.004 0.004	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST12			—
	Final examination	0.41 0.39 0.39	0.007 0.006 0.006	P
Supplementary information: N/A				

Table 12: MST 11 - Accessibility test			
Test Date **Initial** examination (YYYY-MM-DD)....	2022-11-05		—
Test Date **Final** examination (YYYY-MM-DD).....	2023-01-18		—
Sample #	Position in test sequence:		
1-3	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
1-4	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 51, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
1-5	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 34, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
1-7	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
1-8	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST12		—
	Final examination, access?	☐ Yes ☒ No	P
Supplementary information: N/A			

SEQUENCE A				
Sample #	1-6			—
Table 13: MST 37 - Materials creep test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-21 / 2022-11-30		—
Duration [h] .....:		200		—
Applied temperature [°C] .....:		105		—
MST 01: Visual inspection after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos		No		—
Supplementary information: For clearance and creepage distances see table XYZ				
MST 16: Insulation test after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Test Voltage applied (V, dc) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
38320	15.5	-	No	P
MST 17: Wet leakage current test after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1810		—
Solution temperature (°C).....:		21.8		—
Measured(MΩ)		Required (MΩ)		Result
7348		15.5		P
Supplementary information: N/A				

SEQUENCE B				
Sample #	1-7			—
Table 14: MST 53 - Damp heat test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-01 / 2022-11-10		—
Duration [h] .....:		200		—
MST 01: Visual inspection after Damp heat test				—
Test Date (YYYY-MM-DD) .....:		2022-11-10		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Damp heat test				—
Test Date (YYYY-MM-DD) .....:		2022-11-10		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
38660	15.5	-	No	P
Supplementary information: N/A				

Table 15: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-18 / 2022-12-05		—
Module temperature [°C] .....:		60± 5		—
Irradiation total [kWh/ m²] .....:		60		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-12-05		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-12-05		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
35100	15.5	-	No	P
Supplementary information: N/A				

Table 16: MST 52 -Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-05 / 2022-12-15		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
29700	15.5	-	No	P
Supplementary information: N/A				

Table 17: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-15 / 2023-01-02		—
Module temperature [°C] .....:		60± 5		—
Irradiation total [kWh/ m²] .....:		60		—
Open circuits .....:		☐ Yes ☒ No		
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2023-01-03		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2023-01-03		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
25090	15.5	-	No	P
Supplementary information: N/A				

Table 18: MST 52 - Humidity freeze test		
Test Date (YYYY-MM-DD) start/end.....:	2023-01-03 / 2023-01-13	—
Total cycles (10) .....:	10	—

Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
19300	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze 10 test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		1739		—
Solution temperature (°C) .....:		20.5		—
Measured (MΩ)		Required (MΩ)		Result
3280		15.5		P
Supplementary information: N/A				

SEQUENCE B1				
Sample #	1-8			—
Table 19: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-04 / 2022-11-06		—
Temperature [°C] Duration [h] .....:		-40 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-07		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-07		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
36920	15.5	-	No	P
Supplementary information: N/A				

Table 20: MST 56 - Dry heat conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-21 / 2022-11-30		—
Temperature [°C] Duration [h] ..... :		200		—
MST 01: Visual inspection after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
32850	15.5	-	No	P
Supplementary information: N/A				

Table 21: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-05 / 2022-12-15		—
Total cycles (10) ..... :		10		—
Open circuits..... :		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
27310	15.5	-	No	P
Supplementary information: N/A				

Table 22: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-16 / 2022-12-18		—
Temperature [°C] / Duration [h] ..... :		-40 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-12-19		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-12-19		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
24620	15.5	-	No	P
Supplementary information: N/A				

Table 23: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-19 / 2022-12-29		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-29		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-29		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
20260	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-29		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1652		—
Solution temperature (°C).....:		21.3		—
Measured (MΩ)		Required (MΩ)		Result
3526		15.5		P
Supplementary information: N/A				

SEQUENCE C				
Sample #	1-3			—
Table 24: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-08 / 2022-11-12		—
Module temperature [°C] .....:		60±5		—
Irradiation total [kWh/ m²] .....:		15		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-11-14		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-11-14		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
39810	15.5	-	No	P
Supplementary information: N/A				

Table 25: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-14 / 2022-11-21		—
Total cycles (50) .....:		50		—
Applied current (A) .....:		13.0 / 0.13		—
Limiting voltage (V) .....:		90		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-11-21		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-11-21		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	

35190	15.5	-	No	P
Supplementary information: N/A				

Table 26: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-22 / 2022-12-02		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
29170	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1827		—
Solution temperature (°C).....:		20.6		—
Measured (MΩ)		Required (MΩ)		Result
5086		15.5		P
Supplementary information: N/A				

Table 27: MST 42 - Robustness of terminations test		
Test Date (YYYY-MM-DD) .....:	2022-12-02	—
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) .....:	2022-12-02	—
Findings ..... :	☐ Yes.....☒ No	P
Nature and position of findings – comments or attach photos		—
MST 17: Wet leakage current test after retention of junction box on mounting surface		
Test Date (YYYY-MM-DD) .....:	2022-12-02	—

Test Voltage applied [V] .....:	1500	—
Solution resistivity (Ω cm) .....:	1827	—
Solution temperature (°C) .....:	20.6	—
Measured [MΩ]	Required [MΩ]	Result
5075	15.5	P
Supplementary information: N/A		

SEQUENCE D				
Sample #	1-4			—
Table 28: MST 53 - Damp heat test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-30 / 2023-01-11		—
Total hours (1000) .....:		1000		—
MST 01: Visual inspection after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
27410	15.5	-	No	P
MST 17: Wet leakage current test after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1741		—
Solution temperature (°C).....:		20.2		—
Measured (MΩ)		Required (MΩ)		Result
4836		15.5		P
Supplementary information: N/A				

Table 29: MST 34 - Static mechanical load test			
Test Date (YYYY-MM-DD) .....:	2023-01-13		—
Mounting method .....:	4 clamps and 2 rails		—
Design Load [Pa] / Safety factor ɣm.....:	3600 / 1600 / 1.5		—
Load applied to.....:	front side	back side	—
Mechanical load [Pa].....:	5400	2400	—
First cycle time (start/end) .....:	1h	1h	—
Intermittent open-circuit (yes/no).....:	no	no	P
Second cycle time (start/end).....:	1h	1h	—
Intermittent open-circuit (yes/no).....:	no	No	P
Third cycle time (start/end) .....:	1h	1h	—

Intermittent open-circuit (yes/no) .....:	no	no	P
Supplementary information: Maximum bending at module centre 35 mm.			

MST 01: Visual inspection after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
24120	15.5	-	No	P
MST 17: Wet leakage current test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, dc) ..... :		1500		—
Solution resistivity (Ω cm) .....:		1736		—
Solution temperature (°C) ..... :		20.2		—
Measured (MΩ)		Required (MΩ)		Result
4463		15.5		P
Supplementary information: N/A				

SEQUENCE E				
Sample #	1-5			—
Table 30: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-21 / 2022-12-21		—
Total cycles (200) .....:		200		—
Applied current (A) .....:		13.0 / 0.13		—
Limiting voltage (V) .....:		90		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
31400	15.5	-	No	P
MST 17: Wet leakage current test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1784		—
Solution temperature (°C).....:		20.5		—
Measured (MΩ)		Required (MΩ)		Result
5810		15.5		P
Supplementary information: N/A				

SEQUENCE F					
Sample #	1-2				—
Table 32: MST 21 - Temperature Test					
Reference solar irradiance (W/m²) .....:		1000 W/m²			—
Reference ambient temperature (°C) .....:		28.6			—
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		61.8	73.2	-	P
PV module backsheet below the centre cell		50.9	62.3	-	P
Terminal enclosure interior surface		42.6	54.0	85	P
Field wiring terminals		N/A	N/A	-	N/A
Insulation of the field wiring leads		40.8	52.2	85	P
External connector bodies		38.2	49.6	85	P
Bypass diode bodies		N/A	N/A	-	N/A
MST 01: Visual inspection after Temperature Test					—
Test Date (YYYY-MM-DD) .....:		2022-11-15			—
Findings ..... :		☐ Yes .....☒ No			P
Nature and position of findings – comments or attach photos					—
MST 16: Insulation test after Temperature Test					—
Test Date (YYYY-MM-DD) .....:		2022-11-15			—
Test Voltage applied (V, DC) .....:		8000 /1500			—
Measured	Required	Dielectric breakdown			Result
MΩ	MΩ	Yes (description)		No	
45100	15.5	-		No	P
MST 17: Wet leakage current test after Temperature Test					—
Test Date (YYYY-MM-DD) .....:		2022-11-15			—
Test Voltage applied (V, dc) .....:		1500			—
Solution resistivity (Ω cm) .....:		1829			—
Solution temperature (°C) .....:		21.7			—
Measured (MΩ)		Required (MΩ)			Result
8066		15.5			P
Supplementary information: N/A					

Table 33: MST 22 - Hot-spot endurance test		
Test Date (YYYY-MM-DD) start/end .....:	2022-11-16 / 2022-11-16	—
Cell interconnection circuit.....:	☐ S ☒ SP ☐ PS	—
Irradiance during each cycle…… .....:	1000 W/m²	—
Module temperature at thermal equilibrium in each cycle [°C] .....:	50	—
Determination of worst case cell		—
Maximum measured cell temperature in each cycle [°C] .....:	134.8	—
Shading rate [%] or number of cells shaded.....:	45%	—
Test hours for each cycle.....:	1	—
MST 01: Visual inspection after hot-spot endurance test		—
Test Date (YYYY-MM-DD) .....:	2022-11-16	—
Findings ..... :	☐ Yes .....☒ No	P
Nature and position of findings – comments or attach photos		—
MST 02: Maximum power determination after hot-spot endurance test		—
Test Date [YYYY-MM-DD].....:	2022-11-16	—
Module temperature [°C].....:	25	—
Irradiance [W/m²].....:	1000	—

Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]
13.68	50.99	13.04	42.64	556.09	79.71

MST 16: Insulation test after hot-spot endurance test				—
Test Date (YYYY-MM-DD) .....:		2022-11-16		—
Test Voltage applied [V] .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
44980	15.5	-	No	P

MST 17: Wet leakage current test after hot-spot endurance test		—
Test Date (YYYY-MM-DD) .....:	2022-11-16	—
Test Voltage applied [V] .....:	1500	—
Solution resistivity [Ω cm) .....:	1832	—
Solution temperature [°C] .....:	21.5	—
Measured [MΩ]	Required [MΩ]	Result
7960	15.5	P
Supplementary information: N/A		

Table 34: MST 26 - Reverse current overload test				
Test Date (YYYY-MM-DD)..... :		2022-11-17		—
Module over-current protection rating (A) .....:		25		—
Test current (A) .....:		33.75		—
Range of applied voltage (V).....:		48.1-56.3		—
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: 87.5°C				
MST 01: Visual inspection after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-17		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-17		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
43920	15.5	-	No	P
MST 17: Wet leakage current test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-17		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1894		—
Solution temperature (°C).....:		21.5		—
Measured (MΩ)		Required (MΩ)		Result
7880		15.5		P
Supplementary information: N/A				

SEQUENCE G				
Sample #:	1-9			—
Table 35: MST 14 - Impulse voltage test				
Test Date (YYYY-MM-DD)....:		2022-11-24		—
Maximum system voltage (V)....:		1500		—
Required Impulse voltage (V) ....:		16000		—
Measured Impulse voltage (V)....:		16010		P
T_1 (µs)....:		1.00		P
T_2 (µs)....:		52.20		P
Thickness of conductive foil (mm) ....:		0.05		—
Results				
☒ No evidence of dielectric breakdown or surface tracking observed ☒ No evidence of major visual defects (see table MST 01 below)				P
MST 01: Visual inspection after Impulse voltage test				—
Test Date (YYYY-MM-DD)....:		2022-11-24		—
Findings .... :		☐ Yes....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Impulse voltage test				—
Test Date (YYYY-MM-DD) ....:		2022-11-24		—
Test Voltage applied (V, DC) ....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
47330	15.5	-	No	P
Supplementary information: N/A				

OTHER TESTS		
Sample #:		—
Table 36: MST 23 - Fire test		
Test Date (YYYY-MM-DD) .....:		—
Module fire resistance class (A, B, C) .....:		—
No. of modules provided to create the test assembly .....:		—
☒ The module complies with the requirements for the fire resistance class		
Supplementary information: N/A		

Sample #:	1-10	—
Table 37: MST 24 - Ignitability test		
Test Date (YYYY-MM-DD) .....:	2022-12-16	—
Flame application point.....:	1.5mm behind the leading edge	—
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	P
Length of destroyed area.....:	No findings	P
Supplementary information: N/A		

Sample #:	1-11		—
Table 38: MST 32 - Module breakage test			
Test Date (YYYY-MM-DD) .....:	2022-12-19		—
Weight of impactor (kg).....:	45.5		—
Thickness of sample (mm) .....:	35		—
Mounting technique used .....:	4 clamps		—
Module breakage .....:	☒	No breakage	—
	☒	No separation from frame or mounting structure	P
	☐	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 cm² ejected from sample	—
	☒	Continuity of equipotential bonding provided, see table 10.11	P
Nature and position of findings – comments or attach photos			Result
No			P
Supplementary information: N/A			

Table 41: MST 12 - Cut susceptibility test			
Test Date (YYYY-MM-DD) .....:		2023-01-16	—
Applied force (N) .....:		8.9	—
MST 01 Visual inspection after cut test			—
Test Date (YYYY-MM-DD) .....:		2023-01-16	—
Sample # 1-3	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 1-4	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 1-5	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 1-7	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 1-8	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Supplementary information: N/A			

MST 16: Insulation test after cut test					—
Test Date (YYYY-MM-DD) .....:			2023-01-16		—
Test Voltage applied (V, DC) .....:			8000 /1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1-3	33460	15.5	-	No	P
1-4	23720	15.5	-	No	P
1-5	29140	15.5	-	No	P
1-7	19220	15.5	-	No	P
1-8	20240	15.5	-	No	P
Supplementary information: N/A					

MST 17: Wet leakage current test after cut test		—
Test Date (YYYY-MM-DD) .....:	2023-01-16	—
Test Voltage applied (V, dc) .....:	1500	—
Solution resistivity (Ω cm) .....:	1713	—

Solution temperature (°C) .....:		20.8	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
1-3	4950	15.5	P
1-4	4209	15.5	P
1-5	5732	15.5	P
1-7	3275	15.5	P
1-8	3520	15.5	P
Supplementary information: N/A			

Table 42: MST 03 - Maximum power determination final

Test Date (YYYY-MM-DD) .....:			2023-01-17			—
Module temperature (°C) .....:			25			—
Irradiance (W/m²) .....:			1000			—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)
1-1	13.68	50.92	12.98	42.91	556.95	79.96
1-2	13.68	50.98	13.02	42.59	554.48	79.50
1-3	13.54	50.92	12.88	42.89	552.55	80.16
1-4	13.39	50.86	12.74	42.62	542.93	79.74
1-5	13.56	50.87	12.75	42.96	547.84	79.41
1-7	13.30	50.80	12.71	42.92	545.46	80.71
1-8	13.54	50.85	12.89	42.85	552.46	80.22
Supplementary information: N/A						

Table 43: MST 01 - Final Visual inspection			
Test Date (YYYY-MM-DD).....:		2023-01-18	—
Sample # 1-1	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-2	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-3	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-4	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-5	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-7	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 1-8	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Supplementary information: For creepage distances and clearances see Table 1, Table 2, Table 3 and Table 4			

Table 44: MST 05 - Durability of markings							
Test Date (YYYY-MM-DD) .....:			2023-01-18				—
Sample #	Markings legible		Not easily removable		No curling		Result
1-1	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-2	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-3	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-4	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-5	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-7	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
1-8	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
Supplementary information: N/A							

Table 45: MST 06 - Sharp edge test			
Test Date (YYYY-MM-DD) .....:	2023-01-18		—
Sample #	Accessible surfaces free of sharp edges, burrs etc.		Result
1-1	☒ Yes	☐ No	P
1-2	☒ Yes	☐ No	P
1-3	☒ Yes	☐ No	P
1-4	☒ Yes	☐ No	P
1-5	☒ Yes	☐ No	P
1-7	☒ Yes	☐ No	P
1-8	☒ Yes	☐ No	P
Supplementary information: N/A			

Table 46: MST 07 - Bypass diode functionality test				
Test Date (YYYY-MM-DD) .....:	2023-01-18			—
☐ **Method A**				—
Ambient temperature [°C] .....:				—
Current flow applied [A] .....:				—
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %	Result
1-1			☐ Yes ☐ No	
1-2			☐ Yes ☐ No	
1-3			☐ Yes ☐ No	
1-4			☐ Yes ☐ No	
1-5			☐ Yes ☐ No	
1-7			☐ Yes ☐ No	
1-8			☐ Yes ☐ No	
☒ **Method B**				—
Sample #	IV curve after shading			Result
	Diode 1 working properly	Diode 2 working properly	Diode 3 working properly	
1-1	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-2	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-3	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-4	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-5	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-7	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
1-8	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
Supplementary information: N/A				

Sample #		N/A
Table 49: MST 04 - Insulation thickness test		
Test Date (YYYY-MM-DD) ..... :		—
Max. System voltage ..... :		—
Thickness of insulation acc. datasheet ..... :		—
Required thickness of insulation..... :		—
Measurement uncertainty ..... :		—
Location	Measured thickness (including uncertainty)	Result
		N/A
		N/A
		N/A
Supplementary information: N/A		

Table 6: MST 01 - Initial Visual inspection			
Test Date (YYYY-MM-DD)....:		2022-10-28	—
Sample # 2-1	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-2	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-3	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-4	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-5	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-6	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-7	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-8	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-9	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-10	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-11	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-12	Findings ....:	☐ Yes.....☒ No	P
		No	—
Sample # 2-13	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings –	No	—

	comments or attach photos		
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.....			2-1			—
Test Date [YYYY-MM-DD].....			2022-11-07			—
Irradiance (W/m2)			1000			—
Module temperature (°C)			25			—
Test method.....			☒ Simulator ☐ Natural sunlight			—
Rated Isc including manufacturing tolerances.....			4%			—
Rated Voc including manufacturing tolerances ...			3%			—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
13.55	51.04	12.90	42.94	553.91	80.10	—
Supplementary information: N/A						

Table 8: MST 03 - Maximum power determination							
Test Date [YYYY-MM-DD].....			2022-11-07				—
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
2-2	13.56	51.06	12.92	42.95	554.75	80.11	—
2-3	13.58	51.00	12.93	42.93	555.21	80.17	—
2-4	13.60	51.01	12.95	42.94	555.83	80.14	—
2-5	13.59	51.01	12.94	42.94	555.77	80.17	—
2-6	13.53	51.00	12.92	42.88	554.07	80.30	—
2-7	13.58	51.02	12.92	42.93	554.68	80.07	—
2-8	13.58	50.95	12.92	43.04	556.24	80.38	—
2-9	13.56	51.00	12.91	42.94	554.22	80.16	—
Supplementary information: N/A							

Table 9: MST 16 - Initial Insulation test					
Test Date (YYYY-MM-DD).....			2022-11-07		—
Test Voltage applied (V, DC)			8000 /1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
2-2	>50000	15.5	-	No	P
2-3	>50000	15.5	-	No	P
2-4	>50000	15.5	-	No	P
2-5	>50000	15.5	-	No	P
2-6	>50000	15.5	-	No	P
2-7	>50000	15.5	-	No	P
2-8	>50000	15.5	-	No	P
2-9	>50000	15.5	-	No	P
Supplementary information: N/A					

Table 10: MST 17 - Initial Wet leakage current test			
Test Date (YYYY-MM-DD)		2022-11-07	—
Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm).....		2127	—
Solution temperature (°C).....		22.1	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
2-2	10360	15.5	P
2-3	9750	15.5	P
2-4	9366	15.5	P
2-5	9663	15.5	P
2-6	10640	15.5	P
2-7	11050	15.5	P
2-8	9655	15.5	P
Supplementary information: N/A			

Table 11: MST 13 - Continuity test of equipotential bonding		
Test Date Initial examination (YYYY-MM-DD)	2022-11-07	—
Test Date Final examination (YYYY-MM-DD)	2023-01-18	—
Maximum over-current protection rating (A)	25	—
Current applied (A)	62	—
Location of designated grounding point.....	The center of one longer side	—
Location of second contacting point	Adjacent side with greatest distance from the grounding point; At the center of another longer side; At the center of another shorter side.	—

Sample #	Position in test sequence:	Voltage [V]	Resistance [Ω]	
2-3	Initial examination	0.24 0.26 0.25	0.004 0.004 0.004	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12			—
	Final examination	0.37 0.36 0.37	0.006 0.006 0.006	P
2-4	Initial examination	0.25 0.25 0.24	0.004 0.004 0.004	P
	Preconditioning: MST 51, MST 12			—
	Final examination	0.38 0.39 0.38	0.006 0.006 0.006	P
2-5	Initial examination	0.23 0.23 0.24	0.004 0.004 0.004	P
	Preconditioning: MST 53, MST 34, MST 12			—
	Final examination	0.42 0.42 0.41	0.007 0.007 0.007	P
2-6	Initial examination	0.24 0.24 0.24	0.004 0.004 0.004	P
	Preconditioning: MST 37			—
	Final examination	0.39 0.38 0.39	0.006 0.006 0.006	P
2-7	Initial examination	0.24 0.25 0.25	0.004 0.004 0.004	P

	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, MST 12			—
	Final examination	0.42 0.42 0.42	0.007 0.007 0.007	P
2-8	Initial examination	0.24 0.25 0.24	0.004 0.004 0.004	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST12			—
	Final examination	0.40 0.41 0.39	0.006 0.007 0.006	P
Supplementary information: N/A				

Table 12: MST 11 - Accessibility test			
Test Date **Initial** examination (YYYY-MM-DD)....	2022-11-07		—
Test Date **Final** examination (YYYY-MM-DD).....	2023-01-18		—
Sample #	Position in test sequence:		
2-3	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
2-4	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 51, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
2-5	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 34, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
2-7	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, MST 12, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
2-8	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, MST12		—
	Final examination, access?	☐ Yes ☒ No	P
Supplementary information: N/A			

SEQUENCE A				
Sample #	2-6			—
Table 13: MST 37 - Materials creep test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-21 / 2022-11-30		—
Duration [h] .....:		200		—
Applied temperature [°C] .....:		105		—
MST 01: Visual inspection after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos		No		—
Supplementary information: For clearance and creepage distances see table XYZ				
MST 16: Insulation test after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Test Voltage applied (V, dc) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
46800	15.5	-	No	P
MST 17: Wet leakage current test after materials creep test				—
Test Date (YYYY-MM-DD) .....:		2022-11-30		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1810		—
Solution temperature (°C).....:		21.8		—
Measured(MΩ)		Required (MΩ)		Result
7693		15.5		P
Supplementary information: N/A				

SEQUENCE B				
Sample #	2-7			—
Table 14: MST 53 - Damp heat test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-09 / 2022-11-18		—
Duration [h] .....:		200		—
MST 01: Visual inspection after Damp heat test				—
Test Date (YYYY-MM-DD) .....:		2022-11-18		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Damp heat test				—
Test Date (YYYY-MM-DD) .....:		2022-11-18		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
48900	15.5	-	No	P
Supplementary information: N/A				

Table 15: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-18 / 2022-12-05		—
Module temperature [°C] .....:		60± 5		—
Irradiation total [kWh/ m²] .....:		60		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-12-05		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-12-05		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
42800	15.5	-	No	P
Supplementary information: N/A				

Table 16: MST 52 -Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-05 / 2022-12-15		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
37110	15.5	-	No	P
Supplementary information: N/A				

Table 17: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-15 / 2023-01-02		—
Module temperature [°C] .....:		60± 5		—
Irradiation total [kWh/ m²] .....:		60		—
Open circuits .....:		☐ Yes ☒ No		
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2023-01-03		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2023-01-03		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
32730	15.5	-	No	P
Supplementary information: N/A				

Table 18: MST 52 - Humidity freeze test		
Test Date (YYYY-MM-DD) start/end.....:	2023-01-03 / 2023-01-13	—
Total cycles (10) .....:	10	—

Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
27410	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze 10 test				—
Test Date (YYYY-MM-DD) .....:		2023-01-13		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		1835		—
Solution temperature (°C) .....:		22.4		—
Measured (MΩ)		Required (MΩ)		Result
4083		15.5		P
Supplementary information: N/A				

SEQUENCE B1				
Sample #	2-8			—
Table 19: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-07 / 2022-11-09		—
Temperature [°C] Duration [h] .....:		-40 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-09		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-09		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
47320	15.5	-	No	P
Supplementary information: N/A				

Table 20: MST 56 - Dry heat conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-10 / 2022-11-19		—
Temperature [°C] Duration [h] ..... :		105 / 200		—
MST 01: Visual inspection after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-19		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-11-19		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
43490	15.5	-	No	P
Supplementary information: N/A				

Table 21: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-22 / 2022-12-02		—
Total cycles (10) ..... :		10		—
Open circuits..... :		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
38720	15.5	-	No	P
Supplementary information: N/A				

Table 22: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-05 / 2022-12-07		—
Temperature [°C] / Duration [h] ..... :		-40 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-12-07		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2022-12-07		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
34900	15.5	-	No	P
Supplementary information: N/A				

Table 23: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-12-05 / 2022-12-15		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Test Voltage applied (V, DC) .....:		8000 / 1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
29120	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-15		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1652		—
Solution temperature (°C).....:		21.3		—
Measured (MΩ)		Required (MΩ)		Result
4405		15.5		P
Supplementary information: N/A				

SEQUENCE C				
Sample #	2-3			—
Table 24: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-08 / 2022-11-12		—
Module temperature [°C] .....:		60±5		—
Irradiation total [kWh/ m²] .....:		15		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-11-14		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2022-11-14		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
46370	15.5	-	No	P
Supplementary information: N/A				

Table 25: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-14 / 2022-11-21		—
Total cycles (50) .....:		50		—
Applied current (A) .....:		13.0 / 0.13		—
Limiting voltage (V) .....:		90		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-11-21		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-11-21		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	

42600	15.5	-	No	P
Supplementary information: N/A				

Table 26: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-22 / 2022-12-02		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
32800	15.5	-	No	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2022-12-02		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1864		—
Solution temperature (°C).....:		20.6		—
Measured (MΩ)		Required (MΩ)		Result
5036		15.5		P
Supplementary information: N/A				

Table 27: MST 42 - Robustness of terminations test		
Test Date (YYYY-MM-DD) .....:	2022-12-02	—
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) .....:	2022-12-02	—
Findings ..... :	☐ Yes.....☒ No	P
Nature and position of findings – comments or attach photos		—
MST 17: Wet leakage current test after retention of junction box on mounting surface		
Test Date (YYYY-MM-DD) .....:	2022-12-02	—

Test Voltage applied [V] .....:	1500	—
Solution resistivity (Ω cm) .....:	1864	—
Solution temperature (°C) .....:	20.6	—
Measured [MΩ]	Required [MΩ]	Result
5017	15.5	P
Supplementary information: N/A		

SEQUENCE D				
Sample #	2-4			—
Table 28: MST 53 - Damp heat test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-30 / 2023-01-11		—
Total hours (1000) .....:		1000		—
MST 01: Visual inspection after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
31960	15.5	-	No	P
MST 17: Wet leakage current test after damp heat test				—
Test Date (YYYY-MM-DD) .....:		2023-01-11		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		1741		—
Solution temperature (°C).....:		20.2		—
Measured (MΩ)		Required (MΩ)		Result
5537		15.5		P
Supplementary information: N/A				

Table 29: MST 34 - Static mechanical load test			
Test Date (YYYY-MM-DD) .....:	2023-01-14		—
Mounting method .....:	4 clamps and 2 rails		—
Design Load [Pa] / Safety factor ɣm.....:	3600 / 1600 / 1.5		—
Load applied to.....:	front side	back side	—
Mechanical load [Pa].....:	5400	2400	—
First cycle time (start/end) .....:	1h	1h	—
Intermittent open-circuit (yes/no).....:	no	no	P
Second cycle time (start/end).....:	1h	1h	—
Intermittent open-circuit (yes/no).....:	no	No	P
Third cycle time (start/end) .....:	1h	1h	—

Intermittent open-circuit (yes/no) .....:	no	no	P
Supplementary information: Maximum bending at module centre 35 mm.			

MST 01: Visual inspection after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-14		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-14		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
28700	15.5	-	No	P
MST 17: Wet leakage current test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2023-01-14		—
Test Voltage applied (V, dc) ..... :		1500		—
Solution resistivity (Ω cm) .....:		1736		—
Solution temperature (°C) ..... :		20.2		—
Measured (MΩ)		Required (MΩ)		Result
4180		15.5		P
Supplementary information: N/A				

SEQUENCE E				
Sample #	2-5			—
Table 30: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end.....:		2022-11-21 / 2022-12-21		—
Total cycles (200) .....:		200		—
Applied current (A) .....:		13.0 / 0.13		—
Limiting voltage (V) .....:		90		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
33840	15.5	-	No	P
MST 17: Wet leakage current test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:		2022-12-22		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1751		—
Solution temperature (°C).....:		20.5		—
Measured (MΩ)		Required (MΩ)		Result
5590		15.5		P
Supplementary information: N/A				

SEQUENCE F					
Sample #	2-2				—
Table 32: MST 21 - Temperature Test					
Reference solar irradiance (W/m²) .....:	1000 W/m²				—
Reference ambient temperature (°C) .....:	28.5				—
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	62.1	73.6	-		P
PV module backsheet below the centre cell	51.2	62.7	-		P
Terminal enclosure interior surface	43.4	54.9	85		P
Field wiring terminals	N/A	N/A	-		N/A
Insulation of the field wiring leads	41.5	53.0	85		P
External connector bodies	39.4	50.9	85		P
Bypass diode bodies	N/A	N/A	-		N/A
MST 01: Visual inspection after Temperature Test					—
Test Date (YYYY-MM-DD) .....:	2022-11-22				—
Findings ..... :	☐ Yes .....☒ No				P
Nature and position of findings – comments or attach photos					—
MST 16: Insulation test after Temperature Test					—
Test Date (YYYY-MM-DD) .....:	2022-11-22				—
Test Voltage applied (V, DC) .....:	8000 /1500				—
Measured	Required	Dielectric breakdown			Result
MΩ	MΩ	Yes (description)		No	
47920	15.5	-		No	P
MST 17: Wet leakage current test after Temperature Test					—
Test Date (YYYY-MM-DD) .....:	2022-11-22				—
Test Voltage applied (V, dc) .....:	1500				—
Solution resistivity (Ω cm) .....:	1872				—
Solution temperature (°C) .....:	21.6				—
Measured (MΩ)	Required (MΩ)				Result
8894	15.5				P
Supplementary information: N/A					

Table 33: MST 22 - Hot-spot endurance test						
Test Date (YYYY-MM-DD) start/end .....:	2022-11-23 / 2022-11-23					—
Cell interconnection circuit.....:	☐ S ☒ SP ☐ PS					—
Irradiance during each cycle…… .....:	1000 W/m²					—
Module temperature at thermal equilibrium in each cycle [°C] .....:	50					—
Determination of worst case cell						—
Maximum measured cell temperature in each cycle [°C] .....:	137.5					—
Shading rate [%] or number of cells shaded.....:	45%					—
Test hours for each cycle.....:	1					—
MST 01: Visual inspection after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2022-11-23					—
Findings ..... :	☐ Yes .....☒ No					P
Nature and position of findings – comments or attach photos						—
MST 02: Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....:	2022-11-23					—
Module temperature [°C].....:	25					—
Irradiance [W/m²].....:	1000					—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]		FF [%]
13.60	50.91	12.93	42.86	554.18		80.03
MST 16: Insulation test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2022-11-23					—
Test Voltage applied [V] .....:	8000 /1500					—
Measured	Required	Dielectric breakdown				Result
MΩ	MΩ	Yes (description)			No	
46970	15.5	-			No	P
MST 17: Wet leakage current test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2022-11-23					—
Test Voltage applied [V] .....:	1500					—
Solution resistivity [Ω cm) .....:	1848					—
Solution temperature [°C] .....:	21.6					—
Measured [MΩ]		Required [MΩ]				Result
8772		15.5				P
Supplementary information: N/A						

Table 34: MST 26 - Reverse current overload test				
Test Date (YYYY-MM-DD)..... :		2022-11-24		—
Module over-current protection rating (A) .....:		25		—
Test current (A) .....:		33.75		—
Range of applied voltage (V).....:		47.6-56.3		—
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: 87.5°C				
MST 01: Visual inspection after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-24		—
Findings ..... :		☐ Yes.....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-24		—
Test Voltage applied (V, DC) .....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
45130	15.5	-	No	P
MST 17: Wet leakage current test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2022-11-24		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm).....:		1848		—
Solution temperature (°C).....:		21.6		—
Measured (MΩ)		Required (MΩ)		Result
8512		15.5		P
Supplementary information: N/A				

SEQUENCE G				
Sample #:	2-9			—
Table 35: MST 14 - Impulse voltage test				
Test Date (YYYY-MM-DD)....:		2022-11-24		—
Maximum system voltage (V)....:		1500		—
Required Impulse voltage (V) ....:		16000		—
Measured Impulse voltage (V)....:		16120		P
T_1 (µs)....:		1.11		P
T_2 (µs)....:		50.92		P
Thickness of conductive foil (mm) ....:		0.05		—
Results				
☒ No evidence of dielectric breakdown or surface tracking observed ☒ No evidence of major visual defects (see table MST 01 below)				P
MST 01: Visual inspection after Impulse voltage test				—
Test Date (YYYY-MM-DD)....:		2022-11-24		—
Findings .... :		☐ Yes....☒ No		P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Impulse voltage test				—
Test Date (YYYY-MM-DD) ....:		2022-11-24		—
Test Voltage applied (V, DC) ....:		8000 /1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
42080	15.5	-	No	P
Supplementary information: N/A				

OTHER TESTS		
Sample #:	2-12; 2-13	—
Table 36: MST 23 - Fire test		
Test Date (YYYY-MM-DD).....:		—
Module fire resistance class (A, B, C).....:		—
No. of modules provided to create the test assembly .....:		—
☒ The module complies with the requirements for the fire resistance class		
Supplementary information: N/A		

Sample #:	2-10	—
Table 37: MST 24 - Ignitability test		
Test Date (YYYY-MM-DD) .....:	2022-12-16	—
Flame application point.....:	1.5mm behind the leading edge	—
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	P
Length of destroyed area.....:	No findings	P
Supplementary information: N/A		

Sample #:	2-11		—
Table 38: MST 32 - Module breakage test			
Test Date (YYYY-MM-DD) .....:	2022-12-19		—
Weight of impactor (kg).....:	45.5		—
Thickness of sample (mm) .....:	35		—
Mounting technique used .....:	4 clamps		—
Module breakage .....:	☒	No breakage	—
	☒	No separation from frame or mounting structure	P
	☐	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 cm² ejected from sample	—
	☒	Continuity of equipotential bonding provided, see table 10.11	P
Nature and position of findings – comments or attach photos			Result
No			P
Supplementary information: N/A			

Table 41: MST 12 - Cut susceptibility test			
Test Date (YYYY-MM-DD) .....:		2023-01-13	—
Applied force (N) .....:		8.9	—
MST 01 Visual inspection after cut test			—
Test Date (YYYY-MM-DD) .....:		2023-01-13	—
Sample # 2-3	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 2-4	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 2-5	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 2-7	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Sample # 2-8	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos		—
Supplementary information: N/A			

MST 16: Insulation test after cut test					—
Test Date (YYYY-MM-DD) .....:			2023-01-13		—
Test Voltage applied (V, DC) .....:			8000 /1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
2-3	35690	15.5	-	No	P
2-4	25930	15.5	-	No	P
2-5	31360	15.5	-	No	P
2-7	27400	15.5	-	No	P
2-8	29100	15.5	-	No	P
Supplementary information: N/A					

MST 17: Wet leakage current test after cut test		—
Test Date (YYYY-MM-DD) .....:	2023-01-13	—
Test Voltage applied (V, dc) .....:	1500	—
Solution resistivity (Ω cm) .....:	1728	—

Solution temperature (°C) .....:		21.0	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
2-3	5022	15.5	P
2-4	4268	15.5	P
2-5	5570	15.5	P
2-7	4080	15.5	P
2-8	4400	15.5	P
Supplementary information: N/A			

Table 42: MST 03 - Maximum power determination final						
Test Date (YYYY-MM-DD) .....:			2023-01-17			—
Module temperature (°C) .....:			25			—
Irradiance (W/m²) .....:			1000			—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)
2-1	13.59	50.91	12.92	42.85	553.66	80.03
2-2	13.59	50.90	12.91	42.83	553.16	79.95
2-3	13.46	51.04	12.83	42.78	548.99	79.89
2-4	13.37	50.61	12.72	42.57	541.34	80.02
2-5	13.45	51.03	12.86	42.86	551.33	80.31
2-7	13.46	51.02	12.70	42.60	540.90	78.74
2-8	13.48	51.06	12.73	42.65	542.82	78.88
Supplementary information: N/A						

Table 43: MST 01 - Final Visual inspection			
Test Date (YYYY-MM-DD).....:		2023-01-17	—
Sample # 2-1	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-2	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-3	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-4	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-5	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-7	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Sample # 2-8	Findings .....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—
Supplementary information: For creepage distances and clearances see Table 1, Table 2, Table 3 and Table 4			

Table 44: MST 05 - Durability of markings							
Test Date (YYYY-MM-DD) .....:			2023-01-18				—
Sample #	Markings legible		Not easily removable		No curling		Result
2-1	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-2	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-3	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-4	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-5	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-7	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
2-8	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
Supplementary information: N/A							

Table 45: MST 06 - Sharp edge test			
Test Date (YYYY-MM-DD) .....:	2023-01-18		—
Sample #	Accessible surfaces free of sharp edges, burrs etc.		Result
2-1	☒ Yes	☐ No	P
2-2	☒ Yes	☐ No	P
2-3	☒ Yes	☐ No	P
2-4	☒ Yes	☐ No	P
2-5	☒ Yes	☐ No	P
2-7	☒ Yes	☐ No	P
2-8	☒ Yes	☐ No	P
Supplementary information: N/A			

Table 46: MST 07 - Bypass diode functionality test				
Test Date (YYYY-MM-DD) .....:	2023-01-18			—
☐ **Method A**				—
Ambient temperature [°C] .....:				—
Current flow applied [A] .....:				—
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %	Result
2-1			☐ Yes ☐ No	
2-2			☐ Yes ☐ No	
2-3			☐ Yes ☐ No	
2-4			☐ Yes ☐ No	
2-5			☐ Yes ☐ No	
2-7			☐ Yes ☐ No	
2-8			☐ Yes ☐ No	
☒ **Method B**				—
Sample #	IV curve after shading			Result
	Diode 1 working properly	Diode 2 working properly	Diode 3 working properly	
2-1	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-2	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-3	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-4	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-5	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-7	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
2-8	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
Supplementary information: N/A				

Table 6: MST 01 - Initial Visual inspection			
Test Date (YYYY-MM-DD)....:		2022-10-28	—
Sample # 3-1	Findings ....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No	—

Table 8: MST 03 - Maximum power determination							
Test Date [YYYY-MM-DD].....			2022-11-03				—
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
3-1	13.793	51.820	13.204	43.667	576.593	80.67	—
Supplementary information: N/A							

Table 9: MST 16 - Initial Insulation test					
Test Date (YYYY-MM-DD).....			2022-11-04		—
Test Voltage applied (V, DC)			8000 /1500		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
3-1	45700	15.5	-	No	P
Supplementary information: N/A					

Table 10: MST 17 - Initial Wet leakage current test			
Test Date (YYYY-MM-DD)		2022-11-04	—
Test Voltage applied (V, dc)		1500	—
Solution resistivity (Ω cm).....		2127	—
Solution temperature (°C).....		22.1	—
Sample #	Measured (MΩ)	Required (MΩ)	Result
3-1	8010	15.5	P
Supplementary information: N/A			

SEQUENCE F				
3-1			—	
Table 32: MST 21 - Temperature Test				
Reference solar irradiance (W/m²) .....:	1000 W/m²			—
Reference ambient temperature (°C) .....:	28.6			—
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	61.9	73.3	-	P
PV module backsheet below the centre cell	54.8	66.2	-	P
Terminal enclosure interior surface	44.6	56.0	85	P
Field wiring terminals	N/A	N/A	-	N/A
Insulation of the field wiring leads	42.2	53.6	85	P
External connector bodies	40.8	52.2	85	P
Bypass diode bodies	N/A	N/A	-	N/A
MST 01: Visual inspection after Temperature Test				—
Test Date (YYYY-MM-DD) .....:	2022-11-23			—
Findings ..... :	☐ Yes .....☒ No			P
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Temperature Test				—
Test Date (YYYY-MM-DD) .....:	2022-11-23			—
Test Voltage applied (V, DC) .....:	8000 /1500			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
41820	15.5	-	No	P
MST 17: Wet leakage current test after Temperature Test				—
Test Date (YYYY-MM-DD) .....:	2022-11-23			—
Test Voltage applied (V, dc) .....:	1500			—
Solution resistivity (Ω cm) .....:	1864			—
Solution temperature (°C) .....:	21.3			—
Measured (MΩ)	Required (MΩ)			Result
7562	15.5			P
Supplementary information: N/A				

Table 42: MST 03 - Maximum power determination final						
Test Date (YYYY-MM-DD) .....:			2022-11-04			—
Module temperature (°C) .....:			25			—
Irradiance (W/m²) .....:			1000			—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)
3-1	13.571	51.708	12.763	43.346	553.213	79.96
Supplementary information: N/A						

Table 44: MST 05 - Durability of markings						
Test Date (YYYY-MM-DD) .....:			2022-11-04			—
Sample #	Markings legible		Not easily removable		No curling	Result
3-1	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes ☐ No	P
Supplementary information: N/A						

Table 45: MST 06 - Sharp edge test		
Test Date (YYYY-MM-DD) .....:	2022-11-04	—
Sample #	Accessible surfaces free of sharp edges, burrs etc.	Result
3-1	☒ Yes ☐ No	P
Supplementary information: N/A		

Table 46: MST 07 - Bypass diode functionality test				
Test Date (YYYY-MM-DD) .....:		2022-11-04		—
☐ **Method A**				—
Ambient temperature [°C] .....:				—
Current flow applied [A] .....:				—
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %	Result
3-1			☐ Yes ☐ No	
☒ **Method B**				—
Sample #	IV curve after shading			Result
	Diode 1 working properly	Diode 2 working properly	Diode 3 working properly	
3-1	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	P
Supplementary information: N/A				

Annex 1: List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
MST 01	Visual inspection	Band tape DZ-B-A1-0014	3.5m	2021-09-02	2024-09-01
		Digital illuminometer DZ-B-A1-0200	0~2000lux	2022-02-25	2023-02-24
MST 02	Performance at STC	Pulse solar simulator DZ-A-A2-0156	200~1200W/ m^2	2022-09-07	2023-09-06
MST 03	Maximum power determination	Pulse solar simulator DZ-A-A2-0156	200~1200W/ m^2	2022-09-07	2023-09-06
MST 16	Insulation test	Insulation tester DZ-A-A1-0258	Applied voltage:0~6kV Insulation resistance:1~ 50GΩ	2022-05-17	2023-05-16
		Withstand voltage tester DZ-A-A1-0256	0~10kV	2022-02-22	2023-02-21
MST 17	Wet leakage current test	Insulation tester DZ-A-A1-0258	Applied voltage:0~6kV Insulation resistance:1~ 50GΩ	2022-05-17	2023-05-16
		Conductivity meter DZ-B-A2-0055	0μS/cm~100 mS/cm, 0.0~60.0 ºC	2022-05-17	2023-05-16
MST 13	Continuity test of equipotential bonding	Grounding resistance meter DZ-A-A1-0285	0~500A	2022-05-25	2023-05-24
MST 11	Accessibility test	Multimeter DZ-B-A1-0185	-	2022-06-01	2023-05-31
MST 37	Materials creep test	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0040	-70~110 ºC	2022-03-09	2023-03-08
MST 53	Damp heat test	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0005	90º C,90%RH	2022-09-20	2023-09-19
MST 54	UV test	UV test chamber DZ-A-A3-0072	UVB:3~10%	2022-03-09	2023-03-08
		UV test chamber DZ-A-A3-0047	UVB:3~10%	2022-02-09	2023-02-08

MST 52	Humidity freeze test	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0004	-40~90 °C	2022-09-20	2023-09-19
		Program-controlled DC stabilized voltage supply DZ-A-A2-0111	100V/15A	2022-08-08	2023-08-07
MST 55	Cold conditioning	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0027	-40~90 °C	2022-05-29	2023-05-28
MST 56	Dry heat conditioning	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0040	-70~110 ºC	2022-03-09	2023-03-08
MST 51	Thermal cycling test	High and low temperature walk-in wet and hot test chamber DZ-A-A3-0028	-40~90 °C	2022-06-02	2023-06-01
		Program-controlled DC stabilized voltage supply DZ-A-A2-0139	100V/15A	2022-03-09	2023-03-08
MST 42	Robustness of terminations test	Junction box tester- Weight DZ-A-A2-0010-2	40N	2021-08-04	2024-08-03
MST 34	Static mechanical load test	Static mechanical load tester DZ-A-A2-0020	0~10kpa	2022-09-30	2023-09-29
MST 25	Bypass diode thermal test	Temperature Coefficients Measurement chamber DZ-A-A3-0024	0~120 ºC	2022-06-02	2023-06-01
		Pulsed voltage supply DZ-A-A1-0260	0~30A,1ms	2022-06-01	2023-05-31
MST 21	Temperature Test	Steady state solar simulator DZ-A-A2-0024	800~1000W/ m^2	2022-03-22	2023-03-21
MST 22	Hot-spot endurance test	Steady state solar simulator DZ-A-A2-0024	800~1000W/ m^2	2022-03-22	2023-03-21
		Pulse solar simulator DZ-A-A2-0156	200~1200W/ m^2	2022-09-07	2023-09-06
MST 26	Reverse current overload test	DC voltage supply DZ-A-A1-0009	160V 50A	2023-01-04	2024-01-03
		Infrared imaging devices DZ-A-A1-0010	-	2022-06-06	2023-06-05
MST 14	Impulse voltage	Impulse voltage tester	-30kV~+30kV	2022-03-25	2023-03-24

	test	DZ-A-A1-0312			
MST 32	Module breakage test	Module breakage tester DZ-A-A2-0008	45KG	2020-05-08	2023-05-07
MST 12	Cut susceptibility test	Cut susceptibility tester DZ-A-A2-0012	8.9N	2022-10-30	2023-10-29
MST 05	Durability of markings	Hexane DZGYP-02-2009	A mass per unit volume of about 0.66kg/l	/	/
MST 06	Sharp edge test	Sharp edge tester DZ-C-A1-50-94-0	6.7N	2022-09-07	2023-09-06
MST 07	Bypass diode functionality test	Pulse solar simulator DZ-A-A2-0156	200~1200W/ m^2	2022-09-07	2023-09-06
		DC voltage supply DZ-A-A1-0009	160V 50A	2023-01-04	2024-01-03

Annex 3: Photographs

Module type: ERA Pro-72HCB 565M	
Fig. 1: front view of test sample	*Fig. 2: rear view of test sample*
Module type: ERA Pro-72HC 565M	

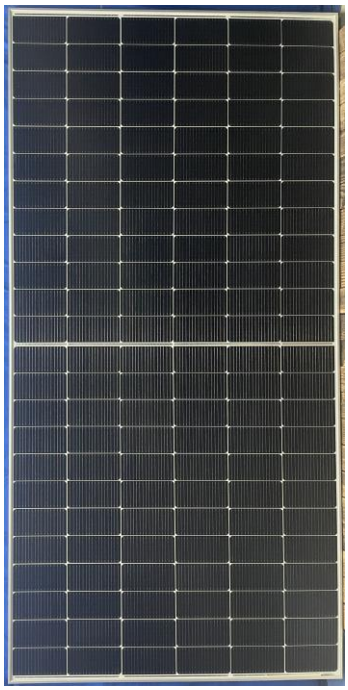



Fig. 3: front view of test sample	*Fig. 4: rear view of test sample*

Module type: ERA Pro-72HC565M(BK)	

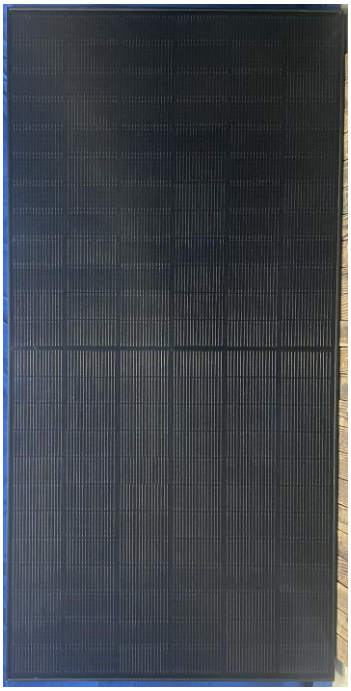



Fig. 5: front view of test sample	*Fig. 6: rear view of test sample*