

TÜV®



Test sample:	Photovoltaic (PV) Module(s)
Type of test object:	Mono-Crystalline Silicon Photovoltaic Module
Trademark:	SUNSHARE®
Model and/or type reference:	See page 3 of this report
Rating(s):	See page 3 of this report
Manufacturer:	Sunshare Technology Co.,Ltd.
Manufacturer number:	127292
Address:	2nd Floor, Building A, No.2999 Jiyin Avenue, Jiangning District, 211100 Nanjing City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Name and address of factory Newway Energy Co.,LTD. (CBW No.: 124505) Building D5, Industrial Workshop Standard Factory, Hutang Science and Technology Industrial Park, Hutang Town, Wujin District, 213162 Changzhou City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA	
Order description:	☒ Complete test according to TRF
	☐ Partial test according to manufacturer's specifications
	☐ Preliminary test
	☐ Spot check
	☐ Others:
Date of order:	2024-07-01
Date of receipt of test item:	2024-07-22 For 2024TL1042 2024-09-28 For 2024TL1311
Date(s) of performance of test:	2024-07-31/2024-10-25 For 2024TL1042 2024-10-08/2024-11-18 For 2024TL1311
Test item particulars: See Test Flow	
Purpose of the product (Description of intended use): The PV modules for electricity generation systems with max. voltage of 1000 V DC	

Characteristic data (not shown on the marking plate):

Product Electrical Ratings:

Monofacial Module:

Module type	SR-M275T-66	SR-M280T-66	SR-M285T-66	SR-M190T-64
Voc [V] /Tolerance	51.31 ±5%	51.77 ±5%	52.34 ±5%	53.43 ±5%
Isc [A] /Tolerance	6.85 ±3%	6.87 ±3%	6.88 ±3%	4.52 ±3%
Vmp [V]	43.38	44.02	44.75	44.19
Imax [A]	6.34	6.36	6.37	4.30
Pmp [W] /Tolerance	275 ±3%	280 ±3%	285 ±3%	190 ±3%
Maximum system voltage [V]	600 or 1000	600 or 1000	600 or 1000	600 or 1000
Maximum Over-Current Protection Rating [A]	28	28	28	28
Module type	SR-M195T-64	SR-M200T-64		
Voc [V] /Tolerance	54.34 ±5%	55.10 ±5%		
Isc [A] /Tolerance	4.56 ±3%	4.58 ±3%		
Vmp [V]	44.94	45.88		
Imax [A]	4.34	4.36		
Pmp [W] /Tolerance	195 ±3%	200 ±3%		
Maximum system voltage [V]	600 or 1000	600 or 1000		
Maximum Over-Current Protection Rating [A]	28	28		
Note: Further qualification for higher and/or lower output power see annex 3				

Bifacial Module:

	Module type				
STC condition	V _{oc} [V] /Tolerance				
	I _{sc} [A] /Tolerance				
	V _{mp} [V]				
	I _{mp} [A]				
	P _{max} [W] /Tolerance				



BNPI condition	$P_{\max}$ [W] /Tolerance				
	V_{oc} [V] /Tolerance				
	I_{sc} [A _{dc}] /Tolerance				
Bifaciality coefficient	$\phi P_{\max}$				
	ϕV_{oc}				
	ϕI_{sc}				
BSI condition	I_{sc} [A _{dc}] /Tolerance				
	Maximum system voltage [V]				
	Maximum Over-Current Protection Rating [A]				
Note: Further qualification for higher and/or lower output power see annex 3.					

**Attachments:**

	attachment number / number of pages
Installation manual	Attachment 1, total pages 18
Drawings mechanical	see report no.: 704062474201-00 part 2 of 2 Annex 2
Circuit diagram	see report no.: 704062474201-00 part 2 of 2 Annex 2
Photographs	Attachment 2, total pages 7
Component datasheets / certificates	Attachment 3, total pages 55
Others:	
Product Description Sheet (Manufacturers and type references)	Annex 1, <u>6</u> pages
Test table for verifying other stabilization procedure	Annex 2, <u>1</u> pages
Lower and higher output power modules	Annex 3, <u>6</u> pages
List of test equipment used	Annex 4, <u>1</u> pages

If additional information is necessary, please provide

N/A

Copy of marking plate:

Model Type: SR-M285T-66 SUNSHARE®	
Maximum Power(Pmax)	285W(±3%)
Maximum Power Voltage (Vmp)	44.75V
Maximum Power Current (Imp)	6.37A
Open-Circuit Voltage (Voc)	52.34V(±5%)
Short-Circuit Current (Isc)	6.88A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70℃
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	9.7Kg
Dimension(HxWxD)	1166*1134*30mm
STC:Irradiance 1000W/m², Cell Temperature 25℃, Air Mass AM=1.5	
WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.	
Sunshare Technology Co., Ltd. Address: No.2999 Jiyin Avenue, Jiangning District, Nanjing P. R. China Web: http://www.sunsharetek.com E-Mail: service@sunsharetek.com	
Made in China	

Model Type: SR-M280T-66 SUNSHARE®	
Maximum Power(Pmax)	280W(±3%)
Maximum Power Voltage (Vmp)	44.02V
Maximum Power Current (Imp)	6.36A
Open-Circuit Voltage (Voc)	51.77V(±5%)
Short-Circuit Current (Isc)	6.87A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70℃
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	9.7Kg
Dimension(HxWxD)	1166*1134*30mm
STC:Irradiance 1000W/m², Cell Temperature 25℃, Air Mass AM=1.5	
WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.	
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Made in China	


Model Type: SR-M275T-66 SUNSHARE®

Maximum Power(Pmax)	275W(±3%)
Maximum Power Voltage (Vmp)	43.38V
Maximum Power Current (Imp)	6.34A
Open-Circuit Voltage (Voc)	51.31V(±5%)
Short-Circuit Current (Isc)	6.85A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70°C
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	9.7Kg
Dimension(HxWxD)	1166*1134*30mm
STC:Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM=1.5	

WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.



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Model Type: SR-M200T-64 SUNSHARE®

Maximum Power(Pmax)	200W(±3%)
Maximum Power Voltage (Vmp)	45.88V
Maximum Power Current (Imp)	4.36A
Open-Circuit Voltage (Voc)	55.10V(±5%)
Short-Circuit Current (Isc)	4.58A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70°C
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	7.5 Kg
Dimension(HxWxD)	1236*766*30mm
STC:Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM=1.5	

WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.



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Model Type: SR-M195T-64 SUNSHARE®

Maximum Power(Pmax)	195W(±3%)
Maximum Power Voltage (Vmp)	44.94V
Maximum Power Current (Imp)	4.34A
Open-Circuit Voltage (Voc)	54.34V(±5%)
Short-Circuit Current (Isc)	4.56A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70°C
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	7.5 Kg
Dimension(HxWxD)	1236*766*30mm
STC:Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM=1.5	

WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.



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Model Type: SR-M190T-64 SUNSHARE®

Maximum Power(Pmax)	190W(±3%)
Maximum Power Voltage (Vmp)	44.19V
Maximum Power Current (Imp)	4.30A
Open-Circuit Voltage (Voc)	53.43V(±5%)
Short-Circuit Current (Isc)	4.52A(±3%)
Maximum Series Fuse	28A
Maximum System Voltage	1000VDC
Power Selection	0~+5W
Min. Design Load	+1600Pa/-1600Pa
Module (T98) Max	70°C
Safety Class	Class II
Connector Type	M2-slim-abcd
Connector Manufacture	NIU-Power Co., Ltd
Weight	7.5 Kg
Dimension(HxWxD)	1236*766*30mm
STC:Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM=1.5	

WARNING: Only qualified personnel should install or perform maintenance work on these modules. This unit produces electricity if exposed to light. Follow all applicable electrical safety precautions. Do not disconnect when loading.



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**Summary of testing:**

Item 1. Full testing according to IEC 61215-1:2021, IEC 61215-1-1:2021, IEC 61215-2:2021 were conducted on representative model SR-M280T-66.

Higher end power class testing are performed on model SR-M285T-66.

Lower end power class testing are performed on model SR-M275T-66.

The test sample can cover the following models:

SR-MxxxT-66 (xxx= 275 to 285, in steps of 5)

xxx stands for rated output power at STC.

Item 2. Based on Item 1, add new cell dimensions: L x W: 182.2 x 61.25 (mm), 1/3 cut, manufactured by Chuzhou jietai new energy technology Co.,Ltd.

Add new electrical circuitry, the number of cell per bypass diode had changed from 24 to 38 and the number of bypass diode had changed from 3 to 2.

According to clause 4.2.3&4.2.8 of IEC TS 62915:2018, the following tests were carried out on representative model SR-M195T-64.

Hot spot endurance test (MQT 09)

Thermal cycling test 200 cycles (MQT 11)

DML-TC-HF sequence

Higher end power class testing are performed on model SR-M200T-64.

Lower end power class testing are performed on model SR-M190T-64.

The test sample can cover the following models:

SR-MxxxT-64 (xxx=190 to 200, in steps of 5)

xxx stands for rated output power at STC.

☐ deviation(s) found

☒ no deviations found

Additional information on Non-standard test method(s)

Sub clause: N/A

Page: N/A

Rational: N/A

Possible test case verdicts:

test case does not apply to the test object: N/A (not applicable / not included in the order)

test object does meet the requirement: P (Pass)

test object does not meet the requirement: F (Fail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report **a point** is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☒ Other: For Verification of rated label values (Gate No. 1), uncertainty of measurement application is required and specified in IEC 61215-2: 2021.

Information on uncertainty of measurement:

The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.



Test item particulars..... :	See test flow
Accessories and detachable parts included in the evaluation..... :	N/A
Mounting system used..... :	Refer to Installation manual
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:	
P_{max} – Maximum power	HF – Humidity Freeze
V_{mp} – Maximum power voltage	DH – Damp Heat
I_{mp} – Maximum power current	TC – Thermal Cycling
I_{sc} – Short circuit current	α – Current temperature coefficient
V_{oc} – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m ²)	TCO – Transparent conductive oxide
	TRF – Test report form
MQT – Module Quality Tests	V _{FM} rated – Rated diode(s) forward voltage
V _{FM} – Measured diode(s) forward voltage	NP – Nameplate
P_{max} (Lab) – the measured maximum power of each module	P_{max} (NP) – the minimum rated nameplate power of each module without tolerances
$\bar{P}_{max}$ (Lab) – the arithmetic average of the measured maximum power of the modules	V_{oc} (Lab) – the measured maximum V_{oc}
I_{sc} (Lab) – the measured maximum I_{sc}	V_{oc} (NP) – the maximum rated nameplate V_{oc} of each module without tolerances
I_{sc} (NP) – the maximum rated nameplate I_{sc} without tolerances	P_{max4} (NP) – the maximum rated nameplate power of each lowest power class module, without tolerances
m_1 – the measurement uncertainty in % of laboratory for P_{max}	m_2 – the measurement uncertainty in % of laboratory for V_{oc}
m_3 – the measurement uncertainty in % of laboratory for I_{sc}	t_1 – the manufacturer's rated lower production tolerance in % for P_{max}
t_2 – the manufacturer's rated upper production tolerance in % for V_{oc}	t_3 – the manufacturer's rated upper production tolerance in % for I_{sc}



$r - P_{\max}$ measurement reproducibility	t_4 – the manufacturer's rated upper production tolerance in % for $P_{\max4}(\text{NP})$
ϕV_{oc} - open-circuit voltage bifaciality coefficient	$\phi P_{\max}$ - the maximum power bifaciality coefficient
ϕI_{sc} – the short circuit current bifaciality coefficient	BSI - for stress on bifacial modules, corresponding to 1 000 W/m ² on the module front and 300 W/m ² on the module rear
BNPI - for bifacial modules, corresponding to 1 000 W/m ² on the module front and 135 W/m ² on the module rear	RTE – Relative thermal endurance index
RTI – Relative temperature index	
TI – Temperature index	

General product information and other remarks:

Modifications:

- ☒ Initial module design qualification
- ☒ Extension of module design qualification
- ☐ Original test report ref. No. :

Model differences and modification:

- | | |
|--|---|
| ☒ Test programs for crystalline silicon PV modules | ☐ Test programs for thin-film PV modules |
| ☐ 4.2.1 Modification to frontsheet | ☐ 4.3.1 Modification to frontsheet |
| ☐ 4.2.2 Modification to encapsulation system | ☐ 4.3.2 Modification to encapsulation system |
| ☒ 4.2.3 Modification to cell technology | ☐ 4.3.3 Modification to front contact (e. g. TCO) |
| ☐ 4.2.4 Modification to cell and string interconnect material or technique | ☐ 4.3.4 Modification to cell technology |
| ☐ 4.2.5 Modification to backsheet | ☐ 4.3.5 Modification to cell layout |
| ☐ 4.2.6 Modification to electrical termination | ☐ 4.3.6 Modification to back contact |
| ☐ 4.2.7 Modification to bypass diode | ☐ 4.3.7 Modification to edge deletion |
| ☒ 4.2.8 Modification to electrical circuitry | ☐ 4.3.8 Modification to interconnect material or technique |
| ☐ 4.2.9 Modification to edge sealing | ☐ 4.3.9 Modification to backsheet |
| ☐ 4.2.10 Modification to frame and/or mounting structure | ☐ 4.3.10 Modification to electrical termination |
| ☐ 4.2.11 Change in PV module size | ☐ 4.3.11 Modification to bypass diode |
| ☐ 4.2.12 Higher or lower output power (by 10 % or more) with the identical design and size and using the identical cell process | ☐ 4.3.12 Modification to edge sealing |
| ☐ 4.2.13 Increase of over-current protection rating | ☐ 4.3.13 Modification to frame and/or mounting structure |
| ☐ 4.2.14 Increase of system voltage | ☐ 4.3.14 Change in PV module size |
| ☐ 4.2.15 Change in cell fixing tape | ☐ 4.3.15 Higher or lower output power (by 10 % or more) with the identical design and size |
| ☒ Others (See summary of testing) | ☐ 4.3.16 Increase of over-current protection rating |
| | ☐ 4.3.17 Increase of system voltage |

Note: The clause references modifications extracted from IEC 62915

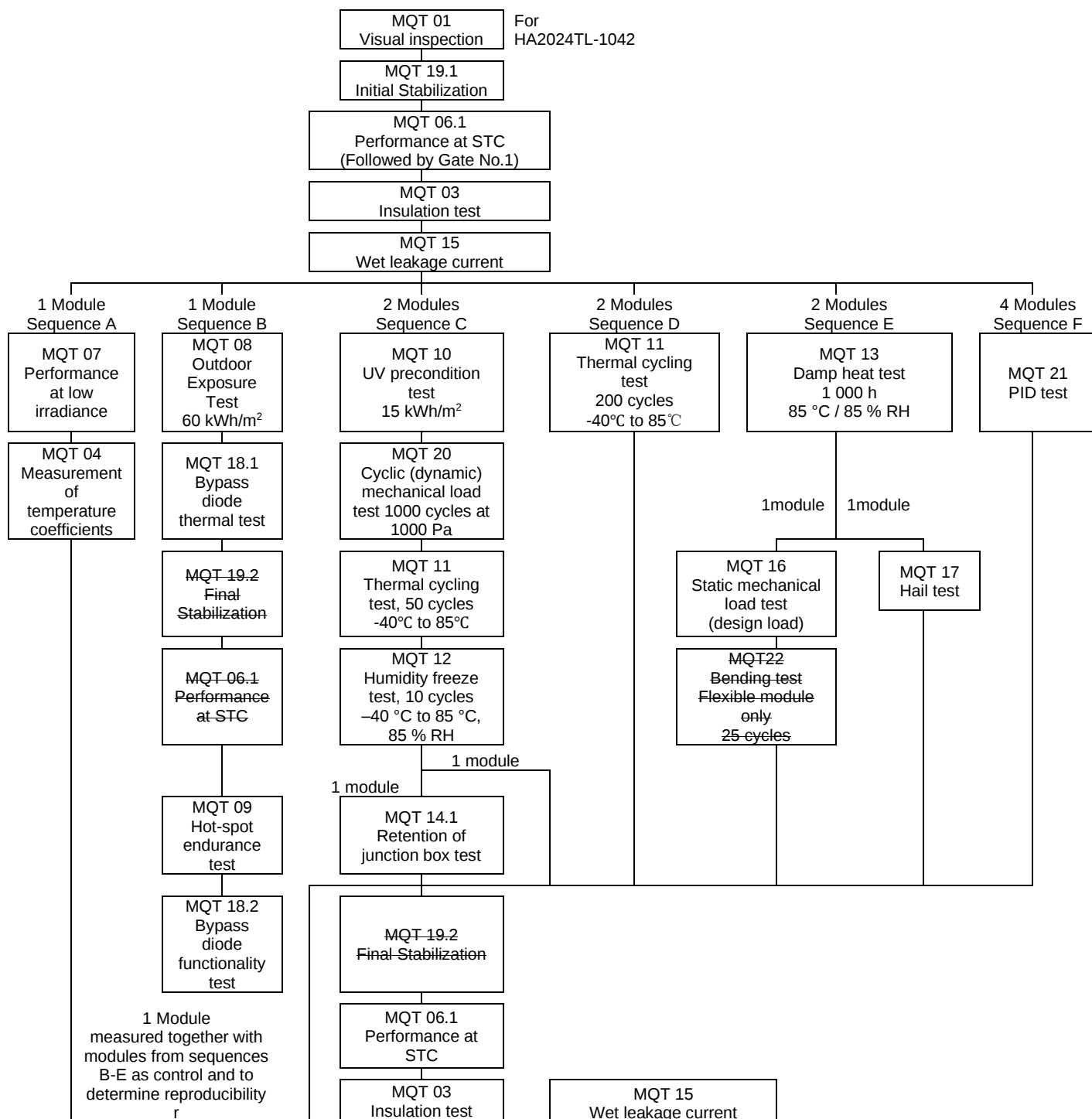


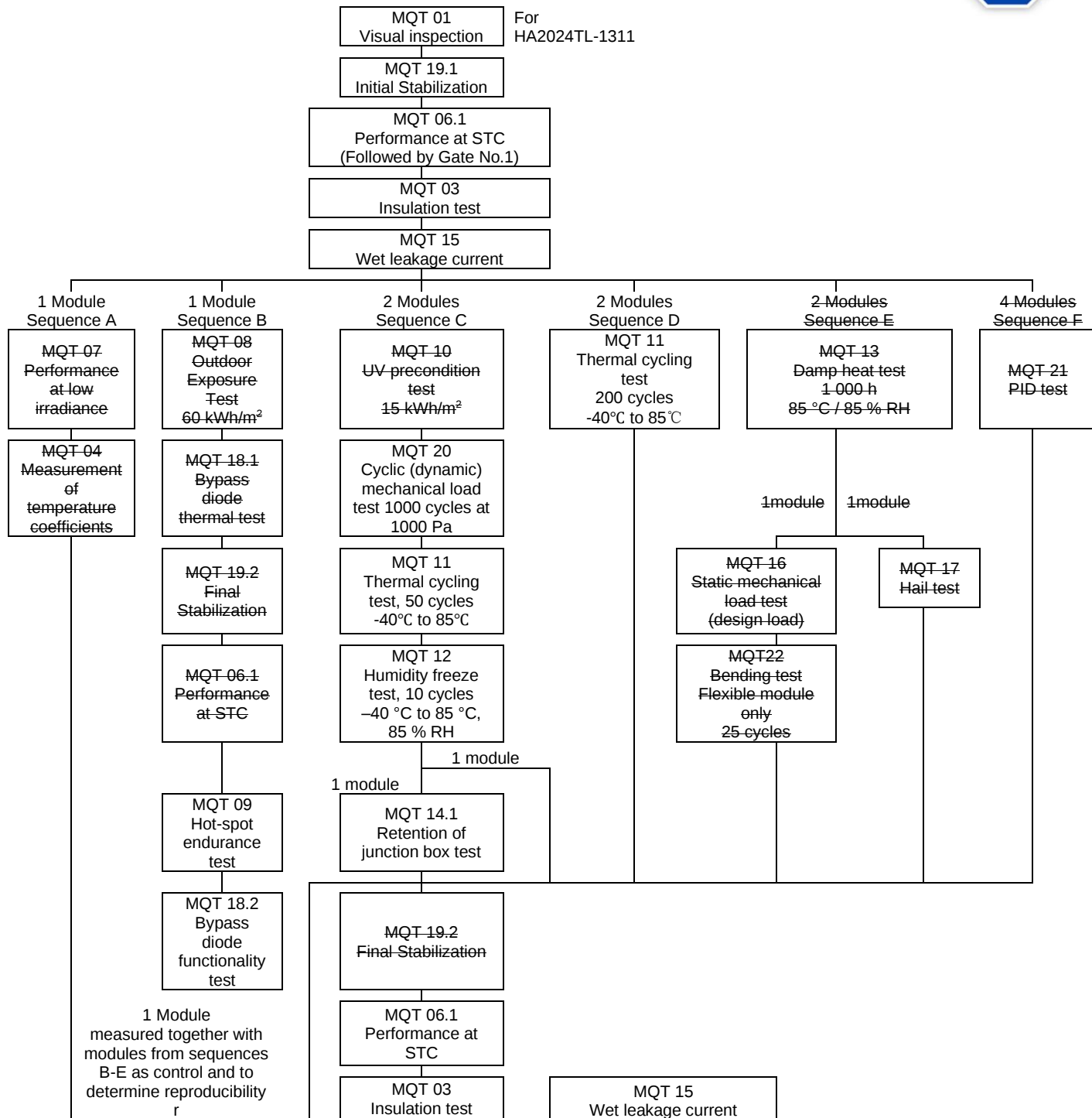
Module group assignment:				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
Item1				
HA2024TL-1042-001X	A	SR-M280T-66	SM3266014225310047	Control module
HA2024TL-1042-004X	B	SR-M280T-66	SM3266014225310015	OE+BD+HS
HA2024TL-1042-005X	C1	SR-M280T-66	SM3266014225310027	UV-DML-TC-HF Sequence
HA2024TL-1042-006X	C2	SR-M280T-66	SM3266014225310029	UV-DML-TC-HF Sequence
HA2024TL-1042-007X	D1	SR-M280T-66	SM3266014225310044	TC200 Sequence
HA2024TL-1042-008X	D2	SR-M280T-66	SM3266014225310028	TC200 Sequence
HA2024TL-1042-009X	E1	SR-M280T-66	SM3266014225310021	DH1000+SML Sequence
HA2024TL-1042-010X	E2	SR-M280T-66	SM3266014225310025	DH1000+Hail Sequence
HA2024TL-1042-011X	F1	SR-M280T-66	SM3266014225310046	PID Sequence
HA2024TL-1042-012X	F2	SR-M280T-66	SM3266014225310022	PID Sequence
HA2024TL-1042-013X	F3	SR-M280T-66	SM3266014225310043	PID Sequence
HA2024TL-1042-014X	F4	SR-M280T-66	SM3266014225310045	PID Sequence
HA2024TL-1042-024X	—	SR-M275T-66	SM3266014227271110	Low Power
HA2024TL-1042-025X	—	SR-M275T-66	SM3266014227271111	Low Power
HA2024TL-1042-026X	—	SR-M285T-66	SM3266014227271106	High Power
HA2024TL-1042-027X	—	SR-M285T-66	SM3266014227271102	High Power
Item 2				
HA2024TL-1311-001X	A1	SR-M195T-64	SM3264014227270016	Control module
HA2024TL-1311-002X	B	SR-M195T-64	SM3264014227270001	HS



HA2024TL-1311-003X	C1	SR-M195T-64	SM3264014227270010	DML-TC-HF Sequence
HA2024TL-1311-004X	C2	SR-M195T-64	SM3264014227270012	DML-TC-HF Sequence
HA2024TL-1311-005X	D1	SR-M195T-64	SM3264014227270002	TC200 Sequence
HA2024TL-1311-006X	D2	SR-M195T-64	SM3264014227270017	TC200 Sequence
HA2024TL-1311-007X	—	SR-M190T-64	SM3264014227270010	Low Power
HA2024TL-1311-008X	—	SR-M190T-64	SM3264014227270002	Low Power
HA2024TL-1311-009X	—	SR-M200T-64	SM3264014227270010	High Power
HA2024TL-1311-010X	—	SR-M200T-64	SM3264014227270012	High Power
Supplementary information: Further qualification for higher and/or lower output power see annex 3				
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 to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.			
Note (3)	Use Annex 1 to list the used materials and components of the module (manufacturer/supplier and type reference).			
Note (4)	The module numbers/identifiers are set in accordance to IEC TS 62915 Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification, Annex A3			

11	TEST FLOW (if it is not a full test, strikethrough non-performed test) Note: Deviations from test sequence are possible but must be documented.
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IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict

5. MARKING AND DOCUMENTATION			P
5.1	Name Plate		
	All electrical data shall be shown as relative to STC (1 000 W/m ² , 25 °C, AM1.5 according to IEC TS 61836), except for bifacial modules where two irradiance levels are required, 1 000 W/m ² and BNPI (higher irradiance at which nameplate verification is performed for bifacial modules, corresponding to 1 000 W/m ² on the module front and 135 W/m ² on the module rear, applied in any method allowed by IEC TS 60904-1-2).	Marked on label	P
	International symbols are used where applicable.	Marked on label	P
	The module includes clear and indelible markings:		
	a. Name, registered trade name or registered trade mark of manufacturer	SUNSHARE®	P
	b. Type or model number designation	SR-M280T-66	P
	c. Serial number (unless marked on other part of product)	SM3266014225310047 for example	P
	d. Date and place of manufacture, alternatively serial number allowing to trace the date and place of manufacture;	serial number allowing to trace the date and place of manufacture	P
	e. Maximum system voltage	1000V	P
	f. Class of protection against electrical shock	Class II	P
	g. Voltage at open-circuit or Voc including tolerances. For bifacial modules, open-circuit voltage shall be reported at two irradiance levels. The first required irradiance level is 1 000 W/m ² . The second required irradiance is BNPI	Marked on label	P
	h. Current at short-circuit or Isc including tolerances. For bifacial modules, short-circuit current shall be reported at two irradiance levels, defined in 5.1g	Marked on label	P
	i. Module maximum power or Pmax including tolerances. For bifacial modules, Pmax shall be reported at the two irradiance levels, defined in 5.1g	Marked on label	P
	j. For bifacial modules the following information including tolerances, shall be given on the nameplate: The values for the short-circuit current bifaciality coefficient ϕ_{Isc} , the opencircuit voltage bifaciality coefficient ϕ_{Voc} , and the maximum power bifaciality coefficient ϕ_{Pmax} , measured at STC as defined in IEC TS 60904-1-2		N/A
	k. For flexible modules, the minimum radius of curvature		N/A

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.2	Documentation		
5.2.1	Minimum requirements		
	Modules are supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the module		P
	The documentation states the class of protection against electrical shock under which the module has been qualified and any specific limitations required for that class.		P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use, and maintenance of the PV modules.		P
5.2.2	Information given in the documentation		P
	a. All information required under 5.1 e) to i)	Refer to manual document	P
	b. Overcurrent protection device type and rating are e.g. given in IEC 60269-6	Refer to manual document	P
	Maximum series/parallel module configuration is recommended	Refer to manual document	P
	c. Manufacturer's stated tolerance for Voc, Isc and maximum power output under standard test conditions		P
	d. Temperature coefficient for voltage at open-circuit		P
	e. Temperature coefficient for maximum power		P
	f. Temperature coefficient for short-circuit current		P
	All electrical data mentioned above shown as relative to standard test conditions (1 000 W/m ² , 25 °C, AM 1,5 according to IEC TS 61836)		P
	g. Performance at low irradiance (MQT 07) is specified		P
	International symbols used where applicable		P
	Compliance checked by inspection and MQT 04 through MQT 07		P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used		—
	h. The minimum cable diameters for modules intended for field wiring		N/A
	i. Any limitations on wiring methods and wire management that apply to the wiring compartment or box;		P
	j. The size, type, material and temperature rating of the conductors to be used		P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	k. Type of terminals for field wiring		N/A
	l. Specific PV connector model/types and manufacturer to which the module connectors are mated		P
	m. The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation	Refer to manual document	P
	n. The type and ratings of bypass diode to be used (if applicable)	Refer to manual document	P
	o. limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)	Refer to manual document	P
	p. A statement indicating the fire rating(s) and the applied standard and the limitations to that rating (e.g., installation slope, sub-structure or other applicable installation information)	Refer to manual document	P
	q. A statement indicating the design load per each mechanical means for securing the module as evaluated during the static mechanical load test according to MQT 16. At discretion of the manufacturer the test load and/or the safety factor γ_m may be noted, too	Designed load: Positive: 1600Pa Negative: 1600Pa Safety factor for both sides: 1.5	P
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: <i>"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."</i>		P
5.2.3	Assembly instructions		N/A
	Provided with a product shipped in subassemblies, detailed and adequate to the degree required to facilitate complete and safe assembly of the product		N/A
Supplementary information: N/A.			

7. Pass Criteria						P
7.2	Power output and electric circuitry					P
7.2.1	Verification of rated label values (Gate No. 1)					P
	Manufacturer's tolerances and Laboratory uncertainties					P
		t ₁	t ₂	t ₃	t ₄	—

IEC 61215-1						
Clause	Requirement + Test		Result - Remark			Verdict
	manufacturer's rated lower/upper production tolerance in %	-3	+5	+3	+3	
		m ₁	m ₂	m ₃		
	measurement uncertainty in % of laboratory	2.01	0.73	1.99		
	Laboratory reproducibility r	+0.28%				
	After stabilization, each individual module meets the requirements					P
	P _{max}:		See Table 03.1, Table 03.3			P
	V _{oc}:		See Table 03.1, Table 03.3			P
	I _{sc}:		See Table 03.1, Table 03.3			P
	After stabilization the arithmetic average $\overline{P}_{max}$ of all modules meet the requirements.		See Table 03.1, Table 03.3			P
7.2.2	Maximum power degradation during type approval testing (Gate #2)					P
	At the end of each test sequence or for sequence B after bypass diode test, each test sample meets the requirements for P _{max}					P
7.2.3	Electrical circuitry					P
	Samples do not exhibit an open-circuit during the tests					P
7.3	Visual defects					P
	There is no visual evidence of a major defect.					P
7.4	Electrical safety					P
	The insulation test (MQT 03) requirements are met at the beginning and the end of each sequence					P
	The wet leakage current test (MQT 15) requirements met at the beginning and at the end of each sequence					P
	Specific requirements of the individual tests are met					P
Supplementary information: N/A.						

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

4. TESTING OVERVIEW			P
	Initial examination	All modules	P
4.1	Visual inspection (MQT 01)) :	See Table 01	P
4.19.5	Initial stabilization (MQT 19.1) :	See Table 02.1 - 02.4 and Table A.4.1 - A.4.4	P
4.6	Performance at STC & BNPI (MQT 06.1)	See Table 03.1 - 03.3 and Tables A.4.7 – A.4.9	P
4.3	Insulation test (MQT 03) :	See Table 04	P
4.15	Wet leakage current test (MQT 15) :	See Table 05	P

Sequence A	1 Module	Sample A	P
4.7	Performance at low irradiance (MQT 07) :	See Table 06.1 - 06.2	P
4.4	Measurement of temperature coefficients (MQT 04) :	See Table 07	P

Sequence B	1 Module	Sample B	P
4.8	Outdoor exposure test (MQT 08) :	See Table 08	P
4.18.1	Bypass diode thermal test (MQT 18.1)		P
	Maximum allowed junction temperature..... :		—
	Calculated junction temperature..... :		—
	Final measurements :	See Table 09	P
4.18.2	Bypass diode functionality test (MQT 18.2) :	See Table 10	P
4.19.6	Final stabilization (MQT 19.2) :	See Table 10.1 – 10.3	N/A
4.9	Hot spot endurance test (MQT 09)..... :	See Table 11	P

Sequence C	2 Modules	Samples C1; C2	P
4.10	UV preconditioning test (MQT 10)..... :	See Table 12.1 - 12.6	P
4.20	Cyclic (dynamic) mechanical load test (MQT 20)	See Table 13	P
4.11	Thermal cycling test 50 cycles (MQT 11) :	See Table 14	P
4.12	Humidity-freeze test (MQT 12) :	See Table 15	P

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Clause	Requirement + Test	Result - Remark	Verdict

Sequence C1	1 Module	Sample C1	P
4.14.2	Retention of junction box on mounting surface (MQT 14.1)	See Table 16	P
4.14.3	Test of cord anchorage (MQT 14.2)		—
4.14.3.1	The junction box, separate from the module, shall be tested to IEC 62790 "Test of cord anchorage" and shall meet the requirements therein	See list of attachments	—

Sequence D	2 Modules	Samples D1; D2	P
4.11	Thermal cycling test 200 cycles (MQT 11)	See Table 17	P

Sequence E	2 Modules	Samples E1; E2	P
4.13	Damp heat test (MQT 13)	See Table 18	P
4.19.6	Final stabilization (MQT 19.2)	See Table 23.3	N/A

Sequence E1	1 Module	Sample E1	P
4.16	Static mechanical load test (MQT 16)	See Table 19	P
4.22	Bending test (MQT 22)	See Table 20	N/A

Sequence E2	1 Module	Sample E2	P
4.17	Hail test (MQT 17)	See Table 21	P

Sequence F	4 Modules	Samples F1; F2; F3; F4	P
4.21	Potential induced degradation test (MQT 21)	See Table 22	P
4.19.6	Final stabilization (MQT 19.2)	See Table 23.4, 23.6, 23.7	N/A
	Final measurement	All modules for Sequence C, D, E, F; Control module for Sequence A	P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.19.6	Final stabilization (MQT 19.2) :	See Table 23.1 - 23.2	N/A
4.6	Performance at STC&BNPI (MQT 06.1) :	See Table 23.5, 23.8	P
4.3	Insulation test (MQT 03) :	See Table 23.9	P
4.15	Wet leakage current test (MQT 15) :	See Table 23.10	P

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

TABLE 01: MQT 01 ini: Initial Visual inspection			P
Test Date [YYYY-MM-DD].....:		2024-07-31 For other samples 2024-10-08 For HA2024TL-1042-024X~ HA2024TL-1042-027X & HA2024TL-1311	—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-001X	No major visual defects found		P
HA2024TL-1042-004X	No major visual defects found		P
HA2024TL-1042-005X	No major visual defects found		P
HA2024TL-1042-006X	No major visual defects found		P
HA2024TL-1042-007X	No major visual defects found		P
HA2024TL-1042-008X	No major visual defects found		P
HA2024TL-1042-009X	No major visual defects found		P
HA2024TL-1042-010X	No major visual defects found		P
HA2024TL-1042-011X	No major visual defects found		P
HA2024TL-1042-012X	No major visual defects found		P
HA2024TL-1042-013X	No major visual defects found		P
HA2024TL-1042-014X	No major visual defects found		P
HA2024TL-1042-024X	No major visual defects found		P
HA2024TL-1042-025X	No major visual defects found		P
HA2024TL-1042-026X	No major visual defects found		P
HA2024TL-1042-027X	No major visual defects found		P
HA2024TL-1311-001X	No major visual defects found		P
HA2024TL-1311-002X	No major visual defects found		P
HA2024TL-1311-003X	No major visual defects found		P
HA2024TL-1311-004X	No major visual defects found		P
HA2024TL-1311-005X	No major visual defects found		P
HA2024TL-1311-006X	No major visual defects found		P
HA2024TL-1311-007X	No major visual defects found		P
HA2024TL-1311-008X	No major visual defects found		P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1311-009X	No major visual defects found		P
HA2024TL-1311-010X	No major visual defects found		P
Supplementary information: N/A.			

TABLE 02: MQT 19.1 ini: Initial stabilization							—
TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (Front side)							—
Test Date [YYYY-MM-DD].....:			2024-07-31 For HA2024TL-1042 2024-10-08 For HA2024TL-1311				—
Test method.....:			☒ Simulator ☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
HA2024TL-1042-001X	6.685	52.927	6.276	45.224	283.823	80.22	—
HA2024TL-1042-004X	6.739	52.830	6.279	45.243	284.081	79.79	—
HA2024TL-1042-005X	6.639	52.810	6.299	45.094	284.047	81.02	—
HA2024TL-1042-006X	6.699	52.915	6.305	45.065	284.117	80.15	—
HA2024TL-1042-007X	6.692	53.038	6.296	45.253	284.894	80.26	—
HA2024TL-1042-008X	6.701	52.892	6.288	45.197	284.202	80.19	—
HA2024TL-1042-009X	6.699	52.892	6.292	45.221	284.528	80.30	—
HA2024TL-1042-010X	6.760	53.010	6.316	45.134	285.048	79.54	—
HA2024TL-1042-011X	6.689	53.044	6.288	45.387	285.379	80.43	—
HA2024TL-1042-012X	6.738	52.913	6.296	45.338	285.448	80.06	—
HA2024TL-1042-013X	6.695	52.907	6.294	45.362	285.515	80.60	—
HA2024TL-1042-014X	6.675	52.920	6.289	45.269	284.714	80.60	—
HA2024TL-1311-001X	4.405	55.649	4.118	47.594	196.003	79.96	—
HA2024TL-1311-002X	4.403	55.541	4.113	46.704	192.103	78.56	—

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IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							
TABLE 02.4: MQT 19.1: Initial Stabilization procedure							P
Light exposure method..... :				☒ Simulator ☐ Natural sunlight			
Stabilization criterion x per IEC 61215-1-x :				1			
Sample #	HA2024TL-1042-001X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	283.823	—	—
1	5	800-1000	50±10	MPPT	283.419	—	—
2	5	800-1000	50±10	MPPT	283.163	0.23	Yes
Sample #	HA2024TL-1042-004X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.081	—	—
1	5	800-1000	50±10	MPPT	283.694	—	—
2	5	800-1000	50±10	MPPT	283.477	0.21	Yes
Sample #	HA2024TL-1042-005X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.047	—	—
1	5	800-1000	50±10	MPPT	283.795	—	—
2	5	800-1000	50±10	MPPT	283.689	0.13	Yes

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Clause	Requirement + Test				Result - Remark		Verdict
Sample #	HA2024TL-1042-006X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.117	—	—
1	5	800-1000	50±10	MPPT	283.609	—	—
2	5	800-1000	50±10	MPPT	283.247	0.31	Yes
Sample #	HA2024TL-1042-007X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.894	—	—
1	5	800-1000	50±10	MPPT	284.283	—	—
2	5	800-1000	50±10	MPPT	283.973	0.32	Yes
Sample #	HA2024TL-1042-008X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.202	—	—
1	5	800-1000	50±10	MPPT	283.186	—	—
2	5	800-1000	50±10	MPPT	282.721	0.52	Yes
Sample #	HA2024TL-1042-009X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.528	—	—
1	5	800-1000	50±10	MPPT	283.417	—	—
2	5	800-1000	50±10	MPPT	282.723	0.64	Yes
Sample #	HA2024TL-1042-010X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	285.048	—	—
1	5	800-1000	50±10	MPPT	284.618	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	800-1000	50±10	MPPT	284.421	0.22	Yes
Sample #	HA2024TL-1042-011X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	285.379	—	—
1	5	800-1000	50±10	MPPT	284.970	—	—
2	5	800-1000	50±10	MPPT	284.699	0.24	Yes
Sample #	HA2024TL-1042-012X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	285.448	—	—
1	5	800-1000	50±10	MPPT	284.868	—	—
2	5	800-1000	50±10	MPPT	284.587	0.30	Yes
Sample #	HA2024TL-1042-013X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	285.515	—	—
1	5	800-1000	50±10	MPPT	285.140	—	—
2	5	800-1000	50±10	MPPT	284.946	0.20	Yes
Sample #	HA2024TL-1042-014X	Test Date (YYYY-MM-DD) start/end.....			2024-07-31/2024-08-06		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	284.714	—	—
1	5	800-1000	50±10	MPPT	284.244	—	—
2	5	800-1000	50±10	MPPT	284.055	0.23	Yes
Sample #	HA2024TL-1311-001X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	196.003	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
1	5	800-1000	50±10	MPPT	195.392	—	—
2	5	800-1000	50±10	MPPT	195.021	0.50	Yes
Sample #	HA2024TL-1311-002X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	192.103	—	—
1	5	800-1000	50±10	MPPT	191.001	—	—
2	5	800-1000	50±10	MPPT	190.502	0.84	Yes
Sample #	HA2024TL-1311-003X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	198.570	—	—
1	5	800-1000	50±10	MPPT	197.836	—	—
2	5	800-1000	50±10	MPPT	197.353	0.62	Yes
Sample #	HA2024TL-1311-004X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	199.973	—	—
1	5	800-1000	50±10	MPPT	199.705	—	—
2	5	800-1000	50±10	MPPT	199.528	0.22	Yes
Sample #	HA2024TL-1311-005X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	190.628	—	—
1	5	800-1000	50±10	MPPT	189.776	—	—
2	5	800-1000	50±10	MPPT	189.386	0.65	Yes
Sample #	HA2024TL-1311-006X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)

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Clause	Requirement + Test				Result - Remark		Verdict
Initial	—	—	—	—	196.782	—	—
1	5	800-1000	50±10	MPPT	195.758	—	—
2	5	800-1000	50±10	MPPT	195.351	0.73	Yes
Supplementary information: N/A.							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
—	—						
—	—						
—	—						
—	—						
—	—						
—	—						
—	—						
Test method description: —							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure.							

TABLE 03.1: MQT 06.1 ini: Performance at STC after initial stabilization (Front side)										P
Test Date [YYYY-MM-DD].....:					2024-08-06					—
P_{max} lower limit (W)					See table below: P_{max} [W] – Min calc.					—
$\bar{P}_{max}$ (lab) lower limit (V)					275.433					—
V_{oc} (lab) upper limit (V)					See table below: V_{oc} [V] Max. calc.					—
I_{sc} (lab) upper limit (A)					See table below: I_{sc} [A] Max. calc.					—
Test method.....:					☒ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]		V_{oc} [V]		I_{mp} [A]	V_{mp} [V]	P_{max} [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
HA2024TL-1042-001X	6.633	6.961	52.929	54.033	6.276	45.121	283.163	267.170	80.66	P
HA2024TL-1042-004X	6.710	6.961	52.870	54.033	6.273	45.189	283.477	267.170	79.91	P
HA2024TL-1042-005X	6.628	6.961	52.876	54.033	6.267	45.269	283.689	267.170	80.95	P
HA2024TL-1042-006X	6.625	6.961	52.846	54.033	6.213	45.587	283.247	267.170	80.90	P

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Clause	Requirement + Test					Result - Remark				Verdict
HA2024TL-1042-007X	6.662	6.961	53.003	54.033	6.265	45.327	283.973	267.170	80.42	P
HA2024TL-1042-008X	6.641	6.961	52.890	54.033	6.270	45.089	282.721	267.170	80.49	P
HA2024TL-1042-009X	6.598	6.961	52.887	54.033	6.253	45.217	282.723	267.170	81.02	P
HA2024TL-1042-010X	6.705	6.961	52.952	54.033	6.295	45.180	284.421	267.170	80.11	P
HA2024TL-1042-011X	6.644	6.961	53.047	54.033	6.262	45.464	284.699	267.170	80.78	P
HA2024TL-1042-012X	6.709	6.961	52.953	54.033	6.291	45.237	284.587	267.170	80.10	P
HA2024TL-1042-013X	6.646	6.961	52.972	54.033	6.277	45.393	284.946	267.170	80.94	P
HA2024TL-1042-014X	6.626	6.961	52.915	54.033	6.275	45.269	284.055	267.170	81.02	P
Average	—						283.808	275.433	—	P
Supplementary information: The limit values are calculated considering manufacturer's tolerances <i>t</i> of rated nameplate values and laboratory measurement uncertainties <i>m</i> .										

TABLE 03.1: MQT 06.1 ini: Performance at STC after initial stabilization (Front side)										P
Test Date [YYYY-MM-DD].....:					2024-10-12					—
$P_{\max}$ lower limit (W)					See table below: $P_{\max}$ [W] – Min calc.					—
$\bar{P}_{\max}$ (lab) lower limit (V)					191.820					—
V_{oc} (lab) upper limit (V)					See table below: V_{oc} [V] Max. calc.					—
I_{sc} (lab) upper limit (A)					See table below: I_{sc} [A] Max. calc.					—
Test method.....:					☒ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]		V_{oc} [V]		I_{mp} [A]	V_{mp} [V]	$P_{\max}$ [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
HA2024TL-1311-001X	4.337	4.620	55.711	56.715	4.090	47.678	195.021	186.065	80.71	P
HA2024TL-1311-002X	4.348	4.620	55.562	56.715	4.078	46.709	190.502	186.065	78.85	P
HA2024TL-1311-003X	4.311	4.620	56.164	56.715	4.086	48.297	197.353	186.065	81.51	P
HA2024TL-1311-004X	4.402	4.620	56.103	56.715	4.137	48.230	199.528	186.065	80.79	P

IEC 61215-2										
Clause	Requirement + Test						Result - Remark			Verdict
HA2024TL-1311-005X	4.353	4.620	55.018	56.715	4.071	46.526	189.386	186.065	79.08	P
HA2024TL-1311-006X	4.339	4.620	55.745	56.715	4.093	47.730	195.351	186.065	80.77	P
Average	—						194.523	191.820	—	P
Supplementary information: The limit values are calculated considering manufacturer's tolerances t of rated nameplate values and laboratory measurement uncertainties m .										

TABLE 03.2: MQT 06.1: Performance at STC after initial stabilization (Back side)										—
Test Date [YYYY-MM-DD].....:				—						—
Test method.....:				☐ Simulator ☐ Natural sunlight						—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	ϕI_{sc}	ϕV_{oc}	ϕP_{max}	Result
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—

Supplementary information: N/A.

TABLE 03.3: MQT 06.1: Performance at BNPI (front side irradiance 1 000 W/m², backside irradiance 135 W/m², 25 °C, AM 1.5) after initial stabilization		—
Test Date [YYYY-MM-DD].....:	—	—
$P_{\max}$ lower limit (W)	See table below: $P_{\max}$ [W] – Min calc.	—
$\bar{P}_{\max}$ (lab) lower limit (V)	—	—
V_{oc} (lab) upper limit (V)	See table below: V_{oc} [V] Max. calc.	—

IEC 61215-2										
Clause	Requirement + Test					Result - Remark				Verdict
I_{sc} (lab) upper limit (A)					See table below: I_{sc} [A] Max. calc.					—
Test method..... :					☐ Simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]		V_{oc} [V]		I_{mp} [A]	V_{mp} [V]	P_{max} [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
Average	—						—	—	—	—
Supplementary information: The limit values are calculated considering manufacturer's tolerances <i>t</i> of rated nameplate values and laboratory measurement uncertainties <i>m</i> .										

TABLE 04: MQT 03: Initial Insulation test					P
Test Date [YYYY-MM-DD].....:		2024-08-06 For HA2024TL-1042 2024-10-12 For HA2024TL-1311			—
Test Voltage applied [V]		6000/1000			—
Size of module [m ²].....:		1.32 For HA2024TL-1042 0.95 For HA2024TL-1311			—
Required Resistance [MΩ]		≥30.30 For HA2024TL-1042 ≥42.10 For HA2024TL-1311			—
Sample #	Measured	Dielectric breakdown			Result
	MΩ	Yes (description)		No	
HA2024TL-1042-001X	>10000	No Dielectrical breakdown		x	P

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Clause	Requirement + Test	Result - Remark	Verdict	
HA2024TL-1042-004X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-005X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-006X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-007X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-008X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-009X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-010X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-011X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-012X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-013X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1042-014X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-001X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-002X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-003X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-004X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-005X	>10000	No Dielectrical breakdown	x	P
HA2024TL-1311-006X	>10000	No Dielectrical breakdown	x	P
Supplementary information: The maximum resistance measurement range is 10000MΩ.				

TABLE 05: MQT 15: Initial Wet leakage current test		P
Test Date [YYYY-MM-DD]..... :	2024-08-06 For HA2024TL-1042 2024-10-12 For HA2024TL-1311	—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22.7 For HA2024TL-1042 21.9 For HA2024TL-1311		P
Solution resistivity [Ω cm]	2437 For HA2024TL-1042 2532 For HA2024TL-1311		P
Size of module [m²].....	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
HA2024TL-1042-001X	≥30.30	7210	P
HA2024TL-1042-004X	≥30.30	5550	P
HA2024TL-1042-005X	≥30.30	7400	P
HA2024TL-1042-006X	≥30.30	6240	P
HA2024TL-1042-007X	≥30.30	5550	P
HA2024TL-1042-008X	≥30.30	7220	P
HA2024TL-1042-009X	≥30.30	5170	P
HA2024TL-1042-010X	≥30.30	5540	P
HA2024TL-1042-011X	≥30.30	5270	P
HA2024TL-1042-012X	≥30.30	7040	P
HA2024TL-1042-013X	≥30.30	6460	P
HA2024TL-1042-014X	≥30.30	5990	P
HA2024TL-1311-001X	≥42.25	6060	P
HA2024TL-1311-002X	≥42.25	7010	P
HA2024TL-1311-003X	≥42.25	6860	P
HA2024TL-1311-004X	≥42.25	7160	P
HA2024TL-1311-005X	≥42.25	5710	P
HA2024TL-1311-006X	≥42.25	6940	P
Supplementary information: N/A.			

TABLE 06.1: MQT 07 - Performance at low irradiance (Front side)			P
Test Date [YYYY-MM-DD].....	2024-08-25		—
Test method ..:	☐ Outdoor measurement		—
	Ambient air temperature [°C]:	—	
	Irradiance [W/m²]:	—	
	Module temperature [°C]:	—	

IEC 61215-2						
Clause	Requirement + Test			Result - Remark		Verdict
	☒ Data corrected to a 25°C cell temperature and 200 W/m ² irradiance					
	☐ Directly measured					—
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]
HA2024TL-1042-001X	1.323	50.601	1.266	43.805	55.438	82.79
Supplementary information: N/A.						

TABLE 06.2: MQT 07 - Performance at low irradiance (Back side)										—
Test Date [YYYY-MM-DD].....:					—					—
Test method ...:	☐ Outdoor measurement									—
	Ambient air temperature [°C]:				—					
	Irradiance [W/m²]:				—					
	Module temperature [°C]:				—					
	☐ Data corrected to a 25°C cell temperature and 200 W/m² irradiance									—
☐ Directly measured										
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	ϕI_{sc}	ϕV_{oc}	ϕP_{max}	
—	—	—	—	—	—	—	—	—	—	
Supplementary information: N/A.										

TABLE 07: MQT 04 - Measurement of temperature coefficients					—
Test Date [YYYY-MM-DD].....:		2024-09-06			—
Ambient air temperature [°C] high/low		—			—
Irradiance [W/m ²] high/low		1000			—
Module temperature [°C] high/low		55/25			—
Sample #	α [%/°C]	β [%/°C]	δ [%/°C]		—
HA2024TL-1042-001X	0.042	-0.306	-0.328		—
Supplementary information: N/A.					

TABLE 08: MQT 08 - Outdoor exposure test		P
Test Date [YYYY-MM-DD] start/end	2024-08-12/2024-09-03	—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Sample #	HA2024TL-1042-004X	—	—
Total irradiation dosage [kWh/m ²]..... :	60.0	—	—
Angle of tilt the test module :	37°	—	—
Electrical load:	☐ Restive load ☒ MPPT	—	—
Supplementary information: N/A.			
Table 08.1: MQT 01: Visual inspection after outdoor exposure test			P
Test Date [YYYY-MM-DD]..... :	2024-09-03	—	—
Sample #	Nature and position of initial findings – comments or attach photos	—	—
HA2024TL-1042-004X	No major visual defects found	P	P
Supplementary information: N/A.			

Table 08.2: MQT 15: Wet leakage current test after outdoor exposure test			P
Test Date [YYYY-MM-DD]	2024-09-03	—	—
Test Voltage applied [V]	1000	—	—
Solution temperature [°C]	22.5	P	P
Size of module [m ²]..... :	1.32	—	—
Solution resistivity [Ω cm]	2442	P	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-004X	6170	≥30.30	P
Supplementary information: N/A.			

Table 08.3: MQT 02 - Maximum power determination after outdoor exposure test - Optional							—
Test Date [YYYY-MM-DD]..... :	—						—
Module temperature [°C]	—						—
Irradiance [W/m ²]	—						—
Sample #	I _{sc} [A]	V _{oc} [V]	I _{mp} [A]	V _{mp} [V]	P _{max} [W]	FF [%]	
—	—	—	—	—	—	—	
Supplementary information: N/A.							

Table 08.4: MQT 03 - Insulation test after outdoor exposure test - Optional							—
Test Date [YYYY-MM-DD]..... :	—						—

IEC 61215-2					
Clause	Requirement + Test			Result - Remark	Verdict
Test Voltage applied [V]		—			—
Size of module [m ²].....		—			—
Required Resistance [MΩ]		—			—
Sample #	Measured	Required (MΩ)	Dielectric breakdown		Result
	(MΩ)	(MΩ)	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: N/A.					

TABLE 09: MQT 18: Bypass diode thermal test					P
Test Date [YYYY-MM-DD] start/end	2024-09-06/2024-09-07				—
Sample #	HA2024TL-1042-004X				—
Module temperature [°C]	75±5				—
Number of diodes in junction box.....	3				—
Diode manufacturer	PAN JIT INTERNATIONAL INC				—
Diode type designation	30SQ050				—
Max. permissible junction temperature, T _{Jmax} [°C] (according to diode datasheet).....	200				—
Detailed description of sample preparation procedure	—				—
Step 1, Determination of V _D versus T _J characteristic					P
Diode1	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C	
Ambient temperature of the junction box....:	30	50	70	90	
Pulsed current	6.88	6.88	6.88	6.88	
Voltage drop, V _D [V]	0.4263	0.4054	0.3846	0.3637	
V _D versus T _J characteristic	V _D = -0.0010 T _J + 0.4578				—
Diode2	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C	
Ambient temperature of the junction box....:	30	50	70	90	
Pulsed current	6.88	6.88	6.88	6.88	
Voltage drop, V _D [V]	0.4294	0.4100	0.3907	0.3713	
V _D versus T _J characteristic	V _D = -0.0010 T _J + 0.4584				—
Diode3	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C	
Ambient temperature of the junction box....:	30	50	70	90	
Pulsed current	6.88	6.88	6.88	6.88	

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Clause	Requirement + Test		Result - Remark		Verdict
Voltage drop, V_D [V] :		0.4345	0.4151	0.3957	0.3764
V_D versus T_J characteristic :		$V_D = -0.0010 T_J + 0.4636$			—
Max. permissible junction temperature T_{Jmax} [°C] (according to diode datasheet)..... :		200			—
Step 2, Bypass diode thermal test					P
	Diode 1	Diode 2	Diode 3	Result	
Current flow applied [A] :	6.88	6.88	6.88	—	
Max. diode surface temperature allowed T_{Jmax} [°C] :	200	200	200	—	
Voltage drop, V_D [V] after 1h :	0.3451	0.3487	0.3520	—	
Calculated max. junction temperature T_{Jcalc} [°C] :	113.2	110.7	111.2	P	
$T_{Jcalc} < T_{Jmax}$ (test passed)? yes/no :	yes	yes	yes	P	
Current flow ($1.25 * I_{sc}$) [A] :	8.60	8.60	8.60	—	
Bypass diode remain(s) functional (yes/no) :	yes	yes	yes	P	
Remarks: See Table 10 for the test details of bypass diode functionality test. 3 Diodes are considered as representative number. These diodes have to be selected as worst case. In case that additional bypass diodes tests are performed the results shall be listed in an attachment. For bifacial modules, use the value of the short-circuit current at elevated irradiance BSI (equivalent to 1 000 W/m ² on the front side and 300 W/m ² on the back side). Extrapolate I_{sc-BSI} , these quantities are combined as follows: $I_{sc-BSI}=I_{sc-BNPI}+(I_{sc-BNPI}-I_{sc})(G_{BSI}-G_{BNPI})/(G_{BNPI}-1\ 000)$, $G_{BSI}=1\ 000+300\phi$, $G_{BNPI}=1\ 000+135\phi$, $\phi=\text{Min}(\phi/I_{sc}, \phi P_{max})$.					

TABLE 09.1: MQT 01 - Visual inspection after bypass diode thermal test			P
Test Date [YYYY-MM-DD].....:		2024-09-07	—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-004X	No major visual defects found		P
Supplementary information: N/A.			
TABLE 09.2: MQT 15 - Wet leakage current test after bypass diode thermal test			P
Test Date [YYYY-MM-DD]		2024-09-07	—
Test Voltage applied [V]		1000	—
Solution temperature [°C]		22.4	P
Size of module [m²].....:		1.32	—
Solution resistivity [Ω cm]		2489	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-004X	6240	≥30.30	P

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Clause	Requirement + Test	Result - Remark	Verdict
Supplementary information: N/A.			

TABLE 09.3: MQT 02 – Max. power determination after bypass diode thermal test - Optional							—
Test Date [YYYY-MM-DD]..... :			—				—
Module temperature [°C]			—				—
Irradiance [W/m ²]			—				—
Sample #	I _{sc} [A]	V _{oc} [V]	I _{mp} [A]	V _{mp} [V]	P _{max} [W]	FF [%]	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

TABLE 09.4: MQT 03 - Insulation test after bypass diode thermal test - Optional					—
Test Date [YYYY-MM-DD]..... :		—			—
Test Voltage applied [V]		—			—
Size of module [m ²]..... :		—			—
Required Resistance [MΩ]		—			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: N/A.					

TABLE 10: MQT 18.2 - Bypass diode functionality test after bypass diode thermal test					P
Test Date [YYYY-MM-DD]..... :		2024-09-07			—
☐ Method A					—
Ambient temperature [°C]		—			—
Current flow applied [A]		—			—
Sample #	VFM	VFM _{rated}	VFM = (N × VFM _{rated}) ± 10 %		Result
—	—	—	☐ Yes ☐ No		—
Supplementary information: N/A.					
☒ Method B					P
	IV curve after shading				Result
Diode 1	Turn on				P
Diode 2	Turn on				P
Diode 3	Turn on				P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Supplementary information: HA2024TL-1042-004X.			

TABLE 10.1: MQT 19.1: Final stabilization							—
TABLE 10.2: MQT 06.1: Performance at STC before final stabilization							—
Test Date [YYYY-MM-DD]..... :				—			—
Test method..... :				☐ Solar simulator ☐ Natural sunlight			—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A							

TABLE 10.3: MQT 19.1 Final Stabilization procedure							—	
Light exposure method :				☐ Solar simulator		☐ Natural sunlight		—
Stabilization criterion x per IEC 61215-1-x ...:				—				—
Sample #	—		Test Date (YYYY-MM-DD) start/end :			—		
Test cycle	Integrated irradiation (kWh/m²)		Irradiance (W/m²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—		—	—	—	—	—	—
1	—		—	—	—	—	—	—
2	—		—	—	—	—	—	—
3	—		—	—	—	—	—	—
4	—		—	—	—	—	—	—
Supplementary information: N/A.								
☐ Other stabilization procedures								
Sample #	—		Test Date (YYYY-MM-DD) start/end:			—		
Test method description: —								
Supplementary information: See Annex 3 for verification of this alternative stabilization procedure.								

TABLE 11: MQT 09 - Hot-spot endurance test		P
Test Date [YYYY-MM-DD] start/end	2024-09-21/2024-09-24	—
Sample #	HA2024TL-1042-004X	—

IEC 61215-2							
Clause	Requirement + Test			Result - Remark		Verdict	
Procedure of technology		☒ wafer-based technologies (WBT) MQT 09.1 ☐ monolithically integrated (MLI) thin film technologies MQT 09.2				—	
Cell interconnection circuit.....		☐ S ☒ SP ☐ PS				—	
Type of light source		☐ Pulse solar simulator ☒ Steady state solar simulator ☐ Natural sunlight				—	
Module temperature at thermal equilibrium [°C]. :		51.1	52.3	51.7	52.4	—	
TABLE 11.1: MQT 09 - Hot-spot endurance test for WBT						P	
Selected hot-spot cells		Low	Low	Low	High	Permanent	—
		—	—	—	—	—	
Shading rate [%]		15	25	15	15	—	—
Max. measured cell temperature in each cell [°C]		155.1	150.8	153.7	138.9	—	—
Test duration of each shading [h]		1	1	1	1	—	—
Irradiance during shading [W/m²]		1000	1000	1000	1000	—	—
Supplementary information: For bifacial modules, determination of the cell shading percent and the prolonged exposure are performed at the elevated irradiance BSI. If double-side illumination is used to produce BSI, both the back and the front of the cell are shaded in the same way. During cell selection, any cell that is permanently shaded by a module feature (such as the junction box) is added to the list of selected cells							
TABLE 11.2: MQT 09 - Hot-spot endurance test for MLI							—
Selected hot-spot cells		—					—
Number of cells shaded.....		—					—
Max. measured cell temperature [°C].....		—					—
Test duration during shading [h]		—					—
Irradiance during shading [W/m²]		—					—
Supplementary information: N/A.							

TABLE 11.3: MQT 01 - Visual inspection after hot-spot endurance test		P
Test Date [YYYY-MM-DD].....:	2024-09-24	—
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-004X	No major visual defects found	P
Supplementary information: N/A.		

TABLE 11.4: MQT 02 - Maximum power determination after hot-spot endurance test					—
Test Date [YYYY-MM-DD].....	2024-09-24				—

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Module temperature [°C]			25			—	
Irradiance [W/m²]			1000			—	
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	—
HA2024TL-1042-004X	6.584	52.840	6.214	45.224	281.038	80.78	—
Supplementary information: N/A.							

TABLE 11.5: MQT 02 - Maximum power determination after hot-spot endurance test (at BNPI)							—
Test Date [YYYY-MM-DD]			—				—
Module temperature [°C]			—				—
Irradiance [W/m ²]			—				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

TABLE 11.6: MQT 03 - Insulation test after hot-spot endurance test					P
Test Date [YYYY-MM-DD]		2024-09-24			—
Test Voltage applied [V]		6000/1000			—
Size of module [m ²]		1.32			—
Required Resistance [MΩ]		≥30.30			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
HA2024TL-1042-004X	>10000	≥30.30	No dielectric breakdown	X	P
Supplementary information: The maximum resistance measurement range is 10000MΩ.					

TABLE 11.7: MQT 15 - Wet leakage current test after hot-spot endurance test				P
Test Date [YYYY-MM-DD]		2024-09-24		—
Test Voltage applied [V]		1000		—
Solution temperature [°C]		21.7		P
Size of module [m ²]		1.32		—
Solution resistivity [Ω cm]		2398		P
Sample #	Measured [MΩ]		Limit [MΩ]	Result

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1042-004X	5740	≥30.30	P
Supplementary information: N/A.			

TABLE 11.8: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test				P
Test Date [YYYY-MM-DD].....:		2024-09-24		—
☐ Method A				—
Ambient temperature [°C]		—		—
Current flow applied [A]		—		—
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %	Result
—	—	—	☐ Yes ☐ No	—
Supplementary information: N/A.				
☒ Method B				P
	IV curve after shading			Result
Diode 1	Diode turn on			P
Diode 2	Diode turn on			P
Diode 3	Diode turn on			P
Supplementary information: HA2024TL-1042-004X.				

TABLE 11: MQT 09 - Hot-spot endurance test						P
Test Date [YYYY-MM-DD] start/end	2024-10-13/2024-10-16					—
Sample #	HA2024TL-1311-002X					—
Procedure of technology	☒ wafer-based technologies (WBT) MQT 09.1 ☐ monolithically integrated (MLI) thin film technologies MQT 09.2					—
Cell interconnection circuit.....	☐ S ☒ SP ☐ PS					—
Type of light source	☐ Pulse solar simulator ☒ Steady state solar simulator ☐ Natural sunlight					—
Module temperature at thermal equilibrium [°C]. :	52.2	51.8	52.5	53.4	—	—
TABLE 11.1: MQT 09 - Hot-spot endurance test for WBT						P
Selected hot-spot cells	Low	Low	Low	High	Permanent	—
	—	—	—	—	—	
Shading rate [%]	40	30	20	30	—	—

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Clause	Requirement + Test			Result - Remark		Verdict
Max. measured cell temperature in each cell [°C]	153.4	148.4	150.6	132.7	—	—
Test duration of each shading [h] :	1	1	1	1	—	—
Irradiance during shading [W/m²]:	1000	1000	1000	1000	—	—
Supplementary information: For bifacial modules, determination of the cell shading percent and the prolonged exposure are performed at the elevated irradiance BSI. If double-side illumination is used to produce BSI, both the back and the front of the cell are shaded in the same way. During cell selection, any cell that is permanently shaded by a module feature (such as the junction box) is added to the list of selected cells						
TABLE 11.2: MQT 09 - Hot-spot endurance test for MLI						—
Selected hot-spot cells :	—					—
Number of cells shaded.....:	—					—
Max. measured cell temperature [°C]..... :	—					—
Test duration during shading [h] :	—					—
Irradiance during shading [W/m²] :	—					—
Supplementary information: N/A.						

TABLE 11.3: MQT 01 - Visual inspection after hot-spot endurance test		P
Test Date [YYYY-MM-DD].....:	2024-10-16	—
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1311-002X	No major visual defects found	P
Supplementary information: N/A.		

TABLE 11.4: MQT 02 - Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....	2024-10-16					—
Module temperature [°C]	25					—
Irradiance [W/m²]	1000					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]
HA2024TL-1311-002X	4.311	55.569	4.073	46.590	189.769	79.22
Supplementary information: N/A.						

TABLE 11.5: MQT 02 - Maximum power determination after hot-spot endurance test (at BNPI)						—
Test Date [YYYY-MM-DD].....	—					—
Module temperature [°C]	—					—
Irradiance [W/m²]	—					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]

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Clause	Requirement + Test				Result - Remark		Verdict
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

TABLE 11.6: MQT 03 - Insulation test after hot-spot endurance test					P
Test Date [YYYY-MM-DD].....:		2024-10-16			—
Test Voltage applied [V]		6000/1000			—
Size of module [m²].....:		0.95			—
Required Resistance [MΩ]		≥42.25			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
HA2024TL-1311-002X	>10000	≥42.25	No dielectric breakdown	X	P
Supplementary information: The maximum resistance measurement range is 10000MΩ.					

TABLE 11.7: MQT 15 - Wet leakage current test after hot-spot endurance test			P
Test Date [YYYY-MM-DD]..... :		2024-10-16	—
Test Voltage applied [V] :		1000	—
Solution temperature [°C] :		22.8	P
Size of module [m²]..... :		0.95	—
Solution resistivity [Ω cm] :		2516	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1311-002X	5400	≥42.25	P
Supplementary information: N/A.			

TABLE 11.8: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test					P
Test Date [YYYY-MM-DD].....:			2024-10-16		—
☐ Method A					—
Ambient temperature [°C]			—		—
Current flow applied [A]			—		—
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %		Result

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Clause	Requirement + Test	Result - Remark	Verdict
—	—	— ☐ Yes ☐ No	—
Supplementary information: N/A.			
☒ Method B			P
	IV curve after shading		Result
Diode 1	Diode turn on		P
Diode 2	Diode turn on		P
Diode 3	—		—
Supplementary information: HA2024TL-1311-002X.			

TABLE 12.1: MQT 10 - UV preconditioning test (Front side)		P
Test Date (YYYY-MM-DD) start/end..... :	2024-08-12/2024-08-16	—
Module temperature [°C]	60±5	—
UV irradiance (280-400nm) [W/m²]	202.6	—
UV dose (280-320nm) [kWh/ m²]	0.93	—
Module operation condition	☒ Short circuited ☐ Pmax	—
Supplementary information: N/A.		

TABLE 12.2: MQT 10 - UV preconditioning test (Back side)		—
Test Date (YYYY-MM-DD) start/end..... :	—	—
Module temperature [°C]	—	—
UV irradiance (280-400nm) [W/m²]	—	—
UV dose (280-320nm) [kWh/ m²]	—	—
Module operation condition	☐ Short circuited ☐ Pmax	—
Supplementary information: For bifacial modules repeat the procedure of UV irradiation on the rear-side of the modules.		

TABLE 12.3: MQT 01 - Visual inspection after UV preconditioning test		P
Test Date [YYYY-MM-DD]..... :	2024-08-16	—
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-005X	No major visual defects found	P
HA2024TL-1042-006X	No major visual defects found	P
Supplementary information: N/A.		

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 12.4: MQT 15 - Wet leakage current test after UV preconditioning test			P
Test Date [YYYY-MM-DD].....:		2024-08-16	—
Test Voltage applied [V]		1000	—
Solution temperature [°C]		21.8	P
Size of module [m²].....:		1.32	—
Solution resistivity [Ω cm]		2411	P
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
HA2024TL-1042-005X	6020	≥30.30	P
HA2024TL-1042-006X	6340	≥30.30	P
Supplementary information: N/A.			

TABLE 12.5: MQT 02 – Max. power determination after UV preconditioning test - Optional							—
Test Date [YYYY-MM-DD].....:		—					—
Module temperature [°C]		—					—
Irradiance [W/m²]		—					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

TABLE 12.6: MQT 03 - Insulation test after UV preconditioning test - Optional					—
Test Date [YYYY-MM-DD].....:		—			—
Test Voltage applied [V]		—			—
Size of module [m²].....:		—			—
Required Resistance [MΩ]		—			—
Sample #	Measured		Dielectric breakdown		Result
	[MΩ]		Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information: N/A.					

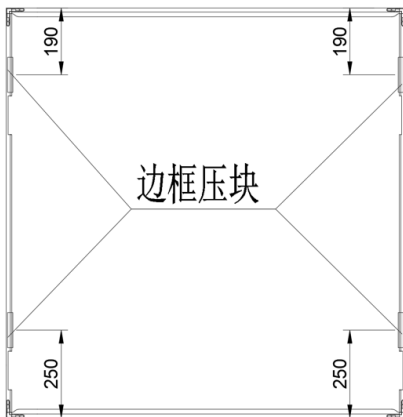
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Clause	Requirement + Test	Result - Remark	Verdict
TABLE 13: MQT 20 - Cyclic (dynamic) mechanical Load test			P
Test Date [YYYY-MM-DD].....:	2024-08-22 For HA2024TL-1042 2024-10-14 For HA2024TL-1311		—
Sample #	HA2024TL-1042-005X HA2024TL-1042-006X HA2024TL-1311-003X HA2024TL-1311-004X		—
Temperature of tested module(°C):	25		—
Maximum pressure (Pa) :	1000		—
Pressure tolerance(Pa) :	± 100		—
Monitoring current (A) :	0.18		—
Rate per minute(cycles) :	3/min		—
Number of cycles	1000		—
Pressure provider (Air pressure or vacuum).....:	Air pressure		—
Cell and alive part broken/ not	not		P
Current continuous (continuous/ disconnection occurred)	continuous		P
Supplementary information: Modules installed with mounting holes.			
			

TABLE 13.1: MQT 01 - Visual inspection after Cyclic (dynamic) mechanical Load test			P
Test Date [YYYY-MM-DD].....:	2024-08-22 For HA2024TL-1042 2024-10-14 For HA2024TL-1311		—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-005X	No major visual defects found		P
HA2024TL-1042-006X	No major visual defects found		P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1311-003X	No major visual defects found		P
HA2024TL-1311-004X	No major visual defects found		P
Supplementary information: N/A.			

TABLE 13.2: MQT 15 - Wet leakage current test after Cyclic (dynamic) mechanical Load test			P
Test Date [YYYY-MM-DD].....:	2024-08-22 For HA2024TL-1042 2024-10-14 For HA2024TL-1311		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]	21.7 For HA2024TL-1042 22.1 For HA2024TL-1311		P
Size of module [m²].....:	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Solution resistivity [Ω cm]	2343 For HA2024TL-1042 2345 For HA2024TL-1311		P
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
HA2024TL-1042-005X	5860	≥30.30	P
HA2024TL-1042-006X	6350	≥30.30	P
HA2024TL-1311-003X	5930	≥42.25	P
HA2024TL-1311-004X	5580	≥42.25	P
Supplementary information: N/A.			

TABLE 14: MQT 11 - Thermal cycling 50 test			P
Test Date [YYYY-MM-DD] start/end	2024-08-28/2024-09-06 For HA2024TL-1042 2024-10-17/2024-10-26 For HA2024TL-1311		—
Total cycles (50)	50		—
Weight attached (N).....:	5		—
Applied current (A)	During the heat up cycle from -40 °C to 80 °C	6.267 A for HA2024TL-1042-005X 6.213 A for HA2024TL-1042-006X 4.09 A for HA2024TL-1311-003X	—

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Clause	Requirement + Test	Result - Remark	Verdict
		4.14 A for HA2024TL-1311-004X	
	Other stages	0.03	—
Dwell time at high temperature.....:	15min		—
Dwell time at low temperature.....:	15min		—
Sample #	Open circuits (yes/no)		—
HA2024TL-1042-005X	No		P
HA2024TL-1042-006X	No		P
HA2024TL-1311-003X	No		P
HA2024TL-1311-004X	No		P
Supplementary information: N/A.			
TABLE 14.1: MQT 01 - Visual inspection after thermal cycling 50 test			P
Test Date [YYYY-MM-DD].....:	2024-09-06 For HA2024TL-1042 2024-10-26 For HA2024TL-1311		—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-005X	No major visual defects found		P
HA2024TL-1042-006X	No major visual defects found		P
HA2024TL-1311-003X	No major visual defects found		P
HA2024TL-1311-004X	No major visual defects found		P
Supplementary information: N/A.			

TABLE 14.2: MQT 15 - Wet leakage current test after thermal cycling 50 test			P
Test Date [YYYY-MM-DD].....:	2024-09-06 For HA2024TL-1042 2024-10-26 For HA2024TL-1311		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22.0 For HA2024TL-1042 22.0 For HA2024TL-1311		P
Size of module [m²].....:	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Solution resistivity [Ω cm]	2435 For HA2024TL-1042 2361 For HA2024TL-1311		P
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
HA2024TL-1042-005X	5350	≥30.30	P
HA2024TL-1042-006X	5860	≥30.30	P
HA2024TL-1311-003X	5290	≥42.25	P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1311-004X	5560	≥42.25	P
Supplementary information: N/A.			

TABLE 14.3: MQT 03 – Max. power determination after thermal cycling 50 test - Optional							—
Test Date [YYYY-MM-DD]..... :		—					—
Module temperature [°C]		—					—
Irradiance [W/m²]		—					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

TABLE 14.4: MQT 03 - Insulation test after thermal cycling 50 test - Optional				—
Test Date [YYYY-MM-DD]..... :		—		—
Test Voltage applied [V] :		—		—
Size of module [m²]..... :		—		—
Required Resistance [MΩ] :		—		—
Sample #	Measured	Dielectric breakdown		Result
	[MΩ]	Yes (description)	No	
—	—	—	—	—
—	—	—	—	—
Supplementary information: N/A.				

TABLE 15: MQT 12 - Humidity freeze 10 test		P
Test Date [YYYY-MM-DD] start/end	2024-09-11/2024-09-21 For HA2024TL-1042 2024-10-29/2024-11-08 For HA2024TL-1311	—
Total cycles (10)	10	—
Applied current (A)	0.03	—
Dwell time at high temperature.....	20h	—
Dwell time at low temperature	30min	—
Sample #	Open circuits (yes/no)	—
HA2024TL-1042-005X	No	P
HA2024TL-1042-006X	No	P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1311-003X	No		P
HA2024TL-1311-004X	No		P
Supplementary information: N/A.			

TABLE 15.1: MQT 01 - Visual inspection after humidity freeze 10 test		P
Test Date [YYYY-MM-DD]..... :	2024-09-21 For HA2024TL-1042 2024-11-08 For HA2024TL-1311	—
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-005X	No major visual defects found	P
HA2024TL-1042-006X	No major visual defects found	P
HA2024TL-1311-003X	No major visual defects found	P
HA2024TL-1311-004X	No major visual defects found	P
Supplementary information: N/A.		

TABLE 15.2: MQT 15 - Wet leakage current test after humidity freeze 10 test			P
Test Date [YYYY-MM-DD]..... :	2024-09-21 For HA2024TL-1042 2024-11-08 For HA2024TL-1311		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]..... :	22.1 For HA2024TL-1042 21.1 For HA2024TL-1311		P
Size of module [m²]..... :	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Solution resistivity [Ω cm]	2445 For HA2024TL-1042 2360 For HA2024TL-1311		P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-005X	5510	≥30.30	P
HA2024TL-1042-006X	5040	≥30.30	P
HA2024TL-1311-003X	5670	≥42.25	P
HA2024TL-1311-004X	6100	≥42.25	P
Supplementary information: N/A.			

TABLE 15.3: MQT 02 - Maximum power determination after humidity freeze 10 test -Optional			—
Test Date [YYYY-MM-DD]..... :	—		—
Module temperature [°C]	—		—
Irradiance [W/m²]	—		—

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Clause	Requirement + Test			Result - Remark		Verdict
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]
—	—	—	—	—	—	—
—	—	—	—	—	—	—
Supplementary information: N/A.						

TABLE 15.4: MQT 03 Insulation test after humidity freeze 10 test) -Optional					—
Test Date [YYYY-MM-DD]..... :			—		—
Test Voltage applied [V]			—		—
Size of module [m ²]..... :			—		—
Required Resistance [MΩ]			—		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information: N/A.					

TABLE 16: MQT 14.1 Retention of junction box on mounting surface			P
Test Date [YYYY-MM-DD] start/end :		2024-09-21 For HA2024TL-1042 2024-11-08 For HA2024TL-1311	—
Sample #	HA2024TL-1042-005X, HA2024TL-1311-003X		—
Supplementary information: Pull force is 40N.			

TABLE 16.1: MQT 01 - Visual inspection after retention of junction box on mounting surface		P
Test Date [YYYY-MM-DD].....:	2024-09-21 For HA2024TL-1042 2024-11-08 For HA2024TL-1311	—
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-005X	No major visual defects found	P
HA2024TL-1311-003X	No major visual defects found	P
Supplementary information: N/A.		
TABLE 16.2: MQT 15 - Wet leakage current test after retention of junction box on mounting surface		P
Test Date [YYYY-MM-DD].....:	2024-09-21 For HA2024TL-1042 2024-11-08 For HA2024TL-1311	—

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Clause	Requirement + Test	Result - Remark	Verdict
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22.1 For HA2024TL-1042 21.1 For HA2024TL-1311		P
Size of module [m²].....	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Solution resistivity [Ω cm]	2445 For HA2024TL-1042 2360 For HA2024TL-1311		P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-005X	5230	≥30.30	P
HA2024TL-1311-003X	5990	≥42.25	P
Supplementary information: N/A.			

TABLE 17: MQT 11 - Thermal cycling 200 test			P
Test Date [YYYY-MM-DD] start/end :	2024-08-12/2024-09-15 For HA2024TL-1042 2024-10-12/2024-11-15 For HA2024TL-1311		—
Total cycles (200) :	200		—
Weight attached (N)..... :	5		—
Applied current (A) :	During the heat up cycle from –40 °C to 80 °C	6.265 A for HA2024TL-1042-007X. 6.270 A for HA2024TL-1042-008X. 4.07 A for HA2024TL-1311-007X. 4.09 A for HA2024TL-1311-008X.	—
	Other stages	0.03	—
Dwell time at high temperature..... :	15min		—
Dwell time at low temperature :	15min		—
Sample #	Open circuits (yes/no)		—
HA2024TL-1042-007X	no		P
HA2024TL-1042-008X	no		P
HA2024TL-1311-007X	no		P
HA2024TL-1311-008X	no		P
Supplementary information: N/A.			

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 17.1: MQT 01 - Visual inspection after thermal cycling 200 test			P
Test Date [YYYY-MM-DD]..... :		2024-09-15 For HA2024TL-1042 2024-11-15 For HA2024TL-1311	—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-007X	No major visual defects found		P
HA2024TL-1042-008X	No major visual defects found		P
HA2024TL-1311-007X	No major visual defects found		P
HA2024TL-1311-008X	No major visual defects found		P

Supplementary information: N/A.

TABLE 17.2: MQT 15 - Wet leakage current test after thermal cycling 200 test			P
Test Date [YYYY-MM-DD]..... :		2024-09-15 For HA2024TL-1042 2024-11-15 For HA2024TL-1311	—
Test Voltage applied [V]		1000	—
Solution temperature [°C]		21.5 For HA2024TL-1042 21.7 For HA2024TL-1311	P
Size of module [m²]..... :		1.32 For HA2024TL-1042 0.95 For HA2024TL-1311	—
Solution resistivity [Ω cm]		2524 For HA2024TL-1042 2433 For HA2024TL-1311	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-007X	6140	≥30.30	P
HA2024TL-1042-008X	5700	≥30.30	P
HA2024TL-1311-007X	5810	≥42.25	P
HA2024TL-1311-008X	6230	≥42.25	P

Supplementary information: N/A.

TABLE 18: MQT 13 - Damp heat 1000 test			P
Test Date [YYYY-MM-DD] start/end		2024-08-12/2024-09-23	—
Total hours (1000h)		1000	—
Weight attached (N)..... :		5	—
Sample #			—
HA2024TL-1042-009X	No		P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1042-010X	No		P
Supplementary information: N/A.			

TABLE 18.1: MQT 01 - Visual inspection after damp heat 1000 test		P
Test Date [YYYY-MM-DD].....:		2024-09-23
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-009X	No major visual defects found	P
HA2024TL-1042-010X	No major visual defects found	P
Supplementary information: N/A.		

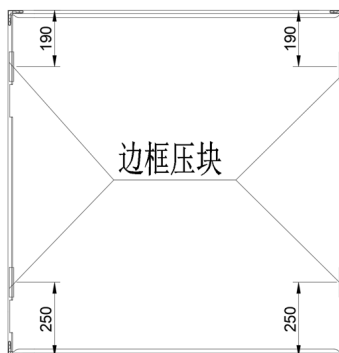
TABLE 18.2: MQT 15 - Wet leakage current test after damp heat 1000 test			P
Test Date [YYYY-MM-DD].....:		2024-09-23	—
Test Voltage applied [V]		1000	—
Solution temperature [°C]		21.1	P
Size of module [m²]		1.32	—
Solution resistivity [Ω cm]		2380	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-009X	5560	≥30.30	P
HA2024TL-1042-010X	5250	≥30.30	P
Supplementary information: N/A.			

TABLE 18.3: MQT 02 - Maximum power determination after damp heat 1000 test - Optional							—
Test Date [YYYY-MM-DD].....:		—					—
Module temperature [°C]		—					—
Irradiance [W/m²]		—					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

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Clause	Requirement + Test			Result - Remark	Verdict
TABLE 18.4: MQT 03 - Insulation test after damp heat 1000 test - Optional					—
Test Date [YYYY-MM-DD].....:		—			—
Test Voltage applied [V]		—			—
Size of module [m²].....		—			—
Sample #	Measured	Required Resistance	Dielectric breakdown		Result
	[MΩ]	[MΩ]	Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information: N/A.					

TABLE 19: MQT 16 Static mechanical load test				P
Sample # :		HA2024TL-1042-009X		—
Design load(front side/ back side)		1600/1600		—
Safety factors.....		1.5		—
Test Date [YYYY-MM-DD].....		2024-10-16		—
Mounting method		Modules installed with mounting holes		—
Load applied to		front side	back side	—
Mechanical load [Pa]		2400	2400	—
First cycle time (start/end)		11:30/12:30	12:41/13:41	—
Intermittent open-circuit (yes/no)		no	no	P
Second cycle time (start/end)		13:55/14:55	15:08/16:08	—
Intermittent open-circuit (yes/no)		no	no	P
Third cycle time (start/end)		16:22/17:22	17:36/18:36	—
Intermittent open-circuit (yes/no)		no	no	P

Supplementary information: Modules installed with mounting holes.



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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 19.1: MQT 01 - Visual inspection after static mechanical load test		P
Test Date [YYYY-MM-DD]..... :		2024-10-17
Sample #	Nature and position of initial findings – comments or attach photos	—
HA2024TL-1042-009X	No major visual defects found	P
Supplementary information: N/A.		

TABLE 19.2: MQT 15 - Wet leakage current test after static mechanical load test			P
Test Date [YYYY-MM-DD].....:		2024-10-17	—
Test Voltage applied [V]		1000	—
Solution temperature [°C]		21.5	P
Size of module [m²].....:		1.32	—
Solution resistivity [Ω cm]		2534	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-009X	5550	≥30.30	P
Supplementary information: N/A.			

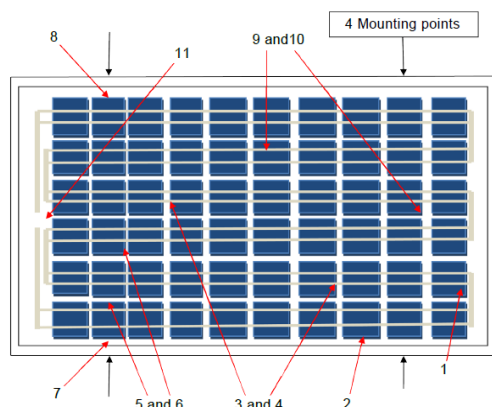
TABLE 20: MQT 22 Bending test			—
Test Date [YYYY-MM-DD].....:		—	—
Sample # :		—	—
Specified radius of curvature		—	—
Bending radius.....:		—	—
Total cycles		—	—
Intermittent open-circuit (yes/no).....:		—	—
Supplementary information: may need to be performed with each mounting situation			

TABLE 20.1: MQT 01 - Visual inspection after bending test		—
Test Date [YYYY-MM-DD].....:		—
Sample #	Nature and position of initial findings – comments or attach photos	—
—	—	—
Supplementary information: N/A.		
TABLE 20.2: MQT 15 - Wet leakage current test after bending test		—
Test Date [YYYY-MM-DD].....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
Test Voltage applied [V]		—	—
Solution temperature [°C]		—	—
Size of module [m ²]		—	—
Solution resistivity [Ω cm]		—	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
—	—	—	—
Supplementary information: N/A.			

TABLE 21: MQT 17 - Hail impact test							P
Test Date [YYYY-MM-DD].....:	2024-09-28						—
Sample #	HA2024TL-1042-010X						—
Ice ball size [mm]..... :	1	2	3	4	5	6	—
	24.5	26.3	26.3	24.0	24.5	24.8	
	7	8	9	10	11	/	
	26.0	24.5	25.5	25.3	24.5	/	
Ice ball weight [g]..... :	1	2	3	4	5	6	—
	7.15	7.45	7.61	7.23	7.30	7.76	
	7	8	9	10	11	/	
	7.68	7.91	7.76	7.76	7.53	/	
Ice ball velocity [m/s] :	1	2	3	4	5	6	—
	23.5	22.5	24.2	22.1	23.7	22.1	
	7	8	9	10	11	/	
	22.8	23.2	21.9	23.7	23.9	/	
Number of impact locations..... :	11						—

Supplementary information: (impact location descriptions)



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Clause	Requirement + Test		Result - Remark	Verdict
TABLE 21.1: MQT 01 - Visual inspection after hail impact test				P
Test Date [YYYY-MM-DD].....:		2024-09-28		—
Sample #	Nature and position of initial findings – comments or attach photos			—
HA2024TL-1042-010X	No major visual defects found			P
Supplementary information: N/A.				
TABLE 21.2: MQT 15 - Wet leakage current test after hail impact test				P
Test Date [YYYY-MM-DD].....:		2024-09-28		—
Test Voltage applied [V]		1000		—
Solution temperature [°C]		21.6		P
Size of module [m²].....:		1.32		—
Solution resistivity [Ω cm]		2377		P
Sample #	Measured [MΩ]		Required Resistance [MΩ]	Result
HA2024TL-1042-010X	5610		≥30.30	P
Supplementary information: N/A.				

TABLE 22: MQT 21 -Potential induced degradation test		P
Test Date [YYYY-MM-DD] start/end :		2024-08-15/2024-08-19
Chamber air temperature (°C)..... :		85
Chamber relative humidity (% RH) :		85
Test duration hours (h) :		96
Sample #	Applied voltage stress (V) and polarities	
HA2024TL-1042-011X	+1000	
HA2024TL-1042-012X	+1000	
HA2024TL-1042-013X	-1000	
HA2024TL-1042-014X	-1000	
Supplementary information: N/A.		

TABLE 22.1: MQT 01 - Visual inspection after potential induced degradation test			P
Test Date [YYYY-MM-DD].....:		2024-08-19	—
Sample #	Nature and position of initial findings – comments or attach photos		—
HA2024TL-1042-011X	No major visual defects found		P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1042-012X	No major visual defects found		P
HA2024TL-1042-013X	No major visual defects found		P
HA2024TL-1042-014X	No major visual defects found		P
Supplementary information: N/A.			

TABLE 22.2: MQT 15 - Wet leakage current test after potential induced degradation test			P
Test Date [YYYY-MM-DD].....:	2024-08-19		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22.4		P
Size of module [m²].....:	1.32		—
Solution resistivity [Ω cm]	2411		P
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
HA2024TL-1042-011X	5900	≥30.30	P
HA2024TL-1042-012X	5790	≥30.30	P
HA2024TL-1042-013X	6010	≥30.30	P
HA2024TL-1042-014X	5440	≥30.30	P
Supplementary information: N/A.			

TABLE 23: MQT 19.2: Final stabilization							—
TABLE 23.1: MQT 06.1: Performance at STC before final stabilization							—
Test Date [YYYY-MM-DD].....:	—						—
Test method.....:	☐ Solar simulator ☐ Natural sunlight						—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A.							

IEC 61215-2							
Clause	Requirement + Test	Result - Remark	Verdict				
TABLE 23.2: MQT 19.1 Final Stabilization procedure			—				
☐ IEC 61215-1-2 ☐ IEC 61215-1-3 ☐ IEC 61215-1-4			—				
Light exposure method:		☐ Solar simulator ☐ Natural sunlight					
Stabilization criterion x per IEC 61215-1-x :		—					
Sample #	—	Test Date (YYYY-MM-DD) start/end	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Sample #	—	Test Date (YYYY-MM-DD) start/end	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Sample #	—	Test Date (YYYY-MM-DD) start/end	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Sample #	—	Test Date (YYYY-MM-DD) start/end	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)				
Initial	—	—	—				

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	—	Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	—	Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	—	Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Supplementary information: N/A.							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
—	—						

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
—	—		
—	—		
—	—		
—	—		
—	—		
—	—		
Test method description: —			
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure			

TABLE 23.3: MQT 19.2: Final stabilization									—
☐IEC 61215-1-1									—
☐Method 1									—
Stress-specific stabilization – BO LID (MQT 19.3)									—
Test Date [YYYY-MM-DD].....:				—					—
Applied current (A)				—					—
Module temperature [°C]				—					—
Total hours (48h)				—					—
Performance at STC after final stabilization— for monofacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator ☐ Natural sunlight					—
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]	<i>P</i> _{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Performance at BNPI after final stabilization — for bifacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator ☐ Natural sunlight					—
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]	<i>P</i> _{max} [W] (LabGateNo.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: N/A.									

IEC 61215-2									
Clause	Requirement + Test						Result - Remark	Verdict	
☒ Method 2									P
Performance at STC before final stabilization— for monofacial modules									P
Test Date [YYYY-MM-DD].....:				2024-10-18					—
Test method.....:				☒ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
HA2024TL-1042-009X	6.559	52.724	6.121	44.594	272.939	78.93	281.931	-3.19%	P
HA2024TL-1042-010X	6.613	52.483	6.139	44.377	272.449	78.50	283.625	-3.94%	P
Performance at BNPI before final stabilization — for bifacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: P_{max} [W] (Lab_GateNo.1) is calculated by considering the reproducibility r of control module.									
If Power Degradation $\geq 5\%$, then perform stress-specific stabilization MQT 19.3 in method 1									
Stress-specific stabilization – BO LID (MQT 19.3)									—
Test Date [YYYY-MM-DD].....:				—					—
Applied current (A)				—					—
Module temperature [°C]				—					—
Total hours (48h)				—					—
Performance at STC after final stabilization — for monofacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Performance at BNPI after final stabilization — for bifacial modules									—
Test Date [YYYY-MM-DD].....:				—					—

IEC 61215-2									
Clause	Requirement + Test						Result - Remark	Verdict	
Test method.....:				☐ Solar simulator		☐ Natural sunlight		—	
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: N/A.									
TABLE 23.4: MQT 19.2: Final stabilization									—
☐ Method 3									—
Test Date (YYYY-MM-DD) start/end.....:				—					—
Test duration (h).....:				—					—
Module temperature [°C]				—					—
UV irradiance (280-400nm) [W/m ²]				—					—
UV dose (280-320nm) [kWh/ m ²]				—					—
UV dose (280-400nm) [kWh/ m ²]				—					—
Side exposed				☐ Front side ☐ Rear side					—
Module operation condition				☐ Short circuited ☐ Open circuited					—
Supplementary information: For bifacial modules, the irradiance shall be applied to the rear side, whereas for monofacial modules, the irradiance shall be applied to the front side.									
Performance at STC after final stabilization— for monofacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator		☐ Natural sunlight		—	
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Performance at BNPI after final stabilization — for bifacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator		☐ Natural sunlight		—	
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—

IEC 61215-2									
Clause	Requirement + Test						Result - Remark	Verdict	
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: N/A.									
☒ Method 4									P
Performance at STC before final stabilization— for monofacial modules									P
Test Date [YYYY-MM-DD].....:				2024-08-19					—
Test method.....:				☒ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
HA2024TL-1042-011X	6.631	52.928	6.263	45.160	282.842	80.59	283.902	-0.37%	P
HA2024TL-1042-012X	6.650	52.852	6.279	44.993	282.511	80.38	283.790	-0.45%	P
HA2024TL-1042-013X	6.703	52.776	6.301	44.996	283.540	80.16	284.148	-0.21%	P
HA2024TL-1042-014X	6.617	52.925	6.249	45.344	283.348	80.91	283.260	0.03%	P
Performance at BNPI before final stabilization — for bifacial modules									—
Test Date [YYYY-MM-DD].....:				—					—
Test method.....:				☐ Solar simulator ☐ Natural sunlight					—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: P_{max} [W] (Lab_GateNo.1) is calculated by considering the reproducibility r of control module.									
If Power Degradation $\geq 5\%$, then perform method 3 final stabilization									
Method 3									—
Test Date [YYYY-MM-DD].....:				—					—
Test duration (h).....:				—					—
Module temperature [°C]				—					—

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Clause	Requirement + Test	Result - Remark	Verdict						
UV irradiance (280-400nm) [W/m ²]	—		—						
UV dose (280-320nm) [kWh/ m ²]	—		—						
UV dose (280-400nm) [kWh/ m ²]	—		—						
Side exposed	☐ Front side ☐ Rear side		—						
Module operation condition	☐ Short circuited ☐ Open circuited		—						
Performance at STC after final stabilization — for monofacial modules			—						
Test Date [YYYY-MM-DD].....	—		—						
Test method.....	☐ Solar simulator ☐ Natural sunlight		—						
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]	<i>P</i> _{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Performance at BNPI after final stabilization — for bifacial modules			—						
Test Date [YYYY-MM-DD].....	—		—						
Test method.....	☐ Solar simulator ☐ Natural sunlight		—						
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]	<i>P</i> _{max} [W] (Lab Gate No.1)	Power Degradation	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: N/A.									

TABLE 23.5: MQT 06.1: Final Performance at STC									P
Test Date [YYYY-MM-DD].....					Different dates				—
Test method.....					☒ Simulator ☐ Natural sunlight				—
Sample #	<i>I</i> _{sc} [A]	<i>V</i> _{oc} [V]	<i>I</i> _{mp} [A]	<i>V</i> _{mp} [V]	<i>P</i> _{max} [W]	FF [%]	<i>P</i> _{max} [W] (Lab Gate No.1)	Power Degradation [%]	Result

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Clause	Requirement + Test					Result - Remark			Verdict
HA2024TL-1042-001X	6.635	52.923	6.277	45.132	283.296	80.68	280.331	0.05%	P
HA2024TL-1042-005X	6.445	52.850	6.169	44.986	277.497	81.47	282.895	-1.91%	P
HA2024TL-1042-006X	6.496	52.979	6.157	45.172	278.144	80.82	282.454	-1.53%	P
HA2024TL-1042-007X	6.631	52.752	6.229	44.892	279.643	79.94	283.178	-1.25%	P
HA2024TL-1042-008X	6.676	52.760	6.282	44.807	281.492	79.92	281.929	-0.16%	P
HA2024TL-1042-009X	6.559	52.724	6.121	44.594	272.939	78.93	281.931	-3.19%	P
HA2024TL-1042-010X	6.613	52.483	6.139	44.377	272.449	78.50	283.625	-3.94%	P
HA2024TL-1042-011X	6.631	52.928	6.263	45.160	282.842	80.59	283.902	-0.37%	P
HA2024TL-1042-012X	6.650	52.852	6.279	44.993	282.511	80.38	283.790	-0.45%	P
HA2024TL-1042-013X	6.703	52.776	6.301	44.996	283.540	80.16	284.148	-0.21%	P
HA2024TL-1042-014X	6.617	52.925	6.249	45.344	283.348	80.91	283.260	0.03%	P
HA2024TL-1311-001X	4.352	55.640	4.087	47.729	195.083	80.57	193.071	0.03%	P
HA2024TL-1311-003X	4.345	55.892	4.115	47.651	196.068	80.74	196.800	-0.37%	P
HA2024TL-1311-004X	4.414	55.867	4.137	47.765	197.593	80.12	198.969	-0.69%	P
HA2024TL-1311-005X	4.338	55.122	4.036	46.413	187.346	78.34	188.856	-0.80%	P
HA2024TL-1311-006X	4.313	55.893	4.045	47.723	193.018	80.07	194.804	-0.92%	P
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility <i>r</i> of control module.									

For bifacial modules		—
TABLE 23.6: MQT 06.1 ini: Performance at STC after final stabilization (Front side)		—
Test Date [YYYY-MM-DD]..... :	—	—
Test method..... :	☐ Solar simulator ☐ Natural sunlight	—

[illegible]

TABLE 23.7: MQT 06.1 ini: Performance at STC after final stabilization (Back side)	—
--	---

Test Date [YYYY-MM-DD].....:	—	—
------------------------------	---	---

Test method.....:	☐ Solar simulator	☐ Natural sunlight	—
-------------------	--	---	---

[illegible]

TABLE 23.8: MQT 06.1: Final Performance at BNPI		—
Test Date [YYYY-MM-DD].....:	—	
Test method.....:	☐ Solar simulator ☐ Natural sunlight	—

IEC 61215-2									
Clause	Requirement + Test					Result - Remark			Verdict
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	P_{max} [W] (Lab Gate No.1)	Power Degradation [%]	Result
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Supplementary information: P_{max} [W] (Lab_GateNo.1) is calculated by considering the reproducibility r of control module.									

TABLE 23.9: MQT 03 fin: Final Insulation test					P
Test Date [YYYY-MM-DD].....:			Different dates		—
Test Voltage applied [V]			6000/1000		—
Size of module [m ²].....:			1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
HA2024TL-1042-001X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-005X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-006X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-007X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-008X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-009X	≥30.30	>10000	No Dielectrical breakdown	X	P

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Clause	Requirement + Test		Result - Remark	Verdict	
HA2024TL-1042-010X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-011X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-012X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-013X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1042-014X	≥30.30	>10000	No Dielectrical breakdown	X	P
HA2024TL-1311-001X	≥42.25	>10000	No Dielectrical breakdown	X	P
HA2024TL-1311-003X	≥42.25	>10000	No Dielectrical breakdown	X	P
HA2024TL-1311-004X	≥42.25	>10000	No Dielectrical breakdown	X	P
HA2024TL-1311-005X	≥42.25	>10000	No Dielectrical breakdown	X	P
HA2024TL-1311-006X	≥42.25	>10000	No Dielectrical breakdown	X	P
Supplementary information: The maximum resistance measurement range is 10000MΩ.					

TABLE 23.10: MQT 15 fin: Final Wet leakage current test			P
Test Date [YYYY-MM-DD]..... :	Different dates		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22 ± 2		P
Size of module [m²]..... :	1.32 For HA2024TL-1042 0.95 For HA2024TL-1311		—
Solution resistivity [Ω cm]	<3500		P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
HA2024TL-1042-001X	6920	≥30.30	P
HA2024TL-1042-005X	6640	≥30.30	P
HA2024TL-1042-006X	6190	≥30.30	P
HA2024TL-1042-007X	5930	≥30.30	P

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Clause	Requirement + Test	Result - Remark	Verdict
HA2024TL-1042-008X	5170	≥ 30.30	P
HA2024TL-1042-009X	5400	≥ 30.30	P
HA2024TL-1042-010X	5150	≥ 30.30	P
HA2024TL-1042-011X	5900	≥ 30.30	P
HA2024TL-1042-012X	5790	≥ 30.30	P
HA2024TL-1042-013X	6010	≥ 30.30	P
HA2024TL-1042-014X	5440	≥ 30.30	P
HA2024TL-1311-001X	5990	≥ 42.25	P
HA2024TL-1311-003X	5740	≥ 42.25	P
HA2024TL-1311-004X	6120	≥ 42.25	P
HA2024TL-1311-005X	5410	≥ 42.25	P
HA2024TL-1311-006X	6730	≥ 42.25	P
HA2024TL-1311-007X	5950	≥ 42.25	P
Supplementary information: N/A.			

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Clause	Requirement + Test	Result - Remark	Verdict

Annex 1: Critical components information

A1.1	MODULE TYPE/S
	SR-M280T-66 For HA2024TL-1042

A1.2	MODULE DESIGN
	Module dimensions (L x W x H) [mm] : 1166 x 1134 x 30 mm
	Weights : 9.7 kg(approx)
	Front/Rear cover bonding classification..... : ☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL
	Cell type reference : Chuzhou jietai new energy technology Co.,Ltd. Cell type: CZJT-182M-16D1, 16bb, TOPCon type cell Mono-Crystalline Silicon Solar cell
	Cell dimensions L x W x T ($\pm$ %) [mm] : 182.2 x 91.875 (Half cut)
	Cell thickness [μ m] : 130 $\pm$ 10%
	Cell area [cm ²] : 167.355

A1.4	IDENTIFICATION OF MATERIALS
	Front cover : IRICO Group New Energy Co., Ltd. Material: AR Coated Tempered Glass Thickness: 1.6 (mm)
	Rear cover..... : Jolywood (Suzhou) Sunwatt Co., Ltd Type: FFC-JW3010plus Material: FFC(EVA side)/PET/FFC(Air side) Thickness:0.12mm/0.285mm/0.13mm Total Thickness: 0.310 (mm), black colar

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Clause	Requirement + Test	Result - Remark	Verdict
	Encapsulation material..... :	Hangzhou First Applied Material Co., Ltd Type: TF4 (between glass and solar cell), POE Thickness: 0.50±0.05mm Type: F806PS (between solar cell and rear cover), EVA Thickness: 0.50±0.05mm	
	Frame parts..... :	Jiangsu Yuejia Metal Technology Co., Ltd. Aluminum profile 6005-T6, black cross section H x W: Long side 30x16mm Short side 30x25mm	
	Mounting parts :	N/A	
	Adhesive for frame :	Huitian New Materials Co., Ltd. Type: HT906Z, black	
	Edge sealing :	N/A	
	Internal wiring..... :	N/A	
	Cell connector :	Wuxi Mingxie Industrial Technology Co., Ltd. Cross section: 0.17 x 0.38 (mm) Coating Sn60Pb40, silvery	
	String connector :	Wuxi Mingxie Industrial Technology Co., Ltd. Cross section: 0.30x4.0(mm), Coating Sn60Pb40, black	
	Soldering material :	N/A	
	Fluxing agent..... :	Asahi Solder Technology (Wuxi) Co., Ltd. Type: SF105	
	Junction box..... :	NIU-Power(Suzhou) Corporation Type: Q18L-plus	
	Cable..... :	Suzhou Yonghao Cable Co., Ltd. Type: 62930 131 1x4mm ² /2x4mm ²	
	Connector..... :	NIU-Power(Suzhou) Corporation Type: M2-slim-abcd	
	Bypass diode..... :	PAN JIT INTERNATIONAL INC Type: 30SQ050	
	Potting material :	Huitian New Materials Co., Ltd. Type: 5299W-S, black	
	Adhesive for junction box :	Huitian New Materials Co., Ltd. Type: HT906Z, black	

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Clause	Requirement + Test	Result - Remark	Verdict

	Additional material (e. g. fixing tape, insulation tape)	Fixing tape: 3M Type: UV-1 Label: Anhui Mingcheng Intelligent Technology Co., Ltd. Type: AT-E BA024	
A1.5	MODULE DESIGN - MINIMUM DISTANCES		
	Between cells	1.0 mm	
	Between cell and accessible surfaces	12.0mm	
	Between any current carrying part and accessible surfaces.....	12.0mm	

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION		
	Total number of cells.....	72	
	Serial-parallel connection of cells	SPS	
	Cells per bypass diode	24	
	No. of bypass diodes.....	3	

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Clause	Requirement + Test	Result - Remark	Verdict

A1.1	MODULE TYPE/S		
	SR-M195T-64 For HA2024TL-1311		

A1.2	MODULE DESIGN		
	Module dimensions (L x W x H) [mm]	1236 x 766 x 30 mm	
	Weights	7.5 kg(approx)	
	Front/Rear cover bonding classification.....	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible	

A1.3	SOLAR CELL		
	Cell type reference	Chuzhou jietai new energy technology Co.,Ltd. Cell type: CZJT-182M-16D1, 16bb, TOPCon type cell Mono-Crystalline Silicon Solar cell	
	Cell dimensions L x W x T ($\pm$ %) [mm]	182.2 x 61.25 (1/3 cut)	
	Cell thickness [μ m]	130 $\pm$ 10%	
	Cell area [cm ²]	111.57	

A1.4	IDENTIFICATION OF MATERIALS		
	Front cover	IRICO Group New Energy Co., Ltd. Material: AR Coated Tempered Glass Thickness: 1.6 (mm)	
	Rear cover.....	Jolywood (Suzhou) Sunwatt Co., Ltd Type: FFC-JW3010plus Material: FFC(EVA side)/PET/FFC(Air side) Thickness:0.12mm/0.285mm/0.13mm Total Thickness: 0.310 (mm), black colar	
	Encapsulation material.....	Hangzhou First Applied Material Co., Ltd Type: TF4 (between glass and solar cell), POE Thickness: 0.50 $\pm$ 0.05mm Type: F806PS (between solar cell and rear cover), EVA Thickness: 0.50 $\pm$ 0.05mm	

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Clause	Requirement + Test	Result - Remark	Verdict
	Frame parts..... :	Jiangsu Yuejia Metal Technology Co., Ltd. Aluminum profile 6005-T6, black cross section H x W: Long side 30x16mm Short side 30x25mm	
	Mounting parts :	N/A	
	Adhesive for frame :	Huitian New Materials Co., Ltd. Type: HT906Z, black	
	Edge sealing :	N/A	
	Internal wiring..... :	N/A	
	Cell connector :	Wuxi Mingxie Industrial Technology Co., Ltd. Cross section: 0.17 x 0.38 (mm) Coating Sn60Pb40, silvery	
	String connector :	Wuxi Mingxie Industrial Technology Co., Ltd. Cross section: 0.30x4.0(mm), Coating Sn60Pb40, black	
	Soldering material :	N/A	
	Fluxing agent..... :	Asahi Solder Technology (Wuxi) Co., Ltd. Type: SF105	
	Junction box..... :	NIU-Power(Suzhou) Corporation Type: Q18L-plus	
	Cable..... :	Suzhou Yonghao Cable Co., Ltd. Type: 62930 131 1x4mm ² /2x4mm ²	
	Connector..... :	NIU-Power(Suzhou) Corporation Type: M2-slim-abcd	
	Bypass diode..... :	PAN JIT INTERNATIONAL INC Type: 30SQ050	
	Potting material :	Huitian New Materials Co., Ltd. Type: 5299W-S, black	
	Adhesive for junction box :	Huitian New Materials Co., Ltd. Type: HT906Z, black	
	Additional material (e. g. fixing tape, insulation tape) :	Fixing tape: 3M Type: UV-1 Label: Anhui Mingcheng Intelligent Technology Co., Ltd. Type: AT-E BA024	
A1.5	MODULE DESIGN - MINIMUM DISTANCES		
	Between cells..... :	1.0 mm	

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Clause	Requirement + Test	Result - Remark	Verdict

	Between cell and accessible surfaces	12.0mm	
	Between any current carrying part and accessible surfaces.....	12.0mm	

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION		
	Total number of cells.....	76	
	Serial-parallel connection of cells	SPS	
	Cells per bypass diode.....	38	
	No. of bypass diodes.....	2	

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Clause	Requirement + Test	Result - Remark	Verdict

Annex 2: Test table for verifying other alternative stabilization procedure

Step 1: Alternative stabilization									—
Test Date (YYYY-MM-DD) start/end: —									—
Test method description: —									—
			Sample		Sample		Sample		—
Power before alternative stabilization (W)	1	—		2	—		3	—	—
Power after alternative stabilization (W)	4	—		5	—		6	—	—
Supplementary information: N/A.									
Step 2: Light exposure									—
☐ Solar simulator ☐ Natural sunlight									
Sample		Test Date (YYYY-MM-DD) start/end					—		
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)	
Initial	—	—	—	—	—	—	—	—	
1	—	—	—	—	—	—	—	—	
2	—	—	—	—	—	—	—	—	
Supplementary information: N/A.									
Sample		Test Date (YYYY-MM-DD) start/end					—		
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)	
Initial	—	—	—	—	—	—	—	—	
1	—	—	—	—	—	—	—	—	
2	—	—	—	—	—	—	—	—	
Supplementary information: N/A.									
Sample		Test Date (YYYY-MM-DD) start/end					—		
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)	
Initial	—	—	—	—	—	—	—	—	
1	—	—	—	—	—	—	—	—	
2	—	—	—	—	—	—	—	—	
Supplementary information: N/A.									

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Clause	Requirement + Test		Result - Remark		Verdict
Step 3: Stabilization determination				—	
	Sample	Sample	Sample	Result	
Stable power P _{max1} after alternative stabilization (W)	7 —	8 —	9 —	—	
Stable power P _{max2} after light exposure (W)	10 —	11 —	12 —	—	
Power change P _{max2} to P _{max1} (%)	13 —	14 —	15 —	—	
Allowed power change P _{max2} to P _{max1} (%)	16 —	17 —	18 —	—	
Is alternative stabilization method valid? (Yes/No)	19 —	20 —	21 —	—	
Supplementary information: N/A.					

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

Annex 3: Lower and higher output power modules

TABLE A.4.1 Performance at STC before initial stabilization (Front side)							—
Test Date [YYYY-MM-DD]			2024-10-08				—
Test method			☒ Solar simulator ☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
HA2024TL-1042-024X	6.676	52.107	6.215	44.223	274.846	79.01	—
HA2024TL-1042-025X	6.632	51.651	6.249	43.767	273.481	79.84	—
HA2024TL-1042-026X	6.761	53.002	6.320	45.389	286.857	80.05	—
HA2024TL-1042-027X	6.722	52.992	6.326	45.464	287.619	80.75	—
HA2024TL-1311-007X	4.403	55.541	4.113	46.704	192.103	78.56	—
HA2024TL-1311-008X	4.406	54.993	4.123	46.238	190.628	78.68	—
HA2024TL-1311-009X	4.409	56.118	4.136	48.006	198.570	80.25	—
HA2024TL-1311-010X	4.425	56.084	4.133	48.380	199.973	80.58	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.2 Performance at STC before initial stabilization (Back side)							—
Test Date [YYYY-MM-DD]			—				—
Test method			☐ Solar simulator ☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.3 Performance at BNPI before initial stabilization							—
Test Date [YYYY-MM-DD]			—				—

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

Test method			☐ Solar simulator		☐ Natural sunlight		—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

21.1.1 TABLE A.4.4: MQT 19.1 ini: Initial Stabilization procedure							P
Light exposure method		☒ Solar simulator	☐ Natural sunlight	—			
Stabilization criterion x per IEC 61215-1-x ...		1					—
Sample #	HA2024TL-1042-024X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} - P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	274.846	—	—
1	5	800-1000	50±10	MPPT	274.085	—	—
2	5	800-1000	50±10	MPPT	273.672	0.43	Yes
Sample #	HA2024TL-1042-025X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} - P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	273.481	—	—
1	5	800-1000	50±10	MPPT	272.160	—	—
2	5	800-1000	50±10	MPPT	271.328	0.79	Yes
Sample #	HA2024TL-1042-026X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} - P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	286.857	—	—
1	5	800-1000	50±10	MPPT	285.743	—	—
2	5	800-1000	50±10	MPPT	285.099	0.61	Yes

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Sample #	HA2024TL-1042-027X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	287.619	—	—
1	5	800-1000	50±10	MPPT	285.988	—	—
2	5	800-1000	50±10	MPPT	285.066	0.89	Yes
Sample #	HA2024TL-1311-007X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	192.103	—	—
1	5	800-1000	50±10	MPPT	191.001	—	—
2	5	800-1000	50±10	MPPT	190.502	0.84	Yes
Sample #	HA2024TL-1311-008X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	190.628	—	—
1	5	800-1000	50±10	MPPT	189.776	—	—
2	5	800-1000	50±10	MPPT	189.386	0.65	Yes
Sample #	HA2024TL-1311-009X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	198.570	—	—
1	5	800-1000	50±10	MPPT	197.836	—	—
2	5	800-1000	50±10	MPPT	197.353	0.62	Yes
Sample #	HA2024TL-1311-010X	Test Date (YYYY-MM-DD) start/end.....			2024-10-08/2024-10-12		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} – P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	199.973	—	—
1	5	800-1000	50±10	MPPT	199.705	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	800-1000	50±10	MPPT	199.528	0.22	Yes
Supplementary information: N/A.							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end..... :			—			
Low 1	—						
Low 2	—						
High 1	—						
High 2	—						
Test method description: —							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure							

TABLE A.4.7: MQT 6.1 Performance at STC after initial stabilization (Front side)							P
Test Date [YYYY-MM-DD]			2024-10-12				—
			Lower end power class		Higher end power class		—
$P_{\max}(\text{lab})$ (W)			≤ 293.263	≥ 262.399	≥ 271.941		—
$\bar{P}_{\max}(\text{lab})$ (W)			≥ 270.515		≥ 280.352		—
$P_{\max 4}(\text{NP})$ (W)			280		—		—
$V_{\text{oc}}(\text{lab})$ (V)			≤ 53.552		≤ 54.628		—
$I_{\text{sc}}(\text{lab})$ (A)			≤ 6.941		≤ 6.971		—
Test method			☒ Solar simulator ☐ Natural sunlight				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	$P_{\max}$ [W]	FF [%]	Result
HA2024TL-1042-024X	6.638	52.104	6.214	44.040	273.672	79.13	P
HA2024TL-1042-025X	6.538	51.655	6.196	43.792	271.328	80.34	P
HA2024TL-1042-026X	6.675	52.998	6.285	45.361	285.099	80.59	P
HA2024TL-1042-027X	6.684	52.995	6.277	45.417	285.066	80.48	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.7: MQT 6.1 Performance at STC after initial stabilization (Front side)							P
Test Date [YYYY-MM-DD]				2024-10-12			—
				Lower end power class		Higher end power class	—

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Clause	Requirement + Test				Result - Remark		Verdict
$P_{\max}(\text{lab})$ (W)	≤ 204.236		≥ 181.294	≥ 190.836			—
$\bar{P}_{\max}(\text{lab})$ (W)	≥ 186.901			≥ 196.738			—
$P_{\max 4}(\text{NP})$ (W)	195			—			—
$V_{\text{oc}}(\text{lab})$ (V)	≤ 55.765			≤ 57.508			—
$I_{\text{sc}}(\text{lab})$ (A)	≤ 4.580			≤ 4.641			—
Test method	☒ Solar simulator ☐ Natural sunlight						—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	$P_{\max}$ [W]	FF [%]	Result
HA2024TL-1311-007X	4.348	55.562	4.078	46.709	190.502	78.85	P
HA2024TL-1311-008X	4.353	55.018	4.071	46.526	189.386	79.08	P
HA2024TL-1311-009X	4.311	56.164	4.086	48.297	197.353	81.51	P
HA2024TL-1311-010X	4.402	56.103	4.137	48.230	199.528	80.79	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.8: MQT 6.1 Performance at STC after initial stabilization (Back side)							—
Test Date [YYYY-MM-DD]	—						—
	Lower end power class			Higher end power class			—
$P_{\max}(\text{lab})$ (W)	—	—	—	—	—	—	—
$\bar{P}_{\max}(\text{lab})(\text{W})$	—	—	—	—	—	—	—
$V_{\text{oc}}(\text{lab})$ (V)	—	—	—	—	—	—	—
$I_{\text{sc}}(\text{lab})$ (A)	—	—	—	—	—	—	—
Test method	☐ Solar simulator ☐ Natural sunlight						—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	$P_{\max}$ [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.9: MQT 6.1 Performance at BNPI after initial stabilization							—
Test Date [YYYY-MM-DD]	—						—

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Clause	Requirement + Test				Result - Remark		Verdict
			Lower end power class		Higher end power class		—
$P_{\max}(\text{lab})$ (W)	—		—		—		—
$\bar{P}_{\max}(\text{lab})$ (W)	—		—		—		—
$V_{\text{oc}}(\text{lab})$ (V)	—		—		—		—
$I_{\text{sc}}(\text{lab})$ (A)	—		—		—		—
Test method	☐ Solar simulator ☐ Natural sunlight						—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	$P_{\max}$ [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

----- End of TRF No. IEC61215 series-----