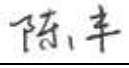




Test Report issued under the responsibility of:



TEST REPORT IEC 61215 Series: 2016 Terrestrial photovoltaic (PV) modules – Design qualification and type approval	
Report Number..... :	CGCZJ-PVT-2024-255
Date of issue..... :	2024-08-09
Total number of pages	69
Name of Testing Laboratory preparing the Report	Beijing CGC Certification Center Co., Ltd. Zhejiang Branch
Applicant's name	Zhe Jiang JEC New Energy Technology Co.,LTD
Address..... :	Building 4, CETC Information Industrial Park of Jiaxing No. 587 Taoyuan Road, Gaozhao Street,Xiuzhou District Jiaxing City, Zhejiang Province, 314000, P.R. China
Test specification:	
Standard	☒ IEC 61215-1:2016 ☒ IEC 61215-2:2016 ☒ IEC 61215-1-1:2016 ☐ IEC 61215-1-2:2016 ☐ IEC 61215-1-3:2016 ☐ IEC 61215-1-4:2016
Test procedure	CB Scheme
Non-standard test method	N/A
TRF template used	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No.	IEC61215E_SE
Test Report Form(s) Originator	TÜV SÜD Product Service GmbH
Master TRF	2021-06-03
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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.	
This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.	
General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

Test item description :	Photovoltaic (PV) Module(s)	
Trade Mark :	/	
Manufacturer	Zhejiang Shengqiang New Energy Co., Ltd 29 Jintang South Road, Eastern New Area, Wenling City, Taizhou City, Zhejiang Province, China	
Model/Type reference	See page 8~9 of this report	
Ratings	See page 8~9 of this report	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ CB Testing Laboratory:	Beijing CGC Certification Center Co., Ltd. Zhejiang Branch	
Testing location/ address :	1/F-2/F, west of Building 6, Jiaying photovoltaic science and technology park, No.1288, Kanghe Road, Gaozhao Street, Xiuzhou District, Jiaying City, Zhejiang Province, China	
Tested by (name, function, signature) :	Feng Chen Test engineer	
Approved by (name, function, signature) ... :	Jack zhu, General Manager of lab	
Testing procedure: CTF Stage 1:		
Testing location/ address :		
Tested by (name, function, signature) :		
Approved by (name, function, signature) ... :		
Testing procedure: CTF Stage 2:		
Testing location/ address :		
Tested by (name + signature)		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) ... :		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location/ address :		
Tested by (name, function, signature) :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) ... :		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual	Attachment 1 / 15 pages
Drawings mechanical	Attachment 2 / 23 pages
Circuit diagram	Attachment 3 / 5 pages
Photographs	Attachment 4 / 5 pages
Component datasheets / certificates	Refer to Annex 1.
Others:	
Product Description Sheet (Manufacturers and type references)	Annex 1, <u>4</u> pages
Test table for verifying other stabilization procedure	N/A
Lower and higher output power modules	Annex 3, <u>4</u> pages
List of test equipment used	Annex 4, <u>2</u> pages

Summary of testing:	
Tests performed (name of test and test clause): Basic qualification for: NES144-7-xxxM (xxx=540W-590W, in steps of 5) NES132-8-xxxM (xxx=640W-700W, in steps of 5) -Add below modules: a) NES108-7-xxxM (xxx=400W-445W, in steps of 5) b) NES120-7-xxxM (xxx=450W-490W, in steps of 5) c) NES132-7-xxxM (xxx=495W-540W, in steps of 5) e) NES80-8-xxxM (xxx=400W-435W, in steps of 5) f) NES100-8-xxxM (xxx=495W-540W, in steps of 5) g) NES110-8-xxxM (xxx=545W-595W, in steps of 5) h) NES120-8-xxxM (xxx=580W-635W, in steps of 5) Add above modules, all modules are identical to basic modules, except power rating and number of cells. According to IEC61215-1:2016, IEC61215-1-1:2016, IEC61215-2:2016, full tests were conducted on module NES144-7-xxxM. -Add 210*210 N-type cell Select NES132-8-670M perform relevant tests. - Addition of Type 182N 30mm thickness for correlation testing at NES144-7-xxxM. The following materials are also applicable for the above mentioned model types: 1) Solar cell: Type: CZJT-182M-16D1 Dimension: 182(±0.5) x 91(±0.5) x 0.13(±0.013) Manufacturer: Jie Tai Type: CZJT-210M-18D1	Testing location: All tests were performed at Beijing CGC Certification Center Co., Ltd. Zhejiang Branch/1/F-2/F, west of Building 6, Jiaying photovoltaic science and technology park, No.1288, Kanghe Road, Gaozhao Street, Xiuzhou District, Jiaying City, Zhejiang Province, China

Dimension: 210($\pm$0.5) x 105($\pm$0.5) x 0.13($\pm$0.013) Manufacturer: Jie Tai 2) cell connectors: Dimension: $\varnothing$ =0.25mm/0.26mm/0.29mm/0.30mm Manufacturer: LAN XIN 3) string connectors: Dimension: 0.35x4mm; 0.35x6mm/0.3x8mm Manufacturer: LAN XIN 4) junction box: PV-ZPB090X Manufacturer: The 40th Institute of China Electronic Technology Group Corporation. Already passed IEC62970:2020,no additional testing required. 5) Frame: 6005-T5, Dimension: 30mm, 35mm Manufacturer: Suzhou Sentong Photovoltaic Co., Ltd Refer to page 10-14 for the name of test and test clause.	
Summary of compliance with National Differences (List of countries addressed): N/A ☐ The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)	
Statement concerning the uncertainty of the measurement systems used for the tests (may be required by the product standard or client) ☐ Internal procedure used for type testing through which traceability of the measuring uncertainty has been established: Procedure number, issue date and title: Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing. ☐ Statement not required by the standard used for type testing (Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)	

Copy of marking plate:

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

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

CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES132-8-640M Peak power(Pmax) 640W±3% Open circuit voltage(Voc) 45.5V±3% Max.power voltage(Vmp) 37.6V Short circuit current(Isc) 17.89A±4% Max.power current(Imp) 17.03A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 256410 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China	CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES132-8-670M Peak power(Pmax) 670W±3% Open circuit voltage(Voc) 46.7V±3% Max.power voltage(Vmp) 38.8V Short circuit current(Isc) 18.19A±4% Max.power current(Imp) 17.27A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 256713 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China	CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES132-8-700M Peak power(Pmax) 700W±3% Open circuit voltage(Voc) 47.9V±3% Max.power voltage(Vmp) 40V Short circuit current(Isc) 18.49A±4% Max.power current(Imp) 17.5A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 257017 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China
CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES144-7-540M Peak power(Pmax) 540W±3% Open circuit voltage(Voc) 50.26V±3% Max.power voltage(Vmp) 42.42V Short circuit current(Isc) 13.44A±4% Max.power current(Imp) 12.73A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 255419 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China	CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES144-7-565M Peak power(Pmax) 565W±3% Open circuit voltage(Voc) 51.31V±3% Max.power voltage(Vmp) 43.42V Short circuit current(Isc) 13.69A±4% Max.power current(Imp) 13.01A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 255662 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China	CEIC 浙江嘉科新能源环保科技有限公司 ZHEJIANG JIC NEW ENERGY TECHNOLOGY CO.,LTD. Type NES144-7-590M Peak power(Pmax) 590W±3% Open circuit voltage(Voc) 52.37V±3% Max.power voltage(Vmp) 44.43V Short circuit current(Isc) 13.94A±4% Max.power current(Imp) 13.28A Monocrystalline Component level Maximum system voltage 1500V Application Class class II Fuse Rating All technical data at standard test condition: AM=1.5 E=1000W/m ² Tc=25℃ WARNING Electrical Hazard Avertissement Risque électrique This unit produces electricity if exposed to light. Cetle unité produit de l'électricité si elle est exposée à la lumière. Do not disconnect under load. Ne débranchez pas en charge. 6 970633 255914 NO.587 Tao Yuan Road, Jiaxing, ZheJiang, 314001,P.R.China Made in China

Test item particulars..... :	
Accessories and detachable parts included in the evaluation..... :	
Mounting system used..... :	
Other options included..... :	
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement : P (Pass)	
- test object does not meet the requirement : F (Fail)	
Abbreviations used in the report:	
Pmax – Maximum power	HF – Humidity Freeze
Vmp – Maximum power voltage	DH – Damp Heat
Imp – Maximum power current	TC – Thermal Cycling
Isc – Short circuit current	α – Current temperature coefficient
Voc – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m ²)	NMOT – Nominal Module Operating Temperature (20°C, 800 W/m ²)
MQT – Module Quality Tests	VFM _{rated} – Rated diode(s) forward voltage
VFM – Measured diode(s) forward voltage	NP – Nameplate
m_1 – the measurement uncertainty in % of laboratory for Pmax	m_2 – the measurement uncertainty in % of laboratory for Voc
m_3 – the measurement uncertainty in % of laboratory for Isc	t_1 – the manufacturer's rated lower production tolerance in % for Pmax
t_2 – the manufacturer's rated upper production tolerance in % for Voc	t_3 – the manufacturer's rated upper production tolerance in % for Isc
r – Pmax measurement reproducibility	
Testing Dates (YYYY-MM-DD)	
Date of first test item received..... :	2023-08-04
Dates of tests (beginning/end)..... :	2023-09-26-2024-01-04

GENERAL REMARKS:				
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. This TRF has been created in cooperation with CTL ETF-9 and German National Committee (DKE). The originator's responsibility of this TRF in IECCE CB Scheme has been assigned to TÜV SÜD Product Service GmbH.				
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.				
Manufacturer's Declaration per sub-clause 4.2.5 of IECCE 02:				
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :			☐ Yes ☒ Not applicable	
When differences exist; they shall be identified in the General product information section.				
Name and address of factory (factories)			Zhejiang Shengqiang New Energy Co., Ltd 29 Jintang South Road, Eastern New Area, Wenling City, Taizhou City, Zhejiang Province, China	
PRODUCT ELECTRICAL RATINGS:				
Module type	NES144-7-565M	NES144-7-540M	NES144-7-590M	NES132-8-670M
Voc [V] /Tolerance	51.31/±3	50.26/±3	52.37/±3	46.7/±3
Vmp [V]	43.42	42.42	44.43	38.80
Imax [Adc]	13.01	12.73	13.28	17.27
Isc [Adc] /Tolerance	13.69/±4	13.44/±4	13.94/±4	18.19/±4
Pmp [W] /Tolerance	565/±3	540/±3	590/±3	670/±3
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	30
Module type	NES132-8-640M	NES132-8-700M	-	-
Voc [V] /Tolerance	45.5/±3	47.9/±3	-	-
Vmp [V]	37.60	40.00	-	-
Imax [Adc]	17.03	17.50	-	-
Isc [Adc] /Tolerance	17.89/±4	18.49/±4	-	-
Pmp [W] /Tolerance	640/±3	700/±3	-	-
Maximum system voltage [V]	1500	1500	-	-
Maximum Over-Current Protection Rating [A]	30	30	-	-

Note: Further qualification for higher and/or lower output power see annex 3

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 |
| | ☐ 4.3.16 Increase of over-current protection rating |
| | ☐ 4.3.17 Increase of system voltage |

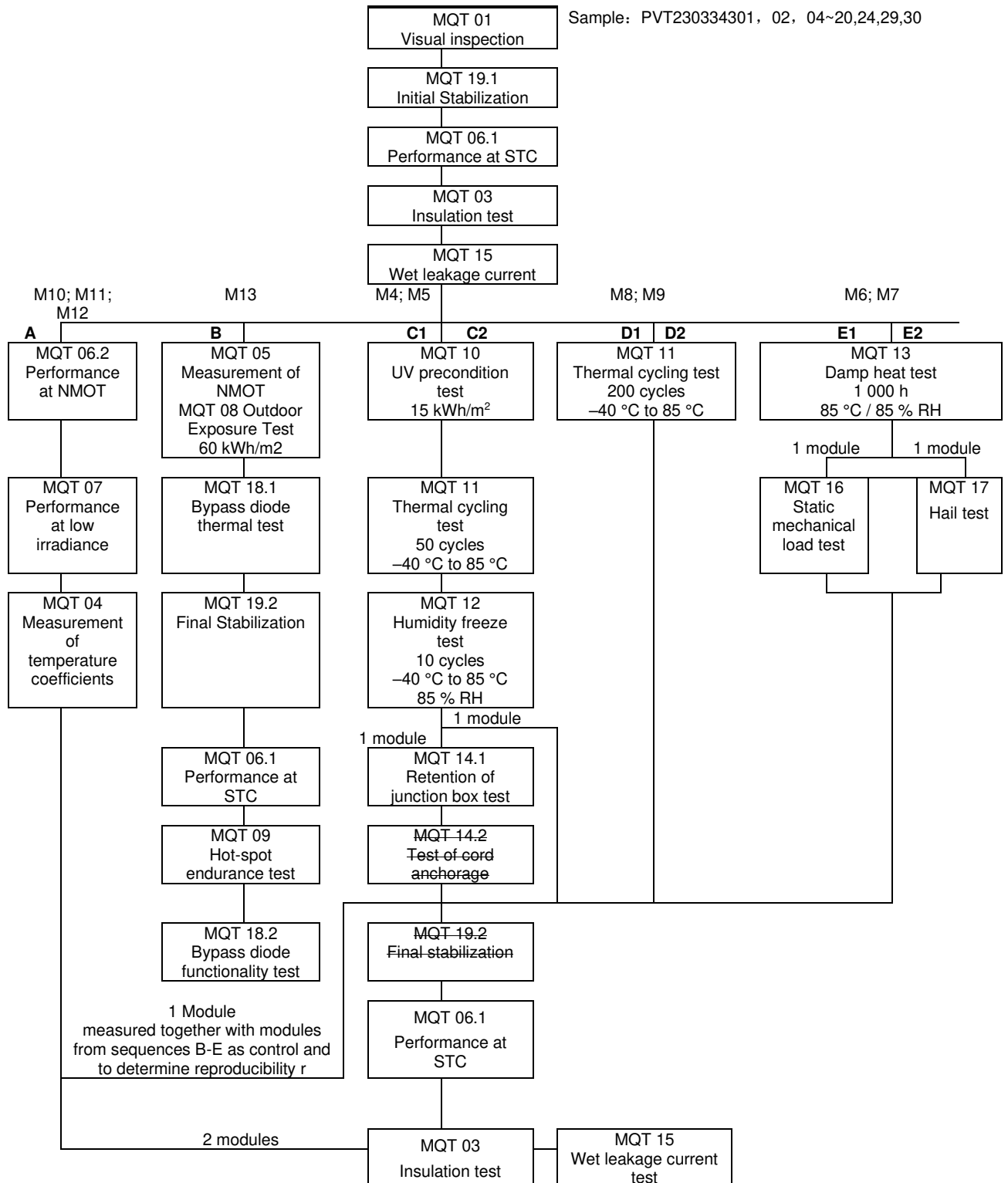
Note: The clause references modifications extracted from IEC 62915

MODULE GROUP ASSIGNMENT:				
Module type: NES144-7-xxxM (Combination A)				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
PVT230334319	Control+Low irradiance+temp. Coefficients Seq	NES144-7-565M	CETC230700009	Control+Low irradiance+temp. Coefficients Seq
PVT230334317	A	NES144-7-565M	CETC230700019	NMOT Seq
PVT230334316	B	NES144-7-565M	CETC230700006	BDT+OD Seq
PVT230334315	B	NES144-7-565M	CETC230700037	HS+TT+RC Seq
PVT230334313	C1	NES144-7-565M	CETC230700036	UV 1 Seq
PVT230334314	C2	NES144-7-565M	CETC230700011	UV 2 Seq
PVT230334311	D1	NES144-7-565M	CETC230700004	TC200 1 Seq
PVT230334312	D2	NES144-7-565M	CETC230700038	TC200 2 Seq
PVT230334310	E1	NES144-7-565M	CETC230700039	DH1000 Seq
PVT230334309	E2	NES144-7-565M	CETC230700007	DH1000 Seq
PVT230334324	G	NES144-7-565M	CETC230700003	IV Seq
PVT230334301	Lower	NES144-7-540M	CETC230700002	Lower
PVT230334302	Lower	NES144-7-540M	CETC230700008	Lower
PVT230334329	Higher	NES144-7-590M	CETC230700001	Higher
PVT230334330	Higher	NES144-7-590M	CETC230700005	Higher
Module type: NES144-7-xxxM (Combination B)				
PVT230334322	E1	NES144-7-565M	CETC230700032	DH1000 Seq
PVT230334320	E2	NES144-7-565M	CETC230700030	DH1000 Seq
Module type: NES132-8-xxxM (Combination C)				
PVT230334341	Control	NES132-8-670M	CETC230700052	Control
PVT230334338	B	NES132-8-670M	CETC230700055	HS+TT+RC Seq
PVT230334339	D1	NES132-8-670M	CETC230700056	TC200 1 Seq
PVT230334340	D2	NES132-8-670M	CETC230700057	TC200 2 Seq
PVT230334337	E1	NES132-8-670M	CETC230700054	DH1000 Seq
PVT230334336	E2	NES132-8-670M	CETC230700053	DH1000 Seq
PVT230334342	Higher	NES132-8-700M	CETC230700059	Higher
PVT230334343	Higher	NES132-8-700M	CETC230700058	Higher
PVT230334333	Lower	NES132-8-640M	CETC230700048	Lower
PVT230334334	Lower	NES132-8-640M	CETC230700050	Lower

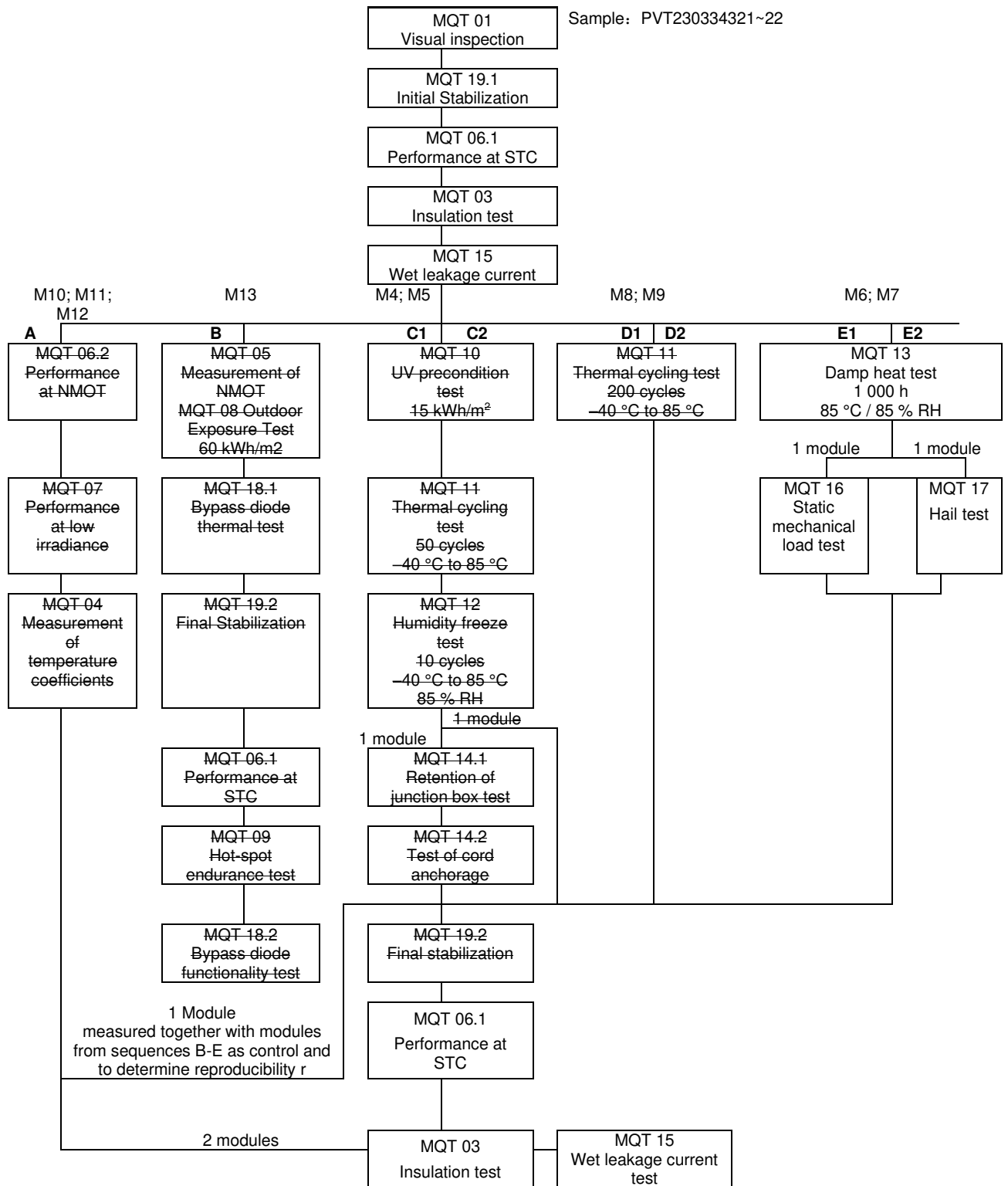
Supplementary information: Further qualification for higher and/or lower output power see annex 3

- 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 62915 Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification, Annex A3

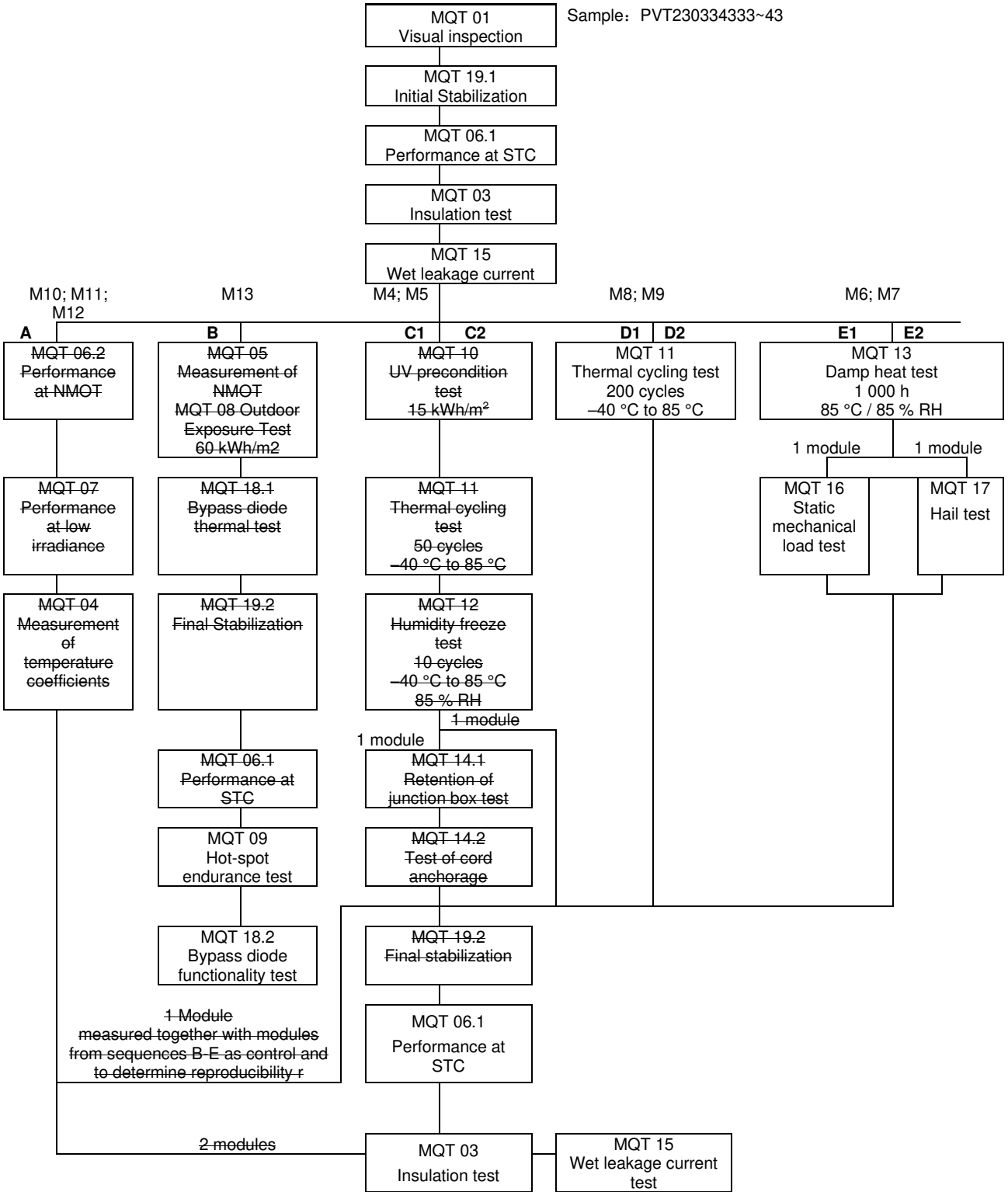
11	TEST FLOW (if it is not a full test, strikethrough non-performed test) Note: Deviations from test sequence are possible but must be documented.
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IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict



IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict



IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
5. MARKING AND DOCUMENTATION			-
5.1	Name Plate		-
	All electrical data is shown as relative to standard test conditions (1 000 W/m ² , 25 °C, AM 1,5 according to IEC TS 61836).	Marked on nameplate	P
	International symbols are used where applicable.	Marked on nameplate	P
	The module includes clear and indelible markings:		
	a. Name, registered trade name or registered trade mark of manufacturer	Marked on nameplate	P
	b. Type or model number designation	Marked on nameplate	P
	c. Serial number (unless marked on other part of product)	Marked on nameplate	P
	d. Date and place of manufacture, alternatively serial number allowing to trace the date and place of manufacture;	Marked on nameplate	P
	e. Maximum system voltage	Marked on nameplate	P
	f. Class of protection against electrical shock	Marked on nameplate	P
	g. Voltage at open-circuit or Voc including tolerances.	Marked on nameplate	P
	h. Current at short-circuit or Isc including tolerances	Marked on nameplate	P
	i. Module maximum power or Pmax including tolerances	Marked on nameplate	P
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	Written in user manual	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.	Written in user manual	P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use, and maintenance of the PV modules.	Written in user manual	P
5.2.2	Information given in the documentation		-
	a. All information required under 5.1 e) to i)	Written in user manual	P
	b. Overcurrent protection device type and rating are e.g. given in IEC 60269-6	Written in user manual	P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Maximum series/parallel module configuration is recommended	Written in user manual	P
	c. Manufacturer's stated tolerance for Voc, Isc and maximum power output under standard test conditions	Written in user manual	P
	d. Temperature coefficient for voltage at open-circuit	Written in user manual	P
	e. Temperature coefficient for maximum power	Written in user manual	P
	f. Temperature coefficient for short-circuit current	Written in user manual	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)	Written in user manual	P
	g. Nominal module operating temperature (NMOT) is specified	Written in user manual	P
	h. Performance at NMOT (MQT 06.2) is specified	Written in user manual	P
	i. Performance at low irradiance (MQT 07) is specified	Written in user manual	P
	International symbols used where applicable	Written in user manual	P
	Compliance checked by inspection and MQT 04 through MQT 07	Written in user manual	P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used		-
	j. The minimum cable diameters for modules intended for field wiring	Written in user manual	P
	k. Any limitations on wiring methods and wire management that apply to the wiring compartment or box;	Written in user manual	P
	l. The size, type, material and temperature rating of the conductors to be used	Written in user manual	P
	m. Type of terminals for field wiring	Written in user manual	P
	n. Specific PV connector model/types and manufacturer to which the module connectors are mated	Written in user manual	P
	o. The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation	Written in user manual	P
	p. The type and ratings of bypass diode to be used (if applicable)	Written in user manual	P
	q. limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)	Written in user manual	P

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Clause	Requirement + Test	Result - Remark	Verdict
	r. 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)	Written in user manual	P
	s. 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	Written in user manual	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>	Written in user manual	P
5.2.3	Assembly instructions		
	Provided with a product shipped in subassemblies, detailed and adequate to the degree required to facilitate complete and safe assembly of the product	Written in user manual	P
Supplementary information:			

7. PASS CRITERIA					
7.2	Power output and electric circuitry				
7.2.1	Verification of rated label values (Gate No. 1)				
	Manufacturer’s tolerances and Laboratory uncertainties				
		t ₁	t ₂	t ₃	—
	manufacturer’s rated lower/upper production tolerance in %	± 3	± 3	± 4	
		m ₁	m ₂	m ₃	
	measurement uncertainty in % of laboratory	± 2.5	± 0.8	± 2.3	
	Laboratory reproducibility r:	0.8%			
	After stabilization, each individual module meets the requirements				
	P _{max}		See Table 03		P
	V _{oc}		See Table 03		P

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Clause	Requirement + Test	Result - Remark	Verdict
	I _{sc} :.....	See Table 03	P
	After stabilization the arithmetic average $\bar{P}_{max}$ of all modules meet the requirements.	See Table 03	P
7.2.2	Maximum power degradation during type approval testing (Gate #2)		
	At the end of each test sequence or for sequence B after bypass diode test, each test sample meets the requirements for P_{max}	See Table 20.3	P
7.2.3	Electrical circuitry		
	Samples do not exhibit an open-circuit during the tests	—	P
7.3	Visual defects		
	There is no visual evidence of a major defect.	—	P
7.4	Electrical safety		
	The insulation test (MQT 03) requirements are met after the tests	—	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:			

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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	P
4.6	Performance at STC (MQT 06.1)	See Table 03	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	3 Modules	Samples PVT230334317; PVT230334319;	P
4.6	Performance at NMOT(MQT 06.2):	See Table 06	P
4.7	Performance at low irradiance(MQT 07).....:	See Table 07	P
4.4	Measurement of temperature coefficients(MQT 04):	See Table 08	P

Sequence B	1 Module	Sample M13	P
4.5	Measurement of nominal module operating temperature (NMOT, °C) (MQT 05):	See Table 09	P
4.8	Outdoor exposure test(MQT 08):	See Table 10	P
4.18.1	Bypass diode thermal test (MQT 18.1)		P
	Maximum allowed junction temperature:		—
	Calculated junction temperature:		—
	Final measurements.....:	See Table 11	P
4.18.2	Bypass diode functionality test (MQT 18.2):	See Table 12	P
4.19.6	Final stabilization (MQT 19.2):	See Table 12.1 – 12.3	P
4.9	Hot spot endurance test (MQT 09):	See Table 13.1 - 13.5	P

Sequence C	2 Modules	Samples M4; M5	P
4.10	UV preconditioning test (MQT 10):	See Table 14.1 - 14.4	P
4.11	Thermal cycling test 50 cycles (MQT 11).....:	See Table 15.1 - 15.4	P
4.12	Humidity-freeze test (MQT 12).....:	See Table 16.1 - 16.4	P

Sequence C1	1 Module	Sample M4	P
4.14	Robustness of terminations test (MQT 14)		

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Clause	Requirement + Test	Result - Remark	Verdict
4.14.2	Retention of junction box on mounting surface (MQT 14.1)	See Table 17.1 - 17.7	P
4.14.3	Test of cord anchorage (MQT 14.2)		P
4.14.3.1	This test omitted if junction box is qualified to IEC 62790	See list of attachments	P
4.14.3.2.1	Junction boxes intended to be used with cables specified by the manufacturer.....	See Table 17.4	P
4.14.3.2.2	Junction boxes intended to be used with generic cables.....	See Table 17.4	P
Sequence D	2 Modules	Sample M8; M9	P
4.11	Thermal cycling test 200 cycles (MQT 11)	See Table 18.1 - 18.2	P
Sequence E	2 Modules	Samples M6; M7	P
4.13	Damp heat test (MQT 13)	See Table 19.1 - 19.4	P
Sequence E1	1 Module	Sample M6	P
4.16	Static mechanical load test (MQT 16)	See Table 19.5 - 19.7	P
Sequence E2	1 Module	Sample M7	P
4.17	Hail test (MQT 17)	See Table 19.8 - 19.10	P
	Final measurement	All modules for Sequence C, D, E; Control module for Sequence A	P
4.19.6	Final stabilization (MQT 19.2)	See Table 20.1 - 20.2	P
4.6	Performance at STC (MQT 06.1)	See Table 20.3	P
4.3	Insulation test(MQT 03)	See Table 21	P
4.15	Wet leakage current test(MQT 15)	See Table 22	P

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 01: MQT 01 ini: Initial Visual inspection			
Test Date [YYYY-MM-DD]..... :	2023-08-07;		—
	2023-09-26;		
	2023-08-08;		
Sample #	Nature and position of initial findings – comments or attach photos		—
PVT230334301	No major visual defects		P
PVT230334302	No major visual defects		P
PVT230334303	No major visual defects		P
PVT230334304	No major visual defects		P
PVT230334305	No major visual defects		P
PVT230334307	No major visual defects		P
PVT230334308	No major visual defects		P
PVT230334309	No major visual defects		P
PVT230334310	No major visual defects		P
PVT230334311	No major visual defects		P
PVT230334312	No major visual defects		P
PVT230334313	No major visual defects		P
PVT230334314	No major visual defects		P
PVT230334315	No major visual defects		P
PVT230334316	No major visual defects		P
PVT230334317	No major visual defects		P
PVT230334319	No major visual defects		P
PVT230334320	No major visual defects		P
PVT230334322	No major visual defects		P
PVT230334321	No major visual defects		P
PVT230334322	No major visual defects		P
PVT230334324	No major visual defects		P
PVT230334325	No major visual defects		P
PVT230334333	No major visual defects		P
PVT230334334	No major visual defects		P
PVT230334335	No major visual defects		P
PVT230334336	No major visual defects		P
PVT230334337	No major visual defects		P
PVT230334338	No major visual defects		P

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Clause	Requirement + Test	Result - Remark	Verdict
PVT230334339	No major visual defects		P
PVT230334340	No major visual defects		P
PVT230334341	No major visual defects		P
PVT230334342	No major visual defects		P
PVT230334343	No major visual defects		P
Supplementary information: —			

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Clause	Requirement + Test				Result - Remark		Verdict
1	5	1000	50 ± 10	MPPT	571.67	—	—
2	5	1000	50 ± 10	MPPT	571.62	0.02	Yes
Sample #	PVT2303 34311	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11;		
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	—	—	—	—	573.20	—	—
1	5	1000	50 ± 10	MPPT	573.39	—	—
2	5	1000	50 ± 10	MPPT	573.23	0.03	Yes
Sample #	PVT2303 34312	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11;		
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	—	—	—	—	573.85	—	—
1	5	1000	50 ± 10	MPPT	573.88	—	—
2	5	1000	50 ± 10	MPPT	574.01	0.03	Yes
Sample #	PVT2303 34313	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11;		
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	—	—	—	—	574.55	—	—
1	5	1000	50 ± 10	MPPT	574.15	—	—
2	5	1000	50 ± 10	MPPT	574.12	0.07	Yes
Sample #	PVT2303 34314	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11;		
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	—	—	—	—	570.78	—	—
1	5	1000	50 ± 10	MPPT	570.48	—	—
2	5	1000	50 ± 10	MPPT	570.57	0.05	Yes
Sample #	PVT2303 34315	Test Date (YYYY-MM-DD) start/end			2023-08-14/2023-08-14;		
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	—	—	—	—	573.88	—	—
1	5	1000	50 ± 10	MPPT	573.93	—	—
2	5	1000	50 ± 10	MPPT	573.82	0.02	Yes
Sample #	PVT2303 34316	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11		
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	—	—	—	—	571.70	—	—
1	5	1000	50 ± 10	MPPT	571.03	—	—
2	5	1000	50 ± 10	MPPT	571.15	0.12	Yes
Sample #	PVT2303 34317	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11		
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	—	—	—	—	573.59	—	—
1	5	1000	50 ± 10	MPPT	573.71	—	—
2	5	1000	50 ± 10	MPPT	573.47	0.04	Yes
Sample #	PVT2303 34319	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11		
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	—	—	—	—	571.64	—	—
1	5	1000	50 ± 10	MPPT	571.38	—	—
2	5	1000	50 ± 10	MPPT	571.64	0.05	Yes
Sample #	PVT2303 34320	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11		
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	—	—	—	—	572.60	—	—
1	5	1000	50 ± 10	MPPT	572.47	—	—
2	5	1000	50 ± 10	MPPT	572.57	0.02	Yes

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Clause	Requirement + Test				Result - Remark		Verdict
Sample #	PVT2303 34322	Test Date (YYYY-MM-DD) start/end			2023-08-11/2023-08-11		
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	—	—	—	—	573.31	—	—
1	5	1000	50±10	MPPT	572.81	—	—
2	5	1000	50±10	MPPT	573.02	0.09	Yes
Sample #	PVT2303 34324	Test Date (YYYY-MM-DD) start/end			2023-08-14/2023-08-14;		
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	—	—	—	—	571.68	—	—
1	5	1000	50±10	MPPT	571.70	—	—
2	5	1000	50±10	MPPT	571.62	0.01	Yes
Sample #	PVT2303 34331	Test Date (YYYY-MM-DD) start/end			2023-08-08/2023-08-11;		
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	—	—	—	—	656.58	—	—
1	5	1000	50±10	MPPT	655.19	—	—
2	5	1000	50±10	MPPT	654.29	0.35	Yes
Sample #	PVT2303 34332	Test Date (YYYY-MM-DD) start/end			2023-08-08/2023-08-11;		
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	—	—	—	—	656.41	—	—
1	5	1000	50±10	MPPT	654.82	—	—
2	5	1000	50±10	MPPT	655.21	0.24	Yes
Sample #	PVT2303 34336	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	656.91	—	—
1	5	1000	50±10	MPPT	656.45	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	1000	50 ± 10	MPPT	656.58	0.07	Yes
Sample #	PVT2303 34337	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	656.08	—	—
1	5	1000	50 ± 10	MPPT	657.48	—	—
2	5	1000	50 ± 10	MPPT	657.45	0.21	Yes
Sample #	PVT2303 34338	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	657.38	—	—
1	5	1000	50 ± 10	MPPT	655.32	—	—
2	5	1000	50 ± 10	MPPT	655.13	0.34	Yes
Sample #	PVT2303 34339	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	657.24	—	—
1	5	1000	50 ± 10	MPPT	656.06	—	—
2	5	1000	50 ± 10	MPPT	656.12	0.18	Yes
Sample #	PVT2303 34340	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	656.77	—	—
1	5	1000	50 ± 10	MPPT	656.28	—	—
2	5	1000	50 ± 10	MPPT	655.47	0.2	Yes
Sample #	PVT2303 34341	Test Date (YYYY-MM-DD) start/end			2023-09-19/2023-09-26;		
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	—	—	—	—	655.97	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
1	5	1000	50±10	MPPT	655.60	—	—
2	5	1000	50±10	MPPT	655.64	0.06	Yes
Supplementary information: —							

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization										
Test Date [YYYY-MM-DD]..... :				2023-09-26						—
				2023-08-11						
Pmax(lab) lower limit (W) :				See table below: Pmax [W] – Min calc.						—
$\bar{P}_{max}(Lab)$ lower limit (W) :				565						—
Voc(lab) upper limit (V) :				See table below: Voc [V] Max. calc.						—
Isc (lab) upper limit (A) :				See table below: Isc [A] Max. calc.						—
Test method..... :				☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]		Voc [V]		Imp [A]	Vmp [V]	Pmax [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
PVT230334309	13.503	13.917	52.19	52.43	12.862	44.22	568.79	534.68	80.72	P
PVT230334310	13.527	13.917	52.28	52.43	12.884	44.36	571.54	534.68	80.81	P
PVT230334311	13.571	13.917	52.28	52.43	12.911	44.41	573.36	534.68	80.82	P
PVT230334312	13.558	13.917	52.29	52.43	12.927	44.40	574.00	534.68	80.97	P
PVT230334313	13.613	13.917	52.31	52.43	12.930	44.40	574.12	534.68	80.62	P
PVT230334314	13.565	13.917	52.21	52.43	12.918	44.15	570.31	534.68	80.53	P
PVT230334315	13.585	13.917	52.24	52.43	12.928	44.39	573.92	534.68	80.88	P
PVT230334316	13.589	13.917	52.22	52.43	12.925	44.19	571.15	534.68	80.48	P
PVT230334317	13.563	13.917	52.30	52.43	12.903	44.44	573.47	534.68	80.84	P
PVT230334319	13.643	13.917	52.19	52.43	12.930	44.21	571.58	534.68	80.27	P
PVT230334320	13.664	13.917	52.24	52.43	13.025	44.09	574.35	534.68	80.46	P
PVT230334322	13.517	13.917	52.17	52.43	12.848	44.19	567.69	534.68	80.50	P
PVT230334324	13.551	13.917	52.12	52.43	12.921	44.24	571.67	534.68	80.95	P
Average	—						572.19	551.22	—	P
PVT230334336	18.275	18.492	45.99	48.33	17.378	37.78	656.58	648.24	78.12	P
PVT230334338	18.251	18.492	46.03	48.33	17.336	37.79	655.13	648.24	77.98	P
PVT230334339	18.282	18.492	45.99	48.33	17.366	37.78	656.12	648.24	78.04	P

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Clause	Requirement + Test						Result - Remark			Verdict
PVT230334340	18.298	18.492	46.03	48.33	17.356	37.75	655.21	648.24	77.78	P
PVT230334341	18.288	18.492	45.99	48.33	17.347	37.80	655.64	648.24	77.95	P
Average	—						655.74	653.66	—	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 04: MQT 03 ini: Initial Insulation test					
Test Date [YYYY-MM-DD]		2023-08-11			—
		2023-09-26			
Test Voltage applied [V]		1500/4000			—
Size of module [m²]		PVT230334307,PVT230334309~22: 2.58			—
		PVT230334336~41: 3.10			—
Required Resistance [MΩ]		PVT230334307,PVT230334309~22: 15.50			—
		PVT230334336~41: 12.90			
Sample #	Measured	Dielectric breakdown			Result
	MΩ	Yes (description)		No	
PVT230334307	30140	-		√	P
PVT230334309	24895	-		√	P
PVT230334310	>50000	-		√	P
PVT230334311	>50000	-		√	P
PVT230334312	>50000	-		√	P
PVT230334313	>50000	-		√	P
PVT230334314	>50000	-		√	P
PVT230334315	>50000	-		√	P
PVT230334316	>50000	-		√	P
PVT230334317	>50000	-		√	P
PVT230334319	>50000	-		√	P
PVT230334320	46711	-		√	P
PVT230334322	38911	-		√	P
PVT230334336	36156	-		√	P
PVT230334337	>50000	-		√	P
PVT230334338	42831	-		√	P
PVT230334339	43871	-		√	P
PVT230334340	41815	-		√	P

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Clause	Requirement + Test		Result - Remark	Verdict
PVT230334341	42563	-	√	P
PVT230334322	38911	-	√	P
PVT230334336	36156	-	√	P
PVT230334337	>50000	-	√	P
PVT230334338	42831	-	√	P
PVT230334339	43871	-	√	P
PVT230334340	41815	-	√	P
PVT230334341	42563	-	√	P
Supplementary information: Maximum range of the device is 50000.0 MΩ				

TABLE 05: MQT 15 ini: Initial Wet leakage current test				—
Test Date [YYYY-MM-DD]		2023-08-11		—
		2023-09-26		—
Test Voltage applied [V]		1500		—
Solution temperature [°C]		≤3500		—
Solution resistivity [Ω cm]		22±2		—
Size of module [m²]		PVT230334307,PVT230334309~22: 2.58		—
		PVT230334336~41: 3.10		—
Sample #	Required Resistance [MΩ]		Measured [MΩ]	Result
PVT230334307	15.50		3679	P
PVT230334309	15.50		28071	P
PVT230334310	15.50		26132	P
PVT230334311	15.50		26774	P
PVT230334312	15.50		28461	P
PVT230334313	15.50		28495	P
PVT230334314	15.50		27560	P
PVT230334315	15.50		24893	P
PVT230334316	15.50		26356	P
PVT230334317	15.50		25841	P
PVT230334319	15.50		25307	P
PVT230334320	15.50		25491	P
PVT230334322	15.50		27710	P
PVT230334336	12.90		47338	P
PVT230334337	12.90		35612	P

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Clause	Requirement + Test	Result - Remark	Verdict
PVT230334338	12.90	38655	P
PVT230334339	12.90	36418	P
PVT230334340	12.90	34813	P
PVT230334341	12.90	36552	P
Supplementary information: —			

TABLE 06: MQT 06.2 - Performance at NMOT							—
Test Date [YYYY-MM-DD]				2023-09-11			—
Module temperature (°C)				45.3			—
Test method				☒ Simulator ☐ Natural sunlight			—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
PVT230334317	10.959	49.69	9.641	41.33	428.50	78.70	-
Supplementary information: —							

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 07: MQT 07 - Performance at low irradiance							
Test Date [YYYY-MM-DD]					2023-08-11		—
Test method ...:	☐ Outdoor measurement						—
	Ambient air temperature [°C]:				25.6		
	Irradiance [W/m²]:				200		
	Module temperature [°C]:				—		
	☒ Data corrected to a 25°C cell temperature and 200 W/m² irradiance						—
	☐ Directly measured						
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	
PVT230334319	2.660	51.46	2.625	42.68	112.03	81.83	
Supplementary information: —							

TABLE 08: MQT 04 - Measurement of temperature coefficients					
Test Date [YYYY-MM-DD]		2023-08-14			—
Ambient air temperature [°C] high/low		65.2/25.4			—
Irradiance [W/m²] high/low		1000/1000			—
Module temperature [°C] high/low		60-26			—
Sample #	α [%/°C]	β [%/°C]	δ [%/°C]	—	
PVT230334319	0.04	-0.25	-0.29	N/A	
Supplementary information: —					

TABLE 09: MQT 05 - Measurement of Nominal Module Operating Temperature (NMOT, °C)		
Test Date [YYYY-MM-DD].....:	2023-08-11/2023-09-11	
Electrical load:	☒ Restive load ☐ MPPT	
All details for the measurements are kept on file and are available on request.		
Sample #	PVT230334317	
Calculated u_0 [W/(m².°C)]	30.498	
Calculated u_1 [W.s/(m³.°C)]	1.279	
Calculated NMOT	45.3	
Supplementary information: —		

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Clause	Requirement + Test	Result - Remark	Verdict
TABLE 10: MQT 08 - Outdoor exposure test			
Test Date [YYYY-MM-DD] start/end	2023-08-29-2023-09-01;		—
Sample #	PVT230334316		
Total irradiation dosage [kWh/m ²]	60		—
Angle of tilt the test module	30		—
Electrical load:	☒ Restive load ☐ MPPT		—
Supplementary information: —			

Table 10.1: MQT 01: Visual inspection after outdoor exposure test			
Test Date [YYYY-MM-DD]	2023-09-01		—
Sample #	Nature and position of initial findings – comments or attach photos		—
PVT230334316	No major visual defects		P
Supplementary information: —			

Table 10.2: MQT 15: Wet leakage current test after outdoor exposure test			
Test Date [YYYY-MM-DD]	2023-09-01		—
Test Voltage applied [V]	1500		—
Solution temperature [°C]	22.1		—
Size of module [m ²]	2.58		—
Solution resistivity [Ω cm]	2342		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334316	15.50	25365	P
Supplementary information: Size of module 2.58[m ²]			

Table 10.3: MQT 02 - Maximum power determination after outdoor exposure test - Optional							
Test Date [YYYY-MM-DD]	—						—
Module temperature [°C]	—						—
Irradiance [W/m ²]	—						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	
—	—	—	—	—	—	—	—
Supplementary information: —							

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Clause	Requirement + Test			Result - Remark	Verdict
Table 10.4: MQT 03 - Insulation test after outdoor exposure test - Optional					
Test Date [YYYY-MM-DD].....:		—			—
Test Voltage applied [V]		—			—
Size of module [m²]		—			—
Required Resistance [MΩ].....:		—			—
Sample #	Measur ed	Required (MΩ)	Dielectric breakdown		Result
	(MΩ)	(MΩ)	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: Size of module [m²]					

TABLE 11: MQT 18: Bypass diode thermal test					
Test Date [YYYY-MM-DD] start/end	2023-09-11				—
Sample #	PVT230334316				—
Module temperature [°C].....	75±5				—
Number of diodes in junction box	3				—
Diode manufacturer	Hangzhou Daoming Micro-electronics Co.Ltd				—
Diode type designation	GFMK4045				—
Max. permissible junction temperature T _{Jmax} [°C] (according to diode datasheet)	200				—
Detailed description of sample preparation procedure	—				—
Step 1, Determination of VD versus TJ characteristic					—
	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C	
Ambient temperature of the junction box ... :	31.77	50.07	71.67	90.94	
Pulsed current.....	13.589	13.589	13.589	13.589	
Voltage drop [V]	0.3995	0.3794	0.3516	0.3295	
	0.4033	0.3830	0.3545	0.3325	
	0.4049	0.3841	0.3561	0.3339	
V _D versus T _J characteristic	VD = -0.0012T _J + 0.4381 (junction box 1) VD = -0.0012T _J + 0.4423 (junction box 2) VD = -0.0012T _J + 0.4438 (junction box 3)			—	
Max. permissible junction temperature T _{Jmax} [°C] (according to diode datasheet)	200				P
Step 2, Bypass diode thermal test					
	Diode 1	Diode 2	Diode 3	Result	
Current flow applied [A]	13.589	13.589	13.589	P	

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Clause	Requirement + Test	Result - Remark		Verdict
Max. diode surface temperature allowed T_{jmax} [°C] :	200	200	200	P
Voltage drop [V] after 1h	0.2885	0.2861	0.2925	P
Calculated max. junction temperature T_{jcalc} [°C]	124.67	130.17	126.08	P
$T_{jcalc} < T_{jmax}$ (test passed)? yes/no	yes	yes	yes	P
Current flow (1.25 * I_{sc}) [A]	16.99	16.99	16.99	P
Bypass diode remain(s) functional (yes/no)	yes	yes	yes	P
Remarks: See Table 12 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.				

TABLE 11.1: MQT 01 - Visual inspection after bypass diode thermal test			
Test Date [YYYY-MM-DD]..... :		2023-09-11	—
Sample #	Nature and position of initial findings – comments or attach photos		—
PVT230334316	No major visual defects		P
Supplementary information: —			

TABLE 11.2: MQT 15 - Wet leakage current test after bypass diode thermal test				
Test Date [YYYY-MM-DD]		2023-09-11		—
Test Voltage applied [V]		1500		—
Solution temperature [°C]		22.3		—
Size of module [m²]		2.58		—
Solution resistivity [Ω cm].....		3067		—
Sample #	Measured [MΩ]	Limit [MΩ]		Result
PVT230334316	15.50	24175		P
Supplementary information: —				

TABLE 11.3: 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: —								

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Clause	Requirement + Test			Result - Remark	Verdict
TABLE 11.4: MQT 03 - Insulation test after bypass diode thermal test - Optional					
Test Date [YYYY-MM-DD]		—			—
Test Voltage applied [V]		—			—
Size of module [m²]		—			—
Required Resistance [MΩ].....		—			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: —					

TABLE 12: MQT 18.2 - Bypass diode functionality test after bypass diode thermal test					
Test Date [YYYY-MM-DD].....:		2023-09-11			—
☐ Method A					—
Ambient temperature [°C]		—			—
Current flow applied [A]		—			—
Sample #	VFM	VFM _{rated}	VFM = (N × VFM _{rated}) ± 10 %		Result
—	—	—	—		—
Supplementary information: —					
☒ Method B					—
	IV curve after shading				Result
Diode 1	Diode work properly				P
Diode 2	Diode work properly				P
Diode 3	Diode work properly				P
Supplementary information: —					

TABLE 12.1: MQT 19.1 Fin: Final stabilization							
TABLE 12.2: MQT 06.1: Performance at STC before final stabilization							
Test Date [YYYY-MM-DD]	—						—
Test method	☐ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
—	—	—	—	—	—	—	—
Supplementary information: —							

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Clause	Requirement + Test				Result - Remark		Verdict
TABLE 12.3: MQT 19.1 Final Stabilization procedure							
Light exposure method				☐ Simulator ☐ Natural sunlight		—	
Stabilization criterion x per IEC 61215-1-x ..				—		—	
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight							
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: —							
☐ 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 13: MQT 09 - Hot-spot endurance test		
Test Date [YYYY-MM-DD] start/end	2023-09-25	—
Sample #	PVT230334315; PVT230334338	—
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 Simulator ☒ Steady state Simulator ☐ Natural sunlight	—
Module temperature at thermal equilibrium [°C] ..	PVT230334315: 52.31; PVT230334338: 55.34	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					
PVT230334315					—
Selected hot-spot cells	LOW	LOW	LOW	HIGH	—

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Clause	Requirement + Test		Result - Remark		Verdict
		A24	F24	D18	D15
Shading rate [%].....:	15	17	15	10	—
Max. measured cell temperature in each cell [°C]:	152.70	147.99	148.70	118.02	—
Test duration of each shading [h]	1000	1000	1000	1000	—
Irradiance during shading [W/m²]	1	1	1	1	—
PVT230334338					
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	F22	F21	C22	B4	
Shading rate [%].....:	16	16	15	11	—
Max. measured cell temperature in each cell [°C]:	139.8	130.2	133.1	116.7	—
Test duration of each shading [h]	1000	1000	1000	1000	—
Irradiance during shading [W/m²]	1	1	1	1	—

TABLE 13.2: 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: —		

TABLE 13.3: MQT 01 - Visual inspection after hot-spot endurance test		
Test Date [YYYY-MM-DD].....:	2023-09-26; 2023-10-13	—
Sample #	Nature and position of initial findings – comments or attach photos	—
PVT230334315	No major visual defects	P
PVT230334338	No major visual defects	P
Supplementary information: —		

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test							
Test Date [YYYY-MM-DD].....:	2023-09-26; 2023-10-13						—
Module temperature [°C].....:	1000						—
Irradiance [W/m²]	25.1						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—

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Clause	Requirement + Test				Result - Remark		Verdict
PVT230334315	13.596	52.26	12.930	44.38	573.81	80.75	—
PVT230334338	18.204	45.97	17.289	37.79	653.31	78.07	—
Supplementary information: —							

TABLE 13.5: MQT 03 - Insulation test after hot-spot endurance test					
Test Date [YYYY-MM-DD]		2023-09-26; 2023-10-13			—
Test Voltage applied [V]		1500/4000			—
Size of module [m²]		PVT230334315: 2.58 PVT230334338: 3.10			—
Required Resistance [MΩ].....		PVT230334315: 15.50; PVT230334338: 12.90			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
PVT230334315	28124	15.50	-	√	P
PVT230334338	41079	12.90	-	√	P

TABLE 13.6: MQT 15 - Wet leakage current test after hot-spot endurance test			
Test Date [YYYY-MM-DD].....:		2023-09-26; 2023-10-13	—
Test Voltage applied [V]		1500	—
Solution temperature [°C].....:		22.8	—
Size of module [m²]		PVT230334315: 2.58 PVT230334338: 3.10	—
Solution resistivity [Ω cm].....		2544	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334315	15.50	20849	P
PVT230334338	12.90	36252	P
Supplementary information: Size of module PVT230334315: 2.58 [m²]; PVT230334338: 3.10 [m²]			

TABLE 13.7: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test						
Test Date [YYYY-MM-DD]			2023-09-26			—
☐ Method A						—
Ambient temperature [°C]			—			—
Current flow applied [A]			—			—

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Clause	Requirement + Test		Result - Remark	Verdict
Sample #	VFM	VFMrated	VFM = (N × VFMrated) ± 10 %	Result
—	—	—	☐ Yes ☐ No	—
Supplementary information: —				
☒ Method B				—
	IV curve after shading			Result
Diode 1	Diode work properly			P
Diode 2	Diode work properly			P
Diode 3	Diode work properly			P
Supplementary information: —				

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 14: MQT 10 - UV preconditioning test		
Test Date (YYYY-MM-DD) start/end	2023-08-25/2023-08-29	—
	2023-08-14-2023-08-18	
Module temperature [°C]	60.1	—
UV irradiance (280-400nm) [W/m²]	182.3	—
UV dose (280-320nm) [kWh/ m²]	15	—
Module operation condition	☒ Short circuited ☐ Pmax	—
Supplementary information: —		

TABLE 14.1: MQT 01 - Visual inspection after UV preconditioning test			
Test Date [YYYY-MM-DD]		2023-08-29/2023-08-18	—
Sample #	Nature and position of initial findings – comments or attach photos		
PVT230334313	No major visual defects		P
PVT230334314	No major visual defects		P

TABLE 14.2: MQT 15 - Wet leakage current test after UV preconditioning test				
Test Date [YYYY-MM-DD]..... :		2023-08-29/2023-08-18		—
Test Voltage applied [V] :		1500		—
Solution temperature [°C].....:		22.3		—
Solution resistivity [Ω cm]..... :		3048		—
Sample #	Measured [MΩ]		Required Resistance [MΩ]	Result
PVT230334313	15.50		28495	P
PVT230334314	15.50		602	P
Supplementary information: Size of module 2.58 [m²]				

TABLE 14.3: MQT 02 – Max. power determination after UV preconditioning test - Optional							
Test Date [YYYY-MM-DD].....:				—			—
Module temperature [°C].....:				—			—
Irradiance [W/m²].....:				—			—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: —							

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 14.4: MQT 03 - Insulation test after UV preconditioning test - Optional					
Test Date [YYYY-MM-DD]		—			—
Test Voltage applied [V]		—			—
Size of module [m ²]		—			—
Required Resistance [MΩ]		—			—
Sample #	Measured		Dielectric breakdown		Result
	[MΩ]		Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information: —					

TABLE 15: MQT 11 - Thermal cycling 50 test				
Test Date [YYYY-MM-DD] start/end		2023-08-29/2023-09-05;		—
		2023-08-18/2023-08-25;		
Total cycles (50)		50		—
Applied current (A)		During the heat up cycle from 40 °C to 80 °C	PVT230334313: 12.930 PVT230334314: 12.918	—
		Other stages	0.1	—
Sample #	Open circuits (yes/no)			—
PVT230334313	no			P
PVT230334314	no			P
Supplementary information: —				

TABLE 15.1: MQT 01 - Visual inspection after thermal cycling 50 test		
Test Date [YYYY-MM-DD].....:		2023-09-05; 2023-08-25
Sample #	Nature and position of initial findings – comments or attach photos	—
PVT230334313	No major visual defects	P
PVT230334314	No major visual defects	P
Supplementary information: —		

TABLE 15.2: MQT 15 - Wet leakage current test after thermal cycling 50 test		
Test Date [YYYY-MM-DD]		2023-09-05; 2023-08-25

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Clause	Requirement + Test	Result - Remark	Verdict
Test Voltage applied [V]		1500	—
Solution temperature [°C]		22.6	—
Solution resistivity [Ω cm]		2976	—
Size of module [m^2]		2.58	—
Sample #	Measured [$M\Omega$]	Required Resistance [$M\Omega$]	Result
PVT230334313	15.50	23618	P
PVT230334314	15.50	583	P
Supplementary information: —			

TABLE 15.3: MQT 03 – Max. power determination after thermal cycling 50 test - Optional							
Test Date [YYYY-MM-DD]		—					—
Module temperature [°C]		—					—
Irradiance [W/m^2]		—					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	
—	—	—	—	—	—	—	
—	—	—	—	—	—	—	
Supplementary information: —							

TABLE 15.4: 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: Size of module [m²]					

TABLE 16: MQT 12 - Humidity freeze 10 test			
Test Date [YYYY-MM-DD] start/end		2023-09-05-2023-09-15;	—
		2023-08-25-2023-09-04;	
Total cycles (10)		10	—
Applied current (A)		0.1	—

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Clause	Requirement + Test	Result - Remark	Verdict
Sample #	Open circuits (yes/no)		—
PVT230334313	no		P
PVT230334314	no		P
Supplementary information: —			

TABLE 16.1: MQT 01 - Visual inspection after humidity freeze 10 test		
Test Date [YYYY-MM-DD]	2023-09-15; 2023-09-04	—
Sample #	Nature and position of initial findings – comments or attach photos	—
PVT230334313	No major visual defects	P
PVT230334314	No major visual defects	P
Supplementary information: —		

TABLE 16.2: MQT 15 - Wet leakage current test after humidity freeze 10 test			
Test Date [YYYY-MM-DD]	2023-09-15; 2023-09-04		—
Test Voltage applied [V]	1500		—
Solution temperature [°C]	22.8		—
Size of module [m²]	2.58		—
Solution resistivity [Ω cm]	2801		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334313	15.50	18023	P
PVT230334314	15.50	578	P
Supplementary information: Size of module 2.58[m²]			

TABLE 16.3: MQT 02 - Maximum power determination after humidity freeze 10 test -Optional						
Test Date [YYYY-MM-DD]	—					—
Module temperature [°C]	—					—
Irradiance [W/m²]	—					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
—	—	—	—	—	—	—
—	—	—	—	—	—	—
Supplementary information: —						

TABLE 16.4: MQT 03 Insulation test after humidity freeze 10 test) -Optional		
Test Date [YYYY-MM-DD]	—	—
Test Voltage applied [V]	—	—

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

TABLE 17: MQT 14 - Robustness of terminations test					
Test Date [YYYY-MM-DD] start/end			2023-09-20		—

TABLE 17.1: MQT 14.1 Retention of junction box on mounting surface		
Sample #	PVT230334313	—
Supplementary information: —		

TABLE 17.2: MQT 01 - Visual inspection after retention of junction box on mounting surface		
Test Date [YYYY-MM-DD]..... : 2023-09-20		—
Sample #	Nature and position of initial findings – comments or attach photos	—
PVT230334313	No major visual defects	P
Supplementary information: —		

TABLE 17.3: MQT 15 - Wet leakage current test after retention of junction box on mounting surface				
Test Date [YYYY-MM-DD]..... :		2023-09-20		—
Test Voltage applied [V]		1500		—
Solution temperature [°C].....:		22.9		—
Size of module [m²]		2.58		—
Solution resistivity [Ω cm]..... :		3115		—
Sample #	Measured [MΩ]		Limit [MΩ]	Result
PVT230334313	15.50		14238	P
Supplementary information: Size of module 2.58 [m²]				

TABLE 17.4: MQT 14.2 - Test of cord anchorage					
Sample #	-				—

IEC 61215-2							
Clause	Requirement + Test				Result - Remark	Verdict	
☐ Junction boxes intended to be used with cables specified by the manufacturer						—	
	Cable diameter, [mm]	Tension Force, [N]	Permissible displacement, [mm]	Measured displacement, [mm]	Result		
Pull test	—	—	—	—	—		
	Cable diameter, [mm]	Torque Force, [Nm]	Permissible angle [°]	Measured angle [°]	Result		
Torque test	—	—	—	—	—		
☐ Junction boxes intended to be used with generic cables						—	
	Anchorage diameter range [mm]		Test mandrel [mm]	Tension Force, [N]	Permissible displacement [mm]	Measured displacement [mm]	Result
Pull test	Min	—	—	—	—	—	—
	Anchorage diameter range [mm]		Test mandrel [mm]	Torque Force [Nm]	Permissible angle [°]	Measured angle [°]	Result
Torque test	Max	—	—	—	—	—	—
Supplementary information: —							

TABLE 17.5: MQT 01 - Visual inspection after retention of test of cord anchorage			
Test Date [YYYY-MM-DD]		—	—
Sample #	Nature and position of initial findings – comments or attach photos		—
—	—		—
Supplementary information: —			

TABLE 17.6: MQT 15 - Wet leakage current test after retention of test of cord anchorage				
Test Date [YYYY-MM-DD]..... :		—		—
Test Voltage applied [V]		—		—
Solution temperature [°C].....:		—		—
Solution resistivity [Ω cm]		—		—
Size of module [m²]		—		—
Sample #	Measured [MΩ]		Required Resistance [MΩ]	Result
—	—		—	—
Supplementary information: Size of module [m²]				

TABLE 17.7: MQT 03 - Insulation test after test of cord anchorage			
Test Date [YYYY-MM-DD]		—	—

IEC 61215-2					
Clause	Requirement + Test			Result - Remark	Verdict
Test Voltage applied [V] :				—	—
Size of module [m²] :				—	—
Required Resistance [MΩ]..... :				—	—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: Size of module [m²].					

TABLE 18: MQT 11 - Thermal cycling 200 test				
Test Date [YYYY-MM-DD] start/end		2023-08-14-2023-09-11		—
		2023-09-28-2023-10-26		
Total cycles (200)		200		—
Applied current (A)		During the heat up cycle from −40 °C to 80 °C	PVT230334311~12: 12.911 PVT230334339~40: 17.366	—
		Other stages	0.1	—
Sample #	Open circuits (yes/no)			—
PVT230334311	no			P
PVT230334312	no			P
PVT230334339	no			P
PVT230334340	no			P
Supplementary information: —				

TABLE 18.1: MQT 01 - Visual inspection after thermal cycling 200 test		
Test Date [YYYY-MM-DD].....:		2023-09-11; 2023-10-26
Sample #	Nature and position of initial findings – comments or attach photos	—
PVT230334311	No major visual defects	P
PVT230334312	No major visual defects	P
PVT230334339	No major visual defects	P
PVT230334340	No major visual defects	P
Supplementary information: —		

TABLE 18.2: MQT 15 - Wet leakage current test after thermal cycling 200 test				
Test Date [YYYY-MM-DD]		2023-09-11; 2023-10-26		—
Test Voltage applied [V]		1500		—

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Clause	Requirement + Test	Result - Remark	Verdict
Solution temperature [°C].....	22.4		—
Size of module [m²]	PVT230334311~12: 2.58 PVT230334339~40: 3.10		—
Solution resistivity [Ω cm].....	2688		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334311	15.50	25537	P
PVT230334312	15.50	27235	P
PVT230334339	12.90	28733	P
PVT230334340	12.90	36672	P
Supplementary information: Size of module PVT230334311~12: 2.58 [m²] PVT230334339~40: 3.10 [m²]			

TABLE 19: MQT 13 - Damp heat 1000 test		
Test Date [YYYY-MM-DD] start/end	2023-08-14-2023-09-25;	—
Total hours (1000h)	1000	—
Supplementary information:		

TABLE 19.1: MQT 01 - Visual inspection after damp heat 1000 test		
Test Date [YYYY-MM-DD]	2023-09-25	—
Sample #	Nature and position of initial findings – comments or attach photos	
PVT230334309	No major visual defects	P
PVT230334310	No major visual defects	P
PVT230334320	No major visual defects	P
PVT230334322	No major visual defects	P
Supplementary information: —		

TABLE 19.2: MQT 15 - Wet leakage current test after damp heat 1000 test			
Test Date [YYYY-MM-DD].....:		2023-09-25	—
Test Voltage applied [V].....:		1500	—
Solution temperature [°C].....:		22.6	—
Size of module [m²].....:		2.58	—
Solution resistivity [Ω cm].....:		3278	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334309	15.50	558	P
PVT230334310	15.50	25728	P

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Clause	Requirement + Test	Result - Remark	Verdict
PVT230334320	15.50	24462	P
PVT230334322	15.50	23744	P
Supplementary information: Size of module 2.58 [m ²]			

TABLE 19.3: MQT 02 - Maximum power determination after damp heat 1000 test - Optional							
Test Date [YYYY-MM-DD]				—			—
Module temperature [°C]				—			—
Irradiance [W/m ²]				—			—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: —							

TABLE 19.4: MQT 03 - Insulation test after damp heat 1000 test - Optional					
Test Date [YYYY-MM-DD]				—	
Test Voltage applied [V]				—	
Size of module [m ²]				—	
Sample #	Measur ed	Required Resistance	Dielectric breakdown		Result
	[MΩ]	[MΩ]	Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information: Size of module [m ²]					

TABLE 19.5: MQT 16 Static mechanical load test				
Sample # :		PVT230334310; PVT230334322		—
Design load(front side/ back side)		3600 / 1600		—
Safety factors		1.5 / 1.5		—
Test Date [YYYY-MM-DD]		2023-09-25; 2023-10-23		—
Mounting method		PVT230334322: Mounting at the long side by clamps the position of the clamps as shown below PVT230334310: Mounting at the frame by 4 mounting holes. The distance between the holes is 1400mm		—
Load applied to		front side	back side	—
Mechanical load [Pa]		5400	2400	—

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Clause	Requirement + Test	Result - Remark	Verdict
First cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	P
Third cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	
Supplementary information: may need to be performed with each mounting situation			

TABLE 19.6: MQT 01 - Visual inspection after static mechanical load test			
Test Date [YYYY-MM-DD].....:		2023-09-25; 2023-10-23	—
Sample #	Nature and position of initial findings – comments or attach photos		—
PVT230334310	No major visual defects		P
PVT230334322	No major visual defects		P
Supplementary information: —			

TABLE 19.7: MQT 15 - Wet leakage current test after static mechanical load test				
Test Date [YYYY-MM-DD]		2023-09-25; 2023-10-23		—
Test Voltage applied [V]		1500		—
Solution temperature [°C]		23.1		—
Size of module [m²]		2.58		—
Solution resistivity [Ω cm]		2625		—
Sample #	Measured [MΩ]		Limit [MΩ]	Result
PVT230334310	15.50		2352	P
PVT230334322	15.50		21036	P
Supplementary information: —				

TABLE 19.8: MQT 17 - Hail impact test							
Test Date [YYYY-MM-DD]..... :	2023-10-11						—
Sample #	PVT230334309						—
Ice ball size [mm] :	1	2	3	4	5	6	—
	25.33	25.47	24.21	24.24	24.76	24.86	
	7	8	9	10	11	—	
	25.34	24.39	25.28	24.60	25.39	—	
Ice ball weight [g] :	1	2	3	4	5	6	—
	7.63	7.73	7.60	7.62	7.37	7.42	

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Clause	Requirement + Test				Result - Remark		Verdict
	7	8	9	10	11	—	
	7.76	7.45	7.61	7.72	7.37	—	
Ice ball velocity [m/s] :	1	2	3	4	5	6	—
	22.23	22.43	23.31	23.58	23.39	23.12	
	7	8	9	10	11	—	
	23.11	23.59	23.65	23.38	22.43	—	
Number of impact locations :						—	
Sample #	PVT230334309					—	
Ice ball size [mm] :	1	2	3	4	5	6	—
	24.76	24.54	24.33	25.04	24.24	24.80	
	7	8	9	10	11	—	
	25.04	24.14	25.26	25.27	24.50	—	
Ice ball weight [g] :	1	2	3	4	5	6	—
	7.55	7.51	7.43	7.55	7.71	7.71	
	7	8	9	10	11	—	
	7.72	7.42	7.59	7.58	7.45	—	
Ice ball velocity [m/s] :	1	2	3	4	5	6	—
	23.45	22.18	23.40	22.66	23.13	22.67	
	7	8	9	10	11	—	
	22.47	22.65	22.00	22.23	23.07	—	
Number of impact locations :						—	

Supplementary information: (impact location descriptions)

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Clause	Requirement + Test	Result - Remark	Verdict
TABLE 19.9: MQT 01 - Visual inspection after hail impact test			
Test Date [YYYY-MM-DD]:		2023-10-11	—
Sample #	Nature and position of initial findings – comments or attach photos		—
PVT230334309	No major visual defects		P
PVT230334320	No major visual defects		P
Supplementary information: —			

TABLE 19.10: MQT 15 - Wet leakage current test after hail impact test			
Test Date [YYYY-MM-DD]		2023-10-11	—
Test Voltage applied [V]		1500	—
Solution temperature [°C]		22.3	—
Solution resistivity [Ω cm]		2.58	—
Size of module [m^2]		2785	—
Sample #	Measured [$M\Omega$]	Required Resistance [$M\Omega$]	Result
PVT230334309	15.50	543	P
PVT230334320	15.50	22574	P
Supplementary information: —			

TABLE 20: MQT 19.2 Fin: Final stabilization							
TABLE 20.1: MQT 06.1: Performance at STC before final stabilization							
Test Date [YYYY-MM-DD]		—					—
Test method		☐ Simulator ☐ Natural sunlight					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: —							

TABLE 20.2: MQT 19.1 Final Stabilization procedure	
---	--

IEC 61215-2							
Clause	Requirement + Test	Result - Remark	Verdict				
Light exposure method:							
		☐ Simulator ☐ Natural sunlight					
Stabilization criterion x per IEC 61215-1-x :		—					
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight							
Sample #	—	Test Date (YYYY-MM-DD) start/end .:					
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				
3	—	—	—				
4	—	—	—				
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)				
Initial	—	—	—				
1	—	—	—				
2	—	—	—				

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

TABLE 20.3: MQT 06.1: Final Performance at STC			
Test Date [YYYY-MM-DD]	2023-10-12		—
	2023-10-23		
	2023-09-11		

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Clause	Requirement + Test					Result - Remark			Verdict
				2023-09-20					
				2023-09-12					
				2023-11-09					
				2023-11-28					
				2023-10-26					
Test method				☒ Simulator ☐ Natural sunlight					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab_GateNo. 1)	Power Degradati on [%]	Result
PVT230334309	13.277	51.97	12.582	43.34	545.33	79.03	568.79	-4.12	P
PVT230334310	13.495	52.29	12.837	44.21	567.56	80.43	571.54	-0.70	P
PVT230334311	13.548	52.19	12.905	44.21	570.50	80.68	573.36	-0.50	P
PVT230334312	13.541	52.22	12.923	44.20	571.19	80.78	574.00	-0.49	P
PVT230334313	13.481	52.05	12.537	43.52	545.55	77.75	574.12	-4.98	P
PVT230334314	13.485	52.06	12.622	43.66	551.06	78.50	570.31	-3.38	P
PVT230334316	13.576	52.28	12.919	44.25	571.70	80.56	571.15	0.10	P
PVT230334317	13.534	52.25	12.891	44.32	571.34	80.79	573.47	-0.37	P
PVT230334320	13.665	52.32	13.039	44.22	576.60	80.66	574.35	0.39	P
PVT230334322	13.283	52.02	12.554	43.33	543.97	78.72	567.69	-4.18	P
PVT230334336	17.988	45.78	17.105	37.50	641.47	77.89	656.58	-2.30	P
PVT230334337	17.973	46.043	17.007	37.747	641.954	77.57	657.45	-2.36	P
PVT230334339	18.228	46.07	17.333	37.88	656.52	78.17	656.12	0.06	P
PVT230334340	18.243	46.10	17.318	37.85	655.56	77.95	655.21	0.05	P
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility <i>r</i> of control module.									

TABLE 21: MQT 03 fin: Final Insulation test		
Test Date [YYYY-MM-DD]..... :	2023-09-26	—
	2023-09-11	—
	2023-09-20	—
	2023-10-09	—
	2023-08-14	—
	2023-11-07	—

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Clause	Requirement + Test			Result - Remark	Verdict
				2023-11-28	—
				2023-10-25	—
				2023-10-26	—
				2023-10-12	—
Test Voltage applied [V]		1500/8000			—
Size of module [m ²]		PVT230334307,PVT230334309~17,19~22: 2.58 PVT230334336~41: 3.10			—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
PVT230334307	19937	15.50	-	√	P
PVT230334309	47274	15.50	-	√	P
PVT230334310	35746	15.50	-	√	P
PVT230334311	36627	15.50	-	√	P
PVT230334312	47836	15.50	-	√	P
PVT230334313	1779	15.50	-	√	P
PVT230334314	21452	15.50	-	√	P
PVT230334315	24237	15.50	-	√	P
PVT230334316	48772	15.50	-	√	P
PVT230334317	48757	15.50	-	√	P
PVT230334319	48158	15.50	-	√	P
PVT230334320	43546	15.50	-	√	P
PVT230334322	34135	15.50	-	√	P
PVT230334336	26487	12.90	-	√	P
PVT230334337	40184	12.90	-	√	P
PVT230334338	36128	12.90	-	√	P
PVT230334339	44294	12.90	-	√	P
PVT230334340	21122	12.90	-	√	P
Supplementary information: —					

TABLE 22: MQT 15 fin: Final Wet leakage current test		
Test Date [YYYY-MM-DD]	2023-09-26	—
	2023-09-11	—
	2023-09-20	—
	2023-10-09	—
	2023-08-14	—

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Clause	Requirement + Test	Result - Remark	Verdict
	2023-11-07	—	—
	2023-11-28	—	—
	2023-10-25	—	—
	2023-10-26	—	—
	2023-10-12	—	—
Test Voltage applied [V]..... :		1500	—
Solution temperature [°C]..... :		22 ± 2	—
Size of module [m²]		PVT230334307,PVT230334309~17,19~22: 2.58 PVT230334336~41: 3.10	—
Solution resistivity [Ω cm]..... :		≤3500	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
PVT230334307	15.50	1937	P
PVT230334309	15.50	540	P
PVT230334310	15.50	16242	P
PVT230334311	15.50	23415	P
PVT230334312	15.50	25861	P
PVT230334313	15.50	1527	P
PVT230334314	15.50	521	P
PVT230334315	15.50	16357	P
PVT230334316	15.50	24175	P
PVT230334317	15.50	43745	P
PVT230334319	15.50	22615	P
PVT230334320	15.50	20142	P
PVT230334322	15.50	23146	P
PVT230334336	12.90	25376	P
PVT230334337	12.90	13228	P
PVT230334338	12.90	31940	P
PVT230334339	12.90	25473	P
PVT230334340	12.90	21932	P
Supplementary information: —			

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Annex 1: Product Description Sheet (Manufacturers and type references)

A1.1	MODULE TYPE/S
	NES144-7-xxxM

A1.2	MODULE DESIGN
	Module dimensions (L x W x H) [mm] : 2279*1134*30/35
	Weights..... : 27
	Front/Rear cover bonding classification : ☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL
	Cell type reference : 182 mono-crystalline Bifacial solar cell (CZJT-182M-16D1)
	Cell dimensions L x W x T ($\pm$ %) [mm] : 182($\pm$ 0.5) x 91($\pm$ 0.5) x 0.13($\pm$ 0.013)
	Cell thickness [μ m] : 130 $\pm$ 13
	Cell area [cm ²] : 165.1

A1.4	IDENTIFICATION OF MATERIALS
	Front cover..... : 3.2mm/CSG
	Rear cover : FFC-JW3010(plus)/ jolywood
	Encapsulation material front side : JCC-305P/Kun shan tian yangn
	Encapsulation material back side : 305T/ Kun shan tian yangn
	Frame parts : 6063-T5
	Mounting parts..... : -
	Adhesive for frame : HT906Z/Huitian
	Edge sealing : -
	Internal wiring : -
	Cell connector..... : ϕ 0.26mm/Lanxin
	String connector : 0.35x4mm ;0.35x6mm/ 0.3x8mm / Lanxin
	Soldering material..... :
	Fluxing agent : SF105/ Singapore Asahi Chemical and Solder Industries Pet Ltd
	Junction box..... : PV-ZPB090X/ The 40th Institute of China Electronic Technology Group Corporation

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	Cable	62930 IEC 131 1x4,0mm ² / Ningbo Kibor Wire & Cable Co., Ltd.
	Connector	PV-ZPJ030A/ The 40th Institute of China Electronic Technology Group Corporation
	Bypass diode	GFMK4045/ Hangzhou Daoming Micro-electronics Co.,LTD
	Potting material.....	5299W-S/ Hui tian
	Adhesive for junction box	HT906Z/Hui tian
	Additional material (e. g. fixing tape, insulation tape).....	F1510, Suzhou Temeisen

A1.5	MODULE DESIGN - MINIMUM DISTANCES	
	Between cells.....	1.5mm
	Between cell and accessible surfaces.....	13mm
	Between any current carrying part and accessible surfaces	17mm

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION	
	Total number of cells	144
	Serial-parallel connection of cells	SP
	Cells per bypass diode	48
	No. of bypass diodes	3

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Clause	Requirement + Test	Result - Remark	Verdict

A1.1	MODULE TYPE/S		
	NES132-8-xxxM		

A1.2	MODULE DESIGN		
	Module dimensions (L x W x H) [mm]	2384 x 1303 x 30/35	
	Weights	32.5	
	Front/Rear cover bonding classification	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible	

A1.3	SOLAR CELL		
	Cell type reference	210 mono-crystalline Bifacial solar cell (CZJT-210M-18D1)	
	Cell dimensions L x W x T ($\pm$ %) [mm]	210($\pm$ 0.5) x 105($\pm$ 0.5) x 0.13($\pm$ 0.013)	
	Cell thickness [μ m]	130 $\pm$ 13	
	Cell area [cm ²]	220.48	

A1.4	IDENTIFICATION OF MATERIALS		
	Front cover	3.2mm/CSG	
	Rear cover	FFC-JW3010(plus)/ jolywood	
	Encapsulation material front side	JCC-305P/Kun shan tian yangn	
	Encapsulation material back side	305T/ Kun shan tian yangn	
	Frame parts	6063-T5	
	Mounting parts	-	
	Adhesive for frame	HT906Z/Huitian	
	Edge sealing	-	
	Internal wiring	-	
	Cell connector	ϕ 0.26mm/Lanxin	
	String connector	0.35x4mm ;0.35x6mm/ 0.3x8mm / Lanxin	
	Soldering material		
	Fluxing agent	SF105/ Singapore Asahi Chemical and Solder Industries Pet Ltd	
	Junction box	PV-ZPB090X/ The 40th Institute of China Electronic Technology Group Corporation	

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Cable	62930 IEC 131 1x4,0mm ² / Ningbo Kibor Wire & Cable Co., Ltd.	
	Connector	PV-ZPJ030A/ The 40th Institute of China Electronic Technology Group Corporation	
	Bypass diode	GFMK4045/ Hangzhou Daoming Micro-electronics Co.,LTD	
	Potting material.....	5299W-S/ Hui tian	
	Adhesive for junction box	HT906Z/Hui tian	
	Additional material (e. g. fixing tape, insulation tape).....	F1510, Suzhou Temeisen	
A1.5	MODULE DESIGN - MINIMUM DISTANCES		
	Between cells.....	0.9	
	Between cell and accessible surfaces.....	13.5	
	Between any current carrying part and accessible surfaces	16	

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION		
	Total number of cells	132	
	Serial-parallel connection of cells	SP	
	Cells per bypass diode	44	
	No. of bypass diodes	3	

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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 M10		Sample M11		Sample M12		—
Power before alternative stabilization (W)			—		—		—		—
Power after alternative stabilization (W)			—		—		—		—
Supplementary information:									
Step 2: Light exposure									
☐ Simulator ☐ Natural sunlight									
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight									
Sample M10		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:									
Sample M11		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:									
Sample M12		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:									

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Clause	Requirement + Test		Result - Remark		Verdict
Step 3: Stabilization determination					
		Sample M10	Sample M11	Sample M12	Result
Stable power P _{max1} after alternative stabilization (W)		—	—	—	—
Stable power P _{max2} after light exposure (W)		—	—	—	—
Power change P _{max2} to P _{max1} (%)		—	—	—	—
Allowed power change P _{max2} to P _{max1} (%)		—	—	—	—
Is alternative stabilization method valid? (Yes/No)		—	—	—	—
Supplementary information: —					

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							
Test Date [YYYY-MM-DD]				—			
Test method				☒ Simulator ☐ Natural sunlight			
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.2: MQT 19.1 ini: Initial Stabilization procedure								
Light exposure method				☒ Simulator ☐ Natural sunlight				—
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight								
Stabilization criterion x per IEC 61215-1-1 ..								—
Sample #	PVT2303 34301	Test Date (YYYY-MM-DD) start/end :			2023-08-14-2023-08-17			
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	—	—	—	—	571.05	—	—	
1	5	1000	50 ± 10	MPPT	571.57	—	—	
2	5	1000	50 ± 10	MPPT	571.45	0.09	Yes	
Sample #	PVT2303 34302	Test Date (YYYY-MM-DD) start/end :			2023-08-14-2023-08-17			
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	—	—	—	—	570.21	—	—	
1	5	1000	50 ± 10	MPPT	569.87	—	—	
2	5	1000	50 ± 10	MPPT	570.52	0.11	Yes	
Sample #	PVT2303 34329	Test Date (YYYY-MM-DD) start/end:			2023-08-14			

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Clause	Requirement + Test				Result - Remark		Verdict
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	—	—	—	—	578.65	—	—
1	5	1000	50 ± 10	MPPT	578.89	—	—
2	5	1000	50 ± 10	MPPT	579.02	0.06	Yes
Sample #	PVT2303 34330	Test Date (YYYY-MM-DD) start/end :			2023-08-14		
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	—	—	—	—	578.87	—	—
1	5	1000	50 ± 10	MPPT	579.92	—	—
2	5	1000	50 ± 10	MPPT	580.62	0.3	Yes
Sample #	PVT2303 34333	Test Date (YYYY-MM-DD) start/end :			2023-08-08-2023-08-11		
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	—	—	—	—	658.39	—	—
1	5	1000	50 ± 10	MPPT	657.28	—	—
2	5	1000	50 ± 10	MPPT	656.22	0.33	Yes
Sample #	PVT2303 34334	Test Date (YYYY-MM-DD) start/end :			2023-08-08-2023-08-11		
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	—	—	—	—	660.02	—	—
1	5	1000	50 ± 10	MPPT	659.28	—	—
2	5	1000	50 ± 10	MPPT	659.62	0.11	Yes
Sample #	PVT2303 34342	Test Date (YYYY-MM-DD) start/end :			2023-08-08-2023-08-11		
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	—	—	—	—	685.43	—	—
1	5	1000	50 ± 10	MPPT	685.84	—	—
2	5	1000	50 ± 10	MPPT	686.12	0.1	Yes
Sample #	PVT2303 34343	Test Date (YYYY-MM-DD) start/end :			2023-08-08-2023-08-11		

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Clause	Requirement + Test				Result - Remark		Verdict
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	—	—	—	—	684.78	—	—
1	5	1000	50 ± 10	MPPT	685.23	—	—
2	5	1000	50 ± 10	MPPT	685.66	0.13	Yes

Supplementary information: —

☐ 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.4.3: MQT 6.1 Performance at STC after initial stabilization							
Test Date [YYYY-MM-DD]..... :			2023-09-26-2023-08-11				—
			Lower end power class		Higher end power class		—
Pmax(lab) (W) :			≥ 511.02/605.66		≥ 558.34/662.44		—
$\bar{P}_{max}(Lab)$ (W)			≥ 526.83/624.39		≥575.61/682.92		—
Voc(lab) (V) :			≤ 51.36/46.49		≤ 53.51/48.94		—
Isc (lab) (A) :			≤ 13.66/18.19		≤ 14.17/18.80		—
Test method			☒ Simulator ☐ Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
PVT23033 4301	13.542	50.69	12.844	42.87	550.62	80.21	P
PVT23033 4302	13.544	50.67	12.847	42.86	550.62	80.23	P
PVT23033 4330	13.655	52.38	13.001	44.66	580.62	81.18	P
PVT23033 4329	13.653	52.39	13.003	44.53	579.02	80.95	P
PVT23033 4333	17.893	45.55	17.030	37.62	640.67	78.61	P
PVT23033 4334	17.899	45.53	17.032	37.70	642.11	78.79	P

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Clause	Requirement + Test				Result - Remark		Verdict
PVT23033 4343	18.344	47.33	17.385	39.44	685.66	79.03	P
PVT23033 4342	18.342	47.31	17.379	39.48	686.12	78.95	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

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Annex 4: List of measurement equipment

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

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

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
1	Visual inspection	Illuminator	—	2023-12-17	2024-12-18
2		Steel measuring tape	—	2023-11-19	2024-11-20
3	Performance at STC	highlight Solar Simulator	—	2024-05-11	2025-05-10
4		Reference cell	—	2024-05-11	2025-05-10
5		Temperature and humidity meter	—	2023-12-17	2024-12-18
6	Insulation test	Temperature and humidity meter	—	2023-12-17	2024-12-18
7		AC/DC insulated withstand voltage tester	—	2023-11-18	2024-11-19
8	Wet leakage current test	AC/DC insulated withstand voltage tester	—	2023-11-18	2024-11-19
9		Conductivity meter	—	2023-12-18	2024-12-17

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10	Damp-Heat test	Constant temperature and humidity climate chamber	—	2024-04-20	2025-04-21
11	Thermal cycling test	Climate chamber	—	2024-04-20	2025-04-21
12	Humidity-freeze test	Climate chamber	—	2024-04-20	2025-04-21
13	UV preconditioning test	UV test equipment	—	2023-08-05	2024-08-06
14	Reverse Current overload test	current	—	2023-4-27	2024-04-26
15		temperature	—	2023-4-27	2024-04-26
16	Hot-spot endurance test	Steady-state environmental	—	2023-08-15	2024-08-16
17	Performance at low irradiance	highlight Solar Simulator	—	2024-05-11	2025-05-10
18		Reference cell	—	2024-05-11	2025-05-10
19	Outdoor exposure test	Steady-state environmental simulation chamber	—	2023-08-15	2024-08-16
20	Bypass diode thermal testing	Bypass diode thermal test system	—	2023-04-25	2024-04-26
21	Bypass diode functionality test	highlight Solar Simulator	—	2023-05-09	2024-05-10
22	Robustness of termination test	Termination stability measurement	—	2023-07-12	2024-07-13
23	Cut susceptibility test	Stopwatch	—	2023-07-01	2024-07-02
24	Hail test	Hail impact tester	—	2023-06-28	2024-06-29