Test Report issued under the responsibility of:

NCB TÜV SÜD Product Service GmbH
Ridlerstr. 65
D – 80339 München
Germany

TEST REPORT

IEC 61215-series:2016

Terrestrial photovoltaic (PV) modules – Design qualification and type approval

Report Number. ..... :	**704061604115-44 part 1 of 2**
Date of issue ..... :	September 21, 2020
Total number of pages ..... :	123
TÜV SÜD Branch ..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Applicant's name ..... :	Shanghai JA Solar Technology Co., Ltd.
Address ..... :	No. 118, Lane 3111, West Huancheng Road, Fengxian District, 201401, Shanghai, PEOPLE'S REPUBLIC of 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 ..... :	TÜV SÜD Mark
Non-standard test method ..... :	MQT 02, 06, 09, 11, 18 were performed considering the contribution from rear side irradiation. UV15 was also applied to module rear side in sequence C.
Test Report Form No. ..... :	IEC61215D_SE
Test Report Form(s) Originator .... :	TÜV SÜD Product Service GmbH
Master TRF ..... :	2017-11-30

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General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description ..... :	Photovoltaic (PV) Module(s)
Trade Mark ..... :	JA SOLAR 晶澳
Manufacturer ..... :	Shanghai JA Solar Technology Co., Ltd. No. 118, Lane 3111, West Huancheng Road, Fengxian District, 201401, Shanghai, PEOPLE'S REPUBLIC of CHINA
Model/Type reference ..... :	See page 13~17 of this report
Ratings ..... :	See page 13~17 of this report

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**TÜV SÜD Branch:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch	
Testing location/address ..... :		No. 151 Heng Tong Road, Shanghai 200070, P. R. China	
☒	**Associated Testing Laboratory:**	Yangzhou Opto-Electrical Products Testing Institute	
Testing location/address ..... :		No. 10 West Kaifa Road, Yangzhou, 225009 Jiangsu, P. R. China	
Tested by (name + signature) ..... :		Rongwei Jing	Jing Rongwei
Approved by (name + signature) ..... :		Guangxia Fu	Guangxia Fu
☐	**Testing procedure: TMP/CTF Stage 1:**		
Testing location/address ..... :			
Tested by (name + signature) ..... :			
Approved by (name + signature) ..... :			
☐	**Testing procedure: WMT/CTF Stage 2:**		
Testing location/address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name + signature) ..... :			
Approved by (name + signature) ..... :			
☐	**Testing procedure: SMT/CTF Stage 3 or 4:**		
Testing location/address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name + signature) ..... :			
Approved by (name + signature) ..... :			
Supervised by (name + signature) ..... :			

List of Attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual	Version: 3.4, total 44 pages for double glass module. Version: 3.0, total 41 pages for double glass module.
Drawings mechanical	Refer to Annex 2 of 704061604115-44 part 2 of 2
Circuit diagram	Refer to Annex 2 of 704061604115-44 part 2 of 2
Photographs	N/A
Component datasheets / certificates	Refer to TÜV SÜD Application form
Others:	
Product Description Sheet (Manufacturers and type references)	Annex 1, _15_ pages
Test table for verifying other stabilization procedure	Annex 2, _N/A_ pages
Lower and higher output power modules	Annex 3, _15_ pages
List of test equipment used	Annex 4, _2_ pages

Summary of testing:	
Tests performed (name of test and test clause): Based on previous project 704061604115-43A3, following modifications were included: 1) Added alternative cell: JACMDBP-B (half cut 180mm*90mm), JACMEBP-B (half cut 182mm*91mm) for single glass module, manufactured by JA Solar Technology Yangzhou Co., Ltd., 2) Included following similar model types for single glass modules with 180/182mm * 90/91mm cells: JAM72S30-xxx/MR, xxx=510 to 550 in steps of 5 JAM72S30-xxx/MR/1500V, xxx=510 to 550 in steps of 5 JAM72S30-xxx/MR/1000V, xxx=510 to 550 in steps of 5 JAM66S30-xxx/MR, xxx=470 to 505 in steps of 5 JAM66S30-xxx/MR/1500V, xxx=470 to 505 in steps of 5 JAM66S30-xxx/MR/1000V, xxx=470 to 505 in steps of 5 JAM60S30-xxx/MR, xxx=435 to 460 in steps of 5 JAM60S30-xxx/MR/1500V, xxx=435 to 460 in steps of 5 JAM60S30-xxx/MR/1000V, xxx=435 to 460 in steps of 5 All models in each family bin are identical in	**Testing location:** Yangzhou Opto-Electrical Products Testing Institute No. 10 West Kaifa Road, Yangzhou, 225009 Jiangsu, P. R. China

structure, except for different output power. JAM66S30-xxx/MR, JAM60S30-xxx/MR have the similar construction with JAM72S30-xxx/MR except for cell number, module dimensions, 3) Increased the over-current protection rating to 25A for JAM72S30-xxx/MR, JAM66S30-xxx/MR, JAM60S30-xxx/MR, Following tests were conducted on representative model JAM72S30-520/MR with cell JACMDBP-B (sample M1-x) according to retest guideline 4.2.3, 4.2.13 of IEC TS 62915 Edition 1.0: Hot-spot endurance test (MQT 09) Thermal cycling test, 200 cycles (MQT 11) Damp heat test (MQT 13) Static mechanical load test (MQT 16) Bypass diode thermal test (MQT 18.1) JAM72S30-510/MR, JAM72S30-525/MR with cell JACMDBP-B were selected as the representative models for qualification of Lower end & Higher end power class. JAM72S30-550/MR with cell JACMEBP-B was selected as the representative models for qualification of Higher end power class. 4) Added alternative cell: JACMEBP-B (half cut 180mm*90mm or 182mm*91mm) for single glass module, manufactured by Aikosolar Energy Technology Co., Ltd., Following tests were conducted on representative model JAM72S30-520/MR with cell JACMEBP-B(180mm*90mm) (sample M2-x) according to retest guideline 4.2.3 of IEC TS 62915 Edition 1.0: Hot-spot endurance test (MQT 09) Thermal cycling test, 200 cycles (MQT 11) Bypass diode thermal test (MQT 18.1) JAM72S30-510/MR, JAM72S30-525/MR with cell JACMEBP-B(180mm*90mm) were selected as the representative models for qualification of Lower end & Higher end power class. JAM72S30-550/MR with cell JACMEBP-B(181mm*91mm) was selected as the representative models for qualification of Higher end power class. 5) Added alternative cell: JACMDBP-B (half cut 180mm*90mm), JACMEBP-B (half cut 182mm*91mm) for double glass module, manufactured by JA Solar Technology Yangzhou Co., Ltd., 6) Included following similar model types for double glass modules with 180/180mm * 90/91mm cells: JAM72D30-xxx/MB, xxx=505 to 545 in steps of 5 JAM72D30-xxx/MB/1500V, xxx=505 to 545 in	

steps of 5 JAM66D30-xxx/MB, xxx=465 to 500 in steps of 5 JAM66D30-xxx/MB/1500V, xxx=465 to 500 in steps of 5 JAM60D30-xxx/MB, xxx=435 to 455 in steps of 5 JAM60D30-xxx/MB/1500V, xxx=435 to 455 in steps of 5 All models in each family bin are identical in structure, except for different output power. JAM66D30-xxx/MB, JAM60D30-xxx/MB have the similar construction with JAM72D30-xxx/MB except for cell number, module dimensions, 7) Increased the over-current protection rating to 30A for JAM72D30-xxx/MB, JAM66D30-xxx/MB, JAM60D30-xxx/MB, Following tests were conducted on representative model JAM72D30-520/MB with cell JACMDBP-B (sample M3-x) according to retest guideline 4.2.3, 4.2.3, 4.2.13 of IEC TS 62915 Edition 1.0: Hot-spot endurance test (MQT 09) UV preconditioning test (MQT 10) Thermal cycling test, 50 & 200 cycles (MQT 11) Humidity freeze test (MQT 12) Damp heat test (MQT 13) Static mechanical load test (MQT 16) Bypass diode thermal test (MQT 18.1) JAM72D30-505/MB, JAM72D30-525/MB with cell JACMDBP-B were selected as the representative models for qualification of Lower end & Higher end power class. JAM72D30-545/MB with cell JACMEBP-B was selected as the representative models for qualification of higher end power class. 8) Added alternative cell: JACMEBP-B (half cut 180mm*90mm or 182mm*91mm) for double glass module, manufactured by Aikosolar Energy Technology Co., Ltd., Following tests were conducted on representative model JAM72D30-520/MB with cell JACMEBP-B(180mm*90mm) (sample M4-x) according to retest guideline 4.2.3 of IEC TS 62915 Edition 1.0: Hot-spot endurance test (MQT 09) UV preconditioning test (MQT 10) Thermal cycling test, 50 & 200 cycles (MQT 11) Humidity freeze test (MQT 12) Bypass diode thermal test (MQT 18.1) JAM72D30-505/MB, JAM72D30-525/MB with cell JACMEBP-B(180mm*90mm) were selected as the representative models for qualification of Lower end & Higher end power class.	

JAM72D30-545/MB with cell JACMEBP-B(182mm*91mm) was selected as the representative models for qualification of higher end power class. 9) Added 35mm height frame section design for JAM72S20, JAM72S09, JAM72S10, JAM72S12, JAM72S17 families: Following tests were conducted on representative model JAM72S20-445/MR (sample M5-x) according to retest guideline 4.2.10 of IEC TS 62915 Edition 1.0: Damp heat test (MQT 13) Static mechanical load test (MQT 16) 10) Updated the Rated input current of J-box PVJB-JA-004/004L from '15A or 20A' to '15A or 20A or 25A', 11) Added alternative potting material 'TONSAN 1521' for J-box PVJB-JA-004/004L, 12) Added alternative bypass diodes 'SBT4050DY', 'XND18-V30C', 'XND18-V30P' for J-box PVJB-JA-004/004L, 13) Added alternative cable 'Type: 62930 IEC 131 1×4mm2' for J-box PVJB-JA-004/004L, Tests were performed on component level in TÜV SÜD report 704071800714-05A2. 14) Added alternative J-box: JSD03 and material combinations, tests were performed on component level in TÜV SÜD report 704071914601-03A1. 15) Added alternative frame manufacturer: Anhui Xinbo Aluminium Industry Share Co., Ltd., no test was considered to be necessary.	

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

The text of IEC 61215-1: 2016 was approved by CENELEC as EN 61215-1: 2016 without any modification.

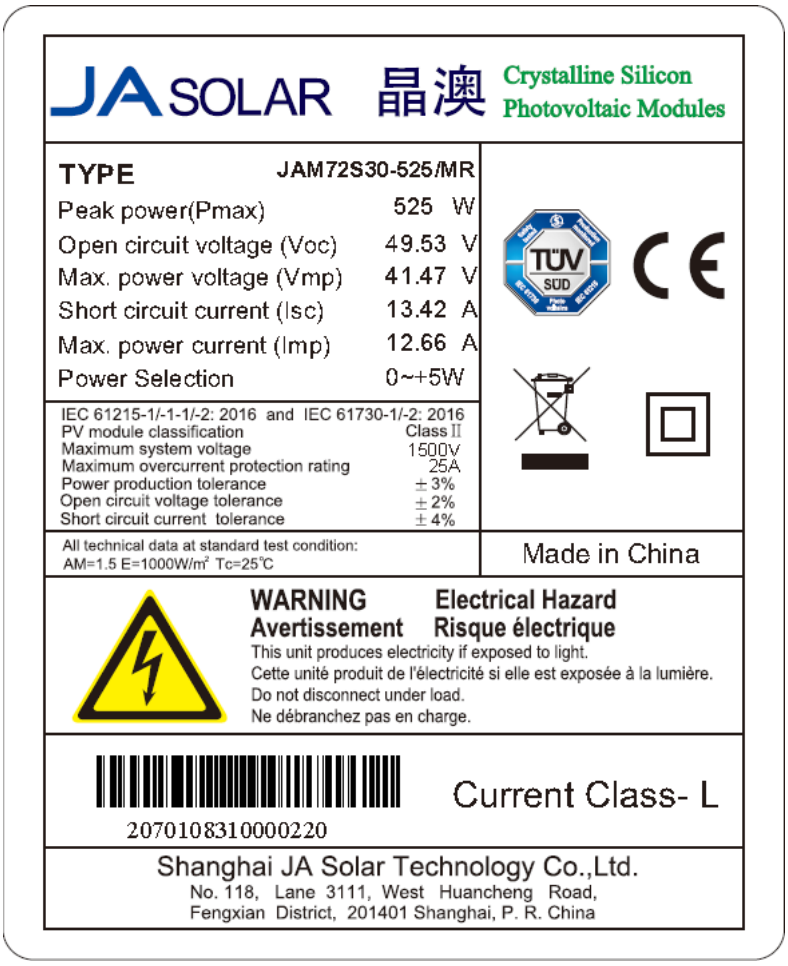
The text of IEC 61215-1-1: 2016 was approved by CENELEC as EN 61215-1-1: 2016 without any modification.

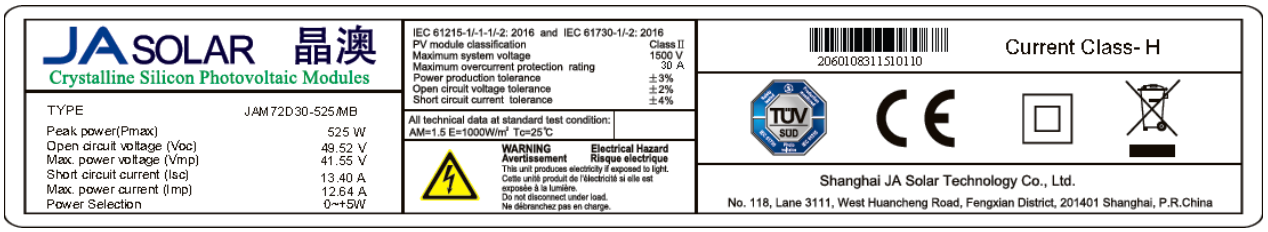
The text of IEC 61215-2: 2016 was approved by CENELEC as EN 61215-2: 2017 without any modification.

☒ **The product fulfils the requirements of _ EN 61215-1: 2016, EN 61215-1-1: 2016 & EN 61215-2: 2017**

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by TÜV SÜD Product Service GmbH 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.)

Test item particulars..... :	Refer to TEST FLOW
Accessories and detachable parts included in the evaluation..... :	N/A
Mounting system used..... :	Refer to user manual
Other options included..... :	N/A
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Abbreviations used in the report:	
Pmax – Maximum power	HF – Humidity Freeze
Vmp – Maximum power voltage	DH – Damp Heat
Imp – Maximum power current	TC – Thermal Cycling
Isc – Short circuit current	α – Current temperature coefficient
Voc – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m²)	NMOT – Nominal Module Operating Temperature (20°C, 800 W/m²)
MQT – Module Quality Tests	$V_{FMrated}$ – 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..... :	July 13, 2020
Dates of tests (beginning/end)..... :	July 16, 2020 to September 18, 2020

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 IECEE 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 IECEE 02:	
The application for obtaining a TÜV SÜD 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) ..... :	1. Shanghai JA Solar Technology Co., Ltd. No. 118, Lane 3111, West Huancheng Road, Fengxian District, 201401, Shanghai, PEOPLE'S REPUBLIC of CHINA Factory No.: 72092 2. Hefei JA Solar Technology Co., Ltd No. 999, Changning Road, Hi-tech Zone, 230088 Hefei City, Anhui Province, PEOPLE'S REPUBLIC of CHINA Factory No.: 79395 3. JA SOLAR CO., LTD. Jinglong Street, Ningjin County, 055550 Xingtai, Hebei, PEOPLE'S REPUBLIC OF CHINA Factory No.: 72056 4. Vina Solar Technology Co., Ltd E12 factory, lot CN-03, Van Trung Industrial park, 21000 Bac Giang Province, Vietnam Factory No.: 90968 5. JA Solar (Xingtai) Co., Ltd No. 1688, Chang An Road, Xingtai Economic Development Area, 054000 Xingtai City, Hebei Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 95903 6. Philadelphia Solar LTD. CO Al Qastal Industrial Area, Air freight Road, 11814 Amman, JORDAN Factory No.: 101572

	7. Dongying Dahai Kelin Solar Power Co., Ltd Yankou Village, Daozhuang Town, Guangrao County 257336 Dongying City, Shandong Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 01783 8. Laiwu Cleo Solar Power Co., Ltd. Room 101, No. 7 Zhenxing Road, Economic Development Zone 271100 Laiwu, Shandong, PEOPLE'S REPUBLIC OF CHINA Factory No.: 102852 9. DAS SOLAR CO., LTD. No. 43, South of Bailing Rd, Quzhou Green Industry Clustering Zone, 324000 Quzhou, Zhejiang Province PEOPLE'S REPUBLIC OF CHINA Factory No.: 102627 10. Tongwei Solar (Hefei) Co., Ltd. No. 888 Changning Road High-tech District 230088 Hefei, Anhui PEOPLE'S REPUBLIC OF CHINA Factory No.: 090075 11. Tangshan Haitai New Energy Technology Co., Ltd. No. 88 Haomen road, Yutai industrial zone, Yutian 064100 Tangshan, Hebei PEOPLE'S REPUBLIC OF CHINA Factory No.: 078666 12. Hengdian Group DMEGC Magnetics CO., LTD Hengdian Industrial Zone, Dongyang, Zhejiang, China 322118 Factory No.: 076053 13. Econess Energy Co., Ltd. No.58 Haida Road Huashi Town 214421 Jiang Yin, Jiangsu Province People's Republic of China Factory No.: 078439 14.YONZ PV. OEM (ChangZhou) Co., LTD No.99 Yuehu North Road Jintan District 213200 Changzhou, Jiangsu PEOPLE'S REPUBLIC OF CHINA Factory No.: 104704 15. Xuzhou Jiayu Solar Energy Technology Co., Ltd. North of Peigong Road, East of Hankang Road, Peixian Economic Development Zone, 221699 Xuzhou, Jiangsu, People's Republic of China Factory No.: 105721 16. Funing GCL System Integration Technology Co., Ltd.

	No.888(A) Hong Kong Road, Funing Ecnomic Development Zone Yancheng City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 105673 17. BaoDing Lightway Green Energy Technology Co., Ltd. Gaobeidian New Industry Park 074000 Gaobeidian, Hebei Province PEOPLE'S REPUBLIC OF CHINA Factory No.: 082738 18. Jiangsu Chuangji Renewable Energy Co., Ltd. No. 35 Jiangong Rd., Nanfeng Town Zhangjiagang, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 107160 19. Anhui Dongsheng New Energy Co., Ltd. No.11 Plant, Optical-Mechanical-Electrical Agglomeration Area, Guoyang County, 233600 Bozhou, Anhui, PEOPLE'S REPUBLIC OF CHINA Factory No.: 104585 20. Jurong GCL System Integration Technology Co., Ltd. No.999 Konggang New District, Guozhuang Town, 212400 Jurong City, PEOPLE'S REPUBLIC OF CHINA Factory No.: 105674 21. Changzhou Almaden Co., Ltd 639, Qinglong East Road, 213000 Changzhou, Jiangsu, PEOPLE'S REPUBLIC OF CHINA Factory No.: 084671 22. GK Solar Power Co., Ltd. Yiyuan Economic Development Zone 256100 Zibo City, Shandong Province PEOPLE'S REPUBLIC OF CHINA Factory No.: 096716 23. Suzhou Akcome Optronics Science & Technology Co., Ltd. No.110 West Jintang Road, Economic Development Zone, 215600 Zhangjiagang, PEOPLE'S REPUBLIC OF CHINA Factory No.: 103323 24. Jiangsu Jinko Day Sheng Solar Co., Ltd. No. 228 Yuesheng North Road, Industry Center, Fanshui Town, Baoying County, 225819 Yangzhou City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 108228

	25.Jetion Solar (China) Co., Ltd. No. 1011, Zhencheng Rd., Shengang Industrial District, 214443 Jiangyin, PEOPLE'S REPUBLIC OF CHINA Factory No.: 068988 26.Junfeng Solar (jiangsu) Co., Ltd. No. 20, 21 Group, Tangang Village, Haian Industry Park, 226600, Haian, Jiangsu, PEOPLE'S REPUBLIC OF CHINA Factory No.: 079922 27.Yangzhou Jinghua New Energy Technology Co., LTD. Xiancheng Industrial Park, Jiangdu District, 225200 Yangzhou City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 108293 28. Yimeixu WitChip Energy Hitech Co., Ltd. Building 2, No. 48, 2nd Donggang Road 324000 Quzhou, Zhejiang Province PEOPLE'S REPUBLIC OF CHINA Factory No.: 096558 29. Zhejiang Akcome Optronics Science & Technology Co., Ltd. Zheneng Science and Technology Industrial Park, Meishan Town, Changxing, 313000 Huzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 108820 30. JA Solar New Energy Yangzhou Co., Ltd. No.1, Jianhua Road, Economic Development Zone, 225000 Yangzhou City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 108746 31. Huajun Power Technology (Jiangsu) Co., LTD No. 7 Konggang New Area, Guozhuang Town, 212400 Jurong, Jiangsu, PEOPLE'S REPUBLIC OF CHINA Factory No.: 101631 32. Anhui Schutten Solar Energy Co., Ltd. Weisan Road, Quanjiao Economic Development Area, 239500 Chuzhou City, Anhui Province, PEOPLE'S REPUBLIC OF CHINA Factory No.: 108941 33. Nantong Pengneng Industrial Co., Ltd Group 2, Jinqiao Village, Chahe Town, Rudong Country 226403 Nantong City, Jiangsu Province PEOPLE'S REPUBLIC OF CHINA

		Factory No.: 002225		
PRODUCT ELECTRICAL RATINGS:				
Module type	JAM72S30-510/MR	JAM72S30-515/MR	JAM72S30-520/MR	JAM72S30-525/MR
	JAM72S30-510/MR/1000V	JAM72S30-515/MR/1000V	JAM72S30-520/MR/1000V	JAM72S30-525/MR/1000V
	JAM72S30-510/MR/1500V	JAM72S30-515/MR/1500V	JAM72S30-520/MR/1500V	JAM72S30-525/MR/1500V
Voc [V] /Tolerance	48.78(±2%)	48.88(±2%)	49.00(±2%)	49.15(±2%)
Isc [Adc] /Tolerance	13.44(±4%)	13.51(±4%)	13.58(±4%)	13.65(±4%)
Vmp [V]	40.64	40.81	40.98	41.15
Imax [Adc]	12.55	12.62	12.69	12.76
Pmp [W] /Tolerance	510(±3%)	515(±3%)	520(±3%)	525(±3%)
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	1500/1000
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	JAM72S30-530/MR	JAM72S30-535/MR	JAM72S30-540/MR	JAM72S30-545/MR
	JAM72S30-530/MR/1000V	JAM72S30-535/MR/1000V	JAM72S30-540/MR/1000V	JAM72S30-545/MR/1000V
	JAM72S30-530/MR/1500V	JAM72S30-535/MR/1500V	JAM72S30-540/MR/1500V	JAM72S30-545/MR/1500V
Voc [V] /Tolerance	49.30(±2%)	49.45(±2%)	49.60(±2%)	49.75(±2%)
Isc [Adc] /Tolerance	13.72(±4%)	13.79(±4%)	13.86(±4%)	13.93(±4%)
Vmp [V]	41.31	41.47	41.64	41.80
Imax [Adc]	12.83	12.90	12.97	13.04
Pmp [W] /Tolerance	530(±3%)	535(±3%)	540(±3%)	545(±3%)
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	1500/1000
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	JAM72S30-550/MR	JAM66S30-470/MR	JAM66S30-475/MR	JAM66S30-480/MR
	JAM72S30-550/MR/1000V	JAM66S30-470/MR/1000V	JAM66S30-475/MR/1000V	JAM66S30-480/MR/1000V

	JAM72S30-550/MR/1500V	JAM66S30-470/MR/1500V	JAM66S30-475/MR/1500V	JAM66S30-480/MR/1500V
Voc [V] /Tolerance	49.90(±2%)	44.81(±2%)	44.94(±2%)	45.07(±2%)
Isc [Adc] /Tolerance	14.00(±4%)	13.51(±4%)	13.58(±4%)	13.65(±4%)
Vmp [V]	41.96	37.25	37.44	37.62
Imax [Adc]	13.11	12.62	12.69	12.76
Pmp [W] /Tolerance	550(±3%)	470(±3%)	475(±3%)	480(±3%)
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	1500/1000
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	JAM66S30-485/MR	JAM66S30-490/MR	JAM66S30-495/MR	JAM66S30-500/MR
	JAM66S30-485/MR/1000V	JAM66S30-490/MR/1000V	JAM66S30-495/MR/1000V	JAM66S30-500/MR/1000V
	JAM66S30-485/MR/1500V	JAM66S30-490/MR/1500V	JAM66S30-495/MR/1500V	JAM66S30-500/MR/1500V
Voc [V] /Tolerance	45.20(±2%)	45.33(±2%)	45.46(±2%)	45.59(±2%)
Isc [Adc] /Tolerance	13.72(±4%)	13.79(±4%)	13.86(±4%)	13.93(±4%)
Vmp [V]	37.81	37.99	38.17	38.35
Imax [Adc]	12.83	12.90	12.97	13.04
Pmp [W] /Tolerance	485(±3%)	490(±3%)	495(±3%)	500(±3%)
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	1500/1000
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	JAM66S30-505/MR	JAM60S30-435/MR	JAM60S30-440/MR	JAM60S30-445/MR
	JAM66S30-505/MR/1000V	JAM60S30-435/MR/1000V	JAM60S30-440/MR/1000V	JAM60S30-445/MR/1000V
	JAM66S30-505/MR/1500V	JAM60S30-435/MR/1500V	JAM60S30-440/MR/1500V	JAM60S30-445/MR/1500V
Voc [V] /Tolerance	45.72(±2%)	40.96(±2%)	41.08(±2%)	41.21(±2%)
Isc [Adc] /Tolerance	14.00(±4%)	13.63(±4%)	13.71(±4%)	13.79(±4%)
Vmp [V]	38.53	34.12	34.33	34.50
Imax [Adc]	13.11	12.75	12.82	12.90
Pmp [W] /Tolerance	505(±3%)	435(±3%)	440(±3%)	445(±3%)
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	1500/1000

Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	JAM60S30-450/MR	JAM60S30-455/MR	JAM60S30-460/MR	
	JAM60S30-450/MR/1000V	JAM60S30-455/MR/1000V	JAM60S30-460/MR/1000V	
	JAM60S30-450/MR/1500V	JAM60S30-455/MR/1500V	JAM60S30-460/MR/1500V	
Voc [V] /Tolerance	41.33(±2%)	41.46(±2%)	41.58(±2%)	
Isc [Adc] /Tolerance	13.87(±4%)	13.94(±4%)	14.01(±4%)	
Vmp [V]	34.67	34.87	35.07	
Imax [Adc]	12.98	13.05	13.12	
Pmp [W] /Tolerance	450(±3%)	455(±3%)	460(±3%)	
Maximum system voltage [V]	1500/1000	1500/1000	1500/1000	
Maximum Over-Current Protection Rating [A]	25	25	25	
Module type	JAM72D30-505/MB	JAM72D30-510/MB	JAM72D30-515/MB	JAM72D30-520/MB
	JAM72D30-505/MB/1500V	JAM72D30-510/MB/1500V	JAM72D30-515/MB/1500V	JAM72D30-520/MB/1500V
Voc [V] /Tolerance	48.55(±2%)	48.70(±2%)	48.85(±2%)	49.00(±2%)
Isc [Adc] /Tolerance	13.37(±4%)	13.44(±4%)	13.51(±4%)	13.58(±4%)
Vmp [V]	40.47	40.64	40.81	40.98
Imax [Adc]	12.48	12.55	12.62	12.69
Pmp [W] /Tolerance	505(±3%)	510(±3%)	515(±3%)	520(±3%)
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	JAM72D30-525/MB	JAM72D30-530/MB	JAM72D30-535/MB	JAM72D30-540/MB
	JAM72D30-525/MB/1500V	JAM72D30-530/MB/1500V	JAM72D30-535/MB/1500V	JAM72D30-540/MB/1500V
Voc [V] /Tolerance	49.15(±2%)	49.30(±2%)	49.45(±2%)	49.60(±2%)
Isc [Adc] /Tolerance	13.65(±4%)	13.72(±4%)	13.79(±4%)	13.86(±4%)
Vmp [V]	41.15	41.31	41.47	41.64
Imax [Adc]	12.76	12.83	12.90	12.97

Pmp [W] /Tolerance	525(±3%)	530(±3%)	535(±3%)	540(±3%)
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	JAM72D30-545/MB	JAM66D30-465/MB	JAM66D30-470/MB	JAM66D30-475/MB
	JAM72D30-545/MB/1500V	JAM66D30-465/MB/1500V	JAM66D30-470/MB/1500V	JAM66D30-475/MB/1500V
Voc [V] /Tolerance	49.75(±2%)	44.68(±2%)	44.81(±2%)	44.94 (±2%)
Isc [Adc] /Tolerance	13.93(±4%)	13.44(±4%)	13.51(±4%)	13.58(±4%)
Vmp [V]	41.80	37.06	37.25	37.44
Imax [Adc]	13.04	12.55	12.62	12.69
Pmp [W] /Tolerance	545(±3%)	465(±3%)	470(±3%)	475(±3%)
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	JAM66D30-480/MB	JAM66D30-485/MB	JAM66D30-490/MB	JAM66D30-495/MB
	JAM66D30-480/MB/1500V	JAM66D30-485/MB/1500V	JAM66D30-490/MB/1500V	JAM66D30-495/MB/1500V
Voc [V] /Tolerance	45.07(±2%)	45.20(±2%)	45.33(±2%)	45.46(±2%)
Isc [Adc] /Tolerance	13.65(±4%)	13.72(±4%)	13.79(±4%)	13.86(±4%)
Vmp [V]	37.62	37.81	37.99	38.17
Imax [Adc]	12.76	12.83	12.90	12.97
Pmp [W] /Tolerance	480(±3%)	485(±3%)	490(±3%)	495(±3%)
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	JAM66D30-500/MB	JAM60D30-435/MB	JAM60D30-440/MB	JAM60D30-445/MB
	JAM66D30-500/MB/1500V	JAM60D30-435/MB/1500V	JAM60D30-440/MB/1500V	JAM60D30-445/MB/1500V
Voc [V] /Tolerance	45.59(±2%)	40.96(±2%)	41.08(±2%)	41.21(±2%)
Isc [Adc] /Tolerance	13.93(±4%)	13.63(±4%)	13.71(±4%)	13.79(±4%)
Vmp [V]	38.35	34.12	34.33	34.50

Imax [Adc]	13.04	12.75	12.82	12.90
Pmp [W] /Tolerance	500(±3%)	435(±3%)	440(±3%)	445(±3%)
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	JAM60D30-450/MB	JAM60D30-455/MB		
	JAM60D30-450/MB/1500V	JAM60D30-455/MB/1500V		
Voc [V] /Tolerance	41.33(±2%)	41.46(±2%)		
Isc [Adc] /Tolerance	13.87(±4%)	13.94(±4%)		
Vmp [V]	34.67	34.87		
Imax [Adc]	12.98	13.05		
Pmp [W] /Tolerance	450(±3%)	455(±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 4				

GENERAL PRODUCT INFORMATION AND OTHER REMARKS:

Modifications:

☐ Initial module design qualification

☒ Extension of module design qualification

☒ Original test report ref. No. .....: 704061604115-43A3

Model differences and modification:

☒ Test programs for crystalline silicon PV modules

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

☐ Test programs for thin-film PV modules

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

Note: The clause references modifications extracted from IEC 62915

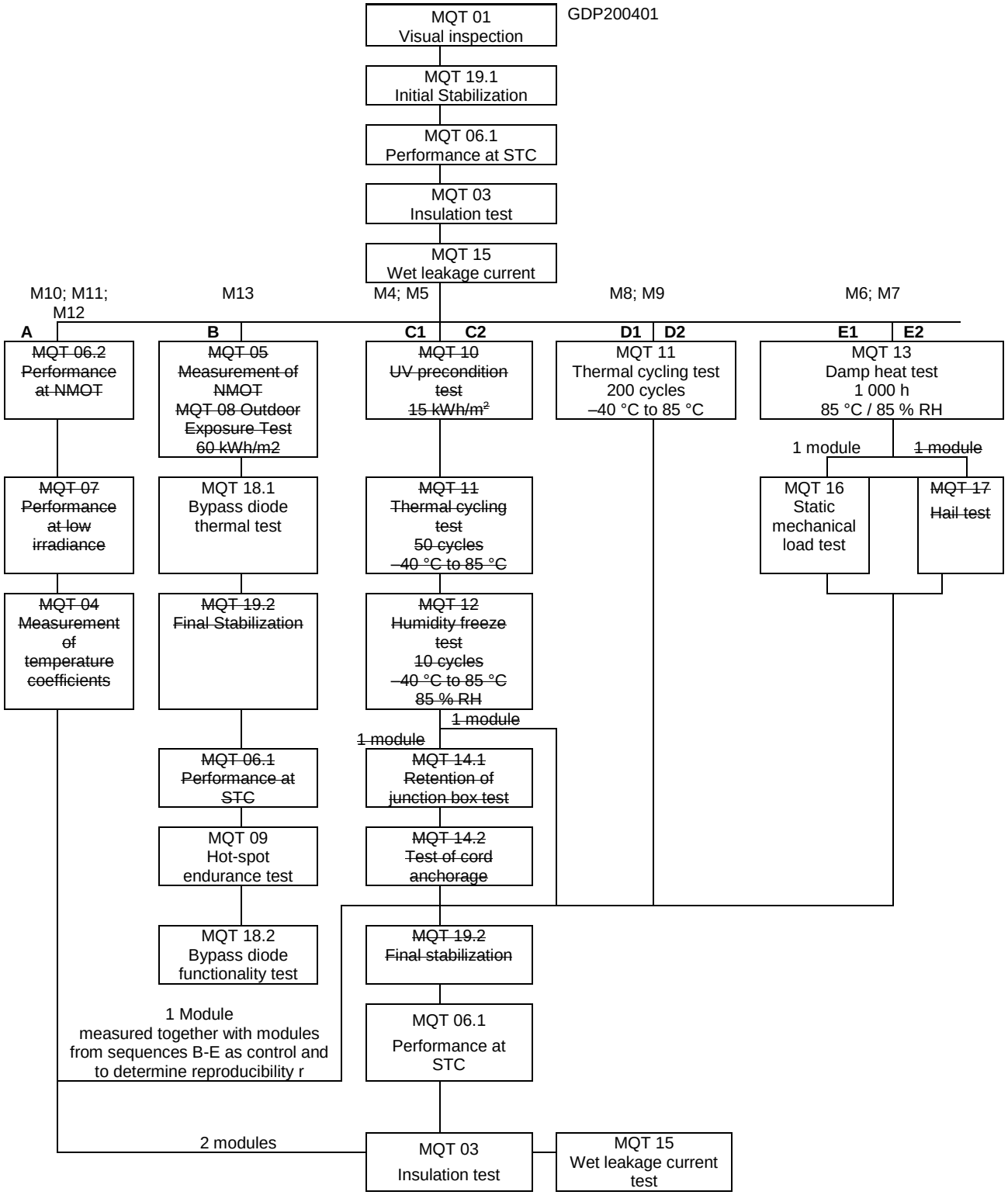
MODULE GROUP ASSIGNMENT:				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
Material combination 1: EVA F406P/F806S + Cell JACMDBP-B (JA)				
M1-10 (GDP200401-1)	A	JAM72S30-520/MR	2070108310000250	Control module
M1-13 (GDP200401-2)	B	JAM72S30-520/MR	2070108310000246	BT/HS
M1-8 (GDP200401-3)	D1	JAM72S30-520/MR	2070108310000227	TC200
M1-9 (GDP200401-4)	D2	JAM72S30-520/MR	2070108310000162	TC200
M1-6 (GDP200401-5)	E1	JAM72S30-520/MR	2070108310000220	DH1000/SML
M1-7 (GDP200401-6)	E2	JAM72S30-520/MR	2070108310000236	DH1000
GDP200401-17	Low 1-1	JAM72S30-510/MR	2070108310000148	Lower end power class
GDP200401-18	Low 1-2	JAM72S30-510/MR	2070108310000130	Lower end power class
GDP200401-15	High 1-1	JAM72S30-525/MR	2070108310000184	Higher end power class
GDP200401-16	High 1-2	JAM72S30-525/MR	2070108310000185	Higher end power class
Cell JACMEBP-B (JA)				
GDP200530-30	High 1-3	JAM72S30-550/MR	208M8A7231000042	Higher end power class
GDP200530-31	High 1-4	JAM72S30-550/MR	208M8A7231000043	Higher end power class
Material combination 2: EVA F406P/F806S + Cell JACMEBP-B (180mm*90mm, Aikosolar)				
M2-10 (GDP200428-1)	A	JAM72S30-520/MR	2070108310000256	Control module
M2-13 (GDP200428-2)	B	JAM72S30-520/MR	2070108310000229	HS
M2-8 (GDP200428-3)	D1	JAM72S30-520/MR	2070108310000187	TC200
M2-9 (GDP200428-4)	D2	JAM72S30-520/MR	2070108310000254	TC200
GDP200428-13	Low 2-1	JAM72S30-510/MR	2070108310000150	Lower end power class

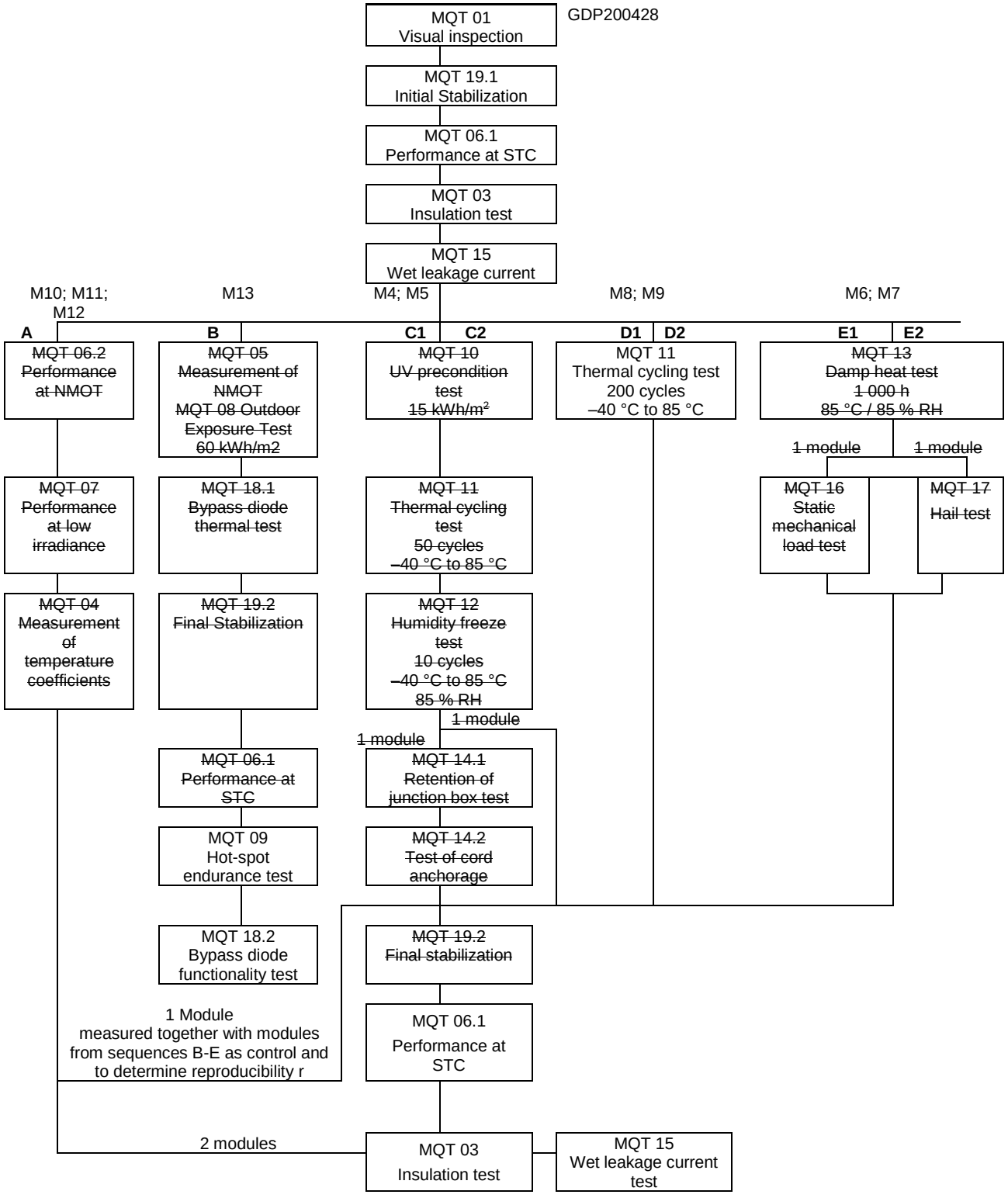
GDP200428-14	Low 2-2	JAM72S30-510/MR	2070108310000152	Lower end power class
GDP200428-11	High 2-1	JAM72S30-525/MR	2070108310000179	Higher end power class
GDP200428-12	High 2-2	JAM72S30-525/MR	2070108310000191	Higher end power class
Cell JACMEBP-B (182mm*91mm, Aikosolar)				
GDP200530-28	High 2-3	JAM72S30-545/MR	208M8A7231000040	Higher end power class
GDP200530-29	High 2-4	JAM72S30-545/MR	208M8A7231000041	Higher end power class
Material combination 3: POE TF4 + Cell JACMDBP-B (JA)				
M3-10 (GDP200402-1)	A	JAM72D30-520/MB	2060108311510120	Control module
M3-13 (GDP200402-2)	B	JAM72D30-520/MB	2060108311510113	HS/BT
M3-4 (GDP200402-3)	C1	JAM72D30-520/MB	2060108311510107	UV/TC50/HF/RT
M3-5 (GDP200402-4)	C2	JAM72D30-520/MB	2060108311510115	UV/TC50/HF
M3-8 (GDP200402-5)	D1	JAM72D30-520/MB	2060108311510116	TC200
M3-9 (GDP200402-6)	D2	JAM72D30-520/MB	2060108311510114	TC200
M3-6 (GDP200402-8)	E1	JAM72D30-520/MB	2070108310000120	DH1000/SML
M3-7 (GDP200402-7)	E2	JAM72D30-520/MB	2070108310000076	DH1000
GDP200402-12	Low 3-1	JAM72D30-505/MB	2070108310000045	Lower end power class
GDP200402-13	Low 3-2	JAM72D30-505/MB	2070108310000056	Lower end power class
GDP200402-10	High 3-1	JAM72D30-525/MB	2060108311510110	Higher end power class
GDP200402-11	High 3-2	JAM72D30-525/MB	2060108311510111	Higher end power class
Cell JACMEBP-B (JA)				
GDP200529-28	High 3-3	JAM72D30-545/MB	208M8B7232000614	Higher end power class
GDP200529-32	High 3-4	JAM72D30-545/MB	208M8B7232000476	Higher end power class
Material combination 4: POE TF4 + Cell JACMEBP-B (180mm*90mm, Aikosolar)				

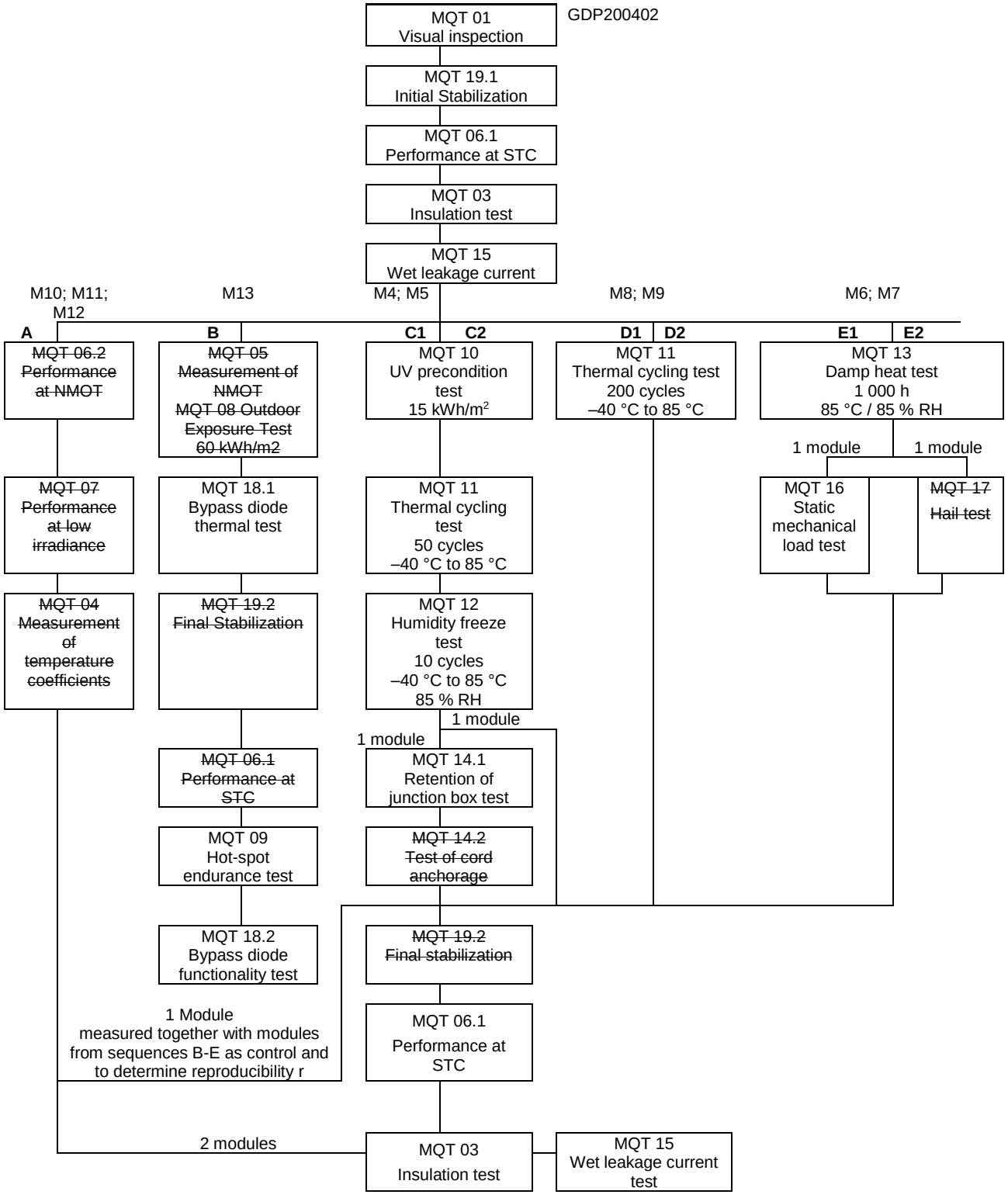
M4-10 (GDP200429-1)	A	JAM72D30-520/MB	2070108310000065	Control module
M4-13 (GDP200429-2)	B	JAM72D30-520/MB	2070108310000100	BT/HS
M4-4 (GDP200429-5)	C1	JAM72D30-520/MB	2070108310000059	UV/TC50/HF/RT
M4-5 (GDP200429-6)	C2	JAM72D30-520/MB	2070108310000079	UV/TC50/HF
M4-8 (GDP200429-3)	D1	JAM72D30-520/MB	2070108310000075	TC200
M4-9 (GDP200429-4)	D2	JAM72D30-520/MB	2070108310000002	TC200
GDP200429-13	Low 4-1	JAM72D30-505/MB	2070108310000038	Lower end power class
GDP200429-14	Low 4-2	JAM72D30-505/MB	2070108310000040	Lower end power class
GDP200429-11	High 4-1	JAM72D30-525/MB	2060108311510112	Higher end power class
GDP200429-12	High 4-2	JAM72D30-525/MB	2060108311510118	Higher end power class
Cell JACMEBP-B (182mm*91mm, Aikosolar)				
GDP200529-30	High 4-3	JAM72D30-545/MB	208M8B7232000471	Higher end power class
GDP200529-31	High 4-4	JAM72D30-545/MB	208M8B7232000473	Higher end power class
Material combination 5: 35mm height frame section design				
M5-10 (GDP200396-1)	A	JAM72S20-445/MR	207M6T7225040198	Control module
M5-13 (GDP200396-2)	E1	JAM72S20-445/MR	207M6T7225040309	DH1000/SML
M5-6 (GDP200396-3)	E1	JAM72S20-445/MR	207M6T7225040311	DH1000/SML
M5-7 (GDP200396-4)	E1	JAM72S20-445/MR	207M6T7225040361	DH1000/SML
Supplementary information: Further qualification for higher and/or lower output power see annex 3				

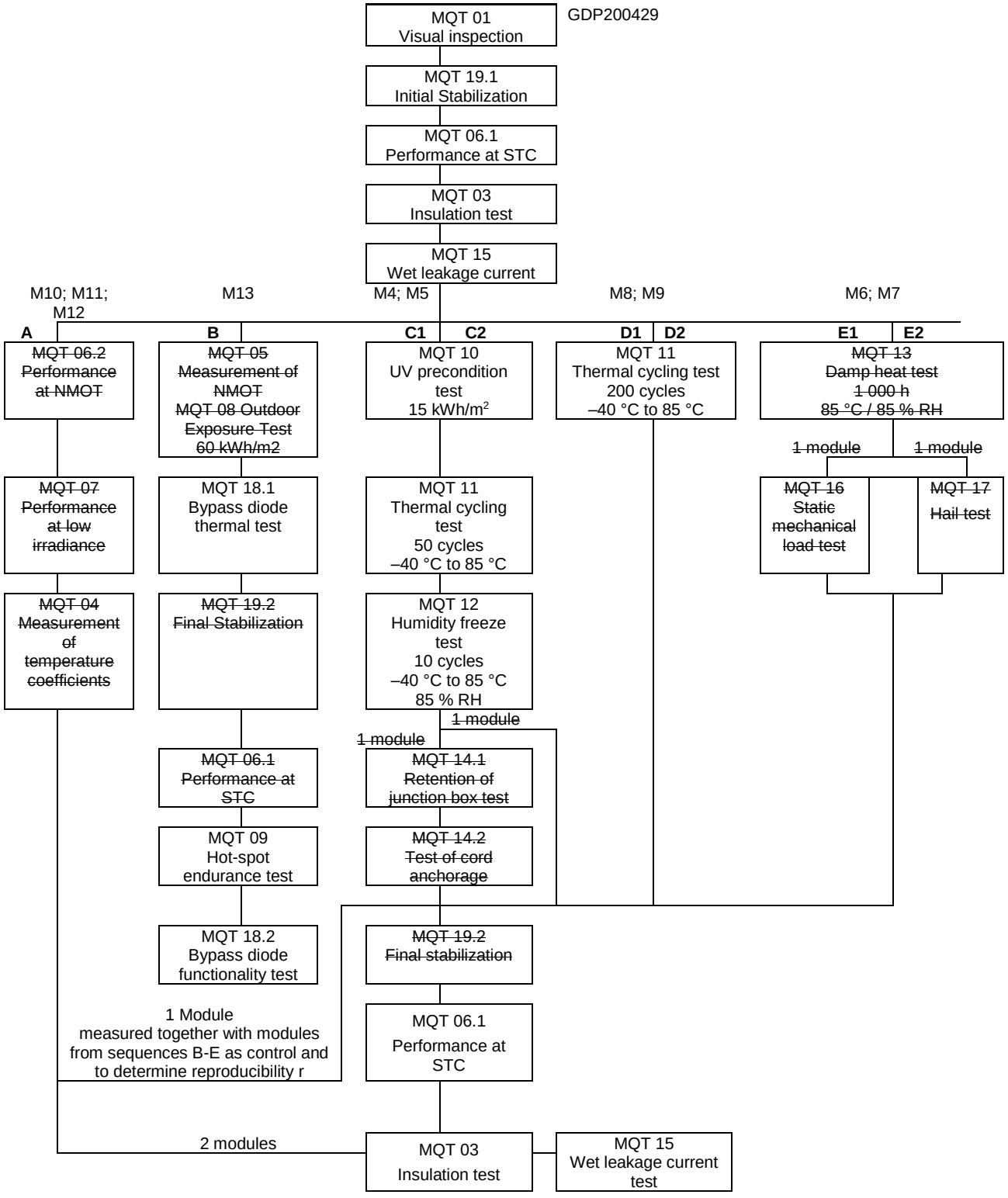
Note (1)	Use the “General product information” field to give any information on model differences within a product type family covered by the test report and to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.
Note (3)	Use Annex 1 to list the used materials 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

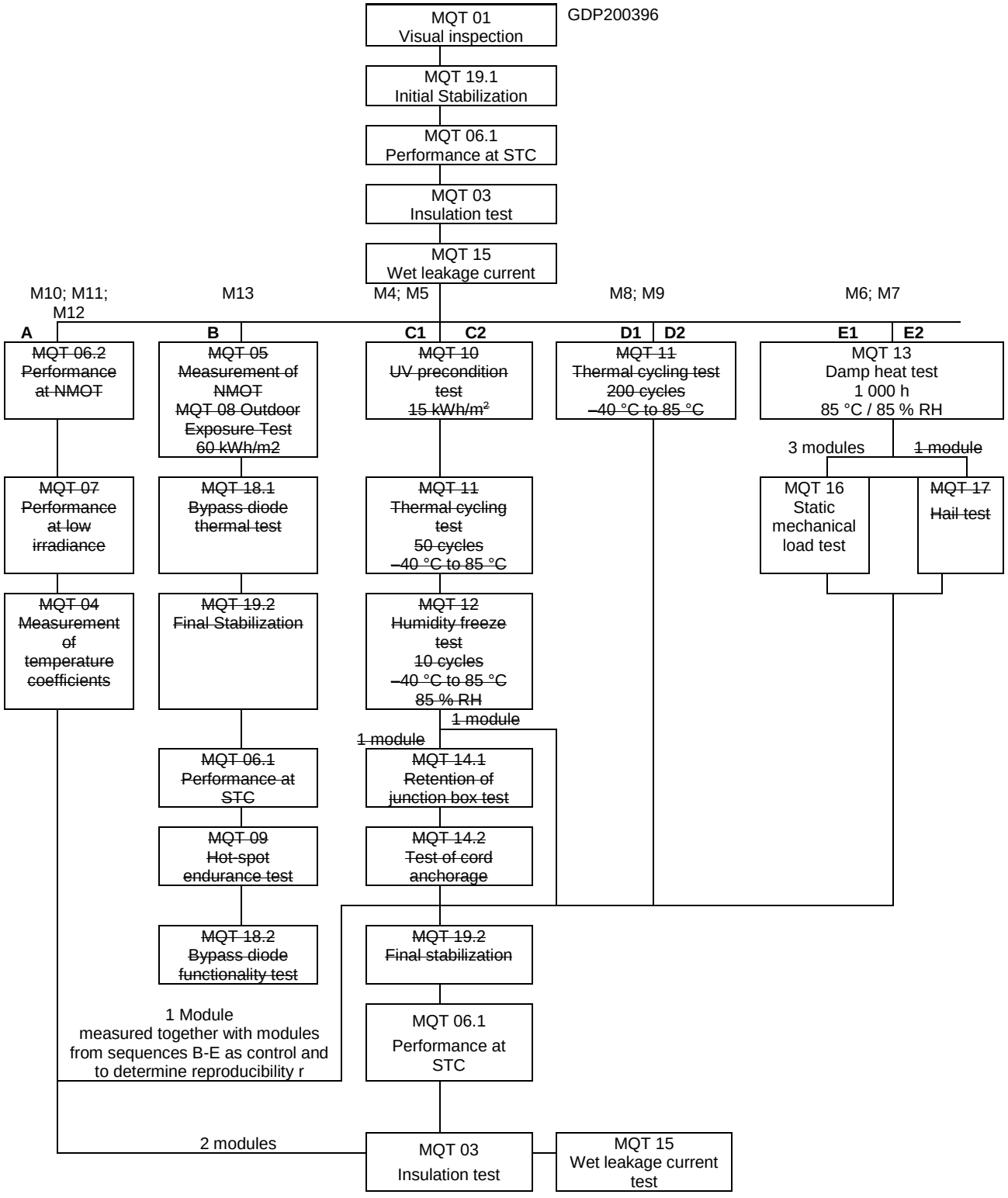
11	**TEST FLOW (if it is not a full test, strikethrough non-performed test)** Note: Deviations from test sequence are possible but must be documented.




MQT 01
Visual inspection
GDP200428
MQT 19.1
Initial Stabilization
MQT 06.1
Performance at STC
MQT 03
Insulation test
MQT 15
Wet leakage current
M10; M11; M12
M13
M4; M5
M8; M9
M6; M7
A
B
C1
C2
D1
D2
E1
E2
~~MQT 06.2 Performance at NMOT~~
~~MQT 05 Measurement of NMOT~~
~~MQT 08 Outdoor Exposure Test 60 kWh/m2~~
~~MQT 10 UV precondition test 15 kWh/m²~~
MQT 11
Thermal cycling test
200 cycles
–40 °C to 85 °C
~~MQT 13 Damp heat test 1 000 h 85 °C / 85 % RH~~
~~1 module~~
~~1 module~~
~~MQT 07 Performance at low irradiance~~
~~MQT 18.1 Bypass diode thermal test~~
~~MQT 11 Thermal cycling test 50 cycles –40 °C to 85 °C~~
~~MQT 16 Static mechanical load test~~
~~MQT 17 Hail test~~
~~MQT 04 Measurement of temperature coefficients~~
~~MQT 19.2 Final Stabilization~~
~~MQT 12 Humidity freeze test 10 cycles –40 °C to 85 °C 85 % RH~~
~~1 module~~
~~1 module~~
~~MQT 06.1 Performance at STC~~
~~MQT 14.1 Retention of junction box test~~
MQT 09
Hot-spot endurance test
~~MQT 14.2 Test of cord anchorage~~
MQT 18.2
Bypass diode functionality test
~~MQT 19.2 Final stabilization~~
1 Module
measured together with modules from sequences B-E as control and to determine reproducibility r
MQT 06.1
Performance at STC
2 modules
MQT 03
Insulation test
MQT 15
Wet leakage current test


MQT 01
Visual inspection
GDP200402
MQT 19.1
Initial Stabilization
MQT 06.1
Performance at STC
MQT 03
Insulation test
MQT 15
Wet leakage current
M10; M11; M12
M13
M4; M5
M8; M9
M6; M7
A
B
C1
C2
D1
D2
E1
E2
~~MQT 06.2 Performance at NMOT~~
~~MQT 05 Measurement of NMOT~~
~~MQT 08 Outdoor Exposure Test 60 kWh/m2~~
MQT 10
UV precondition test
15 kWh/m2
MQT 11
Thermal cycling test
200 cycles
–40 °C to 85 °C
MQT 13
Damp heat test
1 000 h
85 °C / 85 % RH
1 module
1 module
~~MQT 07 Performance at low irradiance~~
MQT 18.1
Bypass diode thermal test
MQT 11
Thermal cycling test
50 cycles
–40 °C to 85 °C
MQT 16
Static mechanical load test
~~MQT 17 Hail test~~
~~MQT 04 Measurement of temperature coefficients~~
~~MQT 19.2 Final Stabilization~~
MQT 12
Humidity freeze test
10 cycles
–40 °C to 85 °C
85 % RH
1 module
1 module
~~MQT 06.1 Performance at STC~~
MQT 14.1
Retention of junction box test
MQT 09
Hot-spot endurance test
~~MQT 14.2 Test of cord anchorage~~
MQT 18.2
Bypass diode functionality test
~~MQT 19.2 Final stabilization~~
1 Module
measured together with modules from sequences B-E as control and to determine reproducibility r
MQT 06.1
Performance at STC
2 modules
MQT 03
Insulation test
MQT 15
Wet leakage current test


MQT 01
Visual inspection
GDP200429
MQT 19.1
Initial Stabilization
MQT 06.1
Performance at STC
MQT 03
Insulation test
MQT 15
Wet leakage current
M10; M11; M12
M13
M4; M5
M8; M9
M6; M7
A
B
C1
C2
D1
D2
E1
E2
~~MQT 06.2 Performance at NMOT~~
~~MQT 05 Measurement of NMOT~~
~~MQT 08 Outdoor Exposure Test 60 kWh/m2~~
MQT 10
UV precondition test
15 kWh/m2
MQT 11
Thermal cycling test
200 cycles
–40 °C to 85 °C
~~MQT 13 Damp heat test 1 000 h 85 °C / 85 % RH~~
~~1 module~~
~~1 module~~
~~MQT 07 Performance at low irradiance~~
MQT 18.1
Bypass diode thermal test
MQT 11
Thermal cycling test
50 cycles
–40 °C to 85 °C
~~MQT 16 Static mechanical load test~~
~~MQT 17 Hail test~~
~~MQT 04 Measurement of temperature coefficients~~
~~MQT 19.2 Final Stabilization~~
MQT 12
Humidity freeze test
10 cycles
–40 °C to 85 °C
85 % RH
~~1 module~~
~~1 module~~
~~MQT 06.1 Performance at STC~~
~~MQT 14.1 Retention of junction box test~~
MQT 09
Hot-spot endurance test
~~MQT 14.2 Test of cord anchorage~~
MQT 18.2
Bypass diode functionality test
~~MQT 19.2 Final stabilization~~
1 Module
measured together with modules from sequences B-E as control and to determine reproducibility r
MQT 06.1
Performance at STC
2 modules
MQT 03
Insulation test
MQT 15
Wet leakage current test


MQT 01
Visual inspection
GDP200396
MQT 19.1
Initial Stabilization
MQT 06.1
Performance at STC
MQT 03
Insulation test
MQT 15
Wet leakage current
M10; M11; M12
M13
M4; M5
M8; M9
M6; M7
A
B
C1
C2
D1
D2
E1
E2
MQT 06.2 Performance at NMOT
MQT 05 Measurement of NMOT
MQT 08 Outdoor Exposure Test 60 kWh/m2
MQT 10 UV precondition test 15 kWh/m²
MQT 11 Thermal cycling test 200 cycles –40 °C to 85 °C
MQT 13 Damp heat test 1 000 h 85 °C / 85 % RH
3 modules
1 module
MQT 07 Performance at low irradiance
MQT 18.1 Bypass diode thermal test
MQT 11 Thermal cycling test 50 cycles –40 °C to 85 °C
MQT 16 Static mechanical load test
MQT 17 Hail test
MQT 04 Measurement of temperature coefficients
MQT 19.2 Final Stabilization
MQT 12 Humidity freeze test 10 cycles –40 °C to 85 °C 85 % RH
1 module
1 module
MQT 06.1 Performance at STC
MQT 14.1 Retention of junction box test
MQT 09 Hot-spot endurance test
MQT 14.2 Test of cord anchorage
MQT 18.2 Bypass diode functionality test
MQT 19.2 Final stabilization
1 Module measured together with modules from sequences B-E as control and to determine reproducibility r
MQT 06.1 Performance at STC
2 modules
MQT 03 Insulation test
MQT 15 Wet leakage current test

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
5. MARKING AND DOCUMENTATION			P
5.1	**Name Plate**		
	All electrical data is shown as relative to standard test conditions (1 000 W/m², 25 °C, AM 1,5 according to IEC TS 61836).	Marked on label	P
	International symbols are used where applicable.	Marked on label	P
	The module includes clear and indelible markings:		—
	a. Name, registered trade name or registered trade mark of manufacturer	JA Solar (logo)	P
	b. Type or model number designation	Marked on label	P
	c. Serial number (unless marked on other part of product)	Provided under superstrate near the top rail of frame	P
	d. Date and place of manufacture, alternatively serial number allowing to trace the date and place of manufacture;	serial number allowing to trace the date and place of manufacture	P
	e. Maximum system voltage	1500V DC	P
	f. Class of protection against electrical shock	Class II	P
	g. Voltage at open-circuit or Voc including tolerances.	Marked on label	P
	h. Current at short-circuit or Isc including tolerances	Marked on label	P
	i. Module maximum power or Pmax including tolerances	Marked on label	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		P
	The documentation states the class of protection against electrical shock under which the module has been qualified and any specific limitations required for that class.		P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use, and maintenance of the PV modules.		P
5.2.2	Information given in the documentation		P
	a. All information required under 5.1 e) to i)	Refer to manual document	P
	b. Overcurrent protection device type and rating are e.g. given in IEC 60269-6	Refer to manual document	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Maximum series/parallel module configuration is recommended		P
	c. Manufacturer's stated tolerance for Voc, Isc and maximum power output under standard test conditions		P
	d. Temperature coefficient for voltage at open-circuit		P
	e. Temperature coefficient for maximum power		P
	f. Temperature coefficient for short-circuit current		P
	All electrical data mentioned above shown as relative to standard test conditions (1 000 W/m^2, 25 °C, AM 1,5 according to IEC TS 61836)		P
	g. Nominal module operating temperature (NMOT) is specified		N/A
	h. Performance at NMOT (MQT 06.2) is specified		N/A
	i. Performance at low irradiance (MQT 07) is specified		P
	International symbols used where applicable		P
	Compliance checked by inspection and MQT 04 through MQT 07		P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used		—
	j. The minimum cable diameters for modules intended for field wiring		P
	k. Any limitations on wiring methods and wire management that apply to the wiring compartment or box;		P
	l. The size, type, material and temperature rating of the conductors to be used		P
	m. Type of terminals for field wiring		N/A
	n. Specific PV connector model/types and manufacturer to which the module connectors are mated		P
	o. The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation	Refer to manual document	P
	p. The type and ratings of bypass diode to be used (if applicable)	Refer to manual document	P
	q. limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)	Refer to manual document	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)		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		P
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: *"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{SC} and V_{OC} marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."*		P
5.2.3	Assembly instructions		N/A
	Provided with a product shipped in subassemblies, detailed and adequate to the degree required to facilitate complete and safe assembly of the product		N/A
Supplementary information: N/A			

7. PASS CRITERIA					P
7.2	**Power output and electric circuitry**				P
7.2.1	Verification of rated label values (Gate No. 1)				P
	Manufacturer’s tolerances and Laboratory uncertainties				P
		t_1	t_2	t_3	—
	manufacturer’s rated lower/upper production tolerance in %	3	2	4	
		m_1	m_2	m_3	
	measurement uncertainty in % of laboratory	2.28	1.08	1.90	
	Laboratory reproducibility r .....:	0.26			
	After stabilization, each individual module meets the requirements				P
	P_{max}	See Table 03			P
	V_{oc}	See Table 03			P
	I_{sc}:.....	See Table 03			P

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

4. TESTING OVERVIEW			
	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 M10; M11; M12	P
4.6	Performance at NMOT (MQT 06.2) .....:	See Table 06	—
4.7	Performance at low irradiance (MQT 07).....:	See Table 07	N/A
4.4	Measurement of temperature coefficients (MQT 04) .....:	See Table 08	—

Sequence B	**1 Module**	Sample M13	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.5	Measurement of nominal module operating temperature (NMOT, °C) (MQT 05) .....:	See Table 09	N/A
4.8	Outdoor exposure test (MQT 08) .....:	See Table 10	N/A
4.18.1	Bypass diode thermal test (MQT 18.1)		N/A
	Maximum allowed junction temperature .....:	See Table 11	—
	Calculated junction temperature .....:	See Table 11	—
	Final measurements.....:	See Table 11	N/A
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	N/A
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)		P
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)		N/A
4.14.3.1	This test omitted if junction box is qualified to IEC 62790 .....:	See list of attachments	N/A
4.14.3.2.1	Junction boxes intended to be used with cables specified by the manufacturer……:	See Table 17.4	N/A
4.14.3.2.2	Junction boxes intended to be used with generic cables……..:	See Table 17.4	N/A
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	**3 Modules**	Samples M6; M7	P
4.13	Damp heat test (MQT 13) .....:	See Table 19.1 - 19.4	P
Sequence E1	**2 Module**	Sample M6	P

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Clause	Requirement + Test	Result - Remark	Verdict
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	N/A
	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	N/A
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

TABLE 01: MQT 01 ini: Initial Visual inspection		P
Test Date [YYYY-MM-DD]..... :	2020-07-21 for M1-x 2020-07-28 for M2-x 2020-07-17 for M3-x 2020-08-01 for M4-x 2020-07-16 for M5-x	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M1-10	No major visual defects found	P
M1-13	No major visual defects found	P
M1-8	No major visual defects found	P
M1-9	No major visual defects found	P
M1-6	No major visual defects found	P
M1-7	No major visual defects found	P
M2-10	No major visual defects found	P
M2-13	No major visual defects found	P
M2-8	No major visual defects found	P
M2-9	No major visual defects found	P
M3-10	No major visual defects found	P
M3-13	No major visual defects found	P
M3-4	No major visual defects found	P
M3-5	No major visual defects found	P
M3-8	No major visual defects found	P
M3-9	No major visual defects found	P
M3-6	No major visual defects found	P

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Clause	Requirement + Test	Result - Remark	Verdict
M3-7	No major visual defects found		P
M4-10	No major visual defects found		P
M4-13	No major visual defects found		P
M4-4	No major visual defects found		P
M4-5	No major visual defects found		P
M4-8	No major visual defects found		P
M4-9	No major visual defects found		P
M5-10	No major visual defects found		P
M5-6-1	No major visual defects found		P
M5-6-2	No major visual defects found		P
M5-6-3	No major visual defects found		P
Supplementary information: N/A			

TABLE 02: MQT 19.1 ini: Initial stabilization							P
TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (single-side front)							
Test Date [YYYY-MM-DD]..... :	2020-07-21 for M1-x 2020-07-28 for M2-x 2020-07-17 for M3-x 2020-08-01 for M4-x 2020-07-16 for M5-x						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
M1-10	12.966	49.213	12.407	41.369	513.254	80.43	—
M1-13	12.963	49.242	12.384	41.435	513.116	80.39	—
M1-8	13.005	49.196	12.433	41.245	512.788	80.15	—
M1-9	13.013	49.252	12.448	41.357	514.794	80.32	—
M1-6	12.966	49.246	12.432	41.337	513.880	80.48	—
M1-7	12.953	49.274	12.412	41.386	513.706	80.49	—
M2-10	12.961	49.120	12.418	41.347	513.446	80.65	—
M2-13	12.955	49.226	12.431	41.390	514.510	80.68	—
M2-8	12.986	49.185	12.433	41.457	515.444	80.70	—
M2-9	12.954	49.211	12.427	41.463	515.266	80.83	—
M3-10	13.051	49.180	12.506	41.217	515.473	80.31	—
M3-13	12.992	49.172	12.460	41.260	514.107	80.48	—

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Clause	Requirement + Test				Result - Remark		Verdict
M3-4	12.962	49.195	12.433	41.283	513.278	80.50	—
M3-5	12.988	49.177	12.482	41.230	514.624	80.57	—
M3-8	12.978	49.238	12.489	41.360	516.560	80.84	—
M3-9	12.967	49.224	12.470	41.385	516.083	80.85	—
M3-6	13.050	49.268	12.501	41.397	517.492	80.49	—
M3-7	13.053	49.258	12.516	41.342	517.453	80.48	—
M4-10	13.018	49.269	12.478	41.448	517.184	80.70	—
M4-13	12.998	49.152	12.407	41.261	511.940	80.13	—
M4-4	12.934	49.100	12.402	41.058	509.186	80.18	—
M4-5	12.957	49.119	12.410	41.120	510.312	80.19	—
M4-8	12.974	49.056	12.415	41.211	511.646	80.39	—
M4-9	12.906	49.157	12.418	41.229	511.965	80.69	—
M5-10	11.328	49.124	10.911	40.639	443.399	79.68	—
M5-6-1	11.351	49.052	10.913	40.565	442.669	79.50	—
M5-6-2	11.350	49.007	10.934	40.617	444.096	79.84	—
M5-6-3	11.301	49.016	10.881	40.758	443.501	80.06	—
Supplementary information: N/A							

TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (single-side rear)							P
Test Date [YYYY-MM-DD]..... :	2020-07-17 for M3-x 2020-08-01 for M4-x						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
M3-10	8.531	48.285	8.044	41.116	330.758	80.30	—
M3-13	8.536	48.261	8.060	41.093	331.211	80.40	—
M3-4	8.492	48.338	7.909	41.254	326.298	79.49	—
M3-5	8.502	48.312	7.919	41.250	326.664	79.53	—
M3-8	8.476	48.483	7.982	41.366	330.181	80.35	—
M3-9	8.478	48.387	7.987	41.269	329.624	80.35	—
M3-6	8.557	48.388	8.105	41.156	333.580	80.57	—
M3-7	8.544	48.420	8.083	41.185	332.908	80.47	—
M4-10	8.594	48.535	8.114	41.363	336.219	80.60	—
M4-13	8.590	48.447	8.113	41.276	334.864	80.47	—

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Clause	Requirement + Test				Result - Remark		Verdict
M4-4	8.422	48.322	7.920	41.241	326.611	80.25	—
M4-5	8.429	49.229	7.929	41.178	326.493	80.31	—
M4-8	8.459	48.151	7.855	41.277	324.243	79.60	—
M4-9	8.437	48.303	7.954	41.234	327.989	80.48	—
Supplementary information: N/A							

TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (Equivalent irradiance)							P
Test Date [YYYY-MM-DD]..... :	2020-07-17 for M3-x 2020-08-01 for M4-x						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
M3-10	14.397	49.073	13.805	41.251	569.449	80.60	—
M3-13	14.400	49.059	13.816	41.260	570.030	80.69	—
M3-4	14.259	49.081	13.711	41.250	565.571	80.82	—
M3-5	14.335	49.138	13.793	41.323	569.975	80.80	—
M3-8	14.265	49.163	13.738	41.457	569.441	81.19	—
M3-9	14.299	49.113	13.783	41.320	569.514	81.10	—
M3-6	14.367	49.279	13.752	41.605	572.157	80.82	—
M3-7	14.402	49.129	13.838	41.300	571.506	80.77	—
M4-10	14.372	49.104	13.826	41.404	572.460	81.12	—
M4-13	14.408	48.724	13.769	40.841	562.334	80.10	—
M4-4	14.222	49.018	13.658	41.054	560.730	80.44	—
M4-5	14.230	49.008	13.647	41.129	561.302	80.49	—
M4-8	14.279	48.921	13.681	41.188	563.513	80.67	—
M4-9	14.208	49.014	13.667	41.173	562.694	80.80	—
Supplementary information: 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.							

TABLE 02.2: MQT 19.1 ini: Initial Stabilization procedure		P
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-x ..... :	1	

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M1-10	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	513.254	—	—
1	5	800~1000	50 ± 10	MPPT	513.229	—	—
2	5	800~1000	50 ± 10	MPPT	512.907	0.07	Yes
3							
4						—	—
Sample #	M1-13	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	513.116	—	—
1	5	800~1000	50 ± 10	MPPT	513.067	—	—
2	5	800~1000	50 ± 10	MPPT	513.000	0.02	Yes
3							
4						—	—
Sample #	M1-8	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	512.788	—	—
1	5	800~1000	50 ± 10	MPPT	511.933	—	—
2	5	800~1000	50 ± 10	MPPT	511.702	0.21	Yes
3							
4						—	—
Sample #	M1-9	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	514.794	—	—
1	5	800~1000	50 ± 10	MPPT	514.079	—	—
2	5	800~1000	50 ± 10	MPPT	513.987	0.16	Yes
3							
4						—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M1-6	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	513.880	—	—
1	5	800~1000	50 ± 10	MPPT	513.741	—	—
2	5	800~1000	50 ± 10	MPPT	513.681	0.04	Yes
3							
4						—	—
Sample #	M1-7	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	513.706	—	—
1	5	800~1000	50 ± 10	MPPT	513.547	—	—
2	5	800~1000	50 ± 10	MPPT	513.266	0.09	Yes
3							
4						—	—
Sample #	M2-10	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	513.446	—	—
1	5	800~1000	50 ± 10	MPPT	513.446	—	—
2	5	800~1000	50 ± 10	MPPT	513.306	0.03	Yes
3							
4						—	—
Sample #	M2-13	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	514.510	—	—
1	5	800~1000	50 ± 10	MPPT	514.510	—	—
2	5	800~1000	50 ± 10	MPPT	513.738	0.15	Yes
3							
4						—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M2-8	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	515.444	—	—
1	5	800~1000	50 ± 10	MPPT	515.444	—	—
2	5	800~1000	50 ± 10	MPPT	514.662	0.15	Yes
3							
4						—	—
Sample #	M2-9	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	515.266	—	—
1	5	800~1000	50 ± 10	MPPT	515.266	—	—
2	5	800~1000	50 ± 10	MPPT	515.134	0.03	Yes
3							
4						—	—
Sample #	M3-10	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	515.473	—	—
1	5	800~1000	50 ± 10	MPPT	515.328	—	—
2	5	800~1000	50 ± 10	MPPT	515.217	0.05	Yes
Initial (R)	—	—	—	—	330.758	—	—
1	5	800~1000	50 ± 10	MPPT	330.578	—	—
2	5	800~1000	50 ± 10	MPPT	330.548	0.06	Yes
Sample #	M3-13	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	514.107	—	—
1	5	800~1000	50 ± 10	MPPT	514.577	—	—
2	5	800~1000	50 ± 10	MPPT	513.308	0.25	Yes
Initial (R)	—	—	—	—	331.211	—	—
1	5	800~1000	50 ± 10	MPPT	330.956	—	—

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Clause	Requirement + Test	Result - Remark	Verdict

2	5	800~1000	50 ± 10	MPPT	330.819	0.12	Yes
Sample #	M3-4	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	513.278	—	—
1	5	800~1000	50 ± 10	MPPT	512.788	—	—
2	5	800~1000	50 ± 10	MPPT	512.234	0.20	Yes
Initial (R)	—	—	—	—	326.298	—	—
1	5	800~1000	50 ± 10	MPPT	326.266	—	—
2	5	800~1000	50 ± 10	MPPT	326.146	0.05	Yes
Sample #	M3-5	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	514.624	—	—
1	5	800~1000	50 ± 10	MPPT	513.584	—	—
2	5	800~1000	50 ± 10	MPPT	513.559	0.21	Yes
Initial (R)	—	—	—	—	326.664	—	—
1	5	800~1000	50 ± 10	MPPT	326.649	—	—
2	5	800~1000	50 ± 10	MPPT	326.479	0.06	Yes
Sample #	M3-8	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	516.560	—	—
1	5	800~1000	50 ± 10	MPPT	516.497	—	—
2	5	800~1000	50 ± 10	MPPT	516.142	0.08	Yes
Initial (R)	—	—	—	—	330.181	—	—
1	5	800~1000	50 ± 10	MPPT	329.684	—	—
2	5	800~1000	50 ± 10	MPPT	329.571	0.18	Yes
Sample #	M3-9	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	516.083	—	—
1	5	800~1000	50 ± 10	MPPT	515.917	—	—

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2	5	800~1000	50 ± 10	MPPT	515.852	0.04	Yes
Initial (R)	—	—	—	—	329.624	—	—
1	5	800~1000	50 ± 10	MPPT	329.530	—	—
2	5	800~1000	50 ± 10	MPPT	329.417	0.06	Yes
Sample #	M3-6	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	517.492	—	—
1	5	800~1000	50 ± 10	MPPT	517.416	—	—
2	5	800~1000	50 ± 10	MPPT	516.892	0.12	Yes
Initial (R)	—	—	—	—	333.580	—	—
1	5	800~1000	50 ± 10	MPPT	333.529	—	—
2	5	800~1000	50 ± 10	MPPT	333.389	0.06	Yes
Sample #	M3-7	Test Date (YYYY-MM-DD) start/end .....:			2020-07-17 / 2020-07-19		
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 (F)	—	—	—	—	517.453	—	—
1	5	800~1000	50 ± 10	MPPT	517.319	—	—
2	5	800~1000	50 ± 10	MPPT	517.061	0.08	Yes
Initial (R)	—	—	—	—	332.908	—	—
1	5	800~1000	50 ± 10	MPPT	332.897	—	—
2	5	800~1000	50 ± 10	MPPT	332.869	0.01	Yes
Sample #	M4-10	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	517.184	—	—
1	5	800~1000	50 ± 10	MPPT	517.366	—	—
2	5	800~1000	50 ± 10	MPPT	517.231	0.04	Yes
Initial (R)	—	—	—	—	336.219	—	—
1	5	800~1000	50 ± 10	MPPT	335.615	—	—
2	5	800~1000	50 ± 10	MPPT	335.476	0.22	Yes

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M4-13	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	511.940	—	—
1	5	800~1000	50 ± 10	MPPT	512.805	—	—
2	5	800~1000	50 ± 10	MPPT	511.929	0.17	Yes
Initial (R)	—	—	—	—	334.864	—	—
1	5	800~1000	50 ± 10	MPPT	334.695	—	—
2	5	800~1000	50 ± 10	MPPT	334.468	0.12	Yes
Sample #	M4-4	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	509.186	—	—
1	5	800~1000	50 ± 10	MPPT	508.834	—	—
2	5	800~1000	50 ± 10	MPPT	508.502	0.13	Yes
Initial (R)	—	—	—	—	326.611	—	—
1	5	800~1000	50 ± 10	MPPT	326.463	—	—
2	5	800~1000	50 ± 10	MPPT	326.376	0.07	Yes
Sample #	M4-5	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	510.312	—	—
1	5	800~1000	50 ± 10	MPPT	510.265	—	—
2	5	800~1000	50 ± 10	MPPT	509.741	0.11	Yes
Initial (R)	—	—	—	—	326.493	—	—
1	5	800~1000	50 ± 10	MPPT	326.327	—	—
2	5	800~1000	50 ± 10	MPPT	326.548	0.07	Yes
Sample #	M4-8	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	511.646	—	—
1	5	800~1000	50 ± 10	MPPT	511.769	—	—
2	5	800~1000	50 ± 10	MPPT	510.724	0.20	Yes

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Clause	Requirement + Test	Result - Remark	Verdict

Initial (R)	—	—	—	—	324.243	—	—
1	5	800~1000	50 ± 10	MPPT	323.637	—	—
2	5	800~1000	50 ± 10	MPPT	323.816	0.19	Yes
Sample #	M4-9	Test Date (YYYY-MM-DD) start/end .....:			2020-08-01 / 2020-08-03		
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 (F)	—	—	—	—	511.965	—	—
1	5	800~1000	50 ± 10	MPPT	511.119	—	—
2	5	800~1000	50 ± 10	MPPT	511.059	0.18	Yes
Initial (R)	—	—	—	—	327.989	—	—
1	5	800~1000	50 ± 10	MPPT	327.518	—	—
2	5	800~1000	50 ± 10	MPPT	327.494	0.15	Yes
Sample #	M5-10	Test Date (YYYY-MM-DD) start/end .....:			2020-07-16 / 2020-07-18		
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	—	—	—	—	443.399	—	—
1	5	800~1000	50 ± 10	MPPT	443.497	—	—
2	5	800~1000	50 ± 10	MPPT	443.376	0.03	Yes
3							
4						—	—
Sample #	M5-6-1	Test Date (YYYY-MM-DD) start/end .....:			2020-07-16 / 2020-07-18		
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	—	—	—	—	442.669	—	—
1	5	800~1000	50 ± 10	MPPT	442.476	—	—
2	5	800~1000	50 ± 10	MPPT	442.429	0.05	Yes
3							
4						—	—
Sample #	M5-6-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-16 / 2020-07-18		
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	—	—	—	—	444.096	—	—
1	5	800~1000	50 ± 10	MPPT	444.001	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	800~1000	50 ± 10	MPPT	444.223	0.05	Yes
3							
4						—	—
Sample #	M5-6-3	Test Date (YYYY-MM-DD) start/end .....:			2020-07-16 / 2020-07-18		
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	—	—	—	—	443.501	—	—
1	5	800~1000	50 ± 10	MPPT	441.817	—	—
2	5	800~1000	50 ± 10	MPPT	441.664	0.42	Yes
3							
4						—	—
Supplementary information: N/A							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
Test method description:							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure							

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization (single-side front)		P
Test Date [YYYY-MM-DD] ..... :	2020-07-23 for M1-x 2020-07-30 for M2-x 2020-07-21 for M3-x 2020-08-03 for M4-x 2020-07-18 for M5-x	—
Pmax(lab) lower limit (W) ..... :	See table below: Pmax [W] – Min calc.	—
$\bar{P}_{max}(Lab)$ lower limit (W) ..... :	508.408 for M1-x, M2-x, M3-x, M4-x 435.080 for M5-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

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.		
M1-10	12.967	13.860	49.210	49.446	12.394	41.385	512.907	493.156	80.38	P
M1-13	12.968	13.860	49.228	49.446	12.391	41.402	513.000	493.156	80.36	P
M1-8	12.964	13.860	49.178	49.446	12.405	41.251	511.702	493.156	80.26	P
M1-9	12.987	13.860	49.243	49.446	12.435	41.334	513.987	493.156	80.37	P
M1-6	12.954	13.860	49.241	49.446	12.429	41.328	513.681	493.156	80.53	P
M1-7	12.944	13.860	49.238	49.446	12.411	41.355	513.266	493.156	80.53	P
Average	—						513.091	508.408	—	P
M2-10	12.948	13.860	49.191	49.446	12.413	41.351	513.306	493.156	80.59	P
M2-13	12.965	13.860	49.195	49.446	12.426	41.345	513.738	493.156	80.55	P
M2-8	12.947	13.860	49.178	49.446	12.423	41.427	514.662	493.156	80.84	P
M2-9	12.957	13.860	49.205	49.446	12.433	41.434	515.134	493.156	80.80	P
Average	—						514.210	508.408	—	P
M3-10	13.039	13.860	49.177	49.446	12.483	41.274	515.217	493.156	80.35	P
M3-13	12.978	13.860	49.172	49.446	12.442	41.257	513.308	493.156	80.44	P
M3-4	12.955	13.860	49.179	49.446	12.419	41.247	512.234	493.156	80.40	P
M3-5	13.001	13.860	49.166	49.446	12.457	41.226	513.559	493.156	80.34	P
M3-8	12.965	13.860	49.228	49.446	12.466	41.405	516.142	493.156	80.87	P
M3-9	12.980	13.860	49.224	49.446	12.460	41.400	515.852	493.156	80.74	P
M3-6	13.065	13.860	49.270	49.446	12.483	41.407	516.892	493.156	80.30	P
M3-7	13.026	13.860	49.266	49.446	12.515	41.315	517.061	493.156	80.57	P
Average	—						515.033	508.408	—	P
M4-10	12.995	13.860	49.252	49.446	12.489	41.423	517.231	493.156	80.83	P
M4-13	13.022	13.860	49.172	49.446	12.412	41.244	511.929	493.156	79.95	P
M4-4	12.930	13.860	49.104	49.446	12.371	41.106	508.502	493.156	80.09	P

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Clause	Requirement + Test	Result - Remark	Verdict

M4-5	12.957	13.860	49.145	49.446	12.394	41.130	509.741	493.156	80.05	P
M4-8	12.992	13.860	49.029	49.446	12.412	41.146	510.724	493.156	80.18	P
M4-9	12.928	13.860	49.113	49.446	12.413	41.172	511.059	493.156	80.48	P
Average	—						511.531	508.408	—	P
M5-10	11.329	11.553	49.112	50.011	10.922	40.596	443.376	422.028	79.69	P
M5-6-1	11.339	11.553	49.039	50.011	10.919	40.521	442.429	422.028	79.57	P
M5-6-2	11.323	11.553	49.030	50.011	10.895	40.773	444.223	422.028	80.02	P
M5-6-3	11.274	11.553	49.033	50.011	10.858	40.677	441.664	422.028	79.89	P
Average	—						442.923	435.080	—	P

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

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization (single-side rear)		P
Test Date [YYYY-MM-DD] ..... :	2020-07-21 for M3-x 2020-08-03 for M4-x	—
Pmax(lab) lower limit (W) ..... :	See table below: Pmax [W] – Min calc.	—
$\bar{P}_{max}(Lab)$ lower limit (W) ..... :	-	—
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.		
M3-10	8.520	-	48.308	-	8.038	41.121	330.548	-	80.31	—
M3-13	8.534	-	48.271	-	8.047	41.111	330.819	-	80.31	—
M3-4	8.487	-	48.349	-	7.903	41.267	326.146	-	79.48	—
M3-5	8.494	-	48.321	-	7.914	41.254	326.479	-	79.54	—
M3-8	8.473	-	48.456	-	7.973	41.337	329.571	-	80.28	—
M3-9	8.473	-	48.396	-	7.979	41.295	329.417	-	80.35	—
M3-6	8.550	-	48.396	-	8.099	41.164	333.389	-	80.57	—
M3-7	8.545	-	48.423	-	8.083	41.181	332.869	-	80.45	—
Average	—						329.905	-	—	—

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Clause	Requirement + Test						Result - Remark			Verdict
M4-10	8.593	-	48.502	-	8.114	41.346	335.476	-	80.49	—
M4-13	8.596	-	48.412	-	8.111	41.234	334.468	-	80.37	—
M4-4	8.428	-	48.251	-	7.921	41.203	326.376	-	80.26	—
M4-5	8.435	-	48.225	-	7.933	41.163	326.548	-	80.27	—
M4-8	8.458	-	48.131	-	7.848	41.262	323.816	-	79.55	—
M4-9	8.438	-	48.255	-	7.951	41.188	327.494	-	80.42	—
Average	—						329.030	-	—	—
Supplementary information: The limit values are calculated considering manufacturer's tolerances ***t*** of rated nameplate values and laboratory measurement uncertainties ***m***.										

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization (Equivalent irradiance)										P
Test Date [YYYY-MM-DD] ..... :	2020-07-21 for M3-x 2020-08-03 for M4-x									—
Pmax(lab) lower limit (W) ..... :	See table below: Pmax [W] – Min calc.									—
$\bar{P}_{max}(Lab)$ lower limit (W) ..... :	-									—
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.				Min. calc.		
M3-10	14.402	-	49.455	-	13.824	41.102	568.203	-	79.78	—
M3-13	14.351	-	49.047	-	13.771	41.304	568.792	-	80.81	—
M3-4	14.264	-	49.076	-	13.681	41.248	564.312	-	80.61	—
M3-5	14.272	-	49.198	-	13.732	41.447	569.157	-	81.06	—
M3-8	14.265	-	49.117	-	13.708	41.436	568.003	-	81.07	—
M3-9	14.277	-	49.128	-	13.748	41.380	568.884	-	81.10	—
M3-6	14.364	-	49.158	-	13.788	41.455	571.560	-	80.95	—
M3-7	14.402	-	49.132	-	13.809	41.339	570.860	-	80.68	—
Average	—						568.721	-	—	—
M4-10	14.316	-	49.120	-	13.783	41.475	571.649	-	81.29	—
M4-13	14.419	-	48.707	-	13.796	40.816	563.104	-	80.18	—

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Clause	Requirement + Test						Result - Remark			Verdict
M4-4	14.216	-	49.017	-	13.628	41.141	559.825	-	80.34	—
M4-5	14.242	-	49.008	-	13.624	41.134	560.428	-	80.29	—
M4-8	14.262	-	48.923	-	13.680	41.124	562.563	-	80.63	—
M4-9	14.245	-	49.000	-	13.681	41.143	562.885	-	80.64	—
Average	—						563.409	-	—	—
Supplementary information: The limit values are calculated considering manufacturer's tolerances ***t*** of rated nameplate values and laboratory measurement uncertainties ***m***. 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.										

TABLE 04: MQT 03 ini: Initial Insulation test				P
Test Date [YYYY-MM-DD].....:	2020-07-23 for M1-x 2020-07-31 for M2-x 2020-07-21 for M3-x 2020-08-04 for M4-x 2020-07-18 for M5-x			—
Test Voltage applied [V] .....:	8000/1500			—
Size of module [m²].....:	2.54 for M1-x, M2-x 2.59 for M3-x, M4-x 2.23 for M5-x			—
Required Resistance [MΩ].....:	15.75 for M1-x, M2-x 15.44 for M3-x, M4-x 17.94 for M5-x			—
Sample #	Measured	Dielectric breakdown		Result
	MΩ	Yes (description)	No	
M1-10	>5000		No	P
M1-13	>5000		No	P
M1-8	>5000		No	P
M1-9	>5000		No	P
M1-6	>5000		No	P
M1-7	>5000		No	P
M2-10	>5000		No	P
M2-13	>5000		No	P
M2-8	>5000		No	P
M2-9	>5000		No	P
M3-10	>5000		No	P
M3-13	>5000		No	P

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Clause	Requirement + Test	Result - Remark	Verdict

M3-4	>5000		No	P
M3-5	>5000		No	P
M3-8	>5000		No	P
M3-9	>5000		No	P
M3-6	>5000		No	P
M3-7	>5000		No	P
M4-10	>5000		No	P
M4-13	>5000		No	P
M4-4	>5000		No	P
M4-5	>5000		No	P
M4-8	>5000		No	P
M4-9	>5000		No	P
M5-10	>5000		No	P
M5-6-1	>5000		No	P
M5-6-2	>5000		No	P
M5-6-3	>5000		No	P
Supplementary information: the maximum resistance measurement range is 5000MΩ.				

TABLE 05: MQT 15 ini: Initial Wet leakage current test			P
Test Date [YYYY-MM-DD] .....:	2020-07-23 for M1-x 2020-07-31 for M2-x 2020-07-21 for M3-x 2020-08-04 for M4-x 2020-07-18 for M5-x		—
Test Voltage applied [V] .....:	1500		—
Solution temperature [°C].....:	22.6 for M1-x, M2-x 22.5 for M3-x 22.3 for M4-x, M5-x		—
Size of module [m²] .....:	2.54 for M1-x, M2-x 2.59 for M3-x, M4-x 2.23 for M5-x		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
M1-10	15.75	393.4	P
M1-13	15.75	428.1	P
M1-8	15.75	386.5	P
M1-9	15.75	411.2	P

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Clause	Requirement + Test	Result - Remark	Verdict
M1-6	15.75	373.8	P
M1-7	15.75	406.3	P
M2-10	15.75	395.4	P
M2-13	15.75	409.8	P
M2-8	15.75	362.5	P
M2-9	15.75	499.5	P
M3-10	15.44	395.1	P
M3-13	15.44	423.6	P
M3-4	15.44	383.4	P
M3-5	15.44	360.7	P
M3-8	15.44	439.8	P
M3-9	15.44	502.7	P
M3-6	15.44	393.4	P
M3-7	15.44	482.1	P
M4-10	15.44	473.9	P
M4-13	15.44	464.8	P
M4-4	15.44	469.1	P
M4-5	15.44	478.6	P
M4-8	15.44	483.1	P
M4-9	15.44	488.3	P
M5-10	17.94	476.1	P
M5-6-1	17.94	483.2	P
M5-6-2	17.94	477.1	P
M5-6-3	17.94	481.6	P
Supplementary information: Solution resistivity [Ω·cm] 2720 for M1-x, 2723 for M2-x, 2735 for M3-x, 2931 for M4-x, 2847 for M5-x			

TABLE 06: MQT 06.2 - Performance at NMOT							N/A
Test Date [YYYY-MM-DD] ..... :							—
Module temperature (°C) ..... :							
Test method ..... :	☐ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

TABLE 07: MQT 07 - Performance at low irradiance							N/A
Test Date [YYYY-MM-DD] ..... :							—
Test method ..:	☐ Outdoor measurement						—
	Ambient air temperature [°C]:						
	Irradiance [W/m^2]:						
	Module temperature [°C]:						
	☐ Data corrected to a 25°C cell temperature and 200 W/m^2 irradiance						
	☐ Directly measured						—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
						—
						—
						—

Supplementary information: N/A

TABLE 08: MQT 04 - Measurement of temperature coefficients				N/A
Test Date [YYYY-MM-DD] ..... :				—
Ambient air temperature [°C] high/low ..... :				—
Irradiance [W/m^2] high/low..... :				—
Module temperature [°C] high/low..... :				—
Sample #	α [%/°C]	β [%/°C]	δ [%/°C]	—
				—
				—
				—

Supplementary information: N/A

TABLE 09: MQT 05 - Measurement of Nominal Module Operating Temperature (NMOT, °C)	N/A
Test Date [YYYY-MM-DD]..... :	
Electrical load:	☐ Restive load ☐ MPPT
All details for the measurements are kept on file and are available on request.	
Sample #	

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Clause	Requirement + Test	Result - Remark	Verdict

Calculated u_0 [W/(m^2.°C)]	
Calculated u_1 [W.s/(m^3.°C)]	
Calculated NMOT	
Supplementary information:	

TABLE 10: MQT 08 - Outdoor exposure test		N/A
Test Date [YYYY-MM-DD] start/end .....:		—
Sample #		—
Total irradiation dosage [kWh/m^2] .....:		—
Angle of tilt the test module .....:		—
Electrical load:	☐ Restive load ☐ MPPT	—
Supplementary information: N/A		

Table 10.1: MQT 01: Visual inspection after outdoor exposure test		N/A
Test Date [YYYY-MM-DD].....:		—
Sample #	Nature and position of initial findings – comments or attach photos	—
		—
Supplementary information: N/A		

Table 10.2: MQT 15: Wet leakage current test after outdoor exposure test			N/A
Test Date [YYYY-MM-DD] .....:			—
Test Voltage applied [V] .....:			—
Solution temperature [°C] .....:			—
Size of module [m²] .....:			—
Required Resistance [MΩ].....:			—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
			—
Supplementary information: Solution resistivity [Ω·cm]			

Table 10.3: MQT 02 - Maximum power determination after outdoor exposure test – Optional		N/A
Test Date [YYYY-MM-DD].....:		—
Module temperature [°C].....:		—
Irradiance [W/m^2) .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
						—

Supplementary information: N/A

Table 10.4: MQT 03 - Insulation test after outdoor exposure test - Optional					N/A
Test Date [YYYY-MM-DD] ..... :					—
Test Voltage applied [V] ..... :					—
Size of module [m²] ..... :					—
Required Resistance [MΩ] ..... :					—
Sample #	Measured (MΩ)	Required (MΩ)	Dielectric breakdown Yes (description)	Dielectric breakdown No	Result
					—

Supplementary information:

TABLE 11: MQT 18: Bypass diode thermal test					P
Test Date [YYYY-MM-DD] start/end ..... :	2020-07-26				—
Sample #	M1-13				—
Module temperature [°C] ..... :	75 ± 5				—
Number of diodes in junction box ..... :	3				—
Diode manufacturer ..... :	PANJIT international Inc.				—
Diode type designation ..... :	SB3045DY				—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200				—
Detailed description of sample preparation procedure ..... :	Standard production module				—
Step 1, Determination of *V*D versus *T*J characteristic					—
	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C	
Ambient temperature of the junction box ... :	31.3 31.0 31.0	51.6 51.8 51.8	70.7 70.8 70.8	90.7 90.9 90.9	
Pulsed current ..... :	12.97	12.97	12.97	12.97	
Voltage drop [V] ..... :	0.444 0.458 0.468	0.417 0.429 0.441	0.409 0.413 0.417	0.388 0.404 0.384	
V_D versus T_J characteristic ..... :	T_J = -1075.490* V_D + 506.784 T_J = -1060.629* V_D + 512.924 T_J = -722.932* V_D + 370.115				—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200				—

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Clause	Requirement + Test	Result - Remark	Verdict

Step 2, Bypass diode thermal test				—
	Diode 1	Diode 2	Diode 3	Result
Current flow applied [A] ..... :	12.97	12.97	12.97	—
Max. diode surface temperature allowed Tj_{max} [°C] :	N/A	N/A	N/A	—
Voltage drop [V] after 1h ..... :	0.33	0.33	0.33	—
Calculated max. junction temperature Tj_{calc} [°C] .... :	151.87	162.92	131.55	—
Tj_{calc} < Tj_{max} (test passed)? yes/no ..... :	yes	yes	yes	P
Current flow (1.25 * Isc) [A] ..... :	16.21	16.21	16.21	—
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.				

Test Date [YYYY-MM-DD] start/end ..... :	2020-08-13			—
Sample #	M2-13			—
Module temperature [°C]..... :	75 ± 5			—
Number of diodes in junction box ..... :	3			—
Diode manufacturer ..... :	PANJIT international Inc.			—
Diode type designation ..... :	SB3045DY			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—
Detailed description of sample preparation procedure ..... :	Standard production module			—
Step 1, Determination of *V*D versus *T*J characteristic				—
	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C
Ambient temperature of the junction box ... :	30.3 31.2 31.3	51.6 51.7 51.3	70.4 72.0 70.7	90.7 91.0 90.7
Pulsed current..... :	12.97	12.97	12.97	12.97
Voltage drop [V] ..... :	0.444 0.450 0.446	0.435 0.436 0.420	0.427 0.416 0.405	0.383 0.401 0.391
V_D versus T_J characteristic ..... :	T_J = -874.014* V_D + 429.759 T_J = -1187.526* V_D + 567.284 T_J = -1072.464* V_D + 506.409			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—

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Clause	Requirement + Test	Result - Remark	Verdict

Step 2, Bypass diode thermal test				—
	Diode 1	Diode 2	Diode 3	Result
Current flow applied [A] ..... :	12.97	12.97	12.97	—
Max. diode surface temperature allowed Tj_{max} [°C] :	N/A	N/A	N/A	—
Voltage drop [V] after 1h ..... :	0.32	0.32	0.32	—
Calculated max. junction temperature Tj_{calc} [°C] .... :	150.07	187.276	163.22	—
Tj_{calc} < Tj_{max} (test passed)? yes/no ..... :	yes	yes	yes	P
Current flow (1.25 * Isc) [A] ..... :	16.21	16.21	16.21	—
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.				

Test Date [YYYY-MM-DD] start/end ..... :	2020-08-26			—
Sample #	M3-13			—
Module temperature [°C]..... :	75 ± 5			—
Number of diodes in junction box ..... :	3			—
Diode manufacturer ..... :	PANJIT international Inc.			—
Diode type designation ..... :	SBT4050DY			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—
Detailed description of sample preparation procedure ..... :	Standard production module			—
Step 1, Determination of *V*D versus *T*J characteristic				—
	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C
Ambient temperature of the junction box ... :	31.0 31.0 31.0	51.7 51.6 51.5	71.0 70.7 70.6	90.7 90.2 90.7
Pulsed current..... :	15.57	15.57	15.57	15.57
Voltage drop [V] ..... :	0.437 0.431 0.441	0.417 0.422 0.425	0.404 0.412 0.401	0.390 0.395 0.389
V_D versus T_J characteristic ..... :	T_J = -1261.722* V_D + 580.888 T_J = -1640.255* V_D + 741.380 T_J = -1080.250* V_D + 508.263			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—

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Clause	Requirement + Test	Result - Remark	Verdict

Step 2, Bypass diode thermal test				—
	Diode 1	Diode 2	Diode 3	Result
Current flow applied [A] ..... :	15.57	15.57	15.57	—
Max. diode surface temperature allowed Tj_{max} [°C] :	N/A	N/A	N/A	—
Voltage drop [V] after 1h ..... :	0.34	0.34	0.34	—
Calculated max. junction temperature Tj_{calc} [°C] .... :	151.90	183.69	140.98	—
Tj_{calc} < Tj_{max} (test passed)? yes/no ..... :	yes	yes	yes	P
Current flow (1.25 * Isc) [A] ..... :	19.46	19.46	19.46	—
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.				

Test Date [YYYY-MM-DD] start/end ..... :	2020-08-19			—
Sample #	M4-13			—
Module temperature [°C]..... :	75 ± 5			—
Number of diodes in junction box ..... :	3			—
Diode manufacturer ..... :	PANJIT international Inc.			—
Diode type designation ..... :	SBT4050DY			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—
Detailed description of sample preparation procedure ..... :	Standard production module			—
Step 1, Determination of *V*D versus *T*J characteristic				—
	30 ± 2 °C	50 ± 2 °C	70 ± 2 °C	90 ± 2 °C
Ambient temperature of the junction box ... :	30.4 31.0 31.0	51.7 51.8 51.8	70.7 70.8 70.8	90.7 90.9 90.9
Pulsed current..... :	15.57	15.57	15.57	15.57
Voltage drop [V] ..... :	0.437 0.468 0.468	0.416 0.441 0.431	0.408 0.417 0.417	0.391 0.404 0.399
V_D versus T_J characteristic ..... :	T_J = -1328.465* V_D + 609.473 T_J = -911.113* V_D + 455.040 T_J = -860.500* V_D + 429.922			—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :	200			—

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Clause	Requirement + Test	Result - Remark	Verdict

Step 2, Bypass diode thermal test				—
	Diode 1	Diode 2	Diode 3	Result
Current flow applied [A] ..... :	15.57	15.57	15.57	—
Max. diode surface temperature allowed Tj_{max} [°C] :	N/A	N/A	N/A	—
Voltage drop [V] after 1h ..... :	0.34	0.34	0.34	—
Calculated max. junction temperature Tj_{calc} [°C] .... :	157.80	145.26	137.35	—
$Tj_{calc} < Tj_{max}$ (test passed)? yes/no ..... :	yes	yes	yes	P
Current flow (1.25 * Isc) [A] ..... :	19.46	19.46	19.46	—
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		P
Test Date [YYYY-MM-DD] ..... :	2020-07-27 for M1-13 2020-08-14 for M2-13 2020-08-27 for M3-13 2020-08-20 for M4-13	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M1-13	No major visual defects found	P
M2-13	No major visual defects found	P
M3-13	No major visual defects found	P
M4-13	No major visual defects found	P
Supplementary information: N/A		

TABLE 11.2: MQT 15 - Wet leakage current test after bypass diode thermal test		P
Test Date [YYYY-MM-DD] ..... :	2020-07-27 for M1-13 2020-08-14 for M2-13 2020-08-27 for M3-13 2020-08-20 for M4-13	—
Test Voltage applied [V] ..... :	8000/1500	—
Solution temperature [°C] ..... :	22.5	—
Size of module [m²] ..... :	2.54 for M1-13, M2-13 2.59 for M3-13, M4-13	—
Required Resistance [MΩ] ..... :	15.75 for M1-13, M2-13 15.44 for M3-13, M4-13	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-13	463.8	15.75	P
M2-13	451.2	15.75	P
M3-13	409.8	15.44	P
M4-13	447.6	15.44	P
Supplementary information: Solution resistivity [Ω·cm] 2811 for M1-13, 2896 for M2-13, 2816 for M3-13, 2966 for M4-13			

TABLE 11.3: MQT 02 – Max. power determination after bypass diode thermal test – Optional							N/A
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: N/A							

TABLE 11.4: MQT 03 - Insulation test after bypass diode thermal test - Optional					N/A
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: the maximum resistance measurement range is 5000MΩ.					

TABLE 12: MQT 18.2 - Bypass diode functionality test after bypass diode thermal test				P
Test Date [YYYY-MM-DD].....:	2020-07-27 for M1-13 2020-08-14 for M2-13 2020-08-27 for M3-13 2020-08-20 for M4-13			—
☐ Method A				—
Ambient temperature [°C] ……:				—
Current flow applied [A] ……..……:				—
Sample #	VFM	$V_{FMrated}$	VFM = (N × $V_{FMrated}$) ± 10 %	Result

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Clause	Requirement + Test	Result - Remark	Verdict

			☐ Yes ☐ No	—
Supplementary information:				
☒ Method B				—
	IV curve after shading			Result
Diode 1	Turn on			P
Diode 2	Turn on			P
Diode 3	Turn on			P
Supplementary information: N/A				

TABLE 12.1: MQT 19.1 Fin: Final stabilization							N/A
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:							

TABLE 12.3: MQT 19.1 Final Stabilization procedure							N/A
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 #	M13	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							

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 13: MQT 09 - Hot-spot endurance test		P
Test Date [YYYY-MM-DD] start/end .....:	2020-07-30	—
Sample #	M1-13	—
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] .:	53.3 / 53.8 / 53.5 / 52.8	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					P
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	/	/	/	/	
Shading rate [%].....:	15	10	15	18	—
Max. measured cell temperature in each cell [°C]:	165.3	188.2	174.4	148.6	—
Test duration of each shading [h] .....:	1	1	1	1	—
Irradiance during shading [W/m²] ……. .....:	1000	1000	1000	1000	—

Test Date [YYYY-MM-DD] start/end .....:	2020-08-28	—
Sample #	M2-13	—
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] .:	53.6 / 54.2 / 53.8 / 53.1	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					P
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	/	/	/	/	
Shading rate [%].....:	10	5	5	10	—
Max. measured cell temperature in each cell [°C]:	175.6	181.4	173.3	153.8	—
Test duration of each shading [h] .....:	1	1	1	1	—

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Clause	Requirement + Test	Result - Remark	Verdict

Irradiance during shading [W/m²] ……..…..:	1000	1000	1000	1000	—

Test Date [YYYY-MM-DD] start/end .....:	2020-08-29	—
Sample #	M3-13	—
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] .:	53.5 / 53.3 / 53.2 / 52.8	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					P
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	/	/	/	/	
Shading rate [%].....:	10	15	10	15	—
Max. measured cell temperature in each cell [°C]:	163.2	197.1	152.4	143.9	—
Test duration of each shading [h] .....:	1	1	1	1	—
Irradiance during shading [W/m²] ……..…..:	1260	1260	1260	1260	—

Test Date [YYYY-MM-DD] start/end .....:	2020-08-30	—
Sample #	M4-13	—
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] .:	54.4 / 54.6 / 53.5 / 53.4	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					P
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	/	/	/	/	
Shading rate [%].....:	15	15	16	10	—
Max. measured cell temperature in each cell [°C]:	181.5	188.2	178.3	157.7	—
Test duration of each shading [h] .....:	1	1	1	1	—

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Clause	Requirement + Test	Result - Remark	Verdict

Irradiance during shading [W/m²] …… ..... :	1260	1260	1260	1260	—

TABLE 13.2: MQT 09 - Hot-spot endurance test for MLI		N/A
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		P
Test Date [YYYY-MM-DD].....:	2020-08-12 for M1-13 2020-08-31 for M2-13, M4-13 2020-09-08 for M3-13	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M1-13	No major visual defects found	P
M2-13	No major visual defects found	P
M3-13	No major visual defects found	P
M4-13	No major visual defects found	P
Supplementary information: N/A		

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test (single-side front)							P
Test Date [YYYY-MM-DD].....:	2020-08-12 for M1-13 2020-08-31 for M2-13, M4-13 2020-09-08 for M3-13						—
Module temperature [°C].....:	25						—
Irradiance [W/m^2) .....:	1000						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
M1-13	12.973	49.146	12.399	41.272	511.720	80.26	—
M2-13	12.957	49.473	12.321	41.631	512.934	80.02	—
M3-13	13.022	49.159	12.446	41.249	513.385	80.20	—
M4-13	12.922	49.306	12.365	41.307	510.739	80.16	—
Supplementary information: N/A							

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test (single-side rear)							P
Test Date [YYYY-MM-DD]....:		2020-09-08 for M3-13 2020-08-31 for M4-13					—
Module temperature [°C]....:		25					—
Irradiance [W/m²] ....:		1000					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
M3-13	8.540	48.248	8.058	41.085	331.063	80.35	—
M4-13	8.655	48.160	8.074	41.299	333.434	80.00	—
Supplementary information: N/A							

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test (Equivalent irradiance)							P
Test Date [YYYY-MM-DD]....:		2020-09-08 for M3-13 2020-08-31 for M4-13					—
Module temperature [°C]....:		25					—
Irradiance [W/m²] ....:		1100					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
M3-13	14.362	49.029	13.794	41.242	568.892	80.79	—
M4-13	14.182	49.409	13.591	41.31	561.459	80.12	—
Supplementary information: 1100W/m² equivalent irradiance is the effective value calculated when backside irradiance is 135W/m².							

TABLE 13.5: MQT 03 - Insulation test after hot-spot endurance test					P
Test Date [YYYY-MM-DD]....:		2020-08-12 for M1-13 2020-09-01 for M2-13, M4-13 2020-09-08 for M3-13			—
Test Voltage applied [V] ....:		8000/1500			—
Size of module [m²]....:		2.54 for M1-13, M2-13 2.59 for M3-13, M4-13			—
Required Resistance [MΩ]....:		15.75 for M1-13, M2-13 15.44 for M3-13, M4-13			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-13	>5000	15.75		No	P
M2-13	>5000	15.75		No	P
M3-13	>5000	15.44		No	P

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M4-13	>5000	15.44		No	P
Supplementary information: the maximum resistance measurement range is 5000MΩ.					

TABLE 13.6: MQT 15 - Wet leakage current test after hot-spot endurance test			P
Test Date [YYYY-MM-DD]..... :		2020-08-12 for M1-13 2020-09-01 for M2-13, M4-13 2020-09-08 for M3-13	—
Test Voltage applied [V] ..... :		1500	—
Solution temperature [°C]..... :		22.5 for M1-13, 22.6 for M2-13, M3-13, M4-13	—
Size of module [m²]		2.54 for M1-13, M2-13 2.59 for M3-13, M4-13	—
Required Resistance [MΩ].....		15.75 for M1-13, M2-13 15.44 for M3-13, M4-13	—
Sample #	Measured [MΩ]	Required [MΩ]	Result
M1-13	378.6	15.75	P
M2-13	498.3	15.75	P
M3-13	483.9	15.44	P
M4-13	501.6	15.44	P
Supplementary information: Solution resistivity [Ω·cm] 2729 for M1-13, 2815 for M2-13, 2817 for M3-13, 2815 for M4-13			

TABLE 13.7: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test				P
Test Date [YYYY-MM-DD]..... :		2020-08-12 for M1-13 2020-09-01 for M2-13, M4-13 2020-09-08 for M3-13		—
☐ Method A				—
Ambient temperature [°C] ..... :				—
Current flow applied [A] ..... :				—
Sample #	VFM	$V_{FMrated}$	VFM = (N × $V_{FMrated}$) ± 10 %	Result
			☐ Yes ☐ No	—
Supplementary information:				
☒ Method B				—
	IV curve after shading			Result
Diode 1	Turn on			P
Diode 2	Turn on			P

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Clause	Requirement + Test	Result - Remark	Verdict
Diode 3	Turn on		P
Supplementary information: N/A			

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 14: MQT 10 - UV preconditioning test		P
Test Date (YYYY-MM-DD) start/end .....:	2020-07-28 / 2020-08-02 for M3-x 2020-08-06 / 2020-08-10 for M4-x	—
Module temperature [°C] ..... :	65±5	—
UV irradiance (280-400nm) [W/m²] ..... :	136.36 for M3-x 166.67 for M4-x	—
Ratio of UV irradiance (280-320nm) (%) ..... :	7.67	—
UV dose (280-400nm) [kWh/ m²] ..... :	15	—
Module operation condition ..... .:	☒ Short circuited ☐ Pmax	—
Supplementary information: Light sources not emitting a significant portion of light in the visible spectrum where the module exhibits a power equal to or larger than 20 % of its STC measured power. UV preconditioning test was performed on front side of the module.		

Test Date (YYYY-MM-DD) start/end .....:	2020-08-02 / 2020-08-07 for M3-x 2020-08-10 / 2020-08-14 for M4-x	—
Module temperature [°C] ..... :	65±5	—
UV irradiance (280-400nm) [W/m²] ..... :	136.37 for M3-x 166.66 for M4-x	—
Ratio of UV irradiance (280-320nm) (%) ..... :	7.73 for M3-x 7.93 for M4-x	—
UV dose (280-400nm) [kWh/ m²] ..... :	15	—
Module operation condition ..... .:	☒ Short circuited ☐ Pmax	—
Supplementary information: Light sources not emitting a significant portion of light in the visible spectrum where the module exhibits a power equal to or larger than 20 % of its STC measured power. UV preconditioning test was performed on back side of the module.		

TABLE 14.1: MQT 01 - Visual inspection after UV preconditioning test		P
Test Date [YYYY-MM-DD].....:	2020-08-10 for M3-x 2020-08-14 for M4-x	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M3-4	No major visual defects found	P
M3-5	No major visual defects found	P
M4-4	No major visual defects found	P
M4-5	No major visual defects found	P
Supplementary information: N/A		

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 14.2: MQT 15 - Wet leakage current test after UV preconditioning test			P
Test Date [YYYY-MM-DD] ..... :	2020-08-11 for M3-x 2020-08-14 for M4-x		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C] ..... :	22.4 for M3-x 22.5 for M4-x		—
Size of module [m²] ..... :	2.59		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M3-4	473.9	15.44	P
M3-5	480.1	15.44	P
M4-4	487.2	15.44	P
M4-5	496.5	15.44	P
Supplementary information: Solution resistivity [Ω·cm] 2939 for M3-x, 2817 for M4-x			

TABLE 14.3: MQT 02 – Max. power determination after UV preconditioning test - Optional							N/A
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: N/A							

TABLE 14.4: MQT 03 - Insulation test after UV preconditioning test - Optional				N/A
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: the maximum resistance measurement range is				

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 15: MQT 11 - Thermal cycling 50 test			P
Test Date [YYYY-MM-DD] start/end .....:	2020-08-11 / 2020-08-21 for M3-x 2020-08-15 / 2020-08-25 for M4-x		—
Total cycles (50).....:	50		—
Applied current (A) .....:	During the heat up cycle from 40 °C to 80 °C	15	—
	Other stages	0.05	—

Sample #	Open circuits (yes/no)	—
M3-4	No	P
M3-5	No	P
M4-4	No	P
M4-5	No	P

Supplementary information: N/A

TABLE 15.1: MQT 01 - Visual inspection after thermal cycling 50 test		P
Test Date [YYYY-MM-DD].....:	2020-08-21 for M3-x 2020-08-25 for M4-x	—

Sample #	Nature and position of initial findings – comments or attach photos	—
M3-4	No major visual defects found	P
M3-5	No major visual defects found	P
M4-4	No major visual defects found	P
M4-5	No major visual defects found	P

Supplementary information: N/A

TABLE 15.2: MQT 15 - Wet leakage current test after thermal cycling 50 test		P
Test Date [YYYY-MM-DD]..... :	2020-08-21 for M3-x 2020-08-25 for M4-x	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C] ……:	22.4 for M3-x 22.5 for M4-x	—
Size of module [m²]	2.59	—

Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M3-4	530.4	15.44	P
M3-5	498.3	15.44	P
M4-4	399.5	15.44	P
M4-5	459.4	15.44	P

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: Solution resistivity [Ω·cm] 2994 for M3-x, 2823 for M4-x						
TABLE 15.3: MQT 03 – Max. power determination after thermal cycling 50 test - Optional						N/A
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: N/A						

TABLE 15.4: MQT 03 - Insulation test after thermal cycling 50 test - Optional				N/A
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: the maximum resistance measurement range is				

TABLE 16: MQT 12 - Humidity freeze 10 test		P
Test Date [YYYY-MM-DD] start/end ..... :	2020-08-22 / 2020-09-01 for M3-x 2020-08-26 / 2020-09-05 for M4-x	—
Total cycles (10) ..... :	10	—
Applied current (A) ..... :	0.05	—
Sample #	Open circuits (yes/no)	—
M3-4	No	P
M3-5	No	P
M4-4	No	P
M4-5	No	P
Supplementary information: N/A		

TABLE 16.1: MQT 01 - Visual inspection after humidity freeze 10 test		P
Test Date [YYYY-MM-DD]..... :	2020-09-01 for M3-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

	2020-09-05 for M4-x	
Sample #	Nature and position of initial findings – comments or attach photos	—
M3-4	No major visual defects found	P
M3-5	No major visual defects found	P
M4-4	No major visual defects found	P
M4-5	No major visual defects found	P
Supplementary information: N/A		

TABLE 16.2: MQT 15 - Wet leakage current test after humidity freeze 10 test			P
Test Date [YYYY-MM-DD].....:	2020-09-01 for M3-x 2020-09-05 for M4-x		—
Test Voltage applied [V] .....:	1500		—
Solution temperature [°C]…….:	22.5 for M3-x 22.6 for M4-x		—
Size of module [m²].....:	2.59		—
Required Resistance [MΩ].....:	15.44		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M3-4	513.2	15.44	P
M3-5	465.8	15.44	P
M4-4	421.7	15.44	P
M4-5	395.8	15.44	P
Supplementary information: Solution resistivity [Ω·cm] 2823 for M3-x, 2815 for M4-x			

TABLE 16.3: MQT 02 - Maximum power determination after humidity freeze 10 test -Optional						N/A
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: N/A						

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

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Clause	Requirement + Test	Result - Remark	Verdict

Size of module [m²] .....:					—
Required Resistance [MΩ].....:					—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
					—
					—
Supplementary information: the maximum resistance measurement range is					

TABLE 17: MQT 14 - Robustness of terminations test		N/A
Test Date [YYYY-MM-DD] start/end .....:		—

TABLE 17.1: MQT 14.1 Retention of junction box on mounting surface		N/A
Sample #		
Supplementary information:		

TABLE 17.2: MQT 01 - Visual inspection after retention of junction box on mounting surface		N/A
Test Date [YYYY-MM-DD]..... :		—
Sample #	Nature and position of initial findings – comments or attach photos	—
		—
		—
Supplementary information: N/A		

TABLE 17.3: MQT 15 - Wet leakage current test after retention of junction box on mounting surface			N/A
Test Date [YYYY-MM-DD]..... :			—
Test Voltage applied [V] ..... :			—
Solution temperature [°C].....:			—
Size of module [m²]			—
Required Resistance [MΩ]..... :			—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
			—
			—
Supplementary information: Solution resistivity [Ω·cm]			

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TABLE 17.4: MQT 14.2 - Test of cord anchorage						N/A
Sample #						—
☐ 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			2mm			
	Cable diameter, [mm]	Torque Force, [Nm]	Permissible angle [°]	Measured angle [°]		Result
Torque test			45°			
☐ 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			2mm		
	Anchorage diameter range [mm]	Test mandrel [mm]	Torque Force [Nm]	Permissible angle [°]	Measured angle [°]	Result
Torque test	Max			45°		
Supplementary information:						

TABLE 17.5: MQT 01 - Visual inspection after retention of test of cord anchorage		N/A
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			N/A
Test Date [YYYY-MM-DD]..... :			—
Test Voltage applied [V] ..... :			—
Solution temperature [°C].....:			—
Size of module [m²]			—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
Supplementary information: Size of module [m²]			

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TABLE 17.7: MQT 03 - Insulation test after test of cord anchorage					N/A
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: Size of module [m²].					

TABLE 18: MQT 11 - Thermal cycling 200 test			
Test Date [YYYY-MM-DD] start/end ..... :	2020-07-25 / 2020-08-25 for M1-x, M3-x 2020-08-06 / 2020-09-05 for M2-x 2020-08-04 / 2020-09-04 for M4-x		—
Total cycles (200) ..... :	200		—
Applied current (A) ..... :	During the heat up cycle from – 40 °C to 80 °C	12.4 for M1-x, M2-x 15.0 for M3-x, M4-x	—
	Other stages	0.05	—

Sample #	Open circuits (yes/no)	—
M1-8	No	P
M1-9	No	P
M2-8	No	P
M2-9	No	P
M3-8	No	P
M3-9	No	P
M4-8	No	P
M4-9	No	P
Supplementary information: N/A		

TABLE 18.1: MQT 01 - Visual inspection after thermal cycling 200 test			P
Test Date [YYYY-MM-DD] ..... :	2020-08-26 for M1-x, M3-x 2020-09-04 for M2-x 2020-09-07 for M4-x		—
Sample #	Nature and position of initial findings – comments or attach photos		—

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Clause	Requirement + Test	Result - Remark	Verdict
M1-8	No major visual defects found		P
M1-9	No major visual defects found		P
M2-8	No major visual defects found		P
M2-9	No major visual defects found		P
M3-8	No major visual defects found		P
M3-9	No major visual defects found		P
M4-8	No major visual defects found		P
M4-9	No major visual defects found		P
Supplementary information: N/A			

TABLE 18.2: MQT 15 - Wet leakage current test after thermal cycling 200 test			P
Test Date [YYYY-MM-DD].....:	2020-08-26 for M1-x, M3-x 2020-09-05 for M2-x 2020-09-07 for M4-x		—
Test Voltage applied [V] .....:	1500		—
Solution temperature [°C].....:	22.3 for M1-x, M3-x, M4-x 22.4 for M2-x		—
Size of module [m²] .....:	2.54 for M1-x, M2-x 2.59 for M3-x, M4-x		—
Required Resistance [MΩ].....:	15.75 for M1-x, M2-x 15.44 for M3-x, M4-x		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-8	482.3	15.75	P
M1-9	495.1	15.75	P
M2-8	442.3	15.75	P
M2-9	451.9	15.75	P
M3-8	491.3	15.44	P
M3-9	486.7	15.44	P
M4-8	462.3	15.44	P
M4-9	449.6	15.44	P
Supplementary information: Solution resistivity [Ω·cm] 2863 for M1-x, 2941 for M2-x, 2914 for M3-x, 2872 for M4-x			

TABLE 19: MQT 13 - Damp heat 1000 test		P
Test Date [YYYY-MM-DD] start/end .....:	2020-07-25 / 2020-09-04 for M1-x, M3-x 2020-07-25 / 2020-09-03 for M5-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

Total hours (1000h) ..... :	1000	—
Sample #	Open circuits (yes/no)	—
M1-6	No	P
M1-7	No	P
M3-6	No	P
M3-7	No	P
M5-6-1	No	P
M5-6-2	No	P
M5-6-3	No	P
Supplementary information: N/A		

TABLE 19.1: MQT 01 - Visual inspection after damp heat 1000 test		P
Test Date [YYYY-MM-DD]..... :	2020-09-04 for M1-x, M3-x 2020-09-03 for M5-x	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M1-6	No major visual defects found	P
M1-7	No major visual defects found	P
M3-6	No major visual defects found	P
M3-7	No major visual defects found	P
M5-6-1	No major visual defects found	P
M5-6-2	No major visual defects found	P
M5-6-3	No major visual defects found	P
Supplementary information: N/A		

TABLE 19.2: MQT 15 - Wet leakage current test after damp heat 1000 test		P
Test Date [YYYY-MM-DD]..... :	2020-09-04 for M1-x, M3-x 2020-09-03 for M5-x	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C]..... :	22.3 for M1-x 22.4 for M3-x 22.5 for M5-x	—
Size of module [m²] ..... :	2.54 for M1-x 2.59 for M3-x 2.23 for M5-x	—
Required Resistance [MΩ]..... :	15.75 for M1-x 15.44 for M3-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

	17.94 for M5-x		
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-6	452.9	15.75	P
M1-7	447.2	15.75	P
M3-6	462.8	15.75	P
M3-7	449.1	15.75	P
M5-6-1	398.5	17.95	P
M5-6-2	459.2	17.95	P
M5-6-3	399.3	17.95	P
Supplementary information: Solution resistivity [Ω·cm] 2973 for M1-x, 2849 for M3-x, 2801 for M5-x			

TABLE 19.3: MQT 02 - Maximum power determination after damp heat 1000 test - Optional							N/A
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: N/A							

TABLE 19.4: MQT 03 - Insulation test after damp heat 1000 test - Optional					N/A
Test Date [YYYY-MM-DD]..... :					—
Test Voltage applied [V] ..... :					—
Size of module [m²]					—
Sample #	Measured	Required Resistance	Dielectric breakdown		Result
	[MΩ]	[MΩ]	Yes (description)	No	
					—
					—
Supplementary information: the maximum resistance measurement range is					

TABLE 19.5: MQT 16 Static mechanical load test		P
Sample # :	M1-6	—
Design load(front side/ back side)..... :	1600/1600	—
Safety factors ..... :	1.5	—
Test Date [YYYY-MM-DD].....	2020-09-11	—

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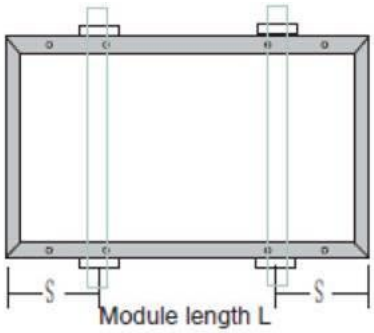
Clause	Requirement + Test	Result - Remark	Verdict

Mounting method	by 4 clamps on long side frame		—
Load applied to.....	front side	back side	—
Mechanical load [Pa].....	2400	2400	—
First cycle time (start/end).....	09:06 / 10:06	10:09 / 11:09	—
Intermittent open-circuit (yes/no).....	No	No	P
Second cycle time (start/end).....	11:16 / 12:16	12:21 / 13:21	—
Intermittent open-circuit (yes/no).....	No	No	P
Third cycle time (start/end).....	13:26 / 14:26	14:29 / 15:29	—
Intermittent open-circuit (yes/no).....	No	No	P

Supplementary information:

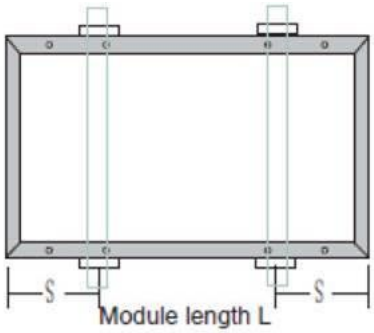


Mounting by clamps (S=1/4L±50)

Sample # :	M1-6		—
Design load(front side/ back side).....	3600/1600		—
Safety factors	1.5		—
Test Date [YYYY-MM-DD].....	2020-09-16		—
Mounting method	by 4 clamps on long side frame		—
Load applied to.....	front side	back side	—
Mechanical load [Pa].....	5400	2400	—
First cycle time (start/end).....	09:12 / 10:12	10:14 / 11:14	—
Intermittent open-circuit (yes/no).....	No	No	P
Second cycle time (start/end).....	11:19 / 12:19	12:24 / 13:24	—
Intermittent open-circuit (yes/no).....	No	No	P
Third cycle time (start/end).....	13:29 / 14:29	14:35 / 15:35	—
Intermittent open-circuit (yes/no).....	No	No	P

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

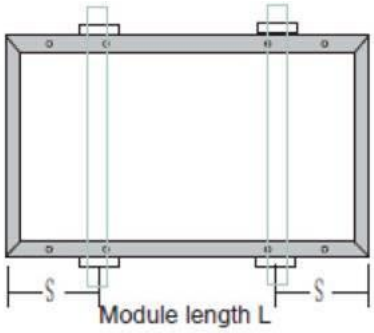
Supplementary information:



Mounting by clamps (S=1/4L±50)

Sample # :	M3-6		—
Design load(front side/ back side) :	1600/1600		—
Safety factors :	1.5		—
Test Date [YYYY-MM-DD]	2020-09-15		—
Mounting method :	by 4 clamps on long side frame		—
Load applied to :	front side	back side	—
Mechanical load [Pa]	2400	2400	—
First cycle time (start/end)	09:06 / 10:06	10:09 / 11:09	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	11:6 / 12:16	12:21 / 13:21	—
Intermittent open-circuit (yes/no)	No	No	P
Third cycle time (start/end)	13:26 / 14:26	14:29 / 15:29	—
Intermittent open-circuit (yes/no)	No	No	P

Supplementary information:



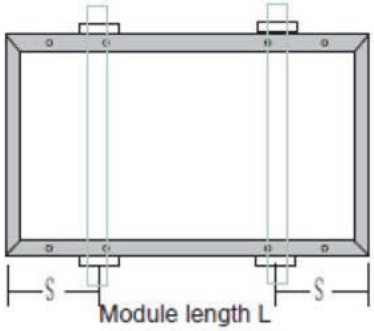
Mounting by clamps (S=1/4L±50)

Sample # :	M3-6	—
Design load(front side/ back side) :	3600/1600	—

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

Safety factors ..... :	1.5		—
Test Date [YYYY-MM-DD]	2020-09-16		—
Mounting method ..... :	by 4 clamps on long side frame		—
Load applied to ..... :	front side	back side	—
Mechanical load [Pa]	5400	2400	—
First cycle time (start/end)	09:07 / 10:07	10:09 / 11:09	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	11:14 / 12:14	12:20 / 13:20	—
Intermittent open-circuit (yes/no)	No	No	P
Third cycle time (start/end)	13:29 / 14:29	14:33 / 15:33	—
Intermittent open-circuit (yes/no)	No	No	P

Supplementary information:

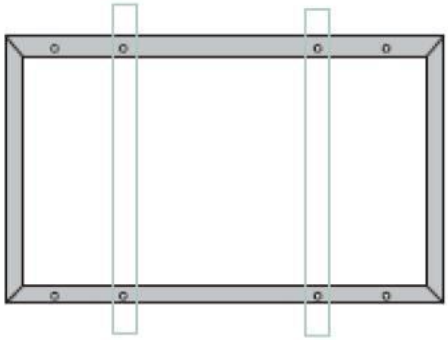


Mounting by clamps (S=1/4L±50)

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

Sample # :	M5-6-1		—
Design load(front side/ back side) ..... :	1600/1600		—
Safety factors ..... :	1.5		—
Test Date [YYYY-MM-DD]	2020-09-12		—
Mounting method ..... :	by 4 inner mounting holes on long side frame		—
Load applied to ..... :	front side	back side	—
Mechanical load [Pa]	2400	2400	—
First cycle time (start/end)	09:06 / 10:06	10:09 / 11:09	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	11:16 / 12:16	12:21 / 13:21	—
Intermittent open-circuit (yes/no)	No	No	P
Third cycle time (start/end)	13:26 / 14:26	14:29 / 15:29	—
Intermittent open-circuit (yes/no)	No	No	P

Supplementary information:

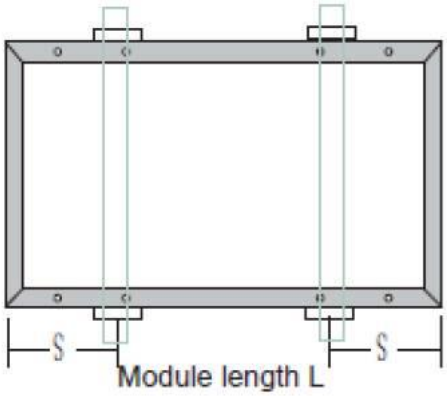


Mounting by inner four holes

Sample # :	M5-6-2		—
Design load(front side/ back side) ..... :	3600/1600		—
Safety factors ..... :	1.5		—
Test Date [YYYY-MM-DD]	2020-09-12		—
Mounting method ..... :	by 4 clamps on long side frame		—
Load applied to ..... :	front side	back side	—
Mechanical load [Pa]	5400	2400	—
First cycle time (start/end)	09:08 / 10:08	10:11 / 11:11	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	11:20 / 12:20	12:40 / 13:40	—
Intermittent open-circuit (yes/no)	No	No	P

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

Third cycle time (start/end).....	13:55 / 14:55	14:58 / 15:58	—
Intermittent open-circuit (yes/no).....	No	No	P
Supplementary information:			



Mounting by clamps (S=1/4L±50)

Sample # :	M5-6-3		—
Design load(front side/ back side)..... :	3600/1600		—
Safety factors ..... :	1.5		—
Test Date [YYYY-MM-DD].....	2020-09-14		—
Mounting method ..... :	by 8 mounting holes on long side frame		—
Load applied to..... :	front side	back side	—
Mechanical load [Pa].....	5400	2400	—
First cycle time (start/end).....	09:07 / 10:07	10:10 / 11:10	—
Intermittent open-circuit (yes/no).....	No	No	P
Second cycle time (start/end).....	11:17 / 12:17	12:23 / 13:23	—
Intermittent open-circuit (yes/no).....	No	No	P
Third cycle time (start/end).....	13:32 / 14:32	14:43 / 15:43	—
Intermittent open-circuit (yes/no).....	No	No	P
Supplementary information: N/A			

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

TABLE 19.6: MQT 01 – Visual inspection after static mechanical load test		P
Test Date [YYYY-MM-DD] ..... :	2020-09-16 for M1-6 2020-09-18 for M3-6 2020-09-14 for M5-6-1, M5-6-2, M5-6-3	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M1-6	No major visual defects found	P
M3-6	No major visual defects found	P
M5-6-1	No major visual defects found	P
M5-6-2	No major visual defects found	P
M5-6-3	No major visual defects found	P
Supplementary information: N/A		

TABLE 19.7: MQT 15 - Wet leakage current test after static mechanical load test			P
Test Date [YYYY-MM-DD] ..... :	2020-09-16 for M1-6 2020-09-18 for M3-6 2020-09-14 for M5-6-1, M5-6-2, M5-6-3		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C] ..... :	22.5 for M1-6 22.4 for M3-6, M5-6-1, M5-6-2, M5-6-3		—
Size of module [m²] ..... :	2.54 for M1-6, 2.59 for M3-6 2.23 for M5-6-1, M5-6-2, M5-6-3		—
Required Resistance [MΩ] ..... :	15.75 for M1-6 15.44 for M3-6 17.94 for M5-6-1, M5-6-2, M5-6-3		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-6	473.6	15.75	P
M3-6	474.5	15.44	P
M5-6-1	466.5	17.94	P
M5-6-2	488.1	17.94	P
M5-6-3	432.9	17.94	P
Supplementary information: Solution resistivity [Ω·cm] 2875 for M1-6, 2962 for M3-6, 2813 for M5-6-1, M5-6-2, M5-6-3			

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

TABLE 19.8: MQT 17 - Hail impact test							N/A
Test Date [YYYY-MM-DD] ..... :							—
Sample #							—
Ice ball size [mm] ..... :	1	2	3	4	5	6	—
	7	8	9	10	11		
Ice ball weight [g]..... :	1	2	3	4	5	6	—
	7	8	9	10	11		
Ice ball velocity [m/s] ..... :	1	2	3	4	5	6	—
	7	8	9	10	11		
Number of impact locations..... :							—

Supplementary information: (impact location descriptions)

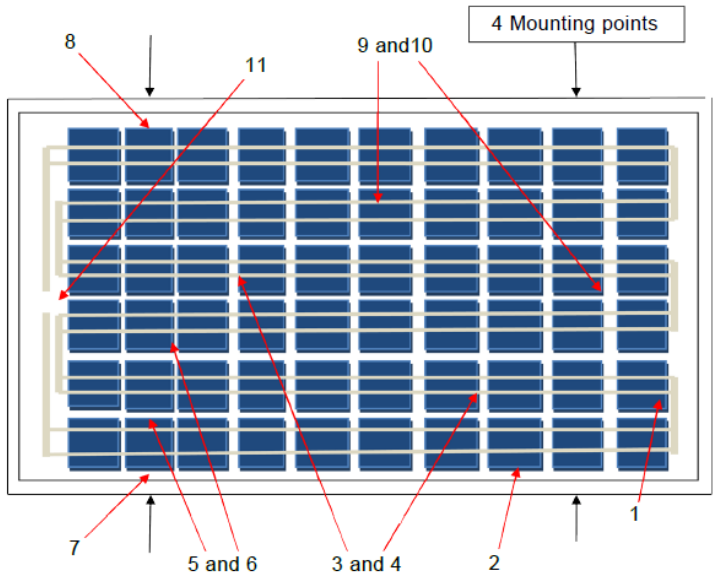


TABLE 19.9: MQT 01 - Visual inspection after hail impact test		N/A
Test Date [YYYY-MM-DD]……..... :		—

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

Sample #	Nature and position of initial findings – comments or attach photos	—
		—
Supplementary information: N/A		

TABLE 19.10: MQT 15 - Wet leakage current test after hail impact test			N/A
Test Date [YYYY-MM-DD] ..... :			—
Test Voltage applied [V] ..... :			—
Solution temperature [°C] ..... :			—
Size of module [m²] ..... :			—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
			—
Supplementary information: Solution resistivity [Ω·cm]			

TABLE 20: MQT 19.1 Fin: Final stabilization							N/A
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			N/A
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..:	

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

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end					

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end					

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end..:					

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end					

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

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end..... :					

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—
Sample #		Test Date (YYYY-MM-DD) start/end					

Test cycle	Integrated irradiation (kWh/m²)	Irradiance (W/m²)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—		—	—
1							
2							
3							
4						—	—

Supplementary information:

☐ Other stabilization procedures

Sample #	Test Date (YYYY-MM-DD) start/end

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

Test method description:
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure

TABLE 20.3: MQT 06.1: Final Performance at STC (single-side front)									P
Test Date [YYYY-MM-DD]..... :	Different date								—
Test method.....	☒ Simulator ☐ Natural sunlight								—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab _GateNo.1)	Power Degradation [%]	Result
M1-10	12.882	49.359	12.380	41.385	512.361	80.58	511.573	0.154	P
M1-13	12.830	49.331	12.325	41.347	509.599	80.52	511.666	-0.404	P
M1-8	12.779	49.328	12.263	41.426	508.002	80.59	510.372	-0.464	P
M1-9	13.000	49.255	12.438	41.240	512.931	80.11	512.651	0.055	P
M1-6	12.813	49.318	12.358	41.302	510.411	80.77	512.345	-0.378	P
M1-7	12.987	49.061	12.440	41.261	513.302	80.55	511.932	0.268	P
M2-10	12.827	49.339	12.347	41.438	511.643	80.84	511.971	-0.064	P
M2-13	12.819	49.318	12.320	41.440	510.562	80.76	512.402	-0.359	P
M2-8	12.832	49.313	12.336	41.427	511.034	80.76	513.324	-0.446	P
M2-9	12.938	49.016	12.423	41.347	513.664	81.00	513.795	-0.025	P
M3-10	12.967	49.316	12.464	41.267	514.351	80.43	513.877	0.092	P
M3-13	12.881	49.322	12.383	41.271	511.068	80.45	511.973	-0.177	P
M3-4	12.697	49.308	12.231	41.259	504.656	80.61	510.902	-1.223	P
M3-5	12.799	49.292	12.255	41.292	506.048	80.21	512.224	-1.206	P
M3-8	12.854	49.317	12.399	41.299	512.067	80.78	514.800	-0.531	P
M3-9	12.898	49.228	12.323	41.207	507.791	79.97	514.511	-1.306	P
M3-6	12.905	49.393	12.407	41.429	514.024	80.64	515.548	-0.296	P
M3-7	13.013	49.164	12.519	41.298	516.998	80.81	515.717	0.248	P
M4-10	12.989	49.417	12.503	41.315	516.581	80.48	515.886	0.135	P
M4-13	12.783	49.411	12.328	41.328	509.499	80.66	510.598	-0.215	P
M4-4	12.729	49.403	12.261	41.312	506.520	80.55	507.180	-0.130	P
M4-5	12.911	48.910	12.339	41.087	506.985	80.28	508.416	-0.281	P
M4-8	12.672	49.412	12.222	41.359	505.480	80.73	509.396	-0.769	P

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Clause	Requirement + Test	Result - Remark	Verdict

M4-9	12.952	49.267	12.370	41.193	509.558	79.86	509.730	-0.034	P
M5-10	11.300	49.015	10.857	40.863	443.650	80.10	442.223	0.323	P
M5-6-1	11.221	49.030	10.757	40.557	436.282	79.30	441.279	-1.132	P
M5-6-2	11.162	48.996	10.767	40.489	435.960	79.71	443.068	-1.604	P
M5-6-3	11.192	49.018	10.745	40.841	438.839	79.99	440.516	-0.381	P
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility *r* of control module.									

TABLE 20.3: MQT 06.1: Final Performance at STC (single-side rear)									P
Test Date [YYYY-MM-DD]..... :	Different date								—
Test method.....	☒ Simulator ☐ Natural sunlight								—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab _GateNo.1)	Power Degradation [%]	Result
M3-10	8.620	47.935	8.029	41.091	329.940	79.85	329.689	0.076	—
M3-13	8.606	47.884	8.018	41.052	329.143	79.88	329.959	-0.247	—
M3-4	8.436	47.883	7.853	41.066	322.485	79.83	325.298	-0.865	—
M3-5	8.435	48.013	7.825	41.261	322.853	79.72	325.630	-0.853	—
M3-8	8.509	47.917	7.914	41.087	325.157	79.75	328.714	-1.082	—
M3-9	8.499	48.094	7.899	41.187	325.339	79.59	328.561	-0.980	—
M3-6	8.462	47.961	8.007	41.121	329.267	81.13	332.522	-0.979	—
M3-7	8.482	48.205	8.067	41.231	332.625	81.35	332.004	0.187	—
M4-10	8.595	48.118	8.142	41.084	334.511	80.88	334.604	-0.028	—
M4-13	8.552	48.055	8.095	41.047	332.286	80.85	333.598	-0.393	—
M4-4	8.288	48.038	7.837	41.049	321.701	80.80	325.527	-1.175	—
M4-5	8.436	47.799	7.942	40.998	325.619	80.75	325.699	-0.025	—
M4-8	8.376	48.023	7.920	41.041	325.044	80.81	322.974	0.641	—
M4-9	8.268	47.998	7.921	40.946	324.322	81.73	326.643	-0.710	—
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility *r* of control module.									

TABLE 20.3: MQT 06.1: Final Performance at STC (Equivalent irradiance)		P
Test Date [YYYY-MM-DD]..... :	Different date	—

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

Test method	☒ Simulator	☐ Natural sunlight	—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab _GateNo.1)	Power Degradation [%]	Result
M3-10	14.263	49.320	13.774	41.230	567.899	80.73	566.726	0.207	P
M3-13	14.272	49.328	13.707	41.227	565.093	80.27	567.313	-0.391	P
M3-4	14.019	49.321	13.457	41.252	555.122	80.29	562.845	-1.372	P
M3-5	14.146	49.402	13.576	41.241	559.880	80.11	567.677	-1.374	P
M3-8	14.105	49.328	13.591	41.216	560.185	80.51	566.526	-1.119	P
M3-9	14.251	49.422	13.662	41.163	562.359	79.85	567.405	-0.889	P
M3-6	14.173	49.435	13.643	41.436	565.326	80.69	570.074	-0.833	P
M3-7	14.306	49.505	13.770	41.389	569.919	80.47	569.376	0.095	P
M4-10	14.272	49.424	13.741	41.355	568.237	80.56	570.163	-0.338	P
M4-13	14.071	49.420	13.570	41.318	560.693	80.63	561.640	-0.169	P
M4-4	14.002	49.422	13.485	41.350	557.609	80.58	558.369	-0.136	P
M4-5	14.051	49.239	13.530	41.196	557.373	80.56	558.971	-0.286	P
M4-8	13.958	49.421	13.479	41.299	556.683	80.70	561.100	-0.787	P
M4-9	14.213	49.334	13.644	41.122	561.078	80.02	561.421	-0.061	P

Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility *r* of control module.

TABLE 21: MQT 03 fin: Final Insulation test					P
Test Date [YYYY-MM-DD] ..... :			Different date		—
Test Voltage applied [V] ..... :			8000/1500		—
Size of module [m²] ..... :			2.54 for M1-x, M2-x 2.59 for M3-x, M4-x 2.23 for M5-x		—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-10	15.75	>5000		No	P
M1-13	15.75	>5000		No	P
M1-8	15.75	>5000		No	P
M1-9	15.75	>5000		No	P
M1-6	15.75	>5000		No	P

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Clause	Requirement + Test		Result - Remark		Verdict
M1-7	15.75	>5000		No	P
M2-10	15.75	>5000		No	P
M2-13	15.75	>5000		No	P
M2-8	15.75	>5000		No	P
M2-9	15.75	>5000		No	P
M3-10	15.44	>5000		No	P
M3-13	15.44	>5000		No	P
M3-4	15.44	>5000		No	P
M3-5	15.44	>5000		No	P
M3-8	15.44	>5000		No	P
M3-9	15.44	>5000		No	P
M3-6	15.44	>5000		No	P
M3-7	15.44	>5000		No	P
M4-10	15.44	>5000		No	P
M4-13	15.44	>5000		No	P
M4-4	15.44	>5000		No	P
M4-5	15.44	>5000		No	P
M4-8	15.44	>5000		No	P
M4-9	15.44	>5000		No	P
M5-10	17.94	>5000		No	P
M5-6-1	17.94	>5000		No	P
M5-6-2	17.94	>5000		No	P
M5-6-3	17.94	>5000		No	P
Supplementary information: the maximum resistance measurement range is 5000MΩ.					

TABLE 22: MQT 15 fin: Final Wet leakage current test		P
Test Date [YYYY-MM-DD] ..... :	Different date	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C] ..... :	22 ± 2	—
Size of module [m²] ..... :	2.54 for M1-x, M2-x 2.59 for M3-x, M4-x 2.23 for M5-x	—
Required Resistance [MΩ] ..... :	15.75 for M1-x, M2-x 15.44 for M3-x, M4-x 17.94 for M5-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-10	468.1	15.75	P
M1-13	378.6	15.75	P
M1-8	482.3	15.75	P
M1-9	495.1	15.75	P
M1-6	473.6	15.75	P
M1-7	447.2	15.75	P
M2-10	457.9	15.75	P
M2-13	498.3	15.75	P
M2-8	442.3	15.75	P
M2-9	451.9	15.75	P
M3-10	462.9	15.44	P
M3-13	483.9	15.44	P
M3-4	513.2	15.44	P
M3-5	465.8	15.44	P
M3-8	491.3	15.44	P
M3-9	486.7	15.44	P
M3-6	474.5	15.44	P
M3-7	462.8	15.44	P
M4-10	443.7	15.44	P
M4-13	501.6	15.44	P
M4-4	421.7	15.44	P
M4-5	395.8	15.44	P
M4-8	462.3	15.44	P
M4-9	449.6	15.44	P
M5-10	438.6	17.94	P
M5-6-1	466.5	17.94	P
M5-6-2	488.1	17.94	P
M5-6-3	432.9	17.94	P
Supplementary information: Solution resistivity <3500 [Ω·cm].			

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

A1.1	MODULE TYPE/S
	a) JAM72S30-xxx/MR, xxx= 510 to 550 in step of 5 b) JAM66S30-xxx/MR, xxx= 470 to 505 in step of 5 c) JAM60S30-xxx/MR, xxx= 435 to 460 in step of 5

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	a) 2267x1122x35 or 2279x1134x35 b) 2094x1134x35 c) 1909x1134x35
	Weights..... :	a) 28.5 or 28.6 ±3% Kg b) 26.3 ±3% Kg c) 24.0 ±3% Kg
	Front/Rear cover bonding classification ..... :	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**JA Solar Technology Yangzhou Co., Ltd.** Cell type: JACMDBP-B, P type mono crystalline silicon, 11 busbars Cell type: JACMEBP-B, P type mono crystalline silicon, 11 busbars
	Cell dimensions L x W x T (± %) [mm] ..... :	180±1.5 x 90±1.5 x 0.18±0.018 182±1.5 x 91±1.5 x 0.18±0.018
	Cell thickness [µm] ..... :	180 ± 18
	Cell area [cm²] ..... :	161.195 165.075

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover..... :	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Coating tempered glass Thickness: 3.2 mm
	Rear cover ..... :	**Cybrid Technology Inc.** Type: Cynagard 205A(R), Layers: PVDF /PET/Fluoridecoating Thickness: 22.5um/ (275~300)um/ 4um, total 0.315 ~0.340mm
	Encapsulation material front side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F406P, material: EVA, thickness: 0.6±0.05 mm

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	Encapsulation material back side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F806S, material: EVA, thickness: 0.6±0.05 mm
	Frame parts ..... :	**Zhaoqing Asia Aluminum Factory Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: Φ0.30 ± 0.02 mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: 63%Sn/37%Pb
	String connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: 0.4 × 6 & 0.4 × 4 mm, Material: Base Cu (≥99.97%), Coating Sn63%Pb37%, coating thickness 0.025 mm per side
	Soldering material ..... :	Sn63%Pb37%
	Fluxing agent ..... :	**Shenzhen Vital New Material Co., Ltd.** Type: WTO-PV105A, no clean halogen free liquid flux.
	Junction box ..... :	**Shanghai JA Solar Technology Co., Ltd.** Type: PVJB-JA-004, DC 1500 V, 15A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 0720920287 Rev.03
	Cable ..... :	**Shanghai JA Solar technology co., Ltd.** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV SÜD certified, No. B 072092 0283 Rev. 02
	Connector ..... :	**QC Solar (Suzhou) Corporation** Type: QC 4.10-35, DC 1500V, 41A, IP 68(1m, 1h), -40 °C to 85 °C TÜV Rheinland certified, No. R 50353779
	Bypass diode ..... :	**Panjit International Inc.** Type: SB3045DY, Schottky, Max. peak reverse voltage 45 V, Max. average forward current 30 A, Max. junction temperature 200 °C.

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	Potting material.....:	**Shanghai Huitian New Material Co., Ltd.** Type: 5299W-S, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Adhesive for junction box .....:	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **3M Company** Type: UV-1 2) Marking label: **AVERY (CHINA) CO LTD** Type: 72826T, 50 microns Bright Silver PET TC/S333(c)(d) 3) Insulation sheet: **Suzhou First PV Material Co., Ltd.** Type: BEC-201

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	a)b)c) 0.8 mm
	Between cell and accessible surfaces.....:	a)b)c) 12 mm
	Between any current carrying part and accessible surfaces .....:	a)b)c) 12 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	a) 144 b) 132 c) 120
	Serial-parallel connection of cells.....:	SPS
	Cells per bypass diode .....:	a) 48 b) 44 c) 40
	No. of bypass diodes .....:	3

Remark: for tested sample with material combination 1

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Annex 1-2: Product Description Sheet (Manufacturers and type references)

A1.1	MODULE TYPE/S
	d) JAM72S30-xxx/MR, xxx= 510 to 545 in step of 5 e) JAM66S30-xxx/MR, xxx= 470 to 500 in step of 5 f) JAM60S30-xxx/MR, xxx= 435 to 455 in step of 5

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	d) 2267x1122x35 or 2279x1134x35 e) 2094x1134x35 f) 1909x1134x35
	Weights..... :	d) 28.5 or 28.6 ±3% Kg e) 26.3 ±3% Kg f) 24.0 ±3% Kg
	Front/Rear cover bonding classification ..... :	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**Aikosolar Energy Technology Co., Ltd.** Cell type: JACMEBP-B, P type mono crystalline silicon, 11 busbars
	Cell dimensions L x W x T (± %) [mm] ..... :	180±1.5 x 90±1.5 x 0.18±0.018 or 182±1.5 x 91±1.5 x 0.18±0.018
	Cell thickness [µm] ..... :	180 ± 18
	Cell area [cm²] ..... :	161.195 or 165.075

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover..... :	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Coating tempered glass Thickness: 3.2 mm
	Rear cover ..... :	**Cybrid Technology Inc.** Type: Cynagard 205A(R), Layers: PVDF /PET/Fluoridecoating Thickness: 22.5um/ (275~300)um/ 4um, total 0.315 ~0.340mm
	Encapsulation material front side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F406P, material: EVA, thickness: 0.5±0.05 mm
	Encapsulation material back side..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F806S, material: EVA, thickness: 0.5±0.05 mm

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	Frame parts ..... :	**Zhaoqing Asia Aluminum Factory Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: Φ0.30 ± 0.02 mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: 63%Sn/37%Pb
	String connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: 0.4 × 6 & 0.4 × 4 mm, Material: Base Cu (≥99.97%), Coating Sn63%Pb37%, coating thickness 0.025 mm per side
	Soldering material ..... :	Sn63%Pb37%
	Fluxing agent ..... :	**Shenzhen Vital New Material Co., Ltd.** Type: WTO-PV105A, no clean halogen free liquid flux.
	Junction box ..... :	**Shanghai JA Solar Technology Co., Ltd.** Type: PVJB-JA-004, DC 1500 V, 15A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 0720920287 Rev.03
	Cable ..... :	**Shanghai JA Solar technology co., Ltd.** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV SÜD certified, No. B 072092 0283 Rev. 02
	Connector ..... :	**QC Solar (Suzhou) Corporation** Type: QC 4.10-35, DC 1500V, 41A, IP 68(1m, 1h), -40 °C to 85 °C TÜV Rheinland certified, No. R 50353779
	Bypass diode ..... :	**Panjit International Inc.** Type: SB3045DY, Schottky, Max. peak reverse voltage 45 V, Max. average forward current 30 A, Max. junction temperature 200 °C.
	Potting material ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: 5299W-S, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611

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	Adhesive for junction box .....:	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **3M Company** Type: UV-1 2) Marking label: **AVERY (CHINA) CO LTD** Type: 72826T, 50 microns Bright Silver PET TC/S333(c)(d) 3) Insulation sheet: **Suzhou First PV Material Co., Ltd.** Type: BEC-201

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	d)e)f) 0.8 mm
	Between cell and accessible surfaces.....:	d)e)f) 12 mm
	Between any current carrying part and accessible surfaces .....:	d)e)f) 12 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	d) 144 e) 132 f) 120
	Serial-parallel connection of cells.....:	SPS
	Cells per bypass diode .....:	d) 48 e) 44 f) 40
	No. of bypass diodes.....:	3

Remark: for tested sample with material combination 2

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Annex 1-3: Product Description Sheet (Manufacturers and type references)

A1.1	MODULE TYPE/S
	g) JAM72D30-xxx/MB, xxx= 505 to 545 in step of 5 h) JAM66D30-xxx/MB, xxx= 465 to 500 in step of 5 i) JAM60D30-xxx/MB, xxx= 435 to 455 in step of 5

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] .....:	g) 2293x1131x35 or 2285x1134x35 or 2289x1143x35 h) 2100x1134x35 or 2104x1143x35 i) 1915x1134x35
	Weights.....:	g) 32 or 31.6 or 31.9 ±3% Kg h) 29 or 29.3 ±3% Kg i) 26.4 ±3% Kg
	Front/Rear cover bonding classification .....:	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference .....:	**JA Solar Technology Yangzhou Co., Ltd.** Cell type: JACMDBP-B, P type mono crystalline silicon, 11 busbars Cell type: JACMEBP-B, P type mono crystalline silicon, 11 busbars
	Cell dimensions L x W x T (± %) [mm] .....:	180±1.5 x 90±1.5 x 0.18±0.018 182±1.5 x 91±1.5 x 0.18±0.018
	Cell thickness [µm] .....:	180 ± 18
	Cell area [cm²] .....:	161.195 165.075

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover.....:	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Heat strengthened AR-coated glass, Thickness: 2.0 mm
	Rear cover .....:	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Heat strengthened glass with white glaze, Thickness: 2.0 mm
	Encapsulation material front side .....:	**Hangzhou First Applied Material Co., Ltd.** Type: TF4, material: PO, thickness: 0.65±0.15 mm

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	Encapsulation material back side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: TF4, material: PO, thickness: 0.65±0.15 mm
	Frame parts ..... :	**Zhaoqing Asia Aluminum Factory Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-8258, Rated HB at min. 2.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: Φ0.30 ± 0.02 mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: 63%Sn/37%Pb
	String connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: 0.4 × 6 & 0.4 × 4 mm, Material: Base Cu (≥99.97%), Coating Sn63%Pb37%, coating thickness 0.025 mm per side
	Soldering material ..... :	Sn63%Pb37%
	Fluxing agent ..... :	**Shenzhen Vital New Material Co., Ltd.** Type: WTO-PV105A, no clean halogen free liquid flux.
	Junction box ..... :	**Shanghai JA Solar Technology Co., Ltd.** Type: PVJB-JA-004, DC 1500 V, 15A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 0720920287 Rev.03
	Cable ..... :	**Shanghai JA Solar technology co., Ltd.** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV SÜD certified, No. B 072092 0283 Rev. 02
	Connector ..... :	**QC Solar (Suzhou) Corporation** Type: QC 4.10-35, DC 1500V, 41A, IP 68(1m, 1h), -40 °C to 85 °C TÜV Rheinland certified, No. R 50353779
	Bypass diode ..... :	**Panjit International Inc.** Type: SBT4050DY, Schottky, Max. peak reverse voltage 50 V, Max. average forward current 40 A, Max. junction temperature 200 °C.

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	Potting material.....:	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-6360A/HT-6360B, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Adhesive for junction box .....:	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-8258, Rated HB at min. 2.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **Cybrid Technologies Inc.** Type: FF-3665 2) Marking label: **AVERY (CHINA) CO LTD** Type: 72826T, 50 microns Bright Silver PET TC/S333(c)(d)

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	g)h)i) 0.8 mm
	Between cell and accessible surfaces.....:	g)h)i) 12 mm
	Between any current carrying part and accessible surfaces .....:	g)h)i) 12 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	g) 144 h) 132 i) 120
	Serial-parallel connection of cells.....:	SPS
	Cells per bypass diode .....:	g) 48 h) 44 i) 40
	No. of bypass diodes.....:	3

Remark: for tested sample with material combination 3

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Annex 1-4: Product Description Sheet (Manufacturers and type references)

A1.1	MODULE TYPE/S
	j) JAM72D30-xxx/MB, xxx= 505 to 545 in step of 5 k) JAM66D30-xxx/MB, xxx= 465 to 500 in step of 5 l) JAM60D30-xxx/MB, xxx= 435 to 455 in step of 5

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] .....:	j) 2293x1131x35 or 2285x1134x35 or 2289x1143x35 k) 2100x1134x35 or 2104x1143x35 l) 1915x1134x35
	Weights.....:	j) 32 or 31.6 or 31.9 ±3% Kg k) 29 or 29.3 ±3% Kg l) 26.4 ±3% Kg
	Front/Rear cover bonding classification .....:	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference .....:	**Aikosolar Energy Technology Co., Ltd.** Cell type: JACMEBP-B, P type mono crystalline silicon, 11 busbars
	Cell dimensions L x W x T (± %) [mm] .....:	180±1.5 x 90±1.5 x 0.18±0.018 or 182±1.5 x 91±1.5 x 0.18±0.018
	Cell thickness [µm] .....:	180 ± 18
	Cell area [cm²] .....:	161.195 or 165.075

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover.....:	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Heat strengthened AR-coated glass, Thickness: 2.0 mm
	Rear cover .....:	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Heat strengthened glass with white glaze, Thickness: 2.0 mm
	Encapsulation material front side .....:	**Hangzhou First Applied Material Co., Ltd.** Type: TF4, material: PO, thickness: 0.65±0.15 mm

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	Encapsulation material back side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: TF4, material: PO, thickness: 0.65±0.15 mm
	Frame parts ..... :	**Zhaoqing Asia Aluminum Factory Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-8258, Rated HB at min. 2.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: Φ0.30 ± 0.02 mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: 63%Sn/37%Pb
	String connector ..... :	**TaiCang JuRen PV Material Co., Ltd** Cross section: 0.4 × 6 & 0.4 × 4 mm, Material: Base Cu (≥99.97%), Coating Sn63%Pb37%, coating thickness 0.025 mm per side
	Soldering material ..... :	Sn63%Pb37%
	Fluxing agent ..... :	**Shenzhen Vital New Material Co., Ltd.** Type: WTO-PV105A, no clean halogen free liquid flux.
	Junction box ..... :	**Shanghai JA Solar Technology Co., Ltd.** Type: PVJB-JA-004, DC 1500 V, 15A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 0720920287 Rev.03
	Cable ..... :	**Shanghai JA Solar technology co., Ltd.** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV SÜD certified, No. B 072092 0283 Rev. 02
	Connector ..... :	**QC Solar (Suzhou) Corporation** Type: QC 4.10-35, DC 1500V, 41A, IP 68(1m, 1h), -40 °C to 85 °C TÜV Rheinland certified, No. R 50353779
	Bypass diode ..... :	**Panjit International Inc.** Type: SBT4050DY, Schottky, Max. peak reverse voltage 50 V, Max. average forward current 40 A, Max. junction temperature 200 °C.

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	Potting material.....:	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-6360A/HT-6360B, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Adhesive for junction box .....:	**Jiangsu Tianchen New Materials CO., LTD** Type: HT-8258, Rated HB at min. 2.0 mm thick, RTI=105, CTI=0 UL certified, No. E344820
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **Cybrid Technologies Inc.** Type: FF-3665 2) Marking label: **AVERY (CHINA) CO LTD** Type: 72826T, 50 microns Bright Silver PET TC/S333(c)(d)

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	j)k)l) 1.5 mm
	Between cell and accessible surfaces.....:	j)k)l) 15.5 mm
	Between any current carrying part and accessible surfaces .....:	j)k)l) 14.25 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	j) 144 k) 132 l) 120
	Serial-parallel connection of cells.....:	SPS
	Cells per bypass diode .....:	j) 48 k) 44 l) 40
	No. of bypass diodes.....:	3

Remark: for tested sample with material combination 4

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Annex 1-5: Product Description Sheet (Manufacturers and type references)

A1.1	**MODULE TYPE/S**
	JAM72S20-445/MR

A1.2	**MODULE DESIGN**	
	Module dimensions (L x W x H) [mm] ..... :	2120x1052x35
	Weights..... :	20 ±3% Kg
	Front/Rear cover bonding classification ..... :	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	**SOLAR CELL**	
	Cell type reference ..... :	**JA Solar Co., Ltd.** Cell type: JACMABP-9, P type mono crystalline silicon, 9 busbars
	Cell dimensions L x W x T (± %) [mm] ..... :	168±1.5 x 84±1.5 x 0.18±0.018
	Cell thickness [µm] ..... :	180 ± 18
	Cell area [cm²] ..... :	140.03

A1.4	**IDENTIFICATION OF MATERIALS**	
	Front cover..... :	**Caihong (Hefei) Photovoltaic Co., Ltd.** Type: Coating tempered glass Thickness: 3.2 mm
	Rear cover ..... :	**Cybrid Technology Inc.** Type: Cynagard 205A(R), Layers: PVDF /PET/Fluoridecoating Thickness: 22.5um/ (275~300)um/ 4um, total 0.315 ~0.340mm
	Encapsulation material front side ..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F406P, material: EVA, thickness: 0.6±0.05 mm
	Encapsulation material back side..... :	**Hangzhou First Applied Material Co., Ltd.** Type: F806S, material: EVA, thickness: 0.6±0.05 mm
	Frame parts ..... :	**Zhaoqing Asia Aluminum Factory Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts..... :	N/A

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	Adhesive for frame .....:	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Edge sealing.....:	N/A
	Internal wiring .....:	N/A
	Cell connector.....:	**TaiCang JuRen PV Material Co., Ltd** Cross section: Φ0.30 ± 0.02 mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: 63%Sn/37%Pb
	String connector .....:	**TaiCang JuRen PV Material Co., Ltd** Cross section: 0.35 × 6 mm, Material: Base Cu (≥99.97%), Coating Sn63%Pb37%, coating thickness 0.025 mm per side
	Soldering material.....:	Sn63%Pb37%
	Fluxing agent .....:	**Shenzhen Vital New Material Co., Ltd.** Type: WTO-PV105A, no clean halogen free liquid flux.
	Junction box.....:	**Shanghai JA Solar Technology Co., Ltd.** Type: PVJB-JA-004, DC 1500 V, 15A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 0720920287 Rev.03
	Cable .....:	**Shanghai JA Solar technology co., Ltd.** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV SÜD certified, No. B 072092 0283 Rev. 02
	Connector .....:	**QC Solar (Suzhou) Corporation** Type: QC 4.10-35, DC 1500V, 41A, IP 68(1m, 1h), -40 °C to 85 °C TÜV Rheinland certified, No. R 50353779
	Bypass diode .....:	**Panjit International Inc.** Type: SB3045DY, Schottky, Max. peak reverse voltage 45 V, Max. average forward current 30 A, Max. junction temperature 200 °C.
	Potting material.....:	**Shanghai Huitian New Material Co., Ltd.** Type: 5299W-S, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Adhesive for junction box .....:	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611

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	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **3M Company** Type: UV-1 2) Marking label: **AVERY (CHINA) CO LTD** Type: 72826T, 50 microns Bright Silver PET TC/S333(c)(d) 3) Insulation sheet: **Suzhou First PV Material Co., Ltd.** Type: BEC-201

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	1.3 mm
	Between cell and accessible surfaces.....:	12.75 mm
	Between any current carrying part and accessible surfaces .....:	12 mm

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

Remark: for tested sample with material combination 5

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Clause	Requirement + Test	Result - Remark	Verdict

Annex 2: Test table for verifying other alternative stabilization procedure

Step 1: Alternative stabilization				N/A
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:				

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Clause	Requirement + Test	Result - Remark	Verdict

Annex 3: Lower and higher output power modules

TABLE A.4.1 Performance at STC before initial stabilization (single-side front)							P
Test Date [YYYY-MM-DD]..... :	2020-07-21 for Low 1-1, 1-2, High 1-1, 1-2 2020-09-09 for High 1-3, 1-4, High 2-3, 2-4, High 3-3, 3-4, High 4-3, 4-4 2020-07-28 for Low 2-1, 2-2, High 2-1, 2-2 2020-07-18 for Low 3-1, 3-2, High 3-1, 3-2 2020-07-29 for Low 4-1, 4-2, High 4-1, 4-2						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1-1	12.984	49.165	12.419	41.173	511.346	80.10	—
Low 1-2	12.977	49.209	12.4	41.231	511.257	80.06	—
High 1-1	13.016	49.445	12.481	41.565	518.777	80.61	—
High 1-2	12.984	49.412	12.447	41.516	516.735	80.54	—
Low 2-1	12.975	49.164	12.424	41.254	512.538	80.35	—
Low 2-2	12.972	49.2	12.448	41.319	514.344	80.59	—
High 2-1	13.044	49.352	12.501	41.431	517.927	80.45	—
High 2-2	13.009	49.384	12.479	41.514	518.067	80.64	—
Low 3-1	12.955	48.877	12.417	40.855	507.303	80.12	—
Low 3-2	12.906	48.763	12.375	40.835	505.341	80.30	—
High 3-1	13.056	49.276	12.523	41.367	518.049	80.52	—
High 3-2	13.055	49.302	12.493	41.454	517.868	80.46	—
Low 4-1	12.977	48.849	12.389	40.882	506.483	79.90	—
Low 4-2	12.984	48.837	12.416	40.780	506.344	79.85	—
High 4-1	13.028	49.315	12.501	41.407	517.632	80.57	—
High 4-2	13.064	49.256	12.541	41.356	518.639	80.60	—
High 1-3	13.486	49.085	13.002	41.763	543.004	82.03	—
High 1-4	13.452	49.135	12.964	41.857	542.619	82.10	—
High 2-3	13.354	49.138	12.862	41.814	537.819	81.96	—
High 2-4	13.346	49.055	12.926	41.642	538.289	82.22	—
High 3-3	13.439	49.181	12.896	41.410	534.039	80.80	—

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Clause	Requirement + Test				Result - Remark		Verdict
High 3-4	13.426	49.176	12.911	41.397	534.478	80.95	—
High 4-3	13.461	49.177	12.905	41.388	534.116	80.69	—
High 4-4	13.455	49.162	12.911	41.382	534.295	80.78	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.1 Performance at STC before initial stabilization (single-side rear)							P
Test Date [YYYY-MM-DD]..... :	2020-09-09 for High 3-3, 3-4, High 4-3, 4-4 2020-07-18 for Low 3-1, 3-2, High 3-1, 3-2 2020-07-29 for Low 4-1, 4-2, High 4-1, 4-2						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	8.336	47.915	7.850	40.936	321.334	80.45	—
Low 3-2	8.343	47.913	7.842	40.913	320.844	80.26	—
High 3-1	8.658	48.451	8.079	41.400	334.477	79.74	—
High 3-2	8.663	48.399	8.085	41.364	334.433	79.76	—
Low 4-1	8.279	47.870	7.955	40.651	323.380	81.60	—
Low 4-2	8.286	47.859	7.965	40.621	323.563	81.59	—
High 4-1	8.592	48.487	8.166	41.176	336.249	80.71	—
High 4-2	8.593	48.440	8.161	41.121	335.601	80.62	—
High 3-3	9.186	48.175	8.564	41.275	353.494	79.88	—
High 3-4	9.230	48.305	8.551	41.563	355.403	79.71	—
High 4-3	9.235	48.294	8.521	41.588	354.382	79.46	—
High 4-4	9.260	48.212	8.545	41.547	355.018	79.52	—
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.1 Performance at STC before initial stabilization (Equivalent irradiance)							P
Test Date [YYYY-MM-DD]..... :	2020-09-09 for High 3-3, 3-4, High 4-3, 4-4 2020-07-18 for Low 3-1, 3-2, High 3-1, 3-2 2020-07-29 for Low 4-1, 4-2, High 4-1, 4-2						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	14.319	48.767	13.730	40.838	560.693	80.29	—

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Clause	Requirement + Test				Result - Remark		Verdict
Low 3-2	14.220	48.652	13.666	40.760	557.012	80.51	—
High 3-1	14.350	49.140	13.838	41.337	572.025	81.12	—
High 3-2	14.359	49.267	13.799	41.524	573.011	81.12	—
Low 4-1	14.253	48.744	13.686	40.903	559.814	80.58	—
Low 4-2	14.278	48.711	13.694	40.798	558.703	80.33	—
High 4-1	14.363	49.178	13.831	41.388	572.451	81.05	—
High 4-2	14.362	49.210	13.810	41.452	572.466	81.00	—
High 3-3	14.626	49.477	14.108	41.390	583.946	80.69	—
High 3-4	14.647	49.534	14.123	41.419	584.968	80.63	—
High 4-3	14.620	49.543	14.079	41.431	583.304	80.53	—
High 4-4	14.655	49.547	14.125	41.440	585.351	80.62	—
Supplementary information: 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.							

TABLE A.4.2: MQT 19.1 ini: Initial Stabilization procedure							P
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-x ..	1						—
Sample #	Low 1-1	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	511.346	—	—
1	5	800~1000	50 ± 10	MPPT	511.171	—	—
2	5	800~1000	50 ± 10	MPPT	511.074	0.05	Yes
3							
4						—	—
Sample #	Low 1-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-21 / 2020-07-23		
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	—	—	—	—	511.257	—	—
1	5	800~1000	50 ± 10	MPPT	511.130	—	—
2	5	800~1000	50 ± 10	MPPT	510.685	0.11	Yes
3							

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Clause	Requirement + Test					Result - Remark		Verdict
4							—	—
Sample #	High 1-1	Test Date (YYYY-MM-DD) start/end .....:				2020-07-21 / 2020-07-23		
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	—	—	—	—		518.777	—	—
1	5	800~1000	50 ± 10	MPPT		518.480	—	—
2	5	800~1000	50 ± 10	MPPT		518.196	0.11	Yes
3								
4							—	—
Sample #	High 1-2	Test Date (YYYY-MM-DD) start/end .....:				2020-07-21 / 2020-07-23		
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	—	—	—	—		516.735	—	—
1	5	800~1000	50 ± 10	MPPT		517.100	—	—
2	5	800~1000	50 ± 10	MPPT		517.123	0.08	Yes
3								
4							—	—
Sample #	Low 2-1	Test Date (YYYY-MM-DD) start/end .....:				2020-07-28 / 2020-07-30		
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	—	—	—	—		512.538	—	—
1	5	800~1000	50 ± 10	MPPT		511.619	—	—
2	5	800~1000	50 ± 10	MPPT		511.313	0.24	Yes
3								
4							—	—
Sample #	Low 2-2	Test Date (YYYY-MM-DD) start/end .....:				2020-07-28 / 2020-07-30		
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	—	—	—	—		514.344	—	—
1	5	800~1000	50 ± 10	MPPT		513.943	—	—
2	5	800~1000	50 ± 10	MPPT		513.791	0.11	Yes
3								
4							—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	High 2-1	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	517.927	—	—
1	5	800~1000	50 ± 10	MPPT	517.703	—	—
2	5	800~1000	50 ± 10	MPPT	517.422	0.10	Yes
3							
4						—	—
Sample #	High 2-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-28 / 2020-07-30		
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	—	—	—	—	518.067	—	—
1	5	800~1000	50 ± 10	MPPT	517.946	—	—
2	5	800~1000	50 ± 10	MPPT	517.556	0.10	Yes
3							
4						—	—
Sample #	Low 3-1	Test Date (YYYY-MM-DD) start/end ..... :			2020-07-18 / 2020-07-20		
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 (F)	—	—	—	—	507.303	—	—
1	5	800~1000	50 ± 10	MPPT	507.083	—	—
2	5	800~1000	50 ± 10	MPPT	506.938	0.07	Yes
Initial (R)	—	—	—	—	321.334	—	—
1	5	800~1000	50 ± 10	MPPT	320.954	—	—
2	5	800~1000	50 ± 10	MPPT	320.898	0.14	Yes
Sample #	Low 3-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-18 / 2020-07-20		
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 (F)	—	—	—	—	505.341	—	—
1	5	800~1000	50 ± 10	MPPT	505.078	—	—
2	5	800~1000	50 ± 10	MPPT	505.031	0.06	Yes
Initial (R)	—	—	—	—	320.844	—	—
1	5	800~1000	50 ± 10	MPPT	320.636	—	—

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2	5	800~1000	50 ± 10	MPPT	320.458	0.12	Yes
Sample #	High 3-1	Test Date (YYYY-MM-DD) start/end ..... :			2020-07-18 / 2020-07-20		
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 (F)	—	—	—	—	518.049	—	—
1	5	800~1000	50 ± 10	MPPT	517.547	—	—
2	5	800~1000	50 ± 10	MPPT	517.409	0.12	Yes
Initial (R)	—	—	—	—	334.477	—	—
1	5	800~1000	50 ± 10	MPPT	334.010	—	—
2	5	800~1000	50 ± 10	MPPT	333.987	0.15	Yes
Sample #	High 3-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-18 / 2020-07-20		
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 (F)	—	—	—	—	517.868	—	—
1	5	800~1000	50 ± 10	MPPT	517.797	—	—
2	5	800~1000	50 ± 10	MPPT	517.777	0.02	Yes
Initial (R)	—	—	—	—	334.433	—	—
1	5	800~1000	50 ± 10	MPPT	334.353	—	—
2	5	800~1000	50 ± 10	MPPT	334.234	0.06	Yes
Sample #	Low 4-1	Test Date (YYYY-MM-DD) start/end ..... :			2020-07-29 / 2020-08-02		
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 (F)	—	—	—	—	506.483	—	—
1	5	800~1000	50 ± 10	MPPT	506.439	—	—
2	5	800~1000	50 ± 10	MPPT	505.801	0.13	Yes
Initial (R)	—	—	—	—	323.380	—	—
1	5	800~1000	50 ± 10	MPPT	323.336	—	—
2	5	800~1000	50 ± 10	MPPT	322.774	0.19	Yes
Sample #	Low 4-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-29 / 2020-08-02		
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 (F)	—	—	—	—	506.344	—	—
1	5	800~1000	50 ± 10	MPPT	506.619	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	800~1000	50 ± 10	MPPT	505.870	0.15	Yes
Initial (R)	—	—	—	—	323.563	—	—
1	5	800~1000	50 ± 10	MPPT	323.278	—	—
2	5	800~1000	50 ± 10	MPPT	322.825	0.23	Yes
Sample #	High 4-1	Test Date (YYYY-MM-DD) start/end ..... :			2020-07-29 / 2020-08-02		
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 (F)	—	—	—	—	517.632	—	—
1	5	800~1000	50 ± 10	MPPT	517.266	—	—
2	5	800~1000	50 ± 10	MPPT	517.160	0.09	Yes
Initial (R)	—	—	—	—	336.249	—	—
1	5	800~1000	50 ± 10	MPPT	336.025	—	—
2	5	800~1000	50 ± 10	MPPT	335.783	0.14	Yes
Sample #	High 4-2	Test Date (YYYY-MM-DD) start/end .....:			2020-07-29 / 2020-08-02		
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 (F)	—	—	—	—	518.639	—	—
1	5	800~1000	50 ± 10	MPPT	518.215	—	—
2	5	800~1000	50 ± 10	MPPT	517.674	0.19	Yes
Initial (R)	—	—	—	—	335.601	—	—
1	5	800~1000	50 ± 10	MPPT	335.416	—	—
2	5	800~1000	50 ± 10	MPPT	335.387	0.06	Yes
Sample #	High 1-3	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-10		
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	—	—	—	—	543.004	—	—
1	5	800~1000	50 ± 10	MPPT	541.520	—	—
2	5	800~1000	50 ± 10	MPPT	540.639	0.44	Yes
3							
4						—	—
Sample #	High 1-4	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-10		
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	—	—	—	—	542.619	—	—
1	5	800~1000	50 ± 10	MPPT	542.360	—	—
2	5	800~1000	50 ± 10	MPPT	542.057	0.10	Yes
3							
4						—	—
Sample #	High 2-3	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-10		
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	—	—	—	—	537.819	—	—
1	5	800~1000	50 ± 10	MPPT	536.633	—	—
2	5	800~1000	50 ± 10	MPPT	536.484	0.25	Yes
3							
4						—	—
Sample #	High 2-4	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-10		
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	—	—	—	—	538.289	—	—
1	5	800~1000	50 ± 10	MPPT	537.570	—	—
2	5	800~1000	50 ± 10	MPPT	537.473	0.15	Yes
3							
4						—	—
Sample #	High 3-3	Test Date (YYYY-MM-DD) start/end ..... :			2020-09-09 / 2020-09-11		
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 (F)	—	—	—	—	534.039	—	—
1	5	800~1000	50 ± 10	MPPT	533.608	—	—
2	5	800~1000	50 ± 10	MPPT	533.567	0.09	Yes
Initial (R)	—	—	—	—	353.494	—	—
1	5	800~1000	50 ± 10	MPPT	353.355	—	—
2	5	800~1000	50 ± 10	MPPT	353.278	0.06	Yes
Sample #	High 3-4	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-11		
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)

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Clause	Requirement + Test				Result - Remark		Verdict
Initial (F)	—	—	—	—	534.478	—	—
1	5	800~1000	50 ± 10	MPPT	533.674	—	—
2	5	800~1000	50 ± 10	MPPT	532.921	0.29	Yes
Initial (R)	—	—	—	—	355.403	—	—
1	5	800~1000	50 ± 10	MPPT	355.241	—	—
2	5	800~1000	50 ± 10	MPPT	355.175	0.06	Yes
Sample #	High 4-3	Test Date (YYYY-MM-DD) start/end ..... :			2020-09-09 / 2020-09-11		
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 (F)	—	—	—	—	534.116	—	—
1	5	800~1000	50 ± 10	MPPT	533.630	—	—
2	5	800~1000	50 ± 10	MPPT	533.397	0.13	Yes
Initial (R)	—	—	—	—	354.382	—	—
1	5	800~1000	50 ± 10	MPPT	354.342	—	—
2	5	800~1000	50 ± 10	MPPT	354.026	0.10	Yes
Sample #	High 4-4	Test Date (YYYY-MM-DD) start/end .....:			2020-09-09 / 2020-09-11		
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 (F)	—	—	—	—	534.295	—	—
1	5	800~1000	50 ± 10	MPPT	534.283	—	—
2	5	800~1000	50 ± 10	MPPT	533.371	0.17	Yes
Initial (R)	—	—	—	—	355.018	—	—
1	5	800~1000	50 ± 10	MPPT	354.960	—	—
2	5	800~1000	50 ± 10	MPPT	354.853	0.05	Yes
Supplementary information: N/A							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end .....:						
Low 1							
Low 2							
High 1							
High 2							
Test method description:							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure							

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization			P
Test Date [YYYY-MM-DD] ..... :	2020-07-23		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ 483.672 ,	≥ 497.898 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 498.631 ,	≥ 513.297 ,	—
Voc(lab) (V) ..... :	≤ 49.224 ,	≤ 49.597 ,	—
Isc (lab) (A) ..... :	≤ 13.717 ,	≤ 13.931 ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1-1	12.984	49.153	12.425	41.134	511.074	80.08	—
Low 1-2	12.965	49.174	12.405	41.168	510.685	80.10	—
High 1-1	13.017	49.431	12.477	41.531	518.196	80.54	—
High 1-2	12.991	49.409	12.459	41.506	517.123	80.56	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization			P
Test Date [YYYY-MM-DD] ..... :	2020-07-30		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ 483.672 ,	≥ 497.898 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 498.631 ,	≥ 513.297 ,	—
Voc(lab) (V) ..... :	≤ 49.224 ,	≤ 49.597 ,	—
Isc (lab) (A) ..... :	≤ 13.717 ,	≤ 13.931 ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 2-1	12.988	49.117	12.399	41.237	511.313	80.15	—
Low 2-2	12.961	49.198	12.423	41.359	513.791	80.58	—
High 2-1	13.060	49.340	12.474	41.479	517.422	80.30	—
High 2-2	13.010	49.333	12.474	41.490	517.556	80.64	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

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

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization			P
Test Date [YYYY-MM-DD] ..... :	2020-09-10		—
	Higher end power class (for High 1-3, 1-4)	Higher end power class (for High 2-3, 2-4)	—
Pmax(lab) (W) ..... :	≥ 521.607 ,	≥ 516.865 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 537.740 ,	≥ 532.851 ,	—
Voc(lab) (V) ..... :	≤ 50.354 ,	≤ 50.203 ,	—
Isc (lab) (A) ..... :	≤ 14.289 ,	≤ 14.217 ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
High 1-3	13.454	49.045	12.934	41.799	540.639	81.93	—
High 1-4	13.477	49.097	12.986	41.742	542.057	81.92	—
High 2-3	13.364	49.114	12.836	41.794	536.484	81.74	—
High 2-4	13.348	49.088	12.890	41.698	537.473	82.03	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side front)			P
Test Date [YYYY-MM-DD] ..... :	2020-07-20		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ 478.930 ,	≥ 497.898 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 493.743 ,	≥ 513.297 ,	—
Voc(lab) (V) ..... :	≤ 48.992 ,	≤ 49.597 ,	—
Isc (lab) (A) ..... :	≤ 13.646 ,	≤ 13.931 ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	12.925	48.880	12.408	40.857	506.938	80.24	—
Low 3-2	12.911	48.734	12.385	40.778	505.031	80.27	—
High 3-1	13.049	49.276	12.498	41.400	517.409	80.47	—
High 3-2	13.083	49.307	12.492	41.449	517.777	80.27	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side rear)							—
Test Date [YYYY-MM-DD] ..... :	2020-07-20						—
	Lower end power class				Higher end power class		—
Pmax(lab) (W) ..... :	≥ _____-_____,				≥ _____-_____,		—
$\bar{P}_{max}(Lab)$ (W)	≥ _____-_____,				≥ _____-_____,		—
Voc(lab) (V) ..... :	≤ _____-_____,				≤ _____-_____,		—
Isc (lab) (A) ..... :	≤ _____-_____,				≤ _____-_____,		—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	8.343	47.903	7.843	40.915	320.898	80.29	—
Low 3-2	8.344	47.908	7.834	40.906	320.458	80.17	—
High 3-1	8.651	48.339	8.072	41.376	333.987	79.77	—
High 3-2	8.666	48.390	8.083	41.349	334.234	79.70	—
Supplementary information: N/A							

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (equivalent irradiance)							—
Test Date [YYYY-MM-DD] ..... :	2020-07-20						—
	Lower end power class				Higher end power class		—
Pmax(lab) (W) ..... :	≥ _____-_____,				≥ _____-_____,		—
$\bar{P}_{max}(Lab)$ (W)	≥ _____-_____,				≥ _____-_____,		—
Voc(lab) (V) ..... :	≤ _____-_____,				≤ _____-_____,		—
Isc (lab) (A) ..... :	≤ _____-_____,				≤ _____-_____,		—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	14.283	48.783	13.670	40.899	559.101	80.24	—
Low 3-2	14.184	48.667	13.622	40.759	555.242	80.44	—
High 3-1	14.355	49.152	13.785	41.387	570.504	80.86	—
High 3-2	14.408	49.172	13.804	41.461	572.341	80.78	—
Supplementary information: 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.							

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side front)	P
Test Date [YYYY-MM-DD] ..... :	2020-08-02 —

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Clause	Requirement + Test	Result - Remark	Verdict

	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ 478.930 ,	≥ 497.898 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 493.743 ,	≥ 513.297 ,	—
Voc(lab) (V) ..... :	≤ 48.992 ,	≤ 49.597 ,	—
Isc (lab) (A) ..... :	≤ 13.646 ,	≤ 13.931 ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	12.962	48.857	12.266	40.902	505.801	79.87	—
Low 4-2	12.980	48.827	12.400	40.796	505.870	79.82	—
High 4-1	13.017	49.293	12.492	41.401	517.160	80.60	—
High 4-2	13.056	49.252	12.509	41.385	517.674	80.51	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side rear)			—
Test Date [YYYY-MM-DD] ..... :	2020-08-02		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ - ,	≥ - ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ - ,	≥ - ,	—
Voc(lab) (V) ..... :	≤ - ,	≤ - ,	—
Isc (lab) (A) ..... :	≤ - ,	≤ - ,	—
Test method ..... :	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	8.275	47.859	7.944	40.634	322.774	81.50	—
Low 4-2	8.273	47.871	7.943	40.643	322.825	81.52	—
High 4-1	8.590	48.447	8.164	41.127	335.783	80.69	—
High 4-2	8.592	48.425	8.161	41.098	335.387	80.61	—

Supplementary information: N/A

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (equivalent irradiance)			—
Test Date [YYYY-MM-DD] ..... :	2020-08-02		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ - ,	≥ - ,	—

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Clause	Requirement + Test	Result - Remark	Verdict

$\bar{P}_{max}(Lab)$ (W)	≥ - ,	≥ - ,	—
Voc(lab) (V) ..... :	≤ - ,	≤ - ,	—
Isc (lab) (A) ..... :	≤ - ,	≤ - ,	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	14.256	48.753	13.612	40.975	557.771	80.25	—
Low 4-2	14.235	48.770	13.605	40.937	556.949	80.23	—
High 4-1	14.327	49.206	13.795	41.414	571.316	81.04	—
High 4-2	14.364	49.146	13.789	41.421	571.172	80.91	—

Supplementary information: 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side front)			P
Test Date [YYYY-MM-DD] ..... :	2020-09-11		—
	Higher end power class (for High 3-3, 3-4)	Higher end power class (for High 4-3, 4-4)	—
Pmax(lab) (W) ..... :	≥ 516.865 ,	≥ 516.865 ,	—
$\bar{P}_{max}(Lab)$ (W)	≥ 532.851 ,	≥ 532.851 ,	—
Voc(lab) (V) ..... :	≤ 50.203 ,	≤ 50.203 ,	—
Isc (lab) (A) ..... :	≤ 14.217 ,	≤ 14.217 ,	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
High 3-3	13.428	49.195	12.878	41.431	533.567	80.77	—
High 3-4	13.411	49.169	12.875	41.392	532.921	80.82	—
High 4-3	13.434	49.175	12.883	41.403	533.397	80.74	—
High 4-4	13.429	49.173	12.881	41.406	533.371	80.77	—

Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side rear)			—
Test Date [YYYY-MM-DD] ..... :	2020-09-11		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ - ,	≥ - ,	—

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Clause	Requirement + Test	Result - Remark	Verdict

$\bar{P}_{max}(Lab)$ (W)	≥ _____-_____,	≥ _____-_____,	—
Voc(lab) (V) ..... :	≤ _____-_____,	≤ _____-_____,	—
Isc (lab) (A) ..... :	≤ _____-_____,	≤ _____-_____,	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
High 3-3	9.185	48.137	8.564	41.250	353.278	79.90	—
High 3-4	9.244	48.253	8.554	41.522	355.175	79.63	—
High 4-3	9.241	48.245	8.518	41.563	354.026	79.41	—
High 4-4	9.257	48.225	8.539	41.558	354.853	79.49	—

Supplementary information: N/A

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (equivalent irradiance)			—
Test Date [YYYY-MM-DD] ..... :	2020-09-11		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ _____-_____,	≥ _____-_____,	—
$\bar{P}_{max}(Lab)$ (W)	≥ _____-_____,	≥ _____-_____,	—
Voc(lab) (V) ..... :	≤ _____-_____,	≤ _____-_____,	—
Isc (lab) (A) ..... :	≤ _____-_____,	≤ _____-_____,	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
High 3-3	14.613	49.481	14.097	41.386	583.438	80.69	—
High 3-4	14.622	49.535	14.113	41.411	584.435	80.69	—
High 4-3	14.651	49.549	14.041	41.465	582.198	80.20	—
High 4-4	14.683	49.548	14.118	41.427	584.891	80.39	—

Supplementary information: 1100W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.

Annex 4: List of measurement equipment of Yangzhou Opto-Electrical Products Testing Institute

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
MQT01	—	SB08102	—	2019-05-03	2020-11-02
MQT01	—	SB08108	—	2019-04-29	2020-10-28
MQT01	—	SB08111	—	2019-06-20	2020-12-19
MQT01	—	SB08092	—	2019-04-26	2020-10-25
MQT01	—	SB08125	—	—	—
MQT02 &MQT07&M0T04&MQT09	—	SB08001	—	2019-04-08	2020-10-07
MQT03 &MQT15	—	SB10018	—	2019-12-13	2021-06-12
MQT15	—	SB08079	—	2019-04-10	2020-10-09
MQT15	—	SB08054	—	2019-04-20	2020-10-19
MQT04	—	SB10022	—	2019-04-10	2020-10-09
MQT08	—	SB08044	—	2019-04-20	2020-10-19
MQT08	—	SB08038	—	2019-04-10	2020-10-09
MQT18	—	SB10022	—	2019-04-10	2020-10-09
MQT18 &MQT09	—	SB08037	—	2019-12-28	2021-06-27
MQT09	—	SB14002	—	2019-04-07	2020-10-06
MQT09	—	SB08002	—	2019-05-23	2020-11-22
MQT16	—	SB01009	—	—	—
MQT10	—	SB16003	—	2019-05-23	2020-11-22
MQT11(50)	—	SB09007	—	2019-04-19	2020-10-18
MQT11(5	—	SB12002	—	2019-12-13	2021-06-12
MQT11(50)	—	SB12011	—	2019-12-13	2021-06-12
MQT11(50)	—	SB10013	—	2019-12-13	2021-06-12

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Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
MQT12	—	SB16004	—	2019-04-19	2020-10-18
MQT12	—	SB16006	—	2019-06-30	2020-12-29
MQT12	—	SB16005	—	2019-04-19	2020-10-18
MQT11(200)	—	SB08085	—	2019-04-19	2020-10-18
MQT11(200)	—	SB08004	—	2019-12-13	2021-06-12
MQT11(200)	—	SB08005	—	2019-12-13	2021-06-12
MQT11(200)	—	SB08036	—	2019-12-28	2021-06-27
MQT14	—	SB08055	—	2019-03-20	2020-09-19
MQT14	—	SB08059	—	2019-03-20	2020-09-19
MQT13	—	SB08087	—	2019-12-28	2021-06-27
MQT16	—	SB10007	—	2019-12-13	2021-06-12
MQT17	—	SB08076	—	2019-05-20	2020-11-19
MQT17	—	SB08107	—	2019-04-28	2020-10-27
MQT17	—	SB08112	—	—	—
MQT17	—	SB08142	—	2019-04-20	2020-10-19
MQT17	—	SB08143	—	2019-04-20	2020-10-19
MQT12	—	SB16004	—	2019-04-19	2020-10-18
MQT12	—	SB16006	—	2019-06-30	2020-12-29
MQT12	—	SB16005	—	2019-04-19	2020-10-18
MQT11(200)	—	SB08085	—	2019-04-19	2020-10-18
MQT11(200)	—	SB08004	—	2019-12-13	2021-06-12

For equipments details, please refer equipments' list in YOT