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. ..... :	**704061908304-07**
Date of issue ..... :	2022-12-16
Total number of pages ..... :	125
TÜV SÜD Branch ..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Applicant's name ..... :	ZNShine PV-tech Co., Ltd.
Address ..... :	No.1, South Zhenxing Road, Industrial Zone, Zhixi Town, Jintan District, Changzhou City, Jiangsu Province, 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

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :	Photovoltaic (PV) Module(s)
Trade Mark ..... :	ZNSHINE SOLAR
Manufacturer ..... :	ZNShine PV-tech Co., Ltd. No.1, South Zhenxing Road, Industrial Zone, Zhixi Town, Jintan District, Changzhou City, Jiangsu Province, China
Model/Type reference ..... :	See page 15~52 of this report
Ratings ..... :	See page 15~52 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) ..... :		Yuezhong Shi	yuezhong shi
Approved by (name + signature) ..... :		Rongwei Jing	
☐	**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	Attachment No.1 / Znshine Installation Instruction for double glass solar module
Drawings mechanical	N/A
Circuit diagram	N/A
Photographs	28 pages
Component datasheets / certificates	Refer to TÜV SÜD Application form
Others:	
Product Description Sheet (Manufacturers and type references)	Annex 1, 12 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, N/A pages

Summary of testing:	
Tests performed (name of test and test clause):	**Testing location:**
Based on 704061908304-06A2, modifications are as below: For module type 50) ZXM8-TPLD132-xxx/M, xxx= 630 to 670 in steps of 5 50') ZXM8-THLD132-xxx/M, xxx= 630 to 670 in steps of 5 51) ZXM8-TPLD120-xxx/M, xxx= 575 to 610 in steps of 5 51') ZXM8-THLD120-xxx/M, xxx= 575 to 610 in steps of 5 52) ZXM8-TPLD110-xxx/M, xxx= 525 to 560 in steps of 5 52') ZXM8-THLD110-xxx/M, xxx= 525 to 560 in steps of 5 53) ZXM8-TPLD100-xxx/M, xxx= 480 to 510 in steps of 5 53') ZXM8-THLD100-xxx/M, xxx= 480 to 510 in steps of 5 54) ZXM8-TPLD90-xxx/M, xxx= 430 to 455 in steps of 5 54') ZXM8-THLD90-xxx/M, xxx= 430 to 455 in steps of 5 55) ZXM8-TPLD80-xxx/M, xxx= 385 to 405 in steps of 5 55') ZXM8-THLD80-xxx/M, xxx= 385 to 405 in steps of 5 xxx is standing for rated output power at STC	Yangzhou Opto-Electrical Products Testing Institute No. 10 West Kaifa Road, Yangzhou, 225009 Jiangsu, P. R. China

below changes are found: 1. Added new material combinations: Cell type: ZXM8HD-12+ Encapsulation material: CybrightT11/Cybright W11 + Rear cover: glass+ Fluxing agent: SF105 Below tests were conducted on representative model ZXM8-TPLD132-650/M according to retest guideline 4.2.3 of IEC TS 62915 Edition 1.0 are required: MQT 01 Visual inspection MQT 03 Insulation test MQT 06.1 Performance at STC MQT 15 Wet leakage current MQT 19.1 Initial Stabilization MQT 09 Hot-spot endurance test MQT 11 Thermal cycling test 200 cycles ZXM8-TPLD132-630/M & ZXM8-TPLD132-670/M was selected as the representative models for qualification of higher end & lower end power class For module type 56) ZXM7-UPLDD156-xxx/N, xxx= 585 to 630 in steps of 5 56') ZXM7-UHLDD156-xxx/N, xxx= 585 to 630 in steps of 5 57) ZXM7-UPLDD144-xxx/N, xxx= 540 to 580 in steps of 5 57') ZXM7-UHLDD144-xxx/N, xxx= 540 to 580 in steps of 5 58) ZXM7-UPLDD132-xxx/N, xxx= 495 to 530 in steps of 5 58') ZXM7-UHLDD132-xxx/N, xxx= 495 to 530 in steps of 5 59) ZXM7-UPLDD120-xxx/N, xxx= 450 to 485 in steps of 5 59') ZXM7-UHLDD120-xxx/N, xxx= 450 to 485 in steps of 5 60) ZXM7-UPLDD108-xxx/N, xxx= 405 to 435 in steps of 5 60') ZXM7-UHLDD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added cell type: manufactured by ZNSHINE PV-TECH Co., Ltd. Type: ZXM7HD-16(N) N type, 16 busbars Cell dimensions: 182 x 91 (mm) Thickness: 130±13 (µm) Cell area: 165.34 (cm^2) 2. Added new front and rear cover type: manufactured by Zhejiang Ninghai Kibing New Energy Management Co., Ltd Thickness: 1.6±10% mm	

3. Added new encapsulation material: manufactured by Jiangsu Lushan Photovoltaic Technology Co., Ltd. Type: S102 (superstrate side), material EPE, Thickness: 0.5 or 0.6±20% mm Type: EV1050G2 (substrate side), material EVA, Thickness: 0.5 or 0.6±20% mm 4. Added new cell and string interconnector type: manufactured by Suzhou YourBest New-Type Materials Co., Ltd. string interconnector: 0.35±1×6±2 mm cell interconnector: Φ0.23±10% mm 5. Added new fixing tape type: manufactured by Shanghai Hyperion Adhesive Material Co., Ltd. Type: 9966 6. Added new adhesive type: manufactured by Shanghai Hyperion Adhesive Material Co., Ltd. Type: HB9952 7. Added new potting type: manufactured by Shanghai Hyperion Adhesive Material Co., Ltd. Type: HB9958 Below tests were conducted on representative model ZXM7-UPLDD156-615/N according to retest guideline 4.2.1 & 4.2.2 & 4.2.3 & 4.2.4 & 4.2.5 & 4.2.6 & 4.2.15 of IEC TS 62915 Edition 1.0 are required: MQT 01 Visual inspection MQT 03 Insulation test MQT 06.1 Performance at STC MQT 15 Wet leakage current MQT 19.1 Initial Stabilization MQT 09 Hot-spot endurance test MQT 10 UV preconditioning test MQT 11 Thermal cycling test 50/200 cycles MQT 12 Humidity-freeze test MQT 14.1 Retention of junction box on mounting surface MQT 13 Damp heat test 1000h MQT 16 Static mechanical load test MQT 17 Hail impact test ZXM7-UPLDD156-585/N & ZXM7-UPLDD156-630/N was selected as the representative models for qualification of higher end & lower end power class	

For module type 61) ZXM7-UPLD156-xxx/N, xxx= 585 to 630 in steps of 5 61') ZXM7-UHLD156-xxx/N, xxx= 585 to 630 in steps of 5 62) ZXM7-UPLD144-xxx/N, xxx= 540 to 580 in steps of 5 62') ZXM7-UHLD144-xxx/N, xxx= 540 to 580 in steps of 5 63) ZXM7-UPLD132-xxx/N, xxx= 495 to 530 in steps of 5 63') ZXM7-UHLD132-xxx/N, xxx= 495 to 530 in steps of 5 64) ZXM7-UPLD120-xxx/N, xxx= 450 to 485 in steps of 5 64') ZXM7-UHLD120-xxx/N, xxx= 450 to 485 in steps of 5 65) ZXM7-UPLD108-xxx/N, xxx= 405 to 435 in steps of 5 65) ZXM7-UHLD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added new encapsulation material: manufactured by Jiangsu Lushan Photovoltaic Technology Co., Ltd. Type: S102 (superstrate side), material EPE, Thickness: 0.5 or 0.6±20% mm Type: EV1050G5 (substrate side), material EVA, Thickness: 0.5 or 0.6±20% mm Below tests were conducted on representative model ZXM7-UPLD156-615/N according to retest guideline 4.2.2 of IEC TS 62915 Edition 1.0 are required: MQT 01 Visual inspection MQT 03 Insulation test MQT 06.1 Performance at STC MQT 15 Wet leakage current MQT 19.1 Initial Stabilization MQT 09 Hot-spot endurance test MQT 10 UV preconditioning test MQT 11 Thermal cycling test 50 cycles MQT 12 Humidity-freeze test MQT 13 Damp heat test 1000h ZXM7-UPLD156-585/N & ZXM7-UPLD156-630/N was selected as the representative models for qualification of higher end & lower end power class 56) ZXM7-EPLDD156-xxx/N, xxx= 585 to 630 in steps of 5 56') ZXM7-EHLDD156-xxx/N, xxx= 585 to 630 in steps of 5	

57) ZXM7-EPLDD144-xxx/N, xxx= 540 to 580 in steps of 5 57') ZXM7-EHLDD144-xxx/N, xxx= 540 to 580 in steps of 5 58) ZXM7-EPLDD132-xxx/N, xxx= 495 to 530 in steps of 5 58') ZXM7-EHLDD132-xxx/N, xxx= 495 to 530 in steps of 5 59) ZXM7-EPLDD120-xxx/N, xxx= 450 to 485 in steps of 5 59') ZXM7-EHLDD120-xxx/N, xxx= 450 to 485 in steps of 5 60) ZXM7-EPLDD108-xxx/N, xxx= 405 to 435 in steps of 5 60') ZXM7-EHLDD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added cell type: manufactured by ZNSHINE PV-TECH Co., Ltd. Type: ZXM7HD-11(N) N type, 11 busbars Cell dimensions: 182 x 91 (mm) Thickness: 130±13 (μm) Cell area: 165.34 (cm^2) ZXM8-EPLDD132-630/M & ZXM8-EPLDD132-670/M was selected as the representative models for qualification of higher end & lower end power class 56) ZXM7-SPLDD156-xxx/N, xxx= 585 to 630 in steps of 5 56') ZXM7-SHLDD156-xxx/N, xxx= 585 to 630 in steps of 5 57) ZXM7-SPLDD144-xxx/N, xxx= 540 to 580 in steps of 5 57') ZXM7-SHLDD144-xxx/N, xxx= 540 to 580 in steps of 5 58) ZXM7-SPLDD132-xxx/N, xxx= 495 to 530 in steps of 5 58') ZXM7-SHLDD132-xxx/N, xxx= 495 to 530 in steps of 5 59) ZXM7-SPLDD120-xxx/N, xxx= 450 to 485 in steps of 5 59') ZXM7-SHLDD120-xxx/N, xxx= 450 to 485 in steps of 5 60) ZXM7-SPLDD108-xxx/N, xxx= 405 to 435 in steps of 5 60') ZXM7-SHLDD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added cell type: manufactured by ZNSHINE PV-TECH Co., Ltd. Type: ZXM7HD-10(N) N type, 10 busbars Cell dimensions: 182 x 91 (mm) Thickness: 130±13 (μm) Cell area: 165.34 (cm^2)	

ZXM8-SPLDD132-630/M & ZXM8-SPLDD132-670/M was selected as the representative models for qualification of higher end & lower end power class For module type 61) ZXM7-EPLD156-xxx/N, xxx= 585 to 630 in steps of 5 61') ZXM7-EHLD156-xxx/N, xxx= 585 to 630 in steps of 5 62) ZXM7-EPLD144-xxx/N, xxx= 540 to 580 in steps of 5 62') ZXM7-EHLD144-xxx/N, xxx= 540 to 580 in steps of 5 63) ZXM7-EPLD132-xxx/N, xxx= 495 to 530 in steps of 5 63') ZXM7-EHLD132-xxx/N, xxx= 495 to 530 in steps of 5 64) ZXM7-EPLD120-xxx/N, xxx= 450 to 485 in steps of 5 64') ZXM7-EHLD120-xxx/N, xxx= 450 to 485 in steps of 5 65) ZXM7-EPLD108-xxx/N, xxx= 405 to 435 in steps of 5 65) ZXM7-EHLD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added cell type: manufactured by ZNSHINE PV-TECH Co., Ltd. Type: ZXM7HD-11(N) N type, 11 busbars Cell dimensions: 182 x 91 (mm) Thickness: 130±13 (µm) Cell area: 165.34 (cm^2) ZXM8-EPLD132-630/M & ZXM8-EPLD132-670/M was selected as the representative models for qualification of higher end & lower end power class For module type 61) ZXM7-SPLD156-xxx/N, xxx= 585 to 630 in steps of 5 61') ZXM7-SHLD156-xxx/N, xxx= 585 to 630 in steps of 5 62) ZXM7-SPLD144-xxx/N, xxx= 540 to 580 in steps of 5 62') ZXM7-SHLD144-xxx/N, xxx= 540 to 580 in steps of 5 63) ZXM7-SPLD132-xxx/N, xxx= 495 to 530 in steps of 5 63') ZXM7-SHLD132-xxx/N, xxx= 495 to 530 in steps of 5 64) ZXM7-SPLD120-xxx/N, xxx= 450 to 485 in steps of 5 64') ZXM7-SHLD120-xxx/N, xxx= 450 to 485 in steps of 5	

65) ZXM7-SPLD108-xxx/N, xxx= 405 to 435 in steps of 5 65) ZXM7-SHLD108-xxx/N, xxx= 405 to 435 in steps of 5 below changes are found: 1. Added cell type: manufactured by ZNSHINE PV-TECH Co., Ltd. Type: ZXM7HD-10(N) N type, 10 busbars Cell dimensions: 182 x 91 (mm) Thickness: 130±13 (μm) Cell area: 165.34 (cm^2) ZXM8-SPLD132-630/M & ZXM8-SPLD132-670/M was selected as the representative models for qualification of higher end & lower end power class Added alternative electrical termination below: J-box: Z8-abcd Cable: 62930 IEC 131 1×4.0mm2, H1Z2Z2-K 1 x 4.0mm2 Connector: Z4S-abcde Test on component level in TÜV SUD report 70.407.21.463.01-00.	

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.

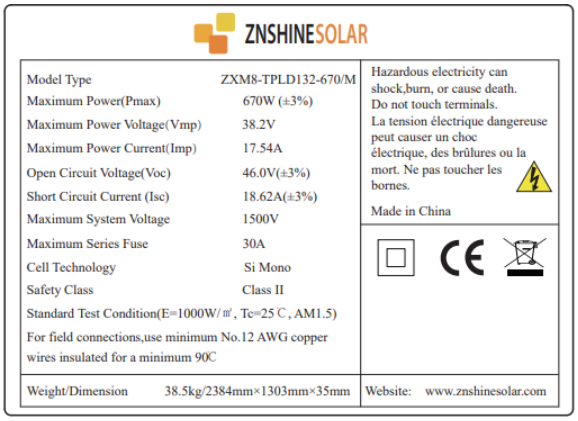
The text of IEC 61215-1-1: 2016 was approved by CENELEC as EN 61215-1-1: 2016 without any modification.

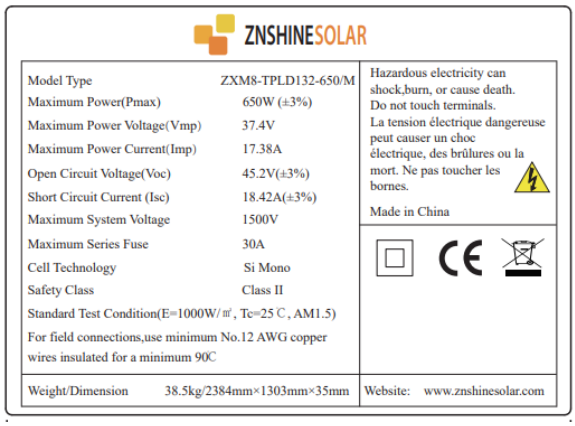
The text of IEC 61215-2: 2016 was approved by CENELEC as EN 61215-2: 2017 without any modification.

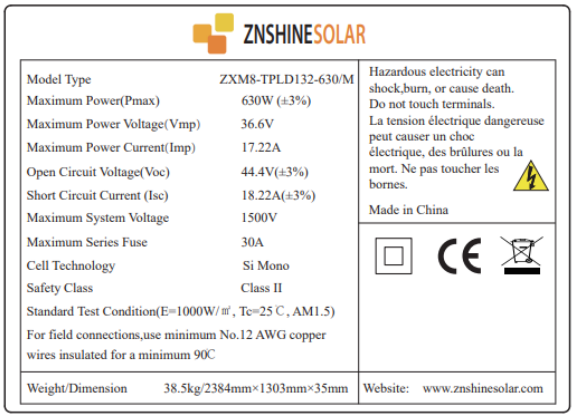
☒ **The product fulfils the requirements of EN 61215-1: 2016, EN 61215-1-1: 2016 & EN 61215-2: 2017**

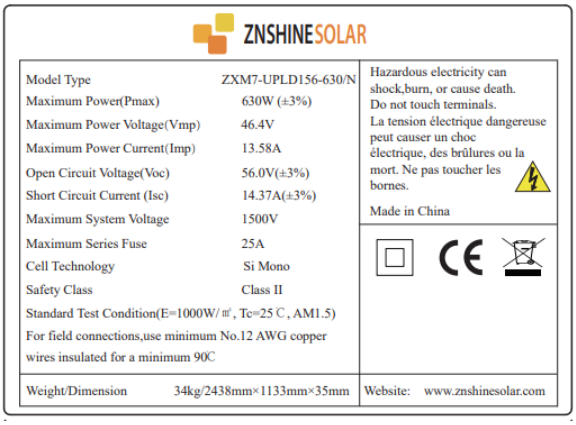
Copy of marking plate:

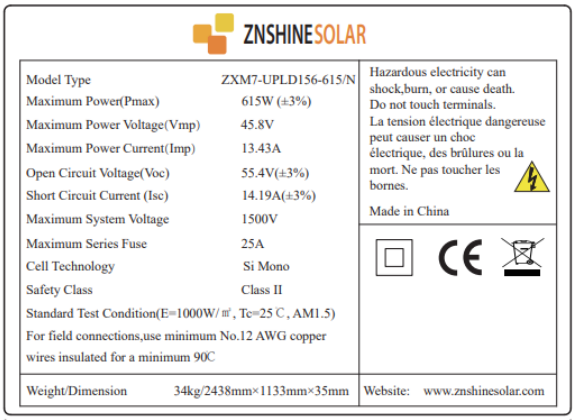
The artwork below may be only a draft. The use of certification marks on a product must be authorized by TÜV SÜD Product Service GmbH that own these marks.

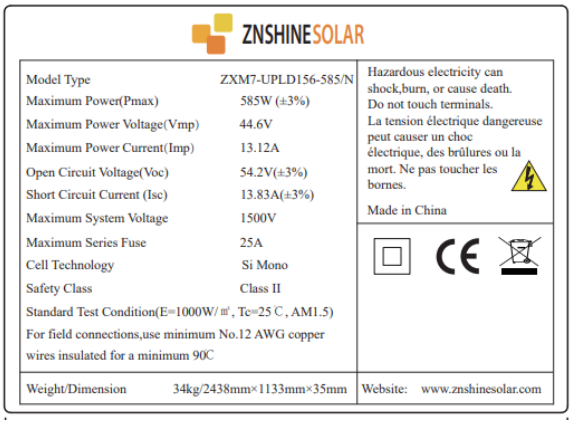


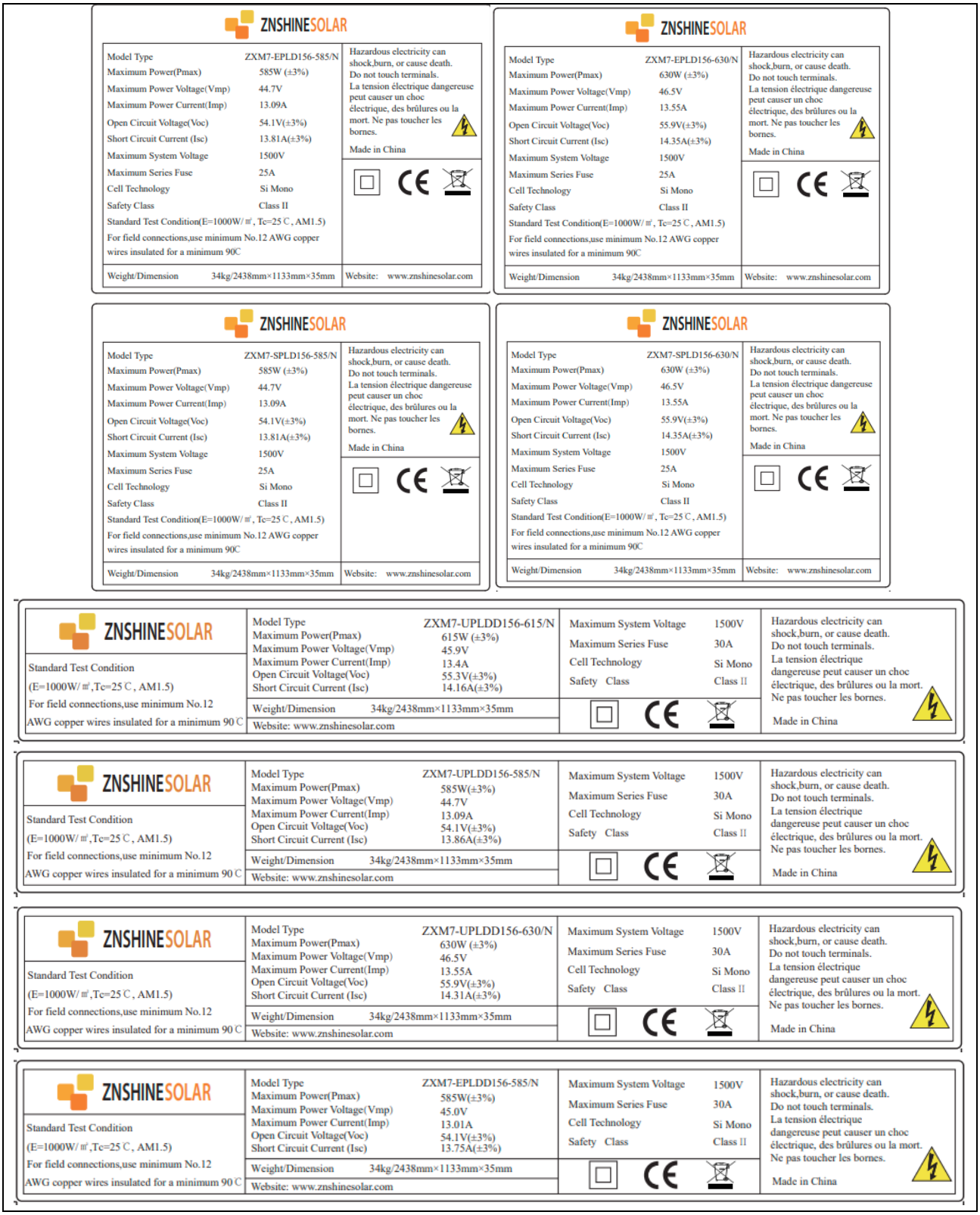












ZNSHINESOLAR

Model Type	ZXM7-EPLD156-585/N
Maximum Power(Pmax)	585W (±3%)
Maximum Power Voltage(Vmp)	44.7V
Maximum Power Current(Imp)	13.09A
Open Circuit Voltage(Voc)	54.1V(±3%)
Short Circuit Current (Isc)	13.81A(±3%)
Maximum System Voltage	1500V
Maximum Series Fuse	25A
Cell Technology	Si Mono
Safety Class	Class II
Standard Test Condition(E=1000W/㎡, Tc=25℃, AM1.5)	
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃	
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China

ZNSHINESOLAR

Model Type	ZXM7-EPLD156-630/N
Maximum Power(Pmax)	630W (±3%)
Maximum Power Voltage(Vmp)	46.5V
Maximum Power Current(Imp)	13.55A
Open Circuit Voltage(Voc)	55.9V(±3%)
Short Circuit Current (Isc)	14.35A(±3%)
Maximum System Voltage	1500V
Maximum Series Fuse	25A
Cell Technology	Si Mono
Safety Class	Class II
Standard Test Condition(E=1000W/㎡, Tc=25℃, AM1.5)	
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃	
Weight/Dimension	34kg/2438mm×1133mm×35mm
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Maximum Power Voltage(Vmp)	44.7V
Maximum Power Current(Imp)	13.09A
Open Circuit Voltage(Voc)	54.1V(±3%)
Short Circuit Current (Isc)	13.81A(±3%)
Maximum System Voltage	1500V
Maximum Series Fuse	25A
Cell Technology	Si Mono
Safety Class	Class II
Standard Test Condition(E=1000W/㎡, Tc=25℃, AM1.5)	
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃	
Weight/Dimension	34kg/2438mm×1133mm×35mm
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Made in China

ZNSHINESOLAR

Model Type	ZXM7-SPLD156-630/N
Maximum Power(Pmax)	630W (±3%)
Maximum Power Voltage(Vmp)	46.5V
Maximum Power Current(Imp)	13.55A
Open Circuit Voltage(Voc)	55.9V(±3%)
Short Circuit Current (Isc)	14.35A(±3%)
Maximum System Voltage	1500V
Maximum Series Fuse	25A
Cell Technology	Si Mono
Safety Class	Class II
Standard Test Condition(E=1000W/㎡, Tc=25℃, AM1.5)	
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃	
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China

ZNSHINESOLAR

Standard Test Condition
(E=1000W/㎡,Tc=25℃, AM1.5)
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃

Model Type	ZXM7-UPLDD156-615/N
Maximum Power(Pmax)	615W (±3%)
Maximum Power Voltage(Vmp)	45.9V
Maximum Power Current(Imp)	13.4A
Open Circuit Voltage(Voc)	55.3V(±3%)
Short Circuit Current (Isc)	14.16A(±3%)
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Maximum System Voltage	1500V
Maximum Series Fuse	30A
Cell Technology	Si Mono
Safety Class	Class II

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China

ZNSHINESOLAR

Standard Test Condition
(E=1000W/㎡,Tc=25℃, AM1.5)
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃

Model Type	ZXM7-UPLDD156-585/N
Maximum Power(Pmax)	585W(±3%)
Maximum Power Voltage(Vmp)	44.7V
Maximum Power Current(Imp)	13.09A
Open Circuit Voltage(Voc)	54.1V(±3%)
Short Circuit Current (Isc)	13.86A(±3%)
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Maximum System Voltage	1500V
Maximum Series Fuse	30A
Cell Technology	Si Mono
Safety Class	Class II

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China

ZNSHINESOLAR

Standard Test Condition
(E=1000W/㎡,Tc=25℃, AM1.5)
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃

Model Type	ZXM7-UPLDD156-630/N
Maximum Power(Pmax)	630W (±3%)
Maximum Power Voltage(Vmp)	46.5V
Maximum Power Current(Imp)	13.55A
Open Circuit Voltage(Voc)	55.9V(±3%)
Short Circuit Current (Isc)	14.31A(±3%)
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Maximum System Voltage	1500V
Maximum Series Fuse	30A
Cell Technology	Si Mono
Safety Class	Class II

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China

ZNSHINESOLAR

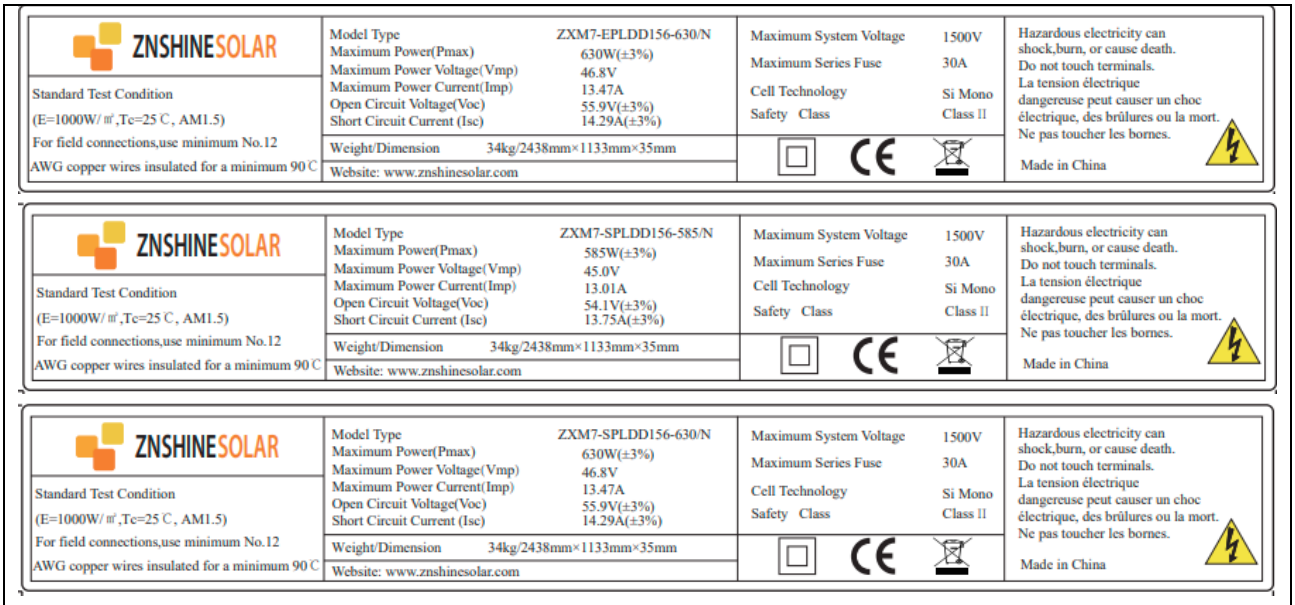
Standard Test Condition
(E=1000W/㎡,Tc=25℃, AM1.5)
For field connections,use minimum No.12 AWG copper wires insulated for a minimum 90℃

Model Type	ZXM7-EPLD156-585/N
Maximum Power(Pmax)	585W(±3%)
Maximum Power Voltage(Vmp)	45.0V
Maximum Power Current(Imp)	13.01A
Open Circuit Voltage(Voc)	54.1V(±3%)
Short Circuit Current (Isc)	13.75A(±3%)
Weight/Dimension	34kg/2438mm×1133mm×35mm
Website:	www.znshinesolar.com

Maximum System Voltage	1500V
Maximum Series Fuse	30A
Cell Technology	Si Mono
Safety Class	Class II

Hazardous electricity can shock,burn, or cause death. Do not touch terminals. La tension électrique dangereuse peut causer un choc électrique, des brûlures ou la mort. Ne pas toucher les bornes.

Made in China



(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..... :	N/A
Accessories and detachable parts included in the evaluation..... :	
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..... :	2022-08-25
Dates of tests (beginning/end)..... :	2022-09-15~2022-12-15

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)..... :	ZNShine PV-tech Co., Ltd. (CBW: 073899) No.1, South Zhenxing Road, Industrial Zone, Zhixi Town, Jintan District, Changzhou City, Jiangsu Province, China Zhengxin photoelectric technology (Suqian) Co., Ltd. (CBW: 114501) No. 1589 Guangzhou road, Suqian Economic and Technological Development Zone,223800 Suqian City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA

PRODUCT ELECTRICAL RATINGS:				
Module type	ZXM8-TPLD132-630/M	ZXM8-TPLD132-635/M	ZXM8-TPLD132-640/M	ZXM8-TPLD132-645/M
	ZXM8-THLD132-630/M	ZXM8-THLD132-635/M	ZXM8-THLD132-640/M	ZXM8-THLD132-645/M
Voc [V] /Tolerance	44.4±3%	44.6±3%	44.8±3%	45.0±3%
Isc [Adc] /Tolerance	18.22±3%	18.27±3%	18.32±3%	18.37±3%
Vmp [V]	36.6	36.8	37.0	37.2
Imax [Adc]	17.22	17.26	17.30	17.34
Pmp [W] /Tolerance	630±3%	635±3%	640±3%	645±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD132-650/M	ZXM8-TPLD132-655/M	ZXM8-TPLD132-660/M	ZXM8-TPLD132-665/M
	ZXM8-THLD132-650/M	ZXM8-THLD132-655/M	ZXM8-THLD132-660/M	ZXM8-THLD132-665/M
Voc [V] /Tolerance	45.2±3%	45.4±3%	45.6±3%	45.8±3%
Isc [Adc] /Tolerance	18.42±3%	18.47±3%	18.52±3%	18.57±3%
Vmp [V]	37.4	37.6	37.8	38.0
Imax [Adc]	17.38	17.43	17.47	17.50
Pmp [W] /Tolerance	650±3%	655±3%	660±3%	665±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30

Product Electrical Ratings:				
Module type	ZXM8-TPLD132-670/M	ZXM8-TPLD132-675/M	ZXM8-TPLD120-575/M	ZXM8-TPLD120-580/M
	ZXM8-THLD132-670/M	ZXM8-THLD132-675/M	ZXM8-THLD120-575/M	ZXM8-THLD120-580/M
Voc [V] /Tolerance	46.0±3%	46.2±3%	40.4±3%	40.6±3%
Isc [Adc] /Tolerance	18.62±3%	18.67±3%	18.12±3%	18.17±3%
Vmp [V]	38.2	38.4	33.4	33.6
Imax [Adc]	17.54	17.58	17.22	17.27
Pmp [W] /Tolerance	670±3%	675±3%	575±3%	580±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD120-585/M	ZXM8-TPLD120-590/M	ZXM8-TPLD120-595/M	ZXM8-TPLD120-600/M
	ZXM8-THLD120-585/M	ZXM8-THLD120-590/M	ZXM8-THLD120-595/M	ZXM8-THLD120-600/M
Voc [V] /Tolerance	40.8±3%	41.0±3%	41.2±3%	41.4±3%
Isc [Adc] /Tolerance	18.22±3%	18.27±3%	18.32±3%	18.37±3%
Vmp [V]	33.8	34.0	34.2	34.4
Imax [Adc]	17.31	17.36	17.40	17.45
Pmp [W] /Tolerance	585±3%	590±3%	595±3%	600±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM8-TPLD120-605/M	ZXM8-TPLD120-610/M	ZXM8-TPLD120-615/M	ZXM8-TPLD110-525/M
	ZXM8-THLD120-605/M	ZXM8-THLD120-610/M	ZXM8-THLD120-615/M	ZXM8-THLD110-525/M
Voc [V] /Tolerance	41.6±3%	41.8±3%	42.0±3%	37.0±3%
Isc [Adc] /Tolerance	18.42±3%	18.47±3%	18.52±3%	18.14±3%
Vmp [V]	34.6	34.8	35.0	30.5
Imax [Adc]	17.49	17.53	17.58	17.22
Pmp [W] /Tolerance	605±3%	610±3%	615±3%	525±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD110-530/M	ZXM8-TPLD110-535/M	ZXM8-TPLD110-540/M	ZXM8-TPLD110-545/M
	ZXM8-THLD110-530/M	ZXM8-THLD110-535/M	ZXM8-THLD110-540/M	ZXM8-THLD110-545/M
Voc [V] /Tolerance	37.2±3%	37.4±3%	37.6±3%	37.8±3%
Isc [Adc] /Tolerance	18.19±3%	18.24±3%	18.29±3%	18.34±3%
Vmp [V]	30.7	30.9	31.1	31.3
Imax [Adc]	17.27	17.32	17.37	17.42
Pmp [W] /Tolerance	530±3%	535±3%	540±3%	545±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM8-TPLD110-550/M	ZXM8-TPLD110-555/M	ZXM8-TPLD110-560/M	ZXM8-TPLD110-565/M
	ZXM8-THLD110-550/M	ZXM8-THLD110-555/M	ZXM8-THLD110-560/M	ZXM8-THLD110-565/M
Voc [V] /Tolerance	38.0±3%	38.2±3%	38.4±3%	38.6±3%
Isc [Adc] /Tolerance	18.39±3%	18.44±3%	18.49±3%	18.54±3%
Vmp [V]	31.5	31.7	31.9	32.1
Imax [Adc]	17.47	17.51	17.56	17.61
Pmp [W] /Tolerance	550±3%	555±3%	560±3%	565±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD100-480/M	ZXM8-TPLD100-485/M	ZXM8-TPLD100-490/M	ZXM8-TPLD100-495/M
	ZXM8-THLD100-480/M	ZXM8-THLD100-485/M	ZXM8-THLD100-490/M	ZXM8-THLD100-495/M
Voc [V] /Tolerance	33.8±3%	34.0±3%	34.2±3%	34.4±3%
Isc [Adc] /Tolerance	18.13±3%	18.18±3%	18.23±3%	18.28±3%
Vmp [V]	27.9	28.1	28.3	28.5
Imax [Adc]	17.21	17.26	17.32	17.37
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
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM8-TPLD100-500/M	ZXM8-TPLD100-505/M	ZXM8-TPLD100-510/M	ZXM8-TPLD100-515/M
	ZXM8-THLD100-500/M	ZXM8-THLD100-505/M	ZXM8-THLD100-510/M	ZXM8-THLD100-515/M
Voc [V] /Tolerance	34.6±3%	34.8±3%	35.0±3%	35.2±3%
Isc [Adc] /Tolerance	18.33±3%	18.38±3%	18.43±3%	18.48±3%
Vmp [V]	28.7	28.9	29.1	29.3
Imax [Adc]	17.43	17.48	17.53	17.58
Pmp [W] /Tolerance	500±3%	505±3%	510±3%	515±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD90-430/M	ZXM8-TPLD90-435/M	ZXM8-TPLD90-440/M	ZXM8-TPLD90-445/M
	ZXM8-THLD90-430/M	ZXM8-THLD90-435/M	ZXM8-THLD90-440/M	ZXM8-THLD90-445/M
Voc [V] /Tolerance	30.3±3%	30.5±3%	30.7±3%	30.9±3%
Isc [Adc] /Tolerance	18.11±3%	18.17±3%	18.23±3%	18.29±3%
Vmp [V]	25.0	25.2	25.4	25.6
Imax [Adc]	17.20	17.27	17.33	17.39
Pmp [W] /Tolerance	430±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
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM8-TPLD90-450/M	ZXM8-TPLD90-455/M	ZXM8-TPLD90-460/M	ZXM8-TPLD80-385/M
	ZXM8-THLD90-450/M	ZXM8-THLD90-455/M	ZXM8-THLD90-460/M	ZXM8-THLD80-385/M
Voc [V] /Tolerance	31.1±3%	31.3±3%	31.5±3%	27.1±3%
Isc [Adc] /Tolerance	18.35±3%	18.41±3%	18.47±3%	18.12±3%
Vmp [V]	25.8	26.0	26.2	22.4
Imax [Adc]	17.45	17.50	17.56	17.19
Pmp [W] /Tolerance	450±3%	455±3%	460±3%	385±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM8-TPLD80-390/M	ZXM8-TPLD80-395/M	ZXM8-TPLD80-400/M	ZXM8-TPLD80-405/M
	ZXM8-THLD80-390/M	ZXM8-THLD80-395/M	ZXM8-THLD80-400/M	ZXM8-THLD80-405/M
Voc [V] /Tolerance	27.3±3%	27.5±3%	27.7±3%	27.9±3%
Isc [Adc] /Tolerance	18.19±3%	18.26±3%	18.33±3%	18.40±3%
Vmp [V]	22.6	22.8	23.0	23.2
Imax [Adc]	17.26	17.33	17.40	17.46
Pmp [W] /Tolerance	390±3%	395±3%	400±3%	405±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD156-585/N	ZXM7-UPLDD156-590/N	ZXM7-UPLDD156-595/N	ZXM7-UPLDD156-600/N
	ZXM7-UHLDD156-585/N	ZXM7-UHLDD156-590/N	ZXM7-UHLDD156-595/N	ZXM7-UHLDD156-600/N
Voc [V] /Tolerance	54.1±3%	54.3±3%	54.5±3%	54.7±3%
Isc [Adc] /Tolerance	13.86±3%	13.91±3%	13.96±3%	14.01±3%
Vmp [V]	44.7	44.9	45.1	45.3
Imax [Adc]	13.09	13.15	13.20	13.25
Pmp [W] /Tolerance	585±3%	590±3%	595±3%	600±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-UPLDD156-605/N	ZXM7-UPLDD156-610/N	ZXM7-UPLDD156-615/N	ZXM7-UPLDD156-620/N
	ZXM7-UHLDD156-605/N	ZXM7-UHLDD156-610/N	ZXM7-UHLDD156-615/N	ZXM7-UHLDD156-620/N
Voc [V] /Tolerance	54.9±3%	55.1±3%	55.3±3%	55.5±3%
Isc [Adc] /Tolerance	14.06±3%	14.11±3%	14.16±3%	14.21±3%
Vmp [V]	45.5	45.7	45.9	46.1
Imax [Adc]	13.30	13.35	13.40	13.45
Pmp [W] /Tolerance	605±3%	610±3%	615±3%	620±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD156-625/N	ZXM7-UPLDD156-630/N	ZXM7-UPLDD144-540/N	ZXM7-UPLDD144-545/N
	ZXM7-UHLDD156-625/N	ZXM7-UHLDD156-630/N	ZXM7-UHLDD144-540/N	ZXM7-UHLDD144-545/N
Voc [V] /Tolerance	55.7±3%	55.9±3%	49.9±3%	50.1±3%
Isc [Adc] /Tolerance	14.26±3%	14.31±3%	13.87±3%	13.93±3%
Vmp [V]	46.3	46.5	41.2	41.4
Imax [Adc]	13.50	13.55	13.11	13.17
Pmp [W] /Tolerance	625±3%	630±3%	540±3%	545±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-UPLDD144-550/N	ZXM7-UPLDD144-555/N	ZXM7-UPLDD144-560/N	ZXM7-UPLDD144-565/N
	ZXM7-UHLDD144-550/N	ZXM7-UHLDD144-555/N	ZXM7-UHLDD144-560/N	ZXM7-UHLDD144-565/N
Voc [V] /Tolerance	50.3±3%	50.5±3%	50.7±3%	50.9±3%
Isc [Adc] /Tolerance	13.99±3%	14.05±3%	14.11±3%	14.17±3%
Vmp [V]	41.6	41.8	42.0	42.2
Imax [Adc]	13.23	13.28	13.34	13.39
Pmp [W] /Tolerance	550±3%	555±3%	560±3%	565±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD144-570/N	ZXM7-UPLDD144-575/N	ZXM7-UPLDD144-580/N	ZXM7-UPLDD132-495/N
	ZXM7-UHLDD144-570/N	ZXM7-UHLDD144-575/N	ZXM7-UHLDD144-580/N	ZXM7-UHLDD132-495/N
Voc [V] /Tolerance	51.1±3%	51.3±3%	51.5±3%	45.7±3%
Isc [Adc] /Tolerance	14.23±3%	14.29±3%	14.35±3%	13.86±3%
Vmp [V]	42.4	42.6	42.8	37.8
Imax [Adc]	13.45	13.50	13.56	13.10
Pmp [W] /Tolerance	570±3%	575±3%	580±3%	495±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-UPLDD132-500/N	ZXM7-UPLDD132-505/N	ZXM7-UPLDD132-510/N	ZXM7-UPLDD132-515/N
	ZXM7-UHLDD132-500/N	ZXM7-UHLDD132-505/N	ZXM7-UHLDD132-510/N	ZXM7-UHLDD132-515/N
Voc [V] /Tolerance	45.9±3%	46.1±3%	46.3±3%	46.5±3%
Isc [Adc] /Tolerance	13.92±3%	13.98±3%	14.04±3%	14.10±3%
Vmp [V]	38.0	38.2	38.4	38.6
Imax [Adc]	13.16	13.23	13.29	13.35
Pmp [W] /Tolerance	500±3%	505±3%	510±3%	515±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD132-520/N	ZXM7-UPLDD132-525/N	ZXM7-UPLDD132-530/N	ZXM7-UPLDD120-450/N
	ZXM7-UHLDD132-520/N	ZXM7-UHLDD132-525/N	ZXM7-UHLDD132-530/N	ZXM7-UHLDD120-450/N
Voc [V] /Tolerance	46.7±3%	46.9±3%	47.1±3%	41.6±3%
Isc [Adc] /Tolerance	14.16±3%	14.22±3%	14.28±3%	13.89±3%
Vmp [V]	38.8	39.0	39.2	34.3
Imax [Adc]	13.41	13.47	13.53	13.13
Pmp [W] /Tolerance	520±3%	525±3%	530±3%	450±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-UPLDD120-455/N	ZXM7-UPLDD120-460/N	ZXM7-UPLDD120-465/N	ZXM7-UPLDD120-470/N
	ZXM7-UHLDD120-455/N	ZXM7-UHLDD120-460/N	ZXM7-UHLDD120-465/N	ZXM7-UHLDD120-470/N
Voc [V] /Tolerance	41.8±3%	42.0±3%	42.2±3%	42.4±3%
Isc [Adc] /Tolerance	13.96±3%	14.03±3%	14.10±3%	14.17±3%
Vmp [V]	34.5	34.7	34.9	35.1
Imax [Adc]	13.19	13.26	13.33	13.40
Pmp [W] /Tolerance	455±3%	460±3%	465±3%	470±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD120-475/N	ZXM7-UPLDD120-480/N	ZXM7-UPLDD120-485/N	ZXM7-UPLDD108-405/N
	ZXM7-UHLDD120-475/N	ZXM7-UHLDD120-480/N	ZXM7-UHLDD120-485/N	ZXM7-UHLDD108-405/N
Voc [V] /Tolerance	42.6±3%	42.8±3%	43.0±3%	37.4±3%
Isc [Adc] /Tolerance	14.24±3%	14.31±3%	14.38±3%	13.90±3%
Vmp [V]	35.3	35.5	35.7	30.9
Imax [Adc]	13.46	13.53	13.59	13.11
Pmp [W] /Tolerance	475±3%	480±3%	485±3%	405±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-UPLDD108-410/N	ZXM7-UPLDD108-415/N	ZXM7-UPLDD108-420/N	ZXM7-UPLDD108-425/N
	ZXM7-UHLDD108-410/N	ZXM7-UHLDD108-415/N	ZXM7-UHLDD108-420/N	ZXM7-UHLDD108-425/N
Voc [V] /Tolerance	37.6±3%	37.8±3%	38.0±3%	38.2±3%
Isc [Adc] /Tolerance	13.97±3%	14.04±3%	14.11±3%	14.18±3%
Vmp [V]	31.1	31.3	31.5	31.7
Imax [Adc]	13.19	13.26	13.34	13.41
Pmp [W] /Tolerance	410±3%	415±3%	420±3%	425±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLDD108-430/N	ZXM7-UPLDD108-435/N	ZXM7-EPLDD156-585/N	ZXM7-EPLDD156-590/N
	ZXM7-UHLDD108-430/N	ZXM7-UHLDD108-435/N	ZXM7-EHLDD156-585/N	ZXM7-EHLDD156-590/N
Voc [V] /Tolerance	38.4±3%	38.6±3%	54.1±3%	54.3±3%
Isc [Adc] /Tolerance	14.25±3%	14.32±3%	13.75±3%	13.81±3%
Vmp [V]	31.9	32.1	45.0	45.2
Imax [Adc]	13.48	13.56	13.01	13.06
Pmp [W] /Tolerance	430±3%	435±3%	585±3%	590±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-EPLDD156-595/N	ZXM7-EPLDD156-600/N	ZXM7-EPLDD156-605/N	ZXM7-EPLDD156-610/N
	ZXM7-EHLDD156-595/N	ZXM7-EHLDD156-600/N	ZXM7-EHLDD156-605/N	ZXM7-EHLDD156-610/N
Voc [V] /Tolerance	54.5±3%	54.7±3%	54.9±3%	55.1±3%
Isc [Adc] /Tolerance	13.87±3%	13.93±3%	13.99±3%	14.05±3%
Vmp [V]	45.4	45.6	45.8	46.0
Imax [Adc]	13.11	13.16	13.21	13.27
Pmp [W] /Tolerance	595±3%	600±3%	605±3%	610±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLDD156-615/N	ZXM7-EPLDD156-620/N	ZXM7-EPLDD156-625/N	ZXM7-EPLDD156-630/N
	ZXM7-EHLDD156-615/N	ZXM7-EHLDD156-620/N	ZXM7-EHLDD156-625/N	ZXM7-EHLDD156-630/N
Voc [V] /Tolerance	55.3±3%	55.5±3%	55.7±3%	55.9±3%
Isc [Adc] /Tolerance	14.11±3%	14.17±3%	14.23±3%	14.29±3%
Vmp [V]	46.2	46.4	46.6	46.8
Imax [Adc]	13.32	13.37	13.42	13.47
Pmp [W] /Tolerance	615±3%	620±3%	625±3%	630±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-EPLDD144-540/N	ZXM7-EPLDD144-545/N	ZXM7-EPLDD144-550/N	ZXM7-EPLDD144-555/N
	ZXM7-EHLDD144-540/N	ZXM7-EHLDD144-545/N	ZXM7-EHLDD144-550/N	ZXM7-EHLDD144-555/N
Voc [V] /Tolerance	49.9±3%	50.1±3%	50.3±3%	50.5±3%
Isc [Adc] /Tolerance	13.77±3%	13.83±3%	13.89±3%	13.95±3%
Vmp [V]	41.5	41.7	41.9	42.1
Imax [Adc]	13.02	13.08	13.13	13.19
Pmp [W] /Tolerance	540±3%	545±3%	550±3%	555±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLDD144-560/N	ZXM7-EPLDD144-565/N	ZXM7-EPLDD144-570/N	ZXM7-EPLDD144-575/N
	ZXM7-EHLDD144-560/N	ZXM7-EHLDD144-565/N	ZXM7-EHLDD144-570/N	ZXM7-EHLDD144-575/N
Voc [V] /Tolerance	50.7±3%	50.9±3%	51.1±3%	51.3±3%
Isc [Adc] /Tolerance	14.01±3%	14.07±3%	14.13±3%	14.19±3%
Vmp [V]	42.3	42.5	42.7	42.9
Imax [Adc]	13.24	13.30	13.35	13.41
Pmp [W] /Tolerance	560±3%	565±3%	570±3%	575±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-EPLDD144-580/N	ZXM7-EPLDD132-495/N	ZXM7-EPLDD132-500/N	ZXM7-EPLDD132-505/N
	ZXM7-EHLDD144-580/N	ZXM7-EHLDD132-495/N	ZXM7-EHLDD132-500/N	ZXM7-EHLDD132-505/N
Voc [V] /Tolerance	51.5±3%	45.7±3%	45.9±3%	46.1±3%
Isc [Adc] /Tolerance	14.25±3%	13.80±3%	13.86±3%	13.92±3%
Vmp [V]	43.1	38.0	38.2	38.4
Imax [Adc]	13.46	13.03	13.09	13.16
Pmp [W] /Tolerance	580±3%	495±3%	500±3%	505±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLDD132-510/N	ZXM7-EPLDD132-515/N	ZXM7-EPLDD132-520/N	ZXM7-EPLDD132-525/N
	ZXM7-EHLDD132-510/N	ZXM7-EHLDD132-515/N	ZXM7-EHLDD132-520/N	ZXM7-EHLDD132-525/N
Voc [V] /Tolerance	46.3±3%	46.5±3%	46.7±3%	46.9±3%
Isc [Adc] /Tolerance	13.98±3%	14.04±3%	14.10±3%	14.16±3%
Vmp [V]	38.6	38.8	39.0	39.2
Imax [Adc]	13.22	13.28	13.34	13.40
Pmp [W] /Tolerance	510±3%	515±3%	520±3%	525±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-EPLDD132-530/N	ZXM7-EPLDD120-450/N	ZXM7-EPLDD120-455/N	ZXM7-EPLDD120-460/N
	ZXM7-EHLDD132-530/N	ZXM7-EHLDD120-450/N	ZXM7-EHLDD120-455/N	ZXM7-EHLDD120-460/N
Voc [V] /Tolerance	47.1±3%	41.6±3%	41.8±3%	42.0±3%
Isc [Adc] /Tolerance	14.22±3%	13.83±3%	13.89±3%	13.95±3%
Vmp [V]	39.4	34.6	34.8	35.0
Imax [Adc]	13.46	13.01	13.08	13.15
Pmp [W] /Tolerance	530±3%	450±3%	455±3%	460±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLDD120-465/N	ZXM7-EPLDD120-470/N	ZXM7-EPLDD120-475/N	ZXM7-EPLDD120-480/N
	ZXM7-EHLDD120-465/N	ZXM7-EHLDD120-470/N	ZXM7-EHLDD120-475/N	ZXM7-EHLDD120-480/N
Voc [V] /Tolerance	42.2±3%	42.4±3%	42.6±3%	42.8±3%
Isc [Adc] /Tolerance	14.01±3%	14.07±3%	14.13±3%	14.19±3%
Vmp [V]	35.2	35.4	35.6	35.8
Imax [Adc]	13.22	13.28	13.35	13.41
Pmp [W] /Tolerance	465±3%	470±3%	475±3%	480±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-EPLDD120-485/N	ZXM7-EPLDD108-405/N	ZXM7-EPLDD108-410/N	ZXM7-EPLDD108-415/N
	ZXM7-EHLDD120-485/N	ZXM7-EHLDD108-405/N	ZXM7-EHLDD108-410/N	ZXM7-EHLDD108-415/N
Voc [V] /Tolerance	43.0±3%	37.4±3%	37.6±3%	37.8±3%
Isc [Adc] /Tolerance	14.25±3%	13.83±3%	13.89±3%	13.95±3%
Vmp [V]	36.0	31.1	31.3	31.5
Imax [Adc]	13.48	13.03	13.10	13.18
Pmp [W] /Tolerance	485±3%	405±3%	410±3%	415±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLDD108-420/N	ZXM7-EPLDD108-425/N	ZXM7-EPLDD108-430/N	ZXM7-EPLDD108-435/N
	ZXM7-EHLDD108-420/N	ZXM7-EHLDD108-425/N	ZXM7-EHLDD108-430/N	ZXM7-EHLDD108-435/N
Voc [V] /Tolerance	38.0±3%	38.2±3%	38.4±3%	38.6±3%
Isc [Adc] /Tolerance	14.01±3%	14.07±3%	14.13±3%	14.19±3%
Vmp [V]	31.7	31.9	32.1	32.3
Imax [Adc]	13.25	13.33	13.40	13.47
Pmp [W] /Tolerance	420±3%	425±3%	430±3%	435±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD156-585/N	ZXM7-SPLDD156-590/N	ZXM7-SPLDD156-595/N	ZXM7-SPLDD156-600/N
	ZXM7-SHLDD156-585/N	ZXM7-SHLDD156-590/N	ZXM7-SHLDD156-595/N	ZXM7-SHLDD156-600/N
Voc [V] /Tolerance	54.1±3%	54.3±3%	54.5±3%	54.7±3%
Isc [Adc] /Tolerance	13.75±3%	13.81±3%	13.87±3%	13.93±3%
Vmp [V]	45.0	45.2	45.4	45.6
Imax [Adc]	13.01	13.06	13.11	13.16
Pmp [W] /Tolerance	585±3%	590±3%	595±3%	600±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLDD156-605/N	ZXM7-SPLDD156-610/N	ZXM7-SPLDD156-615/N	ZXM7-SPLDD156-620/N
	ZXM7-SHLDD156-605/N	ZXM7-SHLDD156-610/N	ZXM7-SHLDD156-615/N	ZXM7-SHLDD156-620/N
Voc [V] /Tolerance	54.9±3%	55.1±3%	55.3±3%	55.5±3%
Isc [Adc] /Tolerance	13.99±3%	14.05±3%	14.11±3%	14.17±3%
Vmp [V]	45.8	46.0	46.2	46.4
Imax [Adc]	13.21	13.27	13.32	13.37
Pmp [W] /Tolerance	605±3%	610±3%	615±3%	620±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD156-625/N	ZXM7-SPLDD156-630/N	ZXM7-SPLDD144-540/N	ZXM7-SPLDD144-545/N
	ZXM7-SHLDD156-625/N	ZXM7-SHLDD156-630/N	ZXM7-SHLDD144-540/N	ZXM7-SHLDD144-545/N
Voc [V] /Tolerance	55.7±3%	55.9±3%	49.9±3%	50.1±3%
Isc [Adc] /Tolerance	14.23±3%	14.29±3%	13.77±3%	13.83±3%
Vmp [V]	46.6	46.8	41.5	41.7
Imax [Adc]	13.42	13.47	13.02	13.08
Pmp [W] /Tolerance	625±3%	630±3%	540±3%	545±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLDD144-550/N	ZXM7-SPLDD144-555/N	ZXM7-SPLDD144-560/N	ZXM7-SPLDD144-565/N
	ZXM7-SHLDD144-550/N	ZXM7-SHLDD144-555/N	ZXM7-SHLDD144-560/N	ZXM7-SHLDD144-565/N
Voc [V] /Tolerance	50.3±3%	50.5±3%	50.7±3%	50.9±3%
Isc [Adc] /Tolerance	13.89±3%	13.95±3%	14.01±3%	14.07±3%
Vmp [V]	41.9	42.1	42.3	42.5
Imax [Adc]	13.13	13.19	13.24	13.30
Pmp [W] /Tolerance	550±3%	555±3%	560±3%	565±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD144-570/N	ZXM7-SPLDD144-575/N	ZXM7-SPLDD144-580/N	ZXM7-SPLDD132-495/N
	ZXM7-SHLDD144-570/N	ZXM7-SHLDD144-575/N	ZXM7-SHLDD144-580/N	ZXM7-SPLDD132-495/N
Voc [V] /Tolerance	51.1±3%	51.3±3%	51.5±3%	45.7±3%
Isc [Adc] /Tolerance	14.13±3%	14.19±3%	14.25±3%	13.80±3%
Vmp [V]	42.7	42.9	43.1	38.0
Imax [Adc]	13.35	13.41	13.46	13.03
Pmp [W] /Tolerance	570±3%	575±3%	580±3%	495±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLDD132-500/N	ZXM7-SPLDD132-505/N	ZXM7-SPLDD132-510/N	ZXM7-SPLDD132-515/N
	ZXM7-SHLDD132-500/N	ZXM7-SHLDD132-505/N	ZXM7-SHLDD132-510/N	ZXM7-SHLDD132-515/N
Voc [V] /Tolerance	45.9±3%	46.1±3%	46.3±3%	46.5±3%
Isc [Adc] /Tolerance	13.86±3%	13.92±3%	13.98±3%	14.04±3%
Vmp [V]	38.2	38.4	38.6	38.8
Imax [Adc]	13.09	13.16	13.22	13.28
Pmp [W] /Tolerance	500±3%	505±3%	510±3%	515±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD132-520/N	ZXM7-SPLDD132-525/N	ZXM7-SPLDD132-530/N	ZXM7-SPLDD120-450/N
	ZXM7-SHLDD132-520/N	ZXM7-SHLDD132-525/N	ZXM7-SHLDD132-530/N	ZXM7-SHLDD120-450/N
Voc [V] /Tolerance	46.7±3%	46.9±3%	47.1±3%	41.6±3%
Isc [Adc] /Tolerance	14.10±3%	14.16±3%	14.22±3%	13.83±3%
Vmp [V]	39.0	39.2	39.4	34.6
Imax [Adc]	13.34	13.40	13.46	13.01
Pmp [W] /Tolerance	520±3%	525±3%	530±3%	450±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLDD120-455/N	ZXM7-SPLDD120-460/N	ZXM7-SPLDD120-465/N	ZXM7-SPLDD120-470/N
	ZXM7-SHLDD120-455/N	ZXM7-SHLDD120-460/N	ZXM7-SHLDD120-465/N	ZXM7-SHLDD120-470/N
Voc [V] /Tolerance	41.8±3%	42.0±3%	42.2±3%	42.4±3%
Isc [Adc] /Tolerance	13.89±3%	13.95±3%	14.01±3%	14.07±3%
Vmp [V]	34.8	35.0	35.2	35.4
Imax [Adc]	13.08	13.15	13.22	13.28
Pmp [W] /Tolerance	455±3%	460±3%	465±3%	470±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD120-475/N	ZXM7-SPLDD120-480/N	ZXM7-SPLDD120-485/N	ZXM7-SPLDD108-405/N
	ZXM7-SHLDD120-475/N	ZXM7-SHLDD120-480/N	ZXM7-SHLDD120-485/N	ZXM7-SHLDD108-405/N
Voc [V] /Tolerance	42.6±3%	42.8±3%	43.0±3%	37.4±3%
Isc [Adc] /Tolerance	14.13±3%	14.19±3%	14.25±3%	13.83±3%
Vmp [V]	35.6	35.8	36.0	31.1
Imax [Adc]	13.35	13.41	13.48	13.03
Pmp [W] /Tolerance	475±3%	480±3%	485±3%	405±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLDD108-410/N	ZXM7-SPLDD108-415/N	ZXM7-SPLDD108-420/N	ZXM7-SPLDD108-425/N
	ZXM7-SHLDD108-410/N	ZXM7-SHLDD108-415/N	ZXM7-SHLDD108-420/N	ZXM7-SHLDD108-425/N
Voc [V] /Tolerance	37.6±3%	37.8±3%	38.0±3%	38.2±3%
Isc [Adc] /Tolerance	13.89±3%	13.95±3%	14.01±3%	14.07±3%
Vmp [V]	31.3	31.5	31.7	31.9
Imax [Adc]	13.10	13.18	13.25	13.33
Pmp [W] /Tolerance	410±3%	415±3%	420±3%	425±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	30	30
Module type	ZXM7-SPLDD108-430/N	ZXM7-SPLDD108-435/N	ZXM7-UPLD156-585/N	ZXM7-UPLD156-590/N
	ZXM7-SHLDD108-430/N	ZXM7-SHLDD108-435/N	ZXM7-UHLD156-585/N	ZXM7-UHLD156-590/N
Voc [V] /Tolerance	38.4±3%	38.6±3%	54.2±3%	54.4±3%
Isc [Adc] /Tolerance	14.13±3%	14.19±3%	13.83±3%	13.89±3%
Vmp [V]	32.1	32.3	44.6	44.8
Imax [Adc]	13.40	13.47	13.12	13.18
Pmp [W] /Tolerance	430±3%	435±3%	585±3%	590±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	30	30	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLD156-595/N	ZXM7-UPLD156-600/N	ZXM7-UPLD156-605/N	ZXM7-UPLD156-610/N
	ZXM7-UHLD156-595/N	ZXM7-UHLD156-600/N	ZXM7-UHLD156-605/N	ZXM7-UHLD156-610/N
Voc [V] /Tolerance	54.6±3%	54.8±3%	55.0±3%	55.2±3%
Isc [Adc] /Tolerance	13.95±3%	14.01±3%	14.07±3%	14.13±3%
Vmp [V]	45.0	45.2	45.4	45.6
Imax [Adc]	13.23	13.28	13.33	13.38
Pmp [W] /Tolerance	595±3%	600±3%	605±3%	610±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-UPLD156-615/N	ZXM7-UPLD156-620/N	ZXM7-UPLD156-625/N	ZXM7-UPLD156-630/N
	ZXM7-UHLD156-615/N	ZXM7-UHLD156-620/N	ZXM7-UHLD156-625/N	ZXM7-UHLD156-630/N
Voc [V] /Tolerance	55.4±3%	55.6±3%	55.8±3%	56.0±3%
Isc [Adc] /Tolerance	14.19±3%	14.25±3%	14.31±3%	14.37±3%
Vmp [V]	45.8	46.0	46.2	46.4
Imax [Adc]	13.43	13.48	13.53	13.58
Pmp [W] /Tolerance	615±3%	620±3%	625±3%	630±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLD144-540/N	ZXM7-UPLD144-545/N	ZXM7-UPLD144-550/N	ZXM7-UPLD144-555/N
	ZXM7-UHLD144-540/N	ZXM7-UHLD144-545/N	ZXM7-UHLD144-550/N	ZXM7-UHLD144-555/N
Voc [V] /Tolerance	49.8±3%	50.0±3%	50.2±3%	50.4±3%
Isc [Adc] /Tolerance	13.82±3%	13.88±3%	13.94±3%	14.00±3%
Vmp [V]	41.2	41.4	41.6	41.8
Imax [Adc]	13.11	13.17	13.23	13.28
Pmp [W] /Tolerance	540±3%	545±3%	550±3%	555±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-UPLD144-560/N	ZXM7-UPLD144-565/N	ZXM7-UPLD144-570/N	ZXM7-UPLD144-575/N
	ZXM7-UHLD144-560/N	ZXM7-UHLD144-565/N	ZXM7-UHLD144-570/N	ZXM7-UHLD144-575/N
Voc [V] /Tolerance	50.6±3%	50.8±3%	51.0±3%	51.2±3%
Isc [Adc] /Tolerance	14.06±3%	14.12±3%	14.18±3%	14.24±3%
Vmp [V]	42.0	42.2	42.4	42.6
Imax [Adc]	13.34	13.39	13.45	13.50
Pmp [W] /Tolerance	560±3%	565±3%	570±3%	575±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLD144-580/N	ZXM7-UPLD132-495/N	ZXM7-UPLD132-500/N	ZXM7-UPLD132-505/N
	ZXM7-UHLD144-580/N	ZXM7-UHLD132-495/N	ZXM7-UHLD132-500/N	ZXM7-UHLD132-505/N
Voc [V] /Tolerance	51.4±3%	45.9±3%	46.1±3%	46.3±3%
Isc [Adc] /Tolerance	14.30±3%	13.83±3%	13.89±3%	13.95±3%
Vmp [V]	42.8	37.8	38.0	38.2
Imax [Adc]	13.56	13.10	13.16	13.22
Pmp [W] /Tolerance	580±3%	495±3%	500±3%	505±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-UPLD132-510/N	ZXM7-UPLD132-515/N	ZXM7-UPLD132-520/N	ZXM7-UPLD132-525/N
	ZXM7-UHLD132-510/N	ZXM7-UHLD132-515/N	ZXM7-UHLD132-520/N	ZXM7-UHLD132-525/N
Voc [V] /Tolerance	46.5±3%	46.7±3%	46.9±3%	47.1±3%
Isc [Adc] /Tolerance	14.01±3%	14.07±3%	14.13±3%	14.19±3%
Vmp [V]	38.4	38.6	38.8	39.0
Imax [Adc]	13.29	13.35	13.41	13.47
Pmp [W] /Tolerance	510±3%	515±3%	520±3%	525±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLD132-530/N	ZXM7-UPLD120-450/N	ZXM7-UPLD120-455/N	ZXM7-UPLD120-460/N
	ZXM7-UHLD132-530/N	ZXM7-UHLD120-450/N	ZXM7-UHLD120-455/N	ZXM7-UHLD120-460/N
Voc [V] /Tolerance	47.3±3%	41.5±3%	41.7±3%	41.9±3%
Isc [Adc] /Tolerance	14.25±3%	13.89±3%	13.95±3%	14.01±3%
Vmp [V]	39.2	34.3	34.5	34.7
Imax [Adc]	13.53	13.13	13.19	13.26
Pmp [W] /Tolerance	530±3%	450±3%	455±3%	460±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-UPLD120-465/N	ZXM7-UPLD120-470/N	ZXM7-UPLD120-475/N	ZXM7-UPLD120-480/N
	ZXM7-UHLD120-465/N	ZXM7-UHLD120-470/N	ZXM7-UHLD120-475/N	ZXM7-UHLD120-480/N
Voc [V] /Tolerance	42.1±3%	42.3±3%	42.5±3%	42.7±3%
Isc [Adc] /Tolerance	14.07±3%	14.13±3%	14.19±3%	14.25±3%
Vmp [V]	34.9	35.1	35.3	35.5
Imax [Adc]	13.32	13.39	13.46	13.52
Pmp [W] /Tolerance	465±3%	470±3%	475±3%	480±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-UPLD120-485/N	ZXM7-UPLD108-405/N	ZXM7-UPLD108-410/N	ZXM7-UPLD108-415/N
	ZXM7-UHLD120-485/N	ZXM7-UHLD108-405/N	ZXM7-UHLD108-410/N	ZXM7-UHLD108-415/N
Voc [V] /Tolerance	42.9±3%	37.5±3%	37.7±3%	37.9±3%
Isc [Adc] /Tolerance	14.31±3%	13.83±3%	13.91±3%	13.98±3%
Vmp [V]	35.7	30.9	31.1	31.3
Imax [Adc]	13.59	13.11	13.19	13.25
Pmp [W] /Tolerance	485±3%	405±3%	410±3%	415±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-UPLD108-420/N	ZXM7-UPLD108-425/N	ZXM7-UPLD108-430/N	ZXM7-UPLD108-435/N
	ZXM7-UHLD108-420/N	ZXM7-UHLD108-425/N	ZXM7-UHLD108-430/N	ZXM7-UHLD108-435/N
Voc [V] /Tolerance	38.1±3%	38.3±3%	38.5±3%	38.7±3%
Isc [Adc] /Tolerance	14.05±3%	14.12±3%	14.19±3%	14.26±3%
Vmp [V]	31.5	31.7	31.9	32.1
Imax [Adc]	13.33	13.40	13.47	13.54
Pmp [W] /Tolerance	420±3%	425±3%	430±3%	435±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD156-585/N	ZXM7-EPLD156-590/N	ZXM7-EPLD156-595/N	ZXM7-EPLD156-600/N
	ZXM7-EHLD156-585/N	ZXM7-EHLD156-590/N	ZXM7-EHLD156-595/N	ZXM7-EHLD156-600/N
Voc [V] /Tolerance	54.1±3%	54.3±3%	54.5±3%	54.7±3%
Isc [Adc] /Tolerance	13.81±3%	13.87±3%	13.93±3%	13.99±3%
Vmp [V]	44.7	44.9	45.1	45.3
Imax [Adc]	13.09	13.15	13.20	13.25
Pmp [W] /Tolerance	585±3%	590±3%	595±3%	600±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-EPLD156-605/N	ZXM7-EPLD156-610/N	ZXM7-EPLD156-615/N	ZXM7-EPLD156-620/N
	ZXM7-EHLD156-605/N	ZXM7-EHLD156-610/N	ZXM7-EHLD156-615/N	ZXM7-EHLD156-620/N
Voc [V] /Tolerance	54.9±3%	55.1±3%	55.3±3%	55.5±3%
Isc [Adc] /Tolerance	14.05±3%	14.11±3%	14.17±3%	14.23±3%
Vmp [V]	45.5	45.7	45.9	46.1
Imax [Adc]	13.30	13.35	13.40	13.45
Pmp [W] /Tolerance	605±3%	610±3%	615±3%	620±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD156-625/N	ZXM7-EPLD156-630/N	ZXM7-EPLD144-540/N	ZXM7-EPLD144-545/N
	ZXM7-EHLD156-625/N	ZXM7-EHLD156-630/N	ZXM7-EHLD144-540/N	ZXM7-EHLD144-545/N
Voc [V] /Tolerance	55.7±3%	55.9±3%	49.9±3%	50.1±3%
Isc [Adc] /Tolerance	14.29±3%	14.35±3%	13.82±3%	13.88±3%
Vmp [V]	46.3	46.5	41.2	41.4
Imax [Adc]	13.50	13.55	13.11	13.17
Pmp [W] /Tolerance	625±3%	630±3%	540±3%	545±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-EPLD144-550/N	ZXM7-EPLD144-555/N	ZXM7-EPLD144-560/N	ZXM7-EPLD144-565/N
	ZXM7-EHLD144-550/N	ZXM7-EHLD144-555/N	ZXM7-EHLD144-560/N	ZXM7-EHLD144-565/N
Voc [V] /Tolerance	50.3±3%	50.5±3%	50.7±3%	50.9±3%
Isc [Adc] /Tolerance	13.94±3%	14.00±3%	14.06±3%	14.12±3%
Vmp [V]	41.6	41.8	42.0	42.2
Imax [Adc]	13.23	13.28	13.34	13.39
Pmp [W] /Tolerance	550±3%	555±3%	560±3%	565±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD144-570/N	ZXM7-EPLD144-575/N	ZXM7-EPLD144-580/N	ZXM7-EPLD132-495/N
	ZXM7-EHLD144-570/N	ZXM7-EHLD144-575/N	ZXM7-EHLD144-580/N	ZXM7-EHLD132-495/N
Voc [V] /Tolerance	51.1±3%	51.3±3%	51.5±3%	45.7±3%
Isc [Adc] /Tolerance	14.18±3%	14.24±3%	14.3±3%	13.81±3%
Vmp [V]	42.4	42.6	42.8	37.6
Imax [Adc]	13.45	13.50	13.56	13.17
Pmp [W] /Tolerance	570±3%	575±3%	580±3%	495±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-EPLD132-500/N	ZXM7-EPLD132-505/N	ZXM7-EPLD132-510/N	ZXM7-EPLD132-515/N
	ZXM7-EHLD132-500/N	ZXM7-EHLD132-505/N	ZXM7-EHLD132-510/N	ZXM7-EHLD132-515/N
Voc [V] /Tolerance	45.9±3%	46.1±3%	46.3±3%	46.5±3%
Isc [Adc] /Tolerance	13.87±3%	13.93±3%	13.99±3%	14.05±3%
Vmp [V]	37.8	38.0	38.2	38.4
Imax [Adc]	13.23	13.29	13.36	13.42
Pmp [W] /Tolerance	500±3%	505±3%	510±3%	515±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD132-520/N	ZXM7-EPLD132-525/N	ZXM7-EPLD132-530/N	ZXM7-EPLD120-450/N
	ZXM7-EHLD132-520/N	ZXM7-EHLD132-525/N	ZXM7-EHLD132-530/N	ZXM7-EHLD120-450/N
Voc [V] /Tolerance	46.7±3%	46.9±3%	47.1±3%	41.6±3%
Isc [Adc] /Tolerance	14.11±3%	14.17±3%	14.23±3%	13.87±3%
Vmp [V]	38.6	38.8	39.0	34.3
Imax [Adc]	13.48	13.54	13.60	13.13
Pmp [W] /Tolerance	520±3%	525±3%	530±3%	450±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-EPLD120-455/N	ZXM7-EPLD120-460/N	ZXM7-EPLD120-465/N	ZXM7-EPLD120-470/N
	ZXM7-EHLD120-455/N	ZXM7-EHLD120-460/N	ZXM7-EHLD120-465/N	ZXM7-EHLD120-470/N
Voc [V] /Tolerance	41.8±3%	42.0±3%	42.2±3%	42.4±3%
Isc [Adc] /Tolerance	13.93±3%	13.99±3%	14.05±3%	14.11±3%
Vmp [V]	34.5	34.7	34.9	35.1
Imax [Adc]	13.19	13.26	13.33	13.40
Pmp [W] /Tolerance	455±3%	460±3%	465±3%	470±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD120-475/N	ZXM7-EPLD120-480/N	ZXM7-EPLD120-485/N	ZXM7-EPLD108-405/N
	ZXM7-EHLD120-475/N	ZXM7-EHLD120-480/N	ZXM7-EHLD120-485/N	ZXM7-EHLD108-405/N
Voc [V] /Tolerance	42.6±3%	42.8±3%	43.0±3%	37.4±3%
Isc [Adc] /Tolerance	14.17±3%	14.23±3%	14.29±3%	13.87±3%
Vmp [V]	35.3	35.5	35.7	30.9
Imax [Adc]	13.46	13.53	13.59	13.11
Pmp [W] /Tolerance	475±3%	480±3%	485±3%	405±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-EPLD108-410/N	ZXM7-EPLD108-415/N	ZXM7-EPLD108-420/N	ZXM7-EPLD108-425/N
	ZXM7-EHLD108-410/N	ZXM7-EHLD108-415/N	ZXM7-EHLD108-420/N	ZXM7-EHLD108-425/N
Voc [V] /Tolerance	37.6±3%	37.8±3%	38.0±3%	38.2±3%
Isc [Adc] /Tolerance	13.93±3%	13.99±3%	14.05±3%	14.11±3%
Vmp [V]	31.1	31.3	31.5	31.7
Imax [Adc]	13.19	13.26	13.34	13.41
Pmp [W] /Tolerance	410±3%	415±3%	420±3%	425±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-EPLD108-430/N	ZXM7-EPLD108-435/N	ZXM7-SPLD156-585/N	ZXM7-SPLD156-590/N
	ZXM7-EHLD108-430/N	ZXM7-EHLD108-435/N	ZXM7-SHLD156-585/N	ZXM7-SHLD156-590/N
Voc [V] /Tolerance	38.4±3%	38.6±3%	54.1±3%	54.3±3%
Isc [Adc] /Tolerance	14.17±3%	14.23±3%	13.81±3%	13.87±3%
Vmp [V]	31.9	32.1	44.7	44.9
Imax [Adc]	13.49	13.56	13.09	13.15
Pmp [W] /Tolerance	430±3%	435±3%	585±3%	590±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-SPLD156-595/N	ZXM7-SPLD156-600/N	ZXM7-SPLD156-605/N	ZXM7-SPLD156-610/N
	ZXM7-SHLD156-595/N	ZXM7-SHLD156-600/N	ZXM7-SHLD156-605/N	ZXM7-SHLD156-610/N
Voc [V] /Tolerance	54.5±3%	54.7±3%	54.9±3%	55.1±3%
Isc [Adc] /Tolerance	13.93±3%	13.99±3%	14.05±3%	14.11±3%
Vmp [V]	45.1	45.3	45.5	45.7
Imax [Adc]	13.20	13.25	13.30	13.35
Pmp [W] /Tolerance	595±3%	600±3%	605±3%	610±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLD156-615/N	ZXM7-SPLD156-620/N	ZXM7-SPLD156-625/N	ZXM7-SPLD156-630/N
	ZXM7-SHLD156-615/N	ZXM7-SHLD156-620/N	ZXM7-SHLD156-625/N	ZXM7-SHLD156-630/N
Voc [V] /Tolerance	55.3±3%	55.5±3%	55.7±3%	55.9±3%
Isc [Adc] /Tolerance	14.17±3%	14.23±3%	14.29±3%	14.35±3%
Vmp [V]	45.9	46.1	46.3	46.5
Imax [Adc]	13.40	13.45	13.50	13.55
Pmp [W] /Tolerance	615±3%	620±3%	625±3%	630±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-SPLD156-620/N	ZXM7-SPLD156-625/N	ZXM7-SPLD156-630/N	ZXM7-SPLD156-620/N
	ZXM7-SHLD156-620/N	ZXM7-SHLD156-625/N	ZXM7-SHLD156-630/N	ZXM7-SHLD156-620/N
Voc [V] /Tolerance	55.5±3%	55.7±3%	55.9±3%	55.5±3%
Isc [Adc] /Tolerance	14.23±3%	14.29±3%	14.35±3%	14.23±3%
Vmp [V]	46.1	46.3	46.5	46.1
Imax [Adc]	13.45	13.50	13.55	13.45
Pmp [W] /Tolerance	620±3%	625±3%	630±3%	620±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLD156-625/N	ZXM7-SPLD156-630/N	ZXM7-SPLD156-620/N	ZXM7-SPLD156-620/N
	ZXM7-SHLD156-625/N	ZXM7-SHLD156-630/N	ZXM7-SHLD156-620/N	ZXM7-SHLD156-620/N
Voc [V] /Tolerance	55.7±3%	55.9±3%	55.5±3%	55.5±3%
Isc [Adc] /Tolerance	14.29±3%	14.35±3%	14.23±3%	14.23±3%
Vmp [V]	46.3	46.5	46.1	46.1
Imax [Adc]	13.50	13.55	13.45	13.45
Pmp [W] /Tolerance	625±3%	630±3%	620±3%	620±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-SPLD156-625/N	ZXM7-SPLD132-495/N	ZXM7-SPLD132-500/N	ZXM7-SPLD132-505/N
	ZXM7-SHLD156-625/N	ZXM7-SHLD132-495N	ZXM7-SHLD132-500/N	ZXM7-SHLD132-505/N
Voc [V] /Tolerance	55.7±3%	45.7±3%	45.9±3%	46.1±3%
Isc [Adc] /Tolerance	14.29±3%	13.81±3%	13.87±3%	13.93±3%
Vmp [V]	46.3	37.6	37.8	38.0
Imax [Adc]	13.50	13.17	13.23	13.29
Pmp [W] /Tolerance	625±3%	495±3%	500±3%	505±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLD132-510/N	ZXM7-SPLD132-515/N	ZXM7-SPLD132-520/N	ZXM7-SPLD132-525/N
	ZXM7-SHLD132-510/N	ZXM7-SHLD132-515/N	ZXM7-SHLD132-520/N	ZXM7-SHLD132-525/N
Voc [V] /Tolerance	46.3±3%	46.5±3%	46.7±3%	46.9±3%
Isc [Adc] /Tolerance	13.99±3%	14.05±3%	14.11±3%	14.17±3%
Vmp [V]	38.2	38.4	38.6	38.8
Imax [Adc]	13.36	13.42	13.48	13.54
Pmp [W] /Tolerance	510±3%	515±3%	520±3%	525±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-SPLD132-530/N	ZXM7-SPLD120-450/N	ZXM7-SPLD120-455/N	ZXM7-SPLD120-460/N
	ZXM7-SHLD132-530/N	ZXM7-SHLD120-450/N	ZXM7-SHLD120-455/N	ZXM7-SHLD120-460/N
Voc [V] /Tolerance	47.1±3%	41.6±3%	41.8±3%	42.0±3%
Isc [Adc] /Tolerance	14.23±3%	13.87±3%	13.93±3%	13.99±3%
Vmp [V]	39.0	34.3	34.5	34.7
Imax [Adc]	13.60	13.13	13.19	13.26
Pmp [W] /Tolerance	530±3%	450±3%	455±3%	460±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLD120-465/N	ZXM7-SPLD120-470/N	ZXM7-SPLD120-475/N	ZXM7-SPLD120-480/N
	ZXM7-SHLD120-465/N	ZXM7-SHLD120-470/N	ZXM7-SHLD120-475/N	ZXM7-SHLD120-480/N
Voc [V] /Tolerance	42.2±3%	42.4±3%	42.6±3%	42.8±3%
Isc [Adc] /Tolerance	14.05±3%	14.11±3%	14.17±3%	14.23±3%
Vmp [V]	34.9	35.1	35.3	35.5
Imax [Adc]	13.33	13.40	13.46	13.53
Pmp [W] /Tolerance	465±3%	470±3%	475±3%	480±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Module type	ZXM7-SPLD120-485/N	ZXM7-SPLD108-405/N	ZXM7-SPLD108-410/N	ZXM7-SPLD108-415/N
	ZXM7-SHLD120-485/N	ZXM7-SHLD108-405/N	ZXM7-SHLD108-410/N	ZXM7-SHLD108-415/N
Voc [V] /Tolerance	43.0±3%	37.4±3%	37.6±3%	37.8±3%
Isc [Adc] /Tolerance	14.29±3%	13.87±3%	13.93±3%	13.99±3%
Vmp [V]	35.7	30.9	31.1	31.3
Imax [Adc]	13.59	13.11	13.19	13.26
Pmp [W] /Tolerance	485±3%	405±3%	410±3%	415±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
Note: Further qualification for higher and/or lower output power see annex 4				

Product Electrical Ratings:				
Module type	ZXM7-SPLD108-420/N	ZXM7-SPLD108-425/N	ZXM7-SPLD108-430/N	ZXM7-SPLD108-435/N
	ZXM7-SHLD108-420/N	ZXM7-SHLD108-425/N	ZXM7-SHLD108-430/N	ZXM7-SHLD108-435/N
Voc [V] /Tolerance	38.0±3%	38.2±3%	38.4±3%	38.6±3%
Isc [Adc] /Tolerance	14.05±3%	14.11±3%	14.17±3%	14.23±3%
Vmp [V]	31.5	31.7	31.9	32.1
Imax [Adc]	13.34	13.41	13.49	13.56
Pmp [W] /Tolerance	420±3%	425±3%	430±3%	435±3%
Maximum system voltage [V]	1500	1500	1500	1500
Maximum Over-Current Protection Rating [A]	25	25	25	25
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. .....: 704061908304-06A2

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
- ☒ See summary

☐ 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: Cell type: ZXM7HD-10+ Encapsulation material: Cybright T11/Cybright W11 + Rear cover: glass+ Fluxing agent: SF105				
M1-10 (GDP230067-1)	A1	ZXM8-TPLD132-650/M	ZX71223623172481	Control module
M1-13 (GDP230067-2)	B	ZXM8-TPLD132-650/M	ZX71223623070528	HS
M1-8 (GDP230067-3)	C1	ZXM8-TPLD132-650/M	ZX71223623070521	TC200
M1-9 (GDP230067-4)	C2	ZXM8-TPLD132-650/M	ZX71223623070531	TC200
GDP230067-5	Low 1-1	ZXM8-TPLD132-630/M	ZX79223621306505	Lower end power class
GDP230067-6	Low 1-2	ZXM8-TPLD132-630/M	ZX79223621306509	Lower end power class
GDP230067-7	High 1-1	ZXM8-TPLD132-670/M	ZX79223621306505	Higher end power class
GDP230067-8	High 1-2	ZXM8-TPLD132-670/M	ZX79223621306509	Higher end power class
Material combination 2: Cell type: ZXM7HD-16(N)+ Encapsulation material: S102 / EV1050G2 + Rear cover: glass+ Fluxing agent: SF105				
M2-10 (GDP230064-1)	A1	ZXM7-UPLDD156-615/N	ZX78223729133823	Control module
M2-13 (GDP230064-4)	B	ZXM7-UPLDD156-615/N	ZX78223729133826	HS
M4-4 (GDP230064-5)	C1	ZXM7-UPLDD156-615/N	ZX78223729133834	UV sequence
M4-5 (GDP230064-6)	C2	ZXM7-UPLDD156-615/N	ZX78223729133837	UV sequence
M2-8 (GDP230064-7)	D1	ZXM7-UPLDD156-615/N	ZX78223729133824	TC200
M2-9 (GDP230064-8)	D2	ZXM7-UPLDD156-615/N	ZX78223729133827	TC200
M2-6 (GDP230064-9)	E1	ZXM7-UPLDD156-615/N	ZX78223729133836	DH1000+SML
M2-7 (GDP230064-10)	E2	ZXM7-UPLDD156-615/N	ZX78223729133832	DH1000+HT
GDP230064-20	Low 2-1	ZXM7-UPLDD156-585/N	ZX78223729133863	Lower end power class
GDP230064-21	Low 2-2	ZXM7-UPLDD156-585/N	ZX78223729133871	Lower end power class
GDP230064-22	High 2-1	ZXM7-UPLDD156-630/N	ZX78223729133875	Higher end power class
GDP230064-23	High 2-2	ZXM7-UPLDD156-630/N	ZX78223729133879	Higher end power class

Material combination 3: Cell type: Cell type: ZXM7HD-16(N)+ Encapsulation material: S102 / EV1050G5 + Rear cover: glass+ Fluxing agent: SF105				
M3-10 (GDP230064-1)	A1	ZXM7-UPLD156-615/N	ZX78223729133892	Control module
M3-13 (GDP230065-4)	B	ZXM7-UPLD156-615/N	ZX78223729133892	HS
M3-4 (GDP230065-5)	C1	ZXM7-UPLD156-615/N	ZX78223729133895	UV sequence
M3-5 (GDP230065-6)	C2	ZXM7-UPLD156-615/N	ZX78223729133899	UV sequence
M3-6 (GDP230065-9)	E1	ZXM7-UPLD156-615/N	ZX78223729133913	DH1000
M3-7 (GDP230065-10)	E2	ZXM7-UPLD156-615/N	ZX78223729133915	DH1000
GDP230065-20	Low 3-1	ZXM7-UPLD156-585/N	ZX78223729133941	Lower end power class
GDP230065-21	Low 3-2	ZXM7-UPLD156-585/N	ZX78223729133952	Lower end power class
GDP230065-22	High 3-1	ZXM7-UPLD156-630/N	ZX78223729133957	Higher end power class
GDP230065-23	High 3-2	ZXM7-UPLD156-630/N	ZX78223729133961	Higher end power class
Material combination 4: Cell type: ZXM7HD-11(N)+ Encapsulation material: S102 / EV1050G2 + Rear cover: glass+ Fluxing agent: SF105				
GDP230068-1	Low 4-1	ZXM7-EPLDD156-585/N	ZX78223729134059	Lower end power class
GDP230068-2	Low 4-2	ZXM7-EPLDD156-585/N	ZX78223729134062	Lower end power class
GDP230068-3	High 4-1	ZXM7-EPLDD156-630/N	ZX78223729134063	Higher end power class
GDP230068-4	High 4-2	ZXM7-EPLDD156-630/N	ZX78223729134067	Higher end power class
Material combination 5: Cell type: ZXM7HD-10(N)+ Encapsulation material: S102 / EV1050G2 + Rear cover: glass+ Fluxing agent: SF105				
GDP230069-1	Low 5-1	ZXM7-SPLDD156-585/N	ZX78223729134064	Lower end power class
GDP230069-2	Low 5-2	ZXM7-SPLDD156-585/N	ZX78223729134066	Lower end power class
GDP230069-3	High 5-1	ZXM7-SPLDD156-630/N	ZX78223729134068	Higher end power class
GDP230069-4	High 5-2	ZXM7-SPLDD156-630/N	ZX78223729134069	Higher end power class
Material combination 6: Cell type: Cell type: ZXM7HD-11(N)+ Encapsulation material: S102 / EV1050G5 + Rear cover: glass+ Fluxing agent: SF105				
GDP230070-1	Low 4-1	ZXM7-EPLD156-585/N	ZX78223729134071	Lower end power class

GDP230070-2	Low 4-2	ZXM7-EPLD156-585/N	ZX78223729134072	Lower end power class
GDP230070-3	High 4-1	ZXM7-EPLD156-630/N	ZX78223729134075	Higher end power class
GDP230070-4	High 4-2	ZXM7-EPLD156-630/N	ZX78223729134077	Higher end power class
Material combination 7: Cell type: Cell type: ZXM7HD-10(N)+ Encapsulation material: S102 / EV1050G5 + Rear cover: glass+ Fluxing agent: SF105				
GDP230071-1	Low 5-1	ZXM7-SPLD156-585/N	ZX78223729134074	Lower end power class
GDP230071-2	Low 5-2	ZXM7-SPLD156-585/N	ZX78223729134076	Lower end power class
GDP230071-3	High 5-1	ZXM7-SPLD156-630/N	ZX78223729134078	Higher end power class
GDP230071-4	High 5-2	ZXM7-SPLD156-630/N	ZX78223729134079	Higher end power class
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

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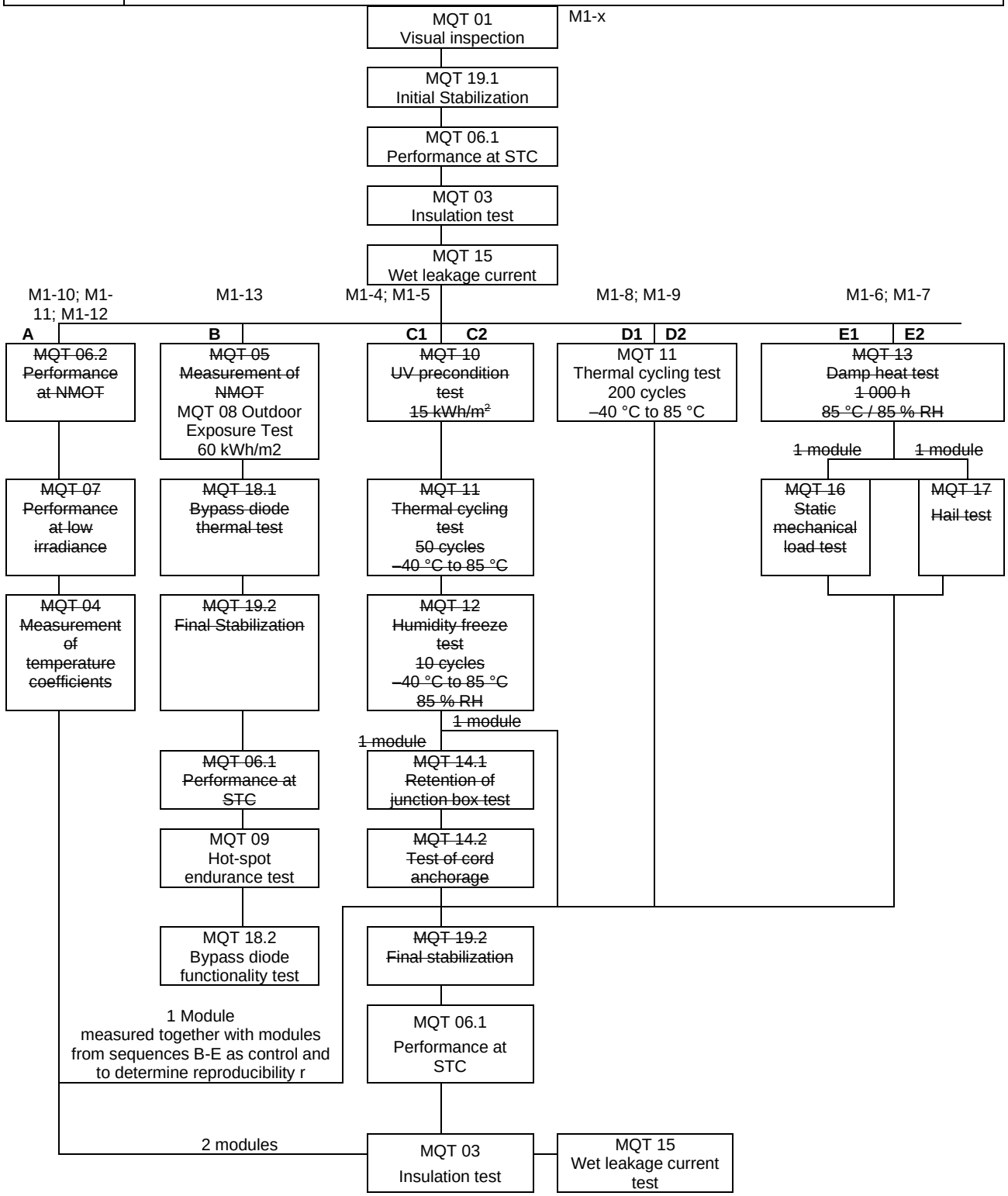
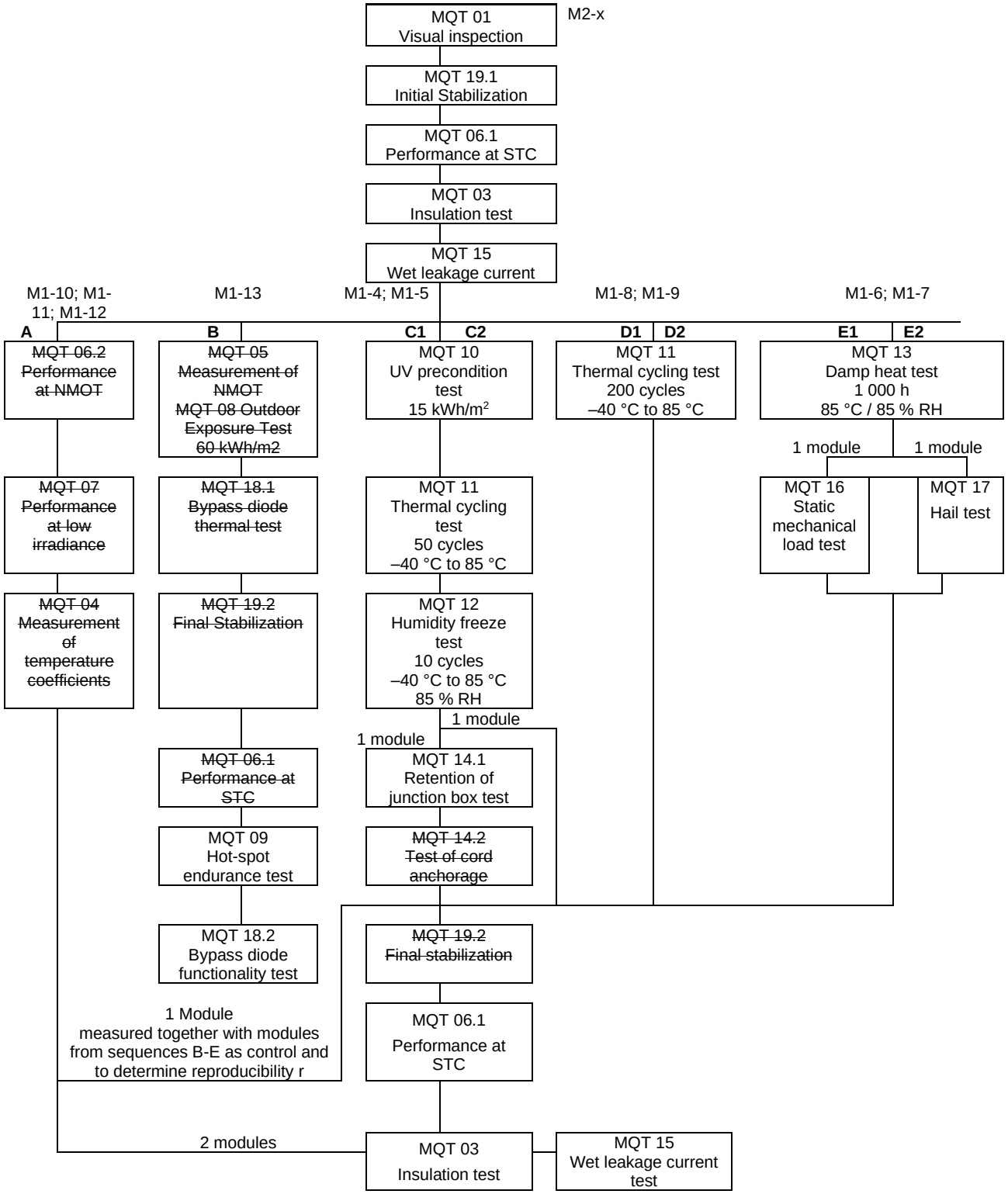
Clause	Requirement + Test	Result - Remark	Verdict

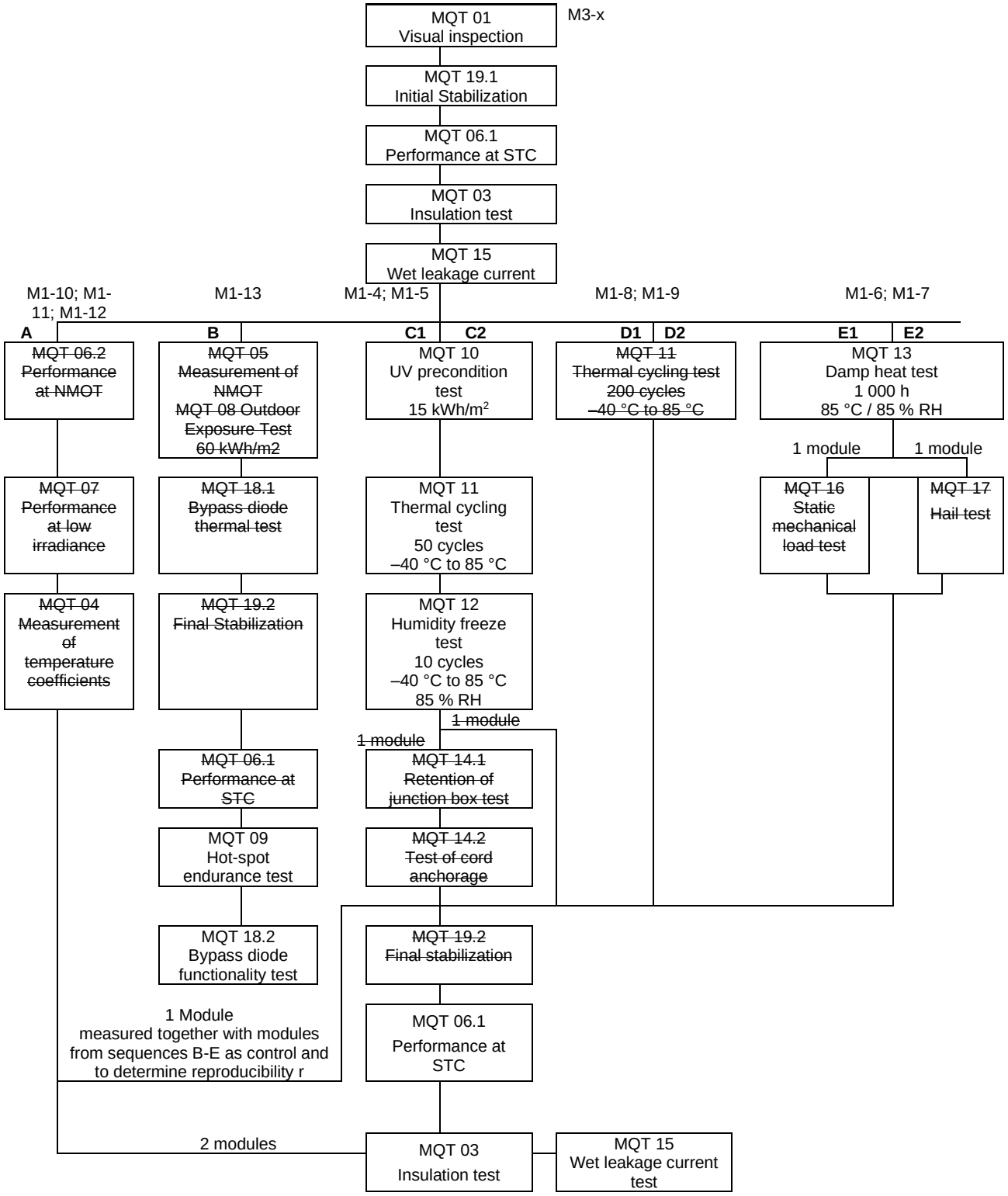
11	**TEST FLOW (if it is not a full test, strikethrough non-performed test)** Note: Deviations from test sequence are possible but must be documented.



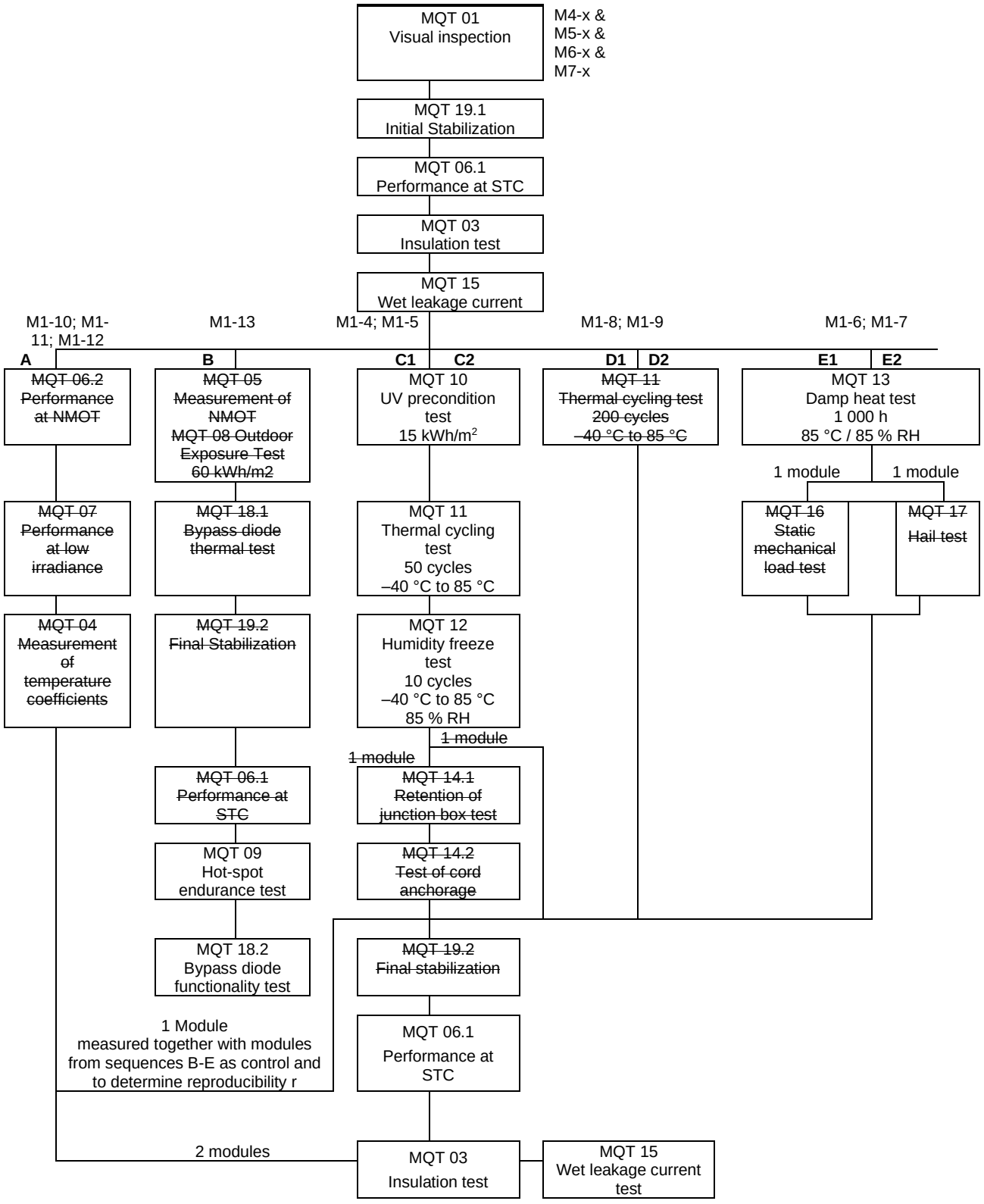
IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict



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



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



IEC 61215-1			
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	ZNShine 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

IEC 61215-1			
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	3	3	
		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

IEC 61215-1			
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		P
Supplementary information: N/A			

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Clause	Requirement + Test	Result - Remark	Verdict
4. TESTING OVERVIEW			P
	Initial examination	All modules	P
4.1	Visual inspection (MQT 01)) .....:	See Table 01	P
4.19.5	Initial stabilization (MQT 19.1) .....:	See Table 02	P
4.6	Performance at STC (MQT 06.1)	See Table 03	P
4.3	Insulation test (MQT 03) .....:	See Table 04	P
4.15	Wet leakage current test (MQT 15) .....:	See Table 05	P
Sequence A	**3 Modules**	Samples M1-10; M1-11; M1-12	N/A
4.6	Performance at NMOT (MQT 06.2) .....:	See Table 06	N/A
4.7	Performance at low irradiance (MQT 07).....:	See Table 07	N/A
4.4	Measurement of temperature coefficients (MQT 04) .....:	See Table 08	N/A
Sequence B	**1 Module**	Sample M1-13	P
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 .....:		—
	Calculated junction temperature .....:		—
	Final measurements.....:	See Table 11	N/A
4.18.2	Bypass diode functionality test (MQT 18.2) .....:	See Table 12	N/A
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 M1-4; M1-5	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 M1-4	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

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Clause	Requirement + Test	Result - Remark	Verdict
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 M1-8; M1-9	P
4.11	Thermal cycling test 200 cycles (MQT 11) .....:	See Table 18.1 - 18.2	P
Sequence E	**2 Modules**	Samples M1-6; M1-7	P
4.13	Damp heat test (MQT 13) .....:	See Table 19.1 - 19.4	P
Sequence E1	**1 Module**	Sample M1-6	P
4.16	Static mechanical load test (MQT 16).....:	See Table 19.5 - 19.7	P
Sequence E2	**1 Module**	Sample M1-7	P
4.17	Hail test (MQT 17)	See Table 19.8 - 19.10	P
	Final measurement	All modules for Sequence C, D, E; Control module for Sequence A	P
4.19.6	Final stabilization (MQT 19.2).....:	See Table 20.1 - 20.2	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

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 01: MQT 01 ini: Initial Visual inspection		P
Test Date [YYYY-MM-DD]..... :	2022-09-20 for M1-x 2022-09-15 for M2-x 2022-09-15 for M3-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
GDP230067-5	No major visual defects found	P
GDP230067-6	No major visual defects found	P
GDP230067-7	No major visual defects found	P
GDP230067-8	No major visual defects found	P
M2-10	No major visual defects found	P
M2-13	No major visual defects found	P
M2-4	No major visual defects found	P
M2-5	No major visual defects found	P
M2-8	No major visual defects found	P
M2-9	No major visual defects found	P
M2-6	No major visual defects found	P
M2-7	No major visual defects found	P
GDP230064-20	No major visual defects found	P
GDP230064-21	No major visual defects found	P
GDP230064-22	No major visual defects found	P
GDP230064-23	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
M3-6	No major visual defects found	P
M3-7	No major visual defects found	P
GDP230065-20	No major visual defects found	P
GDP230065-21	No major visual defects found	P
GDP230065-22	No major visual defects found	P

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Clause	Requirement + Test	Result - Remark	Verdict
GDP230065-23	No major visual defects found		P
Supplementary information: N/A			

TABLE 02: MQT 19.1 ini: Initial stabilization —

TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (single-side front) —

Test Date [YYYY-MM-DD]..... : 2022-09-20 for M1-x
2022-09-15 for M2-x
2022-09-15 for M3-x —

Test method..... : ☒ Simulator ☐ Natural sunlight —

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
M1-10	18.351	45.535	17.284	37.757	652.592	78.10	—
M1-13	18.361	45.514	17.283	37.798	653.263	78.17	—
M1-8	18.357	45.521	17.293	37.727	652.413	78.07	—
M1-9	18.348	45.526	17.267	37.787	652.468	78.11	—
M2-10	13.584	56.349	12.873	47.583	612.542	80.01	—
M2-13	13.601	56.406	12.986	46.945	609.624	79.39	—
M2-4	13.508	56.815	12.921	47.194	609.813	79.40	—
M2-5	13.706	56.147	13.191	46.315	610.950	79.37	—
M2-8	13.592	56.369	12.944	47.299	612.250	79.85	—
M2-9	13.687	55.962	12.936	47.289	611.738	79.8	—
M2-6	13.492	56.654	12.877	47.450	610.993	79.86	—
M2-7	13.687	56.148	12.995	47.044	611.348	79.54	—
M3-10	13.591	56.326	12.836	47.466	609.274	79.59	—
M3-13	13.607	56.424	13.007	46.766	608.285	79.23	—
M3-4	13.510	56.823	12.928	47.031	608.017	79.20	—
M3-5	13.709	56.154	13.165	46.177	607.920	78.97	—
M3-6	13.490	56.658	12.866	47.311	608.703	79.64	—
M3-7	13.692	56.151	12.965	46.912	608.214	79.11	—

Supplementary information: N/A

TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (single-side rear) —

Test Date [YYYY-MM-DD]..... : 2022-09-15 —

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
M2-10	9.937	55.889	9.317	48.551	452.329	81.45	—
M2-13	9.993	55.799	9.353	48.441	453.063	81.28	—
M2-4	9.924	56.088	9.290	48.689	452.322	81.26	—
M2-5	10.061	55.389	9.428	48.023	452.774	81.24	—
M2-8	9.920	55.771	9.403	48.207	453.301	81.91	—
M2-9	10.002	55.492	9.482	47.818	453.415	81.69	—
M2-6	9.880	56.119	9.321	48.670	453.67	81.80	—
M2-7	9.956	55.746	9.287	48.479	450.239	81.13	—
Supplementary information: N/A							

TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization (Equivalent irradiance)							—
Test Date [YYYY-MM-DD]..... :	2022-09-15						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
M2-10	14.965	56.619	14.405	46.768	673.673	79.45	—
M2-13	14.985	56.548	14.366	46.625	669.79	79.03	—
M2-4	14.885	56.98	14.251	47.073	670.832	79.06	—
M2-5	15.088	56.273	14.405	46.559	670.652	78.94	—
M2-8	14.973	56.544	14.353	46.86	672.577	79.42	—
M2-9	15.075	56.119	14.451	46.508	672.076	79.38	—
M2-6	15.086	56.435	14.323	46.999	673.181	79.03	—
M2-7	15.022	56.592	14.261	47.154	672.450	79.07	—
Supplementary information: 1090W/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						
Sample #	M1-10	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	652.592	—	—
1	5	800~1000	50±10	MPPT	650.839	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
2	5	800~1000	50±10	MPPT	649.088	0.54	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M1-13	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	653.263	—	—
1	5	800~1000	50±10	MPPT	651.602	—	—
2	5	800~1000	50±10	MPPT	649.942	0.51	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M1-8	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	652.413	—	—
1	5	800~1000	50±10	MPPT	650.568	—	—
2	5	800~1000	50±10	MPPT	648.726	0.57	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M1-9	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	652.468	—	—
1	5	800~1000	50±10	MPPT	650.715	—	—
2	5	800~1000	50±10	MPPT	648.963	0.54	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M2-10	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	612.542	—	—
1	5	800~1000	50 ± 10	MPPT	611.758	—	—
2	5	800~1000	50 ± 10	MPPT	611.092	0.24	Yes

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Clause	Requirement + Test				Result - Remark		Verdict
Initial (R)	—	—	—	—	452.329	—	—
1	5	800~1000	50 ± 10	MPPT	451.802	—	—
2	5	800~1000	50 ± 10	MPPT	451.182	0.25	Yes
Sample #	M2-13	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	609.624	—	—
1	5	800~1000	50 ± 10	MPPT	608.740	—	—
2	5	800~1000	50 ± 10	MPPT	608.305	0.22	Yes
Initial (R)	—	—	—	—	453.063	—	—
1	5	800~1000	50 ± 10	MPPT	452.137	—	—
2	5	800~1000	50 ± 10	MPPT	451.777	0.28	Yes
Sample #	M2-4	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	609.813	—	—
1	5	800~1000	50 ± 10	MPPT	609.587	—	—
2	5	800~1000	50 ± 10	MPPT	608.821	0.16	Yes
Initial (R)	—	—	—	—	452.322	—	—
1	5	800~1000	50 ± 10	MPPT	451.435	—	—
2	5	800~1000	50 ± 10	MPPT	450.858	0.32	Yes
Sample #	M2-5	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	610.950	—	—
1	5	800~1000	50 ± 10	MPPT	610.091	—	—
2	5	800~1000	50 ± 10	MPPT	609.494	0.24	Yes
Initial (R)	—	—	—	—	452.774	—	—
1	5	800~1000	50 ± 10	MPPT	452.372	—	—
2	5	800~1000	50 ± 10	MPPT	452.233	0.12	Yes
Sample #	M2-8	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)

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Clause	Requirement + Test				Result - Remark		Verdict
Initial (F)	—	—	—	—	612.250	—	—
1	5	800~1000	50 ± 10	MPPT	611.354	—	—
2	5	800~1000	50 ± 10	MPPT	609.956	0.38	Yes
Initial (R)	—	—	—	—	453.301	—	—
1	5	800~1000	50 ± 10	MPPT	453.144	—	—
2	5	800~1000	50 ± 10	MPPT	452.280	0.23	Yes
Sample #	M2-9	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	($P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	611.738	—	—
1	5	800~1000	50 ± 10	MPPT	611.579	—	—
2	5	800~1000	50 ± 10	MPPT	610.470	0.21	Yes
Initial (R)	—	—	—	—	453.415	—	—
1	5	800~1000	50 ± 10	MPPT	453.120	—	—
2	5	800~1000	50 ± 10	MPPT	451.968	0.69	Yes
Sample #	M2-6	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	610.993	—	—
1	5	800~1000	50 ± 10	MPPT	609.032	—	—
2	5	800~1000	50 ± 10	MPPT	607.052	0.65	Yes
Initial (R)	—	—	—	—	453.670	—	—
1	5	800~1000	50 ± 10	MPPT	451.824	—	—
2	5	800~1000	50 ± 10	MPPT	449.997	0.81	Yes
Sample #	M2-7	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	611.348	—	—
1	5	800~1000	50 ± 10	MPPT	609.366	—	—
2	5	800~1000	50 ± 10	MPPT	607.397	0.65	Yes
Initial (R)	—	—	—	—	450.239	—	—
1	5	800~1000	50 ± 10	MPPT	448.403	—	—
2	5	800~1000	50 ± 10	MPPT	446.582	0.82	Yes

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M3-10	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	609.274	—	—
1	5	800~1000	50±10	MPPT	607.391	—	—
2	5	800~1000	50±10	MPPT	604.007	0.87	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M3-13	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	608.285	—	—
1	5	800~1000	50±10	MPPT	606.266	—	—
2	5	800~1000	50±10	MPPT	603.231	0.83	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M3-4	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	608.017	—	—
1	5	800~1000	50±10	MPPT	605.715	—	—
2	5	800~1000	50±10	MPPT	603.986	0.67	Yes
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M3-5	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	607.920	—	—
1	5	800~1000	50 ± 10	MPPT	604.946	—	—
2	5	800~1000	50 ± 10	MPPT	602.444	0.90	Yes
Sample #	M3-6	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)

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Initial (F)	—	—	—	—	608.703	—	—
1	5	800~1000	50 ± 10	MPPT	605.559	—	—
2	5	800~1000	50 ± 10	MPPT	603.147	0.92	Yes
Sample #	M3-7	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	608.214	—	—
1	5	800~1000	50 ± 10	MPPT	605.709	—	—
2	5	800~1000	50 ± 10	MPPT	603.467	0.78	Yes
Supplementary information:							

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization		P
Test Date [YYYY-MM-DD] ..... :	2022-09-22 for M1-x 2022-09-17 for M2-x 2022-09-17 for M3-x	—
Pmax(lab) lower limit (W) ..... :	See table below: Pmax [W] – Min calc.	—
$\bar{P}_{max}(Lab)$ lower limit (W) ..... :	635.510 for M1-x 583.252 for M2-x 583.252 for M3-x	—
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	18.309	18.619	45.515	46.059	17.214	37.707	649.088	616.445	77.89	P
M1-13	18.315	18.619	45.490	46.059	17.217	37.750	649.942	616.445	78.01	P
M1-8	18.307	18.619	45.499	46.059	17.219	37.675	648.726	616.445	77.88	P
M1-9	18.306	18.619	45.506	46.059	17.197	37.737	648.963	616.445	77.90	P
Average	—						649.180	635.510	—	P
M2-10	13.586	14.313	56.236	56.350	12.975	47.097	611.092	583.252	79.95	P
M2-13	13.601	14.313	56.233	56.350	13.021	46.716	608.305	583.252	79.5	P
M2-4	13.507	14.313	56.276	56.350	12.908	47.166	608.819	583.252	80.10	P
M2-5	13.706	14.313	56.004	56.350	13.089	46.566	609.494	583.252	79.33	P
M2-8	13.590	14.313	56.215	56.350	13.062	46.698	609.956	583.252	79.78	P

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Clause	Requirement + Test						Result - Remark			Verdict
M2-9	13.686	14.313	55.215	56.350	13.071	46.705	610.480	583.252	80.79	P
M2-6	13.450	14.313	56.334	56.350	12.807	47.400	607.052	583.252	79.69	P
M2-7	13.645	14.313	56.128	56.350	12.925	46.994	607.397	601.291	80.12	P
Average	—						609.074	596.402	—	P
M3-10	13.591	14.323	56.340	55.350	12.803	47.177	604.007	583.252	78.88	P
M3-13	13.616	14.323	56.320	56.350	12.985	46.456	603.231	583.252	78.66	P
M3-4	13.514	14.323	56.330	55.350	12.930	46.712	603.986	583.252	79.34	P
M3-5	13.703	14.323	56.129	56.350	13.130	45.883	602.444	583.252	78.33	P
M3-6	13.480	14.323	56.312	55.350	12.822	47.040	603.147	583.252	79.46	P
M3-7	13.699	14.323	56.142	56.350	12.938	46.643	603.467	583.252	78.47	P
Average	—						603.380	601.291	—	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)											—
Test Date [YYYY-MM-DD] ..... :	2022-09-17 for M2-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.			
M2-10	9.935	-	55.808	-	9.303	48.501	451.182	-	81.34	-	
M2-13	9.990	-	55.659	-	9.357	48.282	451.777	-	81.21	-	
M2-4	9.918	-	55.946	-	9.292	48.521	450.858	-	81.26	-	
M2-5	10.065	-	55.259	-	9.430	47.957	452.233	-	81.27	-	
M2-8	9.917	-	55.64	-	9.392	48.155	452.28	-	81.96	-	
M2-9	9.989	-	55.321	-	9.456	47.797	451.968	-	81.77	-	
M2-6	9.834	-	56.095	-	9.255	48.622	449.997	-	81.57	-	
M2-7	9.910	-	55.722	-	9.221	48.431	446.582	-	80.87	-	
Average	—						-	-	—	-	

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Clause	Requirement + Test	Result - Remark	Verdict

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)		—
Test Date [YYYY-MM-DD] ..... :	2022-09-17 for M2-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.		
M2-10	14.966	-	56.476	-	14.394	46.706	672.278	-	79.49	-
M2-13	14.983	-	56.411	-	14.322	46.592	667.286	-	78.88	-
M2-4	14.888	-	56.832	-	14.272	46.868	668.905	-	79.02	-
M2-5	15.088	-	56.189	-	14.447	46.298	668.875	-	78.87	-
M2-8	14.971	-	56.393	-	14.243	47.112	670.992	-	79.45	-
M2-9	15.074	-	56.016	-	14.472	46.351	670.772	-	79.38	-
M2-6	15.036	-	56.413	-	14.249	46.947	668.948	-	78.86	-
M2-7	14.972	-	56.57	-	14.187	47.102	668.236	-	78.90	-
Average	—						-	-	—	-

Supplementary information: The limit values are calculated considering manufacturer's tolerances ***t*** of rated nameplate values and laboratory measurement uncertainties ***m***.
1090W/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] ..... :	2022-09-22 for M1-x 2022-09-17 for M2-x 2022-09-17 for M3-x	—
Test Voltage applied [V] ..... :	8000/1500	—
Size of module [m^2] ..... :	3.11 for M1-x 2.80 for M2-x & M3-x	—
Required Resistance [MΩ] ..... :	12.86 for M1-x 14.29 for M2-x & M3-x	—

Sample #	Measured	Dielectric breakdown	Result

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Clause	Requirement + Test	Result - Remark	Verdict

	MΩ	Yes (description)	No	
M1-10	>5000	No Dielectrical breakdown	X	P
M1-13	>5000	No Dielectrical breakdown	X	P
M1-8	>5000	No Dielectrical breakdown	X	P
M1-9	>5000	No Dielectrical breakdown	X	P
M2-10	>5000	No Dielectrical breakdown	X	P
M2-13	>5000	No Dielectrical breakdown	X	P
M2-4	>5000	No Dielectrical breakdown	X	P
M2-5	>5000	No Dielectrical breakdown	X	P
M2-8	>5000	No Dielectrical breakdown	X	P
M2-9	>5000	No Dielectrical breakdown	X	P
M2-6	>5000	No Dielectrical breakdown	X	P
M2-7	>5000	No Dielectrical breakdown	X	P
M3-10	>5000	No Dielectrical breakdown	X	P
M3-13	>5000	No Dielectrical breakdown	X	P
M3-4	>5000	No Dielectrical breakdown	X	P
M3-5	>5000	No Dielectrical breakdown	X	P
M3-6	>5000	No Dielectrical breakdown	X	P
M3-7	>5000	No Dielectrical breakdown	X	P
Supplementary information: the maximum measuring limit of the equipment is 5000 MΩ.				

TABLE 05: MQT 15 ini: Initial Wet leakage current test		P
Test Date [YYYY-MM-DD] .....:	2022-09-22 for M1-x 2022-09-17 for M2-x 2022-09-17 for M3-x	—
Test Voltage applied [V] .....:	1500	—
Solution temperature [°C].....:	22.5 for M1-x 22.6 for M2-x & M3-x	—
Solution resistivity [Ω cm] .....:	2763 for M1-x 2947 for M2-x & M3-x	—
Size of module [m²] .....:	3.11 for M1-x 2.80 for M2-x & M3-x	—

Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
M1-10	12.86	477.2	P
M1-13	12.86	490.5	P
M1-8	12.86	502.9	P

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Clause	Requirement + Test	Result - Remark	Verdict
M1-9	12.86	482.4	P
M2-10	14.29	574.9	P
M2-13	14.29	568.1	P
M2-4	14.29	582.3	P
M2-5	14.29	485.8	P
M2-8	14.29	573.2	P
M2-9	14.29	503.3	P
M2-6	14.29	539.2	P
M2-7	14.29	547.2	P
M3-10	14.29	521.2	P
M3-13	14.29	537.2	P
M3-4	14.29	542.1	P
M3-5	14.29	491.3	P
M3-6	14.29	542.8	P
M3-7	14.29	511.5	P
Supplementary information: N/A			

TABLE 13: MQT 09 - Hot-spot endurance test					P
Test Date [YYYY-MM-DD] start/end .....:	2022-10-18				—
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] .:	54.9/55.6/56.1/52.9				—
TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					P
Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	—	—	—	—	
Shading rate [%].....:	15	10	10	5	—
Max. measured cell temperature in each cell [°C]:	161.2	158.2	152.3	142.4	—
Test duration of each shading [h].....:	1	1	1	1	—
Irradiance during shading [W/m²] ……..... :	1000	1000	1000	1000	—

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A

Test Date [YYYY-MM-DD] start/end .....:	2022-11-10	—
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] .:	57.1/58.1/57.7/54.6	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT — P

Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	—	—	—	—	
Shading rate [%].....:	10	10	16	8	—
Max. measured cell temperature in each cell [°C]:	167.5	159.3	178.3	151.1	—
Test duration of each shading [h] .....:	1	1	1	1	—
Irradiance during shading [W/m²] …… .....:	1185	1185	1185	1185	—

Supplementary information: N/A

Test Date [YYYY-MM-DD] start/end .....:	2022-11-15	—
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] .:	54.2/53.6/55.2/52.3	—

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT — P

Selected hot-spot cells.....:	LOW	LOW	LOW	HIGH	—
	—	—	—	—	
Shading rate [%].....:	15	10	10	7	—
Max. measured cell temperature in each cell [°C]:	158.2	143.6	149.1	131.2	—
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	—
Supplementary information: N/A					

TABLE 13.2: MQT 09 - Hot-spot endurance test for MLI		—
Selected hot-spot cells.....:	—	—
Number of cells shaded .....:	—	—
Max. measured cell temperature [°C] .....:	—	—
Test duration during shading [h] .....:	—	—
Irradiance during shading [W/m²] …… .....:	—	—
Supplementary information:		

TABLE 13.3: MQT 01 - Visual inspection after hot-spot endurance test		P
Test Date [YYYY-MM-DD].....:	2022-10-18 for M1-x 2022-11-11 for M2-x 2022-11-16 for M3-x	—
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
Supplementary information:		

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test		—
Test Date [YYYY-MM-DD].....:	2022-10-18 for M1-x 2022-11-11 for M2-x 2022-11-16 for M3-x	—
Module temperature [°C].....:	25	—
Irradiance [W/m^2) .....:	1000 / 1090	—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
M1-13	13.464	48.517	12.816	40.078	513.640	78.63	—
M2-13 Fornt	13.604	56.218	12.973	46.644	605.113	79.12	—
M2-13 Rear	9.988	55.648	9.357	48.172	450.745	81.10	—
M2-13 equivalent	14.979	56.395	14.314	46.480	665.315	78.76	—
M3-13	13.618	56.407	12.966	46.265	599.872	78.09	—
Supplementary information: 1090W/m^2 equivalent irradiance is the effective value calculated when backside							

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Clause	Requirement + Test	Result - Remark	Verdict

irradiance is 135W/m^2.

TABLE 13.5: MQT 03 - Insulation test after hot-spot endurance test P

Test Date [YYYY-MM-DD]:	2022-10-18 for M1-x 2022-11-11 for M2-x 2022-11-16 for M3-x	—
Test Voltage applied [V]:	8000/1500	—
Size of module [m^2]:	3.11 for M1-x 2.80 for M2-x & M3-x	—
Required Resistance [MΩ]:	3.11 for M1-x 14.29 for M2-x & M3-x	—

Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-13	>5000	12.86	No dielectric breakdown	X	P
M2-13	>5000	14.29	No dielectric breakdown	X	P
M3-13	>5000	14.29	No dielectric breakdown	X	P

Supplementary information: the maximum measuring limit of the equipment is 5000 MΩ.

TABLE 13.6: MQT 15 - Wet leakage current test after hot-spot endurance test P

Test Date [YYYY-MM-DD]:	2022-10-18 for M1-x 2022-11-11 for M2-x 2022-11-16 for M3-x	—
Test Voltage applied [V]:	1500	—
Solution temperature [°C]:	22.6 for M1-x 22.6 for M2-x 22.6 for M3-x	—
Size of module [m^2]	3.11 for M1-x 2.80 for M2-x 2.80 for M3-x	—
Solution resistivity [Ω cm]	2889 for M1-x 2986 for M2-x 2854 for M3-x	—

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-13	521.4	12.86	P
M2-13	481.7	14.29	P
M3-13	513.3	14.29	P

Supplementary information: N/A

TABLE 13.7: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test P

Test Date [YYYY-MM-DD]:	2022-10-18 for M1-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

	2022-11-11 for M2-x 2022-11-16 for M3-x	
☐ Method A		—
Ambient temperature [°C] .....:	—	—
Current flow applied [A] .....:	—	—

Sample #	VFM	$V_{FMrated}$	VFM = (N × $V_{FMrated}$) ± 10 %	Result
—	—	—	☐ Yes ☐ No	—
—	—	—	☐ Yes ☐ No	—

Supplementary information:N/A

☒ 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 14: MQT 10 - UV preconditioning test (Front-side)		P
Test Date (YYYY-MM-DD) start/end.....:	2022-09-25/2022-09-30 for M2-x & M3-x	—
Module temperature [°C] ..... . :	60±5	—
UV irradiance (280-400nm) [W/m²] ..... . :	115.81	—
Ratio of UV irradiance (280-320nm) (%) ..... :	7.8	—
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.

TABLE 14: MQT 10 - UV preconditioning test (Rear-side)		P
Test Date (YYYY-MM-DD) start/end.....:	2022-09-30/2022-10-05 for M2-x	—
Module temperature [°C] ..... :	60 ± 5	—
UV irradiance (280-400nm) [W/m²] ..... :	109.51	—
Ratio of UV irradiance (280-320nm) (%) .....:	7.81	—
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.

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Clause	Requirement + Test	Result - Remark	Verdict

UV preconditioning test was performed on front side of the module.

TABLE 14.1: MQT 01 - Visual inspection after UV preconditioning test		P
Test Date [YYYY-MM-DD]..... :	2022-10-05 for M2-x 2022-09-30 for M3-x	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M2-4	No major visual defects found	P
M2-5	No major visual defects found	P
M3-4	No major visual defects found	P
M3-5	No major visual defects found	P
Supplementary information: N/A		

TABLE 14.2: MQT 15 - Wet leakage current test after UV preconditioning test		P
Test Date [YYYY-MM-DD]..... :	2022-10-05 for M2-x 2022-09-30 for M3-x	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C]..... :	22.5 for M2-x 22.5 for M3-x	—
Solution resistivity [Ω cm]..... :	2768 for M1-x 2768 for M3-x	—

Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M2-4	489.3	14.29	P
M2-5	493.1	14.29	P
M3-4	517.2	14.29	P
M3-5	503.2	14.29	P
Supplementary information: Size of module 2.80.			

TABLE 14.3: MQT 02 – Max. power determination after UV preconditioning test - Optional		—
Test Date [YYYY-MM-DD]..... :	—	—
Module temperature [°C]..... :	—	—
Irradiance [W/m^2]..... :	—	—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information:							

TABLE 14.4: MQT 03 - Insulation test after UV preconditioning test - Optional		—
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		Dielectric breakdown		Result
	[MΩ]		Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information:					

TABLE 15: MQT 11 - Thermal cycling 50 test			P
Test Date [YYYY-MM-DD] start/end .....:	2022-10-12 / 2022-10-22 for M2-x & M3-x		—
Total cycles (50).....:	50		—
Applied current (A) .....:	During the heat up cycle from 40 °C to 80 °C	16.49/16.71 for M2-x 13.13/13.13 for M2-x	—
	Other stages	0.03	—

Sample #	Open circuits (yes/no)	—
M2-4	no	P
M2-5	no	P
M3-4	no	P
M3-5	no	P
Supplementary information:		

TABLE 15.1: MQT 01 - Visual inspection after thermal cycling 50 test		P
Test Date [YYYY-MM-DD].....:	2022-10-22 for M2-x & M3-x	—

Sample #	Nature and position of initial findings – comments or attach photos	—
M2-4	No major visual defects found	P
M2-5	No major visual defects found	P
M3-4	No major visual defects found	P
M3-5	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]..... :	2022-10-22 for M2-x & M3-x		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C] ……..:	22.8		—
Solution resistivity [Ω cm] ……..:	2965		—
Size of module [m²]	2.80 for M2-x & M3-x		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result

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Clause	Requirement + Test	Result - Remark	Verdict
M2-4	479.3	14.29	P
M2-5	448.5	14.29	P
M3-4	474.6	14.29	P
M3-5	483.2	14.29	P
Supplementary information: N/A			

TABLE 15.3: MQT 03 – Max. power determination after thermal cycling 50 test - Optional						—
Test Date [YYYY-MM-DD]..... :	—					—
Module temperature [°C]..... :	—					—
Irradiance [W/m²) ..... :	—					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
—	—	—	—	—	—	—
—	—	—	—	—	—	—
Supplementary information:						

TABLE 15.4: MQT 03 - Insulation test after thermal cycling 50 test - Optional				—
Test Date [YYYY-MM-DD]..... :	—			—
Test Voltage applied [V] ..... :	—			—
Size of module [m²] ..... :	—			—
Required Resistance [MΩ]..... :	—			—
Sample #	Measured	Dielectric breakdown		Result
	[MΩ]	Yes (description)	No	
—	—	—	—	—
—	—	—	—	—
Supplementary information: Size of module [m²]				

TABLE 16: MQT 12 - Humidity freeze 10 test		P
Test Date [YYYY-MM-DD] start/end ..... :	2022-10-23/2022-11-03 for M2-x & M3-x	—
Total cycles (10) ..... :	10	—
Applied current (A) ..... :	0.05	—
Sample #	Open circuits (yes/no)	—
M2-4	no	P
M2-5	no	P
M3-4	no	P
M3-5	no	P
Supplementary information:		

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 16.1: MQT 01 - Visual inspection after humidity freeze 10 test		P
Test Date [YYYY-MM-DD]..... :	2022-11-03 for M2-x & M3-x	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M2-4	No major visual defects found	P
M2-5	No major visual defects found	P
M3-4	No major visual defects found	P
M3-5	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]..... :	2022-11-03 for M2-x & M3-x		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C]……..:	22.6		—
Size of module [m²] ..... :	2.80		—
Solution resistivity [Ω cm]..... :	2894		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M2-4	503.5	14.92	P
M2-5	512.6	14.92	P
M3-4	493.2	14.92	P
M3-5	487.8	14.92	P
Supplementary information: N/A			

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

TABLE 16.4: MQT 03 Insulation test after humidity freeze 10 test) -Optional		—
Test Date [YYYY-MM-DD]..... :	—	—
Test Voltage applied [V] ..... :	—	—
Size of module [m²] ..... :	—	—
Required Resistance [MΩ]..... :	—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—
Supplementary information:					

TABLE 17: MQT 14 - Robustness of terminations test		P
Test Date [YYYY-MM-DD] start/end .....:	2022-11-03	—

TABLE 17.1: MQT 14.1 Retention of junction box on mounting surface		P
Sample #	M1-x	—
Supplementary information: The force of 156N applied.		

TABLE 17.2: MQT 01 - Visual inspection after retention of junction box on mounting surface		P
Test Date [YYYY-MM-DD]..... :	2022-11-03	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M2-4	No major visual defects found	P
Supplementary information: N/A		

TABLE 17.3: MQT 15 - Wet leakage current test after retention of junction box on mounting surface		P
Test Date [YYYY-MM-DD]..... :	2022-11-03	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C].....:	22.5	—
Size of module [m²]	2.80	—
Solution resistivity [Ω cm]..... :	2855	—

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M2-4	456.1	14.92	P
Supplementary information: N/A			

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					
	Cable diameter,	Torque Force,	Permissible angle [°]	Measured angle	Result

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Clause	Requirement + Test	Result - Remark	Verdict

	[mm]	[Nm]		[°]	
Torque test					
☐ Junction boxes intended to be used with generic cables					—

	Anchorage diameter range [mm]		Test mandrel [mm]	Tension Force, [N]	Permissible displacement [mm]	Measured displacement [mm]	Result
Pull test	Min						

	Anchorage diameter range [mm]		Test mandrel [mm]	Torque Force [Nm]	Permissible angle [°]	Measured angle [°]	Result
Torque test	Max						

Supplementary information:

TABLE 17.5: MQT 01 - Visual inspection after retention of test of cord anchorage		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].....:	—		—
Solution resistivity [Ω cm] .....:	—		—
Size of module [m²]	—		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
—	—	—	—

Supplementary information: —

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	
—	—	—	—	—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A

TABLE 18: MQT 11 - Thermal cycling 200 test			P
Test Date [YYYY-MM-DD] start/end .....:	2022-10-14 / 2022-11-17 for M1-x 2022-09-25 / 2022-10-30 for M2-x		—
Total cycles (200).....:	200		—
Applied current (A) .....:	During the heat up cycle from –40 °C to 80 °C	17.22 for M1-8 17.22 for M1-9 16.59 for M2-8 16.69 for M2-9	—
	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

Supplementary information: N/A

TABLE 18.1: MQT 01 - Visual inspection after thermal cycling 200 test		P
Test Date [YYYY-MM-DD].....:	2022-11-17 for M1-x 2022-10-30 for M2-x	—

Sample #	Nature and position of initial findings – comments or attach photos	—
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

Supplementary information: N/A

TABLE 18.2: MQT 15 - Wet leakage current test after thermal cycling 200 test		P
Test Date [YYYY-MM-DD].....:	2022-11-17 for M1-x 2022-10-30 for M2-x	—
Test Voltage applied [V] .....:	1500	—
Solution temperature [°C].....:	22.5 for M1-x 22.7 for M2-x	—
Size of module [m²] .....:	2.59 for M1-x 2.80 for M2-x	—
Solution resistivity [Ω cm].....:	2878 for M1-x 2694 for M2-x	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-8	511.5	12.86	P
M1-9	523.9	12.86	P
M2-8	478.4	14.29	P
M2-9	521.3	14.29	P
Supplementary information: N/A			

TABLE 19: MQT 13 - Damp heat 1000 test		P
Test Date [YYYY-MM-DD] start/end .....:	2022-09-26/2022-11-06 for M2-x & M3-x	—
Total hours (1000h) .....:	1000h	—

Sample #	Open circuits (yes/no)	—
M2-6	no	P
M2-7	no	P
M3-6	no	P
M3-7	no	P
Supplementary information: N/A		

TABLE 19.1: MQT 01 - Visual inspection after damp heat 1000 test		P
Test Date [YYYY-MM-DD].....:	2022-11-06 for M2-x & M3-x	—

Sample #	Nature and position of initial findings – comments or attach photos	—
M2-6	No major visual defects found	P
M2-7	No major visual defects found	P
M3-6	No major visual defects found	P
M3-7	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].....:	2022-11-06 for M2-x & M3-x	—
Test Voltage applied [V].....:	1500	—
Solution temperature [°C].....:	22.5	—
Size of module [m²].....:	2.80	—
Solution resistivity [Ω cm].....:	2905	—

Sample #	Measured [MΩ]	Limit [MΩ]	Result
M2-6	506.9	14.29	P
M2-7	513.5	14.29	P
M3-6	473.6	14.29	P
M3-7	482.1	14.29	P

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A

TABLE 19.3: MQT 02 - Maximum power determination after damp heat 1000 test - Optional —

Test Date [YYYY-MM-DD]..... :	—	—
Module temperature [°C]..... :	—	—
Irradiance [W/m²) ..... :	—	—

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

Supplementary information: N/A

TABLE 19.4: MQT 03 - Insulation test after damp heat 1000 test - Optional —

Test Date [YYYY-MM-DD]..... :	—	—
Test Voltage applied [V] ..... :	—	—
Size of module [m²]	—	—

Sample #	Measured	Required Resistance	Dielectric breakdown		Result
	[MΩ]	[MΩ]	Yes (description)	No	
—	—	—	—	—	—
—	—	—	—	—	—

Supplementary information: Size of module [m²]

TABLE 19.5: MQT 16 Static mechanical load test P

Sample # :	M2-6		—
Design load(front side/ back side)..... :	3600/1600Pa		—
Safety factors ..... :	1.5		—
Test Date [YYYY-MM-DD].....	2022-11-10		—
Mounting method ..... :	Installed with four screws at longer frame		—
Load applied to..... :	front side	back side	—
Mechanical load [Pa]..... :	5400	2400	—
First cycle time (start/end)..... :	09:15-10:15	10:22-11:22	—
Intermittent open-circuit (yes/no) ..... :	no	no	P
Second cycle time (start/end) ..... :	12:35-13:35	13:47-14:47	—
Intermittent open-circuit (yes/no) ..... :	no	no	P
Third cycle time (start/end) ..... :	15:55-16:55	17:03-18:03	—
Intermittent open-circuit (yes/no) ..... :	no	no	P

Supplementary information: A=1/4L±50mm; L=Module length

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Clause	Requirement + Test	Result - Remark	Verdict

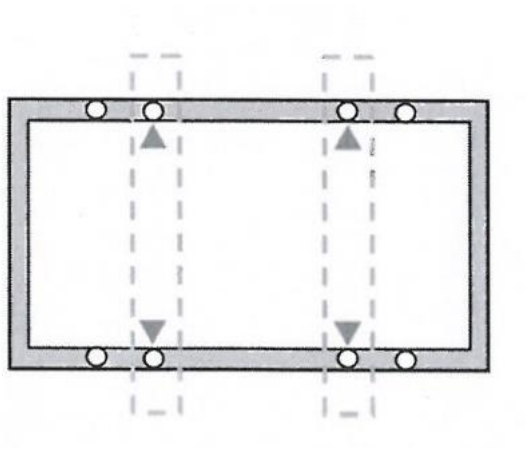

TABLE 19.6: MQT 01 - Visual inspection after static mechanical load test							P
Test Date [YYYY-MM-DD]..... :	2022-11-10 for M2-x						—
Sample #	Nature and position of initial findings – comments or attach photos						—
M2-6	No major visual defects found						P
Supplementary information: N/A							

TABLE 19.7: MQT 15 - Wet leakage current test after static mechanical load test			P
Test Date [YYYY-MM-DD]..... :	2022-11-10 for M2-x		—
Test Voltage applied [V]..... :	1500		—
Solution temperature [°C]..... :	22.6		—
Size of module [m²] ..... :	2.80		—
Solution resistivity [Ω cm]..... :	2786		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M2-6	512.5	14.29	P
Supplementary information: N/A			

TABLE 19.8: MQT 17 - Hail impact test							P
Test Date [YYYY-MM-DD]..... :	2022-11-15						—
Sample #	M2-7						—
Ice ball size [mm] ..... :	1	2	3	4	5	6	—
	24.9	25	25.1	25	24.9	24.9	
	7	8	9	10	11	—	
	25.1	25	25.1	25	25.1	—	
Ice ball weight [g] ..... :	1	2	3	4	5	6	—
	7.48	7.52	7.57	7.53	7.49	7.48	
	7	8	9	10	11	—	

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Clause	Requirement + Test	Result - Remark	Verdict

	7.56	7.51	7.58	7.53	7.56	—	
Ice ball velocity [m/s] ..... :	1	2	3	4	5	6	—
	23.1	22.8	22.9	23	23.1	23.2	
	7	8	9	10	11	—	
	22.9	23	23.1	22.9	22.9	—	
Number of impact locations ..... :	11						—

Supplementary information: (impact location descriptions)

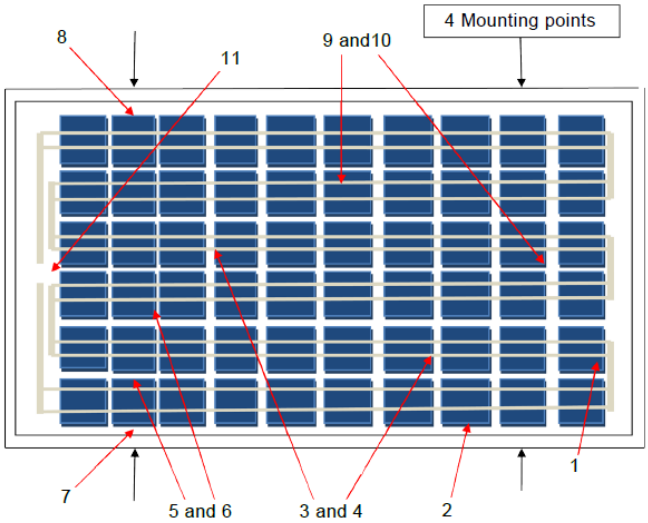

TABLE 19.9: MQT 01 - Visual inspection after hail impact test		P
Test Date [YYYY-MM-DD] ..... :	2022-11-15	—

Sample #	Nature and position of initial findings – comments or attach photos	—
M2-7	No major visual defects found	P

Supplementary information:

TABLE 19.10: MQT 15 - Wet leakage current test after hail impact test		P
Test Date [YYYY-MM-DD] ..... :	2022-11-15	—
Test Voltage applied [V] ..... :	1500	—
Solution temperature [°C] ..... :	22.8	—
Solution resistivity [Ω cm] ..... :	2894	—
Size of module [m²] ..... :	2.80	—

Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M2-7	489.3	14.29	P

Supplementary information: N/A

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 20: MQT 19.2 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
M1-10	—	—	—	—	—	—	—
M1-4	—	—	—	—	—	—	—
M1-5	—	—	—	—	—	—	—
M1-8	—	—	—	—	—	—	—
M1-9	—	—	—	—	—	—	—
M1-6	—	—	—	—	—	—	—
M1-7	—	—	—	—	—	—	—
Supplementary information:							

TABLE 20.2: MQT 19.1 Final Stabilization procedure							—
Light exposure method:	☐ Simulator ☐ Natural sunlight						
Stabilization criterion x per IEC 61215-1-x :	—						
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight							
Sample #		Test Date (YYYY-MM-DD) start/end..:		—			
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end		—			
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—

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Clause	Requirement + Test				Result - Remark		Verdict
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end..:			—		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	M1-6	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	—	—	—	—	—	—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Sample #	M1-7	Test Date (YYYY-MM-DD) start/end	—				
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Supplementary information:							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
—	—						
—	—						
—	—						
—	—						
—	—						
—	—						
—	—						
Test method description:							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure							

TABLE 20.3: MQT 06.1: Final Performance at STC (single-side front)									P
Test Date [YYYY-MM-DD]..... :	Differene 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	18.297	45.511	17.197	37.699	648.310	77.85	647.400	+0.14	P
M1-8	18.244	45.457	17.102	37.588	642.830	77.51	647.039	-0.65	P
M1-9	18.242	45.455	17.083	37.652	643.209	77.57	647.276	-0.63	P
M2-10	13.584	56.226	12.995	46.957	610.206	79.89	609.503	+0.12	P
M2-4	13.381	56.604	12.686	47.004	596.293	78.73	607.236	-1.80	P
M2-5	13.580	55.932	12.867	46.404	597.080	78.61	607.909	-1.78	P
M2-8	13.506	56.151	12.898	46.574	600.711	79.21	608.370	-1.26	P

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Clause	Requirement + Test						Result - Remark		Verdict
M2-9	13.602	55.751	12.907	46.581	601.221	79.28	608.893	-1.26	P
M2-6	13.441	56.597	12.780	46.735	597.273	78.51	605.474	-1.35	P
M2-7	13.648	56.111	12.884	46.344	597.096	77.97	605.818	-1.44	P
M3-10	13.584	56.331	12.804	47.165	603.901	78.92	601.663	+0.37	P
M3-4	13.516	56.789	12.890	45.919	591.896	77.11	602.416	-1.75	P
M3-5	13.701	56.100	13.160	44.976	591.884	77.01	600.878	-1.50	P
M3-6	13.480	56.625	12.827	46.592	597.636	78.30	601.579	-0.66	P
M3-7	13.703	56.126	12.952	46.193	598.292	77.79	601.898	-0.60	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)									—
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
M2-10	9.937	55.794	9.303	48.381	450.088	81.18	—	—	—
M2-4	9.785	55.859	9.079	48.364	439.097	80.34	—	—	—
M2-5	9.932	55.172	9.217	47.8	440.573	80.4	—	—	—
M2-8	9.835	55.562	9.23	48.033	443.345	81.13	—	—	—
M2-9	9.907	55.243	9.294	47.675	443.091	80.96	—	—	—
M2-6	9.826	56.087	9.187	47.931	440.342	79.9	—	—	—
M2-7	9.905	55.696	9.143	47.779	436.843	79.19	—	—	—
Supplementary information: N/A									

TABLE 20.3: MQT 06.1: Final Performance at STC (Equivalent irradiance)									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
M2-10	14.963	56.462	14.399	46.591	670.864	79.41	670.530	0.05	P
M2-4	14.743	56.438	14.041	46.699	655.701	78.80	667.166	-1.72	P

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Clause	Requirement + Test						Result - Remark		Verdict
M2-5	14.943	55.795	14.216	46.129	655.770	78.65	667.136	-1.70	P
M2-8	14.881	55.693	14.077	46.982	661.366	79.80	669.247	-1.18	P
M2-9	14.984	55.316	14.306	46.221	661.238	79.78	669.028	-1.16	P
M2-6	15.038	56.382	14.21	46.304	657.980	77.60	667.209	-1.38	P
M2-7	14.971	56.485	14.106	46.455	655.294	77.49	666.499	-1.68	P
Supplementary information: 1092W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2. 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] ..... :			Differene Date		—
Test Voltage applied [V] ..... :			8000/1500		—
Size of module [m²] ..... :			2.59 for M1-x 2.80 for M2-x 2.80 for M3-x		—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-10	12.86	>5000	No Dielectrical breakdown	X	P
M1-8	12.86	>5000	No Dielectrical breakdown	X	P
M1-9	12.86	>5000	No Dielectrical breakdown	X	P
M2-10	14.29	>5000	No Dielectrical breakdown	X	P
M2-4	14.29	>5000	No Dielectrical breakdown	X	P
M2-5	14.29	>5000	No Dielectrical breakdown	X	P
M2-8	14.29	>5000	No Dielectrical breakdown	X	P
M2-9	14.29	>5000	No Dielectrical breakdown	X	P
M2-6	14.29	>5000	No Dielectrical breakdown	X	P
M2-7	14.29	>5000	No Dielectrical breakdown	X	P
M3-10	14.29	>5000	No Dielectrical breakdown	X	P
M3-4	14.29	>5000	No Dielectrical breakdown	X	P
M3-5	14.29	>5000	No Dielectrical breakdown	X	P
M3-6	14.29	>5000	No Dielectrical breakdown	X	P
M3-7	14.29	>5000	No Dielectrical breakdown	X	P
Supplementary information: the maximum measuring limit of the equipment is 5000 MΩ.					

TABLE 22: MQT 15 fin: Final Wet leakage current test	P

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Clause	Requirement + Test	Result - Remark	Verdict

Test Date [YYYY-MM-DD] ..... :		Differene Date	—
Test Voltage applied [V] ..... :		1500	—
Solution temperature [°C]..... :		22±2	—
Size of module [m²] ..... :		2.59 for M1-x 2.80 for M2-x 2.80 for M3-x	—
Solution resistivity [Ω cm]..... :		<3500	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M1-10	523.8	12.86	P
M1-8	511.5	12.86	P
M1-9	523.9	12.86	P
M2-10	516.9	14.29	P
M2-4	503.5	14.29	P
M2-5	512.6	14.29	P
M2-8	478.4	14.29	P
M2-9	521.3	14.29	P
M2-6	512.5	14.29	P
M2-7	489.3	14.29	P
M3-10	512.4	14.29	P
M3-4	474.6	14.29	P
M3-5	483.2	14.29	P
M3-6	473.6	14.29	P
M3-7	482.1	14.29	P
Supplementary information: N/A			

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

A1.1	MODULE TYPE/S
	ZXM8-TPLD132-650/M

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2384×1303x30
	Weights..... :	38 [kg] (approx)
	Front/Rear cover bonding classification ..... :	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**ZNSHINE PV-TECH Co., Ltd.** Cell type: ZXM8HD-12, P type mono crystalline silicon, 12 busbars
	Cell dimensions L x W x T (± %) [mm] ..... :	210 x 105 x 0.145±10%
	Cell thickness [µm] ..... :	145 ± 14.5
	Cell area [cm²] ..... :	220.5

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 2.0±10% mm
	Rear cover ..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 2.0±10% mm
	Encapsulation material front side ..... :	**Cybird Technologies Inc.** Type: Cybright T11
	Encapsulation material back side..... :	**Cybird Technologies Inc.** Type: Cybright W11
	Frame parts ..... :	**ZNSHINE PV-TECH Co., Ltd.** Anodized aluminum alloy, 6005-T6, assembled by key corners
	Mounting parts..... :	N/A
	Adhesive for frame ..... :	**JIANGSU TOMORROW RUBBER INDUSTRY CO., LTD.** Type: ZQ5612
	Edge sealing..... :	N/A
	Internal wiring ..... :	N/A

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	Cell connector.....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: Φ0.23±10% mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: Sn60%Pb40%
	String connector .....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: 0.35±1×6±2 mm Material: Base Cu (≥99.95%), Coating Sn60%Pb40%
	Soldering material.....:	Sn60%Pb40%
	Fluxing agent .....:	**Singapore Asahi Chemical and Solder Industries Pte Ltd** Type: SF105
	Junction box.....:	**Zerun Co., LTD** Type: Z8-abcd
	Cable .....:	**Zerun Co., LTD** Type:62930 IEC 131 1x4mm², H1Z2Z2-K 1 x 4.0mm² 1500V DC, -40 °C to 90 °C
	Connector .....:	**Zerun Co., LTD** Type: Z4S-abcde
	Bypass diode .....:	**Zerun Co., LTD** Type: 35SQ045
	Potting material.....:	**JIANGSU TOMORROW RUBBER INDUSTRY CO., LTD.** Type: ZQ--5622W
	Adhesive for junction box .....:	**JIANGSU TOMORROW RUBBER INDUSTRY CO., LTD.** Type: ZQ5612
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **Cybrid Technologies Inc** Type: FF-3665 2) Marking label: **AVERY DENNISON** Type: 72826T, silver polyester film

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	0.5 mm
	Between cell and accessible surfaces.....:	13.5 mm
	Between any current carrying part and accessible surfaces .....:	13.5 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	132
	Serial-parallel connection of cells.....:	SPS
	Cells per bypass diode .....:	44

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	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
	ZXM7-UPLDD156-615/N & ZXM7-UPLDD156-630/N & ZXM7-UPLDD156-630/N

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2438 × 1133 x 30
	Weights ..... :	33.5 kg
	Front/Rear cover bonding classification ..... :	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**ZNSHINE PV-TECH Co., Ltd.** Cell type: ZXM7HD-16(N) for M2-x Cell type: ZXM7HD-11(N) for M4-x Cell type: ZXM7HD-10(N) for M5-x
	Cell dimensions L x W x T (± %) [mm] ..... :	182 x 91 x 0.13±10%
	Cell thickness [µm] ..... :	130 ± 13
	Cell area [cm^2] ..... :	165.34

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 1.6±10% mm
	Rear cover ..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 1.6±10% mm
	Encapsulation material front side ..... :	**Jiansu Lushan New Material Co., Ltd.** Type: S102
	Encapsulation material back side ..... :	**Jiansu Lushan New Material Co., Ltd.** Type: EV1050G2
	Frame parts ..... :	**ZNSHINE PV-TECH Co., Ltd.** Anodized aluminum alloy, 6063-T5, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9958
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A

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	Cell connector.....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: Φ0.23±10% mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: Sn60%Pb40%
	String connector .....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: 0.35±1×6±2 mm Material: Base Cu (≥99.95%), Coating Sn60%Pb40%
	Soldering material.....:	Sn60%Pb40%
	Fluxing agent .....:	**Singapore Asahi Chemical and Solder Industries Pte Ltd** Type: SF105
	Junction box.....:	**Zerun Co., LTD** Type: Z8-abcd
	Cable .....:	**Zerun Co., LTD** Type:62930 IEC 131 1x4mm², H1Z2Z2-K 1 x 4.0mm² 1500V DC, -40 °C to 90 °C
	Connector .....:	**Zerun Co., LTD** Type: Z4S-abcde
	Bypass diode .....:	**Zerun Co., LTD** Type: 35SQ045
	Potting material.....:	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9958
	Adhesive for junction box .....:	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9952
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **Shanghai Hyperion Adhesive Material Co., Ltd.** Type: 9966 2) Marking label: **AVERY DENNISON** Type: 72826T, silver polyester film

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	0.5 mm
	Between cell and accessible surfaces.....:	12.5 mm
	Between any current carrying part and accessible surfaces .....:	13 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	156
	Serial-parallel connection of cells .....:	SPS

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	Cells per bypass diode .....:	52/52/52
	No. of bypass diodes .....:	3

Remark: for tested sample with material combination 2 & 4 & 5

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

A1.1	MODULE TYPE/S
	ZXM7-UPLD156-615/N & ZXM7-UPLD156-630/N & ZXM7-UPLD156-630/N

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2438 × 1133 x 30
	Weights ..... :	33.5 kg
	Front/Rear cover bonding classification ..... :	☒ rigid/flexible ☐ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**ZNSHINE PV-TECH Co., Ltd.** Cell type: ZXM7HD-16(N) for M3-x Cell type: ZXM7HD-11(N) for M6-x Cell type: ZXM7HD-10(N) for M7-x
	Cell dimensions L x W x T (± %) [mm] ..... :	182 x 91 x 0.13±10%
	Cell thickness [µm] ..... :	130 ± 13
	Cell area [cm^2] ..... :	165.34

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 1.6±10% mm
	Rear cover ..... :	**Zhejiang Ninghai Kibing New Energy Management Co., Ltd** Thickness: 1.6±10% mm
	Encapsulation material front side ..... :	**Jiansu Lushan New Material Co., Ltd.** Type: S102
	Encapsulation material back side ..... :	**Jiansu Lushan New Material Co., Ltd.** Type: EV1050G5
	Frame parts ..... :	**ZNSHINE PV-TECH Co., Ltd.** Anodized aluminum alloy, 6063-T5, assembled by key corners
	Mounting parts ..... :	N/A
	Adhesive for frame ..... :	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9958
	Edge sealing ..... :	N/A
	Internal wiring ..... :	N/A

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	Cell connector.....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: Φ0.23±10% mm thick, round wire ribbon, Material: Base Cu (≥99.97%), coating: Sn60%Pb40%
	String connector .....:	**Suzhou YourBest New-Type Materials Co., Ltd.** Cross section: 0.35±1×6±2 mm Material: Base Cu (≥99.95%), Coating Sn60%Pb40%
	Soldering material.....:	Sn60%Pb40%
	Fluxing agent .....:	**Singapore Asahi Chemical and Solder Industries Pte Ltd** Type: SF105
	Junction box.....:	**Zerun Co., LTD** Type: Z8-abcd
	Cable .....:	**Zerun Co., LTD** Type:62930 IEC 131 1x4mm², H1Z2Z2-K 1 x 4.0mm² 1500V DC, -40 °C to 90 °C
	Connector .....:	**Zerun Co., LTD** Type: Z4S-abcde
	Bypass diode .....:	**Zerun Co., LTD** Type: 30SQ045
	Potting material.....:	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9958
	Adhesive for junction box .....:	**Shanghai Hyperion Adhesive Material Co., Ltd.** Type: HB9952
	Additional material (e. g. fixing tape, insulation tape).....:	1) Fixing tape: **Shanghai Hyperion Adhesive Material Co., Ltd.** Type: 9966 2) Marking label: **AVERY DENNISON** Type: 72826T, silver polyester film

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells.....:	0.5 mm
	Between cell and accessible surfaces.....:	12.5 mm
	Between any current carrying part and accessible surfaces .....:	13 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .....:	156
	Serial-parallel connection of cells.....:	SPS

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	Cells per bypass diode .....:	52/52/52
	No. of bypass diodes .....:	3

Remark: for tested sample with material combination 3 & 6 & 7

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Annex 2: Test table for verifying other alternative stabilization procedure

Step 1: Alternative stabilization				
Test Date (YYYY-MM-DD) start/end:				—
Test method description:				—
	Sample M10	Sample M11	Sample M12	—
Power before alternative stabilization (W)				—
Power after alternative stabilization (W)				—
Supplementary information:				

Step 2: Light exposure								
☐ Simulator ☐ Natural sunlight								
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight								
Sample M10	Test Date (YYYY-MM-DD) start/end.....:							
Test cycle	Light source	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} – P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								
Sample M11	Test Date (YYYY-MM-DD) start/end.....:							
Test cycle	Light source	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} – P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								
Sample M12	Test Date (YYYY-MM-DD) start/end.....:							
Test cycle	Light source	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$(P_{max} – P_{min}) / P_{average}$ (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								

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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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Annex 3: Lower and higher output power modules

TABLE A.4.1 Performance at STC before initial stabilization (single-side front)							—
Test Date [YYYY-MM-DD]..... :			2022-09-20 for M1-x & M4-x & M5-x & M6-x & M7-x 2022-09-15 for M2-x 2022-09-15 for M3-x				—
Test method..... :			☒ Simulator ☐ Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1-1	18.247	45.016	17.185	37.290	640.829	78.02	—
Low 1-2	18.243	45.024	17.186	37.286	640.797	78.02	—
High 1-1	18.458	45.895	17.346	38.252	663.519	78.32	—
High 1-2	18.453	45.920	17.351	38.149	661.923	78.20	—
Low 2-1	13.592	55.124	12.648	45.877	580.252	77.44	—
Low 2-2	13.694	55.115	12.811	45.672	585.104	77.52	—
High 2-1	13.621	56.240	13.169	46.822	616.599	80.49	—
High 2-2	13.694	55.921	13.294	46.519	618.424	80.76	—
Low 3-1	13.577	55.112	12.647	45.801	579.245	77.41	—
Low 3-2	13.583	55.102	12.702	45.722	580.761	77.60	—
High 3-1	13.606	56.233	13.156	46.816	615.911	80.50	—
High 3-2	13.612	55.917	13.274	46.506	617.321	81.10	—
Low 4-1	13.495	56.635	12.851	47.313	608.019	79.55	—
Low 4-2	13.681	56.146	13.008	46.868	609.659	79.37	—
High 4-1	13.918	56.382	13.225	46.882	620.014	79.01	—
High 4-2	13.980	56.366	13.275	46.815	621.469	78.87	—
Low 5-1	13.787	55.849	13.194	46.246	610.170	79.24	—
Low 5-2	13.564	56.248	12.846	47.128	605.406	79.35	—
High 5-1	13.910	56.386	13.231	46.878	620.243	79.08	—
High 5-2	13.977	56.373	13.269	46.815	621.188	78.84	—
Low 6-1	13.584	56.318	12.848	47.353	608.391	79.53	—
Low 6-2	13.660	56.090	13.061	46.674	609.609	79.56	—
High 6-1	13.920	56.375	13.228	46.865	619.930	79.00	—
High 6-2	13.986	56.372	13.263	46.797	620.669	78.72	—
Low 7-1	13.510	56.624	12.987	46.985	610.194	79.76	—

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Low 7-2	13.603	56.410	13.009	46.770	608.431	79.29	—
High 7-1	13.914	56.381	13.222	46.856	619.530	78.97	—
High 7-2	13.989	56.363	13.257	46.802	620.454	78.69	—

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)							—
Test Date [YYYY-MM-DD]..... :	2022-09-15 for M2-x						—
Test method..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 2-1	9.990	55.932	9.312	48.574	452.338	80.95	—
Low 2-2	9.938	56.337	9.261	48.982	453.63	81.03	—
High 2-1	10.013	55.835	9.323	48.556	452.699	80.98	—
High 2-2	10.052	55.537	9.375	48.181	451.672	80.91	—
Low 4-1	9.879	56.108	9.288	48.550	450.932	81.35	—
Low 4-2	9.956	55.715	9.263	48.360	447.959	80.76	—
High 4-1	10.411	55.938	9.421	48.744	459.217	78.85	—
High 4-2	10.457	55.935	9.480	48.788	462.510	79.07	—
Low 5-1	10.005	55.396	9.365	47.942	448.977	81.01	—
Low 5-2	9.866	55.707	9.213	48.270	444.712	80.91	—
High 5-1	10.411	55.930	9.415	48.749	458.972	78.82	—
High 5-2	10.454	55.942	9.483	48.783	462.609	79.10	—

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

TABLE A.4.2: MQT 19.1 ini: Initial Stabilization procedure							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 ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	640.829	—	—
1	5	800~1000	50 ± 10	MPPT	639.186	—	—

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2	5	800~1000	50 ± 10	MPPT	637.546	0.51	Yes
Sample #	Low 1-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	640.797	—	—
1	5	800~1000	50 ± 10	MPPT	638.972	—	—
2	5	800~1000	50 ± 10	MPPT	637.148	0.58	Yes
Sample #	High 1-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	663.519	—	—
1	5	800~1000	50 ± 10	MPPT	662.823	—	—
2	5	800~1000	50 ± 10	MPPT	660.187	0.50	Yes
Sample #	High 1-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	661.923	—	—
1	5	800~1000	50 ± 10	MPPT	661.902	—	—
2	5	800~1000	50 ± 10	MPPT	659.959	0.30	Yes
Sample #	Low 2-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	580.252	—	—
1	5	800~1000	50 ± 10	MPPT	579.926	—	—
2	5	800~1000	50 ± 10	MPPT	579.065	0.20	Yes
Initial (R)	—	—	—	—	428.189	—	—
1	5	800~1000	50 ± 10	MPPT	428.001	—	—
2	5	800~1000	50 ± 10	MPPT	427.672	0.12	Yes
Sample #	Low 2-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	585.104	—	—
1	5	800~1000	50 ± 10	MPPT	584.654	—	—
2	5	800~1000	50 ± 10	MPPT	584.335	0.13	Yes

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Initial (R)	—	—	—	—	433.262	—	—
1	5	800~1000	50 ± 10	MPPT	433.013	—	—
2	5	800~1000	50 ± 10	MPPT	432.578	0.16	Yes
Sample #	High 2-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	616.599	—	—
1	5	800~1000	50 ± 10	MPPT	616.286	—	—
2	5	800~1000	50 ± 10	MPPT	616.126	0.08	Yes
Initial (R)	—	—	—	—	452.699	—	—
1	5	800~1000	50 ± 10	MPPT	452.260	—	—
2	5	800~1000	50 ± 10	MPPT	451.444	0.13	Yes
Sample #	High 2-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	($P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	618.424	—	—
1	5	800~1000	50 ± 10	MPPT	618.058	—	—
2	5	800~1000	50 ± 10	MPPT	617.786	0.10	Yes
Initial (R)	—	—	—	—	451.672	—	—
1	5	800~1000	50 ± 10	MPPT	451.365	—	—
2	5	800~1000	50 ± 10	MPPT	450.646	0.23	Yes
Sample #	Low 3-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	579.751	—	—
1	5	800~1000	50 ± 10	MPPT	579.413	—	—
2	5	800~1000	50 ± 10	MPPT	579.245	0.09	Yes
Sample #	Low 3-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	581.861	—	—
1	5	800~1000	50 ± 10	MPPT	581.607	—	—
2	5	800~1000	50 ± 10	MPPT	580.761	0.19	Yes
Sample #	High 3-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		

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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	—	—	—	—	616.764	—	—
1	5	800~1000	50 ± 10	MPPT	616.464	—	—
2	5	800~1000	50 ± 10	MPPT	615.911	0.14	Yes
Sample #	High 3-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	618.138	—	—
1	5	800~1000	50 ± 10	MPPT	617.839	—	—
2	5	800~1000	50 ± 10	MPPT	617.321	0.13	Yes
Sample #	Low 4-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
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 (F)	—	—	—	—	608.019	—	—
1	5	800~1000	50 ± 10	MPPT	604.880	—	—
2	5	800~1000	50 ± 10	MPPT	603.587	0.73	Yes
Initial (R)	—	—	—	—	450.932	—	—
1	5	800~1000	50 ± 10	MPPT	448.517	—	—
2	5	800~1000	50 ± 10	MPPT	447.290	0.81	Yes
Sample #	Low 4-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
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 (F)	—	—	—	—	609.659	—	—
1	5	800~1000	50 ± 10	MPPT	608.164	—	—
2	5	800~1000	50 ± 10	MPPT	606.693	0.49	Yes
Initial (R)	—	—	—	—	447.959	—	—
1	5	800~1000	50 ± 10	MPPT	446.072	—	—
2	5	800~1000	50 ± 10	MPPT	444.294	0.82	Yes
Sample #	High 4-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
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 (F)	—	—	—	—	620.014	—	—
1	5	800~1000	50 ± 10	MPPT	618.575	—	—

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2	5	800~1000	50 ± 10	MPPT	616.521	0.56	Yes
Initial (R)	—	—	—	—	459.217	—	—
1	5	800~1000	50 ± 10	MPPT	456.783	—	—
2	5	800~1000	50 ± 10	MPPT	455.451	0.82	Yes
Sample #	High 4-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	($P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	621.469	—	—
1	5	800~1000	50 ± 10	MPPT	618.283	—	—
2	5	800~1000	50 ± 10	MPPT	616.391	0.82	Yes
Initial (R)	—	—	—	—	462.510	—	—
1	5	800~1000	50 ± 10	MPPT	460.157	—	—
2	5	800~1000	50 ± 10	MPPT	459.230	0.71	Yes
Sample #	Low 5-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	610.170	—	—
1	5	800~1000	50 ± 10	MPPT	608.288	—	—
2	5	800~1000	50 ± 10	MPPT	605.706	0.73	Yes
Initial (R)	—	—	—	—	448.977	—	—
1	5	800~1000	50 ± 10	MPPT	447.420	—	—
2	5	800~1000	50 ± 10	MPPT	446.199	0.63	Yes
Sample #	Low 5-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	605.406	—	—
1	5	800~1000	50 ± 10	MPPT	603.129	—	—
2	5	800~1000	50 ± 10	MPPT	601.743	0.61	Yes
Initial (R)	—	—	—	—	444.712	—	—
1	5	800~1000	50 ± 10	MPPT	442.966	—	—
2	5	800~1000	50 ± 10	MPPT	442.470	0.51	Yes
Sample #	High 5-1	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	$P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)

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Initial (F)	—	—	—	—	620.243	—	—
1	5	800~1000	50 ± 10	MPPT	618.847	—	—
2	5	800~1000	50 ± 10	MPPT	616.555	0.60	Yes
Initial (R)	—	—	—	—	458.972	—	—
1	5	800~1000	50 ± 10	MPPT	455.972	—	—
2	5	800~1000	50 ± 10	MPPT	454.880	0.90	Yes
Sample #	High 5-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-15 / 2021-09-17		
Test cycle	Integrated irradiation (kWh/m^2)	Irradiance (W/m^2)	Module temperature (°C)	Resistive load	P_{max} (W) at the end of cycle	($P_{max} – P_{min}$) / $P_{average}$ (%)	Stable (Yes/No)
Initial (F)	—	—	—	—	621.188	—	—
1	5	800~1000	50 ± 10	MPPT	618.137	—	—
2	5	800~1000	50 ± 10	MPPT	616.109	0.82	Yes
Initial (R)	—	—	—	—	462.609	—	—
1	5	800~1000	50 ± 10	MPPT	461.390	—	—
2	5	800~1000	50 ± 10	MPPT	459.074	0.77	Yes
Sample #	Low 6-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	608.391	—	—
1	5	800~1000	50 ± 10	MPPT	606.546	—	—
2	5	800~1000	50 ± 10	MPPT	605.378	0.50	Yes
Sample #	Low 6-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	609.609	—	—
1	5	800~1000	50 ± 10	MPPT	606.730	—	—
2	5	800~1000	50 ± 10	MPPT	605.754	0.63	Yes
Sample #	High 6-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	619.930	—	—
1	5	800~1000	50 ± 10	MPPT	618.537	—	—
2	5	800~1000	50 ± 10	MPPT	616.215	0.60	Yes
Sample #	High 6-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		

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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	—	—	—	—	620.669	—	—
1	5	800~1000	50 ± 10	MPPT	618.627	—	—
2	5	800~1000	50 ± 10	MPPT	616.336	0.70	Yes
Sample #	Low 7-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	610.194	—	—
1	5	800~1000	50 ± 10	MPPT	607.830	—	—
2	5	800~1000	50 ± 10	MPPT	604.661	0.91	Yes
Sample #	Low 7-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	608.431	—	—
1	5	800~1000	50 ± 10	MPPT	605.719	—	—
2	5	800~1000	50 ± 10	MPPT	603.108	0.88	Yes
Sample #	High 7-1	Test Date (YYYY-MM-DD) start/end ..... :			2022-09-20 / 2022-09-22		
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	—	—	—	—	619.530	—	—
1	5	800~1000	50 ± 10	MPPT	617.810	—	—
2	5	800~1000	50 ± 10	MPPT	616.497	0.49	Yes
Sample #	High 7-2	Test Date (YYYY-MM-DD) start/end .....:			2022-09-20 / 2022-09-22		
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	—	—	—	—	620.454	—	—
1	5	800~1000	50 ± 10	MPPT	618.780	—	—
2	5	800~1000	50 ± 10	MPPT	617.095	0.54	Yes
Supplementary information: N/A							
☐ Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end .....:						
Low 1							
Low 2							

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High 1	
High 2	
Test method description:	
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure	

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side front)							P
Test Date [YYYY-MM-DD] ..... :	2022-09-22						—
	Lower end power class		Higher end power class				—
Pmax(lab) (W) ..... :	≥ 597.478		≥ 640.154				—
$\bar{P}_{max}(Lab)$ (W)	≥ 615.956		≥ 659.953				—
Voc(lab) (V) ..... :	≤ 45.243		≤ 47.078				—
Isc (lab) (A) ..... :	≤ 18.417		≤ 18.872				—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1-1	18.201	44.992	17.119	37.242	637.546	77.85	P
Low 1-2	18.193	45.002	17.112	37.234	637.148	77.82	P
High 1-1	18.416	45.875	17.286	38.192	660.187	78.15	P
High 1-2	18.407	45.896	17.285	38.181	659.959	78.12	P
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] ..... :	2022-09-17						—
	Lower end power class		Higher end power class				—
Pmax(lab) (W) ..... :	≥ 554.801		≥ 597.478				—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959		≥ 615.956				—
Voc(lab) (V) ..... :	≤ 55.128		≤ 56.962				—
Isc (lab) (A) ..... :	≤ 14.010		≤ 14.464				—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 2-1	13.583	55.020	12.629	45.852	579.065	77.48	P
Low 2-2	13.684	55.103	12.795	45.669	584.335	77.50	P
High 2-1	13.614	56.231	13.162	46.811	616.126	79.84	P
High 2-2	13.681	55.902	13.282	46.513	617.786	80.78	P

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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] ..... :	2022-09-22						—
	Lower end power class				Higher end power class		—
Pmax(lab) (W) ..... :	≥ 554.801				≥ 597.478		—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959				≥ 615.956		—
Voc(lab) (V) ..... :	≤ 55.230				≤ 57.064		—
Isc (lab) (A) ..... :	≤ 13.979				≤ 14.525		—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3-1	13.577	55.112	12.647	45.801	579.245	77.41	P
Low 3-2	13.583	55.102	12.702	45.722	580.761	77.60	P
High 3-1	13.606	56.233	13.156	46.816	615.911	80.50	P
High 3-2	13.612	55.917	13.274	46.506	617.321	81.10	P
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] ..... :	2022-09-22						—
	Lower end power class				Higher end power class		—
Pmax(lab) (W) ..... :	≥ 554.801				≥ 597.478		—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959				≥ 615.956		—
Voc(lab) (V) ..... :	≤ 55.128				≤ 56.962		—
Isc (lab) (A) ..... :	≤ 13.898				≤ 14.444		—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	13.495	56.621	12.821	47.078	603.587	78.99	P
Low 4-2	13.677	56.092	13.041	46.522	606.693	79.08	P
High 4-1	13.922	56.399	13.240	46.565	616.521	78.52	P
High 4-2	13.989	56.362	13.254	46.506	616.391	78.18	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

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TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization (single-side front)							P
Test Date [YYYY-MM-DD] ..... :	2022-09-22						—
	Lower end power class		Higher end power class				—
Pmax(lab) (W) ..... :	≥ 554.801		≥ 597.478				—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959		≥ 615.956				—
Voc(lab) (V) ..... :	≤ 55.128		≤ 56.962				—
Isc (lab) (A) ..... :	≤ 13.898		≤ 14.444				—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 5-1	13.787	55.842	13.183	45.946	605.706	78.67	P
Low 5-2	13.560	56.231	12.852	46.821	601.743	78.92	P
High 5-1	13.916	56.363	13.245	46.550	616.555	78.61	P
High 5-2	13.979	56.375	13.214	46.555	616.178	78.06	P
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] ..... :	2022-09-22						—
	Lower end power class		Higher end power class				—
Pmax(lab) (W) ..... :	≥ 554.801		≥ 597.478				—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959		≥ 615.956				—
Voc(lab) (V) ..... :	≤ 55.128		≤ 56.962				—
Isc (lab) (A) ..... :	≤ 13.979		≤ 14.505				—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 6-1	13.570	56.288	12.825	47.203	605.378	79.26	P
Low 6-2	13.649	56.071	12.994	46.918	605.754	79.15	P
High 6-1	13.916	56.356	13.234	46.563	616.215	78.57	P
High 6-2	13.981	56.357	13.246	46.530	616.336	78.22	P
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] ..... :	2022-09-22	—

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	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ 554.801	≥ 597.478	—
$\bar{P}_{max}(Lab)$ (W)	≥ 571.959	≥ 615.956	—
Voc(lab) (V) ..... :	≤ 55.128	≤ 56.962	—
Isc (lab) (A) ..... :	≤ 13.959	≤ 14.505	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 7-1	13.500	56.618	12.945	46.710	604.661	79.11	P
Low 7-2	13.606	56.398	12.967	46.511	603.108	78.60	P
High 7-1	13.915	56.350	13.260	46.493	616.497	78.62	P
High 7-2	13.990	56.345	13.274	46.489	617.095	78.29	P

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] ..... :	2022-09-17		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—
$\bar{P}_{max}(Lab)$ (W)	≥ N/A	≥ N/A	—
Voc(lab) (V) ..... :	≤ N/A	≤ N/A	—
Isc (lab) (A) ..... :	≤ N/A	≤ N/A	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 2-1	9.885	54.797	8.918	47.956	427.672	78.95	—
Low 2-2	9.902	56.211	8.846	48.901	432.578	77.18	—
High 2-1	10.018	55.711	9.344	48.313	451.444	80.86	—
High 2-2	10.057	55.387	9.392	47.981	450.646	80.90	—

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] ..... :	2022-09-22		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—

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

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	9.883	56.092	9.262	48.293	447.290	80.69	—
Low 4-2	9.953	55.726	9.244	48.063	444.294	80.10	—
High 4-1	10.407	55.907	9.389	48.509	455.451	82.37	—
High 4-2	10.464	55.917	9.471	48.488	459.230	78.49	—

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] ..... :	2022-09-22		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—
$\bar{P}_{max}(Lab)$ (W)	≥ N/A	≥ N/A	—
Voc(lab) (V) ..... :	≤ N/A	≤ N/A	—
Isc (lab) (A) ..... :	≤ N/A	≤ N/A	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 5-1	9.999	55.376	9.369	47.625	446.199	80.58	—
Low 5-2	9.871	55.690	9.226	47.959	442.470	80.49	—
High 5-1	10.419	55.901	9.378	48.505	454.880	78.10	—
High 5-2	10.464	55.954	9.467	48.492	459.074	78.41	—

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 (Equivalent irradiance)			—
Test Date [YYYY-MM-DD] ..... :	2022-09-22		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—
$\bar{P}_{max}(Lab)$ (W)	≥ N/A	≥ N/A	—
Voc(lab) (V) ..... :	≤ N/A	≤ N/A	—

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Isc (lab) (A) ..... :	≤ N/A	≤ N/A	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 2-1	14.656	56.194	13.831	46.052	636.945	77.34	—
Low 2-2	14.551	56.115	13.754	46.162	634.912	77.76	—
High 2-1	15.029	56.183	14.367	46.654	670.273	79.35	—
High 2-2	15.107	55.942	14.472	46.376	671.135	79.39	—

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

1090W/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 (Equivalent irradiance)			—
Test Date [YYYY-MM-DD] ..... :	2022-09-22		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—
$\bar{P}_{max}(Lab)$ (W)	≥ N/A	≥ N/A	—
Voc(lab) (V) ..... :	≤ N/A	≤ N/A	—
Isc (lab) (A) ..... :	≤ N/A	≤ N/A	—
Test method .....:	☒ Simulator ☐ Natural sunlight		—

Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 4-1	15.086	56.440	14.294	46.573	665.714	78.19	—
Low 4-2	15.009	56.568	14.234	46.734	665.212	78.35	—
High 4-1	15.226	56.254	14.459	46.655	674.585	78.76	—
High 4-2	15.319	56.292	14.565	46.579	678.423	78.67	—

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

1090W/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 (Equivalent irradiance)			—
Test Date [YYYY-MM-DD] ..... :	2022-09-22		—
	Lower end power class	Higher end power class	—
Pmax(lab) (W) ..... :	≥ N/A	≥ N/A	—
$\bar{P}_{max}(Lab)$ (W)	≥ N/A	≥ N/A	—
Voc(lab) (V) ..... :	≤ N/A	≤ N/A	—
Isc (lab) (A) ..... :	≤ N/A	≤ N/A	—

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Test method.....:	☒ Simulator	☐ Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 5-1	15.200	56.131	14.426	46.205	666.553	78.12	—
Low 5-2	15.016	56.139	14.352	45.915	658.972	78.17	—
High 5-1	15.232	56.224	14.515	46.573	676.007	78.94	—
High 5-2	15.308	56.311	14.576	46.598	679.212	78.79	—

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

1090W/m^2 equivalent irradiance is the effective value calculated when backside irradiance is 135W/m^2.

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