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Test Report

No. TRPVP09048/23P/01

Commission test
according to IEC 61215-2

Applicant: **Shenzhen Aiko Digital Energy Technology Co., Ltd.**

Room 607, Building B, Tengfei Industrial Building, No.6 taohua Road
Fubao Community, Fubao Street, Futian District, Shenzhen

File No.: PVP09048/23P-01

Designed: by: Xavier Xie 数字签名者：Xavier Xie 日期：2023.10.18 16:34:14 +08'00'
(Project Engineer)

Reviewed: by: Bella Liu 数字签名者：Bella Liu 日期：2023.10.18 19:03:31 +08'00'
(Technical Certifier)

Applicant ..... :	**Shenzhen Aiko Digital Energy Technology Co., Ltd.** Room 607, Building B, Tengfei Industrial Building, No.6 taohua Road Fubao Community, Fubao Street, Futian District, Shenzhen
Manufacturer ..... :	**Shenzhen Aiko Digital Energy Technology Co., Ltd.** Room 607, Building B, Tengfei Industrial Building, No.6 taohua Road Fubao Community, Fubao Street, Futian District, Shenzhen
Order No. ..... :	QT-PVP09048/23P
Date of Application ..... :	09/12/2023
Product ..... :	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
Module type(s) ..... :	**Single Glass PV Modules with Mono-crystalline Silicon Solar Cells:** JKM580N-72HL4-V AIKO-A610-MAH72Mw LR5-72HTH-580M
General Information • Maximum System Voltage.... : • Electrical Protection Class.... : • Fire Safety Class ..... :	 DC 1500V Class II N/A
Type of examination ..... :	Commission test only
Testing Period ..... :	09/26/2023 - 09/26/2023
Testing Laboratory..... :	**TÜV NORD PV Science and Technology Co., Ltd.** Zone E, 1st Floor, East side of South Building 3, No. 50, Beiguandu Road, Yuexi Street, Suzhou, Jiangsu Province, China

Test results listed in this test report refer exclusively to the mentioned test sample.

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The submitted test samples as described in the reports hereunder are tested based on the requirements:
IEC 61215-2:2021 “Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures”

List of contents

Summary of testing
According to the enquiry of the applicant, a commission test was performed according to IEC 61215-2:2021 for PV modules. JKM580N-72HL4-V, AIKO-A610-MAH72Mw and LR5-72HTH-580M was conducted with STC follow client's application. All tests were successfully completed.

General remarks

Test item particulars:	
Accessories and detachable parts included in the evaluation .....:	N/A
Options included .....:	N/A
Abbreviations used in the report:	
HF - Humidity Freeze	TC - Temperature Cycling
DH - Damp Heat	Vmp - Maximum power voltage
Imp - Maximum power current	Voc - Open circuit voltage
Isc - Short circuit current	FF - Fill Factor
Pmax - Maximum power	α - Current temperature coefficient
NMOT - Nominal Module Operating Temperature	β - Voltage temperature coefficient
STC - Standard Test Conditions	γ - Power temperature coefficient
CTI - Comparative Tracking Index	PTI - Proof Tracking Index
RTI - Relative Temperature Index	RTE - Relative Thermal Endurance index
TI - Temperature Index	DTI - Distance through insulation
Cl - Clearances	Cr - Creepage distances
PD - Pollution Degree	MG - Material Groups
Possible test case verdicts:	
Test case does not apply to the test object .....:	Not Applicable (N/A)
Test object does meet the requirement .....:	Pass (P)
Test object does not meet the requirement .....:	Fail (F)
Other remarks:	
The test verdicts 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 testing laboratory. “(see Annex #)” refers to additional information appended to the report. “(see Table #)” refers to a table appended to the report. Power degradation data expressed in negative value indicates a reduction of maximum power output. Power degradation data expressed in positive value indicates an increment of maximum power output. Throughout this report, a point is used as the decimal separator.	

General product information

Module type: JKM580N-72HL4-V

Product Electrical Ratings at STC:	
Nominal maximum power (Pmax) [W] with tolerance .....:	580 ± 3%
Nominal open circuit voltage at (Voc) [V] with tolerance...:	51.02 ± 3%
Nominal maximum power voltage (Vmp) [V].....:	42.37
Nominal short circuit current at (Isc) [A] with tolerance.....:	14.47 ± 4%
Nominal maximum power current (Imp) [A].....:	13.69
Product Safety Ratings:	
Maximum system voltage [V].....:	1500
Fuse rating [A] .....:	25
Application Class .....:	Class A
Safety class in accordance with IEC 61140 .....:	Class II
Fire safety class.....:	N/A

Module type: AIKO-A610-MAH72Mw

Product Electrical Ratings at STC:	
Nominal maximum power (Pmax) [W] with tolerance .....:	610 + 3%
Nominal open circuit voltage at (Voc) [V] with tolerance...:	53.60± 3%
Nominal maximum power voltage (Vmp) [V].....:	45.41
Nominal short circuit current at (Isc) [A] with tolerance.....:	14.03 ± 3%
Nominal maximum power current (Imp) [A].....:	13.43
Product Safety Ratings:	
Maximum system voltage [V].....:	1500
Fuse rating [A] .....:	25
Application Class .....:	Class A
Safety class in accordance with IEC 61140 .....:	Class II
Fire safety class.....:	N/A

Module type: LR5-72HTH-580M

Product Electrical Ratings at STC:	
Nominal maximum power (Pmax) [W] with tolerance .....:	580 + 3%
Nominal open circuit voltage at (Voc) [V] with tolerance...:	52.21± 3%
Nominal maximum power voltage (Vmp) [V].....:	44.06
Nominal short circuit current at (Isc) [A] with tolerance.....:	14.20 ± 3%
Nominal maximum power current (Imp) [A].....:	13.17
Product Safety Ratings:	
Maximum system voltage [V].....:	1500
Fuse rating [A] .....:	25
Application Class .....:	Class A
Safety class in accordance with IEC 61140 .....:	Class II
Fire safety class.....:	N/A

Module group assignment

Module type: JKM580N-72HL4-V

Sample #	Serial number	Dimension (l x w x h) [mm]	Remark
1	63FX7A23C131901093106983	2278 x 1134 x 35	STC

Module type: AIKO-A610-MAH72Mw

Sample #	Serial number	Dimension (l x w x h) [mm]	Remark
2	Z012309E330000070	2278 x 1134 x 35	STC

Module type: LR5-72HTH-580M

Sample #	Serial number	Dimension (l x w x h) [mm]	Remark
3	LRP004088230200117152	2278 x 1134 x 35	STC

Clause	Requirement + Test	Result - Remark	Verdict

Test result overview

Module type: JKM580N-72HL4-V

Initial examinations			-
MQT06.1	Performance at STC ..... :	See table 4.6	-

Module type: AIKO-A610-MAH72Mw

Initial examinations			-
MQT06.1	Performance at STC ..... :	See table 4.6	-

Module type: LR5-72HTH-580M

Initial examinations			-
MQT06.1	Performance at STC ..... :	See table 4.6	-

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

Test results of IEC 61215-2

Module type: JKM580N-72HL4-V

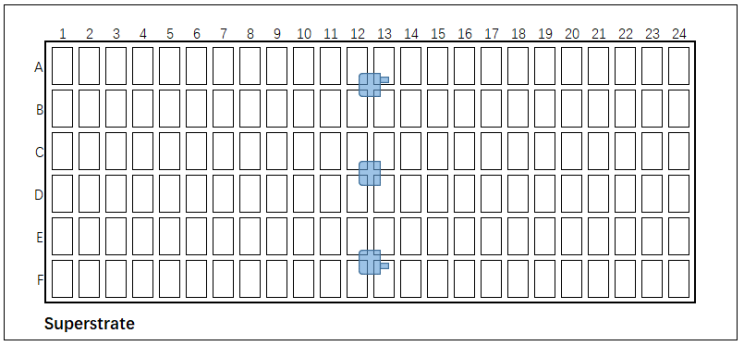
4.6 Performance at STC (initial) - MQT06.1								-
Test date [MM/DD/YYYY].....:	09/26/2023							-
Test method .....:	☒ Simulator / ☐ Natural sunlight							-
Irradiance [W/m²].....:	Corrected to 1000							-
Module temperature [°C] .....:	Corrected to 25							-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	Ratio [%]	-
1-front	52.102	44.381	13.573	12.838	569.77	80.57	100.00	-
1-10%	52.109	44.825	13.569	12.643	566.70	80.15	99.46	-
1-20%	52.123	45.514	13.575	12.060	548.92	77.58	96.34	-
1-30%	52.119	45.962	13.572	11.349	521.62	73.74	91.55	-
1-40%	52.137	46.251	13.569	10.731	496.34	70.16	87.11	-
1-50%	52.128	46.481	13.579	10.059	467.55	66.05	82.06	-
1-60%	52.121	46.629	13.570	9.489	442.45	62.56	77.65	-
1-70%	52.135	46.836	13.565	8.762	410.40	58.03	72.03	-
1-80%	52.128	46.989	13.567	8.220	386.27	54.62	67.79	-
1-90%	52.100	47.185	13.567	7.646	360.77	51.04	63.32	-
1-100%	52.112	47.122	13.564	7.123	335.65	47.49	58.91	-

Supplementary information:

Sample #-front: Exposure under 1000W/m² on the front side with rear side covered by black cover.

Sample #-xx%: Shadowed Cell A1 for xx% and exposure under 1000W/m² on the front side with rear side covered by black cover.

Ratio [%]: The ratio is the Pmax compared to the Pmax without shading.



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

Module type: AIKO-A610-MAH72Mw

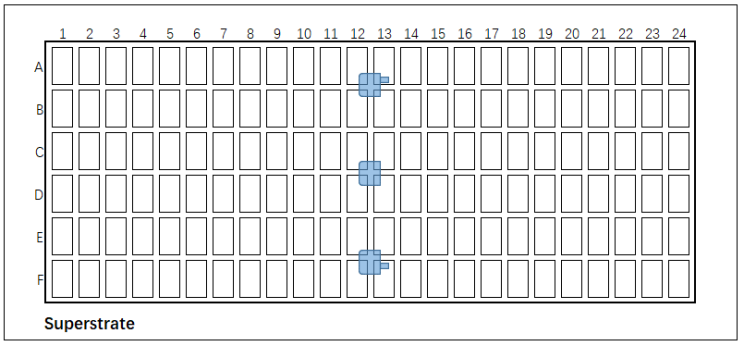
4.6 Performance at STC (initial) - MQT06.1								-
Test date [MM/DD/YYYY].....:	09/26/2023							-
Test method .....:	☒ Simulator / ☐ Natural sunlight							-
Irradiance [W/m²].....:	Corrected to 1000							-
Module temperature [°C] .....:	Corrected to 25							-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	Ratio [%]	-
2-front	53.505	46.363	14.015	13.156	609.93	81.34	100.00	-
2-10%	53.525	46.766	14.015	12.987	607.34	80.96	99.58	-
2-20%	53.517	47.333	14.019	12.454	589.47	78.57	96.65	-
2-30%	53.520	43.777	14.015	12.949	566.87	75.58	92.94	-
2-40%	53.514	43.092	14.017	13.076	563.48	75.12	92.38	-
2-50%	53.522	42.730	14.018	13.110	560.19	74.67	91.84	-
2-60%	53.494	42.464	14.021	13.131	557.60	74.34	91.42	-
2-70%	53.482	42.185	14.017	13.153	554.85	74.01	90.97	-
2-80%	53.439	41.981	14.017	13.164	552.62	73.77	90.60	-
2-90%	53.435	41.808	14.017	13.170	550.61	73.51	90.27	-
2-100%	53.481	41.633	14.016	13.165	548.11	73.12	89.86	-

Supplementary information:

Sample #-front: Exposure under 1000W/m² on the front side with rear side covered by black cover.

Sample #-xx%: Shadowed Cell A1 for xx% and exposure under 1000W/m² on the front side with rear side covered by black cover.

Ratio [%]: The ratio is the Pmax compared to the Pmax without shading.



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

Module type: LR5-72HTH-580M

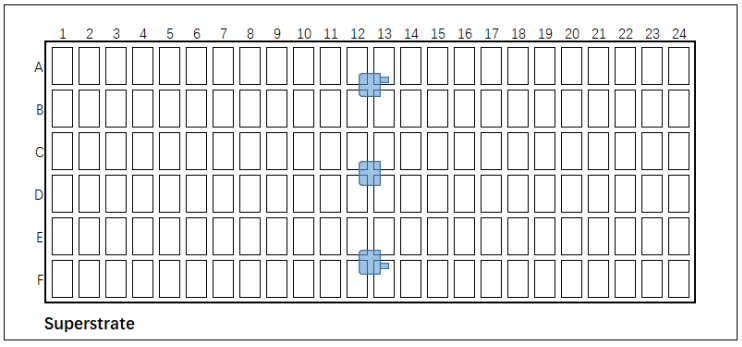
4.6 Performance at STC (initial) - MQT06.1								-
Test date [MM/DD/YYYY].....:	09/26/2023							-
Test method .....:	☒ Simulator / ☐ Natural sunlight							-
Irradiance [W/m²].....:	Corrected to 1000							-
Module temperature [°C] .....:	Corrected to 25							-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	Ratio [%]	-
3-front	52.425	44.581	13.819	13.081	583.18	80.50	100.00	-
3-10%	52.422	44.977	13.820	12.897	580.07	80.07	99.47	-
3-20%	52.415	45.607	13.834	12.345	563.01	77.64	96.54	-
3-30%	52.401	46.052	13.832	11.617	534.99	73.81	91.74	-
3-40%	52.403	46.399	13.836	10.961	508.60	70.15	87.21	-
3-50%	52.423	46.656	13.831	10.280	479.61	66.15	82.24	-
3-60%	52.414	46.832	13.828	9.704	454.46	62.70	77.93	-
3-70%	52.405	47.131	13.828	8.938	421.27	58.13	72.24	-
3-80%	52.398	47.121	13.833	8.419	396.70	54.73	68.02	-
3-90%	52.391	47.211	13.827	7.848	370.50	51.14	63.53	-
3-100%	52.404	47.295	13.832	7.088	335.22	46.25	57.48	-

Supplementary information:

Sample #-front: Exposure under 1000W/m² on the front side with rear side covered by black cover.

Sample #-xx%: Shadowed Cell A1 for xx% and exposure under 1000W/m² on the front side with rear side covered by black cover.

Ratio [%]: The ratio is the Pmax compared to the Pmax without shading.



Annex 1: List of measurement equipment

Measurement / testing	Measuring equipment	Equipment ID	Calibration due date
Performance at STC	Pulsed Solar Simulator	TNRDEQ001	02/21/2024

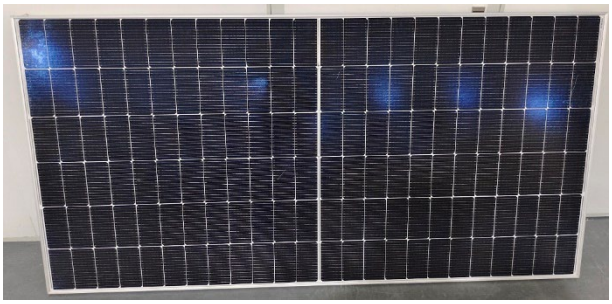
Annex 2: Statement of the estimated uncertainty of the test results

The total measuring uncertainty of Pmpp is ≤ 2.48%

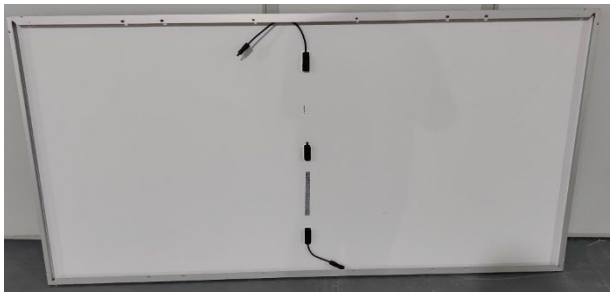
The total measuring uncertainty of Isc is ≤ 2.44%

The total measuring uncertainty of Voc is ≤ 0.90%

Annex 3: Photos
Module type: JKM580N-72HL4-V

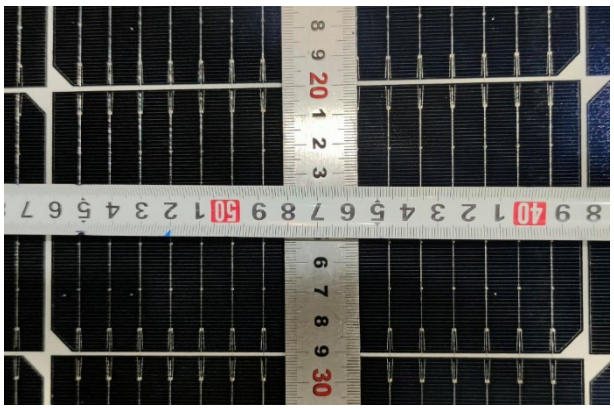


Front overview

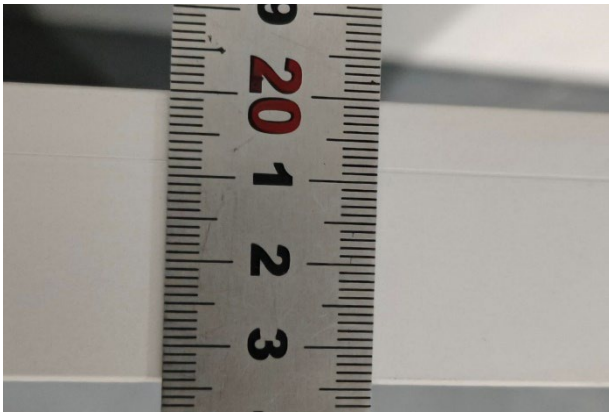


Back overview

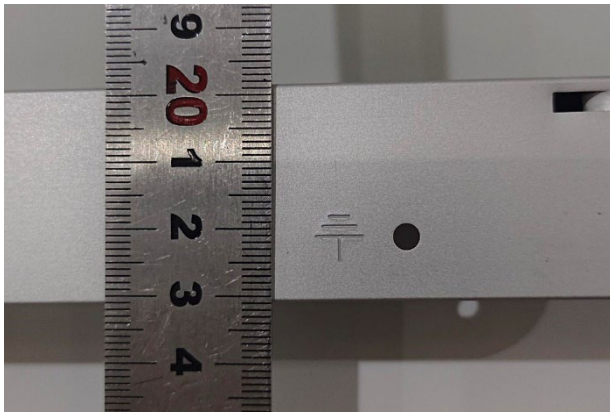
Label (Not stuck on the modules)



Solar cell



Frame



Grounding Mark

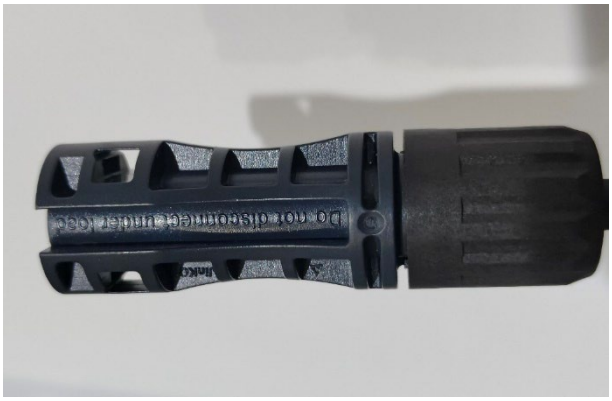
Junction box (PV-JK09ESxy)

Junction box (opened)

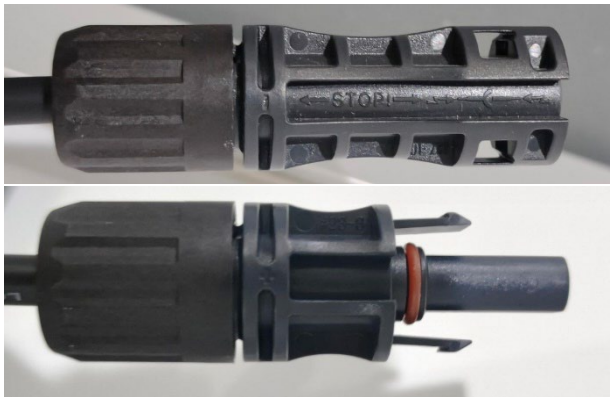
N/A

Bypass diode (N/A)

Cable (62930 IEC 131 1x4.0mm²)



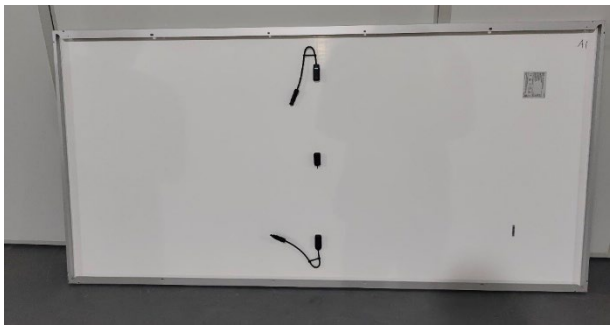
Mark (Do not disconnect under load)



Connectors (not specified)

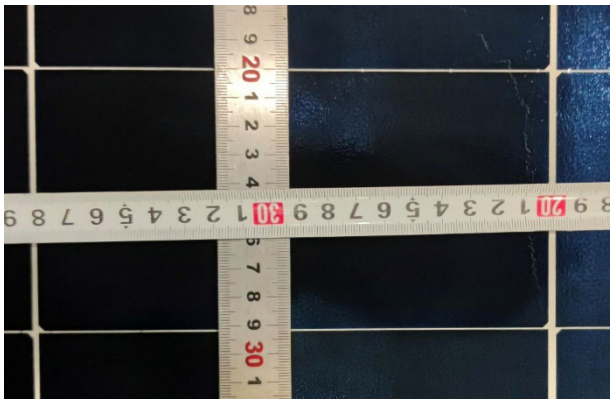
Module type: AIKO-A610-MAH72Mw

Front overview

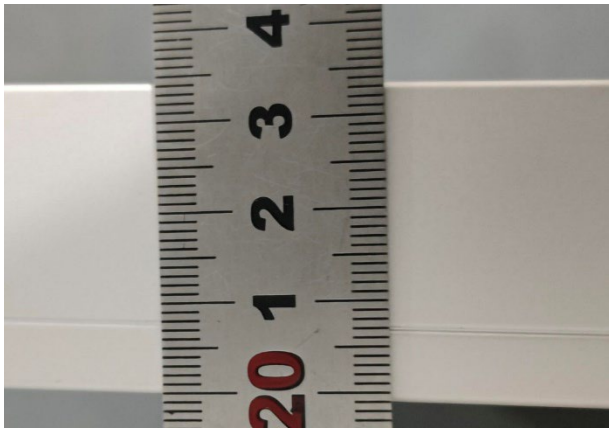


Back overview

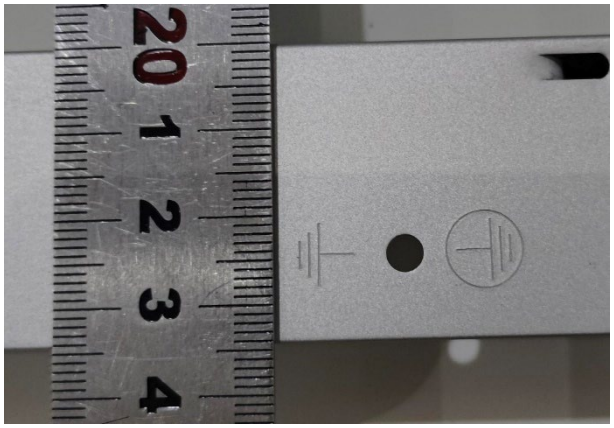
Label (Not stuck on the modules)



Solar cell



Frame



Grounding Mark

Junction box (PV-ZH011C-5)

Junction box (opened)

N/A

Bypass diode (N/A)

Cable (62930 IEC 131 1x4.0mm²)

Mark (Do not disconnect under load)

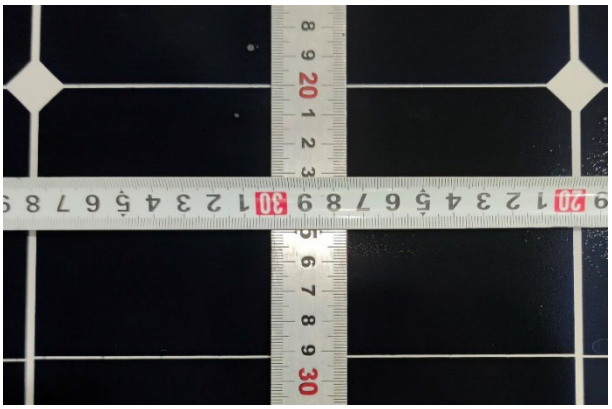
Connectors (PV-ZH202B)

Module type: LR5-72HTH-580M

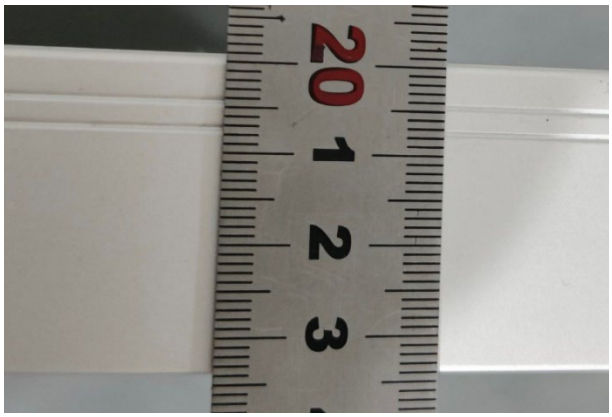
Front overview

Back overview

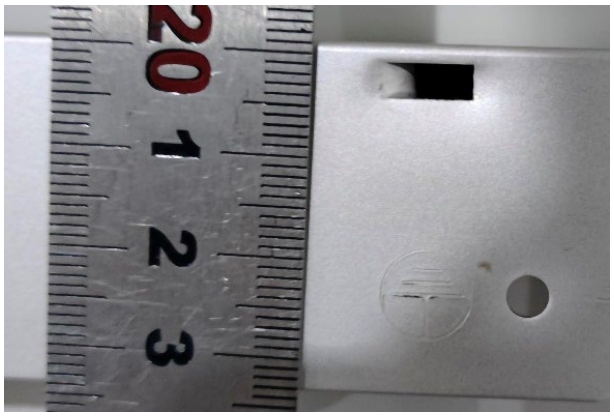
Label (Not stuck on the modules)



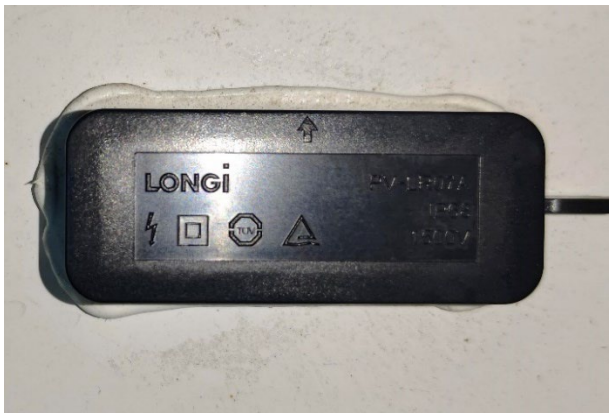
Solar cell



Frame



Grounding Mark



Junction box (PV-LR07A)

Junction box (opened)

N/A

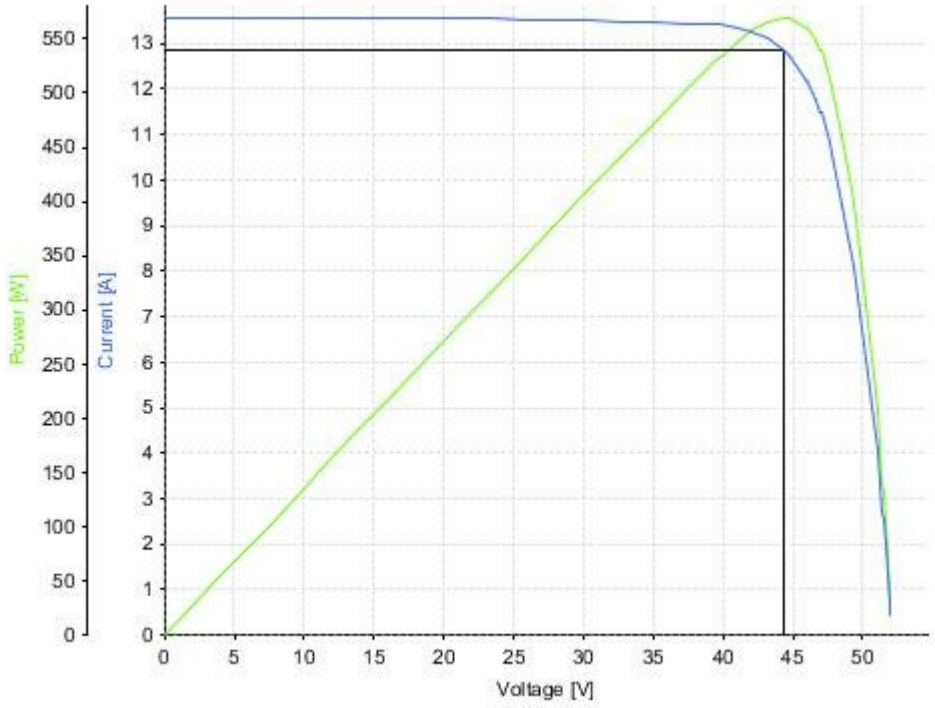
Bypass diode (N/A)

Cable (62930 IEC 131 1x4.0mm²)

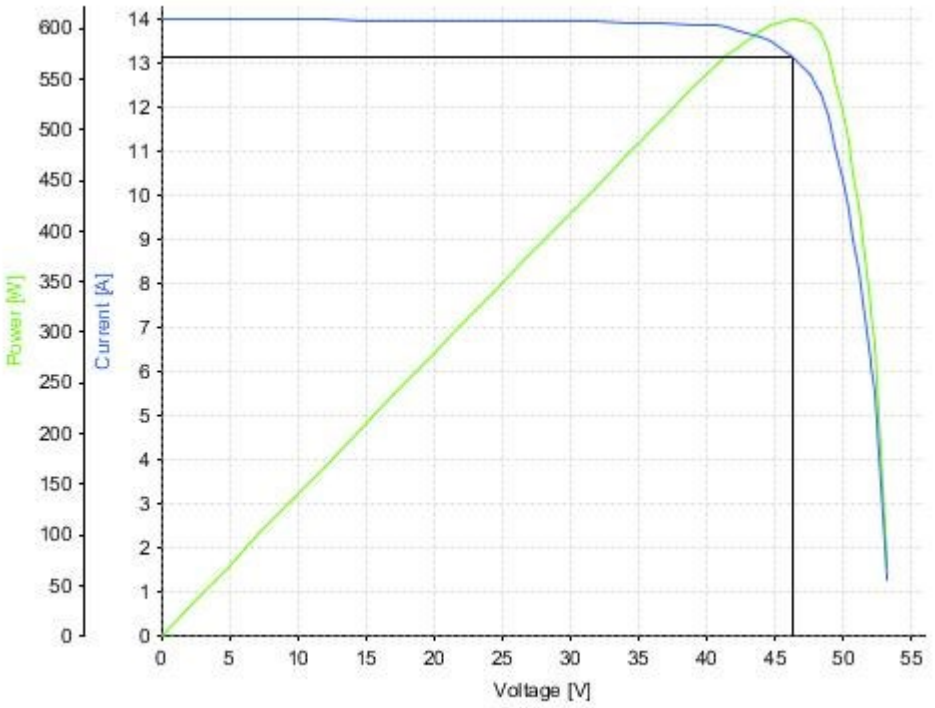
Mark (Do not disconnect under load)

Connectors (PV-LR5)

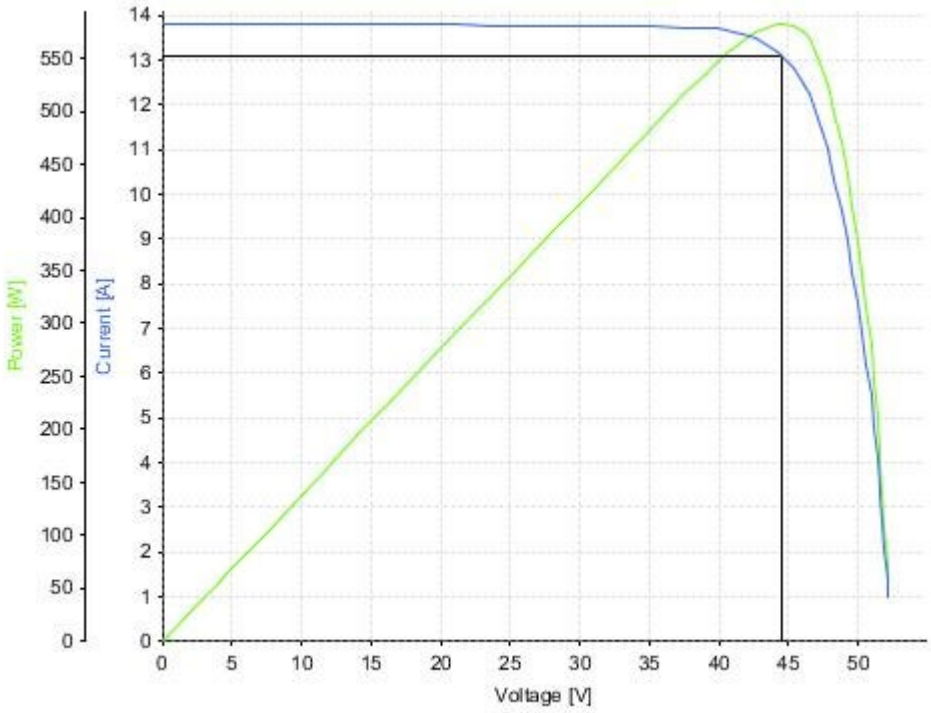
Annex 4: IV measurement characteristics



Sample #1-front



Sample #2-front



Sample #3-front

----- End of test report -----