

Test Report

No. TRPVP07062/20P/04

Commission Testing
according to IEC / EN 61215-2

Applicant: **Sunrise energy Co., Ltd.**
No.20 Tongzi River West Road, Zhonglou Development Zone,
Changzhou Jiangsu, 213023 P.R. China

File No.: PVP07062/20P-04

Designed: *Nov. 16. 2020* by: *[Signature]*

Reviewed: *Nov. 17. 2020* by: *Bella Lu*

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Applicant	Sunrise energy Co., Ltd. No.20 Tongzi River West Road, Zhonglou Development Zone, Changzhou Jiangsu, 213023 P.R. China
Manufacturer	Sunrise energy Co., Ltd. No.20 Tongzi River West Road, Zhonglou Development Zone, Changzhou Jiangsu, 213023 P.R. China
Order No.	QT-PVP07062/20P_R1
Date of Application	09/16/2020
Product	Crystalline Silicon Photovoltaic Modules
Module type(s)	PV Modules with 6" Half-cut Mono-crystalline Silicon Solar Cells: 144 cells: SR-M672430HLP
General Information • Maximum System Voltage.... : • Electrical Protection Class.... : • Fire Safety Class	DC 1500V Class II N/A
Type of examination	Commission testing only
Testing Period	09/07/2020 - 10/21/2020
Testing Laboratory	TÜV Nord PV Science and Technology Co., Ltd. 2/F., Building 4, No. 880, Ziyue Road, Minhang District, Shanghai, 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 based on the requirements:
IEC 61215-2:2016 / EN 61215-2:2017 + AC:2017 + AC:2018 "Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures"

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Summary of testing

According to the enquiry of the applicant, a commission test was performed according to IEC 61215-2:2016.

Test items see page 7 for details.

Module type SR-M672430HLP was delivered to lab and was conducted with all the related tests.

All tests were successfully completed.

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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	Vmpp - Maximum power voltage
Impp - Maximum power current	Voc - Open circuit voltage
Isc - Short circuit current	FF - Fill Factor
Pmpp - 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
CI - 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.	

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General product information

Module type: SR-M672430HLP

Product Electrical Ratings at STC:	
Nominal maximum power (Pmax) [W] with tolerance	430 (0 ~ +3%)
Nominal open circuit voltage at (Voc) [V] with tolerance ...:	49.22 ±3%
Nominal maximum power voltage (Vmpp) [V]	40.59
Nominal short circuit current at (Isc) [A] with tolerance	11.21 ±3%
Nominal maximum power current (Impp) [A]	10.60
Product Safety Ratings:	
Maximum system voltage [V]	1500
Fuse rating [A]	20
Safety class in accordance with IEC 61140	Class II
Fire safety class	N/A
Recommended maximum series module configurations ..:	N/A
Recommended maximum parallel module configurations :	N/A

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Module group assignment

Module type: SR-M672430HLP

Sample #	Serial number	Dimension (l x w x h) [mm]	Remark
1	H72MMA20071610011	2115 x 1052 x 40	UV15+TC50+HF10

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Clause	Requirement + Test	Result - Remark	Verdict
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Test result overview

Module type: SR-M672430HLP

Initial examinations			-
MQT01	Visual inspection	See table 4.1	P
MQT03	Insulation test.....	See table 4.3	P
MQT15	Wet leakage current test.....	See table 4.15	P
MQT02	Maximum power determination.....	See table 4.2	P

Sample 1#			-
MQT10	UV preconditioning test (15kWh/m ²)	See table 4.10	P
MQT11	Thermal cycling test (50 cycles)	See table 4.11	P
MQT12	Humidity freeze (10 cycles)	See table 4.12	P

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

Test results of IEC / EN 61215-2

Module type: SR-M672430HLP

4.1 Visual inspection (initial) - MQT01		-
Test date [MM/DD/YYYY].....:	09/07/2020	-
Sample #	Nature and position of initial findings - comments or attach photos	-
1	No visual defects	P
Supplementary information: N/A		

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IEC / EN 61215-2							
Clause	Requirement + Test		Result - Remark				Verdict
4.2 Maximum power determination (initial) - MQT02							-
Test date [MM/DD/YYYY].....:			09/07/2020				-
Ambient temperature [°C].....:			Corrected to 25.0				-
Irradiance [W/m²].....:			Corrected to 1000				-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	-
1	48.94	41.45	10.74	10.27	425.8	80.98	-
Supplementary information: N/A							

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IEC / EN 61215-2				
Clause	Requirement + Test	Result - Remark		Verdict
4.3 Insulation test (initial) - MQT03				-
Test date [MM/DD/YYYY].....:		09/07/2020		-
Test voltage applied [V].....:		2 minutes of 1500 and 1 minute of 4000		-
Sample #	Required [MΩ]	Measured [MΩ]	Dielectric breakdown?	-
1	18.0	>1000	No	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m². Area of the module is 2.22m².				

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IEC / EN 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.15 Wet leakage current test (initial) - MQT15			-
Test date [MM/DD/YYYY].....:	09/07/2020		-
Test voltage applied [V].....:	2 minutes of 1500		-
Solution resistivity [Ω/cm] / <3500	1977		-
Solution temperature [$^{\circ}\text{C}$] / 22 ± 2	21.9		-
Sample #	Required [$\text{M}\Omega$]	Measured [$\text{M}\Omega$]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is $40\text{M}\Omega\cdot\text{m}^2$. Area of the module is 2.22m^2 .			

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IEC / EN 61215-2							
Clause	Requirement + Test			Result - Remark			Verdict
4.10 UV preconditioning test - MQT10							
Sample #.....	1						-
Test date [MM/DD/YYYY] / start - end..:	09/16/2020 - 09/21/2020						-
Module temperature [°C] / high - low	63.0 - 57.2						-
UV irradiance (280-400nm) [W/m²].....	139.8						-
Ratio of UV irradiance (280-320nm) (%)	7.0						-
Total dosage of UV irradiation (280-400nm) [kWh/m²].....	15.0						-
Module operation condition	☒ Short circuited / ☐ Pmax						-
Supplementary information: N/A							
4.1 Visual inspection (after UV preconditioning test) - MQT01							
Test date [MM/DD/YYYY].....	09/21/2020						-
Sample #	Nature and position of initial findings - comments or attach photos						-
1	No visual defects						P
Supplementary information: N/A							
4.2 Maximum power determination (after UV preconditioning test) - MQT02							
Test date [MM/DD/YYYY].....	09/21/2020						-
Ambient temperature [°C].....	Corrected to 25.0						-
Irradiance [W/m²].....	Corrected to 1000						-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	-
1	48.82	41.37	10.78	10.32	427.0	81.13	-
Supplementary information: N/A							
4.3 Insulation test (after UV preconditioning test) - MQT03							
Test date [MM/DD/YYYY].....	09/21/2020						-
Test voltage applied [V].....	2 minutes of 1500 and 1 minute of 8000						-
Sample #	Required [MΩ]		Measured [MΩ]		Dielectric breakdown?		-
1	18.0		>1000		No		P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m². Area of the module is 2.22m².							

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IEC / EN 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.15 Wet leakage current test (after UV preconditioning test) - MQT15			-
Test date [MM/DD/YYYY].....:		09/21/2020	-
Test voltage applied [V].....:		2 minutes of 1500	-
Solution resistivity [Ω/cm] / <3500		1978	-
Solution temperature [$^{\circ}\text{C}$] / 22 $\pm$ 2		23.0	-
Sample #	Required [$\text{M}\Omega$]	Measured [$\text{M}\Omega$]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is $40\text{M}\Omega\cdot\text{m}^2$. Area of the module is 2.22m^2 .			

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IEC / EN 61215-2							
Clause	Requirement + Test			Result - Remark			Verdict
4.11 Thermal cycling 50 test - MQT11							
Test date [MM/DD/YYYY] / start - end...:		09/22/2020 - 09/30/2020					-
Total cycles		50					-
Current applied [A]		10.6 during the heat up stage from -40°C to 80°C 0.05 during others					-
Sample #	Open circuits?					-	
1	No					P	
Supplementary information: N/A							
4.1 Visual inspection (after thermal cycling 50 test) - MQT01							
Test date [MM/DD/YYYY].....:		09/30/2020					-
Sample #	Nature and position of initial findings - comments or attach photos					-	
1	No visual defects					P	
Supplementary information: N/A							
4.2 Maximum power determination (after thermal cycling 50 test) - MQT02							
Test date [MM/DD/YYYY].....:		09/30/2020					-
Ambient temperature [°C].....:		Corrected to 25.0					-
Irradiance [W/m²].....:		Corrected to 1000					-
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	-
1	48.90	41.35	10.76	10.26	424.5	80.69	-
Supplementary information: N/A							
4.3 Insulation test (after thermal cycling 50 test) - MQT03							
Test date [MM/DD/YYYY].....:		09/30/2020					-
Test voltage applied [V].....:		2 minutes of 1500 and 1 minute of 4000					-
Sample #	Required [MΩ]		Measured [MΩ]		Dielectric breakdown?		-
1	18.0		>1000		No		P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m². Area of the module is 2.22m².							

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IEC / EN 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.15 Wet leakage current test (after thermal cycling 50 test) - MQT15			-
Test date [MM/DD/YYYY].....:	09/30/2020		-
Test voltage applied [V].....:	2 minutes of 1500		-
Solution resistivity [Ω/cm] / <3500	1990		-
Solution temperature [$^{\circ}\text{C}$] / 22 ± 2	21.8		-
Sample #	Required [$\text{M}\Omega$]	Measured [$\text{M}\Omega$]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is $40\text{M}\Omega\cdot\text{m}^2$. Area of the module is 2.22m^2 .			

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IEC / EN 61215-2								
Clause	Requirement + Test			Result - Remark			Verdict	
4.12 Humidity freeze 10 test - MQT12								-
Test date [MM/DD/YYYY] / start - end...:		10/09/2020 - 10/21/2020					-	
Total cycles		10					-	
Current applied [A]		0.05					-	
Sample #	Open circuits?						-	
1	No						P	
Supplementary information: N/A								
4.1 Visual inspection (after humidity freeze 10 test) - MQT01								-
Test date [MM/DD/YYYY].....:		10/21/2020					-	
Sample #	Nature and position of initial findings - comments or attach photos						-	
1	No visual defects						P	
Supplementary information: N/A								
4.2 Maximum power determination (after humidity freeze 10 test) - MQT02								-
Test date [MM/DD/YYYY].....:		10/21/2020					-	
Ambient temperature [°C].....:		Corrected to 25.0					-	
Irradiance [W/m²].....:		Corrected to 1000					-	
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	-	
1	48.91	41.12	10.73	10.26	421.8	80.33	-	
Supplementary information: N/A								
4.3 Insulation test (after humidity freeze 10 test) - MQT03								-
Test date [MM/DD/YYYY].....:		10/21/2020					-	
Test voltage applied [V].....:		2 minutes of 1500 and 1 minute of 4000					-	
Sample #	Required [MΩ]		Measured [MΩ]		Dielectric breakdown?		-	
1	18.0		>1000		No		P	
Supplementary information: Minimum requirement according to the standard is 40MΩ·m². Area of the module is 2.22m².								

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IEC / EN 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.15 Wet leakage current test (after humidity freeze 10 test) - MQT15			-
Test date [MM/DD/YYYY].....:	10/21/2020		-
Test voltage applied [V].....:	2 minutes of 1500		-
Solution resistivity [Ω/cm] / <3500	2026		-
Solution temperature [$^{\circ}\text{C}$] / 22 ± 2	22.4		-
Sample #	Required [$\text{M}\Omega$]	Measured [$\text{M}\Omega$]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is $40\text{M}\Omega\cdot\text{m}^2$. Area of the module is 2.22m^2 .			

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IEC / EN 61215-2						
Clause	Requirement + Test		Result - Remark			Verdict
Power degradation of each module after each test sequences						-
Sample #	Pmp (initial)	Pmp (final)	Reproducibility	Power degradation	Maximum allowed degradation	-
	[W]	[W]	r [%]	[%]	[%]	
1	425.8	421.8	0.00	-0.94	-5.00	P
Supplementary information: Maximum allowed degradation [%] = -(5 + 0.95 x r)						

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Annex 1: List of measurement equipment

Measurement / testing	Measuring equipment	Equipment ID	Calibration due date
Visual inspection	Luminometer	TNRDTO002	12/18/2020
Maximum power determination	Pulsed Solar Simulator	TNRDEQ001	11/06/2020
Insulation test	Withstanding voltage/Insulation resistance tester	TNRDTI020	09/28/2021
UV-test	UV radiation testing machine	TNRDEQ004	11/06/2020
Humidity freeze test	Temperature/humidity cycling environment chamber	TNRDEQ008	11/04/2020
Thermal cycling test	High and low temperature chamber	TNRDEQ005	11/04/2020
	DC Power Supply	TNRDTI011	12/22/2020
Wet leakage current test	Withstanding voltage/Insulation resistance tester	TNRDTI020	09/28/2021
	Conductive meter	TNRDTI004	12/16/2020

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

The total measuring uncertainty of P_{mpp} is $\leq 2.68\%$

The total measuring uncertainty of I_{sc} is $\leq 2.12\%$

The total measuring uncertainty of V_{oc} is $\leq 0.82\%$

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Annex 3: Photos

Module type: SR-M672430HLP



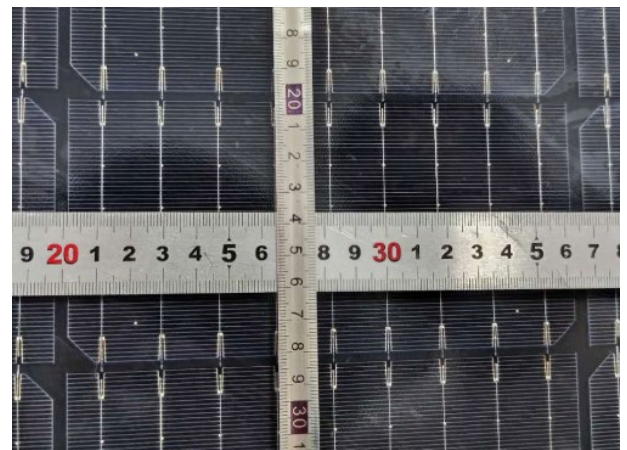
Front overview



Back overview



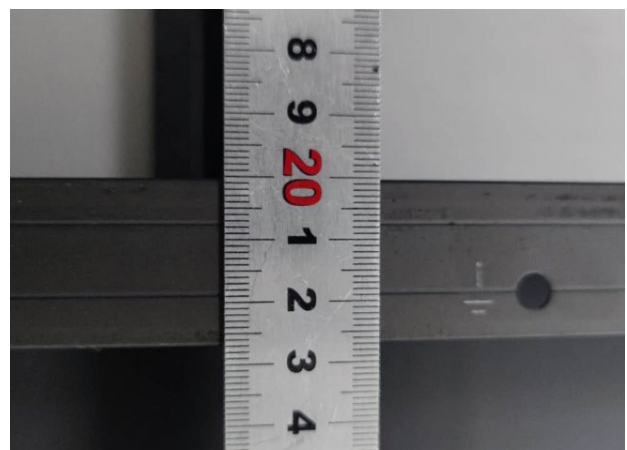
Label



Solar cell



Frame



Grounding Mark

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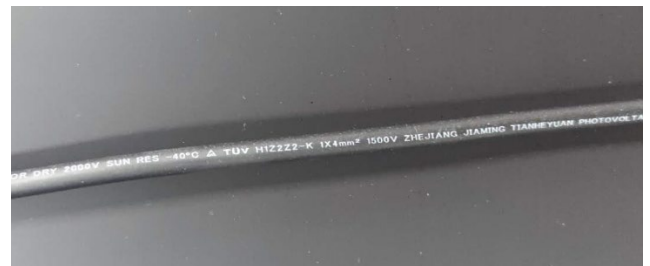


Junction box (FT20xv)



Junction box (opened)

N/A



Bypass diode (Junction box is potted)

Cable (H1Z2Z2-K 1x4.0mm²)



Mark (Do not disconnect under load)



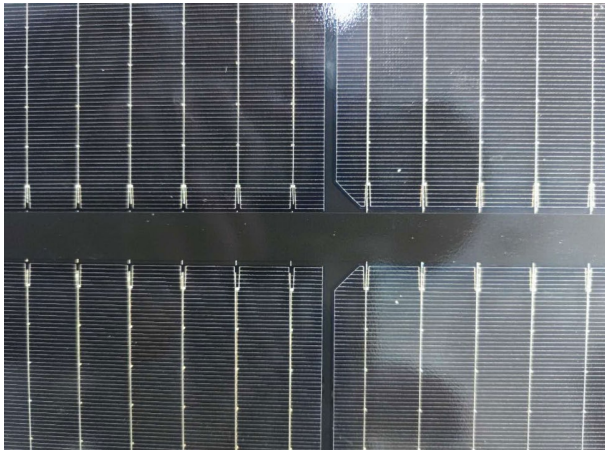
Connectors (not specified)

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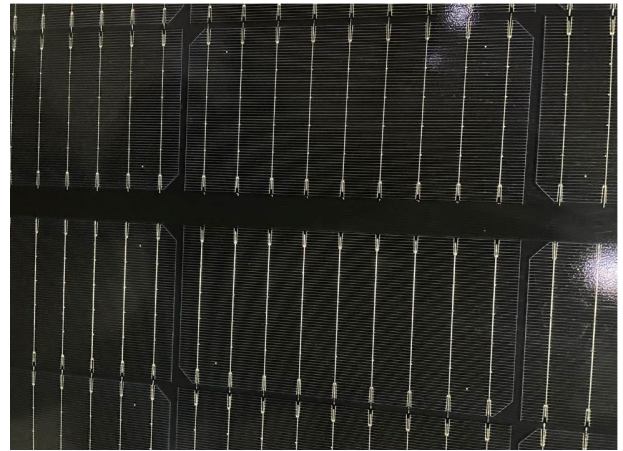
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Annex 4: Photos of insulation tape



Sample #1



Sample #1

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