TÜV NORD (Hangzhou) Co., Ltd.

B502, No.9, JiuhuanRoad
Jinggan District, Hangzhou
China, 310019

Phone: +86 (0) 571 8538 6989
Fax: +86 (0) 571 8538 6986

hzpcert@tuv-nord.com
www.tuv-nord.com/cn

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:

Reviewed: Nov.17. 2020 by: Bella Lu

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.

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”

List of contents

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.

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
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: 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

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

Clause	Requirement + Test	Result - Remark	Verdict

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

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		

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/m^2].....:			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							

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·m^2. Area of the module is 2.22m^2.				

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 [°C] / 22±2 .....:		21.9	-
Sample #	Required [MΩ]	Measured [MΩ]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m^2. Area of the module is 2.22m^2.			

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/m^2].....:			139.8				-
Ratio of UV irradiance (280-320nm) (%) .....:			7.0				-
Total dosage of UV irradiation (280-400nm) [kWh/m^2].....:			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/m^2].....:			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·m^2. Area of the module is 2.22m^2.							

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 [°C] / 22±2 .....:		23.0	-
Sample #	Required [MΩ]	Measured [MΩ]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m^2. Area of the module is 2.22m^2.			

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/m^2].....:			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·m^2. Area of the module is 2.22m^2.							

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 [°C] / 22±2 .....:		21.8	-
Sample #	Required [MΩ]	Measured [MΩ]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m^2. Area of the module is 2.22m^2.			

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/m^2].....:			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·m^2. Area of the module is 2.22m^2.							

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 [°C] / 22±2 .....:		22.4	-
Sample #	Required [MΩ]	Measured [MΩ]	-
1	18.0	>1000	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m^2. Area of the module is 2.22m^2.			

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

Power degradation of each module after each test sequences						-
Sample #	Pmp (initial) [W]	Pmp (final) [W]	Reproducibility *r* [%]	Power degradation [%]	Maximum allowed degradation [%]	-
1	425.8	421.8	0.00	-0.94	-5.00	P
Supplementary information: Maximum allowed degradation [%] = -(5 + 0.95 x *r*)						

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

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

The total measuring uncertainty of Pmpp is ≤ 2.68%

The total measuring uncertainty of Isc is ≤ 2.12%

The total measuring uncertainty of Voc is ≤ 0.82%

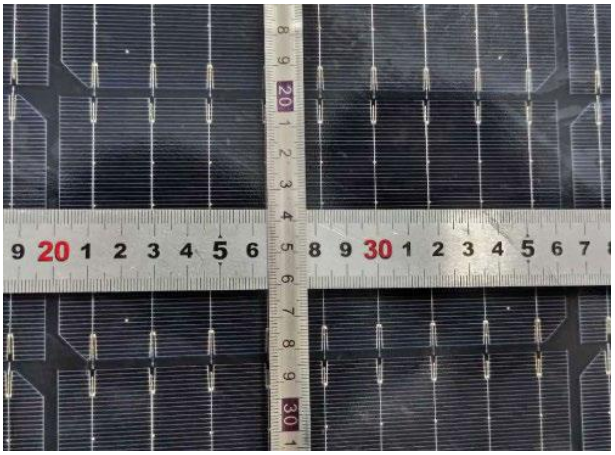
Annex 3: Photos

Module type: SR-M672430HLP

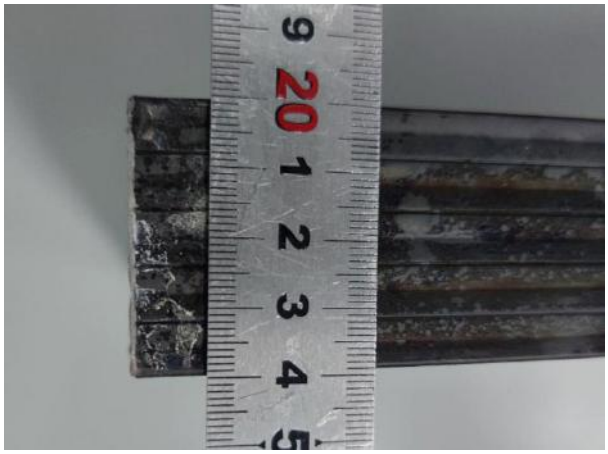
Front overview

Back overview

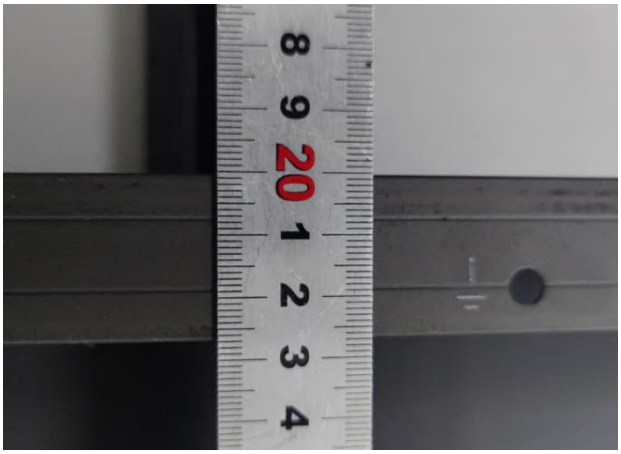
Label



Solar cell



Frame



Grounding Mark

Junction box (FT20xv)

Junction box (opened)

N/A

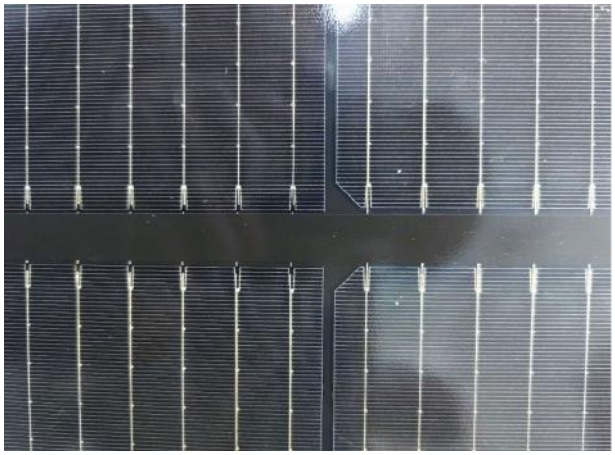
Bypass diode (Junction box is potted)

Cable (H1Z2Z2-K 1x4.0mm²)

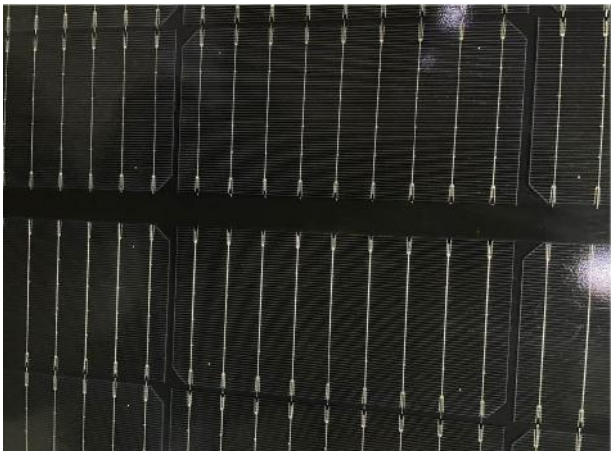
Mark (Do not disconnect under load)

Connectors (not specified)

Annex 4: Photos of insulation tape



Sample #1



Sample #1

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