

Test Report

No. TRHZHPVS04032/23LT/01

Commission Testing
according to ISO 9050

Applicant: **Jinko Solar Co., Ltd.**

File No.: **HZHPVS04032/23LT-01**

Designed:
(Project Engineer)

May 30, 2023

by:

Tomy Ye

Reviewed:

June 01, 2023

by:

Zem Jin.

(Technical Certifier)

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Test Report



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Applicant	Jinko Solar Co., Ltd.
Manufacturer	Jinko Solar Co., Ltd.
Order No.	HZHVPVS04032/23LT
Date of Application	04/18/2023
Product	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
Module type(s)	Jinko Solar PV Modules 156 cells: JKMxxxN-78HL4-(V) (xxx is the maximum power of module) 144 cells: JKMxxxN-72HL4-(V) (xxx is the maximum power of module) 120 cells: JKMxxxN-60HL4-(V) (xxx is the maximum power of module) 108 cells: JKMxxxN-54HL4R-(V) (xxx is the maximum power of module)
General Information • Maximum System Voltage.... : • Electrical Protection Class.... :	DC 1500V Class II
Type of examination	Commission testing only
Testing Period	04/23/2023
Testing Laboratory.....	Shanghai Institute of Quality Inspection and Technical Research No. 900, Jiangyue Road, Minhang District, Shanghai 201114, 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:

ISO 9050:2003 "Glass in building - Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors"

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Summary of testing

According to the enquiry of the applicant, a commission testing was performed according to ISO 9050:2003, testing items are listed in page 7 in this report.

The small modules with dimension of 300x300mm as the representative sample were delivered to testing lab as test samples and conducted with all the related tests.

The representative samples include all the key materials and subassemblies of the module, except for some components do not affect the results of the test like frame/J-BOX/adhesive.

According to the declaration of applicant, the following module types have exactly the same raw materials as the tested sample, only the size and power are different. So the following module types can be considered met the test sample.

156 cells: JKMxxxN-78HL4-(V) (xxx is the maximum power of module)

144 cells: JKMxxxN-72HL4-(V) (xxx is the maximum power of module)

120 cells: JKMxxxN-60HL4-(V) (xxx is the maximum power of module)

108 cells: JKMxxxN-54HL4R-(V) (xxx is the maximum power of module)

According to the request of applicant, each sample was measured on three locations:

1# is located on the cell area;

2# is located on the backsheet area beside the solar cells;

3# is located on the string interconnectors.

Please refer to annex 2 for the details.

All tests were 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	V _{mpp} - Maximum power voltage
I _{mpp} - Maximum power current	V _{oc} - Open circuit voltage
I _{sc} - Short circuit current	FF - Fill factor
P _{mpp} - Maximum power	α - Current temperature coefficient
NOCT - Nominal Operating Cell Temperature	β - Voltage temperature coefficient
STC - Standard Test Conditions	γ - power temperature coefficient
CTI - Comparative Tracking Index	PD - Partial Discharge
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:	
<p>The test verdicts presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full, without the written approval of the issuing testing laboratory.</p> <p>“(see Annex #)” refers to additional information appended to the report.</p> <p>“(see Table #)” refers to a table appended to the report.</p> <p>Throughout this report, a point is used as the decimal separator.</p>	

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Testing procedure

Testing sample: JKMxxxN-54/60/72/78HL4(R)-(V)

- | | |
|-------------------------------------|---------------------------------|
| <input type="checkbox"/> | Random sampling from production |
| <input checked="" type="checkbox"/> | Prototype submitted by client |

Supplementary information: The samples represent module types JKMxxxN-78HL4-(V), JKMxxxN-72HL4-(V), JKMxxxN-60HL4-(V) and JKMxxxN-54HL4R-(V) (xxx is the maximum power of module).

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Module group assignment

Testing sample: JKMxxxN-54/60/72/78HL4(R)-(V)

Sample #	Serial number	Dimension (l x w) [mm]	Remark
W023105000105-1	N/A	300 x 300	Visible light reflectance
W023105000105-2	N/A	300 x 300	Visible light reflectance

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Clause	Requirement + Test	Result - Remark	Verdict
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Test result overview

Measurement of spectral optical reflectance			-
ISO 9050	External light reflectance of glazing :	See table 3.4.1	-

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Test results of ISO 9050

3.4.1 External light reflectance of glazing					-
Test date [MM/DD/YYYY].....:		04/23/2023			-
Sample #	External light reflectance	Measurement location			-
		1#	2#	3#	-
W023105 000105-1	Diffuse reflectance [%]	1.0	62.0	44.8	-
	Regular reflectance [%]	0.7	1.6	13.8	-
	Total reflectance [%]	1.7	63.6	58.6	-
W023105 000105-2	Diffuse reflectance [%]	1.0	61.5	47.4	-
	Regular reflectance [%]	1.3	1.6	9.1	-
	Total reflectance [%]	2.3	63.2	56.6	-

Supplementary information:

The external light reflectance of glazing $\rho_{v,o}$ shall be calculated using the following formula

$$\rho_{v,o} = \frac{\sum_{\lambda=380\text{ nm}}^{780\text{ nm}} \rho_o(\lambda) D_{\lambda} V(\lambda) \Delta\lambda}{\sum_{\lambda=380\text{ nm}}^{780\text{ nm}} D_{\lambda} V(\lambda) \Delta\lambda}$$

$\rho_o(\lambda)$, is the spectral external reflectance of the glazing;

D_{λ} , is the relative spectral distribution of illuminant D65 (see ISO/CIE 10526);

$V(\lambda)$, is the spectral luminous efficiency for photopic vision defining the standard observer for photometry (see ISO/CIE 10527);

$\Delta\lambda$, is the wavelength interval.

Measurement location 1# is located on the cell area; 2# is located on the backsheet area beside the solar cells; 3# is located on the string interconnectors.

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Annex 1: List of measurement equipment

Measurement / testing	Measuring equipment	Equipment ID	Calibration due date
External light reflectance of glazing	Ultraviolet visible spectrophotometer (Integrating sphere with 150mm inner diameter)	Lambda 950	05/31/2023

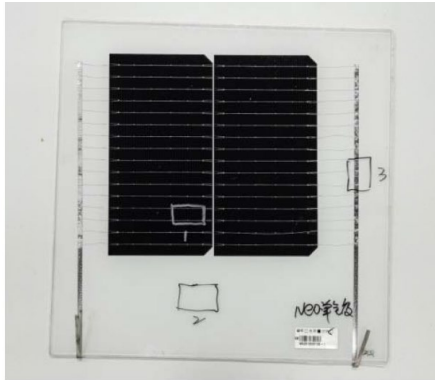
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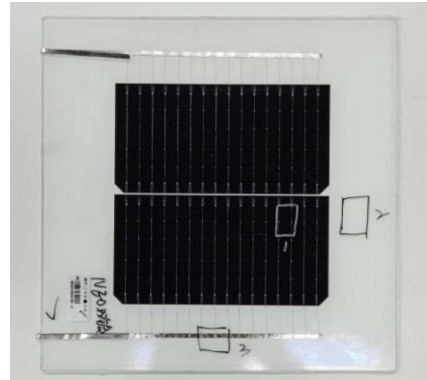
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Annex 2: Photos

Testing sample: JKMxxxN-54/60/72/78HL4(R)-(V)



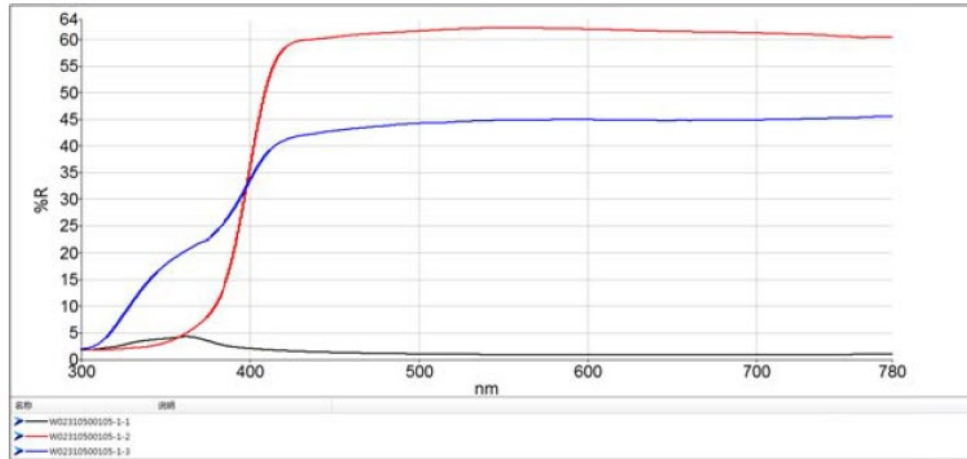
W023105000105-1



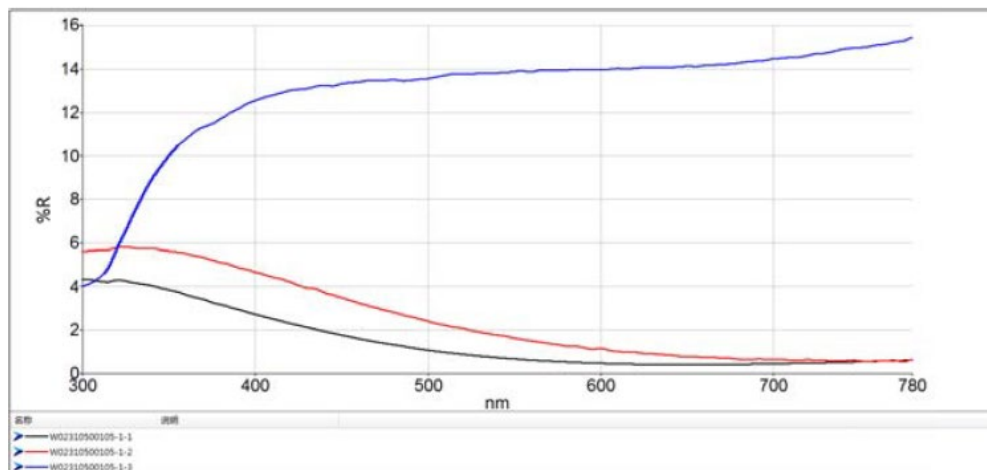
W023105000105-2

Annex 3: Calculation of ISO 9050 external light reflectance

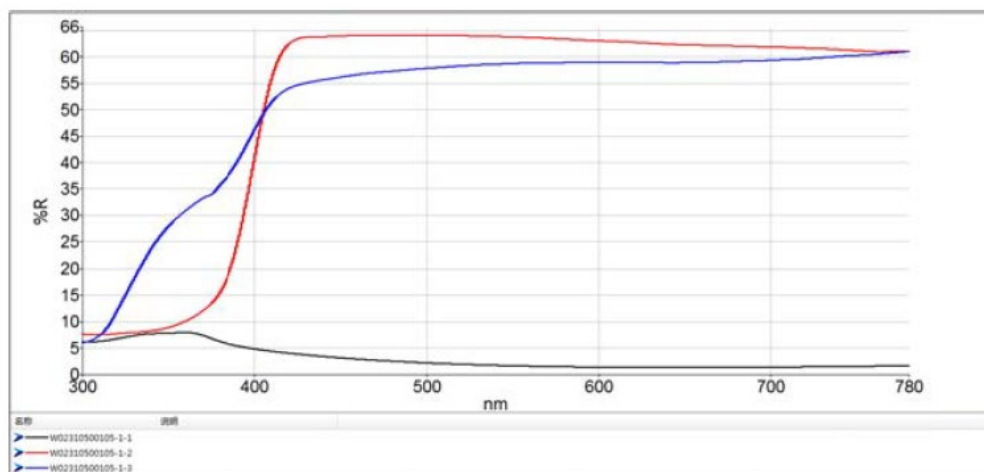
Sample W023105000105-1:



Measured spectral diffuse reflectance curves

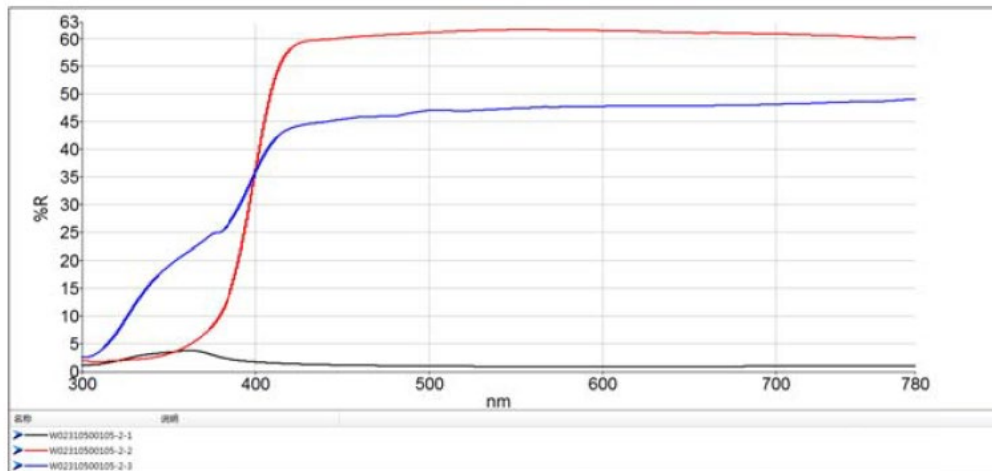


Measured spectral regular reflectance curves

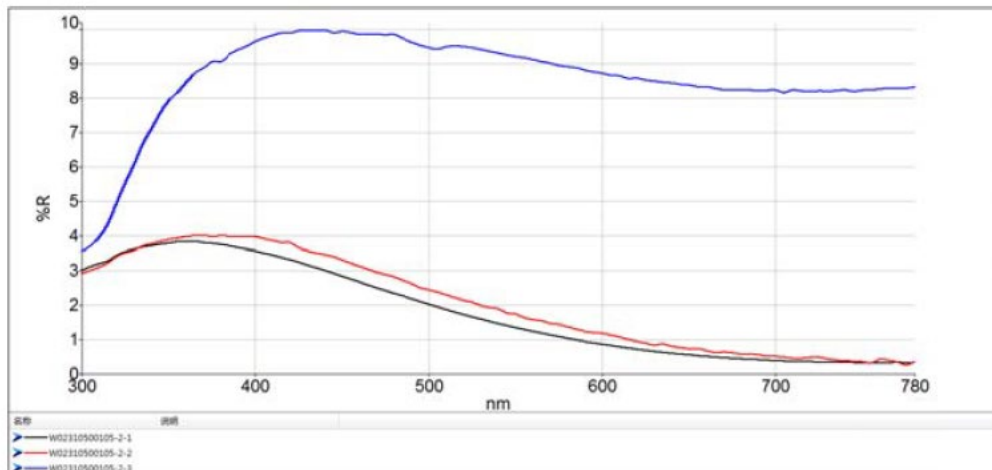


Measured spectral total reflectance curves

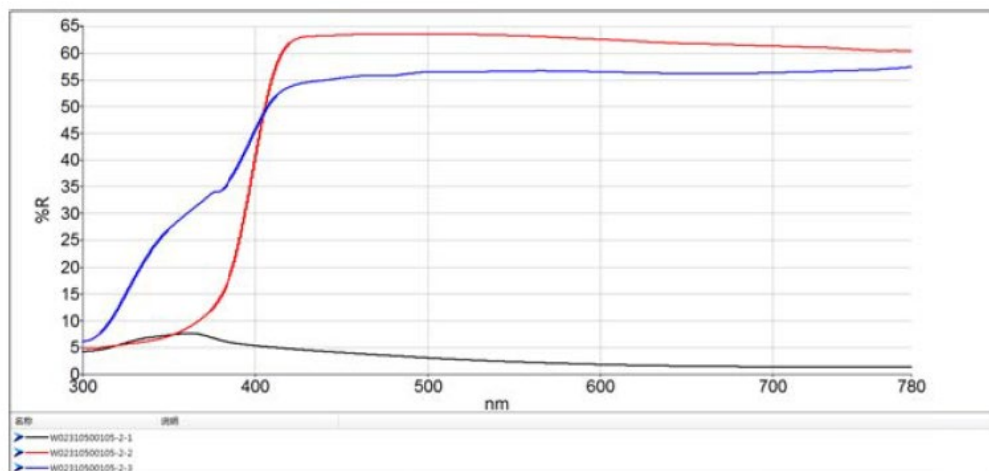
Sample W023105000105-2:



Measured spectral diffuse reflectance curves



Measured spectral regular reflectance curves



Measured spectral total reflectance curves

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