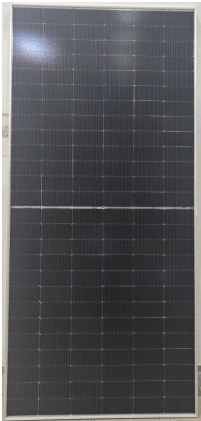





Prüfbericht-Nr.: Test report no.:	CN236B78 002	Auftrags-Nr.: Order no.:	244554199	Seite 1 von 12 Page 1 of 12
Kunden-Referenz-Nr.: Client reference no.:	2496578	Auftragsdatum: Order date:	26/10/2023	
Auftraggeber: Client:	Sany Silicon Energy (Zhuzhou) Co., Ltd. Room 518-50, Building 1, Longxin International, No.255, Tongxia Road, Tongtangwan Street, Shifeng District, Zhuzhou City, 412005, Hunan Province, P.R. China			
Prüfgegenstand: Test item:	Photovoltaic (PV) module			
Bezeichnung / Typ-Nr.: Identification / Type no.:	See module type designation on page 3			
Auftrags-Inhalt: Order content:	Dust and sand test for photovoltaic (PV) modules			
Prüfgrundlage: Test specification:	IEC 60068-2-68:1994 Environmental testing for electric and electronic products-Part 2: Test methods-Test L: Dust and sand			
Wareneingangsdatum: Date of sample receipt:	22/01/2024			
Prüfmuster-Nr.: Test sample no.:	Refer to page 8			
Prüfzeitraum: Testing period:	26/01/2024			
Ort der Prüfung: Place of testing:	Refer to page 5			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	<u>X</u> 	genehmigt von: authorized by:	<u>X</u> 	
Datum: Date:	25/03/2024	Ausstellungsdatum: Issue date:	25/03/2024	
Stellung / Position:	Project Engineer	Stellung / Position:	Authorizer	
Sonstiges / Other:	<ul style="list-style-type: none"> - Introduce to new module types listed on page 3. - Valid only for the material combinations as listed in Constructional Data Form (CDF) No. CN236B78 002 - The required tests were performed according to the standard IEC 60068-2-68:1994 and the given pass criteria is according to IEC 61215-2:2016 & IEC 61730-2:2016. 			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
<p>* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet</p> <p>* Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</p>				
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p> <p><i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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Test report no.:

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Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p> |
| 2 | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i></p> |
| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p> |

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Test report no.:

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Produktbeschreibung
Product description

1	<div>Produktdetails</div> <div>Product details</div>	<div>New model types:</div> <div>Max. system voltage: up to 1500 VDC (Voc at STC):</div> <div>With ½ cut of mono c-Si cells:</div> <div>SYMN156TBDxxx (xxx=615-635, in steps of 5, 156 cells)</div> <div>SYMN144R01TBDxxx (xxx=590-620, in steps of 5, 144 cells)</div> <div>SYMN120R01TBDxxx (xxx=490-520, in steps of 5, 120 cells)</div> <div>SYMN108R01TBDxxx (xxx=440-470, in steps of 5, 108 cells)</div> <div>Power range extension:</div> <div>Max. system voltage: up to 1500 VDC (Voc at STC):</div> <div>With ½ cut of mono c-Si cells:</div> <div>SYMN144TBDxxx (xxx=585, 144 cells)</div> <div>SYMN120TBDxxx (xxx=480, 485, 120 cells)</div> <div>SYMN108TBDxxx (xxx=440, 108 cells)</div> <div>Approved model types:</div> <div>Max. system voltage: up to 1500 VDC (Voc at STC):</div> <div>With ½ cut of mono c-Si cells:</div> <div>SYMN144TBDxxx (xxx=555-580, in steps of 5, 144 cells)</div> <div>SYMN120TBDxxx (xxx=455-475, in steps of 5, 120 cells)</div> <div>SYMN108TBDxxx (xxx=415-435, in steps of 5, 108 cells)</div> <div>xxx represents output power in Wp</div>										
2	<div>Verwendete Materialien</div> <div>Used materials</div>	see Constructional Data Form (CDF) no. CN236B78 002										
3	<div>Adresse(n) der Fertigungsstätte(n)</div> <div>Address(es) of the manufacturing site(s)</div>	<table><tr><td>Name / Description:</td><td>Sany Silicon Energy (Zhuzhou) Co., Ltd.</td></tr><tr><td>Street:</td><td>Sany Energy Equipment Industrial Park, No.320 Qingshui Road, Shifeng District</td></tr><tr><td>Postcode / City, Country:</td><td>412005 / Zhuzhou City, Hunan Province, P.R. China</td></tr><tr><td>Type of production:</td><td>Crystalline PV-module</td></tr><tr><td>Inspection report No. and date</td><td>CN23RWL8 001 / 11/05/2023</td></tr></table>	Name / Description:	Sany Silicon Energy (Zhuzhou) Co., Ltd.	Street:	Sany Energy Equipment Industrial Park, No.320 Qingshui Road, Shifeng District	Postcode / City, Country:	412005 / Zhuzhou City, Hunan Province, P.R. China	Type of production:	Crystalline PV-module	Inspection report No. and date	CN23RWL8 001 / 11/05/2023
Name / Description:	Sany Silicon Energy (Zhuzhou) Co., Ltd.											
Street:	Sany Energy Equipment Industrial Park, No.320 Qingshui Road, Shifeng District											
Postcode / City, Country:	412005 / Zhuzhou City, Hunan Province, P.R. China											
Type of production:	Crystalline PV-module											
Inspection report No. and date	CN23RWL8 001 / 11/05/2023											
4	<div>Sonstiges</div> <div>Other</div>	<div>Test sample(s), as well sample information, description, product details and intended usage was provided by customer.</div> <div>Throughout this report a point is used as the decimal separator.</div>										

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Test report no.:

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Produktbeschreibung
Product description

5	Prüfmusterbereitstellung <i>Test sample obtaining</i>	<input checked="" type="checkbox"/> Sending by customer <input type="checkbox"/> Sampling by TÜV Rheinland Group <input type="checkbox"/> others:
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Produktbeschreibung
Product description

6 Zusammenfassung der Prüfergebnisse
Summary of test results

According to the inquiry the resistance to dust and sand of photovoltaic (PV) modules should be accessed in accordance with IEC 60068-2-68:1994.

The tests documented within this test report were performed according to IEC 60068-2-68:1994, the related pass criteria is according to IEC 61215-2:2016 & IEC 61730-2:2016 which is listed as below:

- Visual inspection (MQT 01 / MST 01)
- Maximum power determination (MQT 02 / MST 02)
- Insulation test (MQT 03 / MST 16)
- Wet leakage current test (MST 17)
- Continuity test of equipotential bonding (MST 13)
- Bypass diode functionality test (MST 07)

- Introduce to new model types as listed in section 1 based on previously approved model types. The test results are documented within test report CN23M7KD 002 & 005.

The differences are as below:

1. SYMN156TBDxxx are for modules with 156 pcs 182mm x 91mm Topcon solar cells;
2. SYMN144R01TBDxxx are for modules with 144 pcs half-cut 182.2mm x 95.8mm Topcon solar cells;
3. SYMN120R01TBDxxx are for modules with 120 pcs half-cut 182.2mm x 95.8mm Topcon solar cells;
4. SYMN108R01TBDxxx are for modules with 108 pcs half-cut 182.2mm x 95.8mm Topcon solar cells;

Critical materials of SYMN156TBDxxx and SYMN144R01TBDxxx keep the same with previously approved module type SYMN144TBDxxx based on test report CN23M7KD 001. No additional tests need to be considered necessary

- Power range extension for previously approved model types as listed in section 1. Test results are documented in this report CN23M7KD 003 & 006.

- Constructional check and maximum power determination were performed on the representative model type SYMN156TBD625.

- The materials and combinations in below table have been approved on module in main license with certificate PV 50587008. No additional testing is considered necessary.

Object	Manufacturer	Type / model	Technical data / ratings
Solar cell	Sany Silicon Energy (Zhuzhou) Co., Ltd.	SYCN18AT16	N type mono c-Si cell with 16 dotted busbars 182.2mmx95.8mm±0.25mm Thickness=130µm±15µm

The test report is valid only for the materials as listed in Constructional Data Form (CDF) No. CN236B78 002.

This test report includes photos in the appendix.

Summary of test location:

All the tests were performed at TÜV Rheinland (Suzhou) Co., Ltd., which is located at No.14 building and north half of No.10 workshop building, No.525,

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Produktbeschreibung
Product description

		Yuewang Lingang South Road, Pingqian (Taicang) Modern Industrial Park, Shaxi Town, Taicang City, Jiangsu Province, P.R. China
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Produktbeschreibung
Product description

Setting of tasks:

According to the IEC 60068-2-68:1994 standard, following measurements shall be performed for each combination:

- Initial visual inspection according to MQT01 of IEC 61215-2:2016 (1 PV module)
- Initial maximum power determination according to MQT02 of IEC 61215-2:2016 (1 PV module)

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Produktbeschreibung
Product description

Reference standards are as follows:

- IEC 60068-2-68:1994 Environmental testing for electric and electronic products-Part 2: Test methods-Test L: Dust and sand.
- IEC 61215-2:2016 Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval.
- IEC 61730-2:2016 Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing.

General information

Abbreviations used in the report:

Pmpp	– Maximum power	Vmpp	– Maximum power voltage
Impp	– Maximum power current	Voc	– Open circuit voltage
Isc	– Short circuit current	FF	– Fill factor
STC	– Standard Test Conditions		

Possible test case verdicts:

- test case does not apply to the test object.....: N/A
- test object does meet the requirement.....: Pass (P)
- test object does not meet the requirement.....: Fail (F)

Date(s) of performance of tests.....: 26/01/2024

General 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 Enclosure #)” refers to additional information appended to the report.
“(see appended table)” refers to a table appended to the report.
Throughout this report a point is used as the decimal separator.

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Absatz Clause	Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse – Bemerkungen / Measuring results - Remarks	Ergebnis Result
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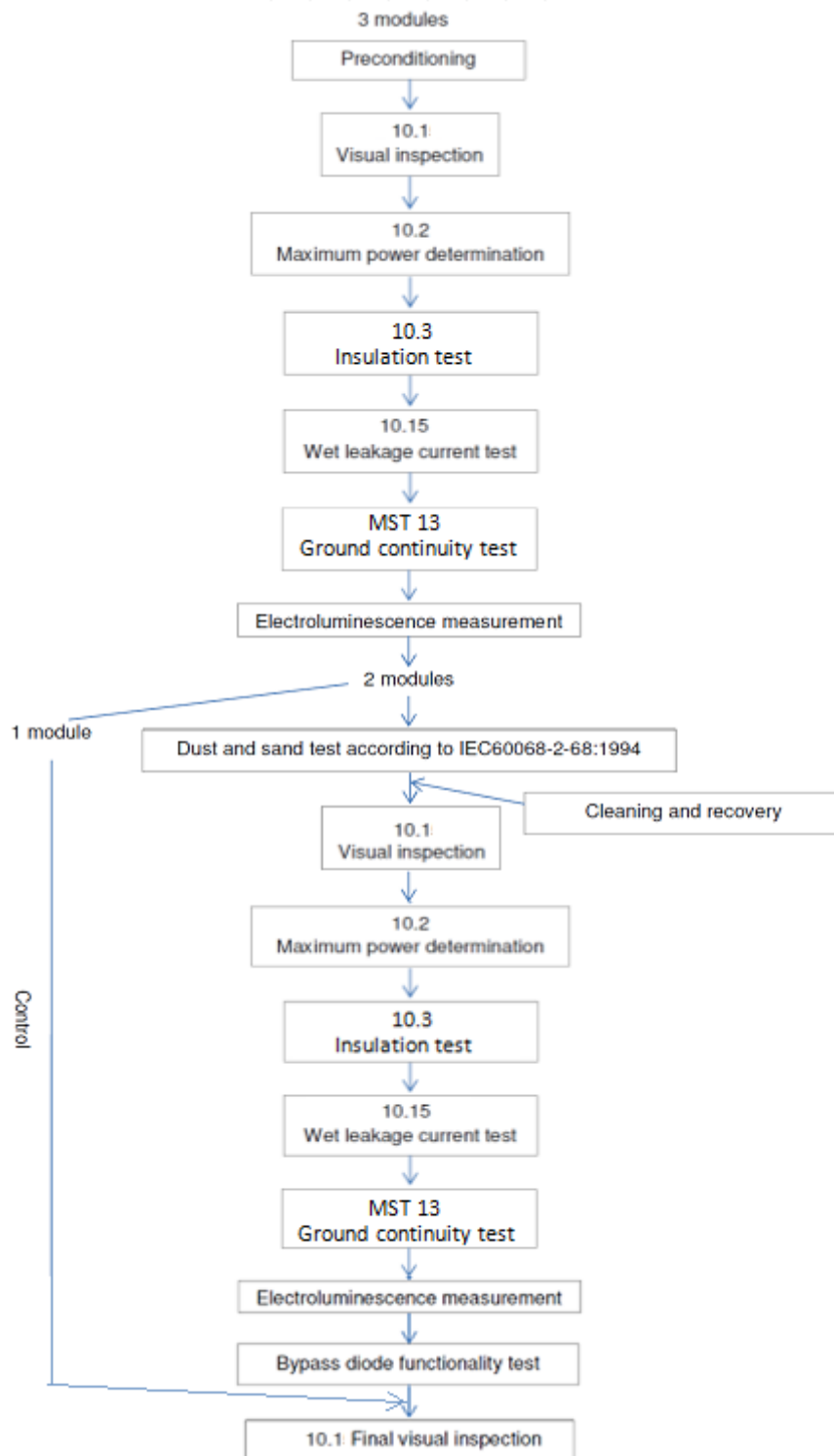
List of test samples Module type: SYMN156TBD625			
Sample no.	Sample SN	Remarks / constructional characteristics (e.g. cell, backsheet, frame type)	
1	312012090004	<p>Front cover: 2.0mm External AR Coating Tempered Glass from Hunan Kibing Solar Technology Co., Ltd.</p> <p>Encapsulation material: EP304 (between glass and cell) / F406PS (between cell and back glass) from HANGZHOU FIRST APPLIED MATERIAL CO., LTD.</p> <p>Rear cover: 2.0mm Semi-Tempered back glass from Hunan Kibing Solar Technology Co., Ltd.</p> <p>Solar Cell: SYCN182T16 from Sany Silicon Energy (Zhuzhou) Co., Ltd.</p> <p>Frame: 30mm, 6005-T6 from CHANGSHU DONGNENG SOLAR TECHNOLOGY CO., LTD</p> <p>Adhesive of frame sealing: HT906Z from Shanghai Huitian New Material Co., Ltd.</p> <p>Cell connector: Ø0.26mm Sn60/Pb40 from Suzhou YourBest New-type Materials Co., Ltd.</p> <p>String connector: 6.0mm x 0.3mm, 4.0mm x 0.3mm Sn60/Pb40 from Suzhou YourBest New-type Materials Co., Ltd.</p> <p>Fluxing agent: SF180 from ASAHI SOLDER TECHNOLOGY(WUXI) CO., LTD</p> <p>Fixing Tape: D60F6-2 from SuZhou Rongzhi Electronic Technology Co., Ltd</p> <p>Junction box: 3Qxy from QC Solar (Suzhou) Corporation</p> <p>Cable: 62930 IEC 131 1 x 4.0mm² from QC Solar (Suzhou) Corporation</p> <p>Connector: QC4.10-cds from QC Solar (Suzhou) Corporation</p> <p>Bypass diode: QCM4045 from QC Solar (Suzhou) Corporation</p> <p>Adhesive of J-Box sealing: HT906Z from Shanghai Huitian New Material Co., Ltd.</p> <p>Potting Material in junction box: 5299W-S from Shanghai Huitian New Material Co., Ltd.</p>	—
Remark: Sample # 1 was tested as reference module.			

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Absatz Clause	Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse – Bemerkungen / Measuring results - Remarks	Ergebnis Result
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Test sequence and test sample requirement



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Absatz <i>Clause</i>	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	Messergebnisse – Bemerkungen / <i>Measuring results - Remarks</i>	Ergebnis <i>Result</i>

10.1	Visual inspection (Initial)-MQT 01/MST 01		
Test date (dd/mm/yyyy)		26/01/2024	
Sample no.	Requirement	Nature and position of initial findings	—
1	No major visual defects	No major visual defects	P
Supplementary information: N/A			

10.2	Maximum power determination (Initial)-MQT 02/MST 03						
Test date (dd/mm/yyyy)			26/01/2024				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 ± 10				
Module temperature [°C]			25 ± 2				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	N/A
1	626.6	48.12	13.022	56.59	13.722	80.7	
Supplementary information: N/A							

--- Ende des Prüfberichts / End of Test Report ---

ANLAGE zum Prüfbericht-Nr.: CN236B78 002
APPENDIX to test report no.:

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FOTO-DOKUMENTATION
PHOTO DOCUMENTATION

Appendix A: Photos

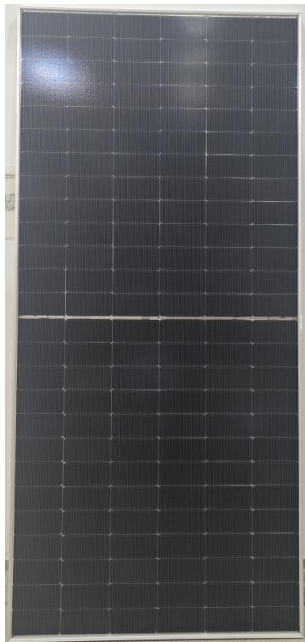


Fig. 1: front view of test sample



Fig. 2: rear view of test sample



PV MODULE
Sany Silicon Energy (Zhuzhou) Co., LTD
Sany Energy Equipment Industrial Park,
No.320 Qingshui Road, Shifeng District,
Zhuzhou City, Hunan Province 412005
China
<https://www.sanyglobal.com/product/>

SYMNI56TBD 625
Max. power (Pmax) 625W
Max. power tolerance +3%
Power sorting 0~4.99W
Voltage at max. power(Vmpp) 47.14V
Current at max. power(Imp) 13.26A
Open-circuit voltage(Voc) 55.81V±3%
Short-circuit current(Isc) 13.84A±3%

Series Fuse Rating 30A
Maximum system voltage 1500VDC
operating temperature range 40°C ~ +85°C
protect range II
module wprotecteigh 34.3(kg)
module size 2485×1134×30(mm)
STC 1000W/m², AM1.5, 25°C



warning

Only the professionals can install and maintain the components. Be careful of the dangerous high DC voltage when connecting the components. Never damage or scratch the back of the assembly.

Certified in accordance with IEC 61215:2016 and IEC 61730:2016
MADE IN CHINA

Fig. 3: detail view of type label



Fig. 4: detail view of closed junction box