





Prüfbericht-Nr.: Test report no.:	CN23SHR7 001	Auftrags-Nr.: Order no.:	244515531	Seite 1 von 29 Page 1 of 29
Kunden-Referenz-Nr.: Client reference no.:	2496578	Auftragsdatum: Order date:	16/05/2023	
Auftraggeber: Client:	Sany Silicon Energy (Zhuzhou) Co., Ltd. Room 518-50, Building 1, Longxin International, No.255, Tongxia Road, Tongtangwan Street, Shifeng District, 412005 Zhuzhou City, 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:	System voltage durability qualification test for photovoltaic (PV) modules			
Prüfgrundlage: Test specification:	2 PfG 2387/01.18 System voltage durability qualification test for crystalline silicon modules and for thin film modules (Potential Induced Degradation (PID))			
Wareneingangsdatum: Date of sample receipt:	28/04/2023			
Prüfmuster-Nr.: Test sample no.:	Refer to page 8			
Prüfzeitraum: Testing period:	04/05/2023 - 14/06/2023			
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:	<input checked="" type="checkbox"/> 	genehmigt von: authorized by:	<input checked="" type="checkbox"/> 	
Datum: Date:	23/10/2023	Ausstellungsdatum: Issue date:	23/10/2023	
Stellung / Position:	Project Engineer	Stellung / Position:	Authorizer	
Sonstiges / Other:	<ul style="list-style-type: none"> - Basic qualification for module types listed on page 3 - Valid in conjunction with TÜV Rheinland certificate PV 50587008. - Valid only for the material combinations as listed in Constructional Data Form (CDF) No. CN23SHR7 001 			
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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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.</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.</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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Produktbeschreibung
Product description

1	Produktdetails <i>Product details</i>	New model types: Max. system voltage: up to 1500 VDC (Voc at STC): With ½ cut of mono c-Si cells: SYMN144TBDxxx (xxx=555-580, in steps of 5, 144 cells) SYMN120TBDxxx (xxx=455-475, in steps of 5, 120 cells) SYMN108TBDxxx (xxx=415-435, in steps of 5, 108 cells) xxx represents output power in Wp											
2	Verwendete Materialien <i>Used materials</i>	Refer to Constructional Data Form (CDF) No. CN23SHR7 001											
3	Adresse der Produktionsstandorte <i>Address(es) of the manufacturing site(s)</i>	<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	Sonstiges <i>Other</i>	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.											
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 Potential Induced Degradation of photovoltaic (PV) modules should be assessed in accordance with 2 PfG 2387/01.18. Test condition also fulfill the specification listed in IEC TS 62804-1:2015.

The tests of the requirements of 2 PfG 2387/01.18 were all fulfilled according to its regulations of the pass criteria. The above listed module types have been fully certified according to the IEC 61215/EN IEC 61215 and IEC 61730/EN IEC 61730 standards and it is the prerequisite to be certified Potential Induced Degradation.

Testing is performed according to IEC TS 62804-1:2015. The only deviation from standard 2 PfG 2387/01.18 is test duration 288hours other than 96 cycles. Therefore, 2 PfG 2387/01.18 is also fulfilled.

- Basic qualification for model types listed in section 1. The relevant tests were performed on SYMN144TBDxxx with bill of materials as listed on page 5 as representative. The test results are documented within this test report.

- The differences of module types are as below:

1. SYMN144TBDxxx are for modules with 144 pcs half-cut 182mm Topcon solar cells;
2. SYMN120TBDxxx are for modules with 120 pcs half-cut 182mm Topcon solar cells;
3. SYMN108TBDxxx are for modules with 108 pcs half-cut 182mm Topcon solar cells;

- 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
Cell connectors	Changzhou Sheng Yue metal new material Co., Ltd.	Sn60Pb40	Ø= 0.26±0.01mm
String connectors	Changzhou Sheng Yue metal new material Co., Ltd.	Sn60Pb40	T(mm) x L(mm): 0.3mm x 6.0mm 0.3mm x 4.0mm
Fluxing agent	Zhuhai Changxian New Materials Technology Co., Ltd	CX700	—
Fixing tape	Guangdong Sunrui New Material Co., Ltd.	HZ UV-100	Thickness= 100µm±40µm

The test report is valid only for the materials as listed in Constructional Data Form (CDF) No. CN23SHR7 001.

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Produktbeschreibung
Product description

	<p>This test report includes a history of reporting and certification, electroluminescence images, measurement reports and photo documentation in the appendix.</p> <p>Throughout this report a point is used as the decimal separator.</p> <p><i>Summary of test locations:</i></p> <p>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, Yuewang Lingang South Road, Pingqian (Taicang) Modern Industrial Park, Shaxi Town, Taicang City, Jiangsu Province, P.R. China.</p>
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7	Stress levels		
	Crystalline silicon modules		
	Test method chosen: Voltage: module rated system voltage and polarities.	1-A <input type="checkbox"/> 1-B <input checked="" type="checkbox"/> 1-1 <input type="checkbox"/> 1-C <input type="checkbox"/> N/A <input type="checkbox"/>	N/A
	Method 1-A: – Chamber air temperature: 60 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 96 h dwell at above stated temperature and relative humidity	N/A	N/A
	Method 1-B: – Chamber air temperature: 85 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 96 h dwell at above stated temperature and relative humidity	Test condition also fulfill the specification listed in IEC TS 62804-1:2015. Test duration: 288 hours dwell at above stated temperature and relative humidity	N/A
	Method 1-1 (Delamination): – Chamber air temperature: 85 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 250 h dwell at above stated temperature and relative humidity	N/A	N/A
	Method 1-C: – Module temperature: 25 °C ± 1°C, – Relative humidity: < 60%rH. – Dwell duration: 168 h -- Cover the PV module surfaces with an electrically conductive medium (e.g. aluminum foil).	N/A	N/A
	The degradation of maximum STC output power between initial and final power measurement does not exceed 5 %.	See table “Maximum power determination”	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	There is no visual evidence of a mayor defect as defined in IEC 61215-1:2016 Clause 8.	See table “Visual inspection”	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
	The wet leakage current test (IEC 61215-1:2016 MQT 15) requirements are met.	See table “Wet leakage current test”	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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	Thin film modules		
	Test method chosen: Voltage: module rated system voltage and polarities.	2-A <input type="checkbox"/> 2-B <input type="checkbox"/> 2-1 <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	N/A
	Method 2-A : – Chamber air temperature: 85 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 168 h dwell at above stated temperature and relative humidity,	N/A	N/A
	Method 2-B: – Chamber air temperature: 85 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 1000 h dwell at above stated temperature and relative humidity,	N/A	N/A
	Method 2-1 (Delamination): – Chamber air temperature: 85 °C ± 2°C, – Chamber relative humidity: 85 % ± 3% RH, – Test duration: 1000 h dwell at above stated temperature and relative humidity	N/A	N/A
	The degradation of maximum STC output power between initial and final power measurement does not exceed 5 % + the maximum degradation of the reference modules. Positive degradation (annealing) of the reference module has been taken into account. Note: For thin film modules, a 10% power loss criterion after 1000 h under damp heat conditions is reasonable.	N/A	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
	There is no visual evidence of a mayor defect as defined in IEC 61215-1:2016 Clause 8.	N/A	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
	The wet leakage current test (IEC 61215-1:2016 MQT 15) requirements are met.	N/A	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>

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Absatz Clause	Anforderungen - Prüfungen Requirements – Tests 2 PfG 2387/01.18	Messergebnisse – Bemerkungen Measuring results - Remarks	Ergebnis Result
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1	List of test samples		
Sample no.	Sample SN	Remarks / constructional characteristics	
Module type: SYMN144TBD565			
1	230401D230215	Front cover: 2.0mm External AR Coating Tempered Glass from Hunan Kibing Solar Technology Co., Ltd. Encapsulation material: EP304 (between glass and cell) / F406PS (between cell and back glass) from HANGZHOU FIRST APPLIED MATERIAL CO., LTD.	
2	230401D230216	Rear cover: 2.0mm Semi-Tempered back glass from Hunan Kibing Solar Technology Co., Ltd. Solar Cell: SYCN182T16 from Sany Silicon Energy (Zhuzhou) Co., Ltd. Frame: 30mm, 6005-T6 from CHANGSHU DONGNENG SOLAR TECHNOLOGY CO., LTD Adhesive of frame sealing: HT906Z from Shanghai Huitian New Material Co., Ltd.	
3	230401D230186	Cell connector: Ø0.26mm Sn60/Pb40 from Suzhou YourBest New-type Materials Co., Ltd. String connector: 6.0mm x 0.3mm, 4.0mm x 0.3mm Sn60/Pb40 from Suzhou YourBest New-type Materials Co., Ltd.	—
4	230401D230184	Fluxing agent: SF180 from ASAHI SOLDER TECHNOLOGY(WUXI) CO., LTD Fixing Tape: D60F6-2 from SuZhou Rongzhi Electronic Technology Co., Ltd Junction box: 3Qxy from QC Solar (Suzhou) Corporation Cable: 62930 IEC 131 1 x 4.0mm ² from QC Solar (Suzhou) Corporation Connector: QC4.10-cds from QC Solar (Suzhou) Corporation	
5	230401D230183	Bypass diode: QCM4045 from QC Solar (Suzhou) Corporation Adhesive of J-Box sealing: HT906Z from Shanghai Huitian New Material Co., Ltd. Potting Material in junction box: 5299W-S from Shanghai Huitian New Material Co., Ltd.	

Remark: Samples #1 was tested as reference module.

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2	Visual inspection (initial)		
Test date (dd/mm/yyyy)		04/05/2023	
Sample no.	Nature and position of initial findings		—
1	No major visual defects		P
2	No major visual defects		P
3	No major visual defects		P
4	No major visual defects		P
5	No major visual defects		P
Supplementary information: N/A			

Absatz <i>Clause</i>	Anforderungen - Prüfungen <i>Requirements – Tests</i> 2 PfG 2387/01.18	Messergebnisse – Bemerkungen <i>Measuring results - Remarks</i>	Ergebnis <i>Result</i>
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3	Maximum power determination (initial)						—
Test date (dd/mm/yyyy)			16/05/2023				
Module temperature [°C]			25 ± 2				
Irradiance W/m ²			1000				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	565.1	43.73	12.924	51.70	13.596	80.4	
2	564.9	43.68	12.934	51.75	13.588	80.3	
3	564.6	43.72	12.916	51.88	13.556	80.3	
4	566.3	43.78	12.936	51.94	13.524	80.6	
5	566.0	43.76	12.935	51.91	13.586	80.3	
Supplementary information: N/A							

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6	Wet leakage current test (Initial)			
Test date (dd/mm/yyyy)		21/05/2023		—
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [Ω cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [MΩ]	A [m²]	R _{iso} ·A [MΩ·m²]	Result
1	6100.0	2.58	15738.0	P
2	6280.0	2.58	16202.4	P
3	6310.0	2.58	16279.8	P
4	6120.0	2.58	15789.6	P
5	6240.0	2.58	16099.2	P
Supplementary information: Minimum requirement is 40 MΩ·m².				
Insulation tester can measure up to 5000.0 MΩ.				

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7	Electroluminescence images (Initial)		
Test date (dd/mm/yyyy)		21/05/2023	—
Current applied		Isc ± 5%	
Sample No.	Remarks		
2	N/A		—
3	N/A		—
4	N/A		—
5	N/A		—
Supplementary information: N/A			

8	Continuity test of equipotential bonding (initial)		
Test date (dd/mm/yyyy)	21/05/2023	—	
Maximum overcurrent protection rating [A]	25		
Current applied [A]	62.5		
Duration of applied current [min]	2		
Location of designated point for equipotential bonding	Long side of the frame		
No. of other conductive parts tested	3		
Sample no.	Max. measured voltage [mV]	Max. calculated resistance [mΩ]	
1	75.1 / 74.3 / 75.7	1.21 / 1.19 / 1.22	P
2	78.4 / 82.3 / 77.1	1.27 / 1.31 / 1.23	P
3	75.5 / 74.7 / 75.3	1.27 / 1.31 / 1.23	P
4	73.6 / 74.1 / 74.7	1.19 / 1.18 / 1.18	P
5	75.3 / 77.5 / 78.2	1.21 / 1.23 / 1.25	P
Supplementary information: N/A			

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9	Potential Induced Degradation (PID) test		
Test date (dd/mm/yyyy)		02/06/2023 - 14/06/2023	
Test Condition		Method 1-B	—
Sample No.	Module rated system voltage and polarities		
2	+1500V		—
3	+1500V		—
4	-1500V		—
5	-1500V		—
Supplementary information: N/A			

10	Visual inspection (after PID test)		
Test date (dd/mm/yyyy)		14/06/2023	
Sample no.	Nature and position of initial findings		—
2	No major visual defects		P
3	No major visual defects		P
4	No major visual defects		P
5	No major visual defects		P
Supplementary information: N/A			

Absatz <i>Clause</i>	Anforderungen - Prüfungen <i>Requirements – Tests</i> 2 PfG 2387/01.18	Messergebnisse – Bemerkungen <i>Measuring results - Remarks</i>	Ergebnis <i>Result</i>
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11	Maximum power determination (after PID test)						
Test date (dd/mm/yyyy)		14/06/2023					—
Irradiance [W/m ²]		1000*					
Module temperature [°C]		25 ± 2					
Sample no.	Pmax [W]	Vmpp [V]	Impp [A]	Voc [V]	Isc [A]	FF [%]	Degradation [%]
2	557.1	43.04	12.946	51.21	13.639	79.8	-1.16
3	554.4	42.92	12.918	51.19	13.553	79.9	-1.84
4	555.0	42.92	12.930	51.11	13.581	80.0	-2.01
5	553.7	42.76	12.951	51.12	13.597	79.7	-2.31
*A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used.							
Supplementary information: <i>Negative</i> degradation means power <i>loss</i> .							

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12	Wet leakage current test (after PID test)			
Test date (dd/mm/yyyy)		14/06/2023		—
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [Ω cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [MΩ]	A [m²]	R _{iso} ·A [MΩ·m²]	
2	2940.0	2.58	7585.2	P
3	2850.0	2.58	7353.0	P
4	2870.0	2.58	7404.6	P
5	2830.0	2.58	7301.4	P
Supplementary information: Minimum requirement is 40 MΩ·m².				

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13	Electroluminescence images (after PID test)		
Test date (dd/mm/yyyy)		14/06/2023	—
Current applied		Isc ± 5%	
Sample No.	Remarks		
2	N/A		—
3	N/A		—
4	N/A		—
5	N/A		—
Supplementary information: N/A			

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

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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Appendix A: Abbreviations used in the report

PID	Potential Induced Degradation
STC	Standard Test Conditions
P_{max}	Maximum power
I_{mpp}	Maximum power point current
V_{mpp}	Maximum power point voltage
I_{sc}	Short circuit current
V_{oc}	Open circuit voltage
FF	Fill factor
α	Current temperature coefficient
β	Voltage temperature coefficient
γ	Power temperature coefficient
R_{iso}	Electrical insulation resistance
A	Module area

Appendix B: Statement of the estimated uncertainty of the test verdicts

- Electrical performance rating is outside the scope of 2 PfG 2387/01.18 qualification testing. The verdicts of performance rating are only related to the test samples that were subjected to the tests. They cannot be generalised to the modules from the series production.
- The calibration to STC was performed with a class A⁽⁺⁾A⁽⁺⁾A⁽⁺⁾ solar simulator. The extended measurement uncertainty is:
 - $2\sigma (P_{mpp}) \leq \pm 3.0 \%$
 - $2\sigma (I_{sc}) \leq \pm 2.8 \%$
 - $2\sigma (V_{oc}) \leq \pm 0.9 \%$
- Relative measurements were performed with a flash type solar simulator.
- The accuracy of measurement reproduction with the solar simulator is less than 0.8 %.

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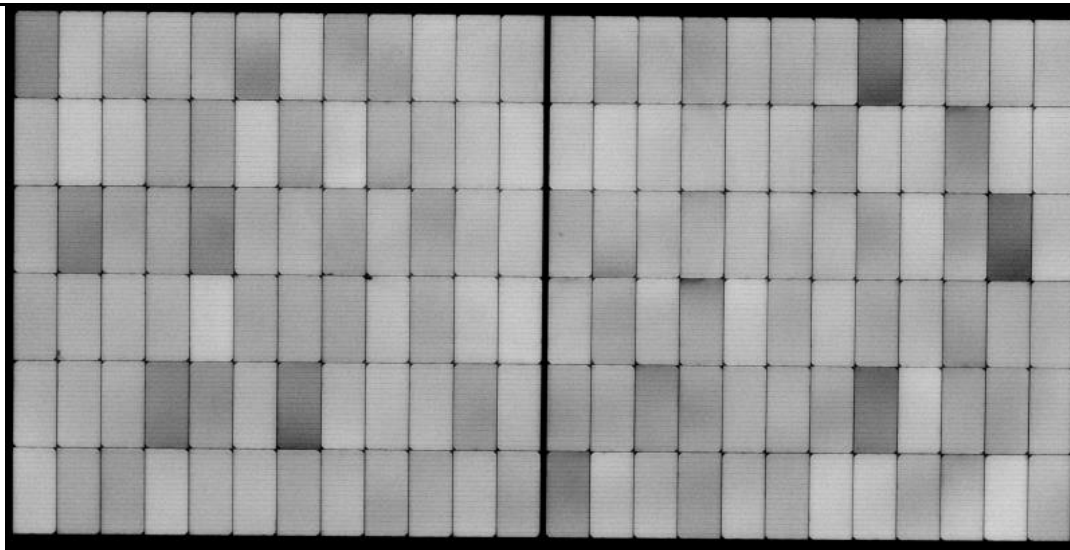
Appendix C: History of certification				
Project no.	Report no.	Date of issue	Result	Remarks
N/A				

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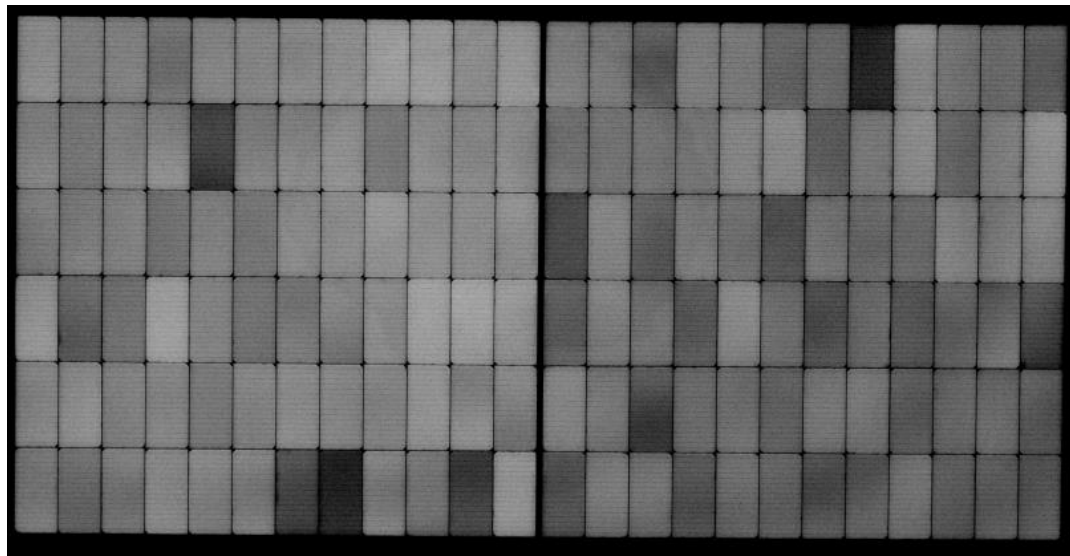
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Appendix D: Electroluminescence Images of PID Testing



Serial number 230401D230216 (before PID test)

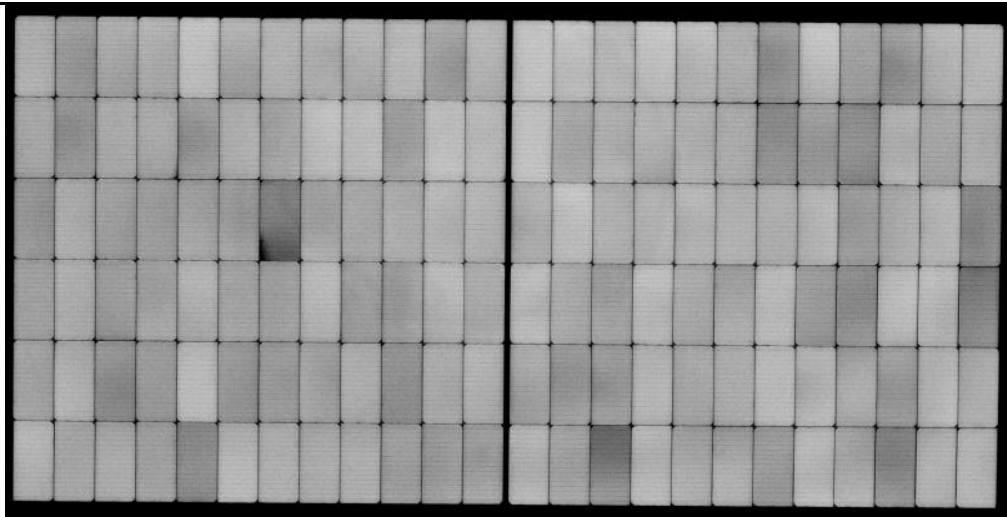


Serial number 230401D230216 (after PID test)

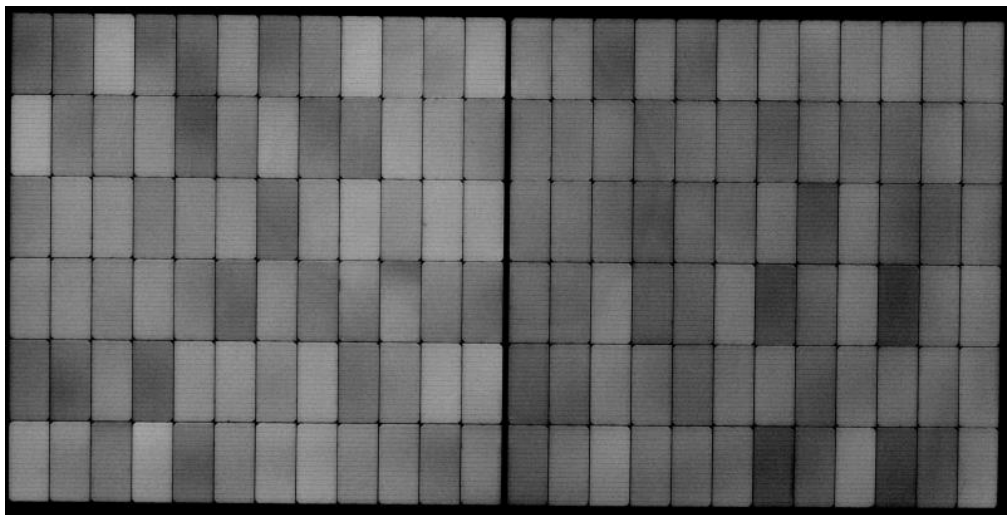
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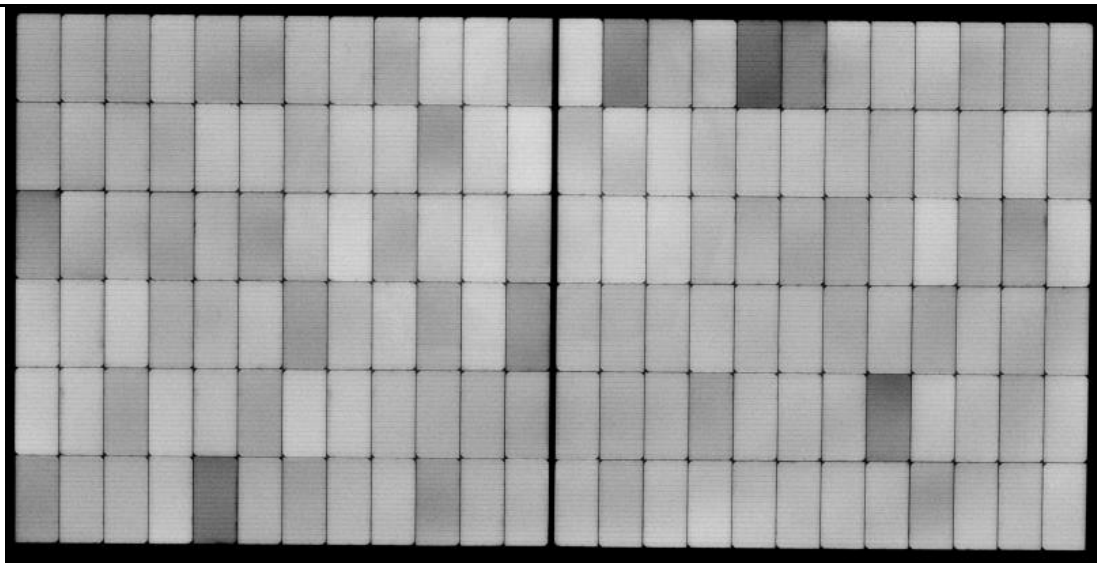


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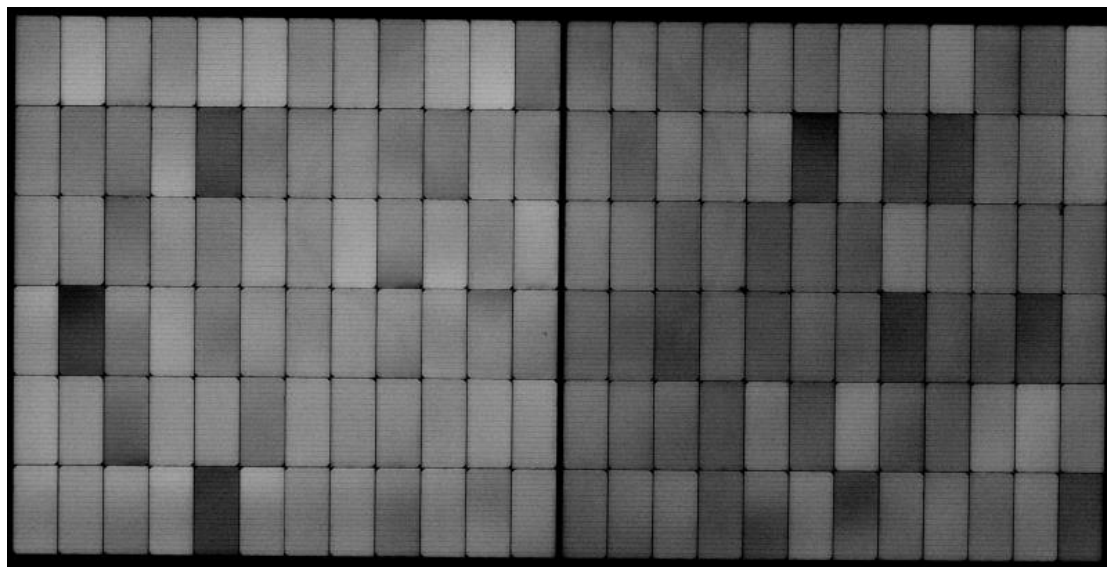
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Serial number 230401D230184 (before PID test)

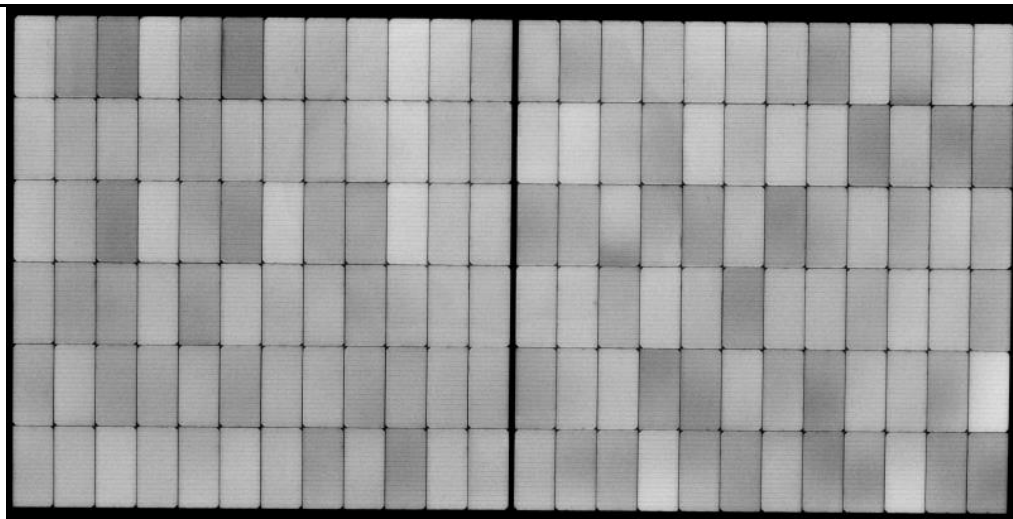


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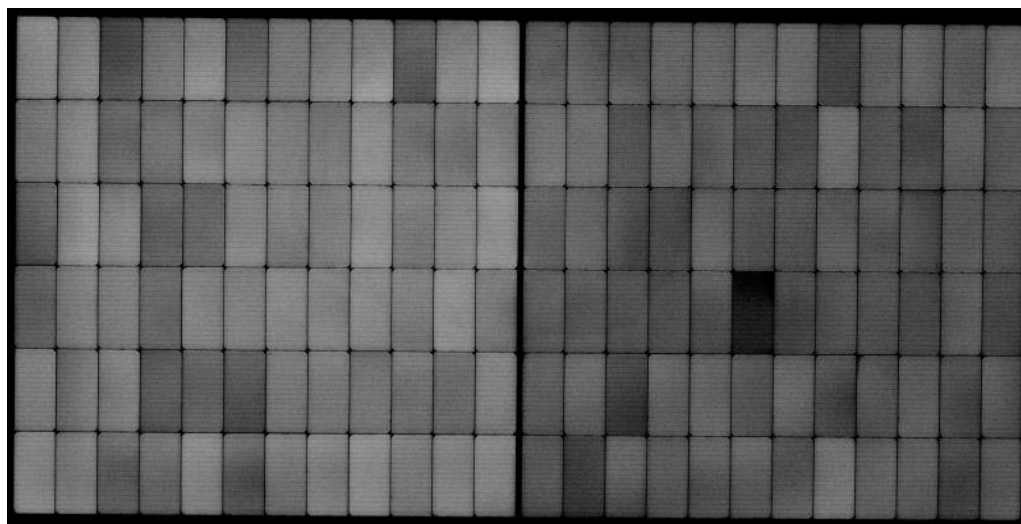
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Serial number 230401D230183 (before PID test)



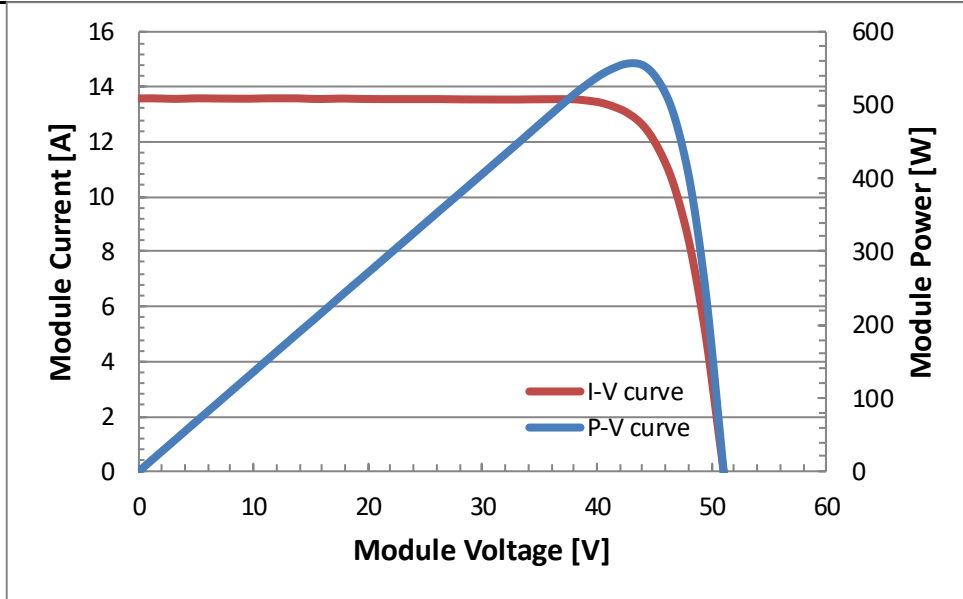
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Test report no.:

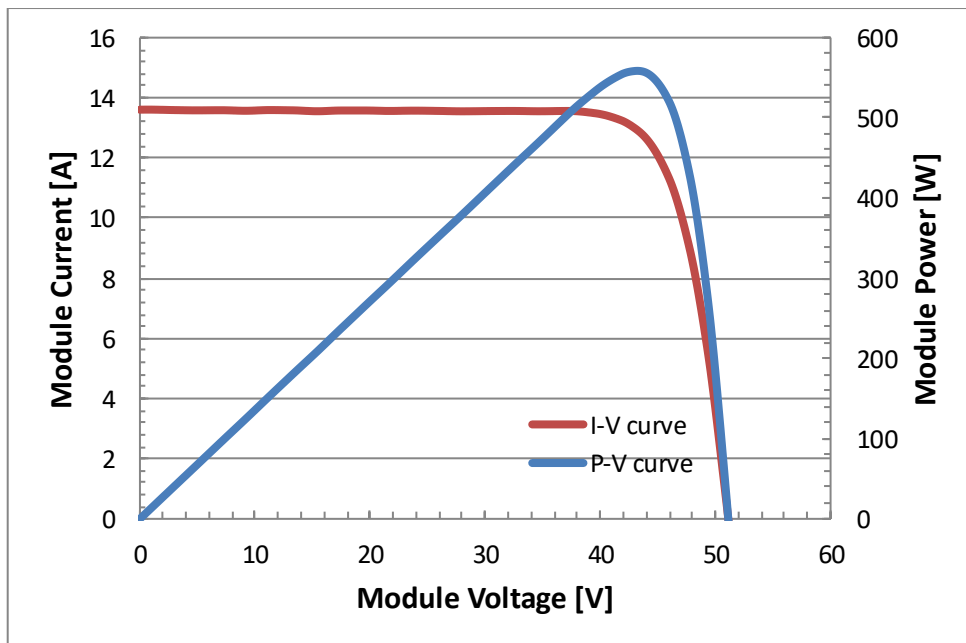
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Appendix E: Measurement Reports



Serial number 230401D230216 (before PID test)

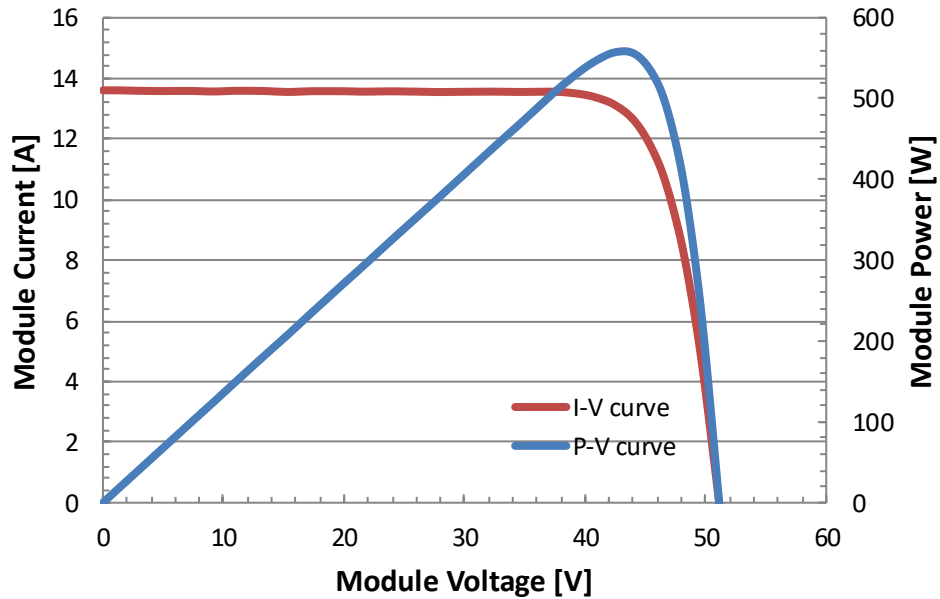


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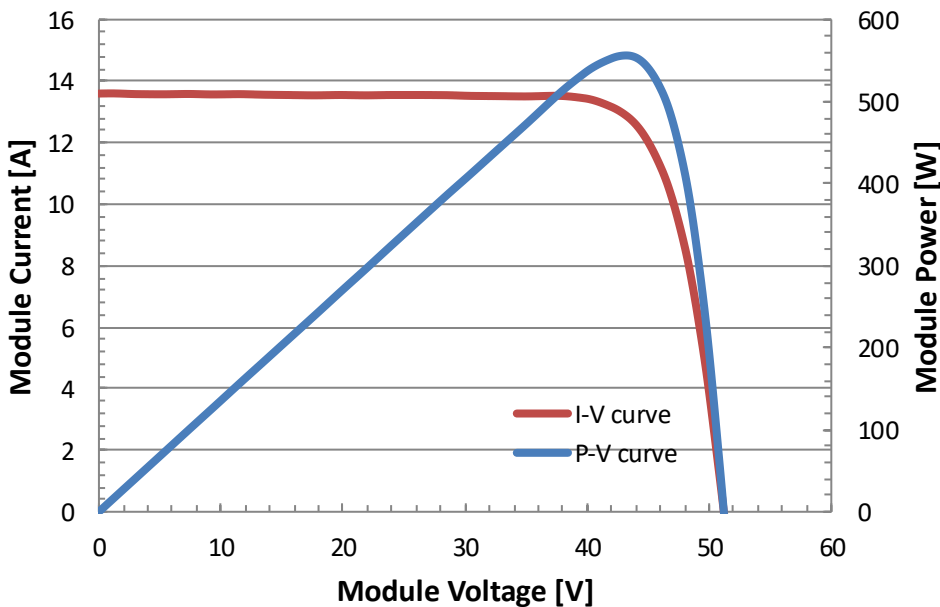
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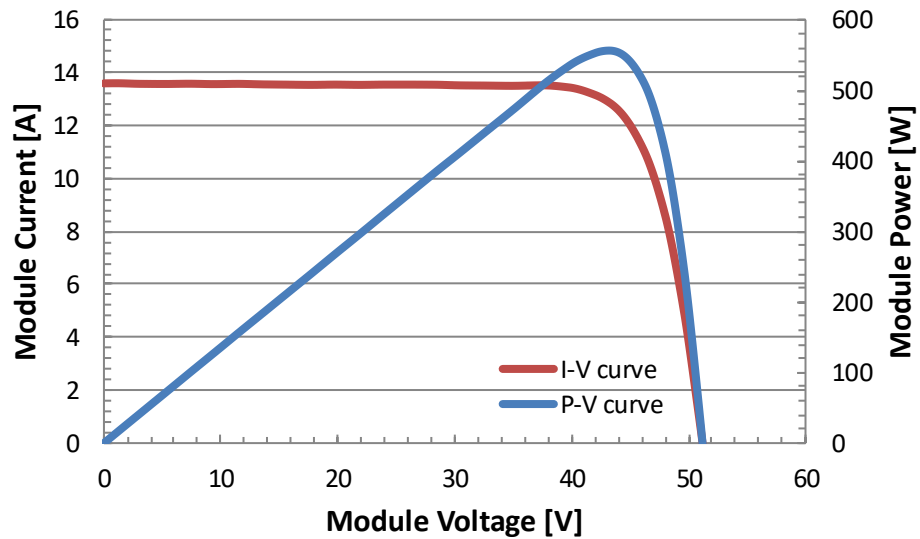


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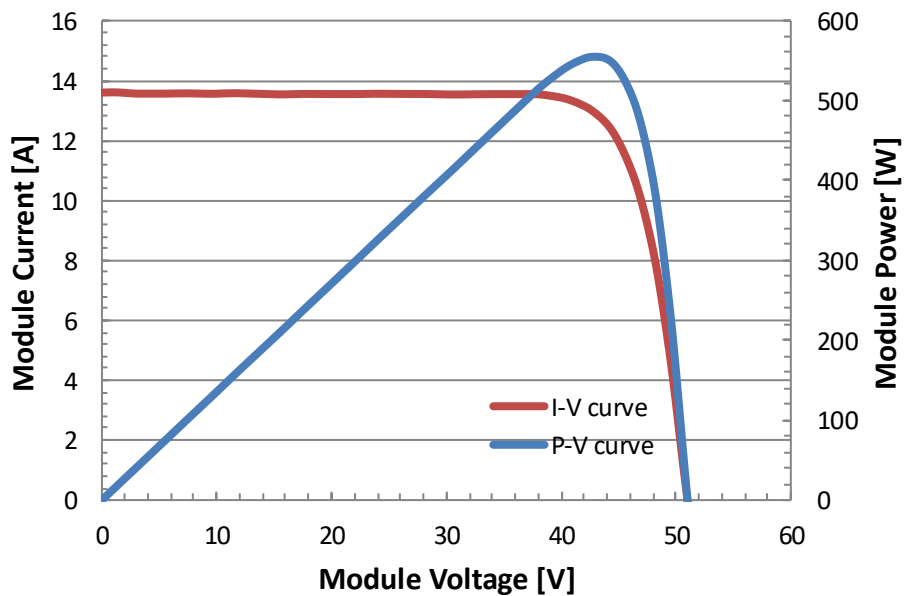
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Serial number 230401D230184 (before PID test)

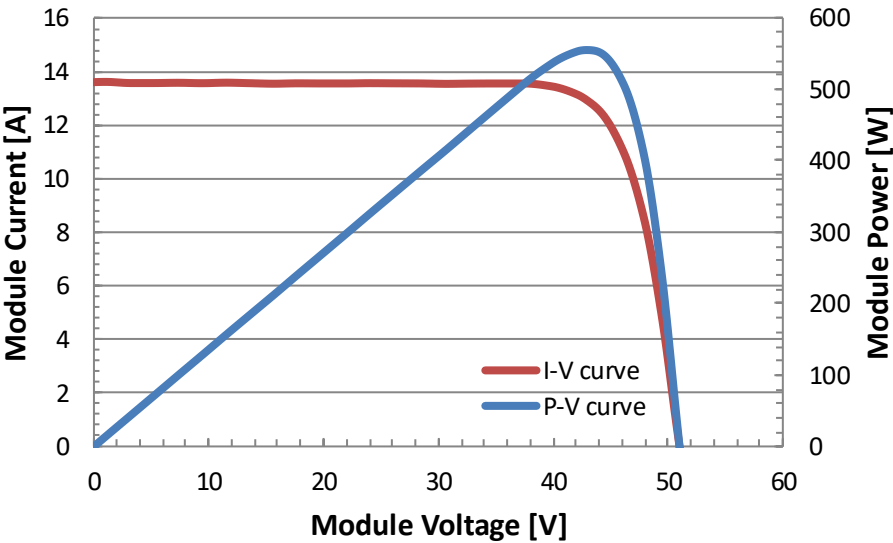


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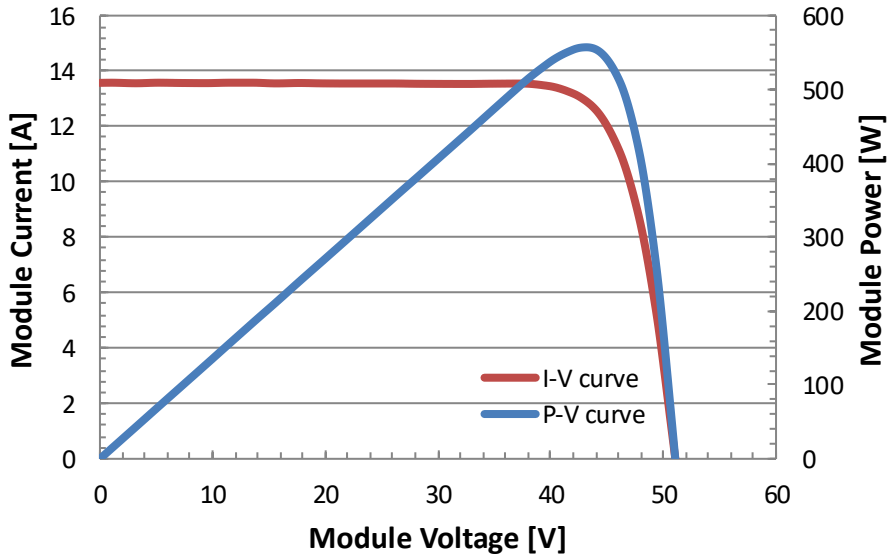
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Serial number 230401D230183 (before PID test)



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Appendix F: Photos



Fig. 1: front view of test sample



Fig. 2: rear view of test sample

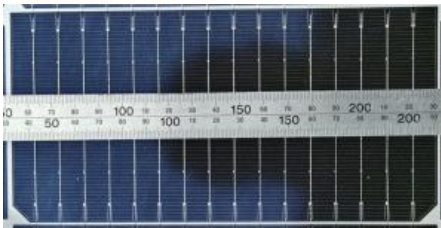


Fig. 3: detail view of solar cell

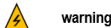


PV MODULE
Sany Silicon Energy (Zhuzhou) Co., LTD
Sany Energy Equipment Industrial Park,
No.320 Qingshui Road, Shifeng District,
Zhuzhou City, Hunan Province
412005 China
www.sanygroup.com/

SYM144TBD565
Max. power (Pmax)
Max. power tolerance
Voltage at max. power (Vmp)
Current at max. power (Imp)
Open-circuit voltage (Voc)
Short-circuit current (Isc)
Maximum system voltage

565W
±3%
42.14V
13.41A
50.87V ±3%
14.19A ±3%
1500VDC

bifaciality 80 ± 5%
Series Fuse Rating 30A
operating temperature range 40°C ~ +85°C
protect rage II
module wprotectheight 32.0(kg)
module size 2278×1134×30(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

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Fig. 4: detail view of type label

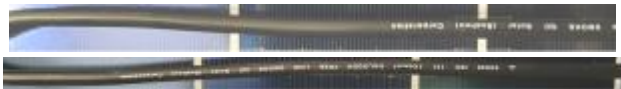


Fig. 5: view of closed junction box

Fig. 6: view of cables




Fig. 7: view of connections

Fig. 8: view of frame corner

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	N/A
<i>Fig. 9: view of grounding mark</i>	N/A