


<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>CN24PF66 004</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	326034570	Seite 1 von 55 <i>Page 1 of 55</i>
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	2496578	<b>Auftragsdatum:</b> <i>Order date:</i>	26/06/2024	
<b>Auftraggeber:</b> <i>Client:</i>	<b>Sany Silicon Energy (Zhuzhou) Co., Ltd.</b> No.333 Qingxia Road, Tongtangwan Street, Shifeng District, Zhuzhou City, 412005, Hunan Province, P.R. China			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Photovoltaic (PV) module			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	See module type designation on page 3			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Design qualification and type approval of photovoltaic (PV) modules			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	Photovoltaic (PV) modules IEC 61215-1:2021; IEC 61215-1-1:2021; IEC 61215-2:2021; IEC 61730-1:2023; IEC 61730-2:2023; EN IEC 61215-1:2021; EN IEC 61215-1-1:2021; EN IEC 61215-2:2021; EN IEC 61730-1:2018; EN IEC 61730-2:2018.			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	23/05/2024			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	See clause 6			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	23/05/2024 - 29/05/2024			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	Refer to page 5			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von:</b> <i>tested by:</i>	<b>genehmigt von:</b> <i>authorized by:</i>			
<b>Datum:</b> <i>Date:</i> 23/09/2024	<b>Ausstellungsdatum:</b> <i>Issue date:</i> 23/09/2024			
<b>Stellung / Position:</b> Project Engineer	<b>Stellung / Position:</b> Authorizer			
<b>Sonstiges /</b> <i>Other:</i> <ul style="list-style-type: none"><li>- Power range extension for previously approved model types as listed in section 1</li><li>- Extension to alternative manufacturing plant: Sany Silicon Energy (Shuozhou) Co., Ltd.</li><li>- Refer to page 5 and Constructional Data Form (CDF) CN24PF66 004 for more details.</li></ul>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>				
<b>Prüfmuster vollständig und unbeschädigt</b> <i>Test item complete and undamaged</i>				
<b>* Legende:</b> P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet <b>* Legend:</b> P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
<b>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.</b> <i>This test report only relates to the a. m. 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>				

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**Anmerkungen**  
*Remarks*

- |          |  |
|----------|--|
| <b>1</b> | <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>  |
| <b>2</b> | <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: <a href="https://go.tuv.com/digital-signature">go.tuv.com/digital-signature</a></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: <a href="https://go.tuv.com/digital-signature">go.tuv.com/digital-signature</a></i></p> |
| <b>3</b> | <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>   |
| <b>4</b> | <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

<b>I</b>	<b>General</b>
<b>1</b>	<p><b>Module type designation</b></p> <p><b>Extension power range for below model types:</b>  <b>Max. System Voltage: up to 1500 VDC (Voc at STC):</b>  <b>With cut of mono c-Si cells: (Under STC)</b>  <b>SYMN156R02TBDxxx (xxx=650, 156 cells)</b></p> <p><b>With cut of mono c-Si cells: (Under BNPI)</b>  <b>SYMN156R02TBDxxx (xxx=715, 156 cells)</b></p> <p>Approved model types:  Max. System Voltage: up to 1500 VDC (Voc at STC):  With cut of mono c-Si cells: (Under STC)  SYMN156TBDxxx (xxx=615-645, in steps of 5, 156 cells)  SYMN144TBDxxx (xxx=555-595, in steps of 5, 144 cells)  SYMN120TBDxxx (xxx=455-495, in steps of 5, 120 cells)  SYMN108TBDxxx (xxx=415-445, in steps of 5, 108 cells)  SYMN108TBDBxxx (xxx=415-445, in steps of 5, 108 cells)  SYMN108TBDFBxxx (xxx=415-445, in steps of 5, 108 cells)  SYMN144R01TBDxxx (xxx=590-620, in steps of 5, 144 cells)  SYMN120R01TBDxxx (xxx=490-520, in steps of 5, 120 cells)  SYMN108R01TBDxxx (xxx=440-470, in steps of 5, 108 cells)  SYMN156R02TBDxxx (xxx=655-675, in steps of 5, 156 cells)  SYMN156TBDOxxx (xxx=615-645, in steps of 5, 156 cells)  SYMN156TBDLxxx (xxx=615-645, in steps of 5, 156 cells)</p> <p>With cut of mono c-Si cells: (Under BNPI)  SYMN156TBDxxx (xxx=677-710, 156 cells)  SYMN144TBDxxx (xxx=611-655, 144 cells)  SYMN120TBDxxx (xxx=501-545, 120 cells)  SYMN108TBDxxx (xxx=457-490, 108 cells)  SYMN108TBDBxxx (xxx=457-490, 108 cells)  SYMN108TBDFBxxx (xxx=457-490, 108 cells)  SYMN144R01TBDxxx (xxx=649-682, 144 cells)  SYMN120R01TBDxxx (xxx=539-572, 120 cells)  SYMN108R01TBDxxx (xxx=484-517, 108 cells)  SYMN156R02TBDxxx (xxx=721-743, 156 cells)  SYMN156TBDOxxx (xxx=677-710, 156 cells)  SYMN156TBDLxxx (xxx=677-710, 156 cells)</p> <p>xxx represents output power in Wp</p>
<b>2</b>	<b>Used materials</b>

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**Produktbeschreibung**  
*Product description*

See Constructional Data Form (CDF) no. CN24PF66 004

**3 Address(es) of the manufacturing site(s)**

Name / Description:	Sany Silicon Energy (Zhuzhou) Co., Ltd.
Street:	No.333 Qingxia Road, Tongtangwan Street, Shifeng District,
Postcode / City, Country:	412005 / Zhuzhou City, Hunan Province, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Inspection date	CN23RWL8 002 / 13/05/2024

Name / Description:	Sany Silicon Energy (Shuozhou) Co., Ltd.
Street:	No.2-1, Weier Road, Pinglu Economic Development Zone,
Postcode / City, Country:	036899 / Shuozhou City, Shanxi Province, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Inspection date	CN24UWQX 001 / 22/08/2024

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**Produktbeschreibung**  
*Product description*

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**Summary of test results**

All of the required tests of the standards IEC 61215 / EN 61215 and IEC 61730 / EN 61730 were passed according to its regulations of the pass criteria.

It is therefore declared, that the photovoltaic modules of the aforementioned types fulfil the requirements of the above mentioned standards, and it is recommended that certification should be granted.

- Power range extension for previously approved model types as listed in section 1. Relevant tests were performed on representative model type SYMN156R02TBD650 (Lower power end) (Under STC) / SYMN156R02TBD715 (Lower power end) (Under BNPI) the test results are documented in this report.

- Extension to alternative manufacturing plant: Sany Silicon Energy (Shuozhou) Co., Ltd. as bold font shown in section 3. The factory inspection has been performed.

This report have to be read in conjunction with Constructional Data Form (CDF) No. CN24PF66 004 and test report No. CN24PF66 001-003.

This test report includes history of reporting and certification, photo documentation in the appendix.

Throughout this report a point is used as the decimal separator.

*Summary of test locations:*

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

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

<b>5</b>	<b>Test specification</b>		
	IEC 61215-1:2021; EN 61215-1:2021: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements	applicable	—
	IEC 61215-1-1:2021; EN 61215-1-1:2021: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules	applicable	
	IEC 61215-2:2021; EN 61215-2:2021: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures	applicable	
	IEC 61730-1:2023; EN IEC 61730-1:2018: Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction	applicable	
	IEC 61730-2:2023; EN IEC 61730-2:2018: Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing	applicable	

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6	List of test samples
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- ☐ The modules tested were taken at random from a production batch and subjected to manufacturer's normal quality control and inspection for safety testing
- ☐ The modules tested were prototypes of a new design and not taken from a production batch.

**Module type: SYMN156R02TBD650 (STC) / SYMN156R02TBD715 (BNPI) (Lower power end)**

Sample no.	Sample SN	Test sequence	Remarks / constructional characteristics (e.g. cell, backsheet, frame type)
1	240501102D00189	A	Front cover: 2.0mm Semi-tempered AR coated glass from CSG HOLDING CO., LTD. Encapsulation material: EP304 (between glass and cell) / F406PS (between cell and backsheet) from HANGZHOU FIRST APPLIED MATERIAL CO., LTD Rear cover: 2.0mm Semi-Tempered mesh glazed back glass from CSG HOLDING CO., LTD. Solar Cell: SYCN18AT16, 191.6mm x 91.1mm (±0.25) x 0.13mm (±0.015), Topcon, 16BB from Sany Silicon Energy (Zhuzhou) Co., Ltd. Frame: 30mm, 6005-T6 from CHANGSHU DONGNENG SOLAR TECHNOLOGY CO., LTD Adhesive of frame sealing: HT-8258 from Jiangsu Tianchen New Materials CO., LTD Cell connector: Φ0.26mm Sn60/Pb40 from Suzhou bonide Photovoltaic Technology Co., Ltd String connector: 6.0mm x 0.3mm, 4.0mm x 0.3mm Sn60/Pb40 from Suzhou bonide Photovoltaic Technology Co., Ltd
2	240501102D00001	A	Fluxing agent: SF180 from ASAHI SOLDER TECHNOLOGY(WUXI) CO., LTD Fixing Tape: HZ UV-100 from Guangdong Sunrui New Material Co., Ltd. Junction box: 3Qxy from QC Solar (Suzhou) Corporation Cable: 62930 IEC 131 1 x 4.0mm <sup>2</sup> from QC Solar (Suzhou) Corporation Connector: QC4.10-cds from QC Solar (Suzhou) Corporation Bypass diode: QCM4045 from QC Solar (Suzhou) Corporation Adhesive of J-Box sealing: HT-8258 from Jiangsu Tianchen New Materials CO., LTD Potting Material in junction box: HT-6360 A/B from Jiangsu Tianchen New Materials CO., LTD

Supplementary information:

See test chart in Appendix A for full test sequences.



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II	IEC 61215-1:2021 and IEC 61730-1:2023 – Requirements for design construction
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7	Classification, application and intended use (Clause 5 of IEC 61730-1:2023)
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7.1	General (Clause 5.1 of IEC 61730-1:2023)
	The module has been evaluated for the following Class (IEC 61140):
	<input type="checkbox"/> Class 0 <input checked="" type="checkbox"/> Class II <input type="checkbox"/> Class III
	—

7.2	Rating categories and special applications (Clause 5.2 of IEC 61730-1:2023)
	Modules are intended for use in the temperature range -40°C - +70°C (T <sub>98 max</sub> ).
	PV modules are installed in the following special applications:
	Building attached PV (BAPV)
	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no
	Building integrated PV (BIPV)
	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no
	Applications in areas where snow and / or wind load exceeding loads as tested in IEC 61730-2
	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no
	Other (please specify)
	<input type="checkbox"/> yes, as follows: <input checked="" type="checkbox"/> no
	—

8	Requirements for design and construction (Clause 6 of IEC 61730-1:2023 and Clause 5 of IEC 61215-1:2021)
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8.1	General (Clause 6.1 of IEC 61730-1:2023)
	Product shipped from the factory as
	<input checked="" type="checkbox"/> completely assembled <input type="checkbox"/> subassemblies
	—
	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form.
	PV modules are completely assembled.
	P
	All methods of PV module mounting and wiring that are specified in the installation instructions are evaluated for compliance with the IEC 61730 series.
	Available in installation manual
	P
	Equipotential bonding continuity is not interrupted by installation.
	Confirmed by test MST 13.
	P
	Any adjustable or movable structural part is provided with a locking device.
	No such parts.
	N/A
	PV modules have no accessible burrs, sharp edges, or sharp points.
	Compliance checked by tests MST 01 and MST 06
	P
	Parts are prevented from loosening or turning.
	Compliance checked by tests MST 01
	P



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	All electrical data to be reported in the marking or in the documentation accompanying a PV module are given for standard test conditions (1000 W/m <sup>2</sup> , 25 °C, spectral irradiance equal to AM1.5 according to IEC TS 61836). For bifacial PV modules, all electrical data are shown as relative to STC, BNPI and aBSI on the front side of the module, plus bifaciality coefficients at STC according to IEC TS 60904-1-2 and IEC 61215-1:2021.	Marked on type label	P
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**8.2 Marking and documentation (Clause 6.2 of IEC 61730-1:2023 and Clause 5 of IEC 61215-1:2021)**

**8.2.1 Marking (Clause 6.2.1 of IEC 61730-1:2023)**



	Instructions related to safety are in an official language of the country where the equipment is to be installed.	Marking and documentation are written in English	P
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**8.2.1.1 General / Name plate (Clause 6.2.2.1 of IEC 61730-1:2023 and Clause 5.1 of IEC 61215-1:2021)**

	Each PV module includes the following clear and indelible markings:	Compliance checked by tests MST 01 and MST 05	—
	a) Name, registered trade name, or registered trade mark of manufacturer	Marked on type label	P
	b) Type or model number designation	Marked on type label	P
	c) Serial number (unless marked on other part of product)	Marked on type label	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	Traceable from serial number (checked during factory inspection)	P
	The manufacturer's identification is in a traceable code if the product is identified by the brand or trademark owned by a private labeler.	Marked on type label	P
	The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code	Marked on type label	P
	- does not repeat in less than 10 years	Marked on type label	P
	- does not require reference to the production records of the manufacturer to determine when the product was manufactured.	Marked on type label	P
	e) Maximum system voltage or "V <sub>sys</sub> "	Marked on type label	P
	f) Class of protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Marked on type label	P
	g) Voltage at open-circuit or "V <sub>oc</sub> " including manufacturing tolerances	N/A	N/A
	h) Current at short-circuit or "I <sub>sc</sub> " including manufacturing tolerances	Marked on type label	P
	i) Maximum power or "P <sub>max</sub> " including manufacturing tolerances	Marked on type label	P
	j) For bifacial modules, a clear indication which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight (> 300 W/m <sup>2</sup> ).	Maximum series fuse rating indicated	P

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	k) Short-circuit current bifaciality coefficient $\phi_{Isc}$ Open-circuit voltage bifaciality coefficient $\phi_{Voc}$ Maximum power bifaciality coefficient $\phi_{Pmax}$	Compliance checked by tests MST 01 and MST 05	P
	l) For flexible modules, the minimum radius of curvature	Marked on type label	P
	m) Positive ("+" or downward) and negative ("- " or upward) design load ratings in pascal (Pa) excluding the test load safety factor, as verified in the static mechanical load test (MST 34)	Marked on type label	P
	n) Maximum overcurrent protection rating	Marked on type label	P
	o) A module temperature rating of 70 °C, (or if tested to IEC TS 63126 Level 1 or Level 2, 80 °C or 90°C)	Marked on type label	P
	p) Connector manufacturer and model used; refer to manual for designated mating connectors	Marked on type label	P
	q) A link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module	Marked on type label	P
	All electrical data are shown at standard test conditions (STC) (1000 W/m <sup>2</sup> , (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	Marked on type label	P
	International symbols are used where applicable.	Marked on type label	P
	PV connectors or wiring are marked with a symbol or/and hint „Do not disconnect under load“. Symbol or/and warning notice is imprinted or labelled close to connector.	Symbol, e.g.  / warning notice indicated on connectors	P
	PV connectors are clearly marked indicating the terminal polarity.	Marked on connectors	P
	For Class II and Class 0 PV modules, the  (IEC 60417-6042: Caution, risk of electric shock) symbol is applied near the PV module electrical connection means.	Electrical hazard symbol indicated on type label	P
	PV modules are marked to indicate the class.	<input checked="" type="checkbox"/> class II:  <input type="checkbox"/> class III:  <input type="checkbox"/> class 0: no symbol	P
	PV modules provided with a functional earth terminal is provided with a symbol according to IEC 60417-5018:2011-07.	No such part	N/A
	PV modules provided with terminals for field wiring rated only for use with copper wire are marked, at or adjacent to the terminals, with the statement "Use copper wire only", "Cu only", or the equivalent.	PV modules provided with terminals for field wiring rated for use with all types of wiring material, do not need to be marked.	N/A
	PV modules provided with terminals for field wiring rated only for use with a different specific wiring material are	PV modules provided with terminals for field wiring rated for use with all types of wiring	N/A

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	marked with a similar statement referring to the rated material.	material, do not need to be marked.	
8.2.1.2	<b>Symbols (Clause 6.2.2.2 of IEC 61730-1:2023 )</b>		
8.2.1.2.1	<b>Equipotential bonding (Clause 6.2.2.2.1 of IEC 61730-1:2023)</b>		
	A wiring terminal or bonding location for equipotential bonding is identified with:		P
	No other terminal or location is identified in this manner.	mounting hole may not be used for bonding.	P
8.2.2	<b>Documentation (Clause 6.2.3 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)</b>		
8.2.2.1	<b>General (Clause 6.2.3.1 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)</b>		
	Documentation describing electrical and mechanical installation is provided.	Available in data sheet / installation manual	P
	The documentation states the class for protection against electrical shock under which the PV module was qualified and any specific limitations required for that class.	Available in data sheet / installation manual	P
	The documentation assures that installers and operators receive appropriate and sufficient instructions for safe installation, use and maintenance of the PV modules that it accompanies.	Available in data sheet / installation manual	P
	The documentation is supplied in at least one of the official languages of the country where the PV modules will be installed.	Available in data sheet / installation manual	P
	International symbols are used where applicable.	Available in data sheet / installation manual	P
	Assembly instructions are provided with a product shipped in subassemblies and are detailed and adequate to the degree required to facilitate complete and safe assembly of the product.	Available in data sheet / installation manual	P
	Documentation is provided in paper form in each shipping unit or as an electronic link.	Available in data sheet / installation manual	P
	- The web address is marked on the device or provided in an information sheet enclosed with each shipping unit.	Available in data sheet / installation manual	P
	- The web address is in the form of a Uniform Resource Locator (URL - <a href="http://www.____.com/____/">http://www.____.com/____/</a> ), or a Quick Response Code (QRcode).	Available in data sheet / installation manual	P
	- The web address link takes the user to an internet page containing the required information or a direct link to the required information.	Available in data sheet / installation manual	P
	- The file is in a file format that is commonly used and is downloadable.	Available in data sheet / installation manual	P
	The needs for maintaining and supporting information during the life cycle of the PV modules is taken into account when planning the preparation of information for use as in IEC/IEEE 82079-1.	Available in data sheet / installation manual	P

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result
	The documentation contains the following information:	N/A	N/A
	- Name, registered trade name, or registered trade mark of manufacturer	Available in data sheet / installation manual	P
	- Type or model number designation	Available in data sheet / installation manual	P
	- Maximum system voltage or " $V_{sys}$ "	Available in data sheet / installation manual	P
	- Class for protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Available in data sheet / installation manual	P
	- Voltage at open-circuit or " $V_{oc}$ " including manufacturing tolerances	Available in data sheet / installation manual	P
	- Current at short-circuit or " $I_{sc}$ " including manufacturing tolerances	Available in data sheet / installation manual	P
	- Maximum power or " $P_{max}$ " including manufacturing tolerances	Available in data sheet / installation manual	P
	- For bifacial modules, a clear indication which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight ( $> 300 \text{ W/m}^2$ ).	N/A	N/A
	- Short-circuit current bifaciality coefficient $\phi_{Isc}$ - Open-circuit voltage bifaciality coefficient $\phi_{Voc}$ - Maximum power bifaciality coefficient $\phi_{Pmax}$	N/A	N/A
	- Minimum radius of curvature	N/A	N/A
	- A module temperature rating of 70 °C, (or if tested to IEC TS 63126 Level 1 or Level 2, 80 °C or 90°C)	N/A	N/A
	- Connector manufacturer and model used; refer to manual for designated mating connectors	Available in data sheet / installation manual	P
	- A link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module	Available in data sheet / installation manual	P
	- Maximum overcurrent protection rating (compliance verified by reverse current overload test (MST 26))	Available in data sheet / installation manual	P
	- Recommended maximum series / parallel PV module configurations	Available in data sheet / installation manual	P
	- Temperature coefficient for maximum output power	Available in data sheet / installation manual	P
	- Temperature coefficient for voltage at open-circuit	Available in data sheet / installation manual	P
	- Temperature coefficient for short-circuit current	Available in data sheet / installation manual	P
	- All electrical data are shown at standard test conditions (1000 W/m <sup>2</sup> , (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	Available in data sheet / installation manual	P
	- Performance at low irradiance (MQT 07) is specified.	Available in data sheet /	P

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		installation manual	
	Detailed wiring method for electrical installation is included in the documentation, containing:	N/A	N/A
	- minimum cable diameters for PV modules intended for field wiring	Available in installation manual	P
	- any limitations on wiring methods and wire management that apply to the PV module junction box	Available in installation manual	P
	- size, type, material, and temperature rating of the conductors to be used	Junction boxes fulfill the requirements of IEC 62790	P
	- type of terminals for field wiring	Junction boxes fulfill the requirements of IEC 62790	P
	- specific PV connector model / types and manufacturer to which the PV module connectors can be mated	Available in installation manual	P
	- bonding to be used (if applicable) including all provided or specified hardware	Available in installation manual	P
	- type and ratings of bypass diode to be used (if applicable) as well as the installation instructions for those diodes (if applicable)	Junction boxes fulfill the requirements of IEC 62790	P
8.2.2.2	Suitable environmental and mounting conditions (Clause 6.2.3.2 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)		
	The documentation states the environmental and mounting conditions for which the module has been qualified, including:		—
	The maximum rated altitude the PV module is designed for	≤ 2000 m above sea level	P
	Indication of the negative (upward) and positive (downward) design load ratings during the static mechanical load test according to MST 34	Available in installation manual	P
	For bifacial PV modules, the exposure side meets the following requirements:	N/A	N/A
	- Clear indication of which side(s) of the module have been tested for the front side exposure	N/A	N/A
	- The back side is restricted for use with indirect or limited direct sunlight (less than 300 W/m <sup>2</sup> ) unless tested as a front side	N/A	N/A
	- Each side meets the requirements for front side if both sides of a module are intended for use with prolonged exposure to direct sunlight (>300 W/m <sup>2</sup> )	N/A	N/A
	Temperature range from a lower limit of environmental temperature of -40 °C to the upper limit set by a 98 <sup>th</sup> percentile module operating temperature of 70 °C (80 °C or 90 °C if tested to Level 1 or Level 2 conditions as described in IEC TS 63126)	Available in installation manual	P
	Guidance on geographic areas, mounting conditions and system design and installation factors where the anticipated 98 <sup>th</sup> percentile module operating temperature will be greater than 70 °C (or 80°C or 90°C if tested to Level 1 or Level 2 conditions)	Available in installation manual	P
	Factors that can increase voltage or current beyond the STC values are given in the documentation, including the following or equivalent statements:	Available in installation manual	P

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	- "A photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Factors to consider include module temperature and front side irradiance (and, for bifacial modules, ground or roof albedo, row spacing, and installation height). Accordingly, the values of $V_{OC}$ and $I_{SC}$ (or for bifacial modules, $I_{SC-aBSI}$ ) marked on this PV module should be multiplied by a factor of 1,25 when determining voltage and current ratings for components connected to the PV output."	Available in installation manual	P
	- "The safety factor of 1,25 given for the minimum voltage rating of the components in the example statement above may be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for $V_{OC}$ . The safety factor of 1,25 given for conductor current ratings values for $I_{SC}$ (or for bifacial modules, $I_{SC-aBSI}$ ) may be adjusted based on the maximum values of irradiance incident on the front side of the module (and the rear side for bifacial modules). To this purpose, a full simulation for the specific location and module orientation (and for bifacial modules, ground albedo, row spacing and installation height) is required. Further guidance for the choice of a safety factor other than 1,25 is given in IEC 62548."	Available in installation manual	P
	The documentation includes a statement advising that artificially concentrated sunlight producing a PV module's current above the value reported on the nameplate shall not be directed onto the front side or the back side of the PV module.	Available in installation manual	P
	The documentation reports if the PV modules were evaluated according to the following standards:	N/A	N/A
	- IEC 61701: Salt mist corrosion testing	N/A	N/A
	- IEC 62716: Ammonia corrosion testing	N/A	N/A
	- IEC 62109-3: Safety of power converters for use in photovoltaic power systems – Part 3: particular requirements for electronic devices in combination with photovoltaic elements	N/A	N/A
	- IEC TS 63126: Guidelines for qualifying PV modules, components and materials for operation at high temperatures	N/A	N/A
8.2.2.3	Mounting (Clause 6.2.3.3 of IEC 61730-1:2023 and Clause 5.2.2 of IEC 61215-1:2021)		
	The documentation includes adequate information and instructions for each mounting methods listed in the manufacturer's mounting instructions as well as:		—
	- A statement indicating the minimum mechanical means for securing the PV module evaluated during the mechanical load test (MST 34 of IEC 61730-2:2023) and the conformity to the mechanical load requirements of the series IEC 61215	Evaluated with Static mechanical load test (MST 34) and Module breakage test (MST 32)	P
	- Limitations to the mounting situation (e.g.slope, orientation, mounting means, cooling, specific spacing and any other condition that can influence the safety of the PV module installation)	No limitations indicated.	P



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	- Type of adhesive and the allowable substrates if adhesives are used for mounting (i.e. flexible modules)	N/A	N/A
	- The manufacturer and unique part number of the adhesive, the required surface preparation, adhesive application process, and curing condition if adhesives are specified for use in the field to provide mechanical securement to specific roof coverings or mounting systems	N/A	N/A
8.2.2.4	<b>Connectors/wiring (Clause 6.2.3.4 of IEC 61730-1:2023)</b>		
	The documentation includes a detailed description of the following information related to the connectors and wiring method:		—
	- Minimum cable diameters, rated voltage, current and temperature of cables for PV modules intended for field wiring and compliance with IEC 62930, type 131 or type 133; or EN 50618	<input checked="" type="checkbox"/> IEC 62930	P
	- Limitations on wiring methods and wire management that apply to the junction box for the PV module	No limitations indicated.	P
	- Statement that wiring to interconnect modules shall be rated for the application, and it is important that the user is aware of national installation codes.	Available in installation manual	P
	- Specific model / types together with the manufacturer name / brand of the PV connector(s) to which the PV module connectors can be mated	Available in installation manual	P
	- The bonding method(s) to be used, if applicable, is specified either all provided or specified hardware	Available in installation manual	P
	- The type and ratings of bypass diode to be used (if applicable)	Available in installation manual	P
8.2.2.5	<b>Fire ratings (Clause 6.2.3.5 of IEC 61730-1:2023)</b>		
	- a statement indicating the fire rating(s)	<input checked="" type="checkbox"/> fire rating(s) and applied standards <input type="checkbox"/> statement that resistance to external fire sources was not evaluated	P
8.3	<b>Electrical components and insulation (Clause 5.3 of IEC 61730-1:2023)</b>		
8.3.1	<b>Internal wiring (Clause 6.3.2 of IEC 61730-1:2023)</b>		
	Internal wiring has sufficient current carrying capacity for the relevant application.	Verified by MST 14 and MST 26	P
8.3.2	<b>Junction boxes for PV modules (Clause 6.3.6 of IEC 61730-1:2023)</b>		
	Junction boxes for PV modules fulfil the requirements of IEC 62790:2020 and additional requirements in 6.5.2.2.3 of IEC 61730-1:2023 or UL 3730:2014.	<input checked="" type="checkbox"/> IEC 62790:2020	P
	Module level testing is performed to validate adhesion/connection of the junction box to the module and minimum clearance and creepage distances.	Verified by MST 01	P



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<b>8.3.3</b>	<b>External wiring and cables (Clause 6.3.3 of IEC 61730-1:2023)</b>		
	External wires and cables fulfil the requirements of IEC 62930:2017.	<input checked="" type="checkbox"/> IEC 62930:2017 (type 131 or type 133) <input type="checkbox"/> EN 50618 (alternative to IEC 62930 type 131)	P
<b>8.3.4</b>	<b>Module overcurrent protection rating (Clause 6.3.4 of IEC 61730-1:2023)</b>		
	Overcurrent protecting rating is determined according to IEC 60269-6.	Compliance verified by reverse current overload test (MST 26)	P
<b>8.3.5</b>	<b>Connectors (Clause 6.3.5 of IEC 61730-1:2023)</b>		
	External DC connectors fulfil the requirements of IEC 62852:2014 + Amd. 1:2020 and requirements in 6.5.2.2 of IEC 61730-1:2023 or/and UL 6703:2014.	<input checked="" type="checkbox"/> IEC 62852:2014 + Amd. 1:2020	P
	Connectors are marked in accordance with 6.2 of IEC 61730-1:2023.	Verified by MST 01	P
<b>8.3.6</b>	<b>Frontsheets and backsheets (Clause 6.3.7 of IEC 61730-1:2023)</b>		
	Material of frontsheet:	<input checked="" type="checkbox"/> Glass <input type="checkbox"/> Polymeric material <input type="checkbox"/> Others	—
	Material of backsheet:	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Polymeric material <input type="checkbox"/> Others	—
	Polymeric frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.	Compliance checked	P
	Backsheets are restricted for use with indirect or limited direct sunlight equal to or lower than 300 W/m <sup>2</sup> .	Compliance checked	P
	The DTI requirements listed in Table 3 and Table 4 of IEC 61730-1:2023 are fulfilled by single or multiple layers of RUI as described in IEC 62788-2-1.	See tables in 8.7	P
	Adhesion of frontsheet and backsheet to encapsulant or glass is appropriate.	Compliance checked at module level by IEC 61730-2:2023 tests listed in this report.	P
<b>8.3.7</b>	<b>Insulation barriers (Clause 6.3.8 of IEC 61730-1:2023)</b>		
	Polymeric insulation barrier meets the relevant requirements of Clause 6.5.2 of IEC 61730-1:2023).	See 8.5.1 Part of IEC 62790:2020 qualification	P
	Barrier is held in place while keeping its required electrical and mechanical properties.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Removal of barrier is only possible by using a tool.	Tools are necessary for removal of the insulation barrier.	P
<b>8.3.8</b>	<b>Electrical connections (Clause 6.3.9 of IEC 61730-1:2023)</b>		
<b>8.3.8.1</b>	<b>General (Clause 6.3.9.1 of IEC 61730-1:2023)</b>		

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	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material.	Compliance checked by MST 01.	P
	Prevention is taken that connections do not become loose, e.g. by using a washer.	Verified by MST 01 / MST 13	P
	End of a stranded conductor is not consolidated by soft soldering.	Compliance checked by MST 01.	P
	Measures are taken to prevent contact stress impairing electrical conductivity.	Compliance checked by MST 01.	P
<b>8.3.8.2</b>	<b>Terminals for external cables and PV connector ribbons (Clause 6.3.9.2 of IEC 61730-1:2023)</b>		
	Terminals for electrical connections are suitable for the type and range of conductor cross-sectional areas according to specification of the manufacturer. They meet the requirements of IEC 62790:2020 and additional RTE, RTI, and TI requirements in 6.5.2.2.3 of IEC 61730-1:2023 or/and UL 3730:2014.	<input checked="" type="checkbox"/> IEC 62790:2020	P
	Insulated terminals are designed in a manner where a possible displacement that may result in a reduction of clearances and creepage distances is prevented.	Insulated terminals are qualified according to the related component standards. Part of IEC 62790:2020 qualification.	P
<b>8.3.9</b>	<b>Encapsulant (Clause 6.3.10 of IEC 61730-1:2023)</b>		
	Thermal properties are sufficient for intended application.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	The insulation properties according to Clause 6.5.2.2 of IEC 61730-1:2023 are met, if applicable.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
<b>8.3.10</b>	<b>Bypass diodes (Clause 6.3.11 of IEC 61730-1:2023)</b>		
	Bypass diodes are rated to withstand the current and voltage for their intended use.	Compliance checked by MST 01, MST 07, MST 22 and MST 25 Datasheet values for bypass diode checked.	P

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<b>8.4</b>	<b>Mechanical and electromechanical connections (Clause 6.4 of IEC 61730-1:2023)</b>		
<b>8.4.1</b>	<b>General (Clause 6.4.1 of IEC 61730-1:2023)</b>		
	Type of connection:	<input checked="" type="checkbox"/> Connection within frame <input type="checkbox"/> Mounting interfaces via adhesive <input checked="" type="checkbox"/> Frame to clamp a mounting system <input checked="" type="checkbox"/> Equipotential bonding <input checked="" type="checkbox"/> Attachment of junction box <input type="checkbox"/> Mechanical connections within the laminate	N/A
	Mechanical connections are durable to withstand the thermal, mechanical, and environmental stresses occurring in the application.	Compliance checked by inspection and by MST 13, MST 32, MST 34 and MST 37	P
	Parts intended to be removed are only detachable with the aid of tools.	Tools are necessary for removal.	P
	A tool does not come into contact with the live parts when the lid is removed with it.	Compliance checked by the corresponding component standards.	P
	No friction occurs between surfaces as the sole means to inhibit the turning or loosening of a part, unless provisions to prevent unintended movement or rotation of the component are given.	No such parts.	N/A
<b>8.4.2</b>	<b>Screw connections (Clause 6.4.2 of IEC 61730-1:2023)</b>		
	Screws and mechanical connections withstand the mechanical stresses occurring in normal use.	No screw is used.	N/A
	Screws are not made of a material which is soft or liable to creep.	No screw is used.	N/A
	Screws used to provide mechanical stability and continuity for equipotential bonding withstand the mechanical stresses occurring in normal use.	No screw is used.	N/A
	At least one screw per electrical-mechanical connection ensures the electrical connection between the metallic components.	No screw is used.	N/A
	Screws used for mechanical and electrical connections with a nominal diameter of less than 3 mm are screwed into metal.	No screw is used.	N/A
	For screws used for mechanical and electrical connections two full threads are engaged into the metal.	No screw is used.	N/A
	Screwed and other fixed connections are in such a way that they do not come loose through torsion, bending stresses, vibration, etc.	No screw is used.	N/A
<b>8.4.3</b>	<b>Rivets (Clause 6.4.3 of IEC 61730-1:2023)</b>		
	Rivets that have the double function of being concurrently electrical and mechanical connections are locked against loosening.	No rivet is used.	N/A

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<b>8.4.4</b>	<b>Thread-cutting screws (Clause 6.4.4 of IEC 61730-1:2023)</b>		
	Thread-cutting and self-tapping screws are not used for interconnection of current-carrying parts made of a material which is soft or liable to creep.	No thread-cutting screw is used.	N/A
	No thread-forming or thread-cutting (self-tapping) screws (sheet metal screws) are used for the connection of current-carrying parts.	No thread-cutting screw is used.	N/A
	Thread-cutting (self-tapping) screws are not used if they are likely to be operated by the user or installer.	No thread-cutting screw is used.	N/A
	Thread-cutting and thread-forming screws, used to provide continuity for equipotential bonding, are such that it is not necessary to disturb the connection in normal use.	No thread-cutting screw is used.	N/A
	For equipotential bonding one screw is used if two full threads engage the metal.	No thread-cutting screw is used.	N/A
<b>8.4.5</b>	<b>Form / press / tight fit (Clause 6.4.5 of IEC 61730-1:2023)</b>		
	Form/press/tight fits of metallic components which are not separately equipotential bonded are electrically connected.	Compliance checked by inspection and tested by MST 32, MST 34 and MST 13 pre and post the MST 32 and MST 34 tests.	P
<b>8.4.6</b>	<b>Connections by adhesives (Clause 6.4.6 of IEC 61730-1:2023)</b>		
	Adhesion of a polymer relied upon for insulation to another insulating layer is appropriate for the application.	Compliance checked by MST 34, MST 13, MST 32 for adhesives used for mounting means and MST 42, MST 17 for junction box adhesives. Example: Adhesion layer in multi-layer backsheet foil. Passed, if all lab tests passed.	
	Connections by adhesive for mounting means are sufficient.	Compliance checked by MST 34, MST 13, MST 32 for mounting adhesives.	P
	- Fixing of junction box by adhesive is sufficient.	Compliance checked by MST 42, MST 17 for junction box adhesives.	P
	- Adhesion of a polymer relied upon for insulation to another insulating layer is appropriate for the application.	Compliance checked by MST 34, MST 13, MST 32 for adhesives used for mounting means and MST 42, MST 17 for junction box adhesives.	P
	- Requirements for adhesive materials are met.	See 7.5.2.2	P
	Connection by adhesive which is considered as cemented joint fulfills the requirements of Clause 5.6.4.2 IEC 61730-1:2023.	No cemented joints	N/A
<b>8.4.7</b>	<b>Other connections (Clause 6.4.7 of IEC 61730-1:2023)</b>		

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	Other connections (such as welded or soldered) as well as materials and processes to create the connections are appropriate for the application and for the intended use.	Compliance checked by MST 01 and MST 13.	P
	Other connections which are relied upon for equipotential bonding fulfil the requirements of MST 13.	Compliance checked by MST 01 and MST 13.	P
<b>8.5</b>	<b>Materials (Clause 6.5 of IEC 61730-1:2023)</b>		
<b>8.5.1</b>	<b>Polymeric materials (Clause 6.5.2 of IEC 61730-1:2023)</b>		
<b>8.5.1.1</b>	<b>General (Clause 6.5.2.1 of IEC 61730-1:2023)</b>		
	Polymeric materials are able to durably and safely withstand the electrical, mechanical, thermal, environmental, and corrosive stresses occurring in the application.	Compliance checked by IEC/EN 61730-2 tests listed in this report and other environmental chamber tests including pre- and post-measurements and including assessment of creepages.	P
	Polymeric materials are resistant to electrical and mechanical property degradation.	Compliance checked by MST 37. Compliance checked by all tests including pre- and post-measurements and including assessment of creepages.	P
	Polymeric parts which ensure either the electrical or mechanical safety of the PV module or both, are resistant to electrical and mechanical property degradation. They comply with the requirements of the Materials creep test (MST 37) depending on their constructive function in the PV module.	Compliance checked by MST 37.	P
	- Polymeric material used as a part of a cemented joint fulfills additionally the requirements of Clause 5.6.4.2 of IEC 61730-1:2023	No cemented joints	N/A
<b>8.5.1.2</b>	<b>Polymeric materials used as electrical insulation (Clause 6.5.2.2 of IEC 61730-1:2023)</b>		
<b>8.5.1.2.1</b>	<b>General (Clause 6.5.2.2.1 of IEC 61730-1:2023)</b>		
	The material which serves as functional insulation is appropriate according to 6.6.4.4 of IEC 61730-1:2023.	Components are evaluated according to the relevant requirements in the applicable component standards. Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	The material relied upon for insulation in thin layers is appropriate for the application according to 6.6.4.2 of IEC 61730-1:2023.	Components are evaluated according to the relevant requirement in the applicable component standard.	P
	Insulation is not impaired by short-term or long-term thermal stresses that can occur in manufacturing processes, transportation, and during normal operation by electrical stress and weathering to an extent that it does not comply with the requirements of IEC 61730-1:2023 and IEC 61730-2:2023.	N/A	N/A

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8.5.1.2.2	Endurance to electrical stress (Clause 6.5.2.2.2 of IEC 61730-1:2023)		
	Materials used as electrical insulation are in compliance with the insulation coordination requirements.	See 8.6.3	P
	Materials relied upon for insulation (RUI) have sufficient breakdown strength and comply with 6.6.4.2 of IEC 61730-1:2023.	N/A	N/A
	The polymeric material which is part of a potential tracking path is resistant to surface tracking, in coordination with the design dimensions in 6.6.3 of IEC 61730-1:2023.	N/A	N/A
8.5.1.2.3	Endurance to thermal stress (Clause 6.5.2.2.3 of IEC 61730-1:2023)		
	Materials used as relied upon insulation have a minimum RTE, RTI or TI in accordance with IEC 60216-5 or IEC 60216-1 of at least 90 °C.	<input checked="" type="checkbox"/> TI <input type="checkbox"/> RTE <input type="checkbox"/> RTI	P
8.5.2	Metallic materials (Clause 6.5.3 of IEC 61730-1:2023)		
8.5.2.1	General (Clause 6.5.3.1 of IEC 61730-1:2023)		
	Metallic components withstand a minimum corrosion atmospheric category level C2 in ISO 9224:2012.		
	Metal parts are not in contact to other metal parts having a difference of their electrochemical potentials of more than 600 mV.	Compliance is checked by inspection.	P
	Iron or mild steel is plated, painted, or enamelled for protection against corrosion.	Compliance is checked by inspection.	P
	For iron or mild steel, corrosion protection is at least equivalent to a zinc coating of 0.015 mm thickness, and the manufacturer specified how they demonstrate this.	Compliance is checked by inspection.	P
8.5.2.2	Current carrying parts (Clause 6.5.3.2 of IEC 61730-1:2023)		
	Assessed parts:	N/A	N/A
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Current-carrying materials are protected against corrosion.	N/A	N/A
	The coating for protective coated metal is capable of preventing corrosion according to either one of the listed standards.	N/A	N/A
	Coated metal is not used if the current-carrying parts are stressed by abrasion.	N/A	N/A
8.5.3	Adhesives (Clause 6.5.4 of IEC 61730-1:2023)		
	Adhesives are appropriate for the application.	Compliance is checked by relevant tests of IEC 61730-2:2023, including MST 42, MST 34, MST 01, MST 11 and MST 17.	
8.6	Protection against electric shock (Clause 6.6 of IEC 61730-1:2023)		
8.6.1	General (Clause 6.6.1 of IEC 61730-1:2023)		



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	Adequate protection against contact with hazardous live parts is provided and poses no risk of electric shock.	See section 8.6.2 - 8.6.4	P
<b>8.6.2</b>	<b>Protection against accessibility to hazardous live parts (Clause 6.6.2 of IEC 61730-1:2023)</b>		
<b>8.6.2.1</b>	<b>General (Clause 6.6.2.1 of IEC 61730-1:2023)</b>		
	Class of module	See safety ratings	—
	For Class 0 and Class II modules, adequate protection against accessibility to hazardous live parts (> Please select Voc) is provided.	Compliance is checked by MST 01 and MST 11.	P
	For Class 0 PV modules, accessible metal parts are separated by at least basic insulation.	Table 2 in Clause 5.6.2.3 of IEC 61730-1:2023	P
	Class II PV modules are constructed and enclosed that only parts separated from hazardous live parts by double or reinforced insulation are accessible.	Table 2 in Clause 5.6.2.3 of IEC 61730-1:2023	P
	In Class III PV modules live parts of different polarity are separated by at least functional insulation.	Table 2 in Clause 5.6.2.3 of IEC 61730-1:2023	P
	Polymeric materials used for realizing protection against accessibility of hazardous live parts by means of enclosure, insulation barrier or relied upon insulation comply with the requirements of Clause 6.5.2 of IEC 61730-1:2023 due to their application.	Table 2 in Clause 5.6.2.3 of IEC 61730-1:2023	P
<b>8.6.2.2</b>	<b>Protection by means of enclosures and insulation barriers (Clause 6.6.2.2 of IEC 61730-1:2023)</b>		
	Enclosures or insulation barriers are designed that, after mounting, the live parts are not accessible (even after possible deformation).	Encapsulant, glass, backsheet, junction box, cable and connectors acceptably insulate any live parts.	P
	The degree of protection of housing is not impaired by any possible deformation.	Encapsulant, glass, backsheet, junction box, cable and connectors acceptably insulate any live parts.	P
	Parts of enclosures and insulation barriers that provide protection are not removable without the use of a tool.	Tools are necessary for removal.	P
	Lids which are attached without screws have one or several detectable features, e.g. recesses.	Compliance verified by evaluation of components.	P
	Tools to open the lid do not come into contact with the live parts if lid is removed correctly.	Tools are necessary for removal.	P
	Insulation barriers are held in place and are not affected by influences expected during normal operation. Electrical and mechanical properties do not fall below the minimum acceptable values for the application.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	Parts are prevented from loosening or turning.	No such parts.	N/A
<b>8.6.2.3</b>	<b>Protection by means of insulation of live parts (Clause 6.6.2.3 of IEC 61730-1:2023)</b>		



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	An insulation material providing the sole insulation between a live part and an accessible metal part, or between uninsulated live parts not of the same potential, is of adequate thickness and of a material appropriate for the application. For requirements see table 2 in Clause 6.6.2.3 of IEC 61730-1:2023.	Compliance verified by evaluation of materials and components.	P
<b>8.6.3</b>	<b>Insulation coordination (Clause 6.6.3 of IEC 61730-1:2023)</b>		
	Clearance and creepage distances fulfil the requirements in Table 3 and Table 4 of IEC 61730-1:2023) (Clause 6.6.3.1 of IEC 61730-1:2023).	Compliance verified by evaluation of materials and components.	P
	Pollution degree (Clause 6.6.3.2.1 of IEC 61730-1:2023):	See tables in 8.7	P
	Material group (Clause 6.6.3.2.2 IEC 61730-1:2023):	See tables in 8.7	P
<b>8.6.3.1</b>	<b>Creepage distance (Clause 6.6.3.3 of IEC 61730-1:2023)</b>		
	Minimum values for creepage distance are in accordance with Table 3 or Table 4 of IEC 61730-1:2023). Compliance is checked by MST 57.	See tables in 8.7	P
	Minimum creepage distance requirements between live parts of different potential inside the junction box are verified according to Table 3 and Table 4 of IEC 61730-1:2023 related to the relevant working voltage considering pollution degree.	See tables in 8.7	P
<b>8.6.3.2</b>	<b>Clearance (Clause 6.6.3.4 of IEC 61730-1:2023)</b>		
	Clearance values are met for air gaps between conductive parts. Compliance is checked by MST 57.	See tables in 8.7	P
	Derating factor for altitude above 2000 m is considered.	Compliance checked by MST 14	P
	Minimum clearance distance requirements between live parts of different potential inside the junction box are verified according to Table 3 and Table 4 of IEC 61730-1:2023 related to the relevant working voltage.	See tables in 8.7	P
<b>8.6.4</b>	<b>Distance through functional and relied upon insulation (Clause 6.6.4 of IEC 61730-1:2023)</b>		
<b>8.6.4.1</b>	<b>General (Clause 6.6.4.1 of IEC 61730-1:2023)</b>		
<b>8.6.4.2</b>	<b>Thin layers – relied upon insulation (Clause 6.6.4.2 of IEC 61730-1:2023)</b>		
	Relied upon insulation in thin layers is applied at	N/A	N/A
	Design requirements of frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.	See 8.3.6	P
	Thickness of the other insulation materials used for RUI, except glass or ceramic materials, are verified by MST 04 (insulation thickness test) and MST 16 (insulation test) after MST 12 (cut susceptibility test).	N/A	N/A
	The thickness requirement (DTI) of row 4) of Table 3 and Table 4 of IEC 61730-1:2023 is fulfilled.	N/A	N/A
	For a single-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:	N/A	N/A

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	- Minimum thickness complies with thin-layers requirements in Table 3 or Table 4 of IEC 61730-2:2023.	N/A	N/A
	- RTE/TI/RTI complies with 6.5.2.2.3 of IEC 61730-1:2023.	N/A	N/A
	- Insulation provides sufficient dielectric strength. Test voltage (2000V + 4 times system voltage)..... V	N/A	N/A
	For a multiple-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:	N/A	N/A
	- Each layer providing RUI meets the following requirements:	N/A	N/A
	- RTE/TI/RTI complies with 6.5.2.2.3 of IEC 61730-1:2023.	N/A	N/A
	- One layer meets the dielectric strength requirements for reinforced insulation; or at least two layers each meet the dielectric strength requirements for basic insulation (1 000 V + 2 times the system voltage.... : V)	N/A	N/A
	- The full multilayer construction meets the following requirements:	N/A	N/A
	- DTI value is in compliance with values according to line 4) "DTI" of Table 3 and Table of IEC 61730-1:2023.	N/A	N/A
	- Test voltage for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage) .....: V	N/A	N/A
<b>8.6.4.3</b>	<b>Cemented joints (Clause 6.6.4.3 of IEC 61730-1:2023)</b>		
	Cemented joints were considered as	<input type="checkbox"/> Edge seal <input type="checkbox"/> Interface between junction box and mounting surface <input type="checkbox"/> Others <input checked="" type="checkbox"/> No cemented joints	—
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4 of IEC 61730-1:2023.	No cemented joints	N/A
	Distance along cemented joints, req./meas. [mm]:	No cemented joints	N/A
	A distance between two rigid parts other than used for junction boxes is considered as cemented joint if following requirements are met:	N/A	N/A
	- Neither cracks nor voids in the insulating compounds have been occurred which either by themselves or in combination.	No cemented joints	N/A
	- No breakdown at MST 16 (initial and final tests) with a 1.35 times higher test voltage occurred.	No cemented joints	N/A
	- No breakdown at MST 17 (initial and final tests) with a 1.35 times higher test voltage occurred.	No cemented joints	N/A

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	- The electrically insulating adhesive / sealant has a volume resistivity of bigger than $50 \times 10^6 \Omega \text{ cm}$ (dry) / bigger than $10 \times 10^6 \Omega \text{ cm}$ (wet).	No cemented joints	N/A
	- Peel test (MST 35) was passed (rigid / flexible or flexible / flexible)	No cemented joints	N/A
	- Lap shear strength test (MST 36) was passed (rigid / rigid)	No cemented joints	N/A
	A distance between two rigid parts or rigid to flexible parts used for junction boxes is considered as cemented joint if following requirement is met:	No cemented joints	N/A
	- The measured distances through cemented joints at adhesive area of junction box do not fall below the minimum values listed in Tables 3 and 4 of IEC 61730-1:2023.	No cemented joints	N/A

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**8.7** Clearance and creepage distances (Clause 5.6.3.4 of IEC 61730-1:2023) and Evaluation of clearances, creepage distances and distance through functional insulation (MST 57 of IEC 61730-2:2023)

**Table 1: Design evaluation**

**Module type: SYMN156R02TBD650 (STC) / SYMN156R02TBD715 (BNPI) (Lower power end)**

Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3 or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage [V]	Clearance <sup>a</sup> cl & Creepage cr [mm]			
						Required	Design	Measured (initial)	Measured (final)
Position 1: Shortest distance string connector – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 2: Shortest distance cell – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 3: Cell to cell	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.7	0.2	1.7
Position 4: String to string	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.8	0.2	1.8
Position 5: Any other position:	3	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.5	N/A*	0.4	N/A*

Supplementary information: \*The junction box is potted and fulfils the requirements of IEC 62790.

<sup>a</sup> List relevant position and test voltage for each clearance which is verified by Impulse voltage test according to IEC 60664-1.

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**8.7 Clearance and creepage distances (Clause 5.6.3.4 of IEC 61730-1:2023) and Evaluation of clearances, creepage distances and distance through functional insulation (MST 57 of IEC 61730-2:2023)**

**Table 2: PV module evaluation MST 01 initial**

Sample no.		1							
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3 or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage [V]	Clearance <sup>a</sup> cl & Creepage cr [mm]			
						Required	Design	Measured (initial)	Measured (final)
Position 1: Shortest distance string connector – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 2: Shortest distance cell – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 3: Cell to cell	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.7	0.2	1.7
Position 4: String to string	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.8	0.2	1.8
Position 5: Any other position:	3	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.5	N/A*	0.4	N/A*

Supplementary information: \*The junction box is potted and fulfils the requirements of IEC 62790.

<sup>a</sup> List relevant position and test voltage for each clearance which is verified by Impulse voltage test according to IEC 60664-1.

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**8.7** Clearance and creepage distances (Clause 5.6.3.4 of IEC 61730-1:2023) and Evaluation of clearances, creepage distances and distance through functional insulation (MST 57 of IEC 61730-2:2023)

**Table 3: PV module evaluation MST 01 final**

Sample no.		1							
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3 or 4	Type of insulation	Pollution degree	CTI Material group	Working voltage [V]	Clearance <sup>a</sup> cl & Creepage cr [mm]			
						Required	Design	Measured (initial)	Measured (final)
Position 1: Shortest distance string connector – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 2: Shortest distance cell – module edge	1a	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	1500	19.4	12.31	10.4	12.31
Position 3: Cell to cell	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.7	0.2	1.7
Position 4: String to string	2	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.1	1.8	0.2	1.8
Position 5: Any other position:	3	<input type="checkbox"/> Functional <input type="checkbox"/> Basic <input type="checkbox"/> Suppl. <input checked="" type="checkbox"/> Reinforced	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> N/A	< 35	0.5	N/A*	0.4	N/A*

Supplementary information: \*The junction box is potted and fulfils the requirements of IEC 62790.

<sup>a</sup> List relevant position and test voltage for each clearance which is verified by Impulse voltage test according to IEC 60664-1.

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9	Pass criteria (Clause 7 of IEC 61215-1:2021)		
9.1	Output power and electric circuitry (Clause 7.2 of IEC 61215-1:2021)		
9.1.1	Verification of rated label values (Gate #1) (STC) (Clause 7.2.1 of IEC 61215-1:2021)		
	<p>After stabilization, each individual module shall meet:</p> $P_{\max}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_1 \right) \geq P_{\max}(\text{NP}) \cdot \left(1 - \frac{ t_1 }{100}\right)$ $P_{\max}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_1 \right) \geq P_{\max}(\text{NP})$	See table "Gate #1 evaluation"	P
	<p>After stabilization, each individual module shall meet:</p> $V_{\text{OC}}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_2 \right) \leq V_{\text{OC}}(\text{NP}) \cdot \left(1 + \frac{ t_2 }{100}\right)$	See table "Gate #1 evaluation"	P
	<p>After stabilization, each individual module shall meet:</p> $I_{\text{SC}}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_3 \right) \leq I_{\text{SC}}(\text{NP}) \cdot \left(1 + \frac{ t_3 }{100}\right)$	See table "Gate #1 evaluation"	P
	<p>After stabilization, each individual module that is used for the qualification of low end power classes shall meet:</p> $P_{\max}(\text{Lab}) \cdot \left(1 - \frac{1.65}{2}  m_1 \right) \geq P_{\max 4}(\text{NP}) \cdot \left(1 + \frac{ t_4 }{100}\right)$	See table "Gate #1 evaluation"	P
	<p> <math>m_1</math> [%] = measurement uncertainty of laboratory for <math>P_{\max}</math>  <math>m_2</math> [%] = measurement uncertainty of laboratory for <math>V_{\text{OC}}</math>  <math>m_3</math> [%] = measurement uncertainty of laboratory for <math>I_{\text{SC}}</math>  <math>t_1</math> [%] = manufacturer's rated lower production tolerance for <math>P_{\max}</math>  <math>t_2</math> [%] = manufacturer's rated upper production tolerance for <math>V_{\text{OC}}</math>  <math>t_3</math> [%] = manufacturer's rated upper production tolerance for <math>I_{\text{SC}}</math>  <math>t_4</math> [%] = manufacturer's rated upper production tolerance for <math>P_{\max 4}</math>  <math>P_{\max 4}</math> = maximum rated nameplate power of lowest power class module  NP = name plate </p>		—
—	Verification of rated label values (Gate #1) (BNPI) (Clause 7.2.1 of IEC 61215-1:2021)		
	<p>After stabilization, each individual module shall meet:</p> $P_{\max}(\text{BNPI})(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_1(\text{BNPI}) \right) \geq P_{\max}(\text{BNPI})(\text{NP}) \cdot \left(1 - \frac{ t_1(\text{BNPI}) }{100}\right)$ $P_{\max}(\text{BNPI})(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_1(\text{BNPI}) \right) \geq P_{\max}(\text{BNPI})(\text{NP})$	See table "Gate #1 evaluation"	P
	<p>After stabilization, each individual module shall meet:</p> $V_{\text{OC}}(\text{BNPI})(\text{Lab}) \cdot \left(1 + \frac{1.65}{2}  m_2(\text{BNPI}) \right) \leq V_{\text{OC}}(\text{BNPI})(\text{NP}) \cdot \left(1 + \frac{ t_2(\text{BNPI}) }{100}\right)$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module shall meet:	See table "Gate #1 evaluation"	P



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	$I_{SC(BNPI)}(Lab) \cdot \left(1 + \frac{\frac{1.65}{2}  m_3(BNPI) }{100}\right) \leq I_{SC(BNPI)}(NP) \cdot \left(1 + \frac{ t_3(BNPI) }{100}\right)$		
	<p>After stabilization, each individual module that is used for the qualification of low end power classes shall meet:</p> $P_{max(BNPI)}(Lab) \cdot \left(1 - \frac{\frac{1.65}{2}  m_1(BNPI) }{100}\right) \leq P_{max4(BNPI)}(NP) \cdot \left(1 + \frac{ t_4(BNPI) }{100}\right)$	See table "Gate #1 evaluation"	P
	<p> <math>m_1(BNPI)</math> [%] = measurement uncertainty of laboratory for <math>P_{max(BNPI)}</math>  <math>m_2(BNPI)</math> [%] = measurement uncertainty of laboratory for <math>V_{OC(BNPI)}</math>  <math>m_3(BNPI)</math> [%] = the measurement uncertainty of laboratory for <math>I_{SC(BNPI)}</math>  <math>t_1(BNPI)</math> [%] = manufacturer's rated lower production tolerance for <math>P_{max(BNPI)}</math>  <math>t_2(BNPI)</math> [%] = manufacturer's rated upper production tolerance for <math>V_{OC(BNPI)}</math>  <math>t_3(BNPI)</math> [%] = manufacturer's rated upper production tolerance for <math>I_{SC(BNPI)}</math>  <math>t_4(BNPI)</math> [%] = manufacturer's rated upper production tolerance for <math>P_{max4(BNPI)}</math>  <math>P_{max4(BNPI)}</math> = maximum rated nameplate power of lowest power class module (under BNPI)  NP = name plate </p>		—
9.1.2	<b>Maximum power degradation during type approval testing (Gate #2) (STC) (Clause 7.2.2 of IEC 61215-1:2021)</b>		
	<p>At the end of each test sequence, each test sample shall meet:</p> $P_{max}(Lab\_Gate\ 2) \geq 0.95 \times P_{max}(Lab\_Gate\ 1) \cdot \left(1 - \frac{r}{100}\right)$	See table "Gate #2 evaluation"	P
	$r$ = reproducibility		—
—	<b>Maximum power degradation during type approval testing (Gate #2) (BNPI) (Clause 7.2.2 of IEC 61215-1:2021)</b>		
	<p>At the end of each test sequence, each test sample shall meet:</p> $P_{max(BNPI)}(Lab\_Gate\ 2) \geq 0.95 \times P_{max(BNPI)}(Lab\_Gate\ 1) \cdot \left(1 - \frac{r_{(BNPI)}}{100}\right)$	See table "Gate #2 evaluation"	P
	$r_{(BNPI)}$ = reproducibility		—
9.1.3	<b>Electrical circuitry (Clause 7.2.3 of IEC 61215-1:2021)</b>		
	Samples are not permitted to exhibit an open-circuit during the tests.	No open-circuit during tests	P
9.2	<b>Visual defects (Clause 7.3 of IEC 61215-1:2021)</b>		
	There is no visual evidence of a major defect.	No major visual defect	P
9.3	<b>Electrical safety (Clause 7.4 of IEC 61215-1:2021)</b>		
	The insulation test (MQT 03) requirements are met at the beginning and the end of each sequence.	See tables below	P
	The wet leakage current test (MQT 15) requirements are met at the beginning and the end of each sequence.	See tables below	P
	Specific requirements of the individual tests are met.	See tables below	P
Supplementary information: -			

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<b>III</b>	<b>IEC 61215-2:2021 and IEC 61730-2:2023 – Test procedures</b>
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<b>10</b>	<b>Overview of tests and test results</b>
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<b>Initial examination</b>	—	—
Visual inspection (MQT 01 / MST 01)	See table 10.1	P
Insulation test (MQT 03 / MST 16)	See table 10.2	P
Wet leakage current test (MQT 15 / MST 17)	See table 10.3	P
Accessibility test (MST 11)	See table 10.4	P
Continuity test of equipotential bonding (MST 13)	See table 10.5	P
Maximum power determination (MQT 02 / MST 03)	See table 10.6	P
Initial stabilization (MQT 19.1)	See table 10.7	P
Performance at STC and BNPI (MQT 06.1 / MST 03)	See table 10.8	P
Gate #1 evaluation	See table 10.9	P

<b>Sequence A</b>	—	—
Measurement of temperature coefficients (MQT 04)	N/A	N/A
Performance at low irradiance (MQT 07)	N/A	N/A

<b>Sequence B1</b>	—	—
Outdoor exposure test (MQT 08)	N/A	N/A

<b>Sequence B2</b>	—	—
Hot-spot endurance test (MQT 09 / MST 22)	N/A	N/A
Reverse current overload test (MST 26)	N/A	N/A

<b>Sequence B3</b>	—	—
Bypass diode thermal test (MQT 18.1 / MST 25)	N/A	N/A

<b>Sequence C</b>	—	—
UV preconditioning test (MQT 10 / MST 54)	N/A	N/A
Cyclic (dynamic) mechanical load test (MQT 20)	N/A	N/A
Thermal cycling test (50 cycles) (MQT 11 / MST 51)	N/A	N/A
Humidity-freeze test (MQT 12 / MST 52)	N/A	N/A

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<b>Sequence C3</b>	—	—
Retention of junction box on mounting surface (MQT 14.1 / MST 42)	N/A	N/A

<b>Sequence D</b>	—	—
Thermal cycling test (200 cycles) (MQT 11 / MST 51)	N/A	N/A

<b>Sequence E</b>	—	—
Damp heat test (MQT 13 / MST 53)	N/A	N/A

<b>Sequence E1</b>	—	—
Retention of junction box on mounting surface (MQT 14.1 / MST 42)	N/A	N/A
Static mechanical load test (MQT 16 / MST 34)	N/A	N/A

<b>Sequence E2</b>	—	—
Hail test (MQT 17)	N/A	N/A

<b>Sequence F</b>	—	—
Materials creep test (MST 37)	N/A	N/A

<b>Sequence Gf</b>	—	—
Damp heat test (200h) (MST 53)	N/A	N/A
UV test (front side) (MST 54)	N/A	N/A
Humidity-freeze test (MST 52)	N/A	N/A

<b>Sequence Gb</b>	—	—
Damp heat test (200h) (MST 53)	N/A	N/A
UV test (back side) (MST 54)	N/A	N/A
Humidity-freeze test (MST 52)	N/A	N/A

<b>Sequence G1</b>	—	—
Cold conditioning test 1 (MST 55)	N/A	N/A
Dry heat conditioning test (MST 56)	N/A	N/A
Humidity-freeze test 1 (MST 52)	N/A	N/A
Cold conditioning test 2 (MST 55)	N/A	N/A
Humidity-freeze test 2 (MST 52)	N/A	N/A

<b>Sequence H</b>	—	—
Impulse voltage test (MST 14)	N/A	N/A

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<b>Sequence M</b>		—	—
Module breakage test (MST 32)		N/A	N/A
<b>Sequence I</b>		—	—
Ignitability test (MST 24)		N/A	N/A
<b>Sequence K</b>		—	—
Potential induced degradation test (MQT 21)		N/A	N/A
<b>Sequence J</b>		—	—
Fire test (MST 23)		N/A	N/A
<b>Final measurements</b>		—	—
Final stabilization (MQT 19.2 / MQT 19.3)		N/A	N/A
Maximum power determination (MQT 02 / MST 03)		N/A	N/A
Performance at STC and BNPI (MQT 06.1 / MST 03)		N/A	N/A
Gate #2 evaluation		N/A	N/A
Bypass diode functionality test (MQT 18.2 / MST 07)		N/A	N/A
Cut susceptibility test (MST 12)		N/A	N/A
Accessibility test (MST 11)		N/A	N/A
Continuity test of equipotential bonding (MST 13)		N/A	N/A
Screw connections test (MST 33)		N/A	N/A
Durability of markings (MST 05)		N/A	N/A
Sharp edge test (MST 06)		N/A	N/A
<b>Component tests</b>		—	—
Peel test (MST 35)		No cemented joints	N/A
Lap shear strength test (MST 36)		No cemented joints	N/A
Supplementary information: See Appendix A: Test charts for more details.			

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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
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10.1	Visual inspection (initial) – MQT 01 / MST 01			
Test date (dd/mm/yyyy)		23/05/2024		—
Sample no.	Requirement		Nature and position of initial findings	
1	No major visual defects		No major visual defects	P
2			No major visual defects	P
Supplementary information: N/A				

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10.6	Initial stabilization – MQT 19.1				
<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight <input type="checkbox"/> Other stabilization procedures					
Test date (dd/mm/yyyy)			26/05/2024-29/05/2024		—
Irradiance [W/m²]			800 - 1000		
Module temperature [°C]			50		
Sample no.	Test	Integrated irradiation [kWh/m²]	P <sub>max</sub> [W]	Stabilization [%] *	
1	Initial	—	666.1	0.04	P
	Light-soaking 1	5	665.8		
	Light-soaking 2	5	665.5		
2	Initial	—	666.1	0.04	P
	Light-soaking 1	5	665.8		
	Light-soaking 2	5	665.5		
Supplementary information:					
* Stabilization criterion: $(P_{\max}\text{-}P_{\min})/P_{\text{avg}} \leq 1 \%$ for three consecutive measurements.					
Initial measurement corresponds to MQT 02 of IEC 61215-2:2021.					

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10.8	Performance at STC (initial) – MQT 06.1
------	---

10.8.1	Performance at STC (initial) (front side) – MQT 06.1
--------	--

Test date (dd/mm/yyyy)			29/05/2024				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				
Illuminated side			<input checked="" type="checkbox"/> Front side <input type="checkbox"/> Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 ± 10				
Module temperature [°C]			25 ± 2				
Spectral mismatch			N/A				
Sample no.	P <sub>max</sub> [W]	V <sub>mpp</sub> [V]	I <sub>mpp</sub> [A]	V <sub>oc</sub> [V]	I <sub>sc</sub> [A]	FF [%]	
1	665.5	47.27	14.079	56.18	14.351	80.2	N/A
2	665.2	47.23	14.084	56.13	14.349	80.1	N/A

Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.



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Clause	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Result</i>

10.8.2	Performance at STC (initial) (rear side) – MQT 06.1						
Test date (dd/mm/yyyy)			29/05/2024				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				
Illuminated side			<input type="checkbox"/> Front side <input checked="" type="checkbox"/> Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 *				
Module temperature [°C]			25 ± 2				
Spectral mismatch			N/A				
Sample no.	P <sub>max</sub> [W]	V <sub>mpp</sub> [V]	I <sub>mpp</sub> [A]	V <sub>oc</sub> [V]	I <sub>sc</sub> [A]	FF [%]	
1	498.1	47.26	10.540	56.18	11.653	78.1	N/A
2	497.9	47.22	10.544	56.13	11.652	78.0	N/A
Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.							

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10.8.3	Bifaciality Coefficients (initial)			
Sample no.	$\Phi_{isc}$	$\Phi_{Voc}$	$\Phi_{Pmax}$	—
1	0.7945	0.9967	0.7971	N/A
2	0.7994	0.9981	0.8009	N/A
Supplementary information: N/A				

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10.8.4	Performance at BNPI (initial) – MQT 06.1						
Test date (dd/mm/yyyy)			29/05/2024				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				
Illuminated side			<input checked="" type="checkbox"/> Front side <input type="checkbox"/> Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 + $\varphi \cdot 135^*$				
Module temperature [°C]			25 ± 2				
Spectral mismatch			N/A				
Sample no.	P <sub>max</sub> [W]	V <sub>mpp</sub> [V]	I <sub>mpp</sub> [A]	V <sub>oc</sub> [V]	I <sub>sc</sub> [A]	FF [%]	
1	732.1	47.37	15.455	56.20	15.726	80.1	N/A
2	732.6	47.33	15.479	56.19	15.724	80.2	N/A

Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.

\*A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used. The bifaciality coefficient  $\varphi$  employed is the minimum value of  $\varphi_{Isc}$  and  $\varphi_{Pmax}$  as documented in table 10.8.3 for each test sample.

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10.9	Gate #1 evaluation (STC)				
Manufacturer tolerances given on name plate	for $P_{\max}$	$t_1$ [%]	$\pm 3.0$	—	
	for $V_{OC}$	$t_2$ [%]	$\pm 3.0$		
	for $I_{SC}$	$t_3$ [%]	$\pm 3.0$		
	for $P_{\max 4}$	$t_4$ [%]	$\pm 3.0$		
Measurement uncertainty of test laboratory	for $P_{\max}$	$m_1$ [%]	$\pm 3.0$ (for c-Si)		
	for $V_{OC}$	$m_2$ [%]	$\pm 0.9$ (for c-Si)		
	for $I_{SC}$	$m_3$ [%]	$\pm 2.8$ (for c-Si)		

<b>10.9.1</b>	<b>Evaluation of output power for each module (STC)</b>				
Sample no.	$P_{max,meas}$ [W]	$P_{max,meas,m1}$ [W]	$P_{max,NP}$ [W]	$P_{max,NP,t1}$ [W]	—
1	665.5	685.47	650.0	630.5	P
2	665.2	685.16	650.0	630.5	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$P_{max,meas,m1}$  = Measured maximum STC power taking positive measurement uncertainty into account

$P_{max,NP,t1}$  = Nominal maximum STC power taking negative rated production tolerance into account

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<b>10.9.2</b>	<b>Evaluation of output power for average of all modules (STC)</b>			
Module type	$P_{\max, \text{meas}, \text{avg}}$ [W]	$P_{\max, \text{meas}, \text{avg}, \text{m1}}$ [W]	$P_{\max, \text{NP}}$ [W]	—
SYMN156R02TBD6 50 (Lower power end)	665.4	685.4	650.0	P
Supplementary information: Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021. $P_{\max, \text{meas}, \text{avg}, \text{m1}}$ = Arithmetic average of meas. max. STC power taking positive measurement uncertainty into account				

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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9.3	Evaluation of open-circuit voltage for each module (STC)				
Sample no.	$V_{oc, meas}$ [V]	$V_{oc, meas, m2}$ [V]	$V_{oc, NP}$ [V]	$V_{oc, NP, t2}$ [V]	—
1	56.18	56.69	56.77	58.47	P
2	56.13	56.64	56.77	58.47	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$V_{oc, meas, m2}$  = Measured open-circuit voltage taking positive measurement uncertainty into account

$V_{oc, NP, t2}$  = Nominal open-circuit voltage taking positive rated production tolerance into account

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9.4	Evaluation of short-circuit current for each module (STC)				
Sample no.	$I_{sc, meas}$ [A]	$I_{sc, meas, m3}$ [A]	$I_{sc, NP}$ [A]	$I_{sc, NP, t3}$ [A]	—
1	14.351	14.624	14.210	14.636	P
2	14.349	14.622	14.210	14.636	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$I_{sc, meas, m3}$  = Measured short-circuit current taking positive measurement uncertainty into account

$I_{sc, NP, t3}$  = Nominal short-circuit current taking positive rated production tolerance into account



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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9	Gate #1 evaluation (BNPI)				
Manufacturer tolerances given on name plate	for $P_{\max}(\text{BNPI})$	$t_{1(\text{BNPI})} [\%]$	$\pm 3.0$	—	
	for $V_{\text{OC}}(\text{BNPI})$	$t_{2(\text{BNPI})} [\%]$	$\pm 3.0$		
	for $I_{\text{SC}}(\text{BNPI})$	$t_{3(\text{BNPI})} [\%]$	$\pm 3.0$		
	for $P_{\max 4}(\text{BNPI})$	$t_{4(\text{BNPI})} [\%]$	$\pm 3.0$		
Measurement uncertainty of test laboratory	for $P_{\max}(\text{BNPI})$	$m_{1(\text{BNPI})} [\%]$	$\pm 3.0$ (for c-Si)		
	for $V_{\text{OC}}(\text{BNPI})$	$m_{2(\text{BNPI})} [\%]$	$\pm 0.9$ (for c-Si)		
	for $I_{\text{SC}}(\text{BNPI})$	$m_{3(\text{BNPI})} [\%]$	$\pm 2.8$ (for c-Si)		

10.9.6	Evaluation of output power for each module (BNPI)				
Sample no.	$P_{\max(\text{BNPI}),\text{meas}} [\text{W}]$	$P_{\max(\text{BNPI}),\text{meas},m1(\text{BNPI})} [\text{W}]$	$P_{\max(\text{BNPI}),\text{NP}} [\text{W}]$	$P_{\max(\text{BNPI}),\text{NP},t1(\text{BNPI})} [\text{W}]$	—
1	732.1	754.1	715.0	693.6	P
2	732.6	754.6	715.0	693.6	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$P_{\max(\text{BNPI}),\text{meas},m1(\text{BNPI})}$  = Measured maximum BNPI power taking positive measurement uncertainty into account

$P_{\max(\text{BNPI}),\text{NP},t1(\text{BNPI})}$  = Nominal maximum BNPI power taking negative rated production tolerance into account

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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9.7	Evaluation of output power for average of all modules (BNPI)			
Module type	$P_{\max(\text{BNPI}),\text{meas,avg}}$ [W]	$P_{\max(\text{BNPI}),\text{meas,avg,m1}(\text{BNPI})}$ [W]	$P_{\max(\text{BNPI}),\text{NP}}$ [W]	—
SYMN156R02TBD715 (Lower power end)	732.4	754.4	715.0	P
Supplementary information: Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021. $P_{\max,\text{meas,avg,m1}}$ = Arithmetic average of meas. max. BNPI power taking positive measurement uncertainty into account				

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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9.8	Evaluation of open-circuit voltage for each module (BNPI)				
Sample no.	$V_{oc(BNPI),meas}$ [V]	$V_{oc(BNPI),meas,m2(BNPI)}$ [V]	$V_{oc(BNPI),NP}$ [V]	$V_{oc(BNPI),NP,t2(BNPI)}$ [V]	—
1	56.20	56.71	56.77	58.47	P
2	56.19	56.70	56.77	58.47	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$V_{oc(BNPI),meas,m2(BNPI)}$  = Measured open-circuit voltage taking positive measurement uncertainty into account

$V_{oc(BNPI),NP,t2(BNPI)}$  = Nominal open-circuit voltage taking positive rated production tolerance into account

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result

10.9.9	Evaluation of short-circuit current for each module (BNPI)				
Sample no.	$I_{sc(BNPI),meas}$ [A]	$I_{sc(BNPI),meas,m3(BNPI)}$ [A]	$I_{sc(BNPI),NP}$ [A]	$I_{sc(BNPI),NP,t3(BNPI)}$ [A]	—
1	15.726	16.050	15.630	16.099	P
2	15.724	16.058	15.630	16.099	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC 61215-1:2021.

$I_{sc(BNPI),meas,m3(BNPI)}$  = Measured short-circuit current taking positive measurement uncertainty into account

$I_{sc(BNPI),NP,t3(BNPI)}$  = Nominal short-circuit current taking positive rated production tolerance into account

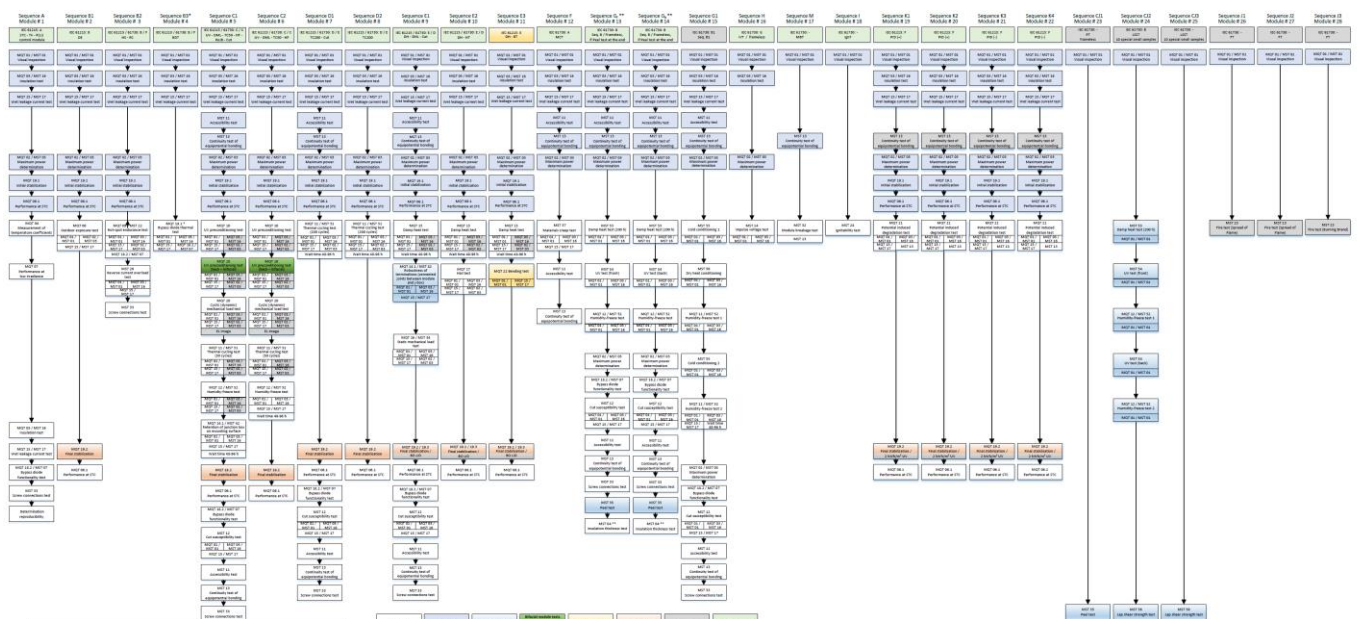
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**ZUSATZ-DOKUMENTATION**  
**ADDITIONAL DOCUMENTATION**

**Appendix A: Test charts**

Acc. to IEC 61215:2021 / IEC 61730:2023:



**DISCLAIMER**

These test sequences were compiled following the requirements as defined in the International Electrotechnical Commission standards IEC 61215:2021 and IEC 61730:2023.

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**ZUSATZ-DOKUMENTATION**  
**ADDITIONAL DOCUMENTATION**

**Appendix B: Abbreviations used in the report**

<b>STC</b>	Standard Test Conditions
<b>P<sub>max</sub></b>	Maximum power
<b>I<sub>mpp</sub></b>	Maximum power point current
<b>V<sub>mpp</sub></b>	Maximum power point voltage
<b>I<sub>sc</sub></b>	Short circuit current
<b>V<sub>oc</sub></b>	Open circuit voltage
<b>FF</b>	Fill factor
<b>α</b>	Current temperature coefficient
<b>β</b>	Voltage temperature coefficient
<b>γ</b>	Power temperature coefficient
<b>S</b>	Series connection
<b>SP</b>	Series-parallel connection
<b>PS</b>	Parallel-series connection
<b>R<sub>iso</sub></b>	Electrical insulation resistance
<b>A</b>	Module area
<b>BNPI</b>	Bifacial nameplate irradiance
<b>BSI</b>	Bifacial stress irradiance
<b>G<sub>BNPI</sub></b>	Equivalent bifacial nameplate irradiance
<b>aBSI</b>	Applied bifacial stress irradiance
<b>φ</b>	Bifaciality refers to the ratios between the main I-V characteristics of the rear side and the front side of a bifacial device, typically at Standard Test Conditions (STC) unless otherwise specified. It is quantified with reference to bifaciality coefficients, namely as φ.
<b>φ<sub>Pmax</sub></b>	Maximum power bifaciality coefficient
<b>φ<sub>Voc</sub></b>	Open-circuit voltage bifaciality coefficient
<b>φ<sub>Isc</sub></b>	Short-circuit current bifaciality coefficient

**Statement of the estimated uncertainty of the test verdicts**

Electrical performance rating is outside the scope of IEC 61215:2016 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 AAA solar simulator. The extended measurement uncertainty is:
  - $2\sigma (P_{mpp}) \leq \pm 3.0 \%$
  - $2\sigma (I_{sc}) \leq \pm 2.8 \%$
  - $2\sigma (V_{oc}) \leq \pm 0.9 \%$
- The reproducibility parameter r with the solar simulator is 0.8%

Relative measurements were performed with a flash type solar simulator.

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**ZUSATZ-DOKUMENTATION**  
**ADDITIONAL DOCUMENTATION**

**Appendix C: History of reporting and certification**

Project no.	Report no.	Certificate no.	Date of issue	Remarks
326022609	CN24PF66 001	PV 50631004 0001	16/05/2024	Basic project
326034570	CN24PF66 002	PV 50631004 0002	05/07/2024	Introduce to new model types and materials
326018267	CN24PF66 002	PV 50631004 0003	20/08/2024	Standard upgrade, Change the address of the license holder and manufacturer, Introduce to new model types, Power range extension and Extension to alternative materials



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**FOTO-DOKUMENTATION**  
*PHOTO DOCUMENTATION*

**Appendix D: Photos**

**Module type: SYMN156R02TBD650 (Lower power end) (Under STC) / SYMN156R02TBD715 (Lower power end) (Under BNPI)**



*Fig. 1: front view of test sample*

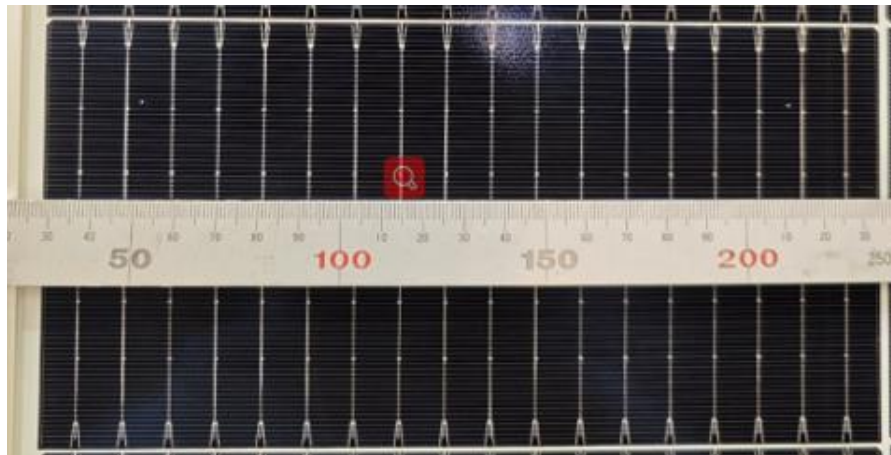


*Fig. 2: rear view of test sample*

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**FOTO-DOKUMENTATION**  
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*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  
<https://www.sanyglobal.com/product/>

SYMNI55R02BD 650  
Test conditions STC BNPI BSI  
Max. power (Pmax) 650W 715W  
Max. power tolerance +3%  
Voltage at max. power (Vmpp) 47.78V  
Current at max. power (Impp) 13.60A  
Open-circuit voltage (Voc) 56.77V±3% 56.77V±3%  
Short-circuit current (Isc) 14.21A±3% 15.63±3% 17.05±3%  
The following coefficients measured at STC according to IEC TS  
60904-1-2, Bifaciality:  
qPmax80%±5%, qIsc80%±5%, qVoc99%±1%

Module(T05)max(°C) 70  
Design Load (Pa) +3600/1900  
Series Fuse Rating 30A  
Maximum system voltage 1500VDC  
operating temperature range 40°C ~ +65°C  
protect rage II  
module wprotecteight 38.2(kg)  
module size 2465×1192×33(mm)  
STC 1000W/m², AM1.5, 25°C  
BNPI front 1000W/m², rear 135W/m²  
Connector Refer to manual



**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 61215:2021 and IEC 61730:2016

MADE IN CHINA

*Fig. 4: detail view of type label*

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*Fig. 5: detail view of closed junction box*



*Fig. 6: detail view of connector*

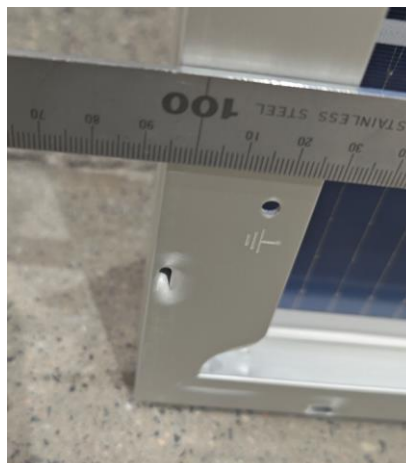
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*Fig. 7: detail view of cable*



*Fig. 8: detail view of equipotential bonding hole*

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*Fig. 9: detail view of frame*