

Prüfbericht-Nr.: Test report no.:	50166155 033	Auftrags-Nr.: Order no.:	326039989	Seite 1 von 56 Page 1 of 56
Kunden-Referenz-Nr.: Client reference no.:	2362242	Auftragsdatum: Order date:	18/07/2024	
Auftraggeber: Client:	Qinghai Huanghe Hydropower Development CO.,Ltd. Xining Solar Power Branch No.4 Jingui Road, Dongchuan Industrial Park, Xining City, 810007 Qinghai, P. R. China			
Prüfgegenstand: Test item:	Photovoltaic (PV) module			
Bezeichnung / Typ-Nr.: Identification / Type no.:	See module type designation on page 3-4			
Auftrags-Inhalt: Order content:	Design qualification and type approval of photovoltaic (PV) modules			
Prüfgrundlage: Test specification:	Photovoltaic (PV) modules IEC 61215-1:2016; IEC 61215-1-1:2016; IEC 61215-2:2016; IEC 61730-1:2016; IEC 61730-2:2016; EN 61215-1:2016; EN 61215-1-1:2016; EN 61215-2:2017; EN IEC 61730-1:2018; EN IEC 61730-2:2018			
Wareneingangsdatum: Date of sample receipt:	15/07/2024			
Prüfmuster-Nr.: Test sample no.:	See clause 6			
Prüfzeitraum: Testing period:	16/07/2024 – 07/08/2024			
Ort der Prüfung: Place of testing:	Refer to page 5			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:		genehmigt von: authorized by:		
Datum: Date:	12/08/2024 Signed by: Jiayu Song	Ausstellungsdatum: Issue date:	12/08/2024 Signed by: Anderson Ruan	
Stellung / Position:	Project Engineer	Stellung / Position:	Authorizer	
Sonstiges / Other:	- Extension to alternative materials and combinations. - Refer to page 5 and Constructional Data Form (CDF) 50166155 033 for more details.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
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. <i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Prüfbericht-Nr.: 50166155 033
Test report no.:

Seite 2 von 56
Page 2 of 56

Anmerkungen
Remarks

1	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. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <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>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	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. <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>

Prüfbericht-Nr.: 50166155 033
Test report no.:

Seite 3 von 56
Page 3 of 56

Produktbeschreibung
Product description

I	General
1	Module type designation Approved model types: Max. system voltage (Up to 1000VDC) With ½ cut of 166 mono c-Si cell: SPICN6(LDG)-72-xxx/IH (xxx=410-425, in steps of 5, 144 cells) SPICN6(LDG)-66-xxx/IH (xxx=380-385, in steps of 5, 132 cells) SPICN6(LDG)-60-xxx/IH (xxx=345-350, in steps of 5, 120 cells) SPICN6(LDG)-54-xxx/IH (xxx=310-315, in steps of 5, 108 cells) SPICN6(LDG)-36-xxx/IH (xxx=205-210, in steps of 5, 72 cells) SPICN6(LDG)-35-xxx/IH (xxx=200-205, in steps of 5, 70 cells) SPICN6(LDG)-25-xxx/IH (xxx=145, 50 cells) SPICN6(LDG)-22.5-xxx/IH (xxx=130, 45 cells) SPICN6(LDG)-20-xxx/IH (xxx=115, 40 cells) SPICN6(LDG)-19.5-xxx/IH (xxx=115, 39 cells) SPICN6(LDG)-18-xxx/IH (xxx=105, 36 cells) SPICN6(LDG)-17.5-xxx/IH (xxx=100, 35 cells) SPICN6(LDG)-16-xxx/IH (xxx=92, 32 cells) SPICN6(LDG)-15-xxx/IH (xxx=86, 30 cells) SPICN6(LDG)-13.5-xxx/IH (xxx=77, 27 cells) SPICN6(LDG)-12-xxx/IH (xxx=70, 24 cells) SPICN6(LDG)-9-xxx/IH (xxx=52, 18 cells) SPICN6(LDG)-7.5-xxx/IH (xxx=43, 15 cells) Max. system voltage (Up to 1500VDC) With ½ cut of 166 mono c-Si cell: SPICN6(LDF)-72-xxx/BIH (xxx=455-485, in steps of 5, 144 cells) SPICN6(LDF)-66-xxx/BIH (xxx=415-440, in steps of 5, 132 cells) SPICN6(LDF)-60-xxx/BIH (xxx=375-400, in steps of 5, 120 cells) With ½ cut of 182 mono c-Si cell: SPICM10(LDF)-72-xxx/BPHM (xxx=530-565, in steps of 5, 144 cells) SPICM10(LDF)-66-xxx/BPHM (xxx=480-515, in steps of 5, 132 cells) SPICM10(LDF)-60-xxx/BPHM (xxx=440-470, in steps of 5, 120 cells) SPICM10(LDF)-54-xxx/BPHM (xxx=395-420, in steps of 5, 108 cells) With ½ cut of 182 mono c-Si cell: SPICN10(LDF)-72-xxx/BHM (xxx=550-580, in steps of 5, 144 cells) SPICN10(LDF)-66-xxx/BHM (xxx=505-530, in steps of 5, 132 cells) SPICN10(LDF)-60-xxx/BHM (xxx=460-485, in steps of 5, 120 cells) SPICN10(LDF)-54-xxx/BHM (xxx=410-435, in steps of 5, 108 cells)

Prüfbericht-Nr.: 50166155 033
Test report no.:

Seite 4 von 56
Page 4 of 56

Produktbeschreibung
Product description

With 6" mono c-Si cell:

SPICM6(MDF)-72-xxx/BP (xxx=355-395, in steps of 5, 72 cells)

SPICM6(MDF)-60-xxx/BP (xxx=305-325, in steps of 5, 60 cells)

SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells)

SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells)

With 6" mono c-Si MBB cell:

SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells)

SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells)

With 6" mono c-Si ½ cut cell:

SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells)

SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells)

With 6" mono c-Si ½ cut MBB cell:

SPICN6(MDF)-72-xxx/BHM (xxx=370-410, in steps of 5, 144 cells)

SPICN6(MDF)-60-xxx/BHM (xxx=310-340, in steps of 5, 120 cells)

SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells)

SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells)

With 6" mono c-Si ½ cut IBC cell:

SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells)

SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)

xxx represents output power in Wp

Refer to Constructional Data Form (CDF) no. 50166155 033 for electrical ratings

2 Used materials

See Constructional Data Form (CDF) No. 50166155 033

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

Name / Description:	Qinghai Huanghe Hydropower Development CO.,Ltd. Xining Solar Power Branch
Street:	No.4 Jingui Road, Dongchuan Industrial Park
Postcode / City, Country:	810007 / Xining City, Qinghai Province, P. R. China
Type of production:	Crystalline PV-module
Inspection report No.and date	50296914 006 / 17/05/2024

Prüfbericht-Nr.: 50166155 033
Test report no.:

Seite 5 von 56
Page 5 of 56

Produktbeschreibung
Product description

4

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 standards IEC 61215/EN 61215 and IEC 61730/EN 61730, and it is recommended that certification should be granted.

- Extension to alternative materials and modifications in below table. The relevant tests were performed on the module type SPICN6(LDF)-72-465/BIH as representative modules and relevant test results are documented in this report.

Object	Manufacturer / trademark	Type / model	Technical data / ratings	Representative model for testing
Frame parts	Magic Green Energy (SuZhou),LTD.	Anodized Aluminium Alloy	Material / hardness: 6063-T5 Coating: AA10 (Silver white) Thickness of longerside= 30mm Thickness of shorterside= 21.5mm	SPICN6(LDF)-72-465/BIH

This report have to be read in conjunction with report 50166155 001-032 and Constructional Data Form (CDF) No. 50166155 033.

This test report includes a history of reporting and certification and 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.

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 6 von 56
Page 6 of 56

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

5	Test specification		
	IEC 61215-1:2016; EN 61215-1:2016: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements	applicable	—
	IEC 61215-1-1:2016; EN 61215-1-1:2016: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules	applicable	
	IEC 61215-2:2016; EN 61215-2:2017: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures	applicable	
	IEC 61730-1:2016; EN IEC 61730-1:2018: Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction	applicable	
	IEC 61730-2:2016; EN IEC 61730-2:2018: Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing	applicable	

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 7 von 56
Page 7 of 56

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

6	List of test samples		
☐ 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: SPICN6(LDF)-72-465/BIH			
Sample no.	Sample SN	Test sequence	Remarks / constructional characteristics (e.g. cell, backsheet, frame type)
1	2142040100530	A2	Front cover: 2.0mm Semi-tempered glass with external AR coating from HENAN ANCAI HI-TECH CO.,LTD. Rear cover: 2.0mm Semi-tempered glass with internal glazing coating from HENAN ANCAI HI-TECH CO.,LTD
2	63-240630XN0705	E1	Encapsulation material: SE-556+SE-556 from Changzhou Sveck PV New Material Co., Ltd. Frame: 30mm,6063-T5 from MODURACK, INC. Adhesive of frame: TS1527 from Suzhou Tonsan New Material Technology Co., Ltd. Solar Cell: SPIC-M6-9BB from Qinghai Huanghe Hydropower Development Co., Ltd. Xining Solar Power Branch. Cell connectors: 0.6×0.18mm, Sn60Pb40 from Xi'an Telison New Materials Co., Ltd.
3	2142040100526	M	String connectors: 7.0×0.3mm & 4.0×0.3mm from Xi'an Telison New Materials Co., Ltd. Fluxing agent: FD-309 from Suzhou Costar Electronic Material Co., Ltd. Fixing Tape: UV-1 from 3M. Junction box: JM07 from Zhejiang Jiaming Tianheyuan Photovoltaic Technology Co., Ltd.. Adhesive of J-Box: 1527 from TOONSAN ADHESIVE, INC.
Supplementary information: N/A			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 8 von 56
Page 8 of 56

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

II	IEC/EN 61215 Part 1 – Test requirements
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7	Marking and documentation (5)		
7.1	Name plate (5.1)		
	The module includes the following clear and indelible markings:		
	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)	Encapsulated inside module	P
	d) Date and place of manufacture; alternatively serial number allowing to trace the date and place of manufacture	Traceable from serial number (checked during factory inspection)	P
	e) Maximum system voltage	Marked on type label	P
	f) Class for protection against electrical shock	Marked on type label	P
	g) Voltage at open-circuit or V_{oc} including tolerances	Marked on type label	P
	h) Current at short-circuit or I_{sc} including tolerances	Marked on type label	P
	i) Module maximum power or P_{max} including tolerances	Marked on type label	P
	All electrical data is shown at standard test conditions (1000 W/m ² , 25 °C, AM 1.5 according to IEC TS 61836).	Marked on type label	P
7.2	Documentation (5.2)		
7.2.1	Minimum requirements (5.2.1)		
	Modules are supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the module.	Available in installation manual	P
	The documentation states the class for protection against electrical shock under which the module has been qualified and any specific limitations required for that class.	Available in installation manual	P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use and maintenance of the PV modules.	Available in installation manual	P
7.2.2	Information to be given in the documentation (5.2.2)		
	Maximum overcurrent protection rating (compliance is verified by reverse current overload test (MST 26)).	Available in installation manual	P
	Maximum series/parallel module configuration is recommended.	Available in installation manual	P
	Manufacturer's stated tolerance for V_{oc} , I_{sc} and maximum power output under standard test conditions	Marked on type label	P

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 9 von 56
Page 9 of 56

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	Temperature coefficient for maximum output power	Available in data sheet	P
	Temperature coefficient for voltage at open-circuit	Available in data sheet	P
	Temperature coefficient for short-circuit current	Available in data sheet	P
	All electrical data mentioned above is shown as relative to standard test conditions (1000 W/m ² , 25 °C, AM 1.5 according to IEC TS 61836).	Marked on type label	P
	Nominal module operating temperature (NMOT) is specified.	Available in data sheet	P
	Performance at NMOT (MQT 06.2) is specified.	Available in data sheet	P
	Performance at low irradiance (MQT 07) is specified.	Available in data sheet	P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used, including:	N/A	N/A
	The minimum cable diameters for modules intended for field wiring	Available in installation manual	P
	Any limitations on wiring methods and wire management that apply to the wiring compartment or box	Limitations are documented in installation manual.	P
	The size, type, material and temperature rating of the conductors to be used	Available in installation manual	P
	Type of terminals for field wiring	Junction box is approved according to IEC 62790	P
	Specific PV connector model/types and manufacturer to which the module connectors are mated.	Available in installation manual	P
	The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation.	Available in installation manual	P
	The type and ratings of bypass diode to be used (if applicable)	Junction box is approved according to IEC 62790	P
	Limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)	No limitations indicated.	N/A
	A statement indicating the fire rating(s) and the applied standard as well as the limitations to that rating (e.g., installation slope, sub structure or other applicable installation information)	Available in installation manual	P
	A statement indicating the design load per each mechanical means for securing the module as evaluated during the static mechanical load test according to MQT 16. At discretion of the manufacturer the test load and/or the safety factor γ_m may be noted, too.	Available in installation manual	P

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 10 von 56
Page 10 of 56

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: <i>"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."</i>	Available in installation manual	P
7.2.3	Assembly instructions (5.2.3)		
	These 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.	No subassemblies	N/A
Supplementary information: N/A			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 11 von 56
Page 11 of 56

Absatz Clause	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
8	Pass criteria (7)		
8.1	Output power and electric circuitry (7.2)		
8.1.1	Verification of rated label values (Gate #1) (7.2.1)		
	After stabilization, each individual module shall meet: $P_{\max}(\text{Lab}) \cdot \left(1 + \frac{ m_1 [\%]}{100}\right) \geq P_{\max}(\text{NP}) \cdot \left(1 - \frac{ t_1 [\%]}{100}\right)$ $\bar{P}_{\max}(\text{Lab}) \cdot \left(1 + \frac{ m_1 [\%]}{100}\right) \geq P_{\max}(\text{NP})$	See table in 9.4 (Gate #1 evaluation)	P
	After stabilization, each individual module shall meet: $V_{\text{OC}}(\text{Lab}) \cdot \left(1 + \frac{ m_2 [\%]}{100}\right) \leq V_{\text{OC}}(\text{NP}) \cdot \left(1 + \frac{ t_2 [\%]}{100}\right)$	See table in 9.4 (Gate #1 evaluation)	P
	After stabilization, each individual module shall meet: $I_{\text{SC}}(\text{Lab}) \cdot \left(1 + \frac{ m_3 [\%]}{100}\right) \leq I_{\text{SC}}(\text{NP}) \cdot \left(1 + \frac{ t_3 [\%]}{100}\right)$	See table in 9.4 (Gate #1 evaluation)	P
	m_1 = measurement uncertainty of laboratory for $P_{\max}$ m_2 = measurement uncertainty of laboratory for V_{OC} m_3 = the measurement uncertainty of laboratory for I_{SC} t_1 = manufacturer's rated lower production tolerance for $P_{\max}$ t_2 = manufacturer's rated upper production tolerance for V_{OC} t_3 = manufacturer's rated upper production tolerance for I_{SC} NP = name plate		N/A
8.1.2	Maximum power degradation during type approval testing (Gate #2) (7.2.2)		
	At the end of each test sequence, each test sample shall meet:	$r = 0.8$	P
	$P_{\max}(\text{Lab_Gate \#2}) \geq 0.95 \times P_{\max}(\text{Lab_Gate \#1}) \cdot \left(1 - \frac{r[\%]}{100}\right)$	See table in 9.25 (Gate # 2 evaluation)	
	r = reproducibility		N/A

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 12 von 56
Page 12 of 56

Absatz <i>Clause</i>	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	Measuring results - Remarks	Evaluation
8.1.3	Electrical circuitry (7.2.3)		
	Samples are not permitted to exhibit an open-circuit during the tests.	No open-circuit during tests	P
8.2	Visual defects (7.3)		
	There is no visual evidence of a major defect.	No major visual defect	P
8.3	Electrical safety (7.4)		
	The insulation test (MQT 03) requirements are met after the tests.	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: N/A			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 13 von 56
Page 13 of 56

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

III	IEC/EN 61215 Part 2 – Test procedures
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9	Overview of tests and test results
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Test	Remarks	Result
Visual inspection (MQT 01)	See table 9.1	P
Maximum power determination (MQT 02)	See table 9.2	P
Insulation test (MQT 03)	See table 9.5	P
Measurement of temperature coefficients (MQT 04)	N/A	N/A
Measurement of nominal module operating temperature (NMOT) (MQT 05)	N/A	N/A
Performance at STC (MQT 06.1)	See table 9.3	P
Performance at NMOT (MQT 06.2)	N/A	N/A
Performance at low irradiance (MQT 07)	N/A	N/A
Outdoor exposure test (MQT 08)	N/A	N/A
Hot-spot endurance test (MQT 09)	N/A	N/A
UV preconditioning test (MQT 10)	N/A	N/A
Thermal cycling test (50 cycles) (MQT 11)	N/A	N/A
Thermal cycling test (200 cycles) (MQT 11)	N/A	N/A
Humidity-freeze test (MQT 12)	N/A	N/A
Damp heat test (MQT 13)	N/A	N/A
Retention of junction box on mounting surface (MQT 14.1)	N/A	N/A
Test of cord anchorage (MQT 14.2)	N/A	N/A
Wet leakage current test (MQT 15)	See table 9.6	P
Static mechanical load test (MQT 16)	See table 9.21	P
Hail test (MQT 17)	N/A	N/A
Bypass diode thermal test (MQT 18.1)	N/A	N/A
Bypass diode functionality test (MQT 18.2)	See table 9.12.5	P
Initial stabilization (MQT 19.1)	See table 9.2	P
Final stabilization (MQT 19.2)	N/A	N/A
Supplementary information: N/A		

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
<i>Clause</i>	<i>Anforderungen - Prüfungen / Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

9.1	Visual inspection (initial) – MQT 01			
Sample no.		Requirement	Nature and position of initial findings	Result
1		No major visual defects	No major visual defects	P
2			No major visual defects	P
3			No major visual defects	P
Supplementary information: N/A				

9.2	Initial stabilization – MQT 19.1				
☒ Simulator ☐ Natural sunlight ☐ Other stabilization procedures					
Irradiance [W/m ²]			1000		Result
Module temperature [°C]			50		
Sample no.	Test	Integrated irradiation [kWh/m ²]	P _{max} [W]	Stabilization [%] *	
1	Initial	—	462.8	0.09	P
	Light-soaking 1	5	462.5		
	Light-soaking 2	5	462.4		
2	Initial	—	459.0	0.48	P
	Light-soaking 1	5	461.2		
	Light-soaking 2	5	461.0		
Supplementary information: * Stabilization criterion: $(P_{\max} - P_{\min}) / P_{\text{avg}} \leq 1 \%$ for three consecutive measurements. Initial measurement corresponds to MQT 02 of IEC/EN 61215.					

9.3	Performance at STC (initial) – MQT 06.1						
Test method			☒ Simulator ☐ Natural sunlight				Result
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000*				
Module temperature [°C]			25 ± 0.2				
Spectral mismatch			N/A				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	462.4	41.99	11.012	50.08	11.733	78.7	N/A
2	461.0	42.04	10.967	49.96	11.619	79.4	N/A
Supplementary information:							
*A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used.							

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 15 von 56
Page 15 of 56

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

9.4	Gate #1 evaluation			
Manufacturer tolerances given on name plate	for P_{max}	t_1 [%]	± 3	N/A
	for V_{oc}	t_2 [%]	± 3	
	for I_{sc}	t_3 [%]	± 3	
Measurement uncertainty of test laboratory	for P_{max}	m_1 [%]	± 3.0 (for c-Si)	
	for V_{oc}	m_2 [%]	± 0.9 (for c-Si)	
	for I_{sc}	m_3 [%]	± 2.8 (for c-Si)	

9.4.1	Evaluation of output power for each module				
Sample no.	$P_{max, meas}$ [W]	$P_{max, meas, m1}$ [W]	$P_{max, NP}$ [W]	$P_{max, NP, t1}$ [W]	Result
1	462.4	476.3	465.0	451.1	P
2	461.0	474.8	465.0	451.1	P
Supplementary information: Pass criteria follow requirements of section 7.2.1 of IEC/EN 61215-1. $P_{max, meas, m1}$ = 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					

9.4.2	Evaluation of output power for average of all modules			
Module type	P _{max, meas, avg} [W]	P _{max, meas, avg, m1} [W]	P _{max, NP} [W]	Result
SPICN6(LDF)-72-465/BIH	461.7	475.6	465.0	P
Supplementary information: Pass criteria follow requirements of section 7.2.1 of IEC/EN 61215-1. P _{max, meas, avg, m1} = Arithmetic average of meas. max. STC power taking positive measurement uncertainty into account				

9.4.3	Evaluation of open-circuit voltage for each module				
Sample no.	$V_{oc, meas}$ [V]	$V_{oc, meas, m2}$ [V]	$V_{oc, NP}$ [V]	$V_{oc, NP, t2}$ [V]	Result
1	50.08	50.53	50.20	51.71	P
2	49.96	50.41	50.20	51.71	P
Supplementary information: Pass criteria follow requirements of section 7.2.1 of IEC/EN 61215-1. $V_{oc, meas, m2}$ = 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					

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 16 von 56
Page 16 of 56

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

9.4.4	Evaluation of short-circuit current for each module				
Sample no.	$I_{sc, meas}$ [A]	$I_{sc, meas, m3}$ [A]	$I_{sc, NP}$ [A]	$I_{sc, NP, t3}$ [A]	Result
1	11.733	12.062	11.790	12.144	P
2	11.619	11.944	11.790	12.144	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC/EN 61215-1.

$I_{sc, meas, m3}$ = 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

9.5	Insulation test (initial) – MQT 03					
Maximum system voltage [V _{DC}]				1500		Result
High voltage applied [V _{DC}]				4000/8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m²]	R _{iso} ·A [GΩ·m²]	Dielectric breakdown		
				Yes (description)	No	
1	17.50	2.18	38.15	-	No	P
2	18.10	2.18	39.46	-	No	P

Supplementary information:

Minimum requirement is $0.04 G\Omega \cdot m^2$ for $A > 0.1 m^2$ and $0.4 G\Omega$ for $A \leq 0.1 m^2$.

9.6	Wet leakage current test (initial) – MQT 15			
Insulation resistance measured at [V _{DC}]		1500		Result
Solution resistivity [Ω·cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [MΩ]	A [m²]	R _{iso} ·A [MΩ·m²]	
1	6650.0	2.18	14497.0	P
2	6250.0	2.18	13625.0	P

Supplementary information:

Minimum requirement is $40 M\Omega \cdot m^2$.

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 17 von 56
Page 17 of 56

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

9.21	Static mechanical load test – MQT 16			
Load direction applied		Positive (downward)	Negative (upward)	N/A
Design load [Pa]		3600	1600	
Safety factor γ_m		1.5	1.5	
Test load [Pa]		5400	2400	
Mounting method		Mounting with 4 rails on longer side.		
Open circuits (yes/no)		No	No	P
Sample no.	Open circuits (yes/no)			N/A
2	No			P
Supplementary information: Load was applied with sandbags; 1 cycle = 1 hour pressure load + 1 hour tensile load (total 3 cycles) 1 st cycle = 5400Pa + 2400Pa 2 nd cycle = 5400Pa + 2400Pa 3 rd cycle = 5400Pa + 2400Pa See photos in Appendix D for detailed mounting method.				

9.21.1	Visual inspection after Static mechanical load test – MQT 01		
Sample no.	Requirement	Nature and position of findings	Result
2	No major visual defects	No major visual defects	P
Supplementary information: N/A			

9.21.2	Wet leakage current test after Static mechanical load test – MQT 15		
Insulation resistance measured at [V _{DC}]	1500	Result	
Solution resistivity [$\Omega \cdot \text{cm}$]	≤ 3500		
Solution temperature [$^{\circ}\text{C}$]	22 ± 2		
Sample no.	R _{ISO} [M Ω]	A [m ²]	R _{ISO} · A [M $\Omega \cdot \text{m}^2$]
2	6040.0	2.18	13167.2
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 18 von 56
Page 18 of 56

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

9.24 Performance at STC (final) – MQT 06.1

Test method			☒ Simulator ☐ Natural sunlight					N/A
Ambient temperature [°C]			25 ± 2					
Irradiance [W/m²]			1000*					
Module temperature [°C]			25 ± 0.2					
Spectral mismatch			N/A					
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]	
2	459.9	42.03	10.941	49.88	11.626	79.3	-0.24	

Supplementary information:

Negative degradation means power loss.

*A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used.

9.25 Gate #2 evaluation

Reproducibility r for P _{max} [%]	0.8	N/A
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9.25.1 Evaluation of output power for each module

Sample no.	P _{max,meas,Gate #1} [W]	P _{max,meas,Gate #1,r} [W]	P _{max,meas,Gate #2} [W]	Result
2	461.0	434.4	459.9	P

Supplementary information:

Pass criteria follow requirements of section 7.2.1 of IEC/EN 61215-1.

P_{max,meas,Gate #1} = Measured initial maximum STC power

P_{max,meas,Gate #1,r} = Measured initial maximum STC power taking reproducibility and degradation of 5% into account

P_{max,meas,Gate #2} = Measured final maximum STC power

9.26 Insulation test (final) – MQT 03

Maximum system voltage [V _{DC}]				1500		Result
High voltage applied [V _{DC}]				4000/8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m²]	R _{iso} ·A [GΩ·m²]	Dielectric breakdown		
				Yes (description)	No	
1	17.10	2.18	37.28	-	No	P
2	17.40	2.18	37.93	-	No	P

Supplementary information:

Minimum requirement is 0.04 GΩ·m² for A > 0.1 m² and 0.4 GΩ for A ≤ 0.1 m².

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 19 von 56
Page 19 of 56

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

9.27 Wet leakage current test (final) – MQT 15

Insulation resistance measured at [V _{DC}]		1500		Result
Solution resistivity [Ω/cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso}	A	R _{iso} ·A	
	[MΩ]	[m²]	[MΩ·m²]	
1	6270.0	2.18	13668.1	P
2	6040.0	2.18	13167.2	P

Supplementary information:
Minimum requirement is 40 M Ω ·m².

Prüfbericht-Nr.: 50166155 033 <i>Test Report No.:</i>	Seite 20 von 56 Page 20 of 56
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Absatz <i>Clause</i>	Photovoltaic (PV) modules <i>Anforderungen - Prüfungen / Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
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IV	IEC/EN 61730 Part 1 – Requirements for construction
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10	Classification, applications and intended use
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10.1	General (4.1)		
	Product details	See section 1	N/A
	The modules are intended for a maximum operating altitude [meters above sea level] of [m]	≤ 2000 m above sea level	N/A
	Recommended maximum series/parallel module configurations	Available in installation manual	P
	The module has been evaluated for the following Class (IEC 61140):	☐ Class 0 ☒ Class II ☐ Class III	N/A

11	Requirements for design and construction (5)
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11.1	General (5.1)		
	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form. (It is not provided in subassemblies).	PV modules are completely assembled.	P
	Product shipped from the factory	☒ completely assembled ☐ as subassemblies	N/A
	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 do not have accessible burrs, sharp edges or sharp points.	Compliance checked by tests MST 01 and MST 06	P
	Parts are prevented from loosening or turning if this results in a risk of fire, electric shock, or injury to persons.	Compliance checked by tests MST 01	P

11.2	Marking and documentation (5.2)		
	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
11.2.1	Marking (5.2.2)		
11.2.1.1	General (5.2.2.1)		
	Each PV module includes the following clear and indelible markings:	Compliance checked by tests MST 01 and MST 05	N/A
	a) Name, registered trade name, or registered trade mark of manufacturer	See section 7.1	P
	b) Type or model number designation	See section 7.1	P

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 21 von 56 Page 21 of 56
Absatz Clause	Photovoltaic (PV) modules Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse - Bemerkungen Measuring results - Remarks	Bewertung Evaluation
	c) Serial number	See section 7.1	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	See section 7.1	P
	e) Polarity of terminals or leads	“+” and “-” indicated on terminal	P
	f) Maximum system voltage or “V _{sys} ”	See section 7.1	P
	g) Class of protection against electrical shock, in accordance with Clause 4 of IEC/EN 61730-1	See section 7.1	P
	h) Voltage at open-circuit or “V _{oc} ” including manufacturing tolerances	See section 7.1	P
	i) Current at short-circuit or “I _{sc} ” including manufacturing tolerances	See section 7.1	P
	j) Maximum power or “P _{max} ” including manufacturing tolerances	See section 7.1	P
	k) Maximum overcurrent protection rating	Maximum series fuse rating indicated	P
	All electrical data are shown at standard test conditions (STC) (1000 W/m ² , (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	See section 7.1	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.	Connector fulfill the requirements of IEC 62852. Symbol or warning notice indicated on connector.	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.	☒ class II:  ☐ class III  ☐ class 0: no symbol	P
	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 marked with a similar statement referring to the rated material.	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
11.2.1.2	Symbols (5.2.2.2)		
11.2.1.2.1	Equipotential bonding (5.2.2.2.1)		
	A wiring terminal or bonding location for equipotential bonding is identified with:		P

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 22 von 56 Page 22 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	No other terminal or location is identified in this manner.	Mounting hole may not be used for bonding.	P
11.2.1.2.2	Functional earthing (5.2.2.2.2)		
	Field installed functional earthing conductor is identified with the symbol:	No functional earthing.	N/A
11.2.2	Documentation (5.2.3)		
	Documentation concerning electrical and mechanical installation is provided.	See section 7.2.1	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.	See section 7.2.1	P
	Environmental conditions to which the module has been qualified are stated.		N/A
	- concerning temperature range, typically -40 °C to +40 °C.	See section 7.2.1	P
	- concerning wind/snow load including safety factor.	See section 7.2.1	P
	The documentation contains the following information:		N/A
	- Name, registered trade name, or registered trade mark of manufacturer	Available in data sheet	P
	- Type or model number designation	Available in data sheet	P
	- Maximum system voltage or " V_{sys} "	Available in data sheet	P
	- Class for protection against electrical shock, in accordance with Clause 4 of IEC/EN 61730	Available in data sheet	P
	- Voltage at open-circuit or " V_{oc} " including manufacturing tolerances	Available in data sheet	P
	- Current at short-circuit or " I_{sc} " including manufacturing tolerances	Available in data sheet	P
	- Maximum power or " P_{max} " including manufacturing tolerances	Available in data sheet	P
	- Maximum overcurrent protection rating (compliance verified by reverse current overload test (MST 26))	Available in data sheet	P
	- Recommended maximum series / parallel PV module configurations	Available in installation manual	P
	- Temperature coefficient for maximum output power	Available in data sheet	P
	- Temperature coefficient for voltage at open-circuit	Available in data sheet	P
	- Temperature coefficient for short-circuit current	Available in data sheet	P
	All electrical data are shown at standard test conditions (1000 W/m ² , (25 ± 2) °C, AM 1.5 according to IEC 60904-3).	Available in data sheet	P
	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

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 23 von 56 Page 23 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	- 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
	The documentation includes	N/A	N/A
	- limitations to the mounting situation (e.g. slope, mounting means, cooling).	Available in installation manual	P
	- a statement indicating the fire rating(s)	☒ fire rating(s) and applied standards ☐ statement that resistance to external fire sources was not evaluated	P
	- a statement indicating the minimum mechanical means for securing the PV module	Available in installation manual	P
	- a statement indicating the maximum altitude the PV module is designed for	≤ 2000 m above sea level Available in installation manual	P
	The documentation for roof mounting includes	N/A	N/A
	- a statement indicating the minimum mechanical means for securing the PV module	Available in installation manual	P
	- specific parameter(s) when the fire rating is dependent on a specific mounting structure, specific spacing, or specific means of attachment to the roof or structure	Available in installation manual	P
	The documentation includes a statement advising that external or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the PV module (if not qualified for).	Available in 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.	No subassemblies	N/A

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 24 von 56
Page 24 of 56

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

	The following or equivalent statement is included: <i>"Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on this PV module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output."</i> Safety factor may vary acc. to local conditions.	Available in installation manual	P
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11.3	Electrical components and insulation (5.3)		
11.3.1	Internal wiring (5.3.2)		
	Internal wiring has sufficient current carrying capacity for the relevant application.	Verified by MST 14 and MST 26	P
11.3.2	Junction boxes for PV modules (5.3.5)		
	Junction boxes for PV modules fulfil the requirements of IEC 62790.	☒ IEC 62790	P
11.3.3	External wiring (5.3.3)		
	External wires and cables fulfil the requirements of IEC 62930.	☒ IEC 62930	P
11.3.4	Connectors (5.3.4)		
	External DC connectors fulfil the requirements of IEC 62852.	☒ IEC 62852	P
11.3.5	Frontsheets and backsheets (5.3.6)		
	Frontsheet:		N/A
	Material of frontsheet:	☒ Glass ☐ Polymeric material ☐ Others	N/A
	Thermal index frontsheet (see also 5.5.2.3.3):	Not applicable for glass frontsheet	N/A
	Adhesion to encapsulant or glass is appropriate.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	Backsheet:		N/A
	Material of backsheet:	☒ Glass ☐ Polymeric material ☐ Others	N/A
	Thermal index backsheet (see also 5.5.2.3.3):	Not applicable for glass frontsheet	N/A
	Adhesion to encapsulant or glass is appropriate.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
11.3.6	Insulation barriers (5.3.7)		

Prüfbericht-Nr.: 50166155 033			Seite 25 von 56
Test Report No.:			Page 25 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	Polymeric insulation barrier meets the relevant requirements of 5.5.2.	See 11.5.1 Part of IEC 62790 qualification	P
	Barrier is held in place while keeping its required electrical and mechanical properties.	Compliance checked by IEC/EN 61730-2 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
11.3.7	Electrical connections (5.3.8)		
11.3.7.1	General (5.3.8.1)		
	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 are taken that connections do not become loose, e.g. by using a washer.	Verified by MST 01 / MST 13	P
11.3.7.2	Terminals for external cables and PV connector ribbons (5.3.8.2)		
	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.	☒ IEC 62790	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 qualification.	P
11.3.8	Encapsulant (5.3.9)		
	Thermal properties are sufficient for intended application.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	The insulation properties according to 5.5.2.3 are met, if applicable.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
11.3.9	Bypass diodes (5.3.10)		
	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

Prüfbericht-Nr.: 50166155 033 <i>Test Report No.:</i>			Seite 26 von 56 Page 26 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

11.4	Mechanical and electromechanical connections (5.4)		
11.4.1	General (5.4.1)		
	Type of connection:	☒ Connection within frame ☐ Mounting interfaces via adhesive ☒ Frame to clamp a mounting system ☒ Equipotential bonding ☒ Attachment of junction box ☐ 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 IEC 62790 tests.	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
11.4.2	Screw connections (5.4.2)		
	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
11.4.3	Rivets (5.4.3)		
	Rivets which serve as electrical as well as mechanical connections are locked against loosening.	No rivet is used.	N/A
11.4.4	Thread-cutting screws (5.4.4)		

Prüfbericht-Nr.: 50166155 033 <i>Test Report No.:</i>			Seite 27 von 56 Page 27 of 56
Absatz <i>Clause</i>	Photovoltaic (PV) modules <i>Anforderungen - Prüfungen / Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
	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
11.4.5	Form / press / tight fit (5.4.5)		
	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
11.4.6	Connections by adhesives (5.4.6)		
	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 11.5.2.2	P
	Connection by adhesive which is considered as cemented joint fulfills the requirements of 5.6.4.2.	No cemented joints	N/A
11.4.7	Other connections (5.4.7)		
	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
11.5	Materials (5.5)		
11.5.1	Polymeric materials (5.5.2)		
11.5.1.1	General (5.5.2.1)		

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 28 von 56 Page 28 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	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 5.6.4.2.	See 11.6.4.2 No cemented joints	N/A
11.5.1.2	Endurance to weathering stress (5.5.2.2)		
	Polymeric materials of the module and its components are durable to weathering stress.	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
11.5.1.3	Polymeric materials used as electrical insulation (5.5.2.3)		
11.5.1.3.1	General (5.5.2.3.1)		
	Material relied upon for insulation is of adequate thickness, as described in Tables 3 and 4.	Components are evaluated according to the relevant requirement in the applicable component standard.	P
	The temperature limits of materials used as insulation are not less than the maximum measured operating temperature of the specific material in application, as measured during the temperature test (MST 21).	See MST 21	P
11.5.1.3.2	Endurance to electrical stress (5.5.2.3.2)		
	Materials used as electrical insulation are in compliance with the insulation coordination requirements.	See 11.6.3	P
11.5.1.3.3	Endurance to thermal stress (5.5.2.3.3)		
	Materials used as relied upon insulation have a electrical relative thermal endurance, relative thermal index or temperature index (RTE / RTI / TI) appropriate for the application, at least 90°C.	☒ TI ☐ RTE ☐ RTI Compliance is checked with temperature test (MST 21).	P
11.5.1.3.4	Polymeric insulating materials used as external parts (5.5.2.3.4)		

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 29 von 56 Page 29 of 56
Absatz Clause	Photovoltaic (PV) modules Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse - Bemerkungen Measuring results - Remarks	Bewertung Evaluation
	External polymeric parts of the PV module whose deterioration could impair the safety meet the following additional requirements:	N/A	N/A
	- Ignitability test (MST 24) in final application (laminated or the PV module)	See section 12.10	P
	- Peel test (MST 35) for proof of cemented joints	No cemented joints	N/A
	- Lap shear strength test (MST 36) for proof of cemented joints	No cemented joints	N/A
11.5.1.3.5	Polymeric materials used for mechanical functions (5.5.2.4)		
	Materials used for mechanical functions have a mechanical relative thermal endurance, relative thermal index or temperature index (RTE / RTI / TI) appropriate for the application, at least 90°C.	☐ TI ☐ RTE ☒ RTI Compliance is checked with Temperature test (MST 21).	P
11.5.2	Metallic materials (5.5.3)		
11.5.2.1	General (5.5.3.1)		
	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
11.5.2.2	Current carrying parts (5.5.3.2)		
	Assessed parts:	N/A	N/A
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	Compliance checked by IEC/EN 61730-2 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
11.5.2.3	Adhesives (5.5.4)		
	Adhesives are appropriate for the application.	Compliance is checked by relevant tests of IEC 61730-2, including MST 42, MST 34, MST 01, MST 11 and MST 17.	P
	Adhesives as part of the relied upon electrical insulation meet the requirements of 5.5.2.3.3.	See section 11.5.1.3.3	P
11.6	Protection against electric shock (5.6)		
11.6.1	General (5.6.1)		

Prüfbericht-Nr.: 50166155 033 <i>Test Report No.:</i>			Seite 30 von 56 Page 30 of 56
Absatz <i>Clause</i>	Photovoltaic (PV) modules <i>Anforderungen - Prüfungen / Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
	Adequate protection against contact with hazardous live parts is provided and poses no risk of electric shock.	See section 11.6.2 – 11.6.4	P
11.6.2	Protection against accessibility to hazardous live parts (5.6.2)		
11.6.2.1	General (5.6.2.1)		
	Class of module	See safety ratings	N/A
	For Class 0 and Class II modules, adequate protection against accessibility to hazardous live parts (> 35 V DC) is provided.	Compliance is checked by MST 01 and MST 11.	P
	For Class 0 PV modules, accessible metal parts and accessible surfaces as well as live parts of different potential of the same circuit are separated by at least basic insulation.	Table 2 of 5.6.2.3	N/A
	For Class II PV modules, construction provides separation between accessible parts or accessible surfaces and hazardous live parts by double or reinforced insulation.	Table 2 of 5.6.2.3	N/A
	For Class II PV modules, live parts of different potential of the same circuit are separated by at least basic insulation.	Table 2 of 5.6.2.3	N/A
	For Class III PV modules, construction provides separation between accessible parts or accessible surfaces and hazardous live parts by at least functional insulation.	Table 2 of 5.6.2.3	N/A
	In Class III PV modules live parts of different polarity are separated by at least functional insulation.	Table 2 of 5.6.2.3	N/A
	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 5.5.2 due to their application.	See 11.5.1	N/A
11.6.2.2	Protection by means of enclosures and insulation barriers (5.6.2.2)		
	Enclosures or insulation barriers are designed that, after mounting, the live parts are not accessible.	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

Prüfbericht-Nr.: 50166155 033 <i>Test Report No.:</i>			Seite 31 von 56 Page 31 of 56
Absatz <i>Clause</i>	Photovoltaic (PV) modules <i>Anforderungen - Prüfungen / Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
	Parts are prevented from loosening or turning.	No such parts.	N/A
11.6.2.3	Protection by means of insulation of live parts (5.6.2.3)		
	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 5.6.2.3 (11.6.2.1).	Compliance verified by evaluation of materials and components.	P
11.6.3	Insulation coordination (5.6.3)		
	Components comply with the requirements for their relevant standards (5.6.3.1).	Compliance verified by evaluation of materials and components.	P
	Pollution degree (5.6.3.2):	See tables in 11.7	N/A
	Material group (5.6.3.3):	See tables in 11.7	N/A
	Clearance and creepage distance (5.6.3.4):	See tables in 11.7	N/A
	Derating factor for altitude above 2000 m is considered.	N/A	N/A
11.6.4	Distance through insulation (5.6.4)		
11.6.4.1	General (5.6.4.1)		
	Polymeric materials for cemented insulation parts and insulation in thin layers withstand environmental, thermal, electrical and mechanical stresses as far as they occur.	See 11.5	N/A
	Distances through insulation (dti) of solid insulation comply with the minimum distance as required:	N/A	N/A
	System voltage	See safety ratings	N/A
	Distances through insulation (dti)	N/A	N/A
	The insulation fulfils the material classification as given in IEC 60216-1, IEC 60216-2 and IEC 60216-5 (RTE/TI/RTI).	See 11.3.5	P
11.6.4.2	Cemented joints (5.6.4.2)		
	Cemented joints were considered as	☐ Edge seal ☐ Interface between junction box and mounting surface ☐ Others ☒ No cemented joints	N/A
	Distances along cemented joints comply with the minimum distances as required in table 3:	—	N/A
	System voltage	No cemented joints	N/A
	Distance along cemented joints, req./meas. [mm]:	No cemented joints	N/A
	A distance can be considered as cemented joint if following requirements are met:	No cemented joints	N/A

Prüfbericht-Nr.: 50166155 033 Test Report No.:			Seite 32 von 56 Page 32 of 56
Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	Neither cracks nor voids in the insulating compounds have been occurred which either by themselves or in combination reduces the distances through the cemented joint below the required values.	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
	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)	No cemented joints	N/A
	Lap shear strength test (MST 36) was passed (rigid / rigid)	No cemented joints	N/A
11.6.4.3	Insulation in thin layers (5.6.4.3)		
	Relied upon insulation in thin layers is applied at	☐ Backsheet ☐ Frontsheet ☐ Insulation within laminate ☐ Others ☒ N/A	N/A
	Initial construction of insulation in thin layers complies with requirements concerning thickness under consideration of figure 4 as described in table 3 or 4.	Not applicable for glass backsheet	N/A
	Construction of insulation in thin layers complies with requirements concerning RTE/TI/RTI.	Not applicable for glass backsheet	N/A
	Insulation in thin layers provides sufficient dielectric strength:	N/A	N/A
	Test voltage for single-layer sheet and for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage):	Not applicable for glass backsheet	N/A
	Single-layer sheet as well as entire multi-layer sheet in final application comply with following:	N/A	N/A
	Dielectric strength for basic insulation is provided after Cut susceptibility test (MST 12). Test voltage [V]: (1000V + 2 times system voltage)	Not applicable for glass backsheet	N/A

Prüfbericht-Nr.: 50166155 033

Seite 33 von 56

Test Report No.:

Page 33 of 56

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

11.7 Clearance and creepage distances (5.6.3.4)

Table 1: Design evaluation

Module type: SPICN6(LDF)-72-465/BIH

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 cl [mm]		Creepage cr [mm]	
						Required	Design ^a	Required	Design
Position 1: Shortest distance string connector – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	12.0±1.0	10.4	12.0±1.0
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	13.5±1.0	10.4	13.5±1.0
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.6±1.0	0.2	1.6±1.0
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	2.0±1.0	0.2	2.0±1.0
Position 5: E.g., distance between terminals in JB or between terminal and outer JB enclosure.	3	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.5	N/A*	0.4	N/A*

Supplementary information:

* The junction box is potted and fulfils the requirements of IEC 62790.

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

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
<i>Clause</i>	<i>Anforderungen - Prüfungen / Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

11.7	Clearance and creepage distances (5.6.3.4)
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Table 2: PV module evaluation MST 01 initial

Module type: SPICN6(LDF)-72-465/BIH

Sample no.			1-1						
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 cl [mm]		Creepage cr [mm]	
						Required	Measured ^a	Required	Measured ^a
Position 1: Shortest distance string connector – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	12.0	10.4	12.0
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	13.5	10.4	13.5
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.6	0.2	1.6
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	2.0	0.2	2.0
Position 5: E.g., distance between terminals in JB or between terminal and outer JB enclosure.	3	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.5	N/A*	0.4	N/A*

Supplementary information: See photographs in Appendix D.

* The junction box is potted and fulfils the requirements of IEC 62790.

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

11.7	Clearance and creepage distances (5.6.3.4)								
Table 3: PV module evaluation MST 01 final									
Module type: SPICN6(LDF)-72-465/BIH									
Sample no.			1-1						
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 cl [mm]		Creepage cr [mm]	
						Required	Measured ^a	Required	Measured ^a
Position 1: Shortest distance string connector – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	12.0	10.4	12.0
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	13.5	10.4	13.5
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.6	0.2	1.6
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	2.0	0.2	2.0
Position 5: E.g., distance between terminals in JB or between terminal and outer JB enclosure.	3	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.5	N/A*	0.4	N/A*
Supplementary information:									
* The junction box is potted and fulfils the requirements of IEC 62790.									
^a List relevant position and test voltage for each clearance which is verified by Impulse voltage test according to IEC 60664-1.									

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 36 von 56
Page 36 of 56

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

V	IEC/EN 61730 Part 2 – Requirements for testing
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12	Overview of tests and test results
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Test	Remarks	Result
Visual inspection (MST 01)	See table 12.1	P
Performance at STC (MST 02)	See table 12.3	P
Maximum power determination (MST 03)	See table 12.2	P
Insulation thickness test (MST 04)	N/A	N/A
Durability of markings (MST 05)	See table 12.32	P
Sharp edge test (MST 06)	See table 12.33	P
Bypass diode functionality test (MST 07)	See table 12.34	P
Accessibility test (MST 11)	See table 12.6	P
Cut susceptibility test (MST 12)	Not applicable for glass backsheet	N/A
Continuity test for equipotential bonding (MST 13)	See table 12.7	P
Impulse voltage test (MST 14)	N/A	N/A
Insulation test (MST 16)	See table 12.4	P
Wet leakage current test (MST 17)	See table 12.5	P
Temperature test (MST 21)	N/A	N/A
Hot-spot endurance test (MST 22)	N/A	N/A
Fire test (MST 23)	N/A	N/A
Ignitability test (MST 24)	N/A	N/A
Bypass diode thermal test (MST 25)	N/A	N/A
Reverse current overload test (MST 26)	N/A	N/A
Module breakage test (MST 32)	See table 12.12	P
Screw connections test (MST 33)	No screw connections	N/A
Static mechanical load test (MST 34)	See table 9.21	P
Peel test (MST 35)	No cemented joints	N/A
Lap shear strength test (MST 36)	N/A	N/A
Materials creep test (MST 37)	N/A	N/A
Robustness of terminations test (MST 42)	N/A	N/A
Thermal cycling (TC50) (MST 51a)	N/A	N/A
Thermal cycling test (TC200) (MST 51b)	N/A	N/A
Humidity-freeze test (MST 52a)	N/A	N/A
Humidity-freeze test (MST 52b)	N/A	N/A
Damp heat test (1000h) (MST 53a)	N/A	N/A

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 37 von 56
Page 37 of 56

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
	Damp heat test (200h) (MST 53b)	N/A	N/A
	UV test (15 kWh/m ²) (MST 54a)	N/A	N/A
	UV test (60 kWh/m ²) (MST 54b)	N/A	N/A
	Cold conditioning (MST 55)	N/A	N/A
	Dry heat conditioning (MST 56)	N/A	N/A
Supplementary information: N/A			

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
<i>Clause</i>	<i>Anforderungen - Prüfungen / Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

12.1	Visual inspection (initial) – MST 01			
Sample no.		Requirement	Nature and position of initial findings	Result
1		No major visual defects	No major visual defects	P
2			No major visual defects	P
3			No major visual defects	P
Supplementary information: N/A				

12.2	Maximum power determination (initial) – MST 03		
Irradiance [W/m ²]		1000*	Result
Module temperature [°C]		25 ± 1	
Test method		☒ Simulator ☐ Natural sunlight	
Sample no.	Appearance of initial IV-curve		
1	No kinks or other unusual characteristics		P
2	No kinks or other unusual characteristics		P
Supplementary information: * A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used. Initial measurements for IEC/EN 61730 correspond to final measurements of IEC/EN 61215 (where applicable).			

12.3	Performance at STC – MST 02						
Irradiance [W/m ²]		1000*					Result
Module temperature [°C]		25 ± 0.2					
Test method		☒ Simulator ☐ Natural sunlight					
I _{sc} [A] with tolerance		49.83 ± 3%					
V _{oc} [V] with tolerance		13.800 ± 5%					
Sample no.	Pmax [W]	Vmpp [V]	I _{mp} [A]	Voc [V]	Isc [A]	FF [%]	
1	462.4	41.99	11.012	50.08	11.733	78.7	N/A
Supplementary information: *A pulse solar simulator class AAA conforming to the requirements of IEC 60904-9 is used. Nominal values of I _{sc} and V _{oc} were confirmed within IEC/EN 61215 qualification.							

Prüfbericht-Nr.: 50166155 033

Seite 39 von 56

Test Report No.:

Page 39 of 56

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

12.4	Insulation test (initial) – MST 16					
Maximum system voltage [V _{DC}]				1500		Result
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m²]	R _{iso} ·A [GΩ·m²]	Dielectric breakdown		
				Yes (description)	No	
1	17.50	2.18	38.15	-	No	P
2	18.10	2.18	39.46	-	No	P
Supplementary information:						
Minimum requirement is 0.04 GΩ·m² for A > 0.1 m² and 0.4 GΩ for A ≤ 0.1 m².						

12.5	Wet leakage current test (initial) – MST 17			
Maximum system voltage [V _{DC}]		1500		Result
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [Ω·cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [MΩ]	A [m ²]	R _{iso} ·A [MΩ·m ²]	
1	6650.0	2.18	14497.0	P
2	6250.0	2.18	13625.0	P
Supplementary information:				
Minimum requirement is 40 MΩ·m ² .				

12.6	Accessibility test (initial) – MST 11				
Applied force [N]		10			Result
Sample no.	Contact with live electrical part?		R _{iso} [MΩ]		
2	☐ Yes ☒ No		≥60.0		P

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 40 von 56
Page 40 of 56

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

12.7	Continuity test of equipotential bonding (initial) – MST 13		
Maximum overcurrent protection rating [A]	20	Result	
Current applied [A]	50		
Duration of applied current [min]	2		
Location of designated point for equipotential bonding	Long side of the frame		
No. of other conductive parts tested	3		
Sample no.	Max. measured voltage [mV]	Max. calculated resistance [$m\Omega$]	
2	51.6/52.3/51.2	1.03/1.05/1.02	P
3	51.2/50.8/52.4	1.02/1.01/1.05	P
Supplementary information: N/A			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 41 von 56
Page 41 of 56

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

12.12	Module breakage test – MST 32				
Weight of impactor [kg]			45.5 ± 0.5		Result
Drop height [mm]			300		
Mounting technique used			Clamps and rails		
Sample no.		Test results			P
3	☒	No breakage occurred			
	☐	PV module separated from the mounting structure or from the framing			
	☐	Breakage occurred, but no shear or opening large enough for a 76 mm diameter sphere to pass freely has developed and no particles larger than 65 cm² have been ejected from the sample.			
Supplementary information: N/A					

12.14	Insulation test – MST 16					
Maximum system voltage [V _{DC}]				1500		Result
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso}	A	R _{iso} ·A	Dielectric breakdown		
	[GΩ]	[m²]	[GΩ·m²]	Yes (description)	No	
After Static mechanical load test – MST 34						
2	17.40	2.18	37.93	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m² for A > 0.1 m² and 0.4 GΩ for A ≤ 0.1 m².						

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 42 von 56
Page 42 of 56

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

12.29	Visual inspection (final) – MST 01			
Sample no.		Requirement	Nature and position of findings	Result
1		No major visual defects	No major visual defects	P
2			No major visual defects	P
Supplementary information: N/A				

12.30	Accessibility test (final) – MST 11		
Applied force [N]		10	Result
Sample no.	Contact with live electrical part?	R _{iso} [MΩ]	
2	☐ Yes ☒ No	≥ 60.0	P
Supplementary information: The resistance tester can measure up to 60.0 MΩ.			

12.31	Continuity test of equipotential bonding (final) – MST 13		
Maximum overcurrent protection rating [A]		20	Result
Current applied [A]		50	
Duration of applied current [min]		2	
Location of designated point for equipotential bonding		Long side of the frame	
No. of other conductive parts tested		3	
Sample no.	Max. measured voltage [mV]	Max. calculated resistance [mΩ]	
2	64.7/65.2/66.5	1.29/1.30/1.33	P
3	54.1/51.2/50.8	1.08/1.02/1.02	P
Supplementary information: N/A			

12.32	Durability of markings – MST 05		
Duration of rubbing with water [s]		15	Result
Duration of rubbing with petroleum spirits [s]		15	
Sample no.	Comments		
1	The marking is legible; the marking plate is not removable and without curling.		P
2	The marking is legible; the marking plate is not removable and without curling.		P
Supplementary information: N/A			

Prüfbericht-Nr.: 50166155 033
Test Report No.:

Seite 43 von 56
Page 43 of 56

Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

12.33	Sharp edge test – MST 06		
Sample no.		Comments	Result
1		The accessible PV module surfaces are smooth and free from sharp edges.	P
2		The accessible PV module surfaces are smooth and free from sharp edges.	P
Supplementary information: N/A			

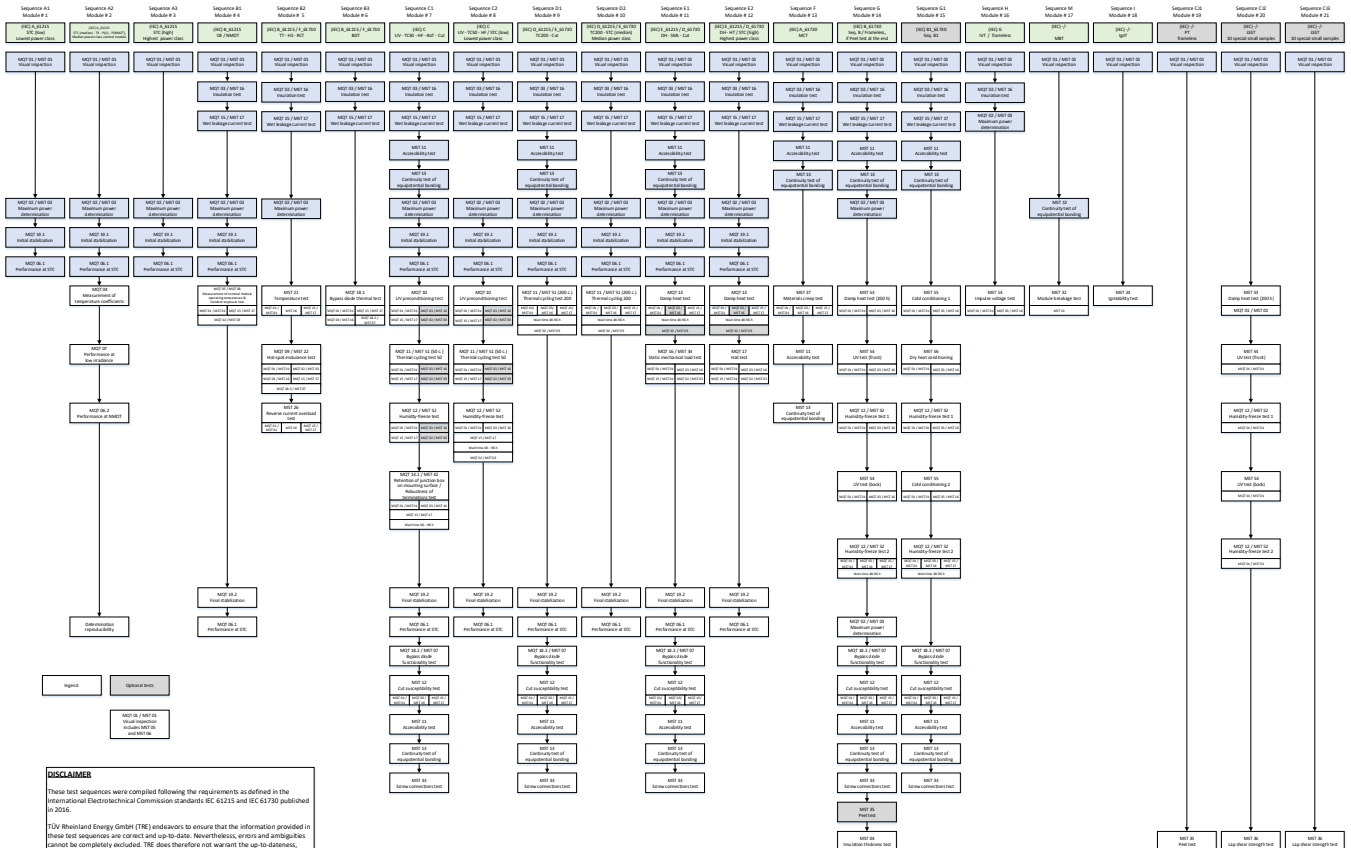
12.34	Bypass diode functionality test (final) – MST 07			
Test method		☐ Method A ☒ Method B		Result
Sample no.	Diode 1	Diode 2	Diode 3	
1	working properly	working properly	working properly	P
2	working properly	working properly	working properly	P
Supplementary information: This test verifies that the sample shows the electrical characteristics of a functional photovoltaic device.				

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 44 von 56
Page 44 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Appendix A: Test charts



ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 45 von 56
Page 45 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Appendix B: Abbreviations used in the report

NMOT	Nominal Module Operating Temperature
STC	Standard Test Conditions
P_{max}	Maximum power
I_{mpp}	Maximum power point current
V_{mpp}	Maximum power point voltage
I_{sc}	Short circuit current
V_{oc}	Open circuit voltage
FF	Fill factor
α	Current temperature coefficient
β	Voltage temperature coefficient
γ	Power temperature coefficient
S	Series connection
SP	Series-parallel connection
PS	Parallel-series connection
R_{iso}	Electrical insulation resistance
A	Module area

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.

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 46 von 56
Page 46 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Appendix C: History of reporting and certification

Subject	Module type	Report no.	Certificate no.	Date of issue
Basic certification IEC 61215-1:2016 IEC 61215-1-1:2016 IEC 61215-2:2016 IEC 61730-1:2016 IEC 61730-2:2016	SPICM6(MDF)-72-xxx/BP (xxx=355-370, in steps of 5, 72 cells)	50166155 001	PV 50419531 Page 1	29/10/2018
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx=355-375, in steps of 5W, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx=305-310, in steps of 5W, 60 cells)	50166155 002	PV 50419531 Page 2	16/07/2019
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si MBB cell: SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5W, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5W, 60 cells)	50166155 003	PV 50419531 Page 3	19/07/2019
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5W, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5W, 120 cells)	50166155 004	PV 50419531 Page 4	26/07/2019
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx=355-375, in steps of 5W, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx=305-310, in steps of 5W, 60 cells) With 6" mono c-Si MBB cell: SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5W, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5W, 60 cells)	50166155 005	Declaration	08/08/2019
Low Voltage Directive (CE): IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx=355-375, in steps of 5W, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx=305-	50166155 006	AN 50447759 0001	23/09/2019

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 47 von 56
Page 47 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	310, in steps of 5W, 60 cells) With 6" mono c-Si MBB cell: SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5W, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5W, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5W, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5W, 120 cells)			
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si ½ cut MBB cells: SPICM6(MDF)-72-xxx/BPHM (xxx=375-395, in steps of 5W, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-325, in steps of 5W, 120 cells)	50166155 007	PV 50419531 Page 5	16/10/2019
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx=380-395, in steps of 5W, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx=315-325, in steps of 5W, 60 cells)	50166155 008	PV 50419531 Page 6	04/12/2019
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx=355-395, in steps of 5W, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx=305-325, in steps of 5W, 60 cells) With 6" mono c-Si MBB cell: SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5W, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5W, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5W, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5W, 120 cells) With 6" mono c-Si ½ cut MBB cells: SPICM6(MDF)-72-xxx/BPHM (xxx=375-395, in steps of 5W, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-325, in steps of 5W, 120 cells)	50166155 009	Declaration	30/12/2019
Co-Certification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: GBEM6(MDF)-72-xxx/BP (xxx=355-395, in steps of 5W, 72 cells) GBEM6(MDF)-60-xxx/BP (xxx=305-325, in steps of 5W, 60 cells) With 6" mono c-Si MBB cell: GBEN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5W, 72 cells) GBEN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5W, 60 cells) With 6" mono c-Si ½ cut cell:	50166155 010	PV 50459929 Page 1-2	17/03/2020

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 48 von 56
Page 48 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	GBEM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5W, 144 cells) GBEM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5W, 120 cells) With 6" mono c-Si ½ cut MBB cell: GBEM6(MDF)-72-xxx/BPHM (xxx=375-395, in steps of 5W, 144 cells) GBEM6(MDF)-60-xxx/BPHM (xxx=315-325, in steps of 5W, 120 cells)			
IEC 61215-2: 2016 MQT 05 Measurement of nominal module operating temperature (NMOT) and MQT 06.2 Measuring at NMOT	SPICM6(MDF)-72-370/BPH	50166155 011	—	—
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5, 60 cells) SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-395, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-325, in steps of 5, 120 cells) SPICN6(MDF)-72-xxx/BHM (xxx=395-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=330-335, in steps of 5, 120 cells)	50166155 012	PV 50419531 Page 7	30/03/2020
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-60-xxx/BHM (xxx=340, 120 cells)	50166155 013	PV 50419531 Page 8	06/06/2020
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-395, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-325, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells)	50166155 014	PV 50419531 Page 9	30/06/2020

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 49 von 56
Page 49 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=395-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=330-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)			
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=395-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=330-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)	50166155 015	PV 50419531 Page 10	17/07/2020
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BPM (xxx=320-	50166155 016	PV 50419531 Page 11	22/07/2020

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 50 von 56
Page 50 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	335, in steps of 5, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=370-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=310-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)			
Low Voltage Directive (CE): IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=370-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=310-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)	50166155 017	AN 50475979 Page 1-3	28/07/2020
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells)	50166155 018	Declaration	11/08/2020

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 51 von 56
Page 51 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells) With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=370-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=310-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)				
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	Max. System voltage: 1500V With mono c-Si ½ cut cell: SPICM10(LDF)-72-xxx/BPHM (xxx=530-545, in steps of 5W, 144 cells) With 6" mono c-Si ½ cut cell: SPICM6(MAR)-72-xxx/PH (xxx=380-405, in steps of 5, 144 cells) SPICM6(MAR)-60-xxx/PH (xxx=320-335, in steps of 5, 120 cells) SPICM6(MAR)-72-xxx/BPH (xxx=380-400, in steps of 5, 144 cells) SPICM6(MAR)-60-xxx/BPH (xxx=320-330, in steps of 5, 120 cells) With 6" mono c-Si cell: SPICM6(MAR)-72-xxx/PR (xxx=370-395, in steps of 5, 72 cells) SPICM6(MAR)-60-xxx/PR (xxx=310-325, in steps of 5, 60 cells) SPICM6(MAR)-72-xxx/BP (xxx=350-395, in steps of 5, 72 cells) SPICM6(MAR)-60-xxx/BP (xxx=295-325, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICN6(MAR)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MAR)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) SPICM6(MAR)-72-xxx/BPM (xxx=380-405, in steps of 5, 72 cells) SPICM6(MAR)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells) With 6" mono c-Si ½ cut MBB cell: SPICM6(MAR)-72-xxx/BPHM (xxx=390-415, in steps of 5, 144 cells) SPICM6(MAR)-60-xxx/BPHM	50166155 019	AN 50419531 Page 12	26/03/2021	

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 52 von 56
Page 52 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	(xxx=325-345, in steps of 5, 120 cells) SPICN6(MAR)-72-xxx/BHM (xxx=385-420, in steps of 5, 144 cells) SPICN6(MAR)-60-xxx/BHM (xxx=325-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MAR)-72-xxx/IH (xxx=390-425, in steps of 5, 144 cells); SPICN6(MAR)-72-428/IH (144 cells) SPICN6(MAR)-66-xxx/IH (xxx=360-390, in steps of 5, 132 cells); SPICN6(MAR)-60-xxx/IH (xxx=325-355, in steps of 5, 120 cells); Max. system voltage: 1000V With 6" mono c-Si cell: SPICM6(MAR)-72-xxx (xxx=330-340, in steps of 5, 72 cells) SPICM6(MAR)-60-xxx (xxx=275-285, in steps of 5, 60 cells) SPICM6(MAR)-72-xxx/PR1000 (xxx=370-395, in steps of 5, 72 cells) SPICM6(MAR)-60-xxx/PR1000 (xxx=310-325, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MAR)-72-xxx/M (xxx=335-345, in steps of 5, 72 cells)			
Extension to alternative materials	Same as above	50166155 020	Declaration	25/05/2021
Basic qualification	Max. system voltage (Up to 1500VDC) With ½ cut of 182 mono c-Si cells: SPICN10(LDF)-72-xxx/BHM (xxx=550-580, in steps of 5, 144 cells) SPICN10(LDF)-66-xxx/BHM (xxx=505-530, in steps of 5, 132 cells) SPICN10(LDF)-60-xxx/BHM (xxx=460-485, in steps of 5, 120 cells) SPICN10(LDF)-54-xxx/BHM (xxx=410-435, in steps of 5, 108 cells) With mono c-Si ½ cut cell: SPICM10(LDF)-72-xxx/BPHM (xxx=530-545, in steps of 5W, 144 cells) With 6" mono c-Si cell: SPICM6(MDF)-72-xxx/BP (xxx = 355-395, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BP (xxx = 305-325, in steps of 5, 60 cells) SPICN6(MDF)-72-xxx/BM (xxx=365-410, in steps of 5, 72 cells) SPICN6(MDF)-60-xxx/BM (xxx=305-340, in steps of 5, 60 cells) With 6" mono c-Si MBB cell: SPICM6(MDF)-72-xxx/BPM (xxx=385-405, in steps of 5, 72 cells) SPICM6(MDF)-60-xxx/BPM (xxx=320-335, in steps of 5, 60 cells)	50166155 021	PV 50539253 Page 1-4	06/04/2022

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 53 von 56
Page 53 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	With 6" mono c-Si ½ cut cell: SPICM6(MDF)-72-xxx/BPH (xxx=370-400, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPH (xxx=310-330, in steps of 5, 120 cells) With 6" mono c-Si ½ cut MBB cell: SPICN6(MDF)-72-xxx/BHM (xxx=370-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BHM (xxx=310-340, in steps of 5, 120 cells) SPICM6(MDF)-72-xxx/BPHM (xxx=375-420, in steps of 5, 144 cells) SPICM6(MDF)-60-xxx/BPHM (xxx=315-350, in steps of 5, 120 cells) With 6" mono c-Si ½ cut IBC cell: SPICN6(MDF)-72-xxx/BIH (xxx = 400-410, in steps of 5, 144 cells) SPICN6(MDF)-60-xxx/BIH (xxx = 335-340, in steps of 5, 120 cells)			
Introduce to new model types. Extension to alternative materials and combinations.	New model types: With ½ cut of 166 mono c-Si cell: SPICN6(LDF)-72-xxx/BIH (xxx=455-470, in steps of 5W, 144 cells) SPICN6(LDF)-66-xxx/BIH (xxx=415-435, in steps of 5W, 132 cells) SPICN6(LDF)-60-xxx/BIH (xxx=375-395, in steps of 5W, 120 cells) With ½ cut of 182 mono c-Si cell: SPICM10(LDF)-66-xxx/BPHM (xxx=480-500, in steps of 5W, 132 cells) SPICM10(LDF)-60-xxx/BPHM (xxx=440-460, in steps of 5W, 120 cells) SPICM10(LDF)-54-xxx/BPHM (xxx=395-415, in steps of 5W, 108 cells)	50166155 022	PV 50539253 Page 5	20/05/2022
Extension to alternative materials and combinations	Same as above.	50166155 023	Declaration	14/07/2022
Extension to alternative materials and combinations	Same as above.	50166155 025	Declaration	23/09/2022
Extension to alternative materials and combinations	Same as above.	50166155 027	Declaration	28/11/2022
Introduce to new model types. Extension to alternative materials and combinations.	With ½ cut of 166 mono c-Si cell: SPICN6(LDG)-72-xxx/IH(xxx=410-425, in steps of 5, 144 cells) SPICN6(LDG)-66-xxx/IH(xxx=380-385, in steps of 5, 132 cells) SPICN6(LDG)-60-xxx/IH(xxx=345-350, in steps of 5, 120 cells) SPICN6(LDG)-54-xxx/IH(xxx=310-315, in steps of 5, 108 cells) SPICN6(LDG)-36-xxx/IH(xxx=205-	50166155 029	PV 50539253 Page 6-7	07/07/2022

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 54 von 56
Page 54 of 56

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

	210, in steps of 5, 72 cells) SPICN6(LDG)-35-xxx/IH(xxx=200-205, in steps of 5, 70 cells) SPICN6(LDG)-25-xxx/IH(xxx=145, 50 cells) SPICN6(LDG)-22.5-xxx/IH(xxx=130, 45 cells) SPICN6(LDG)-20-xxx/IH(xxx=115, 40 cells) SPICN6(LDG)-19.5-xxx/IH(xxx=115, 39 cells) SPICN6(LDG)-18-xxx/IH(xxx=105, 36 cells) SPICN6(LDG)-17.5-xxx/IH(xxx=100, 35 cells) SPICN6(LDG)-16-xxx/IH(xxx=92, 32 cells) SPICN6(LDG)-15-xxx/IH(xxx=86, 30 cells) SPICN6(LDG)-13.5-xxx/IH(xxx=77, 27 cells) SPICN6(LDG)-12-xxx/IH(xxx=70, 24 cells) SPICN6(LDG)-9-xxx/IH(xxx=52, 18 cells) SPICN6(LDG)-7.5-xxx/IH(xxx=43, 15 cells)			
Extension qualification: IEC/EN 61215-1:2016 IEC/EN 61215-1-1:2016 IEC 61215-2:2016 EN 61215-2:2017 IEC 61730-1:2016 EN/IEC 61730-1:2018 IEC 61730-2:2016 EN/IEC 61730-2:2018	Power range extension module types: Max. System voltage: 1500V With ½ cut of 182 mono c-Si cell: SPICM10(LDF)-72-xxx/BPHM (xxx=550-565, in steps of 5, 144 cells) SPICM10(LDF)-66-xxx/BPHM (xxx=505-515, in steps of 5, 132 cells) SPICM10(LDF)-60-xxx/BPHM (xxx=465-470, in steps of 5, 120 cells) SPICM10(LDF)-54-xxx/BPHM (xxx=420, 108 cells)	50166155 031	PV 50539253 0008	19/10/2022
Power range extension for previously approved model types	Power range extension module types: Max. System Voltage: up to 1500 VDC (Voc at STC): With ½ cut of 166 mono c-Si cell: SPICN6(LDF)-72-xxx/BIH (xxx=475-485, in steps of 5, 144 cells) SPICN6(LDF)-66-xxx/BIH (xxx=440, in steps of 5, 132 cells) SPICN6(LDF)-60-xxx/BIH (xxx=400, in steps of 5, 120 cells)	50166155 032	PV 50539253 0009	21/05/2024

For co-license: 50166155 024, 026,028 and 30.

FOTO-DOKUMENTATION
 PHOTO DOCUMENTATION

Appendix D: Photos



Fig. 1: front view of test sample



Fig. 2: rear view of test sample

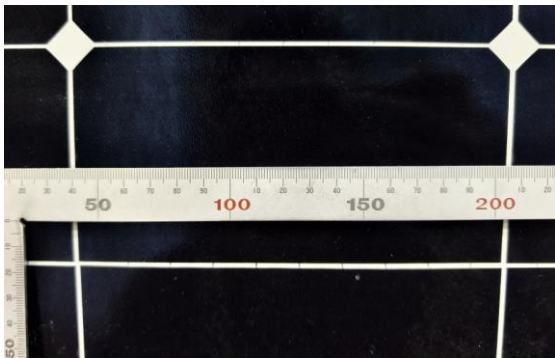


Fig. 3: detail view of solar cell

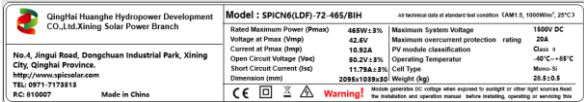


Fig. 4: detail view of type label



Fig. 5: detail view of closed junction box



Fig. 6: detail view of connector

ANLAGE zum Prüfbericht-Nr.: 50166155 033
APPENDIX to test report no.:

Seite 56 von 56
Page 56 of 56

FOTO-DOKUMENTATION
PHOTO DOCUMENTATION



Fig. 7: detail view of cable



Fig. 8: detail view of equipotential bonding hole and symbol



Fig. 9: detail view of frame corner



Fig. 10: view of mechanical load mounting

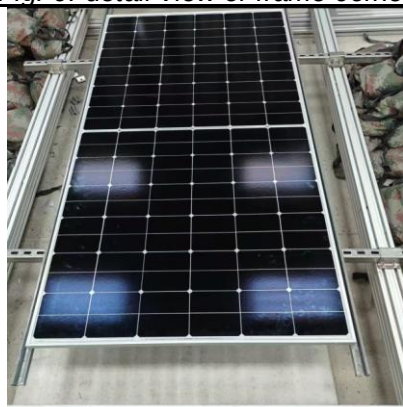


Fig. 11: detail view of mounting method

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N/A