Prüfbericht-Nr.: *Test report no.*:	**CN22IFYR 015**	**Auftrags-Nr.:** *Order no.*:	244461732	Seite 1 von 47 *Page 1 of 47*
Kunden-Referenz-Nr.: *Client reference no.*:	2146145	**Auftragsdatum:** *Order date:*	11/11/2022	
Auftraggeber: *Client*:	Chint New Energy Technology Co., Ltd. No. 1 Jisheng Road, Jianshan New Zone, Haining 314415, Zhejiang, 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*:	11/11/2022			
Prüfmuster-Nr.: *Test sample no:*	See clause 6			
Prüfzeitraum: *Testing period*:	11/11/2022 - 19/12/2022			
Ort der Prüfung: *Place of testing*:	Refer to page 7			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result**:	Pass			

geprüft von: tested by:	x Joy Sun Signed by: Joy Sun	**genehmigt von:** *authorized by*:	x Anderson Ruan Signed by: Anderson Ruan
Datum: *Date:* 20/12/2022		**Ausstellungsdatum:** *Issue date:* 20/12/2022	
Stellung / Position:	Project Engineer	**Stellung** / Position:	Authorizer

Sonstiges /
Other:

- Power range extension for previously approved model types.
- Refer to page 7 and Constructional Data Form (CDF) No. CN22IFYR 015 for more details.

TÜV Rheinland (Shanghai) Co., Ltd. * Inspection/Testing *

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*

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. *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.*
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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. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen 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. *The decision rule for statements of conformity 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.*

Produktbeschreibung
Product description

I	**General**
1	**Product details**
1.1	**Module type designation** **Power range extension:** **With ½ cut of N-type mono c-Si cells:** **CHSM72N(DG)/F-BH-xxx (xxx=570-575, in steps of 5, 144 cells)** **CHSM72N(DG)/F-BH-xxx (xxx=535-545, in steps of 5, 144 cells)** **CHSM60N(DG)/F-BH-xxx(xxx=475, 120 cells)** **CHSM54N(DG)/F-BH-xxx(xxx=430, 108 cells)** Approved model types: Max. System Voltage: up to 1500 VDC (Voc at STC): With mono c-Si cells: CHSM6612M(DG)-xxx (xxx=310-360, in steps of 5, 72 cells) CHSM6612M(DG)/F-xxx (xxx=310-360, in steps of 5, 72 cells) CHSM72M(DG)-B-xxx (xxx=345-400, in steps of 5, 72 cells) CHSM60M(DG)-B-xxx (xxx=285-330, in steps of 5, 60 cells) CHSM72M(DGT)-B-xxx (xxx=340-370, in steps of 5, 72 cells) CHSM60M(DGT)-B-xxx (xxx=280-305, in steps of 5, 60 cells) CHSM72M(DG)/F-B-xxx (xxx=345-400, in steps of 5, 72 cells) CHSM60M(DG)/F-B-xxx (xxx=285-330, in steps of 5, 60 cells) CHSM72M(DGT)/F-B-xxx (xxx=340-370, in steps of 5, 72 cells) CHSM60M(DGT)/F-B-xxx (xxx=280-305, in steps of 5, 60 cells) With ½ cut mono c-Si cells: CHSM72M(DG)-BH-xxx (xxx=365-455, in steps of 5, 144 cells) CHSM60M(DG)-BH-xxx (xxx=305-380, in steps of 5, 120 cells) CHSM72M(DG)/F-BH-xxx (xxx=365-455, in steps of 5, 144 cells) CHSM60M(DG)/F-BH-xxx (xxx=305-380, in steps of 5, 120 cells) CHSM72M(DGT)-BH-xxx (xxx=355-445, in steps of 5, 144 cells) CHSM60M(DGT)-BH-xxx (xxx=295-370, in steps of 5, 120 cells) CHSM72M(DGT)/F-BH-xxx (xxx=355-445, in steps of 5, 144 cells) CHSM60M(DGT)/F-BH-xxx (xxx=295-370, in steps of 5, 120 cells) CHSM72M(DGT)-BH-xxx (xxx=505-545, in steps of 5, 144 cells) CHSM72M(DGT)/F-BH-xxx (xxx=505-545, in steps of 5, 144 cells) CHSM72M(DG)-BH-xxx (xxx=515-555, in steps of 5, 144 cells) CHSM72M(DG)/F-BH-xxx (xxx=515-555, in steps of 5, 144 cells) CHSM66M(DGT)-BH-xxx (xxx=465-495, in steps of 5, 132 cells) CHSM66M(DGT)/F-BH-xxx (xxx=465-495, in steps of 5, 132 cells) CHSM66M(DG)-BH-xxx (xxx=475-510, in steps of 5, 132 cells) CHSM66M(DG)/F-BH-xxx (xxx=475-510, in steps of 5, 132 cells) CHSM54M(DG)-BH-xxx (xxx=390-415, in steps of 5, 108 cells) CHSM54M(DG)/F-BH-xxx (xxx=390-415, in steps of 5, 108 cells) CHSM66M(DG)/F-BH-xxx (xxx=635-675, in steps of 5, 132 cells) CHSM60M(DG)/F-BH-xxx (xxx=580-610, in steps of 5, 120 cells) CHSM55M(DG)/F-BH-xxx (xxx=530-565, in steps of 5, 110 cells) CHSM50M(DG)/F-BH-xxx (xxx=485-510, in steps of 5, 100 cells) CHSM78M(DG)/F-BH-xxx (xxx=580-605, in steps of 5,156 cells) CHSM60M(DG)/F-BH-xxx (xxx=430-465, in steps of 5, 120 cells)

Produktbeschreibung
Product description

	CHSM72M(DG)/F-HC-xxx (xxx=535-555, in steps of 5, 144 cells) CHSM54M(DGT)-BH-xxx (xxx=380-405, in steps of 5, 108 cells) CHSM54M(DGT)/F-BH-xxx (xxx=380-405, in steps of 5, 108 cells) CHSM60M(DG)/F-HC-xxx (xxx=450-460, in steps of 5, 120 cells) CHSM54M(DG)/F-HC-xxx (xxx=405-415, in steps of 5, 108 cells) With ½ cut of N-type mono c-Si cells: CHSM66N(DG)/F-BH-xxx (xxx=650-695, in steps of 5, 132 cells) CHSM60N(DG)/F-BH-xxx (xxx=595-630, in steps of 5, 120 cells) CHSM78N(DG)/F-BH-xxx (xxx=580-615, in steps of 5, 156 cells) CHSM72N(DG)/F-BH-xxx (xxx=550-565, in steps of 5, 144 cells) CHSM54N(DG)/F-BH-xxx (xxx=405-425, in steps of 5, 108 cells) CHSM60N(DG)/F-BH-xxx (xxx=450-470, in steps of 5, 120 cells) CHSM72N(DG)/F-HC-xxx (xxx=550-580, in steps of 5, 144 cells) CHSM60N(DG)/F-HC-xxx (xxx=460-480, in steps of 5, 120 cells) CHSM54N(DG)/F-HC-xxx (xxx=415-435, in steps of 5, 108 cells) CHSM72N(DGT)/F-BH-xxx (xxx=525-565, in steps of 5, 144 cells) CHSM60N(DGT)/F-BH-xxx (xxx=440-470, in steps of 5, 120 cells) CHSM54N(DGT)/F-BH-xxx (xxx=395-420, in steps of 5, 108 cells) xxx represents output power in Wp Refer to Constructional Data Form (CDF) no. CN22IFYR 015 for electrical ratings	
1.2	**Product safety ratings**	
	The modules are intended for a maximum operating altitude [meters above sea level] of [m]	≤ 2000 m above sea level
	Recommended maximum series/parallel module configurations	Available in installation manual
1.3	**Classification, applications and intended use**	
	The module has been evaluated for the following Class (IEC 61140):	☐ Class 0 ☒ Class II ☐ Class III

Produktbeschreibung
Product description

2 Used materials

See Constructional Data Form (CDF) No. CN22IFYR 015.

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

Name / Description:	Chint New Energy Technology Co., Ltd.
Street:	No.1 Jisheng Road, Jianshan Zone, Zhejiang
Postcode / City, Country:	314415 / Haining, P. R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date:	15095638.008 / 21/09/2022

Name / Description:	ECONESS ENERGY CO., LTD.
Street:	No. 58 Haida Road, Huashi Town, Jiangsu
Postcode / City, Country:	214421 / Jiangyin, P.R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date:	50152724 005 / 06/06/2022

Name / Description:	Chint New Energy Technology (Yancheng) Co.,Ltd.
Street:	No.1 Tonghui Road, Dafeng District, Yancheng City, Jiangsu Province
Postcode / City, Country:	Yancheng, P. R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date	CN21B3CD 003 / 13/10/2022

Name / Description:	Chint New Energy Technology (Jiuquan) Co.,Ltd.
Street:	15 Jingwu Road, Jiuquan economic and Technological Development Zone, Suzhou District, Jiuquan City, Gansu Province
Postcode / City, Country:	Jiuquan, P. R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date	CN21BX1N 003 / 06/12/2022

Name / Description:	Suzhou Akcome Optronics Science & Technology Co., Ltd.
Street:	Jintang Road, Zhangjiagang Economic Development Zone, Jiangsu
Postcode / City, Country:	215618 / Zhangjiagang, P. R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date	CN225RRM 002 / 11/11/2022

Produktbeschreibung
Product description

Name / Description:	Chint Solar (HaiNing) Co., Ltd.
Street:	No.2 Jisheng Road, Jianshan New Zone, Zhejiang Province
Postcode / City, Country:	314415, Haining, P. R. China
Type of production:	Crystalline PV-module
Inspection report No: / Date	CN22NL26 002 / 21/09/2022

Name / Description:	M.L.T. Solar Energy Product Co.,Ltd.
Street:	88/1 Moo. 9 Ko khanun Phanomsarakham
Postcode / City, Country:	24120, Chachoengsao, Thailand
Type of production:	Crystalline PV-module
Inspection report No: / Date	CN227UU4 001 / 12/10/2022

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. - Power range extension for previously approved model types as listed in section 1 based on CHSM72N(DG)/F-BH-xxx and CHSM78N(DG)/F-BH-xxx series. Relevant tests were performed on representative model type CHSM72N(DG)/F-BH-575 and test results are documented in this report. The differences of model types are as below: 1. CHSM78N(DG)/F-BH-xxx (xxx=580-615, in steps of 5, 156 cells) are for modules with 156 pcs N-type mono c-Si bifacial cells in cell dimension 182mmx91mm. 2. CHSM72N(DG)/F-BH-xxx (xxx=550-565, in steps of 5, 144 cells) are for module with 144 pcs N-type mono c-Si bifacial cells in cell dimension 182mmx91mm. 3. CHSM60N(DG)/F-BH-xxx (xxx=450-475, in steps of 5, 120 cells) are for module with 120 pcs N-type mono c-Si bifacial cells in cell dimension 182mmx91mm. 4. CHSM54N(DG)/F-BH-xxx (xxx=405-430, in steps of 5, 108 cells) are for module with 108 pcs N-type mono c-Si bifacial cells in cell dimension 182mmx91mm. This report have to be read in conjunction with report CN22IFYR 001 to 014 and Constructional Data Form (CDF) No. CN22IFYR 015. This test report includes a history of reporting and certification, measurement reports 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 tested at TÜV Rheinland (Shanghai) Co., Ltd.

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	

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.				
Sample no.	Sample SN	Test sequence	Remarks / constructional characteristics (e.g. cell, backsheet, frame type)	
Module type: CHSM72N(DG)/F-BH-575				
1	650000140287000368	A3	Front cover: 2.0mm AR coated semi-tempered glass from Xinyi Rear cover: 2.0mm AR coated semi-tempered glazed glass from Xinyi Encapsulation material: TF4 (between cell and front cover) / F806PS (between cell and rear cover) from Hangzhou First Solar cell: CHSC-182N11SB-N, 182mm x91mm x 150μm (±15 μm) from Chint Cell connector: Sn60/Pb40 from Chint, Φ(mm)=0.29 String connector: Sn60/Pb40 from Hangzhou Xiaoshan Jianghai, L(mm) X T(mm)=6.0x0.35 and 4.0x0.35 Fluxing agent: GOLF703-C from Shenzhen Yik Shing Tat Fixing tape: 9966 from Shanghai Hyperion Adhesive Material Co.,ltd Frame: 6005-T6 from Chint, Thickness=30mm Adhesive (junction box and frame): HT906Z from Shanghai Huitian Junction box: CHS3xyz from Chint	—
2	650000140287000369	A3		
Supplementary information: N/A				

Absatz	**Photovoltaic (PV) modules**	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / *Requirements - Tests*	*Measuring results - Remarks*	*Evaluation*
II	**IEC/EN 61215 Part 1 – Test requirements**		
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

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/m², 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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: *"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 Isc and Voc 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."*	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			

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *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: $P_{\max}(\text{Lab}) \cdot \left(1 + \frac{\lvert m_1 \rvert [\%]}{100}\right) \geq P_{\max}(\text{NP}) \cdot \left(1 - \frac{\lvert t_1 \rvert [\%]}{100}\right)$ $\bar{P}_{\max}(\text{Lab}) \cdot \left(1 + \frac{\lvert m_1 \rvert [\%]}{100}\right) \geq P_{\max}(\text{NP})$	See table in 9.4 (Gate #1 evaluation)	P
	After stabilization, each individual module shall meet: $V_{\text{OC}}(\text{Lab}) \cdot \left(1 + \frac{\lvert m_2 \rvert [\%]}{100}\right) \leq V_{\text{OC}}(\text{NP}) \cdot \left(1 + \frac{\lvert t_2 \rvert [\%]}{100}\right)$	See table in 9.4 (Gate #1 evaluation)	P
	After stabilization, each individual module shall meet: $I_{\text{SC}}(\text{Lab}) \cdot \left(1 + \frac{\lvert m_3 \rvert [\%]}{100}\right) \leq I_{\text{SC}}(\text{NP}) \cdot \left(1 + \frac{\lvert t_3 \rvert [\%]}{100}\right)$	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: $P_{\max}(\text{Lab\_Gate \#2}) \geq 0.95 \times P_{\max}(\text{Lab\_Gate \#1}) \cdot \left(1 - \frac{r[\%]}{100}\right)$	r = 0.8 See table in 9.25 (Gate # 2 evaluation)	P
	r = reproducibility		N/A

Prüfbericht-Nr.: CN22IFYR 015
Test Report No.:

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

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

III	**IEC/EN 61215 Part 2 – Test procedures**

9	**Overview of tests and test results**

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)	N/A	N/A
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)	N/A	N/A
Static mechanical load test (MQT 16)	N/A	N/A
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)	N/A	N/A
Initial stabilization (MQT 19.1)	See table 9.2	P
Final stabilization (MQT 19.2)	N/A	N/A
Supplementary information: N/A		

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

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

Supplementary information: N/A

9.2 Initial stabilization – MQT 19.1

☒ Simulator ☐ Natural sunlight ☐ Other stabilization procedures

Irradiance [W/m²]			1000		Result
Module temperature [°C]			50		
Sample no.	Test	Integrated irradiation [kWh/m²]	P_{max} [W]	Stabilization [%] *	
1	Initial	—	540.1	0.79	P
	Light-soaking 1	5	544.4		
	Light-soaking 2	5	543.1		
2	Initial	—	538.2	0.63	P
	Light-soaking 1	5	541.6		
	Light-soaking 2	5	541.4		

Supplementary information:
* Stabilization criterion: $(P_{max}-P_{min})/P_{avg} \leq 1$ % 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	561.3	43.31	12.960	51.94	13.613	79.4	N/A
2	559.2	43.10	12.973	51.92	13.615	79.1	N/A

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

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

9.4	**Gate #1 evaluation**			
Manufacturer tolerances given on name plate	for P_{max}	t_1 [%]	± 3.5	N/A
	for V_{OC}	t_2 [%]	± 3.5	
	for I_{SC}	t_3 [%]	± 5.0	
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	561.3	578.1	575.0	554.9	P
2	559.2	575.9	575.0	554.9	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
CHSM72N(DG)/F-BH-575	560.2	577.0	575.0	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	51.94	52.41	51.10	52.89	P
2	51.92	52.39	51.10	52.89	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

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	13.613	13.994	14.190	14.900	P
2	13.615	13.996	14.190	14.900	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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
IV	**IEC/EN 61730 Part 1 – Requirements for construction**		
10	**Classification, applications and intended use**		
10.1	**General (4.1)**		
	Product details	See 1	N/A
	Classification, applications and intended use	See 1.3	N/A
11	**Requirements for design and construction (5)**		
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
	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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	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/m², (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: ◇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
	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

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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	- 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
	The following or equivalent statement is included: *"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."* Safety factor may vary acc. to local conditions.	Available in installation manual	P
11.3	**Electrical components and insulation (5.3)**		

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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	**External wiring (5.3.3)**		
	External wires and cables fulfil the requirements of IEC 62930 and/or EN 50618.	☒ EN 50618 ☒ IEC 62930	P
11.3.3	**Connectors (5.3.4)**		
	External DC connectors fulfil the requirements of IEC 62852.	☒ IEC 62852	P
11.3.4	**Junction boxes for PV modules (5.3.5)**		
	Junction boxes for PV modules fulfil the requirements of IEC 62790.	☒ IEC 62790	P
11.3.5	**Frontsheets and backsheets (5.3.6)**		
	Frontsheet:		N/A
	Material of frontsheet:	☒ Glass ☐ Polymeric material ☐ Others	N/A
	Polymeric frontsheets meet relevant requirements of section 5.5.2.	Not applicable for glass frontsheet	N/A
	Polymeric frontsheets used as relied upon insulation fulfil requirements of		N/A
	- 5.6.4.3 for insulation in thin layers	Not applicable for glass frontsheet	N/A
	- 5.5.2.3 for electrical insulation	Not applicable for glass frontsheet	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
	Polymeric backsheets meet relevant requirements of section 5.5.2.	Not applicable for glass backsheet	N/A
	Polymeric backsheets used as relied upon insulation fulfil requirements of		—
	- 5.6.4.3 for insulation in thin layers	Not applicable for glass backsheet	N/A
	- 5.5.2.3 for electrical insulation	Not applicable for glass backsheet	N/A
	Thermal index backsheet (see also 5.5.2.3.3):	Not applicable for glass backsheet	N/A

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	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)**		
	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
	End of a stranded conductor is not consolidated by soft soldering.	Part of IEC 62790 qualification.	P
	Precautions are taken to prevent contact stress which might impair electrical conductivity.	Part of IEC 62790 qualification.	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
11.3.7.3	**Splices and connections inside a PV module (5.3.8.3)**		
	Splices and connections inside a PV module are mechanically secured.	Part of IEC 62790 qualification.	P
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	A soldered or conductively adhered joint is additionally mechanically secured.	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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	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
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
	Lids attached without screws have one or several detectable facilities for enabling tools.	Compliance checked by the corresponding component standards.	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

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

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

Absatz	**Photovoltaic (PV) modules**	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / *Requirements - Tests*	*Measuring results - Remarks*	*Evaluation*
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)**		
	External polymeric parts of the PV module whose deterioration could impair the safety meet the following additional requirements:	N/A	N/A
	- Flammability class minimum V-1 according to IEC 60695-11-10	Part of IEC 62790 qualification.	P
	- Ball pressure test according to IEC 60695-10-2 with a temperature of 75°C (not applicable to insulation in thin layers)	Part of IEC 62790 qualification.	P
	- 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 insulating parts supporting live parts (5.5.2.3.5)**		
	External parts of insulating material supporting live parts including connections, and parts of polymeric material providing supplementary insulation or reinforced insulation, are sufficiently resistant to heat.	Part of IEC 62790 qualification.	P
	Other than elastomeric polymeric materials meet the following requirements:		N/A
	- Flammability class minimum HB	Part of IEC 62790 qualification.	P
	- Ball pressure test with a temperature of 125°C	Part of IEC 62790 qualification.	P
	- Material creep test (MST 37)	N/A	N/A
11.5.1.3.6	**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

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

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

Absatz *Clause*	**Photovoltaic (PV) modules** Anforderungen - Prüfungen / *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
	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
	- 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 50×10^6 Ω cm (dry) / bigger than 10×10^6 Ω 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

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

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

Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3or 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	N/A	10.4	10.4
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	N/A	10.4	10.4
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.96±0.5	0.2	1.96±0.5
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	3.0±1.0	0.2	3.0±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 clearence which is verified by Impulse voltage test according to IEC 60664-1.

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 2: PV module evaluation MST 01 initial

Sample no.			1, 2						
Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3or 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	N/A	10.4	10.4
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	N/A	10.4	10.4
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.9	0.2	1.9
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	3.0	0.2	3.0
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 E.
* The junction box is potted and fulfils the requirements of IEC 62790.

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

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 3: PV module evaluation MST 01 final

Sample no.: 1, 2

Clearance (cl) and creepage distance (cr) at/of/between:	Line of table 3or 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	N/A	10.4	10.4
Position 2: Shortest distance cell – module edge	1a	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	1500	19.4	N/A	10.4	10.4
Position 3: Cell to cell	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	1.9	0.2	1.9
Position 4: String to string	2	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2 ☐ 3	☒ I ☐ II ☐ IIIa	< 35	0.1	3.0	0.2	3.0
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 clearence which is verified by Impulse voltage test according to IEC 60664-1.

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**

12	**Overview of tests and test results**	
Test	Remarks	Result
Visual inspection (MST 01)	See table 12.1	P
Performance at STC (MST 02)	N/A	N/A
Maximum power determination (MST 03)	N/A	N/A
Insulation thickness test (MST 04)	N/A	N/A
Durability of markings (MST 05)	N/A	N/A
Sharp edge test (MST 06)	N/A	N/A
Bypass diode functionality test (MST 07)	N/A	N/A
Accessibility test (MST 11)	N/A	N/A
Cut susceptibility test (MST 12)	N/A	N/A
Continuity test for equipotential bonding (MST 13)	N/A	N/A
Impulse voltage test (MST 14)	N/A	N/A
Insulation test (MST 16)	N/A	N/A
Wet leakage current test (MST 17)	N/A	N/A
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)	N/A	N/A
Screw connections test (MST 33)	N/A	N/A
Static mechanical load test (MST 34)	N/A	N/A
Peel test (MST 35)	N/A	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
Damp heat test (200h) (MST 53b)	N/A	N/A

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

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
Supplementary information: N/A			

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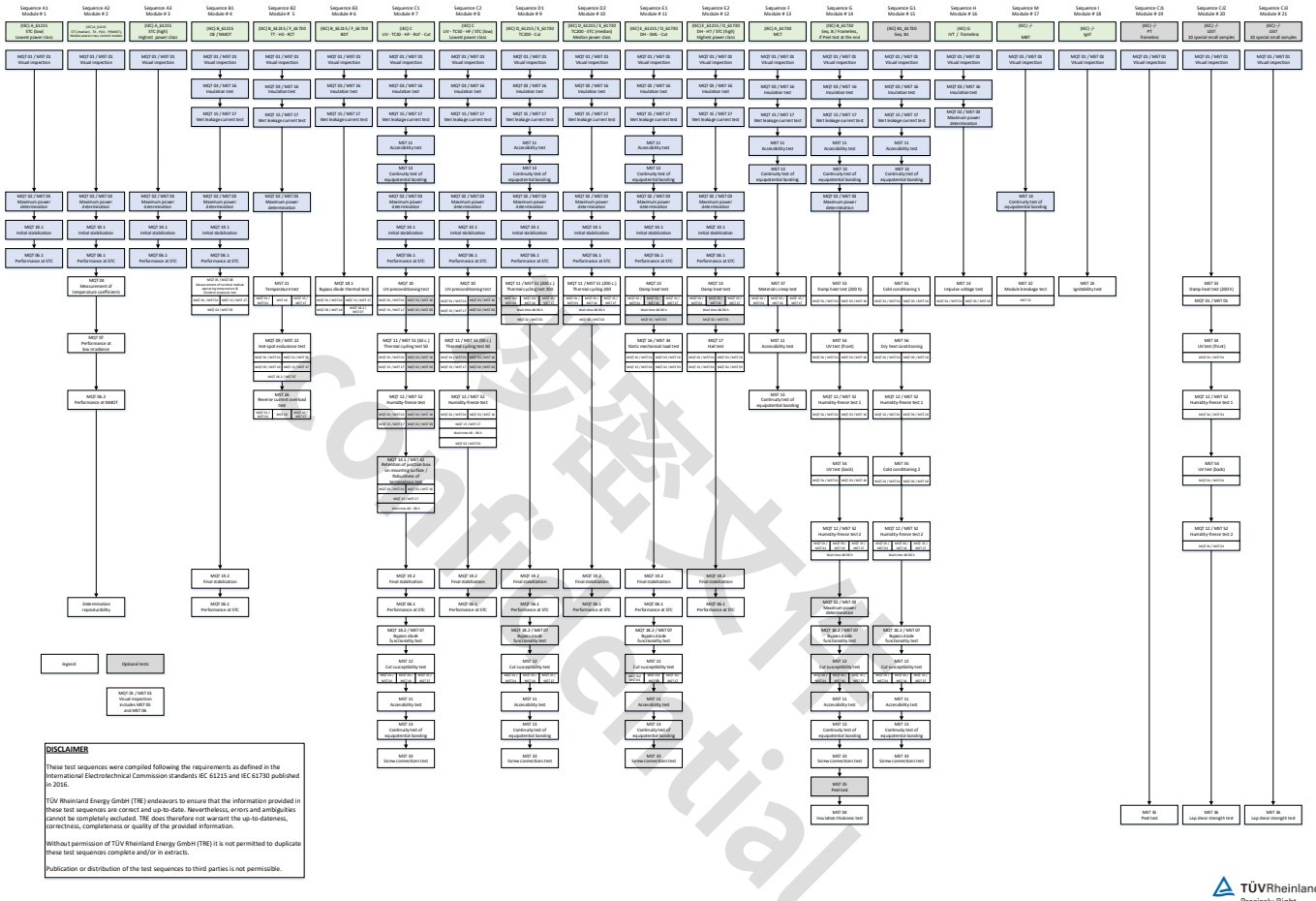
Appendix A: Test charts



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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
G_E	Equivalent irradiance
Φ	Bifaciality refers to the ratios between the main I-V characteristics of the rear side and the front side of a bifacial device, typically at Standard Test Conditions (STC) unless otherwise specified. It is quantified with reference to bifaciality coefficients, namely as φ.

Statement of the estimated uncertainty of the test verdicts

- Electrical performance rating is outside the scope of IEC 61215:2016 qualification testing. The verdicts of performance rating are only related to the test samples that were subjected to the tests. They cannot be generalised to the modules from the series production.
- The calibration to STC was performed with a class AAA solar simulator. The extended measurement uncertainty is:
  - $2\sigma\ (P_{mpp}) \leq \pm 3.0\ \%$
  - $2\sigma\ (I_{SC}) \leq \pm 2.8\ \%$
  - $2\sigma\ (V_{OC}) \leq \pm 0.9\ \%$
- The reproducibility parameter r with the solar simulator is 0.8 %.
- Relative measurements were performed with a flash type solar simulator.

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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 EN 61215-1:2016 EN 61215-1-1:2016 EN 61215-2:2017 EN IEC 61730-1:2018 EN IEC 61730-2:2018	Max. System Voltage: up to 1500 VDC (Voc at STC): With mono c-Si cells: CHSM6612M(DG)-xxx (xxx=310-360, in steps of 5, 72 cells) CHSM6612M(DG)/F-xxx (xxx=310-360, in steps of 5, 72 cells) CHSM72M(DG)-B-xxx (xxx=345-400, in steps of 5, 72 cells) CHSM60M(DG)-B-xxx (xxx=285-330, in steps of 5, 60 cells) CHSM72M(DGT)-B-xxx (xxx=340-370, in steps of 5, 72 cells) CHSM60M(DGT)-B-xxx (xxx=280-305, in steps of 5, 60 cells) CHSM72M(DG)/F-B-xxx (xxx=345-400, in steps of 5, 72 cells) CHSM60M(DG)/F-B-xxx (xxx=285-330, in steps of 5, 60 cells) CHSM72M(DGT)/F-B-xxx (xxx=340-370, in steps of 5, 72 cells) CHSM60M(DGT)/F-B-xxx (xxx=280-305, in steps of 5, 60 cells) With ½ cut mono c-Si cells: CHSM72M(DG)-BH-xxx (xxx=365-455, in steps of 5, 144 cells) CHSM60M(DG)-BH-xxx (xxx=305-380, in steps of 5, 120 cells) CHSM72M(DG)/F-BH-xxx (xxx=365-455, in steps of 5, 144 cells) CHSM60M(DG)/F-BH-xxx (xxx=305-380, in steps of 5, 120 cells) CHSM72M(DGT)-BH-xxx (xxx=355-445, in steps of 5, 144 cells) CHSM60M(DGT)-BH-xxx (xxx=295-370, in steps of 5, 120 cells) CHSM72M(DGT)/F-BH-xxx (xxx=355-445, in steps of 5, 144 cells) CHSM60M(DGT)/F-BH-xxx (xxx=295-370, in steps of 5, 120 cells) CHSM72M(DGT)-BH-xxx (xxx=505-545, in steps of 5, 144 cells) CHSM72M(DGT)/F-BH-xxx (xxx=505-545, in steps of 5, 144 cells) CHSM72M(DG)-BH-xxx (xxx=515-555, in steps of 5, 144 cells) CHSM72M(DG)/F-BH-xxx (xxx=515-555, in steps of 5, 144 cells) CHSM66M(DGT)-BH-xxx (xxx=465-495, in steps of 5, 132 cells)	CN22IFYR 001	PV 50542224 0001-0005	10/05/2022

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	CHSM66M(DGT)/F-BH-xxx (xxx=465-495, in steps of 5, 132 cells) CHSM66M(DG)-BH-xxx (xxx=475-510, in steps of 5, 132 cells) CHSM66M(DG)/F-BH-xxx (xxx=475-510, in steps of 5, 132 cells) CHSM54M(DG)-BH-xxx (xxx=390-415, in steps of 5, 108 cells) CHSM54M(DG)/F-BH-xxx (xxx=390-415, in steps of 5, 108 cells) CHSM66M(DG)/F-BH-xxx (xxx=635-675, in steps of 5, 132 cells) CHSM60M(DG)/F-BH-xxx (xxx=580-610, in steps of 5, 120 cells) CHSM55M(DG)/F-BH-xxx (xxx=530-565, in steps of 5, 110 cells) CHSM50M(DG)/F-BH-xxx (xxx=485-510, in steps of 5, 100 cells) CHSM78M(DG)/F-BH-xxx (xxx=585-605, in steps of 5,156 cells) CHSM60M(DG)/F-BH-xxx (xxx=430-465, in steps of 5, 120 cells) With ½ cut of N-type mono c-Si cells: CHSM66N(DG)/F-BH-xxx (xxx=650-695, in steps of 5, 132 cells) CHSM60N(DG)/F-BH-xxx (xxx=595-630, in steps of 5, 120 cells) CHSM78N(DG)/F-BH-xxx (xxx=580-615, in steps of 5, 156 cells) CHSM72N(DG)/F-BH-xxx (xxx=550-565, in steps of 5, 144 cells) CHSM54N(DG)/F-BH-xxx (xxx=405-425, in steps of 5, 108 cells)			
Extension qualification 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	Power range extension: With ½ cut of N-type mono c-Si cells: CHSM60N(DG)/F-BH-xxx (xxx=450-470, in steps of 5, 120 cells)	CN22IFYR 002	PV 50542224 0006	24/06/2022
Extension qualification 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	Same as above.	CN22IFYR 003	new factory list	01/07/2022
CE: IEC 61730-1:2016;	Same as above.	CN22IFYR	AN 50552489	01/08/2022

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IEC 61730-2:2016; EN IEC 61730-1:2018; EN IEC 61730-2:2018		004	0001	
UKCA: EN IEC 61730-1:2018; EN IEC 61730-2:2018.	Same as above.	CN22IFYR 005	AQ 50553657 0001	03/08/2022
Extension qualification 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	New model types: With ½ cut mono c-Si cells: CHSM72M(DG)/F-HC-xxx (xxx=535-555, in steps of 5, 144 cells) CHSM54M(DGT)-BH-xxx (xxx=380-405, in steps of 5, 108 cells) CHSM54M(DGT)/F-BH-xxx (xxx=380-405, in steps of 5, 108 cells)	CN22IFYR 007	PV50542224 0007	26/08/2022
Extension qualification 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	Same as above.	CN22IFYR 009	Final declaration_ CN22IFYR 009	14/10/2022
Extension qualification 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	Same as above.	CN22IFYR 010	new factory list	25/10/2022
Extension qualification 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	New model types: With ½ cut mono c-Si cells: CHSM60M(DG)/F-HC-xxx (xxx=450-460, in steps of 5, 120 cells) CHSM54M(DG)/F-HC-xxx (xxx=405-415, in steps of 5, 108 cells) With ½ cut of N-type mono c-Si cells: CHSM72N(DG)/F-HC-xxx (xxx=550-580, in steps of 5, 144 cells) CHSM60N(DG)/F-HC-xxx (xxx=460-480, in steps of 5, 120 cells) CHSM54N(DG)/F-HC-xxx (xxx=415-435, in steps of 5, 108 cells)	CN22IFYR 012	PV 50542224 0008	22/11/2022
Extension qualification IEC 61215-1:2016 IEC 61215-1-1:2016 IEC 61215-2:2016	New model types: With ½ cut of N-type mono c-Si cells: CHSM72N(DGT)/F-BH-xxx (xxx=525-565, in steps of 5, 144 cells)	CN22IFYR 014	PV 50542224 0009	08/12/2022

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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	CHSM60N(DGT)/F-BH-xxx (xxx=440-470, in steps of 5, 120 cells) CHSM54N(DGT)/F-BH-xxx (xxx=395-420, in steps of 5, 108 cells) Power range extension: With ½ cut mono c-Si cells: CHSM78M(DG)/F-BH-xxx (xxx=580, 156 cells)			

Remarks: CN22IFYR 006, CN22IFYR 008, CN22IFYR 011, CN22IFYR 013 are co-license.

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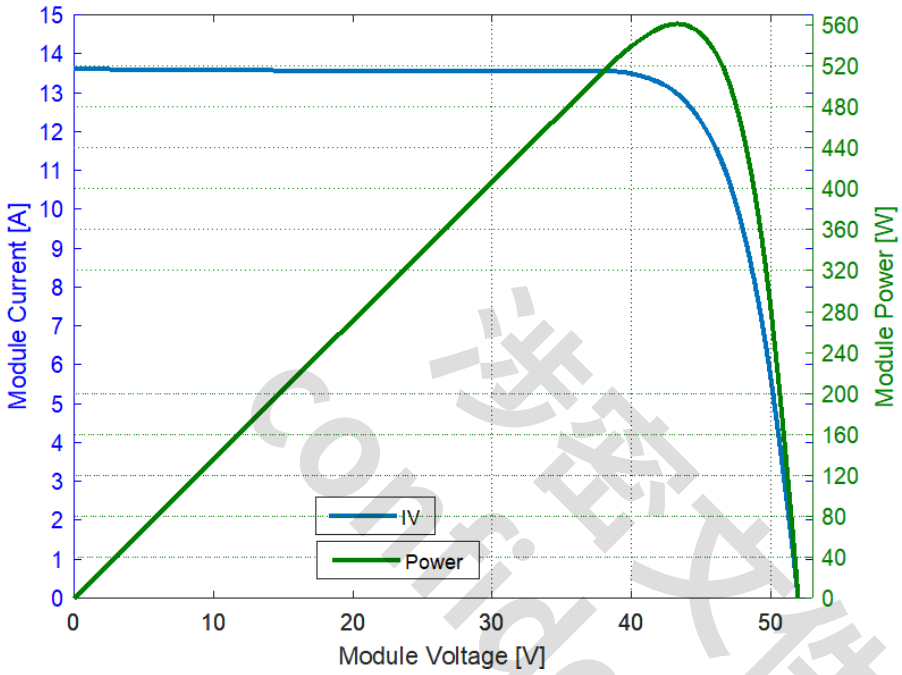
ADDITIONAL DOCUMENTATION

Appendix D: Measurement reports

Serial number: 650000140287000368 (initial)



Serial number: 650000140287000369 (initial)

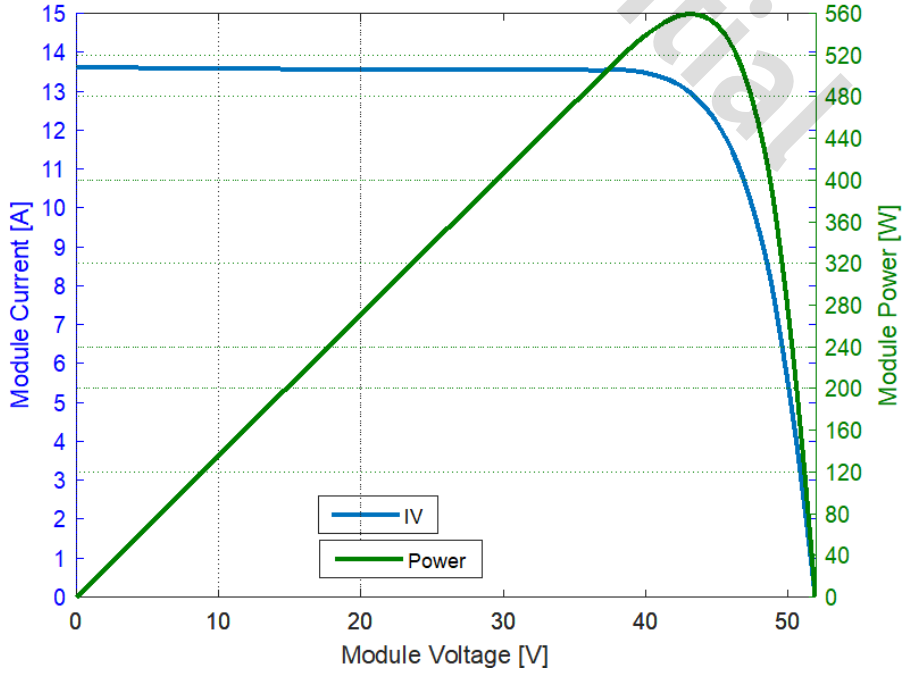


FOTO-DOKUMENTATION
PHOTO DOCUMENTATION

Appendix E: Photos

Fig. 1: front view of test sample

Fig. 2: rear view of test sample

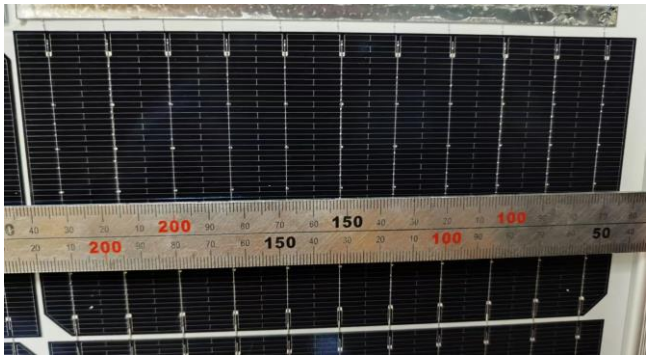


Fig. 3: detail view of solar cell

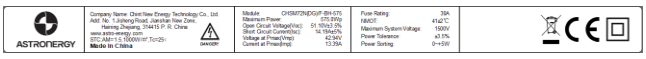


Fig. 4: detail view of type label

FOTO-DOKUMENTATION
PHOTO DOCUMENTATION

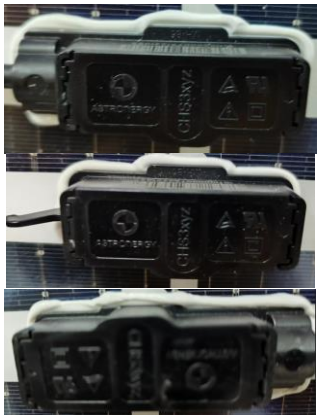


Fig. 5: detail view of closed junction box

Fig. 6: detail view of connector

Fig. 7: detail view of cable

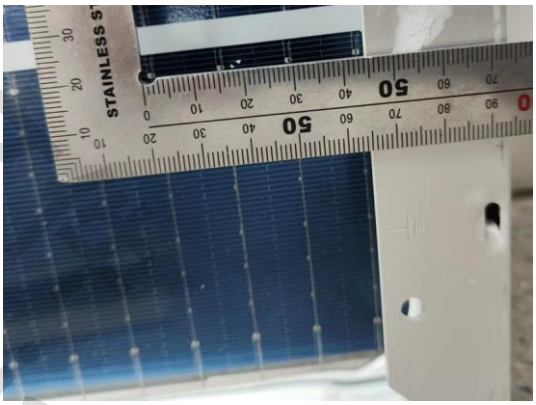


Fig. 8: detail view of equipotential bonding hole and symbol

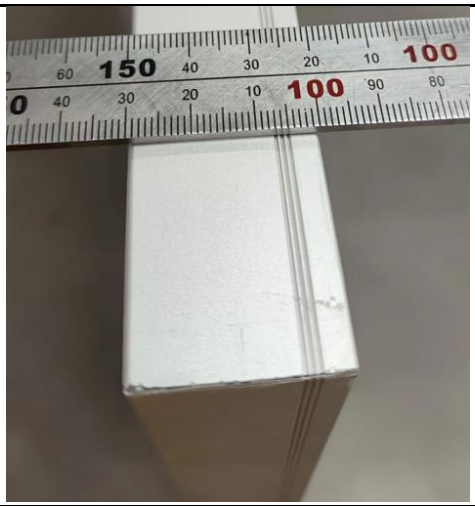


Fig. 9: detail view of frame corner