

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23DWS9 054	Auftrags-Nr.: <i>Order no.:</i>	326148409	Seite 1 von 128 Page 1 of 128
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2050703	Auftragsdatum: <i>Order date:</i>	13/01/2026	
Auftraggeber: <i>Client:</i>	LONGi Green Energy Technology Co., Ltd. No. 388, Middle Hangtian Road, Chang'an District, Xi'an, 710100 Shaanxi, P.R.China			
Prüfgegenstand: <i>Test item:</i>	Photovoltaic (PV) module			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	See module type designation on page 4-6			
Auftrags-Inhalt: <i>Order content:</i>	Design qualification and type approval of photovoltaic (PV) modules			
Prüfgrundlage: <i>Test specification:</i>	Photovoltaic (PV) modules IEC 61215-1:2021; IEC 61215-1-1:2021; IEC 61215-2:2021; IEC 61730-1:2023; IEC 61730-2:2023; EN IEC 61215-1:2021; EN IEC 61215-1-1:2021; EN IEC 61215-2:2021; EN IEC 61730-1:2018; EN IEC 61730-2:2018			
Wareneingangsdatum: <i>Date of sample receipt:</i>	31/03/2026			
Prüfmuster-Nr.: <i>Test sample no.:</i>	See clause 12			
Prüfzeitraum: <i>Testing period:</i>	01/04/2026 - 29/06/2026			
Ort der Prüfung: <i>Place of testing:</i>	Refer to page 3-4			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	x <u>Lexuan Fang</u>		genehmigt von: <i>authorized by:</i>	x <u>Jianchao Gao</u>
Datum: <i>Date:</i>	02/07/2026		Ausstellungsdatum: <i>Issue date:</i>	02/07/2026
Stellung / Position:	Project Engineer		Stellung / Position:	Authorizer
Sonstiges / <i>Other:</i>	- Introduce new module types as listed on page 5. - Extension to alternative materials and combinations. - Refer to page 3 and Constructional Data Form (CDF) No CN23DWS9 054 for more details.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* 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>				

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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>
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature <i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i>
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 115:2023, 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 115:2023, 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>

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Zusammenfassung der Prüfung Summary of testing

5 An extension qualification according to the standards IEC 61215 / EN 61215 and IEC 61730 / EN 61730 for the module types listed in clause 6 referring to the new materials and processes listed at the end of this clause was conducted.

All the required tests were passed according to the pass criteria regulations. It is therefore declared that the photovoltaic modules of these types comply with the requirements of the above-mentioned standards, and it is recommended that certification should be granted.

- Introduce new module types as listed on page 5, relevant tests were performed on LR7-72HVDA-650M to cover module types with fewer cells.

1. LR7-72HVDA-xxxM for module types with 192x182.2mm, BC cells, 144 cells.
2. LR7-60HVDA-xxxM for module types with 192x182.2mm, BC cells, 120 cells.
3. LR7-54HVDA-xxxM for module types with 192x182.2mm, BC cells, 108 cells.

Remark: Above mentioned module types were qualified with fire rating: Class A.

- Extension to alternative materials and modifications in below table. The relevant tests were performed on representative models and test results are documented in this test report.

Object	Manufacturer / trademark	Type / model	Technical data / ratings	Representative models
Front cover	ShaoXin Kibing Lightweight Glass Co., Ltd.	AR Coating Heat Strengthened Glass	Thickness: 2.0±0.2 (mm)	LR7-72HVDA-650M
Rear cover	ShaoXin Kibing Lightweight Glass Co., Ltd.	Chemically tempered glass	Thickness: 2.0 ± 0.2 mm	
Encapsulation material	HANGZHOU FIRST APPLIED MATERIAL CO., LTD / First Materials Science (Thailand) Co., Ltd. / Vietnam Advance Film Material Company Limited	EP304 (between front glass and solar cell) & S806 (between solar cell and rear cover)	Thickness: 0.20 ~ 0.80 mm for EP304 Thickness: 0.20 ~ 0.80 mm for S806	
Solar cell	LONGi Solar Technology Co., Ltd.	M11M0B	Cell dimensions: L x W: 182.2±0.25 x 96±0.25 Thickness: 140µm ±14µm	

Remark: 1. Above Encapsulation material with LONGi band was qualified without tests.
2. Above solar cell with qualified thickness: 155µm±15µm & 135µm±13.5µm & 135µm±14µm were qualified in previous reports, the thickness: 140µm ±14µm was tested and documented in this report.

This report has to be read in conjunction with report CN23DWS9 001-053 and Constructional Data Form (CDF) No. CN23DWS9 054.

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

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

Summary of test locations:

All the tests were performed at TÜV Rheinland (Suzhou) Co., Ltd., which is located at No.14 building and north half of No.10 workshop building, No.525, Yuewang Lingang South Road, Pingqian (Taicang) Modern Industrial Park, Shaxi Town, Taicang City, Jiangsu Province, P.R. China. Except for the followings tests:

Fire test (MST 23) was performed at Leading Edge Construction Materials Testing Company Limited, which is located at Asia Aluminum Industrial City, the New & High Tech Industrial Development Zone, Dawang,

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Product description

Zhaoqing, Guang Dong Province, China

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Produktbeschreibung
Product description

6	Produktdetails <i>Product details</i>	Module type designation New model types: Max. system voltage (Up to 1500VDC) With 1/2 cut of mono c-Si cells: LR7-72HVDA-xxxM (xxx = 610-670, in steps of 5, 144 cells, Pmax@BNPI= 668-733) LR7-60HVDA-xxxM (xxx=525-550, in steps of 5, 120 cells, Pmax@BNPI= 575-602) LR7-54HVDA-xxxM (xxx=455-500, in steps of 5, 108 cells, Pmax@BNPI= 498-515) xxx represents output power in Wp Approved model types: Max. system voltage (Up to 1500VDC) With 1/2 cut of mono c-Si cells: LR5-72HND-xxxM (xxx = 545-570, in steps of 5, 144 cells, Pmax@BNPI= 601.7-629.3) LR7-72HGD-xxxM (xxx = 585-620, in steps of 5, 144 cells, Pmax@BNPI= 648.2-687.0) LR5-72HGD-xxxM (xxx = 540-595, in steps of 5, 144 cells, Pmax@BNPI= 598.3-659.0) LR5-72HBD-xxxM (xxx = 520-565, in steps of 5, 144 cells, Pmax@BNPI= 569.1-618.4) LR5-78HBD-xxxM (xxx = 570-590, in steps of 5, 156 cells, Pmax@BNPI= 623.9-645.8) LR5-72HTD-xxxM (xxx = 550-600, in steps of 5, 144 cells, Pmax@BNPI= 594.6-648.6) LR5-72HTDR-xxxM (xxx = 550-600, in steps of 5, 144 cells, Pmax@BNPI= 594.6-648.6) LR8-66HGD-xxxM (xxx=595-645, in steps of 5, 132 cells, Pmax@BNPI=659-715) LR8-48HGD-xxxM (xxx=430-465, in steps of 5, 96 cells, Pmax@BNPI=476-515) LR5-78HGD-xxxM (xxx=610-645, in steps of 5, 156 cells, Pmax@BNPI= 676-715) LR7-72HTDR-xxxM (xxx=585-655, in steps of 5, 144 cells, Pmax@BNPI=632-708) LR7-66HTDR-xxxM (xxx=535-575, in steps of 5, 132 cells, Pmax@BNPI=578-622) LR7-60HTDR-xxxM (xxx=485-525, in steps of 5, 120 cells, Pmax@BNPI=524-568) LR7-54HTDR-xxxM (xxx=435-475, in steps of 5, 108 cells, Pmax@BNPI=470-513) LR7-72HYD-xxxM (xxx = 610-670, in steps of 5, 144 cells, Pmax@BNPI= 668-733) LR8-66HTD-xxxM (xxx=600-655, in steps of 5, 132 cells, Pmax@BNPI=657-717) LR7-54HGBB-xxxM (xxx = 440-460, in steps of 5, 108 cells, Pmax@BNPI= 488-510) LGi7-72HTD-xxxM (xxx=585-625, in steps of 5, 144 cells) LGi7-72HYD-xxxM (xxx=625-660, in steps of 5, 144 cells) LGi5-60HTBB-xxxM (xxx=460-475, in steps of 5, 120 cells) LR7-72HVD-xxxM (xxx = 610-670, in steps of 5, 144 cells, Pmax@BNPI= 668-733) LR7-72HVDF-xxxM (xxx = 610-670, in steps of 5, 144 cells,
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Produktbeschreibung
Product description

Pmax@BNPI= 668-733)
LR7-60HVD-xxxM (xxx=525-550, in steps of 5, 120 cells,
Pmax@BNPI= 575-602)
LR7-60HVDF-xxxM (xxx=525-550, in steps of 5, 120 cells,
Pmax@BNPI= 575-602)
LR7-54HVD-xxxM (xxx=455-500, in steps of 5, 108 cells,
Pmax@BNPI= 498-515)
LR7-54HVDF-xxxM (xxx=455-500, in steps of 5, 108 cells,
Pmax@BNPI= 498-515)
LR8-66HVD-xxxM (xxx=600-670, in steps of 5, 132 cells,
Pmax@BNPI= 661-738)
LR8-66HVDF-xxxM (xxx=600-670, in steps of 5, 132 cells,
Pmax@BNPI= 661-738)
LR8-66HYD-xxxM (xxx=600-670, in steps of 5, 132 cells,
Pmax@BNPI= 661-738)
LR9-66HYD-xxxM (xxx=730-755, in steps of 5, 132 cells,
Pmax@BNPI=804-831)
LR7-72WVD-xxxM (xxx=645-680, in steps of 5, 144 cells)
LR7-72WVDB-xxxM (xxx=635-675, in steps of 5, 144 cells)
LR7-54WVD-xxxM (xxx=475-510, in steps of 5, 108 cells)
LR7-54WVDB-xxxM (xxx=470-505, in steps of 5, 108 cells)
LGi7-72HVD-xxxM (xxx=610-670, in steps of 5, 144 cells)
LGi8-66HVD-xxxM (xxx=600-670, in steps of 5, 132 cells)
LGi7-11CHYD-xxxM (xxx=50-110, in steps of 5, 22 cells)
LR7-72HJD-xxxM (xxx=650-680, in steps of 5, 144 cells,
Pmax@BNPI=698-730)
LR7-66HJD-xxxM (xxx=595-625, in steps of 5, 132 cells,
Pmax@BNPI=639-671)
LR7-60HJD-xxxM (xxx=540-570, in steps of 5, 120 cells,
Pmax@BNPI=580-612)
LR7-54HJD-xxxM (xxx=485-515, in steps of 5, 108 cells,
Pmax@BNPI=521-553)
LR7-48HJD-xxxM (xxx=430-460, in steps of 5, 96 cells,
Pmax@BNPI=462-494)
LR7-36HJD-xxxM (xxx=320-350, in steps of 5, 72 cells,
Pmax@BNPI=344-376)
LR7-32HJD-xxxM (xxx=280-310, in steps of 5, 64 cells,
Pmax@BNPI=301-333)
LR7-72HJBB-xxxM (xxx=650-680, in steps of 5, 144 cells,
Pmax@BNPI=698-730)
LR7-66HJBB-xxxM (xxx=590-620, in steps of 5, 132 cells,
Pmax@BNPI=634-666)
LR7-60HJBB-xxxM (xxx=535-565, in steps of 5, 120 cells,
Pmax@BNPI=575-607)
LR7-54HJBB-xxxM (xxx=480-510, in steps of 5, 108 cells,
Pmax@BNPI=516-548)
LR7-48HJBB-xxxM (xxx=425-455, in steps of 5, 96 cells,
Pmax@BNPI=457-489)
LR7-36HJBB-xxxM (xxx=315-345, in steps of 5, 72 cells,
Pmax@BNPI=338-371)
LR7-32HJBB-xxxM (xxx=280-310, in steps of 5, 64 cells,
Pmax@BNPI=301-333)
LR7-72HVBB-xxxM (xxx=625-655, in steps of 5, 144 cells,
Pmax@BNPI=684-717)
LR7-54HVBB-xxxM (xxx=470-495, in steps of 5, 108 cells,
Pmax@BNPI=515-542)
LGi7-60CHYD-xxxM (xxx=325-480, in steps of 5, 120 cells)
LGi7-33CHYD-xxxM (xxx=180-260, in steps of 5, 66 cells)

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		LGi7-16.5CHYD-xxxM (xxx=85-130, in steps of 5, 33 cells) xxx represents output power in Wp										
7	Verwendete Materialien <i>Used materials</i>	See Constructional Data Form (CDF) no. CN23DWS9 054										
8	Sonstiges <i>Other</i>	N/A										
9	Prüfmusterbereitstellung <i>Test sample obtaining</i>	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ Others: -										
10	Anschrift(en) der Produktionsstätte(n) <i>Address(es) of the manufacturing site(s)</i>											
<table border="1"> <tr> <td>Name / Description:</td> <td>LONGi Photovoltaic Technology (Taizhou) Co., Ltd.</td> </tr> <tr> <td>Street:</td> <td>NO.8 Taikang Road,Hailing District</td> </tr> <tr> <td>Postcode / City, Country:</td> <td>225314 / Taizhou, Jiangsu, P.R. China</td> </tr> <tr> <td>Type of production:</td> <td>Crystalline PV-module</td> </tr> <tr> <td>Inspection report No / Date:</td> <td>15102134 011 / 17/04/2026</td> </tr> </table>			Name / Description:	LONGi Photovoltaic Technology (Taizhou) Co., Ltd.	Street:	NO.8 Taikang Road,Hailing District	Postcode / City, Country:	225314 / Taizhou, Jiangsu, P.R. China	Type of production:	Crystalline PV-module	Inspection report No / Date:	15102134 011 / 17/04/2026
Name / Description:	LONGi Photovoltaic Technology (Taizhou) Co., Ltd.											
Street:	NO.8 Taikang Road,Hailing District											
Postcode / City, Country:	225314 / Taizhou, Jiangsu, P.R. China											
Type of production:	Crystalline PV-module											
Inspection report No / Date:	15102134 011 / 17/04/2026											
<table border="1"> <tr> <td>Name / Description:</td> <td>LONGi Solar Technology (Jiangsu) Co., Ltd.</td> </tr> <tr> <td>Street:</td> <td>No.288 Yaojia Road, Jiulong Town,Taizhou City</td> </tr> <tr> <td>Postcode / City, Country:</td> <td>Jiangsu P.R. China</td> </tr> <tr> <td>Type of production:</td> <td>Crystalline PV-module</td> </tr> <tr> <td>Inspection report No / Date:</td> <td>60386143 008 / 16/04/2026</td> </tr> </table>			Name / Description:	LONGi Solar Technology (Jiangsu) Co., Ltd.	Street:	No.288 Yaojia Road, Jiulong Town,Taizhou City	Postcode / City, Country:	Jiangsu P.R. China	Type of production:	Crystalline PV-module	Inspection report No / Date:	60386143 008 / 16/04/2026
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Postcode / City, Country:	Jiangsu P.R. China											
Type of production:	Crystalline PV-module											
Inspection report No / Date:	60386143 008 / 16/04/2026											
<table border="1"> <tr> <td>Name / Description:</td> <td>LONGi Solar Technology (Jiaxing) Co., Ltd.</td> </tr> <tr> <td>Street:</td> <td>No.130 Ruifeng Street, Gaozhao Subdistrict</td> </tr> <tr> <td>Postcode / City, Country:</td> <td>Xiuzhou district Jiaxing, Zhejiang P.R.China</td> </tr> <tr> <td>Type of production:</td> <td>Crystalline PV-module</td> </tr> <tr> <td>Inspection report No / Date:</td> <td>60423263 006 / 23/10/2025</td> </tr> </table>			Name / Description:	LONGi Solar Technology (Jiaxing) Co., Ltd.	Street:	No.130 Ruifeng Street, Gaozhao Subdistrict	Postcode / City, Country:	Xiuzhou district Jiaxing, Zhejiang P.R.China	Type of production:	Crystalline PV-module	Inspection report No / Date:	60423263 006 / 23/10/2025
Name / Description:	LONGi Solar Technology (Jiaxing) Co., Ltd.											
Street:	No.130 Ruifeng Street, Gaozhao Subdistrict											
Postcode / City, Country:	Xiuzhou district Jiaxing, Zhejiang P.R.China											
Type of production:	Crystalline PV-module											
Inspection report No / Date:	60423263 006 / 23/10/2025											
<table border="1"> <tr> <td>Name / Description:</td> <td>LONGi Photovoltaic Technology (Jiaxing) Co., Ltd.</td> </tr> <tr> <td>Street:</td> <td>No. 855 Zhongxin Road, Wangdian Township, Xiuzhou District</td> </tr> <tr> <td>Postcode / City, Country:</td> <td>Jiaxing City, Zhejiang, P.R. China</td> </tr> <tr> <td>Type of production:</td> <td>Crystalline PV-module</td> </tr> <tr> <td>Inspection report No / Date:</td> <td>CN23S8VI 003 / 08/01/2026</td> </tr> </table>			Name / Description:	LONGi Photovoltaic Technology (Jiaxing) Co., Ltd.	Street:	No. 855 Zhongxin Road, Wangdian Township, Xiuzhou District	Postcode / City, Country:	Jiaxing City, Zhejiang, P.R. China	Type of production:	Crystalline PV-module	Inspection report No / Date:	CN23S8VI 003 / 08/01/2026
Name / Description:	LONGi Photovoltaic Technology (Jiaxing) Co., Ltd.											
Street:	No. 855 Zhongxin Road, Wangdian Township, Xiuzhou District											
Postcode / City, Country:	Jiaxing City, Zhejiang, P.R. China											
Type of production:	Crystalline PV-module											
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Produktbeschreibung
Product description

Street:	No.435 Changfan Road, Jiaxing Economic and Technological Development Zone
Postcode / City, Country:	314001 / Zhejiang, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Date:	CN23LFL3 003 / 24/10/2025
Name / Description:	LONGi Solar Technology (Xi'an) Co., Ltd
Street:	Zaoxin Road, Weiqu District
Postcode / City, Country:	Xi'an City, Shaanxi, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Date:	CN21OJLL 006 / 15/04/2026
Name / Description:	LONGi Photovoltaic Technology (Ordos) Co., LTD.
Street:	No. 1 Jingyi Road, West Zone, Zero Carbon Industrial Park, Mengsu Economic Development Zone, Ejin Horo Banner
Postcode / City, Country:	017000 / Ordos City, Nei Mongol, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Date:	CN24ZQWM 002 / 10/07/2025
Name / Description:	LONGi Photovoltaic Technology (Heshan) Co., LTD.
Street:	No. 77 Yiyuan Road, Zhishan Town
Postcode / City, Country:	529700 / Heshan City, Jiangmen City, Guangdong, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Date:	CN24WMUC 002 / 12/08/2025
Name / Description:	LONGi Solar Technology (Datong) Co., Ltd.
Street:	Room 106B, North Zone, Enterprise Incubation Service Center, Xinrong Economic and Technological Development Zone, Huayuantun Town, Xinrong District
Postcode / City, Country:	037002 / Datong, P.R. China
Type of production:	Crystalline PV-module
Inspection report No / Date:	50241861 006 / 03/07/2025
Name / Description:	PT ALLIANZ SOLAR INDONESIA
Street:	Desa/Kelurahan Belian, Kec. Batam Kota, Kota Batam, Kawasan Industri PT. BODYNITS INTERNATIONAL INDONESIA, Provinsi Kepulauan Riau.
Postcode / City, Country:	Indonesia
Type of production:	Crystalline PV-module

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Product description

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Name / Description:	Illuminate USA LLC
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Street:	3600 Etna Parkway
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Postcode / City, Country:	43062 / Pataskala OH, USA
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Type of production:	Crystalline PV-module
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Inspection report No / Date:	CN24FPSO 003 / 25/03/2026
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Name / Description:	LONGi Solar Technology (Chuzhou) Co., Ltd.
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Street:	No. 19 Huaian Road
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Postcode / City, Country:	239000 / Chuzhou City, Anhui, P.R. China
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Type of production:	Crystalline PV-module
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Inspection report No / Date:	50231069 008 / 05/03/2026
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Name / Description:	IC Star Solar (USA) LLC
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Street:	19200 Hamish Road Tomball
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Postcode / City, Country:	77377 / Harris County TX USA
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Type of production:	Crystalline PV-module
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Inspection report No / Date:	CN255EPD 002 / 16/03/2026
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Prüfgrundlagen
Test specification

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

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Prüfmusterliste
List of test samples

12	☐ 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.			
	Model type	Sample No.	Serial No.	Test seq.
	LR7-72HVDA-650M (Median power)	1	LRP004138260201200126	A
		2	LRP004138260201200183	B1 +B3
		3	LRP004138260201200187	B2
		4	LRP004138260201200188	B2
		5	LRP004138260201200189	C1
		6	LRP004138260201200239	C2
		7	LRP004138260201200264	D1
		8	LRP004138260201200265	D2
		9	LRP004138260201200284	E1
		10	LRP004138260201200285	E2
		11*	LRP004138260201200286	H
		12	LRP004138260201200294	Gf
		13	LRP004138260201200295	Gb
		14	LRP004138260201200306	G1
		15	LRP004138260201200315	M
		16	LRP004138260201200496	I
		17	LRP004138260201200528	K1
		18	LRP004138260201200548	K2
		19	LRP004138260201200588	K3
	Front cover: 2.0±0.2mm AR Coating Heat Strengthened Glass, ShaoXin Kibing Lightweight (LONGi) Rear cover: 2.0±0.2mm Chemically tempered glass, ShaoXin Kibing Lightweight (LONGi) Encapsulation material: EP304/S806 (LRPFT/LREFT), Thickness: 0.20mm, First (LONGi) Frame: 6005-T6, 30mm, LONGi Adhesive of frame: 1527, H.B.FULLER Solar Cell: M11M0B, L x W x T(±%)(mm): 182.2±0.25 x 96±0.25 x 0.14±0.014, LONGi Cell connectors: 0.25*0.6mm, Sn49Pb41Bi10, LONGi String connectors: 3*6mm, 0.3*3.5mm, light reflecting, Sn60Pb40, LONGi Fluxing agent: WTO-PV112F, Vital Fixing Tape: UV-1, 3M Insulation glue: THW-5DG100, Shenzhen RongDa Soldering paste: SRT902-ZF-4-ZXZ01, 60%Sn/40%Pb & LZFLTS345-4-NW01, SnPbBiAgX_R154, BEIJING COMPO / GRINM NEXUSX Label: V336, Vision Intelligent Junction box: PV-LR07A, LONGi Cable: 62930 IEC 131 1×4mm², LONGi Connector: PV-LR5, LONGi Bypass Diode: 30SQ045, LONGi Potting material: 1521, H.B.FULLER Adhesive of J-Box: 1527, H.B.FULLER			

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List of test samples

		20	LRP00413826020120 0626	K4	
		21	LRP00413826020120 0645	J1	
		22	LRP00413826020120 0389	J3	

Supplementary information: See test chart in Appendix A for full test sequences.

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

II	IEC 61215-1:2021 and IEC 61730-1:2023 – Requirements for design construction
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13	Classification, application and intended use (Clause 5 of IEC 61730-1:2023)
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13.1	General (Clause 5.1 of IEC 61730-1:2023)
	The module has been evaluated for the following Class (IEC 61140): ☐ Class 0 ☒ Class II ☐ Class III —

13.2	Rating categories and special applications (Clause 5.2 of IEC 61730-1:2023)
	Modules are intended for use in the temperature range -40°C - +70°C (T_{98 max}). —
	PV modules are installed in the following special applications: —
	Building attached PV (BAPV) ☐ yes ☒ no —
	Building integrated PV (BIPV) ☐ yes ☒ no —
	Other (please specify) ☐ yes, as follows: ☒ no —

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14	Requirements for design and construction (Clause 6 of IEC 61730-1:2023 and Clause 5 of IEC 61215-1:2021)		
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14.1	General (Clause 6.1 of IEC 61730-1:2023)		
	Product shipped from the factory as	☒ completely assembled ☐ subassemblies	—
	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form.	PV modules are completely assembled.	P
	All methods of PV module mounting and wiring that are specified in the installation instructions are evaluated for compliance with the IEC 61730 series.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	Equipotential bonding continuity is not interrupted by installation.	Confirmed by test MST 13.	P
	Any adjustable or movable structural part is provided with a locking device.	No such parts.	N/A
	PV modules have no accessible burrs, sharp edges, or sharp points.	Compliance checked by tests MST 01 and MST 06	P
	Parts are prevented from loosening or turning.	Compliance checked by tests MST 01	P
	All electrical data to be reported in the marking or in the documentation accompanying a PV module are given for standard test conditions (1000 W/m ² , 25 °C, spectral irradiance equal to AM1.5 according to IEC TS 61836). For bifacial PV modules, all electrical data are shown as relative to STC, BNPI and aBSI on the front side of the module, plus bifaciality coefficients at STC according to IEC TS 60904-1-2 and IEC 61215-1:2021.	Marked on type label and available in installation manual / data sheet	P

14.2	Marking and documentation (Clause 6.2 of IEC 61730-1:2023 and Clause 5 of IEC 61215-1:2021)		
14.2.1	Marking (Clause 6.2.1 of IEC 61730-1:2023)		
	Instructions related to safety are in an official language of the country where the equipment is to be installed.	Marking and documentation are written in English	P
14.2.1.1	General / Name plate (Clause 6.2.2.1 of IEC 61730-1:2023 and Clause 5.1 of IEC 61215-1:2021)		
	Each PV module includes the following clear and indelible markings:	Compliance checked by tests MST 01 and MST 05	—
	a) Name, registered trade name, or registered trade mark of manufacturer	Marked on type label	P
	b) Type or model number designation	Marked on type label	P
	c) Serial number (unless marked on other part of product)	Additional label with barcode	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	Traceable from serial number (checked during factory inspection)	P
	e) Maximum system voltage or "V _{sys} "	Marked on type label	P

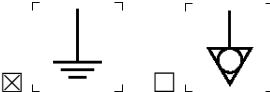
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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result
	f) Class of protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Marked on type label	P
	g) Voltage at open-circuit or " V_{oc} " including manufacturing tolerances	Marked on type label	P
	h) Current at short-circuit or " I_{sc} " including manufacturing tolerances	Marked on type label	P
	i) Maximum power or " P_{max} " including manufacturing tolerances	Marked on type label	P
	j) For bifacial modules, a clear indication which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight ($> 300 \text{ W/m}^2$).	Marked on type label	P
	k) Short-circuit current bifaciality coefficient ϕ_{Isc} Open-circuit voltage bifaciality coefficient ϕ_{Voc} Maximum power bifaciality coefficient ϕ_{Pmax}	Marked on type label	P
	l) For flexible modules, the minimum radius of curvature	No flexible module	N/A
	m) Positive ("+" or downward) and negative ("- or upward) design load ratings in pascal (Pa) excluding the test load safety factor, as verified in the static mechanical load test (MST 34)	Marked on type label	P
	n) Maximum overcurrent protection rating	Maximum series fuse rating indicated	P
	o) A module temperature rating of 70°C , (or if tested to IEC TS 63126 Level 1 or Level 2, 80°C or 90°C)	Marked on type label	P
	p) Connector manufacturer and model used; refer to manual for designated mating connectors	Marked on type label	P
	q) A link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module	Marked on type label	P
	All electrical data are shown at standard test conditions (STC) (1000 W/m^2 , $(25 \pm 2)^\circ\text{C}$, AM 1.5 according to IEC 60904-3).	Marked on type label	P
	International symbols are used where applicable.	Marked on type label	P
	PV connectors or wiring are marked with a symbol or/and hint „Do not disconnect under load“. Symbol or/and warning notice is imprinted or labelled close to connector.	Symbol, e.g.  / warning notice indicated on connectors	P
	PV connectors are clearly marked indicating the terminal polarity.	"+" and "-" indicated on terminal	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: 	P

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Result
		☐ class 0: no symbol	
	PV modules provided with a functional earth terminal is provided with a symbol according to IEC 60417-5018:2011-07.	No functional earthing.	N/A
	PV modules provided with terminals for field wiring rated only for use with copper wire are marked, at or adjacent to the terminals, with the statement "Use copper wire only", "Cu only", or the equivalent.	PV modules provided with terminals for field wiring rated for use with all types of wiring material, do not need to be marked.	N/A
	PV modules provided with terminals for field wiring rated only for use with a different specific wiring material are 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
14.2.1.2	Symbols (Clause 6.2.2.2 of IEC 61730-1:2023)		
14.2.1.2.1	Equipotential bonding (Clause 6.2.2.2.1 of IEC 61730-1:2023)		
	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
14.2.1.2.2	Functional earthing (Clause 6.2.2.2.2 of IEC 61730-1:2023)		
	Field installed functional earthing conductor is identified with the symbol:	 No functional earthing.	N/A
	No other terminal or location is identified in this manner.	Mounting hole may not be used for bonding.	P
14.2.2	Documentation (Clause 6.2.3 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)		
14.2.2.1	General (Clause 6.2.3.1 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)		
	Documentation describing electrical and mechanical installation is provided.	Available in installation manual	P
	The documentation states the class for protection against electrical shock under which the PV module was qualified and any specific limitations required for that class.	Available in installation manual	P
	The documentation assures that installers and operators receive appropriate and sufficient instructions for safe installation, use and maintenance of the PV modules that it accompanies.	Available in installation manual	—
	The documentation is supplied in at least one of the official languages of the country where the PV modules will be installed.	The documentation is written in English	P
	International symbols are used where applicable.	Available in installation manual	P
	Assembly instructions are provided with a product shipped in subassemblies and are detailed and adequate to the	PV modules are completely assembled.	N/A

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	degree required to facilitate complete and safe assembly of the product.		
	Documentation is provided in paper form in each shipping unit or as an electronic link.	In paper form / As an electronic link	—
	- The web address is marked on the device or provided in an information sheet enclosed with each shipping unit.	Available on marking label / package	P
	- The web address is in the form of a Uniform Resource Locator (URL – http://www.____.com/____/), or a Quick Response Code (QRcode).	The web address / The QR code is provided	P
	- The web address link takes the user to an internet page containing the required information or a direct link to the required information.	Available on web address	P
	- The file is in a file format that is commonly used and is downloadable.	Available on web address	P
	The needs for maintaining and supporting information during the life cycle of the PV modules is taken into account when planning the preparation of information for use as in IEC/IEEE 82079-1.	Verified during documentation check and factory inspection	P
	The documentation contains the following information:	—	—
	- Name, registered trade name, or registered trademark of manufacturer	Available in installation manual / data sheet	P
	- Type or model number designation	Available in installation manual / data sheet	P
	- Maximum system voltage or " V_{sys} "	Available in installation manual / data sheet	P
	- Class for protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Available in installation manual / data sheet	P
	- Voltage at open-circuit or " V_{oc} " including manufacturing tolerances	Available in installation manual / data sheet	P
	- Current at short-circuit or " I_{sc} " including manufacturing tolerances	Available in installation manual / data sheet	P
	- Maximum power or " P_{max} " including manufacturing tolerances	Available in installation manual / data sheet	P
	- For bifacial modules, a clear indication which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight ($> 300 \text{ W/m}^2$).	Available in installation manual / data sheet	P
	- Short-circuit current bifaciality coefficient ϕ_{Isc} - Open-circuit voltage bifaciality coefficient ϕ_{Voc} - Maximum power bifaciality coefficient ϕ_{Pmax}	Available in installation manual / data sheet	P
	- Minimum radius of curvature	No flexible modules	N/A
	- A module temperature rating of 70 °C, (or if tested to IEC TS 63126 Level 1 or Level 2, 80 °C or 90°C)	Available in installation manual / data sheet	P

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	- Connector manufacturer and model used; refer to manual for designated mating connectors	Available in installation manual / data sheet	P
	- A link (website or QR code) to required documentation if a paper copy of the documentation required is not included with the module	Available in installation manual / data sheet	P
	- Maximum overcurrent protection rating (compliance verified by reverse current overload test (MST 26))	Available in installation manual / data sheet	P
	- Recommended maximum series / parallel PV module configurations	Available in installation manual / data sheet	P
	- Temperature coefficient for maximum output power	Available in installation manual / data sheet	P
	- Temperature coefficient for voltage at open-circuit	Available in installation manual / data sheet	P
	- Temperature coefficient for short-circuit current	Available in installation manual / 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 installation manual / data sheet	P
	- Performance at low irradiance (MQT 07) is specified.	Available in installation manual / data sheet	P
14.2.2.2	Suitable environmental and mounting conditions (Clause 6.2.3.2 of IEC 61730-1:2023 and Clause 5.2 of IEC 61215-1:2021)		
	The documentation states the environmental and mounting conditions for which the module has been qualified, including:		—
	The maximum rated altitude the PV module is designed for	≤ 2000 m above sea level Available in installation manual	P
	Indication of the negative (upward) and positive (downward) design load ratings during the static mechanical load test according to MST 34	Available in installation manual / data sheet	P
	For bifacial PV modules, the exposure side meets the following requirements:	—	—
	Clear indication of which side(s) of the module have been tested for the front side exposure	Available in installation manual / data sheet	P
	The back side is restricted for use with indirect or limited direct sunlight (less than 300 W/m ²) unless tested as a front side	Available in installation manual / data sheet	P
	Each side meets the requirements for front side if both sides of a module are intended for use with prolonged exposure to direct sunlight (>300 W/m ²)	Available in installation manual / data sheet	P
	Temperature range from a lower limit of environmental temperature of -40 °C to the upper limit set by a 98 th percentile module operating temperature of 70 °C (80 °C or 90 °C if tested to Level 1 or Level 2 conditions as described in IEC TS 63126)	Available in installation manual / data sheet	P
	Guidance on geographic areas, mounting conditions and system design and installation factors where the anticipated 98 th percentile module operating temperature	Available in installation manual / data sheet	P

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	will be greater than 70 °C (or 80°C or 90°C if tested to Level 1 or Level 2 conditions)		
	Factors that can increase voltage or current beyond the STC values are given in the documentation, including the following or equivalent statements:	—	—
	- "A photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Factors to consider include module temperature and front side irradiance (and, for bifacial modules, ground or roof albedo, row spacing, and installation height). Accordingly, the values of V_{OC} and I_{SC} (or for bifacial modules, $I_{SC-aBSI}$) marked on this PV module should be multiplied by a factor of 1,25 when determining voltage and current ratings for components connected to the PV output."	Available in installation manual / data sheet	P
	- "The safety factor of 1,25 given for the minimum voltage rating of the components in the example statement above may be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for V_{OC} . The safety factor of 1,25 given for conductor current ratings values for I_{SC} (or for bifacial modules, $I_{SC-aBSI}$) may be adjusted based on the maximum values of irradiance incident on the front side of the module (and the rear side for bifacial modules). To this purpose, a full simulation for the specific location and module orientation (and for bifacial modules, ground albedo, row spacing and installation height) is required. Further guidance for the choice of a safety factor other than 1,25 is given in IEC 62548."	Available in installation manual / data sheet	P
	The documentation includes a statement advising that artificially concentrated sunlight producing a PV module's current above the value reported on the nameplate shall not be directed onto the front side or the back side of the PV module.	Available in installation manual	P
	The documentation reports if the PV modules were evaluated according to the following standards:	—	—
	- IEC 61701: Salt mist corrosion testing	Test method used:	N/A
	- IEC 62716: Ammonia corrosion testing	N/A	N/A
	- IEC 62109-3: Safety of power converters for use in photovoltaic power systems – Part 3: particular requirements for electronic devices in combination with photovoltaic elements	MIE Type: ☐ A ☐ B	N/A
	- IEC TS 63126: Guidelines for qualifying PV modules, components and materials for operation at high temperatures	Temperature Level: ☐ 1 ☐ 2	N/A
14.2.2.3	Mounting (Clause 6.2.3.3 of IEC 61730-1:2023 and Clause 5.2.2 of IEC 61215-1:2021)		
	The documentation includes adequate information and instructions for each mounting methods listed in the manufacturer's mounting instructions as well as:		—
	- A statement indicating the minimum mechanical means for securing the PV module evaluated during the mechanical load test (MST 34 of IEC 61730-2:2023) and the conformity to the mechanical load	Available in installation manual Evaluated with Static mechanical load test (MST 34) and Module breakage test	P

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	requirements of the series IEC 61215	(MST 32)	
	- Limitations to the mounting situation (e.g. slope, orientation, mounting means, cooling, specific spacing and any other condition that can influence the safety of the PV module installation)	Available in installation manual	P
	- Type of adhesive and the allowable substrates if adhesives are used for mounting (i.e. flexible modules)	Available in installation manual	P
	- The manufacturer and unique part number of the adhesive, the required surface preparation, adhesive application process, and curing condition if adhesives are specified for use in the field to provide mechanical securement to specific roof coverings or mounting systems	Available in installation manual	P
14.2.2.4	Connectors/wiring (Clause 6.2.3.4 of IEC 61730-1:2023)		
	The documentation includes a detailed description of the following information related to the connectors and wiring method:		—
	- Minimum cable diameters, rated voltage, current and temperature of cables for PV modules intended for field wiring and compliance with IEC 62930, type 131 or type 133; or EN 50618	Available in installation manual / data sheet	P
	- Limitations on wiring methods and wire management that apply to the junction box for the PV module	Available in installation manual / data sheet	P
	- Statement that wiring to interconnect modules shall be rated for the application, and it is important that the user is aware of national installation codes.	Available in installation manual / data sheet	P
	- Specific model / types together with the manufacturer name / brand of the PV connector(s) to which the PV module connectors can be mated	Available in installation manual / data sheet	P
	- The bonding method(s) to be used, if applicable, is specified either all provided or specified hardware	Available in installation manual / data sheet	P
	- The type and ratings of bypass diode to be used (if applicable)	Available in installation manual / data sheet	P
14.2.2.5	Fire ratings (Clause 6.2.3.5 of IEC 61730-1:2023)		
	- a statement indicating the fire rating(s)	☒ fire rating(s) and applied standards ☐ statement that resistance to external fire sources was not evaluated	P
	- Limitations to the achieved ratings (e.g., installation slope, sub structure or other applicable installation information)	Available in installation manual / data sheet	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 / data sheet	P

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14.3	Electrical components and insulation (Clause 5.3 of IEC 61730-1:2023)		
14.3.1	Internal wiring (Clause 6.3.2 of IEC 61730-1:2023)		
	Internal wiring has sufficient current carrying capacity for the relevant application.	Verified by MST 14 and MST 26	P
14.3.2	Junction boxes for PV modules (Clause 6.3.6 of IEC 61730-1:2023)		
	Junction boxes for PV modules fulfil the requirements of IEC 62790:2020 and additional requirements in 6.5.2.2.3 of IEC 61730-1:2023.	☒ IEC 62790:2020	P
	Module level testing is performed to validate adhesion/connection of the junction box to the module and minimum clearance and creepage distances.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
14.3.3	External wiring and cables (Clause 6.3.3 of IEC 61730-1:2023)		
	External wires and cables fulfil the requirements of IEC 62930:2017.	☒ IEC 62930:2017 (type 131 or type 133) ☐ EN 50618 (alternative to IEC 62930 type 131)	P
14.3.4	Module overcurrent protection rating (Clause 6.3.4 of IEC 61730-1:2023)		
	Overcurrent protecting rating is determined according to IEC 60269-6.	Compliance verified by reverse current overload test (MST 26)	P
14.3.5	Connectors (Clause 6.3.5 of IEC 61730-1:2023)		
	External DC connectors fulfil the requirements of IEC 62852:2014 + Amd. 1:2020 and requirements in 6.5.2.2 of IEC 61730-1:2023.	☒ IEC 62852:2014 + Amd. 1:2020	P
	Connectors are marked in accordance with 6.2 of IEC 61730-1:2023.	Verified by Visual inspection (MST 01)	P
14.3.6	Frontsheets and backsheets (Clause 6.3.7 of IEC 61730-1:2023)		
	Material of frontsheet:	☒ Glass ☐ Polymeric material ☐ Others	—
	Material of backsheet:	☒ Glass ☐ Polymeric material ☐ Others	—
	Polymeric frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.	Not applicable for glass-glass construction module.	N/A
	Backsheets are restricted for use with indirect or limited direct sunlight equal to or lower than 300 W/m ² .	—	P
	The DTI requirements listed in Table 3 and Table 4 of IEC 61730-1:2023 are fulfilled by single or multiple layers of RUI as described in IEC 62788-2-1.	Not applicable for glass-glass construction module.	N/A
	Adhesion of frontsheet and backsheet to encapsulant or glass is appropriate.	Compliance checked at module level by IEC 61730-2:2023 tests listed in this report.	P
14.3.7	Insulation barriers (Clause 6.3.8 of IEC 61730-1:2023)		

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	Polymeric insulation barrier meets the relevant requirements of Clause 6.5.2 of IEC 61730-1:2023).	See table 14.5.1 Part of IEC 62790:2020 qualification	P
	Barrier is held in place while keeping its required electrical and mechanical properties.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Removal of barrier is only possible by using a tool.	Tools are necessary for removal of the insulation barrier.	P
14.3.8	Electrical connections (Clause 6.3.9 of IEC 61730-1:2023)		
14.3.8.1	General (Clause 6.3.9.1 of IEC 61730-1:2023)		
	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material.	Compliance checked by MST 01.	P
	Prevention is taken that connections do not become loose, e.g. by using a washer.	Verified by MST 01 / MST 13	P
	End of a stranded conductor is not consolidated by soft soldering.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Measures are taken to prevent contact stress impairing electrical conductivity.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
14.3.8.2	Terminals for external cables and PV connector ribbons (Clause 6.3.9.2 of IEC 61730-1:2023)		
	Terminals for electrical connections are suitable for the type and range of conductor cross-sectional areas according to specification of the manufacturer. They meet the requirements of IEC 62790:2020 and additional RTE, RTI, and TI requirements in 6.5.2.2.3 of IEC 61730-1:2023.	☒ IEC 62790:2020	P
	Insulated terminals are designed in a manner where a possible displacement that may result in a reduction of clearances and creepage distances is prevented.	Insulated terminals are qualified according to the related component standards. Part of IEC 62790:2020 qualification.	P
14.3.8.3	Splices and connections inside a PV module (Clause 6.3.9.3 of IEC 61730-1:2023)		
	Splices and connections are mechanically secured and provide electrical continuity.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	A soldered or conductively adhered joint is additionally mechanically secured.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
14.3.9	Encapsulant (Clause 6.3.10 of IEC 61730-1:2023)		

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	Thermal properties are sufficient for intended application.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	The insulation properties according to Clause 6.5.2.2 of IEC 61730-1:2023 are met, if applicable.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
14.3.10	Bypass diodes (Clause 6.3.11 of IEC 61730-1:2023)		
	Bypass diodes are rated to withstand the current and voltage for their intended use.	Compliance checked by MST 01, MST 07, MST 22 and MST 25 Datasheet values for bypass diode checked.	P

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14.4	Mechanical and electromechanical connections (Clause 6.4 of IEC 61730-1:2023)		
14.4.1	General (Clause 6.4.1 of IEC 61730-1:2023)		
	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	—
	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
	A tool does not come into contact with the live parts when the lid is removed with it.	Compliance checked by IEC 62790:2020 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
14.4.2	Screw connections (Clause 6.4.2 of IEC 61730-1:2023)		
	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
14.4.3	Rivets (Clause 6.4.3 of IEC 61730-1:2023)		
	Rivets that have the double function of being concurrently electrical and mechanical connections are locked against loosening.	No rivet is used.	N/A
14.4.4	Thread-cutting screws (Clause 6.4.4 of IEC 61730-1:2023)		

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	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
14.4.5	Form / press / tight fit (Clause 6.4.5 of IEC 61730-1:2023)		
	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
14.4.6	Connections by adhesives (Clause 6.4.6 of IEC 61730-1:2023)		
	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
	For flexible modules:	—	—
	- The modules are mounted in accordance with the manufacturer's documentation with prescribed substrate and adhesive/mounting means during testing.	No flexible module	N/A
	- The test is done on the worst condition if the manufacturer's specified application allows mounting in a rigid or flexible mounting condition.	No flexible module	N/A
	- The specific substrate(s) that was (were) adhered to the flexible module in the tests are noted in the documentation.	No flexible module	N/A
	Connection by adhesive which is considered as cemented joint fulfills the requirements of Clause 6.6.4.3 IEC 61730-1:2023.	See table 14.6.4.3	P
14.4.7	Other connections (Clause 6.4.7 of IEC 61730-1:2023)		
	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
14.5	Materials (Clause 6.5 of IEC 61730-1:2023)		

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14.5.1	Polymeric materials (Clause 6.5.2 of IEC 61730-1:2023)		
14.5.1.1	General (Clause 6.5.2.1 of IEC 61730-1:2023)		
	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 61730-2:2023 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
	Components meet the requirements of the following standards on the component level:	—	—
	- IEC 62788-2-1 for frontsheets and backsheets	Not applicable for glass-glass construction module.	N/A
	- IEC 62790 for junction-boxes for PV modules	Junction box meets the requirements of IEC 62790.	P
	- IEC 62852 for connectors for DC-application in PV systems	Connector meets the requirements of IEC 62852.	P
	- IEC 62930 (or EN 50618 for type 131) for electric cables for PV systems	Cable meets the requirements of IEC 62930.	P
14.5.1.2	Polymeric materials used as electrical insulation (Clause 6.5.2.2 of IEC 61730-1:2023)		
14.5.1.2.1	General (Clause 6.5.2.2.1 of IEC 61730-1:2023)		
	The material which serves as functional insulation is appropriate according to 6.6.4.4 of IEC 61730-1:2023.	See table 14.6.4	P
	The material relied upon for insulation in thin layers is appropriate for the application according to 6.6.4.2 of IEC 61730-1:2023.	Components are evaluated according to the relevant requirement in the applicable component standard.	P
	Insulation is not impaired by short-term or long-term thermal stresses that can occur in manufacturing processes, transportation, and during normal operation by electrical stress and weathering to an extent that it does not comply with the requirements of IEC 61730-1:2023 and IEC 61730-2:2023.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
14.5.1.2.2	Endurance to electrical stress (Clause 6.5.2.2.2 of IEC 61730-1:2023)		
	Materials used as electrical insulation are in compliance with the insulation coordination requirements.	See table 14.6.3	P
	Materials relied upon for insulation (RUI) have sufficient breakdown strength and comply with 6.6.4.2 of IEC 61730-1:2023.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	The polymeric material which is part of a potential tracking path is resistant to surface tracking, in coordination with the design dimensions in 6.6.3 of IEC 61730-1:2023.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
14.5.1.2.3	Endurance to thermal stress (Clause 6.5.2.2.3 of IEC 61730-1:2023)		

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	Materials used as relied upon insulation have a minimum RTE, RTI or TI in accordance with IEC 60216-5 or IEC 60216-1 of at least 90 °C.	☐ TI: ☐ RTE: ☐ RTI:	P
14.5.1.2.4	Endurance to environmental stress (Clause 6.5.2.2.4 of IEC 61730-1:2023)		
	The material's endurance to withstand simulated environmental stress is checked by compliance with IEC 61730-2:2023 at module level.	Compliance checked by IEC/EN 61730-2 tests listed in this report.	P
	Components comply with the requirements in the individual applicable international standards.	See table 14.5.1.1	P
14.5.1.3	Flammability (Clause 6.5.2.3 of IEC 61730-1:2023)		
	BAPV and BIPV comply with specific fire-related safety requirements originating from national building codes.	No BAPV or BIPV module	N/A
	External polymeric parts of the PV module whose deterioration could impair the safety comply with all the following additional requirements:	—	—
	- Minimum flammability class V-1	Compliance checked by MST 24	P
	- Ignitability test (MST 24) in final application (laminated or the PV module)	See table 16.40	P
	- Polymeric parts which are not components of the laminate fulfil the requirements of ignitability test	Compliance checked by MST 24	P
	When the polymeric materials between two parts of different potential are recategorized as described in 6.6.4.4 of IEC 61730-1:2023, then at least one of the following requirements is met for the encapsulant:	☐ Flammability class minimum HB ☒ A method to verify spacings is established in the production process	P
14.5.1.4	Rigid polymeric materials used for mechanical functions (Clause 6.5.2.4 of IEC 61730-1:2023)		
	Rigid polymeric materials used for mechanical functions pass the following tests:	—	—
	- Mechanical strength at lower temperatures, IEC 62790:2020, 5.3.8 followed by MST 01 (visual inspection) of IEC 61730-2	Junction box fulfills the requirements of IEC 62790	P
	- Weather resistance test, IEC 62790:2020, 5.3.11 followed by MST 01 (visual inspection) of IEC 61730-2:2023	Junction box fulfills the requirements of IEC 62790	P
	- Minimum flammability class V-1	Junction box fulfills the requirements of IEC 62790	P
	- RTI/RTE/TI (≥ 90 °C)	☐ TI: ☐ RTE: ☐ RTI: Junction box fulfills the requirements of IEC 62790	P
14.5.2	Metallic materials (Clause 6.5.3 of IEC 61730-1:2023)		
14.5.2.1	General (Clause 6.5.3.1 of IEC 61730-1:2023)		

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	Metallic components withstand a minimum corrosion atmospheric category level C2 in ISO 9224:2012.	Compliance is checked by inspection.	P
	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
14.5.2.2	Current carrying parts (Clause 6.5.3.2 of IEC 61730-1:2023)		
	Assessed parts:	—	—
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Current-carrying materials are protected against corrosion.	N/A	N/A
	The coating for protective coated metal is capable of preventing corrosion according to either one of the listed standards.	N/A	N/A
	Coated metal is not used if the current-carrying parts are stressed by abrasion.	N/A	N/A
14.5.3	Adhesives (Clause 6.5.4 of IEC 61730-1:2023)		
	Adhesives are appropriate for the application.	Compliance is checked by relevant tests of IEC 61730-2:2023, including MST 42, MST 34, MST 01, MST 11 and MST 17.	P
	Adhesives as part of the relied upon electrical insulation meet the requirements of Clause 6.5.2.2.3 of IEC 61730-1:2023.	See table 14.5.1.2.3	P
14.6	Protection against electric shock (Clause 6.6 of IEC 61730-1:2023)		
14.6.1	General (Clause 6.6.1 of IEC 61730-1:2023)		
	Adequate protection against contact with hazardous live parts is provided and poses no risk of electric shock.	See table 14.6.2 - 14.6.4	P
14.6.2	Protection against accessibility to hazardous live parts (Clause 6.6.2 of IEC 61730-1:2023)		
14.6.2.1	General (Clause 6.6.2.1 of IEC 61730-1:2023)		
	Class of module	See safety ratings	—
	For Class 0 and Class II modules, adequate protection against accessibility to hazardous live parts (> 30 V DC) is provided.	Compliance is checked by MST 01 and MST 11.	P
	For Class 0 PV modules, accessible metal parts are separated by at least basic insulation.	Table 2 in Clause 6.6.2.3 of IEC 61730-1:2023	P

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	Class II PV modules are constructed and enclosed that only parts separated from hazardous live parts by double or reinforced insulation are accessible.	Table 2 in Clause 6.6.2.3 of IEC 61730-1:2023	P
	In Class III PV modules live parts of different polarity are separated by at least functional insulation.	Table 2 in Clause 6.6.2.3 of IEC 61730-1:2023	P
	Polymeric materials used for realizing protection against accessibility of hazardous live parts by means of enclosure, insulation barrier or relied upon insulation comply with the requirements of Clause 6.5.2 of IEC 61730-1:2023 due to their application.	See table 14.5.1	P
14.6.2.2	Protection by means of enclosures and insulation barriers (Clause 6.6.2.2 of IEC 61730-1:2023)		
	Enclosures or insulation barriers are designed that, after mounting, the live parts are not accessible (even after possible deformation).	Encapsulant, glass, backsheet, junction box, cable and connectors acceptably insulate any live parts.	P
	The degree of protection of housing is not impaired by any possible deformation.	Encapsulant, glass, backsheet, junction box, cable and connectors acceptably insulate any live parts.	P
	Parts of enclosures and insulation barriers that provide protection are not removable without the use of a tool.	Tools are necessary for removal.	P
	Lids which are attached without screws have one or several detectable features, e.g. recesses.	Compliance verified by evaluation of components.	P
	Tools to open the lid do not come into contact with the live parts if lid is removed correctly.	Tools are necessary for removal.	P
	Insulation barriers are held in place and are not affected by influences expected during normal operation. Electrical and mechanical properties do not fall below the minimum acceptable values for the application.	Compliance checked by IEC 61730-2:2023 tests listed in this report.	P
	Parts are prevented from loosening or turning.	No such parts.	N/A
14.6.2.3	Protection by means of insulation of live parts (Clause 6.6.2.3 of IEC 61730-1:2023)		
	An insulation material providing the sole insulation between a live part and an accessible metal part, or between uninsulated live parts not of the same potential, is of adequate thickness and of a material appropriate for the application. For requirements see table 2 in Clause 6.6.2.3 of IEC 61730-1:2023.	Compliance verified by evaluation of materials and components.	P
14.6.3	Insulation coordination (Clause 6.6.3 of IEC 61730-1:2023)		
	Clearance and creepage distances fulfil the requirements in Table 3 and Table 4 of IEC 61730-1:2023) (Clause 6.6.3.1 of IEC 61730-1:2023).	See table 14.7	—
	Pollution degree (Clause 6.6.3.2.1 of IEC 61730-1:2023):	See tables in 14.7	—
	Material group (Clause 6.6.3.2.2 IEC 61730-1:2023):	See tables in 14.7	—
14.6.3.1	Creepage distance (Clause 6.6.3.3 of IEC 61730-1:2023)		

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	Minimum values for creepage distance are in accordance with Table 3 or Table 4 of IEC 61730-1:2023). Compliance is checked by MST 57.	See tables in 14.7	P
	Minimum creepage distance requirements between live parts of different potential inside the junction box are verified according to Table 3 and Table 4 of IEC 61730-1:2023 related to the relevant working voltage considering pollution degree.	See tables in 14.7	P
14.6.3.2	Clearance (Clause 6.6.3.4 of IEC 61730-1:2023)		
	Clearance values are met for air gaps between conductive parts. Compliance is checked by MST 57.	See tables in 14.7	P
	Derating factor for altitude above 2000 m is considered.	N/A	N/A
	Minimum clearance distance requirements between live parts of different potential inside the junction box are verified according to Table 3 and Table 4 of IEC 61730-1:2023 related to the relevant working voltage.	See tables in 14.7	P
14.6.4	Distance through functional and relied upon insulation (Clause 6.6.4 of IEC 61730-1:2023)		
14.6.4.1	General (Clause 6.6.4.1 of IEC 61730-1:2023)		
14.6.4.2	Thin layers – relied upon insulation (Clause 6.6.4.2 of IEC 61730-1:2023)		
	Relied upon insulation in thin layers is applied at	☐ Backsheet ☐ Frontsheet ☐ Insulation within laminate ☐ Others	—
	Design requirements of frontsheets and backsheets fulfil the requirements of IEC 62788-2-1.	Not applicable for glass-glass construction module.	N/A
	Thickness of the other insulation materials used for RUI, except glass or ceramic materials, are verified by MST 04 (insulation thickness test) and MST 16 (insulation test) after MST 12 (cut susceptibility test).	Not applicable for glass-glass construction module.	N/A
	The thickness requirement (DTI) of row 4) of Table 3 and Table 4 of IEC 61730-1:2023 is fulfilled.	Not applicable for glass-glass construction module.	N/A
	For a single-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:	—	—
	- Minimum thickness complies with thin-layers requirements in Table 3 or Table 4 of IEC 61730-1:2023.	N/A	N/A
	- RTE/TI/RTI complies with 6.5.2.2.3 of IEC 61730-1:2023.	N/A	N/A
	- Insulation provides sufficient dielectric strength. Test voltage (2000V + 4 times system voltage): 8000V	N/A	N/A
	For a multiple-layer construction that the RUI layers contributing to the DTI fulfils the following requirements:	—	—
	- Each layer providing RUI meets the following requirements:	—	—

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	- RTE/TI/RTI complies with 6.5.2.2.3 of IEC 61730-1:2023.	N/A	N/A
	- One layer meets the dielectric strength requirements for reinforced insulation; or at least two layers each meet the dielectric strength requirements for basic insulation (1 000 V + 2 times the system voltage:	N/A	N/A
	- Full multilayer construction meets the following requirements:	—	—
	- DTI value is in compliance with values according to line 4) "DTI" of Table 3 and Table of IEC 61730-1:2023.	N/A	N/A
	- Test voltage for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage):	N/A	N/A
Supplementary information: Above listed tests have to be performed for each cemented joint.			
14.6.4.3	Cemented joints (Clause 6.6.4.3 of IEC 61730-1:2023)		
	Cemented joints were considered as	☐ Edge seal ☒ Interface between junction box and mounting surface ☐ Others ☐ No cemented joints	—
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4 of IEC 61730-1:2023.	Junction box is approved according to IEC 62790:2020.	P
	Distance along cemented joints, req./meas. [mm]:	Junction box is approved according to IEC 62790:2020.	P
	A distance between two rigid parts other than used for junction boxes is considered as cemented joint if following requirements are met:	—	—
	- Neither cracks nor voids in the insulating compounds have occurred which either by themselves or in combination.	No cemented joints	N/A
	- No breakdown at MST 16 (initial and final tests) with a 1.35 times higher test voltage occurred.	No cemented joints	N/A
	- No breakdown at MST 17 (initial and final tests) with a 1.35 times higher test voltage occurred.	No cemented joints	N/A
	- The electrically insulating adhesive / sealant has a volume resistivity of bigger than $50 \times 10^6 \Omega \text{ cm}$ (dry) / bigger than $10 \times 10^6 \Omega \text{ cm}$ (wet).	No cemented joints	N/A
	- Peel test (MST 35) was passed (rigid / flexible or flexible / flexible)	No cemented joints	N/A
	- Lap shear strength test (MST 36) was passed (rigid / rigid)	No cemented joints	N/A
	A distance between two rigid parts or rigid to flexible parts used for junction boxes is considered as cemented joint if following requirement is met:	—	—

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	- The measured distances through cemented joints at adhesive area of junction box do not fall below the minimum values listed in Tables 3 and 4 of IEC 61730-1:2023.	Compliance checked by MST 57	P
14.6.4.4	Distance through functional insulation (Clause 6.6.4.4 of IEC 61730-1:2023)		
	Distance through functional insulation meets the requirements described in line 3) a) of Table 3 and Table 4 of IEC 61730-1:2023.	See table 14.7	P
	The values in line 3) b) of Table 3 and Table 4 of IEC 61730-1:2023 is used as the following requirements are met:	—	—
	- The MST 57 evaluation of insulation coordination is passed.	See table 16.38	P
	☐ the encapsulant meets flammability requirements, minimum HB according to IEC 60695-11-10 ☐ a method to verify spacings is included in the production process	☐ the encapsulant meets flammability requirements, minimum HB according to IEC 60695-11-10 ☒ a method to verify spacings is included in the production process	P

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14.7	Clearance and creepage distances (Clause 6.6.3.4 of IEC 61730-1:2023) and Evaluation of clearances, creepage distances and distance through functional insulation (MST 57 of IEC 61730-2:2023)									
Sample no.			11							—
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 ^a cl & Creepage cr [mm]				
						Required	Design	Measured (initial)	Measured (final)	
Position 1: Shortest distance string connector – module edge	1a	☐ F ☐ B ☐ S. ☒ R	☒ 1 ☐ 2	☐ I ☐ II ☐ IIIa ☒ N/A	1500	Cl: 19.4	Cl: 13±1	Cl: 13	Cl: 13	P
						Cr: 10.4	Cr: 13±1	Cr: 13	Cr: 13	P
Position 2: Shortest distance cell – module edge	1a	☐ F ☐ B ☐ S. ☒ R	☒ 1 ☐ 2	☐ I ☐ II ☐ IIIa ☒ N/A	1500	Cl: 19.4	Cl: 13±0.8	Cl: 13	Cl: 13	P
						Cr: 10.4	Cr: 13±0.8	Cr: 13	Cr: 13	P
Position 3: Cell to cell	2	☐ F ☒ B ☐ S. ☐ R	☒ 1 ☐ 2	☐ I ☐ II ☐ IIIa ☒ N/A	< 35	Cl: 0.1	Cl: 0.7±0.6	Cl: 0.7	Cl: 0.7	P
						Cr: 0.2	Cr: 0.7±0.6	Cr: 0.7	Cr: 0.7	P
Position 4: String to string	2	☐ F ☒ B ☐ S. ☐ R	☒ 1 ☐ 2	☐ I ☐ II ☐ IIIa ☒ N/A	< 35	Cl: 0.1	Cl: 1.48±1	Cl: 2	Cl: 2	P
						Cr: 0.2	Cr: 1.48±1	Cr: 2	Cr: 2	P
Position 5: Any other position:	3	☐ F ☐ B ☐ S. ☐ R ☒ N/A	☐ 1 ☐ 2 ☒ N/A	☐ I ☐ II ☐ IIIa ☒ N/A	< 35	Cl: N/A	Cl: N/A	Cl: N/A	Cl: N/A	N/A
						Cr: N/A	Cr: N/A	Cr: N/A	Cr: N/A	N/A
Supplementary information: See photographs in Appendix D. Abbreviations of types of insulation F = Functional B = Basic S = Suppl. R = Reinforced										
^a List relevant position and test voltage for each clearance which is verified by Impulse voltage test according to IEC 60664-1.										

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15	Pass criteria (Clause 7 of IEC 61215-1:2021)		
15.1	Output power and electric circuitry (Clause 7.2 of IEC 61215-1:2021)		
15.1.1	Verification of rated label values (Gate #1) (STC) (Clause 7.2.1 of IEC 61215-1:2021)		
	After stabilization, each individual module shall meet: $P_{\max}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_1 \right) \geq P_{\max}(\text{NP}) \cdot \left(1 - \frac{ t_1 }{100}\right)$ $\bar{P}_{\max}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_1 \right) \geq P_{\max}(\text{NP})$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module shall meet: $V_{\text{OC}}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_2 \right) \leq V_{\text{OC}}(\text{NP}) \cdot \left(1 + \frac{ t_2 }{100}\right)$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module shall meet: $I_{\text{SC}}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_3 \right) \leq I_{\text{SC}}(\text{NP}) \cdot \left(1 + \frac{ t_3 }{100}\right)$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module that is used for the qualification of low end power classes shall meet: $P_{\max}(\text{Lab}) \cdot \left(1 - \frac{1.65}{2} m_1 \right) \leq P_{\max4}(\text{NP}) \cdot \left(1 + \frac{ t_4 }{100}\right)$	See table "Gate #1 evaluation"	P
	m_1 [%] = measurement uncertainty of laboratory for $P_{\max}$ m_2 [%] = measurement uncertainty of laboratory for V_{OC} m_3 [%] = 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} t_4 [%] = manufacturer's rated upper production tolerance for $P_{\max4}$ $P_{\max4}$ = maximum rated nameplate power of lowest power class module NP = name plate		
—	Verification of rated label values (Gate #1) (BNPI) (Clause 7.2.1 of IEC 61215-1:2021)		
	After stabilization, each individual module shall meet: $P_{\max}(\text{BNPI})(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_{1(\text{BNPI})} \right) \geq P_{\max}(\text{BNPI})(\text{NP}) \cdot \left(1 - \frac{ t_{1(\text{BNPI})} }{100}\right)$ $\bar{P}_{\max}(\text{BNPI})(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_{1(\text{BNPI})} \right) \geq P_{\max}(\text{BNPI})(\text{NP})$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module shall meet: $V_{\text{OC}(\text{BNPI})}(\text{Lab}) \cdot \left(1 + \frac{1.65}{2} m_{2(\text{BNPI})} \right) \leq V_{\text{OC}(\text{BNPI})}(\text{NP}) \cdot \left(1 + \frac{ t_{2(\text{BNPI})} }{100}\right)$	See table "Gate #1 evaluation"	P
	After stabilization, each individual module shall meet:	See table "Gate #1 evaluation"	P

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	$I_{SC(BNPI)}(Lab) \cdot \left(1 + \frac{1.65}{2} \frac{ m_3(BNPI) }{100}\right) \leq I_{SC(BNPI)}(NP) \cdot \left(1 + \frac{ t_3(BNPI) }{100}\right)$		
	After stabilization, each individual module that is used for the qualification of low end power classes shall meet: $P_{max(BNPI)}(Lab) \cdot \left(1 - \frac{1.65}{2} \frac{ m_1(BNPI) }{100}\right) \leq P_{max4(BNPI)}(NP) \cdot \left(1 + \frac{ t_4(BNPI) }{100}\right)$	See table "Gate #1 evaluation"	P
	$m_1(BNPI)$ [%] = measurement uncertainty of laboratory for $P_{max(BNPI)}$ $m_2(BNPI)$ [%] = measurement uncertainty of laboratory for $V_{OC(BNPI)}$ $m_3(BNPI)$ [%] = the measurement uncertainty of laboratory for $I_{SC(BNPI)}$ $t_1(BNPI)$ [%] = manufacturer's rated lower production tolerance for $P_{max(BNPI)}$ $t_2(BNPI)$ [%] = manufacturer's rated upper production tolerance for $V_{OC(BNPI)}$ $t_3(BNPI)$ [%] = manufacturer's rated upper production tolerance for $I_{SC(BNPI)}$ $t_4(BNPI)$ [%] = manufacturer's rated upper production tolerance for $P_{max4(BNPI)}$ $P_{max4(BNPI)}$ = maximum rated nameplate power of lowest power class module (under BNPI) NP = name plate		—

15.1.2	Maximum power degradation during type approval testing (Gate #2) (STC) (Clause 7.2.2 of IEC 61215-1:2021)		
	At the end of each test sequence, each test sample shall meet:	$r = 0.8$	P
	$P_{max}(Lab_Gate\ 2) \geq 0.95 \times P_{max}(Lab_Gate\ 1) \cdot \left(1 - \frac{r}{100}\right)$	See table "Gate #2 evaluation"	
	r = reproducibility		—
—	Maximum power degradation during type approval testing (Gate #2) (BNPI) (Clause 7.2.2 of IEC 61215-1:2021)		
	At the end of each test sequence, each test sample shall meet:	$r_{(BNPI)} = 0.8$	P
	$P_{max(BNPI)}(Lab_Gate\ 2) \geq 0.95 \times P_{max(BNPI)}(Lab_Gate\ 1) \cdot \left(1 - \frac{r_{(BNPI)}}{100}\right)$	See table "Gate #2 evaluation"	
	$r_{(BNPI)}$ = reproducibility		—

15.1.3	Electrical circuitry (Clause 7.2.3 of IEC 61215-1:2021)		
	Samples are permitted to exhibit an open-circuit during the tests.	No open-circuit during tests	P
15.2	Visual defects (Clause 7.3 of IEC 61215-1:2021)		
	There is no visual evidence of a major defect.	No major visual defect	P
15.3	Electrical safety (Clause 7.4 of IEC 61215-1:2021)		
	The insulation test (MQT 03) requirements are met at the beginning and the end of each sequence.	See tables below	P
	The wet leakage current test (MQT 15) requirements are met at the beginning and the end of each sequence.	See tables below	P
	Specific requirements of the individual tests are met.	See tables below	P

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III	IEC 61215-2:2021 and IEC 61730-2:2023 – Test procedures
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16	Overview of tests and test results
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Initial examination	—	—
Visual inspection (MQT 01 / MST 01)	See table 16.1	P
Insulation test (MQT 03 / MST 16)	See table 16.2	P
Wet leakage current test (MQT 15 / MST 17)	See table 16.3	P
Accessibility test (MST 11)	See table 16.4	P
Continuity test of equipotential bonding (MST 13)	See table 16.5	P
Initial stabilization (MQT 19.1)	See table 16.6	P
Maximum power determination (MQT 02 / MST 03)	See table 16.7	P
Performance at STC and BNPI (MQT 06.1 / MST 03)	See table 16.8	N/A
Gate #1 evaluation	See table 16.9	P

Sequence A	—	—
Measurement of temperature coefficients (MQT 04)	See table 16.10	N/A
Performance at low irradiance (MQT 07)	See table 16.11	N/A

Sequence B1	—	—
Outdoor exposure test (MQT 08)	See table 16.12	P

Sequence B2	—	—
Hot-spot endurance test (MQT 09 / MST 22)	See table 16.13	P
Reverse current overload test (MST 26)	See table 16.14	P

Sequence B3	—	—
Bypass diode thermal test (MQT 18.1 / MST 25)	See table 16.15	P

Sequence C	—	—
UV preconditioning test (MQT 10 / MST 54)	See table 16.16	P
Cyclic (dynamic) mechanical load test (MQT 20)	See table 16.17	P
Thermal cycling test (50 cycles) (MQT 11 / MST 51)	See table 16.18	P
Humidity-freeze test (MQT 12 / MST 52)	See table 16.19	P

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Sequence C1		—	—
Retention of junction box on mounting surface (MQT 14.1 / MST 42)		See table 16.20	P
Test of cord anchorage (MQT 14.2)		See table 16.21 Junction box is approved according to IEC 62790:2020.	P
Sequence D		—	—
Thermal cycling test (200 cycles) (MQT 11 / MST 51)		See table 16.22	P
Sequence E		—	—
Damp heat test (MQT 13 / MST 53)		See table 16.23	P
Sequence E1		—	—
Retention of junction box on mounting surface (MQT 14.1 / MST 42)		See table 16.24	P
Static mechanical load test (MQT 16 / MST 34)		See table 16.25	P
Sequence E2		—	—
Hail test (MQT 17)		See table 16.26	P
Sequence F		—	—
Materials creep test (MST 37)		See table 16.27	P
Sequence Gf		—	—
Damp heat test (200h) (MST 53)		See table 16.28	P
UV test (front side) (MST 54)		See table 16.29	P
Humidity-freeze test (MST 52)		See table 16.31	P
Insulation thickness test (MST 04)		Not applicable for glass frontsheet	N/A
Sequence Gb		—	—
Damp heat test (200h) (MST 53)		See table 16.28	P
UV test (back side) (MST 54)		See table 16.30	P
Humidity-freeze test (MST 52)		See table 16.31	P
Insulation thickness test (MST 04)		Not applicable for glass backsheet	N/A
Sequence G1		—	—
Cold conditioning test 1 (MST 55)		See table 16.33	P
Dry heat conditioning test (MST 56)		See table 16.34	P
Humidity-freeze test 1 (MST 52)		See table 16.35	P

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	Cold conditioning test 2 (MST 55)	See table 16.36	P
	Humidity-freeze test 2 (MST 52)	See table 16.37	P
Sequence H		—	—
	Impulse voltage test (MST 14)	See table 16.38	P
Sequence M		—	—
	Module breakage test (MST 32)	See table 16.39	P
Sequence I		—	—
	Ignitability test (MST 24)	See table 16.40	P
Sequence K		—	—
	Potential induced degradation test (MQT 21)	See table 16.41	P
Sequence J		—	—
	Fire test (MST 23)	See table 16.42	P
Sequence L		—	—
	Bending test (MQT 22)	No flexible module	N/A
Final measurements		—	—
	Final stabilization (MQT 19.2 / MQT 19.3)	See table 16.44	P
	Maximum power determination (MQT 02 / MST 03)	See table 16.45	P
	Performance at STC and BNPI (MQT 06.1 / MST 03)	See table 16.46	P
	Gate #2 evaluation	See table 16.47	P
	Bypass diode functionality test (MQT 18.2 / MST 07)	See table 16.48	P
	Cut susceptibility test (MST 12)	See table 16.49	P
	Accessibility test (MST 11)	See table 16.50	P
	Continuity test of equipotential bonding (MST 13)	See table 16.51	P
	Screw connections test (MST 33)	No screw connections	N/A
	Durability of markings (MST 05)	See table 16.53	P
	Sharp edge test (MST 06)	See table 16.54	P
Component tests		—	—
	Peel test (MST 35)	No cemented joints	N/A
	Lap shear strength test (MST 36)	No cemented joints	N/A
Supplementary information: See Appendix A: Test charts for more details.			

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16.1	Visual inspection (initial) – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		01/04/2026	—
Sample no.	Requirement	Nature and position of initial findings	
1	No major visual defects	No major visual defects	P
2		No major visual defects	P
3		No major visual defects	P
4		No major visual defects	P
5		No major visual defects	P
6		No major visual defects	P
7		No major visual defects	P
8		No major visual defects	P
9		No major visual defects	P
10		No major visual defects	P
11		No major visual defects	P
12		No major visual defects	P
13		No major visual defects	P
14		No major visual defects	P
15		No major visual defects	P
16		No major visual defects	P
17		No major visual defects	P
18		No major visual defects	P
19		No major visual defects	P
20		No major visual defects	P
Supplementary information: -			

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16.2	Insulation test (initial) – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				23/04/2026 - 23/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	16.30	2.70	44.01	-	No	P
2	14.70	2.70	39.69	-	No	P
3	15.40	2.70	41.58	-	No	P
4	15.80	2.70	42.66	-	No	P
5	17.30	2.70	46.71	-	No	P
6	17.10	2.70	46.17	-	No	P
7	13.40	2.70	36.18	-	No	P
8	16.80	2.70	45.36	-	No	P
9	14.10	2.70	38.07	-	No	P
10	16.10	2.70	43.47	-	No	P
11	16.80	2.70	45.36	-	No	P
12	15.40	2.70	41.58	-	No	P
13	16.30	2.70	44.01	-	No	P
14	13.20	2.70	35.64	-	No	P
17	13.40	2.70	36.18	-	No	P
18	15.90	2.70	42.93	-	No	P
19	16.30	2.70	44.01	-	No	P
20	15.80	2.70	42.66	-	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.

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16.3	Wet leakage current test (initial) – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		23/04/2026 - 07/05/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	
1	5430.0	2.70	14661.0	P
2	6440.0	2.70	17388.0	P
3	5380.0	2.70	14526.0	P
4	5640.0	2.70	15228.0	P
5	5520.0	2.70	14904.0	P
6	6390.0	2.70	17253.0	P
7	5490.0	2.70	14823.0	P
8	6340.0	2.70	17118.0	P
9	4410.0	2.70	11907.0	P
10	5480.0	2.70	14796.0	P
12	5380.0	2.70	14526.0	P
13	4760.0	2.70	12852.0	P
14	5460.0	2.70	14742.0	P
17	5180.0	2.70	13986.0	P
18	6120.0	2.70	16524.0	P
19	5480.0	2.70	14796.0	P
20	5400.0	2.70	14580.0	P
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.4	Accessibility test (initial) – MST 11		
Test date (dd/mm/yyyy)		23/04/2026 - 07/05/2026	—
Applied force [N]		10	
Sample no.	Contact with live electrical part?	R _{iso} [MΩ]	
5	☐ Yes ☒ No	60.0	P
7	☐ Yes ☒ No	60.0	P
9	☐ Yes ☒ No	60.0	P
12	☐ Yes ☒ No	60.0	P
13	☐ Yes ☒ No	60.0	P
14	☐ Yes ☒ No	60.0	P
Supplementary information: The resistance tester can measure up to 60.0 MΩ.			

16.5	Continuity test of equipotential bonding (initial) – MST 13		
Test date (dd/mm/yyyy)		23/04/2026 - 07/05/2026	—
Maximum overcurrent protection rating [A]		30	
Current applied [A]		75	
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]	
5	/	1.42 1.37 1.38	P
7	94.3 92.7 96.8	1.26 1.24 1.29	P
9	94.3 92.1 96.8	1.26 1.23 1.29	P
12	95.4 91.7 92.7	1.27 1.22 1.24	P
13	95.3 91.8 96.6	1.27 1.22 1.29	P
14	/	1.28 1.32	P

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		1.33	
15	96.5	1.29	P
	91.3	1.22	
	92.6	1.23	

Supplementary information: -

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16.6	Initial stabilization – MQT 19.1				
☒ Simulator ☐ Natural sunlight ☐ Other stabilization procedures					
Test date (dd/mm/yyyy)			21/04/2026 - 23/04/2026		—
Irradiance [W/m²]			800 - 1000		
Module temperature [°C]			50		
Sample no.	Test	Integrated irradiation [kWh/m²]	P _{max} [W]	Stabilization [%] *	
1	Initial	—	642.8	0.03	P
	Light-soaking 1	5	642.7		
	Light-soaking 2	5	642.6		
2	Initial	—	643.2	0.09	P
	Light-soaking 1	5	642.7		
	Light-soaking 2	5	642.6		
3	Initial	—	643.8	0.07	P
	Light-soaking 1	5	643.6		
	Light-soaking 2	5	643.4		
5	Initial	—	640.6	0.04	P
	Light-soaking 1	5	640.8		
	Light-soaking 2	5	640.8		
6	Initial	—	641.7	0.14	P
	Light-soaking 1	5	642.6		
	Light-soaking 2	5	642.2		
7	Initial	—	643.6	0.03	P
	Light-soaking 1	5	643.6		
	Light-soaking 2	5	643.4		
8	Initial	—	643.8	0.09	P
	Light-soaking 1	5	643.6		
	Light-soaking 2	5	643.2		
9	Initial	—	645.6	0.13	P
	Light-soaking 1	5	645.0		
	Light-soaking 2	5	644.8		
10	Initial	—	644.5	0.17	P
	Light-soaking 1	5	643.9		
	Light-soaking 2	5	643.4		
17	Initial	—	643.5	0.04	P
	Light-soaking 1	5	643.4		

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	Light-soaking 2	5	643.3		
18	Initial	—	643.4	0.05	P
	Light-soaking 1	5	643.2		
	Light-soaking 2	5	643.6		
	Initial	—	640.2		
19	Light-soaking 1	5	640.5	0.05	P
	Light-soaking 2	5	640.3		
	Initial	—	642.2		
20	Light-soaking 1	5	641.7	0.08	P
	Light-soaking 2	5	641.7		
	Initial	—	642.2		

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 61215-2:2021.

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16.7	Maximum power determination (initial) – MST 03		
Test date (dd/mm/yyyy)		23/04/2026	—
Irradiance [W/m²]		1000 ± 10	
Module temperature [°C]		Corrected to 25	
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
3	No kinks or other unusual characteristics		P
4	No kinks or other unusual characteristics		P
5	No kinks or other unusual characteristics		P
7	No kinks or other unusual characteristics		P
9	No kinks or other unusual characteristics		P
11	No kinks or other unusual characteristics		P
12	No kinks or other unusual characteristics		P
13	No kinks or other unusual characteristics		P
14	No kinks or other unusual characteristics		P
Supplementary information: -			

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16.8	Performance at STC (initial) – MQT 06.1
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Absatz	Photovoltaic (PV) modules	Messergebnisse - Bemerkungen	Ergebnis
Clause	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Result</i>

16.8.2	Performance at STC (initial) (rear side) – MQT 06.1						
Test date (dd/mm/yyyy)			23/04/2026 - 15/05/2026				—
Test method			☒ Simulator ☐ Natural sunlight				
Illuminated side			☐ Front side ☒ Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 ± 10				
Module temperature [°C]			25 ± 2				
Spectral mismatch			N/A				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	451.1	46.13	9.779	53.28	10.591	79.9	P
2	448.2	46.10	9.722	53.24	10.556	79.8	P
3	448.3	47.04	9.530	53.23	10.555	79.8	P
5	449.0	46.11	9.737	53.22	10.556	79.9	P
6	450.0	46.36	9.706	53.41	10.532	80.0	P
7	445.3	46.84	9.506	53.22	10.523	79.5	P
8	448.9	46.04	9.749	53.29	10.535	80.0	P
9	444.8	46.67	9.529	53.25	10.552	79.2	P
10	444.7	46.85	9.491	53.23	10.580	79.0	P
17	447.4	46.39	9.646	53.26	10.539	79.7	P
18	447.7	47.02	9.521	53.31	10.485	80.1	P
19	445.8	46.27	9.635	53.12	10.498	80.0	P
20	444.6	46.97	9.466	53.20	10.522	79.4	P
Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.							

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16.8.3	Bifaciality Coefficients (initial)			
Sample no.	Φ_{isc}	Φ_{Voc}	Φ_{Pmax}	—
1	0.71	0.99	0.70	—
2	0.71	0.99	0.70	—
3	0.71	0.99	0.70	—
5	0.71	0.99	0.70	—
6	0.71	0.99	0.70	—
7	0.71	0.99	0.69	—
8	0.71	0.99	0.70	—
9	0.71	0.99	0.69	—
10	0.71	0.99	0.69	—
17	0.71	0.99	0.70	—
18	0.71	0.99	0.70	—
19	0.71	0.99	0.70	—
20	0.71	0.99	0.69	—
Supplementary information: -				

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

16.8.4	Performance at BNPI (initial) – MQT 06.1						
Test date (dd/mm/yyyy)			23/04/2026 - 15/05/2026				—
Test method			☒ Simulator ☐ Natural sunlight				
Illuminated side			☒ Front side ☐ Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 + $\varphi \cdot 135^*$				
Module temperature [°C]			25 ± 2				
Spectral mismatch			N/A				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	701.6	45.98	15.259	53.79	16.212	80.5	P
2	701.6	46.01	15.248	53.84	16.225	80.3	P
3	702.3	45.99	15.269	53.86	16.199	80.5	P
5	699.2	45.89	15.235	53.82	16.197	80.2	P
6	700.6	46.10	15.199	53.91	16.181	80.3	P
7	701.7	45.99	15.257	53.85	16.206	80.4	P
8	702.1	46.02	15.255	53.83	16.233	80.3	P
9	702.9	46.02	15.274	53.87	16.214	80.5	P
10	701.6	46.03	15.242	53.83	16.226	80.3	P
17	701.8	46.06	15.239	53.86	16.211	80.4	P
18	702.4	46.12	15.230	53.91	16.178	80.5	P
19	698.4	45.95	15.198	53.76	16.151	80.4	P
20	699.8	45.89	15.250	53.79	16.182	80.4	P

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

* The bifaciality coefficient φ employed is the minimum value of φ_{Isc} and φ_{Pmax} as documented in table 16.8.3 for each test sample.

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16.9	Gate #1 evaluation (STC)				
Manufacturer tolerances given on name plate		for P_{max}	t_1 [%]	± 3	—
		for V_{oc}	t_2 [%]	± 5	
		for I_{sc}	t_3 [%]	± 5	
		for P_{max4}	t_4 [%]	± 3	
Measurement uncertainty of test laboratory		for P_{max}	m_1 [%]	± 3.0	
		for V_{oc}	m_2 [%]	± 0.9	
		for I_{sc}	m_3 [%]	± 2.8	

16.9.1	Evaluation of output power for each module (STC)				
Sample no.	$P_{max, meas}$ [W]	$P_{max, meas, m1}$ [W]	$P_{max, NP}$ [W]	$P_{max, NP, t1}$ [W]	—
1	642.6	658.5	650.0	630.5	P
2	642.6	658.5	650.0	630.5	P
3	643.4	659.3	650.0	630.5	P
5	640.8	656.7	650.0	630.5	P
6	642.2	658.1	650.0	630.5	P
7	643.4	659.3	650.0	630.5	P
8	643.2	659.1	650.0	630.5	P
9	644.8	660.8	650.0	630.5	P
10	643.4	659.3	650.0	630.5	P
17	643.3	659.2	650.0	630.5	P
18	643.6	659.5	650.0	630.5	P
19	640.3	656.1	650.0	630.5	P
20	641.7	657.6	650.0	630.5	P

Supplementary information:

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

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

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

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16.9.2	Evaluation of output power for average of all modules (STC)			
Module type	$P_{\max, \text{meas, avg}}$ [W]	$P_{\max, \text{meas, avg, m1}}$ [W]	$P_{\max, \text{NP}}$ [W]	—
LR7-72HVDA-650M (Median power)	642.7	658.6	650.0	P

Supplementary information:

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

$P_{\max, \text{meas, avg, m1}}$ = Arithmetic average of meas. max. STC power taking positive measurement uncertainty into account

16.9.3	Evaluation of open-circuit voltage for each module (STC)				
Sample no.	$V_{\text{oc, meas}}$ [V]	$V_{\text{oc, meas, m2}}$ [V]	$V_{\text{oc, NP}}$ [V]	$V_{\text{oc, NP, t2}}$ [V]	—
1	53.70	54.10	54.22	56.93	P
2	53.72	54.12	54.22	56.93	P
3	53.74	54.14	54.22	56.93	P
5	53.70	54.10	54.22	56.93	P
6	53.81	54.21	54.22	56.93	P
7	53.72	54.12	54.22	56.93	P
8	53.73	54.13	54.22	56.93	P
9	53.75	54.15	54.22	56.93	P
10	53.73	54.13	54.22	56.93	P
17	53.73	54.13	54.22	56.93	P
18	53.79	54.19	54.22	56.93	P
19	53.64	54.04	54.22	56.93	P
20	53.67	54.07	54.22	56.93	P

Supplementary information:

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

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

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

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16.9.4	Evaluation of short-circuit current for each module (STC)				
Sample no.	$I_{sc, meas}$ [A]	$I_{sc, meas, m3}$ [A]	$I_{sc, NP}$ [A]	$I_{sc, NP, t3}$ [A]	—
1	14.830	15.173	15.140	15.897	P
2	14.844	15.187	15.140	15.897	P
3	14.814	15.156	15.140	15.897	P
5	14.811	15.153	15.140	15.897	P
6	14.804	15.146	15.140	15.897	P
7	14.833	15.176	15.140	15.897	P
8	14.850	15.193	15.140	15.897	P
9	14.847	15.190	15.140	15.897	P
10	14.853	15.196	15.140	15.897	P
17	14.829	15.172	15.140	15.897	P
18	14.784	15.126	15.140	15.897	P
19	14.766	15.107	15.140	15.897	P
20	14.807	15.149	15.140	15.897	P

Supplementary information:

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

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

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

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

16.9	Gate #1 evaluation (BNPI)				
Manufacturer tolerances given on name plate	for $P_{\max(\text{BNPI})}$	$t_{1(\text{BNPI})}$ [%]	± 3	—	
	for $V_{\text{OC}(\text{BNPI})}$	$t_{2(\text{BNPI})}$ [%]	± 5		
	for $I_{\text{SC}(\text{BNPI})}$	$t_{3(\text{BNPI})}$ [%]	± 5		
	for $P_{\max 4(\text{BNPI})}$	$t_{4(\text{BNPI})}$ [%]	± 3		
Measurement uncertainty of test laboratory	for $P_{\max(\text{BNPI})}$	$m_{1(\text{BNPI})}$ [%]	± 3.0		
	for $V_{\text{OC}(\text{BNPI})}$	$m_{2(\text{BNPI})}$ [%]	± 0.9		
	for $I_{\text{SC}(\text{BNPI})}$	$m_{3(\text{BNPI})}$ [%]	± 2.8		

16.9.6	Evaluation of output power for each module (BNPI)				
Sample no.	$P_{\max}(\text{BNPI}),_{\text{meas}}$ [W]	$P_{\max}(\text{BNPI}),_{\text{meas},m1}(\text{BNPI})$ [W]	$P_{\max}(\text{BNPI}),_{\text{NP}}$ [W]	$P_{\max}(\text{BNPI}),_{\text{NP},t1}(\text{BNPI})$ [W]	—
1	701.6	719.0	711.0	689.7	P
2	701.6	719.0	711.0	689.7	P
3	702.3	719.7	711.0	689.7	P
5	699.2	716.5	711.0	689.7	P
6	700.6	717.9	711.0	689.7	P
7	701.7	719.1	711.0	689.7	P
8	702.1	719.5	711.0	689.7	P
9	702.9	720.3	711.0	689.7	P
10	701.6	719.0	711.0	689.7	P
17	701.8	719.2	711.0	689.7	P
18	702.4	719.8	711.0	689.7	P
19	698.4	715.7	711.0	689.7	P
20	699.8	717.1	711.0	689.7	P

Supplementary information:

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

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

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

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16.9.7	Evaluation of output power for average of all modules (BNPI)			
Module type	$P_{\max(\text{BNPI}),\text{meas,avg}}$ [W]	$P_{\max(\text{BNPI}),\text{meas,avg,m1}(\text{BNPI})}$ [W]	$P_{\max(\text{BNPI}),\text{NP}}$ [W]	—
LR7-72HVDA-650M (Median power)	701.2	718.6	711.0	P

Supplementary information:

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

$P_{\max,\text{meas,avg,m1}}$ = Arithmetic average of meas. max. BNPI power taking positive measurement uncertainty into account

16.9.8	Evaluation of open-circuit voltage for each module (BNPI)				
Sample no.	$V_{\text{oc}(\text{BNPI}),\text{meas}}$ [V]	$V_{\text{oc}(\text{BNPI}),\text{meas,m2}(\text{BNPI})}$ [V]	$V_{\text{oc}(\text{BNPI}),\text{NP}}$ [V]	$V_{\text{oc}(\text{BNPI}),\text{NP,t2}(\text{BNPI})}$ [V]	—
1	53.79	54.19	54.22	56.93	P
2	53.84	54.24	54.22	56.93	P
3	53.86	54.26	54.22	56.93	P
5	53.82	54.22	54.22	56.93	P
6	53.91	54.31	54.22	56.93	P
7	53.85	54.25	54.22	56.93	P
8	53.83	54.23	54.22	56.93	P
9	53.87	54.27	54.22	56.93	P
10	53.83	54.23	54.22	56.93	P
17	53.86	54.26	54.22	56.93	P
18	53.91	54.31	54.22	56.93	P
19	53.76	54.16	54.22	56.93	P
20	53.79	54.19	54.22	56.93	P

Supplementary information:

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

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

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

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

16.9.9	Evaluation of short-circuit current for each module (BNPI)				
Sample no.	$I_{sc(BNPI),meas} [A]$	$I_{sc(BNPI),meas,m3(BNPI)} [A]$	$I_{sc(BNPI),NP} [A]$	$I_{sc(BNPI),NP,t3(BNPI)} [A]$	—
1	16.212	16.586	16.570	17.399	P
2	16.225	16.600	16.570	17.399	P
3	16.199	16.573	16.570	17.399	P
5	16.197	16.571	16.570	17.399	P
6	16.181	16.555	16.570	17.399	P
7	16.206	16.580	16.570	17.399	P
8	16.233	16.608	16.570	17.399	P
9	16.214	16.589	16.570	17.399	P
10	16.226	16.601	16.570	17.399	P
17	16.211	16.585	16.570	17.399	P
18	16.178	16.552	16.570	17.399	P
19	16.151	16.524	16.570	17.399	P
20	16.182	16.556	16.570	17.399	P

Supplementary information:

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

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

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

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16.10	Measurement of temperature coefficients – MQT 04		
Test date (dd/mm/yyyy)		06/04/2026	—
Irradiance [W/m²]		1000 ± 10	
Module temperature [°C] low / high		25-75	
Sample no.	Coefficient	Calculated value	
1	α [%/K]	0.0356	
	β [%/K]	-0.2301	
	δ [%/K]	-0.2843	
Supplementary information: Temperature coefficients were measured with a solar simulator of class AAA acc. to IEC 60904-9. The non-illuminated side was covered with non-reflective background and aperture.			

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16.11	Performance at low irradiance – MQT 07
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16.11.1		Performance at low irradiance (front side)					
Test date (dd/mm/yyyy)			23/04/2026				—
Test method			☒ indoor		☐ outdoor		
Illuminated side			☒ Front side ☐ Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			200 ± 20 corrected to 200				
Module temperature [°C]			25 ± 2 corrected to 25				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	123.4	44.56	2.770	50.95	3.001	80.7	
Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.							

16.11.2	Performance at low irradiance (rear side)						
Test date (dd/mm/yyyy)			23/04/2026				—
Test method			☒ indoor		☐ outdoor		
Illuminated side			☐ Front side ☒ Rear side				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			200 ± 20 corrected to 200				
Module temperature [°C]			25 ± 2 corrected to 25				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
1	85.2	44.05	1.934	50.22	2.106	80.6	
Supplementary information: The non-illuminated side was covered with non-reflective background and aperture.							

16.11.3	Bifaciality Coefficients at low irradiance			
Sample no.	φ_{Isc}	φ_{Voc}	φ_{Pmax}	—
1	0.70	0.99	0.69	—
Supplementary information: -				

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

16.12	Outdoor exposure test – MQT 08		
Test date (dd/mm/yyyy)		24/04/2026 - 19/05/2026	—
Sample no.		2	
Total irradiation dosage [kWh/m²]		60	
Supplementary information: -			

16.12.1	Visual inspection after Outdoor exposure test – MQT 01		
Test date (dd/mm/yyyy)		19/05/2026	—
Sample no.	Requirement	Nature and position of findings	
2	No major visual defects	No major visual defects	P
Supplementary information: -			

16.12.2	Insulation test after Outdoor exposure test – MQT 03					
Test date (dd/mm/yyyy)				19/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		
				Yes (description)	No	
2	13.50	2.70	36.45	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

16.12.3	Wet leakage current test after Outdoor exposure test – MQT 15			
Test date (dd/mm/yyyy)		19/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} · A [M $\Omega \cdot \text{m}^2$]	
2	4580.0	2.70	12366.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.13	Hot-spot endurance test (WBT) – MQT 09 / MST 22		
Test date (dd/mm/yyyy)	22/05/2026		
Sample no.	3		
Cell interconnection circuit	☐ S	☒ SP	☐ PS
Module temperature at thermal equilibrium [°C]	49.3		
Cell of complete module with highest shunt resistance shaded			
Maximum measured cell temperature [°C]	125.7		
Shading rate [%]	60		
1 st worst case cell of complete module with lowest shunt resistance shaded			
Maximum measured cell temperature [°C]	104.8		
Shading rate [%]	60		
2 nd worst case cell of complete module with lowest shunt resistance shaded			
Maximum measured cell temperature [°C]	103.2		
Shading rate [%]	60		
Cell adjacent to module edge with lowest shunt resistance shaded			
Maximum measured cell temperature [°C]	98.8		
Shading rate [%]	50		
Supplementary information: The exposure was performed under aBSI.			

16.13.1	Visual inspection after Hot-spot endurance test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)	22/05/2026		—
Sample no.	Requirement	Nature and position of findings	
3	No major visual defects	No major visual defects	P
Supplementary information: -			

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16.13.2	Insulation test after Hot-spot endurance test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				22/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} · A [GΩ · m ²]	Dielectric breakdown		
				Yes (description)	No	
3	15.20	2.70	41.04	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ · m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

16.13.3	Wet leakage current test after Hot-spot endurance test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		22/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} · A [M $\Omega \cdot \text{m}^2$]	P
3	5430.0	2.70	14661.0	
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.13.4	Maximum power determination after Hot-spot endurance test – MQT 02 / MST 03						
Test date (dd/mm/yyyy)			22/05/2026				—
Test method			☒ Simulator ☐ Natural sunlight				
Ambient temperature [°C]			25 ± 2				
Irradiance [W/m²]			1000 ± 10				
Module temperature [°C]			Corrected to 25				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	P
3	638.4	46.25	13.801	53.73	14.667	81.0	
Supplementary information: -							

16.13.5	Bypass diode functionality test after Hot-spot endurance test – MQT 18.2 / MST 07			
Test date (dd/mm/yyyy)		22/05/2026		—
Test method		☐ Method A ☒ Method B		
Sample no.	Diode 1	Diode 2	Diode 3	
3	working properly	working properly	working properly	P
Supplementary information: This test verifies that the sample shows the electrical characteristics of a functional photovoltaic device.				

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16.14	Reverse current overload test – MST 26		
Test date (dd/mm/yyyy)		09/05/2026	—
Module over-current protection rating [A]		30.0	
Test current [A]		40.50	
Range of applied voltage [V]		61.46-55.70	
Test duration [h]		2	
Sample no.	Test results		—
4	Maximum external module surface temperature during the test [°C]: 81.9		P
Supplementary information: -			

16.14.1	Visual inspection after Reverse current overload test – MST 01		
Test date (dd/mm/yyyy)		09/05/2026	—
Sample no.	Requirement	Nature and position of findings	
4	No major visual defects	No major visual defects	P
Supplementary information: -			

16.14.2	Insulation test after Reverse current overload test – MST 16					
Test date (dd/mm/yyyy)				09/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		P
				Yes (description)	No	
4	13.70	2.70	36.99	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

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16.14.3	Wet leakage current test after Reverse current overload test – MST 17			
Test date (dd/mm/yyyy)		09/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
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 $\Omega \cdot \text{m}^2$]	P
4	4550.0	2.70	12285.0	
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.15	Bypass diode thermal test – MQT 18.1 / MST 25				
Test date (dd/mm/yyyy)		04/06/2026			
Sample no.		2			
Number of diodes in junction box		3			
Max. permissible junction temperature T_{jmax} [°C] (according to diode datasheet)		200.0			
Step 1: Determination of V_D versus T_J characteristic					
Temperature of junction box (average) [°C]		30 ± 2	50 ± 2	70 ± 2	90 ± 2
Diode voltage [V_D]		0.4031/ 0.4016/ 0.4056	0.3796/ 0.3787/ 0.3860	0.3622/ 0.3601/ 0.3626	0.3433/ 0.3536/ 0.3490
Determined V_D versus T_J characteristics					
$V_D = -0.000984 T_J + 0.4311$ (diode 1) $V_D = -0.000813 T_J + 0.4223$ (diode 2) $V_D = -0.000966 T_J + 0.4338$ (diode 3)					
Step 2: Bypass diode thermal test					
		Diode 1	Diode 2	Diode 3	
Module temperature [°C]		75 ± 5	75 ± 5	75 ± 5	
Diode current flow applied (I_{sc}) [A] *		17.91	17.91	17.91	
Voltage drop across diode after 1 hour [V]		0.284	0.284	0.284	
Calculated junction temperature T_{jcalc} [°C]		149.5	149.5	149.5	
$T_{jcalc} < T_{jmax}$ (required for passing the test)?		Yes	Yes	Yes	P
Diode current flow applied ($1.25 \cdot I_{sc}$) [A] **		22.39	22.39	22.39	—
Diode functional?		Yes	Yes	Yes	P
Supplementary information: * current for the 1 st hour shall be I_{sc} (aBSI), ** current for the 2 nd hour shall be $1.25 \times I_{sc}$ (aBSI).					

16.15.1	Visual inspection after Bypass diode thermal test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)			
Sample no.	Requirement	Nature and position of findings	—
2	No major visual defects	No major visual defects	P
Supplementary information: -			

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16.15.2	Insulation test after Bypass diode thermal test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				04/06/2026		—
Maximum system voltage [V_{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V_{DC}]				8000		
Insulation resistance measured at [V_{DC}]				1500		
Sample no.	R_{iso} [$G\Omega$]	A [m^2]	$R_{iso} \cdot A$ [$G\Omega \cdot m^2$]	Dielectric breakdown		
				Yes (description)	No	
2	15.30	2.70	41.31	-	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 $A \leq 0.1 m^2$.						

16.15.3	Wet leakage current test after Bypass diode thermal test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		04/06/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{iso} [M Ω]	A [m²]	R _{iso} · A [M $\Omega \cdot \text{m}^2$]	
2	6410.0	2.70	17307.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

16.15.4	Bypass diode functionality test after Bypass diode thermal test – MQT 18.2 / MST 07			
Test date (dd/mm/yyyy)		04/06/2026		—
Test method		☐ Method A ☒ Method B		
Sample no.	Diode 1	Diode 2	Diode 3	
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.				

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16.16	UV preconditioning test – MQT 10 / MST 54			
Test date (dd/mm/yyyy)		24/04/2026 - 28/04/2026 for front side 28/04/2026 - 02/05/2026 for rear side		—
Module temperature [°C]		60 ± 5		
Ratio of UV-B irradiation (280 – 320 nm) [%]		3 – 10		
UV irradiation dose (280 – 400 nm) [kWh/m²]		15		
UV irradiation direction		☒ Front side ☒ Rear side		
Operation mode		☐ Short-circuit	☒ Open-circuit	
Sample no.	—			—
5	—			
6	—			
Supplementary information: -				

16.16.1	Visual inspection after UV preconditioning test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		02/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	P
6		No major visual defects	P
Supplementary information: -			

16.16.2	Insulation test after UV preconditioning test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				02/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
5	17.10	2.70	46.17	-	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.						

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16.16.3	Wet leakage current test after UV preconditioning test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		02/05/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	
5	5440.0	2.70	14688.0	P
6	6240.0	2.70	16848.0	P
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.17	Cyclic (dynamic) mechanical load test – MQT 20		
Test date (dd/mm/yyyy)		05/05/2026	—
Mechanical pressure load applied [Pa]		1000	
Mechanical tensile load applied [Pa]		1000	
Total number of cycles		1000	
Frequency of cycles [cycles/minute]		7	
Mounting method		4 mounting holes, 4 screws, 2 rails	
Sample no.	Open circuits (yes/no)		
5	No		P
6	No		P
Supplementary information: -			

16.17.1	Visual inspection after Cyclic (dynamic) mechanical load test – MQT 01		
Test date (dd/mm/yyyy)		05/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	P
6		No major visual defects	P
Supplementary information: -			

16.17.2	Insulation test after Cyclic (dynamic) mechanical load test – MQT 03					
Test date (dd/mm/yyyy)				05/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
5	15.80	2.70	42.66	-	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.						

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16.17.3	Wet leakage current test after Cyclic (dynamic) mechanical load test – MQT 15			
Test date (dd/mm/yyyy)		05/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
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 $\Omega \cdot \text{m}^2$]	
5	4930.0	2.70	13311.0	P
6	5480.0	2.70	14796.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.18	Thermal cycling test (50 cycles) – MQT 11 / MST 51		
Test date (dd/mm/yyyy)		06/05/2026 - 15/05/2026	—
Total number of cycles		50	
Actual dwell duration at high and low temperatures		Minimum 10 min / Minimum 10 min	
Sample no.	Open circuits (yes/no)		
5	No		P
6	No		P
Supplementary information: A single 5N weight was attached to the electrical termination leads. I _{mpp} (aBSI) (aBSI equals to 1000W/m² + φ•300W/m²) was applied.			

16.18.1	Visual inspection after Thermal cycling test (50 cycles) – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		15/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	P
6		No major visual defects	P
Supplementary information: -			

16.18.2	Insulation test after Thermal cycling test (50 cycles) – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				15/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
5	15.40	2.70	41.58	-	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.						

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16.18.3	Wet leakage current test after Thermal cycling test (50 cycles) – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		15/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [$^{\circ}\text{C}$]		22 $\pm$ 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} ·A [M $\Omega \cdot \text{m}^2$]	
5	4820.0	2.70	13014.0	P
6	5310.0	2.70	14337.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.19	Humidity-freeze test – MQT 12 / MST 52		
Test date (dd/mm/yyyy)		15/05/2026 - 25/05/2026	—
Total number of cycles		10	
Sample no.	Open circuits (yes/no)		
5	No		P
6	No		P
Supplementary information: -			

16.19.1	Visual inspection after Humidity-freeze test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		25/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	P
6		No major visual defects	P
Supplementary information: -			

16.19.2	Insulation test after Humidity-freeze test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				25/05/2026		—
Maximum system voltage [V_{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V_{DC}]				8000		
Insulation resistance measured at [V_{DC}]				1500		
Sample no.	R_{iso} [$G\Omega$]	A [m^2]	$R_{iso} \cdot A$ [$G\Omega \cdot m^2$]	Dielectric breakdown		
				Yes (description)	No	
5	12.40	2.70	33.48	-	No	P
6	16.80	2.70	45.36	-	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 $A \leq 0.1 m^2$.						

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16.19.3	Wet leakage current test after Humidity-freeze test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		25/05/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	
5	5290.0	2.70	14283.0	P
6	7720.0	2.70	20844.0	P
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.20	Retention of junction box on mounting surface – MQT 14.1 / MST 42		
Test date (dd/mm/yyyy)		25/05/2026	
Sample no.		5	
Applied force in all directions parallel to the mounting surface and parallel to the module edges [N]		40	
Applied force perpendicular to the mounting surface [N]		40	
Supplementary information: -			

16.20.1	Visual inspection after Retention of junction box on mounting surface – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		25/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	
Supplementary information: -			

16.20.2	Insulation test after Retention of junction box on mounting surface – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				25/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☐ No ☒ Yes		
High voltage applied [V _{DC}]				10800		
Insulation resistance measured at [V _{DC}]				2025		
Sample no.	R _{iso} [GΩ]	A [m²]	R _{iso} · A [GΩ · m²]	Dielectric breakdown		
				Yes (description)	No	
5	10.10	2.70	27.27	-	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.						

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16.20.3	Wet leakage current test after Retention of junction box on mounting surface – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		25/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☐ No ☒ Yes		
Insulation resistance measured at [V _{DC}]		2025		
Solution resistivity [Ω·cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{Iso} [MΩ]	A [m²]	R _{Iso} ·A [MΩ·m²]	P
5	4180.0	2.70	11286.0	
Supplementary information: Minimum requirement is 40 MΩ·m².				

16.21	Test of cord anchorage – MQT 14.2 / MST 42			
Test not required, since junction box is qualified in accordance with IEC 62790:2020.				—

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16.22	Thermal cycling test (200 cycles) – MQT 11 / MST 51		
Test date (dd/mm/yyyy)		06/05/2026 - 15/05/2026	—
Total number of cycles		200	
Actual dwell duration at high and low temperatures		Minimum 10 min / Minimum 10 min	
Sample no.	Open circuits (yes/no)		
7	No		P
8	No		P
Supplementary information: A single 5N weight was attached to the electrical termination leads. I _{mpp} (aBSI) (aBSI equals to 1000W/m ² + φ•300W/m ²) was applied.			

16.22.1	Visual inspection after Thermal cycling test (200 cycles) – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		28/05/2026	—
Sample no.	Requirement	Nature and position of findings	
7	No major visual defects	No major visual defects	
8		No major visual defects	
Supplementary information: -			

10.22.2	Insulation test after Thermal cycling test (200 cycles) – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				28/05/2026		—
Maximum system voltage [V_{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V_{DC}]				8000		
Insulation resistance measured at [V_{DC}]				1500		
Sample no.	R_{iso} [$G\Omega$]	A [m^2]	$R_{iso} \cdot A$ [$G\Omega \cdot m^2$]	Dielectric breakdown		
				Yes (description)	No	
7				-	No	P
8				-	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 $A \leq 0.1 m^2$.						

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16.22.3	Wet leakage current test after Thermal cycling test (200 cycles) – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		28/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [$^{\circ}\text{C}$]		22 $\pm$ 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} ·A [M $\Omega \cdot \text{m}^2$]	
7	5690.0	2.70	15363.0	P
8	6450.0	2.70	17415.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.23	Damp heat test – MQT 13 / MST 53		
Test date (dd/mm/yyyy)		24/04/2026 - 05/06/2026	—
Total duration [h]		1000	
Sample no.	—		
9	—		—
10	—		—
Supplementary information: A single 5N weight was attached to the electrical termination leads.			

16.23.1	Visual inspection after Damp heat test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		05/06/2026	—
Sample no.	Requirement	Nature and position of findings	
9	No major visual defects	No major visual defects	
10		No major visual defects	
Supplementary information: -			

16.23.2	Insulation test after Damp heat test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				05/06/2026		—
Maximum system voltage [V _{DC}]				1500		
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		P
				Yes (description)	No	
9	12.40	2.70	33.48	-	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.						

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16.23.3	Wet leakage current test after Damp heat test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		05/06/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [$^{\circ}\text{C}$]		22 $\pm$ 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} · A [M $\Omega \cdot \text{m}^2$]	
9	5270.0	2.70	14229.0	P
10	4490.0	2.70	12123.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.24	Retention of junction box on mounting surface – MQT 14.1 / MST 42			
Test date (dd/mm/yyyy)		05/06/2026		—
Sample no.		9		
Applied force in all directions parallel to the mounting surface and parallel to the module edges [N]		40		
Applied force perpendicular to the mounting surface [N]		40		
Supplementary information: -				

16.24.1	Visual inspection after Retention of junction box on mounting surface – MQT 01 / MST 01		
Test date (dd/mm/yyyy)		05/06/2026	—
Sample no.	Requirement	Nature and position of findings	
9	No major visual defects	No major visual defects	P
Supplementary information: -			

16.24.2	Insulation test after Retention of junction box on mounting surface – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				05/06/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☐ No ☒ Yes		
High voltage applied [V _{DC}]				10800		
Insulation resistance measured at [V _{DC}]				2025		
Sample no.	R _{iso} [GΩ]	A [m²]	R _{iso} ·A [GΩ·m²]	Dielectric breakdown		
				Yes (description)	No	
9	11.40	2.70	30.78	-	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.						

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16.24.3	Wet leakage current test after Retention of junction box on mounting surface – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		05/06/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☐ No ☒ Yes		
Insulation resistance measured at [V _{DC}]		2025		
Solution resistivity [Ω·cm]		≤ 3500		
Solution temperature [°C]		22 ± 2		
Sample no.	R _{Iso} [MΩ]	A [m²]	R _{Iso} ·A [MΩ·m²]	P
9	4270.0	2.70	11529.0	
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.25	Static mechanical load test – MQT 16 / MST 34			
Test date (dd/mm/yyyy)		25/06/2026		—
Load direction applied		Positive (downward)	Negative (upward)	
Design load [Pa]		3600	1600	
Safety factor γ_m		1.5	1.5	
Test load [Pa]		5400	2400	
Mounting method		4 mounting holes, 4 screws, 2 rails		
Sample no.	Open circuits (yes/no)			—
9	No			P
Supplementary information: Load was applied pneumatically. 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.				

16.25.1	Visual inspection after Static mechanical load test – MQT 01 / MST 01		
Test date (dd/mm/yyyy)	25/06/2026		—
Sample no.	Requirement	Nature and position of findings	
9	No major visual defects	No major visual defects	P
Supplementary information: -			

16.25.2	Insulation test after Static mechanical load test – MQT 03 / MST 16					
Test date (dd/mm/yyyy)				25/06/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
9	15.30	2.70	41.31	-	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.						

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16.25.3	Wet leakage current test after Static mechanical load test – MQT 15 / MST 17			
Test date (dd/mm/yyyy)		25/06/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	P
9	7640.0	2.70	20628.0	
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.26	Hail test – MQT 17		
Test date (dd/mm/yyyy)		15/06/2026	—
Ice ball diameter [mm]		25	
Ice ball mass [g]		7.53 ± 5 %	
Ice ball velocity [m/s]		23 ± 5 %	
Number of impact locations		11	
Sample no.	—		—
10	—		
Supplementary information: -			

16.26.1	Visual inspection after Hail test – MQT 01		
Test date (dd/mm/yyyy)		15/06/2026	—
Sample no.	Requirement	Nature and position of findings	
10	No major visual defects	No major visual defects	P
Supplementary information: -			

16.26.2	Insulation test after Hail test – MQT 03					
Test date (dd/mm/yyyy)				15/06/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		
				Yes (description)	No	
10	14.80	2.70	39.96	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

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16.26.3	Wet leakage current test after Hail test – MQT 15			
Test date (dd/mm/yyyy)		15/06/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{Iso} · A [MΩ·m²]	P
10	6120.0	2.70	16524.0	
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.27	Materials creep test – MST 37		
Test date (dd/mm/yyyy)		29/04/2026 - 07/05/2026	—
Temperature [°C]		90 ± 3	
Duration [h]		200	
Worst case mounting angle [°]		90	
Sample no.	—		
14	—		—
Supplementary information: -			

16.27.1	Visual inspection after Materials creep test – MST 01		
Test date (dd/mm/yyyy)		07/05/2026	—
Sample no.	Requirement	Nature and position of findings	
14	Creepage and clearance distances acc. to IEC 61730-1:2023, Table 3 are met.	No major visual defects	P
Supplementary information: -			

16.27.2	Insulation test after Materials creep test – MST 16						
Test date (dd/mm/yyyy)				07/05/2026		—	
Maximum system voltage [V _{DC}]				1500			
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		
14	15.40	2.70	41.58	-	No	P	

Supplementary information:

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

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16.27.3	Wet leakage current test after Materials creep test – MST 17			
Test date (dd/mm/yyyy)		07/05/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	P
14	5180.0	2.70	13986.0	
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.28	Damp heat test (200h) – MST 53		
Test date (dd/mm/yyyy)		23/04/2026 - 02/05/2026	—
Total duration [h]		200	
Sample no.	—		
12	—		—
13	—		—
Supplementary information: -			

16.28.1	Visual inspection after Damp heat test (200h) – MST 01		
Test date (dd/mm/yyyy)		02/05/2026	—
Sample no.	Requirement	Nature and position of findings	
12	No major visual defects	No major visual defects	P
13		No major visual defects	P
Supplementary information: -			

16.28.2	Insulation test after Damp heat test (200h) – MST 16					
Test date (dd/mm/yyyy)				02/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
12	13.80	2.70	37.26	-	No	P
13	14.10	2.70	38.07	-	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.						

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16.29	UV test (front side) – MST 54			
Test date (dd/mm/yyyy)		02/05/2026 - 13/05/2026		—
Module temperature [°C]		60 ± 5		
Ratio of UV-B irradiation (280 – 320 nm) [%]		3 – 10		
UV irradiation dose (280 – 400 nm) [kWh/m²]		60		
Operation mode		☐ Short-circuit	☒ Open-circuit	
Sample no.	—			
12	—			—
Supplementary information: The sample front side was exposed.				

16.29.1	Visual inspection after UV test (front side) – MST 01		
Test date (dd/mm/yyyy)		13/05/2026	—
Sample no.	Requirement	Nature and position of findings	
12	No major visual defects	No major visual defects	P
Supplementary information: -			

16.29.2		Insulation test after UV test (front side) – MST 16				
Test date (dd/mm/yyyy)				13/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
12	13.40	2.70	36.18	-	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.						

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16.30	UV test (back side) – MST 54			
Test date (dd/mm/yyyy)		23/05/2026 - 03/06/2026		—
Module temperature [°C]		60 ± 5		
Ratio of UV-B irradiation (280 – 320 nm) [%]		3 – 10		
UV irradiation dose (280 – 400 nm) [kWh/m²]		60		
Operation mode		☐ Short-circuit	☒ Open-circuit	
Sample no.	—			—
13	—			
Supplementary information: The sample back side was exposed.				

16.30.1	Visual inspection after UV test (back side) – MST 01		
Test date (dd/mm/yyyy)		03/06/2026	—
Sample no.	Requirement	Nature and position of findings	
13	No major visual defects	No major visual defects	P
Supplementary information: -			

16.30.2	Insulation test after UV test (back side) – MST 16					
Test date (dd/mm/yyyy)				03/06/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		
				Yes (description)	No	
13	13.70	2.70	36.99	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

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16.31	Humidity-freeze test – MST 52		
Test date (dd/mm/yyyy)		03/06/2026 - 13/06/2026	—
Total number of cycles		10	
Sample no.	Open circuits (yes/no)		
12	No		
13	No		P
Supplementary information: -			

16.31.1	Visual inspection after Humidity-freeze test – MST 01		
Test date (dd/mm/yyyy)		15/06/2026	—
Sample no.	Requirement	Nature and position of findings	
12	No major visual defects	No major visual defects	P
13		No major visual defects	P
Supplementary information: -			

16.31.2	Insulation test after Humidity-freeze test – MST 16					
Test date (dd/mm/yyyy)				15/06/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
12	12.70	2.70	34.29	-	No	P
13	11.10	2.70	29.97	-	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.						

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16.31.3	Wet leakage current test after Humidity-freeze test – MST 17			
Test date (dd/mm/yyyy)		15/06/2026		—
Maximum system voltage [V _{DC}]		1500		
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 [m²]	R _{iso} ·A [MΩ·m²]	
12	4330.0	2.70	11691.0	P
13	4290.0	2.70	11583.0	P
Supplementary information: Minimum requirement is 40 MΩ·m².				

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16.33	Cold conditioning test 1 – MST 55		
Test date (dd/mm/yyyy)		27/04/2026 - 29/04/2026	—
Temperature [°C]		-40 ± 3	
Duration [h]		48	
Sample no.	—		—
14	—		
Supplementary information: -			

16.33.1	Visual inspection after Cold conditioning test 1 – MST 01		
Test date (dd/mm/yyyy)		29/04/2026	—
Sample no.	Requirement	Nature and position of findings	
14	No major visual defects	No major visual defects	P
Supplementary information: -			

16.33.2	Insulation test after Cold conditioning test 1 – MST 16					
Test date (dd/mm/yyyy)				29/04/2026		—
Maximum system voltage [V _{DC}]				1500		
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		P
				Yes (description)	No	
14	15.70	2.70	42.39	-	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.						

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16.34	Dry heat conditioning test– MST 56		
Test date (dd/mm/yyyy)		29/04/2026 - 07/05/2026	—
Temperature [°C]		90 ± 3	
Duration [h]		200	
Sample no.	—		
14	—		—
Supplementary information: -			

16.34.1	Visual inspection after Dry heat conditioning test– MST 01		
Test date (dd/mm/yyyy)		07/05/2026	—
Sample no.	Requirement	Nature and position of findings	
14	No major visual defects	No major visual defects	P
Supplementary information: -			

16.34.2	Insulation test after Dry heat conditioning test– MST 16					
Test date (dd/mm/yyyy)				07/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		
				Yes (description)	No	
14	15.40	2.70	41.58	-	No	P
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

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16.35	Humidity-freeze test 1 – MST 52		
Test date (dd/mm/yyyy)		08/05/2026 - 18/05/2026	—
Total number of cycles		10	
Sample no.	Open circuits (yes/no)		
14	No		P
Supplementary information: -			

16.35.1	Visual inspection after Humidity-freeze test 1 – MST 01		
Test date (dd/mm/yyyy)		18/05/2026	—
Sample no.	Requirement	Nature and position of findings	
14	No major visual defects	No major visual defects	
Supplementary information: -			

16.35.2	Insulation test after Humidity-freeze test 1 – MST 16					
Test date (dd/mm/yyyy)				18/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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		P
				Yes (description)	No	
14	15.20	2.70	41.04	-	No	
Supplementary information: Minimum requirement is 0.04 GΩ · m² for A > 0.1 m² and 0.4 GΩ for A ≤ 0.1 m².						

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16.36	Cold conditioning test 2 – MST 55		
Test date (dd/mm/yyyy)		18/05/2026 - 20/05/2026	—
Temperature [°C]		-40 ± 3	
Duration [h]		48	
Sample no.	—		
14	—		—
Supplementary information: -			

16.36.1	Visual inspection after Cold conditioning test 2 – MST 01		
Test date (dd/mm/yyyy)		20/05/2026	—
Sample no.	Requirement	Nature and position of findings	
14	No major visual defects	No major visual defects	P
Supplementary information: -			

16.36.2	Insulation test after Cold conditioning test 2 – MST 16					
Test date (dd/mm/yyyy)				20/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
14	15.70	2.70	42.39	-	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.						

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16.37	Humidity-freeze test 2 – MST 52		
Test date (dd/mm/yyyy)		20/05/2026 - 30/05/2026	—
Total number of cycles		10	
Sample no.	Open circuits (yes/no)		
14	No		P
Supplementary information: -			

16.37.1	Visual inspection after Humidity-freeze test 2 – MST 01		
Test date (dd/mm/yyyy)		30/05/2026	—
Sample no.	Requirement	Nature and position of findings	
14	No major visual defects	No major visual defects	P
Supplementary information: -			

16.37.2	Insulation test after Humidity-freeze test 2 – MST 16					
Test date (dd/mm/yyyy)				30/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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		P
				Yes (description)	No	
14	16.30	2.70	44.01	-	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.						

16.37.3	Wet leakage current test after Humidity-freeze test 2 – MST 17			
Test date (dd/mm/yyyy)		30/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
Solution resistivity [$\Omega \cdot \text{cm}$]		≤ 3500		
Solution temperature [$^{\circ}\text{C}$]		22 $\pm$ 2		
Sample no.	R _{iso} [M Ω]	A [m ²]	R _{iso} · A [M $\Omega \cdot \text{m}^2$]	P
14	7150.0	2.70	19305.0	
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.38	Impulse voltage test – MST 14		
Test date (dd/mm/yyyy)		21/05/2026	—
Maximum system voltage [V]		1500	
Rated impulse voltage [V]		19680	
Impulse test voltage [V]		19680	
Lab altitude [m]		4	
Sample no.	Test results		
11	No evidence of dielectric breakdown or surface tracking observed		P
Supplementary information: -			

16.38.1	Visual inspection after Impulse voltage test – MST 01		
Test date (dd/mm/yyyy)		21/05/2026	—
Sample no.	Requirement	Nature and position of findings	
11	No major visual defects	No major visual defects	P
Supplementary information: Test sample was covered with conductive foil.			

16.38.2	Insulation test after Impulse voltage test – MST 16					
Test date (dd/mm/yyyy)				21/05/2026		—
Maximum system voltage [V _{DC}]				1500		
Cemented joints?				☒ No ☐ Yes		
High voltage applied [V _{DC}]				8000		
Insulation resistance measured at [V _{DC}]				1500		
Sample no.	R _{iso} [GΩ]	A [m ²]	R _{iso} ·A [GΩ·m ²]	Dielectric breakdown		P
				Yes (description)	No	
11	10.20	2.70	27.54	-	No	
Supplementary information: Minimum requirement is 0.04 GΩ·m ² for A > 0.1 m ² and 0.4 GΩ for A ≤ 0.1 m ² .						

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16.39	Module breakage test – MST 32		
Test date (dd/mm/yyyy)		29/06/2026	—
Weight of impactor [kg]		45.5 ± 0.5	
Drop height [mm]		300	
Mounting technique used		4 mounting holes, 4 screws, 2 rails	
Sample no.	Test results		P
15	☒	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: -			

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16.40	Ignitability test – MST 24		
Test date (dd/mm/yyyy)	20/05/2026		—
Sample no.	16		
Surface exposure			
☐ Ignition occurs			P
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			P
Backsheet foil exposures			
☐ Ignition occurs			N/A
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			N/A
Frame adhesive exposures			
☐ Ignition occurs			P
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			P
Backrail adhesive exposure			
☐ Ignition occurs			N/A
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			N/A
Junction box adhesive exposures			
☐ Ignition occurs			P
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			P
Edge sealing exposures			
☐ Ignition occurs			N/A
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			N/A
Type label			
☐ Ignition occurs			P
☐ The flame tip reaches a height of 150 mm above the flame application point at < 20s.			P
Supplementary information: -			

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16.41	Potential induced degradation test – MQT 21		
Test date (dd/mm/yyyy)		26/04/2026 - 04/05/2026	—
Chamber air temperature [°C]		85	
Chamber relative humidity [%]		85	
Test duration [h]		96	
Mounting configuration		N/A	
Sample no.	—		—
17	+1500V		
18	+1500V		
19	-1500V		
20	-1500V		
Supplementary information: -			

16.41.1	Visual inspection after Potential induced degradation test – MQT 01		
Test date (dd/mm/yyyy)		04/05/2026	—
Sample no.	Requirement	Nature and position of findings	
17	No major visual defects	No major visual defects	P
18		No major visual defects	P
19		No major visual defects	P
20		No major visual defects	P
Supplementary information: -			

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16.41.2	Insulation test after Potential induced degradation test – MQT 03					
Test date (dd/mm/yyyy)				04/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
17	15.90	2.70	42.93	-	No	P
18	15.70	2.70	42.39	-	No	P
19	15.80	2.70	42.66	-	No	P
20	15.20	2.70	41.04	-	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.						

16.41.3	Wet leakage current test after Potential induced degradation test – MQT 15			
Test date (dd/mm/yyyy)		04/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
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 $\Omega \cdot \text{m}^2$]	
17	5480.0	2.70	14796.0	P
18	6120.0	2.70	16524.0	P
19	6030.0	2.70	16281.0	P
20	5430.0	2.70	14661.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.42	Fire test – MST 23 (acc. to UL 790)			
16.42.1	Spread of flame test			
Test date (dd/mm/yyyy)		02/06/2026		—
Sample no.		21		
Fire class test specification		A		
Test results				
Did any portion of the module blow off or fall off the test deck in the form of flaming / glowing brands?		☐ Yes	☒ No	P
Did any portion of the roof desk fall away in the form of glowing particles?		☐ Yes	☒ No	
Was the flame spread beyond 1.82m for Class A, 2.40m for Class B or 3.96m for Class C?		☐ Yes	☒ No	
Was there a significant lateral spread-of-flame from the path directly exposed to the test flame?		☐ Yes	☒ No	
Supplementary information: -				

16.42.2	Burning brand test		
Test date (dd/mm/yyyy)		03/06/2026	—
Sample no.		22	
Fire class test specification		A	
Test results			
Did any portion of the module blow off or fall off the test deck in the form of flaming / glowing brands?	☐ Yes	☒ No	P
Did any portion of the roof desk fall away in the form of glowing particles?	☐ Yes	☒ No	
Did the brand burn a hole through the roof covering or through any part of the module?	☐ Yes	☒ No	
Did any sustained flaming of the module occur?	☐ Yes	☒ No	
Supplementary information: -			

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16.44	Final stabilization – MQT 19.2 / MQT 19.3
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16.44.1	Stress-specific stabilization – BO LID after Damp heat test – MQT 19.3
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Test date (dd/mm/yyyy)	N/A	—
Test method	☐ Method 1 ☒ Method 2	
Chamber air temperature [°C]	N/A	
Total duration [h]	N/A	
Sample no.	—	—
9	—	
10	—	

Supplementary information: The modules were not stabilized and amount of observed degradation may be larger than if module had been stabilized.

16.44.2	Final stabilization after Potential induced degradation test – MQT 19.2
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Test date (dd/mm/yyyy)	12/05/2026	—
Test method	☐ Method 3 ☒ Method 4	
Ratio of UV-B irradiation (280 – 320 nm) [%]	3 – 10	
UV irradiation dose (280 – 400 nm) [kWh/m²]	2	
UV irradiation direction	☐ Front side ☒ Rear side	
Operation mode	☐ Short-circuit ☒ Open-circuit	
Module temperature [°C]	50 ± 5	
Total duration [h]	Max. 24	
Sample no.	—	P
17	—	

Supplementary information: N/A

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16.44.2	Final stabilization after Potential induced degradation test – MQT 19.2			
Test date (dd/mm/yyyy)		N/A		—
Test method		☐ Method 3 ☒ Method 4		
Ratio of UV-B irradiation (280 – 320 nm) [%]		N/A		
UV irradiation dose (280 – 400 nm) [kWh/m²]		N/A		
UV irradiation direction		☐ Front side ☐ Rear side		
Operation mode		☐ Short-circuit ☐ Open-circuit		
Module temperature [°C]		N/A		
Total duration [h]		N/A		
Sample no.	—			—
18	—			
19	—			
20	—			
Supplementary information: The modules were not stabilized and amount of observed degradation may be larger than if module had been stabilized.				

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16.45	Maximum power determination (final) – MST 03				
Test date (dd/mm/yyyy)		04/05/2026 - 27/06/2026			—
Irradiance [W/m²]		1000 ± 10			
Module temperature [°C]		Corrected to 25			
Test method		☒ Simulator ☐ Natural sunlight			
Sample no.		Appearance of final IV-curve			
5		No kinks or other unusual characteristics			P
7		No kinks or other unusual characteristics			P
9		No kinks or other unusual characteristics			P
12		No kinks or other unusual characteristics			P
13		No kinks or other unusual characteristics			P
14		No kinks or other unusual characteristics			P
Supplementary information: -					

16.46	Performance at STC (final) – MQT 06.1							
Test date (dd/mm/yyyy)			04/05/2026 - 27/06/2026					—
Test method			☒ Simulator ☐ Natural sunlight					
Ambient temperature [°C]			25 ± 2					
Irradiance [W/m²]			1000 ± 10					
Module temperature [°C]			25 ± 2					
Spectral mismatch			N/A					
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degra- dation [%]	
2	641.0	46.19	13.876	53.69	14.726	81.1	-0.25	P
5	631.5	46.04	13.716	53.60	14.595	80.7	-1.45	P
6	622.2	46.04	13.516	53.58	14.558	79.8	-3.11	P
7	625.7	46.08	13.579	53.61	14.724	79.3	-2.76	P
8	628.7	46.21	13.607	53.71	14.676	79.8	-2.25	P
9	639.7	46.25	13.831	53.70	14.710	81.0	-0.79	P
10	634.4	46.03	13.783	53.59	14.669	80.7	-1.40	P
17	641.6	46.20	13.887	53.73	14.757	80.9	-0.26	P
18	640.2	46.02	13.912	53.68	14.766	80.8	-0.52	P
19	617.3	45.16	13.671	53.34	14.675	78.9	-3.62	P
20	618.6	45.10	13.717	53.37	14.694	78.9	-3.60	P

Supplementary information: Negative degradation means power loss.

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16.46	Performance at STC (final) – MQT 06.1
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16.46.1	Bifaciality Coefficients (final)				
Sample no.		Φ_{IsC}	Φ_{Voc}	Φ_{Pmax}	—
17		0.72	0.99	0.69	—
18		0.71	0.99	0.70	—
19		0.71	0.99	0.69	—
20		0.71	0.99	0.69	—
Average		0.71	0.99	0.69	—

Supplementary information: -

16.46.2	Performance at BNPI (final) – MQT 06.1							
Test date (dd/mm/yyyy)				04/05/2026 - 27/06/2026				—
Test method				☒ Simulator ☐ Natural sunlight				
Illuminated side				☒ Front side ☐ Rear side				
Ambient temperature [°C]				25 ± 2				
Irradiance [W/m²]				1000 + φ•135*				
Module temperature [°C]				25 ± 2				
Spectral mismatch				N/A				
Sample no.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degra- dation [%]	
2	699.6	45.98	15.216	53.84	16.087	80.8	-0.28	P
5	690.3	45.91	15.038	53.71	15.969	80.5	-1.27	P
6	678.2	46.00	14.744	53.70	15.930	79.3	-3.20	P
7	683.1	46.17	14.796	53.75	16.075	79.1	-2.65	P
8	686.5	46.32	14.821	53.84	16.054	79.4	-2.22	P
9	698.4	46.30	15.086	53.82	16.078	80.7	-0.64	P
10	692.6	45.92	15.082	53.72	16.049	80.3	-1.29	P
17	700.7	46.06	15.214	53.86	16.130	80.7	-0.16	P
18	699.5	46.07	15.184	53.80	16.140	80.6	-0.40	P
19	674.6	45.03	14.980	53.48	16.030	78.7	-3.41	P
20	675.7	45.05	14.999	53.51	16.043	78.7	-3.45	P

Supplementary information:

Negative degradation means power loss.

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

* The bifaciality coefficient Φ employed for sample no. 17-20 is the minimum value of Φ_{ISC} and Φ_{Pmax} as documented in table 16.46.1 for each test sample. The bifaciality coefficient Φ employed for other samples is the minimum value of Φ_{ISC} and Φ_{Pmax} as documented in table 16.8.3 for each test sample.

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16.47	Gate #2 evaluation		
Reproducibility r for P_{max} [%]		0.8	—

16.47.1	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]	—
2	642.6	605.6	641.0	P
5	640.8	603.9	631.5	P
6	642.2	605.2	622.2	P
7	643.4	606.3	625.7	P
8	643.2	606.2	628.7	P
9	644.8	607.7	639.7	P
10	643.4	606.3	634.4	P
17	643.3	606.2	641.6	P
18	643.6	606.5	640.2	P
19	640.3	603.4	617.3	P
20	641.7	604.7	618.6	P

Supplementary information:

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

$P_{max,meas, Gate \#1}$ = 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

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16.47	Gate #2 evaluation		
Reproducibility $r_{(BNPI)}$ for $P_{max(BNPI)}$ [%]		0.8	—

16.47.1	Evaluation of output power for each module			
Sample no.	$P_{max(BNPI),meas,Gate \#1(BNPI)}$ [W]	$P_{max(BNPI),meas,Gate \#1,r(BNPI)}$ [W]	$P_{max(BNPI),meas,Gate \#2(BNPI)}$ [W]	—
2	701.6	661.2	699.6	P
5	701.6	661.2	690.3	P
6	702.3	661.8	678.2	P
7	699.2	658.9	683.1	P
8	700.6	660.2	686.5	P
9	701.7	661.3	698.4	P
10	702.1	661.7	692.6	P
17	702.9	662.4	700.7	P
18	701.6	661.2	699.5	P
19	701.8	661.4	674.6	P
20	702.4	661.9	675.7	P

Supplementary information:

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

$P_{max(BNPI),meas,Gate \#1(BNPI)}$ = Measured initial maximum BNPI power

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

$P_{max(BNPI),meas,Gate \#2(BNPI)}$ = Measured final maximum BNPI power

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

16.48	Bypass diode functionality test (final) – MQT 18.2 / MST 07			
Test date (dd/mm/yyyy)		23/04/2026 - 25/06/2026		—
Test method		☐ Method A ☒ Method B		
Sample no.	Diode 1	Diode 2	Diode 3	
1	working properly	working properly	working properly	P
2	working properly	working properly	working properly	P
3	working properly	working properly	working properly	P
4	working properly	working properly	working properly	P
5	working properly	working properly	working properly	P
7	working properly	working properly	working properly	P
9	working properly	working properly	working properly	P
12	working properly	working properly	working properly	P
13	working properly	working properly	working properly	P
14	working properly	working properly	working properly	P
Supplementary information: This test verifies that the sample shows the electrical characteristics of a functional photovoltaic device.				

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16.49	Cut susceptibility test – MST 12		
Test date (dd/mm/yyyy)		26/05/2026	—
Applied force [N]		8.9 ± 0.5	
Sample no.	Test results		
5	No exposure of active circuitry of module		P
7	No exposure of active circuitry of module		P
9	No exposure of active circuitry of module		P
12	No exposure of active circuitry of module		P
13	No exposure of active circuitry of module		P
14	No exposure of active circuitry of module		P
Supplementary information: -			

16.49.1	Visual inspection after Cut susceptibility test – MST 01		
Test date (dd/mm/yyyy)		26/05/2026	—
Sample no.	Requirement	Nature and position of findings	
5	No major visual defects	No major visual defects	P
7		No major visual defects	P
9		No major visual defects	P
12		No major visual defects	P
13		No major visual defects	P
14		No major visual defects	P
Supplementary information: -			

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

16.49.2	Insulation test after Cut susceptibility test – MST 16					
Test date (dd/mm/yyyy)				26/05/2026		—
Maximum system voltage [V _{DC}]				1500		
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	
5	16.30	2.70	44.01	-	No	P
7	16.30	2.70	44.01	-	No	P
9	15.60	2.70	42.12	-	No	P
12	12.80	2.70	34.56	-	No	P
13	13.20	2.70	35.64	-	No	P
14	13.30	2.70	35.91	-	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.						

16.49.3	Wet leakage current test after Cut susceptibility test – MST 17			
Test date (dd/mm/yyyy)		26/05/2026		—
Maximum system voltage [V _{DC}]		1500		
Cemented joints?		☒ No ☐ Yes		
Insulation resistance measured at [V _{DC}]		1500		
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 $\Omega \cdot \text{m}^2$]	
5	5340.0	2.70	14418.0	P
7	5680.0	2.70	15336.0	P
9	6530.0	2.70	17631.0	P
12	3580.0	2.70	9666.0	P
13	3770.0	2.70	10179.0	P
14	6630.0	2.70	17901.0	P
Supplementary information: Minimum requirement is 40 M $\Omega \cdot \text{m}^2$.				

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16.50	Accessibility test (final) – MST 11		
Test date (dd/mm/yyyy)		25/06/2026	—
Applied force [N]		10	
Sample no.	Contact with live electrical part?	R _{iso} [MΩ]	
5	☐ Yes ☒ No	60.0	P
7	☐ Yes ☒ No	60.0	P
9	☐ Yes ☒ No	60.0	P
12	☐ Yes ☒ No	60.0	P
13	☐ Yes ☒ No	60.0	P
14 (after MST 37)	☐ Yes ☒ No	60.0	P
14 (after Sequence B1)	☐ Yes ☒ No	60.0	P
Supplementary information: The resistance tester can measure up to 60.0 MΩ.			

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16.51	Continuity test of equipotential bonding (final) – MST 13		
Test date (dd/mm/yyyy)		25/05/2026 - 29/06/2026	—
Maximum overcurrent protection rating [A]		30	
Current applied [A]		75	
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]	
5	101.3	1.35	P
	98.3	1.31	
	97.5	1.30	
7	115.5	1.54	P
	111.0	1.48	
	108.0	1.44	
9	102.8	1.37	P
	103.5	1.38	
	106.5	1.42	
12	99.8	1.33	P
	108.0	1.44	
	106.5	1.42	
13	103.5	1.38	P
	101.3	1.35	
	105.8	1.41	
14 (after MST 37)	/	1.28	P
		1.32	
		1.33	
14 (after Sequence B1)	102.0	1.36	P
	102.8	1.37	
	99.0	1.32	
15	97.5	1.30	P
	96.0	1.28	
	93.0	1.24	
Supplementary information: -			

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

16.53	Durability of markings – MST 05		
Test date (dd/mm/yyyy)		23/04/2026 - 25/06/2026	—
Duration of rubbing with water [s]		15	
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
3	The marking is legible; the marking plate is not removable and without curling.		P
4	The marking is legible; the marking plate is not removable and without curling.		P
5	The marking is legible; the marking plate is not removable and without curling.		P
7	The marking is legible; the marking plate is not removable and without curling.		P
9	The marking is legible; the marking plate is not removable and without curling.		P
12	The marking is legible; the marking plate is not removable and without curling.		P
13	The marking is legible; the marking plate is not removable and without curling.		P
14	The marking is legible; the marking plate is not removable and without curling.		P
Supplementary information: -			

16.54	Sharp edge test – MST 06		
Test date (dd/mm/yyyy)		23/04/2026 - 25/06/2026	—
Sample no.	Comments		
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
3	The accessible PV module surfaces are smooth and free from sharp edges.		P
4	The accessible PV module surfaces are smooth and free from sharp edges.		P
5	The accessible PV module surfaces are smooth and free from sharp edges.		P
7	The accessible PV module surfaces are smooth and free from sharp edges.		P
9	The accessible PV module surfaces are smooth and free from sharp edges.		P
12	The accessible PV module surfaces are smooth and free from sharp edges.		P
13	The accessible PV module surfaces are smooth and free from sharp edges.		P
14	The accessible PV module surfaces are smooth and free from sharp edges.		P
Supplementary information: -			

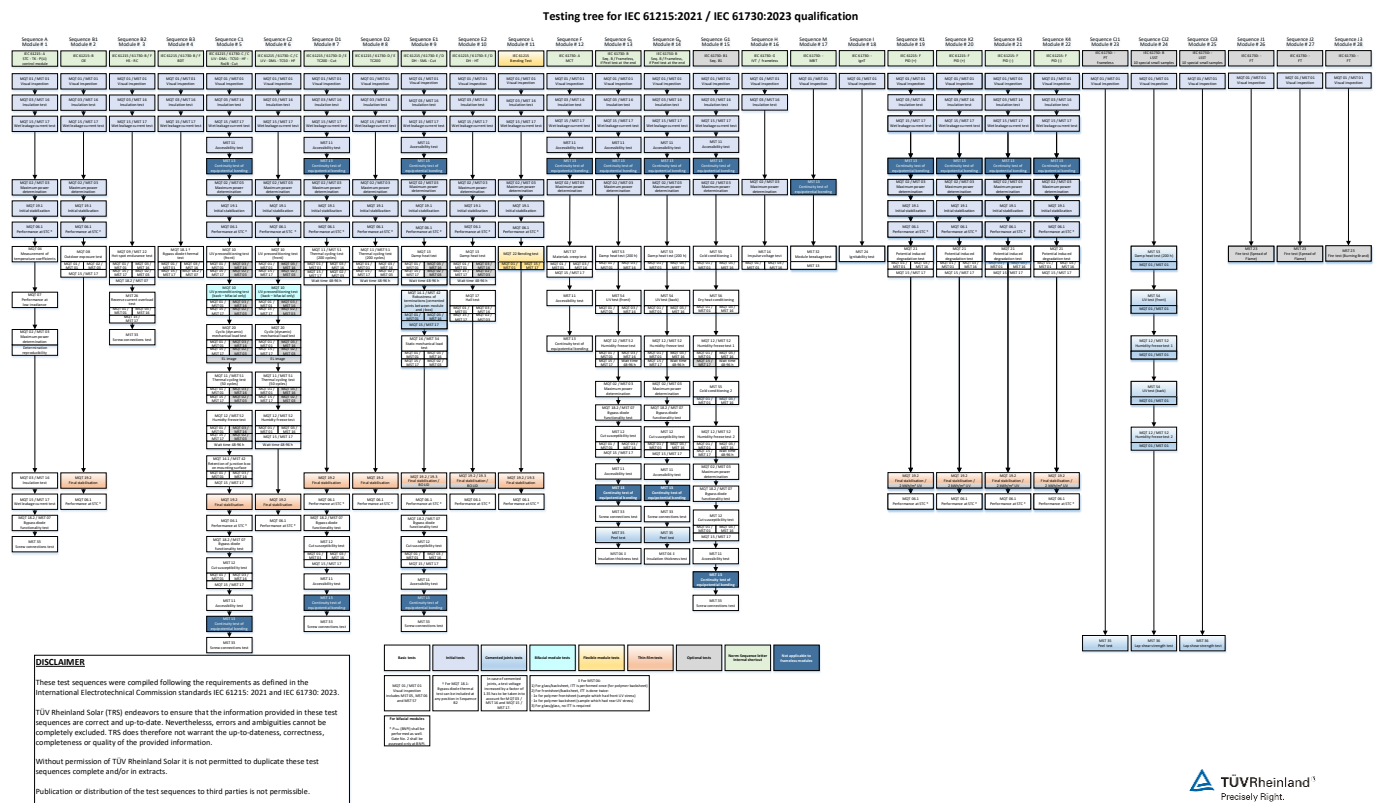
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Appendix A: Test charts

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



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Appendix B: Abbreviations used in the report

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
δ	Power temperature coefficient
S	Series connection
SP	Series-parallel connection
PS	Parallel-series connection
R_{iso}	Electrical insulation resistance
A	Module area
BNPI	Bifacial nameplate irradiance
BSI	Bifacial stress irradiance
G_{BNPI}	Equivalent bifacial nameplate irradiance
aBSI	Applied bifacial stress 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.
φ_{Pmax}	Maximum power bifaciality coefficient
φ_{Voc}	Open-circuit voltage bifaciality coefficient
φ_{Isc}	Short-circuit current bifaciality coefficient

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Statement of the estimated uncertainty of the test verdicts

- Electrical performance rating is outside the scope of IEC 61215:2021 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:
 - o $2\sigma (P_{mpp}) \leq \pm 3.0 \%$
 - o $2\sigma (I_{sc}) \leq \pm 2.8 \%$
 - o $2\sigma (V_{oc}) \leq \pm 0.9 \%$
- 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

Project no.	Report no.	Certificate no.	Date of issue	Remarks
244533551	CN23DWS9 001	PV 50602768 0001	21/09/2023	/
244532599	CN23DWS9 002	PV 50602768 0002	05/02/2024	/
244571563	CN23DWS9 003	PV 50602768 0003	26/02/2024	/
244571563	CN23DWS9 004	PV 50602768 0004	22/04/2024	/
326001062	CN23DWS9 005	PV 50602768 0005	20/06/2024	/
326007040	CN23DWS9 006	Declaration	27/06/2024	/
326007023	CN23DWS9 007	PV 50602768 0006	28/06/2024	/
326011399	CN23DWS9 008	PV 50602768 0007	12/07/2024	/
244548381	CN23DWS9 009	Declaration	31/07/2024	/
326017921	CN23DWS9 010	PV 50602768 0008	19/08/2024	/
326036937	CN23DWS9 011	Declaration	09/10/2024	/
326056427	CN23DWS9 012	Declaration	15/10/2024	/
326054775	CN23DWS9 013	PV 50602768 0009	29/11/2024	/
326053097	CN23DWS9 014	Declaration	26/12/2024	/
244571563	CN23DWS9 015	Declaration	21/01/2025	/
326039809	CN23DWS9 016	Declaration	20/02/2025	/
326065770	CN23DWS9 017	PV 50602768 0010	26/02/2025	/
326071840	CN23DWS9 018	Declaration	06/03/2025	/
326044019	CN23DWS9 019	Declaration	24/03/2025	/

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326092832	CN23DWS9 020	PV 50602768 0011	27/03/2025	/
326066969	CN23DWS9 021	PV 50602768 0012	01/04/2025	/
326102912	CN23DWS9 022	Declaration	03/04/2025	/
326098885	CN23DWS9 023	PV 50602768 0013	25/04/2025	/
326066969	CN23DWS9 024	Declaration	29/05/2025	/
326098885	CN23DWS9 025	PV 50602768 0014	12/05/2025	/
326108953	CN23DWS9 026	PV 50602768 0015	19/05/2025	/
244507596	CN23DWS9 027	Declaration	19/05/2025	/
326056219	CN23DWS9 028	PV 50602768 0016	20/06/2025	/
326061793	CN23DWS9 029	Declaration	17/07/2025	/
326107731	CN23DWS9 030	Declaration	29/07/2025	/
326117477	CN23DWS9 031	PV 50602768 0017	15/09/2025	/
326127710	CN23DWS9 032	PV 50602768 0018	28/09/2025	/
326128117	CN23DWS9 033	Declaration	22/10/2025	/
326122469 & 326122455	CN23DWS9 034	Declaration	30/10/2025	/
326123662	CN23DWS9 035	Declaration	09/11/2025	/
326124695	CN23DWS9 036	PV 50602768 0019	17/11/2025	/
326129222	CN23DWS9 037	Declaration	25/11/2025	/
326129222	CN23DWS9 038	Declaration	16/12/2025	/
326137250 & 326117477	CN23DWS9 039	PV 50602768 0020	08/01/2026	/

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326012702	CN23DWS9 040	Declaration	26/01/2026	/
326172863	CN23DWS9 041	PV 50602768 0021	06/03/2026	/
326173761	CN23DWS9 042	Certificate	10/03/2026	Co-license
326175892	CN23DWS9 043	Declaration	13/03/2026	/
326179115	CN23DWS9 044	Certificate	30/03/2026	Co-license
326108946	CN23DWS9 045	Declaration	31/03/2026	/
326108946	CN23DWS9 046	PV 50602768 0022	01/04/2026	/
326140330	CN23DWS9 047	PV 50602768 0023	10/04/2026	/
326173751	CN23DWS9 048	Declaration	16/04/2026	/
326146046	CN23DWS9 049	Declaration	17/04/2026	/
326129962	CN23DWS9 050	PV 50602768 0024	27/04/2026	/
326174726	CN23DWS9 051	Declaration	30/04/2026	/
326178301	CN23DWS9 052	PV 50602768 0025	02/06/2026	/
326155969	CN23DWS9 053	Declaration	22/06/2026	/

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Appendix D: Photos



Fig. 1: front view of test sample



Fig. 2: rear view of test sample

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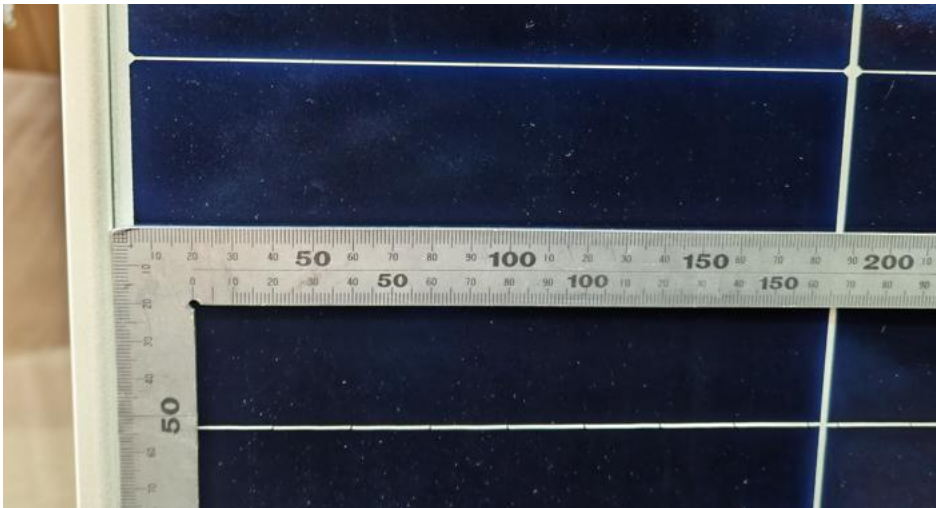


Fig. 3: detail view of solar cell

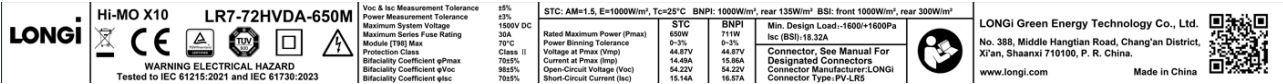


Fig. 4: detail view of type label

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Fig. 5: detail view of closed junction box



Fig. 6: detail view of connector

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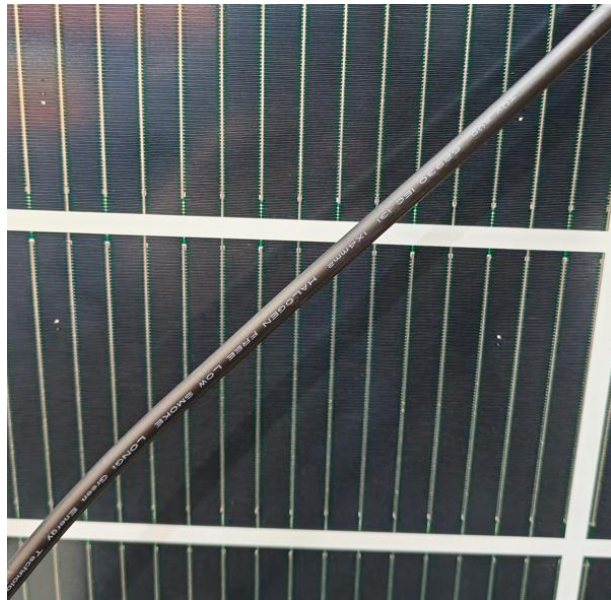


Fig. 7: detail view of cable



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

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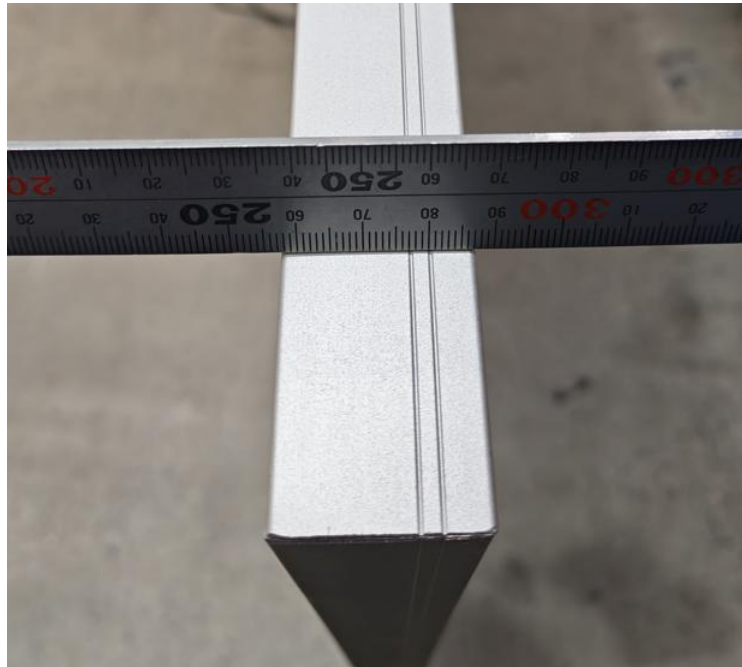


Fig. 9: detail view of frame corner



Fig. 10: view of mechanical load mounting

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Fig. 11: detail view of mounting method