

|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                                                                                                                                                                                          |                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Prüfbericht-Nr.:</b><br><i>Test report no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                         | <b>DE25CWUL 002</b>                                                                                                                                                                                                                                                                                                                                                           | <b>Auftrags-Nr.:</b><br><i>Order no.:</i>   | 30010 2540                                                                                                                                                                                                                                               | Seite 1 von 19<br>Page 1 of 19 |
| <b>Kunden-Referenz-Nr.:</b><br><i>Client reference no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                | 2146145                                                                                                                                                                                                                                                                                                                                                                       | <b>Auftragsdatum:</b><br><i>Order date:</i> | 2025-01-14                                                                                                                                                                                                                                               |                                |
| <b>Auftraggeber:</b><br><i>Client:</i>                                                                                                                                                                                                                                                                                                                                                                                                                     | Chint New Energy Technology Co., Ltd. (for add. information see page 3)                                                                                                                                                                                                                                                                                                       |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüfgegenstand:</b><br><i>Test item:</i>                                                                                                                                                                                                                                                                                                                                                                                                                | Photovoltaik Module                                                                                                                                                                                                                                                                                                                                                           |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Bezeichnung / Typ-Nr.:</b><br><i>Identification / Type no.:</i>                                                                                                                                                                                                                                                                                                                                                                                         | ASTRO N7s_CHSM48RN(DG)F-BH-445 (representative for various module types)                                                                                                                                                                                                                                                                                                      |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Auftrags-Inhalt:</b><br><i>Order content:</i>                                                                                                                                                                                                                                                                                                                                                                                                           | Hail impact test with the aim of recommendation/classification for VFK "Hagelregister"                                                                                                                                                                                                                                                                                        |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | according to / following VKF - Prüfbestimmung ***<br>"Nr. 25 "Photovoltaik Module" - Version 1.03 (01/11/2016)<br>following IEC 61215-2 "Terrestrial photovoltaic modules - Design qualification and type approval - Part 2: Test procedures                                                                                                                                  |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Wareneingangsdatum:</b><br><i>Date of sample receipt:</i>                                                                                                                                                                                                                                                                                                                                                                                               | 2025-01-28                                                                                                                                                                                                                                                                                                                                                                    |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüfmuster-Nr.:</b><br><i>Test sample no.:</i>                                                                                                                                                                                                                                                                                                                                                                                                          | see "List of test samples"                                                                                                                                                                                                                                                                                                                                                    |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüfzeitraum:</b><br><i>Testing period:</i>                                                                                                                                                                                                                                                                                                                                                                                                             | 2025-01-31 – 2025-02-17                                                                                                                                                                                                                                                                                                                                                       |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Ort der Prüfung:</b><br><i>Place of testing:</i>                                                                                                                                                                                                                                                                                                                                                                                                        | Am Grauen Stein,<br>51105 Köln, Cologne                                                                                                                                                                                                                                                                                                                                       |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüflaboratorium:</b><br><i>Testing laboratory:</i>                                                                                                                                                                                                                                                                                                                                                                                                     | TÜV Rheinland Solar<br>GmbH                                                                                                                                                                                                                                                                                                                                                   |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Prüfergebnis*:</b><br><i>Test result*:</i>                                                                                                                                                                                                                                                                                                                                                                                                              | Siehe Sonstiges / See Other                                                                                                                                                                                                                                                                                                                                                   |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>geprüft von:</b><br><i>tested by:</i>                                                                                                                                                                                                                                                                                                                                                                                                                   | X <br>Datum: 2025-03-14<br><small>Signiert von: Juergen Sommer</small>                                                                                                                                                                                                                     |                                             | <b>genehmigt von:</b><br><i>authorized by:</i><br>X <br><b>Ausstellungsdatum:</b><br><i>Issue date:</i> 2025-03-14<br><small>Signiert von: Ulrich Fritzsche</small> |                                |
| <b>Stellung / Position:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                | Sachverständige(r)/Expert                                                                                                                                                                                                                                                                                                                                                     |                                             | Stellung / Position: Sachverständige(r)/Expert                                                                                                                                                                                                           |                                |
| <b>Sonstiges / Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | *** VKF (Vereinigung Kantonaler Feuerversicherungen) /// Additional test specifications:<br>- Prüfbestimmung Nr 00a – Allgemeiner Teil A - Version 1.03 (01/03/2018)<br>- Prüfbestimmung Nr 00b – Allgemeiner Teil B - Version 1.01 (01/12/2018)<br>- Beschlussammlung HSR – formal - Version 30 (16.10.2024)<br>- Beschlussammlung HSR - technisch - Version 19 (13/09/2018) |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br><i>Condition of the test item at delivery:</i>                                                                                                                                                                                                                                                                                                                                                     | Prüfmuster vollständig und unbeschädigt<br><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<br>* 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                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                                                                                                                                                                                          |                                |
| <b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br><i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i> |                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                                                                                                                                                                                          |                                |

V05

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**Anmerkungen**  
*Remarks*

| A                | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.</i></p> <p><i>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p>                                                           |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------|--|--|----------|------|-------------------|------|---|------------|----------------|--|-----|------------|---------------------------------------|---|--|--|--|--|
| B                | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i></p> |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| C                | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| D                | <p>Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC GC8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird.</p> <p><i>The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance to ILAC GC8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.</i></p>                                                                                                                                                                                                             |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| E                | <p>Wenn auf dem Bericht kein Akkreditierungshinweis aufgebracht ist, wurde der Bericht nicht im akkreditierten Bereich erstellt und ist folglich auch nicht vom EA MLA abgedeckt. Unabhängig davon wurde der Bericht auf Basis der allgemeinen Regeln der ISO/IEC 17000er Reihe erstellt. Mit "#" gekennzeichnete Prüfungen sind nicht Bestandteil der Akkreditierung D-PL-22040-01-00.</p> <p><i>If there is no accreditation notice on the report, the report has not been produced in the accredited area and is consequently not covered by the EA MLA. Regardless of this, the report has been prepared based on the general rules of the ISO/IEC 17000 series. Tests marked with "#" are not covered by the accreditation D-PL-22040-01-00.</i></p>                                                                                                                                                                                                                                                                                                                                                         |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| F                | <table><tr><th colspan="4">Revision History</th></tr><tr><th>Revision</th><th>Date</th><th>Nature of changes</th><th>Page</th></tr><tr><td>-</td><td>2025-03-07</td><td>Original issue</td><td></td></tr><tr><td>002</td><td>2025-03-14</td><td>Type writing error in frame thickness</td><td>3</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Revision History                      |      |  |  | Revision | Date | Nature of changes | Page | - | 2025-03-07 | Original issue |  | 002 | 2025-03-14 | Type writing error in frame thickness | 3 |  |  |  |  |
| Revision History |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| Revision         | Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Nature of changes                     | Page |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| -                | 2025-03-07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Original issue                        |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
| 002              | 2025-03-14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Type writing error in frame thickness | 3    |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |      |  |  |          |      |                   |      |   |            |                |  |     |            |                                       |   |  |  |  |  |

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**Produktbeschreibung**  
*Product description*

|   |                                                     |                                                                                                                                                                                                                                                                                   |                                        |
|---|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1 | Auftraggeber<br>Client                              | Chint New Energy Technology Co., Ltd.<br>No. 1 Jisheng Road, Jianshan New Zone<br>314415 Haining Zhejiang<br>China                                                                                                                                                                |                                        |
| 2 | Produktdetails<br>Product details                   | Allgemeine Informationen ; General Information based on datasheet                                                                                                                                                                                                                 |                                        |
|   |                                                     | Brand name                                                                                                                                                                                                                                                                        | Astronergy                             |
|   |                                                     | Type name                                                                                                                                                                                                                                                                         | CHSM48RN(DG)F-BH-445                   |
|   |                                                     | Product category                                                                                                                                                                                                                                                                  | PV-module                              |
|   |                                                     | Year of production                                                                                                                                                                                                                                                                | 2024                                   |
|   |                                                     | Power class [W]                                                                                                                                                                                                                                                                   | 445                                    |
|   |                                                     | Cell technology                                                                                                                                                                                                                                                                   | Mono (bi-facial)                       |
|   |                                                     | Cell dimension (l / w) [mm]                                                                                                                                                                                                                                                       | 182.3 / 105 (cut)                      |
|   |                                                     | No. of cells                                                                                                                                                                                                                                                                      | 96                                     |
|   |                                                     | Max. system voltage [V]                                                                                                                                                                                                                                                           | 1500                                   |
|   |                                                     | Thickness of glazing [mm]                                                                                                                                                                                                                                                         | 2.5 (front) / 2.5 (back)               |
|   |                                                     | Glazing (front)                                                                                                                                                                                                                                                                   | high transmission, AR coated, tempered |
|   |                                                     | Glazing (back)                                                                                                                                                                                                                                                                    | white grided glass, semi-tempered      |
|   |                                                     | Frame material                                                                                                                                                                                                                                                                    | Aluminium                              |
|   |                                                     | Frame thickness [mm]                                                                                                                                                                                                                                                              | 35                                     |
|   |                                                     | Dimensionen ; Dimension                                                                                                                                                                                                                                                           |                                        |
|   |                                                     | Dimension (l / w / h) [mm]                                                                                                                                                                                                                                                        | 1762 / 1134 / 35                       |
|   |                                                     | Gross area [m²]                                                                                                                                                                                                                                                                   | 1.998                                  |
| 3 | Technische Dokumentation<br>Technical documentation | for detailed constructional data see<br>Certificate PV 50625618, as well as report and Annexes issued by TÜV Rheinland<br>Technical Datasheet<br>“ASTRO N7s_CHSM48RN(DG)F-BH_1762×1134×35_2.5 glass”<br>issued by Astronergy                                                      |                                        |
| 4 | Hersteller<br>Manufacturer                          | Chint New Energy Technology Co., Ltd.                                                                                                                                                                                                                                             |                                        |
| 5 | Sonstiges<br>Other                                  | <div>- The tested module type might be also available in different powerclasses.</div> <div>- Further the result is aplicable to additional types; for more details see “General remarks”</div> <div>- Mounting: Asymetric (mounting holes / 181 mm and 331 mm from corner)</div> |                                        |
| 6 | Prüfmusterbereitstellung:<br>Test sample obtaining  | <div><input checked="" type="checkbox"/> Sending by customer                      <input type="checkbox"/> Sampling by TÜV Rheinland Group</div> <div><input type="checkbox"/> others: randomly chosen from existing test batch</div>                                             |                                        |

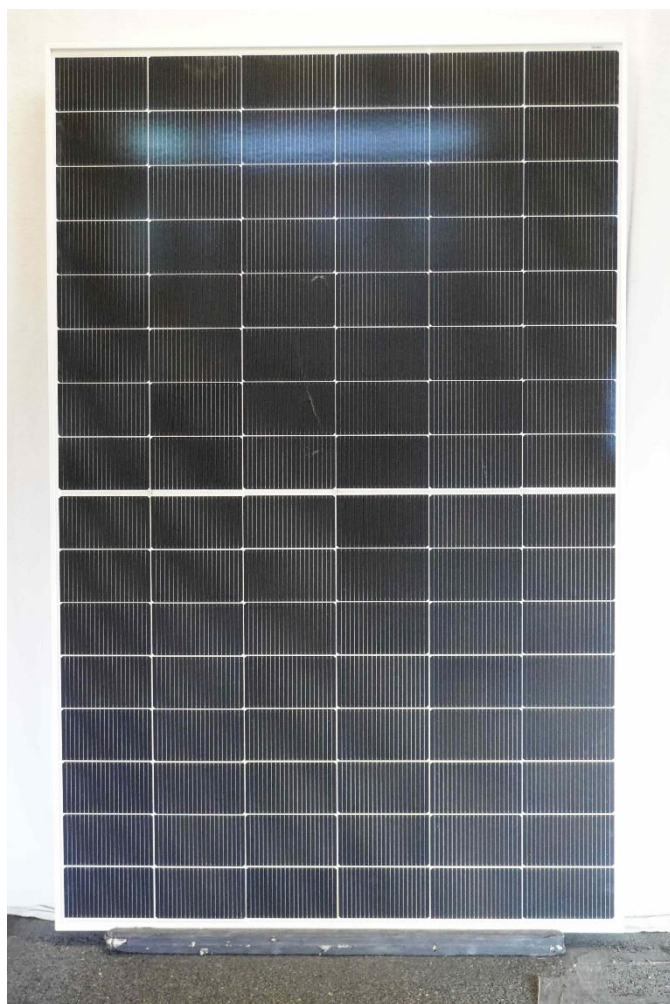


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**Produktbeschreibung**  
Product description

Sample - Front (example)



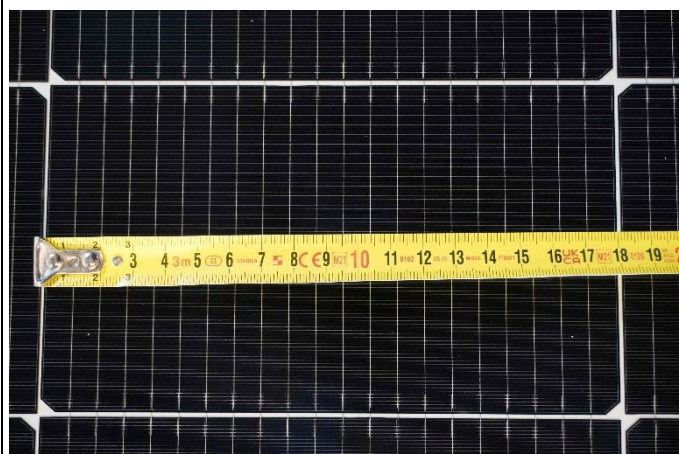
Sample - Back (example)



Example of junction box



Example of cells



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| Absatz<br>Clause | Anforderungen - Prüfungen /<br>Requirements - Tests | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|
|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|

| -                                                                                                                                                                                                                                                                                       | Result summary table       |                          |                                 |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|---------------------------------|---|
| Test                                                                                                                                                                                                                                                                                    | Date [DD Month YYYY]       |                          | Summary of main test results    | — |
|                                                                                                                                                                                                                                                                                         | Initial (1 <sup>st</sup> ) | Final (2 <sup>nd</sup> ) |                                 |   |
| Insulation test                                                                                                                                                                                                                                                                         | 04 February 2025           | 10 February 2025         | -                               | P |
| Wet leakage current test                                                                                                                                                                                                                                                                | 04 February 2025           | 10 February 2025         | -                               | P |
| Performance at STC                                                                                                                                                                                                                                                                      | 05 February 2025           | 10 February 2025         | -                               | P |
| Electroluminescence images                                                                                                                                                                                                                                                              | 05 February 2025           | 10 February 2025         | -                               | P |
| Impact resistance                                                                                                                                                                                                                                                                       | 10 February 2025           |                          | HW4 with 40 mm ice balls passed | P |
| Final inspection                                                                                                                                                                                                                                                                        | 17 February 2025           |                          | see <i>Final evaluation</i>     | P |
| Supplementary information:                                                                                                                                                                                                                                                              |                            |                          |                                 |   |
| <ul style="list-style-type: none"><li>All results are related to the tested sample/s</li><li>According to test procedure the tested PV module is <b><u>recommended</u></b> to be <b><u>classified in HW4</u></b></li><li>No pre-exposure necessary; no relevant plastic parts</li></ul> |                            |                          |                                 |   |

|                                                                                                                  |                                                         |              |   |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------|---|
|                                                                                                                  | Final evaluation (recommendation of testing laboratory) |              |   |
| In four-eyes principle; by                                                                                       | J. Sommer                                               | U. Fritzsche | — |
| The acceptance of recommendation and final classification is part of FER (Fachkommision Elementarschutzregister) |                                                         |              |   |
| Properties of component                                                                                          | Evaluation of hail withstand                            |              |   |
| Water tightness                                                                                                  | - - -                                                   |              |   |
| Visual nature / look                                                                                             | HW4                                                     |              |   |
| Mechanics                                                                                                        | HW4                                                     |              |   |
| Transmittance                                                                                                    | - - -                                                   |              |   |
| Opacity                                                                                                          | - - -                                                   |              |   |
| Supplementary information: -                                                                                     |                                                         |              |   |

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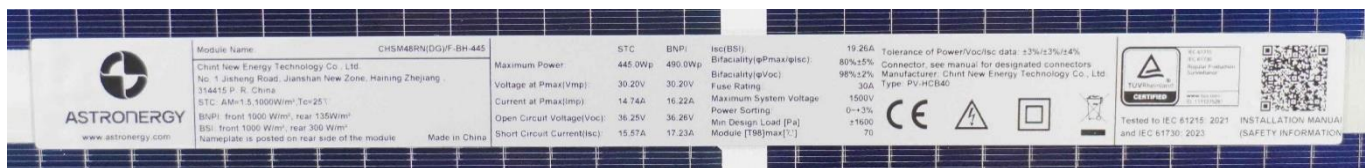
| Absatz<br>Clause | Anforderungen - Prüfungen /<br>Requirements - Tests | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|
|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|

|   |                             |  |  |
|---|-----------------------------|--|--|
| - | Visual inspection (Initial) |  |  |
|---|-----------------------------|--|--|

|                        |                                         |   |   |
|------------------------|-----------------------------------------|---|---|
| Test date [YYYY-MM-DD] | 2025-01-31                              | — |   |
| Sample No.             | Nature and position of initial findings |   | — |
| HV2025000308           | No relevant visual defects              |   | P |
| HV2025000309           | No relevant visual defects              |   | P |
| HV2025000310           | No relevant visual defects              |   | P |
| HV2025000311           | No relevant visual defects              |   | P |

Supplementary information: -

Type plate (example)



|                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Name:</b> CWSM48RN/DGYF-BH445<br><b>Manufacturer:</b> Chint New Energy Technology Co., Ltd.<br><b>Address:</b> No. 7 Jisheng Road, Jianshan New Zone, Haining Zhejiang 314415 P. R. China<br><b>STC:</b> AM=1.5, 1000W/m², T=25°C<br><b>BSF:</b> front 1000 W/m², rear 350 W/m²<br><b>BS:</b> front 1000 W/m², rear 350 W/m²<br><b>Note:</b> Nameplate is posted on rear side of the module<br><b>Made in:</b> China | <b>STC</b> <b>BSF</b> <b>BS</b><br><b>Maximum Power</b> 445.0Wp    490.0Wp<br><b>Voltage at Pmax(Vmp)</b> 30.20V    30.20V<br><b>Current at Pmax(Imp)</b> 14.74A    16.22A<br><b>Open Circuit Voltage(Voc)</b> 36.25V    36.26V<br><b>Short Circuit Current(Isc)</b> 15.57A    17.23A | <b>BSF</b> <b>BS</b><br><b>Inc(BS)</b> <b>Bifaciality(IgPmax/Isc)</b> <b>Tolerance of Power/Voc/Isc data:</b> ±3%/±3%/±4%<br><b>Bifaciality(IgVoc)</b> 80%±5%<br><b>Fuse Rating</b> 30A<br><b>Maximum System Voltage</b> 1500V<br><b>Power Sorting</b> 0~±3%<br><b>Min Design Load (Pa)</b> ±1600<br><b>Module [T90]max[°C]</b> 70 | <b>19.26A</b> <b>Connector:</b> see manual for designated connectors<br><b>Manufacturer:</b> Chint New Energy Technology Co., Ltd.<br><b>Type:</b> PV-HCB40<br><b>Tested to IEC 61215: 2021 and IEC 61730: 2023</b><br><b>INSTALLATION MANUAL (SAFETY INFORMATION)</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|   |                      |  |  |
|---|----------------------|--|--|
| - | List of test samples |  |  |
|---|----------------------|--|--|

| Sample No.   | Sample S/N          | Remarks /<br>constructional characteristics | — |
|--------------|---------------------|---------------------------------------------|---|
| HV2025000308 | A212262642J86002023 | Main test sample                            | — |
| HV2025000309 | A212262642J86002021 | Backup                                      |   |
| HV2025000310 | A212262642J86002019 | Backup                                      |   |
| HV2025000311 | A212262642J86002018 | Backup                                      |   |

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*Test report no.:*

[illegible]

|                                                      |                       |      |                 |                            |    |   |
|------------------------------------------------------|-----------------------|------|-----------------|----------------------------|----|---|
| -                                                    | Insulation test (ISO) |      |                 |                            |    |   |
| General; for all following measurements              |                       |      |                 |                            |    | — |
| Maximum system voltage [V <sub>DC</sub> ]            |                       |      |                 | 1500                       |    |   |
| High voltage applied [V <sub>DC</sub> ]              |                       |      | 1 <sup>st</sup> | 3000                       |    |   |
|                                                      |                       |      | 2 <sup>nd</sup> | 8000                       |    |   |
| Insulation resistance measured at [V <sub>DC</sub> ] |                       |      |                 | 1000                       |    |   |
| Initial / Final*                                     |                       |      |                 |                            |    |   |
| Test date [YYYY-MM-DD]                               |                       |      |                 | 2025-02-04 and *2025-02-10 |    |   |
| Sample No.                                           | Measured              | Area | Result*         | Dielectric breakdown       |    |   |
|                                                      | [GΩ]                  | [m²] | [GΩ × m²]       | Yes (description)          | No |   |
| HV2025000308                                         | 1.0                   | 2.00 | 2.0             | -                          | x  | P |
|                                                      | 1.0                   | 2.00 | 2.0             | -                          | x  | P |
| Supplementary information: -                         |                       |      |                 |                            |    |   |

|                                                                 |                                                                   |                                                                            |                                  |
|-----------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------|
| <b>Prüfbericht-Nr.: DE25CWUL 002</b><br><b>Test report no.:</b> |                                                                   |                                                                            |                                  |
| <b>Absatz</b><br><i>Clause</i>                                  | <b>Anforderungen - Prüfungen /</b><br><i>Requirements - Tests</i> | <b>Messergebnisse – Bemerkungen/</b><br><i>Measuring results - Remarks</i> | <b>Ergebnis</b><br><i>Result</i> |

|                                                      |                               |                            |           |   |
|------------------------------------------------------|-------------------------------|----------------------------|-----------|---|
| -                                                    | Wet leakage current test (WL) |                            |           |   |
| General; for all following measurements              |                               |                            |           | — |
| Insulation resistance measured at [V <sub>DC</sub> ] |                               | 1000                       |           |   |
| Solution resistivity [Ω cm]                          |                               | < 3.500                    |           |   |
| Solution temperature [°C]                            |                               | 22 ± 3                     |           |   |
| Initial / Final*                                     |                               |                            |           |   |
| Test date [YYYY-MM-DD]                               |                               | 2025-02-04 and *2025-02-10 |           |   |
| Sample No.                                           | Measured                      | Area                       | Result    |   |
|                                                      | [MΩ]                          | [m²]                       | [MΩ × m²] |   |
| HV2025000308                                         | 1000                          | 2.00                       | 2000      | P |
|                                                      | 1000                          | 2.00                       | 2000      | P |
| Supplementary information: -                         |                               |                            |           |   |

|                                                                 |                                                                                                                                    |                             |   |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---|
| -                                                               | <b>Electroluminescence images (EL)</b><br>Analysis of electroluminescence images (see also <i>Annex : Additional information</i> ) |                             |   |
| Initial / Final*                                                |                                                                                                                                    |                             | — |
| Test date [YYYY-MM-DD]                                          |                                                                                                                                    | 2025-02-05 and *2025-02-10  |   |
| Sample No.                                                      | Reverse current applied [A]                                                                                                        | Attributes                  |   |
| HV2025000308                                                    | 1.5 (@ 3000 ms)                                                                                                                    | No conspicuousness/findings |   |
|                                                                 | 1.5 (@ 3000 ms)                                                                                                                    | No conspicuousness/findings |   |
| Supplementary information: Estimated analysis without guarantee |                                                                                                                                    |                             |   |



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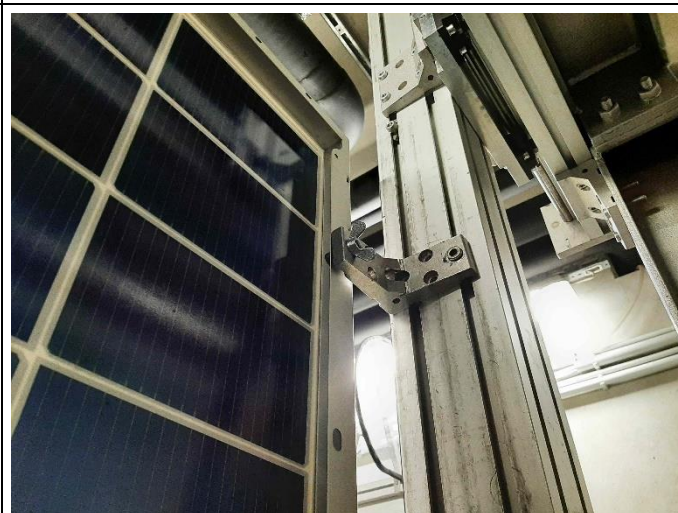
| Absatz<br>Clause | Anforderungen - Prüfungen /<br>Requirements - Tests | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|
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|                                                           |                                  |                             |
|-----------------------------------------------------------|----------------------------------|-----------------------------|
| -                                                         | Impact resistance test (general) |                             |
| Test date [YYYY-MM-DD]                                    | Day code                         | 2025-02-10 <sup>a</sup>     |
| Sample-No.                                                | ID code                          | HV2025000308 <sup>308</sup> |
| Method used for impact resistance                         |                                  | Nr. 25 "Photovoltaik Module |
| Surface conditioning                                      |                                  | none                        |
| Sample tilt angle [° from horizontal]                     |                                  | 90                          |
| Direction of shoot [°]                                    |                                  | 0 (horizontal)              |
| Impact angle [° from sample surface]                      |                                  | 90                          |
| Distance (sample to center of v <sub>0</sub> -meas.) [mm] |                                  | 500 to 700                  |
| Ice ball production [week of the year]                    |                                  | 2 (hermetically sealed)     |
| Storage temperature of ice ball [°C]                      |                                  | -20                         |
| Ambient conditions (mean) [°C and % RH]                   |                                  | <sup>a</sup> 23.6 and 48.8  |
| Diameter of ice ball [mm]                                 |                                  | 40                          |
| Weight of ice ball (mean) [g]                             |                                  | 30.0                        |
| Velocity of ice ball (mean) [m/s ]                        |                                  | 27.5                        |
| Impact energy (at least) [J]                              |                                  | 11.1                        |

Example of Test Set-up



Mounting elements



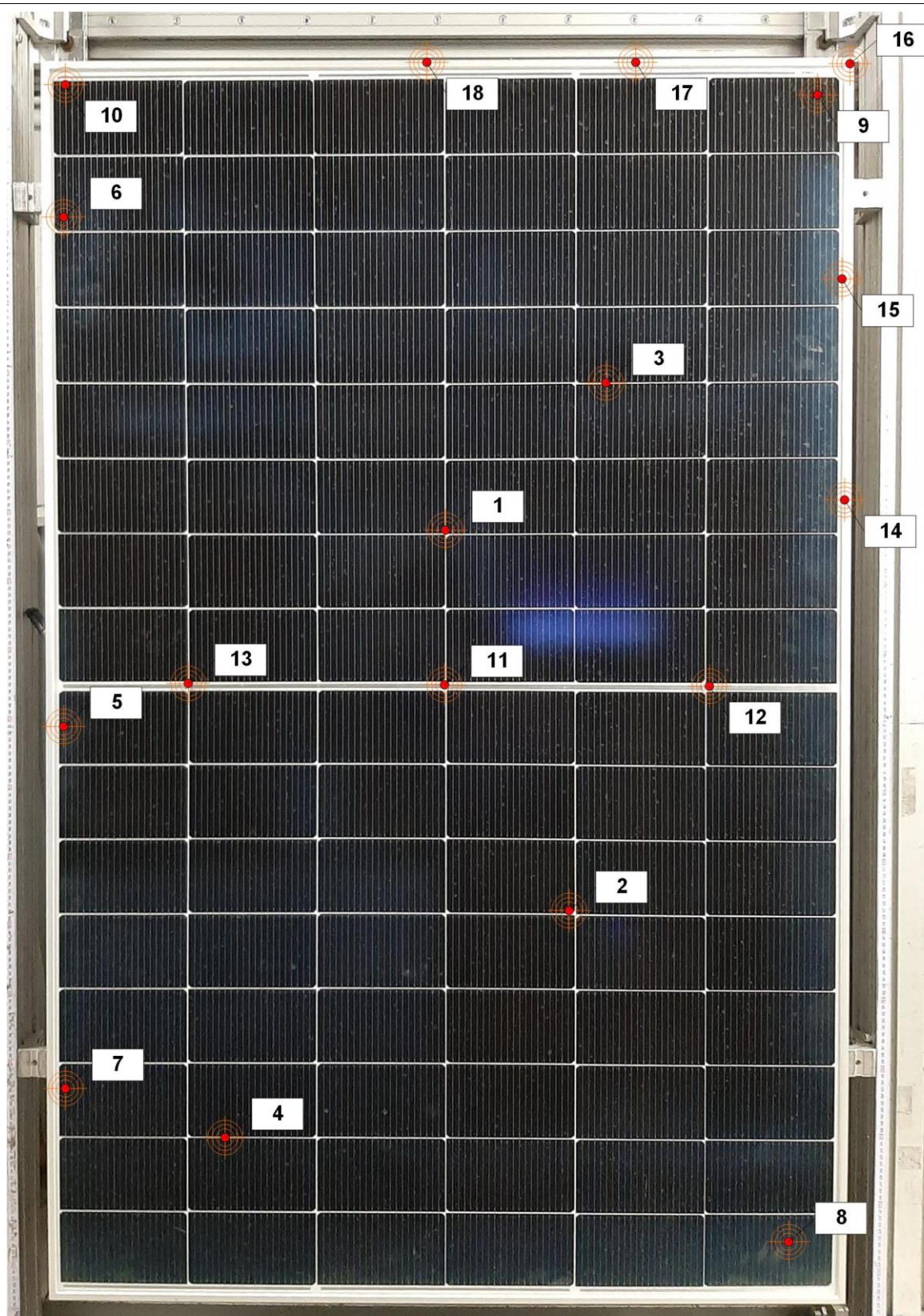
Supplementary information:

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Overview of impact positions



Supplementary information: -

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|------------------|-----------------------------------------------------|--------------------------------------------------------------|--------------------|
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| -         | Impact resistance test – Result table                                    |     |                                                          |                             |        |                  |                        |                   |   |
|-----------|--------------------------------------------------------------------------|-----|----------------------------------------------------------|-----------------------------|--------|------------------|------------------------|-------------------|---|
| Sample ID | Impact information                                                       |     |                                                          |                             |        | Mass of ball [g] | Velocity of ball [m/s] | Impact energy [J] | — |
|           | Day                                                                      | No. | Location & description<br>(cells from left bottom [x/y]) |                             | IEC*** |                  |                        |                   |   |
| 308       | Initial - After initial control measurements (Ice ball diameter = 40 mm) |     |                                                          |                             |        |                  |                        |                   |   |
|           | a                                                                        | 1   | 3/10 – 4/11                                              | Over edges of circuit       | 3      | 29.63            | 27.87                  | 11.51             | P |
|           |                                                                          | 2   | 4/4 – 5/5                                                | Over edges of circuit       | 4      | 29.18            | 27.59                  | 11.11             | P |
|           |                                                                          | 3   | 5/12 – 5/13                                              | Near interconnects          | 5      | 30.09            | 28.62                  | 12.32             | P |
|           |                                                                          | 4   | 2/2 – 2/3                                                | Near interconnects          | 6      | 29.57            | 27.41                  | 11.11             | P |
|           |                                                                          | 5   | 1/8                                                      | Edge of module window       | 2      | 29.55            | 28.28                  | 11.82             | P |
|           |                                                                          | 6   | 1/15                                                     | Near mounting position      | 7      | 29.99            | 27.53                  | 11.36             | P |
|           |                                                                          | 7   | 1/3                                                      | Near mounting position      | 8      | 30.41            | 29.17                  | 12.94             | P |
|           |                                                                          | 8   | 6/1                                                      | Far away from other impacts | 9      | 29.35            | 27.53                  | 11.12             | P |
|           |                                                                          | 9   | 6/16                                                     | Far away from other impacts | 10     | 29.56            | 27.57                  | 11.23             | P |
|           |                                                                          | 10  | 1/16                                                     | Corner of module window     | 1      | 29.96            | 27.55                  | 11.37             | P |
|           |                                                                          | 11  | 3/8 – 4/9                                                | Over the junction box       | 11     | 29.84            | 27.9                   | 11.61             | P |
|           |                                                                          | 12  | 1/8 – 2/9                                                | Over the junction box       | 11     | 29.5             | 27.84                  | 11.43             | P |
|           |                                                                          | 13  | 5/8– 6/9                                                 | Over the junction box       | 11     | 30.04            | 28.44                  | 12.15             | P |
|           |                                                                          | 14  | 600 mm from corner                                       | Vertical frame              | -      | 29.54            | 27.93                  | 11.52             | P |
|           |                                                                          | 15  | 300 mm from corner                                       | Vertical frame              | -      | 29.86            | 27.77                  | 11.51             | P |
|           |                                                                          | 16  | Corner                                                   | Tip of frame                | -      | 30.01            | 28.71                  | 12.37             | P |
|           |                                                                          | 17  | 300 mm from corner                                       | Horizontal frame            | -      | 29.99            | 28.03                  | 11.78             | P |
|           |                                                                          | 18  | 600 mm from corner                                       | Horizontal frame            | -      | 29.94            | 28.15                  | 11.86             | P |
|           | Change to final measurement and inspection                               |     |                                                          |                             |        |                  |                        |                   | — |

Supplementary information: \*value to low (not valid); \*\*value to high (not valid); \*\*\*location acc. to IEC-standard



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| Absatz<br>Clause             | Anforderungen - Prüfungen /<br>Requirements - Tests                                                                                                                                                  |                                                                                                                                             | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------|
| -                            | Final inspection (general)                                                                                                                                                                           |                                                                                                                                             |                                                              |                    |
| Test date [YYYY-MM-DD]       |                                                                                                                                                                                                      | 2025-02-17                                                                                                                                  |                                                              | —                  |
| Sample-No.                   | Potential<br>problem                                                                                                                                                                                 | Evaluation*/**                                                                                                                              |                                                              |                    |
|                              |                                                                                                                                                                                                      | HW4                                                                                                                                         |                                                              |                    |
| HV2025000308                 | Technical<br>problems                                                                                                                                                                                | HW 4 <b>passed</b> ;<br><u>with 40 mm</u><br><br>NO cracks visible under use of electroluminescence<br><br>NO power degradation detectable* |                                                              | P                  |
|                              | Visual<br>problems<br>(distance;<br>> 5 m)                                                                                                                                                           | HW 4 <b>passed</b> ;<br><u>with 40 mm</u><br><br>NO cracks visible ; NO dents visible                                                       |                                                              | P                  |
|                              | Visual<br>problems<br>(near;<br>< 0.5 m)                                                                                                                                                             | HW 4 <b>passed</b> ;<br><u>with 40 mm</u><br><br>NO cracks visible ; NO dents visible                                                       |                                                              | -                  |
| NOTE                         | Individual additional remarks: All results are related to the tested samples.<br>* referred to measuring uncertainty<br>**see also <i>Final evaluation</i> and <i>Annex : Additional information</i> |                                                                                                                                             |                                                              | —                  |
| Supplementary information: - |                                                                                                                                                                                                      |                                                                                                                                             |                                                              |                    |

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|                                                                                                        |                                               |   |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------|---|
| -                                                                                                      | General remarks and subplementary information |   |
| Measuring uncertainties                                                                                |                                               | — |
| All results only refer to the test samples that were subjected to testing.                             |                                               |   |
| The extended total measuring uncertainty for velocity, weight and performance is:    u (k=2) ≤ ± 2.5 % |                                               |   |

|                                                                                                                                                                                                        |                                               |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---|
| Related test reports / certificates / documents                                                                                                                                                        |                                               | — |
| The construction of the tested samples is documented in the relevant report valid in conjunction with the IEC certificate.                                                                             |                                               |   |
| Document no.                                                                                                                                                                                           | Certificate no.                               |   |
| Test report CN24LDFA 001, <i>incl. Annexes</i><br><i>issued by TÜV Rheinland</i>                                                                                                                       | PV 50625618<br><i>issued by TÜV Rheinland</i> |   |
| Technical data sheets<br>“ASTRO N7s_CHSM48RN(DG)F-BH_1762×1134×35_2.5 glass”<br><i>issued by Astronergy</i><br>“ASTRO N7s_CHSM48RN(DG)(BLH)F-BH_1762×1134×35_2.5 glass”<br><i>issued by Astronergy</i> |                                               |   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Others - The result of the tested sample is also equivalent to:                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Main Types                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li><b>CHSM48RN(DH)/F-BH</b> (tested type) <ul style="list-style-type: none"> <li>power classes 440 - 460 W (96 cells)</li> <li>glass package (2.5 + 2.5 mm)</li> <li>cells (mono / half-cut)</li> <li>frame color (silver or black)</li> <li>backside glazing (white grid)</li> <li>encapsulation color (transparent)</li> <li>frame thickness (35 mm)</li> <li>maximum system voltage (1500 V<sub>DC</sub>)</li> <li>dimension (L/W) (1762/1134 mm)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li><b>CHSM48RN(DH)(BLH)/F-BH</b> <ul style="list-style-type: none"> <li>power classes 435 - 455 W (96 cells)</li> <li>glass package (2.5 + 2.5 mm)</li> <li>cells (mono / half-cut)</li> <li>frame color (black)</li> <li>backside glazing (black grid)</li> <li>encapsulation color (transparent)</li> <li>frame thickness (35 mm)</li> <li>maximum system voltage (1500 V<sub>DC</sub>)</li> <li>dimension (L/W) (1762/1134 mm)</li> </ul> </li> </ul> |
| The recommendation “ <b>HW4</b> ” is applicable to the various power ranges of above listed main types and endings.                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



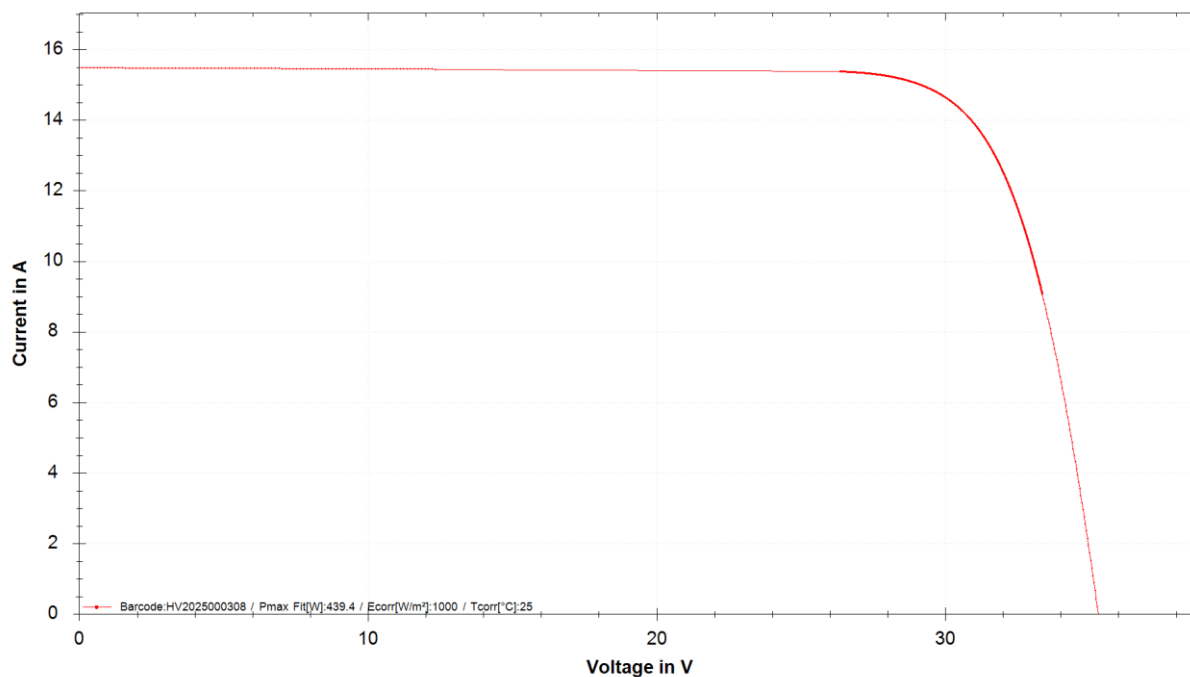
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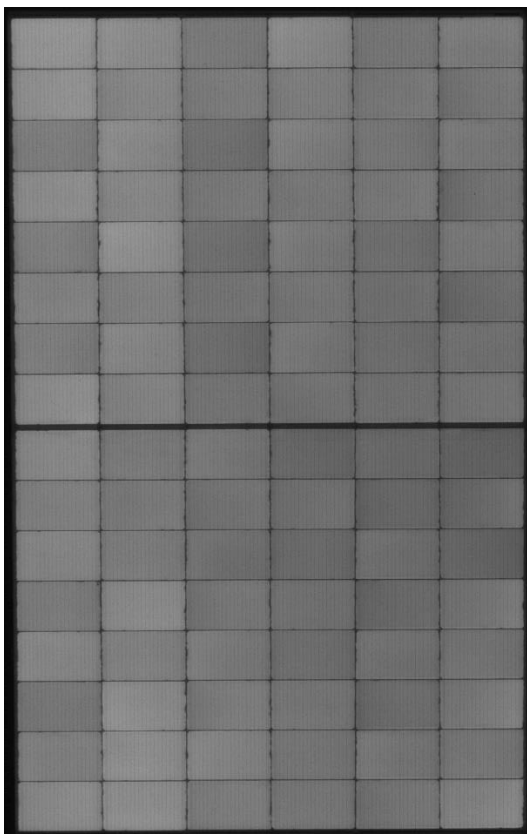
| Absatz<br>Clause | Anforderungen - Prüfungen /<br>Requirements - Tests | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
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- Annex: Additional information

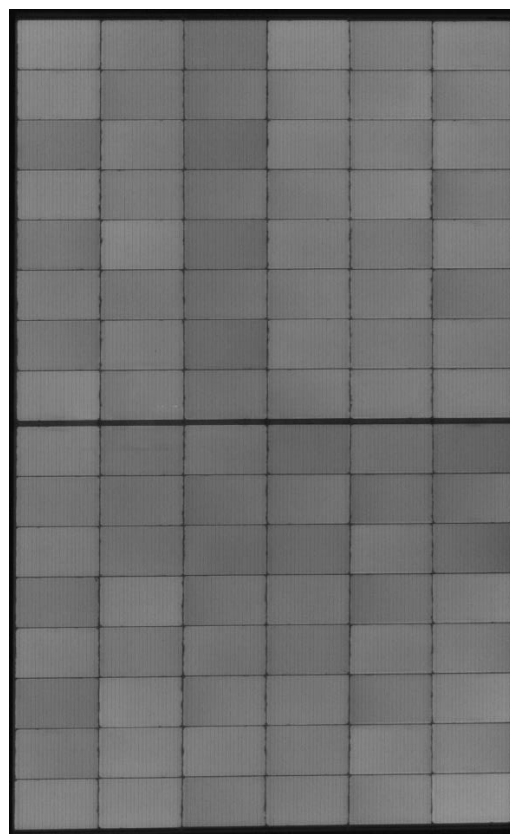
IV-curve and Electroluminescence image - for 40 mm Hail Impact (final)



initial



final



Supplementary information: -

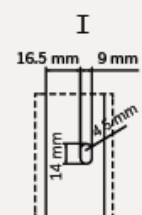
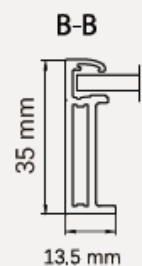
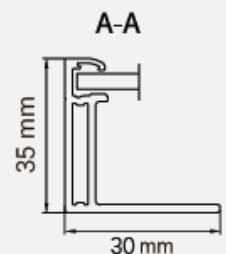
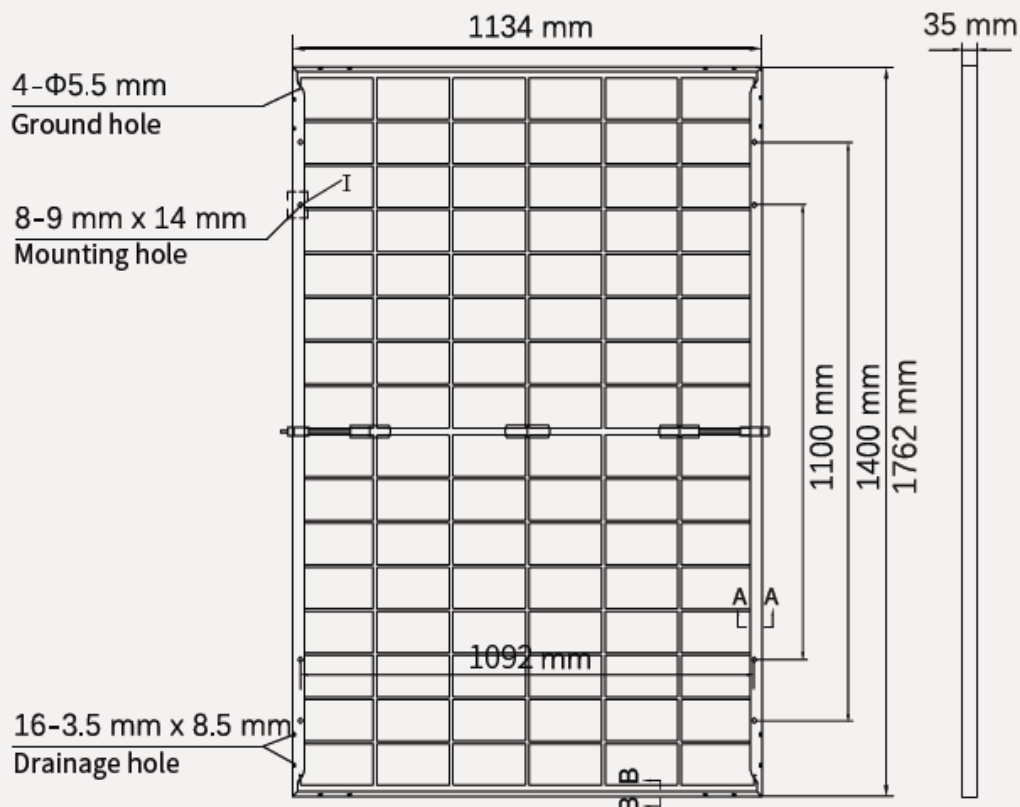
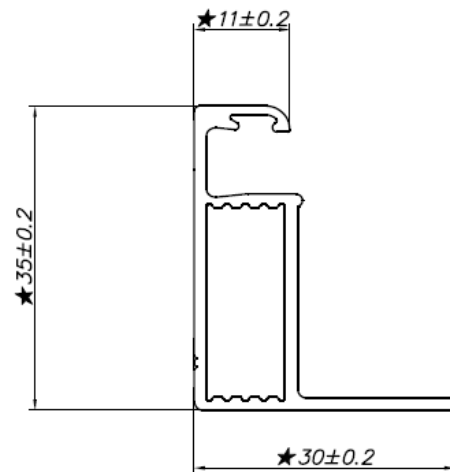
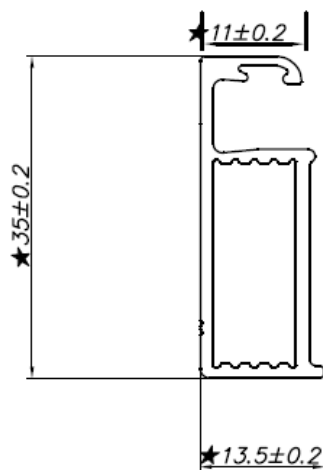
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- Annex: Additional information

Frame - Extract of drawing and datasheet



Supplementary information: -

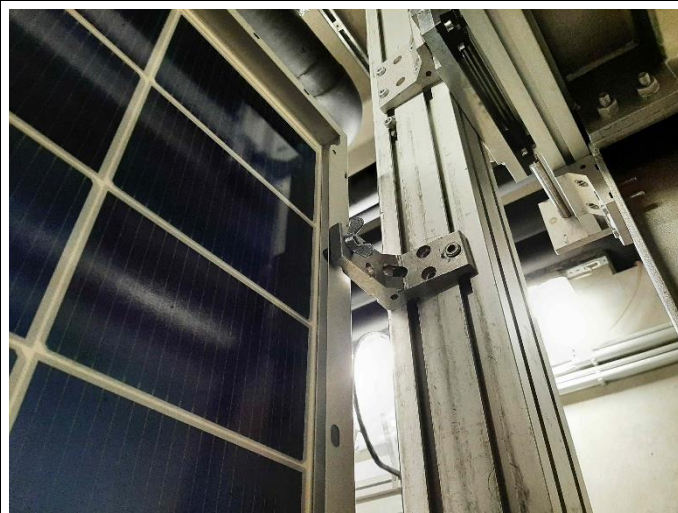
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|   |                                       |  |  |
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| - | Annex: Additional photo documentation |  |  |
|---|---------------------------------------|--|--|

Test Set-up (example)





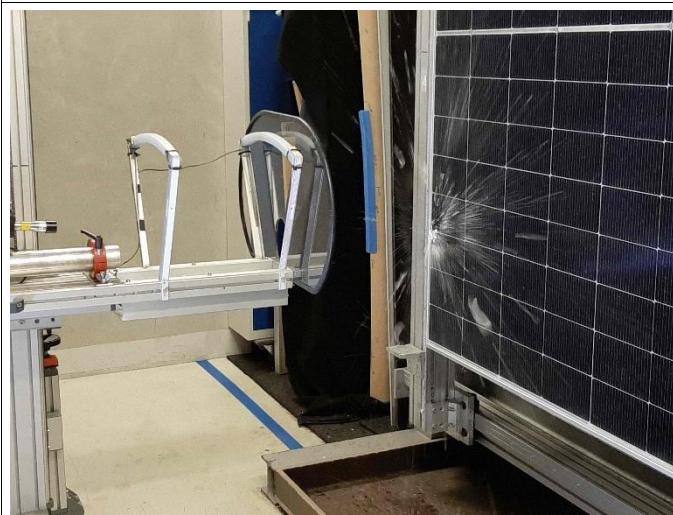
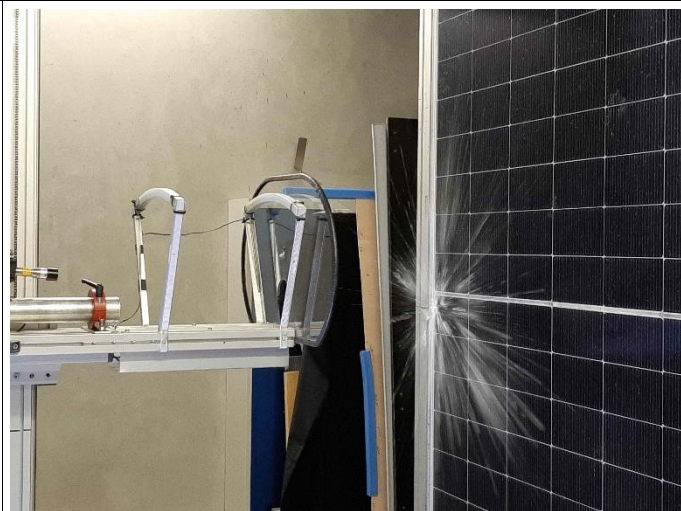
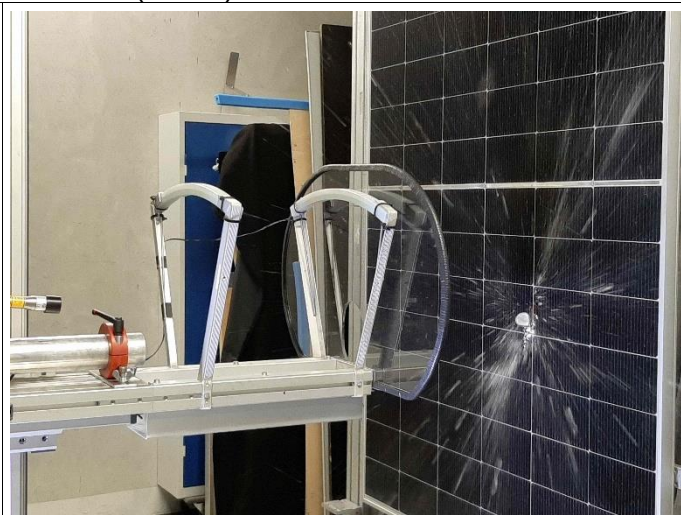
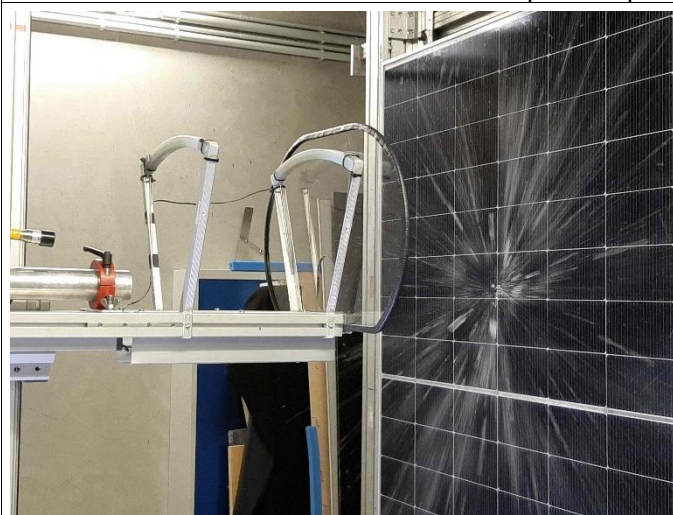
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| - | Annex: Additional photo documentation |  |  |
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Example of Impacts on Module (40 mm)





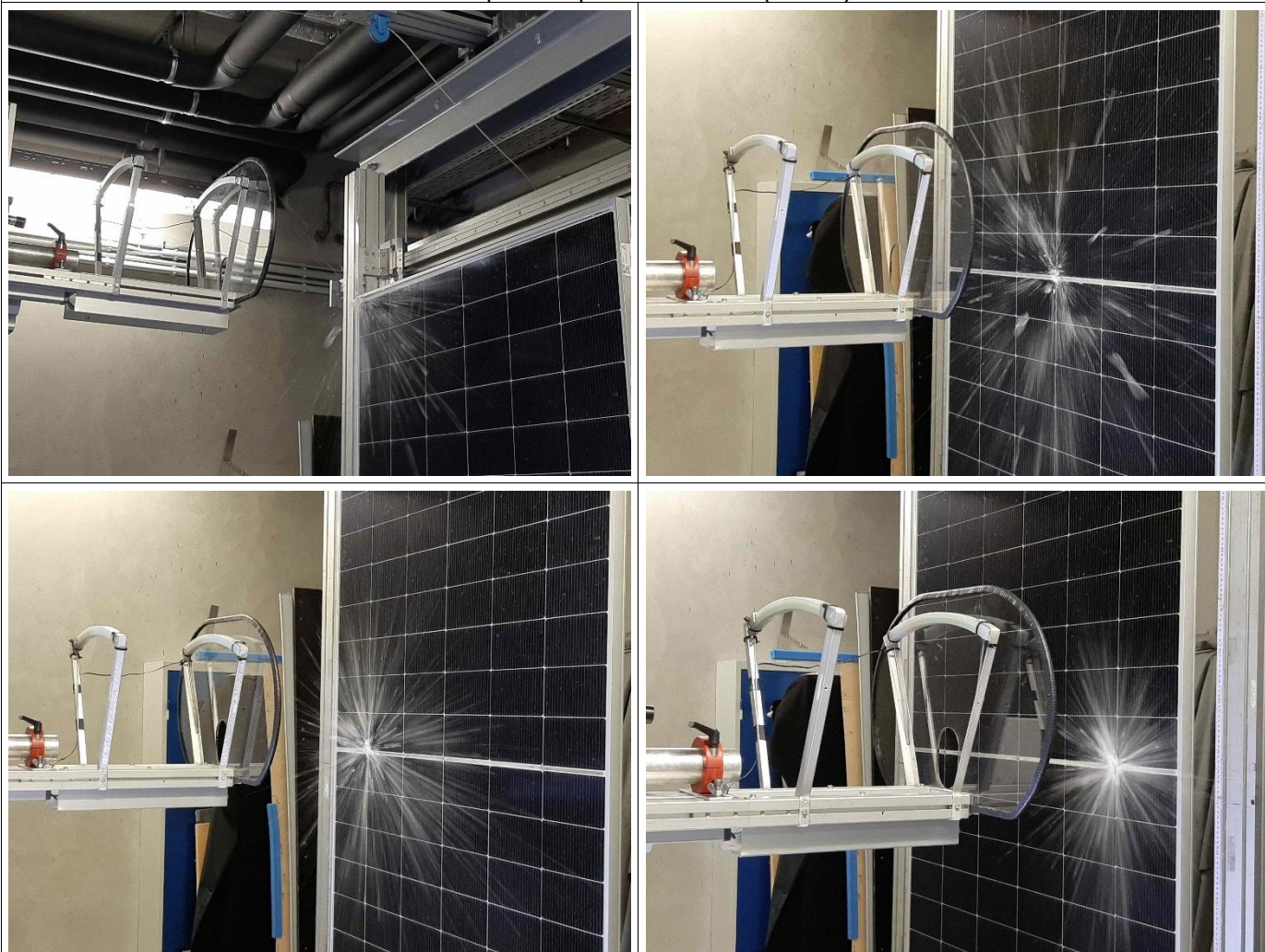
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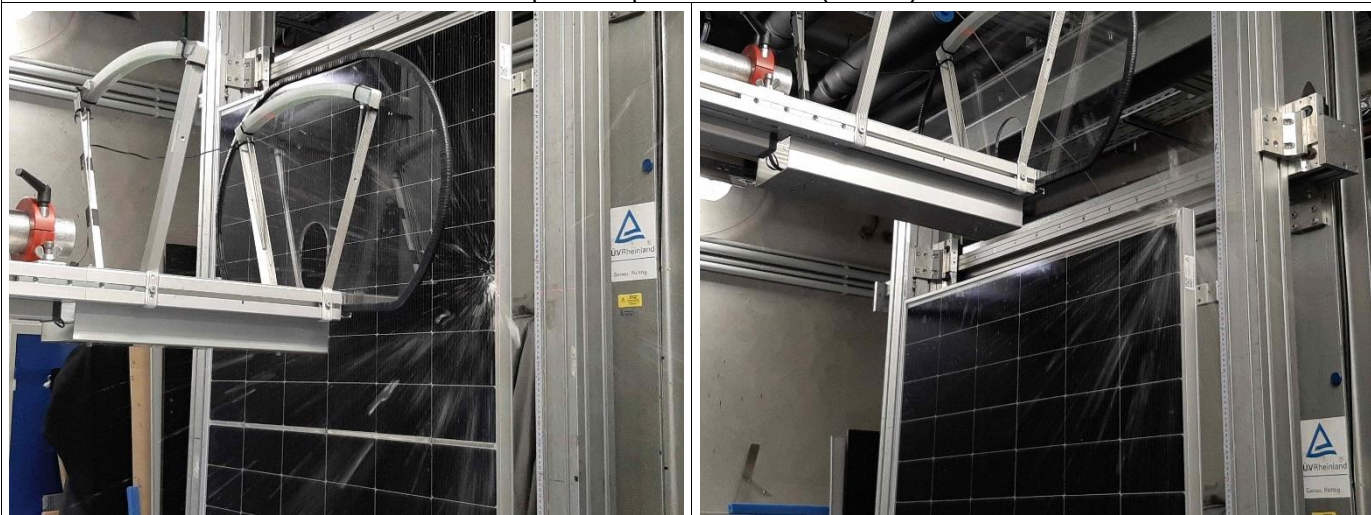
| Absatz<br>Clause | Anforderungen - Prüfungen /<br>Requirements - Tests | Messergebnisse – Bemerkungen/<br>Measuring results - Remarks | Ergebnis<br>Result |
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| - | Annex: Additional photo documentation |  |  |
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Example of Impacts on Module (40 mm)



Example of Impacts on Frame (40 mm)





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- - - End of report - - -