

Test Report

REPORT NUMBER:
208405



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Page 1 of 14
Init: MMH
Order No.: 208405
Appendix: 3

Assignor: CM Solar ApS
Brandhøjgårdsvej 108
2640 hedehusene.

Item: Model: CM Solar – SUNSLATE
Material: Monocrystalline
Appearance: Dark and blank
Dimensions: 1210 x 600 x 5 mm (L x W x T)

Sampling: The test material was forwarded by client and received at the Danish Technological Institute in January 2024.

Period: The test took place from 26-10-2023 till 22-01-2025.

Method: **EAD 090062-01-0404** Kits for external wall cladding mechanically fixed
- Test 2.2.9 – Annex E Wind load resistance
IEC-61215-2:2021 Crystalline silicon terrestrial photovoltaic (PV) modules
- Design qualification and type approval.
- MQT 16: Static mechanical load test
- MQT 17: Hail test

Test result: The specimen successfully passed all three tests without significant mechanical damage. The test results can be found on page 6.

Remarks: No measurements acc. to MQT 01 & MQT 15 were preformed.

Terms: This test was conducted in accordance with international requirements (ISO/IEC 17025:2017) and in accordance with the General Terms and Conditions of Danish Technological Institute. The test results solely apply to the tested item. This test report may be quoted in extract only if Danish Technological Institute has granted its written consent.

Signature: This document is only valid with a digital signature from Danish Technological Institute. The date of issue appears from the digital signature.

Mads B. Hansen
Product leader, Engineering



DIGITALLY SIGNED DOCUMENT

30 June 2026

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Introduction

This report examines the results of mechanical tests performed on a glass roof and slate system. The purpose of these tests was to evaluate the mechanical integrity of the materials under various conditions. The testing included a wind load test of the roofing system, conducted in accordance with EAD 090062-01-0404, section 2.0.9, as well as a snow load test applying a pressure of 5400 Pa, performed in compliance with IEC 61215-2 MQT 16. Additionally, a hail impact test was carried out in accordance with IEC 61215-2 MQT 17.

It is important to note that the evaluation focuses solely on the mechanical requirements of the materials. The electrical properties and performance of the solar cells themselves were not measured or assessed as part of this study.



Laboratory tests

Wind Load Resistance

A test frame with dimensions of 2.0m × 1.4 m was assembled with solar panels and slates mounted by the client. The frame was placed in a wind generator with a maximum capacity of 6500 m³/h or 6500 Pa, whichever limit was reached first. The frame was positioned to simulate suction on the wall cladding system. See photos in Appendix A, figure 1 and 2.

A program created according to the description in the EAD, Figure E.1.2, was initiated. See Table 1.

Table 1 - Wind load steps end reactions

Suction [Pa]	Deformation [mm]	Permanent deformation [mm]	Reaction
300	1,6	0	
300	1,5	0,19	
500	2,5	0,33	
1000	5,6	0,66	
1200	7,1	0,84	
1400	8,3	1,00	
1600	9,6	1,19	
1800	11,4	1,40	
2000	13,0	1,46	
2200	14,2	1,58	
2400	15,1	1,61	
2600	16,6	1,67	
2800	17,8	1,67	
3000	19,1	-	≥6500 m ³ /h

The maximum pressure reached before the maximum flow was 3000 Pa, corresponding to a wind speed of 70 m/s on the opposite vertical face of the building. This wind speed corresponds to a Category 5 hurricane.

Result

A maximum deformation of 19.1 mm was observed, but no mechanical failures were detected during the testing.



Snow Load (Static mechanical load test), MQT 16

The purpose of this test was to determine the ability of the module to withstand a minimum static load. The minimum static load for this test is 5400 Pa or 550 kg/m².

A test frame with dimensions of 2.0m×1.4m was assembled with solar panels and slates mounted by the client. The frame was positioned horizontally on a test rig. Additionally, a wooden frame with dimensions of 1.37m×0.86m was constructed. This wooden frame was not placed directly on top of the solar panels but rested along the test frames boundaries. The purpose of the smaller wooden frame was solely to define and control the static load area.

Inside the small wooden frame, layers of sandbags were placed to simulate part of the load. The remaining load was applied using a weighted pallet, which was put onto the structure via a weight distribution board and lifted with a forklift. The total load that was applied to the test area was:

$$1.37\text{m} \times 0.86 \text{ m} \times 550 \text{ kg/m}^2 = 648 \text{ kg.}$$

The test load was maintained for one hour and repeated for a total of three times. See photos in Appendix A, figure 5-8.

Result

No visible signs of failure or breakage were observed on the test object.



Hail testing, MQT 17

The purpose of this test is to verify that the module is capable of withstanding the impact of hail in accordance with the IEC 61215-2.

One solar panel was mounted in a vertical test frame. Talcum powder was applied to the surface of the solar panel to help the tester better identify the impact points. The diameter, mass, and velocity of the hail were as described in Table 2. However, instead of ice balls, wooden balls were used. The impact locations on the solar panel were marked in accordance with Table 3.

Table 2 - Hail test parameters

Diameter [mm]	Mass [g]	Test velocity [m/s]
25	7.53	23.0

Impact Locations

Table 3 - Impact locations

Shot No.	Location	Comment
1	Any corner of the module window, not more than one radius of ice-ball from the module edge.	No damage was observed.
2	Any edge of the module, not more than one radius of ice-ball from the module edge.	No damage was observed.
3, 4	Over the circuit near interconnects (i.e. cell interconnects and bus ribbons).	No damage was observed.
5, 6	Over edges of the circuit (e.g. individual cells)	No damage was observed.
7, 8	On the module window, not more than half diameter of ice-ball from one of the points at which the module is mounted to the supporting structure.	No damage was observed.
9, 10	On the module window, at points farthest from the points selected above.	No damage was observed.

Results

No visible damage was observed after the impact test.



Summary

Property	Performance
EAD 090062-01-0404, 2.2.9 – Annex E	The test specimen endured a wind suction pressure of 3000 Pa without any mechanical failures or breakage, but with a deformation of 19.2 mm.
IEC-61215-2:2021, MQT 16	No visible signs of failure or breakage were observed on the test object.
IEC-61215-2:2021, MQT 17	No visible damage was observed on the solar panels.



Appendix A: Photos



Figure 1 – Front of the test specimen mounted in the wind pressure test rig.



Figure 2 - The displacement sensor was mounted at the center of the test specimen.



Figure 3 – Backside of test specimen



Figure 4 – Backside of test specimen, electric wiring.



Figure 5 – Test setup for snow load.



Figure 6 – Ekstra test frame to control the loading area.

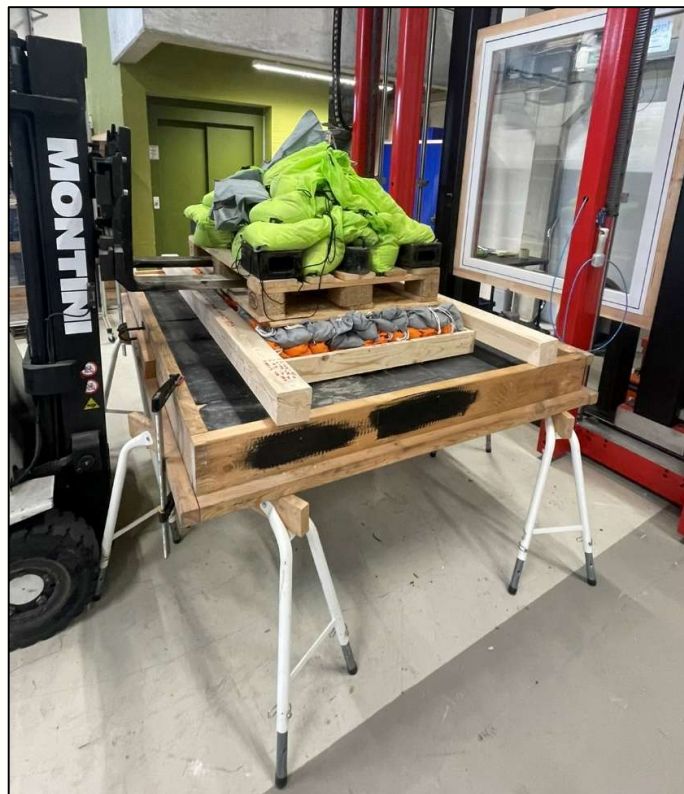


Figure 7 – Snow load applied with sandbags.

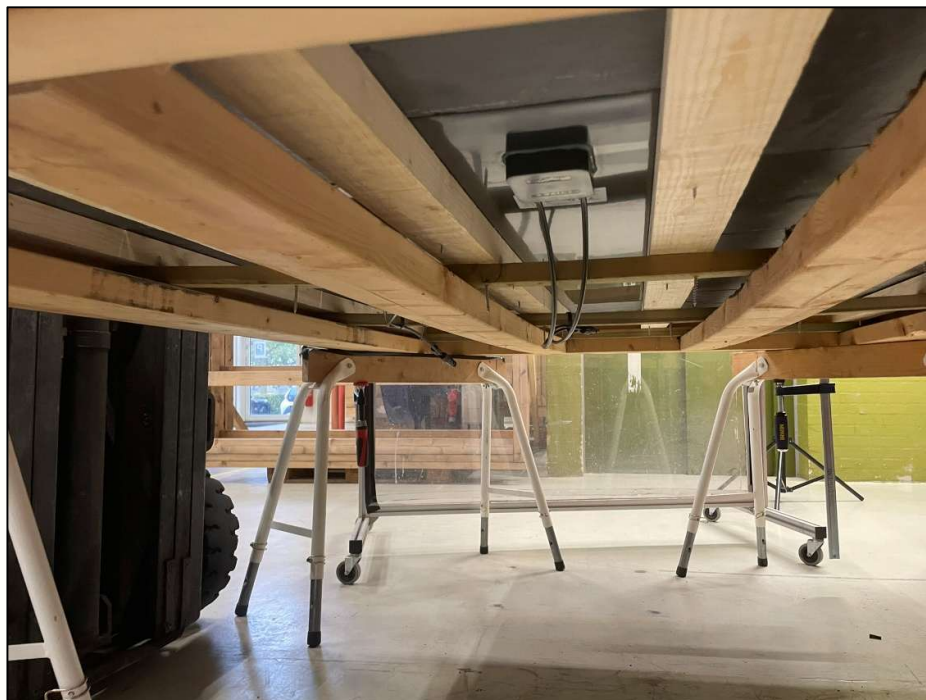


Figure 8 – Deformation of the test specimen during the snow load.



Figure 9 – Test apparatus and photoelectric velocity measuring system.



Figure 10 – Talcum used to better specify the impact location.

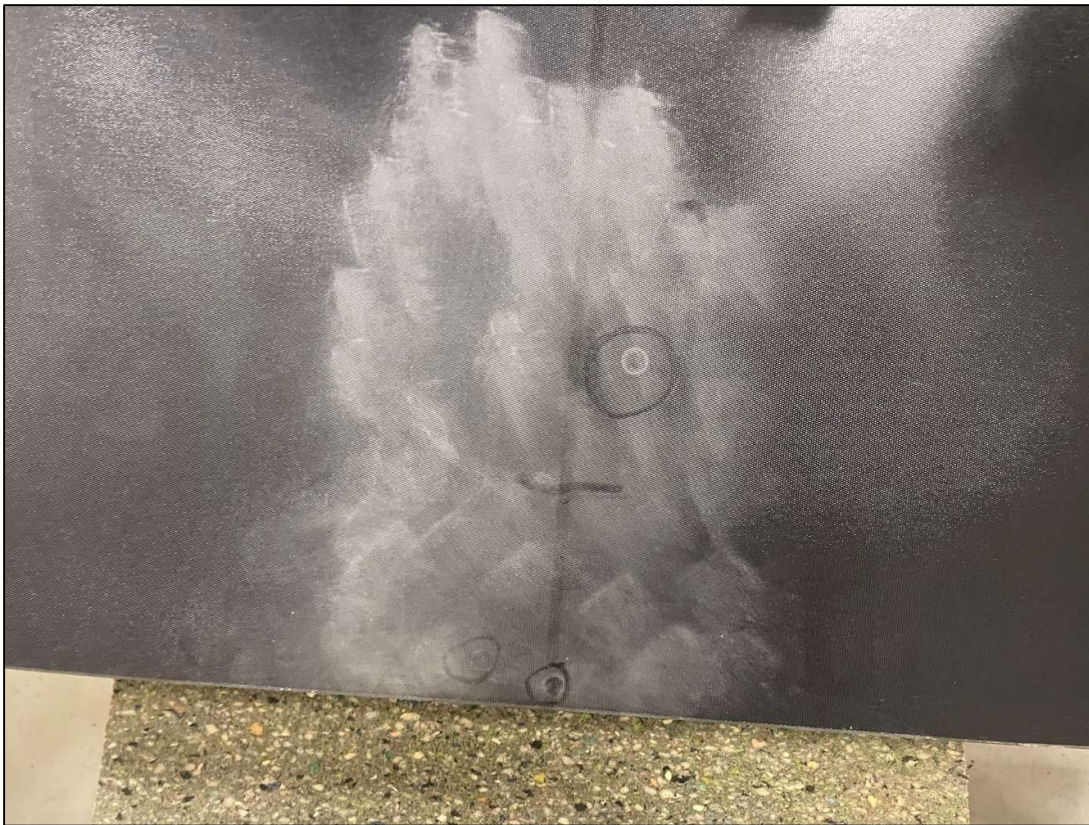


Figure 11 – Impact locations.



Appendix B: Client information

- Montagevejledning
- Tegningsmateriale osv.
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Mekaniske specifikationer					
Modul mål	mm	300 x 600 x 5	603 x 600 x 5	906 x 600 x 5	1210 x 600 x 5
Dæk mål	m ²	0,08	0,16	0,24	0,33
Modul vægt	kg	2	4,1	6,2	8,0
Kabel (2 stk, 4 mm ²)	mm	500	500	900	900
Vægt pr. m ²	kg	25	25	25	25



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Appendix C

The general conditions pertaining to assignments accepted by Danish Technological Institute shall apply in full to the technical testing or calibration at Danish Technological Institute and to the completion of test reports or calibration certificates within the relevant field.