

Test report – EAD 090062

Solartag ApS -

BIPVT-system



Title:

Test report – EAD 090062
Solartag ApS - BIPVT-system


Client:

Solartag ApS
Kappelkærvej 5
DK-4660 Store Heddinge

Prepared by:

Danish Technological Institute
Kongsvang Allé 29
DK-8000 Aarhus C
Tel. +45 7220 2000
Building and Construction

Quality Assurance:



Responsible: Morten Jul Laegaard, tel. +45 7220 1132, mjld@dti.dk



Approved by: Per Dalgaard, tel. +45 7220 1149, pd@dti.dk

Reference No.: 157480

Version No.: 1

Date: 2023-06-20

The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. It is not allowed to mention or refer to DTI or DTI's employees for advertising or marketing purposes unless DTI has granted its written consent in each case.

Table of Contents

- 1. Introduction 4
- 2. Scope..... 4
- 3. Description 4
- 4. Received information 4
- 5. Laboratory tests 4
 - 5.1 Wind load resistance 4
 - 5.2 Resistance to horizontal points load 5
 - 5.3 Impact resistance 5
- 6. Summary 7
- 7. Annexes 7

1. Introduction

As agreed with Solartag ApS, Anders Fog Vogelius and Jens Romundstad, Danish Technological Institute has conducted test on a BIPVT-system (Building-Integrated PhotoVoltaic Thermal System), mechanically fixed. The testing is done according to EAD 090062-00-0404, published July 2018, even though all parties are aware that roof systems are not included in the scope.

We use this method for the following reasons:

- There is no direct test setup for this kind of products,
- The testing is repeatable,
- The test is more onerous on a vertical mounted system than on an inclined,
- The system can now also be used as wall-cladding.

The tests were made in June 2023 by Per Dalgaard and Morten Jul Laegaard.

2. Scope

According to the test program from the EAD, the following tests have been conducted:

- Clause 2.2.9 and Annex E – Wind load resistance.
- Clause 2.2.10 and Annex F – Resistance to horizontal points load.
- Clause 2.2.11 and Annex G – Impact resistance.

3. Description

See the appendix 2.

4. Received information

The client has provided drawings of the system and information on the material used.
See the appendix 2.

5. Laboratory tests

5.1 Wind load resistance

A test-frame with an area of 2,0 x 1,4 m covered with solar panels and metal sheets that were mounted according to the instructions by the client.

The frame was placed in a wind-generator with a maximum capacity of 6500 m³/h or 6500 Pa, whichever is reached first.

The frame was positioned to emulate suction on the wall cladding system.

A program made according to the description in the EAD, Figure E.2, were started.

During each step of load the deflection in the centre of the test frame were measured.

Suction [Pa]	Deflection [mm]	Observations
300	<3	N.O.
300	<3	N.O.
500	<5	N.O.
1000	-	Volume above 6500 m ³ /h
1200	-	
1400	-	
1600	-	
1800	-	
2000	-	
2200	-	
2400	-	

N.O.: No Observations = No breakage, no permanent deflection, no falling of detached elements, no failure or detachment of the subframe.

The maximum pressure reached before the maximum flow, was 750 Pa corresponding to a wind speed of 35 m/s on the opposite vertical face of the building.

5.2 Resistance to horizontal points load

A test-frame with an area of 2,0 x 1,4 m covered with solar panels and metal sheets that were mounted according to the instructions by the client.

The frame was placed horizontally.

A 500 mm bar with two squares of 25 x 25 mm positioned 440 mm apart was placed on the cladding on the supposedly weakest point, which is in the centre and on an edge of a solar panel.

A load of 500 N was imposed on the bar for 1 minute and the reaction observed.

No failure occurred.

5.3 Impact resistance

A test-frame with an area of 2,0 x 1,4 m covered with solar panels and metal sheets that were mounted according to the instructions by the client.

The frame was placed horizontally, and all impacts were done on the solar panels.

All the described impact situations from the EAD, Table G.1, were imposed on the system.

Impact	Force	No. of impact	Reaction
H1	1 J = 0,5 kg, height 0,20 m	1	None.
		2	None.
		3	None.
H2	3 J = 0,5 kg, height 0,61 m	1	None.
		2	None.
		3	None.
H3	10 J = 1,0 kg, height 1,02 m	1	None.
		2	None.
		3	None.
S1	10 J = 3,0 kg, height 0,34 m	1	None.
		2	None.
		3	None.
S2	60 J = 3,0 kg, height 2,04 m	1	None.
		2	None.
		3	None.
S3	300 J = 50 kg, height 0,61 m		Breakage in an undangerous manner (pieces < 5 g each)
S4	400 J = 50 kg, height 0,82 m		Breakage in an undangerous manner (pieces < 5 g each)

"Hx" is hard impact (steel-ball)

"Sx" is soft impact (sandbag)

6. Summary

Property	Performance
EAD Clause 2.2.9 and Annex E – Wind load resistance.	750 Pa reached without failures. Maximum deformation < 7 mm. Airflow above 6500 m ³ /h.
EAD Clause 2.2.10 and Annex F – Resistance to horizontal points load.	Passed.
EAD Clause 2.2.11 and Annex G – Impact resistance.	Category I.

7. Annexes

Annex 1: Photos

Annex 2: Client information

Annex 1: Photos



Photo 1 – Test frame during point load



Photo 2 – Test frame after all impacts

Annex 2: Client information



SOLARTAG

Aktivt tag med æstetik og bæredygtighed

Solartage er tage med usynlige indbyggede solceller. Taget producerer strøm hvor den forbruges uden synligvis forskel til konventionelle tage med en stilren og mat overflade i glans 7 med minimalt genskin.

Solartag T-ROOF™ tagplader

Størrelse <small>(dæk mål)</small> 38-30 x 116 cm	Effekt 71 Wp
Materiale Skifertag af hærdet glas	Integration Usynlige solceller
Brudstyrke Meget høj brudstyrke	Design T-ROOF™
Garanti (tag) 40 års produktgaranti	Garanti (solceller) 25 års ydelsesgaranti

T-ROOF™

 Positivt aftryk +80 års levetid	 Et aktivt tag For dig & miljøet	 Mobil app Overvåg effekt
--	--	---

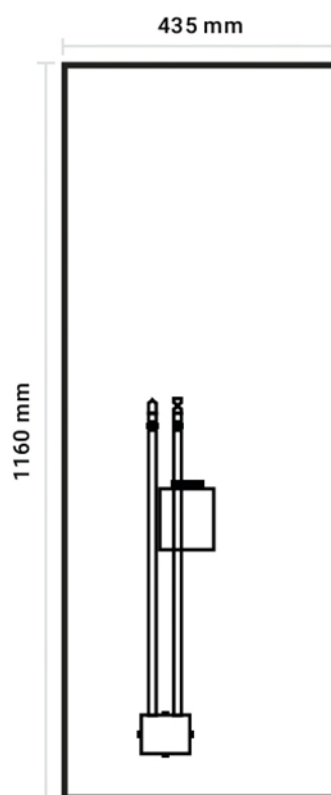
Solartag.eu **info@solartag.eu** **(+45) 70 40 08 37**

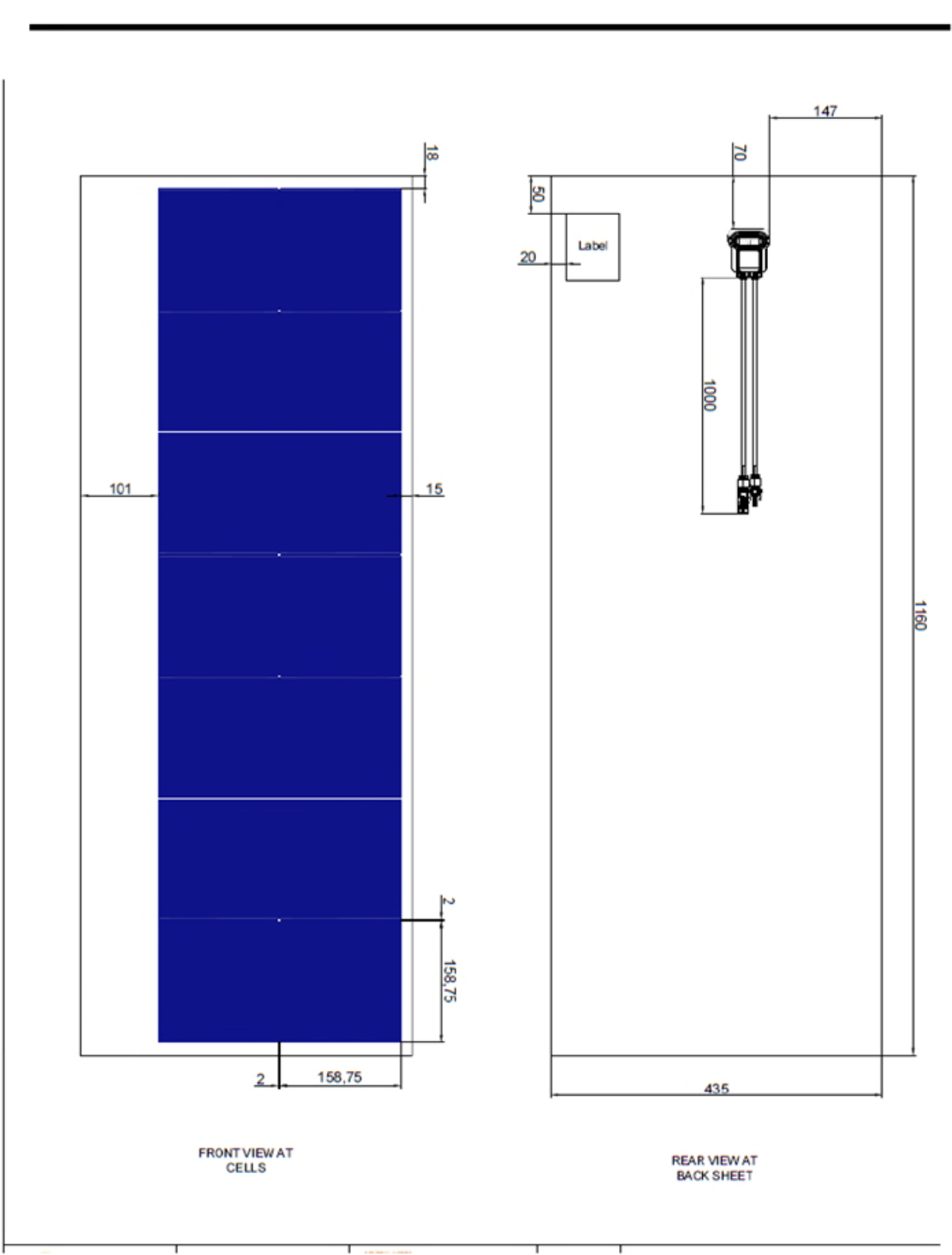
Elektriske specifikationer		STC: Indstråling v/1.000 W/m ² - AM1,5 - Modultemperatur 25°C				
Modultype	P _{mpp} [W]	I _{mpp} [A]	V _{mpp} [V]	I _{sc} [A]	V _{oc} [V]	Tolerance
TRoof GB 1160x435 2x7 MFC	71	8,6	8,2	9,17	9,6	+/- 5%

Mekaniske specifikationer	
Modulmål (mm)	5,5x435x1160, Samleboks: 14,5
Celletype	Sorte monokrystallinske PERC
Cellematrix	14 celler, 2x7
Modulopbygning	Glas/EVA/celler/EVA/bagfolie
Glashøjde	4 mm
Samleboks klassificering	IP67
Kabler	700 mm, 4 mm ²
Forbindelser	MC4 kompatible

Øvrige specifikationer	
Driftstemperatur	+40°C-50°C
Maksimal systemspænding	1.000 V
Sikringsstørrelse, seriel	15 A
Antal dioder	1

Temperaturkoefficienter	
I _{sc}	+0,048%/°C
V _{oc}	- 0,31%/°C
P _{mpp}	-0,38 %/°C





Module Layout

Electrical data (at STC*)	
Rated power P _{mpp} , Wp	71
Power tolerance, %	+/-5%
Rated voltage V _{mpp} , V	8,2
Rated current I _{mpp} , A	8,6
Open circuit voltage V _{oc} , V	9,6
Short circuit current I _{sc} , A	9,17
Solar cells	
Cell size	158.75 x 158.75 mm
Number of cells	14
Cell type	Monocrystalline PERC 5BB
Temperature coefficients, %/°C	
Temperature coefficient P	-0,38
Temperature coefficient I _{sc}	+0,048
Temperature coefficient V _{oc}	-0,31
Other Specifications	
Module design	Full black (Seamless)
Size	1160 x 435 x 5,5 mm
Glass	4 mm, Satinated, tempered
JBox	2 rail with diode with 2 x 1 m cables & MC4 compatible connectors

*STC – Standard Testing Conditions (1000 W/m², 25°C, A_m=1,5)

Warranty: 10 year material and workmanship, 25 year performance (80% of initial power)

