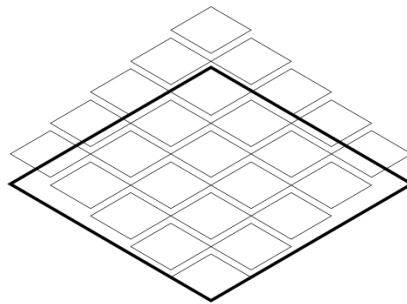


Safety & Installation (Europe)

Product: Biosphere Solar Blaze
Module

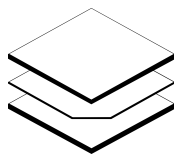
Contents of this manual are subject to change without notice.

For the latest version please refer to: <https://wikifactory.com/@biosphere-solar/solar-blaze-module>



Biosphere Solar BV

<https://biosphere.solar>



1 Introduction

How amazing that you are planning on installing the world's first repairable solar module. This product will enable the full potential of the circular economy. The name Blaze is inspired by the term trailblazer, an imperfect yet daring move forward into the unknown. As it is still a prototype, it is important to keep the system requirements and warnings in mind **carefully**.

Parts 1 and 2 are **essential** reading for an installer or user. The parts thereafter are provided to elaborate on the module design, manufacturing and compliance.

1.1 Disclaimer of Liability

The installation techniques, handling, and use of this product are beyond company control. Therefore, Biosphere Solar assumes no responsibility for loss, damage or expense resulting from improper installation, handling, or use.



A photovoltaic module is an electrical product. There is a risk of electric shock in the event of incorrect handling and installation. All work may only be carried out by qualified specialist personnel.

1.2 Intended use

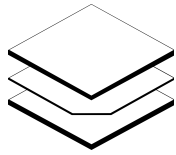
This installation manual is valid in Europe, as the main form of pre-compliance testing and certification is done in accordance with the CE Low Voltage Directive (LVD). The instructions provide information on how to handle crystalline PV modules safely, as well as on installation, assembly, cabling and maintenance.

1.3 Product Serial Identification

Serial number: XXX-YYY

Where:

XXX - refers to code for pilot project



YY - refers to batch number

ZZ - refers to number of product within the batch

2 Electrical planning, design and wiring

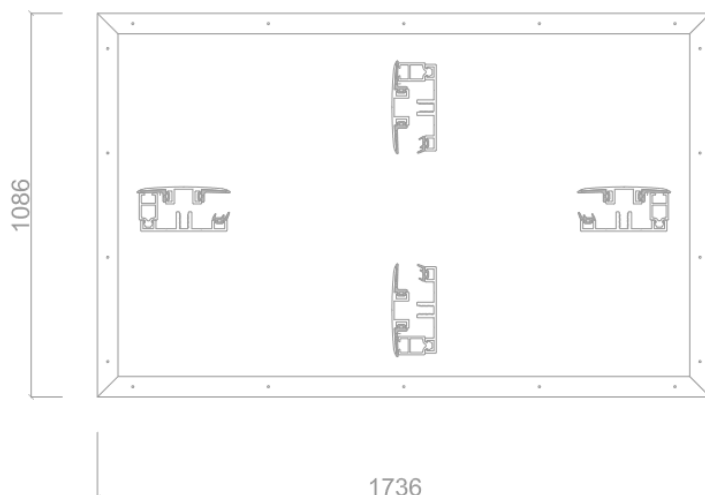
2.1 Scope of application

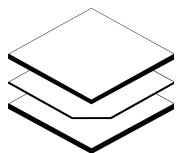
The PV modules are suitable for the following applications:

- Operating ambient temperature -10°C to $+45^{\circ}\text{C}$
- Module operating temperature -10°C to $+85^{\circ}\text{C}$
- Pressure loads of max. $2400\text{ Pa} = 400\text{kg/panel}$

2.2 Product Description

The Biosphere Solar Blaze Module is a prototype solar module, developed by Biosphere Solar B.V. and first produced in October 2023. It is electrically compatible with conventional solar systems. Below, the dimensions are shown and an intersection of the aluminium frame.



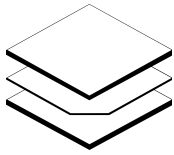


2.3 Electrical Planning

For safe operation, the PV system must be limited to the following specifications:

Maximum Voltage (V)	150
Maximum number of panels per string	6
Maximum number of panels per system	16
Minimum sky view factor (SVF)	0.7

- Biosphere Solar modules have two bypass diodes, one in each junction box that ensure protection and improved performance in the shade.
- It is advisable to only connect PV modules of the same module line and performance class.
- When designing the photovoltaic system (PV system) and its components, a safety factor of 1.25 for the electrical variables (VOC, ISC) must be observed, as a module can supply a higher current and/or higher voltage than under standardised test conditions due to special ambient conditions.
- Identical connection plugs (same manufacturer, same plug types) must be used for the extension and connection cables.
- Shading must be avoided in order to achieve optimal solar radiation and maximise yield.
- The individual system components (PV modules, fuses, inverters, etc.) must be coordinated according to their data sheets.



The following safety instructions must be observed at all times:

- Work may only be carried out by qualified personnel.
- The applicable safety instructions and regulations must be observed.
- Even with low lighting, the open circuit voltage (VOC) is applied.
- Do not touch the PV modules with bare hands.
- Do not wear metallic jewellery when working with the PV modules.
- Use dry and insulated tools and insulating gloves.
- The PV modules must be dry, clean and free of damage during installation.
- Do not modify the PV modules.
- Never connect or disconnect PV modules under load. There is a risk of electric arc.

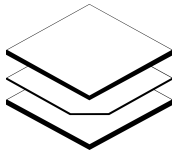
2.4 Transport & Handling

Biosphere Solar Blaze **does not contain lamination**. This means that it is relatively sensitive to shaking and shocks.



During transport and handling, keep the panel with the cells facing up **as much as physically possible**. This prevents unwanted shifting of the cells. Misconduct can lead to panel dysfunction.

- The aluminium profile has drainage holes on one of the long ends. Make sure these are facing down
- The Biosphere Solar Blaze modules are not suitable for individual handling. Make sure at least two people are carrying the module.
- Module pallets should only be loaded and moved using suitable forklifts.
- The forklift truck must have a minimum fork length of 1.20 m, a fork length of 1.75 m is recommended. The forks must be selected and placed so that they do not come into contact with the PV modules under any circumstances.
- Ride over uneven surfaces slowly.



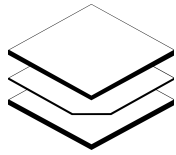
- It is prohibited to handle and carry the module by the cables and junction boxes.
- Climbing on the PV modules and other point loads (e.g. carrying the PV modules by their head or back) is prohibited, as this can lead to irreversible damage to the PV modules.

2.5 Maintenance

- It is recommended to have the system checked regularly (monthly) by an installer. The inspection interval may vary depending on local circumstances/conditions/regulations.
- Check the glass surface, frame and connections for damage.
- Check the electrical components for corrosion and good connection contact.
- After an unusual weather event (storm, hail, a lot of snow, etc.), the modules must be checked for damage.

2.5.1 Cleaning

- Use sufficient water and a soft cloth to clean the PV modules.
- The PV modules must only be cleaned manually.
- Do not use high-pressure cleaners for cleaning.
- Allow the PV modules to cool down before cleaning.
- Never touch glass with bare hands as this may leave fingerprints.
- The use of acids, alkalis, bleach powders and strong bases is not permitted.
- Do not use deionized water for cleaning.
- The use of abrasive cleaning agents such as sanding powder, steel wool, scrapers and steel cleaning equipment is not permitted.
- Care should be taken when cleaning if sand or heavy soiling is present to avoid scratches.
- To remove heavy soiling, use generous amounts of water before wiping the glass surface. Stubborn dirt should be soaked if necessary.
- Carefully remove leaves, snow, ice or other loose dirt with a soft broom.



2.6 Prototype Disclaimer

The solar module is in development. This means that it is designated for testing environments. It also means that pre-compliance testing has been carried out to ensure base-line safe use. This will be elaborated in section Pre-Compliance Testing. The fully certified testing procedure conforming to IEC 61215 and IEC 61730 standards has not been carried out. In accordance with the classification of IEC 61730-2016, this module is Class III. For this class, the following is said concerning safety & insulation: “Based upon the inherently limited electrical output capability of Class III PV modules their use, misuse, and failure are unlikely to result in a risk of electric shock or fire. Based upon these electrical output limitations there are no requirements for construction or insulation beyond functional insulation”.

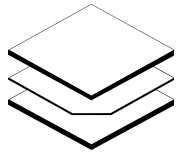
2.7 Conceptual Design

The Biosphere Solar Blaze combines Insulating Glass (IGU) technology with PV module technology. It does not use lamination but instead the cells are kept in place with a spacer made of ABS, that is dimensionally constrained within the module.

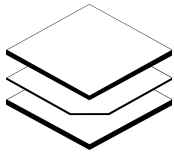
Components

The Bill of Materials is provided below. The more complicated and significant components will be described later in more detail.

Bill of Materials (BOM)									
Part Number	Part name	Category	Description	Main Material Composition	Units	Unit metric	Weight per unit (kg)	Weight Units	Total weight (kg)
F1	Glass	Frame	Two tempered glass plates	Soda-Lime Glass	2	1000x1650x4 plate	10.625	2.55584 1259	27.1558 1338
C1	Bi-facial Perc Cells	Cells	Cells with current collection at the back.	c-Si	32	182x182 M10 cell	0.02	36	0.72



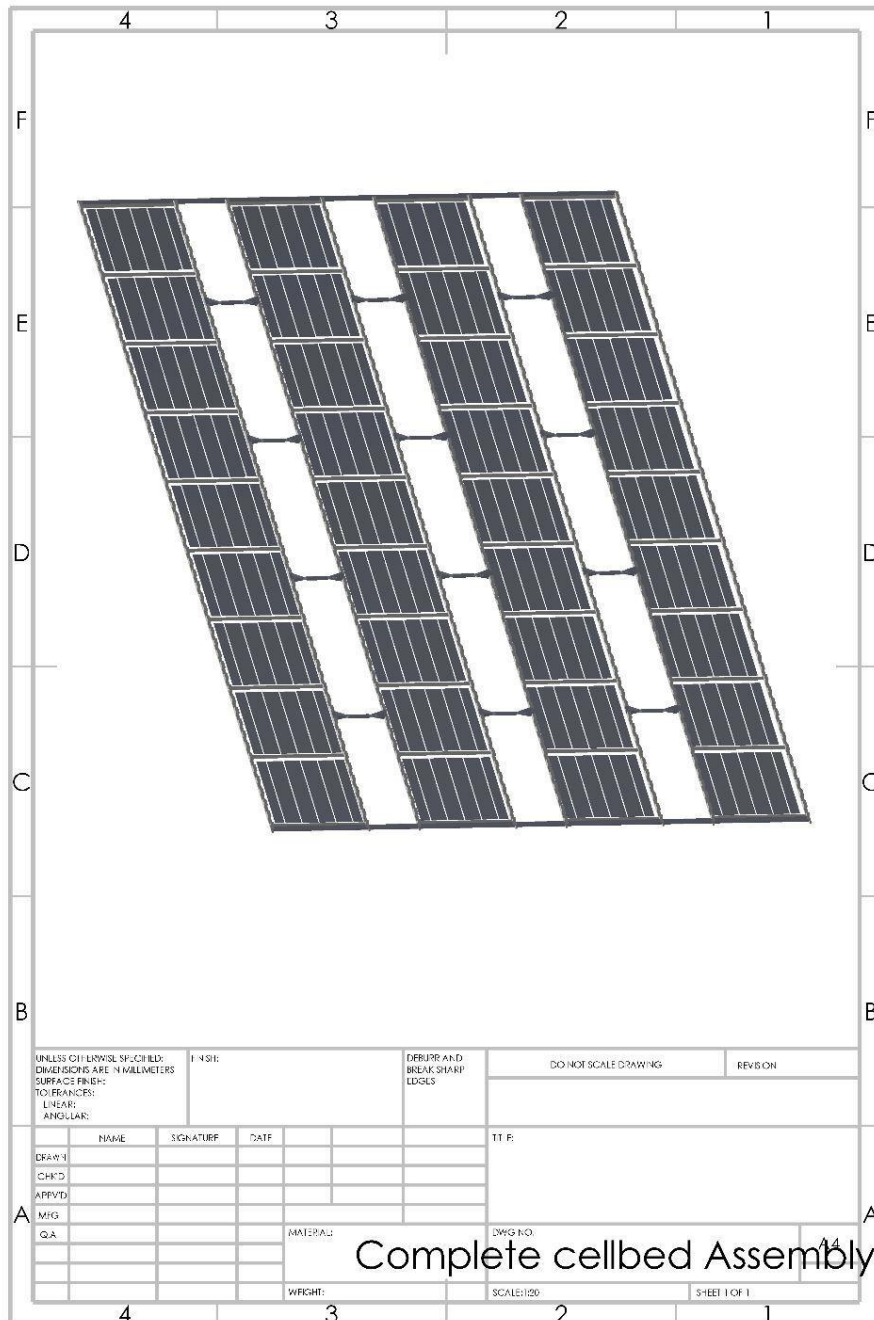
S1	PIB	Encapsulation	Sealant material used in Insulating Glass Unit industry (IGU)	Polyisobutylene	21.2	meters of tape	0.0092	8	0.0736
S2	Silicone Sealant	Encapsulation	Sealant material to protect PIB from weathering	Silicone Other unknown substance	0.1	Standard tube of sealant	0.2	0.125	0.025
S3	IGU Frame	Encapsulation	8mm warm edge spacer	Polymer	5.3	m	0.3	2.555841259	0.7667523777
E1	Tabbing Wire	Electrical	To connect the cells into strings	Tin Flux Copper	28.566	m	0.005	36	0.18
E2	Bus Bar Wire	Electrical	To connect the cell strings	Tin Flux Copper	1.2	m	0.05	0.12	0.006
S3	Silica Gel & Oxy absorber mix	Encapsulation	Absorbs moisture & oxygen (resp)	Silica & Iron (LD)PE (resp)	0.2597	L of powder	0.02	0.02	0.0004
C2	Cell bed spacer	Encapsulation	Keeps cells in place	ABS	4	strings	0.12	4	0.48
C3	Cell bed place holder	Encapsulation	Keeps cell bed spacer in place	ABS	2	place holders	0.02	2	0.04
C4	String Spacer	Encapsulation	Keeps cell bed spacer in place	ABS	12	spacers	0.005	12	0.06
E3	MC4 Connector	Electrical	Connects solar panels	Plastic Polymer Rubber	2	mc4 connector	0.01	2	0.02
E4	Cables	Electrical	Connects solar panels	PVC/PE/PP Copper	2	1m cable	0.09	2	0.18

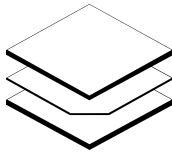


E5	Edge Junction Box	Electrical	Connection box between busbar wire and cables and contains bypass diodes	Polymer Copper wire Rubber Silicon	2	Junction box	0.15	1	0.15
F2	Weather resistant label	Frame	Contains all relevant information conform IEC 61730-1	Paper Adhesive	1	max 25mm height	-	1	
F3	Aluminium profile	Frame	Built around panel for mounting and rigidity	Aluminium	1	1786x1086mm (outer dimensions) frame	6	1	6
								TOTAL	35.85



The cells are kept in place using a cell bed. A render of the cell bed is shown below.



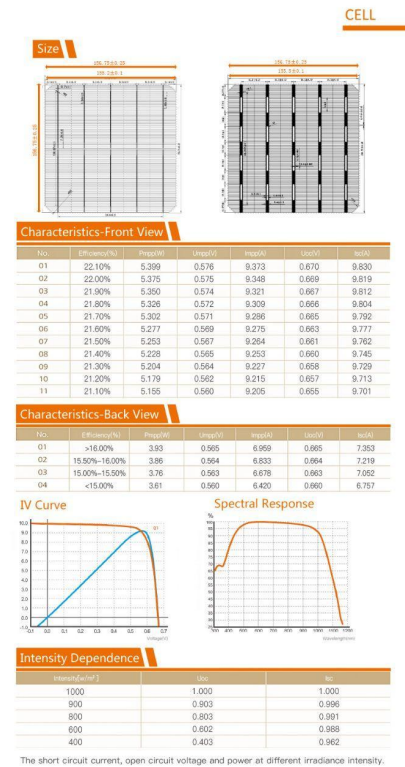
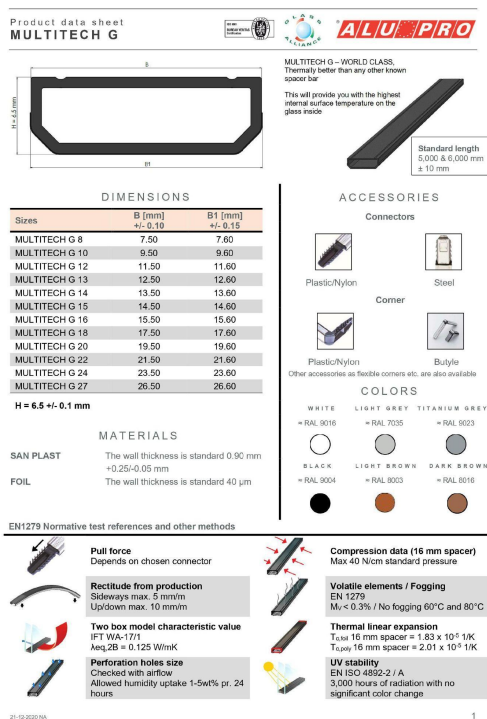


Cells

The cells used in the product are Fullstar MONO PERC Bifacial CELL (5BB). The electronic and mechanical specifications are shown on the right below (source: © 2015 FULLSTAR - ALL RIGHTS RESERVED).

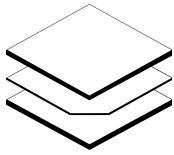
IGU Spacer

The spacer that surrounds the cell bed is shown on the left below. It complies with ISO9001 certification and is CE conformed.

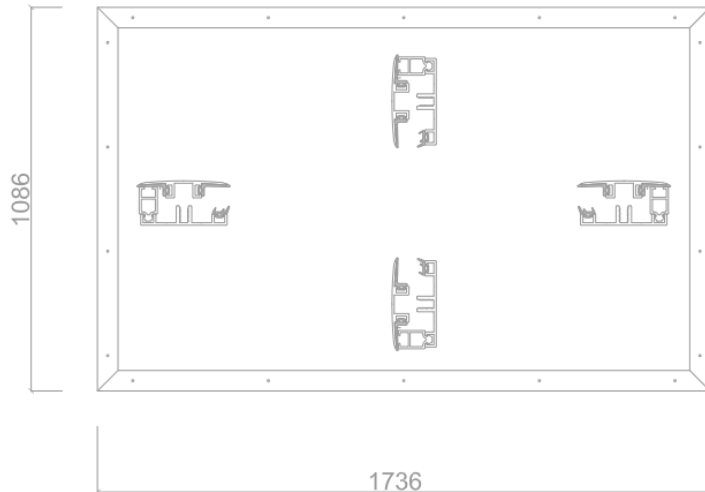


Aluminium profile

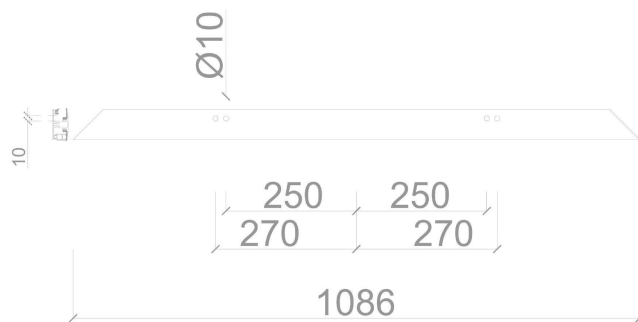
An aluminium profile is clamped onto the module to provide rigidity and enable compatibility with conventional solar mounting systems. The profile is suitable for clamping 16mm stacks, as is the



thickness of the module. An intersection of the profile is shown below.



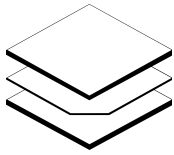
Below it is shown that holes are made for the busbars to pass through the frame. The junction box will be connected directly to the frame.



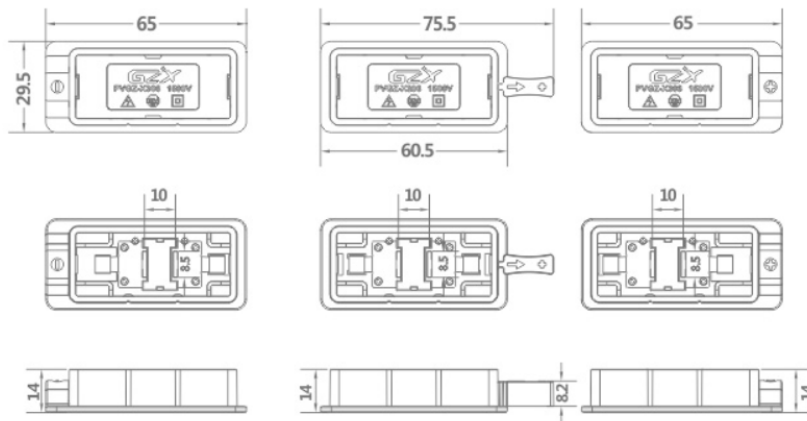
in 1st. onderprofiel van 1086 mm
2 gaten van 10 mm boren!

Junction Box

The junction boxes used are the [GZX306](#). Two boxes are placed on the aluminium profile, so that the busbars can be connected directly to the box. To prevent contact with the profile, the hole is filled with silicone caulk. The junction boxes are adhered to the profile with ???



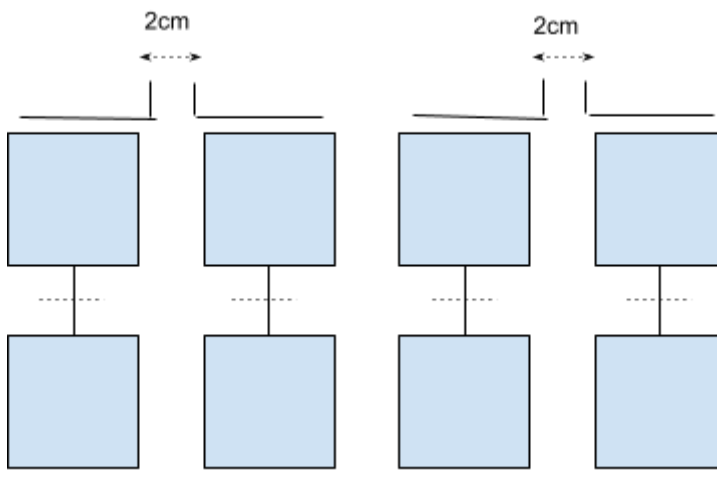
Cables from the boxes will be 1m and are provided with a female MC4 cable on the positive side and a male MC4 connector on the negative side.

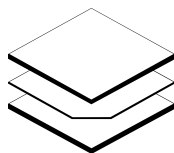


Manufacturing steps

The manufacturing steps are qualitatively described below.

1. Bottom glass is cleaned
2. Cells are strung with 19mm distance. Four strings of 9 cells
3. Strings are placed on the glass
4. Cell spacers are placed
5. String spacers are placed to space the strings correctly
6. Strings are connected with busbar wires with the following dimension





7. Cellbed placeholders are placed
8. Warm edge spacers are filled with desiccant
9. Warm edge spacer is fit around the cell by pushing the corners until the fit is tight
10. Warm edge spacer is removed and one layer of flat PIB is applied
11. Warm edge spacer is placed and pressed down, *after removing plastic from PIB*
12. Other side of the warm edge spacer is layered with one layer of flat PIB
13. Second glass sheet is placed *after removing plastic from PIB*
14. Edge is filled with silicone caulk

15. PART ABOUT FRAME & JB

3 Pre-Compliance Testing

3.1 Procedures

[Procedure MQT 03 IEC 61215-2 Insulation Test](#)

[SMLT-1-1.3 May 2023](#)

Factory Acceptance Test

3.2 Results

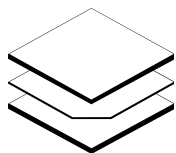
IEC 61215 MQT03 Results

IEC 61215 MQT16 Results

IEC 61215 MQT07 Results (Datasheet)

Conform IEC 61730:

Name product	Biosphere Solar Blaze
Model number designation	1.0



Serial number	SIR-101
Date and place of manufacture	02-10-2023 P7 Thor Park, Genk, Belgium
Polarity of terminals or leads	Female MC4 - Positive Male MC4 - Negative
Maximum system voltage (V)	150V
Class of protection against electrical shock	Class III
Voc (V)	TBD
Isc (A)	TBD
Pmax (W)	TBD
Maximum overcurrent protection rating (A)	16A