



## MANUFACTURER

SOLAR INNOVA GREEN TECHNOLOGY, S.L.  
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## PHOTOVOLTAIC MODULES

Series

NON STANDARD

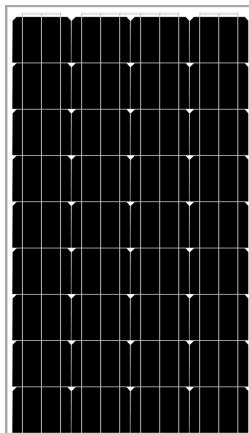
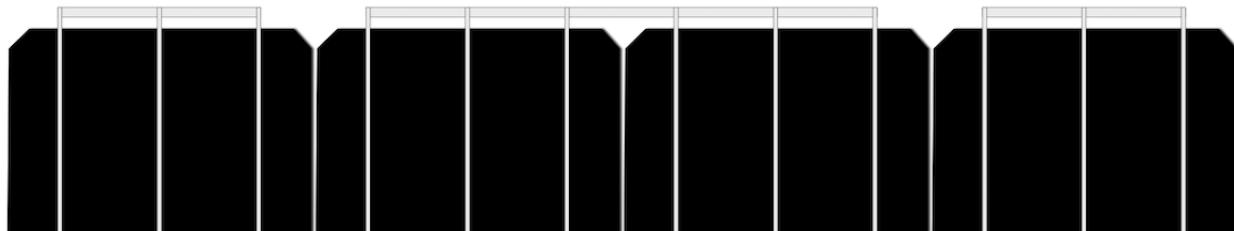
Reference

SI-ESF-M-NE-M-110W

Type

MONOCRYSTALLINE

### INTRODUCTION



#### MATERIALS

Solar Innova uses the latest materials to manufacture photovoltaic modules.

#### USE

Our modules are ideal for any application that uses the photoelectric effect as a clean energy source because of its minimal chemical pollution and no noise pollution.

#### FRONT

The front of the module contains a tempered solar glass with:

- High transmissivity.
- Low reflectivity.
- Low iron content.

#### PV CELLS

These PV modules use high-efficiency monocrystalline silicon cells (the cells are made of a single crystal of high purity silicon) to transform the energy of sunlight into electric energy.

Each cell is electrically rated to optimize the behavior of the module.

Its performance is excellent over the entire range of light spectrum, with particularly high yields in low light situations or cloudiness to direct sunlight (diffuse radiation).

#### ENCAPSULANT

The cell circuit is laminated using as encapsulant:

- EVA (Ethylene-Vinyl Acetate).

#### BACK

The rear of the module contains a plastic polymer (Tedral) which provides complete protection and seals against environmental agents and electrical insulation.

#### FRAME

The compact, anodized aluminum frame provides an optimal relationship-weight moment of inertia, to obtain greater rigidity and resistance to twisting and bending. It has several holes to attach the module to the support structure and ground if necessary.

#### JUNCTION BOX

The junction boxes with IP67, are made from high temperature resistant plastics and containing terminals, connection terminals and protection diodes (by-pass).

These modules are supplied with symmetric lengths of cable, with a diameter of copper section of 4 mm and an extremely low contact resistance, all designed to achieve the minimum voltage drop losses.

#### PERFORMANCE

Our modules comply with all safety requirements not only flexibility but also double insulation and high resistance to UV rays, all are suitable for use in outdoor applications. The design of these modules makes their integration in both industrial and residential buildings (one of the most emerging sectors in the photovoltaic market), and other infrastructure, simple and aesthetic.

#### QUALITY CONTROL

We have quality control divided into three elements:

- Regular inspections allow us to guarantee the quality of the raw material.
- Quality control in the process of our manufacturing procedures.
- Quality control of finished products, we conduct through inspections and tests of reliability and performance.

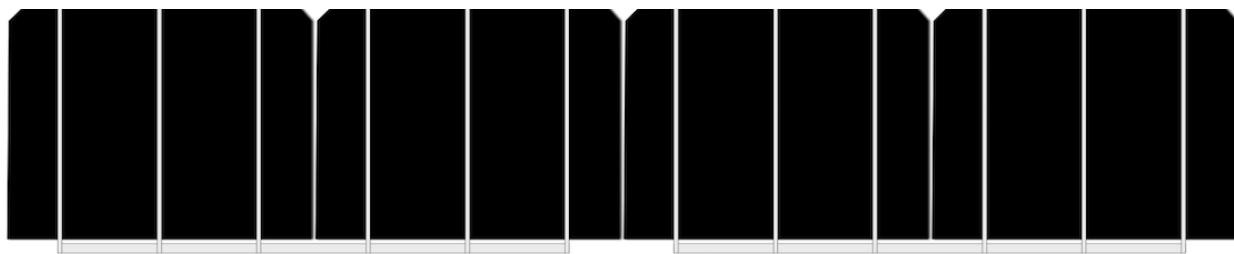
#### WARRANTIES

Our manufacturing plants have been prepared in accordance with:

- ISO 9001, in terms of Quality Systems and Business.
- ISO 14001, in terms of Environmental Management Systems.
- ISO 45001, in terms of Management Systems Health and Safety.

#### CERTIFICATES

Our PV modules are certified by internationally recognized laboratories and are proof of our strict adherence to international safety standards, long term performance and overall quality of products.



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PHOTOVOLTAIC MODULES					
Series	NON STANDARD	Reference	SI-ESF-M-NE-M-110W	Type	MONOCRYSTALLINE
Type	Monofacial	sc-Si	PV CELLS		
MECHANICAL CHARACTERISTICS			TEMPERATURE COEFFICIENTS		
Size	mm	156,75 x 130 ±0,5	Tk Voltage	%/K	-0,36
Thickness	µm	210 ±20	Tk Current	%/K	0,07
Front	[ - ]	Si3N4 anti-reflection coating	Tk Power	%/K	-0,38
Back	[ + ]	Aluminum back surface field (Al-BSF)			
PV MODULES					
ELECTRICAL CHARACTERISTICS					
STC CONDITIONS					
Maximum power	[Pmpp]	Wp	110		±3% (*)
Power selection	[Pmpp]	Wp	0/+3,30		
Voltage at maximum power	[Vmpp]	V	16,90		IEC 60904-1
Current at maximum power	[Impp]	A	6,51		IEC 60904-3
Open circuit voltage	[Voc]	V	22,20		±3% (*)
Short circuit current	[Isc]	A	6,97		±4% (*)
Maximum system voltage	[Vsyst]	V	715		IEC / UL
Maximum series fuse rating	[Icf]	A	15		
Efficiency	[ηm]	%	13,13		
Form Factor	[FF]	%	71,10		
STC (Standard Test Conditions):	Irradiance: 1000 W/m <sup>2</sup> + Cell Temperature: 25º C + Air Mass: 1.5				
	* (Considering LID, the power range of the certification authority)				
NMOT CONDITIONS					
Maximum power	[Pmpp]	Wp	81		IEC 61215
Voltage at maximum power	[Vmpp]	V	15,39		
Current at maximum power	[Impp]	A	5,29		
Open circuit voltage	[Voc]	V	20,29		
Short circuit current	[Isc]	A	5,65		
NMOT (Nominal Module Operating Temperature):	Irradiance: 800 W/m <sup>2</sup> + Ambient Temperature: 20º C + Air Mass: 1.5 + Wind Speed: 1 m/s				
MECHANICAL CHARACTERISTICS					
PANEL	WIDTH (X)	HIGH (Y)		AREA	POWER/AREA
Size	676	x	1240 mm	0,84 m <sup>2</sup>	131 Wp/m <sup>2</sup>
CELLS					
Quantity	4	x	9	= 36 units	0,73 m <sup>2</sup>
COMPONENTS					
MATERIAL	QUANTITY	THICKNESS (Z)	DESCRIPTION	DENSITY	TOTAL WEIGHT
Frame	1 units	35 mm	Al 6065-T5	1,23 kg/m <sup>2</sup>	1,03 kg
Glass	1 units	3,2 mm	Tempered	8,10 kg/m <sup>2</sup>	6,79 kg
Sheet Encapsulant	1 units	0,38 mm	EVA	0,40 kg/m <sup>2</sup>	0,34 kg
Busbars	5 units	0,2 mm	CuSn6	0,10 kg/m <sup>2</sup>	0,07 kg
PV Cells	36 units	0,21 mm	sc-Si	0,20 kg/m <sup>2</sup>	0,15 kg
Sheet Encapsulant	1 units	0,38 mm	EVA	0,40 kg/m <sup>2</sup>	0,34 kg
Backsheet	1 units	0,5 mm	TPT	0,47 kg/m <sup>2</sup>	0,39 kg
Junction Box	1 units	10 mm	PVC-IP68	0,10 kg/m <sup>2</sup>	0,10 kg
Diodes (By-pass)	2 units			0,01 kg/m <sup>2</sup>	0,02 kg
Cables (+/-)	2 units	4 mm <sup>2</sup>	900 mm	0,10 kg/m <sup>2</sup>	0,20 kg
Connectors	2 units	MC4-T4 type	PVC-IP67	0,05 kg/m <sup>2</sup>	0,10 kg
TOTAL		35 mm		11,16 kg/m <sup>2</sup>	9,53 kg
THERMAL CHARACTERISTICS					
TEMPERATURE COEFFICIENTS			MONOCRYSTALLINE		
Temperature coefficient of short circuit current	α	[Isc]	0,0814		%/° C
Temperature coefficient of open circuit voltage	β	[Voc]	-0,3910		%/° C
Temperature coefficient of maximum power	γ	[Pmpp]	-0,5141		%/° C
Temperature coefficient of current at maximum power		[Impp]	0,1000		%/° C
Temperature coefficient of voltage at maximum power		[Vmpp]	-0,3800		%/° C
Nominal Module Operating Temperature		[NMOT]	+ 47 ± 2		° C
TOLERANCES					
Working temperature	- 40 / + 85 °C		Glass dimension	< ± 2,5 mm	EN 12543-5
Dielectric isolation voltage	3000 V		Glass symmetry tolerance	< ± 3 mm	EN 12543-5
Relative humidity	0 / 100 %		Cell single string distolerance	< ± 1 mm	EN 12543-6
Wind resistance	2400 Pa	245 kg/m <sup>2</sup>			IEC 61215
Snow resistance	5400 Pa	551 kg/m <sup>2</sup>	Maximum hail resistance	Ø 28	23 m/s IEC 61215
Conductivity at ground	≤ 0,1 Ω		Resistance	≥ 100 Ω	
CLASSIFICATIONS					
Application class	A Class	IEC 61730	Pollution	Degree	1 IEC 61730
Electrical protection class	II Class	IEC 61140	Material	Group	I IEC 61730
Fire safety class	C Class	ANSI/UL 790	Safety	Factors	1,5 IEC 61730

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PHOTOVOLTAIC MODULES									
Series	NON STANDARD	Reference	SI-ESF-M-NE-M-110W	Type	MONOCRYSTALLINE				
DRAWING									
JUNCTION BOX									
Position	[Front] - [Rear]	■ Border	- [Axis (X)] ■ [Axis (Y)] -						
FRONT									
REAR									
mm									
1240 mm									
WIDTH (X) 676 mm									
PERFORMANCE									
CELLS									
TEMPERATURE			IRRADIANCE						
Temperature depending on Isc, Voc and Pmax			Irradiance depending on Isc, Voc and Pmax (cell temperature: 25°C)						
Isc, Voc, Pmax normalized (%)									
Cell temperature (°C)			Irradiance (W/m²)						
--- Pmax	--- Voc	--- Isc	--- Voc	--- Isc	--- Pmax				
PANELS									
IV-IRRADIANCE									
TEMPERATURE			IV-IRRADIANCE						
Electrical performance (cell temperature: 25°C)									
Current (A)			Voltage (V)		Power (W)				
Voltage (V)			Voltage (V)						
---- I-V 1000 W/m²	---- P-I 1000 W/m²		I-V (-25°C)	I-V (0°C)	I-V (+25°C)				
---- I-V 800 W/m²	---- P-I 800 W/m²		I-V (+50°C)	I-V (+75°C)					
---- I-V 600 W/m²	---- P-I 600 W/m²								
---- I-V 400 W/m²	---- P-I 400 W/m²								
---- I-V 200 W/m²	---- P-I 200 W/m²								
SOLAR SIMULATOR									
Class	AAA	IEC 60904-9	Power measurement uncertainty is ± 3 %						
ELECTRICAL MEASURES									
STC CONDITIONS			NMOT CONDITIONS						
Irradiance	1000 W/m²	IEC 60904-1	Irradiance	800 W/m²	IEC 61215				
Cell temperature	25 °C	IEC 60904-3	Ambient temperature	20 °C					
Air Mass	1,5	ASTM G173	Air Mass	1,5	ASTM G173-03				
		ASTM 1036	Wind speed	1 m/s					

