MANUFACTURER

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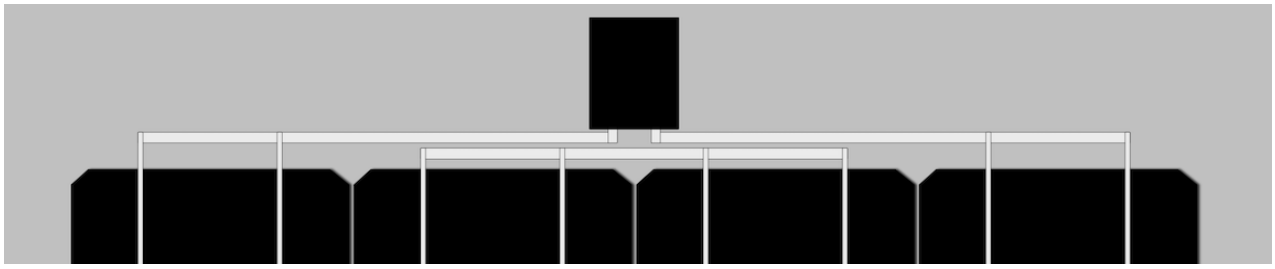
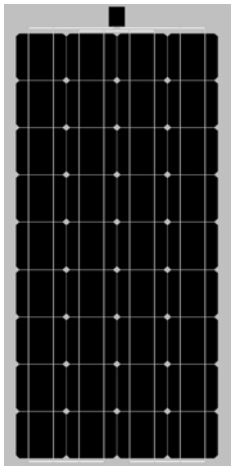
PHOTOVOLTAIC MODULES

Series	FLEXIBLE	Reference	SI-ESF-M-SF-M-100W	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 ETFE 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 aluminum sheet which provides complete protection and seals against environmental agents and electrical insulation.

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

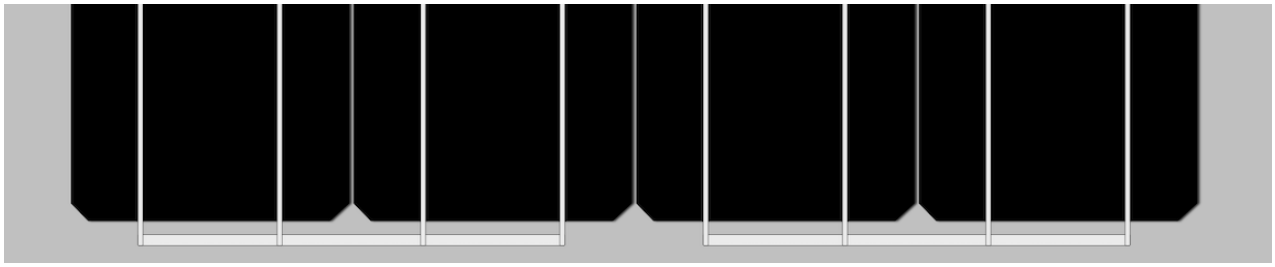
These modules are supplied with symmetric lengths of cable, with a diameter of copper section of 4 mm and an extremely low contact resistance, all designed to achieve the minimum voltage drop losses.

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.
- OHSAS 18001, 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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PV CELLS

Type	Monofacial	sc-Si

MECHANICAL CHARACTERISTICS			TEMPERATURE COEFFICIENTS		
Size	mm	125 x 125 ±0,5	Tk Voltage	%/K	4,72
Thickness	µm	180 ±20	Tk Current	%/K	0,55
Front	[-]	Si3N4 anti-reflection coating	Tk Power	%/K	8,58
Back	[+]	Aluminum (Al-BSF)			

PV MODULES

ELECTRICAL CHARACTERISTICS

STC CONDITIONS

Maximum power	[Pmpp]	Wp	100	IEC 60904-1
Tolerance	[Pmpp]	Wp	0/+3	IEC 60904-3
Voltage at maximum power	[Vmpp]	V	18,90	ASTM G173
Current at maximum power	[Impp]	A	5,29	ASTM 1036
Open circuit voltage	[Voc]	V	22,50	
Short circuit current	[Isc]	A	5,75	
Maximum system voltage	[Vsyst]	V	715	IEC / UL
Maximum series fuse rating		A	20	
Efficiency	[ηm]	%	14,80	
Form Factor	[FF]	%	77,29	

STC (Standard Test Conditions): Irradiance: 1000 W/m2 + Cell Temperature: 25º C + Air Mass: 1.5

NMOT CONDITIONS

Maximum power	[Pmpp]	Wp	74	IEC 61215
Voltage at maximum power	[Vmpp]	V	17,21	
Current at maximum power	[Impp]	A	4,30	
Open circuit voltage	[Voc]	V	20,57	
Short circuit current	[Isc]	A	4,66	

NMOT (Nominal Module Operating Temperature): Irradiance: 800 W/m2 + Ambient Temperature: 20º C + Air Mass: 1.5 + Wind Speed: 1 m/s

MECHANICAL CHARACTERISTICS

PANEL	WIDTH (X)		HIGH (Y)			AREA	
Size	536	x	1261	mm		0,68	m2
CELLS							
Size	125,00	x	125,00	mm		0,16	m2
Quantity	4	x	9	=	36 units	0,56	m2

COMPONENTS

MATERIAL	QUANTITY		THICKNESS (Z)		DESCRIPTION	DENSITY		TOTAL WEIGHT	
Frontsheet	1	units	0,3	mm	ETFE	0,76	kg/m2	0,51	kg
Sheet Encapsulant	1	units	0,38	mm	EVA	0,40	kg/m2	0,27	kg
Busbars	5	units	0,2	mm	CuSn6		kg/m2		kg
PV Cells	1	units	0,21	mm	sc-Si	0,11	kg/m2	0,07	kg
Sheet Encapsulant	1	units	0,38	mm	EVA	0,40	kg/m2	0,27	kg
Backsheet	1	units	1,5	mm	TPT	1,41	kg/m2	0,95	kg
Junction Box	1	units	10	mm	Monopolar	0,10	kg/m2	0,10	kg
Diodes (By-pass)	2	units				0,01	kg/m2	0,02	kg
Cables (+/-)	2	units	4	mm2	900 mm	0,10	kg/m2	0,20	kg
Connectors	2	units	MC4-T4	type	PVC-IP67	0,05	kg/m2	0,10	kg
TOTAL			**2,97**	**mm**		**3,70**	**kg/m2**	**2,50**	**kg**

THERMAL CHARACTERISTICS

TEMPERATURE COEFFICIENTS		MONOCRYSTALLINE		
Temperature coefficient of short circuit current	α	[Isc]	0,0814	%/º C
Temperature coefficient of open circuit voltage	β	[Voc]	-0,3910	%/º C
Temperature coefficient of maximum power	γ	[Pmpp]	-0,5141	%/º C
Temperature coefficient of current at maximum power		[Impp]	0,1000	%/º C
Temperature coefficient of voltage at maximum power		[Vmpp]	-0,3800	%/º C
Nominal Module Operating Temperature		[NMOT]	+ 47 ± 2	º C

TOLERANCES

Working temperature	- 40 / + 85	ºC			
Dielectric isolation voltage	3000	V			
Relative humidity	0 / 100	%	Cell single string distolerance	< ± 1	mm
Wind resistance	2400	Pa	244	kg/mm2	
Snow resistance	5400	Pa	550	kg/mm2	
Maximum hail resistance	⌀ 28		23	m/s	

CLASSIFICATIONS

Application class	A Class		IEC 61730	Pollution	Degree	1	IEC 61730
Electrical protection class	II Class	IEC 61140	IEC 61730	Material	Group	I	IEC 61730
Fire safety class	C Class	ANSI/UL 790	IEC 61730	Safety	Factors	1.5	IEC 61730

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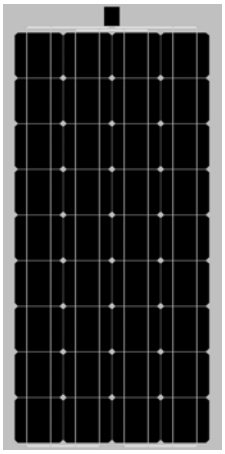
DRAWING

JUNCTION BOX

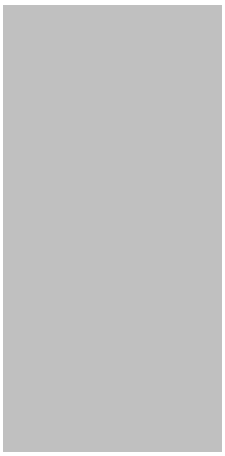
Position	Front ■	Rear -	Border -	Axis (X) ■	Axis (Y) -

PANEL

FRONT



REAR



HIGH (Y) 1261 mm

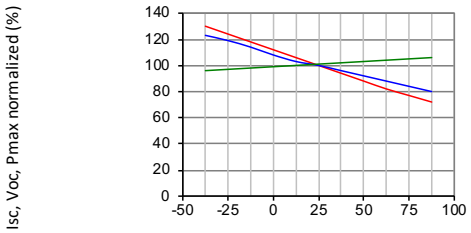
WIDTH (X) 536 mm

PERFORMANCE

CELLS

TEMPERATURE

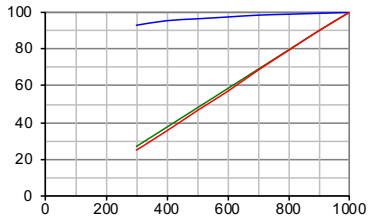
Temperature depending on Isc, Voc and Pmax



--- Pmax --- Voc --- Isc

IRRADIANCE

Irradiance depending on Isc, Voc and Pmax
(cell temperature: 25º C)

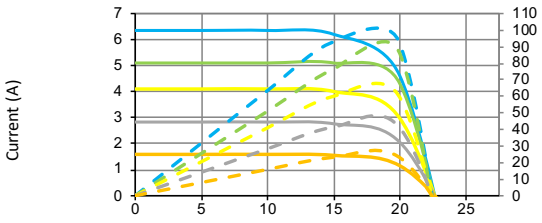


--- Voc --- Isc --- Pmax

PANELS

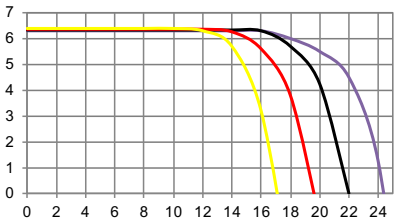
TEMPERATURE

Electrical performance
(cell temperature: 25º C)



--- I-V 1000 W/m2	- - - P-I 1000 W/m2
--- I-V 800 W/m2	- - - P-I 800 W/m2
--- 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

IV-IRRADIANCE



I-V (-25ºC) I-V (0ºC) I-V (+25ºC) I-V (+50ºC) I-V (+75ºC)

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 ºC	IEC 60904-3	**Ambient temperature**	20 ºC	
Air Mass	1,5	ASTM G173	**Air Mass**	1,5	ASTM G173-03
		ASTM 1036	**Wind speed**	1 m/s	

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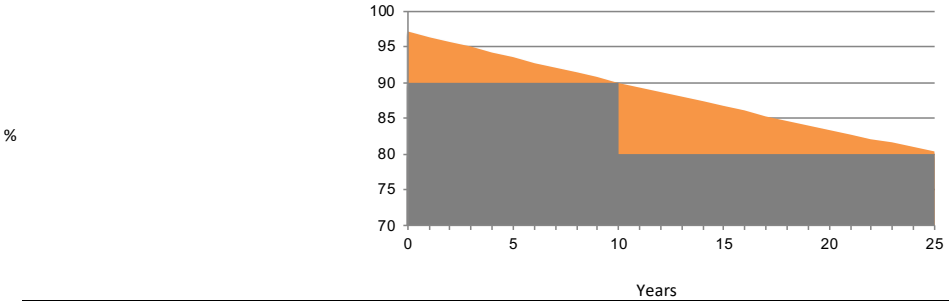
STANDARD GUARANTEES

LINEAR PERFORMANCE WARRANTY



Manufacturing defects	12 years.
Performance	90% of rated power after 10 years of operation,
	80% of rated power after 25 years of operation.

ENVIRONMENTAL INFORMATION

Solar Hours Peak	6 day		**kWh**	**Coal**	**Petrol/Gas**	**Combined**	
Irradiation rate	1000 W/ m2		1	0,961	0,828	0,372	kg/CO2
Energy generated	600 kWh day	**Avoid**	**day**	577	497	223	kg/CO2
	18000 kWh month	**CO2**	**month**	17298	14904	6696	kg/CO2
	219000 kWh year	**emissions**	**year**	210459	181332	81468	kg/CO2

CERTIFICATES

ISO 9001	Quality Management Systems.
ISO 14001	Environmental Management Systems.
OHSAS 18001	Occupational Health and Safety Management Systems.
CE	Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
IEC/EN 61215	Crystalline silicon terrestrial photovoltaic (PV) modules. Design qualification and type approval.
IEC/EN 61730-1	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction.
IEC/EN 61730-2	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing.
IEC/EN 61701	Salt mist corrosion testing of photovoltaic (PV) modules.
IEC/EN 62716	Photovoltaic (PV) modules - Ammonia corrosion testing.
UNE-EN IEC 62804-1	Photovoltaic (PV) Modules - Test Methods for the detection of potential-induced degradation. Part 1: Crystalline silicone.
IEC/EN 62790	Junction boxes for photovoltaic modules - Safety requirements and tests.
IEC/EN 62852	Connectors for DC-application in photovoltaic systems - Safety requirements and test.
UL 1703	Standard for Flat-Plate Photovoltaic Modules and Panels.

PACKING

CONTAINER 20'			CONTAINER 40'HQ		
PANELS X PALLET	**PALLETS**	**TOTAL**	**PANELS X PALLET**	**PALLETS**	**TOTAL**
-	-	-	26	22	572

IEC 62759-1	Photovoltaic (PV) modules - Transportation testing - Part 1: Transportation and shipping of module package units.

EXPORT INFORMATION

HS Code	85414020	**TARIC code**	8541409021

COMMENTS

NOTICE

The specifications and technical data may be subject to possible modifications without notice.
This data sheet are conform to the requirements of the Standard EN 50380:2018.