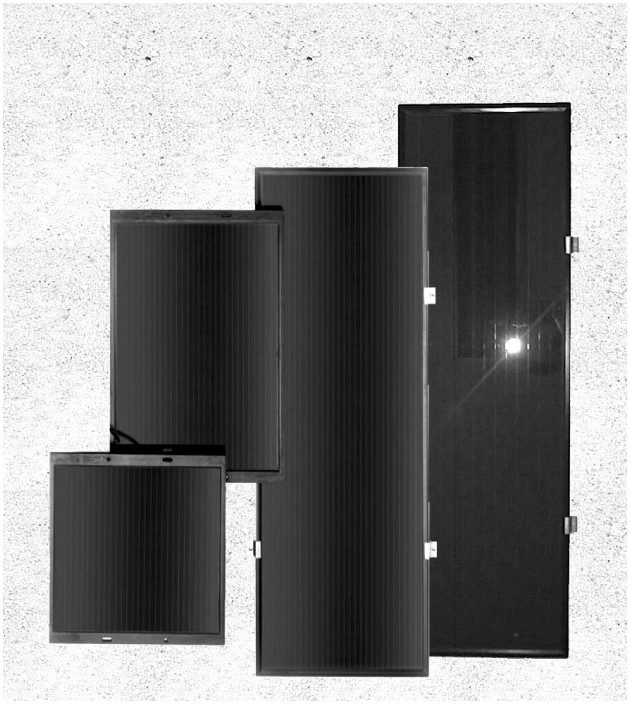
FREE ENERGY EUROPE

Solar panels, 5-20 Watts
Advanced amorphous silicon technology

Reliable cell technology

Free Energy Europe produces stable and reliable amorphous silicon cells. After initial stabilization during the first two months of outdoor use, the amorphous silicon cell will be stable for decades.

The expected lifetime of the advanced amorphous silicon solar cells is at least 20 years.



High energy yield

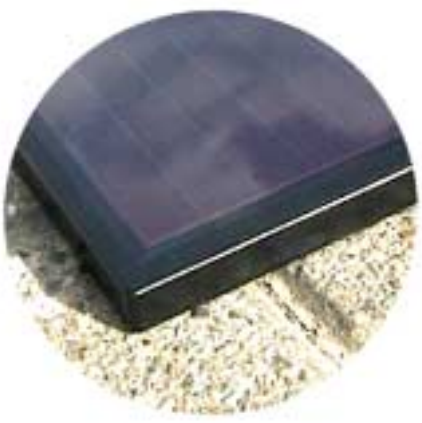
The amorphous silicon solar cells, produced by Free Energy Europe, function better than crystalline silicon solar cells in partial or indirect sunlight. Tests have shown that the annual energy output is approximately 15 % higher per rated Watt-peak power.

Outdoor performance

The outdoor performance of amorphous silicon solar panels depends primarily on their protection against corrosion.

Free Energy Europe applies an *injected* polymer frame, with a very high moisture barrier. This technology has been developed internally and is unique to the Free Energy Europe products.

This advanced framing technology makes our solar panels reliable for outdoor use.



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Main characteristics

Type	*FEE-20-12*	*FEE-14-12*	*FEE-7-12*	*FEE-5-12*
Cell technology	Tandem junction amorphous Si	Single junction amorphous Si	Single junction amorphous Si	Single junction amorphous Si
Module framing technology	5th generation	4th generation	4th generation	4th generation
Encapsulation	Glass-to-glass encapsulation with moulded polymer injection framing.			
Expected lifetime	> 20 years			
Operating conditions	−40 °C to +85 °C			

Maximum power electrical characteristics - at Standard Test Conditions*

Type	*FEE-20-12*	*FEE-14-12*	*FEE-7-12*	*FEE-5-12*
Maximum output power	19 Watt peak	14 Watt peak	7 Watt peak	5 Watt peak
Maximum current at 16 V	1.18 Ampere	0.87 Ampere	0.43 Ampere	0.29 Ampere
Short circuit current	1.45 Ampere	1.05 Ampere	0.52 Ampere	0.35 Ampere
Open circuit voltage	22.8 Volts	22.0 Volts	22.0 Volts	22.0 Volts

* *Data refers to Standard Test Conditions, an approximation of functioning in full sunlight (STC : 1000W/m² irradiance, 25 °C cell temperature, spectrum AM1.5). The rated electrical parameters may vary ± 10%.*

Stabilised electrical characteristics - at Standard Test Conditions*

Type	*FEE-20-12*	*FEE-14-12*	*FEE-7-12*	*FEE-5-12*
Stabilised peak power	16 Watt peak	12 Watt peak	6.0 Watt peak	4.0 Watt peak
Current at 16 V	0.99 Ampere	0.75 Ampere	0.38 Ampere	0.25 Ampere
Short circuit current	1.22 Ampere	0.90 Ampere	0.45 Ampere	030 Ampere
Open circuit voltage	22.8 Volts	22.0 Volts	22.0 Volts	22.0 Volts

* *Data refers to Standard Test Conditions, an approximation of functioning in full sunlight (STC: 1000W/m² irradiance, 25 °C cell temperature, spectrum AM1.5). The rated electrical parameters may vary ± 10%.*

Stabilised electrical characteristics – at Average Operating Conditions*

Type	*FEE-20-12*	*FEE-14-12*	*FEE-7-12*	*FEE-5-12*
Equivalent yield peak power	18 Watt peak	14 Watt peak	6.9 Watt peak	4.6 Watt peak

* *Data refers to real annual average irradiation in the Netherlands, normalised on average performance of crystalline silicon technology. Rated electrical parameters may vary ± 10%.*

Temperature coefficients

Voltage	– 0.29% / °C
Current	+ 0.08% / °C
Normal operating cell temperature	45 °C (à 800 W/m², ambient temperature 21 °C)

Dimensions

Type	*FEE-20-12*	*FEE-14-12*	*FEE-7-12*	*FEE-5-12*
Dimensions	1015 x 312 mm	930mm x 317 mm	495mm x 317 mm	343mm x 317mm
Thickness	13.9 mm	12.5 mm	12.5 mm	12.5 mm
Weight	4.6 kg	4.1 kg	2.1 kg	1.5 kg