



... a greener tomorrow, today



# BAYAT ENERGY

## THIN-FILM SOLAR PV MEMBRANE



[www.bayatenergy.co.uk](http://www.bayatenergy.co.uk)

# Thin-Film Membrane Photovoltaic



## Key Features and Benefits

- Lightweight with a loading calculation of just 5kg/m<sup>2</sup>
- No need for roof penetrations
- Laid flat to a pitch as low as 3°
- Not restricted to south facing orientation
- No glass components
- No need for expensive mounting frame hardware
- Quick and effective installation process
- High grade and environmentally friendly TPO roofing membrane
- Shadow and low-light tolerant
- No issues with glass
- No issues with weight
- No issues with aesthetics



## Flexible Solar Roof Covering



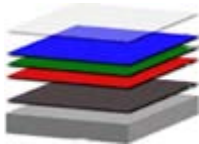
A system is now available which allows us to fully integrate photovoltaics into a flat roof membrane covering.

The technology incorporates unique Thin-Film Amorphous Silicon laminates designed for the flat roof sector; a roofing membrane with built-in power generation (BIPV solar roofing membrane). The flexibility of the solar membrane offers the freedom of design to architects, as it can conform to curved surfaces.

It also allows the increased demand for aesthetically pleasing building-integrated photovoltaic modules (BIPV). By using a building integrated PV system, there is no need for large and heavy framework, and can be used for retrofitting in existing buildings where weight and wind loads are critical to the roof sub-structure. The Membrane System is installed with traditional methods, weighing just 5kg/m<sup>2</sup> compared to 50kg/m<sup>2</sup> for some fixing frames.

The glass-free durable polymer laminates have proven themselves under the most extreme weather conditions imaginable, including satellites, ocean buoys and military applications, and are resistant to vandalism.

### Amorphous Silicon



Thin-Film laminates render better energy yield at high module temperatures and in warm climates. Under real outdoor conditions, module temperature can be up to 80°C, especially if they are building-integrated and directly in the sun. At these temperatures, thin-film laminates can yield up to 20% more electricity compared to conventional crystalline solar modules of the same power rating. As well as high temperature performance, Triple Junction laminates offer high outdoor performance in low and diffused light conditions due to higher absorption of light in the blue wavelength range. If a solar cell is broken or comes under shading, the electricity can by-pass the cell to continue the flow of electricity by using specially designed solar by-pass diodes. This enables the module to continue to operate with dysfunctional cells.

## TPO single Ply Membrane

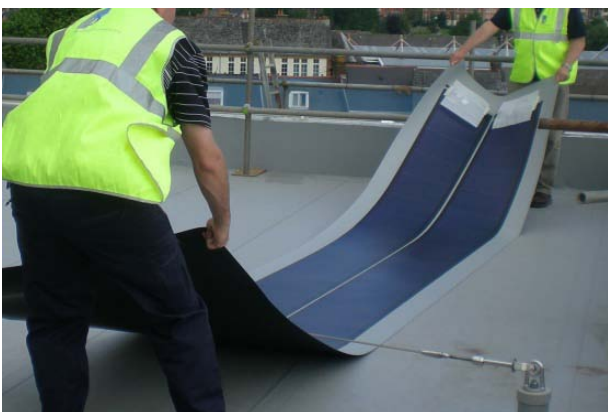
TPO, or Thermoplastic Polyolefin is a mixture of Ethylene based rubber and Polypropylene, which enables this membrane to incorporate the best elements of both EPDM and PVC.



TPO waterproof membrane incorporates the weldability of thermoplastics and superior mechanical properties of thermoset sheets. The membrane is totally inert; it contains no plasticiser or other components which can migrate with time. It is totally non-toxic and recyclable.

The TPO membrane system utilises the unique features of Triple Junction Technology. Triple Junction Technology is the compression of blue, green and red Amorphous Silicon cells. This allows for the light from the sun to be split and absorbed within the different layers of the module, yielding unprecedented performance. The light spectrum splitting capacity is the key to higher efficiency, especially at lower insolation levels and in diffused light.

Thin-Film cells are the most environmentally advanced development of photovoltaic cells available today. The solar cells are manufactured to create the ideal energy balance between manufacture and function, to produce the quickest payback time available for PV technologies. With a 300°C manufacturing process temperature compared to the 1000°C - 1500°C for its crystalline counterpart, thin film cells provide a higher contribution to the protection of the environment.



# TF Membrane

## Electrical data\*

Module type	288 B Pro	288 G Pro	
Nominal power ( $P_{MPP}$ )	144	144	Wp
Voltage ( $U_{MPP}$ )	33	33	V
Current ( $I_{MPP}$ )	4.36	4.36	A
Open circuit voltage ( $U_{OC}$ )	46.2	46.2	V
Short circuit current ( $I_{SC}$ )	5.3	5.3	A
Power coefficient ( $\Delta P_{MPP}$ )	-0.3	-0.3	W/K
Voltage coefficient ( $\Delta U_{OC}$ )	-102	-102	mV/K
Current coefficient ( $\Delta I_{SC}$ )	4.36	4.36	mA/K
Voltage coefficient ( $\Delta U_{OC}$ )	-176	-176	mV/K
Current coefficient ( $\Delta I_{SC}$ )	5.3	5.3	mA/K
NOCT	46	46	°C

At standard test conditions (1,000 W/m<sup>2</sup>, spectrum AM 1.5, cell temperature 25 °C). During the first 8-10 weeks of operation, electrical output exceeds specified ratings:

Power PMPP +15%, Open Voltage  $U_{oc}$  +11%, Short Circuit  $I_{sc}$  +4%.

\* Electrical data refer to one submodule, the module consists of two separately interconnectable submodules.

## Dimensions and weight

Length	5900	5900	mm
Width	1050	1050	mm
Weight	35	32	kg
Misplacing measure	5750 (min.) x 950	5750 (min.) x 950	mm

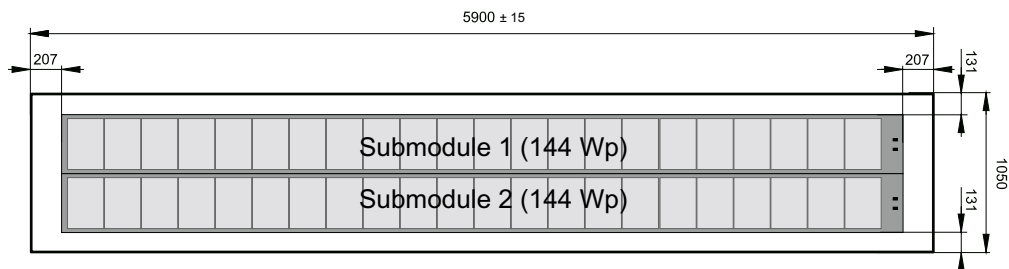
## Quality characteristics

Performance tolerance	±5%
Performance guarantee	20 years at 80% performance
Product warranty	5 years
Max. system voltage	1000 V

## Construction characteristics

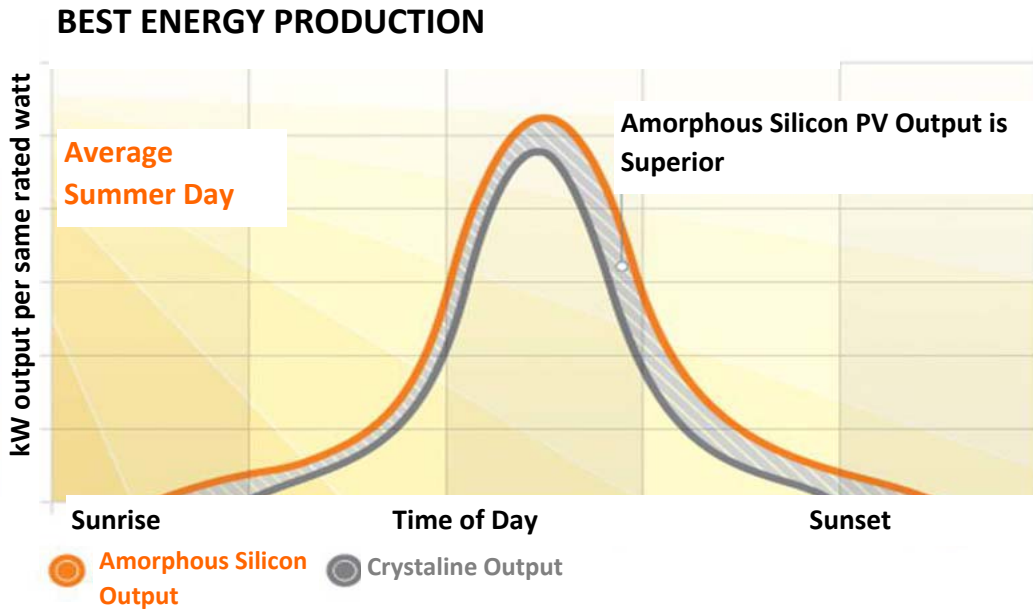
Cells	Amorphous silicon Triple Junction cells
Construction	Laminates on roofing membrane
Front	Highly transparent ETFE fluorine polymer
Junction Box	Protection class IP65
Bypass diodes	Integrated bypass diodes
Connecting cables	2 x 0.5 m, pin-and-socket connector system
System application	Roofing for flat roofs, roof inclination above 3°

Specifications subject to change without notice,



## Superior Energy Output of Amorphous Silicon

Amorphous Silicon out performs conventional solar by converting a wider spectrum of the Sun's light into a Triple Junction Light Spectrum to produce more energy.



### Amorphous Silicon performs better under Higher Temperature conditions

Amorphous Silicon also performs better at higher temperatures whereas output of crystalline arrays decreases by 0.5% per degree Celcius over the standard test conditions temperature of 25° C. Amorphous silicon is one of a number of thin film technologies. This type of solar cell can be applied as a film to low cost substrates such as glass or plastic in a variety of module sizes. Advantages of thin film cells include easier deposition and assembly, low cost of substrates or building materials, ease of production and suitability to large applications.

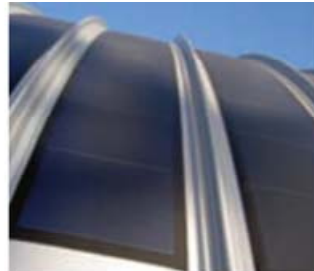


# STRUCTURAL ADVANTAGES:

## Engineering Advantages

Easy assembly without roof penetration maintains the integrity of the roofing material and its respective roofing guarantees.

The low visual impact, its direct fixation to the roofing material paired with a glass-free encapsulation make the Solar PV laminates impervious to vandalism or theft.



## System Advantages

The textured module surface has a self-cleaning effect and by being anti-glare increases light absorption. While this attribute increases energy yield it also makes the Solar PV laminates a perfect choice for reflection-sensitive applications such as at airports.

Our unique PV-laminates offer cost advantages inherent in the system due to

- 1 Reduce installation time
- 2 reduced logistics expenditure
- 3 reduced balance of system (BoS) costs

Particularly attractive is the fact that no additional substructure is required for mounting, reducing material and handling requirements.

### Higher Return on Investment

The advantage described combined with the higher energy yield of the shadow-and-heat-tolerant triple-junction cell technology ensure a high rate of return on the investment over the systems lifetime.

### Three Step Performance Warranty

Our confidence in the long term performance of our products allows us to offer a three-step performance warranty, which guarantees that the Solar modules will produce:

- 1: 92% of minimum power after 10 yrs
- 2: 84% of minimum power after 20 years
- 3: 80% of minimum power after 25 years





... a greener tomorrow, today



# BAYAT ENERGY

## THIN-FILM SOLAR PV MEMBRANE



### **Bayat Energy Ltd**

Suite 110 Business Design Centre  
52 Upper Street, London N1 0QH  
United Kingdom

tel. +44(0)20 7288 6358

email. [info@bayatenergy.co.uk](mailto:info@bayatenergy.co.uk)

[www.bayatenergy.co.uk](http://www.bayatenergy.co.uk)