



# BIOSOL TF MEMBRANE

A TPO/FPA PHOTOVOLTAIC LAMINATED MEMBRANE FOR TOP ENERGY OUTPUT, PERFORMANCE AND BECAUSE GREEN MATTERS

While oil, gas and coal reserves continue to decline, solar energy is a virtually inexhaustible energy source. Photovoltaic panels offer clean, safe and reliable electricity. The billions of m<sup>2</sup> of flat roofs installed in Europe are a suitable substrate for such panels and therefore offer a great potential for renewable, environmentally friendly power supply.

# TF (Thin Film) Membrane : a winning concept

*The specialist of TPO accessories, MAST further strengthens its supply range with the launch of a line of environmentally friendly TPO/FPA photovoltaic panels developed together with CentroSolar AG, a PV market leader with a long experience.*

## AMORPHOUS PHOTOVOLTAIC CELLS

With the rising interest in protection of the environment and the development of the solar technology, the photovoltaic represents an increasingly important type of renewable energy. The photovoltaic technology has been developed to the point it enables a significant part of the future energy supply to be produced in an environmentally friendly manner. PV cells is a renewable energy source which contributes to climate protection while ensuring sustainable development.

Crystalline silicon is the original material used by the PV industry. Considerable advances have been made in this type of technology but still crystalline modules remain bulky, break easily and consume a high energy during manufacture. Thin film solar cells as recently developed are highly resistant and use far less raw material.

The importance of PV in architecture is also growing. As a result of the advance in technology, thin films made of amorphous cells now offer the possibility to install modules over large roof areas. They are lightweight and flexible, so they can be integrated into most roof structures, while maintaining the main goal, i.e. generate optimal energy output.

## TPO/ FPA (FLEXIBLE POLYPROPYLENE ALLOY)

Single ply membranes have traditionally been manufactured from either thermoplastic materials (ex: PVC) or thermo set materials (ex: EPDM). Each of these material types has its own advantages over the other e.g. the weldability of thermoplastics and the superior mechanical properties of thermo set sheets.

TPO is a new generation membrane which incorporates the best of what PVC and EPDM have to offer. The concept of mixing Polypropylene (PP) and Ethylene Propylene Rubber (EPR) is now a proven concept, as TPO/FPA membranes installed 15 years ago keep showing outstanding performances.

Today, TPO is the fastest growing segment in the single ply roofing market. These membranes have gained acceptance and recognition from roofing contractors, consultants, architects and building owners. Over 50 million m<sup>2</sup> of TPO roofing systems are now successfully installed every year worldwide.

The success of TPO is due to its intrinsic nature. The membrane is totally inert; it contains no plasticiser or other component which can migrate with time, causing the product to become brittle or shrink. Furthermore, it is totally non toxic and recyclable.

## AN ADVANCED ENVIRONMENTALLY FRIENDLY SOLUTION

The Biosol TF membrane as developed by CentroSolar AG and MAST SA includes a thin film module bonded to a tough TPO/FPA Rubberfuse membrane. It is designed to withstand UV, extreme weather conditions and ponding water. Available in 2 versions, this panel can be either hot air welded to TPO/FPA membranes or adhered to other compatible roofing sheets.

The TF Membrane is the State of the Art in terms of ecology. Selecting such "100% green" panel allows to:

- convert roofs into energy producing assets
- participate in meeting the European Charter for Solar Energy requirements
- obtain access to incentives from local Authorities, which implies quicker ROI
- position the user as a corporate environment leader

The TF Membrane provides a unique combination, as it offers long term high performance, roof integration and environment friendliness at a competitive price.

In order to be most effective, the installation of TF Membranes on a roof requires the combined skills of roofers and solar experts. The Centrosolar - Rubberfuse Team is prepared to evaluate your roof and propose a system, installed by a Rubberfuse Authorised Applicator, which will result in maximised solar coverage, top electricity output and watertight performance.



# The last generation in PV technology

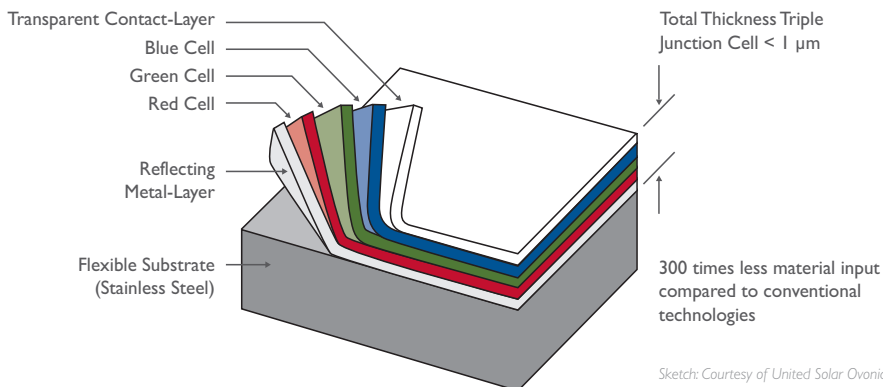
## TRIPLE JUNCTION EFFICIENCY

The solar cells used in the amorphous silicon modules are made of 3 silicon layers laid on a stainless steel base and protected by high end PVF and ETFE layers. Each silicon layer is arranged in order to best convert their respective light spectrum into electrical energy. The total thickness of the triple junction cell is  $< 1 \mu\text{m}$ .

Amorphous silicon (a-Si) absorbs the light with a far superior efficiency. Consequently, the a-Si cells layer can be up to 100 times thinner than its crystalline counterpart.

The TF Membrane made of a-Si cells provides an optimal kilowatt-hour input. Due to the good efficiency under diffuse light conditions, the annual energy yield can be higher for suboptimal roof orientations (e.g. flat roofs), when compared to crystalline modules.

## TRIPLE JUNCTION TECHNOLOGY



## MORE ADVANTAGES

### HIGH TEMPERATURE PERFORMANCE

Maximum radiation hitting a PV module generates maximum energy output. According to standard testing conditions, the rated power of a module is measured at  $25^{\circ}\text{C}$ . Due to the typically low temperature coefficient of amorphous silicon, a superior output efficiency of a-Si cells is obtained in field conditions, where the actual temperature is higher.

### LIGHTWEIGHT

The TF membrane weighs  $5.2 \text{ kg/m}^2$ , so the static requirements of the roof structure do not need to be increased.

### MECHANICAL RESISTANCE

The cells use ETFE (Ethylene Tetra Fluorine Ethylene), a high transmissive polymer protective layer. The TF Membrane consequently offers a very high impact resistance and avoids the inconvenience of glass.

### FLEXIBILITY

The TF membrane allows to adapt to most roofs configuration. The roof surface remains neat and uncluttered.

### LOW SLOPE

The TF Membrane operates on a roof slope as low as 3%, while  $10^{\circ}$  is the usual requirement for crystalline modules.

### DIFFUSED SUNBEAMS PICK-UP

In many locations, diffused sunbeams are frequent (ex: Paris 52%). When light conditions are diffuse, thin films produce more power than crystalline modules.

### SECURE “TOP” INSTALLATION

The TF membranes are connected through a fast and easy “pin and socket” connector on top of the membrane. This will ensure the watertightness of the roof complex while eliminating the need to create a wiring channel in the insulation. Such system also facilitates any maintenance operation.

### ADEQUATE SIZE

The standard product width is 1,05m. This allows for a safe and easy installation and results in a secure fixing pattern, hence a better wind uplift resistance.



# Technical characteristics

## DESCRIPTION

Triple junction amorphous photovoltaic thin film laminated to a 2.0mm thick TPO/FPA membrane.

The TPO/FPA membrane is available in a standard of fleece-backed version.

The panel is delivered with potted terminal housing assembly and quick connect terminals.

Meets IEC / EN 61646 and 61730 requirements.

Product guarantee : 5 years.

Performance guarantee: 20 years to 80% of the rated nominal power.

## SIZES

PV laminate (for 44 cells)	mm	4* x 394 x 5.486	(*16 with junction boxes)
TPO/FPA membrane	mm	2* x 1.050 x 5.900	(* other thicknesses available)

## WEIGHT

32kg per unit - 5.2kg/m<sup>2</sup>

## ELECTRICAL SPECIFICATIONS

Per sub-module, at standard test conditions: 1.000 W/m<sup>2</sup> irradiance, 1,5 Air Mass, 25°C cell temperature.

Actual performance may vary up to 10% due to low temperature, spectral or other related effect.

Module Class	TFM 272	TFM 288
Nominal power (PMPP), +/- 5%	2 x 136 Wp	2 x 144 Wp
Nominal Voltage (UMPP)	33 V	33 V
Nominal Current (IMPP)	4,10 A	4,36 A
Short-circuit Current (ISC)	5,1 A	5,3 A
Open-circuit Voltage (UOC)	46,2 V	46,2 V

## TEMPERATURE COEFFICIENTS

PMPP	- 0,29 W/K	- 0,30 W/K	- 0,21 %/K
UMPP	-102 mV/K	-102 mV/K	- 0,31 %/K
IMPP	4,10 mA/K	4,36 mA/K	0,10 %/K
UOC	-176 mV/K	-176 mV/K	- 0,38 %/K
ISC	5,1 mA/K	5,3 mA/K	- 0,10 %/K

## APPLICATION CRITERIA

Standard Membrane panel	mechanically attached system (using Rubberfuse fixings)
Fleece-Backed Membrane panel	adhered system (using FB-Solvent Free Adhesive on compatible substrate)

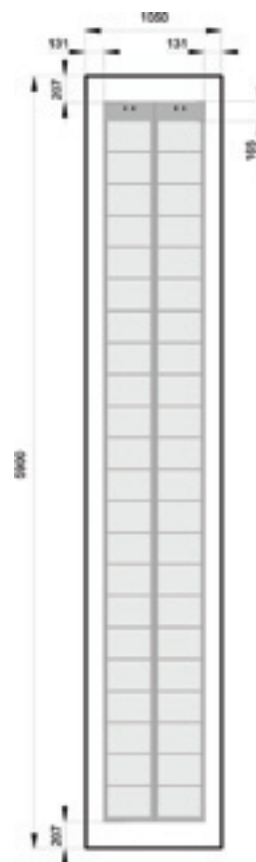
Application on flat roofs with a 3% minimum slope

Application Temperature	10°C - 40°C
Maximum roof temperature	85°C

The roofing works will be carried out by a Rubberfuse Authorised Applicator.

Refer to the Rubberfuse technical manual and installation specifications for approved substrates and installation methods.

All specifications may be subject to change without notice.



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