



Instruction Manual

Installation and maintenance of
semi-flexible ETFE panels series “SGM-FLY”

Manual made by:
FLY SOLARTECH SOLUTIONS S.r.l.

Telephone: 0432 955377
Legal HQ: Piazza Carlo Cattaneo, 6 – 33038 San Daniele del Friuli (UD)
Operative HQ: Via Giuseppe Mazzini, 4 – 33838 San Daniele del Friuli (UD)

*FLY SOLARTECH thanks you for having purchased a
Semi-Flexible Solar panel Series SGM-S2-FLY.*

*Confident that the advanced technologies and materials
used in the production of this panel will meet your needs,
We invite you to read the manual carefully for a proper use of the product.*

Introduction and Recommendations

!!! This manual does not serve as a warranty certificate, whether implied or explicit. The recommendations contained within are of a general nature and FLY SOLARTECH SOLUTIONS will not be responsible for any kind of voluntary or accidental damage caused by incorrect installation, maintenance, or use of SGM-S2-FLY photovoltaic panels !!!

The installation of a solar panel can be done by anyone who possesses the necessary skills and the right tools.

That said, FLY SOLARTECH SOLUTIONS strongly suggests installation of qualified personnel in compliance with safety standards.



Contact with live electrical components can cause shock or burns.

This is because the photovoltaic module will start generating power as soon as it's exposed to sun.



Although a single module is not capable of generating enough electrical current to represent a danger of death, its use in combination with other electronic devices (or other modules connected in series and / or in parallel) can increase its voltage and therefore the danger.

ELECTRIC RISK RECOMMENDATIONS

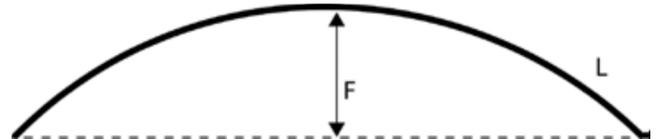
- Use FLY-S2-SGM modules only in combination with other SGM-S2-FLY modules;
- Do not tamper with the electrical connections inside the junction box and do not attempt to open or remove the box itself;
- Do not drill holes or cuts on the surface of the panel that could expose live electrical components;
- Perform all installation and maintenance operations in dry places and preferably away from direct light sources;
- Perform all installation and maintenance operations away from aggressive, explosive or flammable chemicals;
- Install the photovoltaic panel so that the module and its electrical cables are not subjected to excessive mechanical stress or bending;
- Do not use photovoltaic (even if new) modules that are damaged by the transportation or packaging. Instead, contact the customer service as soon as possible to receive proper assistance;
- Do not apply paint or coating products for the protection of the module. Please contact customer service for information about any extraordinary maintenance of the PV module;
- If the charge controller has been purchased separately, check the compatibility with the photovoltaic module first;

In order to make warranty service more convenient and quicker if the panel defections are not attributable to its incorrect use, **FLY SOLARTECH SOLUTIONS recommends that you keep the original packaging and purchase invoice for the entire Warranty period (3 years).**

Indications about mechanical properties

The special ETFE cell coating material guarantees additional protection, but still it is necessary to pay attention when handling the photovoltaic module in order to prevent accidental damage which could compromise the efficiency of the module if not even its operation.

SGM-S2-FLY panels fall into the category of semi-flexible panels, indicating that it is possible to apply a certain radius of curvature to the module. That said, the modules should be handled by trying to avoid any bending angles greater than 40 °. This means that, considering the image on the side, if L is equal to 1000mm (module length), then F must not be greater than 60mm.



 **Never make a bend inward the module, as the particular arrangement and interconnection of the cells would be irreparably compromised.**

The FLY-S2-SGM modules can be trampled but only when they are installed on rigid surfaces as smooth as possible and free from irregularities.

It is also advisable not to foot the modules with shoes that are particularly rigid or that have shabby parts (heels, wedges, etc.) in order to avoid any damage to the cells.

As for the handling of the modules, they can be carried by hand by gripping them in such a way that you do not cause them to bend with an angle higher than the one specified above. Alternatively they can be grabbed even from the long side, being careful not to exert too much pressure with the fingers on the edges of the cells. Absolutely avoid the transportation of the modules by grabbing them from the edges or angles as sudden or excessive bending may lead to breakage of the cells.

Further recommendations regarding the mechanical properties of the module are related to the choice of the installation area, which should not be subjected to continuous stresses (such as acute vibrations or sudden and repetitive movements) and exposed to the sun as much as possible in order to avoid partial shading phenomena which could affect the overall efficiency of the module. It is also recommended to ensure adequate airflow near the module in order to avoid overheating phenomena that would decrease the energy yield.

Indications about installation options

INSTALLATION WITH EYELETS AND / OR BOLTS

Some versions of the SGM-S2-FLY modules have metal eyelets that are functional to their installation. Through these arrangements, it is possible to secure the modules using ropes, strings or straps with sufficient strength to ensure the solid support of the module even in the presence of aggressive atmospheric agents. Alternatively, drills can be made on the host surface in correspondence with the position of the eyelets on the module so that the panel and the receiving surface can be firmly secured by screws. In both of the above described cases, as it is not possible to ensure direct contact between the module and the underlying surface, it is strongly advised not to tap the modules or place any heavy objects on them.

INSTALLATION WITH TENAX® BUTTONS

On the panel versions equipped with eyelets, it is possible to secure the modules to the host surface even with the usage of TENAX® buttons. These buttons are also indicated for anchoring on fabrics such as bimini tops or other canvas curtains and structures. The wide availability of TENAX® solutions makes it possible to find the type of installation that best suits your needs.

INSTALLATION WITH 3M ADHESIVE VELCRO OR GLUE

For both the standard ETFE panel version with eyelets and those that are not fitted (identified by the FLYE tag) it is possible to request the implementation of adhesive Velcro strips along the long sides of the panel. The part fixed to the module will already be set up, so the user have just to secure the second part to the host surface. The 3M high-adhesive adhesive allows the Velcro strip fastening even on surfaces that are not perfectly smooth or regular, but in this case it is advisable not to apply excessive weights on the module or place it in areas subject to strong wind flows. This type of installation is to be considered definitive, therefore it is not advisable to reposition the Velcro strip placed on the host surface as the 3M adhesive may lose its strength.

An equivalent installation can also be achieved through the use of silicone or polyurethane glues. In this case, FLY SOLARTECH SOLUTIONS will not be responsible for any damages to the module, so we recommend that you contact the customer service directly to obtain support. When using glues, much care should be taken in order not to create any thickness irregularities underneath the module if you want to maintain its walkability. It is also advisable to keep the thickness of the glue layer below 2mm.

For these two types of permanent installations, it is advisable to check the module's correct functioning beforehand, verifying that the current values and voltages are comparable to those indicated on the product datasheet.

INSTALLATION WITH HIGH QUALITY ZIP

For both standard FLY panel version (with eyelets) and FLYE panel version (without eyelets), it is possible to request the implementation of a high strength ZIP applied to the long sides of the panel that allows a removable installation through the sewing of the other end of the ZIP to the fabric (normally the bimini of a boat) or the fibre that will house the panel. Also in this case, since there is no direct contact between the panel and the host surface, the panel is considered non-walkable.

Electric Indications

Although the panel can be considered a battery, which means a DC power generator, this cannot be directly connected to an electrical device because of the instability in the panel current production, which is subject to module illumination and could damage the loads directly connected.

Therefore it is common practice to connect the photovoltaic module to a battery that will store the current generated by the panel and then distribute it to the connected utilities.

Even in this case, however, the direct connection between the panel and the battery can only be achieved if the voltage of the two devices is perfectly sized and even in this case problems such as battery overload or charge management may cause on the long run severe damages to the PV system.

It is therefore advisable to adopt a charge controller able to stabilize the process of collecting and converting energy from the panel to the connected batteries. Specifically, a Maximum Power Point Tracking (MPPT) regulator can instantly get the maximum charge current from the module at any time and represents the best possible solution for your stand-alone system. FLY SOLARTECH will be pleased to suggest you the charge controller that most suites to your needs.

Sizing the solar cables is also a key component in determining the efficiency of your PV system, as a too small section for a high cable length can lead to voltage drops that can affect the panel's energy harvesting capacity. Below there is a small explanatory table that shows the correct dimensioning of the solar cables:

MAX PANEL CURRENT (ISC)	CABLE LENGHT (L)		
	L < 2 mt.	2 mt. < L < 8 mt.	8 mt. < L < 15 mt.
6 A	2,5 mm ²	4,0 mm ²	6,0 mm ²
8 A	4,0 mm ²	6,0 mm ²	8,0 mm ²
12 A	4,0 mm ²	8,0 mm ²	10,0 mm ²

Although the optimal solution for a PV system consists in each module connected to its controller, which in turn is connected to a battery, it is still possible to connect multiple modules in series or in parallel according your needs. In the case of serial connections, where the PV system voltage is the sum of the voltages of the individual panels of the series, it is recommended to use modules with the same cells and therefore able to dispense the same electrical current.

Even in the case of parallel connections, where the currents of the individual panels are summed, it should be firstly checked that the panels all work at the same output voltage and are connected to the controller with sufficient cross-sectional cables to support the current resulting from the connection of the panels. In addition, in order to avoid energy dispersion or current reflux, FLY SOLARTECH strongly recommends the adoption of a diode system to be connected between panel and controller (see the specific manual for diode and fuse installation and maintenance).

Maintenance notes and possible faults

MAINTENANCE

Considering the great chemical and mechanical resistance given by the ETFE and glass fiber addition to the module, as well as the absence of complex mechanical parts that might undergo a failure, the maintenance of this type of product is limited to the adoption of few, simple precautions, including:

- Verify that the self-cleaning panel surface is free from stains or large residuals that could cover the cells. In addition, although the panel is resistant to salt and other chemicals, it is advisable to clean it with fresh water and without the use of abrasive substances;
- Periodically check the integrity of the electrical connections and the integrity of the module in general;
- Periodically check the efficiency and operation of the panel by consulting the data from the charging controller connected to it;

PREVENTING THE "HOT-SPOT" ISSUE

If one or more damaged or shaded photovoltaic cells are present on the module for an extended period of time, the so-called "HOT-SPOT" phenomenon may occur on the panel, which consists in the overheating at very high temperatures (higher than 150 °C) of a very small area of the panel. This local overheating can cause the cells to fuse, create smoke or even small local burns. If there are any obvious signs of the "HOT-SPOT" phenomenon, the affected module must be immediately disconnected from the system in order to stop the current flow and avoid the continuous overheat of the affected area. Alternatively, if it is not immediately possible to disconnect the panel from the system, simply cover the cells in order to stop their functioning.

POSSIBLE FAULTS

- **Cell breakdown.** Cell breakage usually does not lead to total inefficiency of the module, but rather to a drop in yield. Breaks may occur due to excessive bending of the module during installation or use, or mechanical shock or stress. A module that has broken or malfunctioning cells can be recognized by measuring the current produced to its heads with a full-scale ammeter. In full sun, the current produced must be comparable to the **I_{sc}** value given in the datasheet. The voltage at the head of the module is, however, a less significant measure, since even in the presence of cells breaks it may vary slightly.
- **Presence of water inside the Junction Box.** Although the junction boxes used on FLY SOLARTECH panels have a high degree of impermeability, it may happen that due to production defects or shocks, water infiltrations occur inside the junction box. In this case, the removal of its lid and a careful drying can restore normal conditions. If that is not the case, contact FLY SOLARTECH customer service before performing any repairs, otherwise the warranty will be declined.

Generally, FLY SOLARTECH suggests checking firstly that all the electrical connections between PV module, charge controller and batteries are properly executed and in good conditions.