Safety & Installation Manual

Silfab Solar

Photovoltaic Modules:
SLA M SERIES, SLG M SERIES, SLA X SERIES, SLG X SERIES, SSA M SERIES, SSG M SERIES

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1. SAFETY NOTICE

This Safety and Installation Manual provides important safety information relating to the installation, maintenance and handling of Silfab SLA/SSA and SLG/SSG modules. Professional installers, operation & maintenance technicians, and system users/owners should read this manual carefully and strictly follow the instructions. Failure to follow these instructions may result in death, injury or property damage, and possible void of warranty.

Please keep this manual for future reference.
We recommend checking www.silfabsolar.com regularly for the most updated version.

Warning: All instructions should be read and understood before attempting to install, wire, operate and/or maintain the module. Module interconnects pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, whether the module is connected or disconnected.

Avertissement: Toutes les instructions devront être lues et comprises avant de procéder à l'installation, le câblage, l'exploitation et/ou l'entretien des panneaux. Les interconnexions des panneaux conduisent du courant continu (CC) lorsque le panneau est exposé à la lumière du soleil ou à d'autres sources lumineuses. Tout contact avec des éléments sous tension du panneau tels que ses bornes de sortie peut entraîner des blessures ou la mort, que le panneau soit connecté ou non.

2. INSTALLATION MANUAL DISCLAIMER

The information contained in this manual is subject to change by Silfab Solar Inc. without prior notice. Silfab Solar Inc. gives no guarantee of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein. This Manual (or document) is written in English with Spanish (or other language) translation for reference only. In case there are inconsistencies or conflicts between the English version and the Spanish version (or other language version) of this Manual (or document), the English version shall overcome and take control in all respects.

3. GENERAL INFORMATION

Silfab Solar products produce electrical energy by converting the sunlight's radiation reaching their surface, when appropriately exposed, into continuous/direct current (DC).

The SLAxxxM and the SLGxxxM are similar in the sense that both series employ Mono-Si Cells and are different in the sense that the SLAxxxM contain 60 cells per module and the SLGxxxM contains 72 cells per module. SLA and SSA models are the same, except SSA model is using optimizer, and SLG and SSG models are the same, except SSG model is using optimizer. X series are similar to the SLAxxxM, SLGxxxM, models with n-type Mono-Si Bi-facial cells.

3.1 Model Naming Overview:

S (S/L) (A/G) (xxx) (M/X)

Where:

S – Silfab brand
(S/L) – (S) Smart and (L) Standard module.
(A/G)- (A) is used to indicate 60-Cell modules and (G) for 72-Cell modules.
(xxx) - indicates the power output in terms of watts.
(M/X) – (M) is used to indicate monocrystalline cell and (X) is used to indicate Bi-facial Cell type.

The rated currents at Standard Test Conditions (STC) of these modules are variable depending on the model and the relative power rating, as indicated in the respective datasheets.

3.2 Disclaimer of Liability

Since the methods of system design, installation techniques, handling and use of this product are beyond company control; Silfab Solar Inc. does not assume responsibility and expressly disclaims liability, for loss, damage or expense resulting from improper installation, handling or use.

4. PRODUCT CERTIFICATION

Silfab products meets and/or exceeds the requirements set forth by UL 1703 for PV Modules. Dependent on the product markings, this product may also be certified to IEC 61215 ed.2, IEC 61730-1 and IEC 61730-2 for application Class A.

These UL and IEC to be freestanding. To satisfy the listing for this product the modules must be mounted with a rack or standoff structure. The UL and IEC listing does not include integration into a building surface because additional requirements may apply. The module is considered to be in compliance with UL 1703 and/or IEC 61215/61730 only when the module is mounted in the manner specified by the mounting instructions contained in this document.

5. LIMITED WARRANTY

Please refer to Silfab General Terms and Conditions of Sale for details of the modules' limited warranty. Failure to comply with this Safety and Installation Manual would void Silfab Warranty for the PV modules as stated in the General Terms and Conditions of Sale.

6. MODULE SPECIFICATION

Please refer to the appropriate Silfab SLA M, SLG M, SLA X or SLG X datasheet for electrical performance data and mechanical installation information.

7. SAFETY PRECAUTIONS

Installation should be performed only by authorized personnel.

All installations must comply with the applicable geographic electrical standards. I.e. International, National, Regional and local electrical standards etc.

Within the modules there are no user serviceable parts. Do not attempt to repair any part of the modules. Do not use or install broken modules

In order to reduce the risk of electric shock, prior to installing the modules, remove metallic jewelry and use insulated tools during installation.

Modules produce voltage even when not connected to an electrical circuit or load and have no on/off switch. Modules can be rendered inoperative only by removing them from sunlight, or by fully covering their front surface with cloth, cardboard, or other completely opaque non-marking material, or by working with them face down on a smooth, flat surface.

• Do not expose the modules to artificially concentrated sunlight.

• Do not stand on, drop, scratch, or allow objects to fall on the modules.

• Do not lift the modules by the junction box or junction box cables.

• Do not install or handle the modules when they are wet or during periods of high winds. Modules in Silfab packaging should not be kept outdoors exposed to rain.

• Ensure that junction box cables are provided with strain relief to avoid damage to the junc¬tion box, maintaining a minimum bending radius of 50 mm at all locations along the cable.

• Do not leave cable connectors exposed in adverse climatic conditions. Water and dust deposits inside the cable connectors can cause long term damage.

A module with broken glass, torn or cut backsheet, damaged junction box, connectors or cables present electrical safety hazards and must be removed from service.

The total voltage of modules connected in series corresponds to the sum of the voltages of the single modules; whereas connecting the modules in parallel results in adding up the currents. Consequently, strings of inter-connected modules can produce high voltages and high currents and constitute an increased risk of electric shock and may cause injury or death.

For installation, maintenance, or before making any electrical connection or disconnection, ensure all modules in the PV array are exposed to a light intensity that is less than 400W/m2 as measured by an accurate solarmeter/ pyranometer.

Methods to reduce solar irradiance when making electrical connections or disconnections include:

• Covering the modules with an opaque cloth or other material in order to shield them from exposure.

• Making the connections during hours of low intensity of solar irradiance (such as early morning or late afternoon).

8. INSTALLATION

8.1 Module Mounting Overview

The fire rating of Silfab modules is valid only when mounted in the manner specified in the mechanical mounting instructions.

When installing Silfab modules, local building code requirements and regulations must be adhered to at all times. In case of roof mounting, the appropriate system fire class rating of PV module with Mounting system in combination with roof covering and slope applications should be considered. Silfab modules are Type 2 or Type 1 (only on request) modules. Sufficient ventilation of the module backside is required to maintain the Type 1 or 2 fire rating, and therefore the mounting configuration (e.g. sufficient clearance) should be adapted accordingly. The recommended clearance distance is a minimum 10 cm (3 15/16”).

Select a site and configuration that maximizes direct sunlight exposure and eliminates or minimizes shadowing.

Avoid low tilt angles to prevent the accumulation of dirt/debris along the module edge.

Modules must be spaced a minimum 10 mm (3/8’) a part on all sides to provide space for thermal expansion and to provide ventilation.

Do not drill any additional holes into the module frames and do not cover the drainage holes.

Do not mount Silfab modules in a position where the junction boxes are “upside down” (leads facing upwards).

8.2 Module Mounting Method using mounting holes

Each module must be securely fastened at a minimum of 4 points.

Only use the 4 pre-drilled mounting holes (slots, see Fig. 3a/3b) on the PV module frame to bolt the module with M6 (1/4") stainless steel screws and nuts to the mounting framework.

The distance of the mounting holes has been designed in order to result in a uniform wind and snow load without damaging the module.

⊘ Do not drill additional holes in the module frame; doing so will void the Warranty.

8.3 Mounting using clamping method

Silfab recommends the use of clamps with a design as shown in Fig. 4a (or equivalent). The use of improper clamps will void the Warranty.

• These modules can be installed in either Portrait (vertical) or Landscape (horizontal) configuration. Refer to Fig. 4 b, c, and d for an example of attaching the modules to a support structure using mounting clamps. Use stainless steel hardware.

• These modules can be mounted on continu¬ous base structures (inclined or horizontal) such as rails or similar.

• Both base structures must be mounted at the same distance from the symmetrical axis (portrait or landscape) of the module (Fig. 5a/5b).

• Placing the supporting elements as per Fig. 5a/5b is necessary in order to maintain a correct load distribution and achieve the minimum UL1703 design load rating of 30 lb/ft2 and IEC61215 2400 Pa load rating.

• When clamping the modules on a support structure, the following rules have to be applied in order to maintain the resistance against static loads as certified:

If the bars or rails run parallel to the module's horizontal frames, they have to be placed nearby the mounting holes (±50 mm (±2') of the mounting hole) in order to achieve IEC61215 5400 Pa (113 lb/ft2) downward applied load rating. Please see the blue mounting zone sections in Fig. 5a/5b.

If the bars or rails run parallel to the module's vertical frame, they have to be placed within the spacing of 500-750 mm (19 11/16 – 29 1/2") in order to achieve the UL1703 design load rating of 30 lb/ft2 and IEC61215 2400 Pa load rating. Please see the orange mounting zone sections in Fig. 5a/5b.

The modules can also be secured by placing the framed module on a structure that is supporting the two vertical sides of the frame covering the entire length. In this case, the position of the mounting clamps must be in accordance with the above mentioned spacing(s) – refer also to Fig. 5a/5b. Please see the orange mounting zone sections in Fig. 5a/5b.

Recommended:
A photovoltaic system composed of Silfab modules mounted on a UL2703 certified mounting system should be evaluated in combination with roof coverings in accordance with UL 1703 standard meet the requirements to achieve the specified System Fire Class rating for a non-BIPIV module or panel.

For instance, if a listed mounting system with Class A System rating is installed with type 1 modules, the photovoltaic system is suitable to maintain the System Class A Fire Rating.

Any mounting system limitations on inclination or accessories required to maintain a specified System Fire Class Rating should be clearly specified in the installation instruction and UL2703 certification of the mounting system supplier.

Recommended clearance distance of 115mm (4.5inch) (recommended) between module frame and the surface of the wall or roof. Other mounting techniques may affect the UL Listing or the fire class ratings.

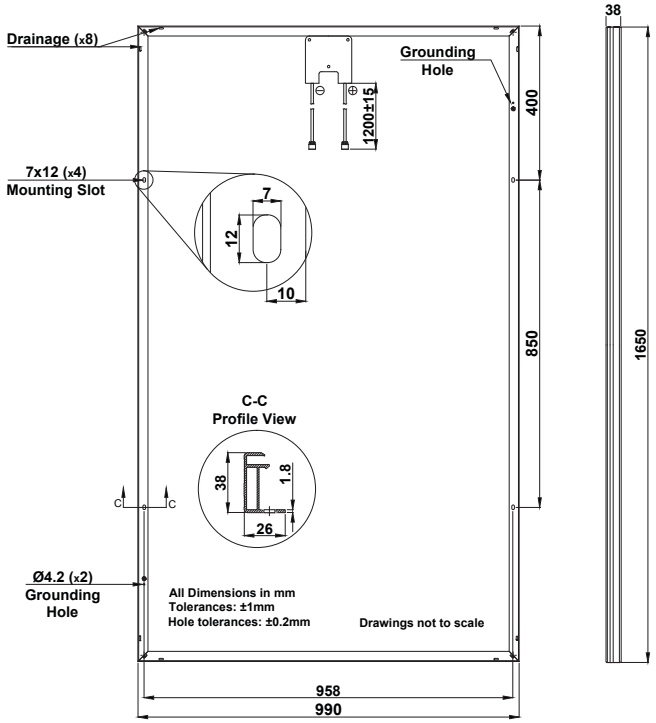


Fig. 3a: Mechanical drawing of the SLA/SSA module showing the mounting holes, the drainage holes, and the ground connection holes

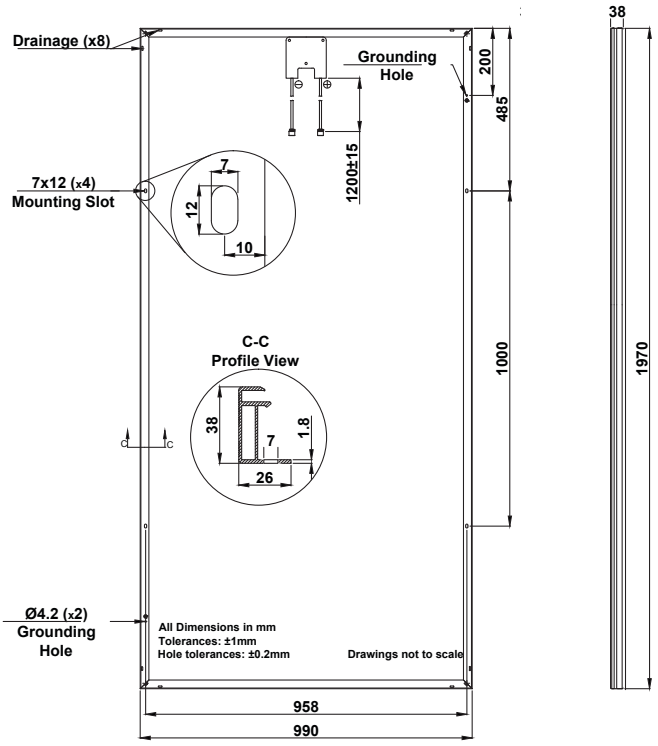


Fig. 3b: Mechanical drawing of the SLG/SSG module showing the mounting holes, the drainage holes, and the ground connection holes

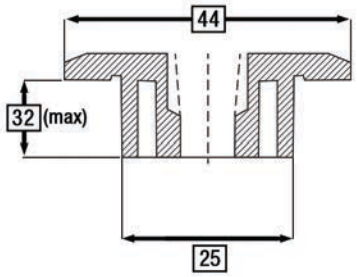
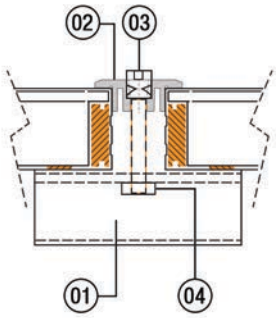


Fig. 4a: cross section of a mounting clamp to be used for attaching the modules to support structure (minimum length is 40 mm).



1 Rail 2 Clamp 3 Bolt 4 Nut

Fig. 4b: modules attached to supporting structure (rail, item 01) using a clamp (item 02) fixed with a bolt (item 03) and nut (item 04) – view between two modules.

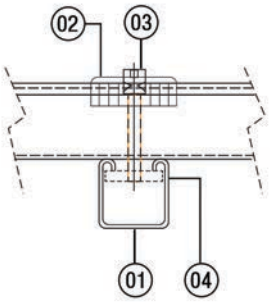


Fig. 4c: modules attached to supporting structure – side view

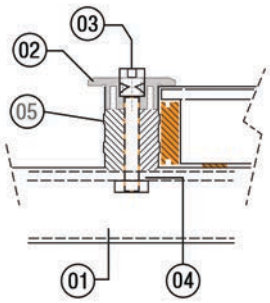


Fig. 4d: end of module row with additional spacer (item 05: 50mm x 30mm x 24mm)

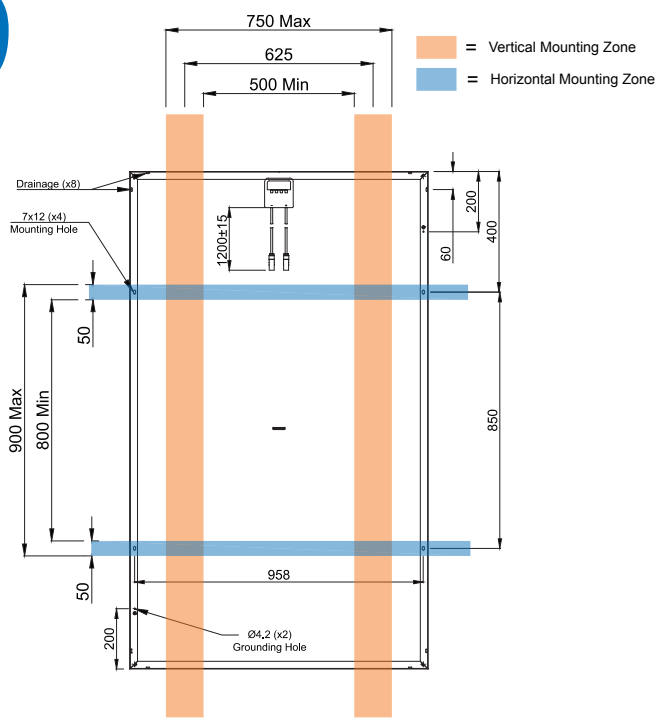


Fig. 5a: allowed positions for fixing SLA/S-SA modules using mounting clamps. Mounting must stay WITHIN the coloured areas.

⚠ ATTENTION:
in the case of installation with modules in the portrait configuration, install the modules with the junction boxes at the top in their “upright” position. This will reduce the risk of water infiltration into the junction box.

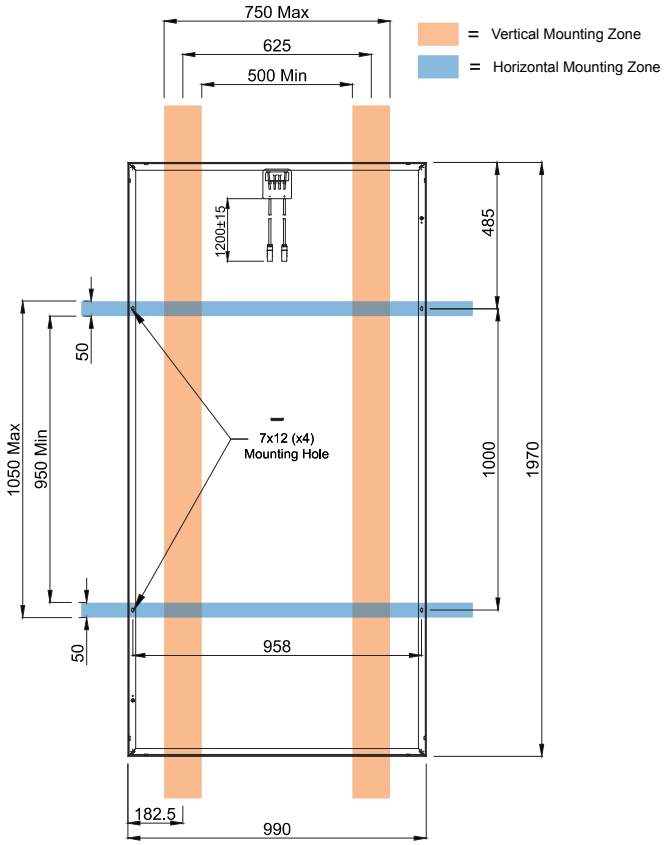


Fig. 5b: allowed positions for fixing SLG/SSG modules using mounting clamps. Mounting must stay WITHIN the coloured areas.

9. HANDLING OF MODULES

⚠ The Silfab modules are robust, but cells may be subject to damage if the modules are improperly handled or installed.

⚠ Wear protective gloves when handling and installing the modules to protect against cuts and burns.

⚠ Handle the module in a way that avoids breakage or scratching of the glass or backsheet and mechanical damage to any other part of the module.

⊘ Do not carry the module by its cables. Electric shock or damage to the module may result.

⊘ Do not drop sharp or heavy objects on either surfaces of the module.

⊘ Do not subject the modules to any impact, and do not flex them mechanically.

⚠ In the event of any damage to either the front or the back of the module, dangerous electrical hazards may exist, especially if the module is connected in series to a string. Replace the module immediately and take extreme caution when handling.

⚠ Any modifications to the junction box cables or connectors will void the module warranty. Any attempted repairs or other tampering with the junction box will void the warranty.

⊘ Do not step or stand on the PV Module.

9.1 Electrical Connection

⊘ Do not connect or disconnect modules under load! Danger! Risk of serious injury or death from electric shock or electric arc flash!

⚠ Only connect modules with the same rated current in series and modules with the same rated voltage in parallel.

⚠ High hazardous voltage (several hundreds of volts) may occur during installation. Consequently, installation and maintenance of the modules, as well as the connection to the main power supply, may only be performed by authorized and qualified persons.

⚠ Under normal conditions, a PV module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on the module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to the module output.

⚠ The maximum system voltage rating is 1000V for TUV/IEC and 1000V for UL.

⚠ The maximum series fuse rating is 15A.

⚠ The bypass diodes are not over-current protection devices. In the event of known or suspected diode failure, installers or maintenance providers should contact Silfab. Never attempt to open the junction box!

⚠ To obtain the desired system voltage, modules are wired in series connection. The recom-mended maximum series configuration must NOT exceed the certified maximum system voltage stated in the module spec sheet. The recommended number of modules for series connection can be found below:

Product	Modules in Series	Modules in Parallel
SLAxxM, SSAxxxM, SLA-X xxx	22	1
SLGxxxM, SSGxxxM, SLG-X xxx	18	1

*Refer to the appropriate local geographic electrical codes and regulations for the correct Voc correction factor according to the respective temperatures. If this information is not available, a 1.25 multiplying factor can be used as default value for correction of Voc.

⚠ For connection of the modules use only appropriate cables with a minimum conduct cross-section of 4 mm2 that is compliant to the relevant jurisdiction code.

⚠ Verify the junction box lid is firmly closed before installing the module.

⊘ Do not repair or reconnect junction box cable. It may occur spark or electric shock.

⊘ Do not bend junction box cable. Under stress, it can damage the module. Cable bending radius should be at least more than 4 times the cable diameter.

⚠ Before connection of the system to the grid, the PV system must be approved for correct installation, by all appropriate authorities.

⚠ Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

⚠ The design of the PV system should be done by a qualified person familiar with PV system design. Silfab does not assume any responsibility for how the modules are installed or how the system is designed.

⚠ Refer to the tables at the end of this installation manual for electrical parameters.

9.2 Grounding

⚠ A Silfab module with exposed conductive parts is considered to be in compliance with UL 1703 and/or IEC 61730 and 61215 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the US National Electrical Code, Canadian Electrical Code, and/or any other applicable international standards and codes.

⚠ The module frame must be grounded before wiring. The grounding connection must penetrate the frame's anodized layer.

⚠ The grounding should be performed by a qualified electrician using grounding methods in accordance with article 250 of NEC or Canadian Electrical Code requirements CSA C22.1.

• A ground hole is present on each module, marked with a ground symbol and/or green label.

• Use a 6-12 AWG copper wire only. The bolts, nuts, flat washers, lock washers or other hardware should be made of stainless steel.

• The bolted or screwed ground connection, should include the following:

• A screw size of M4 (minimum)/#8 imperial (maximum)

• A star washer under the screw head or serrated screw that must penetrate the frame's anodized layer.

• A UL-listed grounding lug or UL approved ring terminal.

• Torque the grounding connections to 25 inch-pounds

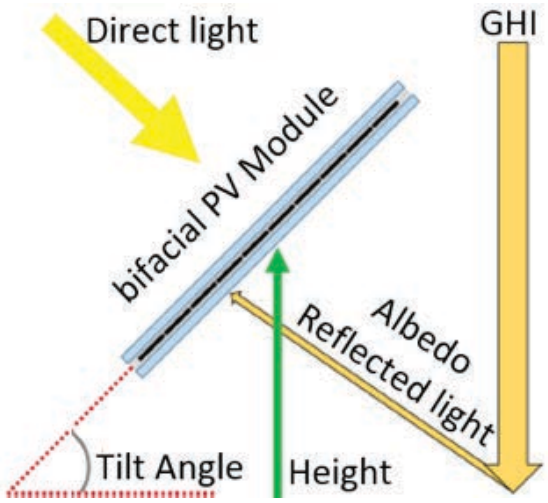
⚠ The modules can be grounded using third party grounding devices as long as they are certified for their intended purpose, have been evaluated and tested with the system, and the devices are installed according to the requirements of American NFPA NEC 70, Canadian CSA C22.1 and/or relevant local codes and regulations.

• Ensure that the grounding area for the connection is clean and free from oxides or any debris that could impede the electrical grounding.

Always follow safety procedures when installing any grounding/mounting system.

9.3 Silfab SLA X Bifacial Modules

Bi-facial modules are able to capture and convert light from both the front and back surface of the module, as shown FIGURE 6.a As a result, Levelized cost of electricity (LCOE) can be further reduced with Silfab bi-facial technology through rear-side generation up to 20% annual gain. This section outlines the fundamental components for consideration to maximize power output of your bi-facial PV system.



Step #1: Highest Surface Reflectivity/Albedo

• Performances of bifacial PV modules are linearly dependent on the albedo.
• Best results: crushed white rock, bright white paint, or an ENERGY STAR™ roof.

Step #2: Select the optimum height of installation & mounting structure

• Elevate the module above as much as possible, as it will capture more ground-reflected light.

• For flat ground/rooftop installation it's recommended a minimum height of 50-70 cm (19 11/16 – 27 9/16").
• Avoid shading the back side of the module from the support rack as much as possible.

Step #3: Tilt angle of modules

• Case-by-case based on site location. For site specific energy yield analysis and power reports, please contact Silfab Solar.

Important note:
Electrical connection

With an expected gain of power (Pmp) and current (Isc) from the rear due to significant light contribution, i.e from a high albedo background, the user/designer must consider the electrical performance of both front and irradiance % on backside for the following below. It's suggested at least +20% bi-faciality gain.

• Wire and string sizing
• Inverter short-circuit current input limit
• Overcurrent protection device

TIP: With multi rows structure, connect horizontal series of modules to different MPPT to reduce losses due to mismatch on reflected light on back side.

9.4 Silfab Smart Modules

This section of the installation manual is specific to Silfab Smart Modules (SSA and SSG), which use Tigo Energy's integrated junction box.

For residential, commercial and utility scale photovoltaic solar arrays, the Silfab Smart Modules and Tigo Optimizer System optimizes power output per-module. These modules also deliver module-level data for operational management and performance monitoring.

The SSA and SSG modules have also been programmed to a maximum voltage output to allow for longer strings of modules to be connected in series when compared to the standard SLA or SLG modules. The maximum system voltage rating of 1000V for TUV/IEC and 1000V for UL must be maintained in accordance to the US National Electrical Code, Canadian Electrical Code, and/or any applicable local standards and codes.

In addition to the SSA or SSG modules, the Tigo Optimizer System requires Gateways and Management Units (MMU) for proper operation.

For more information on the Tigo Optimizer System please contact Tigo Energy at:

- www.TigoEnergy.com
- (USA) 1.888.609.8446
- (outside the US) +1.408.402.0802
- skype: support.tigoenergy

9.5 Silfab Module installation in Marine Applications

This section provides guidance of safe handling and installation of Silfab PV modules between 50 to 500 meters to any salt water costal waterway regarded as “near-coastal”. Improper care and negligence to properly protect PV system as recommended may potentially induce salt-mist corrosion and accelerate electrical insulation losses and galvanic corrosion. Any violation found will not be covered under Silfab’s Limited Product and Linear Performance Warranty. For further inquiries, please contact Silfab’s Customer Service.

Mechanical Installation

- Do not scratch or break the corrosion-resistant coating (e.g. anodization layer) on PV Modules and mounting system.
- Use corrosion-resistant material (e.g. stainless steel SUS 316) for components (e.g. nuts, bolts, gaskets, etc.) to install your PV system.
- For safe mounting system installation, use insulation gaskets between mounting and grounding hardware attached to the PV module frame and between PV module frame and rail.
- For safe clamping installation method, use insulation gaskets between clamp and PV module frame, and PV module frame and rail.
- Recommendation for gasket insulation are mica lamination, or silicone, or fluoride made insulating material.

Grounding

- Silfab recommends to protect the grounding points of the PV system with an insulating pad, for example (a) Butyl Plaster to completely cover grounding block or (b) spray fluorocarbon varnish of 40 um thick onto ground blocks thoroughly to form an anti-corrosion coating. Remember to clean the grounding block and surrounding area and make sure the surface is dry. The components must be fully covered from exposure to salt.

To ensure optimum module performance, Silfab recommends maintenance service every three months with the following measures:

- Check the module frame, mounting system, grounding block and junction areas for potential signs of corrosion.
- Clean the module frame, mounting system, grounding block and junction areas from accumulation of dust and/or salt with soft foam materials, non-woven fabrics, whisks, soft sponges, soft brushes and hair brushes may be used.
- Upon possible finding of corrosion due to salt, re-apply Butyl Plaster or fluorocarbon varnish to cover rusty area thoroughly.

Important note: Disclaimer of liability

Silfab PV Modules have successfully passed IEC 61701:2011 – Level 5 Salt Mist Corrosion Test. However, full protection against salt exposure is largely dependent on multiple components of the PV system beyond Silfab’s control. As such, Silfab can strongly recommends to adhere to the installation procedure. If negligence is found, Silfab cannot hold responsibility and disclaim liability for any loss, damage, or expense arising out from “near-coastal” installation.

10. MAINTENANCE

Cleaning method of ARC-Glass of Silfab PV Module Silfab uses anti-reflective coated glasses for maximum performance. It is recommended to regularly clean the modules to ensure maximum power output. Module cleaning should be done in the early morning, in the evening, at night or on rainy days when solar irradiance is low.

Detailed description:

• Do not touch the glass with bare fingers or hands. Wear clean gloves to prevent fingerprints and other dirt from staying on the glass.
• Do not use metal tools, such as blades, knives, steel wood and other abrasive materials. Cleaning the glass with hard surface will scratch the ARC-glass.
• Do not use high pressure washers, abrasive brushes, powders, cleaners, polishers, sodium hydroxide, benzene, nitro-thinners, acid or alkali and other chemical substances. Doing so may damage the anti-reflective coating that is present on the glass of the modules and void warranty.
• All types of commercial glass cleaners, or alcohol/ethanol/methanol can be used.

Routine steps of cleaning:

1. Whisking: Debris such as dust and leaves on module surface should be removed with dry cloth.

2. Scraping: hard foreign matters such as dirt, bird droppings, plant branches, etc., should be scraped off with non-woven fabric or hair brush.

3. Washing: Colored substances, such as bird dropping, plant juices, etc., on module surface can be removed by cleaning by spraying water onto the dirty region and scraping with hair brush or non-woven fabric. The pressure of the cleaning water should be less than 690Kpa (100 PSI).

4. Cleaning of snow: Silfab modules can withstand heavy snow pressure up to 5400 Pascal. Do not try to remove frozen snow or ice from the module. Use a hair brush to gently remove the snow.

11. DIAGNOSTICS & TROUBLESHOOTING

The strict quality controls in Silfab Solar's manufacturing facility ensures all of our modules are sold free of significant defects, breakages and/or other problems. However, in its operation some problems may arise that can alter the correct operation of the modules.

In the event of accelerated deterioration of the module, Silfab Solar should be notified immediately to make the necessary replacement under the Silfab Limited warranty.

Please refer to the Silfab RMA Procedure for details on how to obtain repair or replacement service, credit or refund (as applicable) under the modules' limited warranty.

12. MODULE IDENTIFICATION

Each module is equipped with three identical serial numbers that acts as a unique identifier. They are located:
• inside the laminate under the front glass
• module frame
• on the pallet list

13. PACKAGING, HANDLING & STORAGE

13.1 Silfab's Packaging

These modules are arranged in horizontal position with the glass facing downwards as shown in Fig. 6.b. Transport the module in its original packaging until installation, to avoid water infiltration and do not place any heavy or sharp object on the top of the pallet or the modules, as it could damage the back of the modules.

15

Silfab packaging details

72 cell module:
Pallet footprint: 2005 x 1041 x 152 mm or 79 ½ x 41 x 6”
Package height: 1152 mm or 45 ¼”
Pallet weight: 668 Kg or 1473 lb
Pallet is IPPC-compliant.
Number of modules stacked: 25
Max loading configuration: 34

60 cell module:
Pallet footprint: 1701 x 1041 x 101.6 mm (67 x 41 x 4”)
Package height: 1142 mm or 45”
Pallet weight: 668 Kg
Pallet is IPPC-compliant.
Number of modules stacked: 26
Max loading configuration: 36

Figure 6.a. Silfab Packaging.

Figure 6.b. Silfab Packaging.

Figure 6.c. Silfab Packaging.

The packaging consists of:
- 1 wooden pallet (Fig. 7)
- 4 plastic protective corner angles per module (Fig. 8)
- Containment straps
- 1 water resistant cover
- Transparent film for containment

Fig. 7: Wooden pallet

Fig. 8: Protective corner

13.2 Correct Handling of Module Packaging

Each package has been designed for safe shipment and storage of modules. The following symbols apply to the packing, with the following meanings:

DO NOT EXPOSE TO RAIN, SNOW OR FLOODING: The plastic wrap is intended to prevent temporary contact with dirt, water or other materials but will not protect the modules from damage resulting from rain, snow and flooding. Modules should be stored in a sheltered dry location.

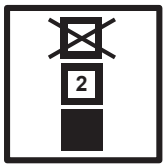
KEEP PACKAGING UPRIGHT: The packaging is only designed to be handled and stored with the modules sitting on the pallet as per Fig. 6. Not following these indicated directions may create forms of mechanical stress on the modules that could cause damage or breakage.

RECYCLE WHERE POSSIBLE: Both modules and packaging contain recyclable materials. Use caution when dealing with damaged modules.

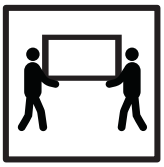
FRAGILE: Any direct impact to the glass or on the corners of the modules should be avoided. Avoid flexing the laminates or applying non-distributed loads and stresses. Avoid scratching the surface of the exterior glass or backsheet. Do not apply any forces to the backsheets. Do not drop the modules or pallets from any height.

HANDLE WITH CARE: during the operation of shipping and storage of the modules use maximum care to ensure the full integrity of the modules. Hidden cell damage can result if care is not taken.

DO NOT STEP ON MODULE.



DO NOT STACK MORE THAN TWO PALLETS HIGH.



SAFETY FIRST.

13.3 How to Handle the Pallet

During the handling of the pallet make sure to pay the utmost attention. The packaging must be raised/moved exclusively with fork-lift trucks or hand pallet trucks fitted with forks of length appropriate to its size and weight. The pallet which supports the packaging is a "4 ways" type (able to be lifted from any of the short or long sides). For the safe handling of the pallet the forks length should be:

• A minimum of 1800 mm for lifting from the shorter side

• Able to support the total weight of the packaging (>1000 kg)

Fig. 9: How to handle the packaging - When using a forklift, please ensure the forks go all the way through pallet. The fork length should be a minimum of 1800 mm

⚠ Verify that the package is positioned on a surface that is either flat or not excessively deformed to a point that would impart an inclination to the pallets which could damage the PV modules.

⊘ Do not aggressively lift pallets as module damage may occur.

13.4 Unpacking Modules

Observe the following procedures for the unpacking of modules:

• Place the packaging on a stable and flat surface
• Using a knife carefully cut the straps and plastic wrap then remove them.
• Remove the upper cover
• Recover the flash list (for record keeping)
• Remove the PV modules and their protective corners without damaging them
• Collect and store the protective and the wooden pallets

ⓘ Note: Once you have removed the strapping the pallet must no longer be moved as the load will not be secure.

If movement of the pallet is required be sure to re-strap the pallet as per the original packaging strap locations.

13.5 Pallet Sheet

Each package has a sheet (“pallet sheet”) placed in a visible position and containing some pertinent information such as: serial number of each module, part number of each module and pallet number. All Numbers are readable with a standard bar code reader.

13.6 Recycling Packaging Materials

Silfab undertakes efforts to treat every aspect of production to minimize the environmental impact. The packaging is made with materials that for the most part are reusable.

In particular, the wooden pallets (Fig.11) and protective corners (Fig.12) should be retained. Arrangements for recovery will be made on a case by case basis.

Fig.11

Fig.12

Fig. 11 & 12: How to package the pallets and plastic corners, respectively, after unloading, ready to deliver back to Silfab for reuse.

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15. REVISION LOG

Revision Level	Section(s) affected	Brief description of changes	Date
MAN-SLA-01 and MAN-SLG-01	ALL	Initial release	14/11/2011
MAN-SFO-02	MULTIPLE	Consolidated SLA & SLG manuals into SFO; added safety note; added more info on shading, diode failure, grounding, load ratings, environmental considerations, cleaning, transport, handling, etc.	04/22/2013
MAN-SFO-03	MULTIPLE	Added SSA/SSG models; clarified/revised information in multiple sections. A full re-read is recommended.	02/17/2015
MAN-SFO-4	ENTIRE DOCUMENT	Removed Poly modules; Added Bifacial modules; Added Identification locators; Added Diagnostics and Trouble-shooting; clarified/revised information in multiple sections. A full re-read is recommended.	05/10/2017
MAN-SFO-5	MULTIPLE	Reviewed and implemented changes each section.	17/11/2017
MAN-SFO-6	SECTION 9 - handling of module	Addition of Marine Application.	01/12/2017

Please retain a copy of this manual for future reference.

To download a copy of this installation manual
go to: http://www.silfabsolar.com/downloads

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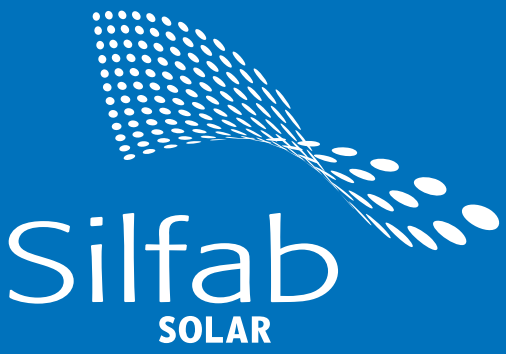
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