SILFAB SOLAR®

SILFAB SOLAR INC.
SAFETY & INSTALLATION MANUAL

SILFAB ELITE : BK/BG
SILFAB PRIME : HC/HC+/QD
SILFAB COMMERCIAL : HN/HM/QM/XM/XM+

BABA COMPLIANT | FLUORINE FREE | 25 YEAR PRODUCT WARRANTY | 30 YEAR PERFORMANCE WARRANTY | AUTOMATED MANUFACTURING | HIGH EFFICIENCY

Document Number: MAN-SSI-10 | SAFETY AND INSTALLATION MANUAL FOR PHOTOVOLTAIC MODULES

TABLE OF CONTENTS

1. SAFETY NOTICE

This Safety and Installation Manual provides important safety information relating to the installation, maintenance and handling of Silfab Solar SIL series 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 panneau solaire. Les interconnexions des panneau solaire 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 modules convert the energy of light directly into continuous/direct current (DC) by the photovoltaic effect.

SIL series consisted of different modules in the sense of cell number, contact technology, and module size.

3.1 Model Naming Overview:

SIL-XXX B(X)/H(X)/N(X)/Q(X)/X(M) Where:
SIL-Silfab Solar brand and XXX-indicates the power bin in watts.
B/H/N/Q/X is used to indicate technology, e.g. B = back-contact, H = mono half-cell, N = mono M3, Q = N-type, X = Bifacial. (X) to indicate size. C = 1762 mm x 1037 mm, C+ = 1914 mm x 1036 mm, D = 1721 mm x 1133 mm, G = 1864 mm x 1029 mm, K = 1795 mm x 990 mm, M = 2098 mm x 1133 mm, M+ = 2278 mm x 1133 mm, N = 2263 mm x 1037 mm.

3.2 Electrical Specifications

The performance and all photovoltaic parameters of the modules are measured under two different conditions: (1) Standard Test Conditions (STC) and (2) Normal Operating Cell Temperature (NOCT). Detailed electrical characteristics for all PV modules are presented in our products' DATASHEET and www.silfabsolar.com.

3.3 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

All Silfab Solar products have UL 61215-1:2017 Ed.1, UL 61215-2:2017 Ed.1, UL 61730-1:2017 Ed.1, UL 61730-2:2017 Ed.1, CSA C22.2#61730-1:2019 Ed.2, CSA C22.2#61730-2:2019 Ed.2, IEC 61215-1:2016 Ed.1, IEC 61215-2:2016 Ed.1, IEC 61730-1:2016 Ed.2, IEC 61730-2:2016 Ed.2 certification. A list of products including SIL-XXX BK, SIL-XXX HC, SIL-XXX HN have UL 1703 and ULC ORD C1703 certifications. These UL and IEC to be freestanding. To satisfy the listing for this product, the modules must be mounted with a rack or stand-off structure and installed at an altitude at or below 2000 meters. 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, IEC 61215/61730 and UL 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 Solar General Terms and Conditions of Sale for details of the module's limited warranty. Failure to comply with this Safety and Installation Manual would void Silfab Solar's Warranty for the PV modules as stated in the General Terms and Conditions of Sale.

6. MODULE SPECIFICATION

Please refer to the appropriate DATASHEETS 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).

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, whether monofacial or bifacial, generate voltage when exposed to light, even if they are not connected to an electrical circuit or load, and they do not have an on/off switch. To minimize the risk of electric shock, they must either be removed

from sunlight or completely shielded from light exposure. For monofacial modules, covering the front surface with an opaque, non-marking material such as cloth or cardboard is sufficient. For bifacial modules, both the front and rear surfaces must be fully covered to stop power generation.

- 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 Solar packaging should not be kept outdoors for a period exceeding 60 days.
- Ensure that junction box cables are provided with strain relief to avoid damage to the junction box, maintaining a minimum bending radius of 60 mm (2 3/8") 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/m^2 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 Solar modules is valid only when mounted in the manner specified in the mechanical mounting instructions.

When installing Silfab Solar 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 Solar modules are fire rating Type 1 or Type 2 in accordance with UL 1703 and/or UL 61730. For more information about the specific product, please check DATASHEET or www.silfabsolar.com.

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 100 mm (4").

Modules must be spaced a minimum 5 mm (13/64") apart on all sides to provide space for thermal expansion and to provide ventilation.

Modules are designed to flex under load; however, damage caused by interference with objects (e.g., ballast blocks, roof vents, or racking) during deflection or otherwise is not covered under the module warranty. To mitigate this risk, Silfab Solar recommends maintaining at least 100 mm (4") of clearance above and below the module.

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

Modules can be installed in either Portrait (vertical) or Landscape (horizontal) configuration.

For the highest load rating, mounting attachment points must be symmetrically positioned along the module's axis (portrait or landscape). The load ratings on the following pages are based on symmetrical mounting. For support with asymmetrical mounting configurations not listed in this manual, contact Silfab Solar at productsupport@silfabsolar.com.

Modules must be mounted using a UL 2703 or UL 3703 listed racking system with a load rating appropriate for the project.

The following pages provide design and test load ratings for approved mounting configurations and methods. Unless marked with an asterisk, these load ratings are not part of UL/IEC 61215 and UL/IEC 61730 certification. Use the centerline of the attachment method (e.g., clamp) to determine the correct mounting zone and corresponding load rating.

8.2 Module Mounting Using Mounting Holes

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

Only use the factory-provided mounting holes on the PV module frame to bolt the module to the racking system. Follow the racking manufacturer's instructions to secure the module to the racking system. At a minimum, mounting must include M6 or 1/4-inch corrosion-resistant bolts, nuts, and locking mechanisms such as lock washers or corrosion-resistant swaged collar fasteners, like BobTails, properly specified for the application.

Do not drill new holes or enlarge the factory-provided holes in the module frame, as this will void the warranty.

8.3 Module Mounting Using Clamps

Silfab Solar permits all common clamp types (e.g., top-down, bottom-mount, rear flange, etc.) provided that the following conditions are met:

- The clamps are designed for mounting framed PV modules like those manufactured by Silfab Solar.
- The clamps are included in a UL 2703 or UL 3703 Nationally Recognized Testing Laboratory (NRTL) listing.
- The clamps and racking system are installed according to the manufacturer's specifications.
- The design loads do not exceed the capacity of the clamps or racking system.

Please note that Silfab Solar's module warranty does not cover damage resulting from exceeding the capacity of the clamps or racking system. Silfab Solar also advises against using a racking system that is not rated for the project design loads or that has not been evaluated and approved by a professional engineer for the project.

In addition, clamps must not obstruct water drainage from

the modules (for example, by blocking drainage holes).

Rear flange-mounted clamps—those that attach to the bottom flange of the aluminum frame—are permitted only for the following Silfab Solar product lines: SIL-XXX BK/BG/HC/HC+/QD/HN/HM/QM/XM/XM+. These clamps must be installed at least 15 mm (9/16”) away from the edge of any mounting hole.

Additional module supports (e.g., clamps) may be added beyond the minimum requirements outlined in the following pages without voiding the warranty, provided they do not and cannot come into contact with the module laminate or junction boxes.

For racking systems designed for clamps to be installed in pairs, both clamps may be installed, with the midpoint between them serving as the effective clamp location, provided that the clamps are spaced less than 800 mm (31 1/2”) apart.

8.4 Module Orientation and Tilt

The highest energy yields are achieved when sunlight shines perpendicularly (at 90°) to the surface of the PV modules. To maximize system output, panels should be installed at the optimum orientation and tilt angle, which depends on location and on local conditions. The optimum orientation can be calculated by a qualified system design engineer(s). It is recommended that all panels in one string have the same orientation and tilt to ensure the system does not underperform due to mismatched outputs. To prevent solar module hot spots and/or reduction in power, find a location that has the lowest shading. Maintain a minimum module tilt of 3° to mitigate the effects of soiling and pooling water. Dependent on location, rainfall and pollution levels—a lower angle of installation potentially increases the requirement for regular cleaning.

SILFAB SOLAR®

Still have questions regarding installation?
Contact a product representative in the USA at
productsupport@silfabsolar.com.

RECOMMENDED

A photovoltaic system composed of Silfab modules mounted on a UL 2703–certified mounting system should be evaluated in combination with roof coverings, in accordance with UL 1703 and/or IEC 61215 standards, to meet the requirements for the specified System Fire Type designation for a non-BIPV 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 UL 2703 certification of the mounting system supplier.

Recommended clearance distance of 100 mm (4”) (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.

RAIL MOUNTING FOR SIL BK

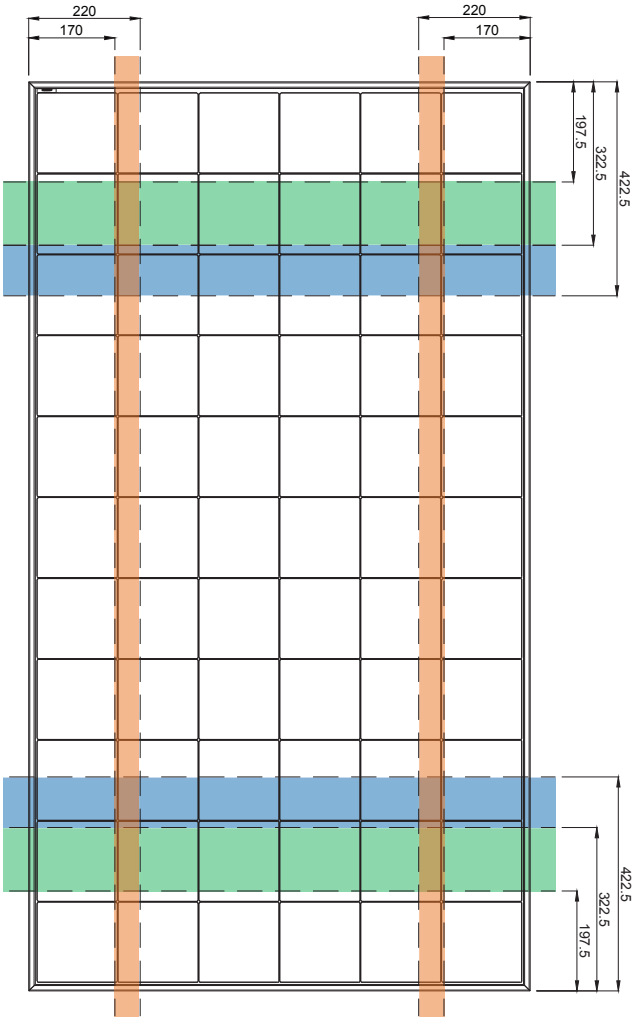
Allowed positions for fixing the **SIL BK** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

= Long Edge Primary Mounting Zone

= Long Edge Secondary Mounting Zone

= Short Edge Mounting Zone



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- For portrait installation, position modules with junction boxes right side up to reduce the risk of moisture ingress.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL BK

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp / Mounting Holes	Long Edge Primary	322.5 - 422.5	+3600 / -2667	+5400 / -4000
Clamp	Long Edge Secondary	197.5 - 322.5	+2667 / -1600	+4000 / -2400
Clamp	Short Edge	170 - 220	+1600 / -1470	+2400 / -2200

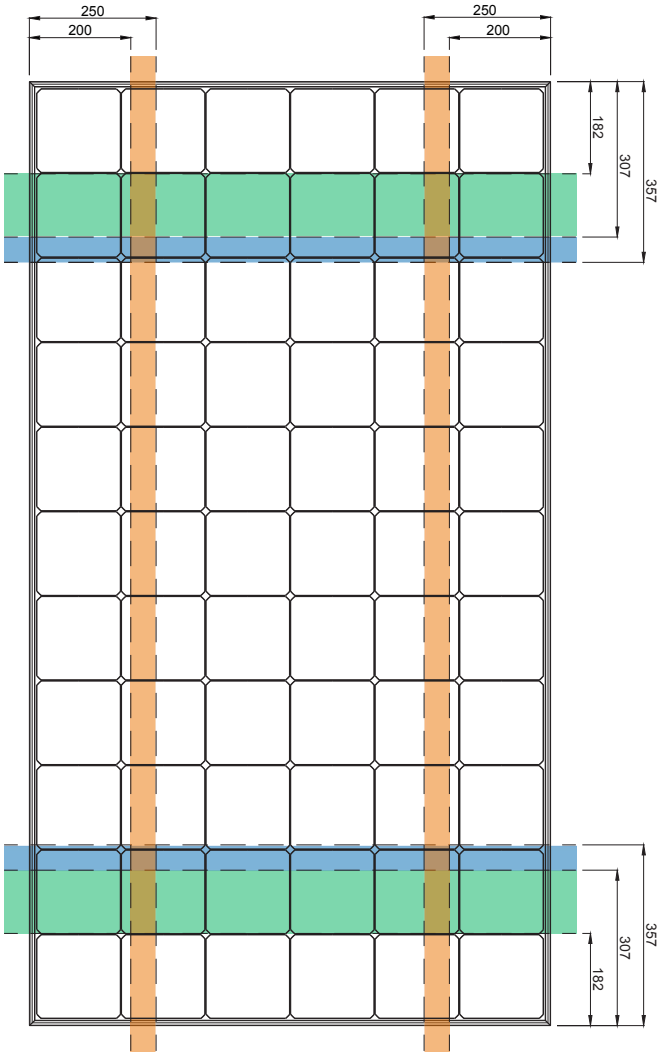
- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

RAIL MOUNTING FOR SIL BG

Allowed positions for fixing the **SIL BG** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

- = Long Edge Primary Mounting Zone
- = Long Edge Secondary Mounting Zone
- = Short Edge Mounting Zone



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- For portrait installation, position modules with junction boxes right side up to reduce the risk of moisture ingress.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL BG

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp / Mounting Holes	Long Edge Primary	307 - 357	+3600 / -3600	+5400 / -5400
Clamp	Long Edge Secondary	182 - 307	+2667 / -1600	+4000 / -2400
Clamp	Short Edge	200 - 250	+1600 / -1470	+2400 / -2200

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

RAIL MOUNTING FOR SIL HC

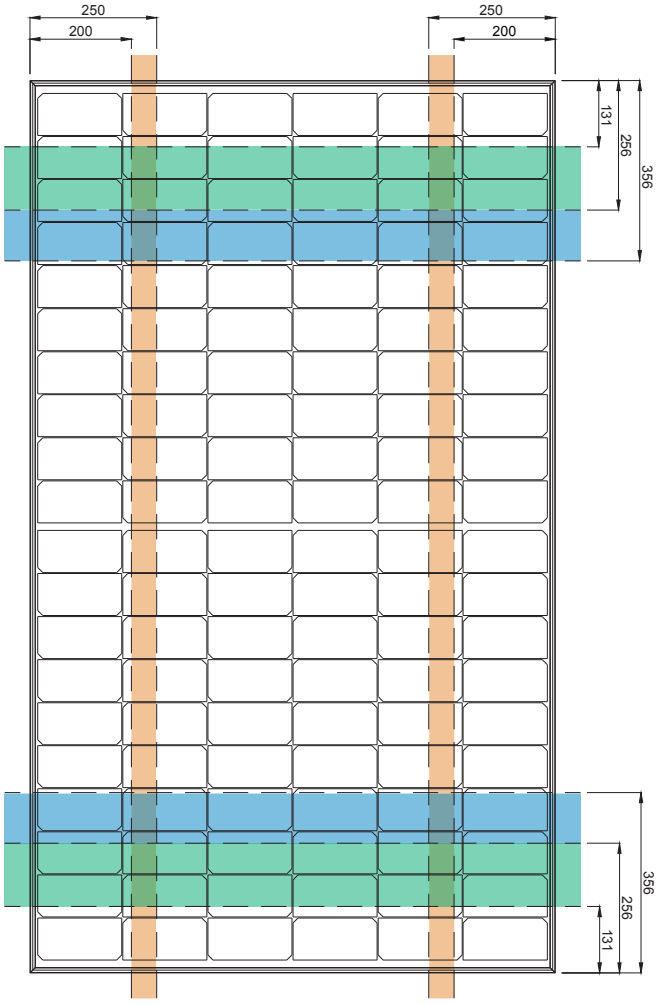
Allowed positions for fixing the **SIL HC** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

= **Long Edge Primary Mounting Zone**

= **Long Edge Secondary Mounting Zone**

= **Short Edge Mounting Zone**



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL HC

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp / Mounting Holes	Long Edge Primary	256 - 356	+3600 / -3600	+5400 / -5400
Clamp	Long Edge Secondary	131 - 256	+2667 / -1600	+4000 / -2400
Clamp	Short Edge	200 - 250	+1600 / -1600	+2400 / -2400

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

RAIL MOUNTING FOR SIL HC+

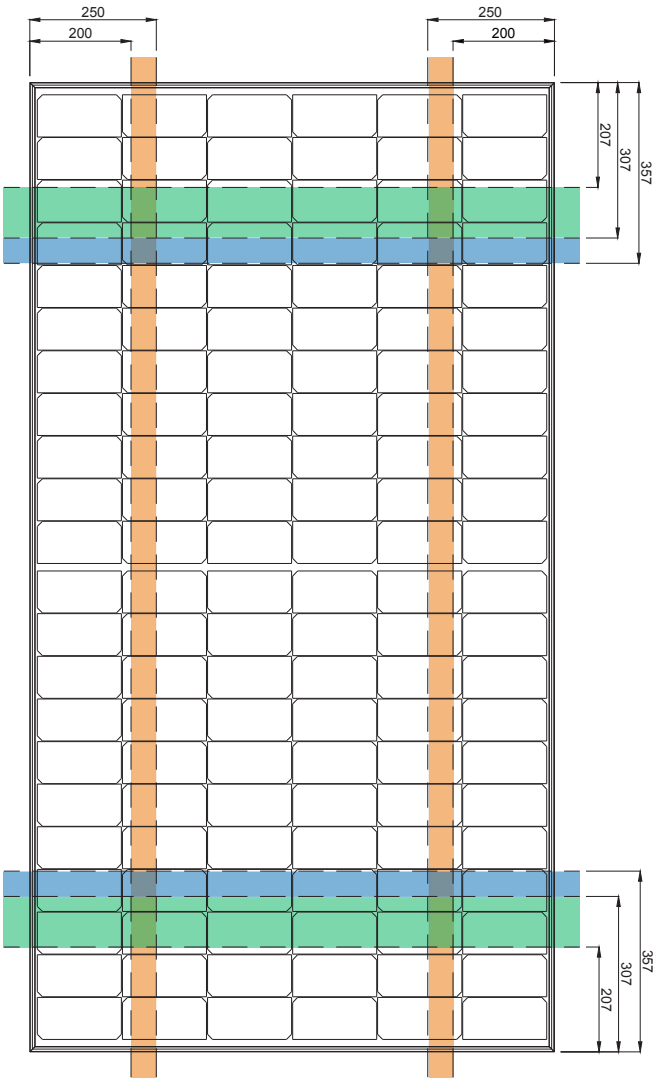
Allowed positions for fixing the **SIL HC+** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

= **Long Edge Primary Mounting Zone**

= **Long Edge Secondary Mounting Zone**

= **Short Edge Mounting Zone**



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL HC+

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp / Mounting Holes	Long Edge Primary	307 - 357	+3600 / -3600	+5400 / -5400
Clamp	Long Edge Secondary	207 - 307	+2667 / -1600	+4000 / -2400
Clamp	Short Edge	200 - 250	+1600 / -1600	+2400 / -2400

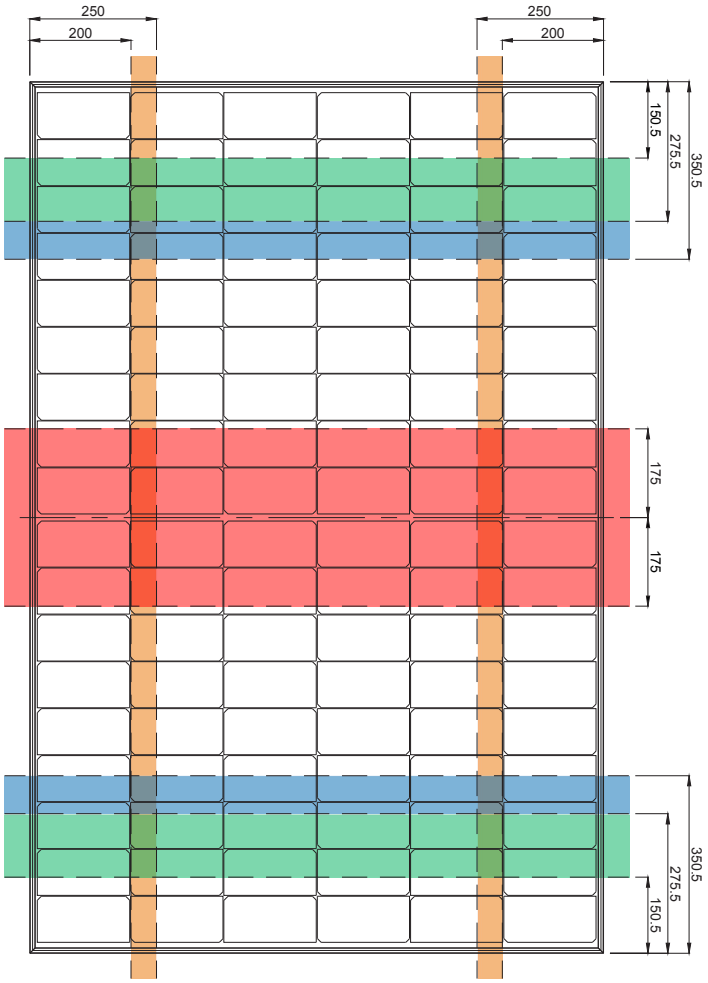
- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

RAIL MOUNTING FOR SIL QD

Allowed positions for fixing the **SIL QD** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

- = **Long Edge Primary Mounting Zone**
- = **Long Edge Secondary Mounting Zone**
- = **Long Edge Third Mounting Zone**
- = **Short Edge Mounting Zone**



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.
- When using the third mounting zone, avoid placing the third rail under the junction boxes.

SIL QD

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp	Long Edge Primary	275.5 - 350.5	+3600 / -2667	+5400 / -4000
Clamp	Long Edge Secondary	150.5 - 275.5	+2667 / -2400	+4000 / -3600
Clamp	Long Edge Three Rails	150.5 - 350.5 and red zone	+3600 / -3600	+5400 / -5400
Clamp	Short Edge	200 - 250	+1600 / -1600	+2400 / -2400

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

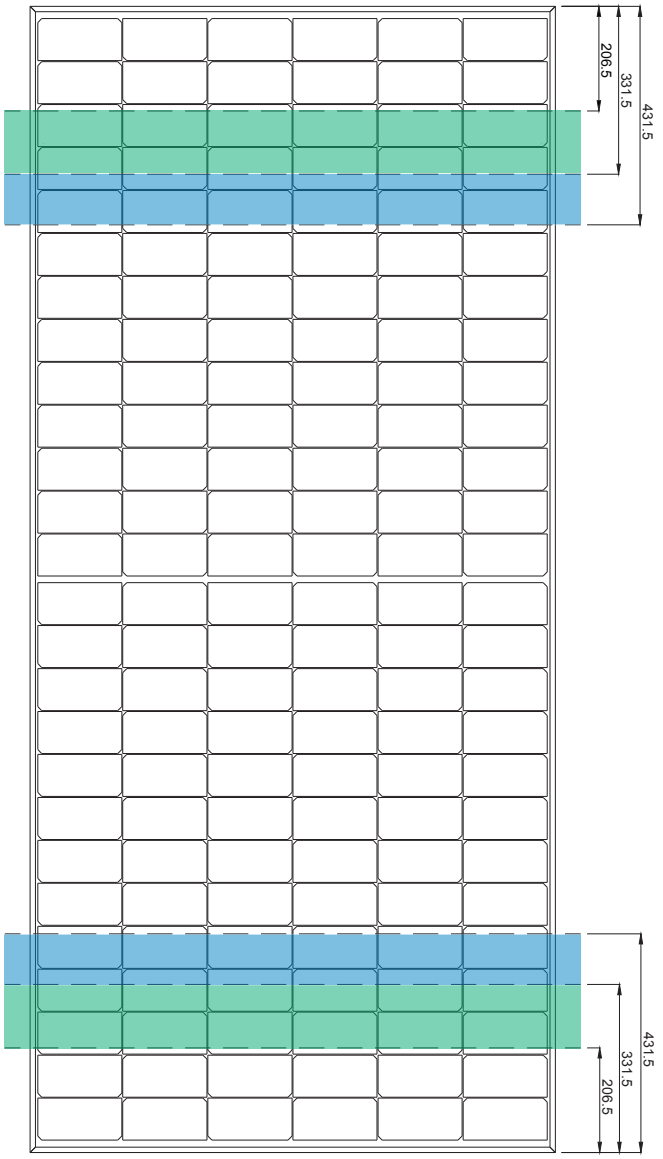
RAIL MOUNTING FOR SIL HN

Allowed positions for fixing the **SIL HN** module using mounting clamps.

Mounting must stay WITHIN the colored areas.

= Long Edge Primary Mounting Zone

= Long Edge Secondary Mounting Zone



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL HN

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp / Mounting Holes	Long Edge Primary	331.5 - 431.5	+3600 / -1600	+5400 / -2400
Clamp	Long Edge Secondary	206.5 - 331.5	+1600 / -1600	+2400 / -2400

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

RAIL MOUNTING FOR SIL HM AND QM

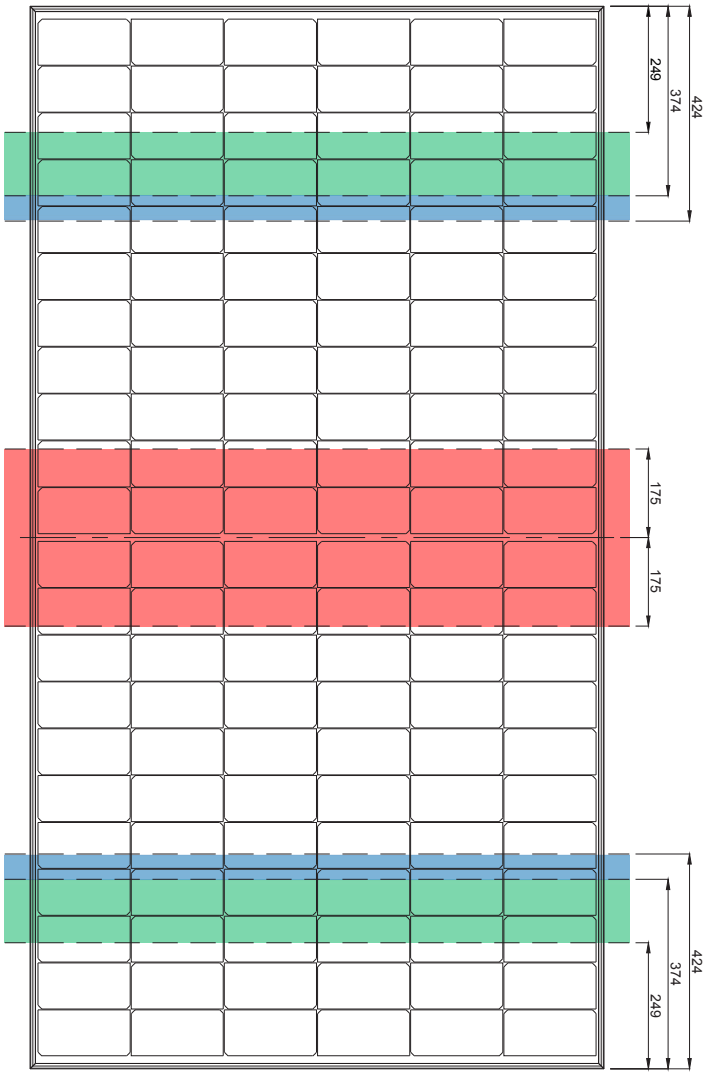
Allowed positions for fixing the **SIL HM** and **QM** modules using mounting clamps.

Mounting must stay WITHIN the colored areas.

= Long Edge Primary Mounting Zone

= Long Edge Secondary Mounting Zone

= Long Edge Third Mounting Zone



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.
- When using the third mounting zone, avoid placing the third rail under the junction boxes.

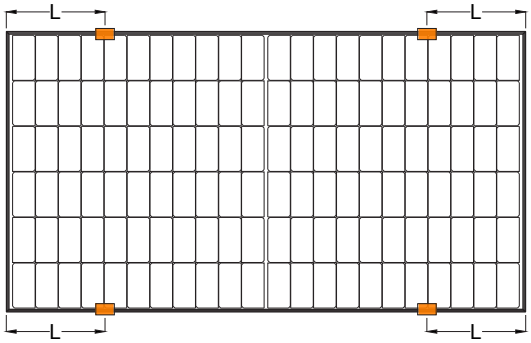
SIL HM / QM

MOUNTING TYPE	MOUNTING POSITION	MOUNTING ZONE	DESIGN LOAD RATING	TEST LOAD RATING
Clamp/Mounting Hole	Long Edge Primary	374 - 424	+3600 / -1600	+5400 / -2400
Clamp	Long Edge Secondary	249 - 374	+1600 / -1600	+2400 / -2400
Clamp	Long Edge Three Rails	249 - 424 and red zone	+3600 / -2667	+5400 / -4000

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

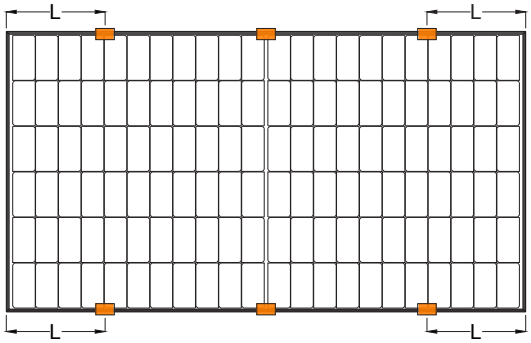
MOUNTING FOR SIL XM

RAIL-LESS MOUNTING SYSTEMS FOR SIL XM



LONG EDGE MOUNTING

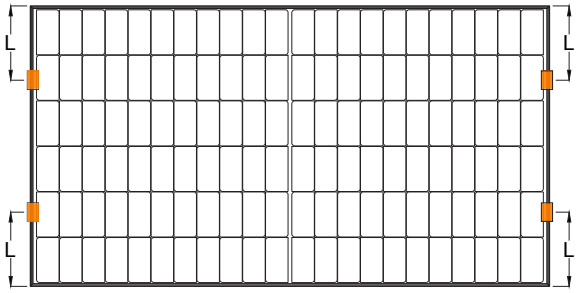
L	Design Load	Test Load
0* - 175	+1066 / -933	+1600 / -1400
175 - 425	+1333 / -1200	+2000 / -1800
425 - 525	+1600 / -1600	+2400 / -2400



LONG EDGE MOUNTING WITH CENTER SUPPORT

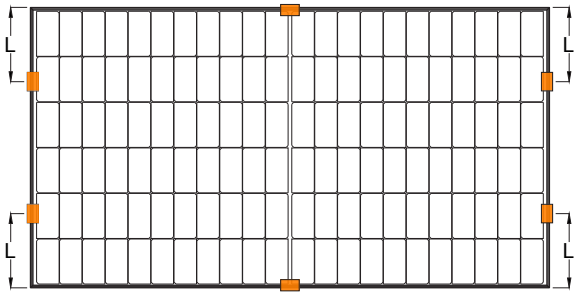
L	Design Load	Test Load
0* - 175	+2166 / -1600	+3250 / -2400
175 - 425	+2400 / -2400	+3600 / -3600

- Center supports must be located within 100 mm of the mid-point of the module's long edge and must resist both downward and uplift forces. If center supports do not resist uplift, use the uplift load rating for the corresponding Long Edge Mounting configuration without center supports.



SHORT EDGE MOUNTING

L	Design Load	Test Load
0* - 300	+933 / -800	+1400 / -1200



SHORT EDGE MOUNTING WITH CENTER SUPPORT

L	Design Load	Test Load
0* - 300	+2400 / -2400	+3600 / -3600

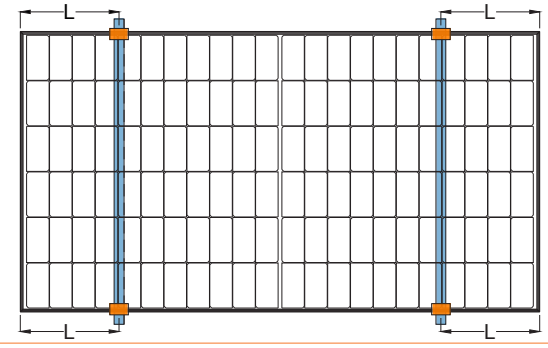
- Center supports must be located within 100 mm of the mid-point of the module's long edge and must resist both downward and uplift forces. If center supports do not resist uplift, use the uplift load rating for the corresponding Short Edge Mounting configuration without center supports.

= clamp = rail = torque tube

- *Assume L = 0 for clamps that secure the corners of adjacent modules (i.e., where the clamp centerline falls in the gap between the two modules).
- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

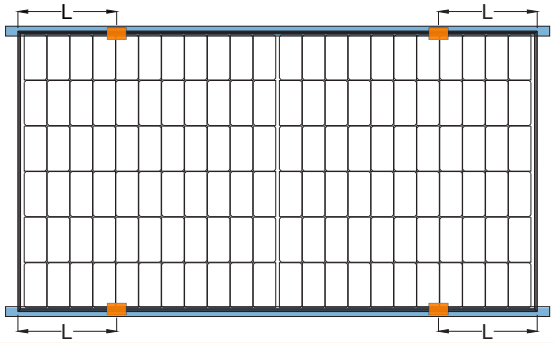
MOUNTING FOR SIL XM

RAIL MOUNTING SYSTEMS FOR SIL XM



SHORT EDGE PARALLEL TO RAILS		
L	Design Load	Test Load
325 - 425	+2400 / -1600	+3600 / -2400
425 - 475	+3600 / -2400	+5400 / -3600
475 - 575	+2400 / -1600	+3600 / -2400

- Shadows cast by rails may reduce bifacial gain.



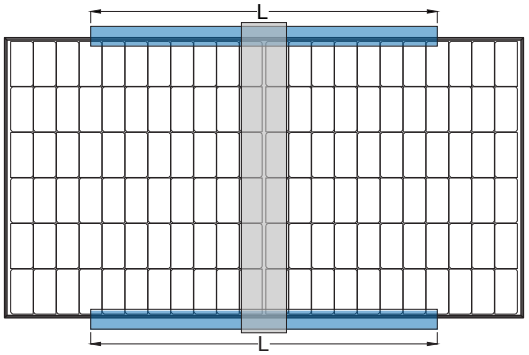
LONG EDGE PARALLEL TO RAILS		
L	Design Load	Test Load
325 - 375	+1600 / -1600	+2400 / -2400

- Threaded fasteners, such as nuts and bolts, or swaged-collar fasteners (e.g., BobTails), may be used instead of clamps.
- Use of additional fasteners (e.g., clamps, bolts) between the mounting rail and module frame is permitted.

= clamp = rail = torque tube

- Rails must be continuous and fixed directly to the module. A bonding washer may be used between the rail and the module frame.
- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

TRACKING MOUNTING SYSTEMS FOR SIL XM



LONG EDGE TRACKER MOUNTING		
L*	Design Load	Test Load
400	+1200 / -1200	+1800 / -1800
1400	+1600 / -1600	+2400 / -2400

- L* indicates the distance between mounting fasteners. Each rail must be secured with two fasteners, placed symmetrically about the module's midpoint. Additional fasteners may be used. All fasteners must be installed in factory-provided holes.Rails must extend beyond mounting holes. Rails must be continuous and fixed directly to the module. A bonding washer may be used between the rail and the module frame.
- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

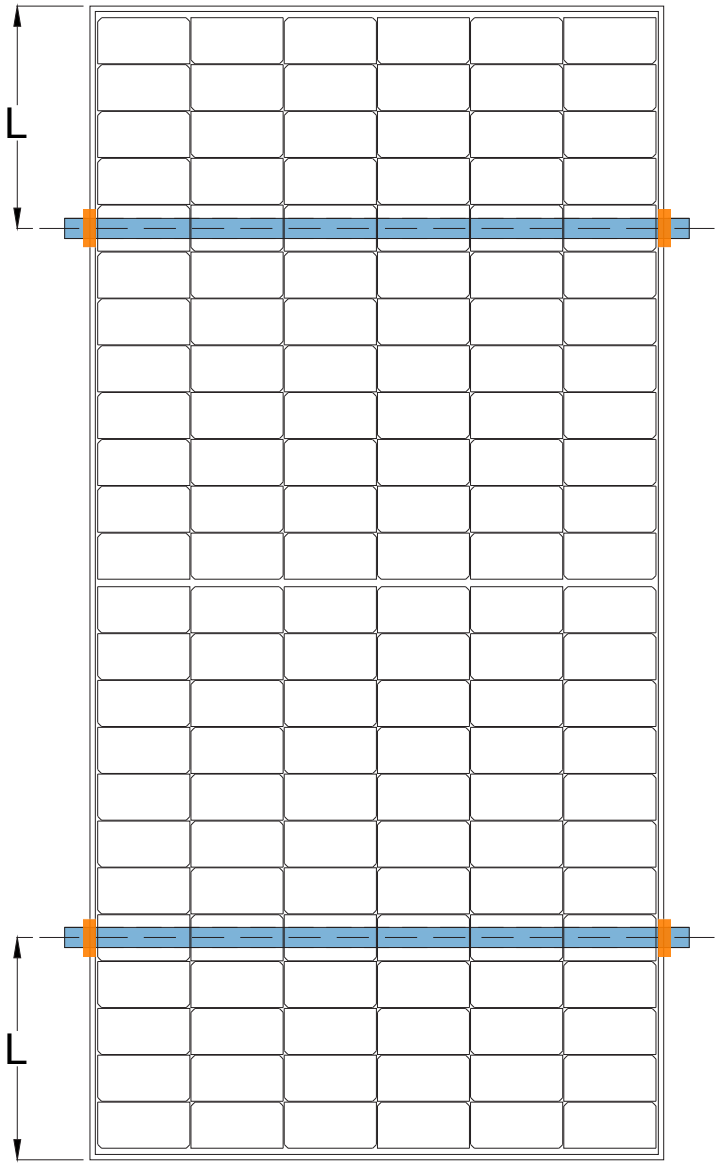
= clamp = rail = torque tube

RAIL MOUNTING FOR SIL XM+

Allowed positions for fixing the **SIL XM+** module using mounting clamps.

= Mounting Rail

= Clamp



ATTENTION:

- Rail mounting systems are those with continuous rails fixed directly to the module.
- The centerlines of the clamps and rails must both be within the mounting zones.

SIL XM+

MOUNTING TYPE	CLAMP POSITION		DESIGN LOAD RATING	TEST LOAD RATING
4 Clamps on Long Side 2 Continuous Rails Parallel to Short Side	L	350 - 500	+2400 / -1600	+3600 / -2400

- Measurements are in millimeters. Load ratings are in Pascals. Positive load ratings represent downward forces; negative ratings represent uplift forces. See Section 8. Installation for more information. For assistance with mounting configurations not shown, special use cases, or requests for higher load ratings, please contact Silfab Solar at productsupport@silfabsolar.com.

9. HANDLING OF MODULES

The Silfab Solar 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.

Do not step or stand on the PV Module.

9.1 Electrical Connection

Do not connect or disconnect modules under load! 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 an appropriate safety factor to be determined by the design engineer based on local electrical code requirements. As a worst case, use a safety factor of 1.25 for voltage and fuse sizing and a safety factor of 1.56 for cable ampacities.

For SIL-XXX BK/BG/HC/HC+/QD, the maximum system voltage rating is 1000V for TUV/IEC and 1000V for UL. For SIL-XXX HN/HM/QM/XM/XM+, the maximum system voltage rating is 1500V.

For SIL-XXX BK/BG/HC/HC+/HN, the maximum series fuse rating is 20A. For SIL-XXX QD/QM/HM, the maximum series fuse rating is 25A. For SIL-XXX XM/XM+, the maximum series fuse rating is 30A.

The bypass diodes are not over-current protection devices. In the event of known or suspected diode failure, installers or maintenance providers should file a warranty claim at silfabsolar.com. Never attempt to open the junction box!

To obtain the desired system voltage, modules are wired in series connection. The recommended maximum series configuration must NOT exceed the certified maximum system voltage stated in the module spec sheets calculated in the worst case Voc conditions to be determined by the engineer of record (EOR).

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 strings wired in parallel, Silfab Solar recommends installing an overcurrent protection device (OCPD) on each string. The OCPD rating must not exceed the series fuse rating specified in the module datasheet.

For projects 100 kW or larger, if permitted by local electrical code, a licensed professional engineer may, as part of a stamped PV design, utilize a project-specific simulated irradiance model (developed according to industry standards) to determine the highest 3-hour current. If the analysis demonstrates that an overcurrent protection device is unnecessary for certain strings, it may be omitted.

For connection of the modules use only appropriate cables with a minimum conductor cross-section of 4 mm^2 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 60 mm (2 3/8”).

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 Solar does not

assume any responsibility for how the modules are installed or how the system is designed.

⚠ For all solar systems, the connectors MUST be listed to UL 6703 rated for interminability and fully intermatable with Silfab Solar modules' connectors. Otherwise, Silfab Solar will void the warranty and will not be responsible for any resulting safety issue.

⚠ Silfab Solar modules are equipped with factory-assembled Junction box with 12AWG/4mm^2 cables, and insulated for 90°C maximum, with either MC4 or EV2 connectors. Any attempt to repair/modify the junction box, cable, or connector will void the Silfab Solar warranty.

9.2 Functioning Grounding

For installations located in tropical regions (between 23.5° N and 23.5° S), functional grounding at the negative pole of the DC side of the system must be implemented.

- Ensure the difference in potential between the negative pole of the DC array and the negative end of the DC side of the inverter input terminals is 0V.
- Follow the directions of the inverter manufacturer and prevailing local regulations.
- Only use inverters listed to locally recognized standards (e.g., UL 1741, IEC 62109) that have been evaluated for compliance with applicable grounding and bonding requirements.
- Functional grounding is required to be implemented in installation sites with increased salt content in the air. (e.g. close the sea, defined as less than 500m from a coastline).

9.3 Protective Grounding

In order to prevent electrical shock or fire, the frame of the module as well as any non-current carrying metal parts of the system must be electrically grounded. While this section provides some information about grounding Silfab Solar's frames and modules, reference should be made to local statutes and regulations for specific requirements on grounding. As an additional resource, reference the U.S. National Electrical Code addresses equipment grounding/bonding requirements in Article 250. You may also reference Canadian Electrical Code requirements located in CSA C22.1.

Proper grounding is achieved by bonding all exposed non-current carrying conductive parts to the appropriately sized equipment grounding conductor (EGC) or racking/rail system that has been tested and verified to be used as a means of integrated grounding.

Silfab Solar's frames are protected from corrosion via an anodized coating. This coating must be penetrated in order to ensure proper bonding for equipment grounding requirements. The different methods outlined below are suggested methods to establish an appropriate bond between the frame and the EGC or racking system. The installer must ensure that the ground path of the EGC or racking system follows proper grounding requirements.

Option A: Use of a grounding lug

A UL listed grounding lug can be bonded to the grounding hole located on the bottom flange of Silfab Solar's module frame. The holes are marked with an electrical ground symbol. ⏚

To install the grounding lug, follow the specified instructions of the manufacturer. The grounding lug should be made of stainless steel or tin plated metals such as aluminum to avoid corrosion. The grounding lug should be attached to the frame grounding hole using stainless steel hardware (screw, serrated flange nut, toothed lock washer, KEPS nut, etc). A lock washer or other locking mechanism is required to maintain pressure between the bolt and assembly. The conductor must be attached to the ground lug using the lug's set screw. Refer to NEC Article 690. Care should be taken to avoid the use of grounding hardware of dissimilar metals which may lead to corrosion. Ensure that the grounding area for the connection is clean and free from oxides and/or any debris that could impede the pathway for the electrical ground. Always follow safety procedures when installing any grounding/mounting system.

Option B: Integrated grounding methods

Silfab Solar modules may be bonded to a racking or rail system using an integrated grounding method certified to UL 2703. The racking or rail system must be properly grounded and bonded to ensure compliance with applicable local codes and regulations, such as NEC Article 250 or Canadian CSA C22.1.

A common method involves the use of a bonding washer recognized under a UL 2703 listing to establish the required electrical connection between the module frame and the racking system. Installers are responsible for installing these washers according to the racking manufacturer's instructions. Bonding washers are available in various sizes, must be properly selected for the application, and are typically single-use components that must not be reused.

Alternative grounding methods may also be used if they are part of a UL 2703–listed racking system. In such cases, additional testing may be required to confirm compatibility with Silfab Solar modules and ensure compliance with local bonding and grounding requirements. Regardless of the method used, all modules must be installed, bonded, and grounded in accordance with the racking system's installation instructions and all applicable local codes and authority requirements

9.4 Silfab Solar Bifacial Modules

Bifacial solar modules generate electricity from their front and rear surfaces, increasing overall energy production. Their enhanced efficiency can reduce the Levelized Cost of Electricity (LCOE) by increasing annual energy yield by up to 20% through rear-side generation.

To maximize the performance of bifacial solar modules:

- Install bifacial modules over a high-albedo (highly reflective) surface to enhance rear-side energy generation.
- Elevate the modules to increase exposure to reflected sunlight.
- Minimize shading on both the front and rear surfaces.
- Use performance modeling to optimize system parameters.

IMPORTANT NOTE: ELECTRICAL CONNECTION

Bifacial modules generate additional energy from the rear side, particularly when installed above reflective surfaces. This rear-side gain should be accounted for in system design and equipment selection, including inverters, wiring, and overcurrent protection devices (OCPDs). Refer to the module data sheet for detailed bifacial performance specifications.

TIP: When connecting bifacial modules to a Maximum Power Point Tracker (MPPT), ensure all modules on the same tracker have similar tilt, orientation, mounting height, shading, and albedo conditions. This will maximize MPPT performance and overall system production.

9.5 Silfab Module Installation in Marine Applications

This section provides guidance of safe handling and installation of Silfab Solar PV modules less than 500 meters to any salt water coastal 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. Silfab reserves the right to review any potential warranty claims in "near-coastal" environments against a customer's strict adherence to the best practices and recommendations provided in this section. Any non-conformances found will potentially disqualify the product from being covered under Silfab's Limited Product and Linear Performance Warranty. For further inquiries please contact Silfab Solar's Customer Service at customer_support@silfabsolar.com.

Mechanical Installation

- Do not scratch or break the corrosion-resistant coating (e.g. anodization layer) on PV Modules and mounting system unless it is part of the electrical equipment grounding system (grounding lugs, integrated grounding hardware compliant to UL 2703).
- 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 installation, use insulation gaskets between the mounting hardware and the PV module frame or between the PV module frame and rail, unless the mounting hardware is part of the electrical equipment grounding system using integrated mounting/grounding hardware compliant with UL 2703.
- Recommendation for gasket insulation are mica lamination, or silicone, or fluoride made insulating material.

Grounding

- Silfab recommends to protect any exposed grounding points (such as a grounding block) of the PV system with a corrosion-resistant coating, for example (a) Butyl Plaster to completely cover an exposed grounding block or (b) spray fluorocarbon varnish of 40 um thick onto exposed ground blocks thoroughly to form an anti-corrosion protective film.

  Remember to clean the exposed grounding block and surrounding area and make sure the surface is dry. Any exposed 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/or hair brushes.
- 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 Solar 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 Solar's control. As such, Silfab Solar strongly recommends to adhere to the installation procedure. If negligence is found, Silfab Solar 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 Solar PV Module

Silfab uses anti-reflective coated (ARC) glass 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 abrasive tools to clean the glass. Cleaning the glass with hard or rough surfaces can damage the ARC glass coating.
- 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. Do not try to remove frozen snow or ice from the module. Use a 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

Moreover, each module has a specific label that is attached on the rear side. This label specifies the product information. Product label has a QR-CODE to download more information.

13. PACKAGING, HANDLING & STORAGE

13.1 Silfab Solar Packaging

These modules are arranged in horizontal or vertical positions as shown in Fig. 7 and 8. 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 or sides of the pallet, as it could damage the modules.

SILFAB SOLAR PACKAGING DETAILS

	SILFAB ELITE	SILFAB PRIME	SILFAB COMMERCIAL
	SIL-XXX BK	SIL-XXX HC	SIL-XXX HN
Number of modules stacked	26	26	31
Modules Orientation	Horizontal	Horizontal	Vertical
Package size (L x W x H)	184 cm x 105.5 cm x 126 cm	182 cm x 109 cm x 119 cm	230 cm x 116 cm x 125 cm
	72.4 in x 41.5 in x 49.6 in	71.7 in x 43 in x 46.9 in	90.5 in x 45.6 in x 49.2 in
Package weight	550 kg / 1212.5 lbs	525 kg / 1157.4 lbs	850 kg / 1874 lbs
Pallet	Wooden Pallet IPPC compliant	Wooden Pallet IPPC compliant	Wooden Pallet IPPC compliant
Packaging	Stretch Wrap Film, Containment Straps	Stretch Wrap Film, Containment Straps	Cardboard Box, Containment Straps
Module protective corners	Plastic	Plastic	Cardboard
	SIL-XXX BG	SIL-XXX HC+	SIL-XXX HM/QM/XM
Number of modules stacked	27	26	29
Modules Orientation	Horizontal	Horizontal	Vertical
Package size (L x W x H)	192 cm x 108 cm x 123 cm	197 cm x 109 cm x 119 cm	213cm x 106 cm x 128 cm
	75.6 in x 42.5 in x 48.4 in	77.5 in x 43 in x 46.9 in	83.8 in x 41.7 in x 50.4 in
Package weight	620 kg / 1367 lbs	605 kg / 1334 lbs	810 kg / 1786 lbs
Pallet	Wooden Pallet IPPC compliant	Wooden Pallet IPPC compliant	Wooden Pallet IPPC compliant
Packaging	Stretch Wrap Film, Containment Straps	Stretch Wrap Film, Containment Straps	Cardboard Box, Containment Straps
Module protective corners	Plastic	Plastic	Cardboard
		SIL-XXX QD	SIL-XXX XM+
Number of modules stacked		26	29
Modules Orientation		Horizontal	Vertical
Package size (L x W x H)		177 cm x 118 cm x 119 cm	231cm x 107 cm x 128 cm
		69.7 in x 46.6 in x 46.9 in	90.9 in x 42.1 in x 50.4 in
Package weight		600 kg / 1320 lbs	916 kg / 2020 lbs
Pallet		Wooden Pallet IPPC compliant	Wooden Pallet IPPC compliant
Packaging		Stretch Wrap Film, Containment Straps	Cardboard Box, Containment Straps
Module protective corners		Plastic	Cardboard

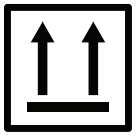
Fig. 7 Horizontal packaging of photovoltaic modules.

Fig. 8 Vertical packaging of photovoltaic modules.

Fig. 9 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:



KEEP PACKAGING UPRIGHT

Keep the packaging upright during transportation and storage, as shown in Fig. 7 and Fig. 8. Failure to do so may result in damage to the modules.

AVOID EXPOSING TO RAIN OR SNOW. DO NOT LEAVE EXPOSED TO FLOODING

The plastic wrap and/or cardboard is intended to prevent temporary contact with dirt, water or other materials but will not protect the modules from damage resulting from excessive rain, snow and flooding. Modules should be stored in a sheltered dry location whenever possible. Modules are not to be stored outside for a period exceeding 60 days.

STACKING

Do not stack more than two pallets high.

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.

RECYCLE WHERE POSSIBLE

Both modules and packaging contain recyclable materials. Contact Silfab Solar for solar module recycling options in your area. WARNING: Handle damaged modules with care. Contact Silfab Solar at sustainability@silfabsolar.com for solar module recycling options in your area.

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.

13.3 How to Handle the Pallet

The packaged pallet must be handled with the utmost care and attention. The equipment used for handling a full packaged pallet should be rated for a minimum of 1000 kg (or 2000 kg for a double stack). The "4-way" style pallet can be handled from both the short and long sides, however, lifting from the short side will provide the best support for the modules within. For that reason, lifting from the long side should only be done by suitable equipment during loading and unloading of truck and containers. The handling equipment must be fitted with forks of appropriate length for the pallet's size (see table below).

MINIMUM FORK LENGTH FOR HANDLING OF PALLETIZED MODULES (SINGLE/DOUBLE STACKS)		
	BK/BG HC/HC+/QD	HM/HN/QM/ XM/XM+
Short Side	1.5 m / 60 in	1.8 m / 72 in
Long Side (For loading/ unloading from trucks/ containers only)	1.2 m / 48 in	1.2 m / 48 in

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

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

⚠ Do not attempt to move more than one pallet at a time, unless properly secured as provided by the factory. Never attempt to move a stack of three pallets under any circumstances.

13.4 Unpacking Modules

Follow these steps when unpacking modules:

- Place the packaging on a stable, flat surface. Remove the module stack cover, if present.
- BG, HC, HC+, and QD modules are shipped horizontally. Use a knife to carefully cut and remove all straps and plastic wrap.
- HM, QM, XM, and XM+ modules are shipped vertically. Remove all but the two vertical straps, then lean the modules against a suitable surface or rack before cutting the remaining straps.
- Retain the packing list for your records.
- Remove the PV modules and their protective corners without causing damage.
- Collect and store the protective corners and 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. See Fig.7.

13.6 Recycling Packaging Materials

Silfab Solar strives to reduce the environmental impact of its packaging. Most materials are reusable or recyclable, with cardboard widely accepted by local waste management programs.

Wooden pallets (Fig. 10) and protective corners (Fig. 11) should be retained, as recovery arrangements are managed on a case-by-case basis.

Fig.10

Fig.11

Fig. 10 & 11: How to package the pallets and plastic corners, respectively, after unloading, ready to deliver back to Silfab Solar for reuse.

14. REVISION LOG

Revision Level	Section(s) affected	Brief description of changes	Date
MAN-SSI-01	NEW DOCUMENT	For Silfab Elite/BK, Silfab Prime/HC, Silfab Commercial/HN	10/20/2021
MAN-SSI-02	Page 4	Updates to PRIME/SIL BK mounting	10/27/2021
MAN-SSI-02	Cover/Back Cover	Update Silfab Solar Logo to registered trademark	07/01/2022
MAN-SSI-03	Multiple Sections	Addition of BG, HC+, HM information, P. 3 8.5	12/15/2022
MAN-SSI-03	Pg. 5	SIL BG - Updated Design Load Rating, Test Load Rating	03/24/2023
MAN-SSI-04	Cover, TOC, Muliple Sections	Updates include the addition of QM, QD	12/05/2023
MAN-SSI-05	pp. 8, 10	Mounting data updated to include 3 rail mounting data and illustrations for QD, HM, QM	01/23/2024
MAN-SSI-06	pp. Cover, 2, 10, 11, 15, 17	Included XM in the text.	01/31/2024
MAN-SSI-07	p. 1	Included N-type reference	04/22/2024
MAN-SSI-08	pp. Cover, 1, 2, 11, 12, 16, 18	Included XM+ data	08/09/2024
MAN-SSI-09	p. 10	Update to chart	08/23/2024
MAN-SSI-10	Multiple Sections	Text updates, mounting details update	04/22/2025

PLEASE RETAIN A COPY OF THIS MANUAL FOR FUTURE REFERENCE

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

For general product information, email: customer_support@silfabsolar.com

SILFAB SOLAR®

WWW.SILFABSOLAR.COM

SILFAB SOLAR INC.

1770 Port Drive, Burlington WA 98233 USA | **T** +1 360.569.4733 | info@silfabsolar.com

7149 Logistics Lane, Fort Mill SC 29715 USA | **T** +1 839.400.4338

240 Courtneypark Drive East, Mississauga ON L5T 2S5 Canada | **T** +1 905.255.2501 | **F** +1 905.696.0267

SILFABSOLAR.COM