

Safety and Installation Instructions

1.0 Introduction

This manual provides safety and installation instructions for Sunny Apex IEC High Efficiency series photovoltaic (PV) modules made with high efficiency back contact cells (Model number SA-IHXXX which XXX defines product power output variants).

Important! Read this instruction sheet in its entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the Sunny Apex Development Limited Warranty.

1.1 Disclaimer of Liability

The installation techniques, handling and use of this product are beyond company control. Therefore, Sunny Apex does not assume responsibility for loss, damage or expense resulting from improper installation, handling or use.

1.2 International Electro technical Commission (IEC) Listing Information

This product meets or exceeds the requirements set forth by IEC 61215 Edition 2 and 61730 for PV Modules. The IEC Standard covers flat-plate PV modules intended for installation on buildings and those intended to be freestanding. This product is not intended for use where artificially concentrated sunlight is applied to the module.

1.3 Limited Warranty

Module limited warranties are described in the Sunny Apex warranty certificates obtainable at www.sunnyapex.com.

Warranties do not apply to any of the following;

PV modules which in Sunny Apex absolute judgment have been subjected to: misuse, abuse, neglect or accident; alteration, improper installation, application or removal

(including but not limited to installation, application or removal by any party other than a qualified personnel; non-observance of Sunny Apex installation, users and/or maintenance instructions; repair or modifications by someone other than an approved service technician; power failure surges, lightning, flood, fire, accidental breakage or other events outside Sunny Apex control.

2.0 Safety Precautions

Before installing this device, read all safety instructions in this manual.

Danger! Module interconnects pass direct current (DC) and are sources of voltage when the module is under load and when it is exposed to light. ***Direct current can arc across gaps and may cause injury or death if improper connection or disconnection is made, or if contact is made with module components that are damaged.*** Do not connect or disconnect modules when current from the modules or an external source is present.

- Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.
- It is imperative to use the supplied locking connectors and safety clips in order to defend against untrained personnel disconnecting the modules once they have been installed.
- All installations must be performed in compliance with all applicable regional and local codes.
- There are no user serviceable parts within the module. Do not attempt to repair any part of the module.
- Installation should be performed only by qualified personnel.
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Use insulated tools to reduce your risk of electric shock.
- Do not stand on, drop, scratch or allow objects to fall on modules.

- Damaged modules (broken glass, torn back sheet, broken j-boxes, broken connectors, etc) can be electrical hazards as well as laceration hazards. Contact with damaged module surfaces or module frame can cause electric shock. The dealer or installers should remove the module from array and contact the supplier for disposal instructions.
- Do not install or handle the modules when they are wet or during periods of high wind.
- Contact your module supplier if maintenance is necessary.
- Save these instructions!

3.0 Electrical Characteristics

The module electrical ratings are measured under Standard Test Conditions (STC) of 1 kW/m² irradiance with AM 1.5 spectrum and a cell temperature of 25° C. Sunny Apex modules have specific electrical characteristics as shown on the datasheets.

A photovoltaic module may produce more current and/or voltage than reported at STC. Sunny, cool weather and reflection from snow or water can increase current and power output. Therefore, the values of I_{sc} and V_{oc} 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 PV output. An additional 1.25 multiplier may be required by certain codes for sizing fuses and conductors.

Sunny Apex recommends the use of open-circuit voltage temperature coefficients listed on the datasheets when determining Maximum System Voltage.

4.0 Electrical Connections

Modules may be connected in series and/or parallel to achieve the desired electrical output as long as certain conditions are met. Please use only the same type of modules in a combined source circuit.

Sunny Apex recommends that all wiring be double insulated with a minimum rating of 85° C (185° F). All wiring should use flexible copper (Cu) conductors. The minimum size should be determined by the applicable codes. We recommend a size not less than 4mm². The insulation type should be appropriate for the type of installation method used and must meet SCII (Safety Class II) and IEC 61730 requirements.

4.1 System Grounding

Please refer to the applicable regional and local codes on grounding PV arrays and mounting frames for specific requirements (e.g. lightning protection).

Important! For optimal performance of the PV systems, Sunny Apex HOP series modules are recommended to be used in configurations with **galvanically insulated inverters** where the positive (+) polarity of the PV array is connected to ground protected by a fuse. As for off-grid applications, it is also mandatory to ground the positive (+) polarity of the PV module protected by a fuse.

4.2 Series Connection

The modules may be wired in series to produce the desired voltage output. Do not exceed the maximum system voltage.

4.3 Parallel Connection

The modules may be combined in parallel to produce the desired current output. Series string must be fused prior to combining with other strings if the resulting maximum reverse current exceeds the fuse rating as shown in the datasheets. Bypass diodes are factory installed in the modules. Please refer to the applicable regional and local codes for additional fusing requirements and limitations on the maximum number of modules in parallel.

5.0 Module Mounting

The Sunny Apex Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

5.1 Site Considerations

Sunny Apex modules should be mounted in locations that meet the following requirements:

Operating Temperature: All Sunny Apex modules must be mounted in environments that ensure Sunny Apex modules will operate within the following maximum and minimum operating temperatures:

Maximum Operating Temperature	+85°Celsius, +185° Fahrenheit
Minimum Operating Temperature	-40°Celsius, -40° Fahrenheit

Care should be taken to provide adequate ventilation behind the modules, especially in hot environments.

No Sunny Apex module should be mounted at a site where it may be subject to direct contact with salt water.

5.2 Mounting Configurations

Modules may be mounted at any angle from horizontal to vertical. Select the appropriate orientation to maximize sunlight exposure.

In order to prevent water from entering the junction box, which could present a safety hazard, modules should not be mounted such that the front/top glass faces downward (e.g., on a tracking structure that positions the module with the junction box facing skyward during sleep mode).

Clearance between the module frames and structure or ground is required to prevent wiring damage and allows air to circulate behind the module.

When installed on a roof, the module shall be mounted over a fire-resistant roof covering rated for the application.

The module is only guaranteed for use when its factory

frame is fully intact. Do not remove or alter the module frame. Creating additional mounting holes may damage the module and reduce the strength of the frame.

Modules may be mounted using the following methods only:

- 1) **Frame Holes:** Secure the module to the structure using the factory mounting holes. Stainless steel bolts, with nuts, washers, and lock washers are recommended per module.
- 2) **Pressure Clamps or Clips:** Mount the module with the clips on the side frame of the module. The side frames are attached to the longer sides of the module. Installers should ensure the clamps are of sufficient strength to allow for the maximum design pressure of the module. Clips and clamps are not provided by Sunny Apex.
- 3) **End Mount:** End mounting is the capture mounting of the length of the module's end frame to a supporting rail. The end frames are on the shorter sides of the module. The end-mounting rail and clips or clamps must be of sufficient strength to allow for maximum design pressure of the module. Verify this capacity with the mounting system vendor before installation.

6.0 Maintenance

Inspect all modules annually for safe electrical connections, sound mechanical connection and freedom from corrosion. Periodically clean the module surface with water and a soft cloth or sponge. Fingerprints may be removed with standard glass cleaner. Do not use harsh cleaning materials such as scouring powder, steel wool, scrapers, blades or other sharp instruments to clean the glass surface of the module. Use of such materials will invalidate the product warranty.