

**Safety and Installation Instructions**

Photovoltaic Modules

## Global Safety and Installation Instructions

This document applies to the following Silevo Modules:

**Triex™ T96-Series & Triex™ T72-Series**

### Introduction

This manual provides safety and installation instructions for IEC certified Silevo photovoltaic (PV) modules.

### Disclaimer of Liability

The installation techniques, handling and use of this product are beyond company control. Therefore, Silevo does not assume responsibility for loss, damage or expense resulting from improper installation, handling or use. Installers should assume all risks of injury that might occur during installation, including, but not limited to, the risk of electric shock.

### International Electrotechnical Commission (IEC) Listing Information

This product meets or exceeds the requirements set forth by IEC 61646:2008 for Class A applications.

The solar module electrical characteristics are within +/-10% of the module label indicated values of  $I_{sc}$ ,  $V_{oc}$  and  $P_{mpp}$  under Standard Test Conditions (irradiance of  $1000 \text{ W/m}^2$ , AM 1.5 spectrum, and a cell temperature of  $25^\circ\text{C}/77^\circ\text{F}$ ). Under normal conditions, a photovoltaic module is likely to produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of  $I_{sc}$  and  $V_{oc}$  marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the PV output.

An additional 1.25 multiplying factor may be required by certain codes.

### Safety Precautions

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

When installing the system, abide to all local, regional and national statutory regulations.

Do not use mirrors or other magnifiers to concentrate sunlight onto the modules.

There are no user serviceable parts within the module. Do not attempt to repair any part of the module. Do not attempt to disassemble the modules, and do not remove any attached nameplates or components from the modules.

**Handling Precautions**

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

To avoid glass breakage, do not place any heavy objects on the module.

Be careful when setting the module down onto a surface, particularly when placing it on a corner.

Inappropriate transport and installation may break the module.

If the front glass is broken, or the back sheet is torn, contact with any module surface or module frame can cause electric shock.

Do not apply paint or adhesive to the module top surface.

Do not drill holes in the frame. This may compromise the frame strength and cause corrosion of the frame.

Do not install or handle the modules when they are wet or during periods of high wind.

Do not lift the module by grasping the module's junction box or electrical leads.

Do not scratch the anodized coating of the frame (except for grounding connection). It may cause corrosion of the frame or compromise the frame strength.

Do not touch the PV module unnecessarily during installation. The glass surface and the frame may be hot; there is a risk of burns and electric shock.

**Electrical Precautions**

Never open electrical connections or unplug connectors while the circuit is under load.

One single module may generate more than 50V DC when exposed to direct sunlight. Contact with electrically charged parts of the modules, such as terminals, can result in burns, sparks and lethal shock whether or not the module is connected.

Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.

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.

Avoid exposing cables to direct sunlight in order to prevent their degradation.

Only use equipment, connectors, wiring and support frames suitable for solar electric systems

**Fire Safety**

The modules have been rated Fire Class C, and are suitable for mounting on to a Class A roof. Roof constructions and installations may affect the fire safety of a building; improper installation may create hazards in the event of a fire. Consult your local authority for guidelines and requirements for building or structural fire safety.

Use components such as ground fault circuit breakers and fuses as required by local authority.

Do not use modules near equipment or in locations where flammable gases may be generated or collected.

**Electrical Connections**

Use only the same type of modules in a combined source circuit.

To prevent the cables and the connectors from overheating, the cross section of the cables and the capacity of the connectors must be selected to suit the maximum system short circuit.

Conductor recommendations: 8-14 AWG (1.5-10 mm<sup>2</sup>) USE-2 or PV Wire (nonconduit)/THWN-2 (conduit), 90°C wet rated. Cable conduits should be used in locations where the wiring is accessible to children or small animals. Refer to local regulations to determine the system wires size, type and temperature.

Modules are supplied with Multi Contact MC4 connectors to be used for system electrical connections.

The DC current generated by photovoltaic systems can be converted into AC and fed into a public grid. As local utilities’ policies on connecting renewable energy systems to their grids vary from region to region, a qualified system designer or integrator should always be consulted. Building permits, inspections and approvals by the local utility are generally required.

Modules may be connected in series and/or parallel to achieve the desired electrical output as long as certain conditions are met.

**Series Connection**

The modules may be wired in series to produce the desired voltage output.

The maximum number of series connected modules depends on system design, the type of inverter used and environmental conditions.

The maximum system voltage is 1000 V.

**Parallel Connection**

The modules may be combined in parallel to produce the desired current output. Each series string or module is required to be fused prior to combining with other strings. Table 1 lists the maximum series fuse size allowed. Refer to applicable regional and local codes for additional fusing requirements and limitations on the maximum number of modules in parallel.

MODEL	MAXIMUM SERIES FUSE
Triex™ T96-series	12A
Triex™ T72-series	12A

**TABLE 1: MAXIMUM SERIES FUSE RATING**

**Bypass Diodes**

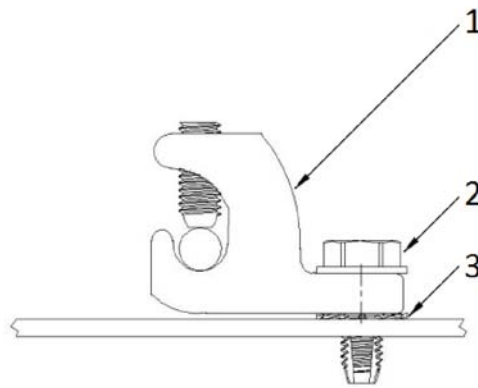
Modules are manufactured with integrated bypass diodes, so no external diodes are needed.

**Grounding**

To reduce the possibility of electrical shock, ground the frame of the module or array using a grounding method that meets local and national requirements for grounding solar electrical systems.

Silevo recommends the following method of grounding the module frame:

Attach a ground conductor to a grounding lay-in lug mounted at one of the four designated 4.1 mm (0.16”) grounding holes on the module frame. The hole is designed to accept a 5 mm (#10) self-threading screw. Use a grounding lug such as Ilco GBL-4DBT or Brundy CL50-DB-T, and stainless steel hardware (screw and washers). A star washer should be used between the grounding lug and the module frame in order to break through the anodizing and establish electrical contact with the aluminum. The copper conductor must be attached to the ground lug using the stainless steel set screw provided by the manufacturer.



**FIGURE 1: GROUNDING LUG ASSEMBLY**

ITEM	DESCRIPTION	MANUFACTURER/DISTRIBUTOR	PART NUMBER
1	Lay-in Lug	Ilco/Brundy	GBL-4DBT/CL50-DB-T
2	410 SS Thread-Cutting Screw Hex Washer Head, Unslotted, 10-32, 1/2" Length	McMaster-Carr	96024A310
3	400 Series SS External-Tooth Lock Washer # 10 Screw Size	McMaster-Carr	98438A230

**Module Mounting**

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

The proper design of support structures lies within responsibility of the system designers and installers.

**Mounting Considerations**

Modules can be ground mounted or mounted on rooftops.

Design Strength: modules are designed to meet a maximum positive (or upward, e.g. wind) design pressure of 2400 Pa (50 lb/ft<sup>2</sup>) and negative (or downward, e.g. snow load) design pressure of 5400 Pa (113 lb/ft<sup>2</sup>) when mounted using the four designated mounted holes.

For optimal performance, the modules should not be shaded at any time.

The modules should be facing south in northern latitudes and north in southern latitudes.

The module mounting structure must be made of durable, corrosion-resistant and UV-resistant material.

Modules must be securely attached to the mounting structure.

Any hardware used must be compatible with the mounting structure material to avoid galvanic corrosion.

Dust building up on the surface of the module can impair with their module performance. Silevo recommends installing the modules with a tilt angle of at least 10 degrees, making it easier for dust to be washed off by rain. For detailed information on the best installation angle, refer to standard solar photovoltaic installation guides or consult a reputable solar installer or systems integrator.

Modules can be mounted in either a portrait (long side vertical) or landscape (long side horizontal) orientation.

When mounting modules in snow-prone or high-wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

Before installing modules on a roof, ensure that the roof construction is suitable. In addition, any roof penetration required to mount the module must be properly sealed to prevent leaks.

To reduce the operating temperature the module has to be mounted on any surface with a minimum distance of 10cm (4").

For ground mounted arrays in regions with heavy snowfall in winter, select the height of the mounting system so that the lowest edge of the module is not covered by snow for any length of time. In addition, ensure that the lowest portion of the module is placed high enough so that it is not shaded by plants or trees or damaged by flying sand.

Observe the linear thermal expansion of the module frames (the recommended minimum distance between two modules is 5 mm (¼")).

Always keep the backsheet of the module free from foreign objects or structural elements, which could come into contact with the module, especially when the module is under mechanical load.

**Excluded Operating Environments:**

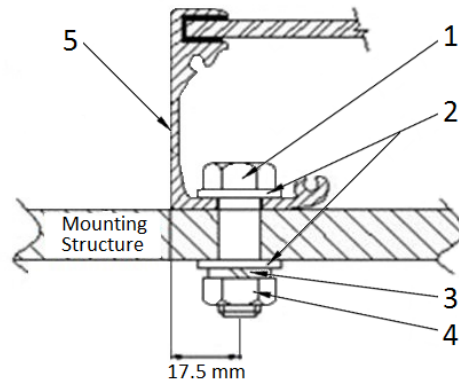
Certain operating environments are not recommended for Silevo modules and are excluded from the Silevo Limited Warranty of these modules.

The module must neither be immersed in water nor be exposed to continuous wetting (e.g. by fountains). Exposure to salt or sulfur (sulfur sources, volcanoes) implies a risk of corrosion. The module must not be used for maritime (e.g. boats) purposes. The module must not be exposed to extraordinary chemical loads (e.g. emissions from manufacturing plants).

**Mounting Configurations**

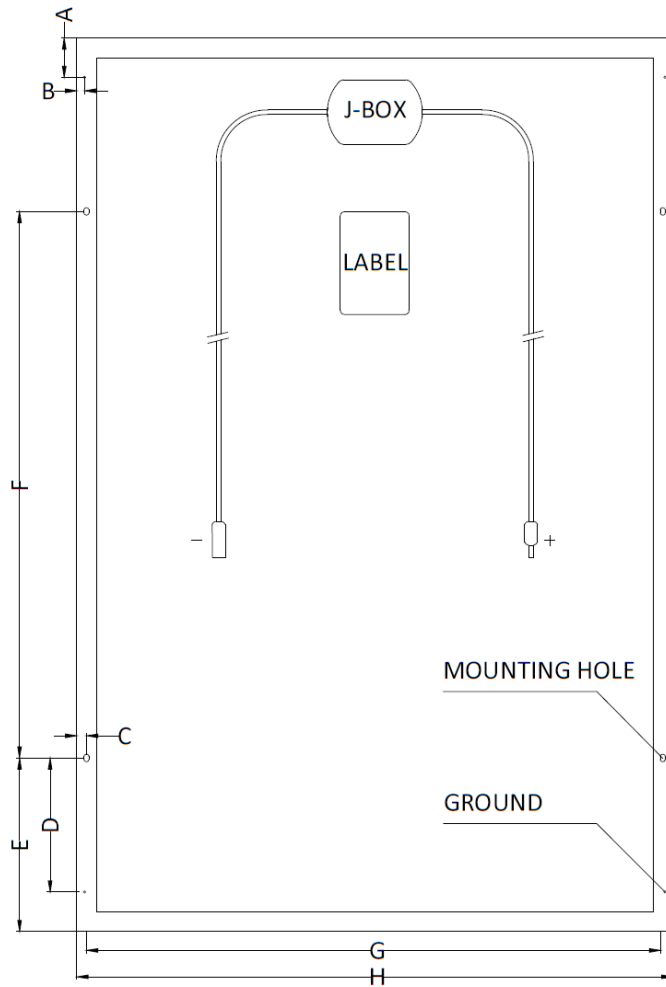
Modules may be mounted using the following methods only:

**Frame Holes:** Secure the module to the structure using the factory mounting holes. Four 8 mm (5/16”) stainless steel bolts, with nuts, washers, and lock washers are required per module. Tighten nuts and bolts to 20 Nm (11.8 ft-lbs). Refer to Figure 2 for hardware detail. Refer to Figure 3 for the module mounting dimensions and hole locations.



**FIGURE 2: MOUNTING HARDWARE DETAILS**

ITEM	DESCRIPTION	SIZE
1	Bolt	M8 x 1.25 x 26 (5/16-20 x 1)
2	Flat washer	14 x 16 (5/16)
3	Lock Washer	12.2 x 2.1 (5/16)
4	Nut	M8 x 1.25 (5/16-20)
5	Module frame height	40 mm (1.57")



DIMENSION	MODEL	
	Triex™ T96-series (mm/")	Triex™ T72-series (mm/")
A	70 (2.76)	70 (2.76)
B	14 (0.55)	14 (0.55)
C	17.5 (0.69)	17.5 (0.69)
D	238 (9.37)	238 (9.37)
E	308 (12.13)	308 (12.13)
F	970 (38.19)	970 (38.19)
G	1021 (40.20)	771 (30.35)
H	1056 (41.57)	806 (31.73)
MOUNTING HOLES	4: 8.5 x 12.5 (0.33 x 0.49)	4: 8.5 x 12.5 (0.33 x 0.49)
GROUND HOLES	4: 4.1 (0.16)	4: 4.1 (0.16)

**FIGURE 3: MOUNTING AND GROUND LOCATIONS**

**Pressure Clamps:** Mount the module with the clips on the side frame of the module only. The side frames are attached to the longer sides of the module. The centerline of the clips should be an eighth ( $\frac{1}{8}$ ) to a quarter ( $\frac{1}{4}$ ) of the module length from the end of the side frame. Installers should ensure the clamps are of sufficient strength to allow for the maximum design pressure of the module.

### 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.