EZ Roof Mount System
With Self-grounding Hardware
UL2703 Compliant

Pub. D10004-V010

Please read carefully before installing

Product is tested to and recognized to UL 2703 standards for safety grounding and bonding equipment and meets UL1703 fire standards.

SunModo EZ Roof Mount System can be used to mount PV panels on pitch roofs. All installations shall be in accordance with NEC requirements in the USA. The self-grounding and bonding system is for use with PV modules that have a maximum series fuse rating of less than 15A.

TABLE OF CONTENTS

Installer Responsibility 3
Safety 3
SunModo Self-Grounding System 4
EZ Roof Mount System Components 5
List of Compliant PV Modules 7
Tools Required for Installation 10
EZ Roof Mount System Installation 11
Torque Values of EZ Roof Mount Components 12
Panel Configurations 13
EZ Roof Mount Installation 15
Helio Rail Installation 17
Panel Clamp Installation for Portrait Mounting 20
Panel Clamp Installation for Landcape Mounting 21
Rail End Cover Installation 22
Grounding Lug Installation 22
Warranty 23
Terms and Conditions 23
SunModo Limited Warranty 23
Indemnification 24

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Document Number D10004-V010

ETL CLASSIFIED
Intertek
5001753

Installer Responsibility

Before ordering and installing materials, all system layout dimensions should be confirmed by field measurements. SunModo reserves the right to alter, without notice, any details, proposals or plans. Any inquiries that you may have concerning installation of the PV system should be directed to your SunModo Sales representative. Consult SunModo Sales for any information not contained in this manual. This manual is intended to be used as a guide when installing SunModo Pitch Roof PV systems. It is the responsibility of the installer to ensure the safe installation of this product as outline herein.

- This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and /or mounting in compliance with the included instructions.
- The installer shall employ only SunModo products detail herein. The use of non SunModo components can void the warranty and cancel the letters of UL compliance.
- Guarantee that screws and anchors have adequate pullout strength and shear capacities.
- Adhere to all relevant local or national building codes. This takes account of those that supplant this document's requirements.
- Guaranteeing safe placement of all electrical details of the PV array
- Installer is responsible to install EZ Roof Mount System over a Fire Resistant roof covering rated for the application.
- Installer is responsible to determine that the roof, its rafters, connections, and other architectural support components can sustain the array under all code level loading conditions
- The installer shall comply with all applicable local or national building codes, including periodic re-inspection of the installation for loose components, loose fasteners and any corrosion, such that if found, the affected components are to be immediately replaced.
- This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Safety

Review relevant OSHA and other safety standards before following these instructions. The installation of solar PV systems is a dangerous procedure and should be supervised by trained and experienced personnel.

It is not possible for SunModo to be aware of all the possible job site situations that could cause an unsafe condition to exist. The installer of the roof system is responsible for reading these instructions and determining the safest way to install the roof system. These instructions are provided only as a guide to show a knowledgeable, trained erector the correct part placement one to another. If following any of the installation steps would endanger a worker, the erector should stop work and decide upon a corrective action. Provide required safety railing, netting, or safety lines for crew members working on the roof.

SunModo Self-Grounding System

SunModo offers a proprietary grounding and bonding system that is designed into the mounting hardware for rails, clamps and splices. All hardware meet UL2703 Grounding and Fire Standards.

The basis of the system is our patented stainless steel floating grounding pin which is designed to be captive in the mounting components and provides a bonding path from the PV panel frames to the rails and rail splices, and finally to the ground lug.

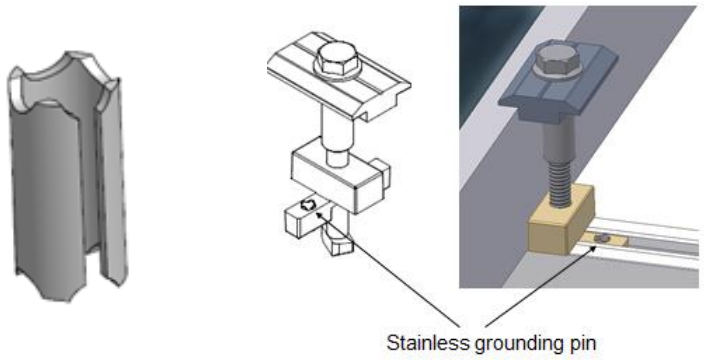


Fig. 1: Mid Clamp with Ground Pins

Fig. 1 shows the grounding pin and the location within the mid and end clamps. Similarly, the rail splices in **Fig. 2** include the grounding pins, eliminating the need for extra bonding components.

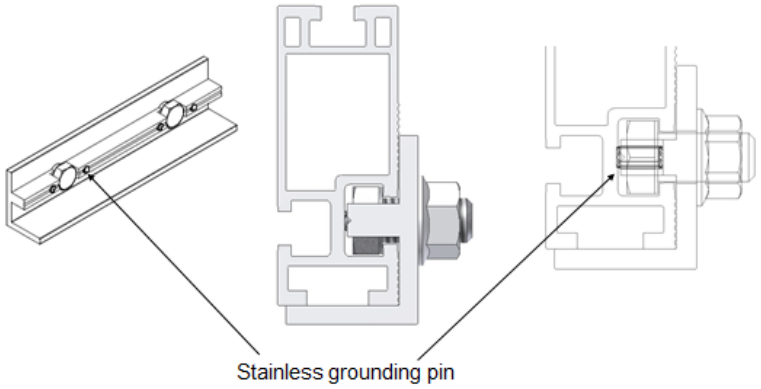


Fig. 2: Rail Splices with Grounding Pins

EZ Roof Mount System Components

Primary Materials

EZ Roof Mount Series:

EZ Roof Mount Kit includes:

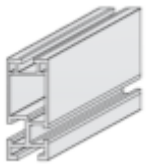
- Roof shoe and gasket
- 4 inch lag screw
- L foot
- AL hex cap
- 3/8” flange nut and bolt
- Flashing

K10068-001 (EZ Roof Mount with L-Foot as shown)

K10070-XXX (EZ Roof Mount with Standoff)

K10082-XXX (EZ Metal Roof Mount with L-Foot)

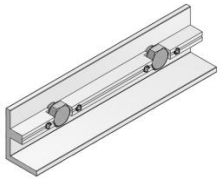
K10064-XXX (EZ Metal Roof Mount with Standoff)



Helio Rails: Features both 1/4” and 3/8” side slots, and 1/4” top slot for clamping PV panels. Last 3 digits denote length. 4 stock sizes in clear and black (Table 1)

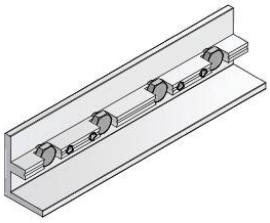
A20144-XXX (Standard Rail)

A20145-XXX (Heavy Rail)



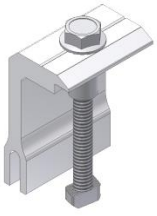
3/8” Slot Rail Splice Kit with (2) 3/8-16 hex bolts and flange nuts with integral grounding. ***Maybe repositioned until torqued to final value.***

K10178-001
For single-use only



1/4” Slot Rail Splice Kit with (4) bolts and flange nuts with integral grounding***. Maybe repositioned until torqued to final value.***

K10177-001
For single-use only



End Clamp Kit, fits panel height from 31 to 50 mm. For last 3 digits, see Table 4

K10224-XXX

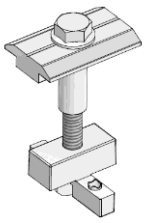
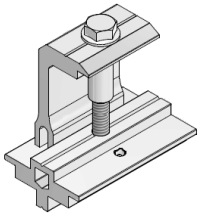
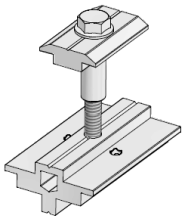
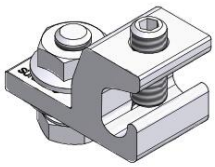
	Mid Clamp Kit with integral grounding, fits panel height from 31 to 50 mm. For last 3 digits, see Table 4. ***Maybe repositioned until torqued to final value.***	K10180-XXX **For single-use only**
	Landscape End Clamp Kit with adaptor for standard rail and integral grounding, fits panel height from 31 to 50 mm. For last 3 digits, see Table 4. ***Maybe repositioned until torqued to final value.***	K10183-XXX **For single-use only**
	Landscape Mid Clamp Kit with adaptor for standard rail and integral grounding, fits panel height from 31 to 50 mm. For last 3 digits, see Table 4. ***Maybe repositioned until torqued to final value.***	K10182-XXX **For single-use only**
	Grounding Lug Kit with Grounding Spacer and 1/4-20 T-Bolt. ***Maybe repositioned until torqued to final value.***	K10179-001 **For single-use only**

Table 1 – SunModo Standard Rail Lengths

Rail Lengths	Part Number (Clear)	Part Number (Black)
84 in	A20144-084	A20144-084-BK
124 in	A20144-124	A20144-124-BK
164 in	A20144-164	A20144-164-BK
206 in	A20144-206	A20144-206-BK

List of Compliant PV Modules

Table 2 – 2703 Qualified Modules for use with SunModo Pitch Roof and SunBeam Systems

Evaluated PV Modules	
Module manufacturer	**Model numbers**
C-Sun	CSUN290-72P, CSUN295-72P, CSUN300-72P, CSUN305-72P, CSUN310-72P, CSUN285-72M, CSUN290-72M, CSUN295-72M, CSUN300-72M, CSUN305-72M, CSUN310-72M, CSUN315-72M, CSUN320-72M, CSUN235-60M, CSUN240-60M, CSUN245-60M, CSUN240-60P, CSUN245-60P, CSUN250-60P, CSUN255-60P, CSUN260-60P
Canadian Solar	CS6X-300P, CS6X-305P, CS6X-310P, CS6X-315P, CS6X-320P, CS6P-255P, CS6P-260P, CS6P-265P, CS6P-260M, CS6P-265M, CS6V-210P, CS6V-215P, CS6V-220M, CS6V-225M, CS6K-265M, CS6K-270M
ET Solar	ET-P672300WW, ET-P672305WW, ET-P672310WW, ET-P672315WW
Hanwha Q Cells	Q.PRO L-G2 305, Q.PRO L-G2 310, Q.PRO L-G2 315
Hareon	HR-280P-24/Ba, HR-285P-24/Ba, HR-290P-24/Ba, HR-295P-24/Ba, HR-300P-24/Ba, HR-305P-24/Ba, HR-310P-24/Ba
Itek Energy (50 mm frame)	IT250HE, IT255HE, IT260HE, IT265HE, IT270HE, IT275HE, IT280HE, IT285HE, IT290HE, IT295HE, IT300HE, IT305HE, IT310HE
Panasonic	VBHN285J40
Phono Solar Tech	PS255M-20/U, PS260M-20/U, PS265M-20/U, PS270M-20/U, PS275M-20/U, PS280M-20/U PS300P-24T, PS305P-24T, PS310P-24T PS315P-24T, PS320P-24T, PS325P-24T

Sanyo	HIP-190BA3, HIP-195BA3, HIP-200BA3, HIP-205BA3, HIT-N215A01, HIT-N220A01, HIT-N225A01
SolarWorld (V2.5 frame)	Sunmodule SW series: SW 220 mono and poly, SW 225 poly, SW 230 poly, SW 235 poly, SW 240 mono and poly, SW 245 mono and poly, SW 250 mono, SW 255 mono, SW 260 mono, SW 265 mono, SW 270 mono Sunmodule Plus series: 285W mono, 280W mono, 275W mono, 270W mono, 265W mono, 260W mono, 255W mono, 250W mono Sunmodule Protect 275W mono Sunmodule Protect 270W mono Sunmodule Protect 265W mono Sunmodule SW 245 - 255 poly / Pro-Series
SolarWorld (33mm frame)	Sunmodule Pro-Series: 250W poly, 255W poly, 260W poly 315W XL mono, 320W XL mono, 325W XL mono, Sunmodule Plus: 260W mono, 270W mono, 275W mono, 280W mono, 285W mono
Stion	STO-135A, STO-140A, STO-145A, STO-150A
SunEdison	F310EzD, F315EzD, F320EzD, F325EzD, F330EzD, F335EzD, F310EzC, F315EzC, F320EzC, F325EzC, F330EzC, F335EzC, R330EzC, R335EzC, R340EzC, R345EzC, R350EzC, R355EzC

SunPower	X21-355-BLK, X21-345, SPR-E20-327,SPR-E19-320
Trina	TSM-225 PC/PA05, TSM-230 PC/PA05, TSM-235 PC/PA05, TSM-240 PC/PA05, TSM-245 PC/PA05
Yingli	YL230P-29b, YL235P-29b, YL240P-29b, YL245P-29b

Tools Required for Installation

Electric Drill or impact driver. Note that the use of an impact driver is strongly discouraged for all stainless nut and bolt hardware.

Roofing Bar

Drill Bit for lag bolts, pilot hole 7/32” diameter for 5/16” lag bolt

3/8” Socket wrench

Sockets for 3/8” drive sockets, 7/16”, 1/2”, 9/16” and 1-1/16”

Torque Wrench 3/8” drive, 0 to 35 ft. lbs.

Anti-seize compound (Permatex 80071 or equivalent).

Caulk gun and silicon sealant (Chem-link M1 construction sealant or equivalent).

Tape measure

Saws for cutting aluminum posts and rails as necessary

EZ Roof Mount System Installation

Torque Values for EZ Roof Mount Components

Table 3 defines the maximum torque values for the screw attachments used to assemble the racking system. These values must be adhered to, both for mechanical strength and to insure the performance of the integral grounding and bonding features. It is required that a torque wrench be used to measure the bolt torque during final assembly, and it is recommended that anti-seize compound be applied to the screw threads.

Table 3 – Torque Values for EZ Roof Mount Components

Hardware	Torque
• 1/4” Bolts and Hex Flange Nuts	7.5 ft. lbs
• 3/8” Bolts and Hex Flange Nuts	15 ft. lbs
• 3/8” T bolts and Hex Flange Nuts	15 ft. lbs
• Mid or End Clamp, 1/4-20 Female Standoff with 7/16” hex head collar nut	7.5 ft. lbs
• Ground Lug: 1/4” Flange Nut with 7/16 hex drive head	7.5 ft. lbs
• Ground Lug: 1/4” setscrew with1/8 Allen drive	4.2 ft.lbs. (50 in. lbs)
• HEX Cap: 1-1/16” socket	15 ft. lbs.

Panel Configurations: Panels can be installed either Portrait or Landscape

Portrait Installation of PV Systems using the Self-grounding Mid Clamps

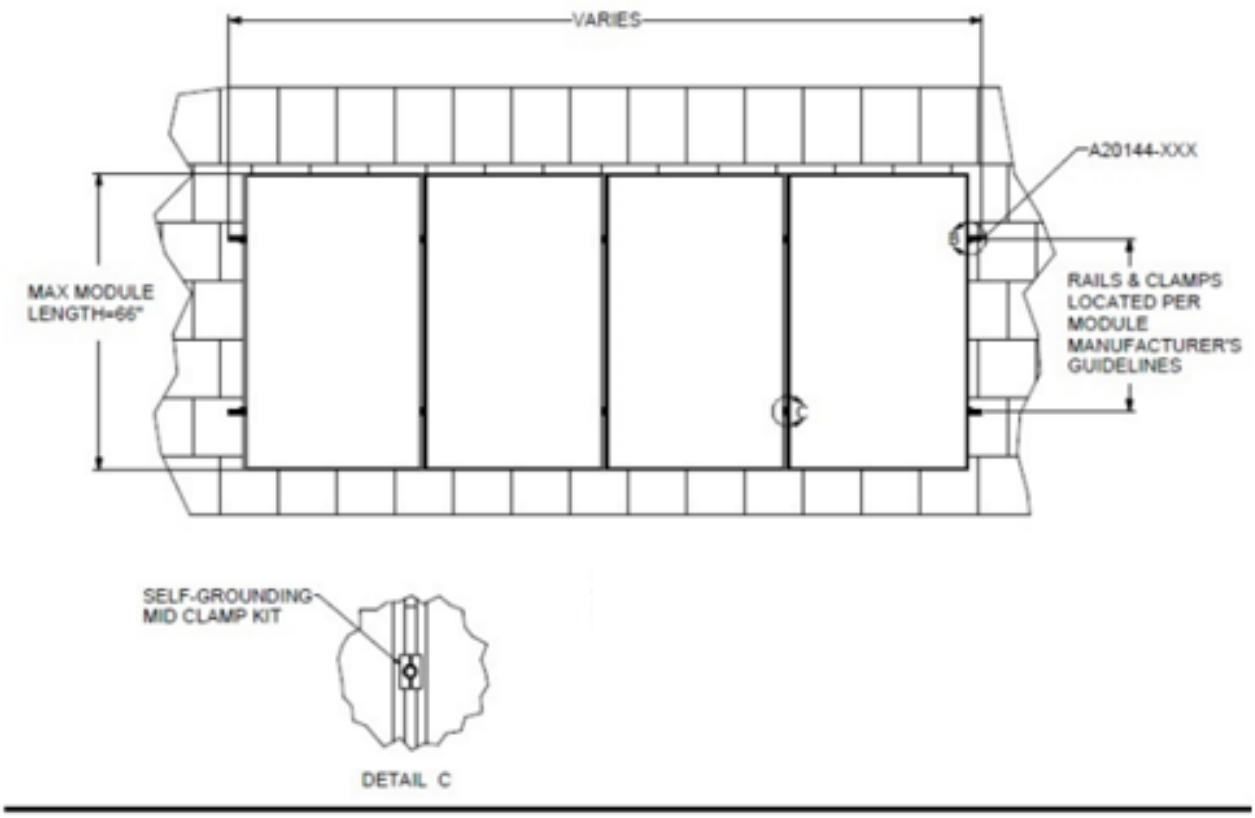


Fig. 3: Self-grounding PV System Portrait

Fig. 3 details a typical portrait roof layout featuring two East-West rails mounted to North-South roof rafters with an L foot. Detail C shows the use and position of Mid Clamps. Module length is shown as a nominal 60 cell PV panel, however longer 72 cell PV panels can also be used.

Landscape Installation of PV Systems using the Self-grounding Mid and End Clamps

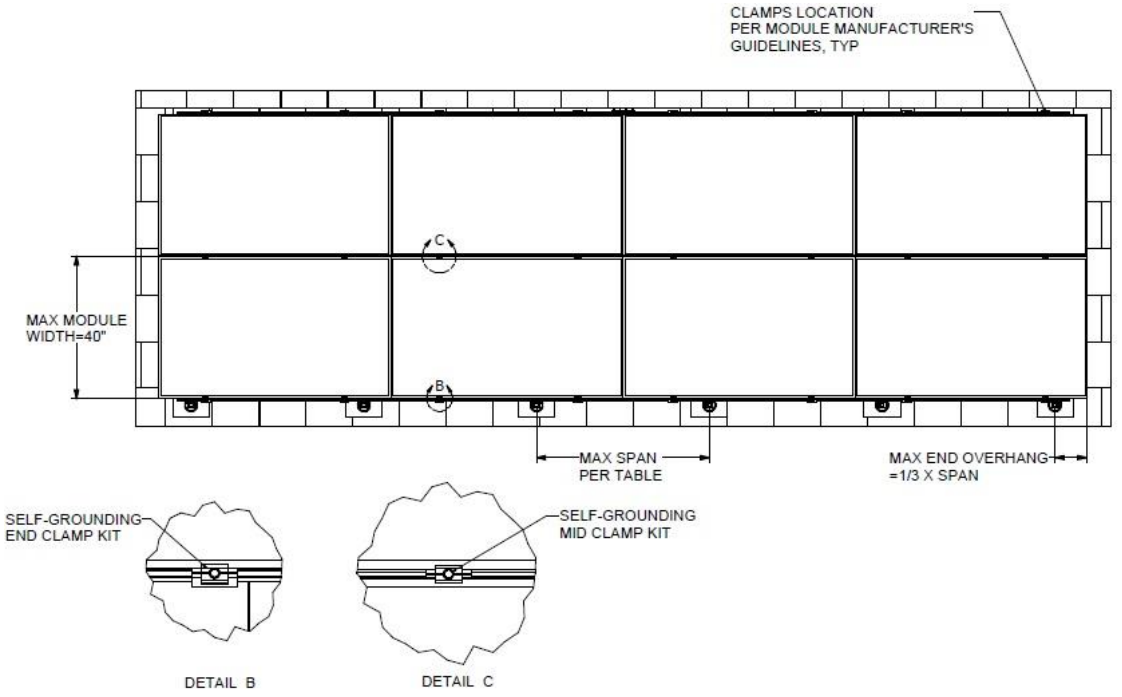


Fig. 4: Self-grounding PV System Landscape

Fig. 4 details a unique product allowing a standard rail to be adapted to share rail use for landscape layout of roof mount PV systems. Note that the PV panels are clamped on the long edges as required by most manufacturers.

This share rail adaptor system is shown in **Fig. 5**. Note that the self-grounding feature is present on mid clamp.

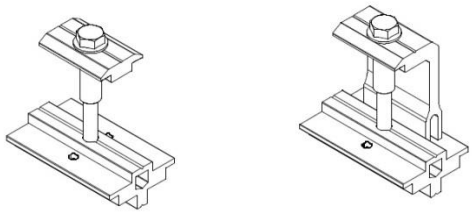


Fig. 5: Mid and End Clamps with Rail Adaptors

The self-grounding adaptors fit into a Standard or Heavy rail, allowing installation flexibility in rooftop designs

EZ Roof Mount Installation

- From the marked location, move down the roof 2-1/4” from the bottom of the shingle, and drill the pilot hole for the lag bolt with a 7/32” drill bit. For maximum strength, the hole should not be more than 3” in depth, and a drill stop may be used to insure this.

Fig. 6: Locate lag screw mounting. Drill a 7/32” hole through the shingle to a depth of 2 inches

- Clean sawdust with drill and fill hole with sealant. Use the 4 inch by 5/16” lag bolt (supplied) to install the aluminum roof shoe. (Use Chem-link M1 Construction Sealant or Equivalent)

Fig. 7: After filling the hole with sealant, secure the roof shoe with the lag bolt. Tighten to 20 ft. lbs

- Make sure the washer on the threaded shank is positioned correctly. Use roofer bar to lift roof shingle, slide the flashing under shingle, and insert the flashing on threaded shank as shown.

  Optional: A U shaped bead of sealant can be added under the flashing if the installer is concerned with water migration

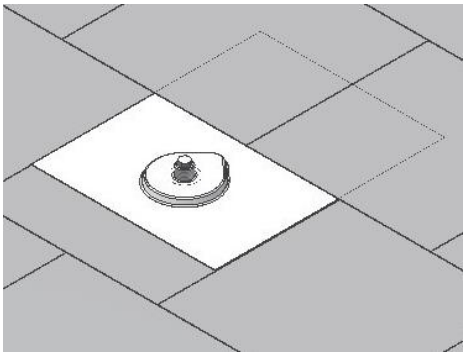


Fig. 8: Slide the roof flashing into place under the overlapping shingle and over the threaded portion of the roof shoe

- Insert L-Foot onto the large thread on the roof shoe on top of flashing. Place aluminum hex cap on shoe, and finger tighten the cap. Then tighten to 15 ft. lbs. nominal torque.

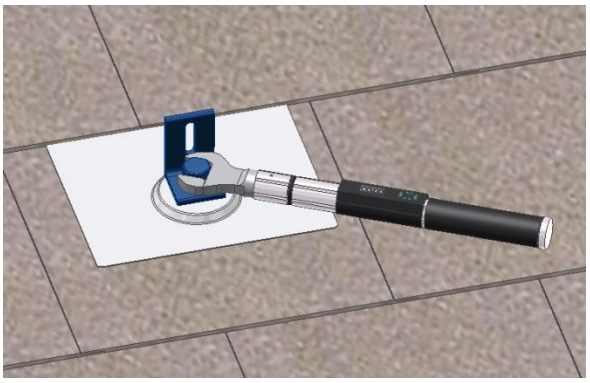


Fig. 9: Install the L-Foot and Aluminum hex cap and tighten to 15 ft. lbs.

Helio Rail Installation

- Slide 3/8” Hex Bolt to 3/8” aluminum rail slot.

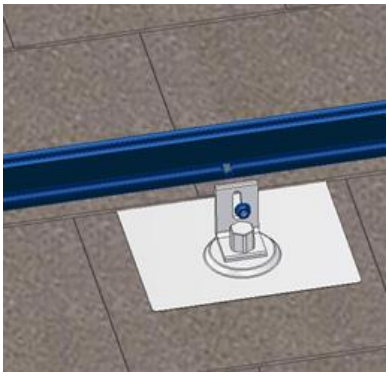


Fig. 10: 3/8” Hex Bolt

- Install AL rail to L-Foot to the specific orientation desired. Tighten 3/8” flange nut to 15 ft. lbs. and 1-1/16” aluminum hex cap to 20 ft. lbs. torque.

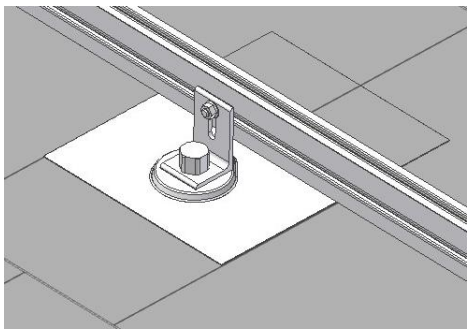


Fig. 11: Aluminum Rail Attached.

- **Minimum leading edge height to meet a UL1703 PV module fire standard is 3 inches.**

3 inch minimum from bottom of PV module frame to the roof covering

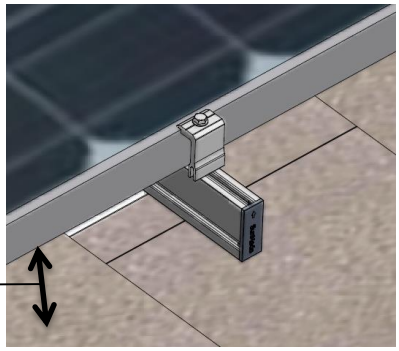


Fig. 12: PV Module Attached.

Splicing the rails together: Where rail splicing is required, either the 2 bolt for the 3/8" rail slot or the 4 bolt for the 1/4" rail slots can be used. **Shown is the 2 bolt 3/8" rail slot version which must be torqued to 15 ft. lbs.**

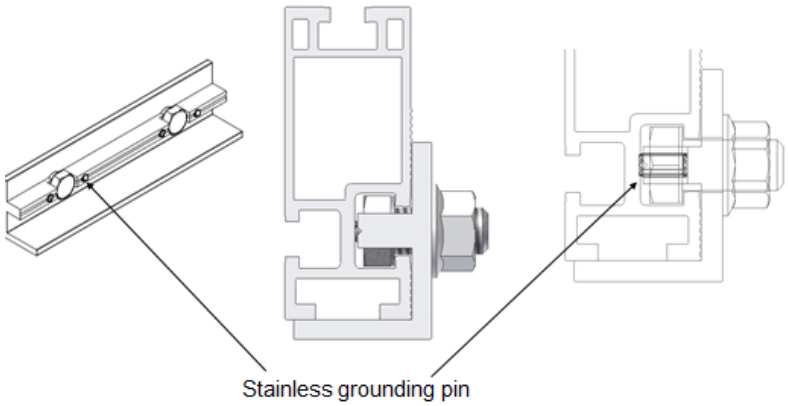


Fig. 13: The 2 bolt splice can be used to join rail section together.

The 4 bolt version of the rail splice can also be used. **Torque on the 1/4" flange nuts is a maximum of 7.5 ft. lbs.**

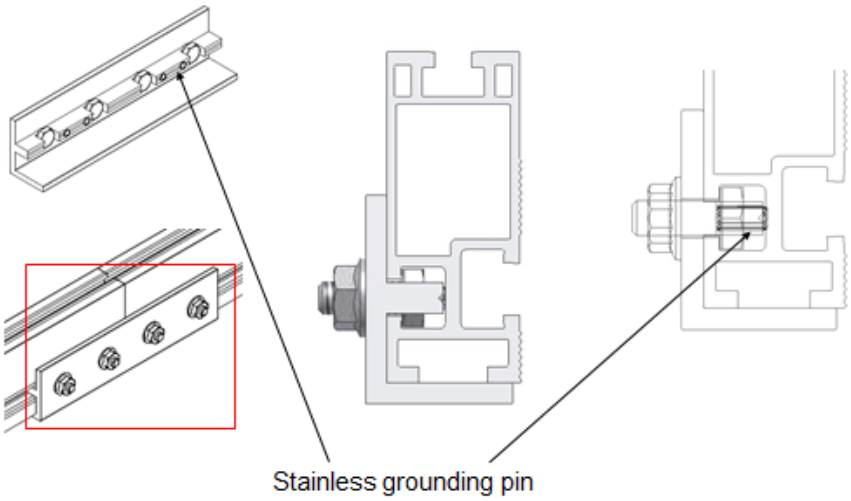


Fig. 14: A 4 bolt version of the self-grounding splice can be installed to join rail sections together.

Table 4 -Table of Clamp Bolt Lengths and Part Numbers

Clamps	Part # End	Part # Mid	Size	"T" Bolt in.	"T" Bolt PN
Portrait	K10224-031	K10180-125	31 mm	1.25	B20015-011
Portrait	K10224-033	K10180-125	33 mm	1.25	B20015-011
Portrait	K10224-040	K10180-157	40 mm	1.57	B20015-013
Portrait	K10224-042	K10180-157	42 mm	1.57	B20015-013
Portrait	K10224-044	K10180-157	44 mm	1.57	B20015-013
Portrait	K10224-046	K10180-157	46 mm	1.57	B20015-013
Portrait	K10224-050	K10180-210	50 mm	2.10	B20015-002

Clamps	Part # End	Part # Mid	Size	"T" Bolt in.	"T" Bolt PN
Landscape	K10183-031	K10182-157	31 mm	1.57	B20015-013
Landscape	K10183-033	K10182-157	33 mm	1.57	B20015-013
Landscape	K10183-040	K10182-157	40 mm	1.57	B20015-013
Landscape	K10183-042	K10182-210	42 mm	2.10	B20015-002
Landscape	K10183-044	K10182-210	44 mm	2.10	B20015-002
Landscape	K10183-046	K10182-210	46 mm	2.10	B20015-002
Landscape	K10183-050	K10182-210	50 mm	2.10	B20015-002

Collar Nut					B20025-001

This table shows the nominal T-Bolt lengths for various PV Panels commonly used in the industry.

Panel Clamp Installation for Portrait Mounting

Installing End Clamps: An end clamp is used at each end of a row of PV panels. There must be at least 1.5" of rail extending beyond the PV panel frame

- Insert the T bolt in the rail slot and turn clockwise 90 degrees to engage the head into the rail slot. For one panel configuration, insert T-bolt holder into T-Bolt for grounding panel to rails.
- Thread the 1/4" (7/16" socket head) collar nut onto the top of the T bolt as shown in **Fig. 14** below. After positioning the end clamp firmly against the PV panel frame, **tighten to 7.5 ft. lbs.**

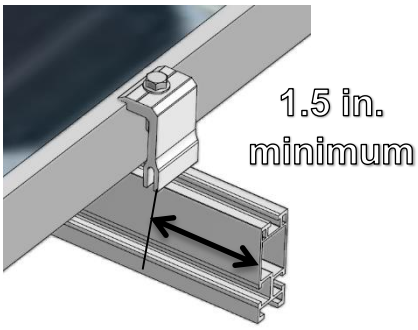


Fig. 15: End Clamp, Collar Nut, and T-Bolt

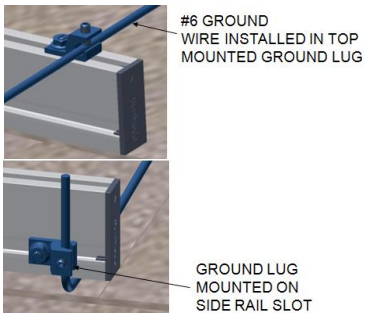


Fig. 16: Ground wire mounting options

Installing Mid Clamps: A mid clamp is used between PV panels and produces a 1/2" spacing between PV panel frames.

- Insert the T bolt in the rail slot and turn clockwise 90 degrees to engage the head into the slot
- Thread the 1/4" (7/16" socket head) collar nut onto the top of the T bolt ash shown in **Fig. 17** below. After positioning the end clamp firmly against the PV panel frame, **tighten to 7.5 ft. lbs.**

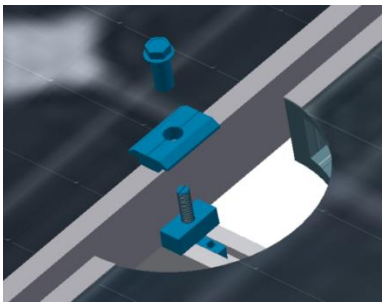


Fig. 17: Mid Clamp, Collar Nut and T Bolt

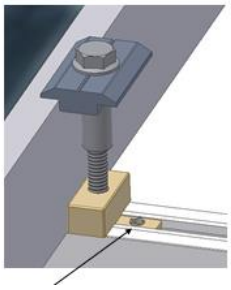


Fig. 18: Mid Clamp Installed

Panel Clamp Installation for Landscape Mounting

Installing End Clamps: A clamp is to be installed at each end of a row of PV panels

- Insert the T bolt in the rail slot and turn clockwise 90 degrees to a) engage the head into the rail slot; and b) ensure the rail adaptor drops into place
- Thread the 1/4" (7/16" socket head) collar nut onto the top of the T bolt as shown in Figure 35 below. After positioning the end clamp firmly against the PV panel frame, **tighten to 7.5 ft. lbs.**

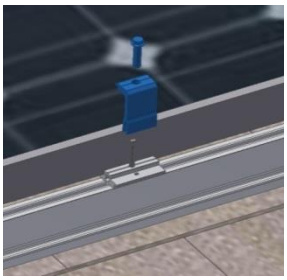


Fig. 19: End Clamp, Collar Nut, and T-Bolt

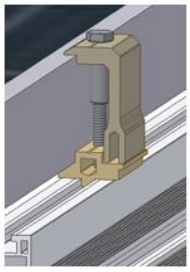


Fig. 20: End Clamp Installed

Installing Mid Clamps: A mid clamp is used between PV panels and produces a 1/2" space between PV panel frames.

- Insert the T bolt in the rail slot and turn clockwise 90 degrees to a) engage the head into the rail slot; and b) ensure the rail adaptor drops into place.
- Thread the 1/4" (7/16" socket head) collar nut onto the top of the T bolt ash shown in **Fig. 21** below. After positioning the end clamp firmly against the PV panel frame, **tighten to 7.5 ft. lbs.**

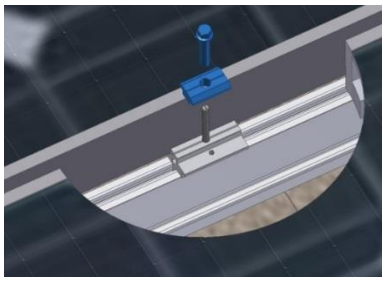


Fig. 21: Mid Clamp, Collar Nut and T Bolt

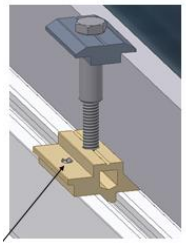


Fig. 22: Mid Clamp Installed

Rail End Cover Installation: It is optional to install the rail end cover as shown in **Fig. 23**.

Fig. 23: Optional Helio Rail Cover: C10017-001

Grounding Lug Installation: Each rail should have a ground lug for fastening the ground conductor to the array. The lug is mounted on the top of the rail using a special 1/4" T bolt, conducting washer, and flange nut**. A detailed Grounding Lug installation document is available from SunModo separately**.

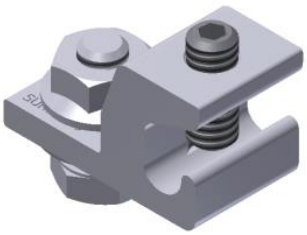


Fig. 24: Grounding Lug

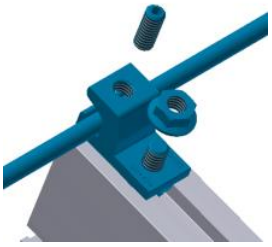


Fig. 25: Mounting Grounding Lug

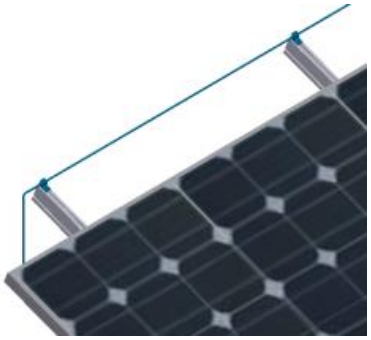


Fig. 26: The picture shows a grounding lug mounted on each rail and a #6 solid copper grounding wire connecting the lugs to the building ground per NEC 690.47.

Warranty

Terms and Conditions

SunModo warrants the original Purchaser that each Mounting Structure is free from defects in materials and workmanship for a period of 10 years except for the finish, which shall be free from visible peeling, or cracking under normal atmospheric conditions for a period of 5 years starting from 1) the date of installation at the original site or 2) 30 days after the original purchase. The Finish Warranty does not apply to any foreign residue deposited on the finish. The Finish Warranty Is void if the practices specified by AAMA 608 & 610-02-"Cleaning and Maintenance for Architecturally Finish Aluminum" (www.aamanet.org) are not followed by Purchaser. The limited warranty is void if the products are not installed properly in accordance with SunModo's Written Installation instructions, or is not used for the purpose for which it is designed, or the product has been modified, repaired, or reworked not authorized by SunModo. **The limited warrantee is void if the system installation is not periodically inspected for loose components, fasteners, and corrosion, and if any are found, the affected components are not immediately replaced.**

SunModo Limited Warranty

The Warranty does not cover the product that is damaged resulting from shipping, storage, and misuse or abuse during installation. The limited warranty covers the cost of parts to repair or replace the products to a proper working condition. Transportation and incidental costs associated with warranty items are not reimbursable SunModo Limited Warranty only covers its products and under no circumstances will be liable for indirect or consequential damages resulting from or related use by original purchaser of the product.

Indemnification

Purchaser shall defend, indemnify and hold harmless SunModo and its Related Persons (as defined below) (each, an "Indemnified Party"), with counsel reasonably acceptable to the Indemnified Party, from and against any and all Claims (as defined below) which may be suffered or incurred by the Indemnified Party or imposed or asserted against the Indemnified Party: (a) resulting from any cause on or about the premises where any Product is installed; (b) resulting from the use of the Product; (c) arising out of any actual or threatened damage to property, or injuries to or death of persons for any reason, including but not limited to, product performance or malfunction, negligence, or improper installation. "Claims" shall mean any and all claims, actions, demands, proceedings, losses, damages, liabilities, losses, costs and expenses, including attorneys', investigators' and consulting fees, court costs and litigation expenses; "Related Person" shall mean any member, partner, principal, officer, director, shareholder, employee, agent, contractor, consultant, representative, affiliate, assign, successor-in-interest of a specified Party, or any other person that has obtained or hereafter obtains rights or interests from such party.

This Warranty constitutes the entire integrated agreement between SunModo and Purchaser concerning the Product warranties and supersedes all prior agreements and discussions and the terms or any purchaser orders, order acknowledgements or similar documents. No agreement or understanding in any way purporting to modify this Warranty, oral or written, shall be binding on SunModo unless made in writing and signed by its authorized representative.

This Warranty and the parties' rights herein are exclusively governed by and construed in accordance with the laws of the State of Washington, United States of America, without regard to the laws of any other state or country. The State and federal courts located in Clark County, Washington shall be the exclusive venue for any legal action relating to this Warranty and Purchaser hereby agrees to the jurisdiction of such courts.

All claims made under this warranty must be submitted to SunModo in writing to the address below within 30 days after Purchaser's discovery the subject defect or problem or the warranty claim will be barred.

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