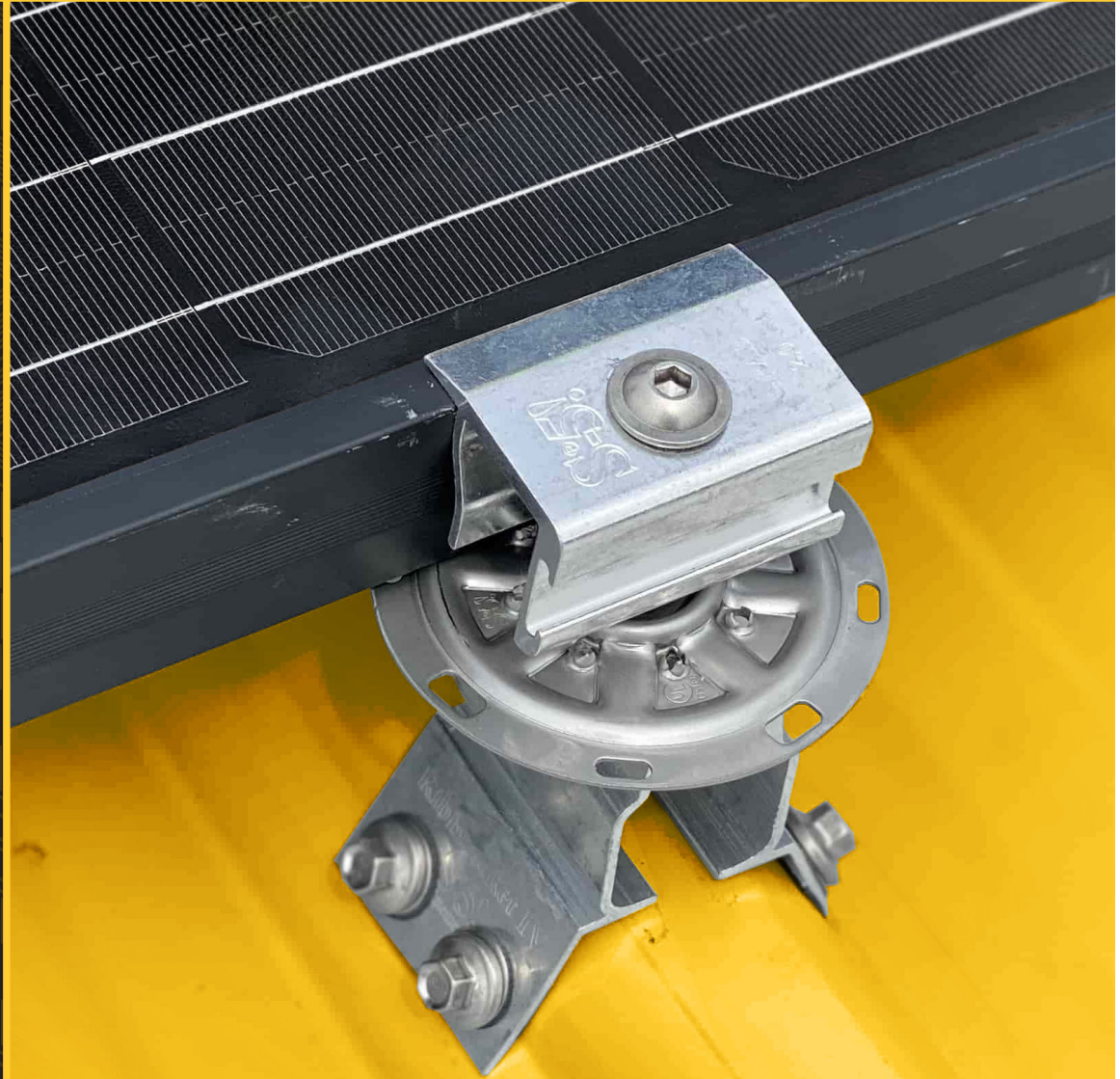




S-5![®]
The Right Way



SOLAR MANUAL

DESIGN | INSTALLATION | PRODUCT SPECIFICATION

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INSTALLATION



Section 1

1.1 WARNINGS

For questions regarding the installation of the PVKIT and EdgeGrab, please contact support@s-5.com or call (888) 825-3432. Due to the variety of attachment needs, PVKITs are sold separately from S-5! Mini clamps. The PVKIT fits both S-5! standard & Mini clamps.

THE S-5! CLAMP IS NOT APPROVED FOR USE AS A PERSONAL FALL RESTRAINT DEVICE!

ALWAYS PROVIDE WORKER FALL PROTECTION WHEN INSTALLING S-5! PRODUCTS. S-5! DOES NOT APPROVE PRODUCTS FOR USE IN PERSONAL FALL RESTRAINT/FALL PROTECTION APPLICATIONS. S-5! PRODUCTS MAY BE USED AS A COMPONENT IN A FALL PROTECTION SYSTEM ONLY WHEN THE SYSTEM MANUFACTURER PROVIDES APPROPRIATE APPROVALS.

- This document is an installation guide only, and the photographs and drawings herein are for the purpose of illustrating components and suggested roof inspection methods. Authority Having Jurisdiction (AHJ) rules, loading scenarios, load transfers, building structures, metal roofing systems and associated components can be complex and unique to each site. S-5! recommends consulting with a qualified design professional.
- Due to the many variables involved with specific metal roofing systems, climates and other job particulars, the manufacturer cannot and does not express any opinions as to the suitability of any S-5! assembly for any specific application and assumes no liability with respect thereto.
- The information in this guide is subject to change without notification.
- For specific test data of ultimate and allowable tensile load per metal roofing system and S-5! clamp, contact your S-5! distributor or visit S-5!'s website <https://www.s-5.com/load-tests/>.
- When published ultimate load and/or other raw data is used, an appropriate factor of safety (SF) must be applied.
- Screw torque should be verified during installation.
- Have a qualified licensed PE look for signs of weak building structure (roof, building structure and foundation).
- Ensure that the installation is performed by a licensed PV installation professional.
- Ensure that installation complies with all roofing manufacturer warranties.
- In the USA: Note that a continuous ground must be followed in accordance with National Electric Code (NEC), ANSI/NFPA 70.
- In Canada: Installation must be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.
- For UL 2703 Listed assemblies, use with PV Modules having 35 A or less for module frames anodize to 20 microns or less
- Contact the local code to determine the proper grounding requirements.
- Consult module manufacturer's installation guide for mounting methods and loading requirements.
- To avoid likelihood of galling: use anti-seize lubrication, avoid spinning nuts at high speed and keep hardware at low temperatures during installation.
- The following suggestions assume that determination has been made that the roof to which the S-5! products will be attached is structurally adequate. S-5! recommends consulting with a qualified PE.
- Any loads imposed on the S-5! clamps will be transferred to the panels. Panel seams must have sufficient flexural strength to carry these loads. Panels must also be adequately attached to the building structure, and the structure must be sufficient to carry these loads. The makers of S-5! clamps make no representations with respect to these variables. S-5! recommends consulting with a qualified design professional.

1.1 AVERTISSEMENTS Français

Pour toute question concernant l'installation du PVKIT et d'EdgeGrab, veuillez contacter support@S-5.com ou appeler le (888) 825-3432. En raison de la variété des besoins de fixation, les PVKIT sont vendus séparément du S-5 ! Mini-pinces. Le PVKIT s'adapte aux deux S-5! pinces standard et mini.

LE S-5! LA PINCE N'EST PAS APPROUVÉE POUR ÊTRE UTILISÉE COMME DISPOSITIF PERSONNEL DE RETENUE AUX CHUTES !

TOUJOURS FOURNIR UNE PROTECTION CONTRE LES CHUTES AU TRAVAILLEUR LORS DE L'INSTALLATION DU S-5 ! DES PRODUITS. S-5 ! N'APPROUVE PAS LES PRODUITS À UTILISER DANS LES APPLICATIONS DE RETENUE PERSONNELLE CONTRE LES CHUTES/ PROTECTION CONTRE LES CHUTES. S-5 ! LES PRODUITS PEUVENT ÊTRE UTILISÉS COMME COMPOSANTS DANS UN SYSTÈME DE PROTECTION CONTRE LES CHUTES UNIQUEMENT LORSQUE LE FABRICANT DU SYSTÈME FOURNIT LES AUTORISATIONS APPROPRIÉES.

- Ce document est uniquement un guide d'installation, et les photographies et dessins ci-dessous ont pour but d'illustrer les composants et les méthodes d'inspection du toit suggérées. Les règles de l'autorité compétente (AHJ), les scénarios de chargement, les transferts de charge, les structures des bâtiments, les systèmes de toiture métallique et les composants associés peuvent être complexes et uniques à chaque site. S-5 ! recommande de consulter un professionnel de la conception qualifié.
- En raison des nombreuses variables impliquées dans les systèmes de toiture métallique spécifiques, les climats et autres détails du travail, le fabricant ne peut pas et n'exprime aucune opinion quant à l'adéquation d'un S-5 ! assemblage pour toute application spécifique et n'assume aucune responsabilité à cet égard.
- Les informations contenues dans ce guide sont susceptibles d'être modifiées sans notification.
- Pour des données de test spécifiques de charge de traction ultime et admissible par système de toiture métallique et S-5 ! pince, contactez votre S-5 ! distributeur ou visitez le site Web de S-5! <https://www.s-5.com/load-tests/>.
- Lorsque la charge ultime publiée et/ou d'autres données brutes sont utilisées, un facteur de sécurité (SF) approprié doit sois appliqué.
- Le couple des vis doit être vérifié lors de l'installation.
- Demandez à un PE agréé qualifié de rechercher les signes de faiblesse de la structure du bâtiment (toit, structure du bâtiment et fondations).
- Assurez-vous que l'installation est effectuée par un professionnel de l'installation photovoltaïque agréé.
- Assurez-vous que l'installation est conforme à toutes les garanties du fabricant de toiture.
- Aux États-Unis : notez qu'une mise à la terre continue doit être respectée conformément au National Electric Code (NEC), ANSI/NFPA 70.
- Au Canada : L'installation doit être conforme à la norme CSA C22.1, Norme de sécurité pour les installations électriques, Code canadien de l'électricité, partie 1.
- Pour les assemblages homologués UL 2703, à utiliser avec des modules PV ayant un calibre de fusible maximum de 35 A ou moins. Pour les cadres de modules anodisés à 20 microns ou moins
- Contactez le code local pour déterminer les exigences de mise à la terre appropriées.
- Consultez le guide d'installation du fabricant du module pour connaître les méthodes de montage et les exigences de chargement.
- Pour éviter tout risque de grippage : utilisez une lubrification antigrippante, évitez de faire tourner les écrous à grande vitesse et conservez le matériel à basse température pendant l'installation.
- Les suggestions suivantes supposent qu'il a été déterminé que le toit sur lequel le S-5! Les produits qui seront attachés sont structurellement adéquats. S-5 ! recommande de consulter un PE qualifié.
- Toutes les charges imposées au S-5 ! les pinces seront transférées aux panneaux. Les joints des panneaux doivent avoir une résistance à la flexion suffisante pour supporter ces charges. Les panneaux doivent également être adéquatement fixés à la structure du bâtiment, et la structure doit être suffisante pour supporter ces charges. Les créateurs du S-5 ! les pinces ne font aucune représentation par rapport à ces variables. S-5 ! recommande de consulter un professionnel de la conception qualifié.

1.1 ADVERTENCIAS español

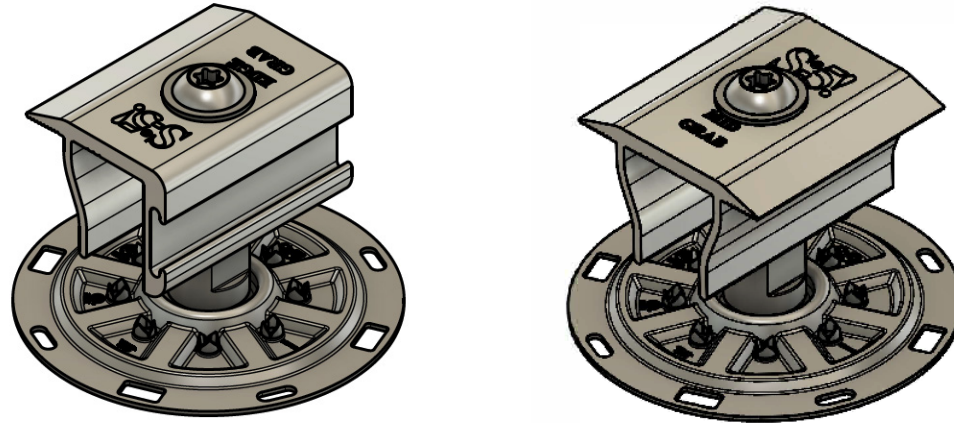
Si tiene preguntas sobre la instalación de PVKIT y EdgeGrab, comuníquese con support@S-5.com o llame al (888) 825-3432. Debido a la variedad de necesidades de accesorios, los PVKIT se venden por separado del S-5. Mini abrazaderas. ¡El PVKIT se adapta a ambos S-5! Abrazaderas estándar y mini.

¡EL S-5! ¡LA ABRAZADERA NO ESTÁ APROBADA PARA SU USO COMO DISPOSITIVO PERSONAL DE RESTRICCIÓN DE CAÍDAS!

¡PROPORCIONE SIEMPRE PROTECCIÓN CONTRA CAÍDAS AL TRABAJADOR AL INSTALAR S-5! PRODUCTOS. T-5! NO APRUEBA PRODUCTOS PARA USO EN APLICACIONES PERSONALES DE RESTRICCIÓN/PROTECCIÓN CONTRA CAÍDAS. T-5! LOS PRODUCTOS PUEDEN UTILIZARSE COMO COMPONENTE DE UN SISTEMA DE PROTECCIÓN CONTRA CAÍDAS SOLO CUANDO EL FABRICANTE DEL SISTEMA PROPORCIONA LAS APROBACIONES APROPIADAS.

- Este documento es solo una guía de instalación, y las fotografías y dibujos que contiene tienen el propósito de ilustrar los componentes y los métodos de inspección del techo sugeridos. Las reglas de la Autoridad con Jurisdicción (AHJ), los escenarios de carga, las transferencias de carga, las estructuras de construcción, los sistemas de techos metálicos y los componentes asociados pueden ser complejos y únicos para cada sitio. T-5! recomienda consultar con un profesional de diseño calificado.
- Debido a las muchas variables involucradas con sistemas de techos metálicos específicos, climas y otros detalles del trabajo, el fabricante no puede expresar ninguna opinión sobre la idoneidad de cualquier S-5. conjunto para cualquier aplicación específica y no asume ninguna responsabilidad con respecto a la misma.
- La información de esta guía está sujeta a cambios sin previo aviso.
- ¡Para obtener datos de prueba específicos de carga de tracción máxima y permitida por sistema de techo metálico y S-5! abrazadera, póngase en contacto con su S-5! distribuidor o visite el sitio web de S-5! <https://www.s-5.com/load-tests/>.
- Cuando se utiliza la carga máxima publicada y/u otros datos sin procesar, se debe aplicar un factor de seguridad (SF) apropiado. se aplicado.
- El torque de los tornillos debe verificarse durante la instalación.
- Haga que un PE calificado y con licencia busque signos de estructura de edificio débil (techo, estructura de edificio y cimientos).
- Asegúrese de que la instalación la realice un profesional de instalación fotovoltaica autorizado.
- Asegúrese de que la instalación cumpla con todas las garantías del fabricante del techo.
- En EE. UU.: Tenga en cuenta que se debe seguir una conexión a tierra continua de acuerdo con el Código Eléctrico Nacional (NEC), ANSI/NFPA 70.
- En Canadá: la instalación debe realizarse de acuerdo con CSA C22.1, Norma de seguridad para instalaciones eléctricas, Código eléctrico canadiense, Parte 1.
- Para conjuntos listados por UL 2703, utilícelo con módulos fotovoltaicos que tengan una clasificación de fusible máxima de 35 A o menos. Para marcos de módulos anodizados a 20 micrones o menos
- Comuníquese con el código local para determinar los requisitos de conexión a tierra adecuados.
- Consulte la guía de instalación del fabricante del módulo para conocer los métodos de montaje y los requisitos de carga.
- Para evitar la posibilidad de irritación: use lubricación antiagarrotamiento, evite girar las tuercas a alta velocidad y mantenga los herrajes a bajas temperaturas durante la instalación.
- Las siguientes sugerencias suponen que se ha determinado que el techo al que se instalará el S-5! se unirán los productos es estructuralmente adecuado. T-5! recomienda consultar con un PE calificado.
- ¡Cualquier carga impuesta al S-5! Las abrazaderas se transferirán a los paneles. Las uniones de los paneles deben tener suficiente resistencia a la flexión para soportar estas cargas. Los paneles también deben estar adecuadamente sujetos a la estructura del edificio, y la estructura debe ser suficiente para soportar estas cargas. ¡Los creadores de S-5! Las abrazaderas no hacen ninguna representación con respecto a estas variables. T-5! recomienda consultar con un profesional de diseño calificado.

1.2 PVKIT 2.0 EDGE & MID GRAB



1.3 PRE CONSTRUCTION & LAYOUT

1.3.1 OVERVIEW

The restrictions to locating the S-5! PVKIT and clamp are: 1) the module manufacturer's allowable mounting locations or UL 2703 tested load configurations (with module producer's approval); and 2) uniformly transferring the service loads to the metal roof panels; then through the roof panels' fastening to the building structure.

This describes the load chain experienced on any PV assembly to the roof. The "weak link" may be the flexural strength of the metal roof panel or the metal roof panel's connection to the building structure. Further information that describes a conservative design approach can be found in Section 1.3.3.

PV Mounting Assembly | Mid Condition

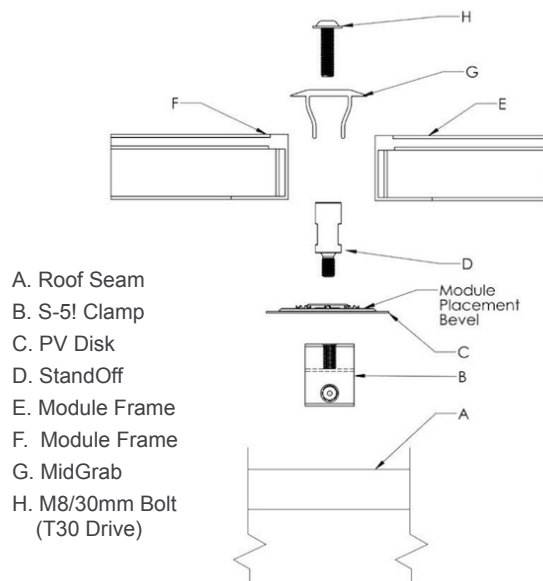


Figure 1: PV Mounting Assembly Mid Condition

PV Mounting Assembly | Edge Condition

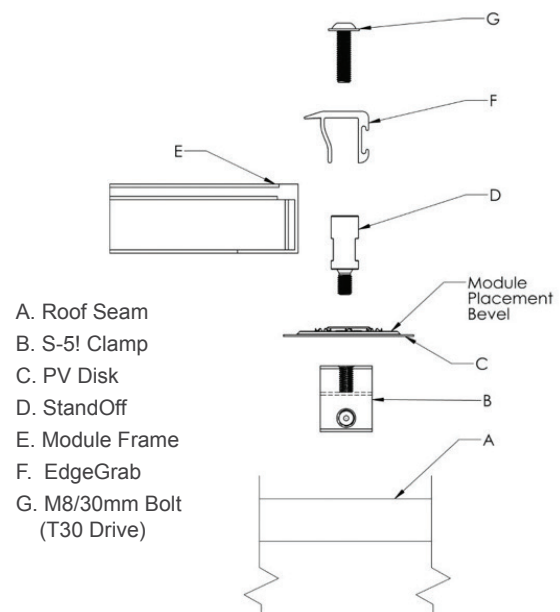


Figure 2: PV Mounting Assembly Edge Condition

1.3.2 PRE CONSTRUCTION

1.3.2A S-5-PVKIT 2.0 MODULE THICKNESS TOLERANCE

To ready the project for layout and construction, the following three areas need to be examined:

1. The **MODULE**: thickness, acceptable mounting locations and allowable loading.
2. The **METAL ROOF SYSTEM/PROFILE**: for S-5! Mini clamp or standard clamp selection, bracket and roof attachment clip type.
3. The **LOCATION** of the roof attachment clips within the seam (when relevant). (See section 1.4.2.2.4).

THE MODULE

S-5! PVKIT and clamps are designed to fit most module frame thicknesses and metal roof types. The Universal PV Grab accommodates module frame thicknesses from 30mm to 46mm, as shown in Figure 3.

It is possible to use the Universal PV Grab in array-edge scenarios (rather than the EdgeGrab). Instructions for this can be found as a 'HINT' breakout in Section 1.5.2.

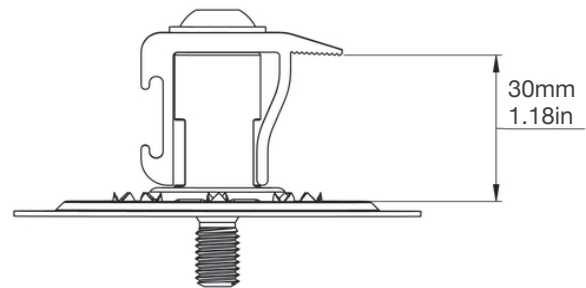
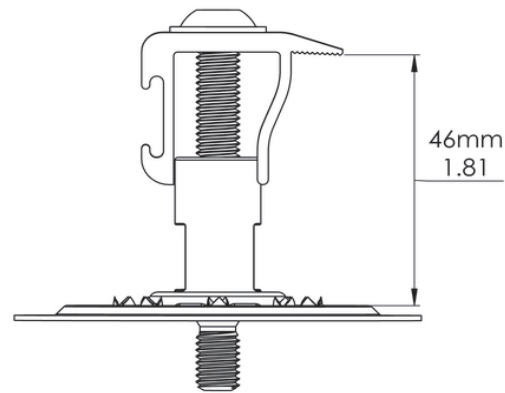


Figure 3: PV Kit 2.0's Acceptable Module Thickness Range



THE METAL ROOF SYSTEM/PROFILE

Please see the diagrams below to choose the S-5! bracket or the S-5! clamp that is compatible with the metal roof profile. Verify dimensions for proper fit. For further info please see: [Clamps](#) and [Brackets](#).



Figure 4: Trapezoidal Roof

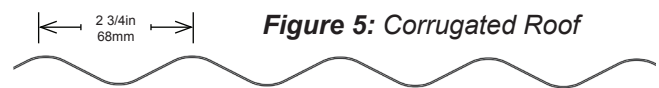


Figure 5: Corrugated Roof

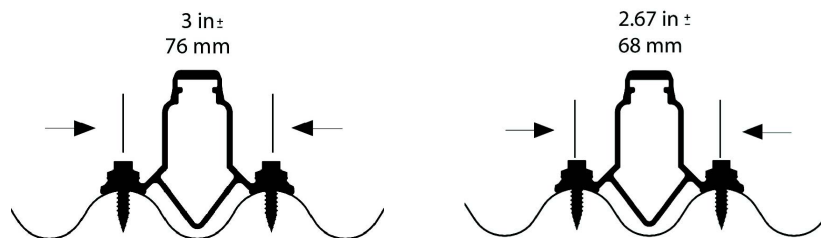
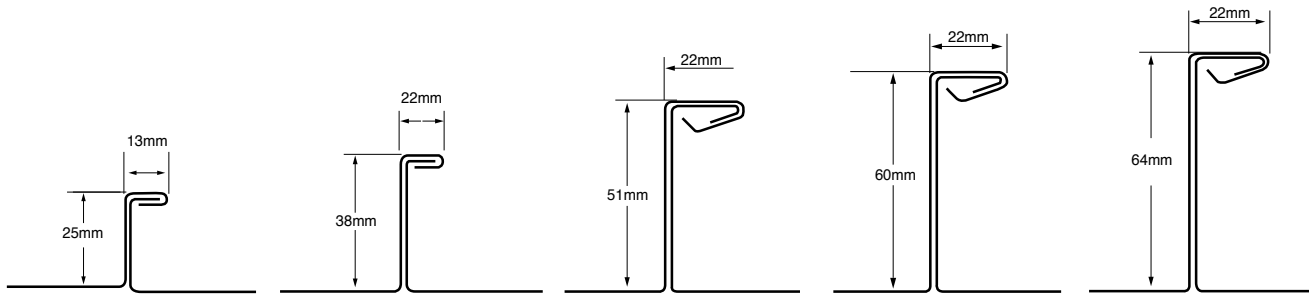


Figure 6: Corrugated Roof Min and Max Rib Span

1.3.2B ROOF PROFILES



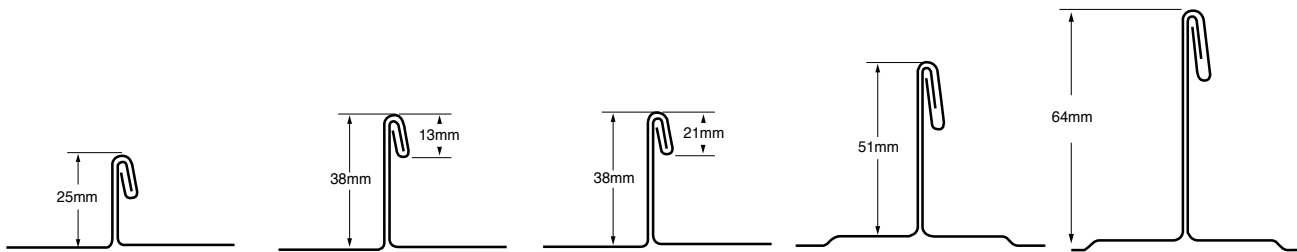
25mm Single Fold
S-5-S, S-5-S Mini

38mm Single Fold
S-5-S, S-5-S Mini

51mm Single Fold
S-5-H90, S-5-H90 Mini
S-5-U, S-5-U Mini
S-5-H, S-5-H Mini

60mm Single Fold
S-5-H90, S-5-H90, Mini
S-5-U, S-5-U Mini
S-5-H, S-5-H Mini

64mm Single Fold
S-5-H90, S-5-H90 Mini
S-5-U, S-5-U Mini
S-5-H, S-5-H Mini



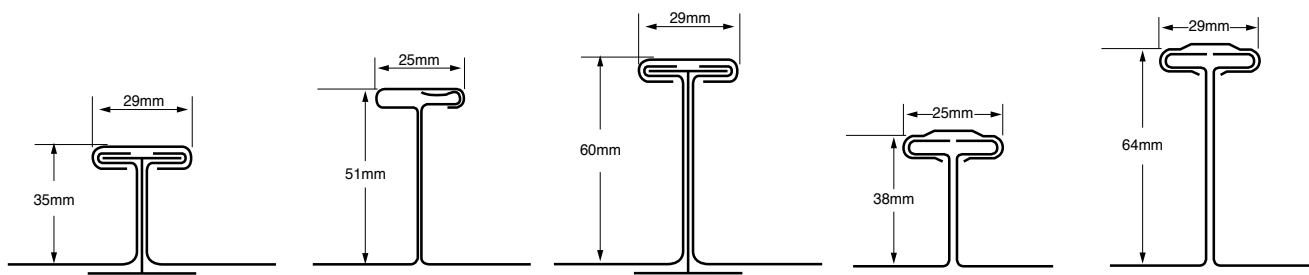
25mm Double Fold
S-5-E, S-5-E Mini

38mm Double Fold
S-5-E, S-5-E Mini

38mm Double Fold
S-5-V, S-5-V Mini
S-5-U, S-5-U Mini

51mm Double Fold
S-5-V, S-5-V Mini
S-5-U, S-5-U Mini

64mm Double Fold
S-5-V, S-5-V Mini
S-5-U, S-5-U Mini



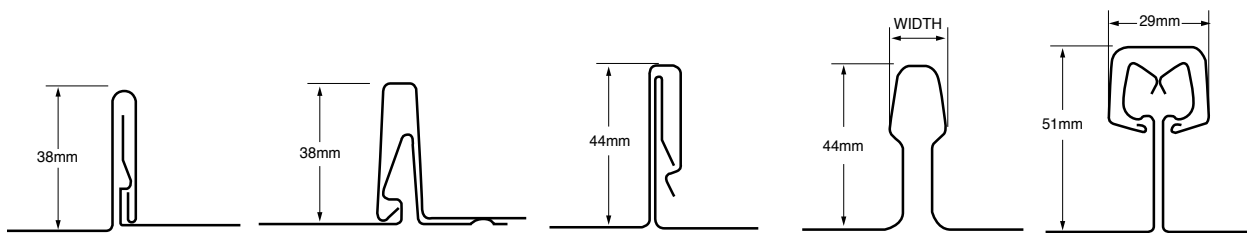
35mm T Seam
S-5-T, S-5-T Mini

51mm T Seam
S-5-T, S-5-T Mini

60mm T Seam
S-5-T, S-5-T Mini

38mm Batten Cap T Seam
S-5-T, S-5-T Mini

64mm Batten Cap T Seam
S-5-T, S-5-T Mini



38mm Snap Seam
S-5-S, S-5-S Mini

38mm Nail Strip
S-5-N 1.5, S-5-N 1.5 Mini

44mm Snap Lock
S-5-S, S-5-S Mini

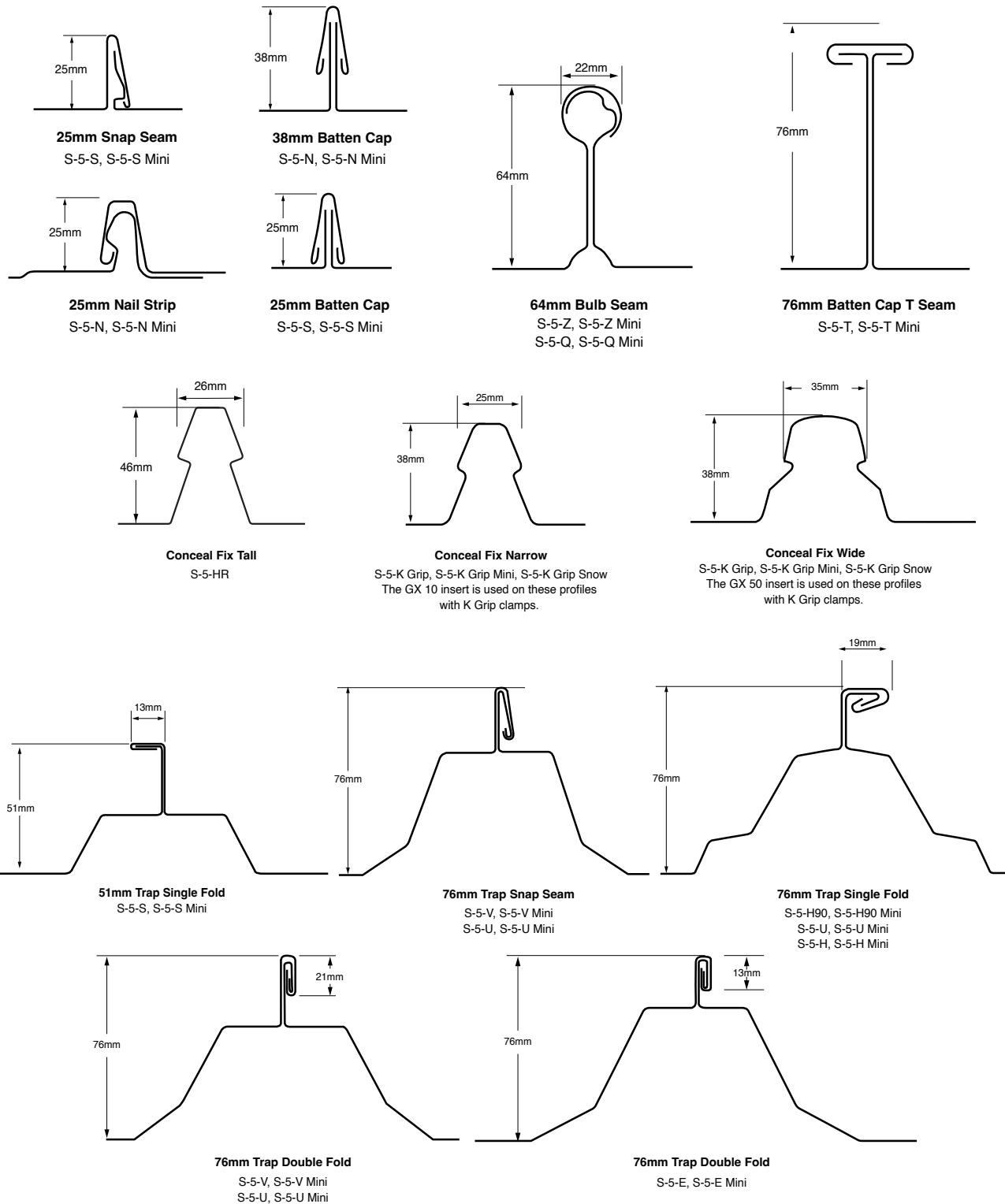
44mm Bulb Seam EU
S-5-Z, S-5-Z Mini
S-5-R465, S-5-R465 Mini

51mm Bulb Seam Cap
S-5-Q, S-5-Q Mini

Section 1

1.3.2B ROOF PROFILES *continued*

Clamp choice dependent on bulb width



1.3.3 CLAMP SPACING CONSIDERATIONS



The key to frequency and spacing of attachment points for PV is to distribute loads to the standing seam metal panels in a manner that is consistent with the intended distribution of loads from the roof panels into the building structure. Often the “weak link” is not the S-5! clamp, but the standing seam metal roof clips that secure the metal panels to the building structure or the beam strength of the roof panel seam itself. Load capacities of all the S-5! clamps have been tested and are published on www.S-5.com. Here you will find testing values that are specific to the standing seam roof manufacturer, standing seam type, material type/thickness and load orientation.

Standing seam metal roof panel attachment to a building structure is accomplished with clips hidden within the seams. The most conservative method to distribute the load into the roof panels is to determine the frequency of the roof’s attachment to the structure, and then duplicate or exceed it with the attachment of the PV components to the roof. Determining panel attachment spacing in one axis is very simple: Standing seam panels’ attachment will be made using concealed hold-down clips within the seam area of the panel. So, in that axis, the clip spacing is the same as the seam spacing.

The location of the clips along the seam (in the other axis) can be determined by the following: a) consultation with the roof system manufacturer or installer; b) checking from the underside; or c) close examination from the topside along the seam. There will usually be a slight, but detectable, deformation of the seam at the clip location visible from

The metal roof panels are attached to the building via concealed roof clips within the metal roof’s seam areas. Acceptable clamping locations for the S-5! Mini clamps are dependent on the type of roof clip used. Once the brand of metal roof system is determined, the roof clip is implied. Use the installer, manufacturer and/or materials invoice to confirm specifications and fitment.

the roof’s topside. Many standing seam roofing systems are installed on “pre-engineered steel” buildings. The attachment spacing in that industry is typically 5’-0” and is observed by inspecting the structural purlins to which the panel clips are attached from the roof underside (i.e. the interior of the building).

If the panel clips are spaced, for instance, 5’-0” on center along the seam, then use the 5’-0” dimension as a maximum spacing for the S-5! clamps. (S-5! clamps may also be spaced at closer centers but not wider.) When modules are direct attached (without racking) in the landscape orientation, this spacing dimension is dictated by the smallest dimension of the PV frame. Using the roof panel clip spacing as a maximum spacing template for S-5! clamps is sound practice, whether the PV modules are direct-attached or attached to a racking system, which is in turn attached to the S-5! clamp (and to the panel seams). To evenly distribute loads, it is also necessary for each seam be included in the finished assembly. Thus, every time a seam is traversed, it should be attached. Such an attachment scheme should evenly distribute wind loads into the building structure through the panels and their attachment, as was intended in the original roof construction assembly. “Skipping” seams with clamp attachment is common practice and may also be acceptable, but only when approved by a design professional.

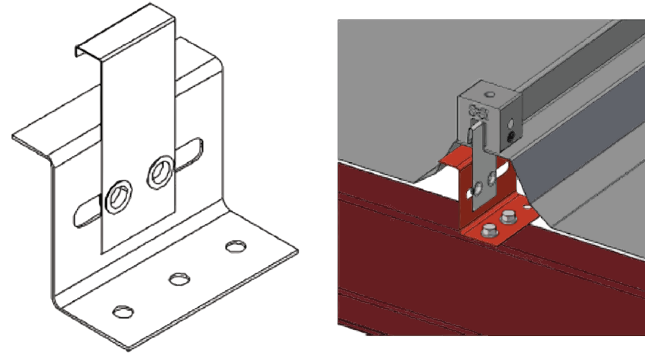
Note: Wind dynamics are complex, and S-5! advises review by a qualified licensed professional who understands wind effects and metal roof design and construction.

1.3.3A DUAL COMPONENT ROOF CLIPS

In a dual component roof clip system, the top component is attached to the metal roof panel via the seam, and the bottom component is attached to the building structure. In order to accommodate differential movement presented during thermal cycling, the two roof clip components are joined with a slip joint.

When attaching to this type of standing seam metal roof, the S-5! clamp can be attached at a roof clip location or between clips.

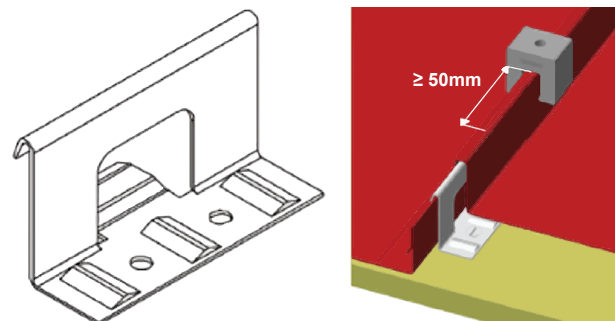
Note: When using a clamp on a dual component roof clip, it is important that the setscrew of the clamp only engages the top portion of the clip.



1.3.3B SINGLE COMPONENT ROOF CLIPS OR HALTERS

In a single component roof clip or halter system, the metal roof panel can slide freely along the roof clip – accommodating any differential movement presented during thermal cycling.

When attaching to this type of standing seam metal roof, the S-5! clamp must be clear of the roof clip by a minimum of 2" to allow for thermal expansion/contraction movement. An exception may be permissible when the metal roof panel is 20 feet or less, or when approved by the metal roofing system manufacturer.



1.3.3C LOCATE THE ROOF CLIPS

Roof clips can be accomplished in three ways: 1) consulting with the roofing system manufacturer or installer, 2) inspecting the underside of the roof or 3) close examination of the top side of the roof.

When examining the clip locations from the underside, look for fasteners. Many standing seam roofing systems are installed on “pre-engineered steel” buildings.

The attachment spacing in that industry is typically 5'-0" and is observed by inspecting the structural purlins to which the panel clips are attached from the roof underside (interior of the building).

When examining the clip location from the topside, look for slight deformations of the seam – these will be the clip locations. Now that the type and locations of the roof clips are known, we can better understand the allowable clamping locations for the S-5! clamps (per roof clip type).



1.3.4 LAYOUT



The first step in designing the system layout is to map the total usable area for solar array. Drawing the total roof area and subtract the following areas:

Required fire setbacks and pathways.
Roof zone restrictions per wind loading.

Required space around any roof obstruction (e.g. skylights, etc.).

Any locations deemed not structurally sound or inappropriate for installation.

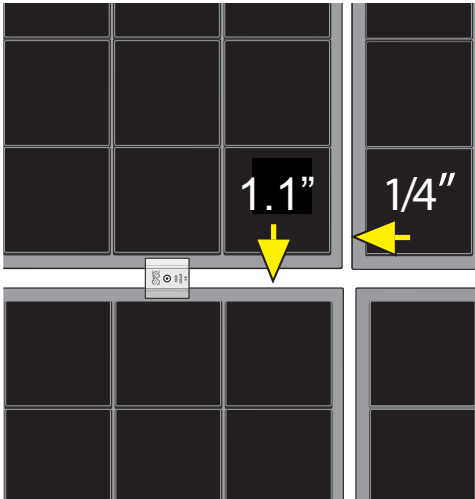
The next step is to map the standing seams and the roof clips, as identified in the last section. Then, identify the areas on the seams that are appropriate for attaching the S-5! PVKIT/Clamp, per the previous section. Finally, map the module placement. Keep in mind, the module manufacturer’s attachment location and cantilever restrictions from Section 2.4. Modules in landscape orientation will generally allow for the most flexibility in design.

1.3.4A GAP MANAGEMENT

Modules in the north/south direction will have a uniform gap of 1.1” between each module provided by the PVKIT 2.0 MidGrab. With these module columns, it is also advised to add a 3.5” gap within a column after a maximum of 10 module sets.

The module gap in the east/west direction will be managed by the designer. For aesthetic reasons, the designer may choose to have a minimal gap, uniform gap or a gap wide enough to accommodate a walk space. However, due to thermal cycling concerns, a minimal gap of 1/4” between module columns is suggested.

For more information on module gaps and pressure coefficients, please reference ASCE 7.



1.4 INSTALLATION OF PVKIT WITH CLAMP

S-5! clamps attach to the panel seam by tightening the “bullet-nosed” stainless-steel setscrews against the seam material. The setscrews compress the seam material against the opposite wall of the clamp. They will “dimple” the seam material but will not penetrate it. Threaded holes in the clamp and the stainless-steel hardware are used to attach the S-5-PVKIT to the clamp. (Refer to section 1.3 for more component details).

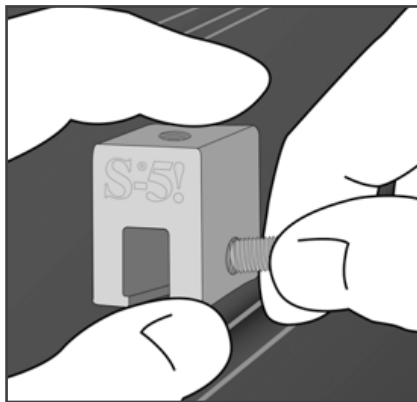
1.4.1 MINI CLAMP INSTALL

Mini Clamp Overview:

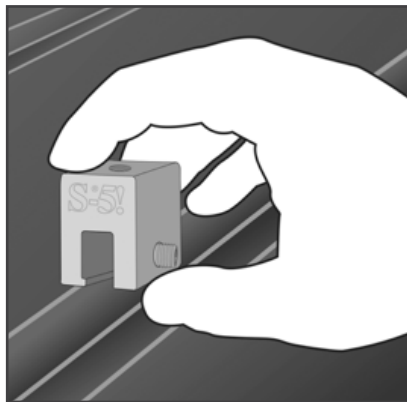
What follows are basic installation instructions for S-5! Mini clamps. Clamp specific instructions can be found on the S-5! website at <https://s-5.com> or in the S-5! Resource Center at <https://s-5.com/metal-roof-resources>.

Install the Clamp:

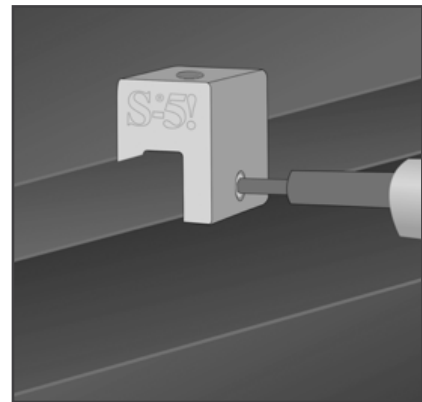
1. Partially thread the round-point setscrew into the side of the clamp manually.
2. Position clamp at desired location along seam. Ensure that the clamp setscrew will engage the proper side of the seam. (See install instructions provided with clamps.) Tighten clamp onto the seam, ensuring a snug and square fit. Clamp must be seated on the profile so that the setscrew is in the correct position to make adequate purchase of the seam.
3. Finally, tighten the setscrew on the side of the clamp to the specified torque range, per section 1.4.2.



Step 1: Preload setscrews



Step 2: Position on clamp seam



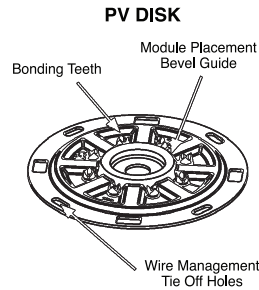
Step 3: Tighten to correct torque

Note: Should clamp sit crooked on seam, lift clamp to a position on the seam where the fold of the roof fully engages the lip on the clamp; then tighten setscrew.

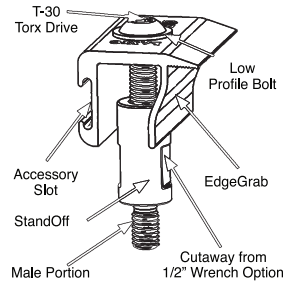
1.4.2 PVKIT INSTALLATION

Tools Needed

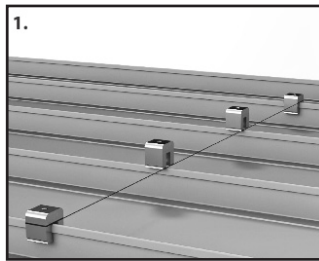
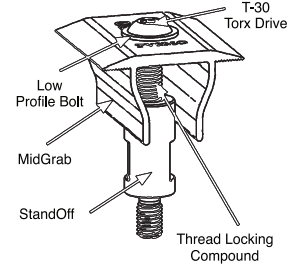
- Screw Gun
- T-30 Torx Bit Tip (provided)
- Calibrated Dial Torque Wrench



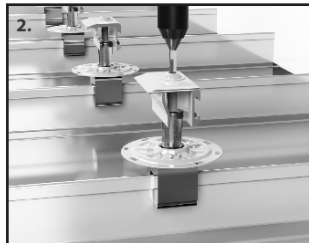
EdgeGrab/StandOff Assembly



MidGrab/StandOff Assembly



1. Install the first row of S-5! clamps, at the edge of the array: It is critical for this row to be straight. Install a clamp at both ends of the row by measuring from a reference point, such as the eave of the roof. Tighten the setscrews with Screw Gun and the included Bit Tip. The setscrews will dimple the seam material but will not penetrate it. When relying on published load values, setscrew tension should be verified periodically using a calibrated torque wrench to ensure the tool is consistently achieving the proper torque range (see Setscrew Torque Table below). Please see installation instructions provided with clamps for specifics. Stretch a string line between the two end clamps to provide a true line to mount the remaining edge clamps (Fig. 1).

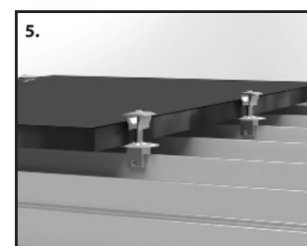
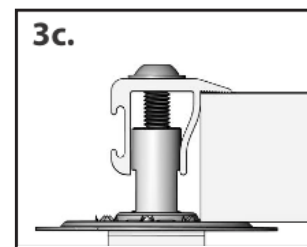
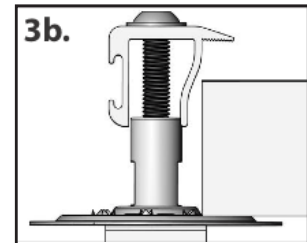
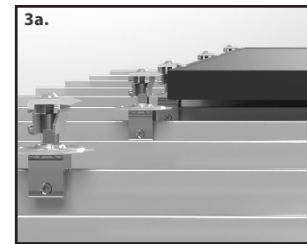


2. Mount the PV Disks and the EdgeGrab/StandOff Assembly to the first row of clamps: Place the PV Disk atop the clamp and thread the Male Portion of the StandOff through the disk and into the clamp. Drive the EdgeGrab/StandOff Assembly down with provided Bit Tip (Fig. 2) until the base of the StandOff seats the disk in place and breaks the thread locking seal between the StandOff and Low Profile Bolt. Leave the grab up, to allow space for a module frame. A 1/2" open-end wrench can be used to further tighten the StandOff atop the disk if desired.

Specified Torque	Inch Pounds	Foot Pounds	Nm
22ga steel	160–180	13–15	18–20
All other metals and thinner gauges of steel	130–150	11–12.5	15–17

1.4.2 PVKIT INSTALLATION *continued*

3. Install the first row of modules (Fig 3a): Place the first module in the grabs, pushing on the frame to seat the module against the EdgeGrabs and Module Placement Bevel Guide (Fig 3b). Drive the Low-Profile Bolt with the provided bit to tighten the grabs (Fig 3c). The Low-Profile Bolt and Standoff should be torqued to 120-130 in lbs. (13.6-14.7 Nm). Check torque periodically during install to ensure the tool is achieving torque. PVKIT 2.0 fits 3b, 3c. module frame thicknesses from 30 mm-46 mm. the grabs (Fig 3c). Low-Profile Bolt and Standoff should be torqued to 120-130 inch-pounds. (13.6-14.7 Nm). Check torque periodically with a torque wrench.
4. Install MidGrab/StandOff Assembly & PV Disk on Clamps: The PV Disk and MidGrab/StandOff Assembly should be mounted to the clamps before mounting the clamps to the roof. Place the PV Disk atop the clamp and thread the male portion of the StandOff through the disk and into the clamp. Drive the MidGrab/StandOff Assembly down with the provided bit tip (Fig 4) in similar fashion to Step 2. Note: When using the S-5-H90 or S-5-K Grip style clamps, the clamp must be secured to the roof prior to fixing the S-5-PVKIT 2.0 EdgeGrab or MidGrab assembly to clamps. See: Tips for Mounting with CorruBrackets, S-5-H90 or S-5 K Grip style clamps at the end of installation instructions.
5. Place MidGrab/StandOff/Disk & Clamp Assemblies: Using the PV module as a guide, place the throat of the clamp over the seam and slide the assembly into place so the edge of the module is seated against the wall of the MidGrab and the Module Placement Bevel Guide, similar to (Fig 3b). Tighten the setscrew(s) of the clamp as described in step 1. The grabs should be left in the partially open position to accommodate the next row of modules before final tightening.
6. Install Additional PV Modules-repeating steps 3-5: Place another module in the MidGrabs left open from the previous step. Tighten the downslope row of grabs each time a module is placed and leave the upslope open until the next module is placed (Fig. 6). The final row will be finished with EdgeGrab/StandOff Assemblies. Periodically look back at the modules you've installed to double check that the MidGrabs were tightened.



1.5 INSTALLATION OF PVKIT WITH BRACKETS

S-5! brackets are designed to fit a range of exposed fastened profiles including trapezoidal, corrugated and flat pan using piercing screws. Top slots and holes on the brackets and the stainless-steel hardware are used to attach the S-5-PVKIT to the bracket. (Refer to section 1.3 for more component details).

1.5.1 BRACKET INSTALL

Bracket Overview:

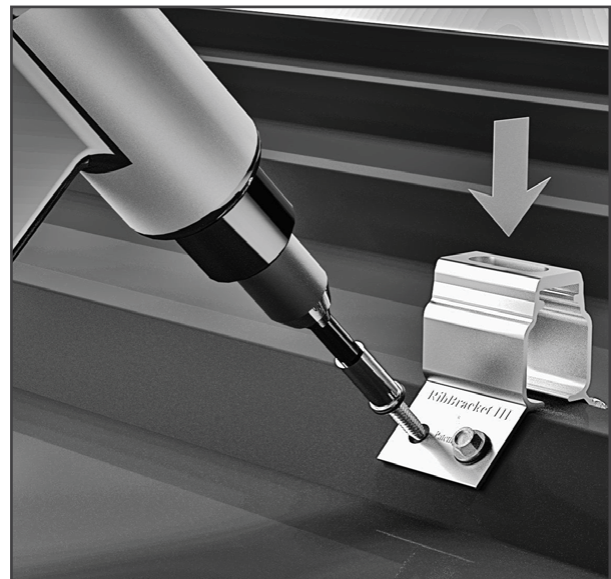
What follows are basic installation instructions for S-5! brackets. Bracket specific instructions can be found on the S-5! website at <https://s-5.com> or in the S-5! Resource Center at <https://s-5.com/metal-roof-resources>.

Install the Bracket:

1. Position the bracket at desired location along seam.
2. If the roof profile is slightly larger than the space between the legs of the bracket, it is necessary to apply pressure to the top of the bracket, pushing it down over the trapezoidal rib to expand the legs. If the trapezoidal rib is slightly smaller, the legs of the bracket can be flexed inward, allowing the rubber gasket to contact the sides of the rib as fasteners are applied.
3. Secure the bracket directly into the roof profile by driving the included fasteners into the pre-punched holes. To achieve tested holding strength, secure the bracket by using all pre-punched hole locations. Drive the fastener in until it is tight and the washer is firmly seated (Fig. 3). Do not over-drive fasteners; a slight extrusion of rubber around the washer is a good visual-tightness check.



Step 1 and 2: Position and flex bracket onto profile



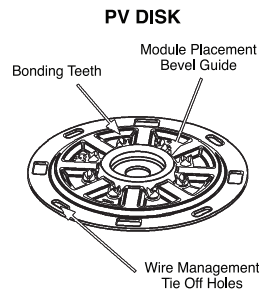
Step 3: Install fasteners

Note: When installing, if a fastener has been stripped, it is important to remove the fastener and replace it with a bulb-tite rivet or larger diameter fastener. To avoid stripping, use screw gun with depth-sensing nose piece or adjustable torque clutch.

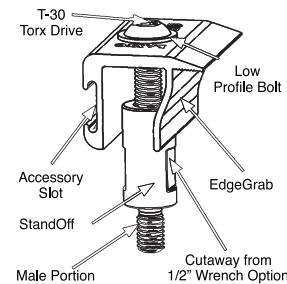
1.5.2 PVKIT INSTALLATION

Tools Needed

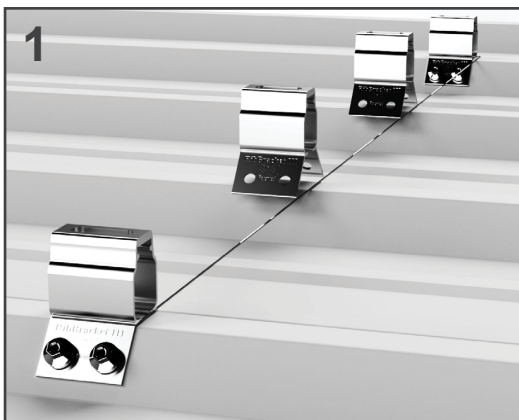
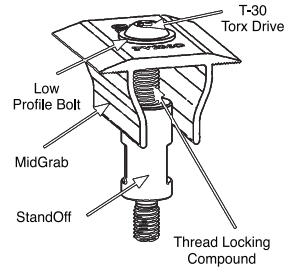
- Screw Gun
- T-30 Torx Bit Tip (provided)
- Calibrated Dial Torque Wrench



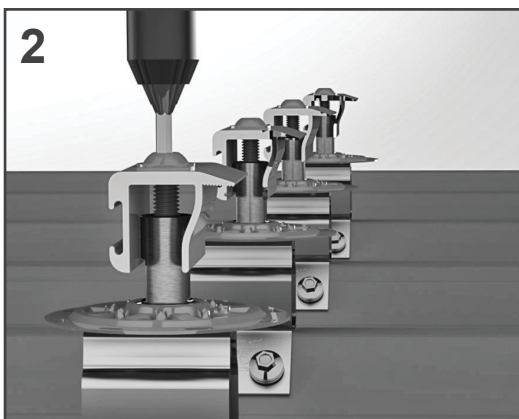
EdgeGrab/StandOff Assembly



MidGrab/StandOff Assembly



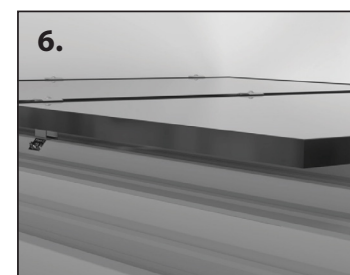
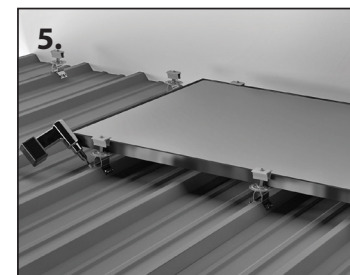
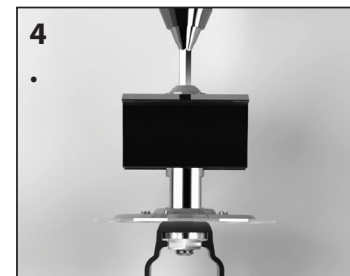
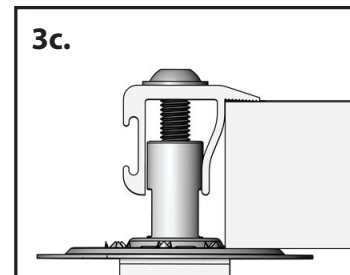
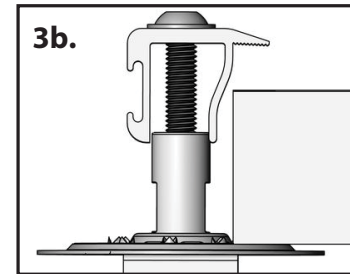
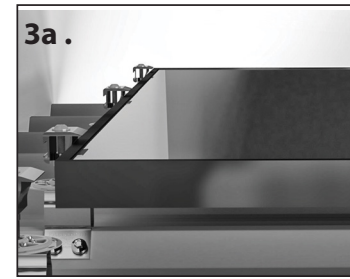
1. Install the first row of S-5! brackets, at the edge of the array: It is critical that this row is straight. Install a bracket at both ends of the row, by measuring from a reference point such as the eave of the roof. Stretch a string line between the brackets to provide a true line to mount the remaining edge brackets (**Fig. 1**). Secure the RibBracket directly into the crown of the roof profile by driving the included fasteners into the pre-punched holes. To achieve tested holding strength, secure the RibBracket by using all pre-punched hole locations. Drive the fastener in until it is tight and the washer is firmly seated. Be careful not to over-drive fasteners. A slight extrusion of rubber around the washer is a good visual-tightness check. Please see S-5! bracket installation instructions for specific install information.



2. Mount the PV Disks and the EdgeGrab/StandOff Assembly to the first row of brackets: place the PV Disk atop the brackets and thread the male portion of the StandOff through the disk and into the M8 nut inserted in the bracket (nut provided with brackets). Drive the EdgeGrab/StandOff assembly down with the provided bit tip (**Fig. 2**) until the base of the Stand-Off seats the disk in place and breaks the thread locking seal between the StandOff and the Low Profile Bolt. Leave the grab up, to allow space for a module frame. A 1/2" open end wrench can be used to further tighten the StandOff atop the disk if desired.

1.5.2 PVKIT INSTALLATION *continued*

3. **Install the first row of modules (Fig 3a):** Place the first module in the grabs pushing on the frame to seat the module against the EdgeGrabs and Module Placement Bevel Guide (**Fig 3b**). Drive the Low Profile Bolt with the provided Torx Bit Tip to tighten the grabs (**Fig 3c On Previous Page**). Low Profile Bolt and Standoff should be **torqued to 120-130 in lbs (13.6-14.7 Nm)**. Check torque periodically during install to ensure the tool is achieving torque.
4. **Install MidGrab/StandOff Assembly & PV Disk on Brackets:** the PV Disk and MidGrab/StandOff Assembly should be mounted to the brackets **before mounting the brackets to the roof**. Place the PV Disk atop the brackets and thread the male portion of the StandOff through the disk and into the M8 nut inserted in the bracket (nut provided with brackets). Drive the EdgeGrab/StandOff assembly down with the provided bit tip until the base of the Stand-Off seats the disk in place (**Fig 4**) in similar fashion to Step 2. **Note:** When using CorruBrackets, the bracket must be secured to the roof **prior** to fixing the S-5-PV Kit 2.0 EdgeGrab or MidGrab assembly to bracket. See: **Tips for Mounting with CorruBrackets, S-5-H90, or S-5 K Grip Style Clamps** at end of installation instructions.
5. **Place MidGrab/StandOff/Disk & Bracket Assemblies:** Using the PV module as a guide, place the bracket on the rib and move into place so that the edge of the module is seated against the wall of the MidGrab and the Module Placement Bevel Guide (**Fig. 3b**). Secure the RibBracket directly into the crown of the roof profile by driving the fasteners (included with RibBrackets) into the pre-punched holes as described in step 1 above. At this point the grabs should be left in the open position, at least partially to accommodate the next row of modules.
6. **Install Additional PV Modules-repeating steps 3-5:** place another module in the MidGrabs that were left open in the previous step. Tighten the downslope row of grabs each time a module is placed and leave the upslope MidGrabs open until the next module is placed (**Fig. 6**). The final row will be finished with EdgeGrab/StandOff Assemblies. Periodically look back at the modules you've installed to double check that the MidGrabs were tightened.



1.6 TIPS FOR MOUNTING WITH CORRUBRACKETS, S-5-H90/H90 MINI, S-5-K GRIP/K GRIP MINI

When mounting with any S-5! CorruBracket, S-5-H90 or S-5-K Grip style clamps, steps 4/5 will vary slightly. The fasteners for a clamp or bracket to the roof must be installed before the PV Disk is mounted atop the clamp/bracket. The module can still be used as a spacer to place the clamps/brackets. Prepare a clamp or bracket with the full MidGrab/StandOff Assembly & PV Disk mounted atop it. Place this assembly so that the inside of the Midgrab and the Module Placement Bevel Guide on the PV Disk rest against the edge of the module seating it in place as described in step 5 and shown in Fig 3b. Use a marker (do not use graphite pencil) to mark the location of the clamp or bracket on the roof. Now remove the preassembled clamp/bracket and PVKIT 2.0, and mount a clamp or bracket without the PVKIT on the mark you made. After fastening the clamp or bracket in place, the MidGrab/StandOff Assembly & PV Disk can be mounted atop it. The slotted hole atop the bracket allows the kit to be slid out of the way as the module is placed, then pushed into place against the edge of the module and tightened.

1.7 REMOVAL/O&M OF PVKIT SYSTEM & CLAMP

1. To remove, reverse the installation instructions found in Section 1.5.
2. The Standoff has a flattened area for a wrench to fit and assist with removal.
3. When re-installing, it is advised to use all new parts.
4. Any loose components or fasteners shall be retightened in accordance with these instructions.
5. Any components showing sign of damage that compromise safety shall be replaced immediately.

1.8 TECHNICAL SUPPORT

For questions regarding the installation of the PVKIT and EdgeGrab, please contact support@S-5.com or call (888) 825-3432.

REFERENCES



Section 2

2.1 PVKIT COMPONENT SPECIFICATIONS & RATINGS (MATERIAL PROP, STRUCTURAL PROP, TORQUES, ETC.)

2.1.1 CLAMP SPECIFICATIONS

Clamp	
Model Numbers:	S-5-U Mini, S-5-U, S-5-S Mini, S-5-S, S-5-T Mini, S-5-T, S-5-Z Mini, S-5-Z, S-5-ZH Mini, S-5-ZH, S-5-K Grip Mini, S-5-K Grip, S-5-D Grip, S-5-R465 Mini, S-5-R465, S-5-Q Mini, S-5-Q, S-5-H Mini, S-5-H, S-5-MX Mini, S-5-MX, S-5-N Mini, S-5-N, S-5-N 1.5 Mini, S-5-N 1.5, S-5-NH 1.5 Mini, S-5-NH 1.5, S-5-E Mini, S-5-E, S-5-V Mini, S-5-V, S-5-H90 Mini, and S-5-H90
Material:	6061-T6 Aluminum
Manufacturer Process:	AA Aluminum Standards and Data
Extrusions	ASTM B221
Aluminum Castings	ASTM B85

Associated Hardware	Round Point Setscrews, T-30 Torx Drive
Material:	300 series stainless steel, 18-8 alloy
Dimensions:	3/8"-24 x 0.900" or 3/8"-24 x .625"
Drive:	T-30 Torx

Associated Hardware	Attachment Bolts (Only Provided with Standard Sized Clamps)
Material:	300 series stainless steel, 18-8 alloy
Dimensions:	8mm diameter, 1.25 thread pitch
Drive:	13mm/T30 hex flange head

2.1.2 BRACKET SPECIFICATIONS

Bracket	
Model Numbers:	CorruBracket, CorruBracket 100T, CorruBracket 100T PV, CorruBracket 500T, CorruBracket 500T PV, RibBracket I-V, ProteaBracket
Material:	6005A-T61 Aluminum
Manufacturer Process: Extrusions Aluminum Castings	AA Aluminum Standards and Data ASTM B221 ASTM B85

Associated Hardware	Fasteners
Sheet Screw:	1/4-14 X 1" self-piercing fastener with stainless cap head

Associated Hardware	Attachment Nuts & Bolts
Material:	300 series stainless steel, 18-8 alloy
Dimensions:	8mm diameter, 1.25 thread pitch
Drive:	13mm/T30 hex flange head

2.1.3 PVKIT EDGEGRAB/MIDGRAB COMPONENT SPECIFICATIONS

PVKIT & EdgeGrab	
Model Numbers:	PV MidGrab PV EdgeGrab
Material:	6005A T-61 Aluminum
Manufacturer Process: Extrusions Aluminum Castings	AA Aluminum Standards and Data ASTM B221 ASTM B85

Associated Hardware	Standoff
Material:	300 series stainless steel
Dimensions:	M8-1.25 female thread with M8-1.25 male thread
Finish:	Mill

Section 2

Associated Hardware	Stainless Steel Flanged Button Head Screw
Material:	300 series stainless steel
Dimensions:	M8-1.25 x 30 mm
Finish:	Mill
Drive:	T-30 Torx

Associated Hardware	3" Mounting Disk
Material:	300 series stainless steel
Dimensions:	3" O.D. / 0.33 I.D. x 0.035" thick
Finish:	Mill

All Manufacturing Processes for S-5! Performed in ISO 9001 Certified Facilities

All Metallurgical and Mechanical Testing Performed in ISO 17025 Certified Laboratories

2.1.4 METALLURGICAL COMPATIBILITY

The metals/finishes below are considered **NON-CORROSIVE** when combined with mill finish or anodized aluminum

Galvanized steel (painted or unpainted)
 Aluminum (painted, bare or anodized)
 Stainless Steel
 Galvalume® Steel
 Zincalume® Steel

Zincalume® Plus
 Acrylume®, Galvalume® Plus
 Galfan®
 Galvanneal steel
 Titanium-Zinc (VM, Rheinzink, Nedzink, Prozink)

HINT: Some examples of incompatible metals common to the trade are:

Exposed copper wire or copper conduit in direct contact with materials such as aluminum and aluminum alloys, galvanized steel, Galvalume® or other Al-Zn roofing coatings. Graphite in direct contact with aluminum and aluminum alloys, Galvalume® or other Al-Zn roofing coatings.

2.1.5 TORQUE

When relying upon published load values, setscrew tension should be periodically verified using a calibrated torque wrench between 160 and 180-inch pounds (not foot pounds) (18-20Nm) when used on 22 ga steel, or between 130 and 150-inch pounds (15-17 Nm) on 24 ga or thinner steel and all other metals. The standing seam of a metal roof is a soft joint which involves compressible materials and/or open space. For this reason, a dial-indicating torque wrench is RECOMMENDED to verify full clamping force has been achieved (adjustable clicktype torque wrenches are NOT RECOMMENDED).

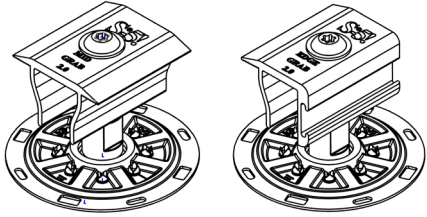
Please visit our load test table at: <https://www.s-5.com/load-tests/> to determine



ROUND POINT SETSCREW TORQUE SPECIFICATIONS

	Fastener	Torque			
		Inch Pounds		Foot Pounds	Newton Meters
	3/8-24 x 0.9" Round Point Setscrew	≤ 24ga	130-150	11-13	15-17
		≤ 22ga	160-180	13-15	18-20
	3/8-24 x 0.625" Round Point Setscrew	≤ 24ga	130-150	11-13	15-17
		≤ 22ga	160-180	13-15	18-20

S-5-PVKIT 2.0 & EDGEGRAB HARDWARE TORQUE SPECIFICATIONS

	Fastener	Torque		
		Inch Pounds	Foot Pounds	Newton Meters
	MidGrab/StandOff and EdgeGrab/StandOff Assembly	120	10-11	13.6 – 14.7

2.2 CODES AND STANDARDS

- Aluminum Standards and Data, 2003 Edition; Aluminum Association (AA) (www.aluminum.org)
- ASTM B85-03 - Standard Specification for Aluminum-Alloy Die Castings.
- ASTM B221-04a - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- ASTM E527-83 (2003) - Standard Practice for Numbering Metals and Alloys
- CSA TIL A-40:2020
- UL 2703 Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
- UL 1703 Standard for Flat-Plate Photovoltaic Modules and Panels
- UL 61730-1 Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction
- UL 61730-2 Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing

Important Note PVKit 2.0 is CSA rated for 800PA upward and downward pressure for maximum module area of 24.88ft² when installed per solar module manufacturer installation method

2.3 MODULE LOADING TABLE FOR PVKIT 2.0

Module Mfg	Module Model	Attachment Location	UL 2703 Design Download	UL 2703 Design Uplift	UL 2703 Design Down Slope
Jinko Solar	JKMXXXPP-60, 60 CELLS SERIES, BLACK FRAME WHERE XXX IS 260-345	10 3/4" From Edge Max	50 PSF	30 PSF	10 PSF
	JKMXXXPP-72, 72 cells series, silver frame where XXX is 260-345	16 1/2" From Edge Max	50 PSF	30 PSF	10 PSF
	JKMXXXM-6RL3-B-V, 66 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 380 - 400 JKMXXXM-7RL3-V, 78 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 455 - 475 JKMXXXM-7RL3-TV, 78 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 445 - 465 JKMXXXM-72HL4-V, 72 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 520-540 JKMXXXM-72HL4-TV, 72 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 525-545	24.35" From Edge Max	50 PSF	30 PSF	10 PSF
	JKMXXXN-54HL4-B (XXX = 390 - 400)	294-394 mm	50 PSF	30 PSF	10 PSF
	TSM-NE09RC.05 (400-430W)	7.87" - 12.99" From Edge Max	50 PSF	30 PSF	10 PSF
	TSM-DEG19C.20, NE-G19RC.20	442 - 642 mm From Edge Max	50 PSF	30 PSF	10 PSF
Trina	TSM-DEG19C.20, NE-G19RC.20	643 - 742 mm From Edge Max	41 PSF	30 PSF	10 PSF
	Q.PEAK DUO XL-G10.3/BFG, Q.PEAK DUO XL-G10.d/BFG	11.8" - 21.6"	40 PSF	30 PSF	10 PSF
	Q.PEAK DUO BLK-G10+/HL, Q.PEAK DUO BLK-G10.a+	11.8" - 19.7"	33 PSF	30 PSF	10 PSF
Hanwa Q-Cell	Q.PEAK DUO XL-G10.3/BFG, Q.PEAK DUO XL-G10.d/BFG	11.8" - 19.7"	33 PSF	30 PSF	10 PSF
	Q.PEAK DUO BLK ML-G10.a+, Q.PEAK DUO BLK ML-G10+/t	11.8" - 19.7"	33 PSF	30 PSF	10 PSF
	Q.PEAK DUO XL-G11.3, Q.PEAK DUO XL-G11.3/BFG, Q.PEAK DUO XL-G11S.3/BFG	7.9" - 21.7"	29 PSF	30 PSF	10 PSF

Section 2

2.3 MODULE LOADING TABLE FOR PVKIT 2.0 *continued*

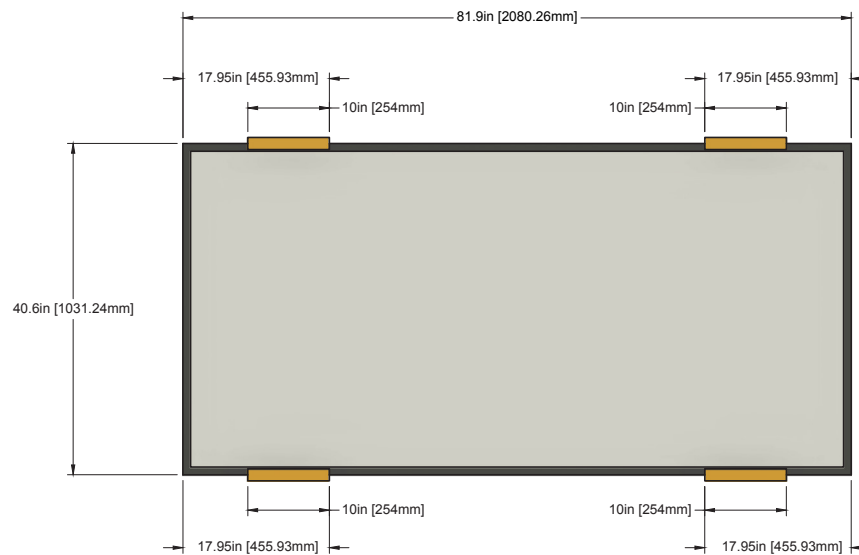
Module Mfg	Module Model	Attachment Location	UL 2703 Design Download	UL 2703 Design Uplift	UL 2703 Design Down Slope
Hanwa Q Cell	Q.TRON BLK M-G2+ XXX (XXX = 415 - 440)	0.79" - 11.8"	30 PSF	30 PSF	10 PSF
Hanwa Q Cell	NRTL Listed PV Module - Q-Cell G4.4 frame models Q.PEAK DUO-G8+, Q.PEAK DUO-G8, Q.PEAK DUOG6+, Q.PEAK DUO-G6 (330-345) Q.PEAK DUO BLK-G8+, Q.PEAK DUO BLK-G8, Q.PEAK DUO BLK-G6+, Q.PEAK DUO BLK-G6 (320-335) Q.PEAK DUO-G7, Q.PEAK DUO G7.2 (325-335) Q.PEAK DUO BLK-G7, Q.PEAK DUO BLK-G5 (305-320) Q.PLUS DUO-G5 (300-315) Q.PEAK DUO-G5 (305-330) Q.PEAK-G4.1, Q.PEAK BLK G4.1 (290-305) Q.PEAK-G4.1/TAA (300-305) Q.PEAK BLK G4.1/TAA (290-300) NRTL Listed PV Module - Q-Cell G4.4L frame models Q.PEAK DUO L-G8.3, Q.PEAK DUO L-G8.2 (405-430) Q.PEAK DUO L-G8.1, Q.PEAK DUO L-G8 (415-430) Q.PEAK DUO L-G7.3, Q.PEAK DUO L-G7.2, Q.PEAK DUO L-G7.1, Q.PEAK DUO L-G7 (385-405) Q.PEAK DUO L-G5.3/ BF (380-400) Q.PEAK DUO L-G6, Q.PEAK DUO L-G6.3 (400-415) Q.PEAK DUO L-G6.2 (400-425) Q.PLUS DUO L-G5, Q.PLUS DUO L-G5.1, Q.PLUS DUO L-G5.2, Q.PLUS DUO L-G5.3 (360-375) Q.PEAK DUO L-G5.2, Q.PEAK DUO L-G5.3 (380-395) Q.PEAK L G4.2, Q.PEAK L G4.1 (365,370) Q.PLUS L G4.2 (325-355) Q.PLUS L G4.1 (330-340) Q.PLUS L G4 (320-340) Q.PEAK_DUO_BLK_ML-G9_365-385 Q.PEAK_DUO_BLK_ML-G9+_365-385 Q.PEAK_DUO_ML-G9_370-390 Q.PEAK_DUO_ML-G9+_370-390 Q.PEAK_DUO_XL-G9.2_440-460 Q_CELLS_Data_sheet Q.PEAK_DUO_XL-G9.3_440-460	18" From Edge Max	30 PSF	30 PSF	10 PSF
Mission Solar	NRTL Listed PV Module - Mission Solar MEXXXSR8T, MEXXXSR8K 60 cells series, black frame, where XXX is 315-330	13" From Edge Max	50 PSF	30 PSF	5 PSF
	NRTL Listed PV module - Mission Solar MEXXXSR9S 72 cells series, black frame, where XXX is 380-390	16.35" From Edge Max	30 PSF	30 PSF	10 PSF

2.3 MODULE LOADING TABLE FOR PVKIT 2.0 *continued*

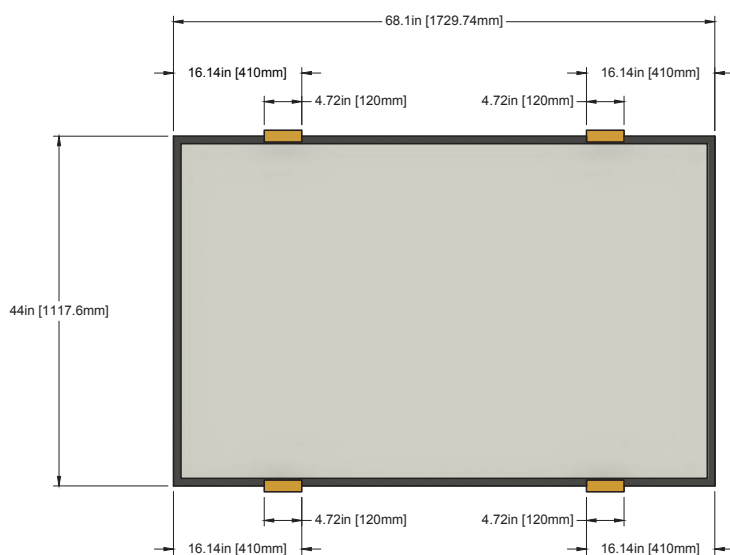
Module Mfg	Module Model	Attach-ment Location	UL 2703 Design Download	UL 2703 Design Uplift	UL 2703 Design Down Slope
REC Solar	N-Peak 3 Black RECxxxNP3 Black (390 - 400)	10.6" - 15.3"	33 PSF	30 PSF	10 PSF
	Alpha Pure-R RECxxxAA PURE-R (400 - 430)	290 - 410 mm	33 PSF	30 PSF	10 PSF
	RECXXXAA Pure-RX (XXX = 450 - 470)	90-570 mm	50 PSF	30 PSF	10 PSF
Longi	LR4-60HPB-XXXM (XXX = 355 - 375)	388-488 mm	50 PSF	30 PSF	10 PSF
Solaria	POERX-XXXR (XXX = 390 - 400)	215.375-480.75 mm	50 PSF	30 PSF	10 PSF
Canadian Solar	CS3N-XXXMS (XXX = 380 - 410)	Max Span 64" Max Cantilever 21.3"	50 PSF	30 PSF	10 PSF

2.3.1 HANWHA Q CELL MOUNTING CONFIGURATIONS

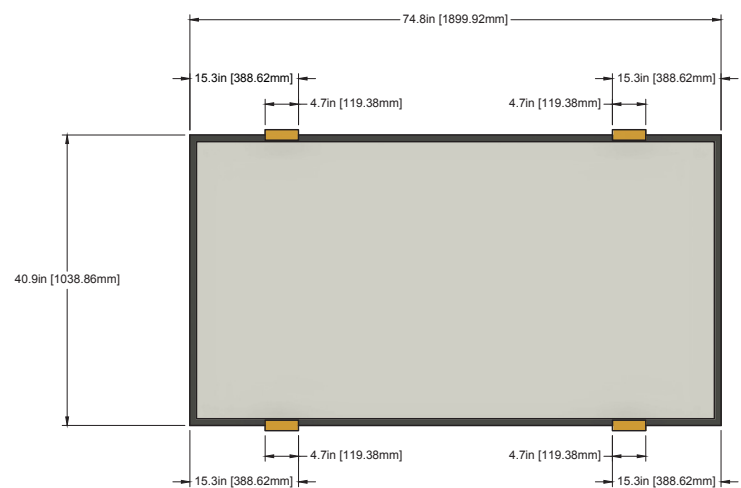
144 Cell



Alpha Pure Series

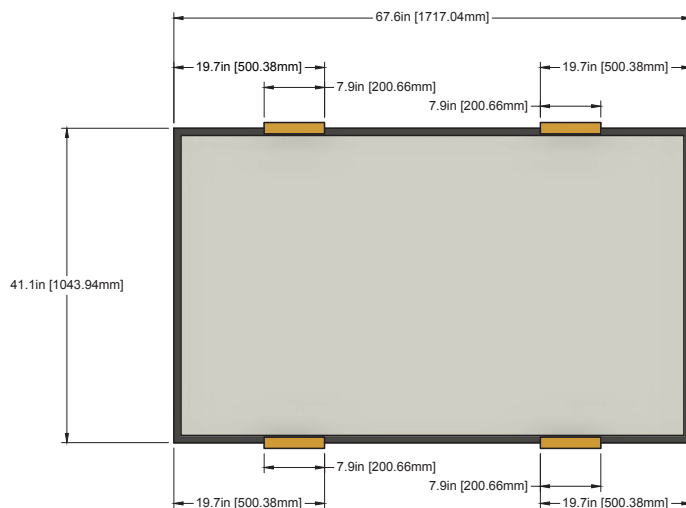


N Peak 3 Black Series

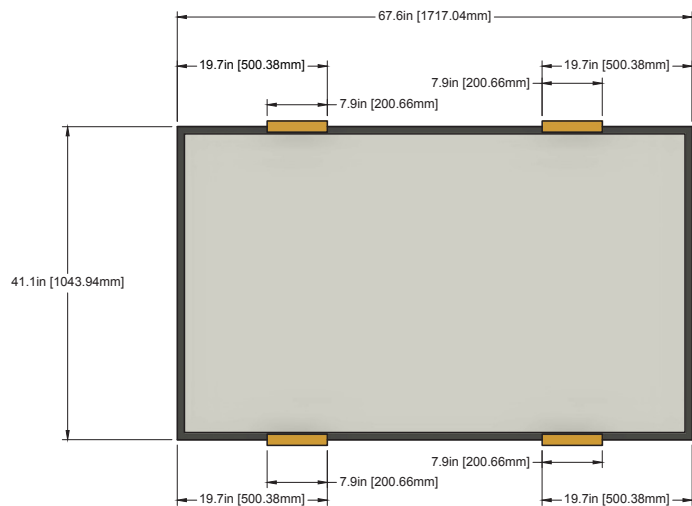


2.3.1 HANWHA Q CELL MOUNTING CONFIGURATIONS *continued*

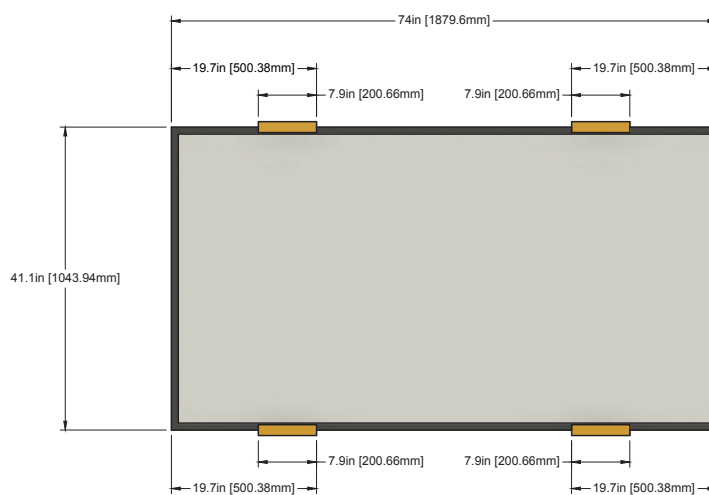
Q.PEAK DUO BLK ML - G10



Q.PEAK DUO BLK G10+

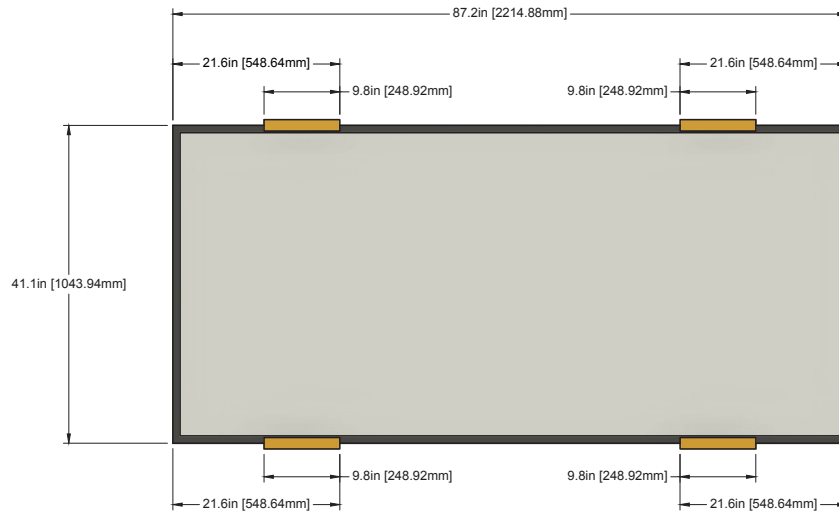


Q.PEAK DUO G10.X+

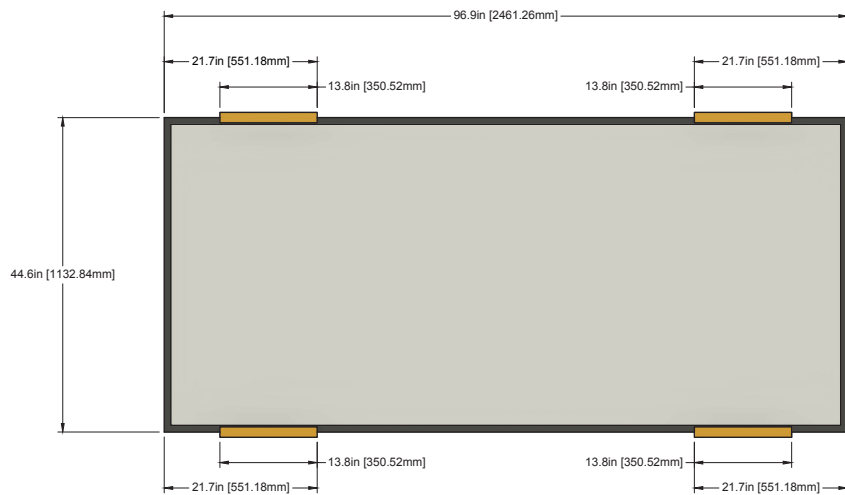


2.3.1 HANWHA Q CELL MOUNTING CONFIGURATIONS *continued*

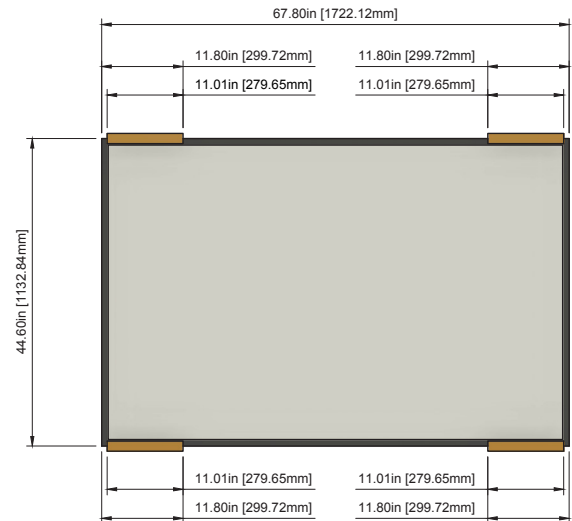
Q.PEAK DUO XL-G10.X



Q.PEAK DUO XL-G11.X

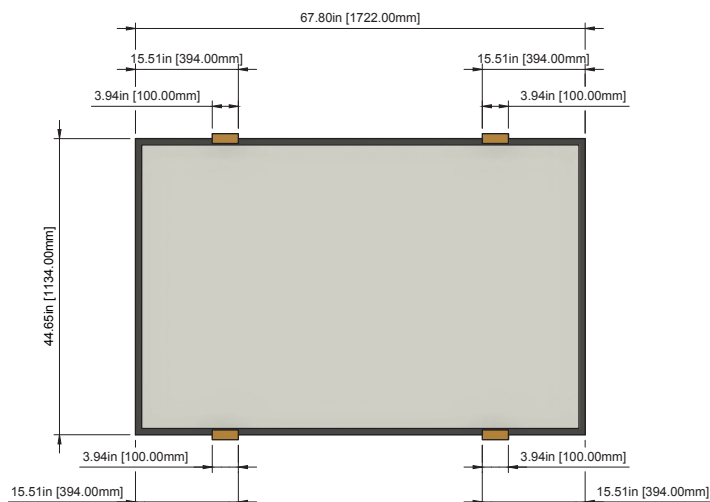


Q.TRON BLK M-G2+

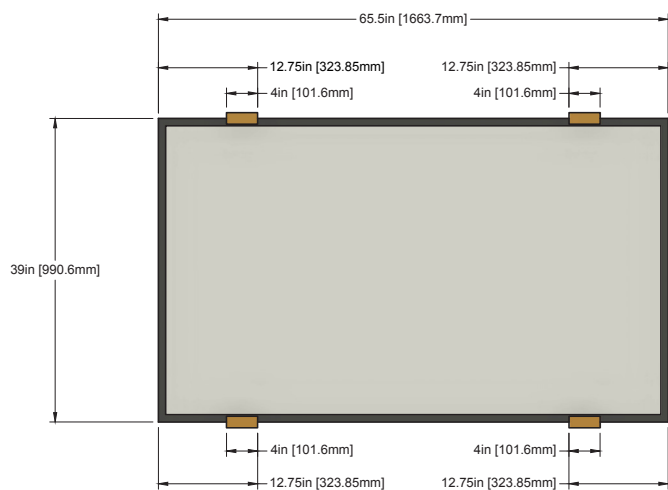


2.3.2 JINKO SOLAR MOUNTING CONFIGURATIONS

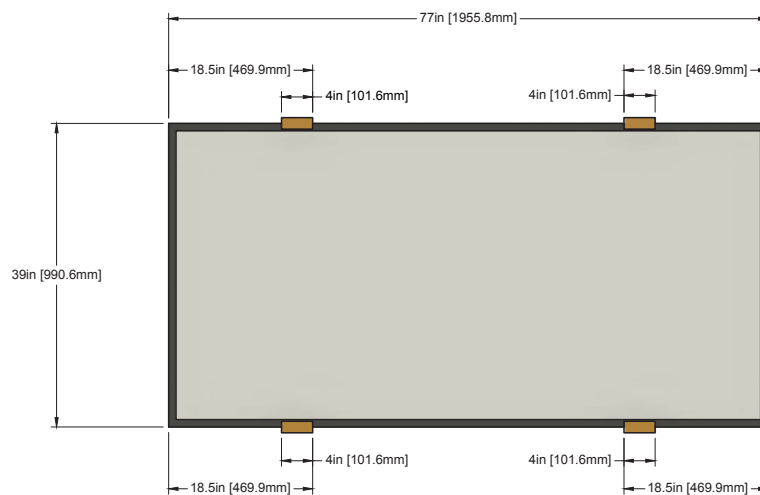
EAGLE 54HM G6



60 Cell Module

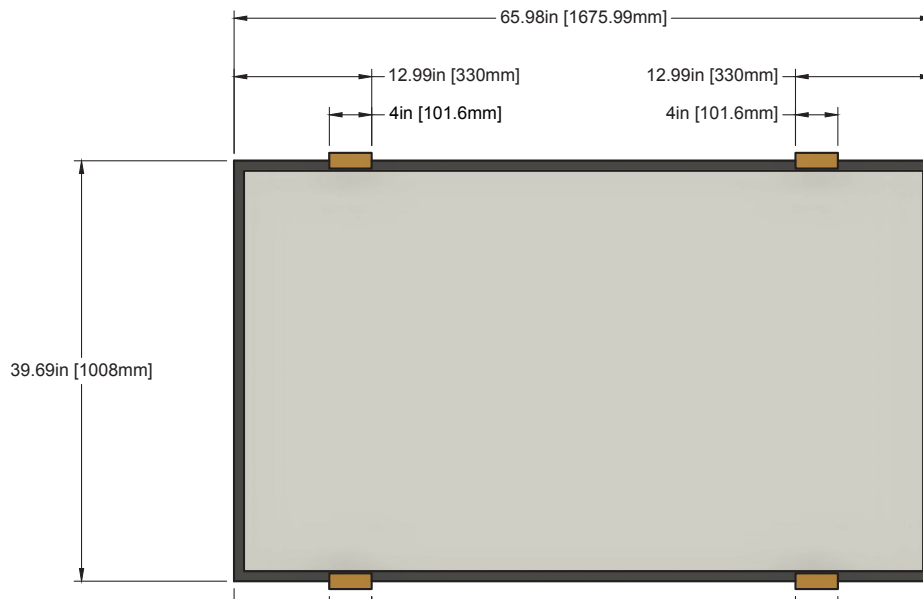


72 Cell Module

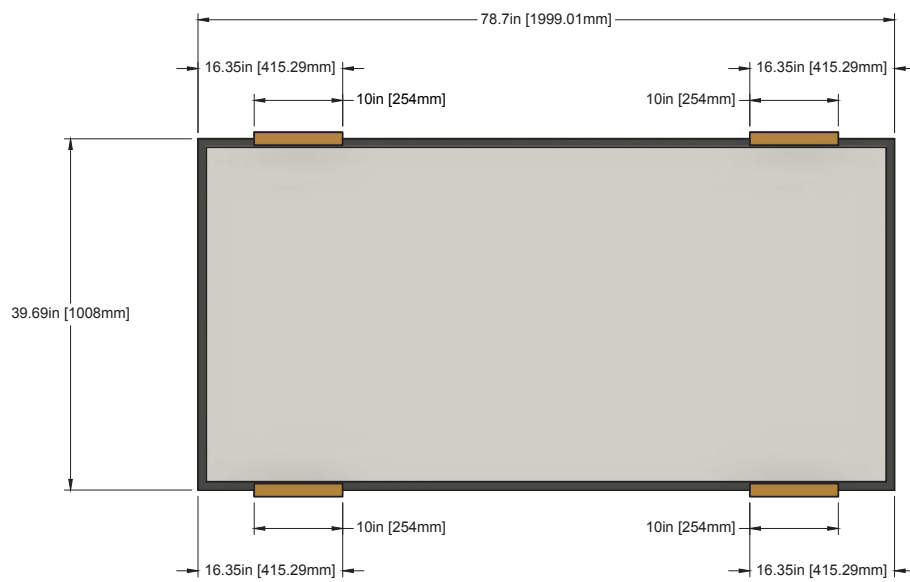


2.3.3 MISSION SOLAR MOUNTING CONFIGURATIONS

60 Cell Module

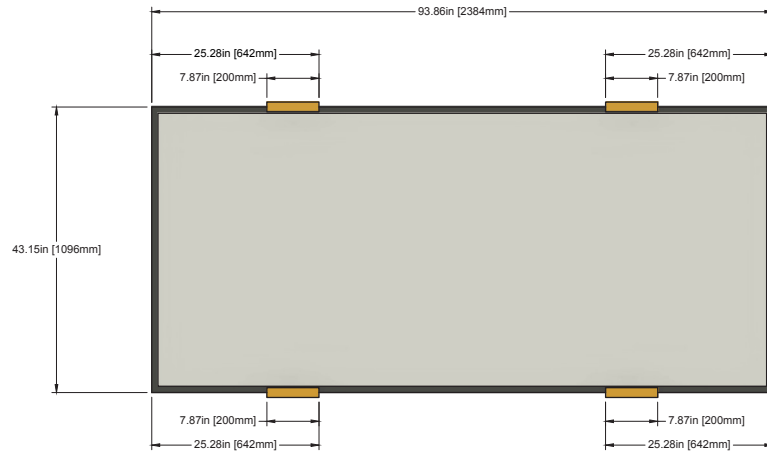


72 Cell Module

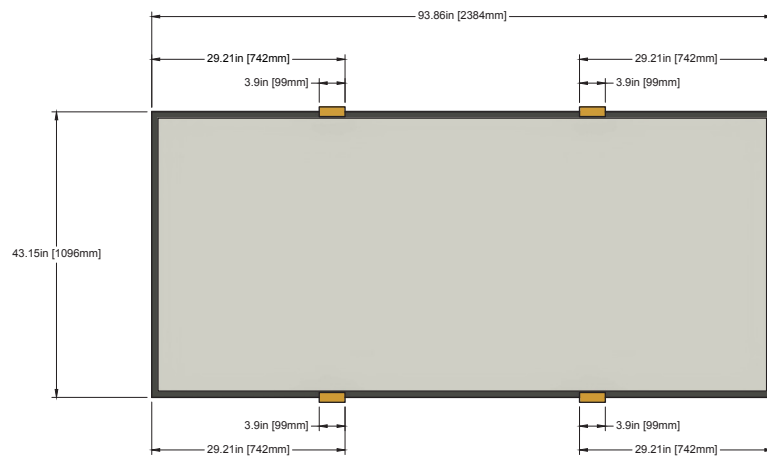


2.3.4 TRINA MOUNTING CONFIGURATIONS

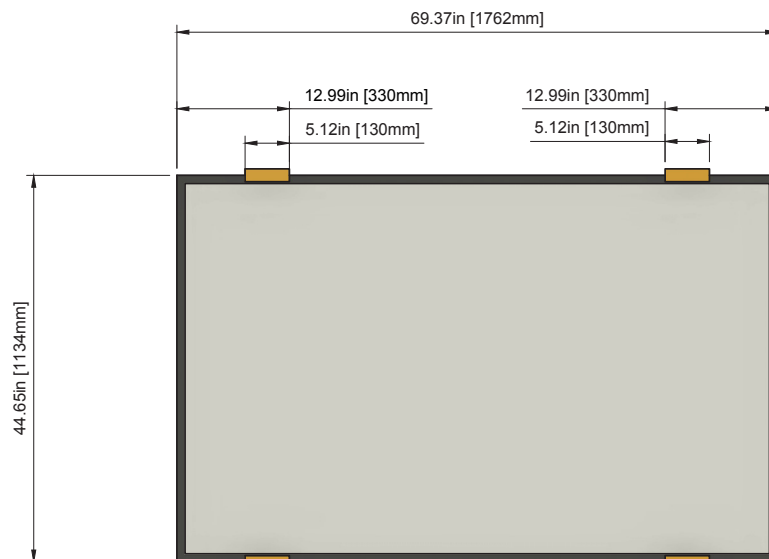
Vertex and Vertex N



Vertex and Vertex N

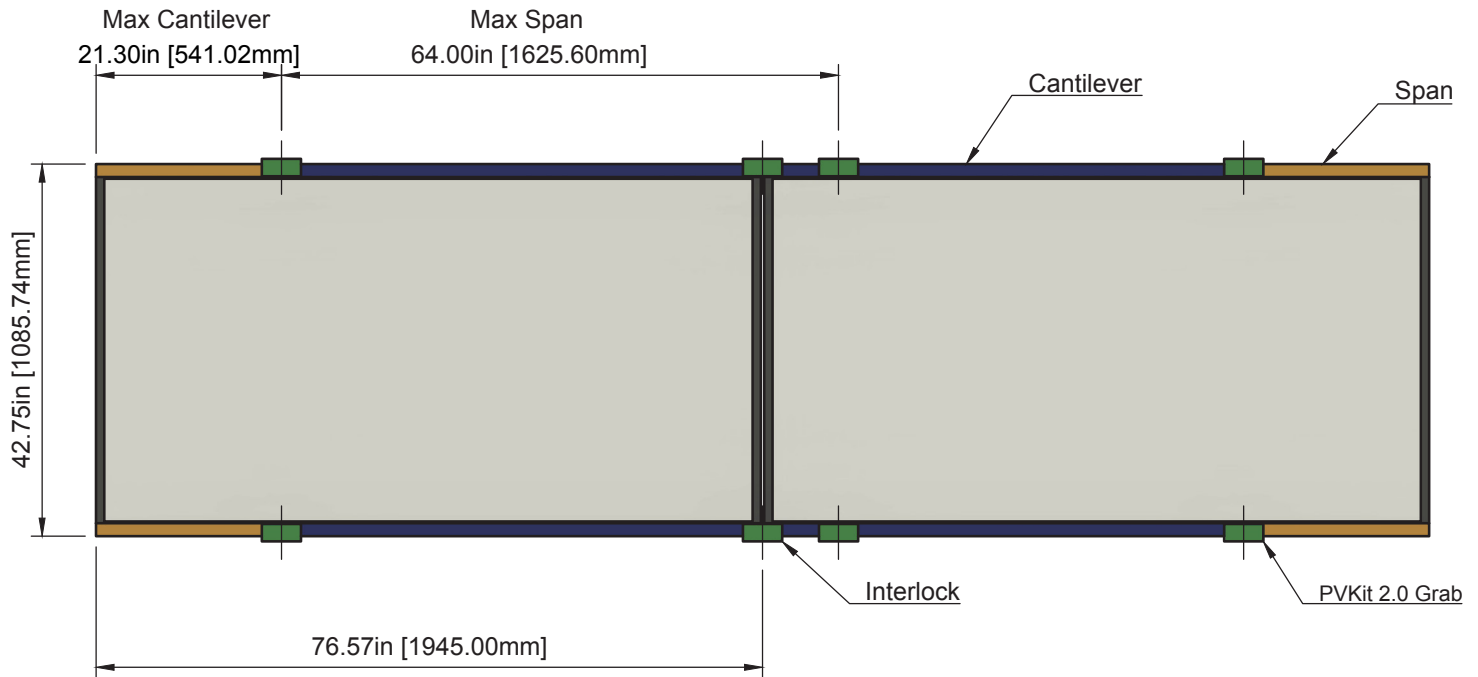


Vertex S+



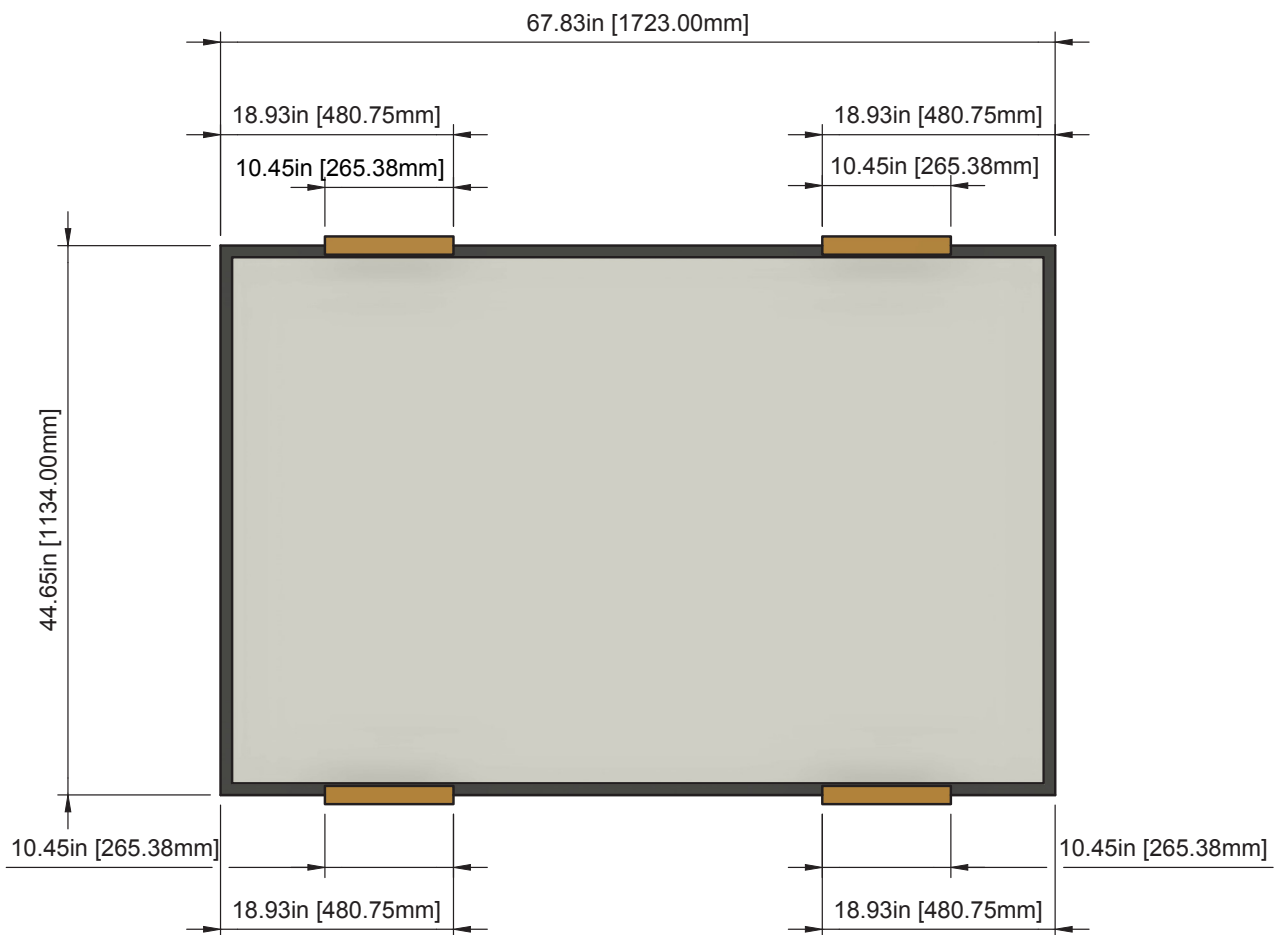
2.3.5 CANADIAN SOLAR MOUNTING CONFIGURATIONS

HiKuBlack Mono PERC



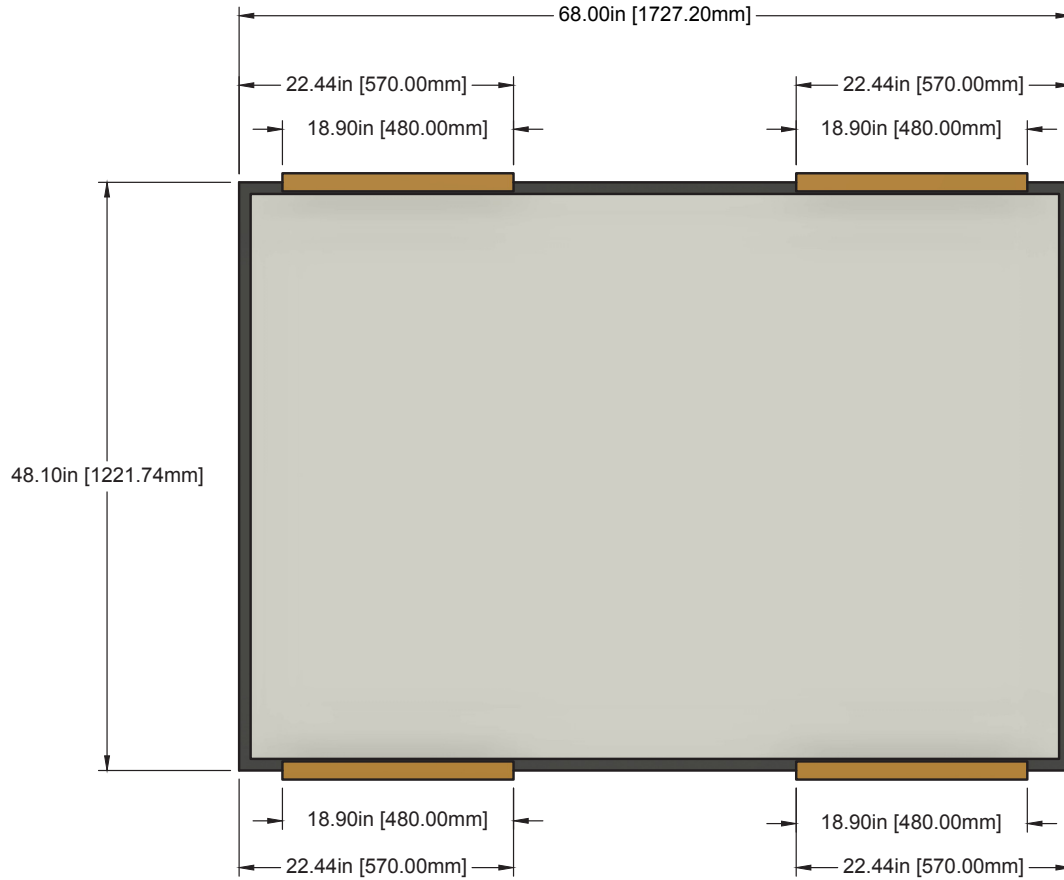
2.3.6 SOLARIA MOUNTING CONFIGURATIONS

PowerX-400R



2.3.7 REC MOUNTING ZONES

ALPHA PURE-RX



2.4 GROUNDING PATH & INFORMATION FOR PVKIT 2.0

S-5! PVKIT WITH THE FOLLOWING ROOF CLAMPS:

S-5-U • S-5-U mini • S-5-S • S-5-S mini • S-5-T • S-5-T mini • S-5-Z • S-5-Z mini • S-5-N • S-5-N mini • S-5-H • S-5-H mini • S-5-H90 • S-5-H90 mini • S-5-K Grip • S-5-K Grip mini • S-5-N 1.5 • S-5-N 1.5 mini • S-5-Q • S-5-Q mini • S-5-R465 • S-5-R465 mini • S-5-V • S-5-V mini • S-5-ZH • S-5-ZH mini • S-5-MX • S-5-MX mini

S-5! PVKIT WITH THE FOLLOWING ROOF BRACKETS:

CorruBracket • CorruBracket 100T • CorruBracket 100T PV • CorruBracket 500T • CorruBracket 500T PV • ProteaBracket • RibBracket • RibBracket I • RibBracket II • RibBracket III • RibBracket IV • RibBracket V • SolarFoot • VersaBracket 47 • VersaBracket 67 • VersaGard

UL Listed PV Modules

Hanwha Q Cell

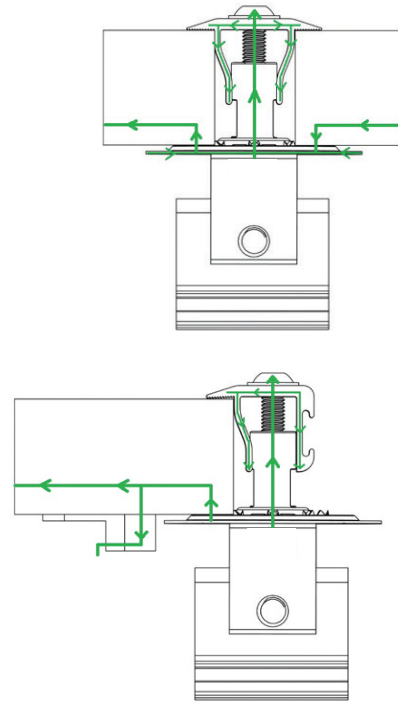
- 60 Cell Modules: NRTL Listed PV Module - Q Cell model Q. PLUS BFR-G4.1 XXX, black frame, where XXX is 270-280
- 72 Cell Modules: NRTL Listed PV Module - Q Cell model Q. PRO L-G4 XXX, 72 cell series, silver frame, where XXX is 310-320
- 144 Cell Modules: NRTL Listed PV Module - Q Cell model Q. PEAK DUO L-G8.3 XXX, 144 cell, where XXX is 415-430

Jinko Solar

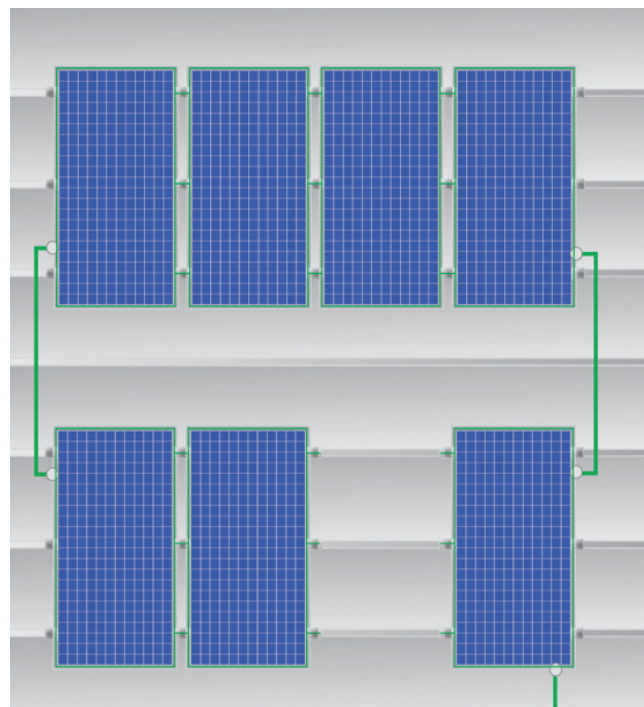
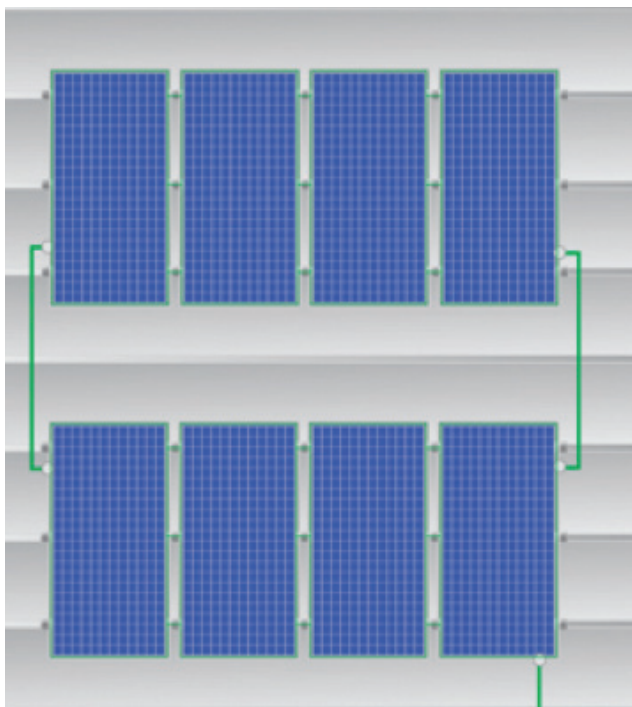
- 60 Cell Modules: JKMXXXPP-60, black frame, where XXX is 260-345
- 60 Cell Modules: JKMXXXM-6RL3-B-V, 66 cells series, Clear or Black Anodized Aluminum Alloy frame where XXX is 380-400
- 72 Cell Modules: JKMXXXPP-72, 72 cell series, silver frame, where XXX is 260-345, JKMXXXM-72HL4-V, 72 cell series, Clear or Black Anodized Aluminum Alloy frame where XXX is 520-540, JKMXXXM-72HL4-TV, 72 cell series, Clear or Black Anodized Aluminum Alloy frame where XXX is 525-545,
- 78 Cell Modules: JKMXXXM-7RL3-V, 78 cell series, Clear or Black Anodized Aluminum Alloy frame where XXX is 455-475, JKMXXXM-7RL3-TV, 78 cell series, Clear or Black Anodized Aluminum Alloy frame where XXX is 445-465

2.4.1 IMPORTANT NOTES

1. Use QIMS UL 2703 Listed or recognized grounding lugs certified for frame thickness or the module being used with a 35 A fuse rating or less. (For example: Burndy BTCGC4 or HEYCO S6527)
2. This ground lug must be utilized in conjunction with a ground wire to connect adjacent rows of modules. The ground lug should be secured to the PV module frame in accordance with manufacturer's installation instructions.
3. In order to maintain a continuous ground path should a module be removed within a row, it is necessary to use a ground lug and ground wire at each end of the row of modules as illustrated on the right. If ground lug and ground wire is not utilized at each end of the row of modules, a temporary ground lug and ground wire must be used to connect modules at the location of removed module.
4. The S-5-PV 3" Mounting Disc (Stainless Steel) is listed as a multiple use bonding device.
5. The intended ground path of black finished parts is through the Mill Finish 3" Stainless Steel Mounting Disc only. For non-separately derived systems, wire positioning must be out of reach of the black finish components.



Please note the Mill Finish 3" Mounting Disc must be utilized to maintain a UL Listed assembly.



The above illustrates the system ground path with green lines.



2.5 SYSTEM FIRE CLASSIFICATION: CLASS A

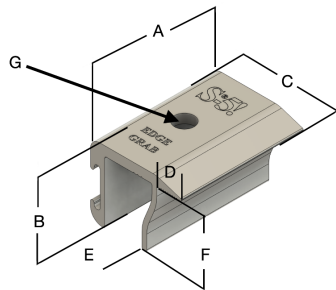
S-5! PVKIT With the following roof clamps:

S-5-E, S-5-E Mini	S-5-N, S-5-N Mini	S-5-S, S-5-S Mini	[BLK], including S-5!
S-5-H, S-5-H Mini	S-5-N 1.5,	S-5-T, S-5-T Mini	EdgeGrab [Mill] with roof
S-5-HR, S-5-H90	S-5! PVKIT 2.0	S-5-U, S-5-U Mini	clamp: S-5-Z Mini [BLK]
S-5-K Grip, S-5-K Grip Mini	S-5-Q, S-5-Q Mini	S-5-V, S-5-V Mini	
S-5-MX, S-5-MX Mini	S-5-R465, S-5-R465 Mini	S-5-Z, S-5-Z Mini	
S-5-N 1.5 Mini	S-5-RC	S-5-ZH Mini	

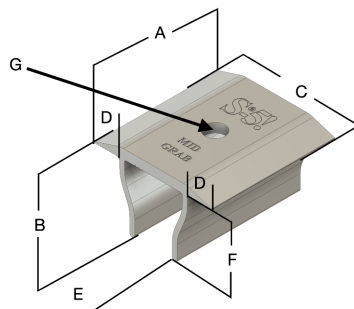
Evaluated for use on existing non-combustible roofs.

Any UL1703 Listed module with fire classification rating: Type 1 or Type 2

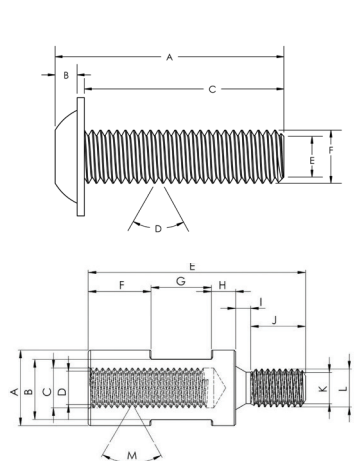
2.6 PVKIT 2.0 ENGINEERING DRAWINGS



PV 2.0 EdgeGrab							
6000 Series Aluminum EdgeGrab for Module Edge/Perimeter Conditions							
UNIT	A	B	C	D	E	F	G
INCH	2.00	1.175	1.49	0.40	0.61	1.02	0.32
MM	50,8	29,85	37,74	10,11	15,49	25,81	8,20



PV 2.0 MidGrab							
6000 Series Aluminum EdgeGrab for Module Edge/Perimeter Conditions							
UNIT	A	B	C	D	E	F	G
INCH	2.00	1.175	1.90	0.40	0.61	1.02	0.32
MM	50,8	29,85	48,13	10,11	15,49	25,81	8,20



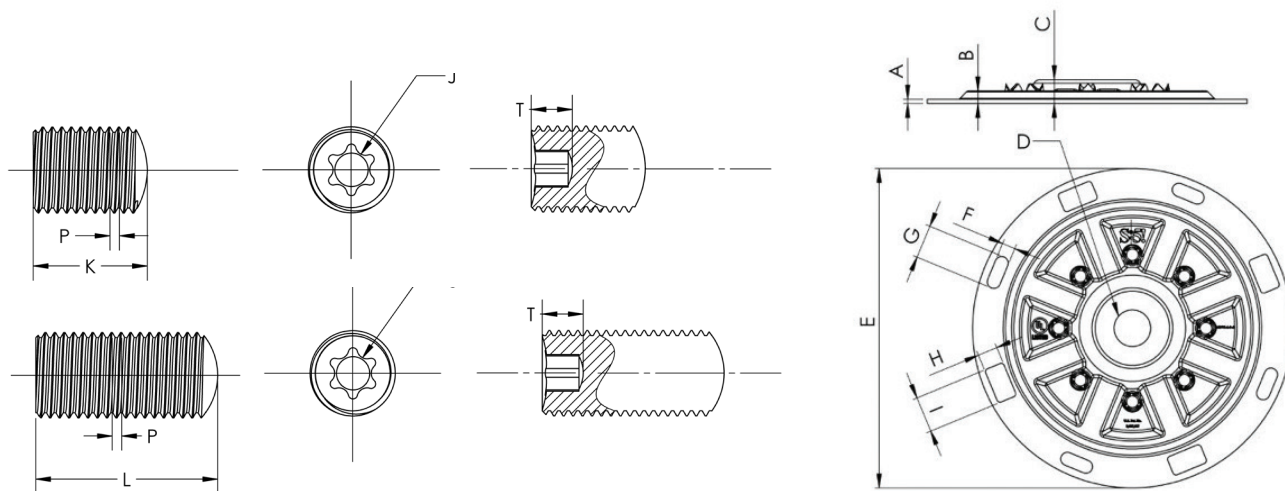
M8-1.25 x 26 mm SS Flanged Button Head Screw											
300 Series Stainless Steel Bolt for PVKit Assembly											
UNIT	A	B	C	D	E	F	G	H	I	J	K
INCH	1.20	0.13	1.02	62.80	∅ 0.25	∅ 0.31	0.23	0.20	∅ 0.70	∅ 0.55	∅ 0.31
MM	30.40	3.30	26.00	65.80	∅ 6.40	∅ 8.00	5.80	5.00	∅ 17.8	∅ 14.0	∅ 8.0

StandOff													
300 Series Stainless for PVKit Assembly													
UNIT	A	B	C	D	E	F	G	H	I	J	K	L	M
INCH	∅ 0.62	∅ 0.50	∅ 0.33	∅ 0.28	1.80	0.52	0.50	0.20	0.13	0.45	∅ 0.26	∅ 0.31	65.8°
MM	∅ 15.7	∅ 12.7	∅ 8.4	∅ 7.1	45.70	13.20	12.70	5.10	3.30	11.40	∅ 6.6	∅ 7.9	65.8°

Section 2

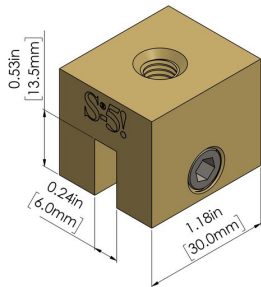
2.6 PVKIT 2.0 ENGINEERING DRAWINGS *continued*

PV Disk 2.0									
300 Series Stainless Steel for PVKit Assembly									
UNIT	A	B	C	D	E	F	G	H	I
INCH	0.039	0.12	0.22	∅ 0.34	∅ 2.96	0.12	0.31	0.86	0.33
MM	1.00	3.00	5.60	∅ 8.6	∅ 75.2	3.00	7.90	21.80	8.40

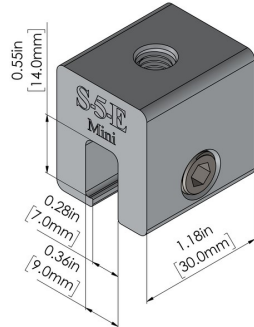


External Threads-Class 2A						
Size (Diameter & Thread Pitch)	Series Designation	Major Diameter D	Torx Socket Size (J)	Key Engagement (T)	Length (K)	Length (L)
3/8-24	UNF	0.3667" 0.3739"	T-30	0.202"	0.625"	0.900"

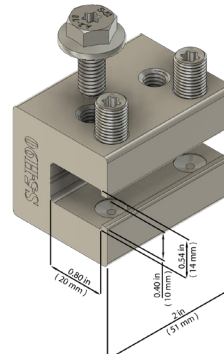
2.7 BASIC CLAMP ENGINEERING DRAWINGS



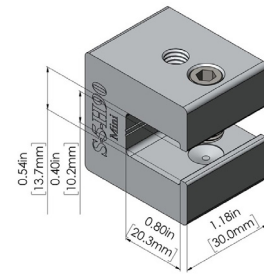
S-5-B™ Mini



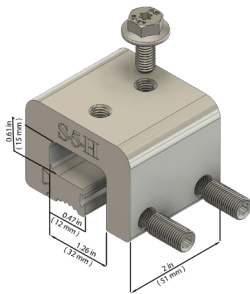
S-5-E™ Mini



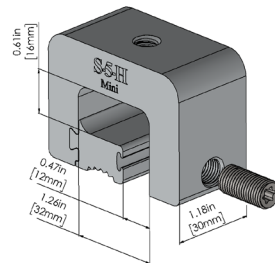
S-5-H90™



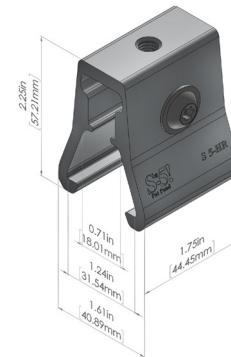
S-5-H90™ Mini



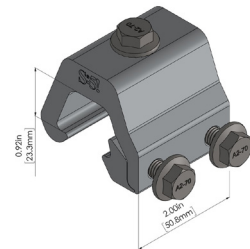
S-5-H™



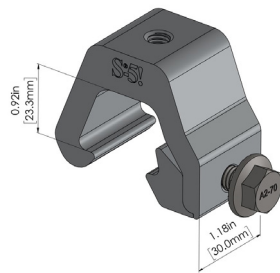
S-5-H™ Mini



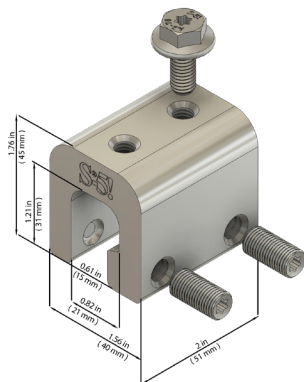
S-5-HR™



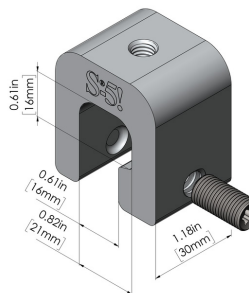
S-5-K Grip™ Mini



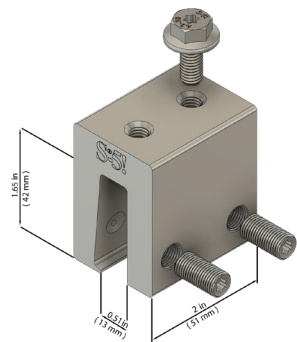
S-5-K Grip™ Mini



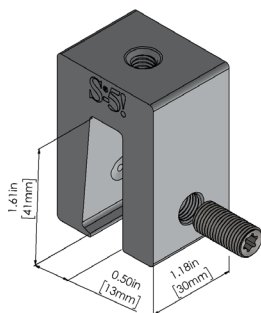
S-5-MX™ Mini



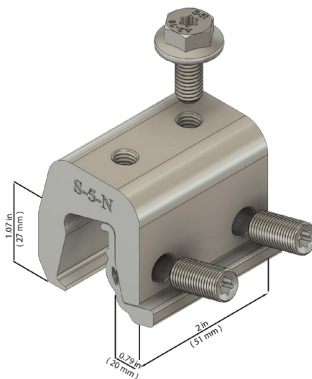
S-5-MX™ Mini



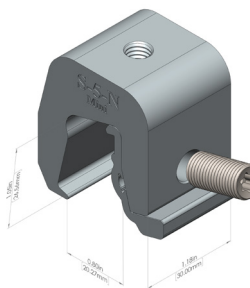
S-5-N 1.5™



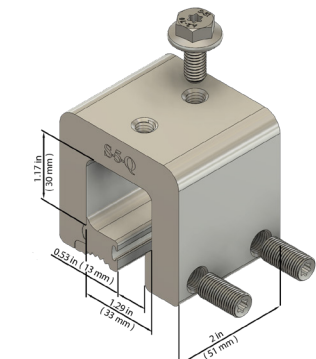
S-5-N 1.5™ Mini



S-5-N™

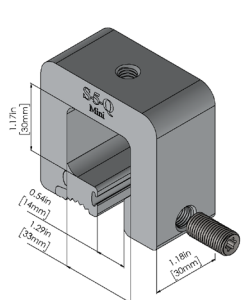


S-5-N™ Mini

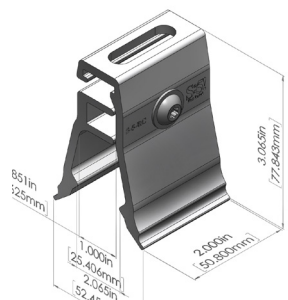


S-5-Q™

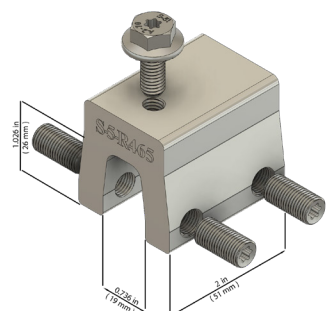
2.7 BASIC CLAMP ENGINEERING DRAWINGS *continued*



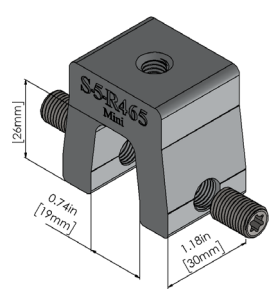
S-5-Q™ Mini



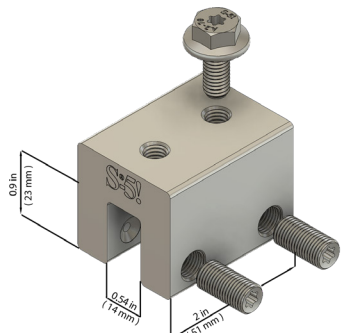
S-5-RC™



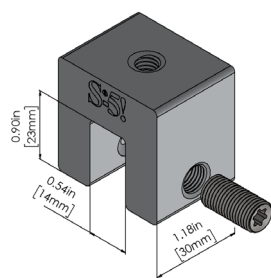
S-5-R465™



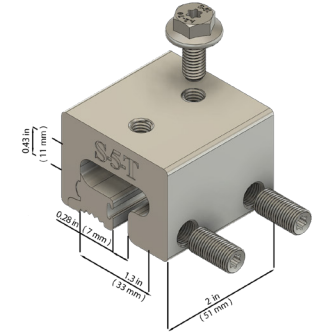
S-5-R465™ Mini



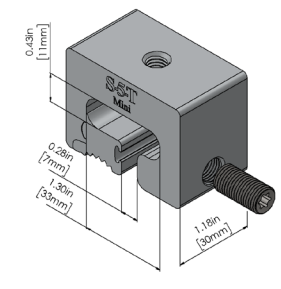
S-5-S™



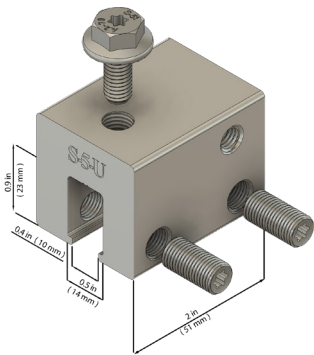
S-5-S™ Mini



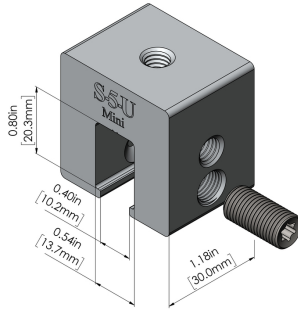
S-5-T™



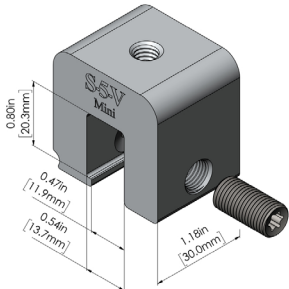
S-5-T™ Mini



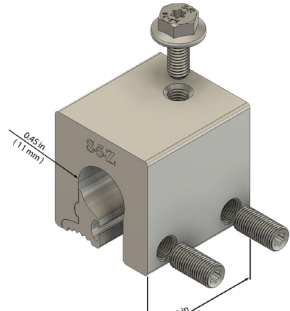
S-5-U™



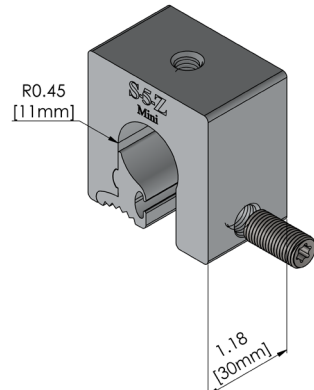
S-5-U™ Mini



S-5-V™ Mini

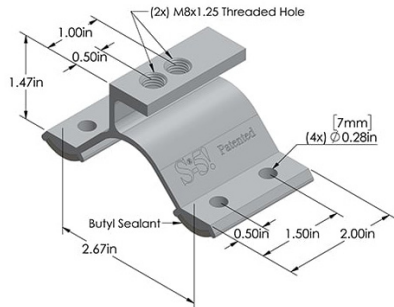


S-5-Z™

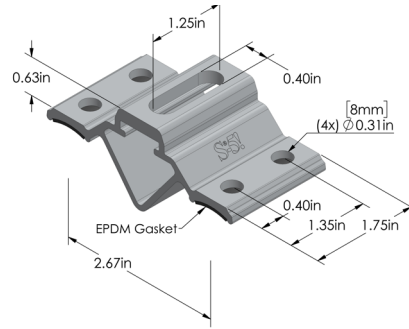


S-5-Z™ Mini

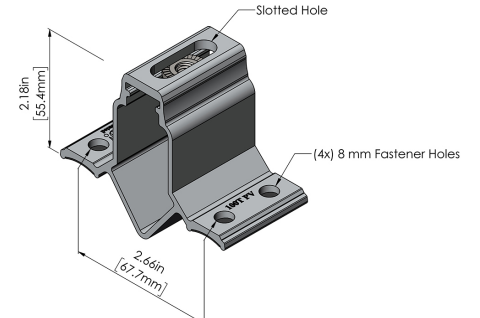
2.8 BASIC BRACKET ENGINEERING DRAWINGS



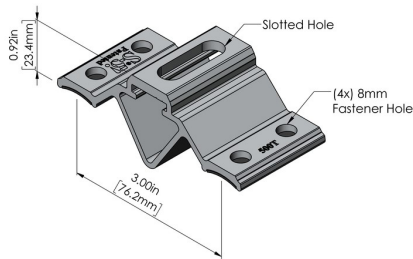
CorruBracket™



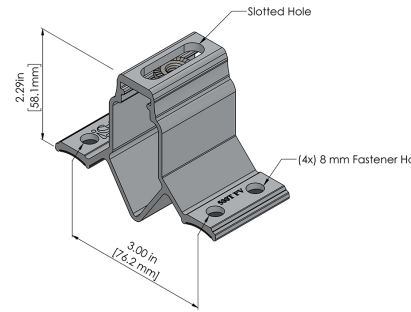
CorruBracket™ 100T



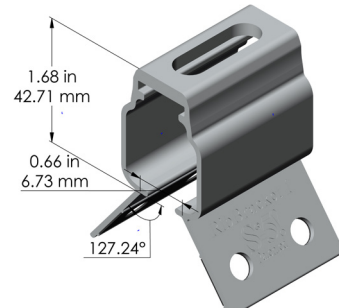
CorruBracket™ 100T PV



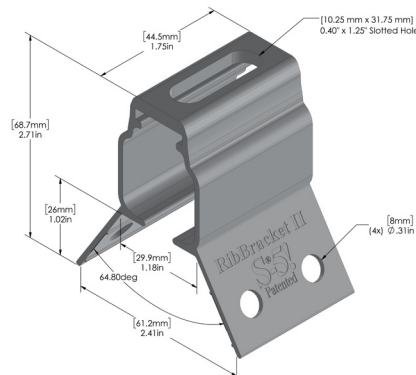
CorruBracket™ 500T



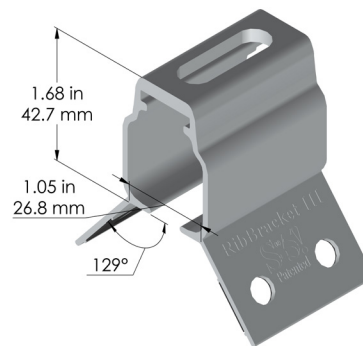
CorruBracket™ 500T PV



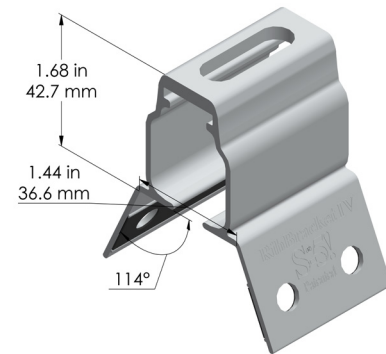
RibBracket™ I



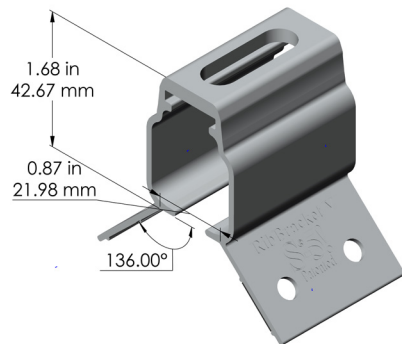
RibBracket™ II



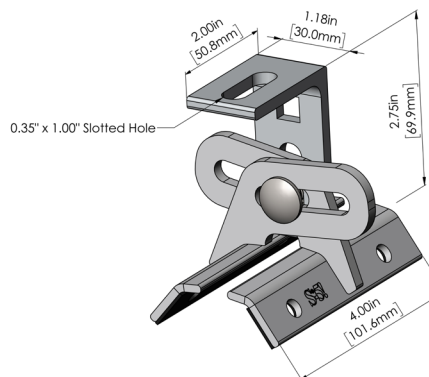
RibBracket™ III



RibBracket™ IV



RibBracket™ V



ProteaBracket™

2.9 METAL ROOF INNOVATIONS, LTD. (MRIL) S-5! LIMITED WARRANTY

Metal Roof Innovations, Ltd (MRIL) warrants that all S-5! products manufactured by it and bearing its name to be free from defects in material and workmanship on the date of first sale by an authorized MRIL distributor to the original purchaser. As purchaser's sole remedy for breach of this warranty, MRIL will repair or replace any part of the S-5! manufactured product which is defective for as long as the product is on the originally installed roof. This warranty applies only when the S-5! product is properly installed, used and maintained.

This warranty does not cover, and MRIL shall not be liable for, any malfunction, damage or wear caused by faulty installation, misapplication, negligence, misuse, abuse, accident, tampering, substitution of non-S-5! component parts, or incompatibility with equipment, structures, accessories or materials not manufactured by MRIL. The purchaser acknowledges that MRIL expresses no opinions as to the suitability of S-5! products or components for any specific application or project condition.

This warranty is conditioned upon (a) the prepaid return of the products claimed to be defective to an authorized MRIL distributor for verification of the claimed defect; and (b) receipt by MRIL of claims for product repair or replacement within thirty (30) days after discovery of the defect or after the defect could have been reasonably discovered. If the claimed defect is verified, MRIL will repair or replace free of charge any defective products manufactured by MRIL. Replacement product will be returned with transportation prepaid.

Claims under this warranty must be in writing and sent to MRIL along with a copy of this limited warranty, the part or product model name or number, date and place purchased, date installed, operating conditions, and date the defect was discovered. MRIL shall have the right to examine the components, related parts, and product application, including adjacent work on the actual building site. Purchaser grants MRIL access to the site of the installation during normal business hours for this purpose.

Disclaimers and Limitations. The terms of this warranty constitute purchaser's sole and exclusive remedy and are in lieu of any other warranties (expressed or implied). MRIL MAKES NO OTHER WARRANTIES ABOUT THE PRODUCTS AND DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR APPLICATION. PURCHASER ASSUMES ALL RISK OF USE OF ANY OF THE PRODUCTS IN COMBINATION WITH OR AS A COMPONENT PART OF ANY PRODUCT APPLICATION. NOTWITHSTANDING THE ABOVE AND REGARDLESS OF THE CIRCUMSTANCES, MRIL'S TOTAL LIABILITY TO PURCHASER IS LIMITED TO AND SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE DEFECTIVE PRODUCTS. PURCHASER WAIVES ANY AND ALL OTHER CLAIMS. IN NO EVENT SHALL MRIL BE LIABLE FOR, AND PURCHASER WAIVES ALL CLAIMS AGAINST MRIL RESPECT TO, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES, OR FOR ANY LOST PROFITS. EVERY FORM OF LIABILITY FOR DIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES IS EXPRESSLY EXCLUDED.

This warranty gives the purchaser specific legal rights. Purchaser may have other rights which vary from state to state. For a copy of warranty, please see: <https://s-5.com/warranty/>



Tested. Trusted. Engineered.



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Colorado Springs, CO 80908



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