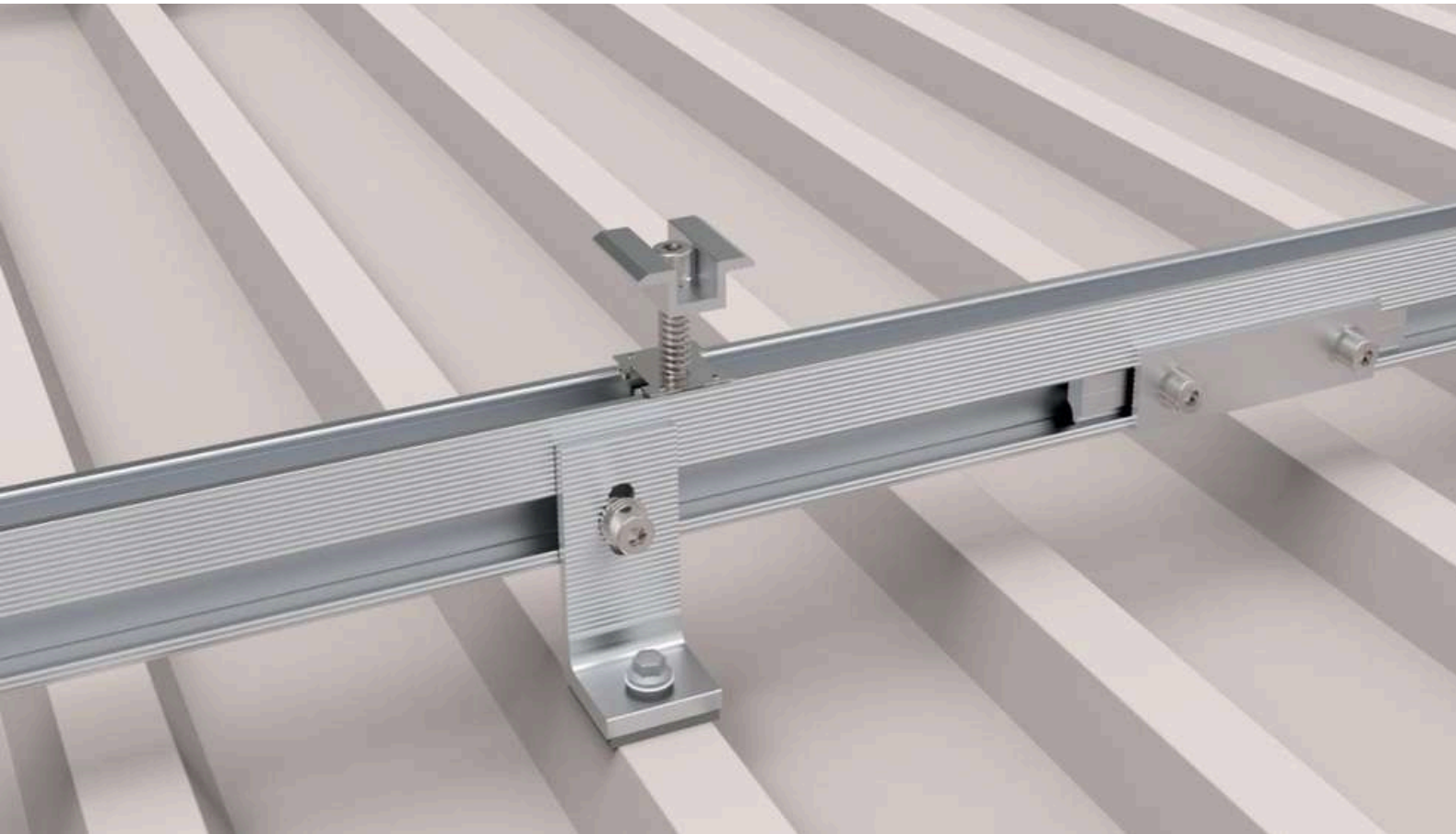
LUMASOL

INSTALLATION GUIDE

FLUSH MOUNT
L-BRACKET
PENETRATIVE ROOF MOUNTING SYSTEM



Introduction:

The Lumasol Flush Mount L-Bracket kit with Penetrative Fixing System offers a practical, durable solution for mounting PV modules on metal rooftops. Designed for speed, simplicity, and long-term stability, this system meets relevant standards for commercial and residential installations.

Please review this manual thoroughly before beginning the installation. It provides essential information, including planning requirements, system components, installation steps, and certification notes.

Product Warranty: For full warranty information, refer to the warranty file on our website. [www.lumasol.co.za]

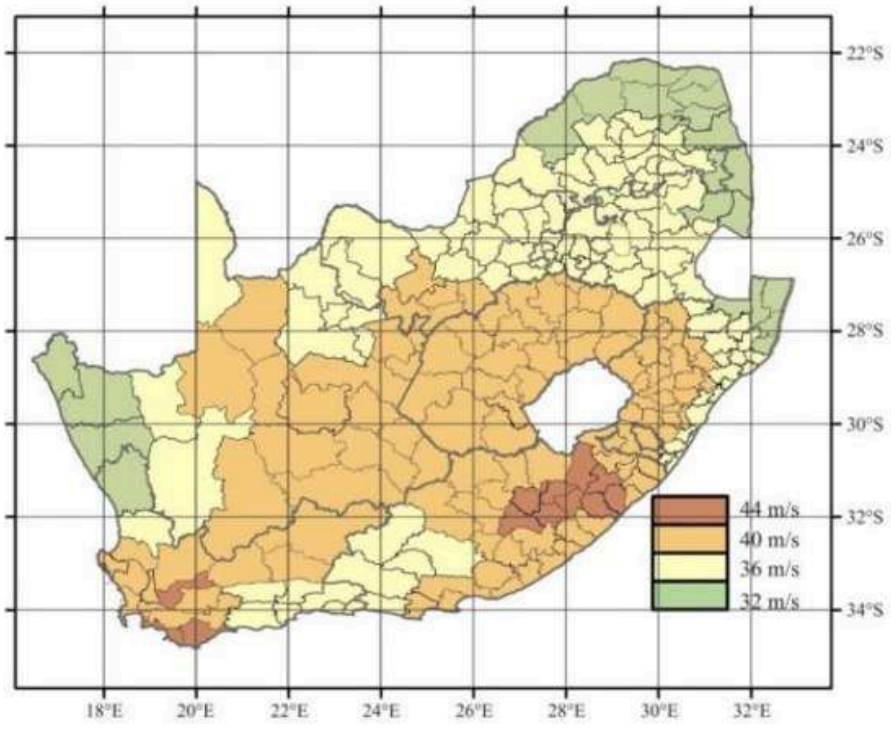
Installer Responsibilities:

- Complying with all relevant local and national building codes, including updates.
- Ensuring the Lumasol system is suitable for the specific project and environment.
- Using only genuine Lumasol components, mixing or substituting products will void the warranty and invalidate certification.
- Ensuring a minimum of two professionals are on site during installation.
- Having all electrical work performed by a licensed electrician.
- Completing all electrical aspects of the PV system safely, including appropriate earth bonding of the array and components, in line with industry standards and local regulations.
- Verifying that the roof structure, rafters, purlins, and connections can support the array under live load conditions.
- Avoiding electrochemical corrosion by checking material compatibility between components and the installation environment.
- Verifying the corrosivity zone of the site, and ensure that the correct products and materials have been supplied.
- Reversing the steps in this guide for system removal.

PLANNING:

Determine the wind region & terrain category:

SANS 10160-3:2019
Edition 2.1



NOTE 1 This map results from comprehensive statistical research. (Strong winds in South Africa: Part 1 and Part 2) and is based on 3 second gust wind speed. Tabularised information, per municipality, is provided in table A.1 of annex A.

NOTE 2 This map should be used in combination with the partial factor for wind loading as stipulated in SANS 10160-1. For structures particularly sensitive to wind action, detailed investigation on an appropriate partial action factor may be required.

Figure 1 — Map of the fundamental value of the basic wind speed, $v_{b,0}$

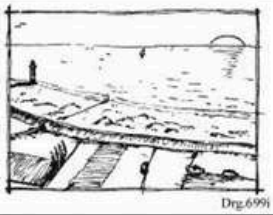
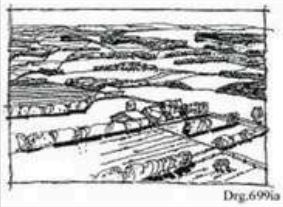
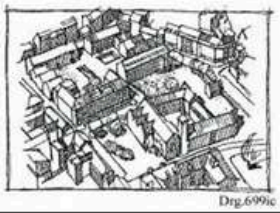
Wind Region Categories:

- **Region A** which indicates a Regional Wind Velocity of **32 m/s** with wind average recurrence of 50 years.
- **Region B** which indicates a Regional Wind Velocity of **36 m/s** with wind average recurrence of 50 years.
- **Region C** which indicates a Regional Wind Velocity of **40 m/s** with wind average recurrence of 50 years.
- **Region D** which indicates a Regional Wind Velocity of **44 m/s** with wind average recurrence of 50 years.

Terrain Category:

Lumasol Rooftop Solar mounting systems are assessed for terrain category C and D. If your installation site is within a category A or B location, reduce the interface spacing accordingly.

Table 2 — Terrain categories

1	2	3
Category	**Description**	**Illustration**
A	Flat horizontal terrain with negligible vegetation and without any obstacles (for example coastal areas exposed to open sea or large lakes)	 Drg.699i
B	Area with low vegetation such as grass and isolated obstacles (for example trees and buildings) with separations of at least 20 obstacle heights	 Drg.699ia
C	Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain and permanent forest)	 Drg.699ib
D	Area in which at least 15 % of the surface is covered with buildings and their average height exceeds 15 m	 Drg.699ic

NOTE 1 A certain amount of a reduction in loading for category D can be obtained (see 7.3.5) by using a procedure described in A.5, which takes into account the vertical displacement of the peak wind pressure profile, within an environment with closely spaced obstructions.

Verify Atmospheric Corrosivity Zone of Installation Site

Refer to ISO 9223:2012 - **Corrosion of Metals and Alloys - Corrosivity of Atmospheres - Classification, Determination, and Estimation** to verify the corrosivity category of the installation site.

This will help determine the appropriate products and interface spacing. When standard products are installed in high-corrosivity zones such as C4 or C5, a reduction factor must be applied to the interface spacing.

For installations in ISO corrosivity category C4, reduce the interface spacing by 5%.
For installations in ISO category C5, reduce the interface spacing by 25%.

Table C.1 — Description of typical atmospheric environments related to the estimation of corrosivity categories

Corrosivity category[a]	Corrosivity	Typical environments — Examples[b]	
		Indoor	Outdoor
C1	Very low	Heated spaces with low relative humidity and insignificant pollution, e.g. offices, schools, museums	Dry or cold zone, atmospheric environment with very low pollution and time of wetness, e.g. certain deserts, Central Arctic/Antarctica
C2	Low	Unheated spaces with varying temperature and relative humidity. Low frequency of condensation and low pollution, e.g. storage, sport halls	Temperate zone, atmospheric environment with low pollution (SO_2 < 5 µg/m^3), e.g. rural areas, small towns Dry or cold zone, atmospheric environment with short time of wetness, e.g. deserts, subarctic areas
C3	Medium	Spaces with moderate frequency of condensation and moderate pollution from production process, e.g. food-processing plants, laundries, breweries, dairies	Temperate zone, atmospheric environment with medium pollution (SO_2: 5 µg/m^3 to 30 µg/m^3) or some effect of chlorides, e.g. urban areas, coastal areas with low deposition of chlorides Subtropical and tropical zone, atmosphere with low pollution
C4	High	Spaces with high frequency of condensation and high pollution from production process, e.g. industrial processing plants, swimming pools	Temperate zone, atmospheric environment with high pollution (SO_2: 30 µg/m^3 to 90 µg/m^3) or substantial effect of chlorides, e.g. polluted urban areas, industrial areas, coastal areas without spray of salt water or, exposure to strong effect of de-icing salts Subtropical and tropical zone, atmosphere with medium pollution
C5	Very high	Spaces with very high frequency of condensation and/or with high pollution from production process, e.g. mines, caverns for industrial purposes, unventilated sheds in subtropical and tropical zones	Temperate and subtropical zone, atmospheric environment with very high pollution (SO_2: 90 µg/m^3 to 250 µg/m^3) and/or significant effect of chlorides, e.g. industrial areas, coastal areas, sheltered positions on coastline

Installation Height:

The system is suitable for installations up to 20m high. For sites above this height, project-specific certification is required.

Roof Slope:

The system supports installation on roof slopes between 0°–30°.

Maximum Rail Support Spacing

Conditions for 1.5m maximum interface spacing:

- Roof height must be ≤ 20m
- Roof tilt angle must be ≤ 10°
- Installation must be in Zone H
- Terrain Category must be C or D
- Roof clamp pull-out strength must be ≥ 2.5kN

If these conditions are not met, reduce interface spacing accordingly.

Rail End Overhang:

The maximum end overhang is 40% of the last interface spacing. For example, if the last interface spacing is 1500mm, the max overhang is 600mm.

Clamping Zone

Refer to the PV module manufacturer's installation manual for specific clamping zones.

List Of Tools:

- Screw Driver (for M8 Hexagon Socket Screw)
- Drill bits for M8 bolt
- Torque Spanner
- 5m Measuring Tape
- Marker Pen
- String

List Of Components:

1	LMS-PRO-RAIL47	PV MOUNTING PRO RAIL 47
2	LMS-PRO-RAIL47-SP-KIT	SPLICE KIT PRO RAIL47
3	LMS-EC30-35-KIT-BP	END CLAMP KIT
4	LMS-IC30-35-KIT-BP	INTER CLAMP KIT
5	LMS-RN-M8x25-KIT	RAIL NUT KIT
6	GM-EGL-KIT	EARTH GROUNDING LUG
7	LMS-LB-KIT	L-BRACKET KIT - METAL
8	LMS-LB-KIT	L-BRACKET KIT - WOOD
9	LMS-LB-COR-KIT-L	L-bracket with EPDM corrugated Adaptor - LANDSCAPE
10	LMS-LB-COR-KIT-P	L-Bracket with EPDM corrugated Adaptor - PORTRAIT
11	LMS-HB-LB-KIT-M	L-BRACKET with Hanger Bolt for Steel Purlins
12	LMS-HB-LB-KIT	L-Bracket with Hanger Bolt for Wood Purlins

PRO-RAIL47

SPLICE KIT
PRO RAIL47

END CLAMP KIT

INTER CLAMP KIT

RAIL NUT KIT

EARTH
GROUNDING
LUG

L-BRACKET KIT -
METAL

L-BRACKET KIT -
WOOD

L-BRACKET KIT -
LANDSCAPE

L-BRACKET KIT - **PORTRAIT**

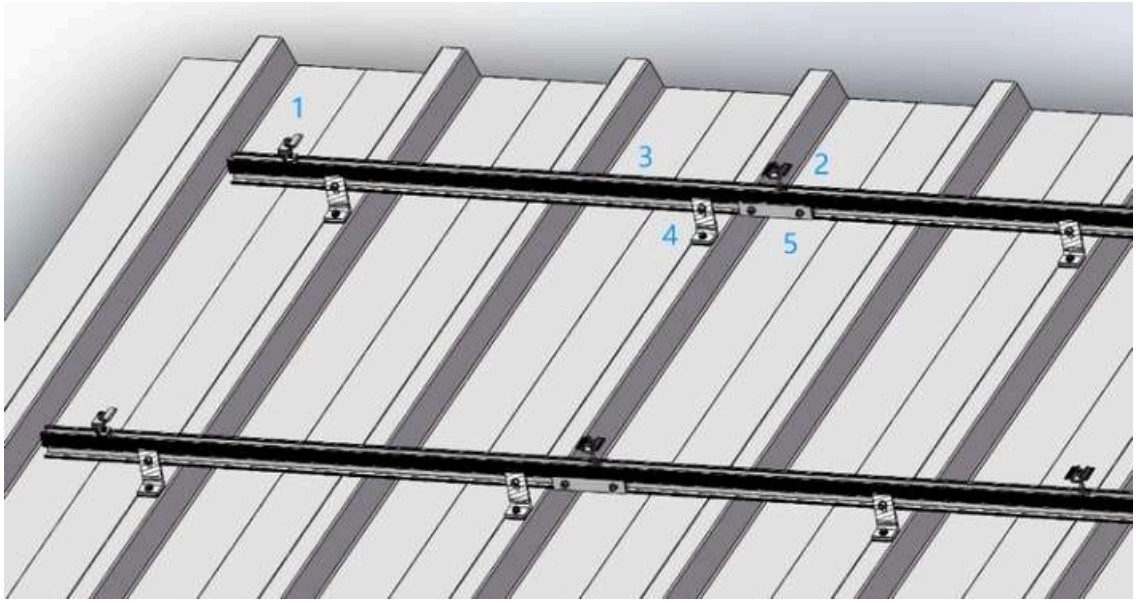
L-BRACKET WITH HANGER BOLT FOR STEEL

L-BRACKET WITH HANGER BOLT FOR WOOD

SYSTEM OVERVIEW:

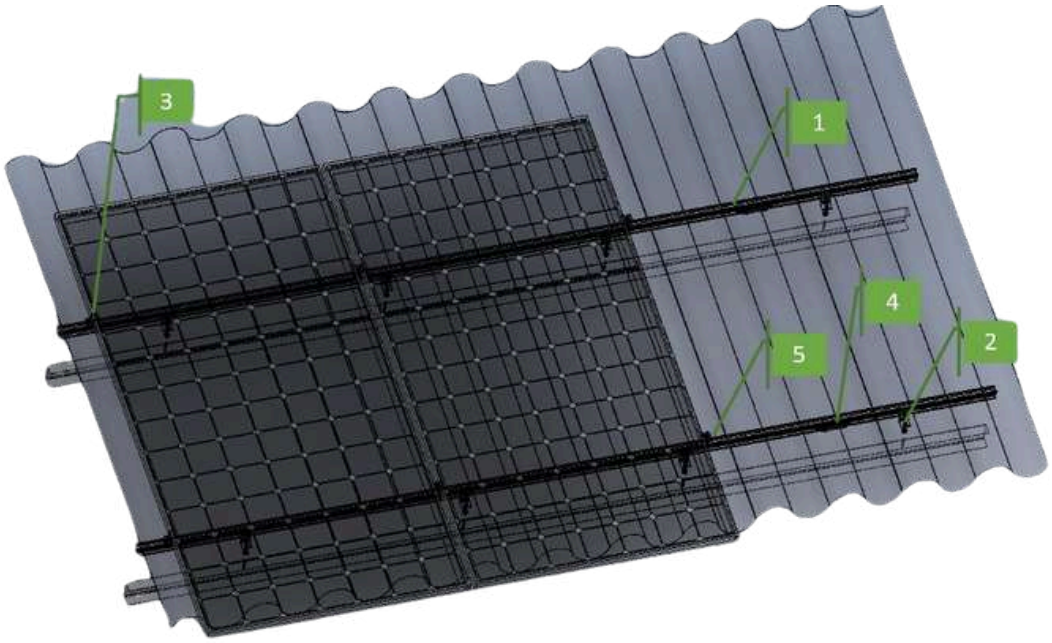
Flush Mount with L-Bracket Kit

1. End Clamp 2. Inter Clamp 3. Rail 4. L-Bracket Kit 5. Rail Splice



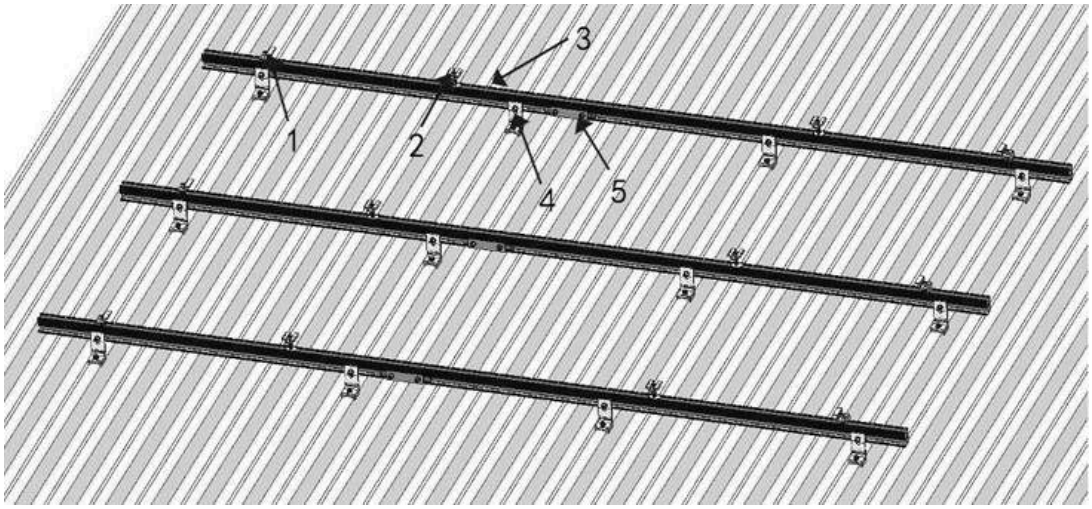
Penetrative Hanger Bolt System

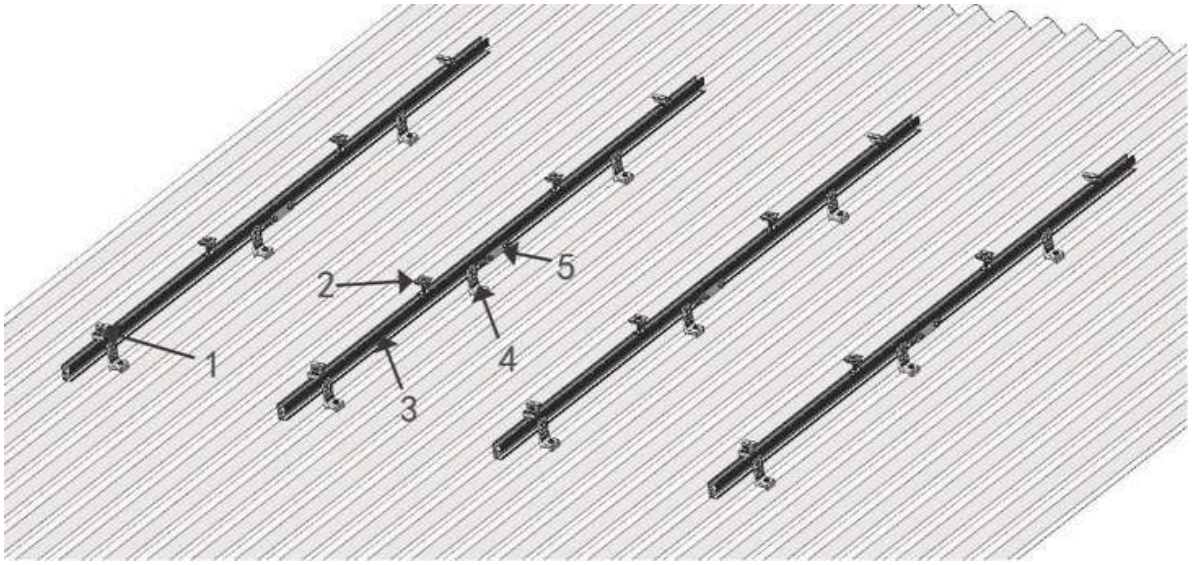
1. Rail 2. Hanger Bolt 3. End Clamp 4. Rail Splice 5. Inter Clamp



L-Bracket Kit + EPDM Corrugated Adaptor System

1.End Clamp 2. Inter Clamp 3. Rail 4. L-Bracket Kit 5. Rail Splice





Stainless Steel Fastener Precautions:

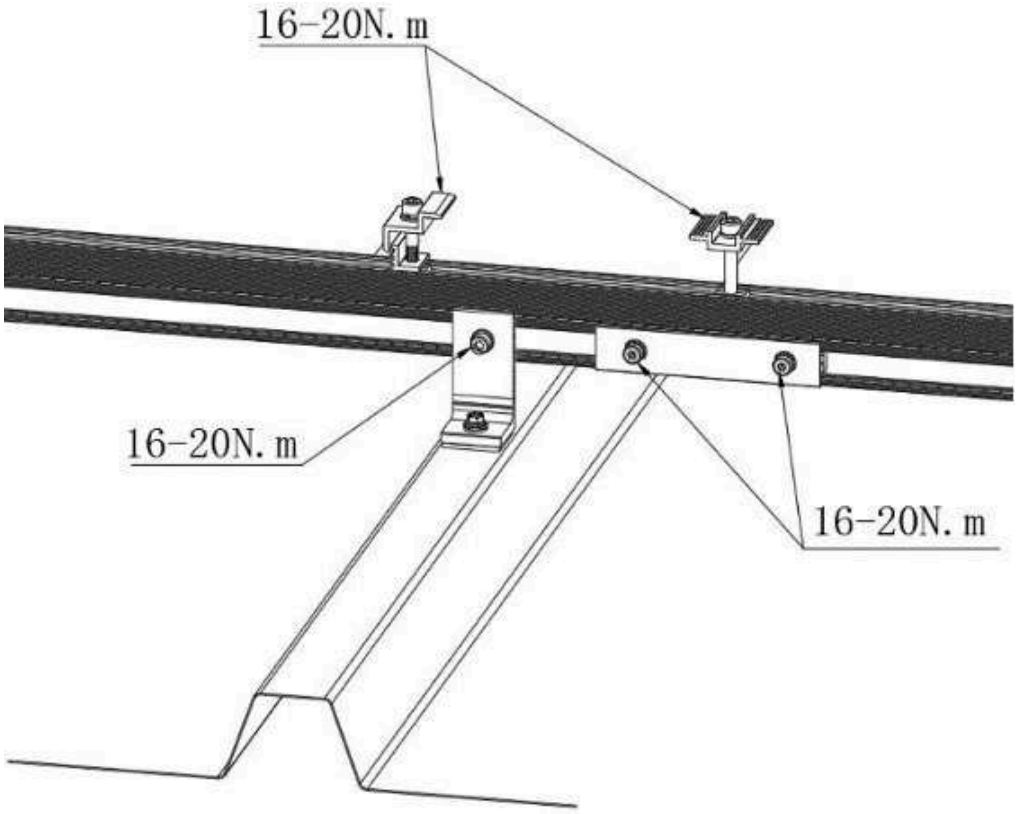
General installation instructions

(1) Apply force to fasteners in the direction of thread
(2) Apply force uniformly, to maintain the required torque
(3) Professional tools and tool belts are recommended
(4) In some cases, fasteners could be seized over time. As an option, to avoid galling or seizing of thread, apply lubricant to fasteners prior to tightening.

SAFE TORQUES

Please refer to safe torques defined in this guide as shown in the figures below.

- If power tools are required, use low speed only to avoid galling.
- Avoid damaging any anodised or galvanised surfaces when tightening.



	Panel Clamps	Rail Splice	Grounding Lug	L-Bracket Kit to Rail
Safe Torques	16-20	16-20	16-20	16-20
Product Codes	LMS-EC30-35-KIT-BP LMS-IC30-35-KIT-BP	LMS-PRO-RAIL47-SP-KIT	GM-EGL-KIT	LMS-LB-KIT

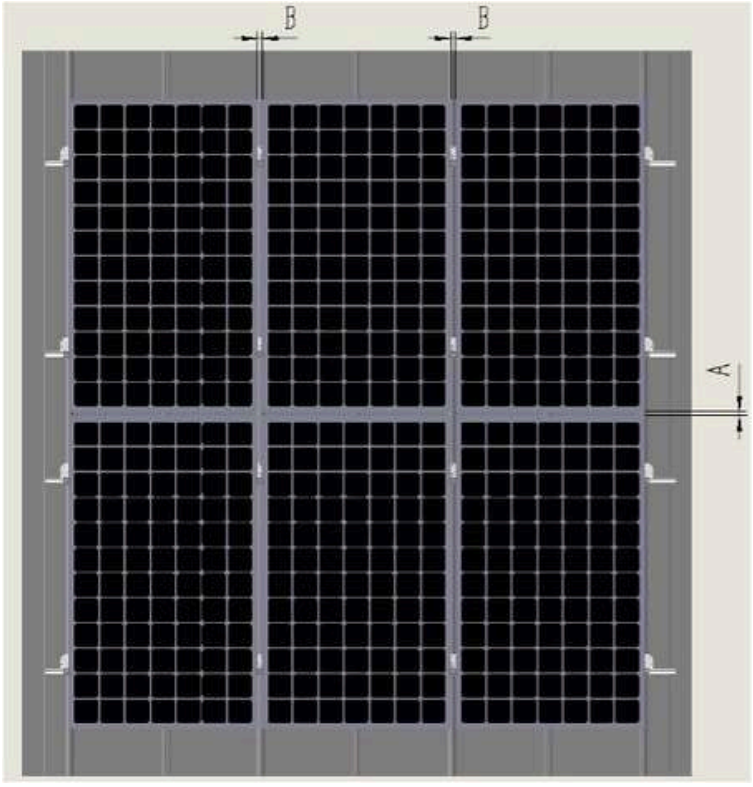
Installation Dimensions -

All drawings and dimensions in this Installation Guide are for generic reference only. The Mounting System must be tailored to meet the specific conditions of each project and documented in a construction drawing.
The installation process outlined in this guide remains consistent, even if component sizes vary.
For any on-site modifications or alterations, please submit marked-up drawings or sketches to Lumasol for review, comment, and approval prior to making changes.

INSTALLATION INSTRUCTIONS:

Module Layout Planning:

- Determine the number of modules in the vertical direction by using the module height, allowing for atleast 18mm (A) spacing between modules (check the solar module manufacturer's installation manual).
- Determine the number of modules in the horizontal direction using module width + width "B". Width B depends on the mid clamps used. Ensure the module frame sits flush against the mid clamp.
- Assess the horizontal spacing of the Metal Roof Clamps.
- Assess the vertical spacing of the Roof Brackets, which should be approximately 1/2 to 3/4 of the module height.
- Always check the installation manual of the PV-Module you use to determine the allowed fixing points on the module frame.

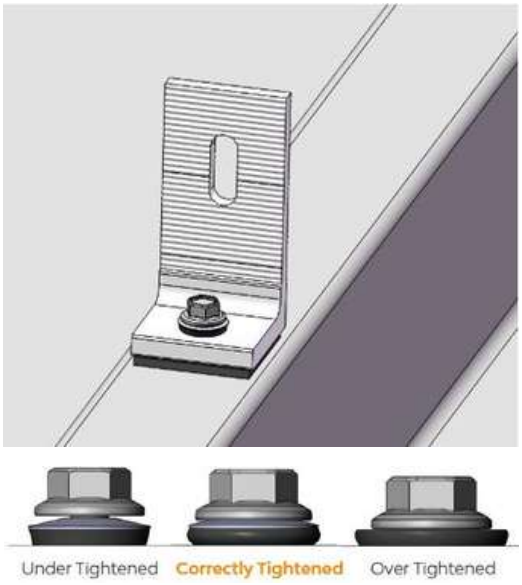


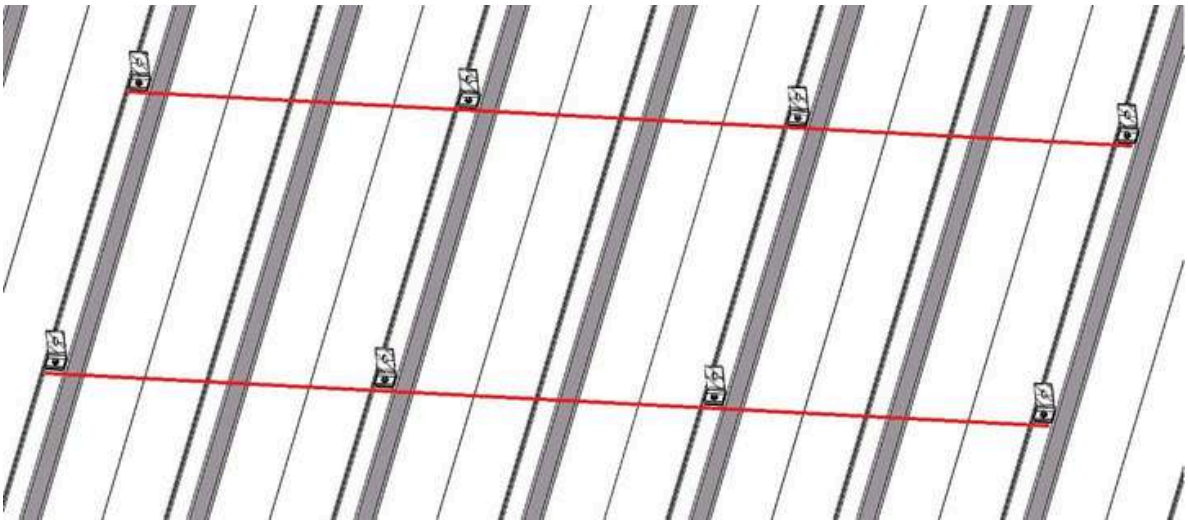
L-BRACKET KIT FEET INSTALLATION:

Follow the installation plan to determine the position of the L-brackets (Contact lumasol for the correct interface spacing)

Fix the L-brackets to the roof purlins in the planned position using the below guide;

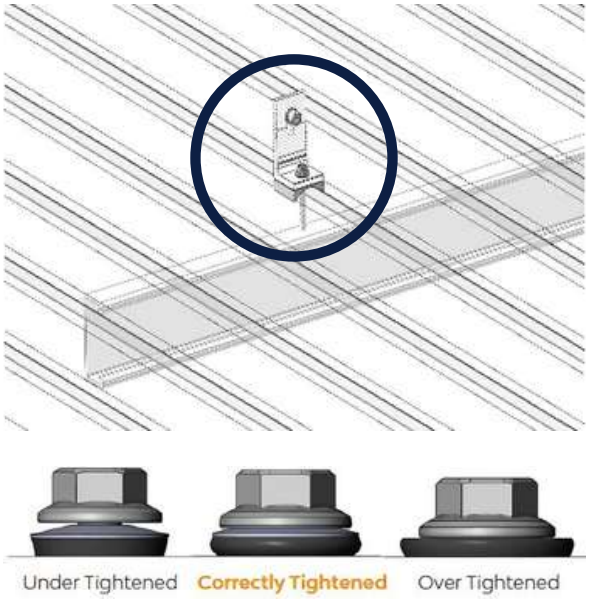
- Use self-drilling screws and 3/8" socket.
- Drill speed must not exceed 300 RPM.
- Tighten until the bonded washer is compressed sufficiently to provide a watertight seal.
- Purlin thickness: 0.42mm–2.4mm
- Install feet in a straight, consistent line.

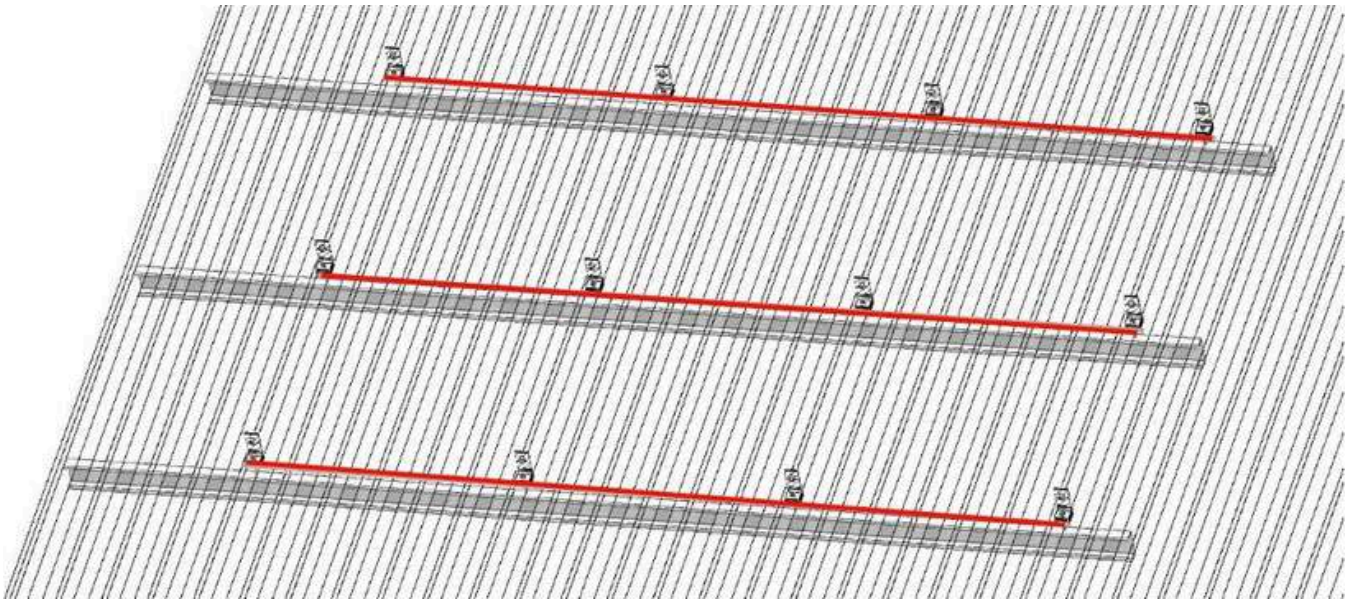




L-BRACKET KIT WITH EPDM CORRUGATED ADAPTOR (PORTRAIT)

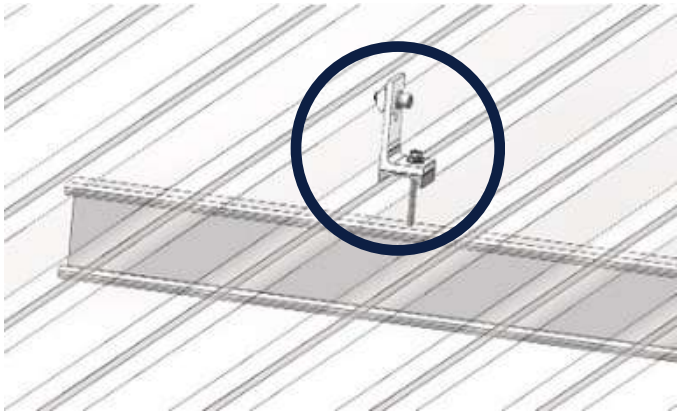
- Follow the same installation steps as for standard L-Bracket Kit.
- Note the orientation of the clamp and epdm adaptor relative to the corrugated ridges as seen in the image below;

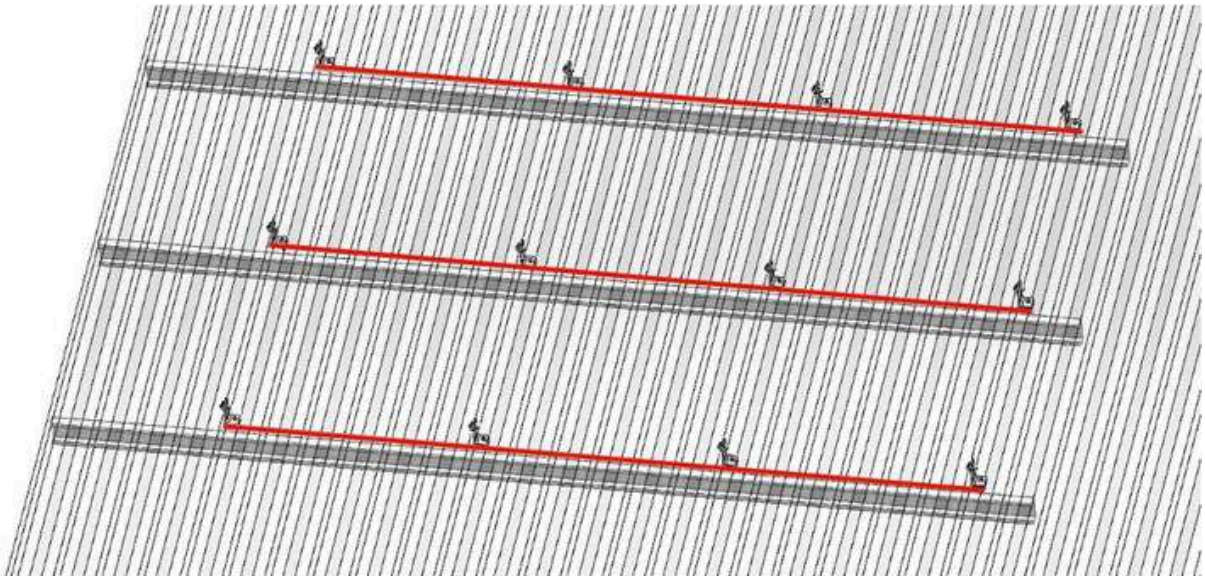




L-BRACKET KIT WITH EPDM CORRUGATED ADAPTOR (LANDSCAPE)

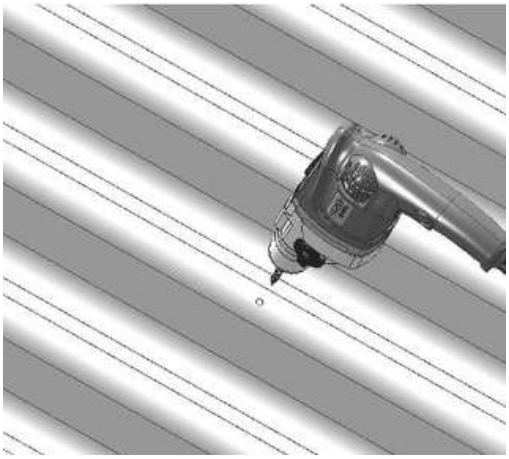
- Follow the same installation steps as for standard L-Bracket Kit.
- Note the orientation of the clamp and epdm adaptor relative to the corrugated ridges as seen in the image below;

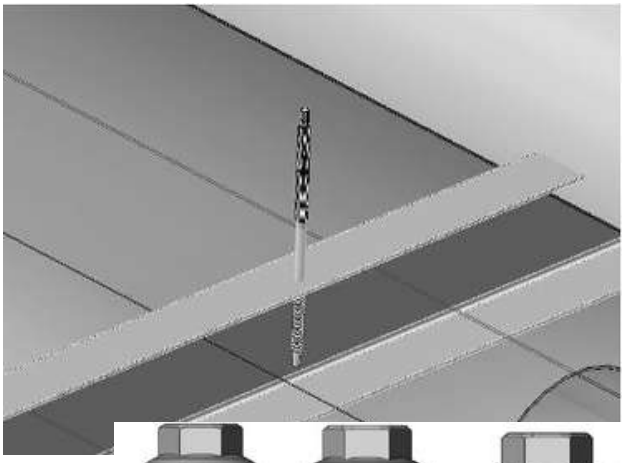


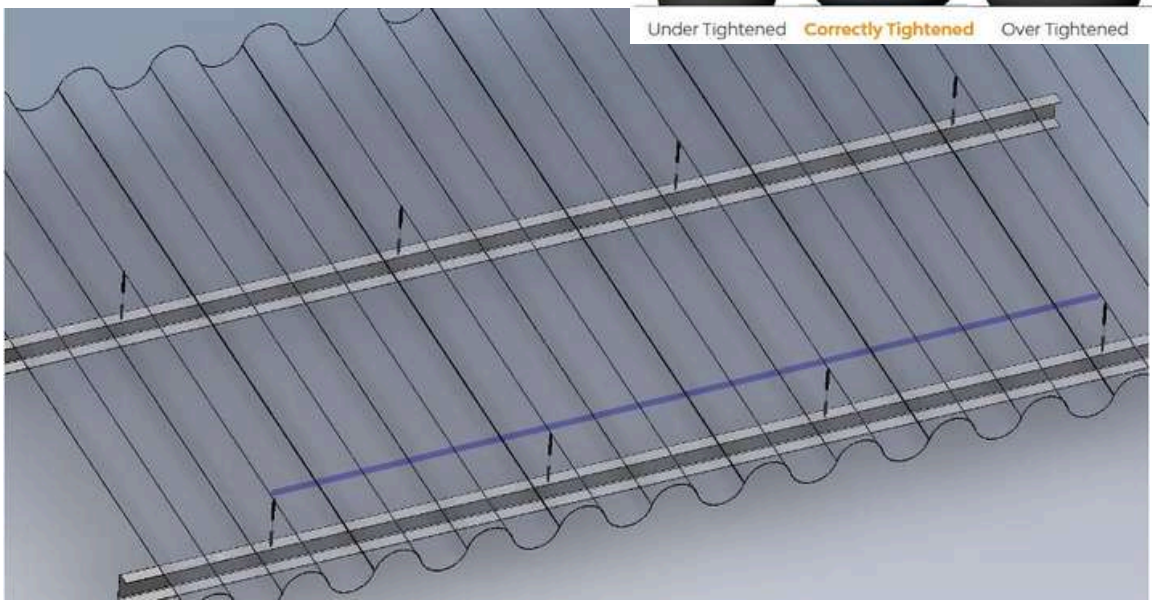


HANGER BOLT INSTALLATION:

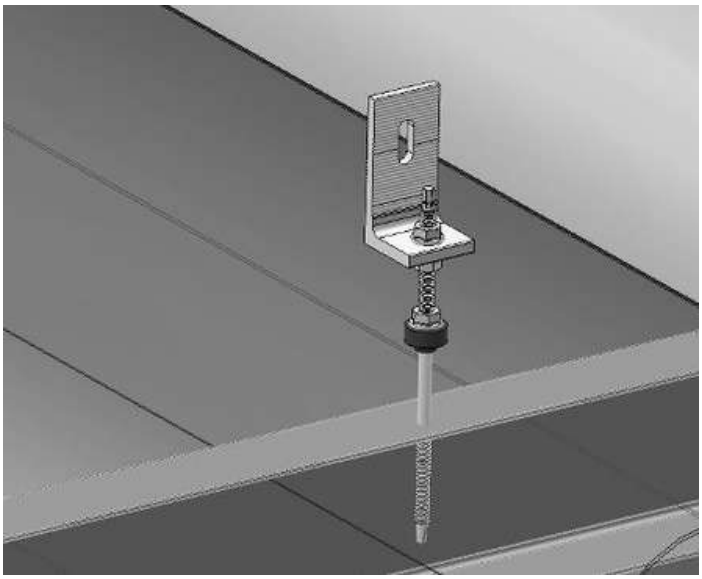
- According to the installation plan, determine and mark the location of the Hanger bolts. Hanger bolts must be above the roof Purlins.
- Drill pilot holes using an M6 drill bit at the marked positions, ensuring the holes are perpendicular to the sheet surface.
- Screw the hanger bolts into pre-drilled holes, applying consistent downward pressure to ensure proper seating.
- Tighten the nut on top of the rubber washer, and confirm that the bonded washer compresses evenly to create a watertight seal without over-tightening.
- Purlin thickness must be between 0.42mm and 2.4mm to ensure structural integrity.
- Align all hanger bolts in a straight line to match the rail layout.







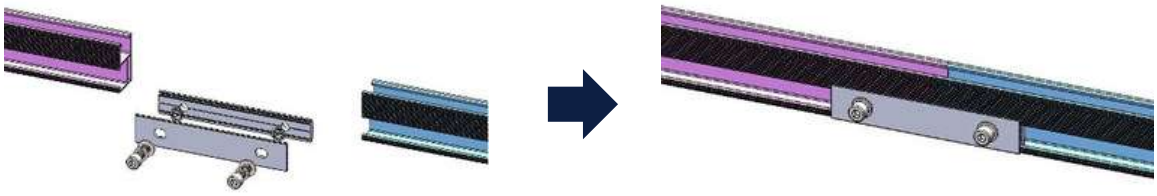
L-BRACKET ON TO HANGER BOLT ASSEMBLY:

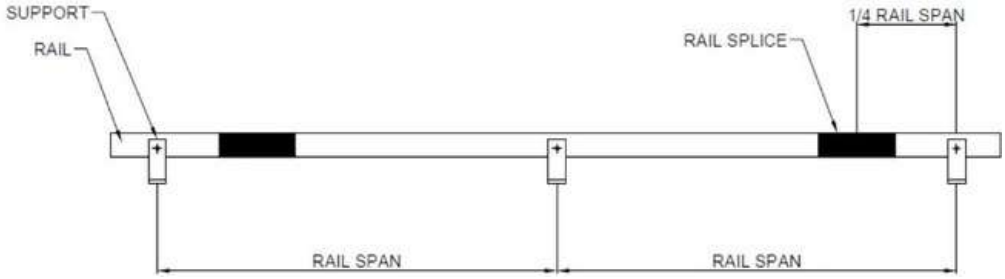


- After securing the hanger bolt and the EPDM waterproof washer, place the nuts and L-bracket Kit onto the hanger bolt.
- Adjust the L-bracket to the correct height (even with the other L-Brackets) and tighten the nuts securely.
- The L-Bracket mounting system is suitable for installing PV modules in both the Landscape and Portrait orientations, offering layout flexibility depending on the project needs.
- This type of mounting is recommended for use only within the internal roof zones, where it is shielded from direct exposure to most extreme wind forces near the edge of the roof.
- Ensure that all components are correctly aligned and securely fastened before proceeding with the rail installation.

RAIL SPLICE INSTALLATION:

- To join two or more rails, slide half of the rail splice into the first rail channel.
- Insert the adjoining rail onto the exposed section of the splice.
- Tighten the bolts securely. As the bolts are tightened, the star washers on the splice will pierce the anodized coating of the rail, ensuring both mechanical stability and electrical conductivity between the two rails.





IMPORTANT INSTALLATION GUIDELINES:

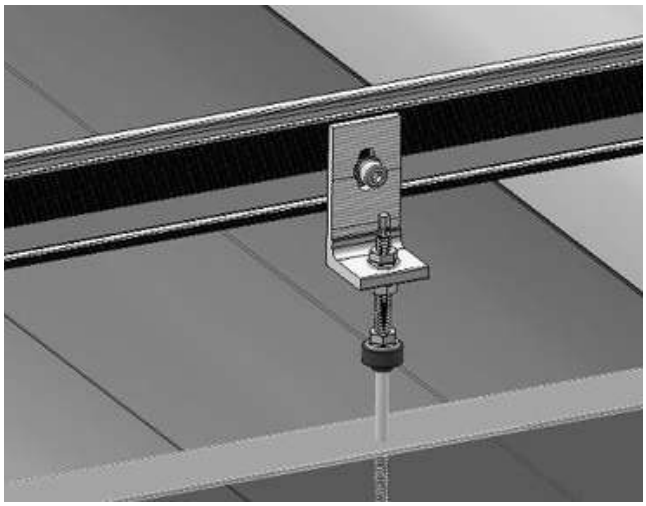
- Do not install the splice connector at a support point or directly at the mid-span between two support points.
- The recommended position for the splice is approximately one-quarter (1/4) of the span length from the nearest support.
- Ensure the star washers are flush against the rail and torque all splice bolts to 16–20 N·m. This ensures the anodized layer is properly pierced and continuity is maintained across the rail sections.

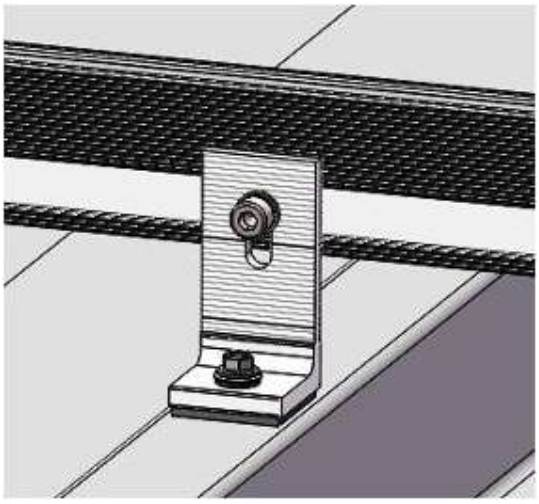
RAIL INSTALLATION:

Determine the correct position for each rail length based on the installation plan.

Connect the rails to the L-Bracket Kits using the Rail Nut Kits.
Tighten them within the 16–20 N·m range after final alignment is verified.

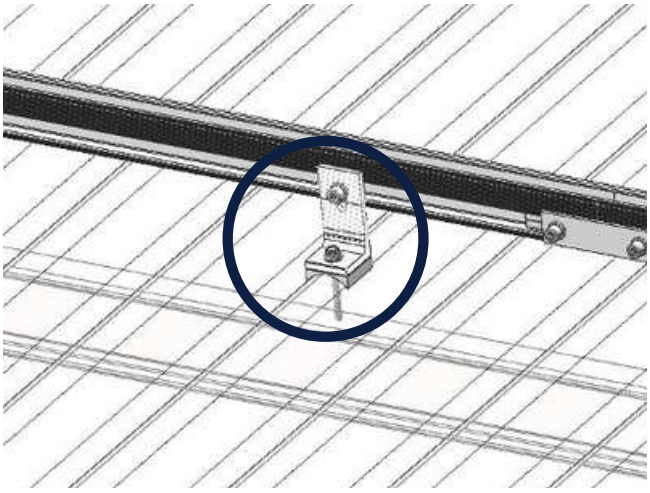
Proper alignment and fastening at this stage are critical to the long-term reliability and structural performance of the system.



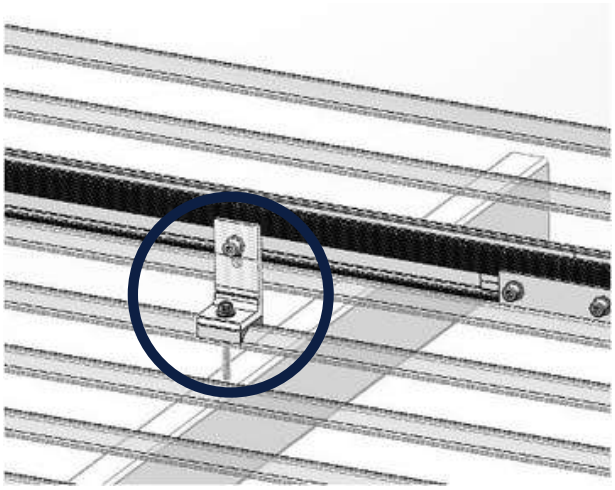


When using the **L-Bracket Kit with EPDM Corrugated Adaptors**, fix the rail and L-Brackets according to the layout plan and installation diagrams.

- Once the rail is in its final position, tighten the M8 bolts between the L-Bracket and rail to a torque of 16–20 N·m.
- Ensure the adaptor is correctly seated to maintain waterproofing integrity.
- Proper alignment and fastening at this stage are critical to the long-term reliability and structural performance of the system.

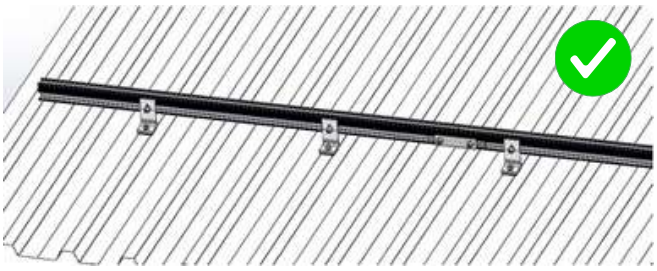


Portrait



Landscape

To ensure the strength of the **rail** and **splice**, **each rail** should be supported by at least **2** interfaces, shown in figures below:

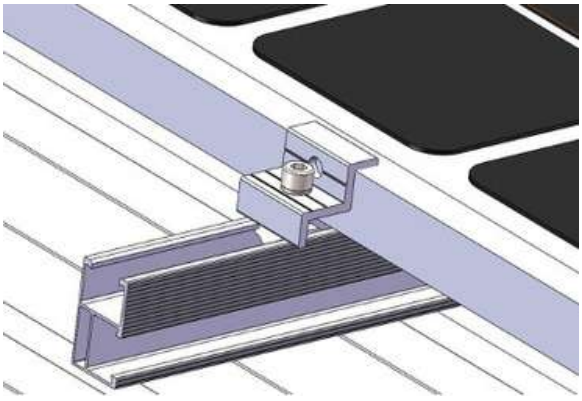


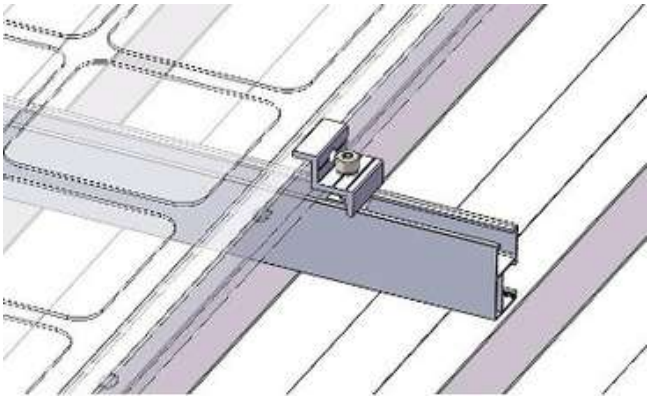
INTER AND END CLAMP INSTALLATION:

Inter and end clamps secure the PV modules to the rails while also ensuring electrical bonding between panels. Follow the steps below carefully:

Place the First Module:

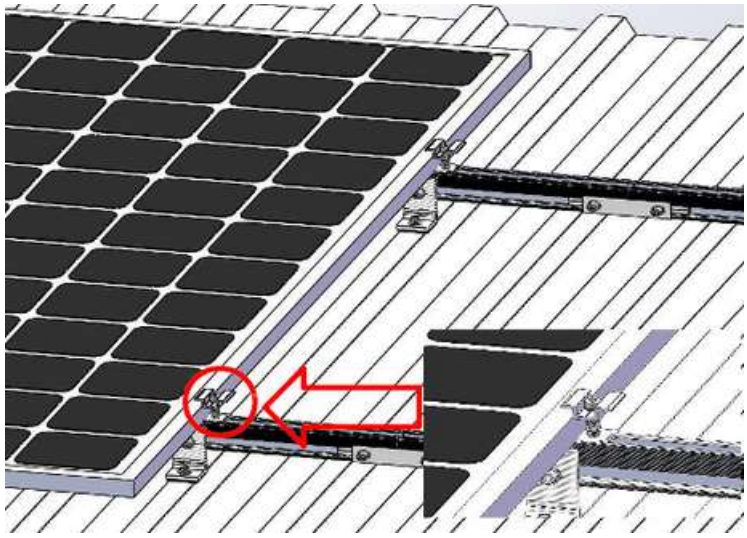
- Position the first PV module onto the rail according to the system layout.
- Insert and loosely fasten the end clamp on one side of the module.





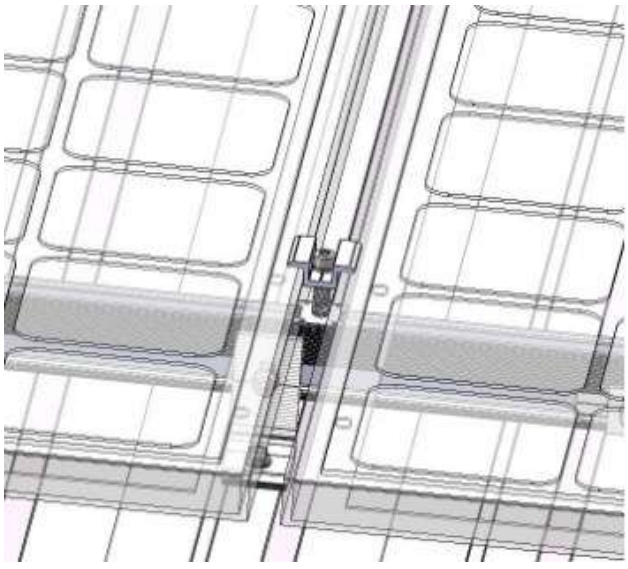
Install the Inter Clamp with Earthing Plate:

- Slide the inter clamp (with integrated earthing plate) into position beside the first module.
- Ensure the plate is aligned correctly so the teeth face the rail and will penetrate the anodized coating to ensure conductivity.



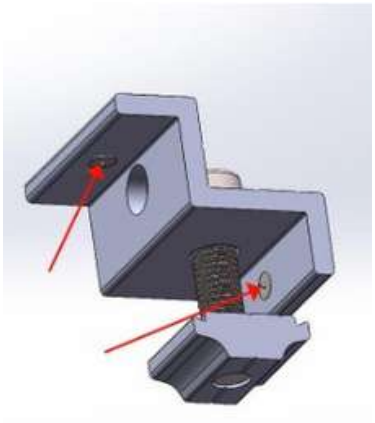
Add the Second Module:

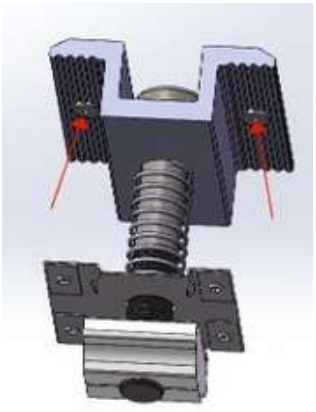
- Place the second module on the opposite side of the inter clamp.
- Check alignment with the first module for consistent spacing (typically 18mm).

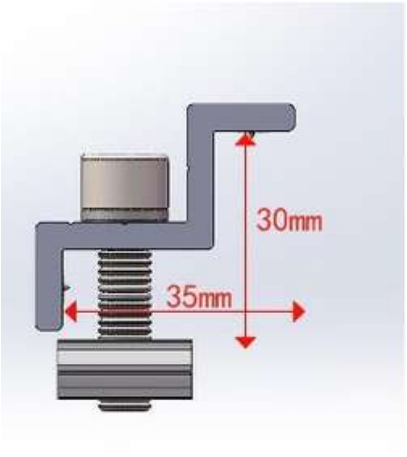


Tightening the Clamps:

- Apply final torque of 16–20 N·m to all M8 bolts once the modules are in their final positions.
- Ensure the bonding teeth of the inter clamp have pierced through the anodized layer of both the rail and module frame.







The end clamp is designed with two mounting holes to accommodate PV module frames of different thicknesses.

Installers can switch between the two holes depending on the panel thickness required - either 30mm or 35mm - by aligning the clamp with the appropriate hole. End clamps come pre-set to 30mm.

Important Notes:

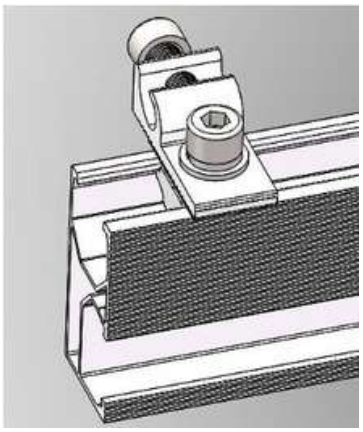
Inter clamps and earthing clips are single-use only - do not reuse.
All earthing clips must be installed as per specification to ensure system grounding continuity.

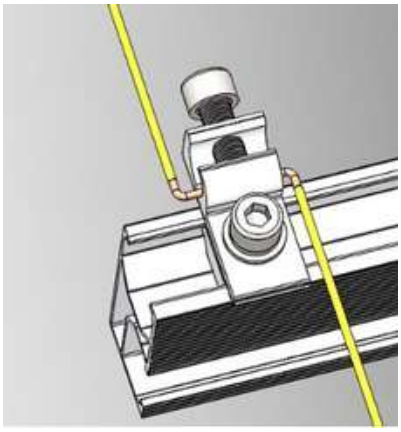
Maintain uniform spacing and alignment between modules.
This process ensures secure fastening and grounding compliance for the entire PV array. Always confirm the torque with a calibrated torque wrench and verify continuity if required.

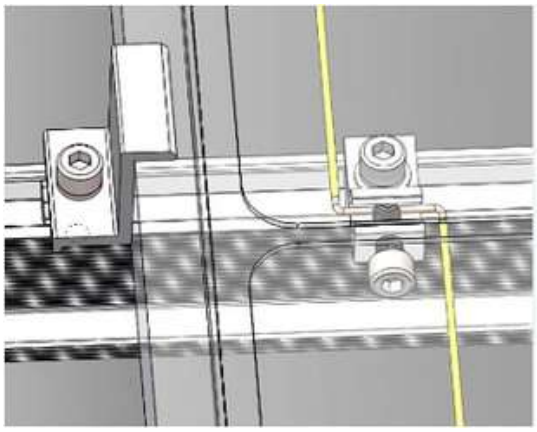
GROUNDING LUG INSTALLATION:

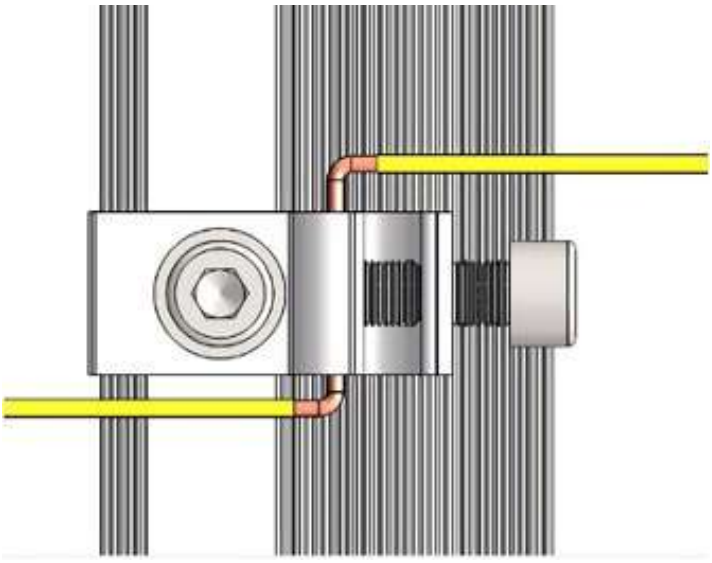
Proper grounding is essential for system safety and compliance. Each rail row must be equipped with a grounding lug to ensure electrical continuity throughout the array.

- Ensure that grounding lugs are properly aligned before tightening.
- Only one grounding lug is required per continuous rail row.
- Always verify grounding continuity if required by local regulations or project standards.
- Refer to grounding diagrams for specific orientation and torque specifications (as shown in Figures, if applicable).









STEP-BY-STEP INSTALLATION:

- Select the mounting channel (top, side, or underside) based on available space and layout requirements.
- Insert the grounding lug into the rail channel and align it properly.
- Secure the lug to the rail by fastening the M8x25 bolt. Apply a torque of 16–20 N·m using a calibrated torque wrench.
- Insert the stripped end of the grounding cable into the cable terminal on the lug.
- Tighten the M8x20 bolt on the cable connection to a torque of 8–12 N·m.
- Ensure full metal-to-metal contact between the lug and the rail for proper electrical bonding.

Important Notes:

- Only one grounding lug is required per continuous row of rails.
- Always visually inspect that the lug is fully seated in the rail channel before torqueing.
- Perform a continuity check if required by local codes or engineering specifications.

Final Installation Check

- Ensure all mounting hardware (bolts, clamps, and structural components) are tightened securely.
- Double-check the alignment and overall stability of the entire mounting system.
- Verify electrical continuity and grounding of all components for safety.

This manual provides comprehensive instructions for the successful installation of the **Lumasol Flush Mount L-Bracket penetrative roof mounting system**. Adhere to these guidelines to guarantee a secure and efficient installation.