Xiamen Goomax Energy Technology Co.,Ltd

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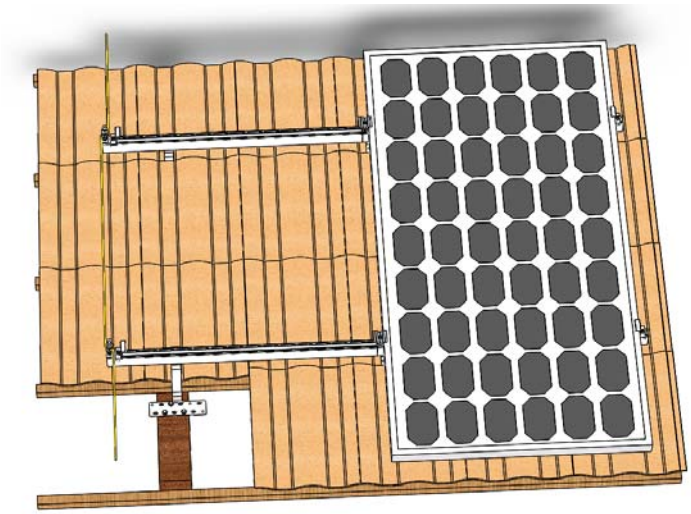
Solar Roof Mounting System Installation Manual
Model Type: Tile Roof Set



1. Introduction

GOOMAX Tile Roof Set adopts the modular design, and consists of tile hook, Rail, Clamps, Rail splice. It is available for a variety of building types, including residential, commercial and remote areas, which can meet the demand of solar power stations from KW to MW. The pre-assembled kits save the installation time and cost on site.
During installation and especially when working on the roof:
Please review this manual thoroughly before installation.
Please comply with the appropriate occupational health and safety regulations.
Please also pay attention to other relevant regulations of your local region.

2.Safety and Installer Responsibilities

1）Do not throw or roughly handle any solar components.
2）Do not bring solar roof set into contact with sharp or heavy objects.
3）Do not modify solar components in any way. Less or more components should be installed and used according to the normal tolerable range.
4）Installation of this system is to be performed only by professionally trained installer. Any attempt by an unqualified person to install this system could result in danger or serious injury.

3. Technical Specifications

Item	Specification	Material	Tensile Strength	Yield Strength	Surface treatment
Rail	28mm*55mm*4200mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Rail Splice	25mm*30mm*150mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Inter Clamp	40mm*42mm*Xmm(Bolts length）	AL6005-T5	260Mpa	240Mpa	Anodizing
End Clamp	34.5mm*40mm*60mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Tile Hook	180mm*165mm*166mm	SUS304	635Mpa	235Mpa	Sand Blasting
Grounding Lug	20mm*44mm*15mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Earthing Clip	30.1mm*31.8mm*7.2mm	SUS304	635Mpa	235Mpa	

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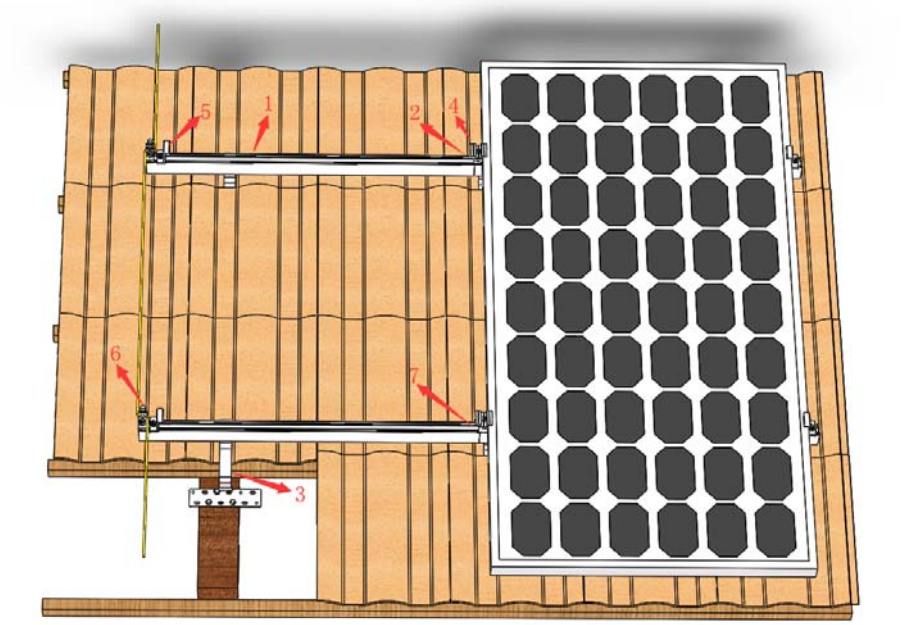
Item

1. Rail
2. Rail Splice
3. Tile Hook
4. Inter Clamp
5. End Clamp
6. Grounding Lug
7. Earthing Clip



Components	Description
 Rail	The rail is extruded by aluminum profile AL6005-T5, and anodized with 10 micron layer to offer high corrosion resistance.
 Rail Splice	Extend rail to any length as required by the quantity or width of the solar panels. Included limit block, 2pcs of T nut, 2pcs of M8*25 bolts, 2pcs of Spring washers, 2pcs of flat washers, and 2pcs of star washers. By connecting the rails, it can ensure the strength of the rails and serve as a conductive bridge to ensure the grounding of the rails.

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 Inter Clamp	Fix between two panels. Included 1pc M8 bolt, 1pc M8 spring washer, 1pc T nut.
 End Clamp	Fix end panels. Included 1pc T nut, 1pc M8*25 bolt, 1pc M8 spring washer.
 35/40mm Adjustable End Clamp	Fix end panels. Adjustable for the panels with 35mm/40mm thickness. There are two holes on the clamp, which can be adjusted to suit the thickness of 35mm/40mm solar panel. Long side for 40mm, short side for 35mm.
 Tile Hook	Consists of tile hook, 6.3X65 wood screws, T nut, M8x25 bolts, 1 spring washer, 1 flat washer. Hold the rail and connect with the tile roof.
 Grounding Lug	The grounding lug is consisted of T nut, M8*25 bolt, M8*20 bolt, cable clip, spring washer, flat washer. It is mainly used for the grounding of the rails and outer system.

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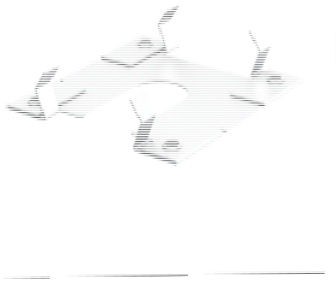
 Earthing Clip	The earthing clip is mainly used for conducting the electricity between the solar panels and the rails. The thorns on the the clip pierce the solar panels, and the lower thorns pierce the rails to realize the electrical conduction between the solar panels and the rails.

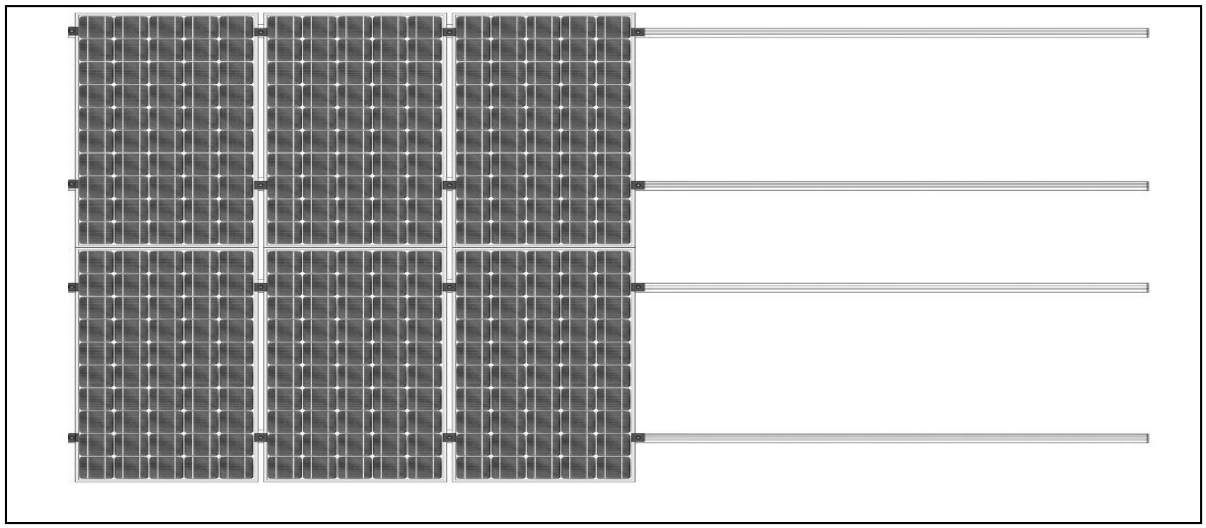
The following tools are required for the installation

Tools for installation	Description
 6mm Allen Key or hexagonal driver bit	Fasten and adjust inter /end clamp, rail splice, roof hook, grounding lug.
 Cordless drill	Drill of impact driver for driving roof material fixings. Noted： Do not spin too fast during the installation, wood screws can be broken easily. (Recommended torque is 8N*m).
 Rule	Measuring installation position of the roof hooks, rail length. Installation location of solar panels.
 Angle grinder	For terracotta tile roof installation, and angle grinder fitted with a continuous edge diamond tripped tile cutting blade; gloves, hearing protection, a face protection mask, and a suitably rated breathing protection mask for all people in proximity of grinding.
 Spirit level	Check the level degree during installation of the rails and the solar panels.

 Gloves	Protect the hazard of the sharp corners.

5. Installation Plan

1. The length of the rail in portrait is evaluated as follows: panel quantity * (panel width +21mm) + 100mm
2. The length of the rail in landscape is evaluated as follows: panel quantity * panel length (Please refer to the panel installation instruction and the size of metal roof also.)
3. The Clamps' span can be 2.0m maximally in portrait.
4. Clamps' span can be about 1/2---3/4 of panel's length in landscape.



6. Installation Charts for Goomax Tile Roof Kits:

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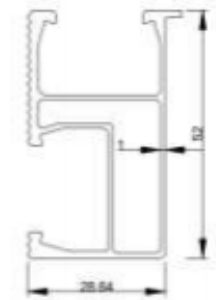
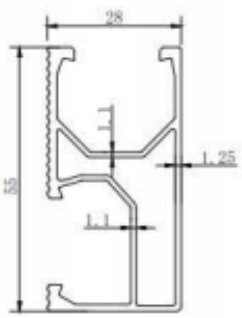
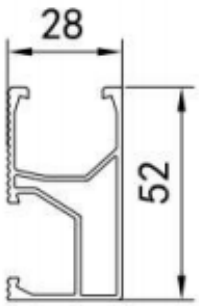
GOOMAX ROOF MOUNTING FOR PORTRAIT AND LANDSCAPE ORIENTATED FLUSH MOUNTED SOLAR PANELS ON TILE ROOF



Railing: GM-R01-LighT



Railing: GM-R56



Railing: GM-R69

Goomax Solar Rail Sections

Panel Size	Portrait	Landscape
1700x1000	1.1 (Page 2)	1.2 (Page 3)
2000x1000	2.1 (Page 3)	2.2 (Page 3)

Terrain Category 2 (TC2) Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.

Table 1.1 TILED ROOF. **Roof Slope: 15 to 35 deg**

Maximum spacing (mm) of the fixing of the railing to Pitched Tiled roof

	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2350	1960	1930	1660	1490	1040	940	570
10m	2120	1800	1780	1440	1340	930	850	530
15m	2020	1740	1720	1300	1160	810	710	500
20m	1960	1700	1670	1220	1040	700	570	#N/A
Panel size 1700 X 1000								

Portrait oriented

Table 1.2 TILE ROOF. **Roof Slope: 15 to 35 deg**

Maximum spacing (mm) of the fixing of the railing to Pitched Tiled roof

	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2850	2400	2330	1620	1380	840	790	600
10m	2560	1980	1910	1330	1240	780	740	550
15m	2460	1780	1730	1200	930	720	670	470
20m	2410	1680	1630	1030	840	660	600	#N/A

Panel size 1700 X 1000

Landscape oriented

Table 2.1 TILED ROOF. **Roof Slope: 15 to 35 deg**

Maximum spacing (mm) of the fixing of the railing to Pitched Tiled roof

	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2160	1830	1800	1480	1260	880	800	520
10m	1970	1700	1660	1220	1140	800	620	#N/A
15m	1880	1580	1550	1100	990	580	550	#N/A
20m	1830	1520	1490	1040	880	550	520	#N/A

Panel size 2000 X 1000

Portrait oriented

Table 2.2 TILE ROOF. **Roof Slope: 15 to 35 deg**

Maximum spacing (mm) of the fixing of the railing to Pitched Tiled roof

	Region A		Region B		Region C		Region D	
Roof Height	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone	Central Zone	Edge Zone
5m	2860	1970	1900	1130	1030	770	710	#N/A
10m	2330	1610	1560	1010	980	700	630	#N/A
15m	2100	1420	1330	960	880	600	550	#N/A
20m	1980	1250	1150	920	770	540	#N/A	#N/A

Panel size 2000 X 1000

Landscape oriented

#N/A : Failure of screw fixing to rafters.

7. References:

Our design investigation is based on the following Australian Standards and sections of Building Code of Australia relevant to structural issues.

- AS/NZS 1170.0-2002 Structural design Actions Part 0: General principles.
- AS/NZS 1170.2-2011(R2016) Structural design Actions Part 2: Wind actions.
- AS 1664.1-1997 Aluminum structures Part 1: Limit state design.
- AS/NZS 4673-2001 Cold Formed Stainless Steel.
- AS 1684.1-1999 Residential timber-framed construction - Design criteria.
- AS 1684.2-2010 Residential timber-framed construction - Non-cyclonic areas.
- AS 1684.3-2010 Residential timber-framed construction - Cyclonic areas.
- AS 1720.1-2010 Timber structures - Design methods.pdf.
- AS 3566.1-2002 Self-drilling screws for the building and construction industries.
- AS3566.2-2002 Part 2: Corrosion resistance requirements.
- ISO3506:1-2009 Mechanical Properties of Corrosion-Resistance Stainless Steel Fasteners.

Following design criteria has been used for the structural verification.

- Design Life 25 years
- Importance Level Type 2: Ordinary
- Annual Probability of exceedance 1/200
- Terrain Category to AS1170.2 2
- Service Deflection Not limited
- Snow loading Not considered
- Earthquake Loading Not considered
- Maximum Roof Pitch 30 degrees
- Minimum pitch for Tiled Roof 15 degrees (As required by NCC)
- Aluminum Rails 6005 - T5
- Maximum dimensions & Minimum weight of Solar panels.
  - 17 Kg panel 1700X1000
  - 20 Kg panel 2000X1000
- Panel Orientation Landscape and Potrait.

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The Components related to this certificate are listed below:

Rail	GM-R56, GM-R01-LIGHT, GM-R69
Rail Joiner	GM-RS-51-AZ (Direct conductive), GM-RS-51-AZ-1 GM-RS-56-AZ
Tile Roof Hook	GM-CTH-01-AZ-02, GM-CTH-01-P, GM-CTH-11-AZ
Mild Clamp	GM-MC-30-AZ GM-MC-35-AZ GM-MC-40-AZ GM-MC-45-AZ GM-MC-50-AZ
Adjust Mild Clamp	GM-MC-35(40)-AZ, GM-MC-35(40)-AZ-1 GM-MC-35(40)-AZ-2,
Adjust End Clamp	GM-EC-35(40)-AZ
Thin Film Mild Clamp	GM-MC-60-TF2
Thin Film End Clamp	GM-EC-60-TF2
End Clamp	GM-EC-30-AZ GM-EC-35-AZ GM-EC-40-AZ GM-EC-45-AZ GM-EC-50-AZ
RAIL CLAMP	GM-BR-02-AZ
T Nut	GM-BN-25-AZ
Wood Screw	SC6.3X65-AZ

The following non-structural components are used with the framing.

Cable Clip :	GM-SL-XJ-AZ, GM-XJ-AZ GM-CT-AZ
Earthing Clip :,	GM-E-EL-AZ, GM-E-EL-12
Grounding Lug :	GM-EK-AZ

8. Determining Wind Region

Figure A.

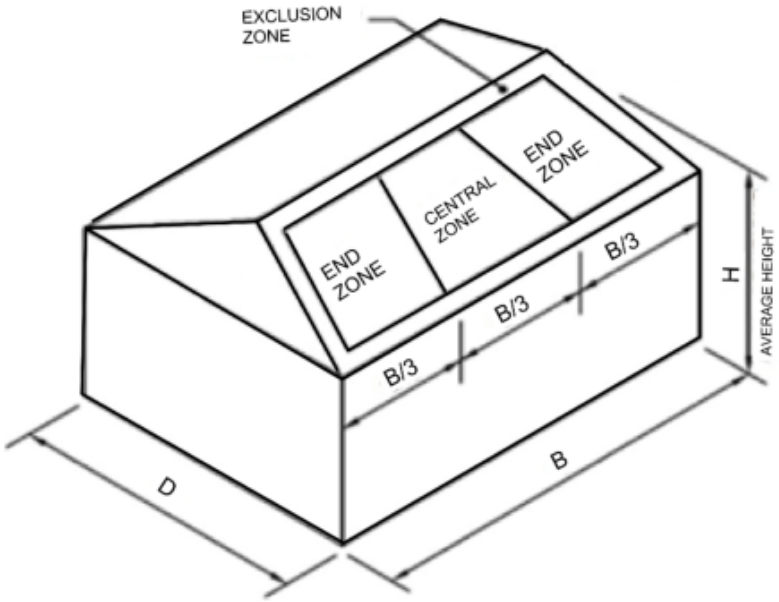


Figure B.

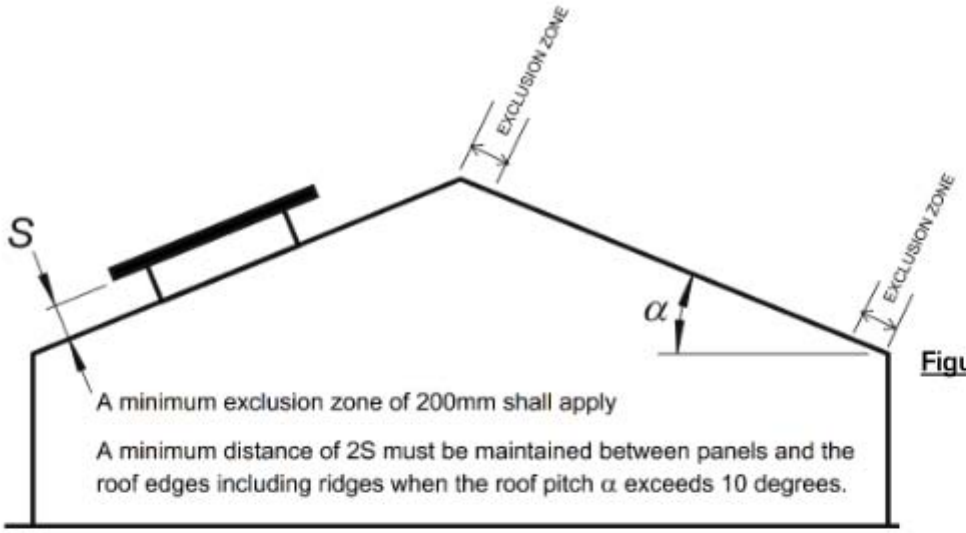
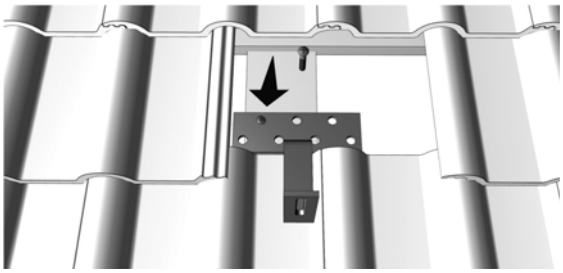
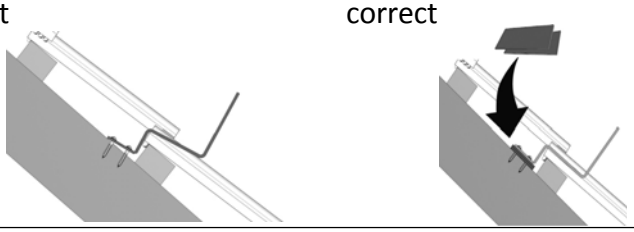
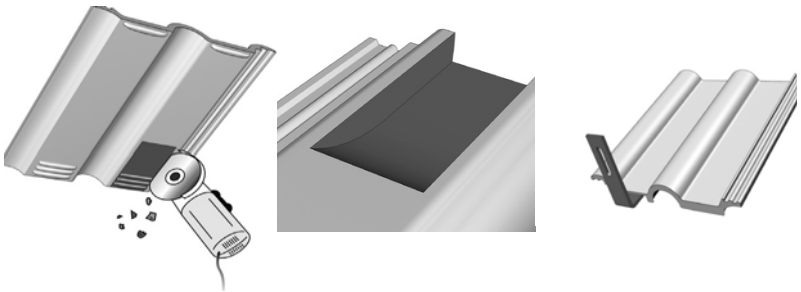


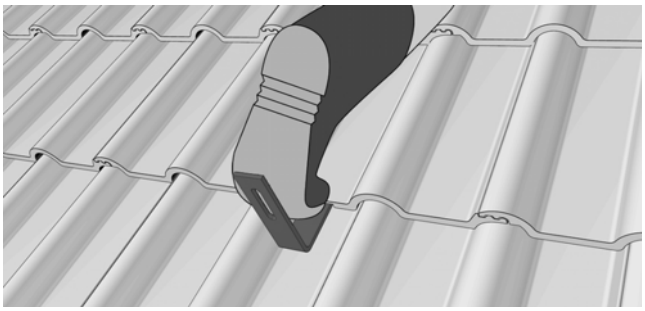
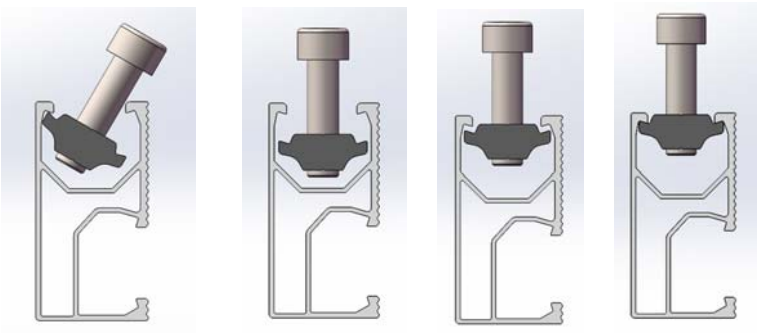
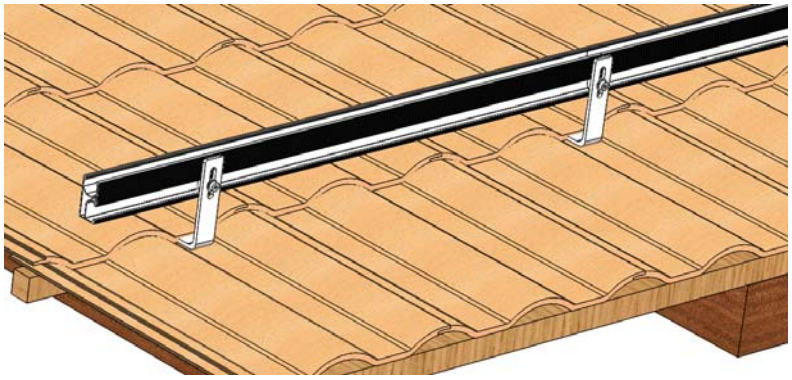
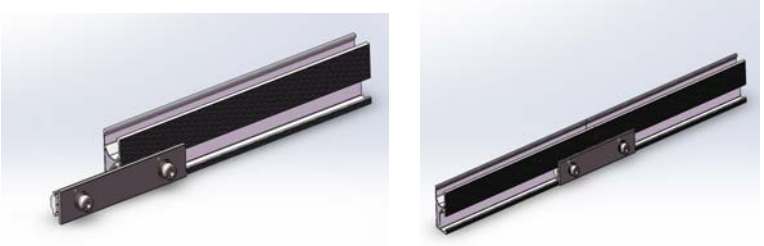
Figure C.

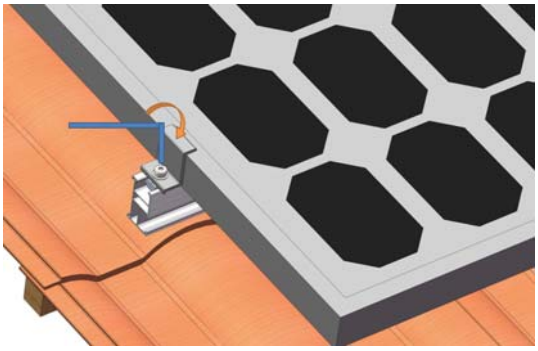
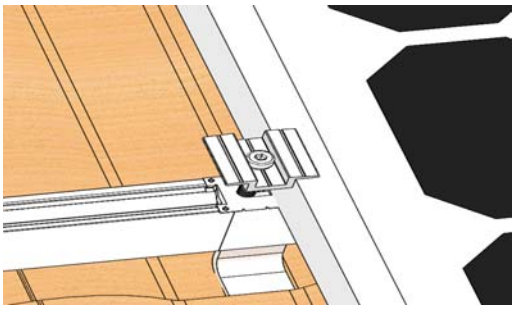
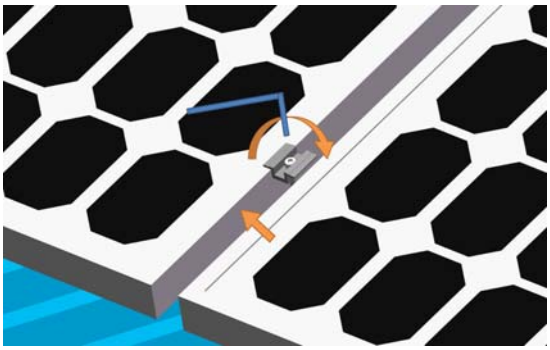
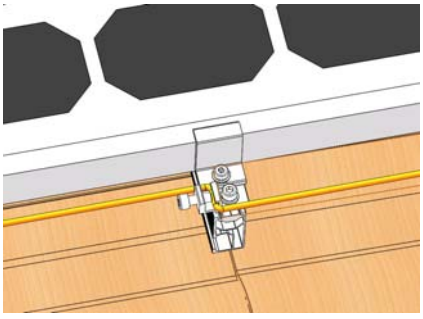
Subject to the following qualifications we certify that the above mentioned frames are structurally adequate and conform to the above Australian standards.

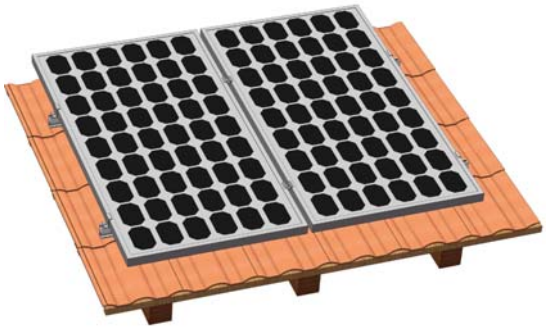
1. The gap between the underside of the solar panels and the roof shall be between 50mm minimum and 300mm maximum. Nominate the actual gap as "S" mm.
2. The solar panels shall be installed 2xS mm or 200 mm (whichever is greater) away from the roof edges and the ridge. Example: If the gap below the panel is 150mm then the panels shall be located 300mm away from the roof edge and the ridge. See Figure C above.
3. Each row of solar panels shall have a minimum of two rows of railing fixed to the roof framing.
4. The connections between the solar panels shall be flexible to accommodate deflection of the railing.
5. The deflection of the railing has not been controlled in the design. If defection has to be limited then spacing shall be reduced as advised by a practicing structural engineer.
6. The roofing to which the panels are to be installed shall conform to N.C.C and the relevant Australian Standards including AS1684, AS4440, AS1720, AS4100 and AS4600.
7. The buildings to which the panels are to be installed shall be of approved construction and conform to BCA and the relevant Australian Standards. The roof framing and the building shall be regularly maintained as required.
8. The existing roof framing shall be verified for compliance to Clause D6, of AS/NZS1170.2.

9. Installation Guide

1. Remove the roof tiles as the marked positions or simply lift them up slightly.	
2. Fix the roof hooks on the roof rafters with 3pcs M6.3x65 wood screws.	
3. Do not press hook onto the tile, pad it with wood plate if required.	incorrect correct 
4. If necessary, cut a part of tile with hammer or grinder so that the hooks can be attached to the tiles smoothly.	

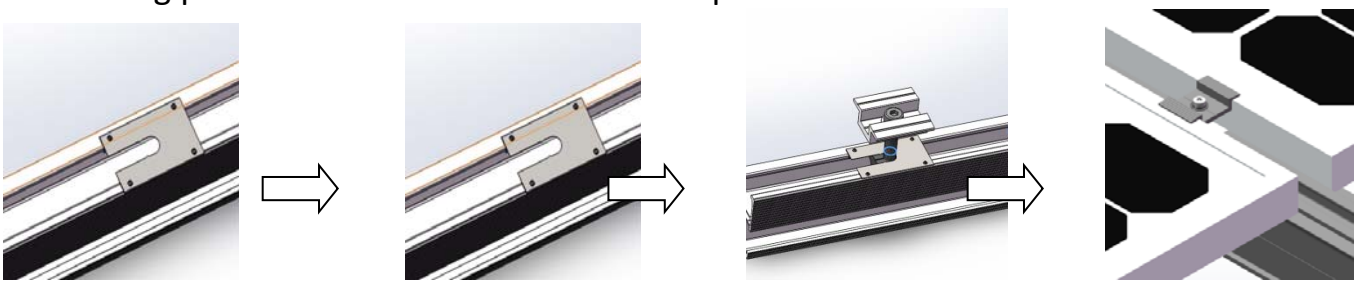
5. Note: Must not use fixed roof hook as a ladder, as this extreme point load could damage the tile below.	
6. To facilitate the connection of the T nut and the rail, it is necessary to ensure that the thread of the bolt does not pass through the bottom of the T nut. Position the T nut into the rail channel and fasten it with 2 to 3 turns of the bolts. The bolts can be freely moved into the rail channel. Slide the bolts to the final position and fasten firmly (Recommended torque is 8N*m).	
7. Rail installation Place the rail onto the hook with T nuts by M8*25MM hexagon socket screw, adjust the rail's level and verticality by sliding the bolt into the hook's slot, and then secure the screw.	
8. Rail Splice installation As the right shown, insert each half of the rail splice into the rails, and fix it with fastening bolts.	

9. Slide the module end clamp tightly against the module and fasten tightly by the Allen key (Recommended torque is 8Nm).	
10. Insert the pre-assembled inter clamp into the rails, place it firmly against the module and fasten tightly (approx. 2- 3 turns). See details in 10. Installation of Mid Clamp Conducting Plate below the chart.	
11. Now slide the next module against the previously installed module. Ensure that the vertical side of the module frame is in contact with the vertical surface of the inter clamp. (Recommended torque is 8Nm).	
12. Fix the grounding lug on the rail, and fasten with 6mm Allen key. Pass the wire through the grounding lug, adjust the bolt to secure and lock. (Recommended torque is 8Nm). See more details in 11. Installation of Grounding Lug below the chart.	

13. The final installation.	

10. Installation of Mid Clamp Conducting Plate

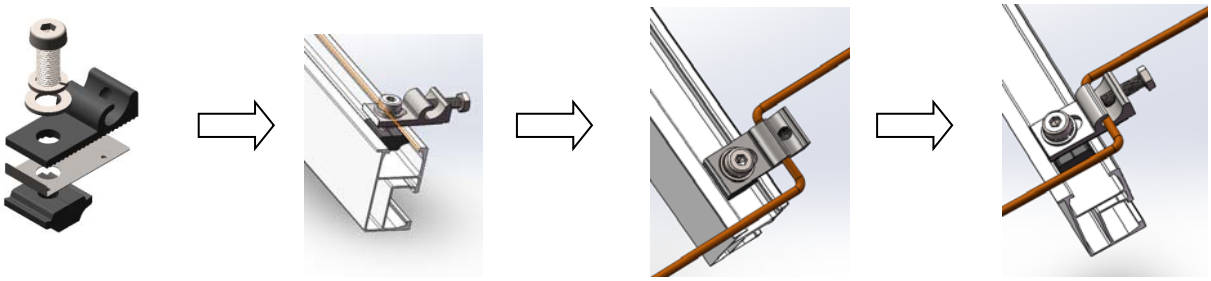
In case that the mid clamp conducting plates are required for the project, please place conducting plates beneath the mid & end clamps before installation..



Place conducting plate on Rail	Place solar panel on one side of the plate	Install mid clamp as per step 6.	Fix another panel on the other side of the conducting plate

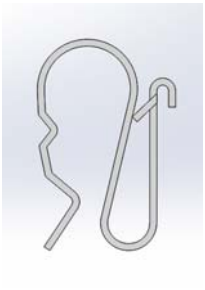
11. Installation of Grounding Lug

Grounding lugs might be needed in some projects.



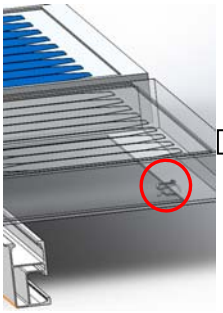
Ground lug is pre-assembled as above	Insert the T-shaped block into the rail slot properly, and fasten well.	Insert grounding cables into the lug's duct	Fasten the cables with the accessory hexagon screw

12. Cable clip installation for panel

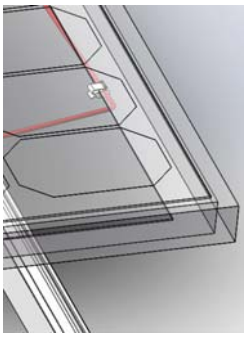


Panel wire clip as the above

Fasten panels onto the rails.



Clamp the wire clips onto the aluminum frame of panels



Pass the wires through wire clips

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Product Warranty

§ 1 Limited Warranty

A. **Xiamen Goomax Energy Technology Co.,Ltd** hereinafter referred to as “Goomax Energy”, warrants only to its direct customers that the solar mounting products offered by Goomax Energy, will be free from defects in workmanship and material during the applicable warranty period identified in as the following:

1) The warranty period for all metallic product components is 10 years.
2) The warranty period for all non-metallic product components is 3 years.
3) Each warranty period commences on the date of delivery of the Product to the Customer.

B. This Limited Warranty sets forth Goomax Energy's total and exclusive warranty obligation. Goomax Energy does not assume, nor authorize any person to assume for it, any other liability in connection with the sales of its Products.

C. This Limited Warranty does not cover any adverse effects on any Product or any Product defects which arise because:

1. The Product was not assembled and installed in accordance with the assembly and installation instructions and the applicable technical norms and regulations;
2. The Product was not assembled and installed by qualified personnel defined in the installation manual;
3. The Product was not transported, installed, assembled, tested or operated in accordance with best prudent industry methods and practices;
4. The Product was not used in accordance with the published technical specifications or the Product was used contrary to the intended purpose as specified in the installation manual;
5. The Product was not properly stored before or during the assembly/installation phase;
6. Interferences with or changes to the Product or its accessories were made without the express written consent of Goomax Energy;
7. Accessories which are not original Goomax Energy’s accessories were used in connection with the Product;
8. The Product was subject to extraordinary environmental conditions (e.g., excess voltage, magnetic fields or similar circumstances);
9. The Product was subject to a force majeure (as defined in § 3A below);
10. A heightened salt content in the ambient air or oxidation-provoking metal combinations (e.g., copper) have caused corrosion at the installation site of the Product; or

11. The load capacity of the roof construction and/or the foundations, footers or ground has not been assured according to the accepted state-of-the-art technology and applicable technical norms and regulations.

D. If any Product fails to operate during the applicable warranty period due to a warranted defect in workmanship or material, Goomax Energy shall either, at its option and expense and as its sole and exclusive obligation, carry out a professional repair of the defective Product component in question or replace the defective component with a new or updated component.

E. Performance under this Limited Warranty will not trigger the commencement of a new warranty period, nor will it extend the applicable warranty period.

§ 2 Procedures in the Event of a Warranty Claim

If the Product exhibits defects that are covered under this Limited Warranty, then please promptly contact Goomax Energy Customer Service at (0086) 592-2938661 or by the fax number (0086) 592-2938662. Please have the following information available when contacting us by phone:

- Your name, address, ZIP or postal code and a telephone number where you can be contacted.
- The Product model description
- Purchase receipt containing the date and Customer's address
- Warranty certificate of the defective Product (if available)
- The date of installation
- The location and address of installation
-A complete listing of the observed defects and additional information which could help in analyzing the defect.

The following documents and information must be made available to Goomax Energy upon request:

- Photographs of the damaged Product(s)
- System circuit diagram(s)
-Any pertinent system monitoring or data capture records

§ 3 Warranty Limitations and Final Provisions

A. This Limited Warranty does not apply if the defects or discrepancies in the condition of the Product are not material and such defects or discrepancies are insignificant with respect to the value or conforming use of the Product.

B. Goomax Energy is not liable for any delays or failure to provide the warranty performance listed in § 1, if that delay or failure is caused by force majeure (i.e., war, war-like conditions, terrorism, vandalism, earthquake, civil unrest, strikes, epidemics, fire, flooding, lightning strike, hail or other similar circumstances which are beyond Goomax's control).

C. The total scope of liability under this Limited Warranty is limited to the purchase price paid by the Customer for the individual Product.

D. The foregoing provisions state Goomax Energy’s entire liability, and the Customer's exclusive remedy, for any breach

of warranty. In no event will Goomax Energy be liable for any consequential or incidental damages arising from or out of the installation or use of any product, or any breach of warranty; Without limiting the foregoing, Goomax Energy shall not be liable for personal injury, property damage, lost profit, lost revenue, advertising or manufacturing costs, overhead costs, lost customers, operational disruptions or down-time resulting from the installation or use of any product or any breach of warranty.

12. MAINTENANCE AND CLEANING

6005-T5 anodized aluminum is largely maintenance free. Only in highly polluted or marine conditions is rinsing with clean water required, during scheduled panel cleaning.

13. REFERENCES

AS/NZS 1170.2:2011/Amdt 3:2012 on wind actions

AS/NZS16641.1:1997 on aluminum structures

AS1720.1:2012 on timber structures AS/NZS4600:2005 on cold-formed steel structures

AS3566-2011, self-drilling screws for the building and construction industries.

14. APPENDIXES:

- ASNZ 1170.2 Certification for Roof Mount P V Array Systems-Tin Roof
- ASNZ 1170.2 Certification for Roof Mount PV Array Systems-Tile Roof
- ASNZ 1170.2 Certification for Roof Mount PV Array Systems-Tilt Roof

These Engineering Certificates contain important installation requirements. Please obtain these from the local distributor.

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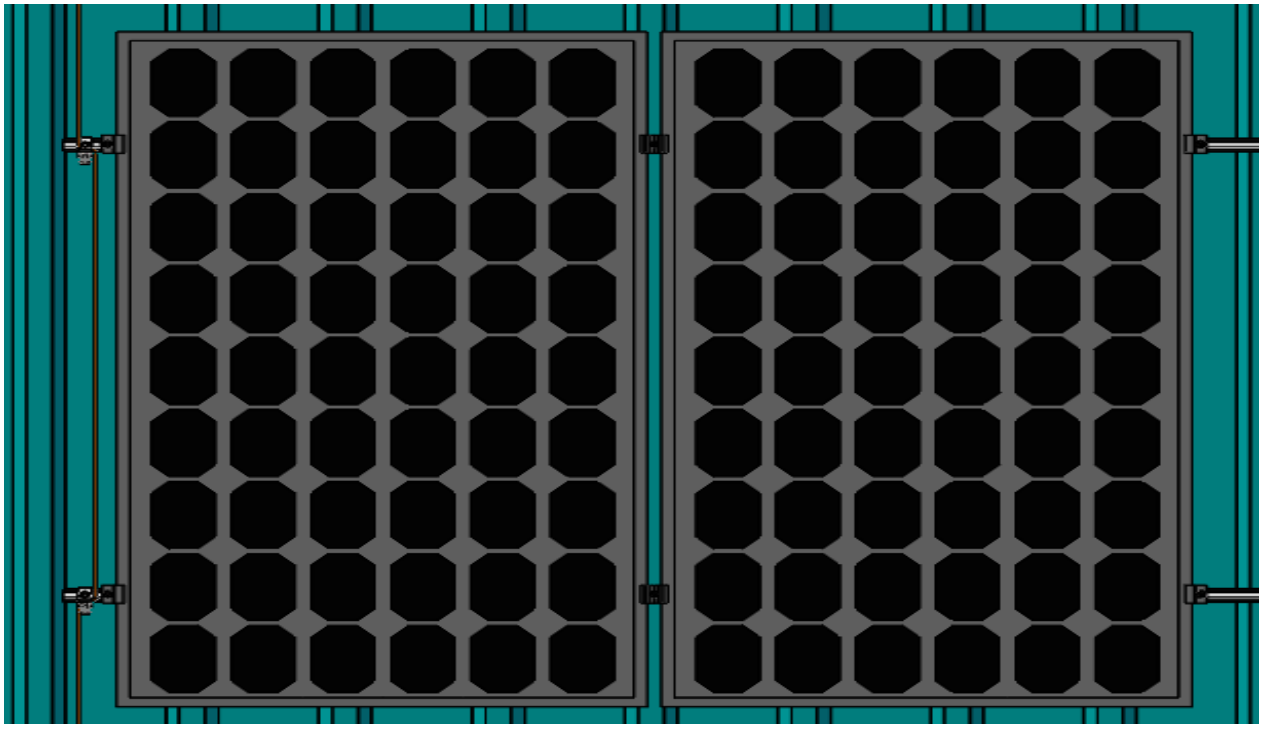
Solar Roof Mounting System Installation Manual

Model Type: Tin Roof Set



1. Introduction

GOOMAX Tin Roof Set is consisted of Aluminum Tin Feet, Rail, Rail splice, and Rail Clamps, which is applicable for Metal sheet roofs. Tin L feet with water-proof rubber pad will not damage the roof water-proof layer.

The system can achieve stable and strong connection between the roof support structure and solar modules. The pre-assembled kits save the installation time and cost on site. It can meet the demand of solar power stations from KW to MW.

During installation and especially when working on the roof:

Please review this manual thoroughly before installation.

Please comply with the appropriate occupational health and safety regulations.

Please also pay attention to other relevant regulations of your region.

2. Safety and Installer Responsibilities

1）Do not throw or roughly handle any solar components.

2）Do not bring solar roof set into contact with sharp or heavy objects.

3）Do not modify solar components in any way. Less or more components should be installed and used according to the normal tolerable range.

4）Installation of this system is to be performed only by professionally trained installer. Any attempt by an unqualified person to install this system could result in danger or serious injury.

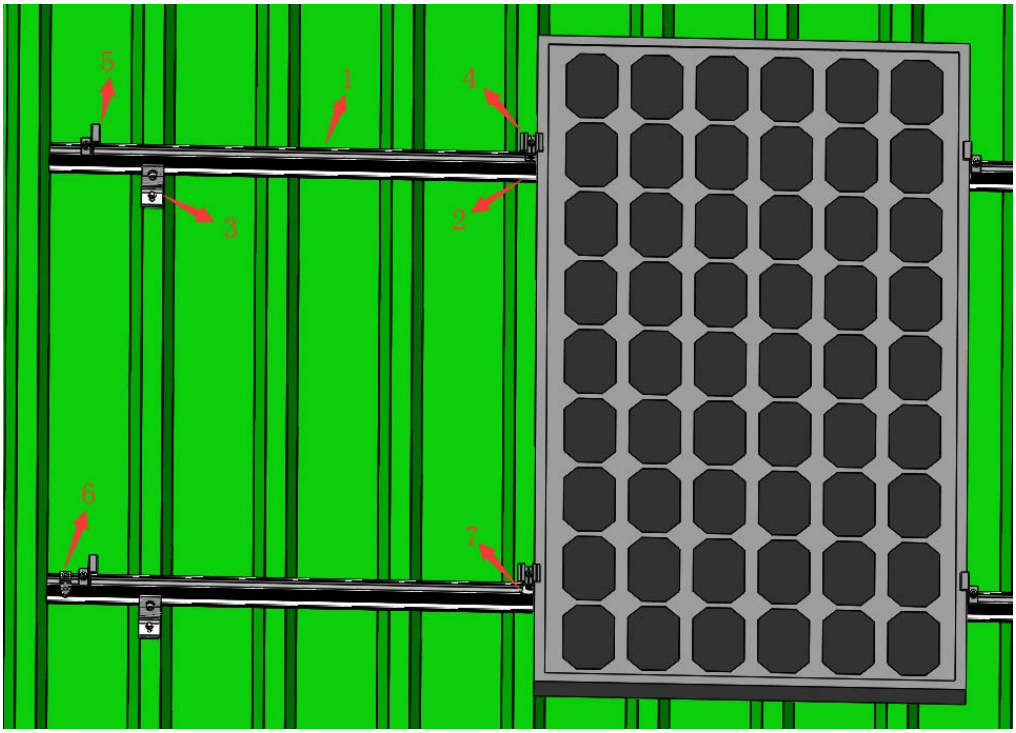
3.Technical Specifications

Item	Specification	Material	Tensile Strength	Yield Strength	surface treatment
Rail	28mm*55mm*4200mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Rail Splice	25mm*30mm*150mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Inter Clamp	40mm*42mm*Xmm(Bolts' length）	AL6005-T5	260Mpa	240Mpa	Anodizing

End Clamp	34.5mm*40mm*60mm	AL6005-T5	260Mpa	240Mpa	Anodizing
L Feet	40mm*40mm*80mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Grounding Lug	20mm*44mm*15mm	AL6005-T5	260Mpa	240Mpa	Anodizing
Earthing Clip	30.1mm*31.8mm*7.24mm	SUS304	635Mpa	235Mpa	

Item

1. Rail
2. Rail Splice
3. L Feet
4. Inter Clamp
5. End Clamp
6. Grounding Lug
7. Earthing Clip



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Components	Description
 Rail	The rail is extruded by aluminum profile AL6005-T5, and anodized with 10 micron layer to offer high corrosion resistance.
 Rail Splice	Extend rail to any length as required by the quantity or width of the solar panels. Included limit block, 1pc of T nut, 2pcs of M8*25 bolts, 2pcs of Spring washers, 2pcs of flat washers, and 2pcs of star washers. By connecting the rails, it can ensure the strength of the rails and serve as a conductive bridge to ensure the grounding of the rails.
 Inter Clamp	Fix between two panels. Included 1pc M8 bolt, 1pc M8 spring washer, 1pc T nut.

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 End Clamp	Fix end panels. Included 1pc T nut, 1pc M8*25 bolt, 1pc M8 spring washer.
 35/40mm Adjustable End Clamp	Fix end panels. Adjustable for the panels with 35mm/40mm thickness. There are two holes on the clamp, which can be adjusted to suit the thickness of 35mm/40mm solar panel. Long side for 40mm, short side for 35mm.

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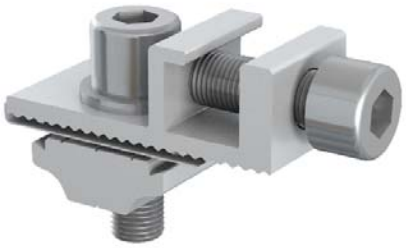
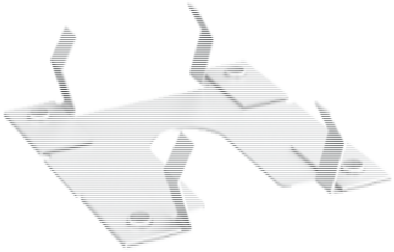
 Tin Feet	Tin L feet is consisted of L feet, with 1pc rubber pad, 1pc 6.3*80 wood screw, 1pc M8*25 bolt, 1pc spring washer, 1pc flat washer and 1pc T nut. It is mainly used for the connection between rails and metal roof.
 Grounding Lug	The grounding lug is consisted of T nut, M8*25 bolt, M8*20 bolt, cable clip, spring washer, flat washer. It is mainly used for the grounding of the rails and outer system.
 Earthing Clip	The earthing clip is mainly used for conducting the electricity between the solar panels and the rails. The thorns on the the clip pierce the solar panels, and the lower thorns pierce the rails to realize the electrical conduction between the solar panels and the rails.

4.The following tools are required for the installation

Tools for Installation	Description
 6mm Allen Key or hexagonal driver bit	Fasten and adjust inter /end clamp, rail splice, tin feet, grounding lug.
 Cordless drill	Drill of impact driver for driving roof material fixings. Noted: Do not spin too fast during the installation, wood screws can be broken easily. (Recommended torque is 8N*m).
 Ruler	Measuring installation position of the roof hooks, rail length, installation location of solar panels

 Spirit level	Check the level degree during installation of the rails and the solar panels.
 Gloves	Protect the hazard of the sharp corners.

5. Installation Plan

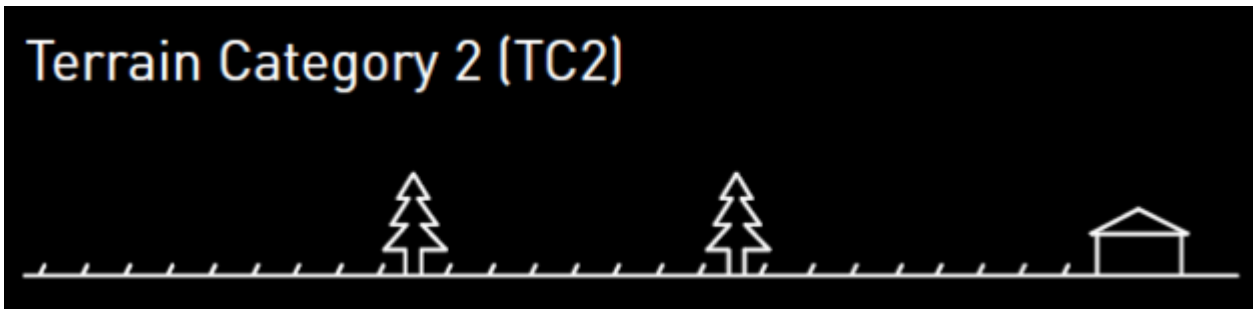
1. The length of the rail in portrait is evaluated as follows: panel quantity * (panel width +21mm) + 100mm
2. The length of the rail in landscape is evaluated as follows: panel quantity * panel length (Please refer to the panel installation instruction and the size of metal roof also.)
3. The Clamps' span can be 2.0m maximally in portrait.
4. Clamps' span can be about 1/2---3/4 of panel's length in landscape.

6. Determining Wind Terrains and Wind Regions

6.1DETERMINING WIND TERRAIN CATEGORY

- Terrain Category 2

Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 meters to 5 meters, with no more than two obstructions per hectare, e.g. farmland or cleared sub-divisions with isolated trees and uncut grass.



- Terrain Category 3

Terrain with numerous closely spaced obstructions having heights generally from 3 meters to 10 meters. For examples suburban housing or light industrial areas. Refer clause 4.2.1 of AS/NZS 1170.2-2011 Amdt 3-2013 for definition of Terrain category 3.

6.2 Determining Wind Region

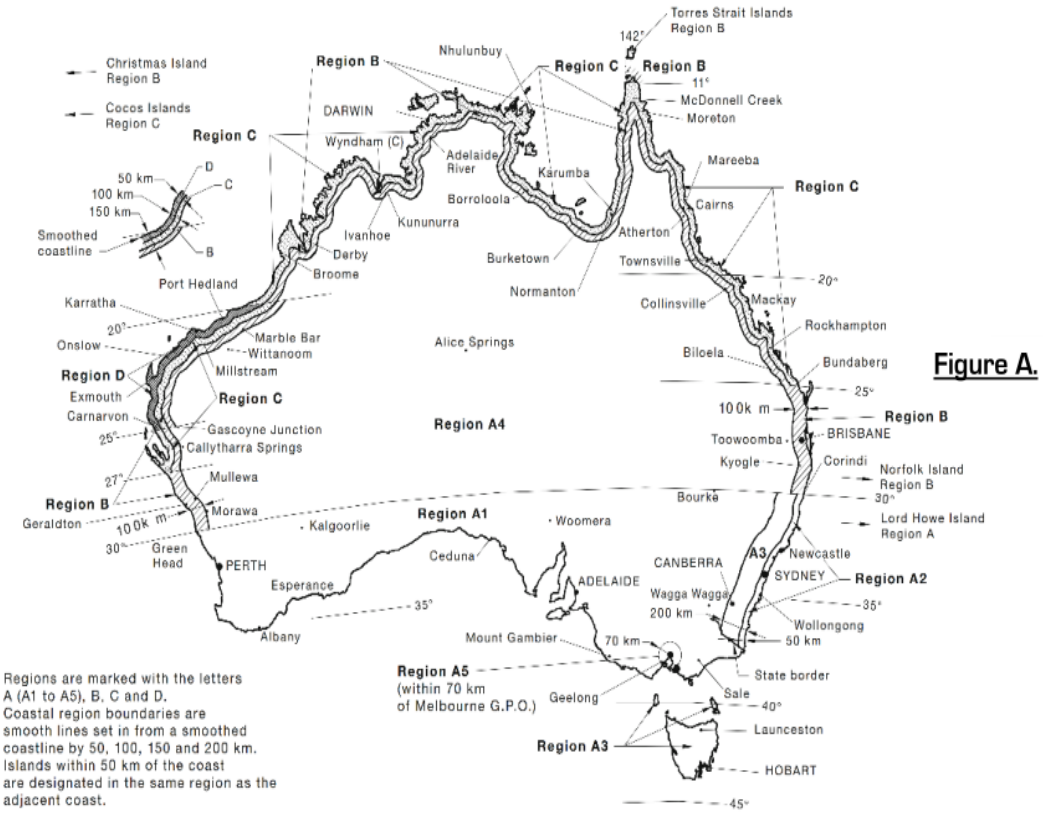


Figure A.

Figure: National wind map (in accordance with AS/NZS 1170.2:2011/Amdt 3:2012)

Wind Zone	A	B	C	D
Wind Speed (m/s)	41	48	69	88

Wind regions are pre-defined for all of Australia by Australian Standard AS/NZS 1170. The Wind Region has nothing to do with surrounding topography or buildings.

Wind Zone	A	B	C	D
Wind Speed (m/s)	41	48	69	88

6.3 Determine the roof height of your installation site

The document provides sufficient information for Goomax solar mounting system installation height less than 20m.

If your installation site is more than 20m in height, please contact us to obtain the engineering data first.

6.4 Determine roof installation Areas

Goomax solar mounting system can be installed on metal roof but fixing centers are required to be reduced at ridges and edges. Please refer to the following diagrams.

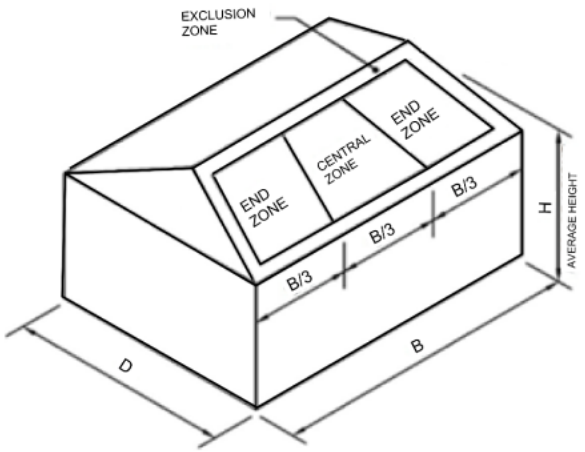


Figure B.

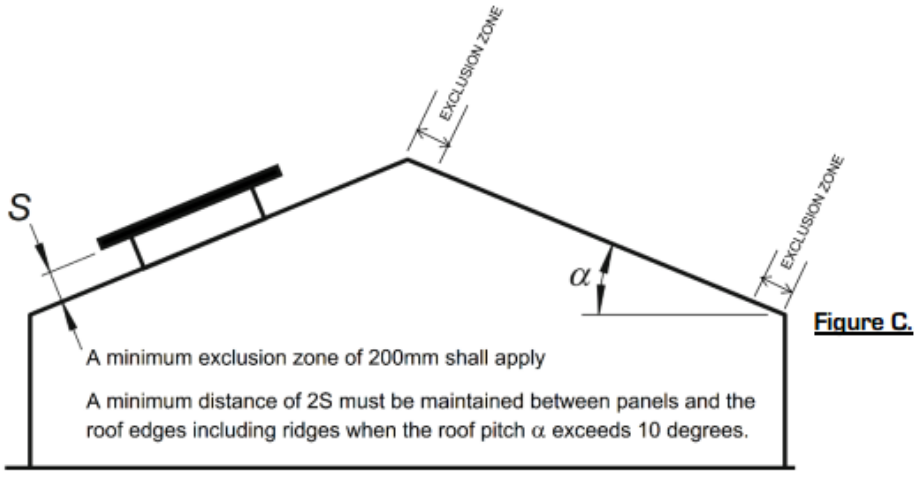


Figure C.

6.5 Determine the Maximum Rail spacing for metal roof installation.

Wind Terrain Category: WTC 2 & 3

Designed: **JD**
Checked: **AA**

Date: **Jun-20**

Flush Array Frame System Spacing Table for Tin Roof (Pierced Fix Roof) – mm

Type of Rail GM–R56
Type of Interface L-Feet
Solar Panel Dimension 1.67m x 1m
Terrain category **2**

Roof Angle (Φ) – Φ < 5°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1565	1685	1420	1565	1275	1510	1205	1475
B	1160	1425	950	1165	855	1050	805	985
C	600	735	490	600	445	545	420	515

Roof Angle (Φ) – 5°≤Φ ≤ 30°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1565	1770	1420	1665	1275	1600	1205	1565
B	1160	1685	950	1375	855	1235	805	1165
C	600	865	490	705	445	640	420	600

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Flush Array Frame System Spacing Table for Tin Roof (Pierced Fix Roof) – mm

Type of Rail GM–R56
Type of Interface L-Feet
Solar Panel Dimension 1.67m x 1m
Terrain category **3**

Roof Angle (Φ) – Φ < 5°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1680	1790	1680	1790	1590	1715	1525	1645
B	1405	1730	1405	1730	1215	1495	1080	1330
C	725	890	725	890	625	765	560	685

Roof Angle (Φ) – 5°≤Φ ≤ 30°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1680	1880	1680	1880	1590	1800	1525	1740
B	1405	1815	1405	1815	1215	1740	1080	1570
C	725	1050	725	1050	625	905	560	805

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Flush Array Frame System Spacing Table for Tin Roof (Pierced Fix Roof) – mm

Type of Rail	GM–R56
Type of Interface	L-Feet
Solar Panel Dimension	2m x 1m
Terrain category	**2**

Roof Angle (Φ) – Φ < 5°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1460	1585	1185	1465	1065	1315	1010	1240
B	965	1190	790	975	715	875	670	825
C	500	615	410	500	370	455	350	425

Roof Angle (Φ) – 5°≤Φ ≤ 30°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1460	1690	1185	1565	1065	1505	1010	1470
B	965	1410	790	1145	715	1035	670	970
C	500	720	410	590	370	535	350	500

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Flush Array Frame System Spacing Table for Tin Roof (Pierced Fix Roof) – mm

Type of Rail GM–R56
Type of Interface L-Feet
Solar Panel Dimension 2m x 1m
Terrain category **3**

Roof Angle (Φ) – Φ < 5°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1580	1710	1580	1710	1500	1615	1360	1550
B	1175	1450	1175	1450	1010	1245	900	1110
C	605	745	605	745	520	640	465	570

Roof Angle (Φ) – 5°≤Φ ≤ 30°

Wind Region	Building Height – H (m)							
	H≤5		5<H≤10		10<H≤15		15<H≤20	
	End	Central	End	Central	End	Central	End	Central
A	1580	1795	1580	1795	1500	1720	1360	1645
B	1175	1720	1175	1720	1010	1475	900	1310
C	605	875	605	875	520	755	465	670

General Notes

Note 1 Following components are satisfied to use according to AS/NZS 1170.2-2011(R2016)

Components	Part Number	Description
Rail	GM-R56	As per drawing provided by client
Splice	GM-RS-51-AZ GM-RS-51-AZ-1 GM-RS-56-AZ	
L Feet	GM-MRH-LDS-AZ GM-MRH-L5-AZ	
Mid clamp	GM-MC-30-AZ GM-MC-35-AZ GM-MC-40-AZ GM-MC-45-AZ GM-MC-50-AZ	
Adjustable Mid / End Clamp	GM-EC-35(40)-AZ GM-MC-35(40)-AZ GM-MC-35(40)-AZ-2 GM-MC-35(40)-AZ-1	
Thin Film Mid/ End Clamp	GM-MC-60-TF2-AZ GM-EC-60-TF2-AZ	
End Clamp	GM-EC-30-AZ GM-EC-35-AZ GM-EC-40-AZ GM-EC-45-AZ GM-EC-50-AZ	
Earthing Clip	GM-E-EL-AZ GM-E-EL-12	
Grounding Lug	GM-EK-AZ	
Cable Clip / Cable Tie	GM-XJ-AZ GM-SL-XJ-AZ GM-CT-AZ	
Earthing Clip / T Nut	GM-BR-02-AZ GM-BN-25-AZ	

Note 2 Spacing calculated based on 1.9mm steel purlin or 35mm screw embedment length into timber (JD4 seasoned timber).

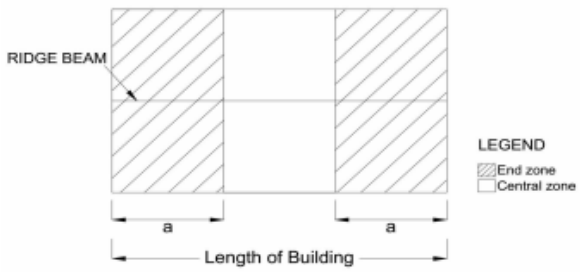
Note 3 Recommended screws

Metal Purlins/Battens	14g-10 TPI Teks screws or approved equivalent
Timber Purlins/Battens	14g-10 TPI T17 screws or approved equivalent

Note 4 Maximum uplift wind pressure is limited to 5 kPa. "--" states more uplift pressure.

Note 5 Deflection is limited to Minimum of L/120 and 15mm

Note 6 Refer Figure D9 of AS/NZS 1170.2:2011 (R2016) for definition of (End/Central) roof zones.



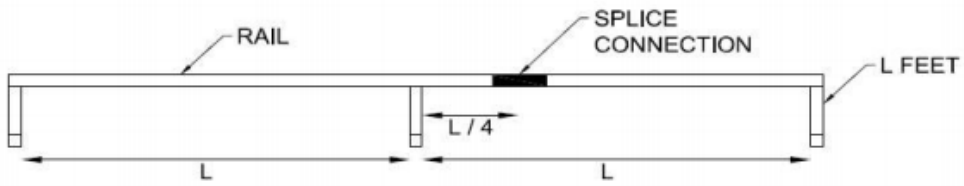
The value of dimension "a" is 1/3 of the length of building

Note 7

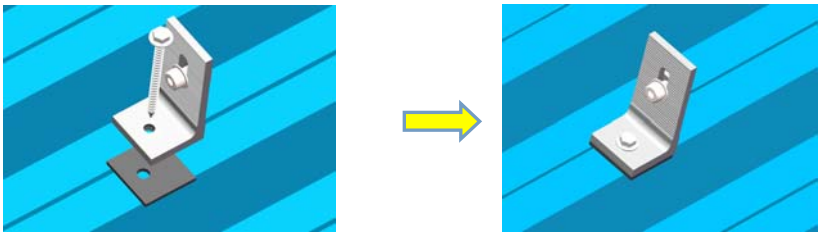
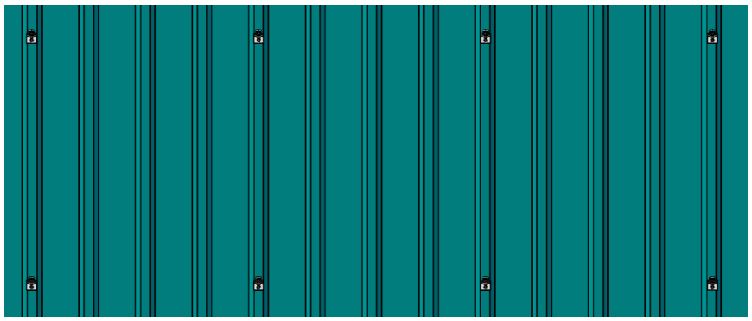
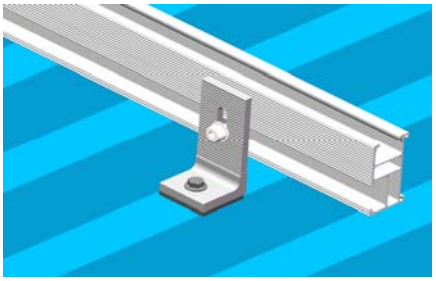
Terrain Category 2 (TC2) refers to open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.
Terrain Category 3 (TC3) refers to terrain with numerous closely spaced obstructions having heights generally from 3 m to 10 m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare, e.g. suburban housing, light industrial estates or dense forests.

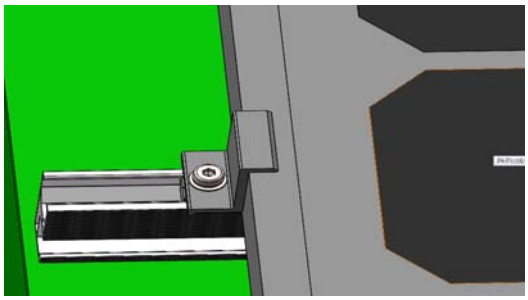
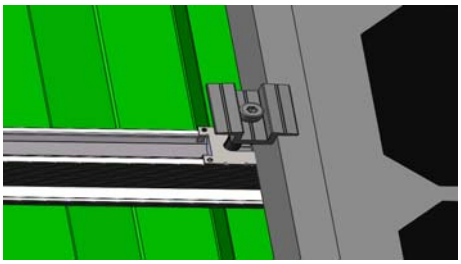
Note 8

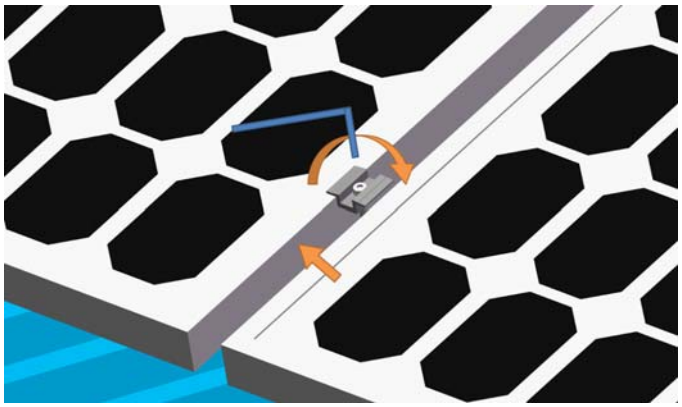
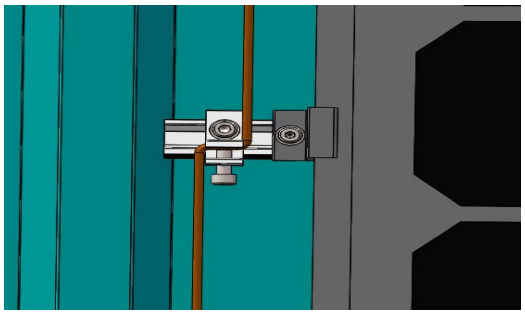
The optimised location of rail splice connection is at quarter length of the spacing of the interface. No Splice connection should be placed at the centre of spacing or over the interface.

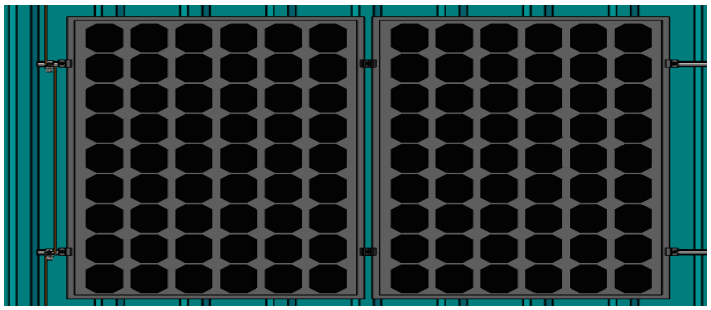


6. Installation Guide

1.Tin Feet Installation	
1. Penetrate M6.3*80 self-tapping screw through L feet, water-proof rubber and metal roof, fasten the screw into the rafter.	
2. Complete fixture installation according to the engineering drawing.	
3. Rail installation: Fix the rails with L feet. (L feet includes M8*25 bolt, spring washer, flat washer and M8 bolt)	

4.Rail Splice installation: As the right shown, insert each half of the rail splice into the rails, and fix it with fastening bolts.	 
5. Slide the module end clamp tightly against the module and fasten tightly by the Allen key (Recommended torque is 8Nm).	
6. Insert the pre-assembled inter-clamp into the rails, place it firmly against the module and fasten tightly (approx. 2- 3 turns).	

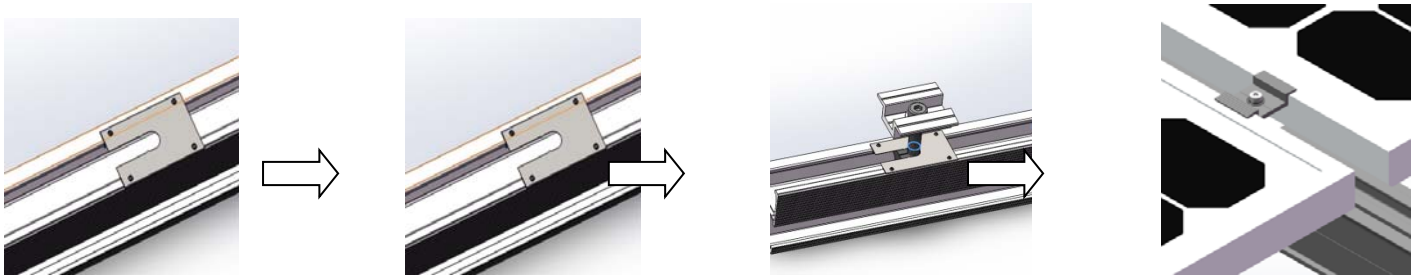
7. Now slide next module against the previously installed module. Ensure that the vertical side of the module frame is in contact with the vertical surface of the inter clamp. (Recommended torque is 8Nm).	
8. Grounding Lug. Fix the grounding lug on the rail, and fasten with 6mm Allen key. Pass the wire through the grounding lug, adjust the bolt to secure and lock. (Recommended torque is 8Nm).	

9. The final installation.	

Note: For the definition of Downwind, Upwind end and central, refer figure D9 from AS/NZS 1170.2-2011.

7. Installation of Mid Clamp Conducting Plate

In case mid clamp conducting plates are required for the project, please place conducting plates beneath the mid & end clamps, and install as per step 5

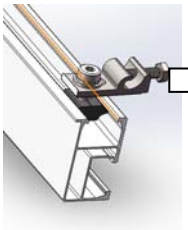


Place conducting plate on Rail	Place solar panel on one side of the plate	Install mid clamp as per step 6.	Fix another panel on the other side of the conducting plate

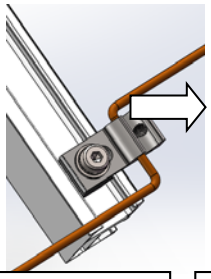
8. Installation of Grounding Lug

Grounding lugs might be needed in some projects.

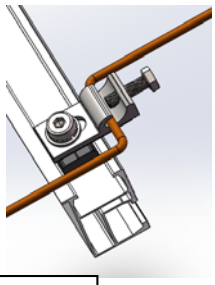
Ground lug is pre-assembled as above



Insert the T-shaped block into the rail slot properly, and fasten well.

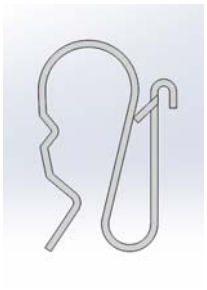


Insert grounding cables into the lug's duct

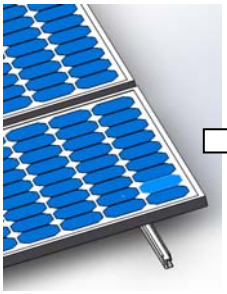


Fasten the cables with the accessory hexagon screw

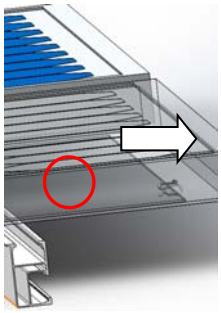
9. Cable clip installation for panel



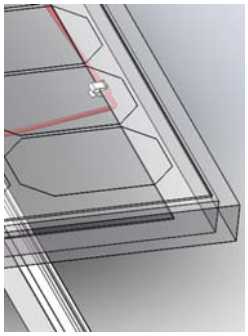
Panel wire clip as the above



Fasten panels onto the rails.



Clamp the wire clips onto the aluminum frame of panels



Pass the wires through wire clips

Xiamen Goomax Energy Technology Co.,Ltd

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Product Warranty

§ 1 Limited Warranty

A. **Xiamen Goomax Energy Technology Co.,Ltd** hereinafter referred to as "Goomax Energy", warrants only to its direct customers that the solar mounting products offered by Goomax Energy, will be free from defects in workmanship and material during the applicable warranty period identified in as the following:

1) The warranty period for all metallic product components is 10 years.
2) The warranty period for all non-metallic product components is 3 years.
3) Each warranty period commences on the date of delivery of the Product to the Customer.

B. This Limited Warranty sets forth Goomax Energy's total and exclusive warranty obligation. Goomax Energy does not assume, nor authorize any person to assume for it, any other liability in connection with the sales of its Products.

C. This Limited Warranty does not cover any adverse effects on any Product or any Product defects which arise because:

1. The Product was not assembled and installed in accordance with the assembly and installation instructions and the applicable technical norms and regulations;
2. The Product was not assembled and installed by qualified personnel defined in the installation manual;
3. The Product was not transported, installed, assembled, tested or operated in accordance with best prudent industry methods and practices;
4. The Product was not used in accordance with the published technical specifications or the Product was used contrary to the intended purpose as specified in the installation manual;
5. The Product was not properly stored before or during the assembly/installation phase;
6. Interferences with or changes to the Product or its accessories were made without the express written consent of Goomax Energy;
7. Accessories which are not original Goomax Energy's accessories were used in connection with the Product;
8. The Product was subject to extraordinary environmental conditions (e.g., excess voltage, magnetic fields or similar circumstances);
9. The Product was subject to a force majeure (as defined in § 3A below);
10. A heightened salt content in the ambient air or oxidation-provoking metal combinations (e.g., copper) have caused corrosion at the installation site of the Product; or
11. The load capacity of the roof construction and/or the foundations, footers or ground has not

been assured according to the accepted state-of-the-art technology and applicable technical norms and regulations.

D. If any Product fails to operate during the applicable warranty period due to a warranted defect in workmanship or material, Goomax Energy shall either, at its option and expense and as its sole and exclusive obligation, carry out a professional repair of the defective Product component in question or replace the defective component with a new or updated component.

E. Performance under this Limited Warranty will not trigger the commencement of a new warranty period, nor will it extend the applicable warranty period.

§ 2 Procedures in the Event of a Warranty Claim

If the Product exhibits defects that are covered under this Limited Warranty, then please promptly contact Goomax Energy Customer Service at (0086) 592-2938661 or by the fax number (0086) 592-2938662. Please have the following information available when contacting us by phone:

- Your name, address, ZIP or postal code and a telephone number where you can be contacted.
- The Product model description
- Purchase receipt containing the date and Customer's address
- Warranty certificate of the defective Product (if available)
- The date of installation
- The location and address of installation
-A complete listing of the observed defects and additional information which could help in analyzing the defect.

The following documents and information must be made available to Goomax Energy upon request:

- Photographs of the damaged Product(s)
- System circuit diagram(s)
-Any pertinent system monitoring or data capture records

§ 3 Warranty Limitations and Final Provisions

A. This Limited Warranty does not apply if the defects or discrepancies in the condition of the Product are not material and such defects or discrepancies are insignificant with respect to the value or conforming use of the Product.

B. Goomax Energy is not liable for any delays or failure to provide the warranty performance listed in § 1, if that delay or failure is caused by force majeure (i.e., war, war-like conditions, terrorism, vandalism, earthquake, civil unrest, strikes, epidemics, fire, flooding, lightning strike, hail or other similar circumstances which are beyond Goomax's control).

C. The total scope of liability under this Limited Warranty is limited to the purchase price paid by the Customer for the individual Product.

D. The foregoing provisions state Goomax Energy’s entire liability, and the Customer's exclusive remedy, for any breach

of warranty. In no event will Goomax Energy be liable for any consequential or incidental damages arising from or out of the installation or use of any product, or any breach of warranty; Without limiting the foregoing, Goomax Energy shall not be liable for personal injury, property damage, lost profit, lost revenue, advertising or manufacturing costs, overhead costs, lost customers, operational disruptions or down-time resulting from the installation or use of any product or any breach of warranty.

MAINTENANCE AND CLEANING

6005-T5 anodized aluminum is largely maintenance free. Only in highly polluted or marine conditions is rinsing with clean water required, during scheduled panel cleaning.

REFERENCES

AS/NZS 1170.2:2011/Amdt 3:2012 on wind actions

AS/NZS16641.1:1997 on aluminum structures

AS1720.1:2012 on timber structures AS/NZS4600:2005 on cold-formed steel structures

AS3566-2011, self-drilling screws for the building and construction industries.

APPENDIXES:

- ASNZ 1170.2 Certification for Roof Mount P V Array Systems-Tin Roof
- ASNZ 1170.2 Certification for Roof Mount PV Array Systems-Tile Roof
- ASNZ 1170.2 Certification for Roof Mount PV Array Systems-Tilt Roof

These Engineering Certificates contain important installation requirements. Please obtain these from the local distributor.