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Grasol Adjustable Racking System
Installation Guide

Grasol Adjustable Racking System has developed to mount the module tilt a certain angle on a flat roof or ground. You can have the adjustable angle solution as 10-15deg, 5-30deg and 30-60deg according to your exact requirement. The special extruded aluminum rail, tilt-in module, clamps and legs should be pre-assembled to make the installation easy and quick for saving your labor cost and time. Besides, the customized length of rail will not require onsite weld and cut, keeping the appearance entirety, structural strength and anticorrosive performance.

The installations please follow the procedures and precautions in these instructions carefully. And it must be complied with the local construction acts and the safety laws.

1. Introduction

1.1 Intended use

- Are intended to be used by individuals with sufficient technical skills for the task. Knowledge and use of hand tools, measuring devices and values is also required.
- Include various precautions in the forms of Notes, Cautions, and Warnings. These are to assist in the assembly process and/or to draw attention to the fact that certain assembly steps may be dangerous could cause serious personal injury and/or damage to components. Following the step-by-step procedures and these precautions should minimize the risk of any personal injury or damage to components making the installation not only safe but an efficient process.

1.2 Service life warranty

Grace Solar provides a warranty of 10 years for the service life of all materials used.

1.3 Safety

The following basic safety instructions and warning symbols form an essential part of this manual and are of fundamental importance when handling this product.

- Do not remove or disable any safety devices
- Comply with the relevant safety regulations.
- The presence of a second party who can provide help in the event of an accident is obligatory during the entire installation process.
- Keep a copy of this installation manual in the immediate vicinity of the system.

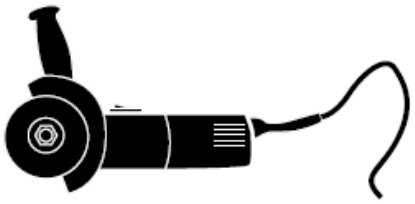
1.4 Responsibilities of the owner/operator

The system operator has the following safety-related responsibilities:

- To ensure that installation of the system is only carried out by individuals with specialist technical knowledge and basic knowledge of mechanical engineering.
- To ensure that those commissioned to perform the work can evaluate their assigned tasks and recognize possible risks.
- To ensure that those commissioned to perform the work are familiar with the system components.
- To ensure that the installation manual is available during installation. The installation manual is an integral part of the product.
- Ensure that the installation manual, and in particular the safety instructions, are red and understood by the relevant personnel before installation.
- Ensure that the permissible operation conditions are observed. Mounting systems is not liable for damage occurring when these conditions are not adhered to.
- Ensure the durability of all connections and the attachment of the system.
- Ensure that suitable lifting gear is used for installation.
- Ensure that only Mounting System components are used when parts need to be replaced. Otherwise any warranty claim is null and void

2. Tools For Installation

The following tools are required for the installation:

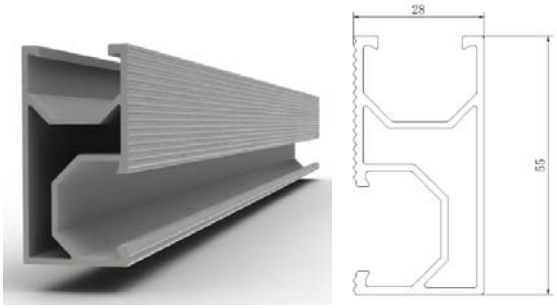
✓ 6 mm Allen key or hexagonal driver bit. If using a 6mm driver bit, make sure the cordless power tool used for the driving has a hand-tight clutch setting a fine (soft) impact drive to prevent damage to the fragile glass panels and threads on the Structure.	
✓ Cordless drill; Drill or impact driver for driving roof material fixings	
✓ Angle grinder; For terracotta tile roof installation, and angle grinder fitted with a continuous edge diamond tipped tile0cutting blade; gloves, hearing protection, a face protection mask, and a suitably rated breathing protection mask for all people in proximity of grinding	
✓ Gloves; Protect the hazard of the sharp corners.	
✓ Cord or color pen; Mark the installation position;	
✓ Spirit level	
✓ Rule	
✓ If necessary, timber to shim the legs	

3. Components

GD-Rail

- ✓ hold each panel row
- ✓ length can be customized
- ✓ 6005-T5 extruded aluminum

Standard Rail Length	
808~826mm wide panels	990~1020mm wide panels
2560mm	
3405mm	4200mm



GD-Rail Splice Kit

- ✓ Extend GD-Rail to any length as required by the quantity or width of the solar panels

Inter Clamp Kit for Framed Modules

- ✓ Fit between two panels
- ✓ Fastened with a 6mm Allen key
- ✓ Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

End Clamp Kit for Framed Modules

- ✓ Hold the edge of each end panels
- ✓ Fastened with a 6mm Allen key
- ✓ Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

Adjustable End Clamp Kit

- ✓ Hold the edge of each end panels
- ✓ Fastened with a 6mm Allen key
- ✓ Adjustable for the panels with thickness from 25~60mm

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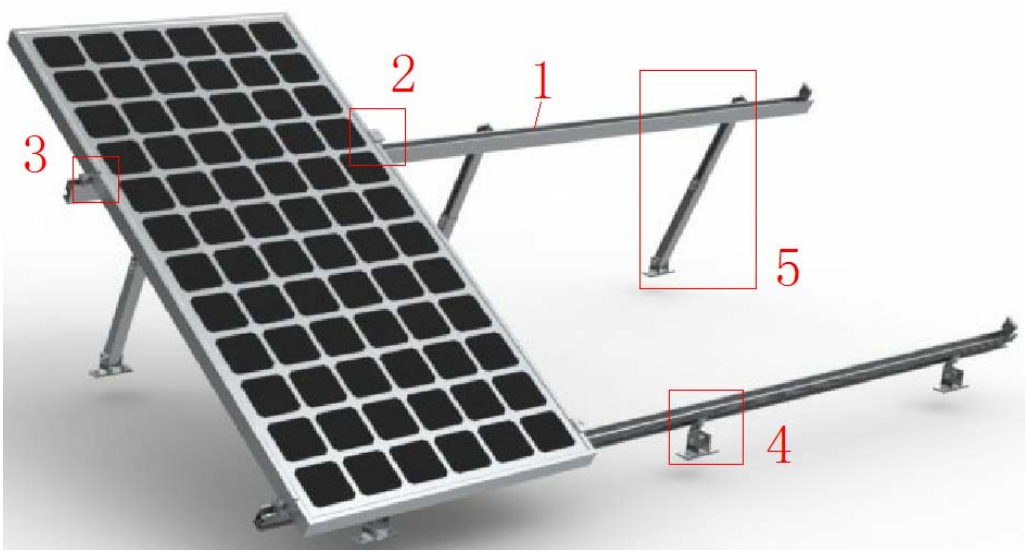
Support Leg	
Adjustable Front Leg ✓ Pre-assembly ✓ Include 2pcs st6.3x80 wood screws	
Adjustable Rear Leg 10/15 ✓ Pre-assembly ✓ Adjust angle from 10 deg to 15 ✓ Include 2pcs st6.3x80 wood screws	
Adjustable Rear Leg 15/30 ✓ Pre-assembly ✓ Adjust angle from 15 deg to 30 ✓ Include 2pcs st6.3x80 wood screws	
Adjustable Rear Leg 30/60 ✓ Pre-assembly ✓ Adjust angle from 30 deg to 60 ✓ Include 2pcs st6.3x80 wood screws	

4. System overview

All components of the system are listed below. The version and quantities of the parts can vary, depending of

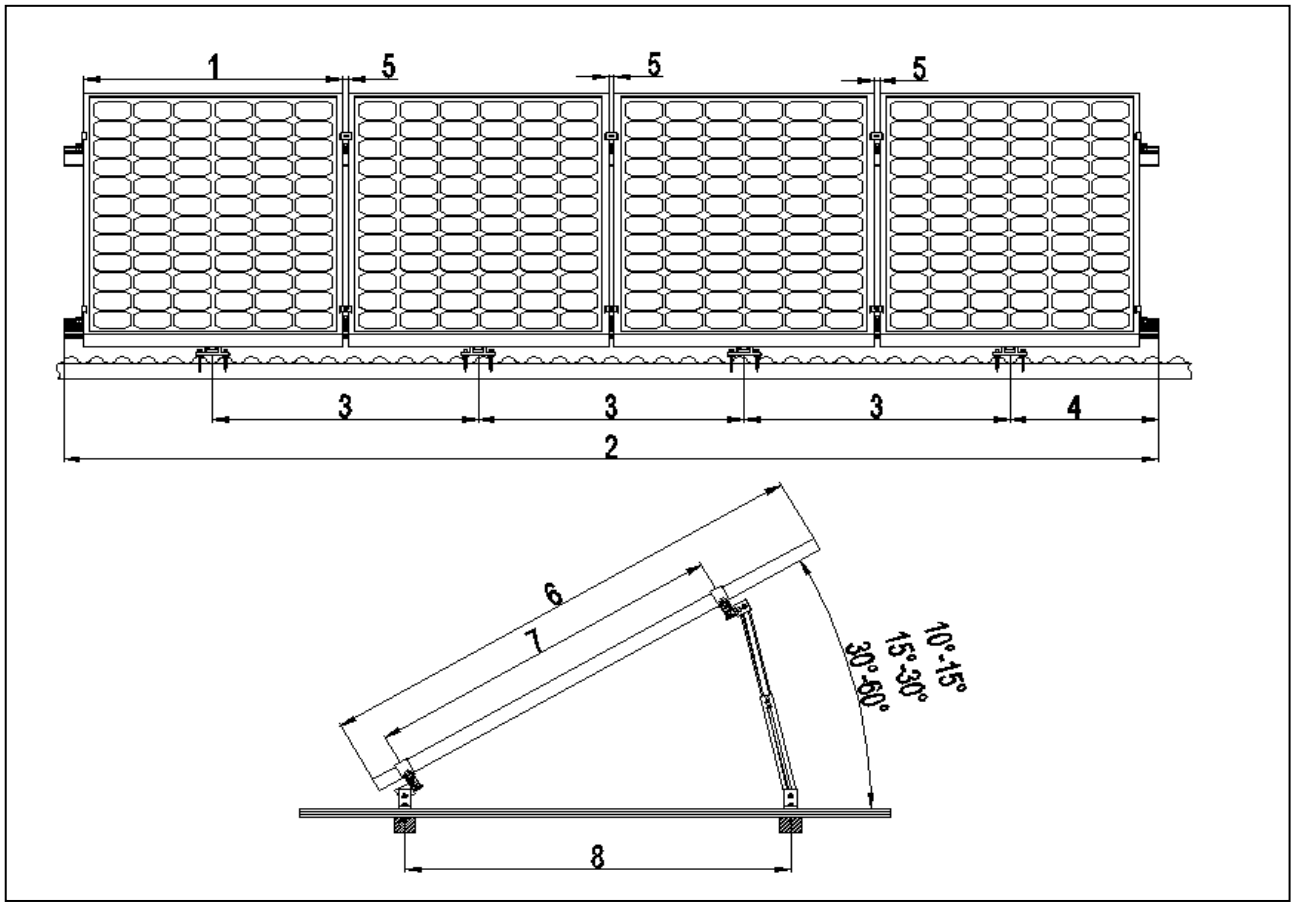
- Type of roof
- Number of modules
- Type of module
- Site specifics



Item	Code	Description
1	GS-DR-3405	GD-Rail
2	GS-IC-F46	Inter Clamp Kit
3	GS-EC-F46	End Clamp Kit
4	GS-AD-FL	Adjustable Front Leg Kit
5	GS-AD-RL15/30	Adjustable Rear Leg Kit
6	GS-DR-SP	GD-Rail Splice (optional)

5. Installation Dimension

Below, the distances between roof connections for a portrait installation are specified. Clamp-on Front and Rear Legs need to be installed in specific distances, depending on the distance of rafters and the stoical conditions.



1. Width of the module
2. Length of GD-Rail: number of modules horizontally x (width of the module + 18 mm)+32 mm
3. Distance between roof connections horizontally: Depending on the distance between rafters and on the static requirement.
4. Cantilever Length: less than half of dimension 3
5. Distance between modules: 17 mm
6. Length of the module
7. Length of support: similar with the dimension 8
8. Front and Rear Space: 1200~1400mm

6. code-compliant AS/NZS 1170 planning

6.1 Determine the wind region of your installation site

Region Definition:

FIGURE 3.1(A) WIND REGIONS

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

- Most of Australia is designated Region A which indicates a Regional Ultimate Basic Wind Velocity of 45msec.
- Some areas are designated Region B (57msec). Local authorities will advise if this applies in your area.
- Region C areas (66msec) are generally referred to as Cyclonic and are generally limited to northern coastal areas. Most Region C zones end 100km inland.
- Region D (80msec) Australia's worst Cyclonic Region between Carnarvon and Pardoo in Western Australia.

6.2 Determine the height of the of your installation site

This document provides sufficient information for Grace solar system installation height less than 20 meters. If your installation site is more than 20 meters in height, please contact Grace solar to obtain engineering data to support your installation.

6.3 Determine the Maximum Rail Support Spacing

Please use the following table to determine the GD-Rail support spacing for the tilt system installations.

a. 10 to 15deg

Max1970mm Long Panels fixed to Metal Sheet Roof				
Installation Height	**Region A (mm)**	**Region B (mm)**	**Region C (mm)**	**Region D (mm)**
Max area 1 panels	**3.0m^2**	**2.5m^2**	**2.0m^2**	**1.5m^2**
5 Meters	1560	975	660	405
10 Meters	1420	890	600	370
15 Meters	1345	845	570	350
20 Meters	1275	800	540	330

b. 15 to 30deg and 30 to 60deg

Max1970mm Long Panels fixed to Metal Sheet Roof				
Installation Height	**Region A (mm)**	**Region B (mm)**	**Region C (mm)**	**Region D (mm)**
Max area 1 panels	**3.0m^2**	**2.5m^2**	**2.0m^2**	**1.5m^2**
5 Meters	770	530	330	205
10 Meters	635	440	300	185
15 Meters	580	400	260	160
20 Meters	550	380	235	145

- ✓ The above figures are based on modules lengths of up to 1970mm, maximum weight is 15Kg/m^2
- ✓ The above spacing applies for fixing through thin sheet purlins (greater than 0.75mm thickness) or a minimum embedment of 50mm into timber purlins.
- ✓ Tilt system should be fixed to the purlins under using 2 SCW-12G-P screws (M6*80mm).
- ✓ For 35mm min embedment into timber or fixing into 0.55mm thickness sheet purlins the max length of module should be reduce to 1700mm the max spacing reduced by 20%
- ✓ Please note that the screws provided with our products are designed for mounting into wooden structures.
- ✓ For solar panel installed in the edge zone. The max support spacing should be half.

6.4 Verify acceptable Rail End Overhang

Rail End Overhang must equal 50 percent or less of foot spacing. Thus, if foot spacing is 1200mm, the Rail End Over hang can be up to 600mm. In this case, two feet can support a rail of as much as 2400mm (1200mm between the feet and 600mm of overhang at each end).

6.5 Determine Roof slope

Grasol system can be used for roof slope up to 60 degrees. Please verify the Installation site roof slope should be between 0 degrees and 60 degrees.

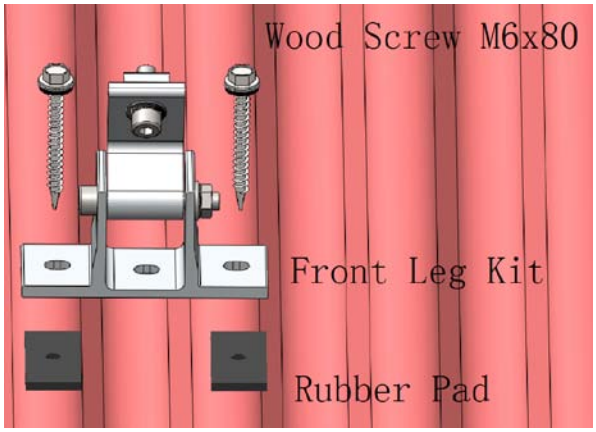
6.6 Determine Roof Installation Roof Areas

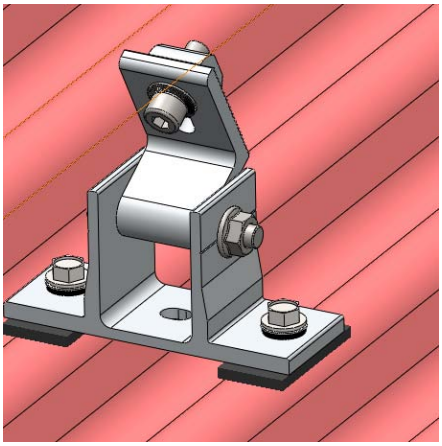
Grasol Tilt System can be installed using those spacing everywhere on the roof.

7. Installation Guide

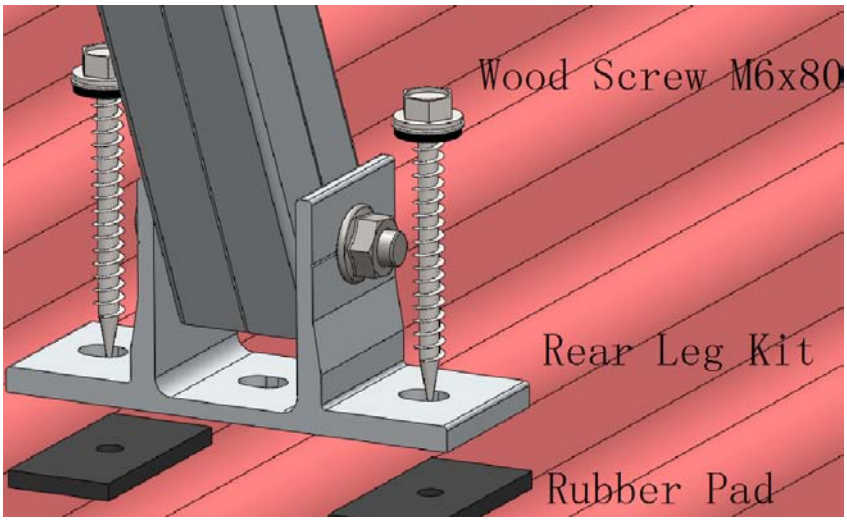
7.1 Install the Front Leg and Rear Leg

a. After selecting proper spaces on the roof according to chapter 1.1 and 1.2, install the first front leg as picture showed left below. Adjust the location of front leg (assuring the down surface of front leg being parallel to the edge of the roof). Put the 25x50mm rubber under the front leg, and align the screw holes. Fix the front leg kits to the roof with M6x80 wood screw, locked as right below picture shown.
(if the foundation is concrete, please comply with the Chapter 6.2 to install)

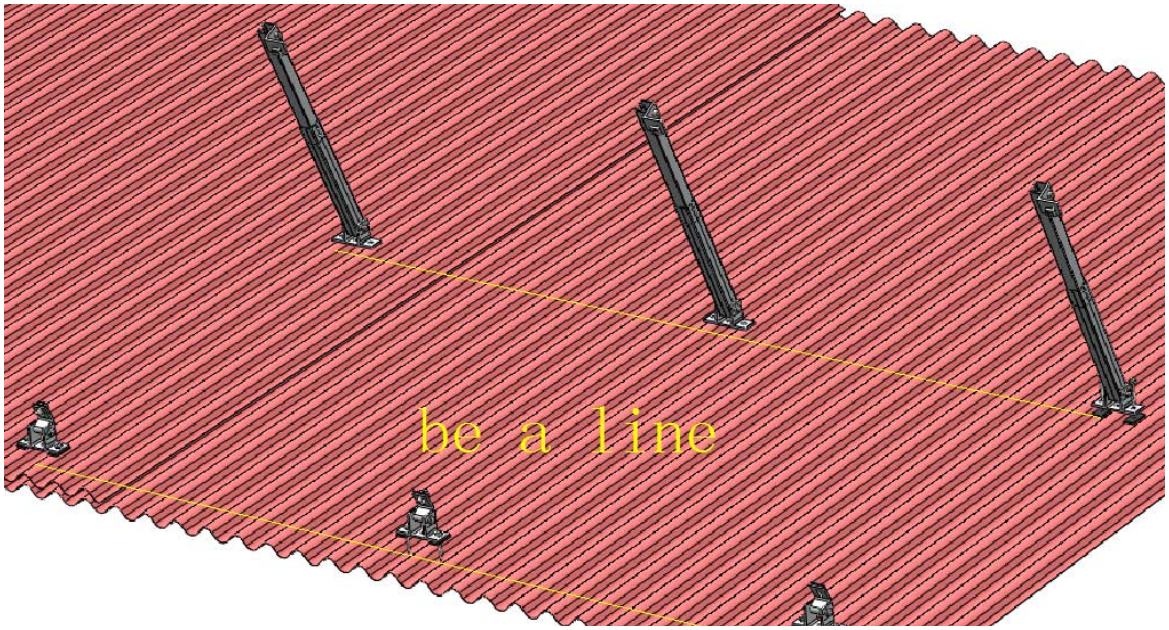




b. As installation way of the first front leg, adjust the arrangement of the rear leg (assuring the down surface of front leg being parallel to the edge of the roof). Vertically be in line with the front legs, and fix the rear legs to the roof beam with wood screws, as picture shown below:

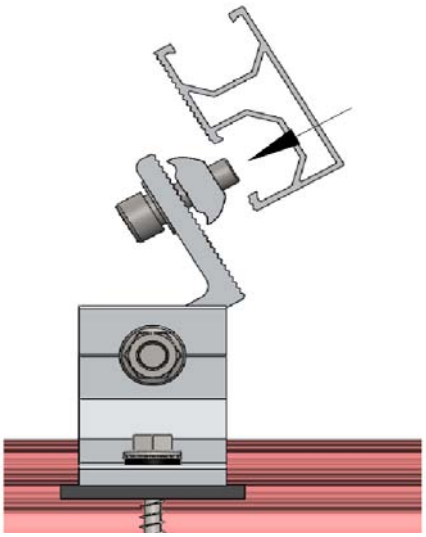


c. Comply with the Step a and b, finish the installation of the other legs; please make sure the legs are in one line.

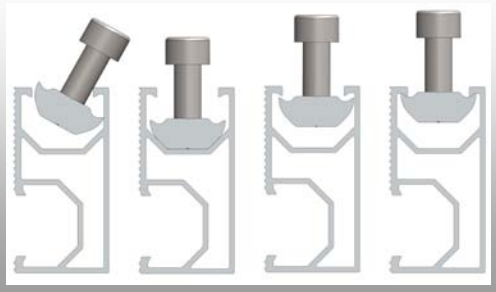


7.2 Install the GD-Rail

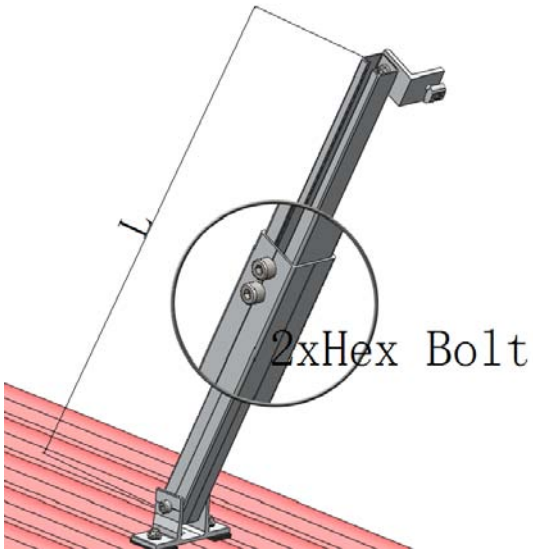
a. Put the D-Module of front legs into the GD-Rail groove. Adjust the length left at 2 terminals of rail. Then lock screws.

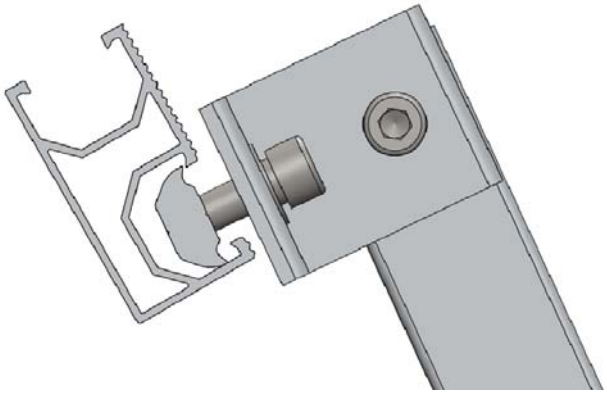


Grasol patented product：4 steps of easily installing the tilt-in module to GD rail



b. Loosen the 2 Hex screws in the rear leg and adjust the length of rear legs as per demanding angle. Adjust the H of 4 rear legs in the same line and lock the screws, shown as left below picture. Then put the D-Module into rail groove as per last step and adjust the location of rail, keeping the rail being parallel to the rail on front legs. Then lock one by one as right below picture shown:



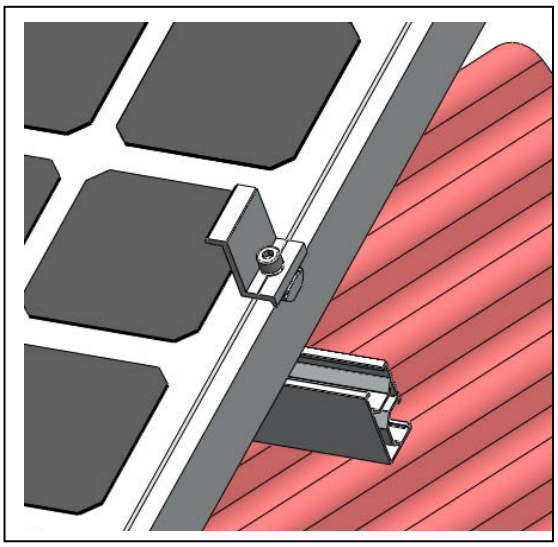


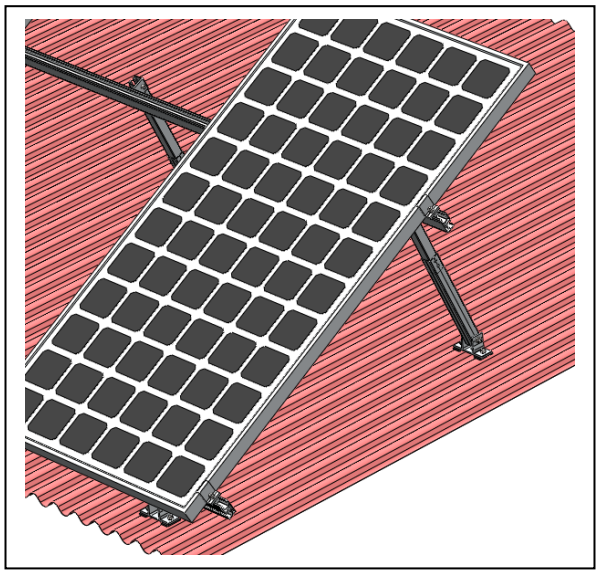
7.4 Install the Module

Installation of modules from one side of rail to the other side

a. Installation of End Clamp

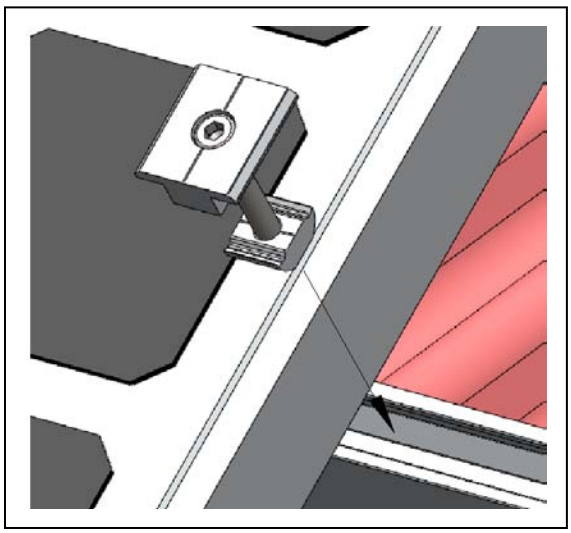
End clamps are designed to install at the end of each string panels. Tilt the end clamp into the upper groove of rails. After slightly locking the screw, put the panel on rails. Lock the end clamps after adjusting location of the panel.

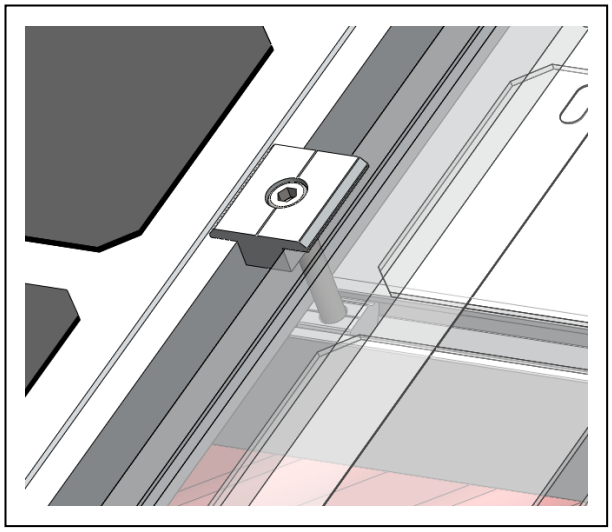




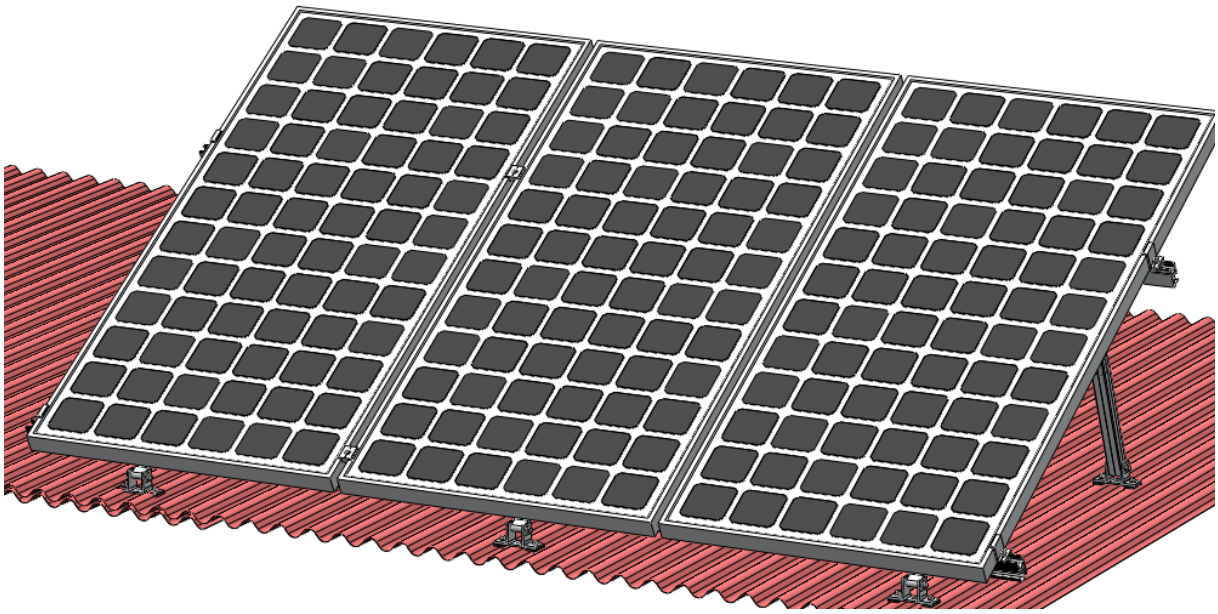
b. Installation of Inter Clamp

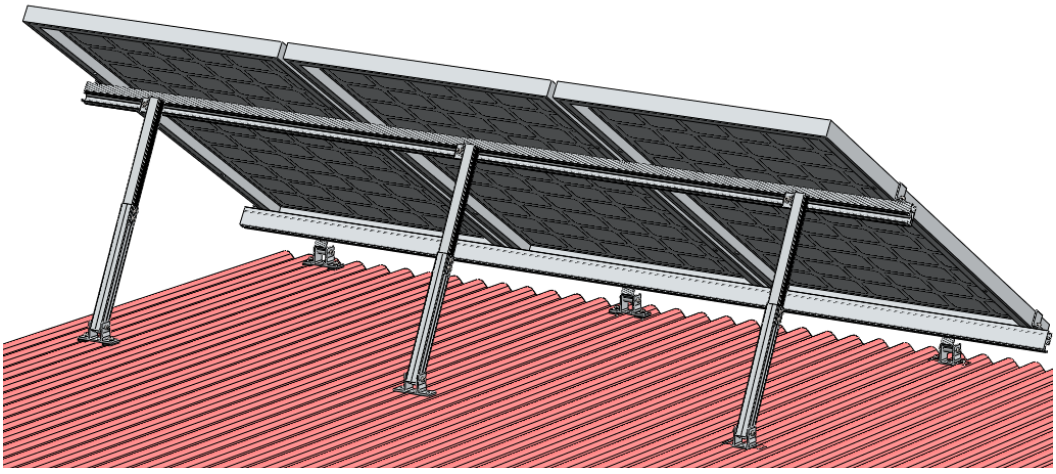
Inter clamps are designed to fix between 2 solar panels. Tilt the inter clamp into the upper groove of rails. After slightly locking the screw, put another panel on rails. Lock the inter clamps after adjusting location of the panel.





c. Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.

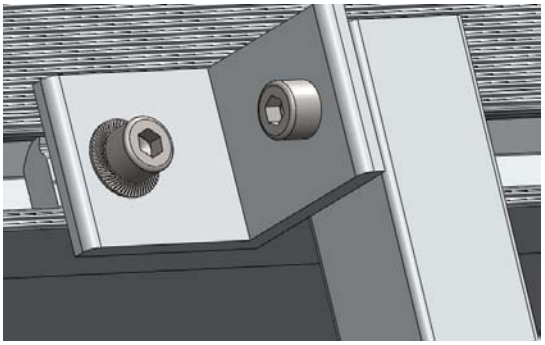


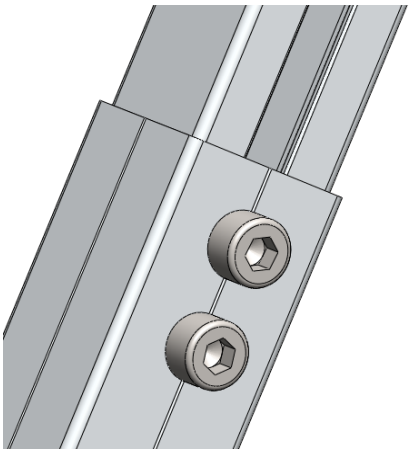


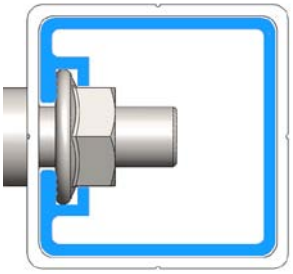
7.5 Adjust the Angle

If needing to adjust the tilt angle of panels to mostly using the solar energy after finished installation of whole system, please adjust the lengths of rear legs to achieve it, shown as below pictures:

a. Slightly unlock the screw on rear leg with a wrench, shown as left blow picture. Then unlock the 2 screws on rear legs and adjust, shown as right below picture:

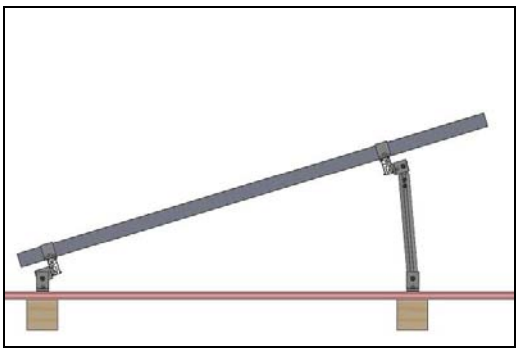


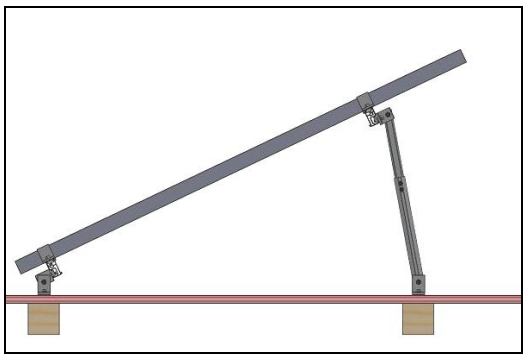




Telescopic Tubs

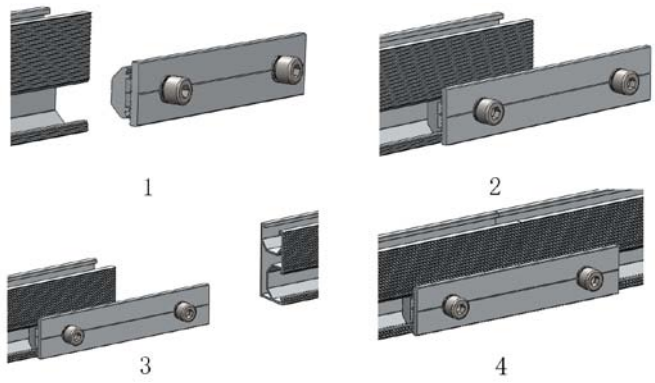
b. Calculate the suitable length of rear leg according to the required angle (for choices, 10°-15°，15°-30°and 30°-60° rear legs are available). Then draw out or shorten the rear leg tube and lock the 2 screws, assuring height of rear legs keeping in the same line after adjust, for even loading requests on each section of rails. Angle differences shown as below pictures:



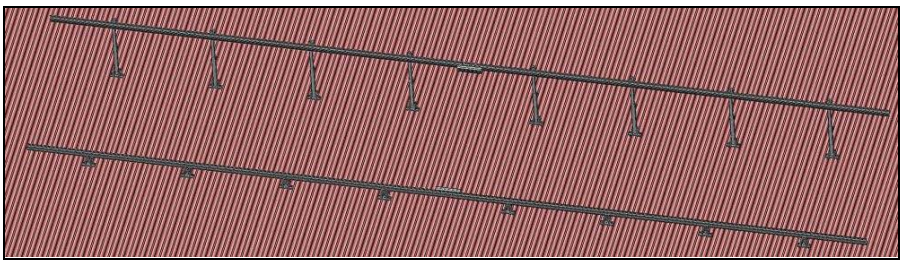


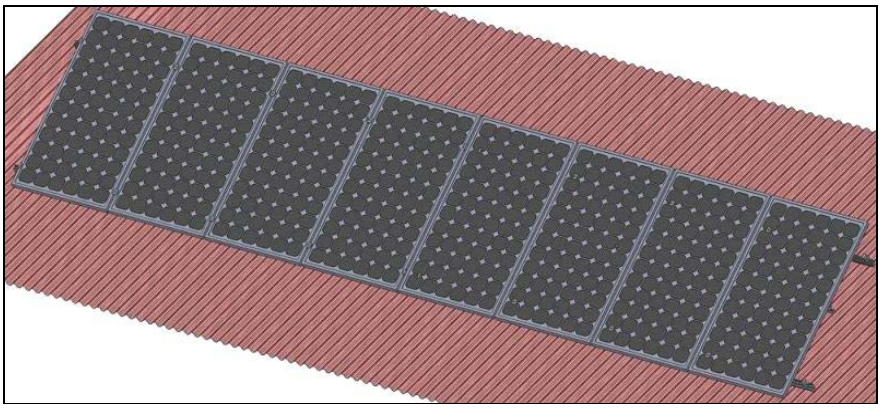
7.6 Connection of GD-Rail

If planning to add solar panels with enough space on the roof, methods of steps are the same as talked in previous chapter. Add more front and rear legs and connect rails with rail splice kit. Connecting rail steps shown as below pictures:



Rail Connect Steps





Attentions:

-A2-70 bolt lock torque shown as follows:

M8 bolt: 15N*m M10 bolt: 22 N*m M12 bolt: 43 N*m