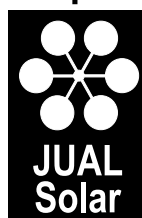


INSTALLATION GUIDE CONSOLE SYSTEM

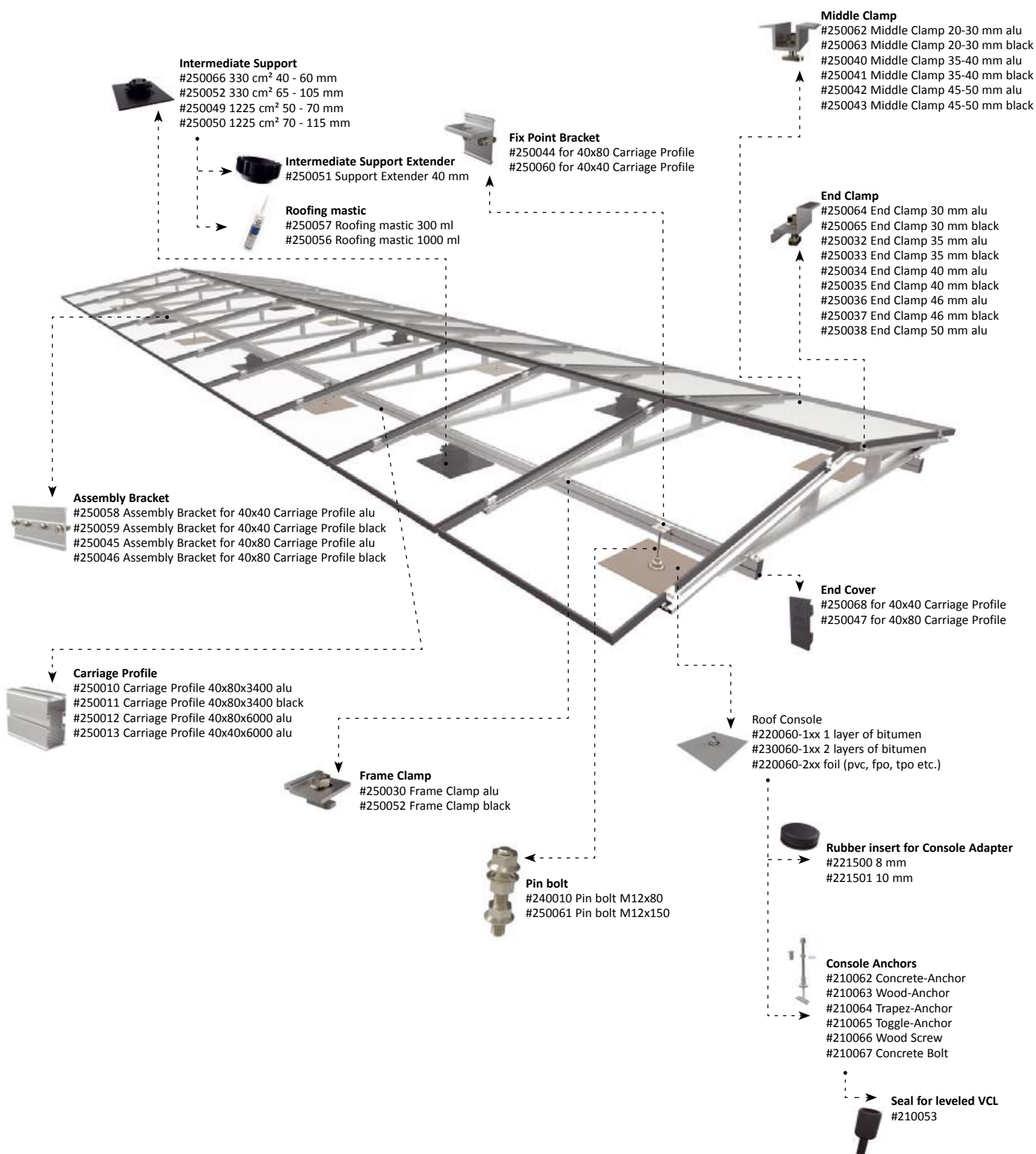


Need proof?



100% proof!

System Overview





Toos and symbol overview



Leveling device
laser or similar



Grinder



Impact wrench (13 mm socket)
Capacity: (100 - 120 Nm)



13 mm Socket incl. 1/4" adapter
Article number: #250090
Max. out side diameter Ø17,5 mm



Wrench (18 mm)
Two pieces must be available



Caulking gun
Must be applicable for 300 ml and 1000 ml cartridges

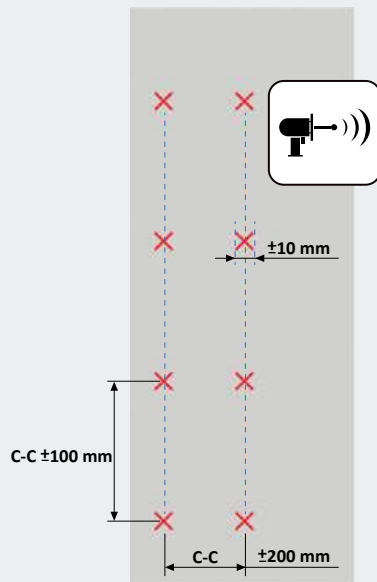


Marking pen

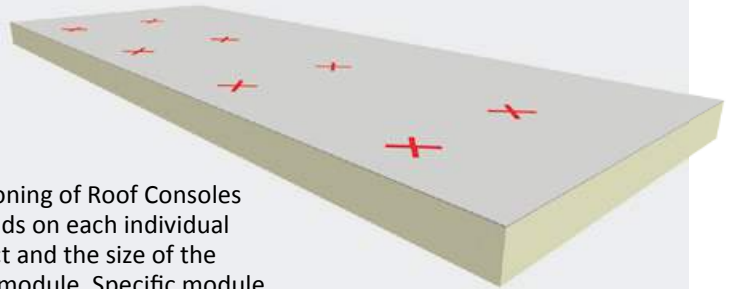


Soft hammer

1 Positioning of Roof Consoles



The illustration above shows the generally allowed tolerances for positioning of Roof Consoles. If larger deviations are needed, JUAL Solar A/S must be contacted.



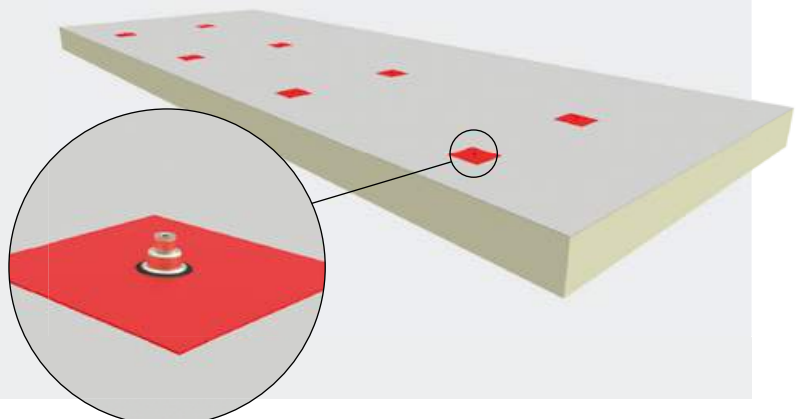
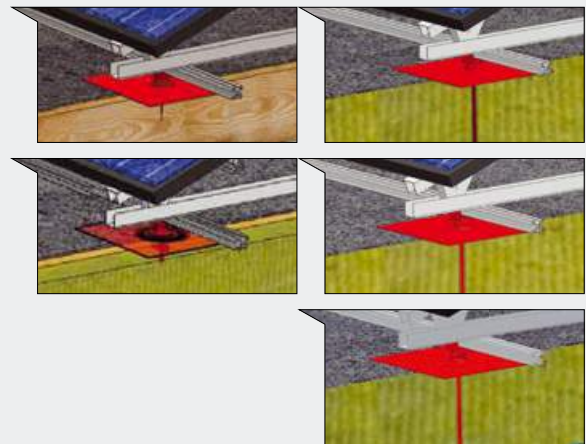
Positioning of Roof Consoles depends on each individual project and the size of the given module. Specific module dimensions are defined in the corresponding Technical Design Report created by JUAL Solar.

[illegible]

2 Installation of Roof Consoles

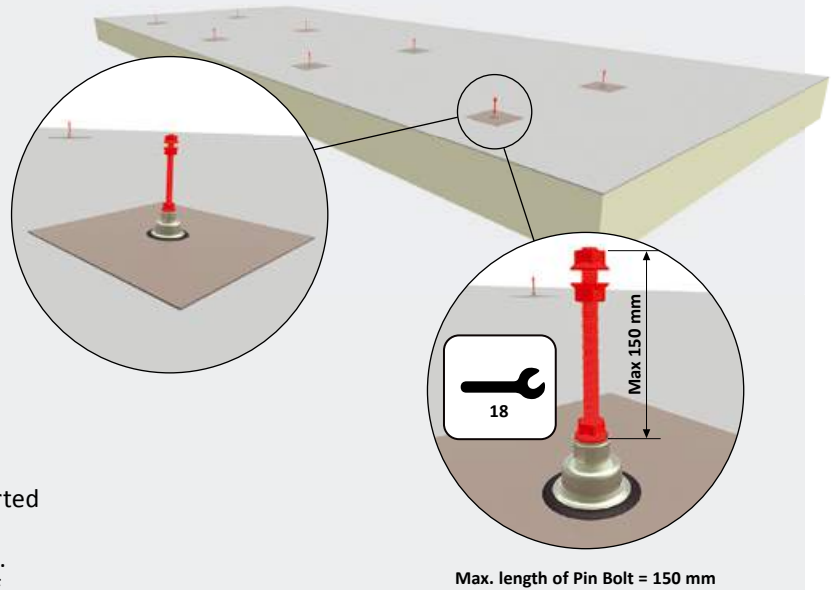
Details about how to install JUAL Solar Roof Consoles correctly are found in the separate installation guide lines and videos available at www.jualsolar.dk. Please note that each guide is specific for one roof type only.

The exact type of Roof Console must be chosen in collaboration with JUAL Solar A/S or with the roofing company working on the installation. This must be done in line with general guidelines, best practices and warranty specifications on the specific roof. The general rule is that the Roof Consoles must be specified with the same type of membrane as the roof on which these are to be installed.



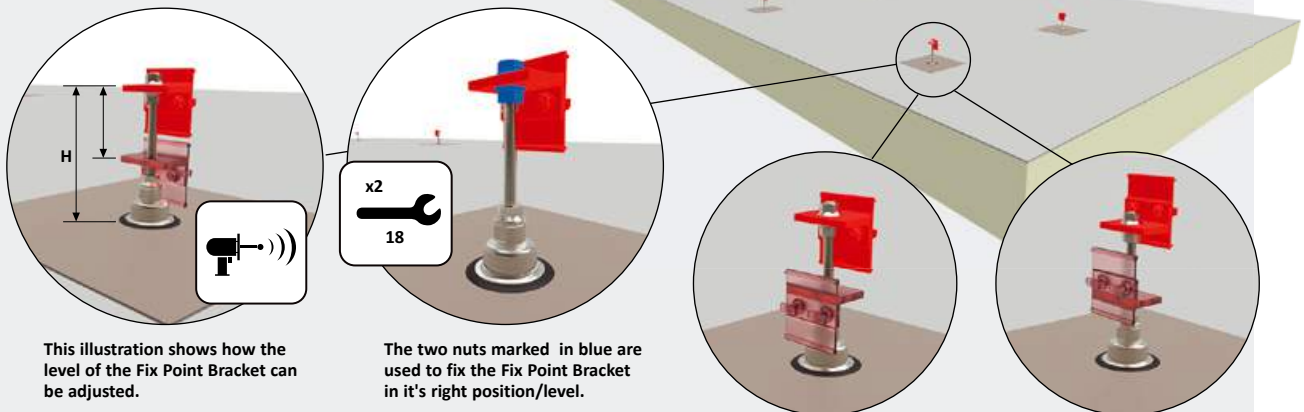
On this illustration the installed Roof Consoles are presented which are ready for the following installation of the East/West frame system.

3 Installing Pin Bolts



The Pin Bolt is installed into the internal M12 thread of each Roof Console. It must be inserted approximately 20 mm into the thread and afterwards secured with the bottom lock nut. Please note that this nut is the only means of securing the Pin Bolt - and it must be avoided that the Pin Bolt is tapped up against the bottom of the M12 thread hole in the Roof Console.

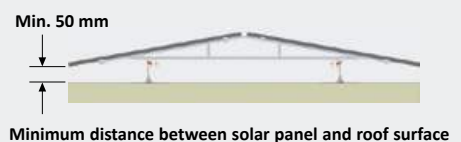
4 Installing Fix Point Brackets



Before installing the Fix Point Brackets, the level of the Module must be determined. Normally, this is done by locating the highest point of the roof surface which is the point defining the minimum distance between the Module and the roof surface.

As the Fix Point Bracket is adjusted to the defined level, it is fixed by tightening the two lock nuts on each Pin Bolt.

This illustration shows how the Fix Point Bracket can be installed in different positions to achieve the desired height and profile position.

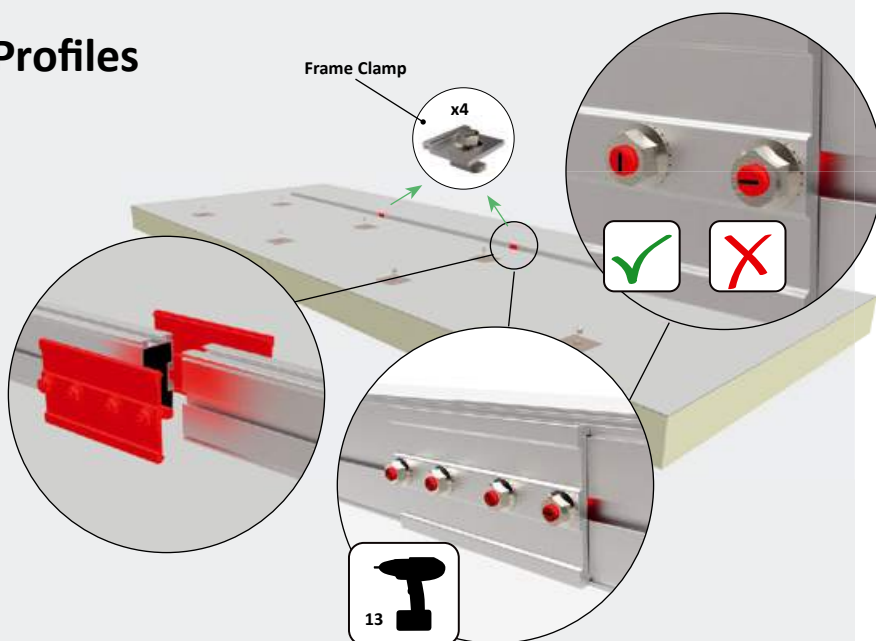


5 Assembly of Carriage Profiles

The first step is to assemble the profiles so the total (Module)* length is obtained prior to fixing these to the Fix Point Brackets. This is done by using two pcs. Assembly Brackets for each assembly point.

Before the bolts are fixed, the Carriage Profiles must be pushed together and then all the hammer-head bolts are turned and tightened.

* The module length is listed in the corresponding Technical Design Report

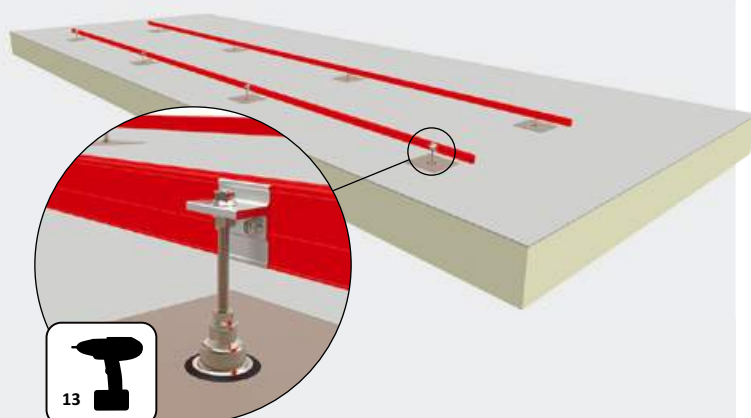


This illustration shows how the two Assembly Brackets are positioned in each profile assembly point.

As the hammer-head bolts are tightened, they must rotate 90° to secure correct strength of the assembly. Please note that each bolt has a marking at it's end that shows the position of the hammer-head bolt.

6 Installation of Carriage Profiles

The Carriage Profiles are installed on the Fix Point Brackets by tightening the premounted hammer-head bolts in the same way as described for the Assembly Brackets above. The assembled Carriage Profiles must have a length which is min. the total length of the given Module.

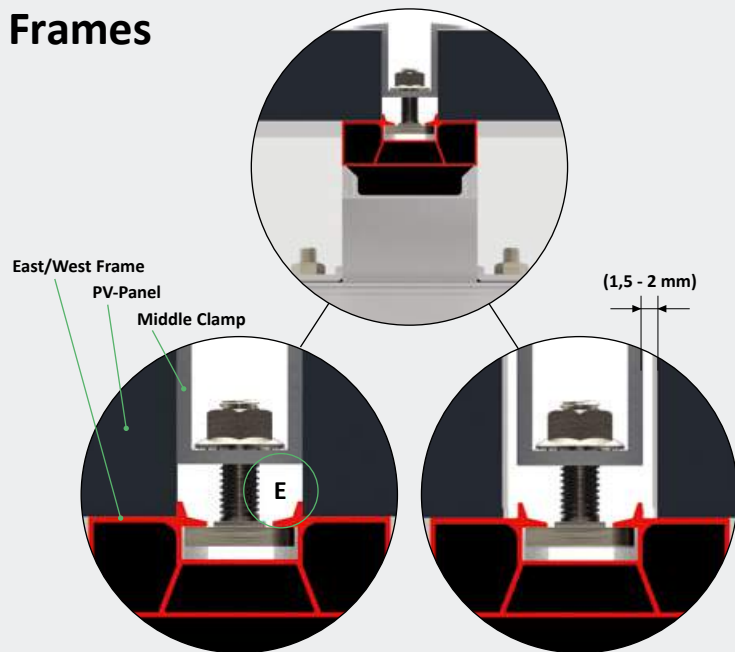
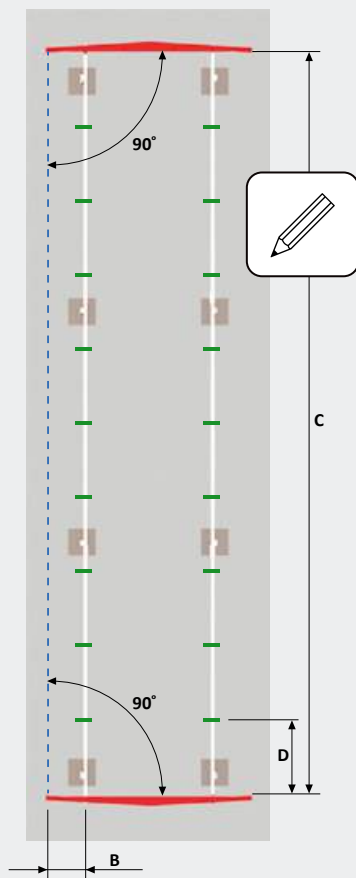


Installation of the assembled Carriage Profiles is done in the same way as the assembly of the Carriage Profiles - i.e. by using the pre-installed hammer-head bolts to secure the assembly. Again, it is very important to pay close attention to the position of the hammer-head bolts.



7

Installation of East/West Frames



When the distance (D) is determined, it is important to note that this distance should include extra distance to accommodate tolerance on the used PV-panels. This tolerance can be both on length/height but also 'straightness' of the panels might differ from panel to panel. As illustrated above, the East/West Frames have an edge to guide the PV-panels. Normally, an extra gap of 3-4 mm between each frame is suitable.

This is how to calculate the distance from frame to frame (middle-to-middle):

$$D = \text{Panel width} + 25 \text{ mm} + \text{tolerance on panel width}$$

It is recommended that all East/West Frames for each module are installed prior to installing the PV-panels.

Firstly, the two end Frames are installed while paying attention to the distance (B) in each end of the Module. The frames do not have to be positioned symmetrically on the Carriage Profiles but cannot be offset more than 200 mm from center. All remaining Frames on the Module will be positioned according to these two end Frames. Besides from this distance, attention must also be paid to the angle of the frames which must be 90° in relation the length direction of the module.

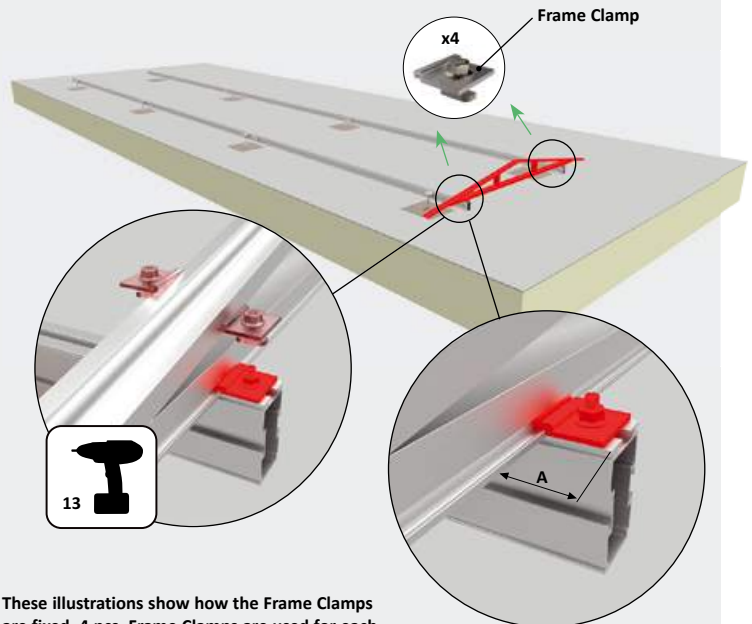
8 Fixation of East/West Frames

Fixation of the East/West Frames is done by using 4 pcs. of Frame Clamps per Frame.

The Frame Clamps each has one pre-installed hammer-head bolt and a lock nut. These are installed in the same way and with the same attention points as described in Step 5 (Assembly of Carriage Profiles).

The Frame Clamp is shaped to fit the bottom edge on each side of the Frame.

Note: When installing black versions of Frame Clamps it is only necessary to use two pcs. of black Frame Clamps on the outer side of the end Frame - totally 4 pcs. per Module. The rest of the Frame Clamps can be raw alu as these will be covered by the PV-panels.



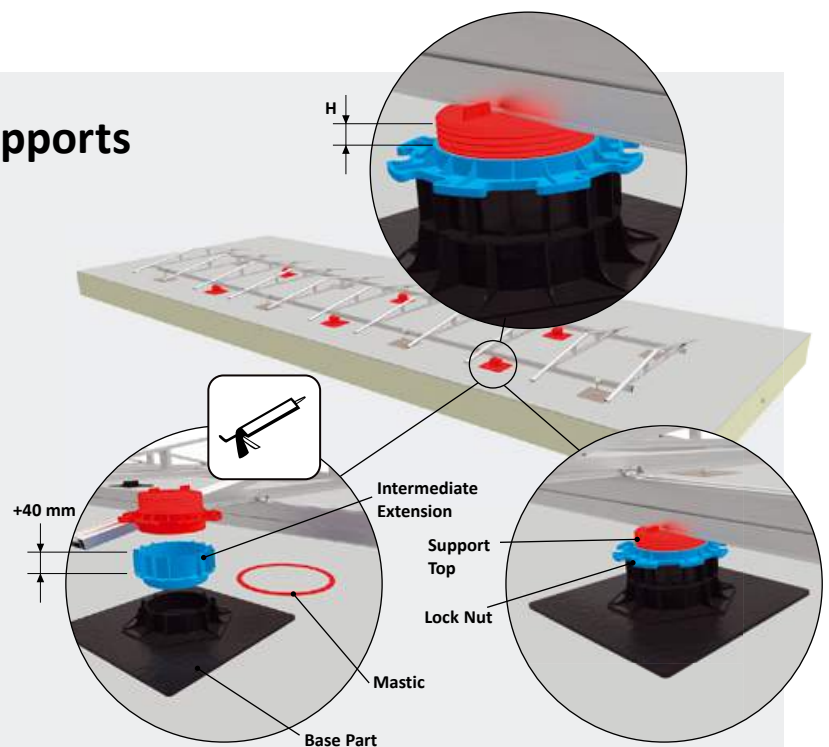
These illustrations show how the Frame Clamps are fixed. 4 pcs. Frame Clamps are used for each Frame. The min. distance (A) from the end of the Carriage Profile to the first Frame must be 35 mm.

9 Installing Intermediate Supports

Depending on each specific project, the use of Intermediate Supports can be specified in this case it will be described in detail in the Technical Design Report created by JUAL Solar A/S.

When the position of each Support is determined, Roofing mastic is applied to the roof surface and the Support is fixed onto the roof. The type of mastic used must be determined according to the specific type of roofing membrane.

Afterwards, the height of the Support is adjusted either by adjusting the support or by inserting Intermediate Extensions (max. allowed 3 pcs. per supporting point). Final adjustment is done by rotating the Support Top counter clockwise until the Support point tightens up against the bottom surface of the Carriage Profile.



This illustration shows the components of one Intermediate Support. The BLACK part is the Base Part which is supplied with different sized bottom flanges.

The BLUE part is an Extension Part which is used at points where the height of a standard Intermediate Support is not sufficient.

The RED Support Top is the part which is adjustable (two versions available: 0-20 mm and 0-40 mm). It has a self-locking function so it will stay at the chosen height.

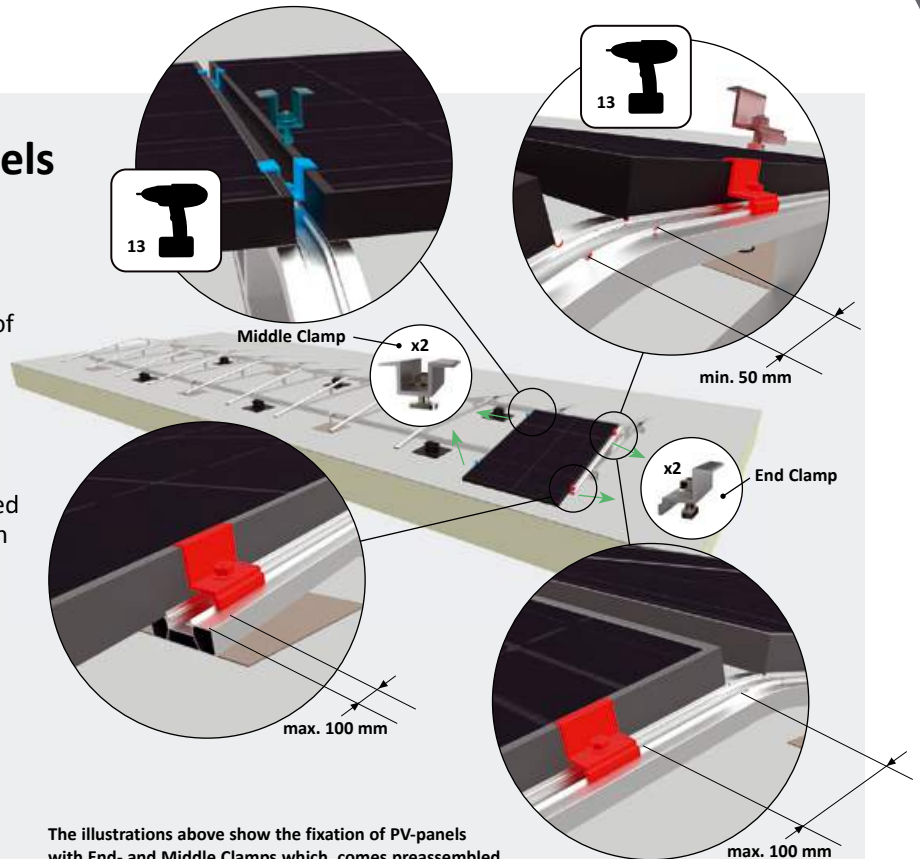
10

Installation of PV-Panels

It is recommended that the installation of PV-panels is completed on one side of the East/West Module before the installation is initiated on the 2nd.

The installation of the first PV-panel require 2 x End Clamps and 2 x Middle Clamps. The Middle Clamps are mounted and fixed after the second PV-panel is in place.

In order to ensure a correct horizontal placement of the PV-panels each East/West Frame has been marked with two positioning marks with a center distance of 50 mm symmetric across the ridge of the East/West Module.



The illustrations above show the fixation of PV-panels with End- and Middle Clamps which, comes preassembled with a hammerhead bolt and flange nut and the fixation is once again controlled by observing the orientation of the T-bolt marking. When the Clamps are mounted they must be positioned with a maximum distance from the top edge of the PV-panel of 100 mm and maximum 100 mm from the East/West Frames bottom edge.

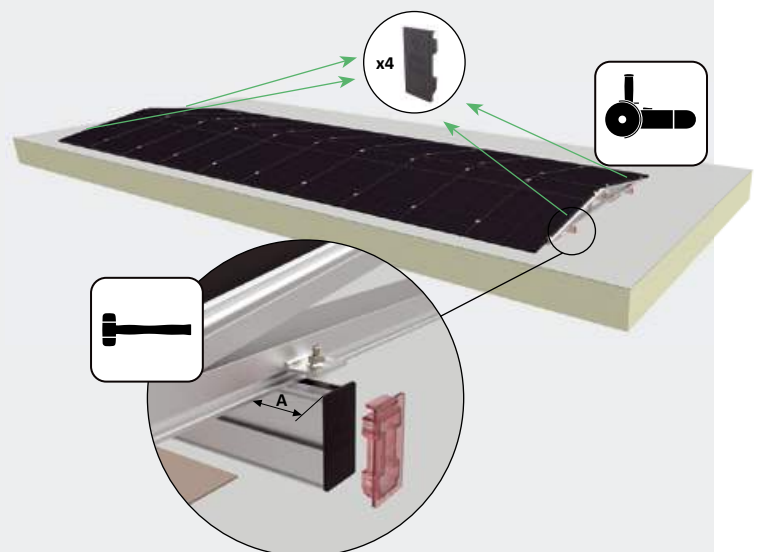
11

Installation of End Covers

Before the installation is completed End Covers should be installed in the Carriage Profile ends.

Before this can be done the Carriage Profiles must be cut to the right length and in this process it must be observed the the Min. distance (A) from the profile end to the nearest East/West Frame is kept (previously described under position 8). Care should be taken not to spray warm metal dust while grinding on fragile surfaces or flammable materials.

When the Carriage Profiles are cut the End Covers can be installed. Due to the geometry of the The End Cover it can be installed without any deburring of the freshly cut profile ends. The End Cover furthermore contain a drainage cut out which will help to drain the profiles if necessary.



The illustration above shows the installation of the End Cover.

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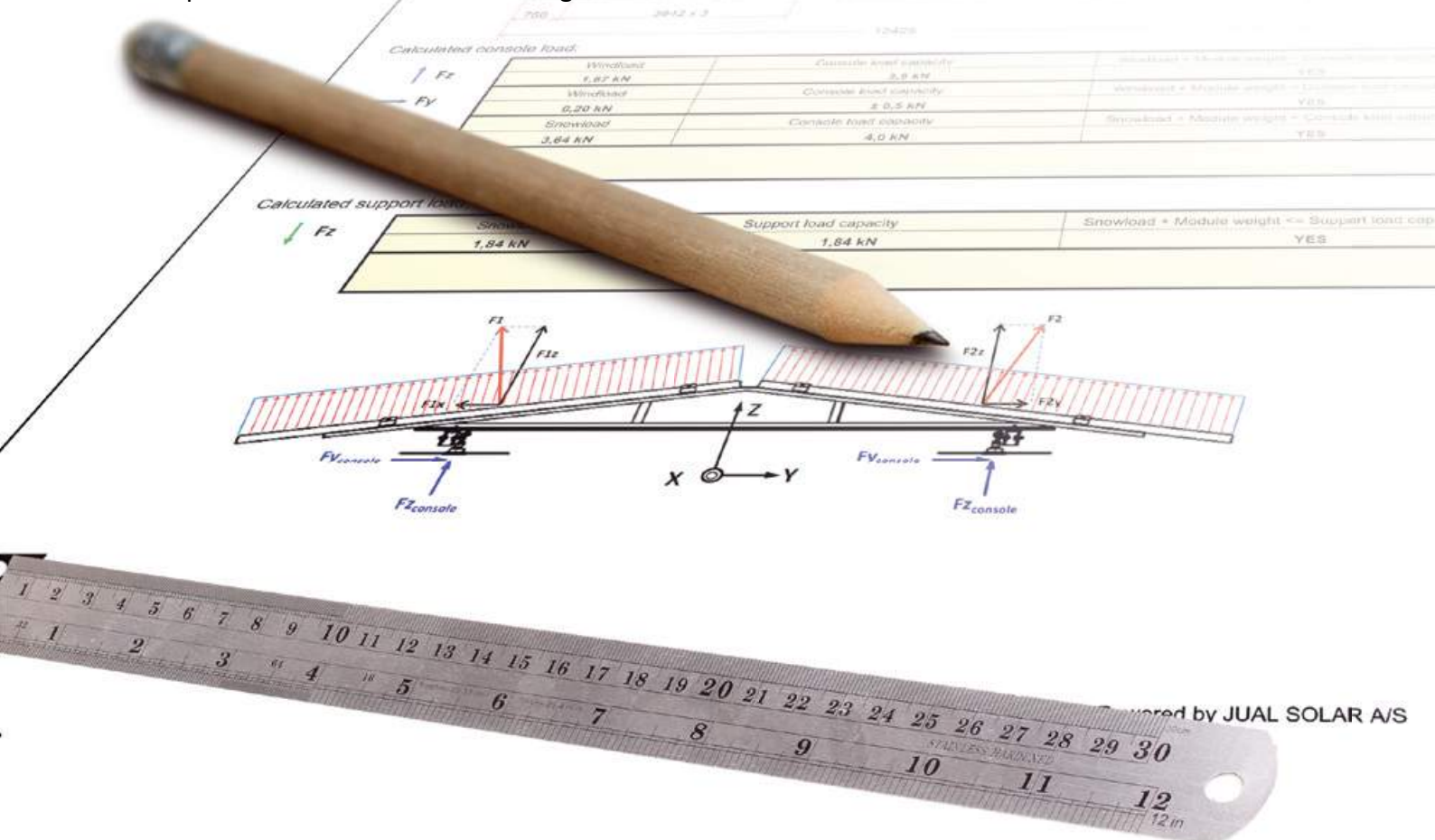
JUAL SOLAR EAST/WEST CONSOLE SYSTEM

The Console system has been designed with the intension of creating the basis for a trouble free PV-installation with a long life time for flat roofs with bituminous- or synthetic roofing membranes.

A technical design report which describe how the PV-installation influences the current roof surface is generated for each individuel project and the specific requirements for the roof surface has been validated through out the project planning.

Design calculations are based upon the EuroCode EN1991 1-3 and EN1991 1-4 where aerodynamic values derived from specific wind tunnel tests forms the foundation for the wind related fixation into the building structure. Besides the wind technical aspect the snow related design is also an important part of the load design as this forms the basis for how the pressure load will be distributed from the framing structure to the roof surface.

The precondition for a succesfull result is that each element in the installation is carried out in full compliance with both the Technical Design Report as well as the relevant installation guide lines. It is therefore recommended that the installation guide line is thouroughly studied and that JUAL Solar A/S is contacted if uncertainties, questions or if the need for changes arises.

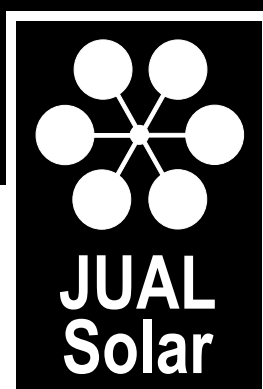


About JUAL Solar



JUAL Solar was established as a separate company to focus on the solar market with the purpose of trading JUAL Solar products directly to partners, such as system suppliers, installers and others within the solar industry, and furthermore to be more directly involved in system design, specific project solutions and in the planning process.

www.jualsolar.dk



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