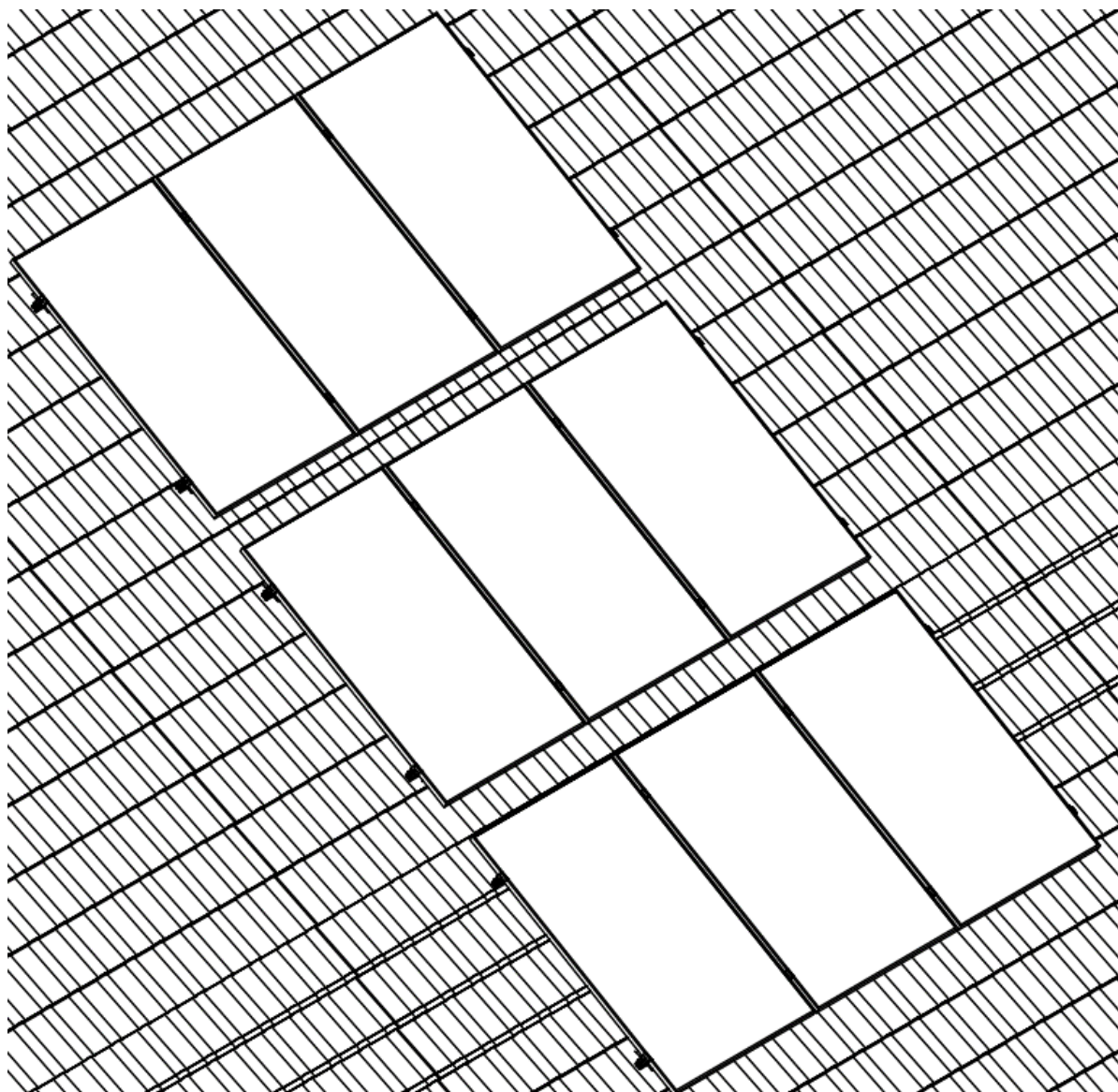




# **INSTALLATION MANUAL**

## **ALUMINIUM HOOK K-64**

### **MOUNTING SYSTEM**



**The mounting system described below is used to mount photovoltaic modules on a pitched roof.**

During production, every effort was made to provide you with a product of the highest quality which is also easy to mount. This instruction is a set of rules for the correct mounting of the mounting structure components but is not a blueprint or a substitute for it. The installer performing the mounting must be properly trained and licensed for the job. Overall responsibility for proper mounting rests with the installer who should select the appropriate type of construction.

In situations where the strength of the roof structure is questionable, a structural engineer should be consulted to perform strength calculations for the roof.

## 1. Technical data of the construction:

- The mounting system is compatible with a pitched roof with concrete roof tile,
- Minimum pitch of the roof 10 degrees,
- Maximum pitch of the roof 45 degrees,
- Maximum size of photovoltaic module 2275 mm x 1140 mm,
- Additional weight per roof surface [14kg/m<sup>2</sup>],
- System wind uplift resistance 1290 [Pa].
- Maximum area of one row mounting horizontally 23,5 [m<sup>2</sup>]
- Maximum area of one row mounting vertically 47,6 [m<sup>2</sup>]

- ## 2. The layout of the modules shall be arranged to minimize or preclude the appearance of shadows on the modules. Keep in mind that even the shadow cast by trees or buildings can limit the yields generated by modules. When mounting the system in summer, be aware that the shadow cast by trees and neighboring buildings will reach much further in winter. Also, remember to keep the safe zone on the roof sheathing (figure 1).

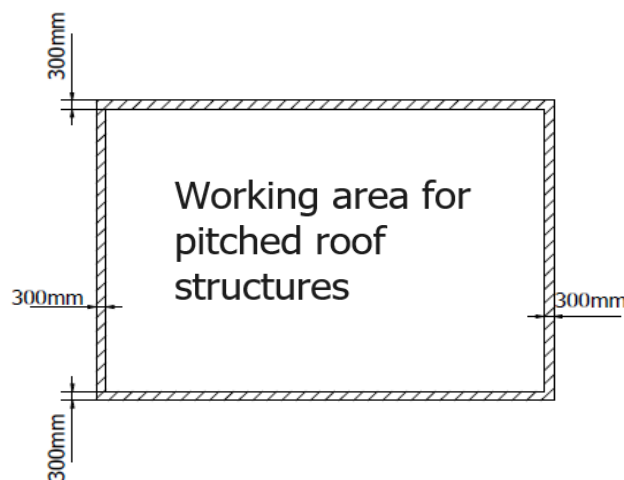


FIGURE. 1 Working area for pitched roof structures

**3. List of parts (example quantities for two modules)**

Table 1. Modules mounted on the long side

#	Component name	Component Part Number	Quantity	Comments
1	Aluminium Hook	K-64	6	
2	Allen screw	K-16	12	
3	“T” Bolt	K-19	6	
4	Nut	K-21	6	
5	Profile 2xT	K-70	5492 [mm]	
6	Connector	K-02	-	
7	Mid Clamp	K-05	2	
8	End Clamp	K-06	4	
9	Allen bolt	K-18	6	
10	Feather	K-04	6	

Table 2. Modules mounted on the short side

#	Component name	Component Part Number	Quantity	Comments
1	Aluminium Hook	K-64	8	
2	Allen screw	K-16	16	
3	“T” Bolt	K-19	8	
4	Nut	K-21	8	
5	Profile 2xT	K-70	9816 [mm]	
6	Connector	K-02	2	
7	Mid Clamp	K-05	2	
8	End Clamp	K-06	4	
9	Allen bolt	K-18	6	
10	Feather	K-04	6	

4. The length of one row of modules can be calculated using the two formulas described below.

**ATTENTION: Maximum row length - 21 [m].**

- a. Formula for row mounted on the short side:

**ROW LENGTH = NUMBER OF MODULES IN THE ROW \* MODULE + 20mm ) + 60mm**

$$\text{ROW LENGTH} = (\text{MODULE LENGTH} + 20) * \text{NUMBER OF MODULES} + 60$$

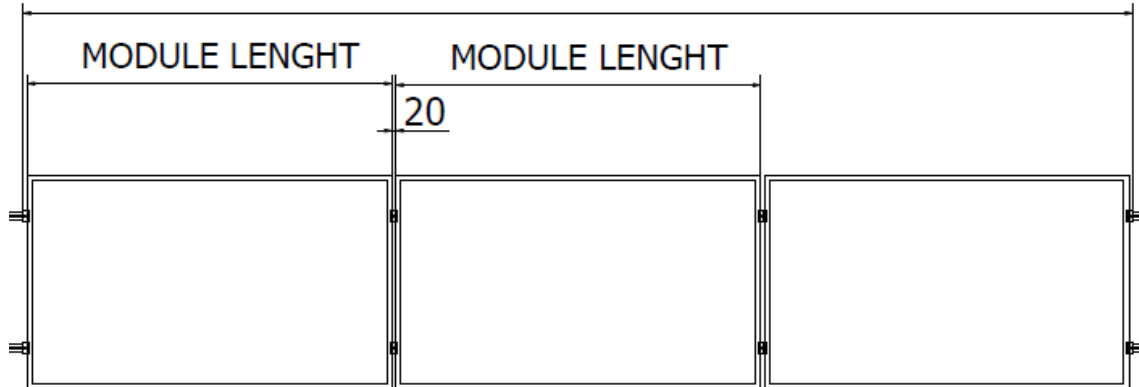


FIGURE. 2 Construction row length for short side mounted modules.

- b. Formula for a row mounted on the long side:

**ROW LENGTH = NUMBER OF MODULES IN THE ROW \* MODULE + 20mm ) + 60mm**

$$\text{ROW LENGTH} = (\text{MODULE WIDTH} + 20) * \text{NUMBER OF MODULES} + 60$$

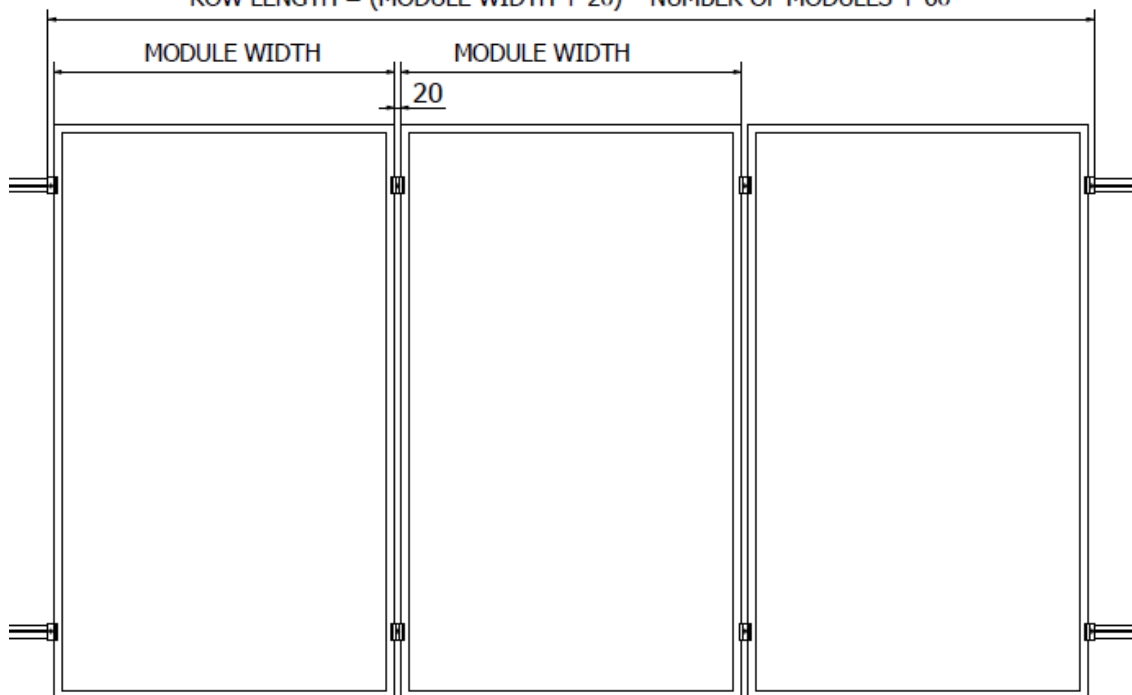


FIGURE. 3 Length of the row of structures mounted on the long side

5. The spacing between the mounting points depends on the selected mounting profile and how the module is mounted to the bracket. The maximum space between brackets is recorded in Table 1 and Table 2.
- a. Bracket spacing when modules are arranged vertically, mounting clamps on the long side.

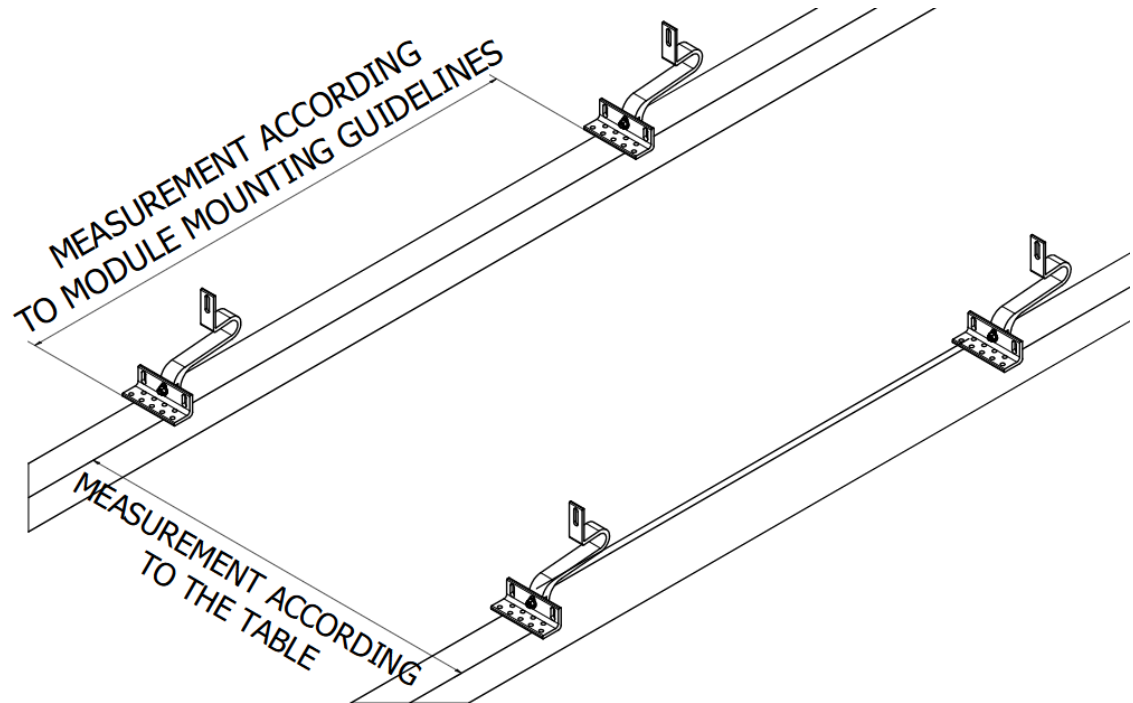


FIGURE. 4 Bracket spacing

Table 3. Maximum spacing of brackets

Module length - X	Module width - X	K-70
$X \leq 1780$ [mm]	$X \leq 1052$ [mm]	1.6 [m]
$1780$ [mm] $< X \leq 2275$ [mm]	$1052 < X \leq 1140$ [mm]	1.4 [m]

- b. Bracket spacing when modules are arranged horizontally, mounting clamps on the shorter side.

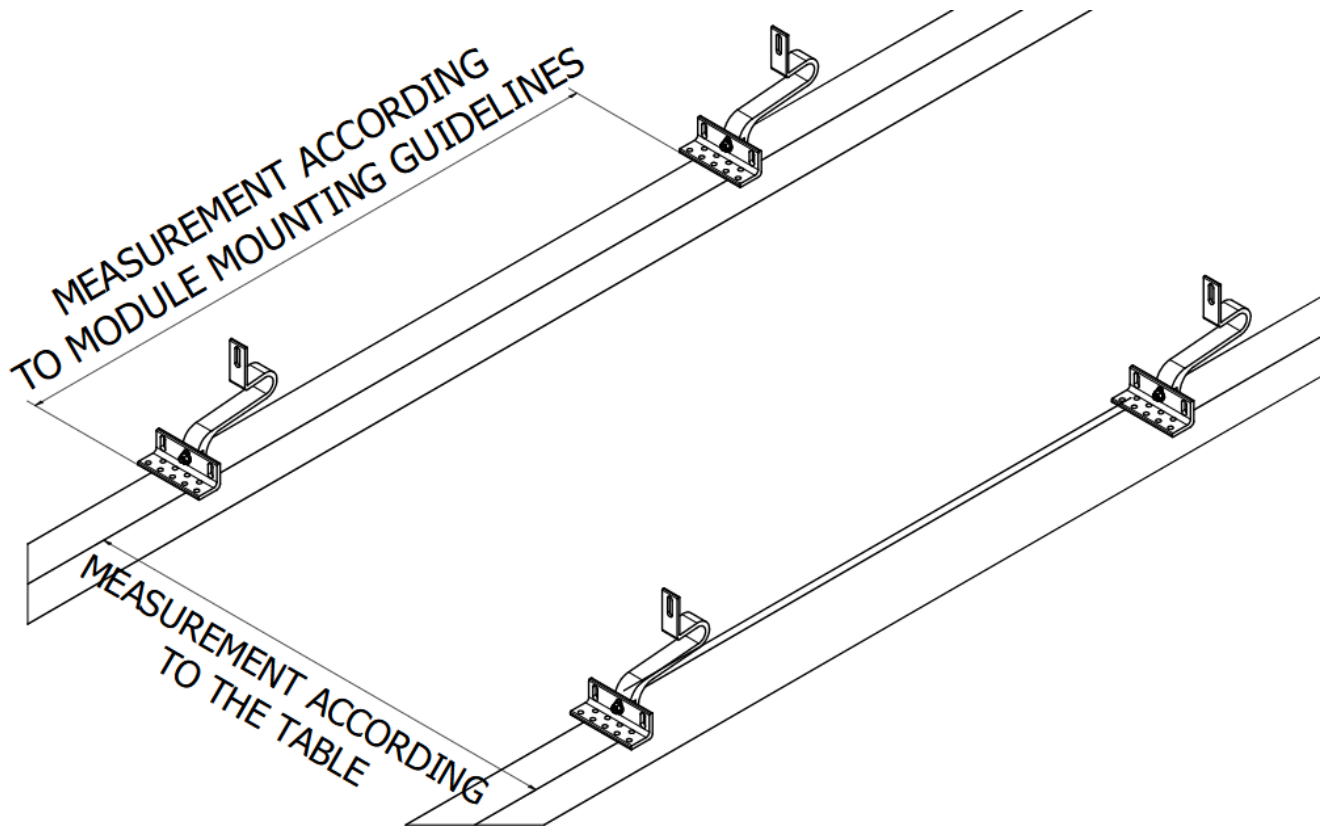


FIGURE. 5 Bracket spacing

Table 4. Maximum spacing of brackets

Module length - X	Module width - X	K-70
$X \leq 1780$ [mm]	$X \leq 1052$ [mm]	1.8 [m]
$1780$ [mm] $< X \leq 2275$ [mm]	$1052 < X \leq 1140$ [mm]	1.7 [m]



6. First, remove the tiles at the bracket locations. Removing the tiles will allow access to the rafters. Then you need to sand the tile locks so that the installed hook does not rest on the tiles. Place the mounting bracket against the rafters and attach it with a minimum of two K-16 screws of the appropriate length (no pre-drilling).

**ATTENTION:** Sanding should be done so that there are no gaps between the roof tile and the hook.

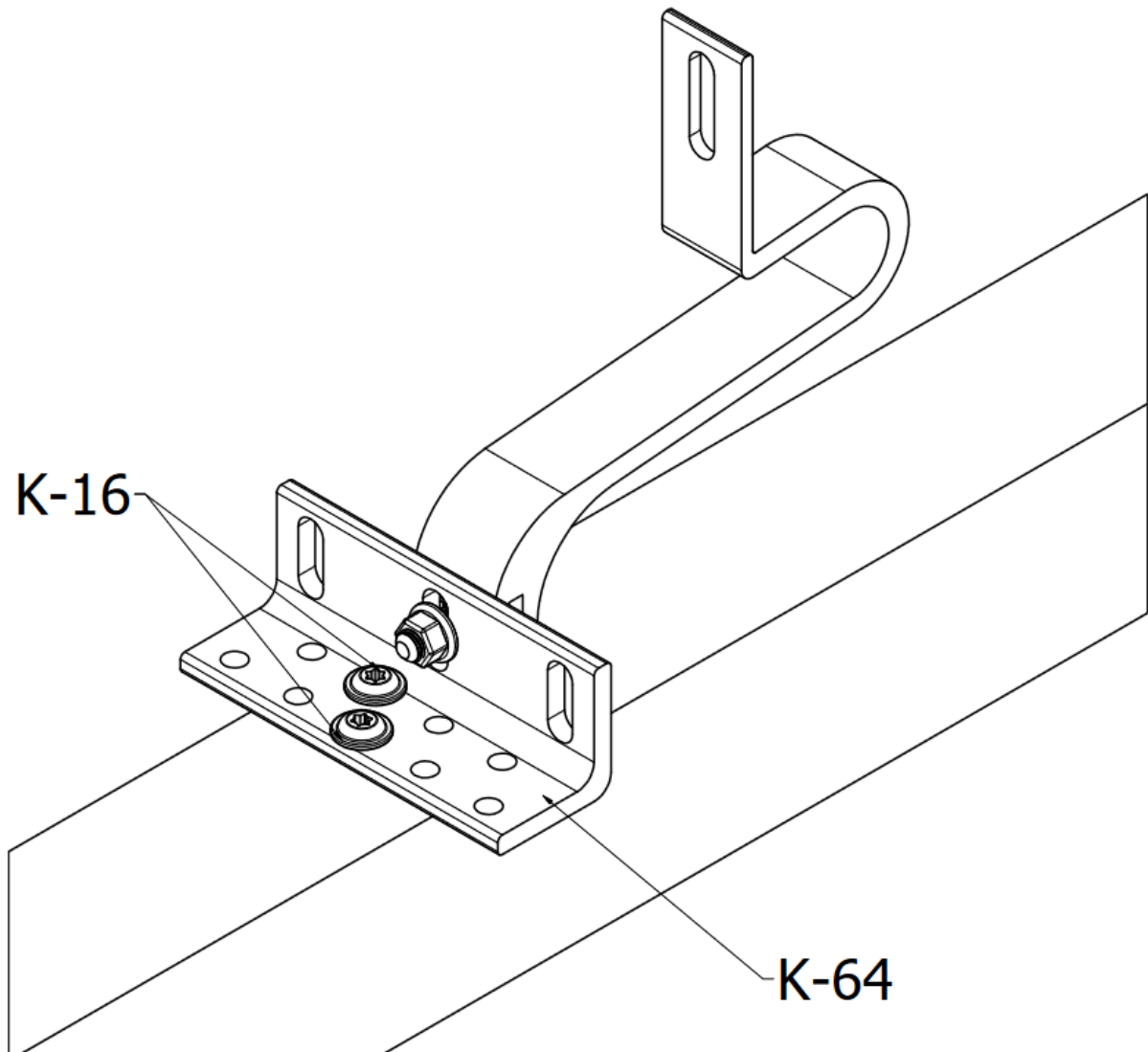


FIGURE. 6 Mounting of the bracket to the rafters

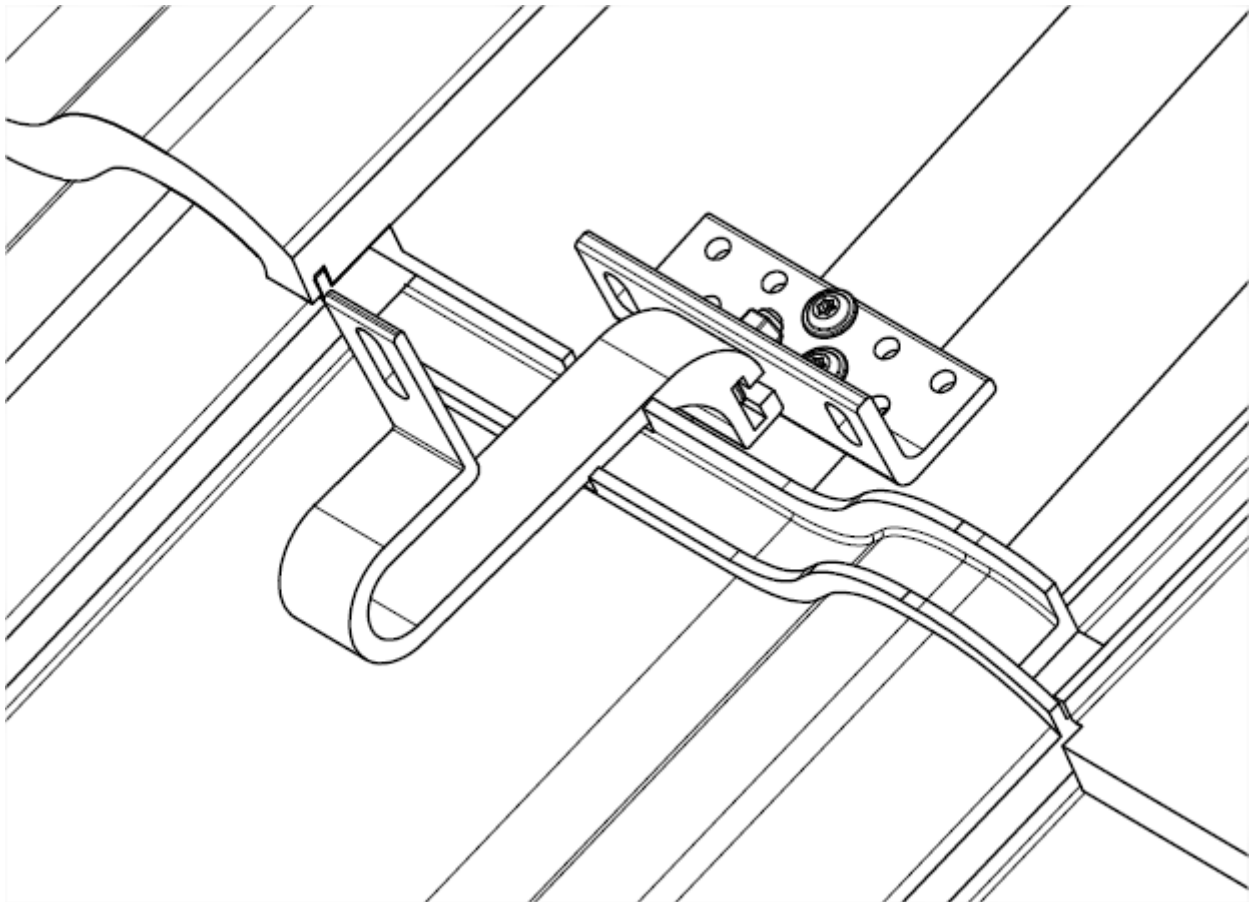


FIGURE. 7 Example of sanding bottom ceramic tile locks

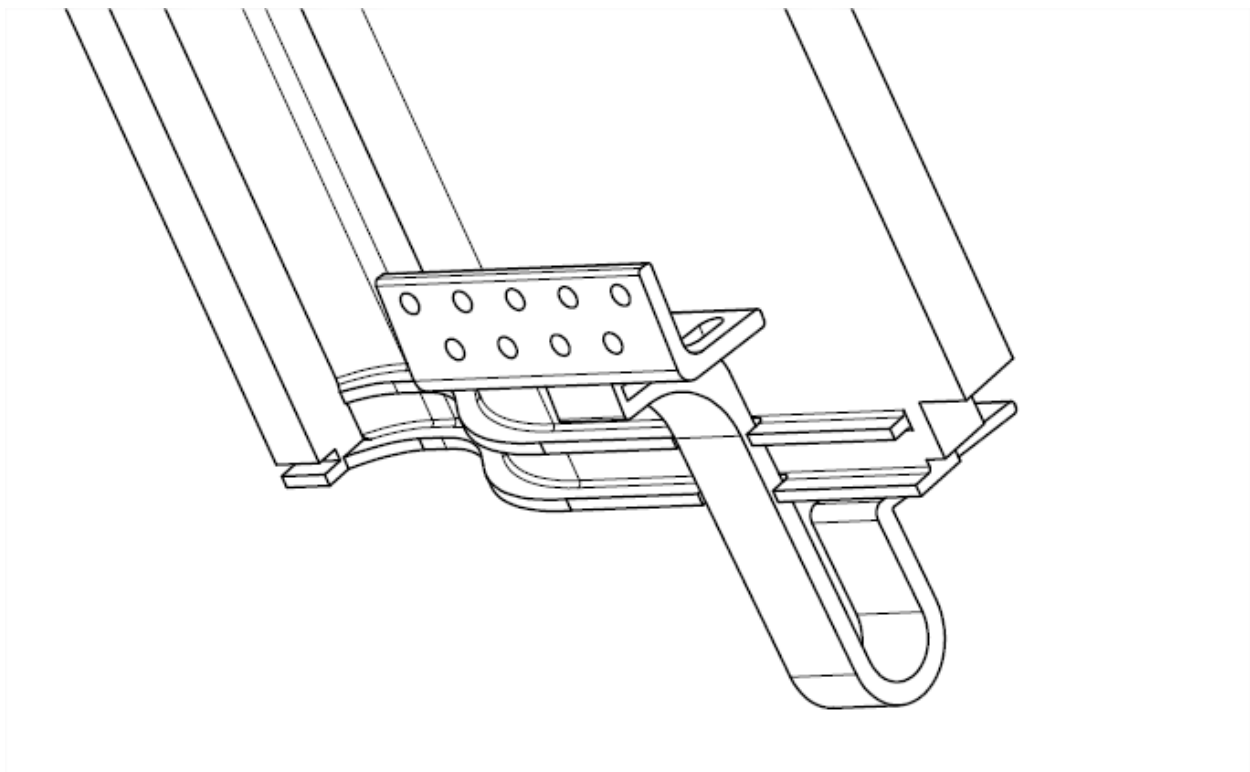


FIGURE. 8 Example of sanding upper ceramic tile locks



7. After mounting the brackets, prepare the mounting profiles by connecting them to the appropriate length using the K-02 connectors placed at the ends of two adjacent profiles. Bolt the connector together using two K-19 "T" bolts. Profiles can be cut to the required length.

**ATTENTION:** The minimum useful length of the profile in the construction is 500mm.

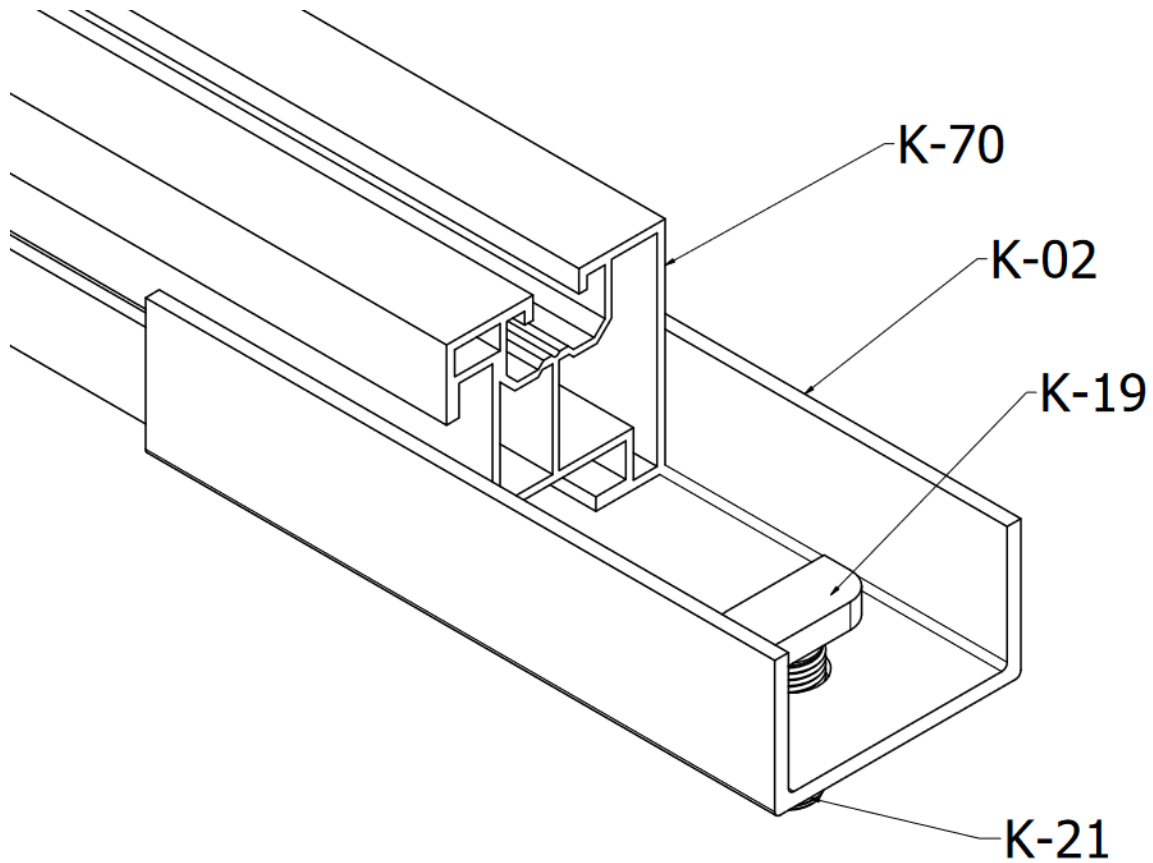


FIGURE. 9 Mounting of the K-02 connector with the K-70 profile

8. The prepared profiles should be attached to the installed hooks using "T" bolts. The heads of the bolts must go into a specially designed channel through the bean-type holes in the mounting bracket.

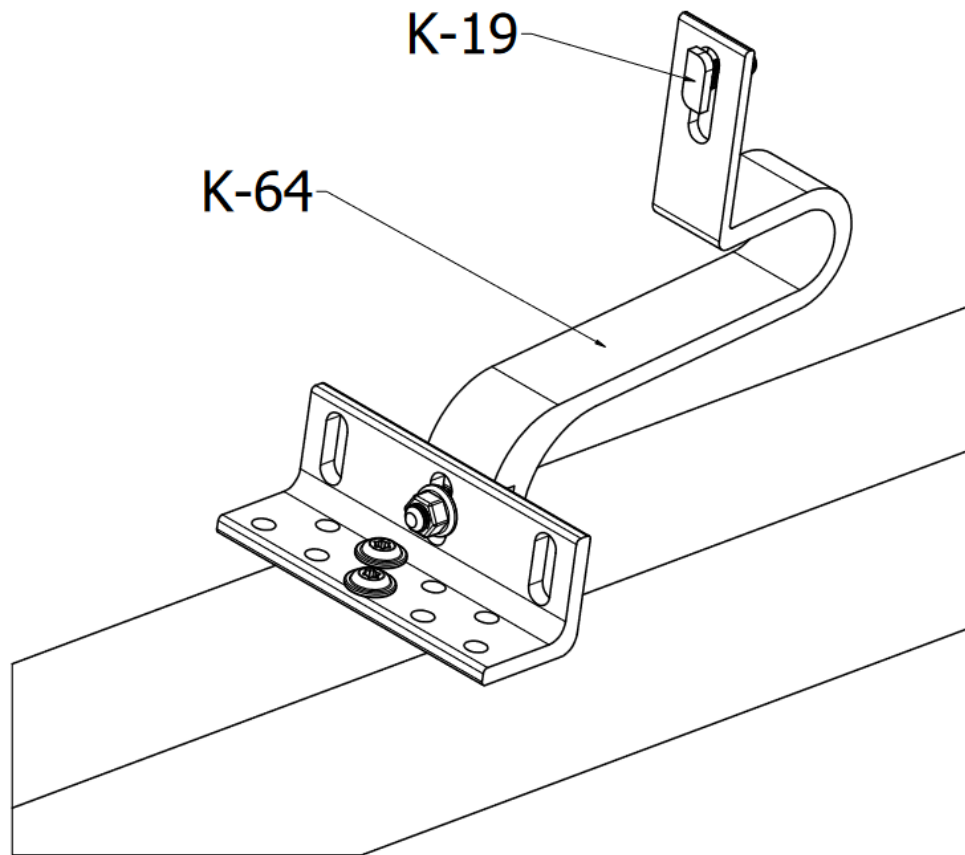


FIGURE. 10 Mounting of "T" bolts

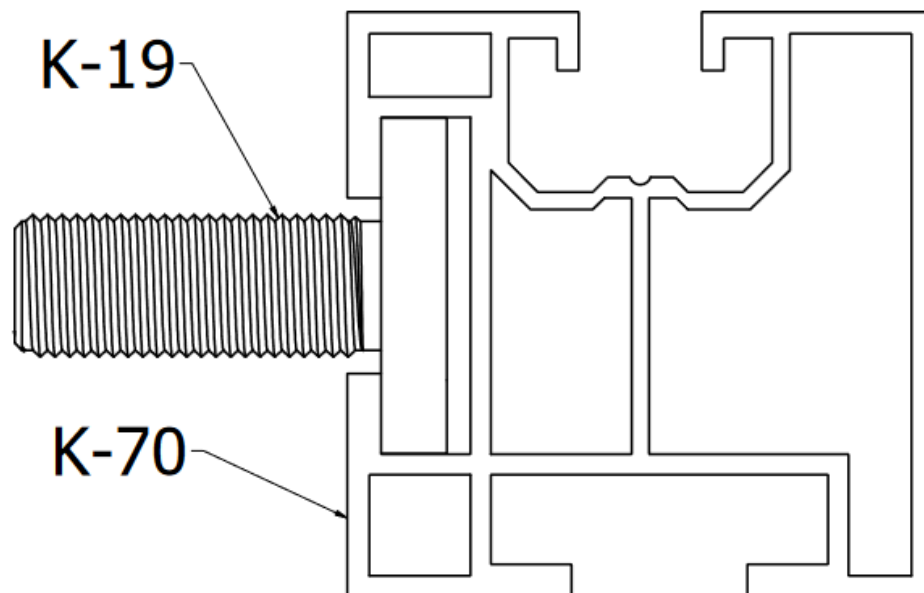


FIGURE. 11 Mounting of profile K-70

9. Thread the K-21 nuts onto the protruding threads from the K-19 bolts.

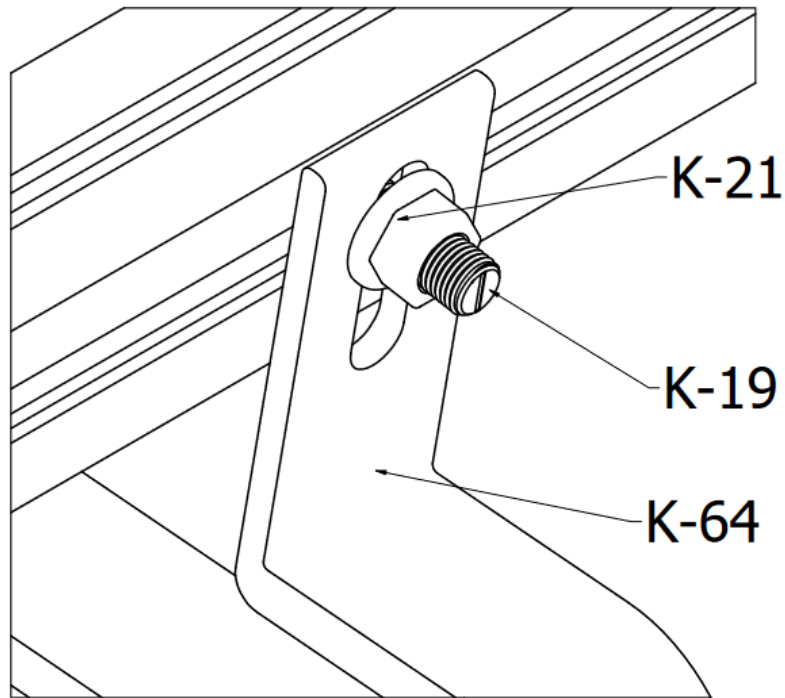


FIGURE. 12 Mounting of "T" bolts

10. The prepared structure should be bolted together with a torque of 30Nm
11. The K-04 T-slot nut can be mounted to the prepared structure in a specially prepared channel. It can be mounted in any desired location.

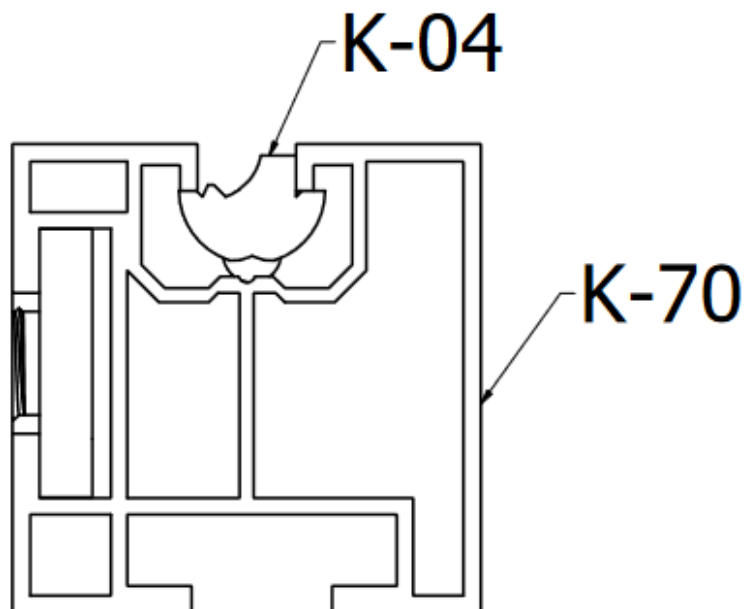


FIGURE. 13 Mounting of the K-04 nut to K-70 profiles

- 12.** Then insert the K-06 end clamps into the first beam with the K-18 allen bolts. The first from the edge and the last from the edge will always be the end clamp, stabilizing the edge of the first and last module in a row. The mid-clamps, on the other hand, will simultaneously stabilize the sides of the two modules. Properly selected edge clamps will have a height equal to the module thickness, the allen bolts will be 10mm shorter than the module thickness and the mid clamps are universal and fit any module thickness.

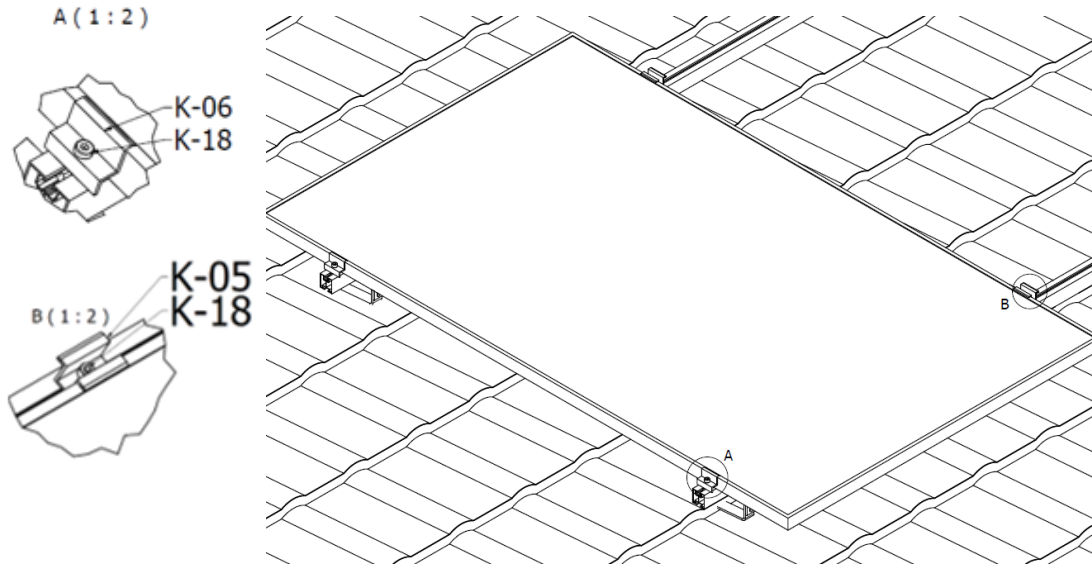


FIGURE. 14 Mounting of the modules and mounting the K-05 and K-06 clamps

- 13.** Tighten clamps to a torque of 18Nm.

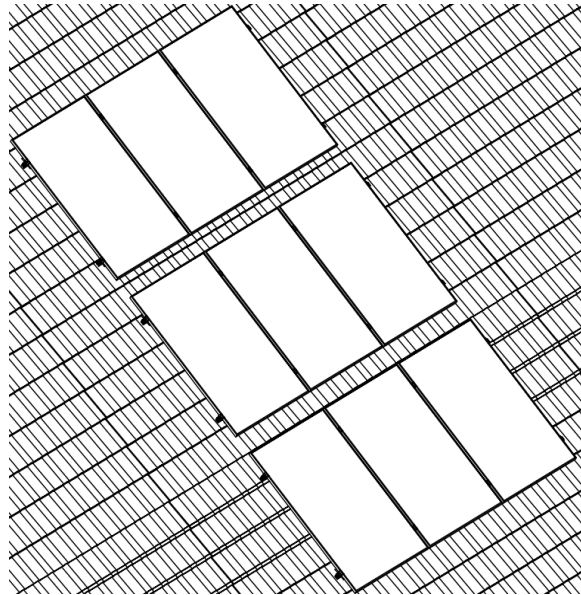


FIGURE. 15 View of assembled structure with modules

**Thank you for using construction KENO Sp z o.o.**