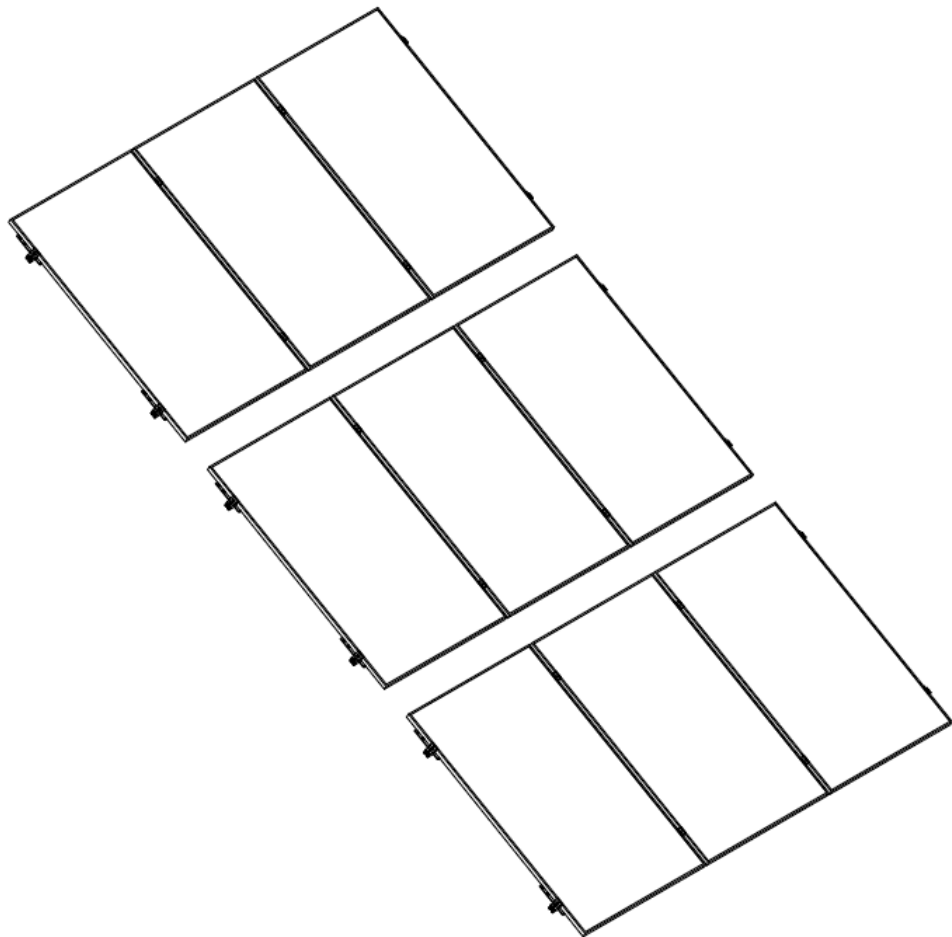




INSTALLATION MANUAL

STEEL HOOK K-08-R

MOUNTING SYSTEM



The mounting system described below is used to mount photovoltaic modules on pitched roofs.

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 covered with slate 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 14 [kg/m²]
- System wind uplift resistance 660 [Pa].
- Maximum area of one row mounting horizontally 23,5 [m²]
- Maximum area of one row mounting vertically 47,6 [m²]

- 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 the summer, be aware that the shadow cast by trees and neighboring buildings will reach much further in the winter. Also, remember to keep the safe zone on the roof sheathing (figure 1).**

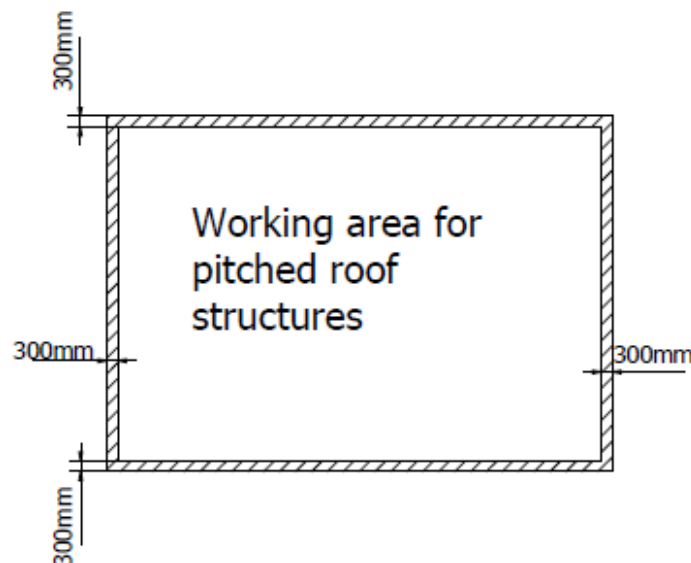


FIGURE. 1 Working area for pitched roof structures

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	Steel Hook	K-08-R	6	
2	Allen screw	K-16	12	
3	"T" Bolt	K-19	6	
4	Nut	K-21	6	
5	Regular profile	K-01	4840 [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	Steel Hook	K-08-R	10	
2	Allen screw	K-16	20	
3	"T" Bolt	K-19	10	
4	Nut	K-21	10	
5	Regular profile	K-01	9340 [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 dimension of one row of modules can be calculated according to the module mounting method with the formula:

ATTENTION: Maximum row length - 21 [m].

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

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

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

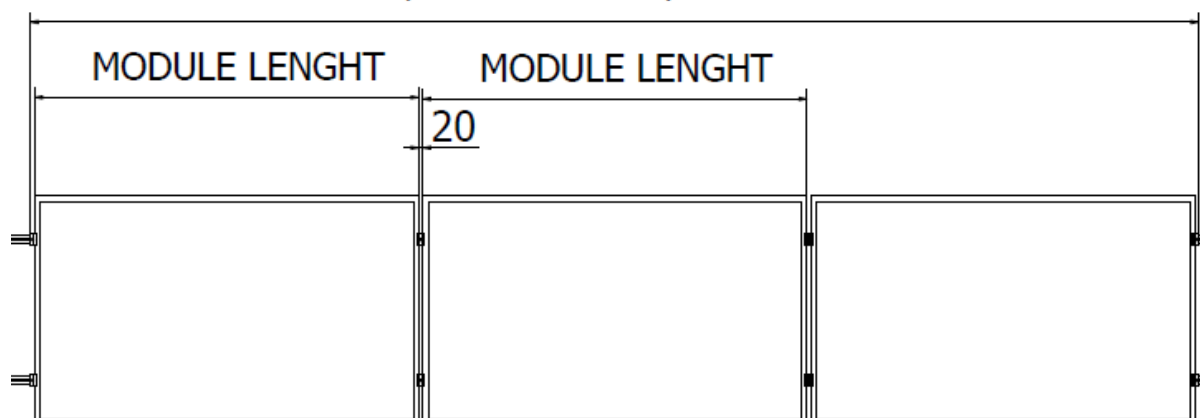


FIGURE. 2 Construction row length of short side mounted structures

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

ROW LENGTH = NUMBER OF MODULES IN A ROW * MODULE WIDTH + 20 mm) + 60 mm

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

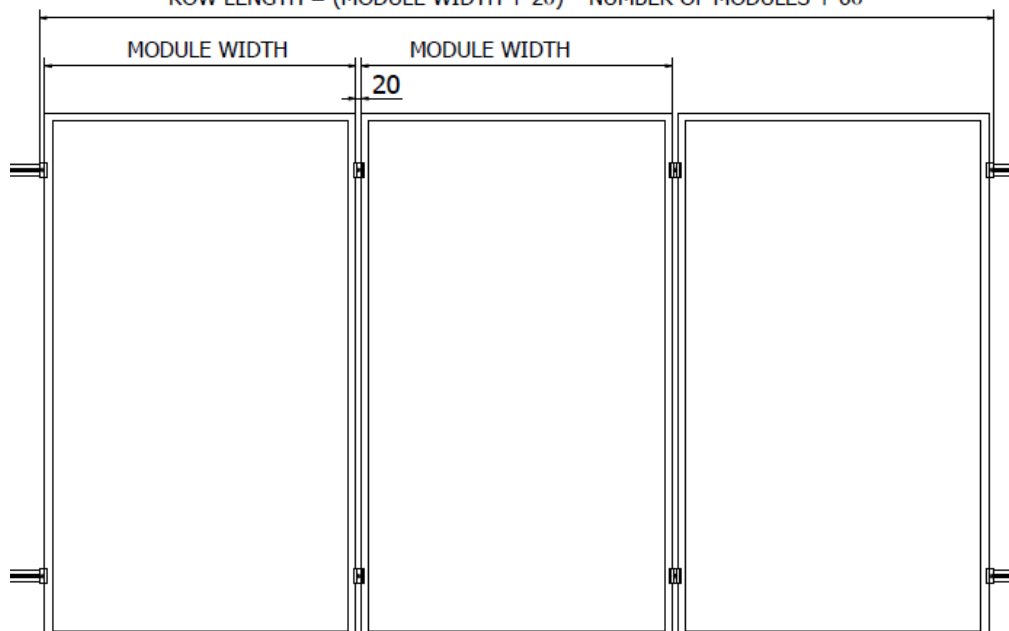


FIGURE. 3 Length of the row of structures mounted on the long side

5. The spacing between each mounting point depends on the size of the module and how the module is mounted to the bracket. The maximum dimension between brackets is recorded in Table 1 and Table 2.

- a. For long-side mounting

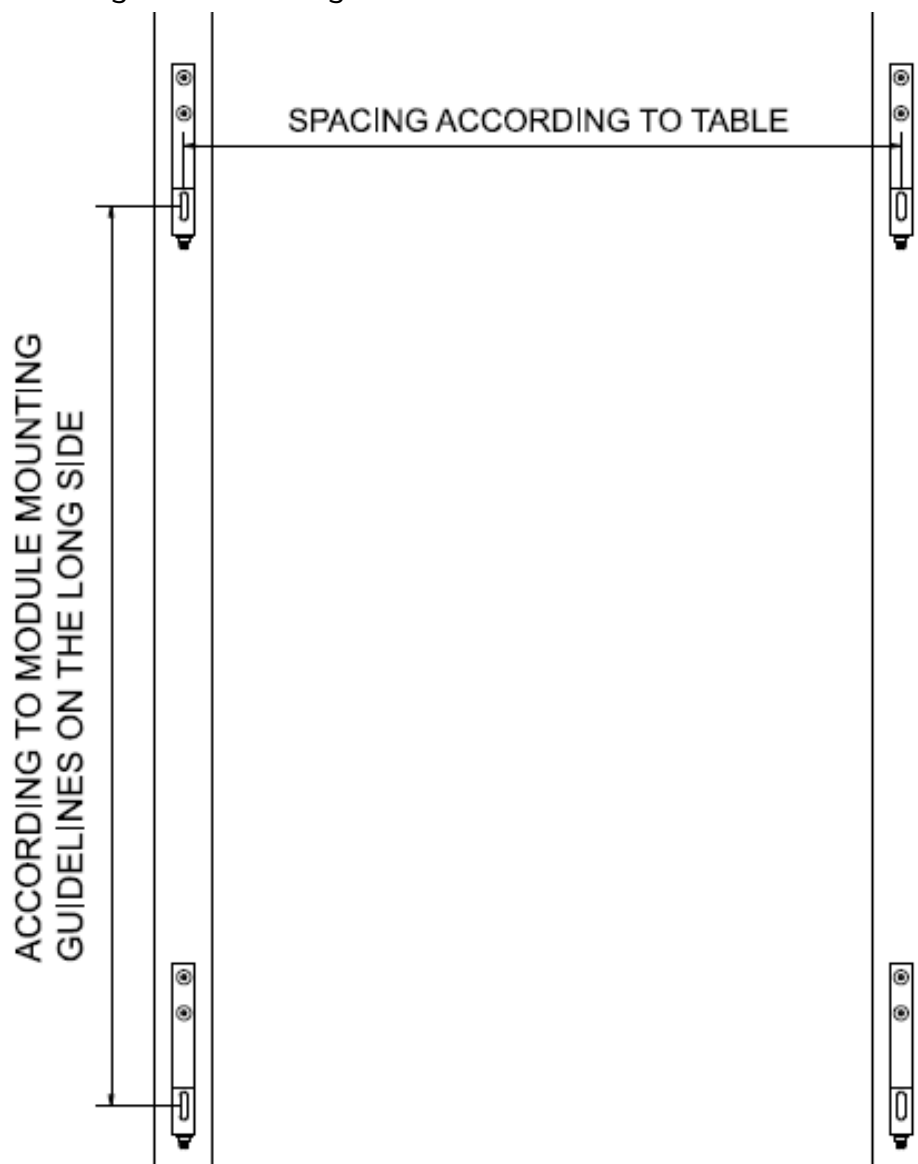


FIGURE. 4 Bracket spacing

Table 3. Maximum bracket spacing depending on the module.

Module length - X	Module width - X	K-01
$X \leq 1780$ [mm]	$X \leq 1052$ [mm]	1.2 [m]
1780 [mm] $< X \leq 2275$ [mm]	$1052 < X \leq 1140$ [mm]	1.1 [m]

b. For mounting on the short side

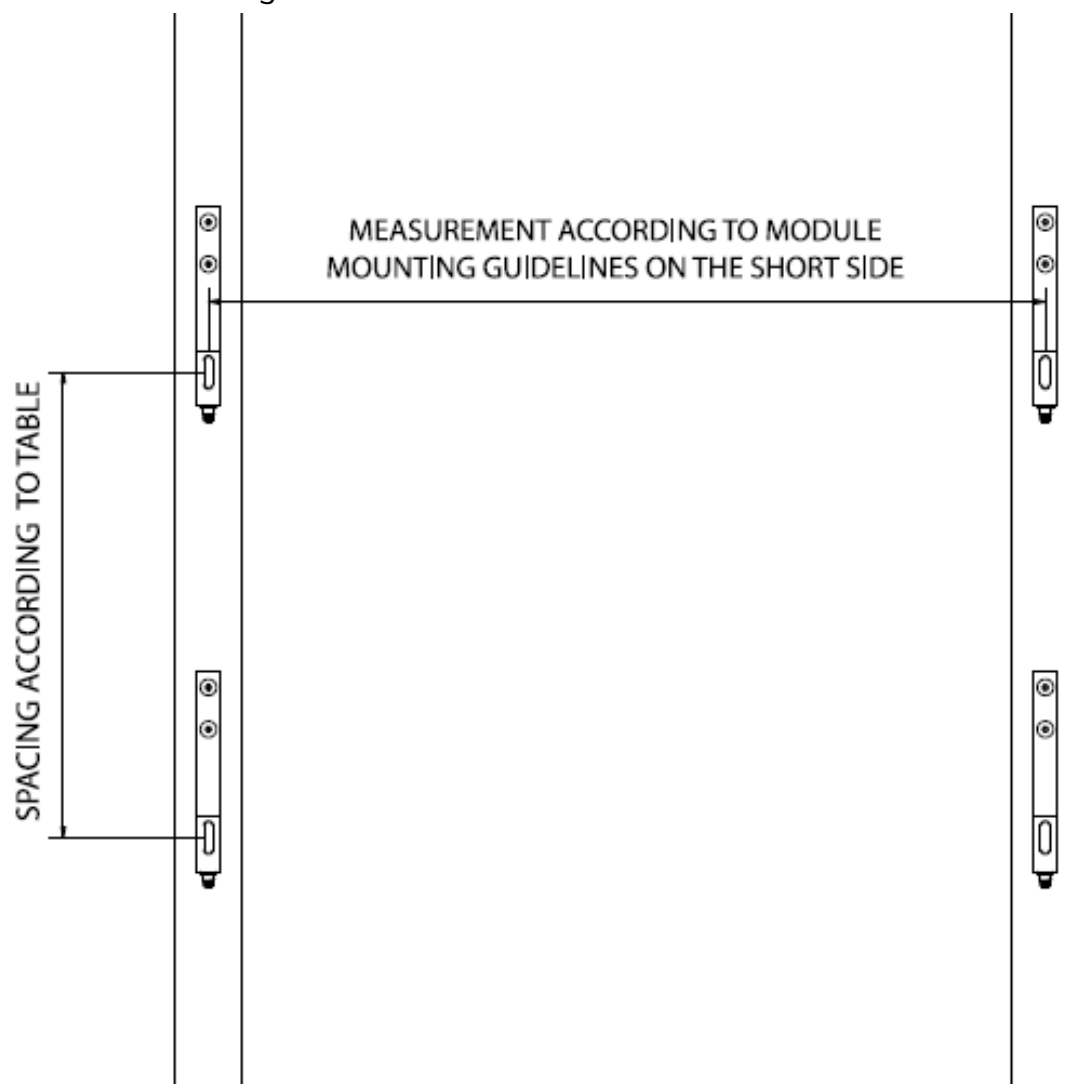


FIGURE. 5 Bracket spacing

Table 4. Maximum bracket spacing depending on the module.

Module length - X	Module width - X	K-01
$X \leq 1780$ [mm]	$X \leq 1052$ [mm]	1.2 [m]
1780 [mm] $< X \leq 2275$ [mm]	$1052 < X \leq 1140$ [mm]	1.1 [m]

6. Ways to install hooks to the roof formwork. First of all, it is necessary to remove selected tiles, allowing access to the rafters. The mounting bracket should be applied to the rafter and fixed with a minimum of two K-16 screws of the appropriate length (without pre-drilling). **The design of the K-08-R hook does not require the installer to additionally grind the roof tiles.**

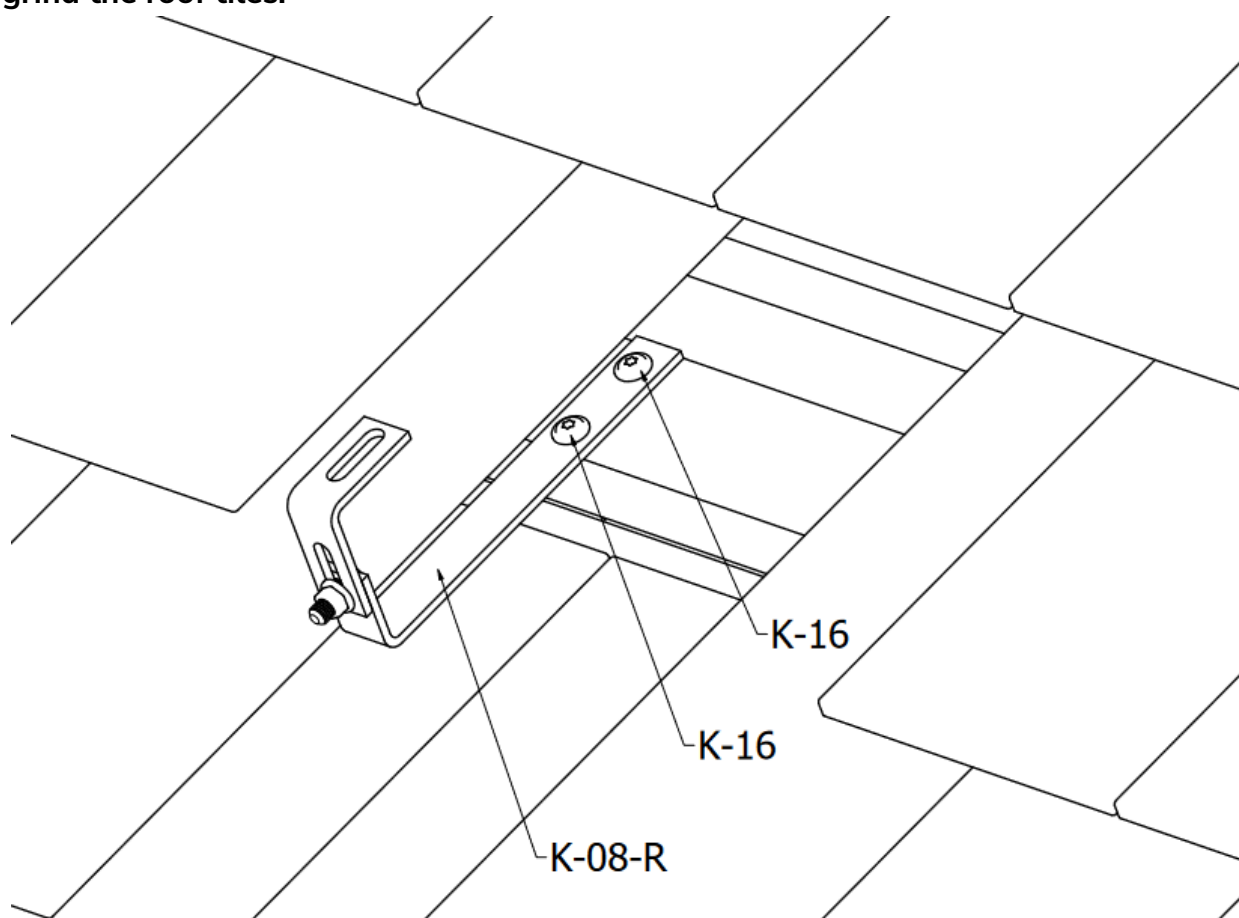


FIGURE. 6 Mounting of K-08-R hook

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.

NOTE The minimum useful length of the profile in the construction is 500mm.

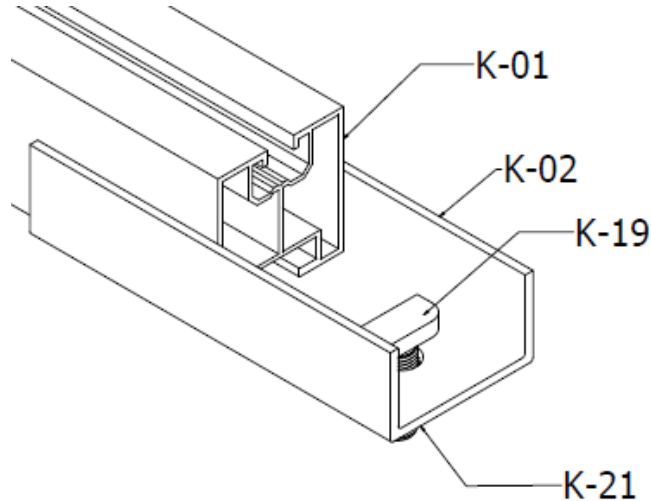


FIGURE. 7 Installation of the K-02 connector with the K-01 profile

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.

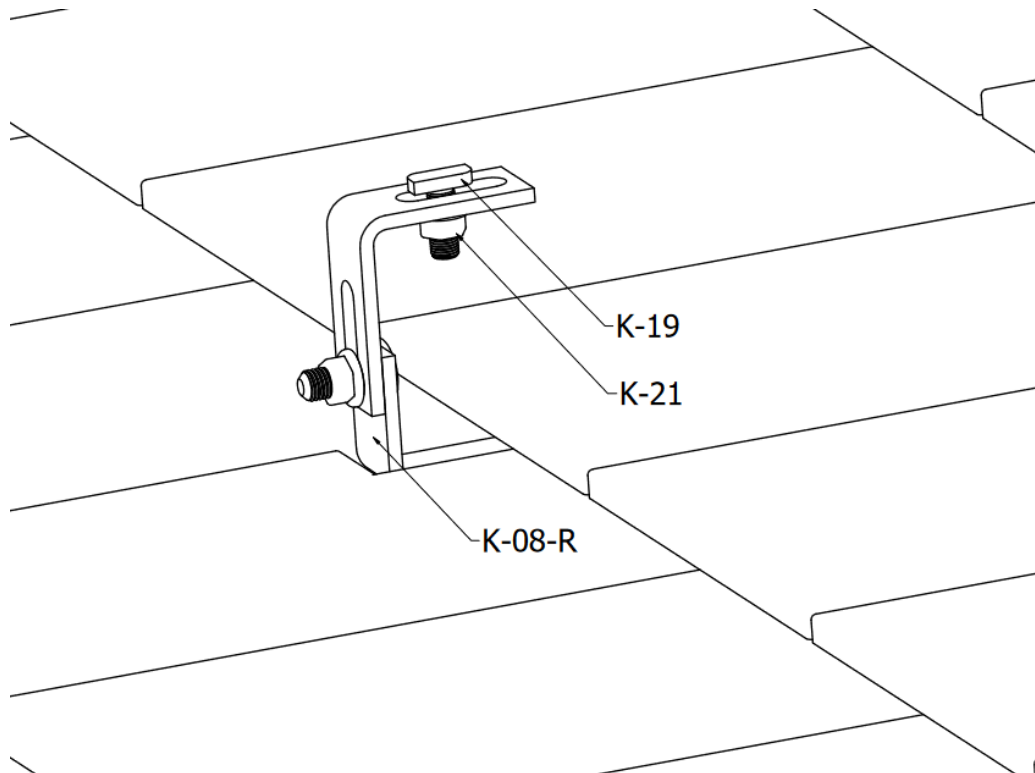


FIGURE. 8 Mounting of T-bolts
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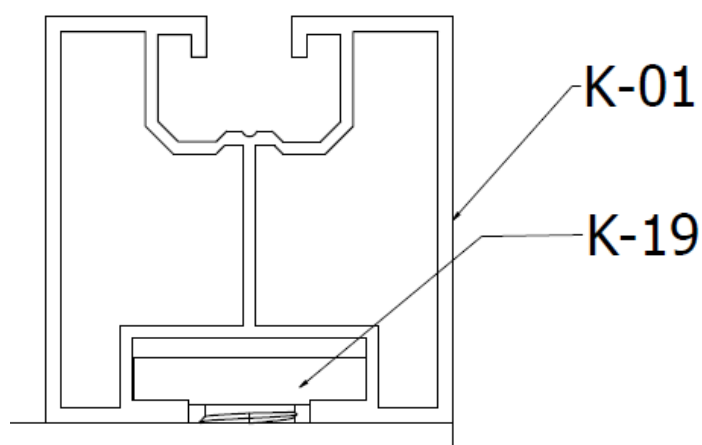


FIGURE. 9 Mounting of K-01 profiles

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

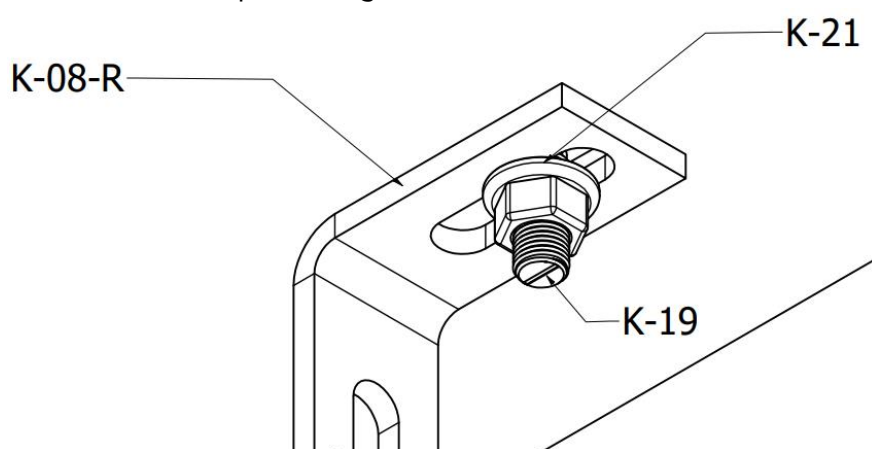


FIGURE. 10 Mounting of "T" bolts

10. The prepared structure should be bolted together using 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.

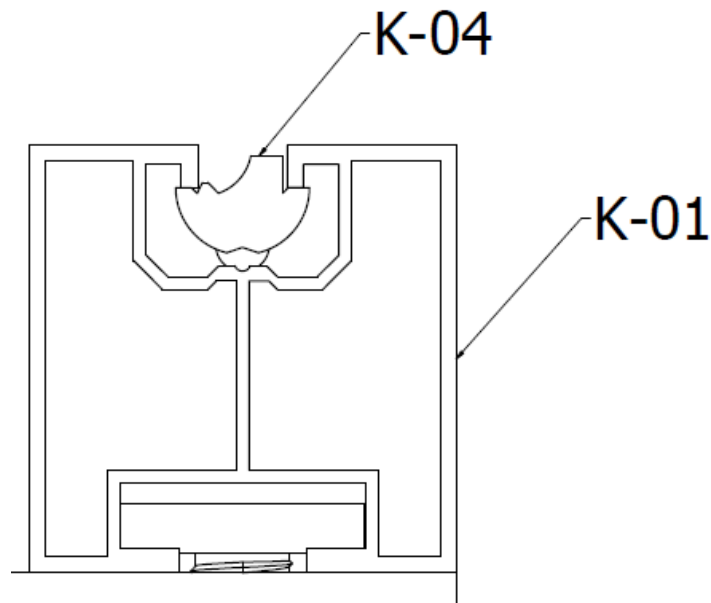


FIGURE. 11 Mounting of the K-04 t-slot nut to K-01 profiles

- 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 the 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.

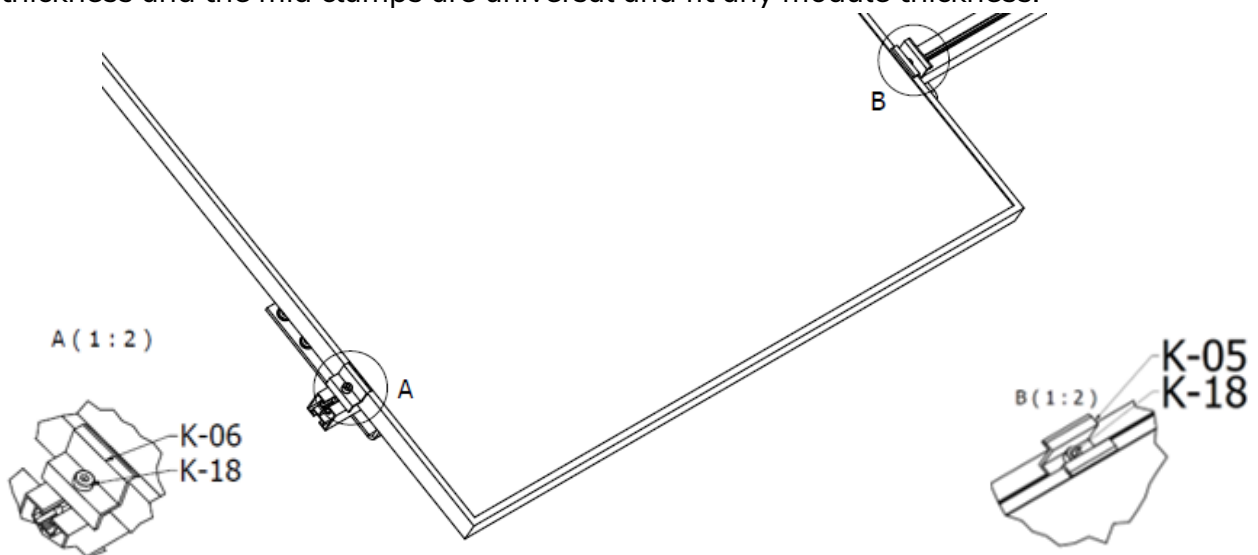


FIGURE. 12 Mounting of the modules and mounting of the K-05 and K-06 clamps

13. Tighten clamps with a torque of 18Nm.

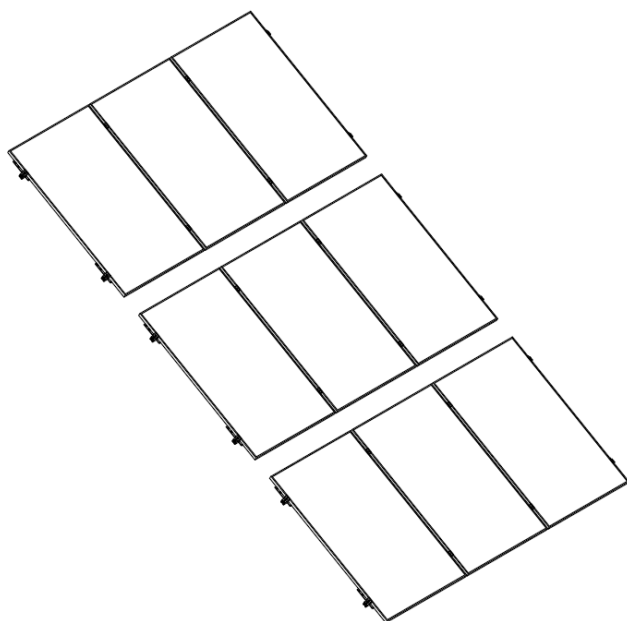


FIGURE. 13 View of assembled structure with modules

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