

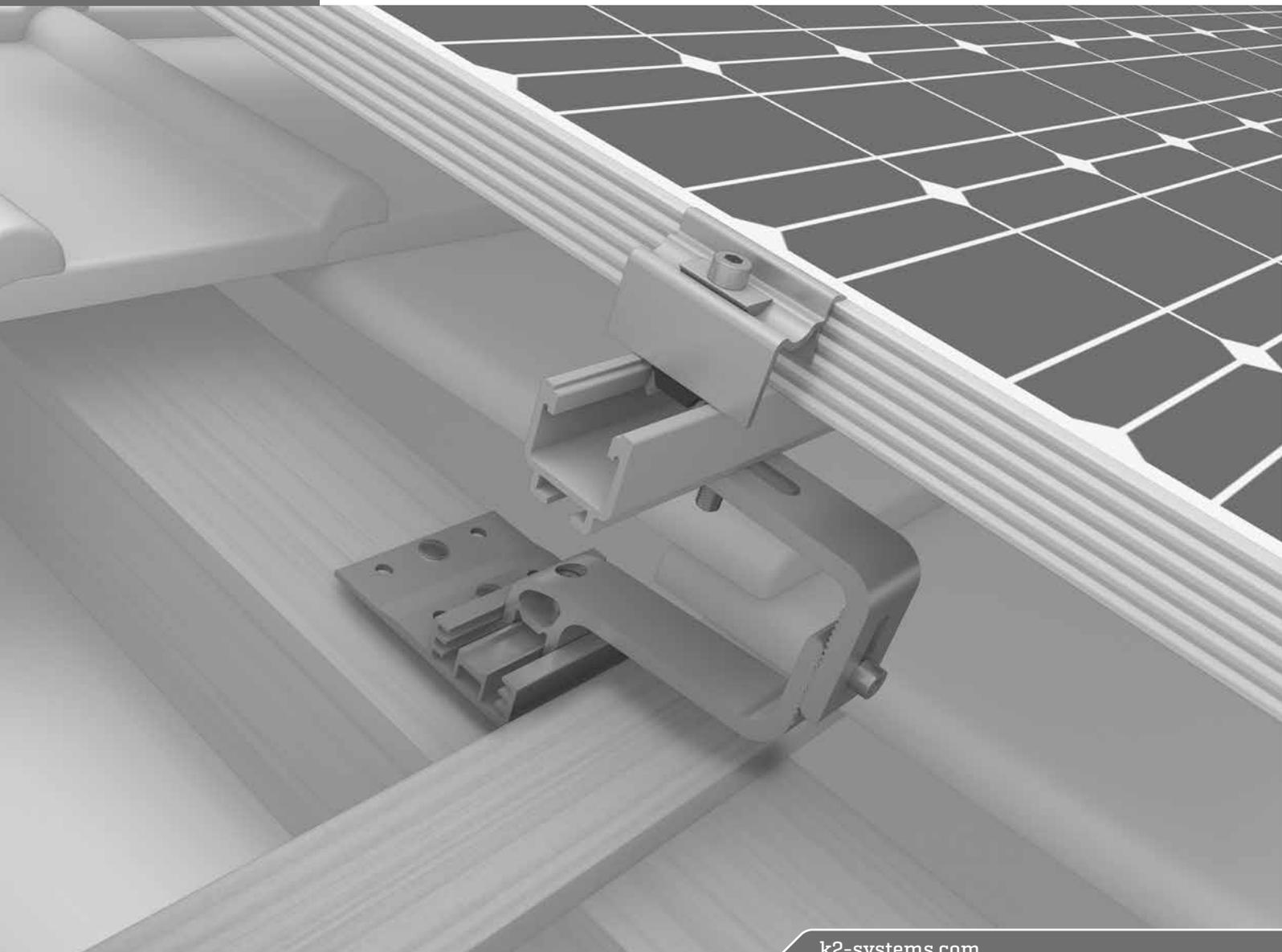
We support PV systems



K2 Roof hook with Heco Fastening Topix-plus screws

Processing according to ETA-19/0553

MANUAL



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Tested quality - certified several times

K2 Systems stands for secure connections, highest quality and precision. Our customers and business partners have known this for a long time. Independent bodies have tested, confirmed and certified our competences and components.

At k2-systems.com/en/technical-information you will find our quality and product certificates.

Übereinstimmungszeichen (Ü-Zeichen)



The SpeedRail system SpeedRail/SpeedClip has the general building authority approval Z-14.4-603.

The CrossHook 3S has the ETA-16/0709.

Introduction



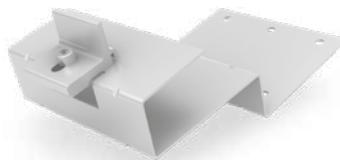
The screw connection between K2 roof hooks and the roof substructure has the task of transferring the forces acting on the photovoltaic system via the roof hook and the screws into the supporting roof substructure and thus guaranteeing the stability of the photovoltaic system. K2 Systems recommends the use of HECO stainless steel screws for fastening its roof hooks. These are of high quality and ensure a secure and good corrosion-resistant connection.

The round slotted hole pattern of the K2 roof hooks has been especially adapted to the Heco Topix screws, so that the combination allows a particularly powerful force transmission, taking into account the European Technical Approval [ETA].

K2 roof hook with round slotted hole pattern and Heco-Topix wood screws



CrossHook 3S & CrossHook 4S
2003215 / 2003144



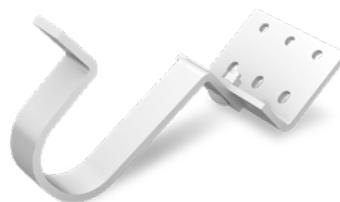
CrossHook 2 Set
2003175



CrossHook 3S+/4S+
2002390 / 2002402



SingleHook 1.1
2001928



SingleHook Vario
2002651



SingleHook Alpin
2003155



HECO-TOPIX-plus wood screw, plate head

Dimension	Art.-No.	Dimension	Art.-No.
6×80	2004106	8×120	2004113
6×100	2004107	8×160	2004115
8×80	2004111	8×180	2004116
8×100	2004112	8×200	2004117

Requirements

General

Before installing roof hooks, it must always be checked whether the roof is capable of bearing the additional load of a photovoltaic system and the resulting changed loads. This usually requires a structural analysis. In the case of existing roofs, the condition of the structure, in particular the load-bearing timbers, must also be inspected on site. The regionally valid building regulations in this regard must be observed.

If the conditions are met, the bolted connection must be calculated according to Eurocode 5. This takes into account the local conditions, the substructure of the building and the geometry of the roof hook. The calculation result shows wheth-

er the selected type and number of screws can transfer sufficient forces from the roof hook to the timber substructure. The values required for the calculation for the Heco-Topix-plus screw can be found in ETA-19/0553. The calculation method is specified by Eurocode 5. The Heco-Topix-plus screws may be used for fastening steel and aluminium roof hooks to the following types of wood with certain minimum requirements:

Solid softwood, glulam, laminated beams, cross laminated timber and laminated veneer lumber. Further details can be found in ETA-19/0553.

Screw diameter

The choice of screw diameter depends both on the rafter geometry in order to maintain the necessary minimum edge distances and on the forces to be transmitted according to the Eurocode calculation. The round oblong hole pattern of the K2 roof hooks offers the geometric prerequisites for the use of screw diameters from $\varnothing 6$ mm to $\varnothing 8$ mm. For these, the connections were mathematically verified taking into account exemplary load assumptions/actions and the bolt resistances defined in the ETA.

Screw length in relation to rafter height

To ensure maximum stress, the penetration depth must be at least the diameter times 4 ($\varnothing 6$ mm $\times 4 = 24$ mm min.; $\varnothing 8$ mm $\times 4 = 32$ mm min.). Only then can the screw transfer the specified forces from the roof hook into the rafter.

Load-bearing capacity

For the screw dimensions listed here, the pull-out values in the screw axis were determined as examples for different wood classes, for solid or glued laminated timber and screw-in angles of 90° to the grain direction. Design values for thread pull-out [axial load capacity] in different timber classes according to ETA-19/0553 with assumption $k_{mod} = 0.9$ [10 mm unused thread length for base plate plus underlay was taken into account]

Design value thread pull [kN] timber class		C24	C27	C30	C35	C40	C45	C50
Timber gross density [kg/m ³]	Usable thread length	350	370	380	400	420	440	460
∅ 6 × 80	70	3.43	3.58	3.66	3.82	3.97	4.12	4.27
∅ 6 × 100	70	3.43	3.58	3.66	3.82	3.97	4.12	4.27
∅ 8 × 80	70	4.58	4.78	4.89	5.09	5.29	5.49	5.69
∅ 8 × 100	80	5.23	5.47	5.58	5.82	6.05	6.28	6.51
∅ 8 × 120	100	6.54	6.83	6.98	7.27	7.56	7.85	8.13
∅ 8 × 160	100	6.54	6.83	6.98	7.27	7.56	7.85	8.13
∅ 8 × 180	100	6.54	6.83	6.98	7.27	7.56	7.85	8.13
∅ 8 × 200	100	6.54	6.83	6.98	7.27	7.56	7.85	8.13

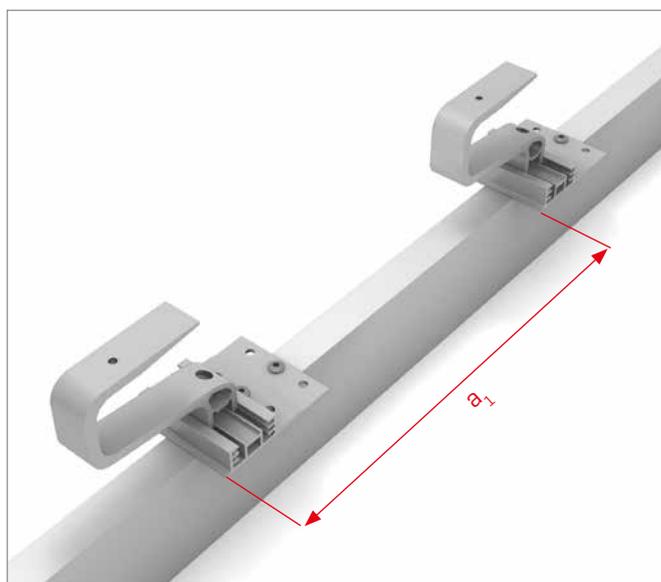
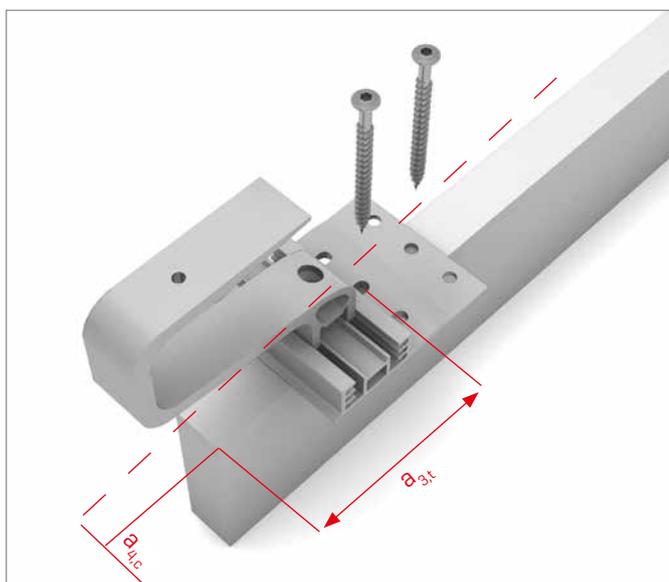
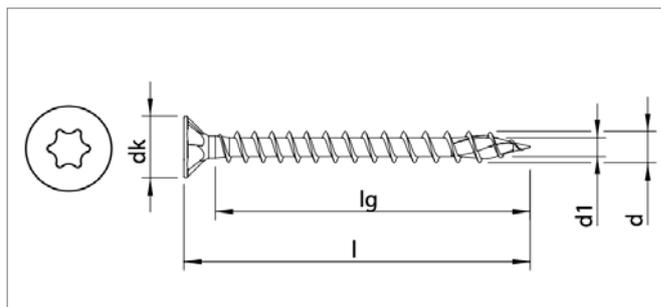
Due to the round oblong hole pattern, the shear loads are absorbed by only one of the two bolts. When calculating the bolted connection, the interaction design according to Eurocode 5 must also be taken into account. Design values for shear loads [loading perpendicular to the bolt axis] with assumption $k_{mod} = 0.6$

Design value of shearing loads [kN]	
∅ 6 mm	1.20
∅ 8 mm	1.36

Requirements

Edge distances

Eurocode 5 and the European approval ETA-19/0553 specify minimum edge distances of the screw to the end-grain end ($a_{3,t}$) and to the unloaded lateral edge ($a_{4,c}$) of the rafter in relation to the screw diameter. The minimum distance between the roof hooks on a rafter (a_1) must also be taken into account. For K2 roof hooks with round oblong hole pattern in combination with Heco-Topix screws of the listed dimensions, the following distances apply:

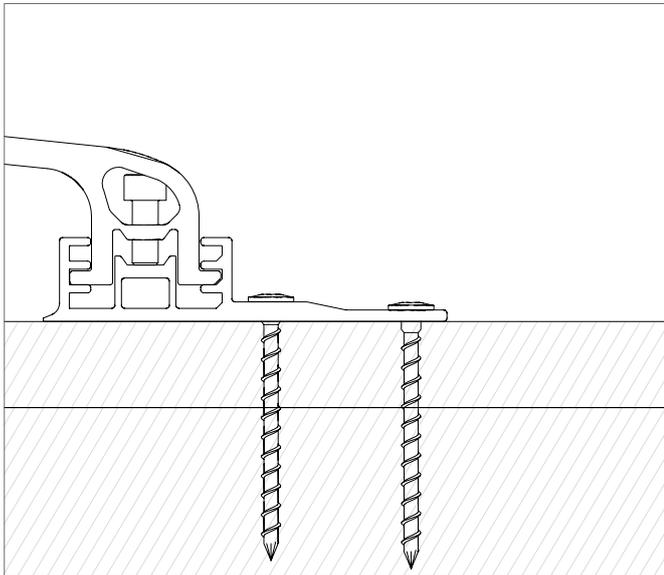


Screw HECO-Topix	K2 Art.No.	d [mm]	L [mm]	Lg [mm]	Drive	Drill Ø for pre-drilling [mm]	Max. screw in torque [Nm]	$a_{4,c}$ [mm]	Min.rafter width [mm]	$a_{3,t}$ [mm]	a_1 [mm]
Ø 6×80	2004106	6	80	70	T25	4.0	5.3	18	36	150	150 *
Ø 6×100	2004107	6	100	70	T25	4.0	5.3	18	36	150	150 *
Ø 8×80	2004111	8	80	70	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200 *
Ø 8×100	2004112	8	100	80	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200 *
Ø 8×120	2004113	8	120	100	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200 *
Ø 8×160	2004115	8	160	100	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200 *
Ø 8×180	2004116	8	180	100	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200 *
Ø 8×200	2004117	10	200	100	T40	5.0 [Softwood] 6.0 [Hardwood]	12.6	24	48	200	200*

* for Douglas fir wood, the value must be increased by 50

- $a_{4,c}$ Min. edge distance to rafter side
- a_1 Min. distance between roof hooks on one rafter
- $a_{3,t}$ Min. distance to the lower rafter end/heartwood

General



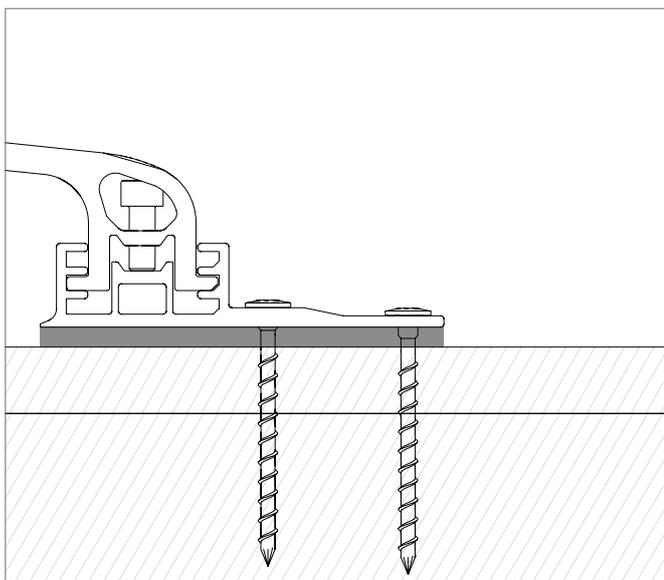
At least 2 screws must always be used to fasten a roof hook to the wooden substructure. The screws may be screwed with pre-drilling or without pre-drilling.

With screw diameters of 8 mm, you may only screw without pre-drilling if the wood type of the substructure is softwood. If you have to pre-drill (for \varnothing 8 mm and wood type hardwood), the recommended drill diameter for 8 mm screw = 6 mm for hardwood (5 mm for softwood), for 6 mm screw = 4 mm.

Select as drive for shoring the screws for \varnothing 6 mm: T25 and for \varnothing 8 mm: T40. The maximum screw-in torque is 5.3 Nm for \varnothing 6 mm and 12.6 Nm for \varnothing 8 mm.

Select the appropriate setting on the cordless screwdriver. The HECO-Topix screw has a sliding coating that allows it to be screwed in smoothly and quickly. The plate head of the screw must lie flush and flat on the base plate of the roof hook after screwing in. The screw must be fully seated in the wood of the substructure, i.e. the tip of the screw must not protrude from the load-bearing solid wood.

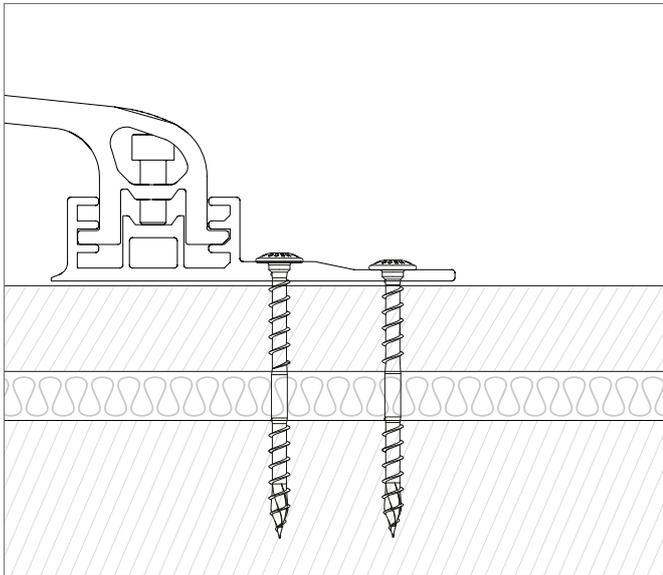
Underlay of the roof hook



If the roof hook is underlaid for height compensation, the underlay must only be so high that the thread of the screw is still completely seated in the rafter timber and not, for example, in the underlay timber, as this cannot introduce tensile and transverse forces into the roof structure.

Installation

With on-roof insulation



If on-roof insulation is present, the screw length must be selected so that the minimum screw-in depth of the screw in the rafter wood is maintained.

This means that the height of the roof hook base plate plus the height of the on-roof insulation must not be higher than the screw length. A special screw (e.g. HECO-TOPIX-Plus Therm) is also recommended for above-rafter insulation in pressure-soft insulation materials.

This is fixed in the counter-batten with its bottom thread. The compressive forces are thus transferred to the screws via the counter-batten. This prevents the counter batten from being pressed into the insulation material.

It should be checked on site whether the fastening of the counter-batten can absorb sufficient shear/slope forces. The screw connection of the counter battens can be improved by additional lag screws. ETA 19/0553 Annex F describes mechanical models and design aids for this.

Further information



Documentation

For traceability purposes of HECO screws, you should document the 12-digit batch number indicated on the packaging and in the delivery documents and quote it to HECO in case of problems or complaints.



Sources:

Eurocode 5 (DIN EN 1995-1) , European Technical Approval ETA-19/0553 , HECO-TOPIX-plus screws.

The information in this manual has been thoroughly checked. Nevertheless, the planner, installer and user are obliged to check and comply with the necessary laws, regulations and applicable standards themselves.

We support PV systems



Thank you for choosing a K2 mounting system.

Systems from K2 Systems are quick and easy to install. We hope these instructions have helped. Please contact us with any questions or suggestions for improvement.

Our contact data:

▶ www.k2-systems.com/en/contact

▶ **Service Hotline: +49 [0]7159 42059-0**

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k2-systems.com

K2 Systems GmbH

Industriestraße 18
71272 Renningen
Germany

+49 [0] 7159 - 42059 - 0
info@k2-systems.com
www.k2-systems.com