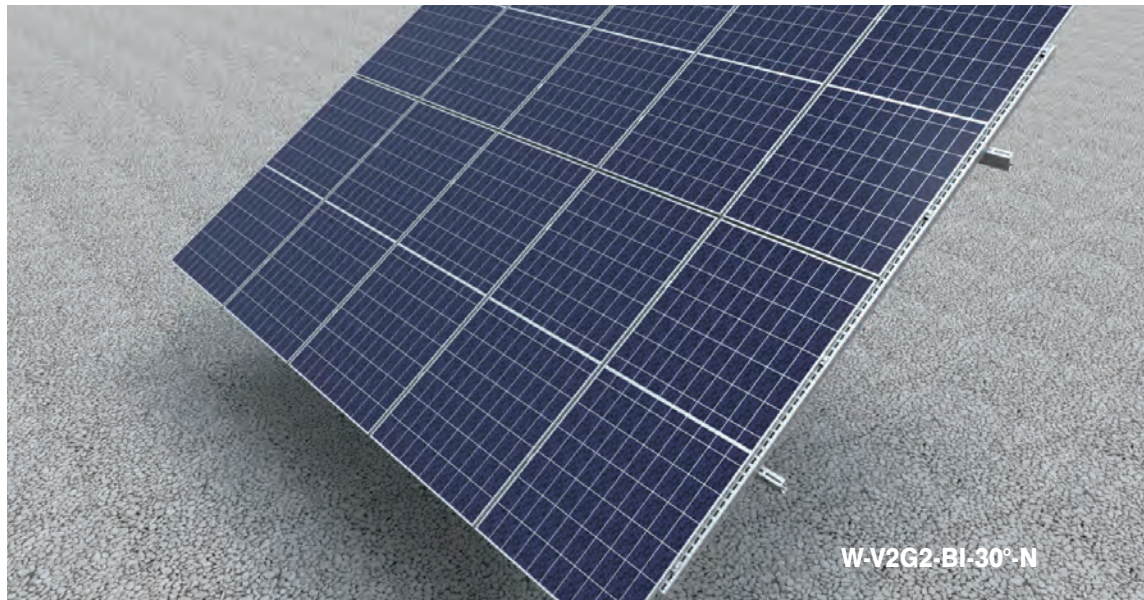
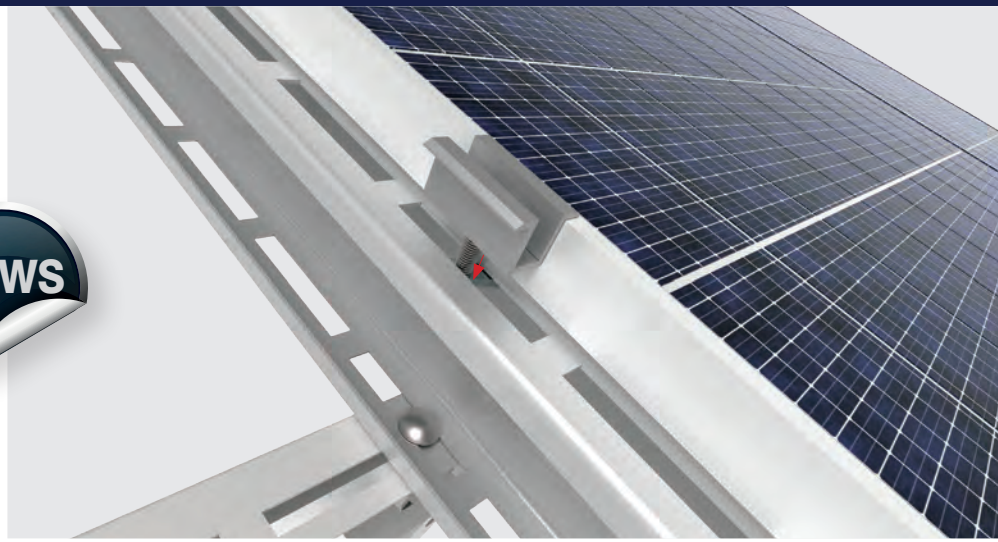
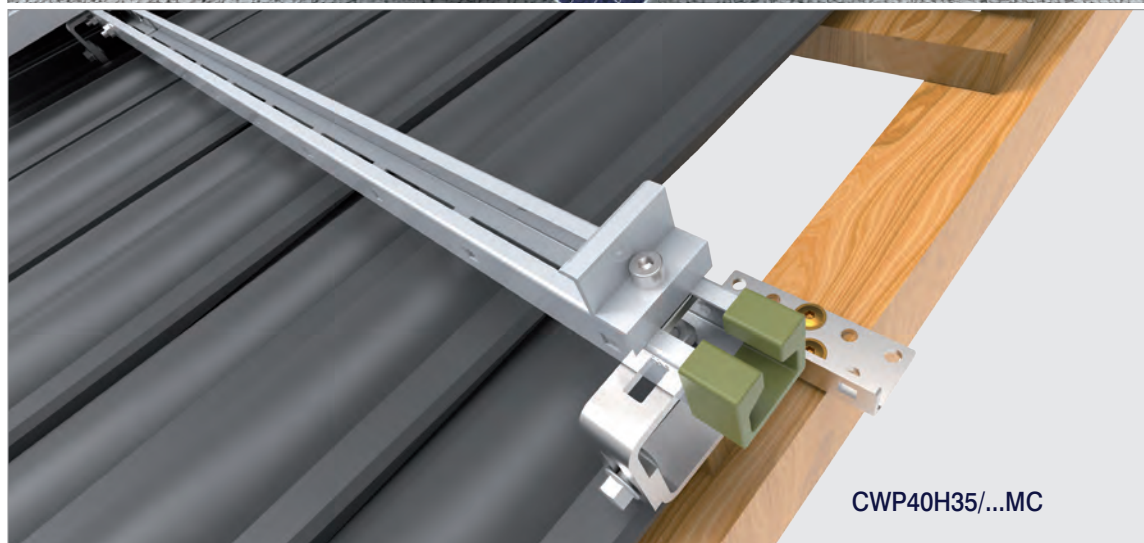


NEWS



W-V2G2-BI-30°-N



CWP40H35/...MC



BAKS STRUCTURES FOR THE INSTALLATION OF PHOTOVOLTAIC PANELS

NEWS

BAKS DESIGNS AVAILABLE AT ALL BAKS WAREHOUSES AND ELECTRICAL WHOLESALERS



W-H4G2-30°-N

BAKS - QUALITY CABLE MANAGEMENT SOLUTIONS

COMPANY & FACTORY BAKS
05-480 Karczew, ul. Jagodne 5, Polska
T: +48 22 710 81 05
E-mail: fotowoltaika@baks.com.pl



BAKS.COM.PL/KONSTRUKCJE_PV/EN

BAKS.COM.PL/KONSTRUKCJE_PV/EN

35 YEARS OF BUSINESS EXPERIENCE





BAKS MOUNTING STRUCTURES FOR THE INSTALLATION OF PHOTOVOLTAIC PANELS

Choice of mounting structures for the installation of PV panels

e-mail: fotowoltaika@baks.com.pl

tel. +48 22 710 81 05



INTERNATIONAL SALES DEPARTMENT

Phone: +48 22 710 81 10, e-mail: export@baks.com.pl

TOMASZ SIELSKI - Chief Operating Officer Phone: +48 22 710 81 85 Mobile: +48 603 685 501 tomasz.sielski@baks.com.pl

AREA I
TOMASZ JACAK - Export Manager Phone: +48 22 710 81 10 Mobile: +48 601 071 242 tomasz.jacak@baks.com.pl
 Jacek Kwiatkowski - Export Specialist Phone: +48 22 710 81 48 jacek.kwiatkowski@baks.com.pl
 Sedina Zofia - Export Specialist Phone: +48 22 710 81 50 zofia.sedina@baks.com.pl

AREA II
KRZYSZTOF DOMAŃSKI - Export Manager Phone: +48 22 710 81 15 Mobile: +48 669 501 324 krzysztof.domanski@baks.com.pl
 Michał Banasiewicz - Export Specialist Phone: +48 22 710 81 94 michal.banasiewicz@baks.com.pl
 Naperty Adam - Export Specialist Phone: +48 22 710 81 57 adam.naperty@baks.com.pl

AREA III
ŁUKASZ ZALEWSKI - Export Manager Phone: +48 22 710 81 66 Mobile: +48 667 944 957 lukasz.zalewski@baks.com.pl
 Adam Polomski - Export Specialist Phone: +48 22 710 81 00 ext. 217 adam.polomski@baks.com.pl
 Klaudia Cackowska - Export Specialist Phone: +48 22 710 81 66 klaudia.cackowska@baks.com.pl
 Jarzabek Alicja - Export Specialist Phone: +48 22 710 81 25 alicja.jarzabek@baks.com.pl
 Mariusz Stępkowski - Export Specialist Phone: +48 22 710 81 58 mariusz.stepkowski@baks.com.pl



QUALITY CABLE MANAGEMENT SOLUTIONS

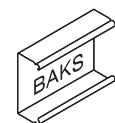
FACTORY BAKS

Jagodne 5
 05-480 Karczew, Polska

Working hours: Monday - Friday 7:00 – 20:0

Phone: +48 22 710 81 00
 Fax: +48 22 710 81 01

E-mail: baks@baks.com.pl



BAKS DESIGNS AVAILABLE AT ALL BAKS WAREHOUSES AND ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

BAKS.COM.PL/KONSTRUKCJE_PV/EN

BAKS DESIGNS AVAILABLE AT ALL BAKS WAREHOUSES AND ELECTRICAL WHOLESALERS THROUGHOUT POLAND



BAKS was established in 1986 and is a leading Polish and European manufacturer of support systems for the power and telecommunications industries as well as for air and water conduits etc.

Due to the increasing demand in the RES industry, BAKS also offers a number of solutions for the installation of photovoltaic panels, both on free-standing structures and on flat and sloping roofs. Systems mounted directly to the building facade and balcony railings are also available. Cutting edge technology, an experienced team of professionals and investments in modern machines and equipment (punching machines, roll forming lines, welding robots, specialised laser cutting machines, bending brakes, powder coating plant, hot dip galvanizing plant) allowed us to achieve the highest standards.

BAKS has at its disposal the following reports and certificates:

- Certificate for photovoltaic panel mounting systems no. Tm61000362.001 issued by TUV Rheinland
- TUV certificate for factory production control according to EN-1090 in accordance with the 2+ system
- Product certificate in accordance with PN-EN 61537:2007 issued by TUV Rheinland, concerning product safety and strength performance of cable route systems provided in the catalogue (strength values specified in the catalogue include 70% safety factor, which means that they are 70% stronger than the values specified in the catalogue). It also confirms the electrical continuity of the cable route system. This standard is harmonized with the EU Low Voltage Directive up to 1 kV.
- Reports of strength calculations of available PV structures made by authorised design offices
- VDE certificates confirming the electrical continuity of BAKS systems
- TUV ISO 9001:2015 certificate confirming that „BAKS” manufactures and designs based on a quality system compliant with ISO 9001:2015.
- Certificate confirming the implementation of the environmental management system – ISO 14001:2015

We are a recognized and valued partner in our field. Participation in various projects **in Poland** is sufficient proof:

- PV farms across Poland in a single investment - 33x1 MW
- PV farms across Poland in a single investment - 31x1 MW
- PV farm in Kamienna Góra - 3 MW
- PV farm in Bierutów - 2 MW
- PV farm in Krosno - 1 MW
- PV farm in Skorowity - 1 MW
- PV farm in Jarosty (for IKEA logistics centee) - 0.8 MW
- PV farm in Osiemborów - 0.8 MW
- PV farm in Kosuty - 0.8 MW
- PV installations on flat and pitched roofs throughout Poland with a total capacity of 200 MW
- PV installations on pitched roofs, including deliveries of structures for projects carried out by the IKEA stores chain
- Investment projects implemented by partner electrical wholesalers throughout the country;

and abroad:

- PV farm in Halmajugra (Hungary) - 24 MW
- PV farm in Novoukrainka (Ukraine) - 5 MW
- PV farm Marjamma (Estonia) - 3.7 MW
- PV farm Pussi (Estonia) - 7.62 MW
- PV farm Vagari Yingli (Estonia) - 5.88 MW
- PV farm Pussi II (Estonia) - 1.24 MW
- PV farm Rapla (Estonia) - 5.27 MW
- PV farm Vagari (Estonia) - 2.78 MW
- PV farm Rabase (Estonia) - 4.51 MW
- PV farm Janikese Hundi (Estonia) - 0.56 MW
- PV farm Joeveere (Estonia) - 1.12 MW

To meet the needs of our customers, the production line has been modernized, which makes it possible to implement custom projects according to the documentation provided. Caring for the customer's needs by providing the highest quality products, maintaining low prices, as well as professional logistics, have earned BAKS the trust of our customers.

BAKS photovoltaic system structures are available from electrical wholesalers throughout the country. We recommend purchasing photovoltaic systems manufactures by us.

Kazimierz Sielski






ŚWIEBODZIN, capacity 1,8 MW , structure type: DP-DNHBE- 15°, DP-DNHWE - 15°



ŚWIEBODZIN, capacity 1,8 MW , structure type: DP-DNHBE- 15°, DP-DNHWE - 15°



BASZYN, capacity 1MW, structure type: W-H4G2-BI



MSZCZONÓW, capacity 1MW, structure type: DP-DNHBE- WZ- 10°



NEKLA, capacity 4MW, structure type: W-H4G2



PODEBŁOCIE, capacity 1MW, structure type: W-H4G2-BI



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

NEWS

HAJNÓWKA, capacity 4MW, structure type: W-H4G2-BI



BAKS STRUCTURES FOR MOUNTING PHOTOVOLTAIC PANELS

NEW STRUCTURES

- changes in free-standing structures
- H4G2 BI structure
- V2G2 BI structure
- structure for mounting photovoltaic panels on flat roofs for angles of 10°, 15°, 20°
- inverter mounting solution
- non-invasive system for mounting structures on flat roofs covered with membrane or roofing paper
- Magnelis® coated steel cable route system

GENERAL INFORMATION

- TUV FPC certificate per 2+ system
- price list – new products
- product changes and their substitutes free standing structures BAKS - new projects
- new PV application, PV installation planning

OTHER NEW PRODUCTS

- SPM1 and SPM2 plates for installation on flat roofs covered with roofing paper or membrane
- NRM8PV channel nuts for fast installation of photovoltaic panels
- new RUBTE trapezoidal sheet fixing
- DUFR60E adjustable fixing for bitumen shingles
- DUFPE plain tile fixing made of Magnelis® coated steel
- new aluminium profile PAL30H32 with dedicated connector - economic version
- SPV clip to prevent cables from falling out of the CWC100H50...NMC profile
- new PCB... and PCS... mounting bases for free-standing structures
- templates for positioning fixing holes in free-standing structures
- DI, BDI, LDI inverter covers
- OWN...NMC universal wind shield with length adjustment
- PCSBV channel base with vibration isolation rubber
- CWP40H35/2.2MC, CWP40H35/3.3MC Reinforced channel section
- LC40H35MC Channel connector
- PDOPD300MC enlarged ballast base
- UBZRPE, UBZRE standing seam sheet fixing
- UPP.MC intermediate panel fixing for free-standing structures
- PUP and PUPK grounding pad for frames of photovoltaic panels



CERTIFICATE

TUV certificate for factory production control according to EN-1090 in accordance with the 2+ system

CERTIFICATE	
conformity of the Factory Production Control	
2627-CPR-1090-1.PL0159.TÜVRh.21.00	
In compliance with Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulations - CPR)	
This certificate applies to the following construction product:	
Construction product	Structural components and kits for aluminium structures to EXC2 according to EN 1090-3:2008
Intended use	for load-bearing structures in all types of buildings
CE-marking method	ZA.3.2, ZA.3.4 according to EN 1090-1:2009+A1:2011
Manufacturer	BAKS - Kazimierz Sielski ul. Jagodne 5 05-480 Karczew Poland
Manufacturing plant <small>Production facility of the manufacturer</small>	ul. Jagodne 5, 05-480 Karczew
Confirmation	This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the harmonised standard EN 1090-1:2009+A1:2011 under system 2+ are applied, and that the factory production control fulfills all the prescribed requirements stated therein.
Date of first issue	05.08.2020
Next Surveillance inspection	04.08.2023
Period of validity	This certificate will remain valid as long as the test methods and/or the factory production control requirements included in the harmonised standard used to assess the performance of the declared characteristics do not change, and the product and the manufacturing conditions in the plant are not modified significantly.
Place and date of issue	Zabrze, 05.08.2021
	 Leszek Zadroga Notified Body
	
www.tuv.com	 AC 141
	 TÜVRheinland® Precisely Right.

© TÜV, TÜV EÜV and TÜV are registered trademarks. Any use or application requires prior approval.



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

FREE-STANDING STRUCTURES

Free-standing structures for mounting photovoltaic panels

 ADVANTAGES

- dense profile perforation provides a wide range of adjustment without the need for drilling
- longitudinal perforation of the profiles allows a smooth adjustment of the tilt angle of the structure in relation to the ground within the range of 20-35 degrees
- possibility to assemble the structure using only one type of locking bolts – SGKFM10x20, which do not require holding with a spanner, thanks to which the assembly of the structure is faster and requires fewer tools
- perforation of profiles reduces the weight of the structure, while not reducing their strength properties; thanks to this, the installers do not have to carry heavy profiles and their work is more efficient
- rectangular perforation ensures better locking of the SGKFM10x20 bolts and extends the bolt adjustment range in the hole
- dense perforation allows the panels to be installed anywhere without the need for drilling
- through the use of CW type profile, we have the possibility of safe laying of cables inside
- thanks to the SPV clip made of stainless steel with a round cross-section, we can protect cables laid in the CWC100H50...NMC profile against falling out and forego the use of unsightly and impermanent cable ties
- top perforation in the CWC100H50...NMC profile to allow for quick mounting of clamps using NRM8PV channel nuts
- longitudinal perforation of the support profiles allows a quick installation of the extension arms and cable trays for a safe cable routing and installation of the inverter structure
- possibility to manufacture legs with different thickness of metal sheets (3 and 4 mm) depending on the quality of soil
- production of profiles takes place on the highest class perforating and profiling machines, which ensures high quality and repeatability of products. Profile ends are virtually free of sharp edges, which significantly reduces the possibility of injury to the installer
- profiles made of Magnelis®-coated sheet metal guarantee many years of corrosion resistance
- the use of mounting templates allows for quick location of holes for screwing the subsequent elements of the construction and mounting clamps
- products made in Poland!

 standard product


W-V2G1-30°-N



W-V2G1-WZ-10°-N



W-H4G2-30°-N



W-H4G2-BI-25°-N



W-H5G2-30°-N



W-H6G2-25°-N



W-V2G2-30°-N



W-V2G2-BI-25°-N



W-V3G2-30°-N



**W-H4G2-BI-(optional 25°)-N
N-New profile design**

**Mounting structure for bifacial photovoltaic panels
(Bifacial)**

optimized horizontal design structure

Description of the structure

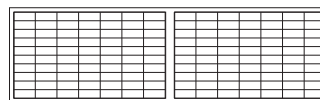
- A complete support system for the installation of bifacial panels that utilize sunlight reflected from the ground
- Changing the rear braces from 41x41 channels to PGM6E threaded rods - this allows more of the sun's rays reflected from the ground to reach the rear active surface of the panels and significantly increases productivity

Advantages

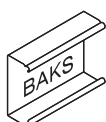
- Maximum limitation of shadowing of the panels at the back of the structure due to the use of support profiles only at the panel frame locations (or halfway along the panels)
- Extended perforation holes along the entire length of the profiles provide great adjustment possibilities during structure assembly
- perforation in CWC100H50...NMC profiles allows for quick installation of panels using NRM8PV channel nuts

Technical description

- **Support system materials:**
MC- structural steel grade S250GD and S350GD with Magnelis® coating, for ZM430 support columns, for above-ground parts ZM310
A- Aluminium
E- Stainless steel
F- Flake zinc plated steel
- **Soil conditions: soil with good/high bearing capacity**
- **Structure mounting variants:**
 - ✦ W-H4G2-BI-N structure - driven into the ground (anchorage depth depends on soil conditions)
 - ✦ W-H4K2-BI-N structure - support columns anchored to concrete foundation
 - ✦ W-H4B2-BI-N structure - support columns poured with min. B20 concrete in holes made in the ground (foundation size depends on ground conditions)
 - ✦ W-H4S2-BI-N structure - on request, ground screw fixing for support column
- **Module layout:**
horizontal-H



- **Warranty:**
BAKS provides a 10 year warranty period for the components included in the support structure - only if all conditions of the manufacturer's warranty are met. The warranty can be extended



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

W-V2G2-BI-(optional 25°) -N N-New profile design

Mounting structure for bifacial photovoltaic panels (Bifacial)

optimized vertical design structure

BIFACIAL

Description of the structure

- A complete support system for the installation of bifacial panels that utilize sunlight reflected from the ground
- Changing the rear braces from 41x41 channels to PGM6E threaded rods - this allows more of the sun's rays reflected from the ground to reach the rear active surface of the panels and significantly increases productivity
- Example of construction bracing arrangement

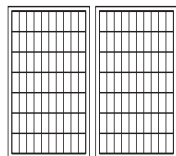
Advantages

- Maximum limitation of shadowing of the panels at the back of the structure due to the use of support profiles only at the panel frame locations (or halfway along the panels)
- Extended perforation holes along the entire length of the profiles provide great adjustment possibilities during structure assembly
- perforation in CWC100H50...NMC profiles allows for quick installation of panels using NRM8PV channel nuts

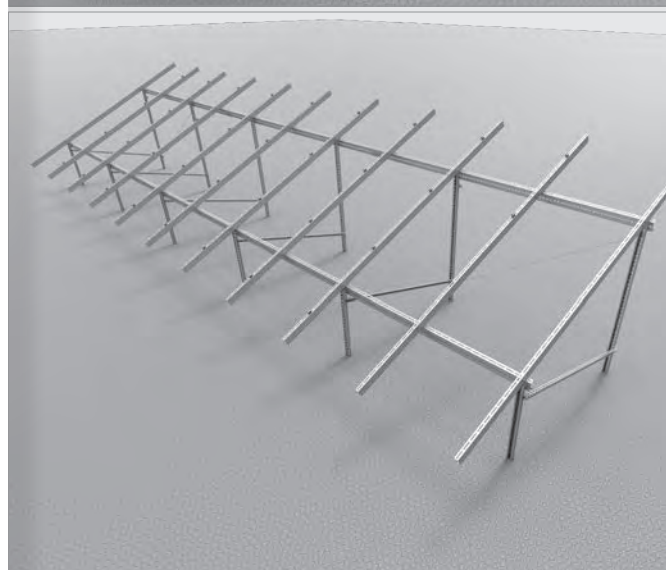
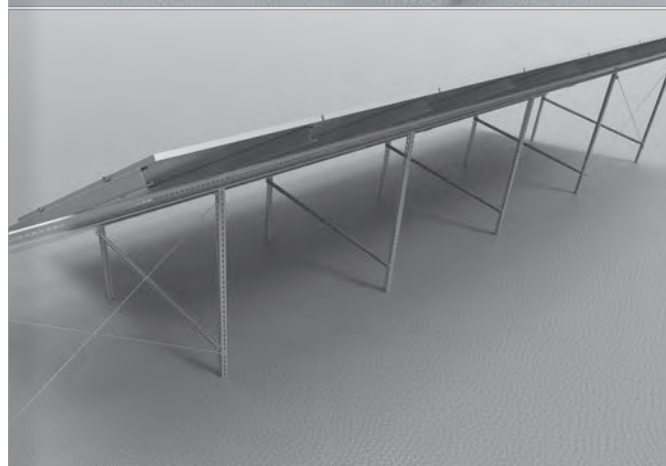
Technical description

- **Support system materials:**
MC- structural steel grade S250GD and S350GD with Magnelis® coating, for ZM430 support columns, for above-ground parts ZM310
A- Aluminium
E- Stainless steel
F- Flake zinc plated steel
- **Soil conditions: soil with good/high bearing capacity**
- **Structure mounting variants:**
 - ✦ W-V2G2-BI-N structure - driven into the ground (anchorage depth depends on soil conditions)
 - ✦ W-V2K2-BI-N structure - support columns anchored to concrete foundation
 - ✦ W-V2B2-BI-N structure - support columns poured with min. B20 concrete in holes made in the ground (foundation size depends on ground conditions)
 - ✦ W-V2S2-BI-N structure - on request, ground screw fixing for support column

- **Module layout:**
vertical-V



- **Warranty:**
BAKS provides a 10 year warranty period for the components included in the support structure - only if all conditions of the manufacturer's warranty are met. The warranty can be extended.



INVERTER MOUNTING SYSTEM WITH COVER ROOFS



Inverter mounting solutions

Inverter cover protects the inverter from rain, snow and mechanical damage

Advantages

Advantages of inverter mounting structures

- possibility to mount horizontal profiles to the rear support pillars in any spacing, adapted to the dimensions of the inverter
- the use of vertical profiles ensures a stable mounting even for the heaviest inverters according to manufacturers' guidelines
- possibility of mounting to a supporting structure for photovoltaic panels and to an independent structure placed on the side of the installation

Advantages of the cover roof system

- inverter protection against rain, snow and mechanical impact
- high strength parameters
- easy and quick to install.
- possibility to extend the cover with more modules creating any width adjusted to the inverter
- Magnelis® coating guarantees many years of corrosion resistance
- symmetrical design of the side covers allows for installation of the same element type on the right and left side

Technical description

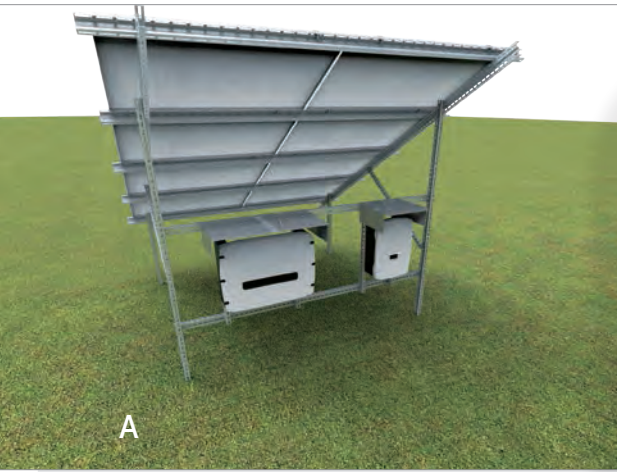
Support system materials: S250GD steel with Magnelis® coating

A Fixing of inverters together with the cover roof system to the existing free-standing structure for photovoltaic panels

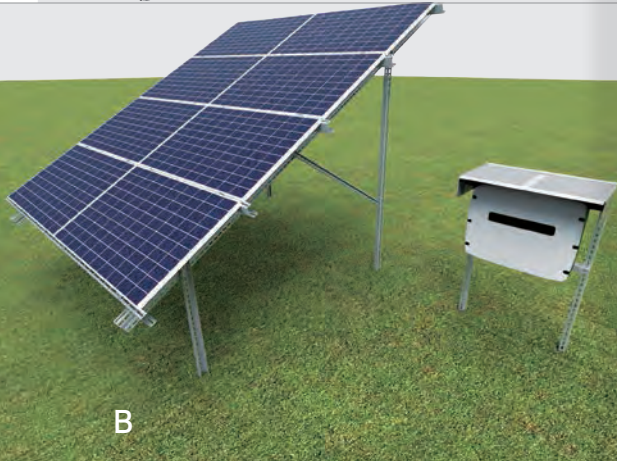
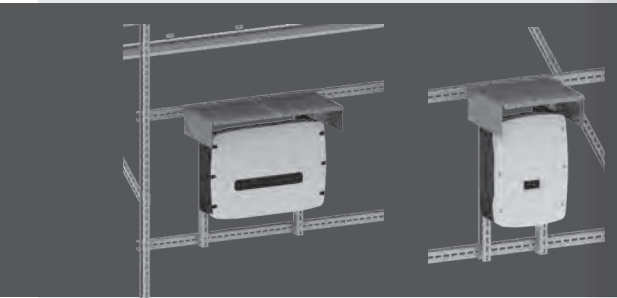
B Fixing of inverters with the cover roof system for independent free-standing structure - dedicated to bifacial panels

- **Warranty:**

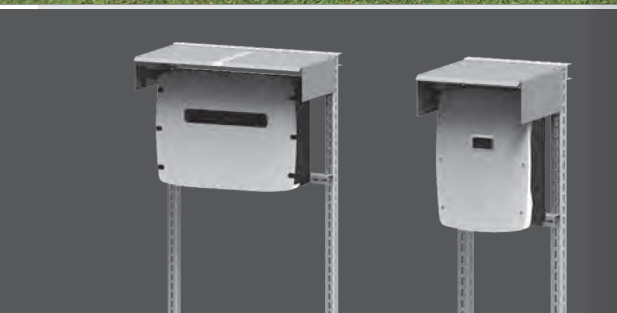
BAKS provides a 10 year warranty period for the components included in the support structure - only if all conditions of the manufacturer's warranty are met. The warranty can be extended.



A



B



ST standard product

STM Standard stock product (in stock)



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

[BAKS.COM.PL/KONSTRUKCJE_PV/EN](https://www.baks.com.pl/konstrukcje_pv/en)

KFL...MC



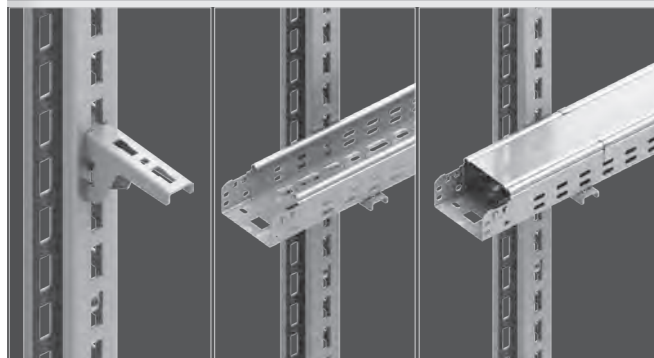
Cable trays KFL...MC with "CLICK"

connection made of sheet metal with Magnelis® coating for the routing of electrical cables in photovoltaic installations

(Tray support - reinforced extension arm WSZ...NMC) snapped into channel section (support column)

Technical description

- BAKS free-standing structures are adapted for mounting extension arms and BAKS cable trays. Clip-on installation of WSZ...NMC extension arms (without tools) to the support columns significantly reduces the installation time of the BAKS tray. Provides good heat dissipation and protection from direct and diffused UV radiation. Allows instant installation of cables. Equipped with covers to protect cables from damage by forest animals and rodents. BAKS products are provided with VDE, TUV and ITB certificates confirming electrical continuity of the circuit, guaranteeing no electric charge storage in earthed structures.
- Longitudinal perforation in Baks free-standing structures enables fast assembly of cable routes to free-standing structures using WSZ...NMC snap-in extensions
- The KFL...MC cable trays can be successfully used to run electrical cables on flat roofs and other external electrical installations
- The KFL ..MC cable trays with "click" connection are certified by TUV, VDE and ITB to ensure electrical continuity of the system



Standard stock product (in stock)

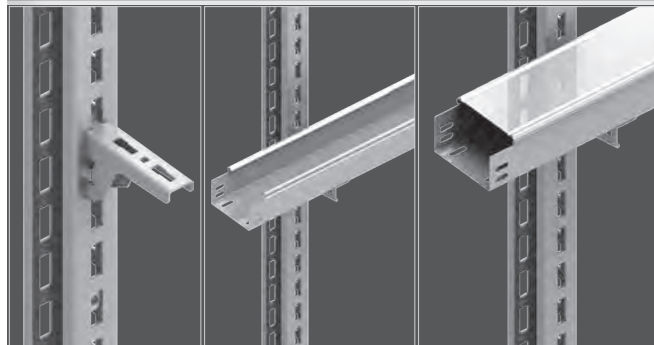
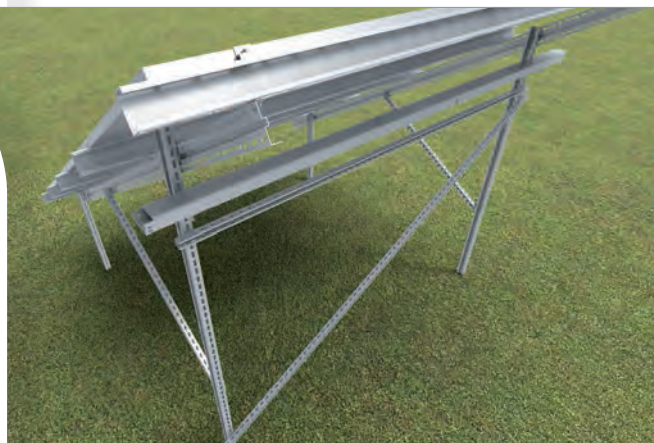
KBL...MC



Electrical wiring in solid KBL...MC cable tray

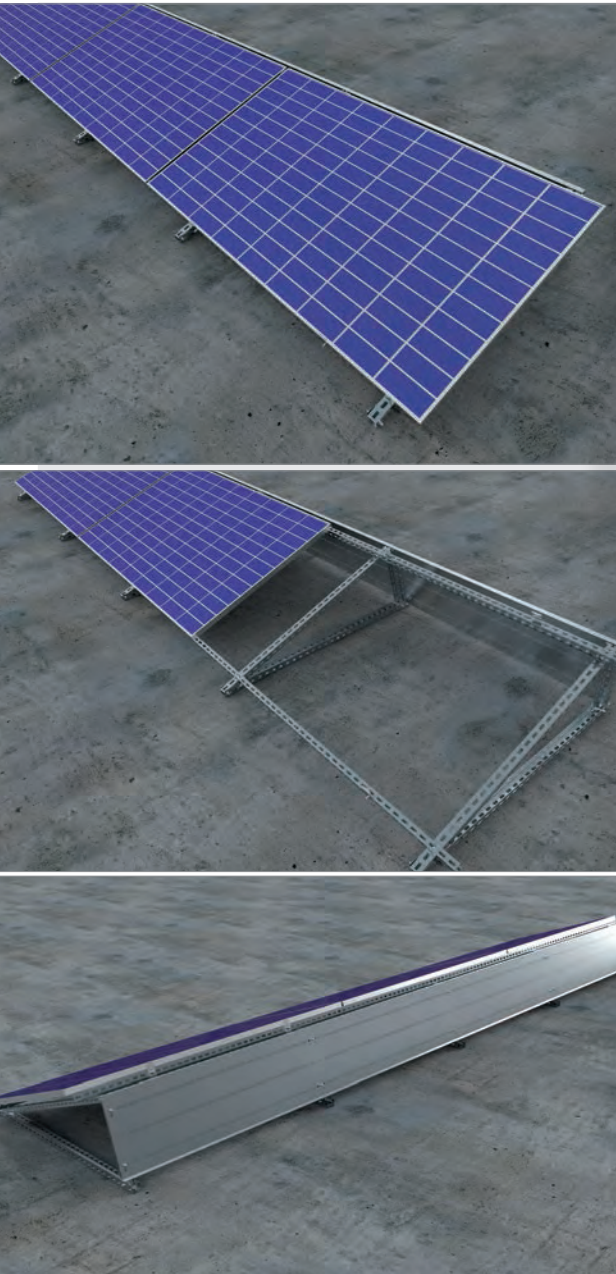
Technical description

- BAKS free-standing structures are adapted for mounting extension arms and BAKS cable trays. Clip-on installation of WSZ...NMC extension arms (without tools) to the support columns significantly reduces the installation time of the BAKS tray. Provides good heat dissipation and protection from direct and diffused UV radiation. Trays can be equipped with covers to protect cables from damage by forest animals and rodents. BAKS products are provided with VDE, TUV and ITB certificates confirming electrical continuity of the circuit, guaranteeing no electric charge storage in earthed structures.
- Longitudinal perforation in Baks free-standing structures enables fast assembly of cable routes to free-standing structures using WSZ...NMC snap-in extensions
- The KBL...MC cable trays can be successfully used to run electrical cables on flat roofs and other external electrical installations
- The KBL ..MC cable trays are certified by TUV, VDE and ITB to ensure electrical continuity of the system



Standard stock product (in stock)





DP-DTHBN-20



structure for mounting photovoltaic panels on flat roofs for angles of 10°, 15°, 20°

Advantages

- system dedicated for mounting photovoltaic panels on flat roofs
- possibility to fix clamps on the long side of the panel
- quick installation thanks to the use of mounting system profiles
- panel support along the entire length of the side
- universal system can be installed in three options of fixing to the roofing: ballasted, anchored, adhesive

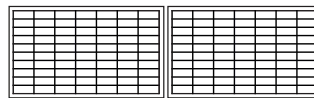
Technical description

Support system materials:
MC- Structural steel with Magnelis® coating
F- Flake zinc plated steel

Strength-tested design

Complete support system to fix the panels in horizontal arrangement at an angle of 10, 15 and 20° on a flat roof covered with roofing paper or membrane without interfering with the roof covering and without using additional ballast.

- **Structure mounting variants:**
✦ glued in with tilt angle 10°, 15° or 20°
- **Module layout:**
horizontal-H



- **Warranty:**
BAKS provides a 10 year warranty period for the components included in the support structure - only if all conditions of the manufacturer's warranty are met. The warranty can be extended
- Installation instructions available on the website
https://www.baks.com.pl/en/konstrukcje_pv/pv-installation-instructions/



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALEERS

[BAKS.COM.PL/KONSTRUKCJE_PV/EN](https://www.baks.com.pl/en/konstrukcje_pv/en)

DP-DNHWE

Structure for installation of photovoltaic panels on flat roofs covered with roofing paper or membrane

Advantages

- no interference with roof covering
- no additional roof load due to elimination of ballast
- quick installation and low price,
- strength-tested construction
- made of Magnelis®-coated sheet metal to guarantee many years of corrosion re-sistance
- fixing of the panel fixings to the guide profile with one bolt and a channel nut
- stepless adjustment of the distance between the fixings in the guide profile
- longitudinal panel mounting holes in the UPDC...MC and UPGC...MC fixings widen the mounting tolerances of the panels to the roof mounted structure
- universal bottom fixing for setting three angles: 10°, 15° or 20°
- possibility to mount panels of length ~ 2 m
- solution dedicated to flat roofs with low bearing capacity

Technical description

Support system materials:

MC- Structural steel with Magnelis® coating

A- Aluminium

E- Stainless steel

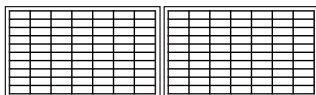
F- Flake zinc plated steel

Strength-tested design

Complete support system to fix the panels in horizontal arrangement at an angle of 10, 15 and 20° on a flat roof covered with roofing paper or membrane without interfering with the roof covering and without using additional ballast.

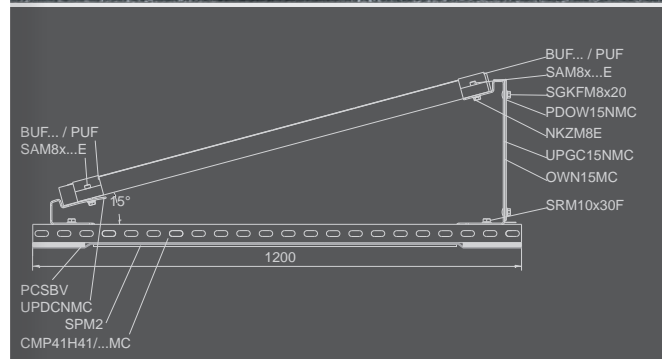
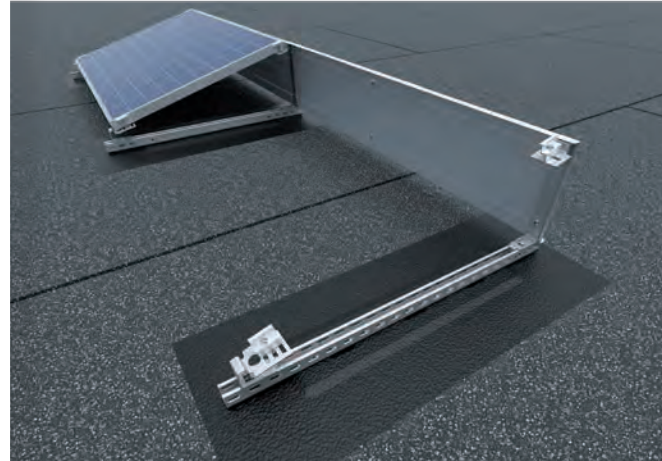
- **Structure mounting variants:**
↔ glued in with tilt angle 10°, 15° or 20°

- **Module layout:**
horizontal-H



- **Warranty:**
BAKS provides a 10 year warranty period for the components included in the support structure - only if all conditions of the manufacturer's warranty are met. The warranty can be extended

- Installation instructions available on the website https://www.baks.com.pl/en/konstrukcje_pv/pv-installation-instructions/



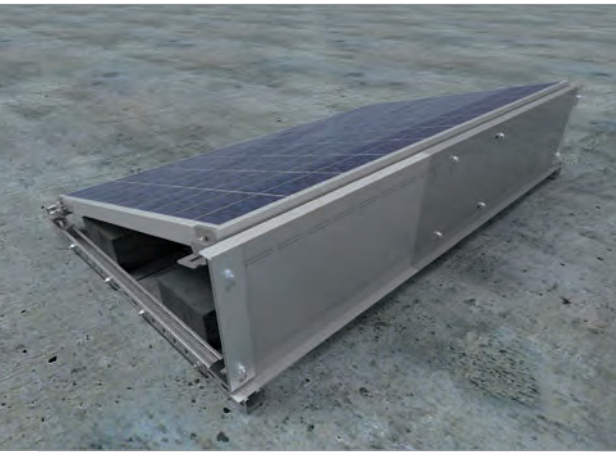
parts list for DP-DNHWE

SYMBOL	4 panels (~1700/1000 mm)	SYMBOL	4 panels (~1700/1000 mm)
	qty		qty
CMP41H41/1,2MC	5	OWN15MC	4
UPDCNMC	5	PDOW15NMC	5
UPGC15NMC	5	BUF..	4
SRM10x30F	10	PUF	6
SPM2	5	SAM8x...E	10
PCSBV	10	NKZM8E	10
SGKFM8x20	10		

The table below allows you to select a set of fixings (lower + upper) in order to obtain a structure with the appropriate tilt angle for the panels.

tilt angle of the panels	bottom fixing	top fixing
10°	UPDCNMC	UPGC10NMC
15°	UPDCNMC	UPGC15NMC
20°	UPDCNMC	UPGC20NMC





OWN...NMC 

Universal wind shield with length adjustment

Mounted on flat roof structures with 10, 15 and 20° panel tilt angle to improve the aerodynamic properties of the structure and reduce ballast weight

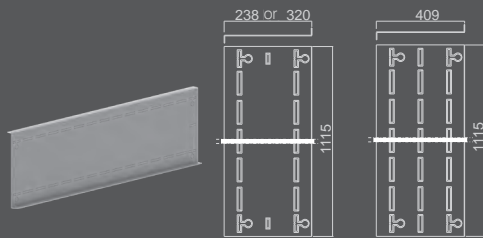
Advantages

- large length adjustment 1270-2350 mm
- dense perforation allows adjustment of shield length to different panels
- specially designed cut-outs allowing breaking out the hole without leaving sharp edges in the product
- Magnelis® coating guarantees many years of corrosion resistance
- mounting to the structure allows for a reduction in the ballast required for the structure
- special cut-outs allow the shield to be fitted by one person without having to reposition and hold the bolts from the other side

Technical description

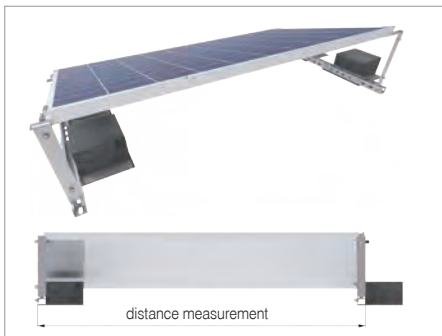
- Material S250GD steel with Magnelis® coating
- Use 6 - 8 sets for installation. SGKFM8x14 1 set consists of 2 pieces with a length of 1270 mm

OWN10NMC and OWN15NMC OWN20NMC

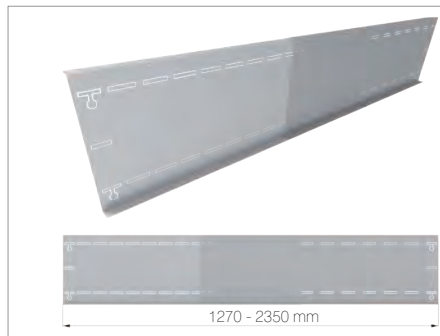


 Standard stock product (in stock)

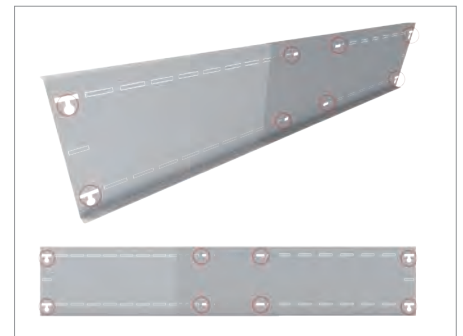
INSTALLATION INSTRUCTIONS FOR WIND SHIELDS



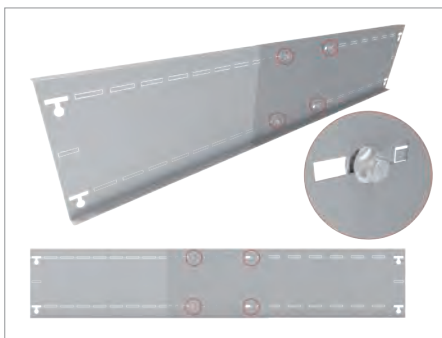
1. Measure the outer distance between the UPGC...NMC fixings to which the panel is to be mounted.



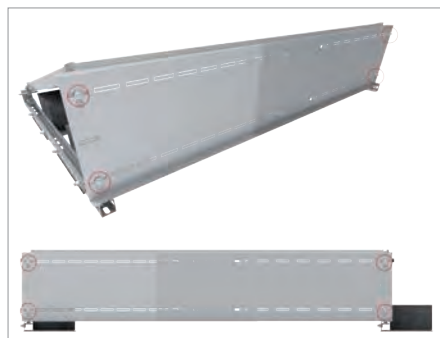
2. Before attaching and tightening the shields to the fixings, extend them to the length previously measured at point 1. The adjustment range for shield length is 1270 - 2350 mm



3. Using a flathead screwdriver, break out the holes at the front and back of the OWN...MC shields and the two overlapping holes in the shields



4. In the overlapping holes, screw the shields together using 4 SGKF8x14 bolts



5. Place the screwed shields onto the four loose bolts previously installed in the UPGC...NMC fixings



6. Attach the PDOW...NMC clamping bars to the already installed wind shields and tighten them with the nuts



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

SPM1, SPM2



Steel fastening plate for flat roof

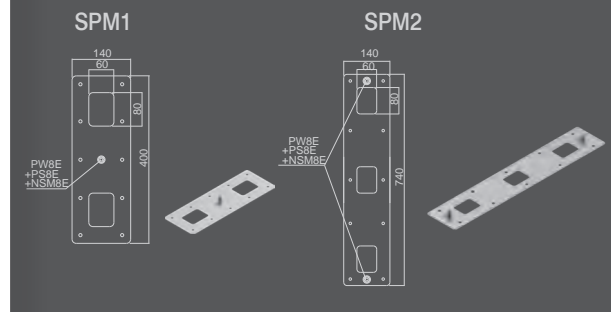
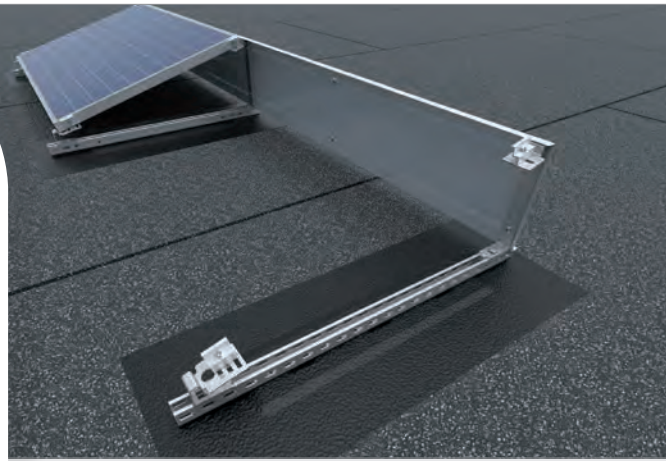
Installation to a flat roof covered with roofing paper or membrane

Advantages

- non-invasive installation on roofs covered with roofing paper or membranes
- geometry and load capacity adapted to BAKS structures
- low weight, which does not cause excessive load on the roof
- SPM1 set includes enlarged washer, spring washer and stainless steel nut
- SPM2 set includes 2 enlarged washers, 2 spring washers and 2 stainless steel nuts

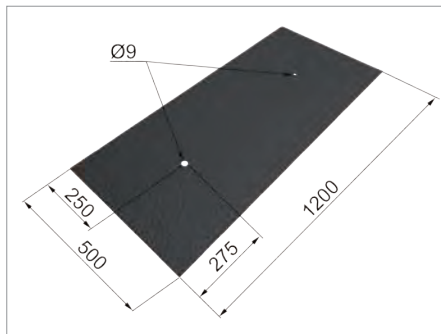
Technical description

- material: S350GD steel with Magnelis® coating
- SPM1 - use two plates for profile mounting in east-west structures
- SPM2 - use one plate for profile installation in south-facing structures

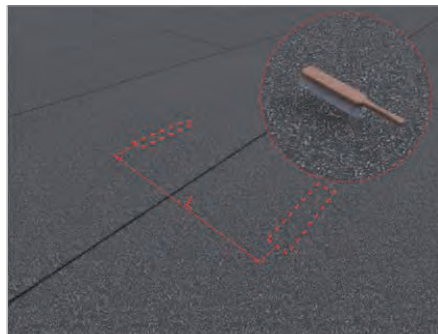


Standard stock product (in stock)

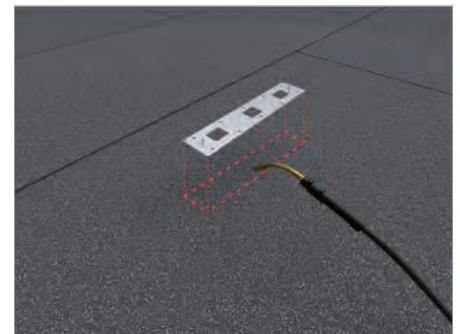
INSTALLATION INSTRUCTIONS FOR PLATES ON ROOFING PAPER:



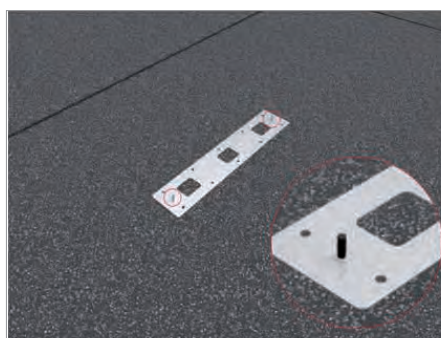
1. Before starting the installation of SPM2 plates, cut the paper with minimum dimensions of 500 x 1200 mm, then cut holes in the places of bolts with a diameter of Ø9 mm



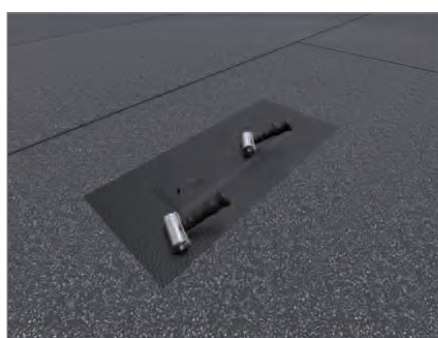
2. Measure the distance between the SPM2 plates, mark the points and then use a wire brush to clean the 500 x 1200 mm area of the roofing paper on the roof



3. Heat an area of SPM2 or slightly with a torch at the designated location



4. SPM2 plate should be placed in heated areas, pressed to prepared surface, protruding threads should be secured with NOP50 protection cap

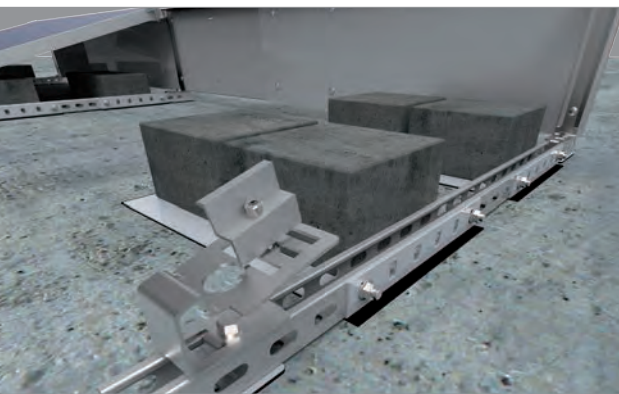


5. Warm up the side of the roofing paper and the surface and at the same time press the paper with a roofing roller, repeat the operation for each side until the plate is fully attached to the roof covering



6. Correctly mounted structure using SPM2 plate and DP-DNHWE mounting system





PDOPD300MC

Enlarged ballast base

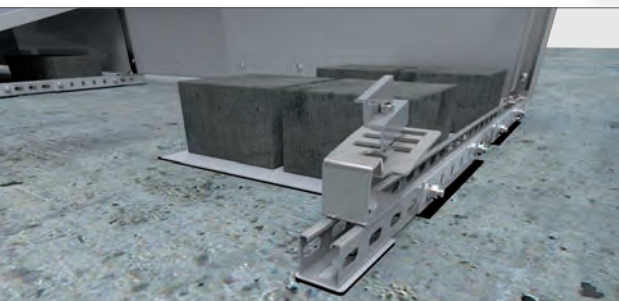
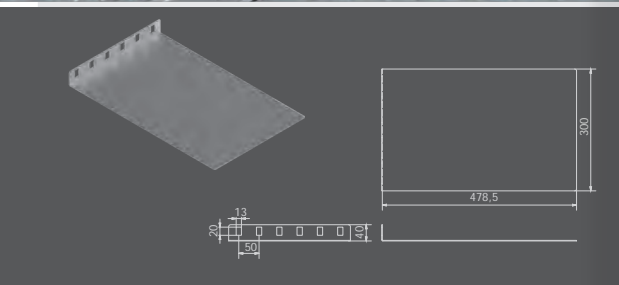
The base allows more ballast to be placed under one panel without stacking concrete blocks on top of each other.

Advantages

- possibility of stacking two concrete blocks side by side
- special perforation allowing the bases to be fitted to different types of structures
- Magnelis® coating with very high corrosion resistance

Technical description

- material: S350GD steel with Magnelis® coating
- Use two sets of SGKFM10x20 bolts for mounting



PCSBV

Channel base with anti-vibration rubber

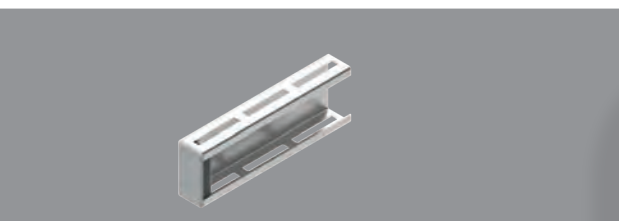
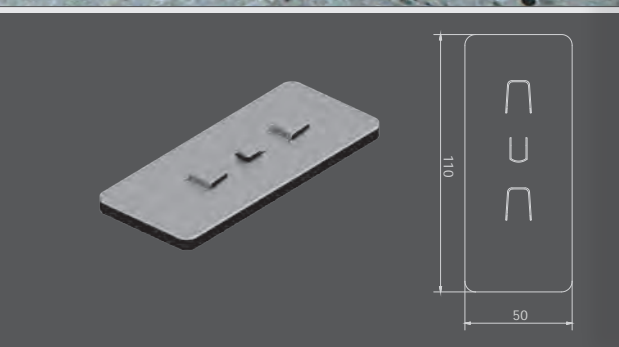
The base separates the load bearing profile of the flat roof structure from the roof sheathing, preventing damage to the roof covering during installation and use of the structure

Advantages

- possibility of stacking two concrete blocks side by side
- special perforation allowing the bases to be fitted to different types of structures
- Magnelis® coating with very high corrosion resistance

Technical description

- material: S350GD steel with Magnelis® coating
- Screwless installation with snap-on connection



NOW100X50SR

CWC100H50/...NMC profile protection cap

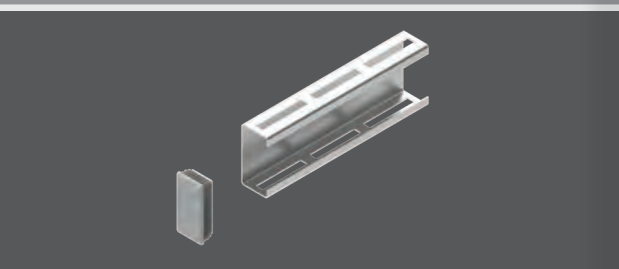
CWC100H50/...NMC profile protection cap for free-standing structures. Caps are used to improve the aesthetics of the construction, safety of installers and users of the installation. The caps are available in RAL9006 silver

Advantages

- improved aesthetics of PV installations
- improved safety for fitters during installation
- improving user safety

Technical description

- material: polyethylene, silver RAL 9006



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

CWP40H35/2,2MC, CWP40H35/3,3MC

CWP40H35/2,2MC, CWP40H35/3,3MC

Reinforced channel section

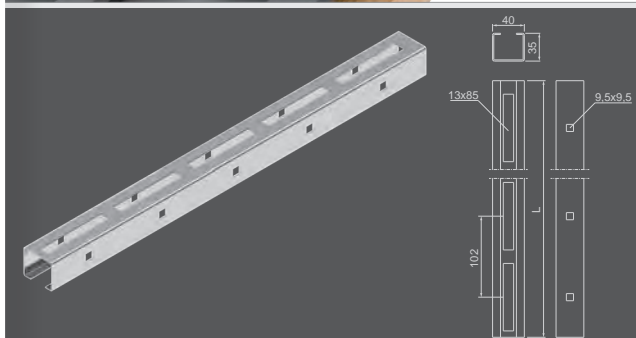
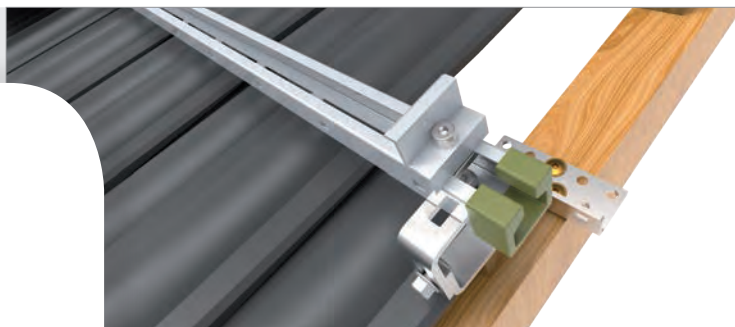
New profile for photovoltaic structures on pitched roofs that can be used as an alternative to aluminium profiles

 Advantages

- Stable support of panels in pitched roof and flat roof structures, mounting of panels to the support structure
- Thanks to the use of structural steel, channels are characterized by very high strength parameters

 Technical description

- Made of S250GD structural steel with Magnelis® coating for extremely high corrosion resistance
- Holes 13x85 allow mounting profiles to fixings in any place without drilling



LC40H35MC

LC40H35MC

Switch

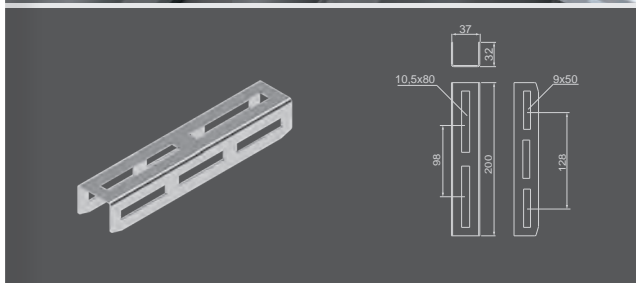
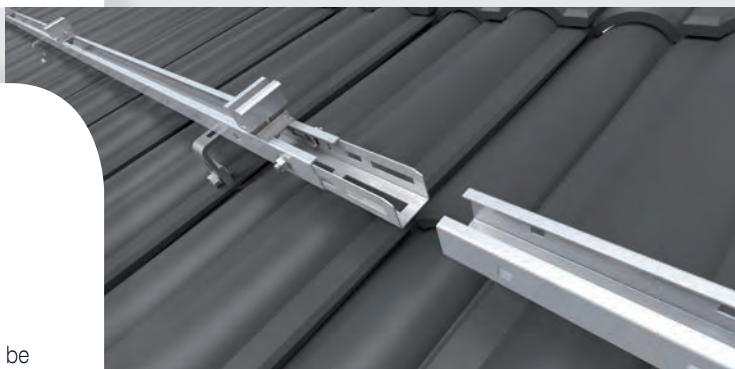
New profile for photovoltaic structures on pitched roofs that can be used as an alternative to aluminium profiles

 Advantages

- Stable, strong channel connection
- The length of the connector increases the range of adjustment
- Specially designed perforation in the connector enables the channel to be mounted anywhere without drilling

 Technical description

- Made of S250GD structural steel with Magnelis® coating for extremely high corrosion resistance
- There are 3 methods of connecting channels:
 - Screwing the connector to the sides of the channel (use 4 sets of SGKMF8x14)
 - Screwing the connector to the bottom of the channel (use 4 sets of SGKMF8x14+4 pcs. PW8F)
 - Screwless connection



CWCR100H50/NMC

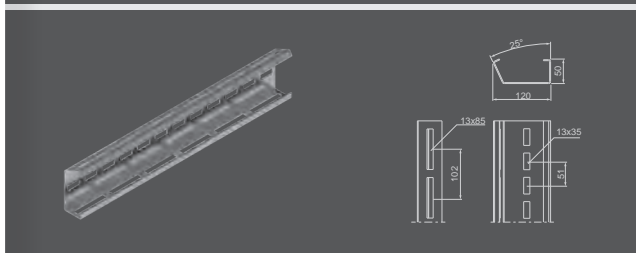
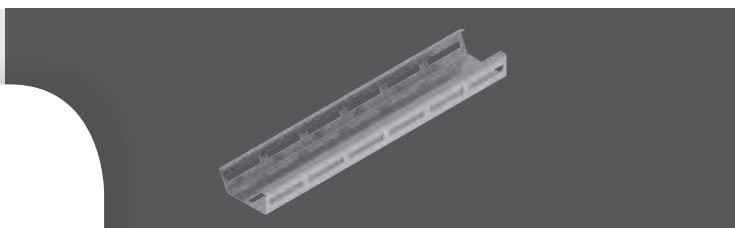
CWCR100H50/NMC

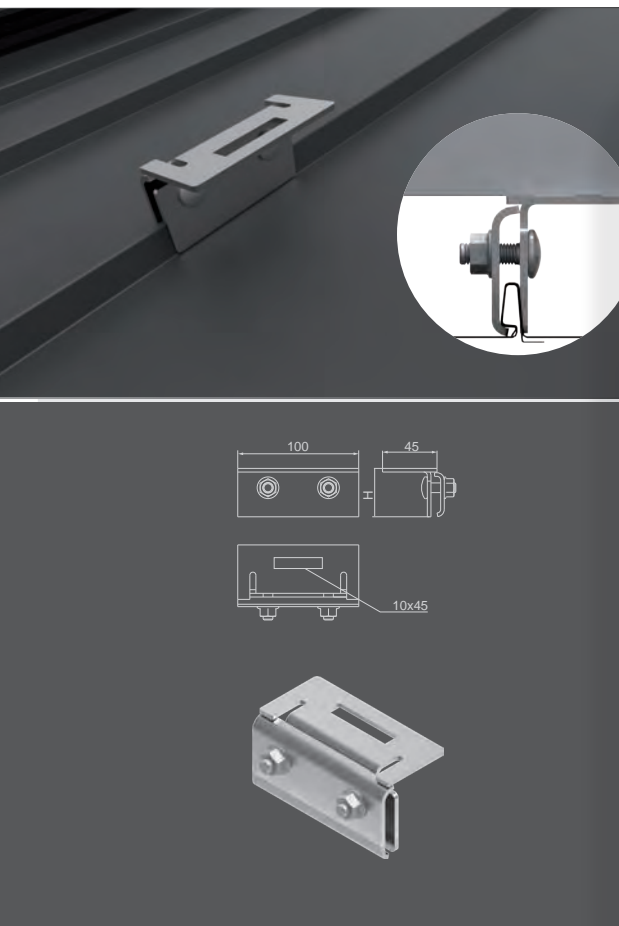
Reinforced channel section

Direct support of bifacial panels and installation of fixings for panels

 Advantages

- One wall is bent at an obtuse angle to ensure a panel installation angle of 250° without additional mounting elements
- Longer and condensed perforation for easier installation of panels with different dimensions without the need to drill additional holes in the profile
- Widened perforation enables the use of quick-mounting channel nuts





UBZRE 

Fixing for standing seam sheets

Installation of PV structure components on a standing seam sheet roof

Advantages

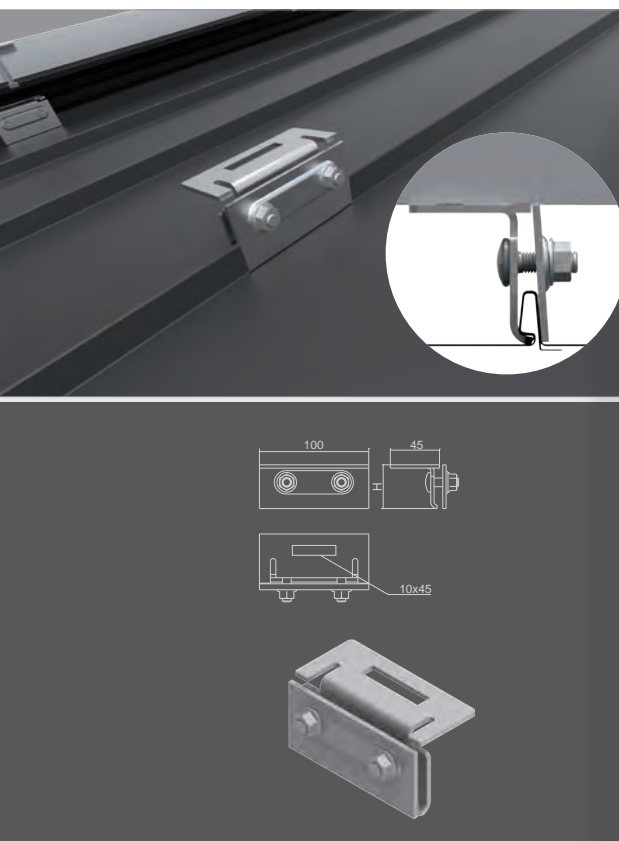
- non-invasive fixing to the roof (fixing to standing seams)
- quick installation without having to search for roof framing components
- high strength parameters
- high quality and aesthetics of workman-ship


Technical description

- Material: Stainless steel
- Table with manufacturers of standing seam sheets compatible with UBZRE25 and UBZRE32 fixings

Symbol	Sheet manufacturer	Seam height [mm]
UBZRE25	Balex	25,1
	Budmat	25/27
	Metzink	25 (before installation) 28 (after installation)
	Pruszyński	25
	Wlastal	25
UBZRE32	BlachDom	32
	Blachotrapez	32
	RUUKKI	32

 Standard stock product (in stock)



UBZRPE... 

Fixing for standing seam sheets

Installation of PV structure components on a standing seam sheet roof

Advantages

- non-invasive fixing to the roof (fixing to standing seams)
- quick installation without having to search for roof framing components
- high strength parameters
- high quality and aesthetics of workman-ship
- the clamping element has a reinforcing embossing

Technical description

- Stainless steel
- Table with manufacturers of standing seam sheets compatible with UBZRPE25 and UBZRPE32 fixings

Symbol	Sheet manufacturer	Seam height [mm]
UBZRPE25	Balex	25,1
	Budmat	25/27
	Metzink	25 (before installation) 28 (after installation)
	Pruszyński	25
	Wlastal	25
UBZRPE32	BlachDom	32
	Blachotrapez	32
	RUUKKI	32

 Standard stock product (in stock)



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

UPP.MC 

Intermediate panel fixing for free-standing structures

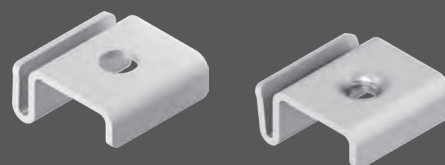
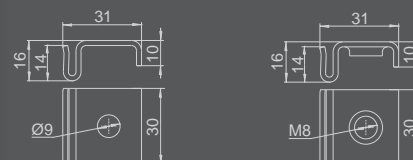
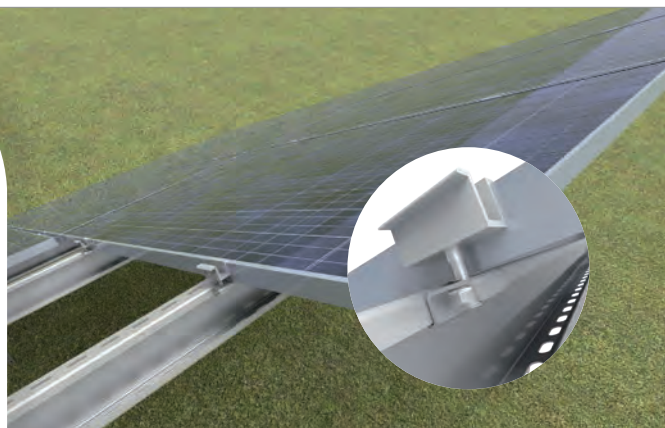
Fixing of PV panels to channel sections without drilling holes in the profile, if the mounting points of the clamps do not coincide with the factory perforation of the profile

Advantages

- Magnelis® coating guarantees many years of corrosion resistance
- allows installation without drilling in case there are no holes for mounting clamps
- smooth adjustment
- installation on the profile edge up to a thickness of 3.0 mm
- M8 tapped hole for UPPM8MC option

Technical description

- Material S250GD steel with Magnelis® coating
- For UPPMC mounting, use 1 SAM8x...E bolt and the NKZM8E nut
Use the SAM8x...E bolt to mount the UPPM8MC


 Standard stock product (in stock)
PUP, PUPK 

Grounding pad for photovoltaic panel frames

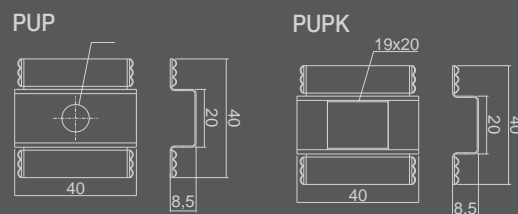
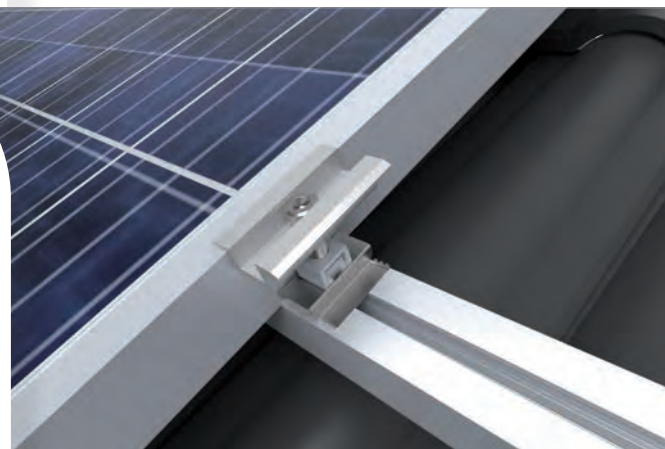
Mounting at the junction between the panel frames and the supporting structure to ensure electrical continuity

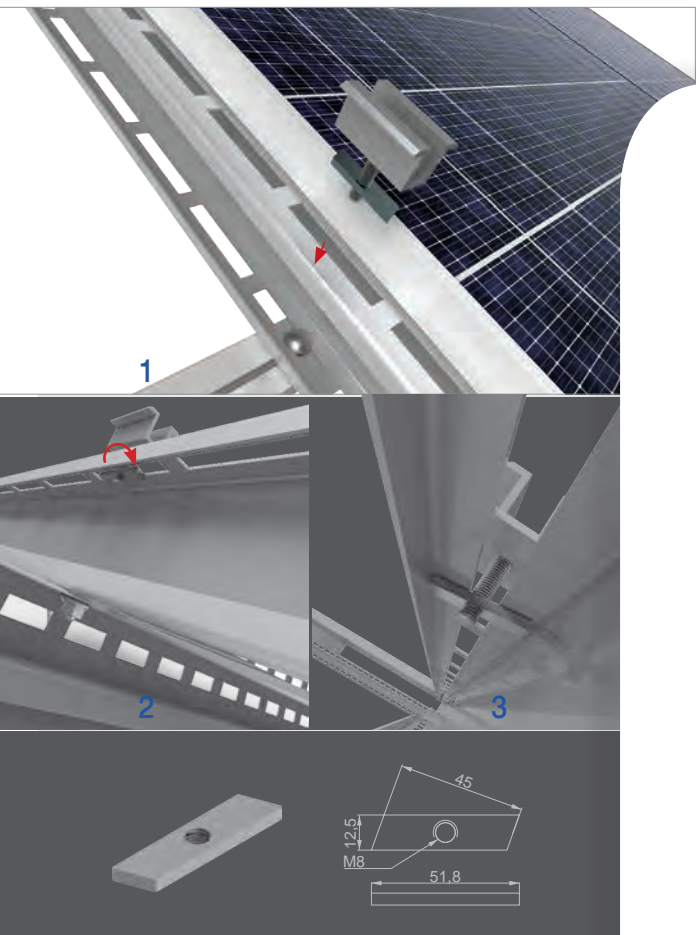
Advantages

- no need to use grounding (balancing) connections in the form of lines
- quicker installation time
- allows the use of ordinary intermediate panel fixings
- improved safety
- ensures electrical continuity

Technical description

- Material: Stainless steel


 Standard stock product (in stock)



NRM8PV



Channel nut

Mounting of PV panels on CWC100H50...NMC profiles

Advantages

- quick installation of panel mounting clamps without holding while tightening nuts on the underside of the structure.
- design allows the nut to lock into the CWC100H50 profile during tightening
- Magnelis® coating guarantees many years of corrosion resistance

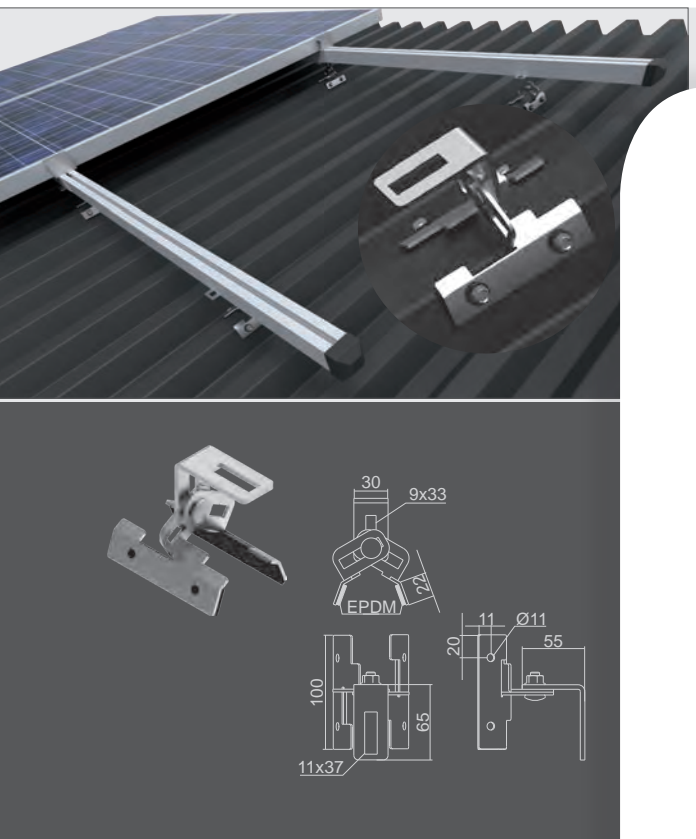
Technical description

- Material: S250GD steel with Magnelis® coating
On request: E - stainless steel

example of mounting panels to CWC100H50...NMC channel sections with NRM8PV channel nut and clamps

1. Insert the NRM8PV nut on the SAM8...E bolt from above, guiding it parallel to the holes in the profile
2. When tightening the SAM8...E bolt with an Allen wrench, the NRM8PV nut is locked in the CWC100H50...NMC profile
3. Correctly mounted nut

STM Standard stock product (in stock)



RUBTE



Adjustable fixing for trapezoidal sheets

Installation of PV structure elements on a roof covered with trapezoidal sheets

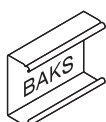
Advantages

- wide range of adjustment allows for the use with different trapezoidal sheets
- fixing equipped with EPDM sealing rubber glued on the bottom
- made of stainless steel with high corrosion resistance
- the possibility to adjust the distance from the roof makes it easier to mount and level out unevenness of the roof

Technical description

- Material: Stainless steel
- Use 4 SMDP6x25E bolts for mounting

STM Standard stock product (in stock)



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALEERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

DUFR60E



Roof fixing adjustable

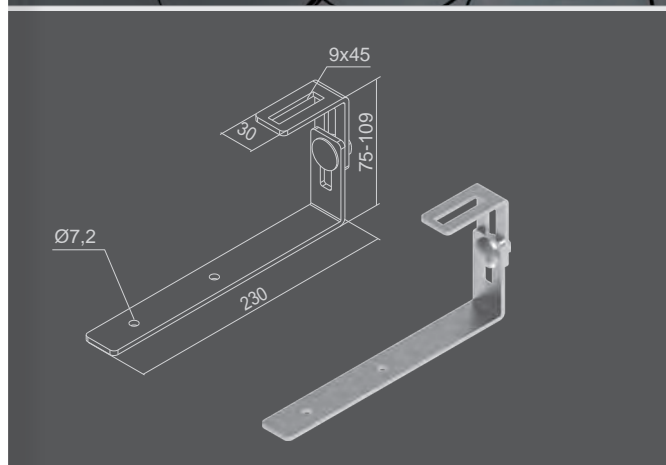
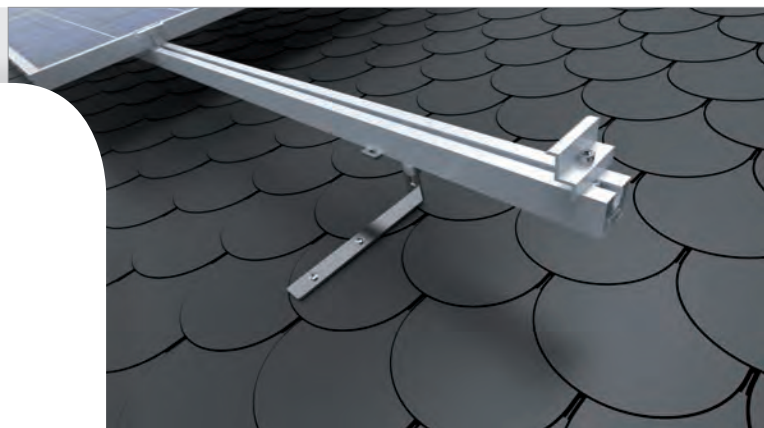
Installation of PV structure elements to a roof covered with asphalt shingles

Advantages

- upper element height adjustment in the range of 75-109 mm allowing for levelling the fixings and roof unevenness
- elongated hole to adjust the position of the aluminium profile
- profile longer arm for easier driving of screws
- made of stainless steel with high corrosion resistance

Technical description

- Material: Stainless steel
- Use 2 DDW6x60E bolts for installation



Standard stock product (in stock)

DUFWE



Plain tile fixing

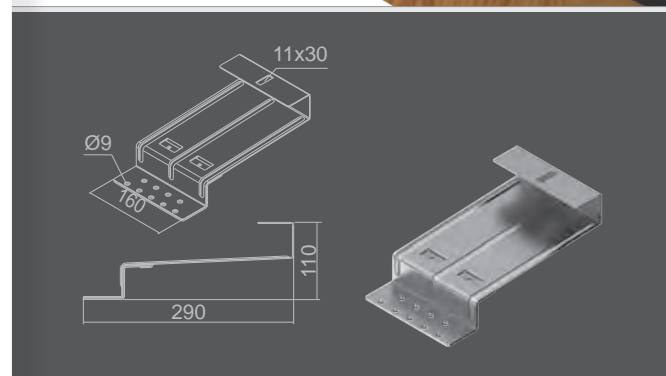
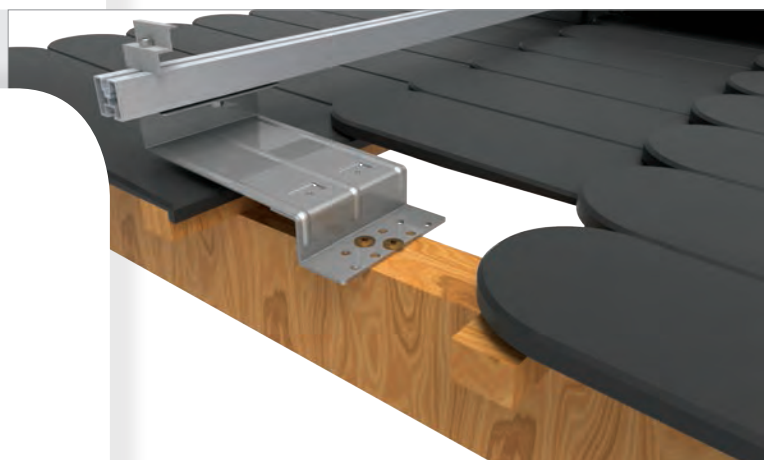
Installation of PV structure components to a roof covered with plain tiles

Advantages

- length to fit most roof tile types
- elongated hole to adjust the position of the aluminium profile
- Magnelis® coating guarantees many years of corrosion resistance
- additional reinforcement provides a strong and stable assembly of aluminum profiles

Technical description

- material: S350GD steel with Magnelis® coating
- the fixing consists of 2 elements assembled with special shape of the connection - the use of an additional element in the lower part of the fixing ensures very high strength parameters
- use 2 DDW6x60E bolts for installation



standard product





PAL30H32...



Aluminium profile

Support of panels in pitched roof and flat roof structures, mounting of panels to the support structure

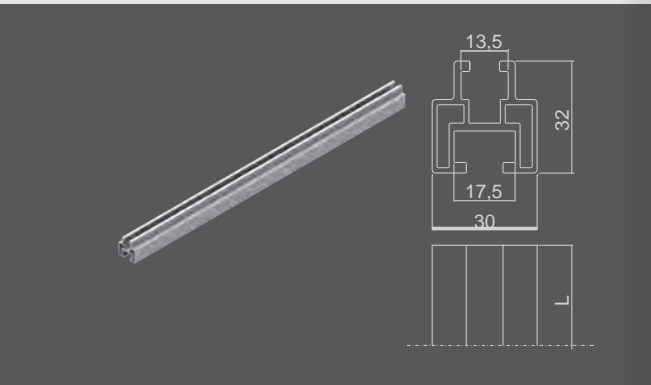
Advantages

- low price
- stable support of panels for pitched roof and flat roof structures
- width of sockets in the profile prevents rotation of hexagon nuts and bolts (M8 for the upper socket and M10 for the lower socket)
- special profile cross-section increasing its strength

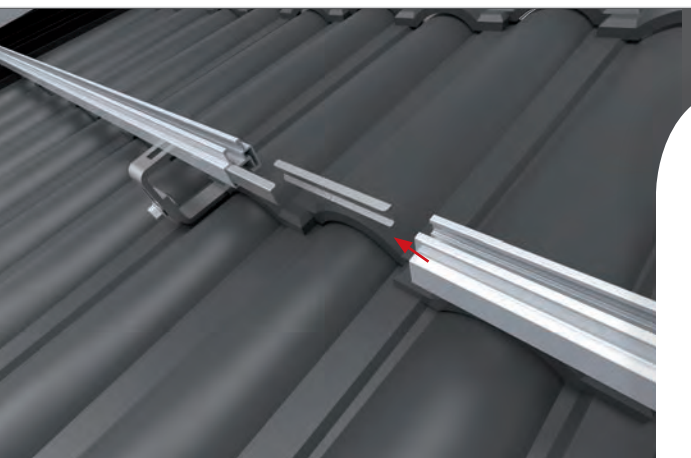
Technical description

- Aluminium (EN AW-6063)
On request:
L- painted in RAL9005
profiles available in stock

note!
new panel mounting profile made of Magnelis® coated steel



STM Standard stock product (in stock)



LPAN30



Aluminium profile connector

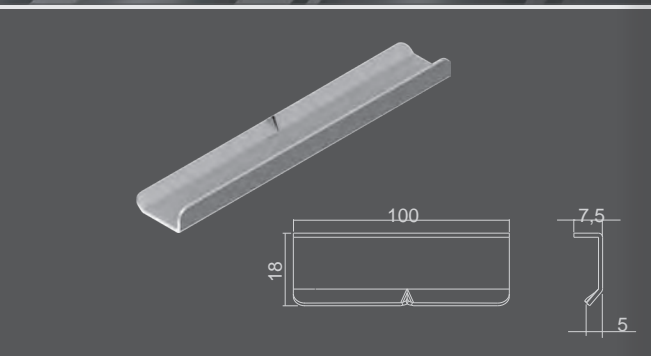
Joining aluminium profiles

Advantages

- bevelled ends facilitate initial insertion of the connector into the profile
- the shape of the connector provides a very stable profile connection
- stops for the depth of insertion of the fastener into the profile
- made of Magnelis®-coated material with very high corrosion resistance
- high strength parameters of the connection

Technical description

- material: S250GD steel with Magnelis® coating



STM Standard stock product (in stock)



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

Clip

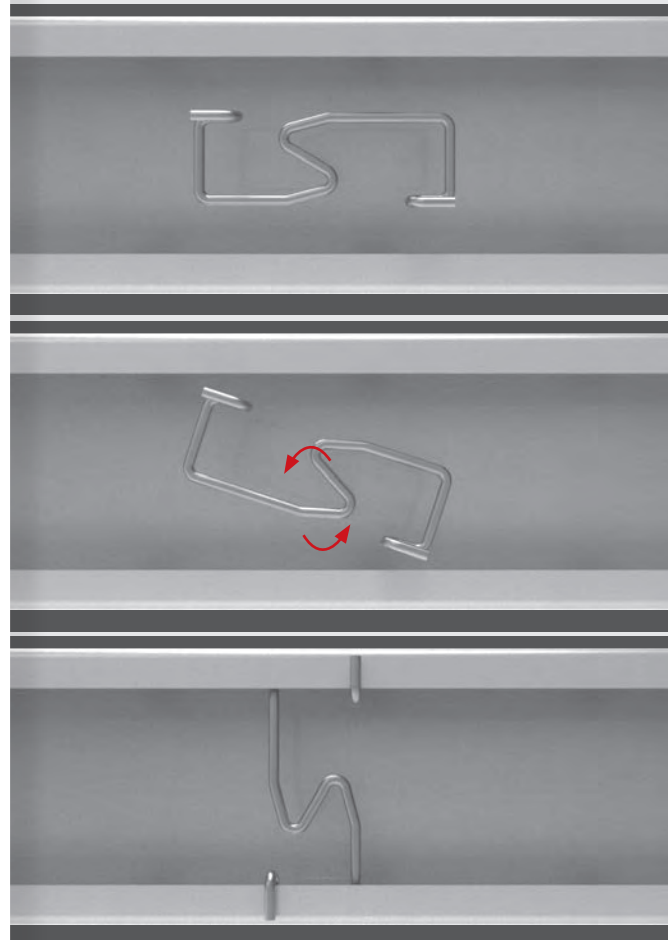
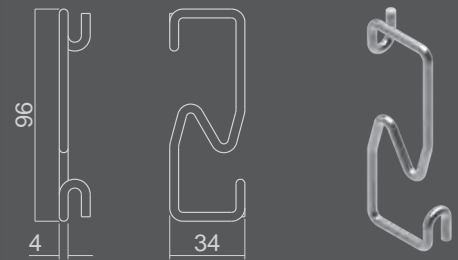
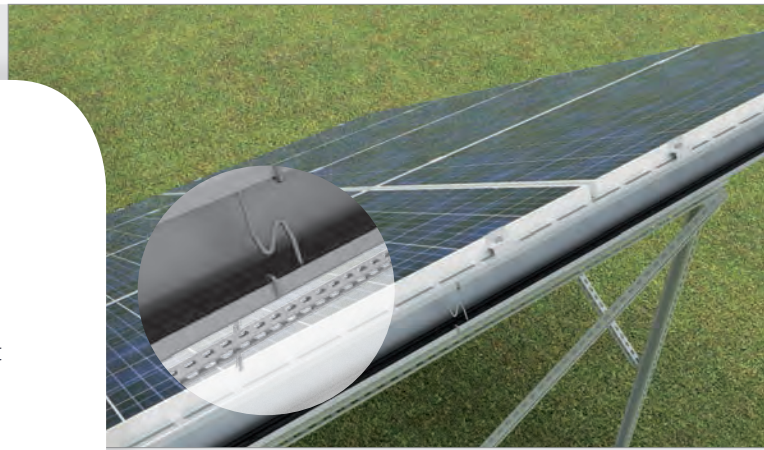
Protection against cables falling inside the CWC100H50...NMC channel


Advantages

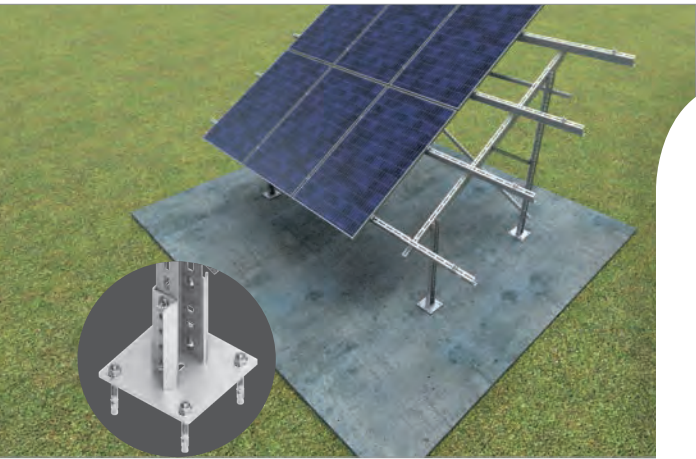
- very quick installation and removal of the clip for easy inserting cables at any time
- round cross-section of the clip protects the cables from damage
- low weight enabling a large number of pieces to be carried by a single installer
- made of stainless material with very good anti-corrosion properties and high mechanical strength
- can be mounted anywhere on the CWC100H50...NMC profile

Technical description

- Stainless steel



 Standard stock product (in stock)



PCB70, PCB100 

Mounting base

PCB70 Mounting of vertical profile CT70H50... NMC and CWT70H50... NMC

to concrete foundation as a structural support column

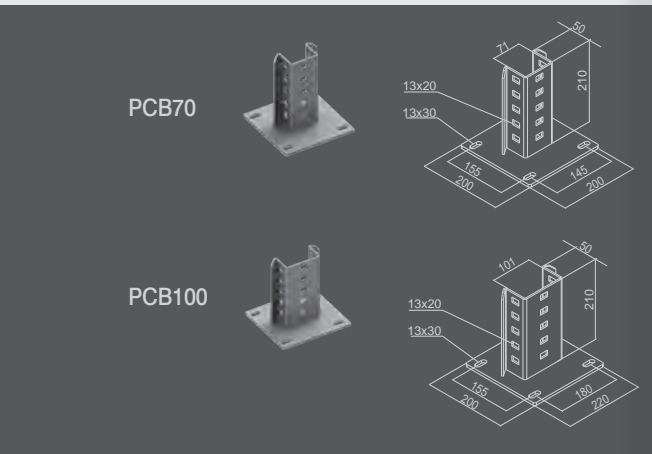
PCB100 Mounting of vertical profile CWE100H50... NMC

 **Advantages**

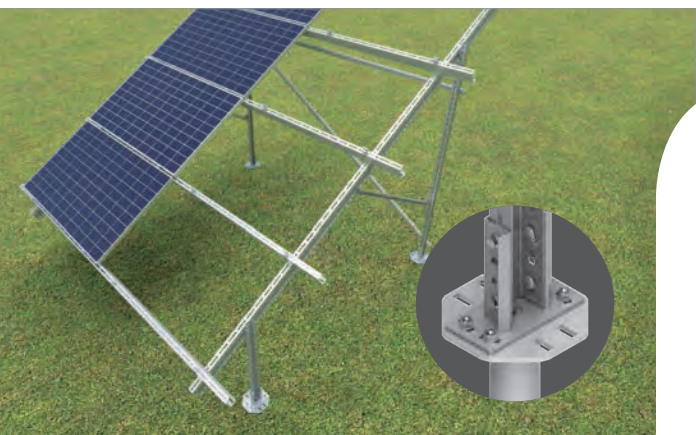
- increased strength due to specially shaped reinforcement folds
- holes in the base to allow adjustment of the position during installation
- dense perforation in the vertical part allows adjustment of the support column installation height
- high clamping stability due to the enlarged base plane

 **Technical description**

- Material: Hot dip galvanized S235 steel
PN-EN ISO 1461:2011
- Use 4 PSRM10x90F anchors to mount to concrete substrate



 Standard stock product (in stock)



PCS70, PCS100 

Mounting base

PCS70 Mounting of vertical profiles CT70H50... NMC and CWT70H50... NMC as a support column for the GSW76x...N ground screw

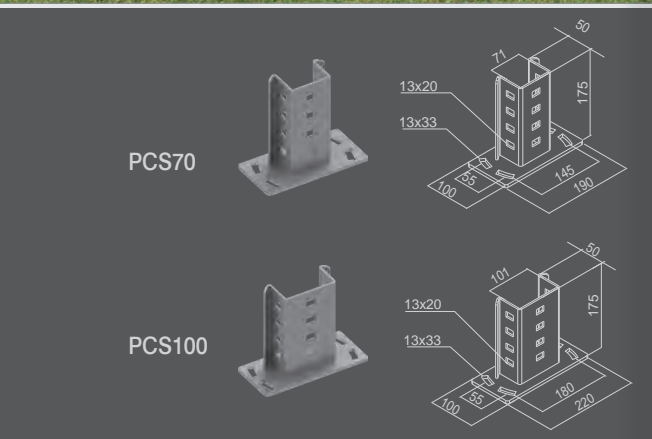
PCS100 Mounting of vertical profile CWE100H50... NMC as a support column for the GSW76x...N ground screw

 **Advantages**

- increased strength due to specially shaped reinforcement folds
- holes in the base to allow adjustment of the position during installation
- dense perforation in the vertical part allows adjustment of the support column installation height

 **Technical description**

- Material: Hot dip galvanized S235 steel
PN-EN ISO 1461:2011
- Use 4 sets for installation. SMM10x30F



 Standard stock product (in stock)



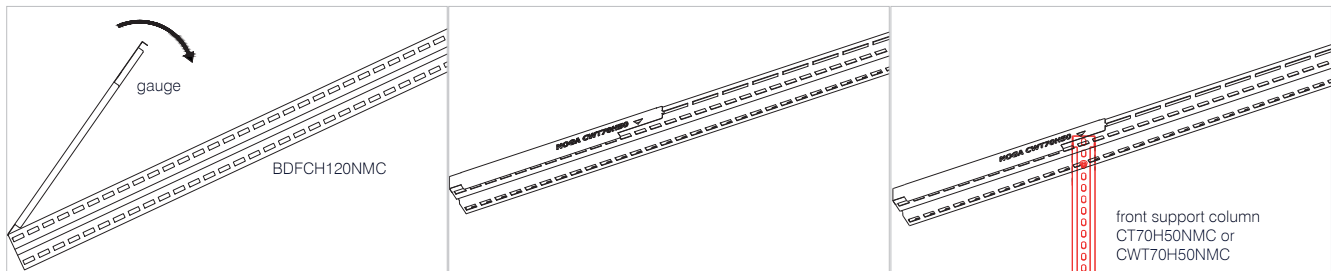
BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALEERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN

Templates for locating mounting holes in free-standing structures
(to be provided for installations of 0.5 MW and above)

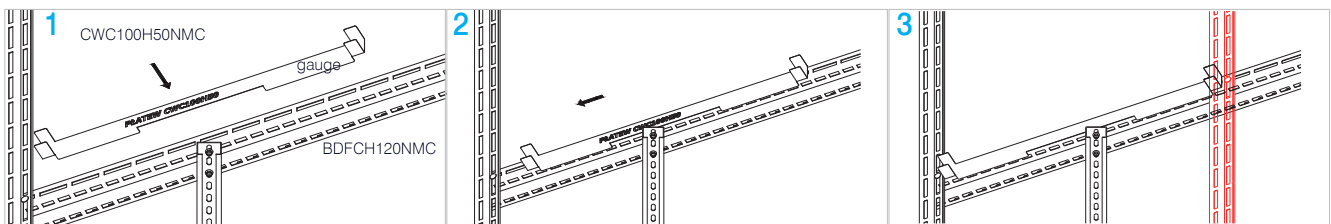
1. Use of the BDFCH120NMC rafter position gauge relative to the front support column – CT70H50NMC or CWT70H50NMC

The gauge is used to quickly and correctly determine the position of the BDFCH120NMC rafter in relation to the front support – CT70H50NMC or CWT70H50NMC. The gauge should be placed against the face of the BDFCH120NMC profile. The position of the gauge is uniquely determined by the bends at its ends locking it to the profile face and the slotted hole. The exact position of the support column is determined by the arrow on the gauge. Use the gauge only on the first and last support in each table. Determine the position of the remaining BDFCH120NMC profiles by stretching a line between the previously installed extreme rafters.



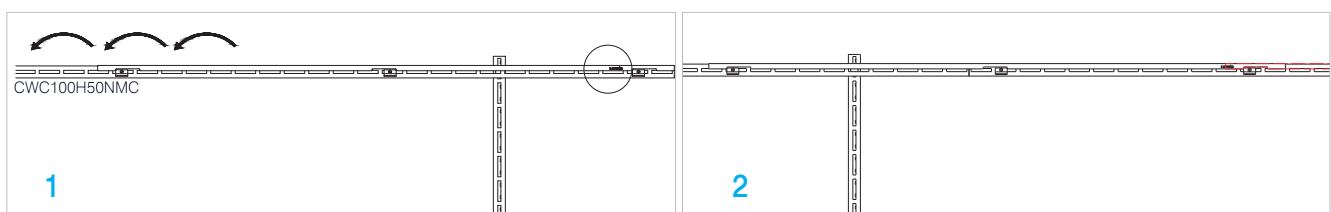
2. Use of the CWC100H50NMC purlin spacing gauge

The installation of profiles starts with screwing the CWC100H50NMC profile into the bottom-most hole of the BDFCH120NMC profile. To determine the remaining purlins, place the gauge on the next two rafters BDFCH120NMC so that it rests on the bottom mounted CWC100H50NMC, then on the shelf place another row of CWC100H50NMC and screw it to the rafters BDFCH120NMC. Repeat the operation until all rows of CWC100H50NMC are mounted.

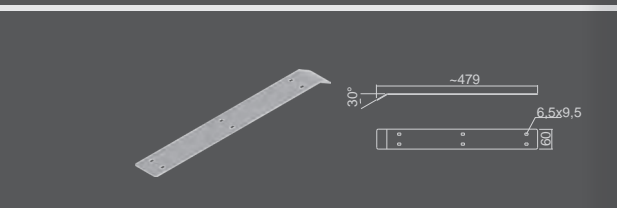
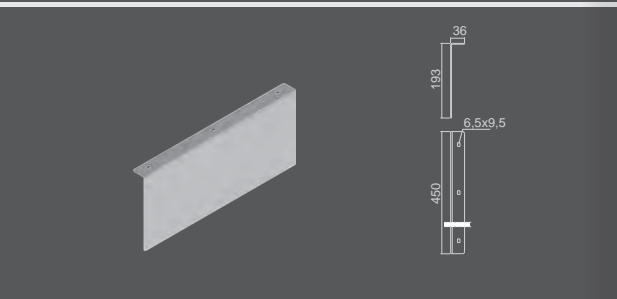
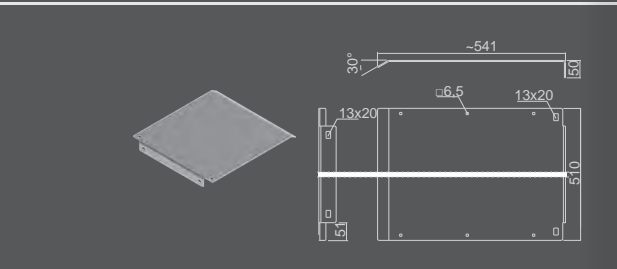
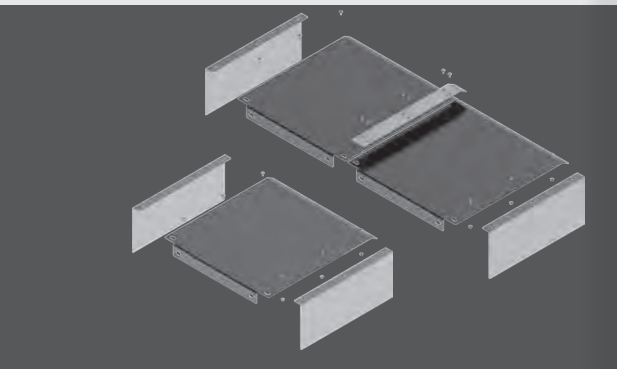
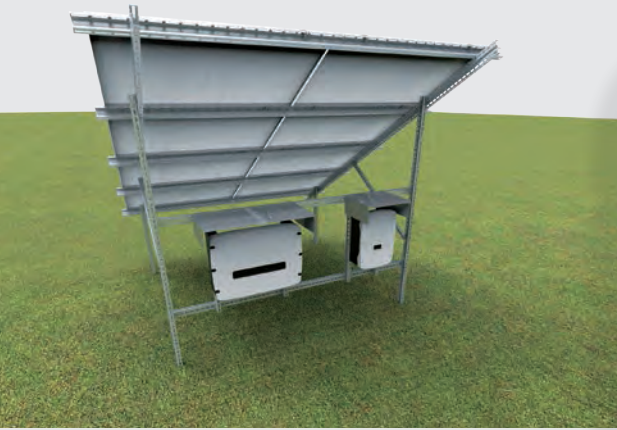


3. Gauge for determining the position of the BUF.../PUF holding clamps

The template marking the position of the clamps should be laid on the CWC100H50NMC profile starting from its right edge. The description on the gauge (e.g. W1S2 1 HOLE) means that the first cut in the template and the installation of the first clamp starts from the first cutout/hole in the CWC100H50NMC profile. Attach another 2 clamps in the next cutouts of the template. In order to determine the mounting locations for the subsequent clamps (4,5 etc.), the template should be repositioned so that the first cutout in the template is placed at the location of the last inserted clamp. This will determine the next two holes in which to place the clamps. Repeat until the end of the table. The clamps in successive rows of CWC100H50NMC purlins should be installed in the line marked by the bottom clamp after installation of successive panels.



DI, BDI, LDI 




 Standard stock product (in stock)

DI inverter cover
BDI inverter side cover
LDI inverter cover connector

Protects the inverter from rain, snow, mechanical impact, etc.

 **Advantages**

- inverter protection against rain, snow and impact
- high strength parameters
- easy and quick to install.
- possibility to extend the cover with more modules creating any width adjusted to the inverter size
- Magnelis® coating guarantees many years of corrosion resistance
- symmetrical design of the side covers allows for installation of the same element type on the right and left side

 **Technical description**

Material: S250GD steel with Magnelis® coating

DI Protection of the inverter against rain, snow, mechanical impact, etc.
inverter over

BDI Reinforcing the cover, **inverter side cover**

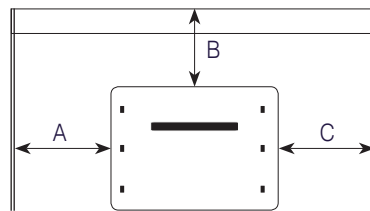
LDI Connecting inverter covers, **inverter cover connector**

INFO

Use EPDM rubber or roofing sealant to seal the connected cover roofs

NOTE:

When selecting a cover roof system, check the minimum A, B, C dimensions in the inverter installation instructions.



BAKS DESIGNS AVAILABLE AT ALL
 BAKS WAREHOUSES AND
 ELECTRICAL WHOLESALERS

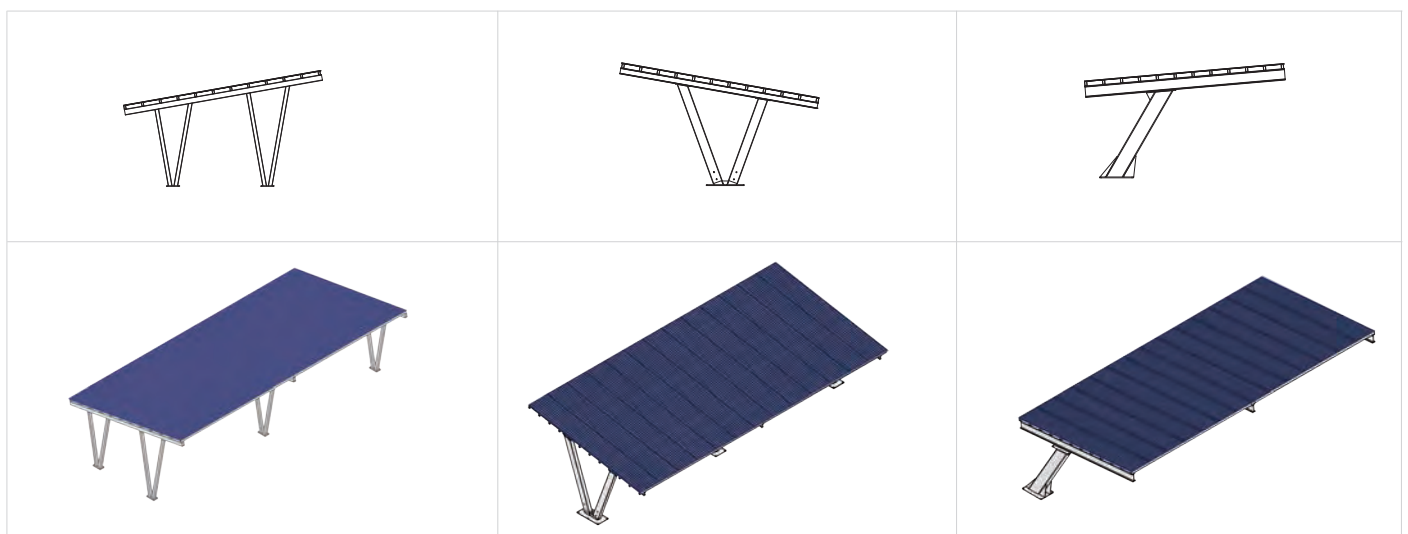
BAKS.COM.PL/KONSTRUKCJE_PV/EN

CARPORTS / Available in 2022



Modern carports made of closed profiles with roofing made of trapezoidal sheet equipped with supporting structure for photovoltaic panels. It is possible to orient the panels towards the south or build an east-west structure.

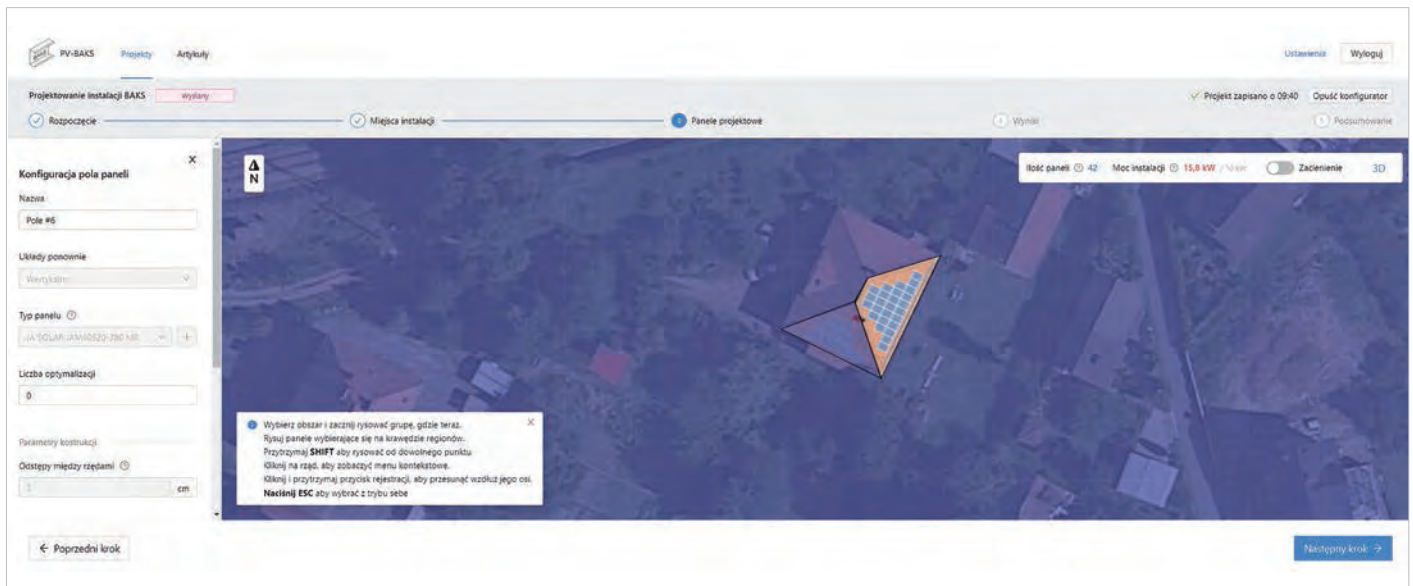
Planned CARPORT configurations:





PV APPLICATION

PV INSTALLATION PLANNING



The application enables planning PV installations: on pitched roofs, flat roofs, free-standing structures, taking into account any type of roofing, any obstacles and shading, in order to optimize the project for individual customer requirements.

With a user-friendly interface and prompts, customers are able to easily and intuitively design their own PV installations. A broad base of PV modules help in adapting the installation to the current market situation. The application is designed for small installations, e.g. 10, 20, 50, 100 kW, as well as for projects over 1 MW.

Dane projektu

Nazwa projektu	Projekt SCREEN - dach płaski
Imię i nazwisko klienta	
Tel. kontaktowy	227108105
Adres instalacji	sanok
Planowana data instalacji	24.02.2022
Transport	Bez limitu
Moc instalacji	295.2 kW

Obszar instalacji

dach nr1

Szczegóły konstrukcji

Typ konstrukcji	Dach płaski (DP-DNHBE-10°)
Typ modułu	JINKO JKM410M-72H-V (2008x1002mm)
Waga konstrukcji	15840 kg
Liczba paneli	720 72x10 modułów
Moc instalacji	295.2 kW
Typ kłom	Standard
Kolor kłom	Srebrny
Liczba optymalizatorów	0



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

[BAKS.COM.PL/KONSTRUKCJE_PV/EN](https://baks.com.pl/konstrukcje_pv/en)

PV APPLICATION

PV INSTALLATION PLANNING


NEWS

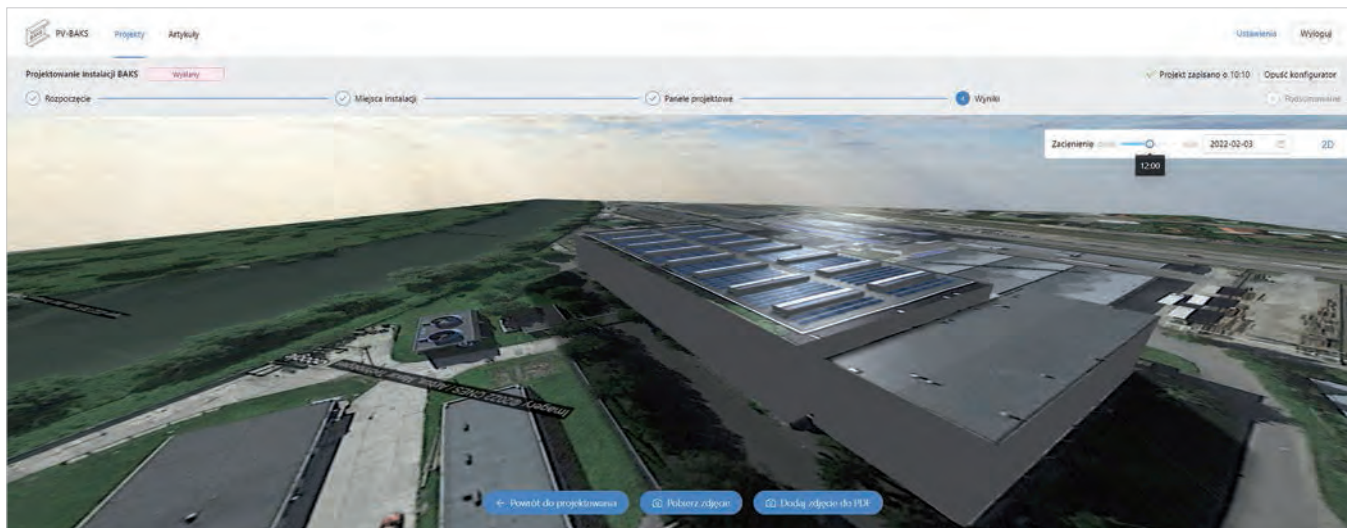
Kosztorysy

Typ konstrukcji	DP-DNHBE-10°
Koszt konstrukcji	112661.04zł netto

Lista produktów

Nr art.	Nazwa	Ilość	Masa	Cena katalogowa
NKZM8E A2	Nakrętka kołnierzkowa	16	0.53 kg	35.00zł netto
SRM10X30F	Śruba z nakrętką rombowa	1584	0.06 kg	4.03zł netto
SAM8X25E	Śruba	1584	0.05 kg	0.53zł netto
SGKFM10X20PV	Śruba z łbem grzybkowym + nakrętka ząbkowana (kpl.)	32	3.3 kg	136.63zł netto
PDOP300MC	Podstawa balastowa	1584	1.05 kg	15.82zł netto
SGKFM8X20	Śruba z łbem grzybkowym + nakrętka ząbkowana (kpl.)	16	1.62 kg	103.43zł netto
SBV250X350	Guma wibroizolacyjna podkładowa	1584	0.32 kg	4.73zł netto
PUP	Podkładka uziemiająca panelu	360	0.016 kg	2.47zł netto
PDOW10NMC	Praskownik dociskowy	792	0.3 kg	5.57zł netto
UPDCNMC	Uchwyt panelu dolny	792	0.37 kg	19.99zł netto
CMP41H41/1,2MC	Ceownik montażowy	792	2.03 kg	25.68zł netto
UPGC10NMC	Uchwyt panelu górny	792	0.7 kg	25.33zł netto
OWP3P10NMC	Oslona wiatrowa	24	4.83 kg	62.55zł netto
BUF30	Boczny uchwyt panelu	288	0.02 kg	2.16zł netto
PUF	Pośredni uchwyt panelu	1296	0.04 kg	2.04zł netto

Zdjęcia wizualizacji 3D



After the design is completed, the client receives a report in the form of a PDF file with a list of elements and prices. Project preview is possible in 2D and 3D.

The application is currently being frequently optimized and updated, therefore we would like to invite any interested individuals to take advantage of it and participate in its further development



Full range of BAKS products can be found:
 in the main catalogue „BAKS STRUCTURES FOR THE INSTALLATION OF PHOTOVOLTAIC PANELS”
 and on the website BAKS.COM.PL/KONSTRUKCJE_PV/EN

BAKS.COM.PL/KONSTRUKCJE_PV/EN

BAKS STRUCTURES FOR THE INSTALLATION OF PHOTOVOLTAIC PANELS



2022

W-H4G2-30°-N

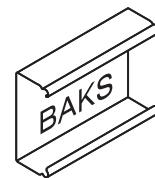
35 YEARS
OF BUSINESS
EXPERIENCE

INNOVATIVE TECHNOLOGY

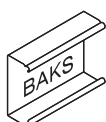
BAKS STRUCTURES
FOR THE INSTALLATION
OF PHOTOVOLTAIC PANELS

2022

BAKS.COM.PL/KONSTRUKCJE_PV/EN



2022



BAKS DESIGNS AVAILABLE AT ALL
BAKS WAREHOUSES AND
ELECTRICAL WHOLESALERS

BAKS.COM.PL/KONSTRUKCJE_PV/EN