



Mounting systems for ground mounted installations

Catalogue



PUK Group GmbH & Co. KG

PO Box 440260

12002 Berlin

Deutschland

PUK-Solar GmbH & Co. KG

Nobelstr. 45-55

12057 Berlin

Deutschland

Phone +49 30 68283-01

Fax +49 30 68283-20

PUK Solar Industry and Trade Inc.

10006 sokak No:11 AOSB Cigli

35620 Izmir

Turkey

Phone +90 232 37681-60

Fax +90 232 37681-59

International contact person

Stephan Hippel

Mobile: + 49 1604766376

stephan.hippel@puksolar.com

Murad Saygin

Mobile: +90 532 235 89 81

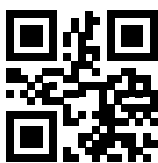
murad.saygin@puksolar.com

Pieter van Lier

Mobile: +31 6 - 83 96 66 04

p.vanlier@pukbenelux.com

Please read our general terms
and conditions online at:



www.puksolar.com

Content

General information	4-9
2-support system, crystalline modules	10-19
2-support system, thin-film modules	20-23
1-support system, crystalline modules	24
3-support system, crystalline modules	26-27
Mounting options	28
Mounting	30
Ramming	31
Concrete mounting	32
Technical information	33
Data for construction planning	34

All of our energy. **For your project.**

Since 2009 PUK Solar GmbH & Co. KG has positioned itself in the international market as an expert in substructures for photovoltaic systems.

As a 100 per cent subsidiary of the PUK Group with 75 years of experience in producing, delivering and mounting cable management systems, we develop robust mounting solutions for free standing solar panels, roof installations and carports.

Expertise and experienced

Equipped with project management and specialising in major projects in the emerging photovoltaic market, PUK Solar GmbH and Co. KG acts as a centre for technical expertise for the globally active group of companies.

Everything from a single source

Our range of services includes technical consultation and planning, production and logistics, standard-conforming foundations, the construction of base frames and mounting of all modules.

In addition to projects in Germany, Turkey, Northern and Eastern Europe, PUK Solar GmbH & Co. KG has delivered and installed mounting systems for facilities with a total capacity of more than 400 megawatts. We manufacture all of our parts in our own factories.

PUK-Solar GmbH & Co. KG is a member of the German Solar Industry Association (Bundesverband Solarwirtschaft).

Here and there

Basically, PUK Solar is a network of solar experts. Alongside to our experts at the headquarter in Berlin, there are different locations throughout Europe and the Middle East where our customers can get support for their solar projects.

In 2016, the PUK Solar Industry and Trade Inc. was founded in Izmir, Turkey with the aim to have our technical expertise right on the spot. With its own production plant and a galvanising plant, the company is perfectly equipped to provide quality and fast deliveries for local demands.

On the Iberian Peninsula, our colleagues from PUK Portacables are in charge of numerous projects from small to large scale solar parks. For many years now, they have proven their technical knowledge as well as their project management skills.

In the MENA region, our Dubai based team is offering solutions ranging from carport systems, rooftop installations to ground mounted installations.

Our polish colleagues at EL-PUK have their own engineering department in place to ensure ideal planning and installation of local PV-solutions.

P&K Energo, our Russian affiliate, specialises in large scale projects with ground mounted PV-installations.

PUK-Benelux B.V. is located in Eersel, the Netherlands, and responsible for the Benelux region. PUK Benelux is specialized in advice, delivery and construction of the PUK Solar ground mounted systems and PUK cable support systems.

Technology that connects. And electrifies.

PUK Solar is part of the PUK Group, an SME which is active worldwide in the metalworking industry.

A group

With 770 employees, an annual turnover of around €140 million and a company history stretching back to 1935, the PUK Group today is one of the leading producers of cable support systems, cable trays, cable clamps, underfloor systems and assembly systems for photovoltaic systems.

Wherever there is a need for a safe infrastructure for power and data cables, the PUK Group offers cus-

tomised, impressive system solutions in the area of cable management. Particularly in the areas of energy, building technology, industry, infrastructure, transportation, oil and gas, our employees demonstrate their extensive industry expertise.

Several locations

In addition to plants in Germany (Berlin and Schönecken), Turkey, Poland, Russia and India, the PUK Group has 30 sales offices worldwide where it focuses on its strengths in the three core areas of

- consultation and planning,
- production and logistics,
- mounting

The group's values are characterised by customer-orientation, long-term thinking, expert advice and planning and responsible action.

Along with PUK Solar and other subsidiaries, the PUK Group forms a globally active SME.



PUK Solar worldwide

Plant Schönecken

Industriestr. 1
54614 Schönecken
Germany
Phone +49 6553 9202-0
Fax +49 6553 9202-30

1 PUK-Solar GmbH & Co. KG

Headquarters and plant
Nobelstr. 45-55
12057 Berlin
Germany
Phone +49 30 68283-299
stephan.hippel@puksolar.com

2 PUK Solar Industry and Trade Inc.

Headquarters and plant
10006 sokak No: 11 AOSB Cigli
35620 Izmir
Turkey
Phone +90 232 376 81 60
Fax +90 232 376 81 59
murad.saygin@puksolar.com



3 PUK-Portacables, S. L.
Polígono Industrial Barcelonés
c/ Noguera, Nave 1
08630 Abrera (Barcelona)
Spain
Phone +34 93 77034-90/91
Fax +34 93 7703518
francisco.redondo@puksolar.com

4 PUK Middle East
Headquarters and plant
10006 sokak No: 11 AOSB Cigli
35620 Izmir
Turkey
Phone +90 232 376 81 60
Fax +90 232 376 81 59
murad.saygin@puksolar.com

5 EL-PUK Sp. z o.o.
ul. Kościelna 15
95-050 Konstantynów
Łódzki
Poland
Phone +48 42 2118801
Fax +48 42 2118804
marketing@elpuk.com.pl

6 P&K-ENERGO LLC
ul. Strelckaja 6, Office 20
127018 Moscow
Russian Federation
Phone +7 495 6468348
michael.saft@puk.com

8 PUK-Benelux B.V.
Meerheide 212
5521 DW Eersel
Netherlands
Phone +31 6 - 83 96 66 04
Fax +31 4 97 - 51 45 02
p.vanlier@pukbenelux.com



Lived quality. In black and white.



Due to their exposed position on rooftops or in fields, photovoltaic panels are constantly subject to damaging environmental influences. Starting in the planning phase, comprehensive specifications and safeguards must be met.

Quality from experience

Decades of experience in solutions for demanding technical requirements, from planning to mounting complex systems, enables us to provide structurally sound and proven solutions.

Quality and conviction

This includes standardised test procedures and strict product control based on detailed procedure and test instructions, which allow for real quality solutions and application safety even under adverse conditions. We ensure both through constant control, certification and development.

These are the cornerstones of a mature and exemplary quality management system in the tradition of our quality culture and quality thinking:

- Our mounting system for photovoltaic panels is checked and certified according to TÜV Spec. TZE/2.572.11.
- Our factories and offices are certified according to DIN EN ISO 9001.
- Our solutions meet the requirements of DIN 1055, DIN 18800 and the Euro codes.
- We test our products in our own test facilities.



Expertise and experience. From A to Z.

For decades, the PUK Group has been one of the most competent technical equipment suppliers for the energy industry. With the German PUK Solar GmbH and Co. KG as a competence centre and the Turkish PUK SOLAR San. ve Tic. A. Ş., we provide customers in 11 countries with mature product solutions and reliable engineering services, even on short notice.

One stop for experience.

The range of services from PUK Solar includes consulting, planning, production, logistics, ramming, foundations, base frame construction and module mounting.

During the planning process we calculate exact, individual structural and load profiles for PV systems of different sizes.

All of the supporting profiles, transverse and longitudinal beams, diagonal bracing and connecting parts manufactured in our factories in Berlin and Schönecken are made from galvanised steel with a minimum durability of 25 years. This makes products from PUK Solar particularly robust, durable and corrosion resistant.

One system. Many possibilities.

Our mounting system offers several advantages: it is structurally optimised and inspected, simple in its design, competitive in its pricing and easy to install. Our system is ideal for both crystalline modules with frames, thin-film glass modules and full-size modules with glued backrails. PUK Solar delivers a mounting system that corresponds with DIN 1055 and the Eurocodes and is structurally optimised for one-, two- or multi-row panels.

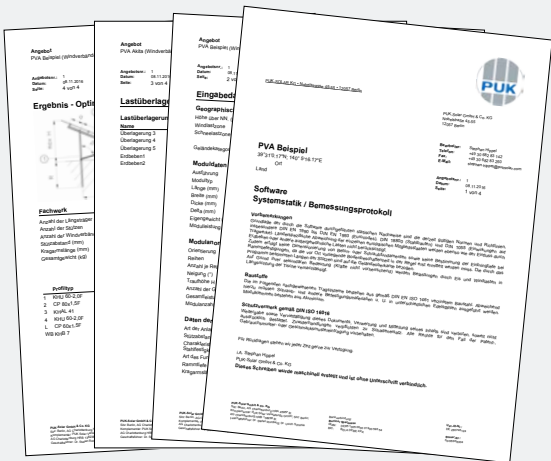
Safety for your project.

- Extensive expertise and decades of experience.
- Certified solutions from a variety of projects of every size
 - worldwide.
- Customised engineering solutions
- Software supported sizing
- Short-term production of all necessary components
- Delivery of large material quantities
- Installation of complex systems
- Experienced project management and in-house construction manager

Sizing and structural analysis

We start by recording system-specific parameters for the project in a data sheet. Our engineers then receive, in just three steps, software-based results for the ideal construction method with a minimum use of materials and assembly. We even calculate in regional wind and snow load characteristics so the structural analysis can apply throughout Europe.

- Step 1: project data acquisition and entry
- Step 2: determination of geographic location
- Step 3: selection of modules and module assembly
- Step 4: selection of base frame options



2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 2-rows, portrait



Modules, crystalline, 2-rows, portrait

2-support systems

Mounting systems for ground mounted installations

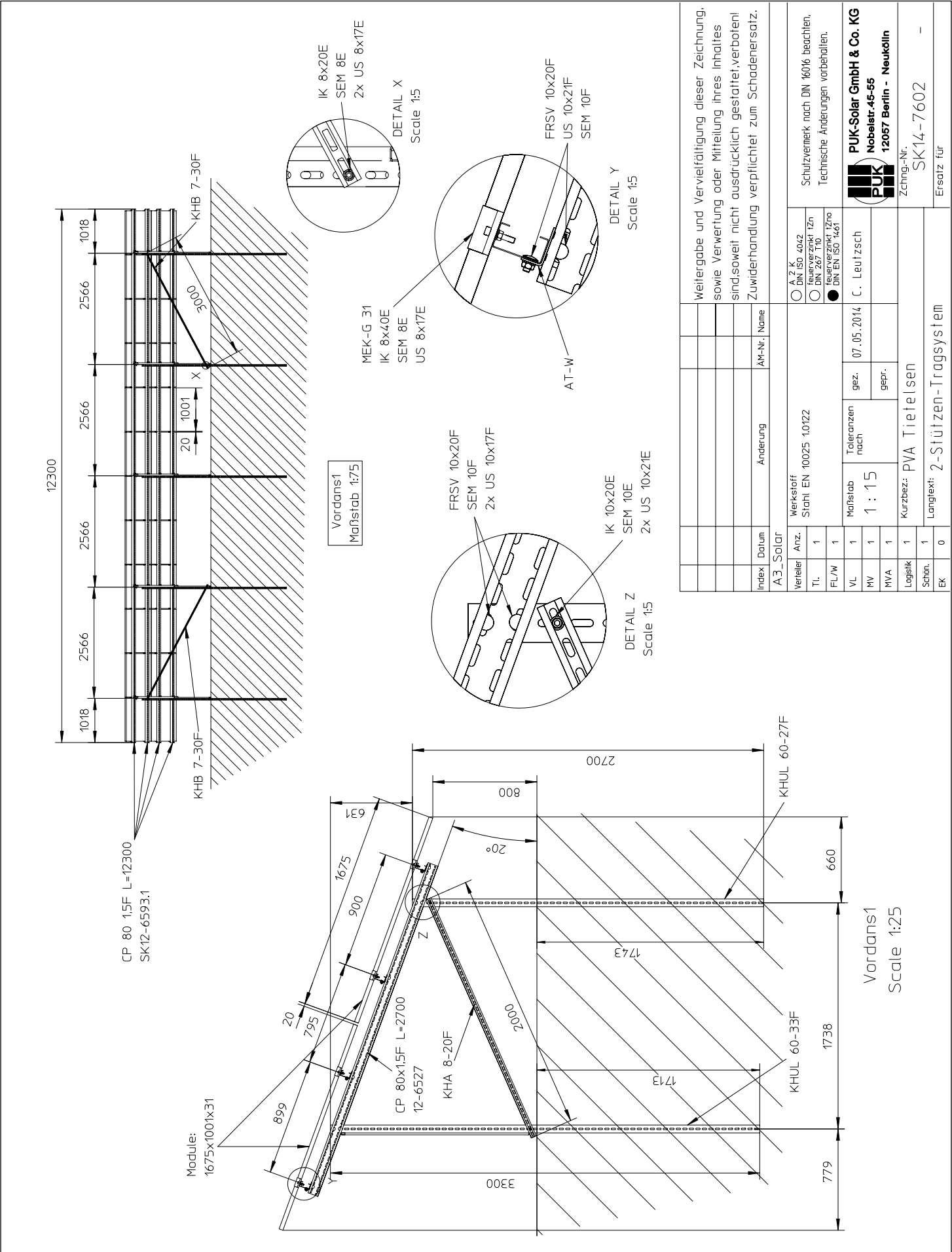


Modules, crystalline, 2-rows, portrait



Modules, crystalline, 2-rows, portrait

2-support systems
Mounting systems for ground mounted installations



2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 2-rows, portrait

2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 3-rows, portrait



Modules, crystalline, 3-rows, portrait

2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 5-rows, landscape



Modules, crystalline, 5-rows, landscape

2-support systems

Mounting systems for ground mounted installations



Modules, thin-film, First Solar, 5-row, landscape



Modules, thin-film, First Solar, 5-row, landscape

2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 4-rows, landscape



Modules, crystalline, 6-rows, landscape

2-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 2-rows, landscape

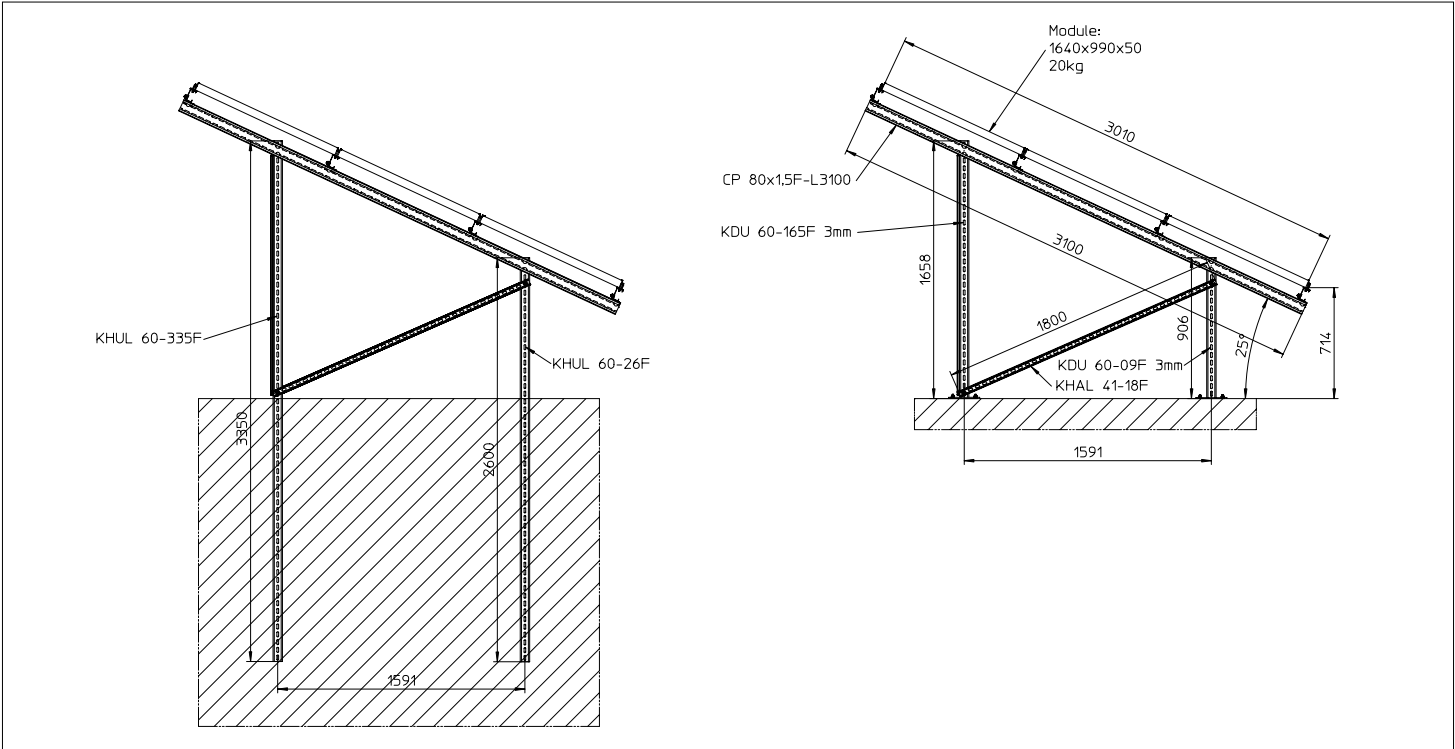


Modules, crystalline, 3-rows, landscape

2-support systems
Mounting systems for ground mounted installations



Modules, crystalline, 3-rows, landscape



Ramming

Dowels in concrete

2-support systems

Mounting systems for ground mounted installations



Modules, thin-film, framed, 3-rows, portrait



Modules, thin-film, framed, 3-rows, portrait

2-support systems

Mounting systems for ground mounted installations



Modules, thin-film with back rails, 1.3 x 1.1 m, 3-rows, portrait



Modules, thin-film with back rails, 1.3 x 1.1 m, 3-rows, portrait

2-support systems

Mounting systems for ground mounted installations



Modules, thin-film with back rails, 2.6 x 1.1 m, 2-rows, portrait



Modules, thin-film with back rails, 2.6 x 1.1 m, 2-rows, portrait

2-support systems

Mounting systems for ground mounted installations



Modules, thin-film with back rails, 2.6 x 2.2 m, 2-rows, portrait



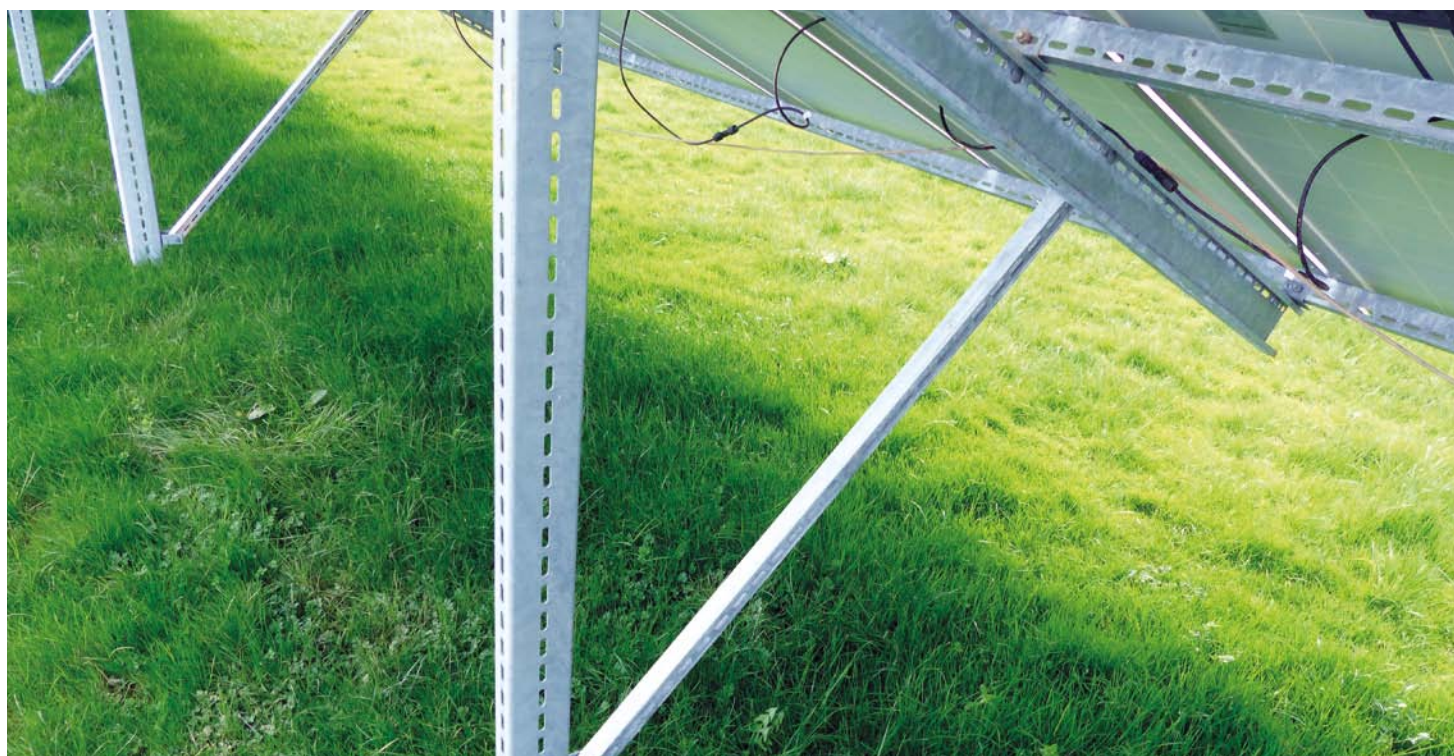
Modules, thin-film with back rails, 2.6 x 2.2 m, 2-rows, portrait

1-support systems

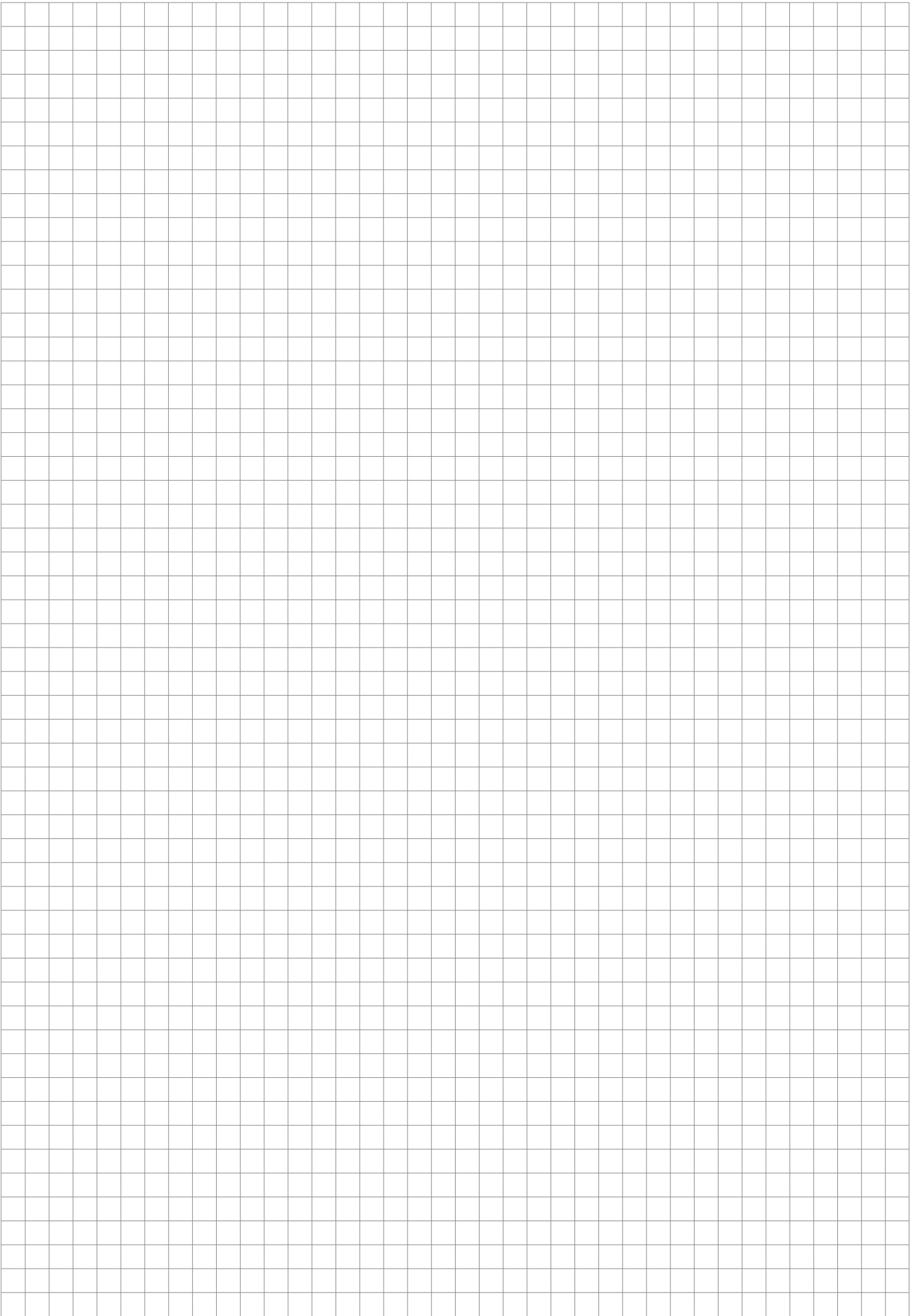
Mounting systems for ground mounted installations



Modules, crystalline, standard size, 2-rows, portrait



Modules, crystalline, standard size, 2-rows, portrait



3-support systems

Mounting systems for ground mounted installations



Modules, crystalline, 4-rows, landscape, east-west orientation



Modules, crystalline, 4-rows, landscape, east-west orientation

3-support systems

Mounting systems for ground mounted installations



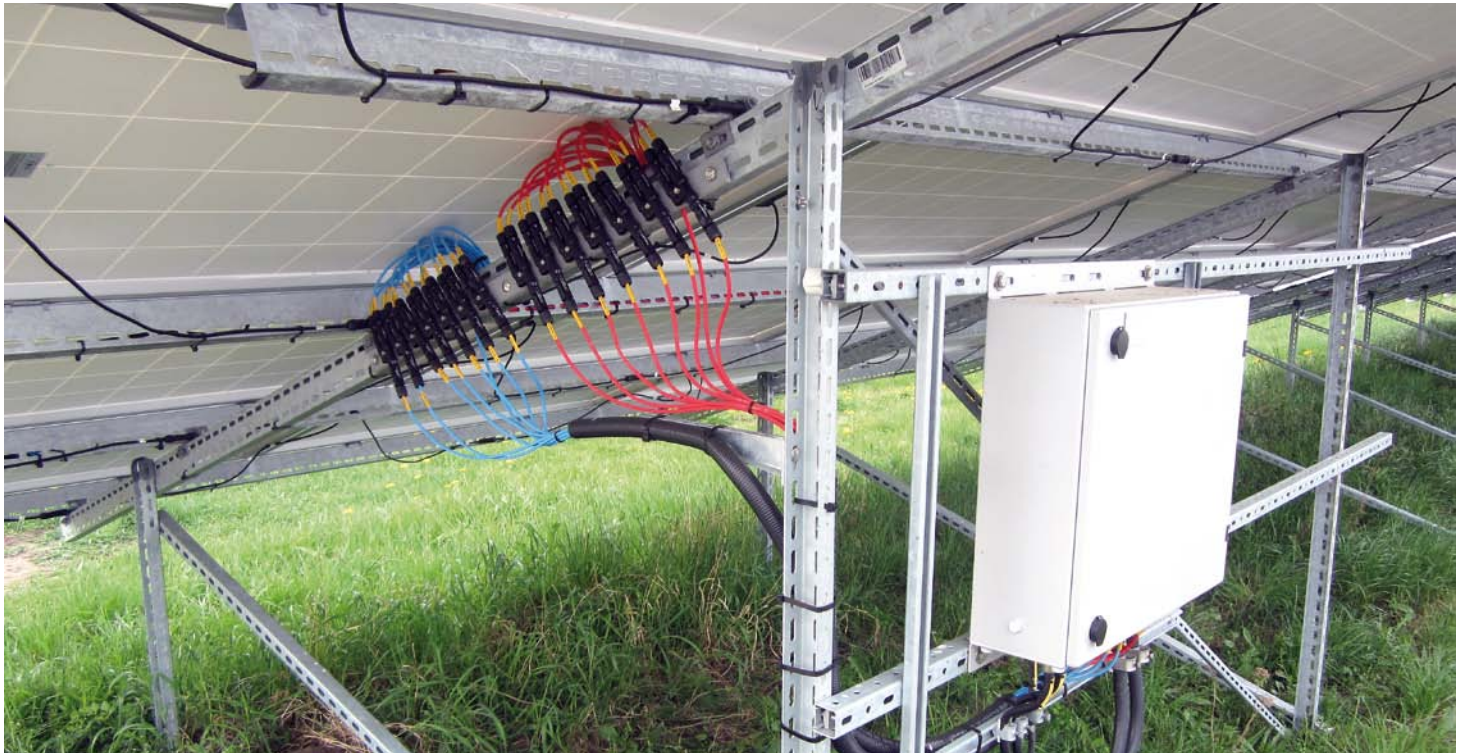
Modules, crystalline, 4-rows, landscape, east-west orientation

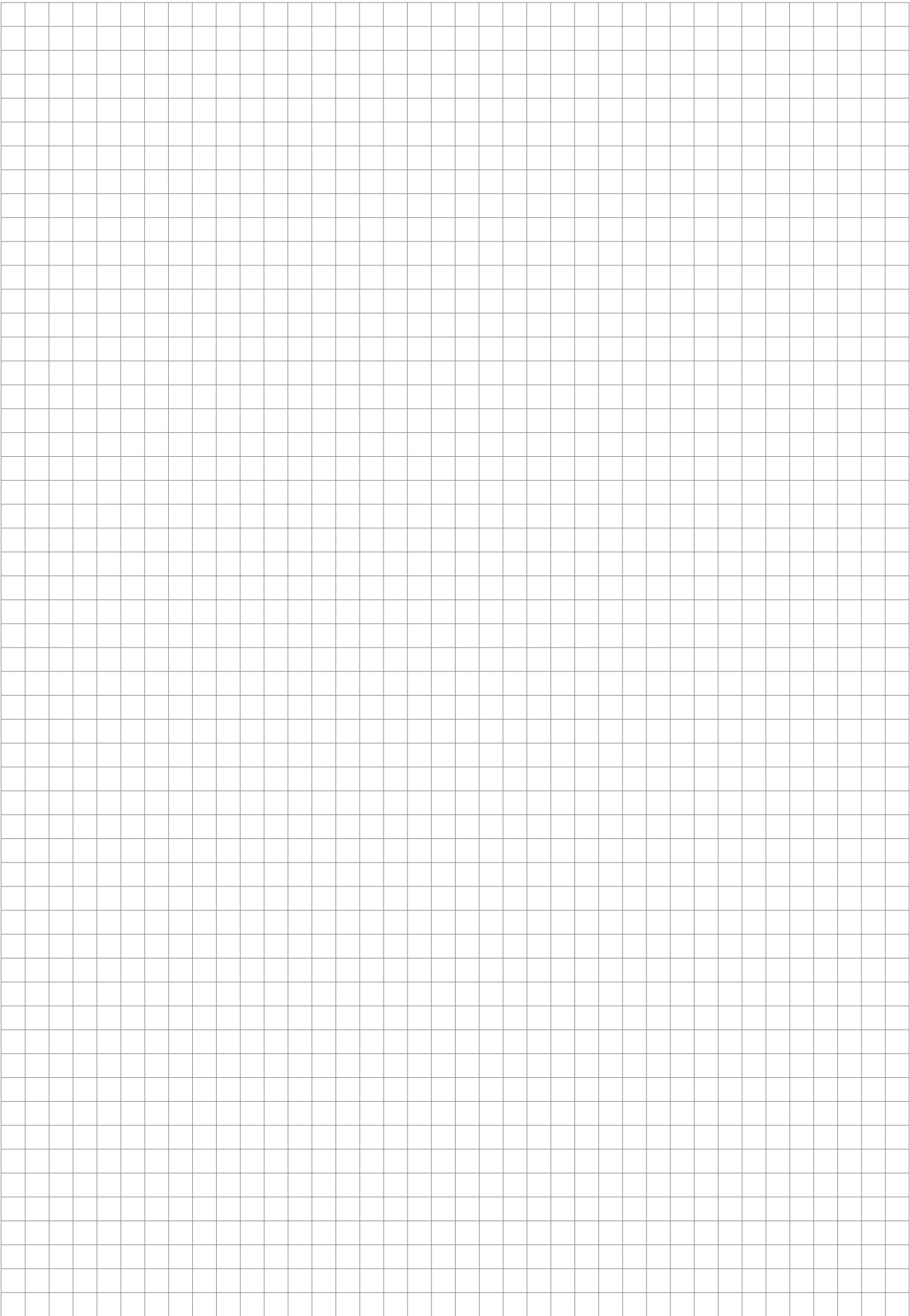


Modules, crystalline, 4-rows, landscape, east-west orientation

Mounting options

Mounting systems for ground mounted installations





Mounting

Mounting systems for ground mounted installations



1 | Ramming of supporting profiles

Profiles are inserted into the earth using hydraulic rams. The posts are rammed into the earth approx. 1.5 to 2 meters deep depending on the soil class.



2 | Mounting of crossbeams and diagonal beams

Crossbeams are screwed into the slot series on the profiles and the required incline is fixed. The diagonals are used to reinforce the support frame.



3 | Mounting longitudinal beams

The longitudinal beams mounted onto the crossbeams give the table its structurally calculated strength. The longitudinal and cross beams are screwed to each other with special connection angles.



4 | Mounting of modules

Modules are directly mounted onto the longitudinal beams with approved module clamps. The attachment points are pre-punched according to module width.

Ramming

Mounting systems for ground mounted installations



The foundation of the base frame is created by ramming the supports (KHU profile 60) into the earth. PUK Solar's hydraulic rams are used to ram the supporting profiles into the earth to the exact millimetre.



The ramming depth is between 1.5 and 2 meters. The exact ramming depth is determined with test ramming. The measured tensile values are compared with structurally calculated load values.

A geological survey is helpful for observing ramming depth but not mandatory. Soil classes 3 through 4 can be rammed. Small stones and rubble with grain sizes of up to 66 mm are not an obstacle to ramming.



If the ground is not firm enough and the extraction values are too low, these values can be tripled by ramming diagonally and screwing the diagonal profiles to the rear supports to ensure stability of the frame.

Concrete mounting

Mounting systems for ground mounted installations



Drilling is necessary if the stones are too large or the ground is too rocky.



The post is subsequently set in concrete.



The supports are doweled onto smooth concrete surfaces with appropriate concrete grade.



If the concrete grade is insufficient or the surface is cracked and porous and the concrete surface is only 30 cm thick, heavy construction equipment is used to drill a hole into the ground. The supports are then rammed into the ground below through this hole.



If the ground cannot be penetrated due to films in landfills or other obstacles (concrete pieces, stones etc.), PUK Solar also provides concrete elements. Supports are initially temporarily attached to the ground and specially placed for the casing body dimensioned for the construction project.



The formwork is then poured using a concrete pump. The exact alignment of the supports is given special attention here. After a hardening period, the rest of the base frame can be mounted.



Once the concrete has completely hardened, the formwork can be easily removed and used for additional concrete elements if needed.

Technical information

Mounting systems for ground mounted installations

Corrosion protection.

All steel elements are made of zinc coated structural steel

- Coil galvanized (e.g. Magnelis) or
- Hot-dip galvanized (DIN EN ISO 1461)

Mounting equipment can also be made in stainless steel or aluminium.

Contact corrosion

Insulation measures are unnecessary unless the surfaces of the components in contact are approximately equal in size.

The following combinations are therefore not critical:

- Stainless steel attachment material (e.g. screws) / galvanized component
- Stainless steel attachment material/module clamps made out of aluminium
- Galvanized component (beam) / module clamps made from aluminium

Critical construction components are checked by our engineers and noted on the final mounting drawings.

Screw connections

Exterior screw connections are subject to dynamic loads (e.g. wind). Compliance with tightening torque (see table) is thus essential.

Tightening torque [Nm]

- Allen screw M8, stainless steel: 12-15 Nm
- Flathead screw M10, galvanised steel: 30-35 Nm

Equipotential

When connecting the longitudinal beams, the equipotential is created with the connectors to be used.

Lighting protection

Ground mounted PV systems must have lightning protection.

Subsoil

Foundations can be laid by ramming supporting profiles, screwing ground anchors or using concrete baseplates. A geological survey or test ramming and extraction tests are required for calculating the base plates or determining the ramming depth.

Data for construction planning

Mounting systems for ground mounted installations

1. Contact person

Company:

Contact person:

Phone:

2. Location of construction

Street:

Postcode:

City:

Country:

Altitude above sea level:

GPS coordinates (if available):

3. Foundation

☐ Concrete

☐ Ramming

Miscellaneous:

4. Module type and arrangement

Module type:

Power [Wp]:

Length [mm]:

Width [mm]:

Height [mm]:

Weight [kg]:

Angle of inclination [°]:

Eaves height (distance from ground to lower edge of module) [mm]:

Arrangement:

☐ Portrait

☐ Landscape

Rows per module tables:

Number of modules per row:

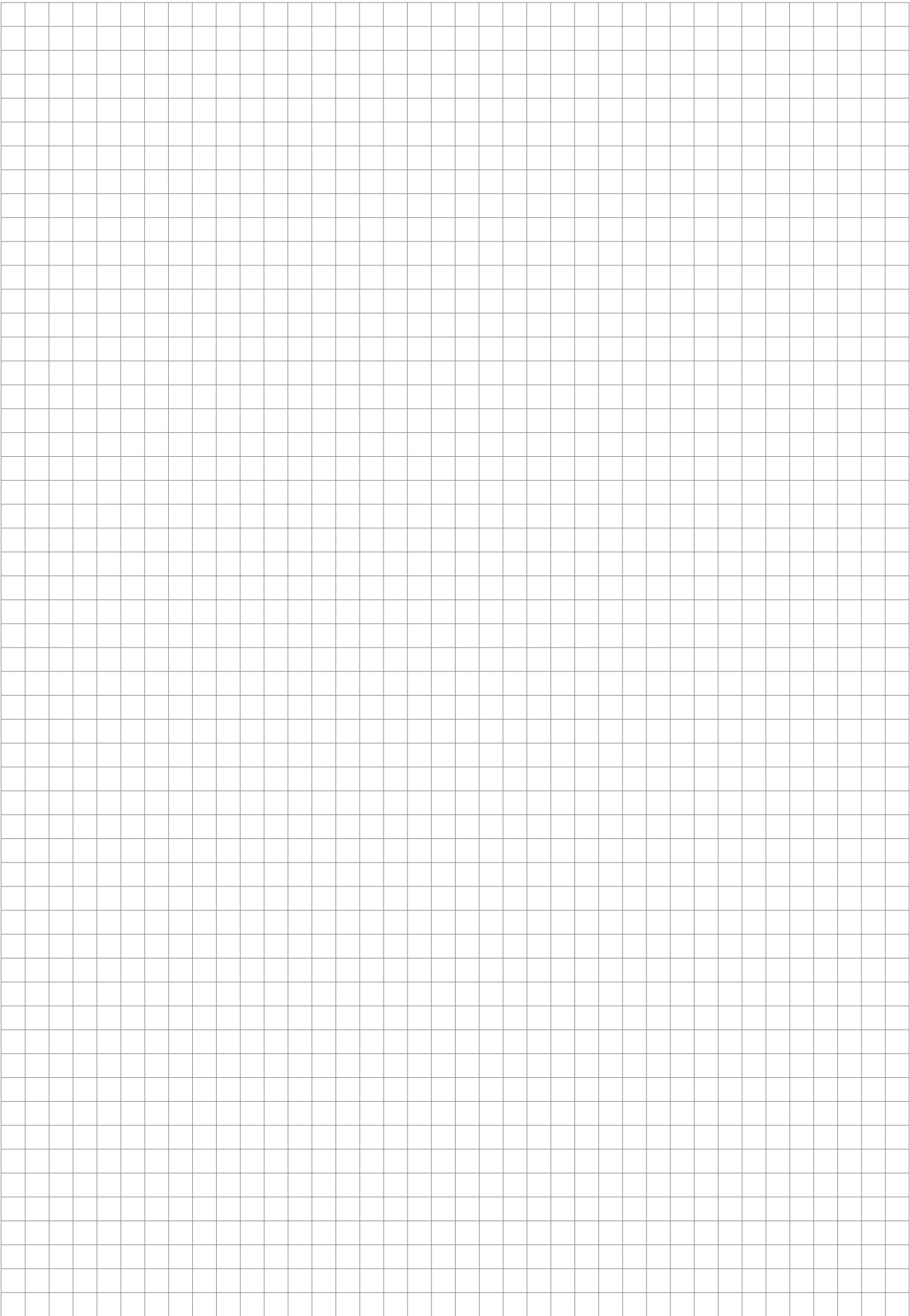
Number of tables:

Total Number of modules:

Total power [kWp/MWp]:

Attention

The layout of the site and the position of the photovoltaic panels on the site decisively influence the sizing of the mounting base frame. Existing sketches, drawings or plans are therefore essential for designing the base frame as light weight as possible and reducing costs. Please submit all available documents along with your inquiry.





Errors and technical modification subject to change. Reproduction as well as electronic duplication only with our written permission. With appearance of this print all preceding documents lose their validity.

