Vario

Carrier systems for open field photovoltaic installations

Engineered in Germany

Content

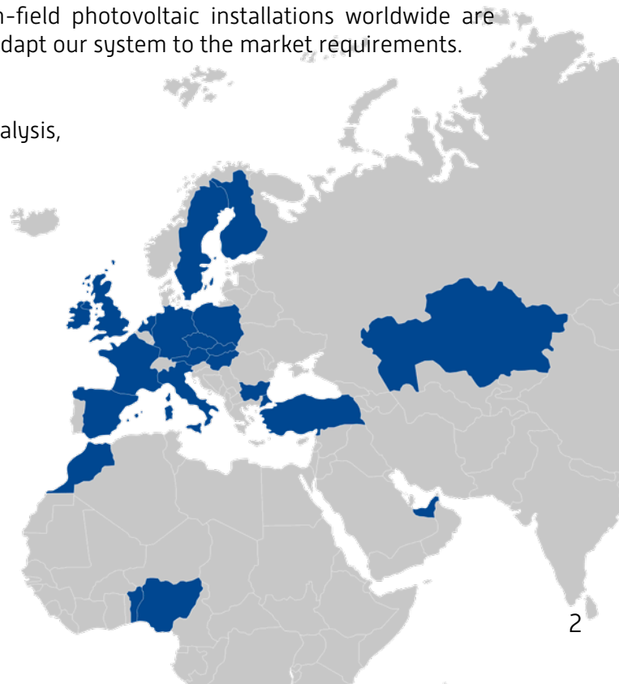
"From sunlight to energy" is an interesting and impressive way to produce renewable energy and to sustainably create and provide regular energy resources. For this reason, we at CWF, decided to make our contribution with the products and services of our company.

We are an established and dynamic company that offers a patented, high-quality carrier system for open-field photovoltaic installations.

Based on long-standing experience, we have eveloped carrier systems that are especially adapted to the requirements of open-field photovoltaic installations. Our aim is always to design a bearing, multi-adjustable and easy-to-install carrier system.
We have made it - down to the last detail!

More than 3,5 gigawatt of carrier system for open-field photovoltaic installations worldwide are evidence of customer satisfaction and our ability to adapt our system to the market requirements.

Our services include:
- Customized consulting and planning (structural analysis, trial pile driving, etc.)
- Delivery and assembly of our carrier system



Vario Carrier system

With our patented, multi- statically tested **Vario angle-adjustment system**, both Σ- and C mounting piles can be chosen. The angle-adjustment system is fixed with only 6 bolts.

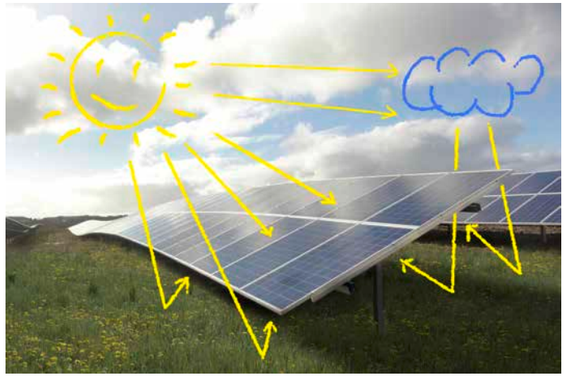
Our cross beams are individually adapted to each module layout. The advantage here is that the loads are distributed evenly across the entire frame design. Besides, it is also possible to further stabilize the cross beams to avoid excessive vibrations in the case of weather storms. The system is suitable for both framed and frameless modules.

For the entire system we only use high quality, weather-resistant and durable materials and components.

Due to the construction with vertical module carriers, the CWF systems are ideal for solutions with bifacial modules.

We at CWF want to leave nothing to chance as we want to make sure that your outdoor system withstands the forces of nature for at least 25 years.

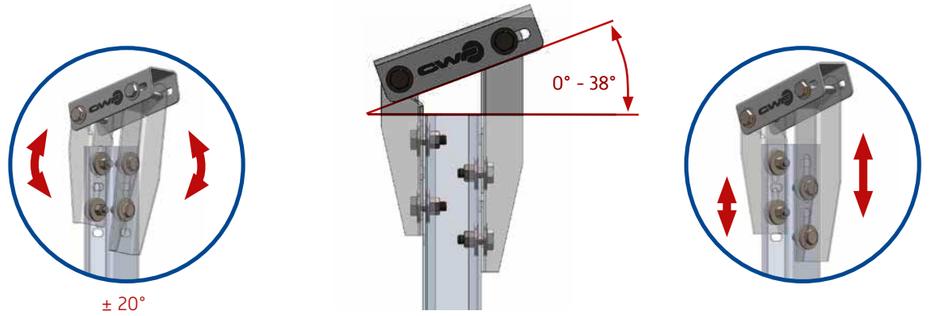
We will be pleased to offer you advice and support to any further question about our system.



Bifacially optimized

Vario angle-adjustment system

Vario SMART angle-adjustment system



- high flexibility on adaption to the compound
- highly flexible and precise angle adjustment

Vario KS I

1-Post-System

- suitable for bifacial use
- no braces required in the system
- cable duct integrated in the system

- 1 or 2 modules portrait (vertical)
- up to 4.50 m span width
- North-South & East-West orientation possible

- 3 modules landscape (horizontal)
- up to 4,50 m span width
- North-South & East-West orientation possible

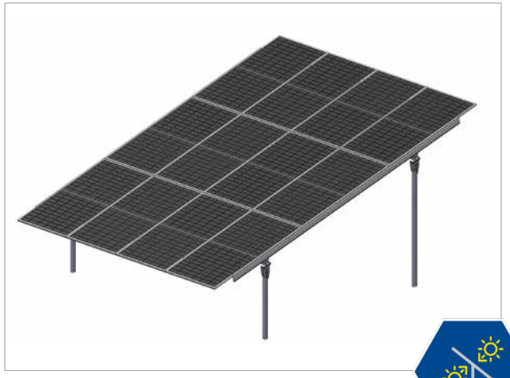
- 4 modules landscape (horizontal)
- up to 4.50 m span width
- North-South & East-West orientation possible

- East-West orientation

Vario SMART

2-Post-System

- suitable for bifacial use
- no braces required in the system
- cable duct integrated in the system

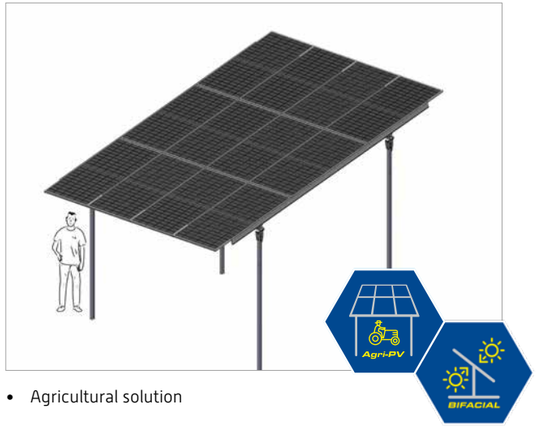


- 2 to 4 modules portrait
- wing span of table from 5 m to approx. 7 m
- North-South & East-West orientation possible

- 4 to 6 modules landscape
- wing span of table from 4 m to approx. 7 m
- North-South & East-West orientation possible

- Module carrier *Vario* ***slide-in*** (see p. 13)
- Module carrier *Vario* ***clamp system*** (see p. 14).

- East-West orientation

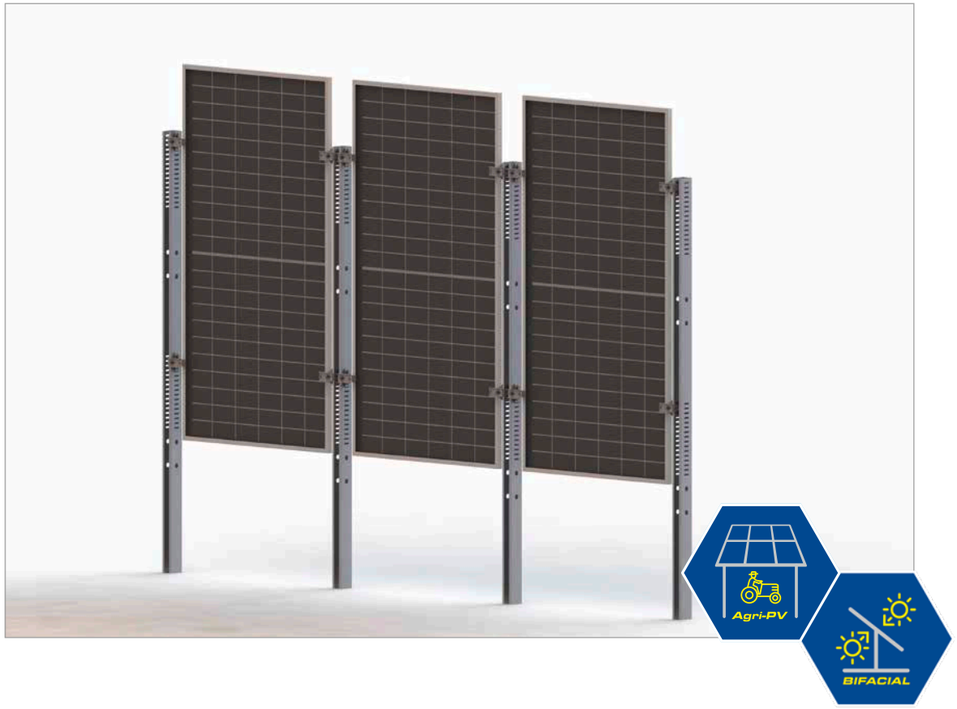


- Agricultural solution

NEW

V1-SOL

Our clever solution for dual agricultural use.

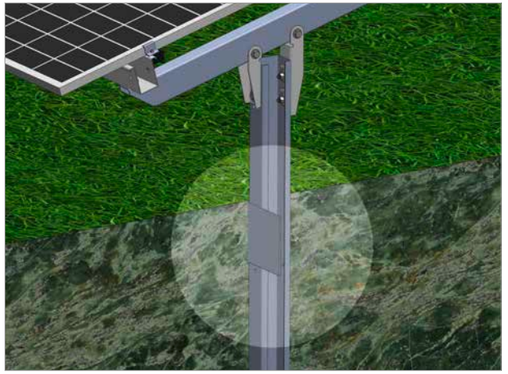


V1-SOL

- 1 module portrait - with the latest module technology, module size approx. 1303x2384mm, approx. 650 watts
- suitable for flat and hilly terrain
- East-West & North-South orientation possible
- designed for wind loads up to wind zone 2 (0.58 kN/m²)
- very little space requirement
- simple stringing of the modules, including ducting the cables through the posts
- the areas between the rows of modules can be used for agricultural purposes
- low shading from profiles
- anti-cyclical production peaks (compared to conventional south-facing PV systems) in the morning and evening hours, therefore better network compatibility
- for fields with up to 15° slope

Vario Solutions

Special solutions for special requirements.

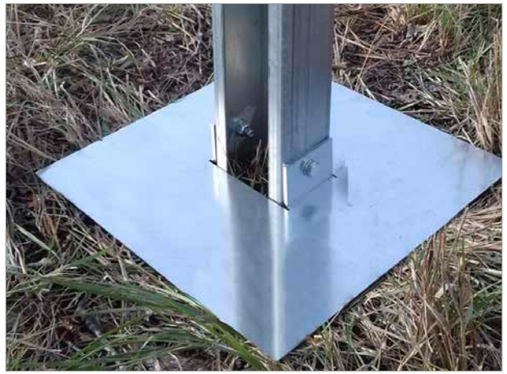


Post reinforcement for horizontal loads

- North-South & East-West orientation possible

Post reinforcement to prevent terrain lowering

- North-South & East-West orientation possible



Because of the growing number of converting areas we develop and offer customized building structures for special projects.

Restrictions to construction activity, such as very short piling depths or general piling interdiction in the soil can be taken into account by using Vario solutions.

Ballast footing

- E.g. project-related concrete footings
- North-South & East-West orientation possible

Foundation with flora stones

- if the required pull-out values are not reached
- North-South & East-West orientation possible

Module fastening system

Vario Slide-in „Aluminium module carrier"

System properties:

- for all current module-frame heights
- for all systems in landscape and portrait orientation
- module carrier made of aluminum alloy ⟶ no contact corrosion with moduie frame
- wedge spacer allows optimal fixation of modules and uniform installation optics
- **Retaining clam**
  - certified to UL 2703 and TÜV requirements
  - grounding of the modules (optionally by attaching the retaining clamp to all modules)
  - avoids the slipping of the modules
  - ensures electrical conductivity
- **Stopper**
  - alternative clamp system to spring steel clamp
  - can be used with most module types and frames

Spring steel clamp

Stopper

Wedge spacer

Mechanical specifications

- outstanding statical advantages
- smooth and damage-preventing installation or de-installation for maintenance or repairs
- use of anti-theft screws possible

Vario Slide-in „Steel module carrier"

System properties:

- for module frame heights 30, 33, 35 mm
- engineered and optimized for high snow and wind loads
- for all systems (Vario KS, Vario Smart) in landscape and portrait orientation
- Steel module carrier S550 GDZM310
- wedge spacer allows optimal fixation of modules and uniform installation optics
- against vibrations and for a uniform installation optics

Mechanical specifications

- outstanding statical advantages
- smooth and damage-preventing installation or de-installation for maintenance or repairs

Vario Clamp system

System properties:

- Module clamping system for inserted mounting
- for all systems in landscape and portrait orientation
- module carrier made of aluminum alloy
- for all current module-frame heights
- also available anti-theft
  (Accessories on page 19)

System properties

Approvals	• certified by TÜV • by 2 PfG 1794/10.10 (quality) • by UL 2703 (lightning protection) • wind expertise by Wacker Engineers
Static calculations	• project-specific • country-specific • by Euro Code (EC 0/1/2/3/7/8/9) • consequential loss class (CC2 nach DIN EN 1990 B.3) • safety class (RC2 nach DIN EN 1990 B.2)
CE-Conformity	EU-Declaration of Conformity 0036 / 13 CWF_01-050-2016 DIN EN 1090-1+A1:2011 Carrier system for open field photovoltaic installations
Warranty on material coating	for Magnelis® by ArcelorMittal up to 25 years
Zinc ablation	only 25% erosion compared to piece galvanizing according to DIN ISO 1461

Material	Posts, Cross beams & Longitudinal beam	• Steel S350 GD/S550 • ZM310/ZM430 Magnelis® by ArcelorMittal Deutsches Institut für Bautechnik DIBt
	Modul carrier	• Aluminium EN AW 6063 T66 • Steel S550 GD + ZM
	Bolt connections	• sainless steel • Steel with zinc-nickel coating
Mounting		• only two screws required (M12) • cable duct integrated in the system via longitudinal beams • no struts necessary in the system • inclination angle 0° - 38° • simple and fast installation • standarised material logistics due to uniform longitudinal beams & pile-driven profiles for edge and center areas
Additionals (optional)		• string cable clip • anti-theft locking screws • post-cap • numbering of rows • earthing clamps • roofed inverter bank

Components

Cable Clip

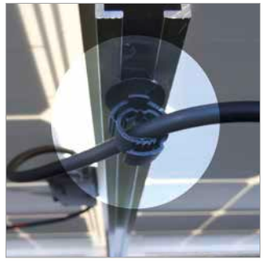
For easy fastening of module cables to our system. We recommend our UV-resistant plastic-material clip.

Description:

- easy to mount
- reusable
- allows high flexibility for changes

V1

- suitable for 1 to 3 DC cables
- Art.No.: 4001021

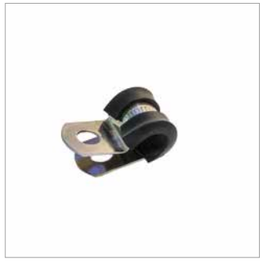


V2

- suitable for 1 to 8 DC cables
- cable strain relief guaranteed
- Art.No.: 4001023

Cable clamp

- suitable for 1 DC cable
- Art.No: 4001024



Cable clip for steel module beam

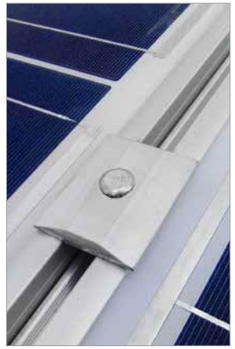
- suitable for 1 to 8 DC cables
- cable strain relief guaranteed
- Art.No.: 4001027

Anti-theft screw

To protect the modules against theft we optionally offer our patented anti-theft screw.

Description:

- easy installation
- impossible to be removed using standard tools
- Inox A2 -70 material
- Art.No.: 3025545



Numbering of Rows

For clear identification of rows.

Description:

- UV-resistant

Post-cap

Ideal cable protection against lawn mowing and animal bite.

Description:

- fits all CWF profiles
- easy and safe mounting on post
- Aluminium
- Art.No.:
  C-110x80x3: 550110xxxx
  C-70x70x3: 55070xxxx

Inverter rack

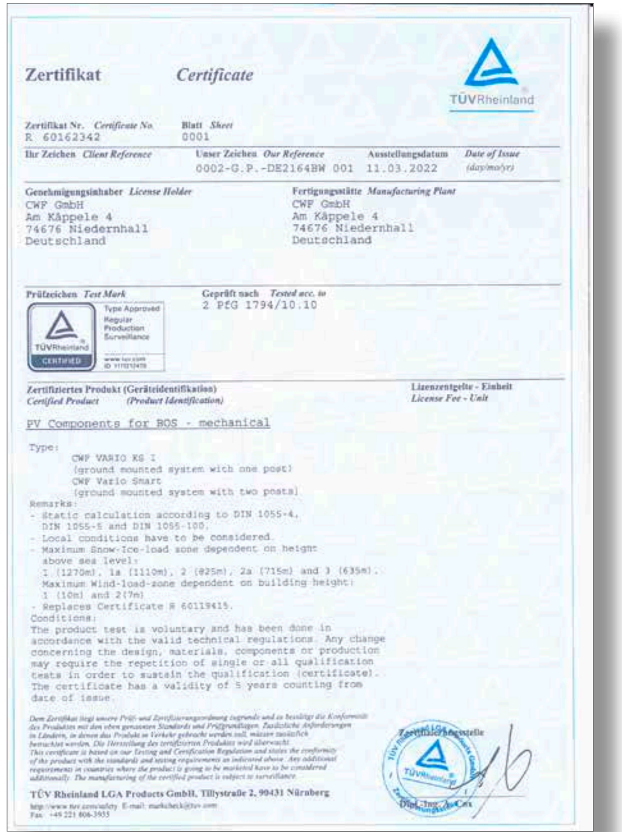
This variant offers protection from rain and UV radiation by being mounted under the modules.

Description:

- can be combined with all CWF Vario systems
- in the accustomed material quality of CWF
- quick mounting
- only one additional post and two crossbars required per inverter
- optionally available with anti-theft screws

Certification

TÜV Rheinland certified statics



Zertifikat Certificate

TÜVRheinland

Zertifikat Nr. Certificate No. R 60162342
Blatt Sheet 0001

Ihr Zeichen Client Reference
Unser Zeichen Our Reference 0002-G.P.-DE2164BW 001
Ausstellungsdatum Date of Issue (day/mo/yr) 11.03.2022

Genehmigungsinhaber License Holder
CWF GmbH
Am Käppele 4
74676 Niedernhall
Deutschland

Fertigungsstätte Manufacturing Plant
CWF GmbH
Am Käppele 4
74676 Niedernhall
Deutschland

Prüfzeichen Test Mark
TÜVRheinland CERTIFIED
Type Approved
Regular Production Surveillance

Geprüft nach Tested acc. to
2 PfG 1794/10.10

Zertifiziertes Produkt (Geräteidentifikation) Certified Product (Product Identification)
Lizenzentgelte - Einheit License Fee - Unit

PV Components for BOS - mechanical

Type:
CWF VARIO KS I
(ground mounted system with one post)
CWF Vario Smart
(ground mounted system with two posts)
Remarks:
- Static calculation according to DIN 1055-4, DIN 1055-5 and DIN 1055-100.
- Local conditions have to be considered.
- Maximum Snow-Ice-load zone dependent on height above sea level: 1 (1270m), 1a (1110m), 2 (825m), 2a (715m) and 3 (635m). Maximum Wind-load-zone dependent on building height: 1 (10m) and 2 (7m)
- Replaces Certificate R 60119415.
Conditions:
The product test is voluntary and has been done in accordance with the valid technical regulations. Any change concerning the design, materials, components or production may require the repetition of single or all qualification tests in order to sustain the qualification (certificate). The certificate has a validity of 5 years counting from date of issue.

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg

TÜV Rheinland certified according to standard UL 2703

Produkte Products

TÜVRheinland®

Prüfbericht-Nr.: Test Report No.:	21237782.001_rev.01	Auftrags-Nr.: Order No.:	21237782	Seite 1 von 5 Page 1 of 5
Kunden-Referenz-Nr.: Client Reference No.:	3205919	Auftragsdatum: Order date:	07. October 2016	
Auftraggeber: Client:	CWF GmbH, Rieslingweg 19, 74676 Niederhall, Germany			
Prüfgegenstand: Test item:	Photovoltaic (PV) mounting system			
Bezeichnung / Typ-Nr.: Identification / Type No.:	Ground mounted system, CWF Vario 1			
Auftrags-Inhalt: Order content:	Testing of the lightning current carrying capacity of the ground mounted system			
Prüfgrundlage: Test specification:	UL 2703 issue 2, section 13, section 22. Outline of investigation for mounting systems, mounting devices, clamping/retention devices, and groung lugs for use with flat-plate photovoltaic modules and panels *section 13:Bonding path resistance test, section 22: Bonding conductor test*			
Wareneingangsdatum: Date of receipt:	15.11.2016			
Prüfmuster-Nr.: Test sample No.:	HV2016003974			
Prüfzeitraum: Testing period:	24.11.2016 – 28.11.2016			
Ort der Prüfung: Place of testing:	Cologne			
Prüflaboratorium: Testing laboratory:	Solar Energy Assessment Center			
Prüfergebnis*: Test result*:	Pass			

geprüft von / tested by: 08 December 2016 D. Kolter, project manager
Datum Date | Name / Stellung Name / Position | Unterschrift Signature

kontrolliert von / reviewed by: 08 Dec. 2016 L. Jakisch, business field manager
Datum Date | Name / Stellung Name / Position | Unterschrift Signature

Sonstiges / Other: N/A

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: Test item complete and undamaged

* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft
P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet
Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor
P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

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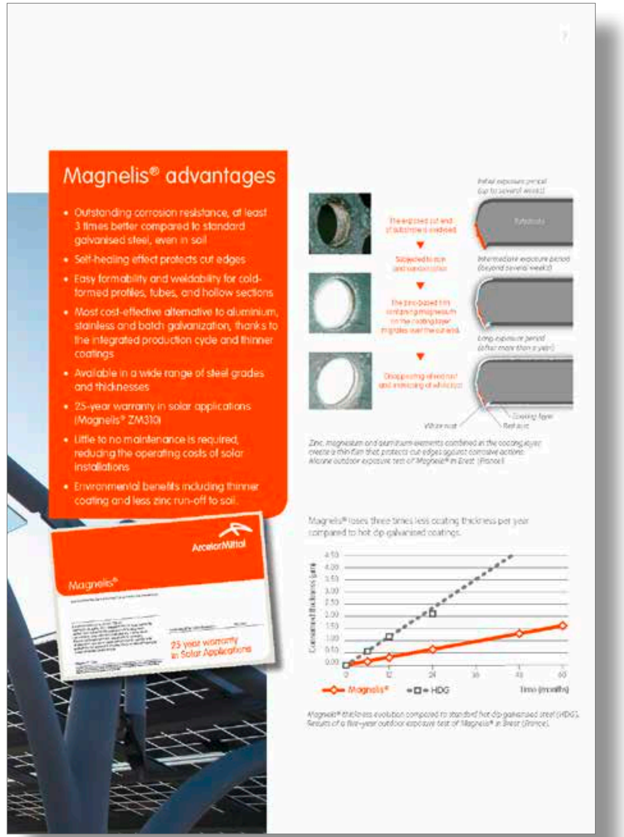
Corrosion resistance



Our services

- full service from one source
- planning and implementation of mounting of modules
- on-site trial pile driving
- chemical soil analysis
- rock drilling
- material logistics on the construction site:
  Simplification of construction site logistics through standardized and uniform components
- project statics / test statics according to Euro Code (EC 0/1/3/7/8/9)
- special-purpose solutions for converting areas
  (disposal sites, former military or industrial areas, etc.)
- short delivery and assembly time
- optional module theft protection by special anti-theft screws

Rock drilling

Delivery and logistics

Mounting

on-site trial pile driving

References

Pentling

8,56 MWp

Boxted Airfield

19,00 MWp

Saran

100,00 MWp

Rüblingen

750 kWp

Wallmersbach

750 kWp

References

Kisvarda

7,77 MWp

Sjöbo

5,80 MWp

Heinrichshöh

1,70 MWp

Kazanlak

25,00 MWp

Arnheim

2,25 MWp

Brandholz

1,34 MWp

Lindesberg

1,00 MWp

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