

Kalzip® Solar Power Systems

Flexible solutions for creative solar architecture

Kalzip®

Solar Power Systems

The synthesis of design and function



Freedom of creativity for environmentally conscious designers and architects

Our partner for triple-junction technology:



Responsibility is a keyword in contemporary architecture. The creation of new buildings is a practice which benefits future generations, and today also includes the implementation of ecological value systems.

The introduction of Solar Photovoltaic (PV) into the building envelope is no longer determined by the mere functionality, but is implemented as an integral part of the building form.

The flexibility of Kalzip® roof systems provides the designer with maximum freedom of creativity; this allows optimal realisation of dedicated architectural concepts for aesthetic solar design.

The longevity of Kalzip® roof systems, together with the performance warranty on the solar laminates, make Kalzip® Solar Power Systems both profitable and in tune with the requirements of modern solar architecture.



Above: Three-court school in **Frechen (Germany)**
Architect: Reich

Page 6: IC-Haus in **Bodenheim (Germany)**
Architect: Dorberth-Kraus

Page 7: Schiller School in **Bretten (Germany)**

With Kalzip® Solar Power Systems, you fulfill the prerequisites of sustainable construction.

Kalzip® Solar Power Systems were developed in the interests of environmental protection and the conservation of resources. Kalzip® standing seam roof sheets are the ideal substrate for PV systems on new buildings and renovated roofs, as well as when retrofitting. A further alternative of power generation is the integration of PV systems into the building envelope.

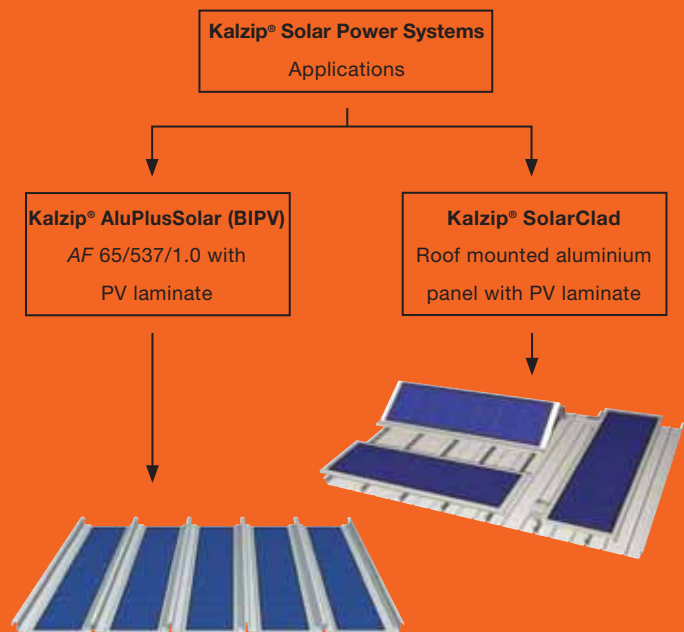
Under diffused light conditions, the silicon thin-film solar cells in the innovative triple-junction technology developed by our partner UNI-SOLAR reach a greater energy yield than crystalline solar cells of the same rated power output. This makes them ideal for installation in all European regions.



When referring to PV systems, architects make a distinction between roof-mounted and roof-integrated (BIPV) systems. Corus Bausysteme offers solutions for both options which are optimized for Kalzip®roof systems

For individual freedom of design, and the simultaneous use of solar energy, Kalzip® AluPlusSolar offers interesting prospects by means of a combination of extremely robust PV laminates and Kalzip® profiled sheets, even making convex and concave constructions possible.

Kalzip® SolarClad is suitable for the design and installation of PV laminates onto existing structures. The roof mounted solution can be clamped to any Kalzip®standing seam profile and accommodates the architectural requirements relating to building shape.





Solar construction gives shape to a new aesthetic. Architects set trends with Kalzip® AluPlusSolar.

The Kalzip® AluPlusSolar panels are the first to enable truly roof-integrated renewable power generation using flexible PV laminates, while providing maximum freedom of creativity for challenging object architecture.

A wide variety of designs can be accommodated, as the solar laminate is permanently attached to Kalzip® aluminum standing seam sheets. This integrate system

allows individuality of roof design incorporating straight, convex, or concave shapes. Without mounting frames, the solar cells are in plane with the roof surface and yet convey an independent, expressive character.

Typical constructions such as shed or barrel vault roofs are also possible, at pitches of up to 60°.

Kalzip® SolarClad: design flexibility and low weight. Possibilities for sustainable construction.

Kalzip® SolarClad is a PV system optimised for use on metal roofing. Its flexibility and versatility enable solar panels to be integrated into almost any standing seam system.

Kalzip® SolarClad is a retro-fit solar solution which can be integrated into the building structure and which is predestined for the utilization of this energy type, whether in installations on existing structures or when planning new buildings.

The PV laminates consist of extremely robust amorphous silicon (a-Si) thin-film cells attached to aluminum carrier panels, which can be installed on any typical standing seam system without penetrating the roof. SolarClad can be conventionally mounted on other system elements, such as trapezoidal sheets. The additional loadings are only slight, due to the low weight per unit area of between 3 and 7 kg/m².

The lightweight panels are suitable for all roof shapes and guarantee architects maximum freedom of design.



Kalzip® AluPlusSolar

Roof-integrated, renewable power generation for aesthetic solar architecture.



The combination of thin-film solar laminates with the properties of Kalzip® roof systems provides architects and designers of photovoltaic systems maximum freedom of design while making efficient use of solar energy.

Kalzip® AluPlusSolar is offered as an all-in-one system including inverter and accessories.

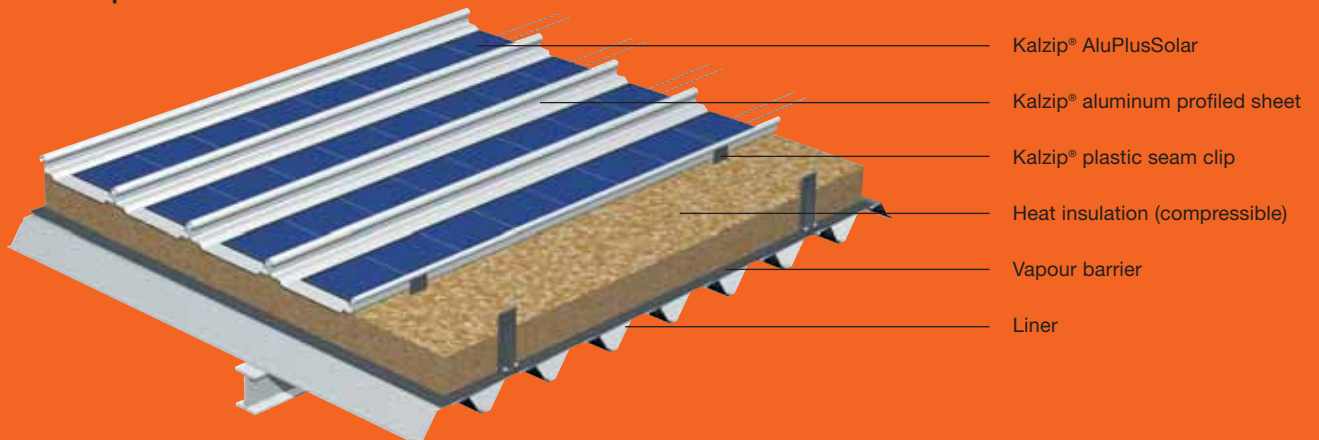
Dimensions of

Kalzip® AluPlusSolar	AF 65/537 mm
Sheet thickness	1.0 mm
Surface	RAL 9006
Weight	Approx. 7.0 kg/m ² (incl. solar laminates)

An overview of the product's advantages

- Aesthetic, roof-integrated photovoltaic system, without additional fasteners
- Ideal for challenging architecture
- Optimal utilisation of solar energy even in poor light conditions by means of triple-junction technology
- Higher shading tolerance than crystalline modules, due to tight bypass circuitry
- Economical due to high performance warranty (20 years)
- Suitable for cold or warm roof design
- Self-cleaning surface – therefore minimum maintenance requirements

Example of a roof structure with Kalzip® AluPlusSolar



Kalzip® SolarClad

The retro-fit solution for all metal roofs – light and flexible.



Kalzip® SolarClad is suitable for all roof shapes up to a 60° pitch. Its low weight generally means that there are no additional structural requirements for the roof.

Kalzip® SolarClad is offered as an all-in-one system, including inverter, for various standing seam profiles and can be delivered in two lengths, laminated onto carrier panels and ready for connection.

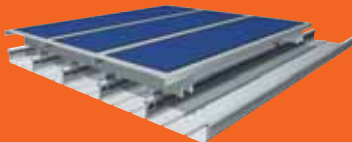
An overview of the product's advantages

- Amorphous thin-film laminates for lasting efficient utilization
- Up to 20% higher energy yields than crystalline modules due to triple-junction technology
- High shading tolerance due to tight bypass circuitry
- Low weight between 4 kg/m² and 8 kg/m², including fasteners

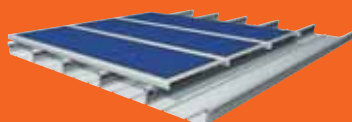
- Suitable for all standing seam systems and varieties due to variable fastening system
- Cost-effective PV solution for new building projects with Kalzip® standard overall widths
- High economic efficiency due to quick, non-penetrative installation
- Environmentally friendly due to short energy payback time < 3 years
- Simple structural calculations for Kalzip® roofs
- Improved heat protection in summer due to roof shading
- Many different installation options for maximum power density and optimized yields
- Ideal for all roof shapes, contour-hugging for barrel vault roofs of up to a minimum 13 m radius

Installation options:

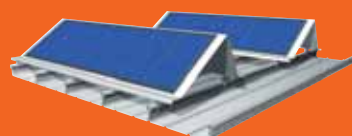
Roof-parallel longitudinally mounted onto Kalzip® aluminum profiled sheets



Roof-parallel transversely mounted onto Kalzip® aluminum profiled sheets

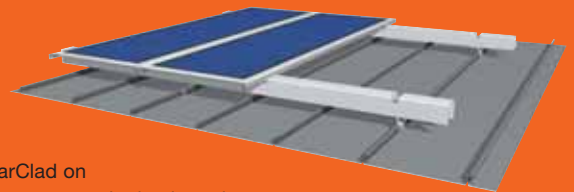


Tilted mounting onto Kalzip® aluminum profiled sheets

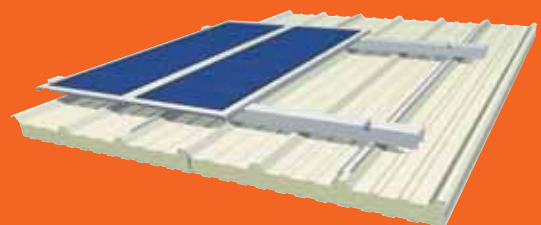


Retrofit solutions

Kalzip® SolarClad on standing seam system in titanium-zinc



Kalzip® SolarClad on trapezoidal sheets



Technical data

The solar laminates (available in two lengths) acts as a solar generator and is laminated onto Kalzip® in the factory ready for connection on site. Kalzip® Solar Power Systems are available with both photovoltaic thin-film solar laminates PVL-68 and PVL-136, which have power outputs of 68 and 136 kWp respectively.

	PVL-68	PVL-136
Required area per kWp Kalzip® AluPlusSolar [m ²]		from 22
Required area per kWp Kalzip® SolarClad (roof-parallel installation) [m ²]	> 18.50	> 18.50
Module length [m]	2.85	5.50
Rated power output [W]	68	136
Operating voltage V_{MPP} [V]	16.5	33.0
Operating current I_{MPP} [A]	4.13	4.13
Open-circuit voltage V_{OC} [V]	23.1	46.2
Open-circuit voltage V_{OC} at -10 °C and 1250 W/m ² [V]	26.3	52.7
Short-circuit current I_{SC} [A]	5.1	5.1
Short-circuit current I_{SC} at 75 °C and 1250 W/m ² [A]	6.7	6.7
Fuse in series, nom./blocking diode, nom. [A]	8.0	8.0
Maximum DC system voltage [V]	1000	1000

Note: The above values ($\pm 5\%$) are stabilised values. During the first 8 to 10 weeks of operation, system power, operating voltage, and operating current may be 15%, 11%, and 4% higher respectively.

Kalzip® Solar Power Systems satisfy protection class II requirements, design qualification and type approval in accordance with IEC 61646.

TÜV Rheinland, Cologne

Corus Bausysteme offers you an optional large solar display unit which clearly indicates the current system power output, the energy yield and the CO₂ savings in a clearly visible manner.



Kalzip® AluPlusSolar planning notes:

- Minimum radius in the area of the laminate-covered sheets > 13m
- Roof pitch min. 5 % (3°)
- Fixing and electrical installation to be completed according to Kalzip® Solar Power Systems installation instructions

Kalzip® SolarClad planning notes

- Suitable for all Kalzip® profiles
- Fixing and electrical installation to be completed according to Kalzip® Solar Power Systems installation instructions



Strong partners: roof renovation using lightweight steel structures combined with Kalzip® Solar Power Systems.

Every year, large sums of money are spent on the repair and maintenance of failing flat roofs.

The Kalzip® renovation concept using lightweight steel construction is a system developed to ensure sustainable building protection. Without interruption to occupant activity, complete roof environments can be economically and lastingly renovated.

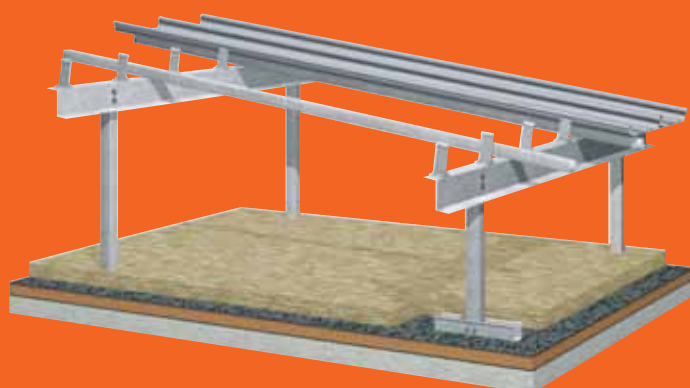
In addition, the implementation of roof-integrated PV systems for renewable power generation creates, by means of the corresponding subsidy schemes, the possibility of securing financing for the entire construction project.

The advantages of the Kalzip® renovation concept:

- Lasting, practically maintenance-free building protection, without follow-up costs
- No interruption to operations
- High freedom of design
- No disposal costs for the existing roof sealing
- Contributes to meeting National Energy Saving Targets for CO₂ reduction
- Active environmental protection by means of optional additional components such as solar technology or Kalzip® Nature roof
- Receipt of government subsidies and favorable energy efficiency classification in energy certificates

Roof renovations with Kalzip® systems are the perfect way to increase the value of buildings, and also actively provide environmental protection – today and in the future.

Town hall in **Mastershausen (D)**
 Architect: Birger Boos
 Right: before renovation
 Above: after renovation



Schematic diagram of the lightweight steel structure

Maximum performance with Kalzip® Solar Power Systems: concise information on system planning.

Location and orientation

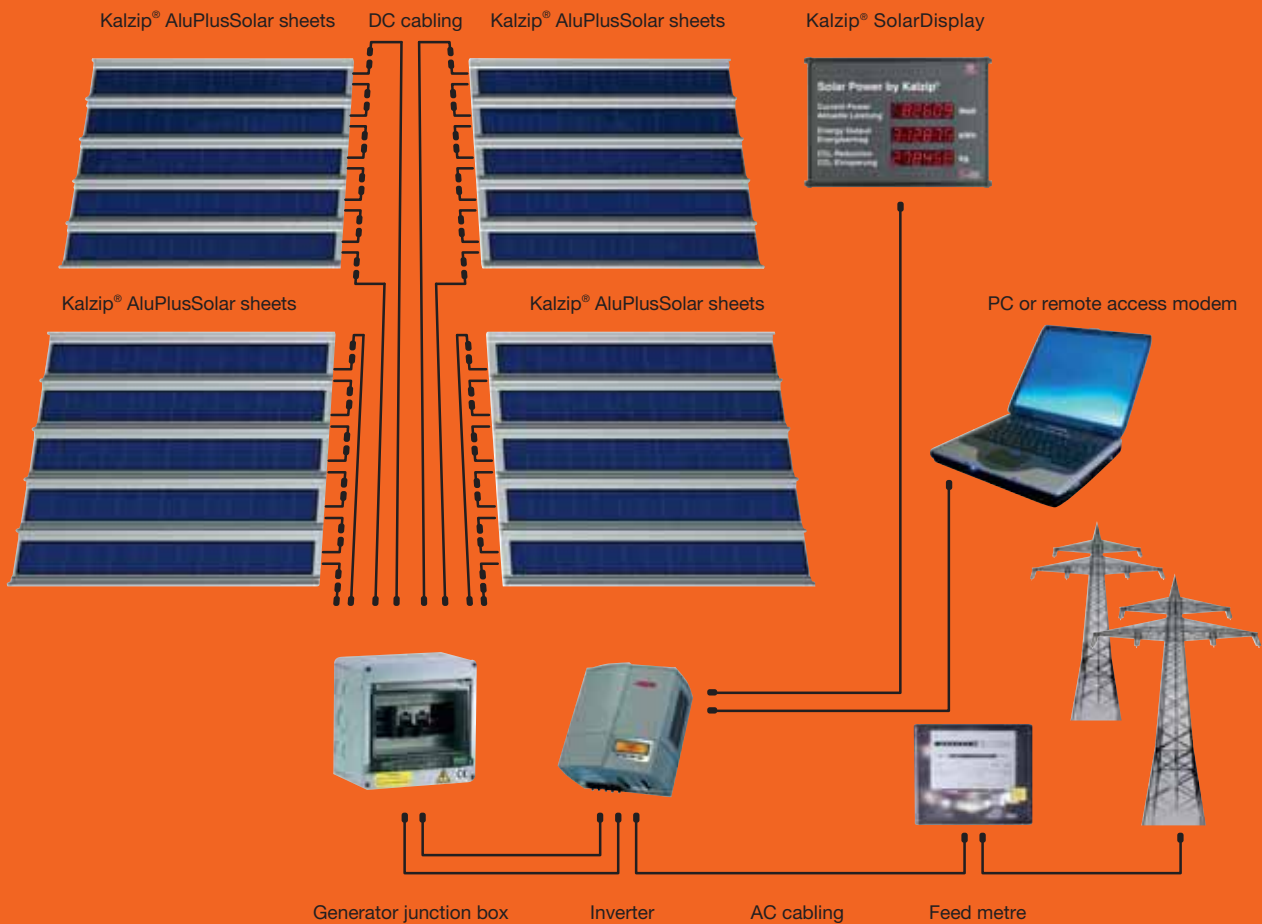
The average annual solar irradiation in Europe ranges from 1,752 kWh/m² in southern Spain to 876 kWh/m² in the North of Scotland. The average in Germany is around 1,000 kWh/m².

Solar cells

When PV laminates absorb light they produce an electrical voltage which results in the generation of a direct current. Solar cells are semiconductor materials which immediately convert light energy into electrical energy. This occurs by means of silicon layers which are designed to absorb the specific spectral colours of sunlight.

Photovoltaic systems

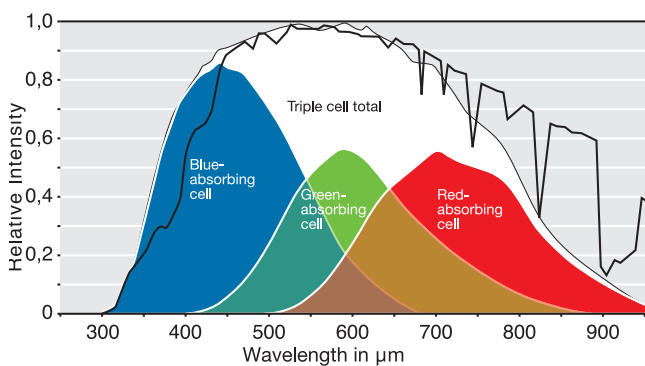
Every grid-connected PV system essentially consists of the solar laminates which generate direct current upon solar irradiation. DC cabling is routed through a central generator junction box, where fuses and lightning protection can also be integrated. The inverter then converts the direct current into a grid-compliant alternating current. The feed metre measures the amount of energy fed into the mains grid.



The advantages of amorphous thin-film technology:

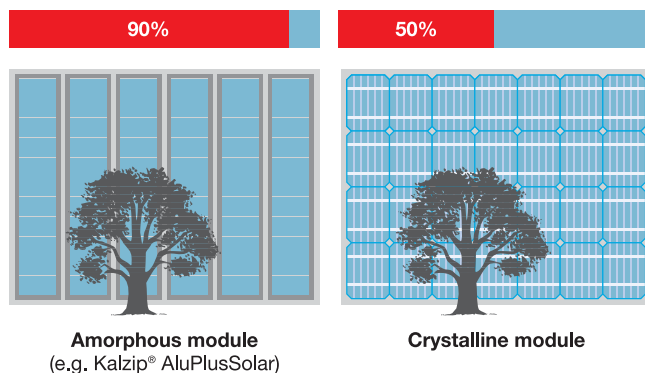
Triple-junction technology

The solar cells used in amorphous silicon thin-film laminates consist of three silicon layers applied one after the other. The different layers are optimized so that each layer can optimally convert a different range of the light spectrum to electrical energy. This enables greater efficiency in diffuse light conditions, which constitute the predominant form of daylight in central and northern Europe. The specific yields of a Kalzip® AluPlusSolar or Kalzip® SolarClad system are thus, depending on local conditions, 10-20% higher than yields from a regular crystalline system in identical conditions.



Tight bypass circuitry

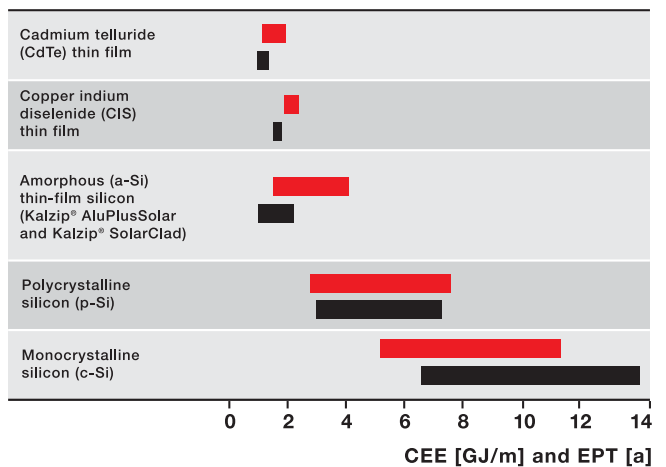
When partially or temporarily shaded, amorphous thin-film laminates have at their disposal a bypass circuit so that the system power is not significantly reduced or affected. This is in contrast to a similarly shaded crystalline system which, in the event of partial shading, would deactivate much larger areas.



Environmentally friendly

The low energy demands during the manufacture and the high yields result in an energy payback time of approximately 3 years. This is a fraction of the required energy payback times for crystalline modules.

Cumulative energy consumption and energy payback time of frameless PV modules



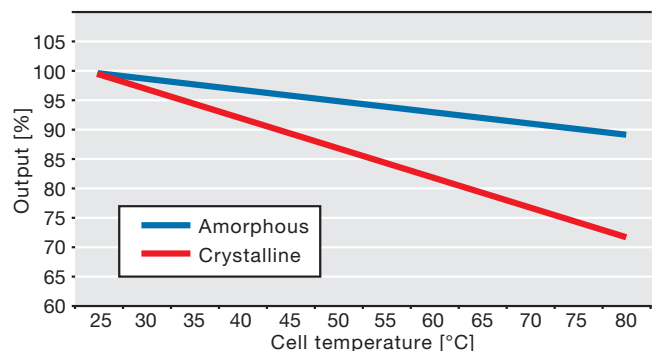
Ranges from different studies for calculation of:

- Red bar: Cumulative expenditure of energy (CEE) in gigajoules per m²
- Black bar: Energy payback time (EPT) in years

(Data source: Möller, Jochen. 1998. *Integrierte Betrachtung der Umweltauswirkungen von Photovoltaik-Technologien.*)

Temperature performance

The temperature coefficient describes the output reductions exhibited by solar cells when exposed to heat. For regular monocrystalline or polycrystalline modules, this coefficient is around -0.5%/K. For the PV laminates used in Kalzip® Solar Power Systems, it is only -0.2%/K.



Photovoltaic systems are a rewarding investment in the future.

In addition to the different government subsidy schemes in the EU, which make PV systems an economically profitable capital investment, environmental protection should also be mentioned. For example, in Germany approx. 40 percent of the harmful, climate-affecting carbon dioxide emissions are caused by power generation.

Every kilowatt hour of solar electricity generated and fed into the National Grid reduces CO₂ emissions. The reduction in levels of carbon dioxide emissions depends on the nature of the energy source displaced. In Germany, a 10 kWp solar system generates approx. 8000 kWh per year, which results in a saving of 5040 kg of CO₂ each year.

In addition to this environmental aspect, a further advantage of Kalzip® solar systems as standalone power generating solutions is that electricity can be produced and consumed in-situ. The energy payback time of a PV system is the time required by the system to generate the same amount of energy as is required to manufacture the product.

Thanks to improved technologies and greater efficiency, this is considered to be three and five years for photovoltaic systems. This shows that PV systems yield many times the amount of energy required to produce them over their service life (> 20 years), and are therefore highly sustainable construction products. Fossil fuel systems never reach this point; with an energy yield factor which is always negative.

Left: Aldi store in **Beilngries (D)**
Architect: Kehrbach Planwerk





Kalzip® customer service – optimal support and individual consulting.

Along with our all-in-one programs for Solar Power Systems and roof renovation, we offer you extensive service and consultancy. Our skilled technical service advisors will support you early in the planning process.

If you have questions, or would like a detailed, personal consultation please contact the sales office responsible for your area. The addresses can be found on the reverse side of this brochure.

You can obtain further information at:

www.aluplussolar.com

Here you will find valuable planning assistance, an FAQ and information area, as well as the „Kalzip® SolarDesigner“ software for project development of individual construction projects involving Kalzip® Solar Power Systems.

Subsidy schemes and payments make solar architecture interesting from an economic point of view. You can obtain an up-to-date overview on the following website:

www.solarfoerderung.de

Europe:

Austria

Corus Bausysteme Österreich GmbH
Honauerstraße 2
4020 Linz
Austria
T +43 - 7 32 78 61 14
F +43 - 7 32 78 61 15
M +43 - 66 49 21 01 84
E kalzip.austria@corusgroup.com

Belgium

Corus International Services NV
Representing Corus Bausysteme GmbH
Coremansstraat 34 · Royal House
2600 Berchem · Belgium
T +32 (0) 3 280.80.10
F +32 (0) 3 280.80.19
E cbsbe@corusgroup.com

Croatia, Serbia, Bosnia and Herzegovina: Kalzip® Engineering Office

Stjepan Klaric
Vj. Vlaho Bukovca 10
31.000 Osijek
Croatia
T +385 - 31 53 01 36
+385 - 31 53 01 37 M
+385 - 98 46 88 77 E
kalzip@hi.t-com.hr

Cyprus

Phanos N. Epiphaniou Ltd. P.O. Box 9078
21 Markou Drakou Avenue Pallouriotissa · 1621 Nicosia Cyprus
T +35 - 722 79 35 20
F +35 - 722 43 15 34

Czech Republic and Slovakia Kalzip®

Engineering Office Eva Sanovcová
Cejl 20 · 60200 Brno
Czech Republic
T +420 - (0) 5 45 11 74 40
F +420 - (0) 5 45 11 74 55
M +420 - (0) 73 72 72 691
E kalzip@ok.cz

Denmark

Corus ByggeSystemer A/S
Kaaresbergsvej 2 · Box 136
8400 Ebeltoft · Denmark
T +45 - 89 53 20 00
F +45 - 89 53 20 01
E mail@corusbyggesystemer.dk
www.corusbyggesystemer.dk

France

Corus Building Systems SAS
Bât. Saria B · 14, Rue de Saria · Serris
77706 Marne la Vallée Cedex 4 France
T +33 - (0) 1 60 43 57 10
F +33 - (0) 1 60 04 28 51
E cbsfr@corusgroup.com

Greece

Corus Building System Kalzip®
Engineering Office Vasilios Ligas
Dekeleon 25 · 11854 Athens Greece
T +30 - 21 03 41 65 04
F +30 - 21 03 41 35 06
M +30 - 69 74 01 40 40
E valigas@gmail.com

Corus Bausysteme GmbH

August-Horch-Str. 20-22 · D-56070
Koblenz P.O. Box 1003 16 · D-56033 Koblenz
T +49 (0) 261 - 98 34-0
F +49 (0) 261 - 98 34-100
E kalzip@corusgroup.com

English

Italy

Corus S.C. Milano SpA
Via Treves 21/23
20090 Trezzano sul Naviglio (Milano)
Italy
T +39 - 02 48 40 26 15
F +39 - 02 44 57 65 610
M +39 - 349 87 47 49 8
E marcello.ranieri@corusgroup.com
www.kalzip.it

The Netherlands

Hafkon BV
Schimminck 18 · 5301 KR Zaltbommel
Postbus 2249 · 5300 CE Zaltbommel
The Netherlands
T +31 - 418 66 66 00
F +31 - 418 66 66 05
E info@hafkon.nl
I www.hafkon.nl

Norway

Corus Bygg Systemer AS Røraskogen
2 · 3739 Skien Norway
T +47 - 35 91 52 00
F +47 - 35 91 52 01
E mail@corusbyggsystemer.no
www.corusbyggsystemer.no

Poland

Schuengel Polska Sp. z o.o. Ul.
Pulawska 506-508
PL 02-844 Warszawa Poland
T +48 - 2 27 15 70 50
F +48 - 2 27 15 68 77
E info@schuengel.pl

Portugal

Corus Sistemas Constructivos Lda.
Av. dos Combatentes 76 · Abrunheira
2710-034 Sintra
Portugal
T +351 - 2 19 15 88 00
F +351 - 2 19 15 88 09
E info@corusportugal.com

Romania

Kalzip Engineering Office Marius Dragan
Spl. Independentei Nr.1
B.16, Sc.2., Ap.40 Sector 4 040011
Bucarest · Romania T +40 213 16 06 32
F +40 213 16 06 32
M +40 721 21 66 10
E kalzip@uv.ro

Russia

Sinerji Insaat Mimarlik Musavirlik
Taahhut Sanayi Ve Ticaret A.S.
Krasnopresnenskaya Nab. 12
Mezhdunarodnaya - 2
Entrance 6 Office 707
123610 Moscow · Russia
T/F +7 495 258 21 24
M +7 495 258 21 25
E sinerji@rol.ru

Spain

Corus Sistemas Constructivos S.L.U.
Calle Guatemala, 1
Bajos 3 y 4 · 28016 Madrid
Spain
T +34 - 9 13 43 03 43
F +34 - 9 13 59 94 73
E kalzip.spain@corusgroup.com

Sweden

Corus ByggSystem AB
Sliparegatan 5 · Box 4003 300 04
Halmstad · Sweden
T +46 - 35 10 01 10
F +46 - 35 15 92 00
E mail@corusbyggsystem.se
www.corusbyggsystem.se

Switzerland

Büro Dach & Wand
Jürg Senteler Karlihofstrasse 4
7208 Malans · Switzerland T +41
- 8 13 22 38 38
F +41 - 8 13 22 38 39
M +41 - 7 94 06 79 12
E info@kalzip.ch

Turkey

Tur Mimari Malzeme Insaat ve San.Tic.Ltd.Sti.
Beybi Giz Plaza
Meydan Sokak No 28 Kat 32
34398 Maslak · Istanbul · Turkey T
+90 - 21 22 90 37 50
F +90 - 21 22 90 37 54
E info@tur-group.com
I www.tur-group.com

United Kingdom and Ireland

Corus Building Systems
Haydock Lane, Haydock
St. Helens · WA11 9TY Merseyside
United Kingdom
T +44 - 19 42 29 55 00
F +44 - 19 42 27 21 36
E kalzip-uk@corusgroup.com

Ukraine

Schuengel Ukraina
Marina Raskova 11, Office 201
02002 Kiev · Ukraine
T/F +38 044 3907050
E schuengel@svitononline.com

America

USA

Corus Building Systems
Corus International Americas
475 N. Martingale Road, Suite 400
60173 Schaumburg, IL
USA
T +1 - 84 76 19 04 00
F +1 - 84 76 19 04 68

Middle East

Kuwait

Ali Alghanim & Sons
Trading & Contracting
Group Co. W.L.L. · P.O. Box 21540
KT-Safat 13076 · Kuwait
T +965 - 4 84 22 23
F +965 - 4 84 18 12

Lebanon

Naggjar Agencies SCS
P.O. Box 175415 Beirut
Negib Hobeika Street 20296406
Saifi-Beirut · Lebanon T +961 - 1
56 26 52
F +961 - 1 44 83 91
E roy.naggjar@naggjar.com.lb
I www.naggjar.com.lb

United Arab Emirates Corus

Building Systems PO Box 18294 ·
Jebel Ali Dubai · United Arab
Emirates T +971 - 48 87 32 32
F +971 - 48 87 39 77
E kalzip@emirates.net.ae

Asia/Pacific

Australia

Corus Building Systems 80/82
Hallam South Road Hallam
Victoria · Australia
T +61 - 3 87 95 78 33
F +61 - 3 87 95 78 44
E kalzip@corus.com.au
I www.kalzip.com.au

China

Beijing
Corus Building Systems Suite
610 Jing Guang Centre Office
Building, Huijialou
Chao Yang District
100020 Beijing · China
T +86 - 10 65 97 42 25/ 41 45 F
F +86 - 10 65 97 42 26
E beijing@corus.com.cn

Shanghai

Corus Building Systems Suite
3002 · Lt Chengdu North 200003
Shanghai · China
T +86 - 21 63 52 61 22
F +86 - 21 63 60 33 99
E shanghai@corus.com.cn

Guangzhou

Corus Building Systems Ltd.
Suite 1208, West Tower
Yang Cheng International
Commercial Centre
Tian He Ti Yu Dong Road 510620
Guangzhou · China
T +86 - 20 38 87 01 90/91
F +86 - 20 38 87 02 65
E sales@corus.com.cn

Hong Kong

Corus Building Systems Pte Ltd
706-8 Asia Orient Tower
33 Lockhart Road · Wan Chai Hong
Kong
T +852 - 28 87 52 77
F +852 - 22 34 67 39
E louielau@kalzip.biz.com.hk

India

Corus Building Systems
412 Raheja Chambers
213 Backbay Reclamation
Nariman Point · 400 021 Mumbai
India
T +91 - 22 22 82 31 26
F +91 - 22 22 87 51 48
E richard.tye@corus.com.sg

Singapore

Corus Building Systems Pte. Ltd.
41 Gul Circle · 629576 Singapore
Singapore
T +65 - 67 68 90 81
F +65 - 68 98 93 74
E sales@corus.com.sg
I www.kalzip.com.sg

Roofway Coberturas e Fachadas

1095 Viamão Street - Grajaú
Zip Code: 30.431-253
Belo Horizonte City/MG
Tel.: +55(31) 3297-7110
Fax: +55(31) 3297-7114
www.roofway.com.br

The product information and technical details contained in this brochure are accurate, according to our research and technical programme, at the point of going to press. They do not refer to any specific application and cannot give rise to claims for compensation. We reserve the right to make any changes to the construction or product range which seem technically appropriate, in view of our high standards for product advancement and development.

Copyright 2006

Corus Bausysteme GmbH · Part of Corus Group plc