Kalzip Ltd

Kalzip solar solutions

Flexible solutions for creative solar architecture
Freedom of creativity for environmentally conscious designers and architects

Environmental responsibility is a key driver in contemporary architecture. The creation of sustainable buildings is a practice which must benefit future generations. Today the inclusion of on-site microgeneration technologies such as solar photovoltaic (PV) panels can make a significant contribution to reducing carbon dioxide emissions to the environment.

The introduction of PV systems onto the building envelope is no longer achievable through the installation of utilitarian, framed crystalline modules only, but with the development of Kalzip AluPlusSolar, solar panels can now be implemented as an integrated part of the building form. The flexibility of Kalzip roof systems provides the designer with maximum freedom of creativity allowing the optimisation of architectural concepts for aesthetic solar design.

The durability of Kalzip roof systems, together with the performance warranty on the Uni-Solar PV laminates make solar solutions from Kalzip, both profitable and in tune to the requirements of sustainable solar architecture.
Photovoltaic systems are a rewarding investment in the future

The energy consumed within buildings accounts for nearly 50% of UK carbon dioxide (CO₂) emissions. A wide variety of incentives and national legislation exist to promote renewable energy sources and hence the mitigation of climate change. The Renewables Obligation, for example requires electricity suppliers to ensure that a percentage of the electricity they provide is derived from renewable energy sources.

The Climate Change Act of 2008 is a first of its kind in any country and makes ambitious reduction targets in the emission of CO₂ legally binding through comprehensive legislation. Following the 2010 revision of the Building Regulations in England and Wales, provided the building meets fabric and other design back-stop values, designers have the flexibility to achieve the target emissions rating (TER) by integrating low and zero carbon technologies (LZT) such as solar PV systems appropriate to the scheme.

This is supported by National Planning Policy statements which require local planning authorities and developers to specifically encourage the integration of renewable energy into all new developments through positively expressed policies in local development documents.

The Code for Sustainable Homes presents another national standard for sustainable building design and construction; the goal of the voluntary rating system being to pave the way to zero emission buildings by 2016.

With the introduction of “Clean Energy Cashback” in 2010, the UK has followed the lead of many of its European neighbours and installed a Feed-in-Tariff (FIT) system for the promotion of renewable energies. The Microgeneration Certification Scheme (MCS) was set up as the approval scheme to ascertain which microgeneration installations are eligible for financial incentives.

Kalzip AluPlusSolar and SolarClad have both been MCS approved with the British Standards Institute’s (BSI) Kitemark licence for the production of integrated solar metal roofing. The BSI’s Kitemark is the UK’s premier symbol of product quality. It is widely trusted and valued by consumers, specifiers and purchasing professionals for the unrivalled quality and safety benefits it delivers.
Kalzip solar solutions
The synthesis of design and function
With Kalzip, you fulfil the prerequisites of sustainable construction work

Kalzip solar solutions were developed in the interests of environmental protection and conservation of precious resources. Kalzip standing seam roof sheets are the ideal substrate for PV systems that can be used for economic solar electricity generation on new buildings as well as the retro-fitting of existing buildings.

Under diffused light conditions, the silicon thin-film solar cells in the innovative triple-junction technology developed by our partner Uni-Solar, produce a greater energy yield than crystalline solar cells of the same rated power output. This makes them ideal for projects in Northern Europe and North America.

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

Kalzip SolarClad
Kalzip SolarClad is suitable for the design and installation of PV laminates on existing structures.

The roof-mounted solution can be clamped to any Kalzip standing seam profile and accommodates the architectural requirements relating to building shape.

In-plane and roof mounted systems
When referring to PV systems, a distinction should be made between in-plane and roof mounted systems. Kalzip offers solutions for both options, which are optimised for the type of Kalzip roof being installed.

Benefits of Kalzip solar solutions
Kalzip offer highly durable and sophisticated systems providing perfect solutions with limitless design potential. This, combined with state-of-the-art production technology, strong partnerships with recognised industry specialists and a worldwide dedicated network of approved installers ensures the provision of ultimate product quality.

In addition, full support and expertise is available at every stage of the project through our highly-skilled and experienced technical experts.

- fully tested and proven to industry standards including:
  - approval by the Microgeneration Certification Scheme (MCS)
  - accreditation by the British Standards Institute’s (BSI) trusted Kitemark Certificate No. KM 558106

- provides access to the Government’s Feed-in-Tariff and associated benefits

- a lightweight system utilising a flexible yet robust thin-film PV laminate that is factory bonded and has a product warranty of 5 years and a limited output warranty of 25 years

- suitable for both new build and retrofit applications including flat roofs and can be applied to most roof shapes providing complete design flexibility

- a minimal maintenance system that is self-cleaning when pitched at 3°
Kalzip SolarClad: design flexibility and low weight

The retrofit solution for all metal roofs – light and flexible
Kalzip SolarClad: adaptable and versatile

Kalzip SolarClad is a variation of AluPlusSolar optimised for overcladding metal roofing. Its flexibility and versatility enable solar panels to be integrated into any Kalzip standing seam profile. SolarClad provides a retro-fit solution for installations on existing structures or for new-build developments.

PV laminates consist of extremely robust amorphous silicon thin-film modules attached to aluminium carrier panels, which can be installed on any Kalzip standing seam system without penetrating the roof. SolarClad can be conventionally mounted on other system elements, such as trapezoidal sheets. The lightweight units are suitable for all roof shapes, giving architects and engineers maximum design freedom.

Installation options

- In-plane, mounted longitudinally on Kalzip aluminium profiled sheet
- In-plane mounted transversely on Kalzip aluminium profiled sheet.
- Tilted mounting on Kalzip aluminium framed panels

Retrofit solutions

- Kalzip SolarClad on traditional standing seam system in FaZinc.
- Kalzip SolarClad on trapezoidal composite panels.
- Flat to pitch conversion

Kalzip SolarClad is suitable for all roof geometries with a pitch of up to 60°. Its low weight means only minor additional structural checks are required for the roof. Kalzip SolarClad is offered with PV laminates of two lengths, factory bonded to carrier trays ready for connection.

Product advantages:

- Amorphous thin-film laminates for lasting efficient utilisation
- Up to 20% higher energy yields than crystalline modules due to triple-junction technology
- High shading tolerance due to tight bypass circuitry
- Suitable for all standing seam systems and varieties due to variable fastening system
- Cost-effective PV solution for new building projects with Kalzip standard cover widths
- High economic efficiency due to quick, non-penetrative installation
- Environmentally friendly due to short energy payback time less than one year.
- Simple structural calculations for Kalzip roofs
- Improved heat protection in summer due to roof shading
- Many different installation options for maximum power density and optimised yields
- Ideal for all roof shapes, contour-hugging for barrel vaulted roofs of up to a minimum 13 m radius of curvature.
Kalzip AluPlusSolar: new possibilities for sustainable construction

Roof-integrated, renewable power generation for aesthetic solar architecture
Kalzip AluPlusSolar: aesthetically integrated

The new Kalzip AluPlusSolar solar panels are the first to enable truly roof-integrated renewable power generation using flexible PV laminates, while providing maximum freedom of creativity for challenging architecture. A wide variety of designs can be accommodated, as the solar laminate is permanently attached to Kalzip aluminium standing seam sheets.

This integrated system allows individually designed roof elements with straight, convex, or concave shapes. Without the need for mounting frames, the solar cells are in-plane with the roof surface and convey a unique expressive character. Typical constructions such as shed or barrel vault are possible, at pitches of up to 60°.

The combination of thin-film solar laminates with the benefits of the Kalzip standing seam roof sheet provides architects and designers of photovoltaic systems maximum freedom of design whilst making efficient use of solar energy.

The PVL consists of triple-junction thin-film silicon cells deposited onto a stainless steel foil and encapsulated in an ethane vinyl acetate (EVA) co-polymer protective envelope.

Each of the three cells converts a different part of the visible spectrum, resulting in superior conversion efficiencies in overcast conditions.

PV laminates are factory-bonded to polyester or PVDF paint coated aluminium.

Product advantages:

- Aesthetic, roof-integrated photovoltaic system, without additional fasteners.
- Ideal for challenging architecture.
- Optimised conversion of solar energy in poor light conditions by utilising triple-junction technology.
- Higher shadow tolerance than crystalline modules, due to individual cell bypass circuitry.
- Economical due to high performance warranty (20 years)
- Suitable for cold or warm roof designs
- Self-cleaning surface – therefore minimum maintenance requirements
## Technical data

The PV laminate (available in two lengths) acts as a solar electric generator and is bonded onto Kalzip in the factory, ready for connection on-site. Kalzip solar solutions are available with photovoltaic thin-film solar laminates PVL-68 and PVL-136, which have power outputs of 68 watt peak and 136Wp respectively.

### Value details

<table>
<thead>
<tr>
<th>Required area per kWp Kalzip AluPlusSolar (m²)</th>
<th>PVL-68</th>
<th>PVL-136</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required area per kWp Kalzip SolarClad (roof-parallel installation) (m²)</td>
<td>&gt; 18.50</td>
<td>&gt; 18.50</td>
</tr>
<tr>
<td>Laminate length (m)</td>
<td>2.85</td>
<td>5.50</td>
</tr>
<tr>
<td>Rated power output (W)</td>
<td>68</td>
<td>136</td>
</tr>
<tr>
<td>Operating voltage VMPP (V)</td>
<td>16.5</td>
<td>33.0</td>
</tr>
<tr>
<td>Operating current IMPP (A)</td>
<td>4.13</td>
<td>4.13</td>
</tr>
<tr>
<td>Open-circuit voltage VOC (V)</td>
<td>23.1</td>
<td>46.2</td>
</tr>
<tr>
<td>Open-circuit voltage VOC at -10 °C and 1250 W/m² (V)</td>
<td>26.3</td>
<td>52.7</td>
</tr>
<tr>
<td>Short-circuit current ISC (A)</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Short-circuit current ISC at 75 °C and 1250 W/m² (A)</td>
<td>6.7</td>
<td>6.7</td>
</tr>
<tr>
<td>Fuse in series, nom./blocking diode, nom. (A)</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Maximum DC system voltage (V)</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Note: The above values (± 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

Kalzip also offers an optional large-format display which clearly indicates the current system power output, the energy yield and the CO₂ savings.

### Kalzip AluPlusSolar planning notes
- Minimum radius in the area of the laminate-covered sheets > 13m
- Roof slope min. 3° / max. 60°.
- Panel fixing and electrical connection to be completed by approved Teamkal contractor.

### Kalzip SolarClad planning notes
- Suitable for all Kalzip profiles.
- Panel fixing and electrical connection to be completed by approved Teamkal contractor.
Maximum performance with Kalzip solar solutions: general design considerations

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.

Photovoltaic cells
When PV laminates absorb light, they produce an electrical voltage, which results in the generation of a direct current. Solar cells are composed of layers of semiconductor materials which continuously convert light energy into electrical energy. This occurs by means of different silicon alloys which are specifically doped to absorb different regions of the visible spectrum.

Solar electric 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.

An inverter then converts the direct current from the laminates into a grid-compliant alternating current. What is not used immediately by the building’s energy needs is fed back into the National Grid. The feed meter measures the amount of AC fed back and the client’s utility bill is credited with the appropriate Feed-in-Tariff.

Solar electric system

Generator junction box   Inverter   AC cabling   Feed meter   National Grid

PC or remote access modem

Kalzip AluPlusSolar string

DC cabling

Kalzip AluPlusSolar string

Kalzip SolarDisplay

Solar Power by Kalzip

Operational data

Inverter rating

PV array rating

National Grid

Kalzip AluPlusSolar string

Kalzip AluPlusSolar string

Kalzip AluPlusSolar string

Kalzip AluPlusSolar string
The advantages of amorphous thin-film technology

Triple-junction technology
The triple-junction technology developed by Uni-Solar has a number of key benefits. The solar cells used in amorphous silicon thin-film laminates consist of three silicon layers applied one after the other in a plasma-enhanced chemical vapour deposition process.

The different layers are optimised so that each layer can convert a different range of the light spectrum to electrical energy. This enables greater conversion efficiency (compared to crystalline panels) 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 systems are, depending on local conditions, 10% to 20% higher than yields from a conventional crystalline system in equivalent conditions.

Environmentally conscious
The low energy demands during manufacture and the high yields obtained during operation result in an embodied energy payback period of less than one year. 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:
- Cumulative expenditure of energy (CEE) in gigajoules per m
- Energy payback time (EPT) in years

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

Bypass circuitry
When partially or temporarily shaded, amorphous thin-film laminates have at their disposal a bypass circuit, so that the total system power is not significantly reduced.

This is contrast to a similarly-shaded crystalline panel, which, in the event of partial shading, would lose a relatively larger output.

Improved temperature performance
The temperature coefficient describes how the output from the solar cells is affected by increasing temperature. For standard monocrystalline or polycrystalline modules the coefficient is around -0.5%/K. For the amorphous PV laminates used in Kalzip solar solutions it is only -0.2%/K.
Case study
Energus Centre of Excellence, Cumbria

Almost 4,000 sqm of Kalzip aluminium standing seam roofing including over 1,500 sqm of Kalzip AluPlusSolar sheets have been installed on the Energus Centre of Excellence in Workington, Cumbria by approved Teamkal contractor, Lakesmere Ltd.

AluPlusSolar provides a lightweight and fully integrated renewable power generation source - the system utilises a robust yet flexible thin-film PV laminate that is factory-bonded directly onto the Kalzip sheet's outer surface. Designed by Architects Plus (UK) Ltd, the environmentally friendly Energus Centre of Excellence was built by Thomas Armstrong Construction Ltd.

“The AluPlusSolar roof is very cost effective and comfortably meets its design performance criteria. We’re delighted with the Kalzip roofs which are extremely well insulated and stand up splendidly to the extreme weather conditions we face here on the west coast of Cumbria,” says Energus Operations Director, John Dyson.

The part of Energus pictured is a huge training and education workshop that is covered by a fully built-up Kalzip roof system with an overall U-value of 0.25 W/m²K. Cranked on plan, the mono pitch roof comprises a combination of AluPlusSolar and standard Kalzip AF sheets which are all PVF² colour coated to RAL 9006, Metallic Silver over a Bright White coated structural liner deck. The AluPlusSolar system at Energus generates a peak power output in excess of 44 Kilowatts which equates to an impressive average of 30,000 Kilowatt hours per annum.

A fully built-up mono pitch Kalzip roof with an overall U-value of 0.25 W/m²K has also been installed over the front half of this main Energus building. The outer sheets are standard stucco embossed Kalzip with Bright White perforated Kalzip roof liner sheets and a combination of sound-absorbing insulation materials for improved acoustic performance. This Kalzip canopy roof covers the main entrance reception, a series of conference, meeting and training rooms, a large open atrium area for conference exhibitions and a separate section leased to the University of Cumbria.

To further conserve energy resources and reduce carbon dioxide emissions, nearly 300 sqm of site-assembled, tripleskin Kalzip Multivault SSR rooflights with a U-value of 2.20 W/m²K have also been incorporated into the workshop’s roof. Installed in a series of runs between the AluPlusSolar panels, the rooflight’s weather sheets comprise a double-skin of polycarbonate barrel vaults over in-plane translucent GRP liner panels to give an even distribution of diffused daylight with minimal shadow effect throughout the workshop.
Case study
Boatemah Walk, Lambeth

Boatemah Walk, is a housing scheme that formed part of the London Borough of Lambeth’s ongoing regeneration of Angell Town and was the first UK project completed to benefit from Kalzip’s sustainable AluPlusSolar roof solution.

Designed by Anne Thorne Architects Partnership, the Boatemah Walk project included the refurbishment of an existing building, Warwick House. Originally a long three-story block with integral corridors, Warwick House was divided into two separate sections with 24 of the properties undergoing complete refurbishment and 18 new council flats being created.

“The new south facing curved building of Boatemah Walk was just asking for photovoltaics and the AluPlusSolar solution is both flexible and elegant. Residents have been very enthusiastic, particularly as the solar counter tells everyone how much electricity is being generated.” Frances Bradshaw, partner at Anne Thorne Architects Partnership

Kalzip’s roof integrated photovoltaic (PV) product, AluPlusSolar was specified for the new build project in order to create a renewable energy source that would help address the fuel concerns of the residents and would also adhere to the London Borough of Lambeth’s commitment to sustainable development and construction.

Consisting of 106 Uni-Solar PVL-136 panels, 341.5 m² of AluPlusSolar was incorporated onto the surface of 742 m² Kalzip aluminium standing seam roof (AF65/537). The sustainable roof system will provide an overall maximum energy output of 14,416 Wp with a 20 year electrical performance warranty. Using new triple-junction technology, Kalzip AluPlusSolar has also been developed specifically to maximise electricity conversion in cloudy weather conditions. The energy generated by the fully integrated Kalzip AluPlusSolar roof will subsequently be used to freely power the ground floor flats, which are let exclusively to disabled residents.
Strong partners: The Teamkal Network

Installation of Kalzip roofing and cladding systems is only carried out by trained and approved installers and the Teamkal Network is the most experienced and highly trained independent installer network in the world.

Stretching across national borders, this professional partnership forms not only an important link in the supply chain but also ensures that projects are perfectly initiated and completed and furthermore ensure the reliable and correct installation of Kalzip products and systems.

Teamkal and Kalzip are mutually committed to providing the best services and to creating the necessary conditions in order to be able to do so. Intensive and regular training courses are obligatory for network members as in this way we can secure not only the quality of the workmanship, but also the maintenance of high safety standards for work carried out on site.

A snapshot of Kalzip solar solutions installations
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