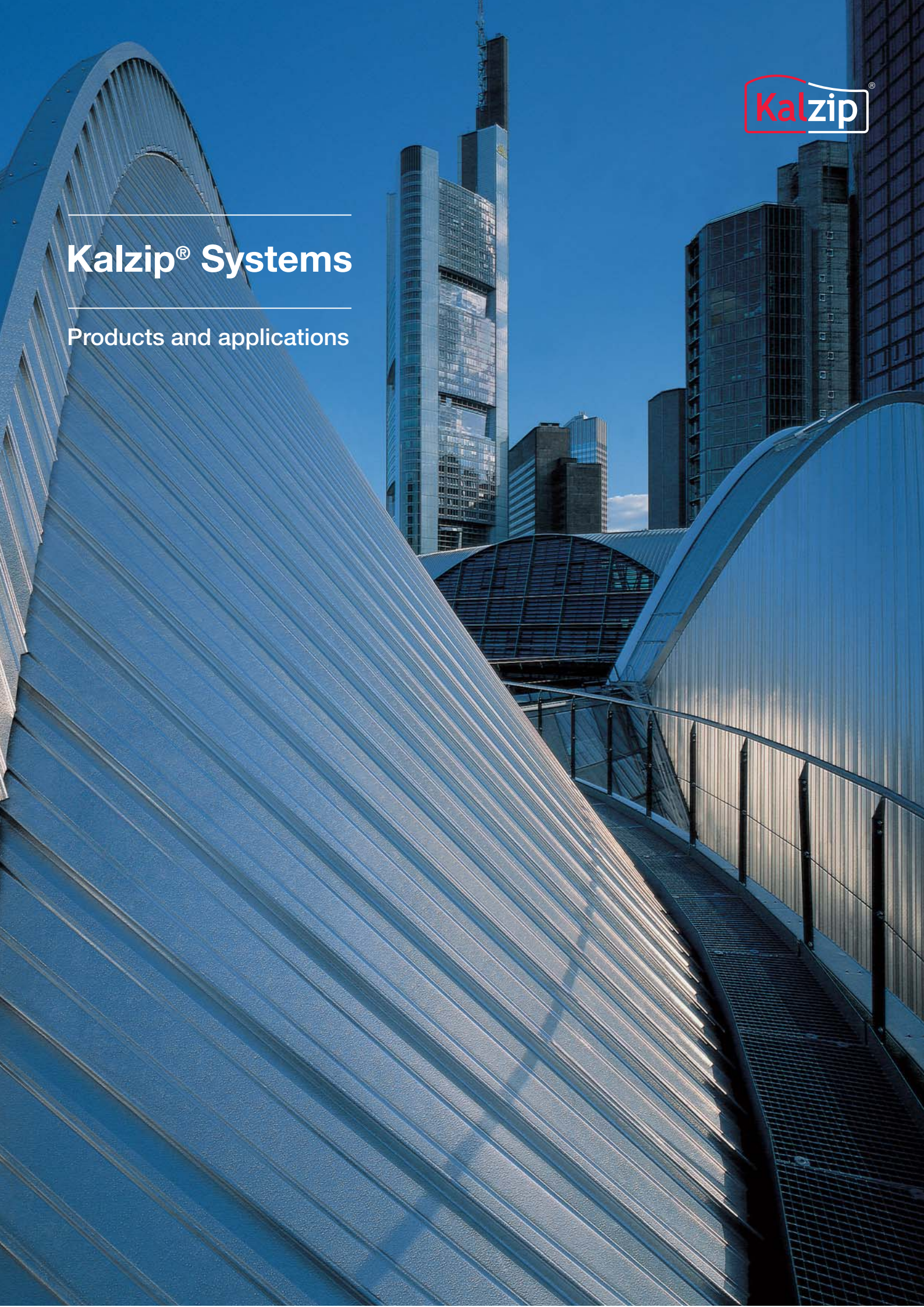




Kalzip® Systems

Products and applications







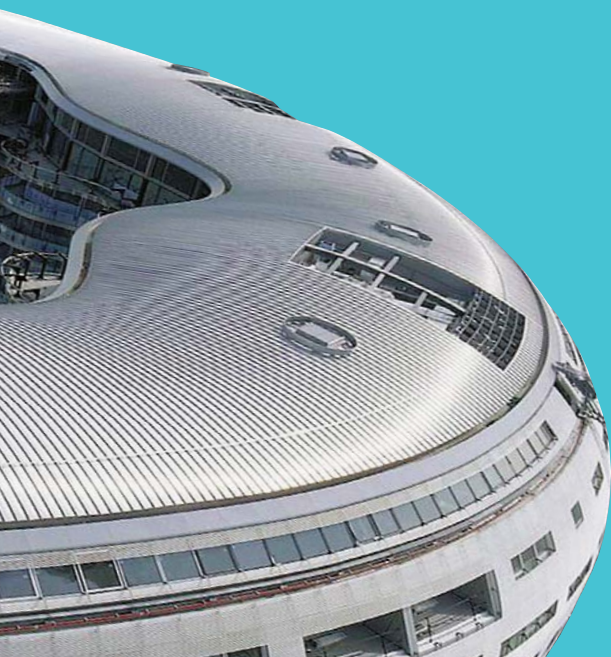
Airport Barajas (E)
Architect: Richard Rogers Partnership

Kalzip
innovative
products and
perfect system
solutions for
discerning
architectural
design



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Innovation is our strength.
Our research and development work is based on one aim: to provide you the customer with the very best solutions everytime.

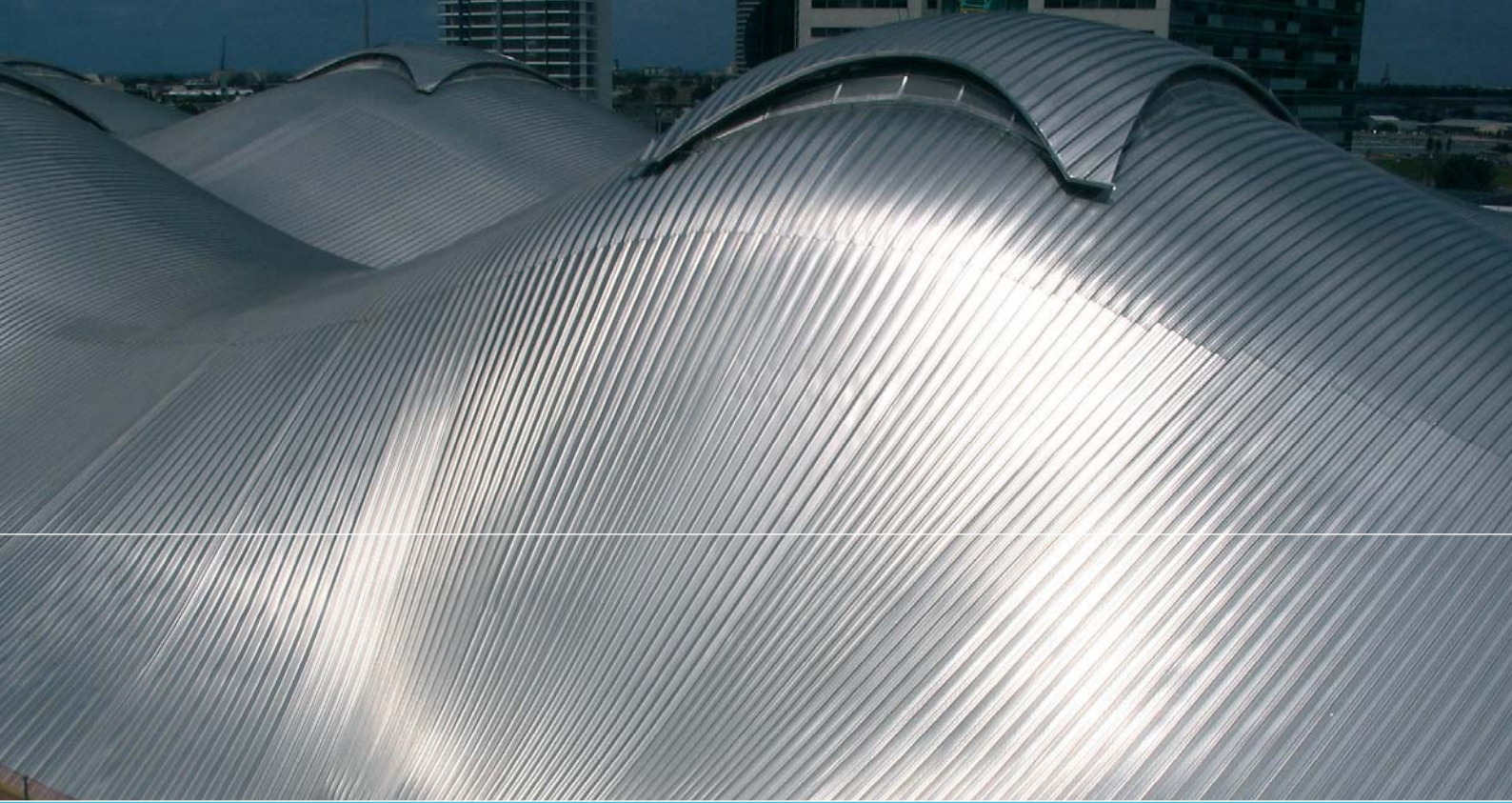
Page 4: Albion Riverside **London (GB)**

Architect: Foster & Partners

below: ARCAM **Amsterdam (NL)**

Architect: Rene van Zuuk





above: Southern Cross Station **Melbourne (AUS)**
Architect: Grimshaw Jackson Joint Venture
Lubetkin Prize winner 2007 by the Royal Institute of British Architects

Kalzip will transform your ideas and dreams into reality – without making any compromises in quality and with a true passion for detail.

Kalzip is the source of inspiration for planners and architects throughout the world. And there are very good reasons for this: Kalzip offers perfect system solutions, limitless design potential, state-of-the-art production technology, ultimate product quality, innovative material combinations and harmonious integration of shapes, colours and surfaces.

Kalzip aluminium standing seam profiles are able to meet even the most demanding construction and design requirements, enabling you to create roofs and facades which successfully combine outstanding functionality with stunning aesthetics. The design potential is virtually limitless – from the discreet to the elaborate; combining sophisticated elegance with contemporary design.

Intelligent additional features such as Kalzip SolarSystems or the Kalzip NatureRoof provide the perfect finishing touches to the unique Kalzip range. Spectacular aesthetics are skillfully integrated into contemporary architectural design. And, as if this were not enough, Kalzip also offers significant economic and ecological advantages.

For more than 40 years we have remained at the very forefront of architectural design, constantly pushing the boundaries of creative potential. We are extremely proud of this achievement. The experience we have gained over many years, together with our highly-specialised technical expertise, guarantees the ultimate in quality and reliability – right down to the very last detail. Kalzip is a highly sophisticated, lightweight building system, which is extremely flexible and can be precisely adapted to suit the static requirements of a building. Even large spans can be accommodated without a problem. Kalzip can be easily combined with other construction materials to create stunning and inspirational buildings.

Whichever Kalzip product or system you choose, you can be rest assured that our products will feature the ultimate in production quality and offer a virtually limitless scope for individual design. The following pages outline the vast scope for design and the outstanding quality which make Kalzip roof and facades systems stand out from the rest. Why not see for yourself!

Kalzip – the sophisticated, lightweight building system: highly flexible and can be adapted to suit the precise static requirements of the building.

Kalzip aluminium profiled sheets are available as standard with a stucco-embossed finish, which diffuses reflected light. The material used is a saltwater-resistant alloy. The core material is additionally protected by means of a fused protective plating (see illustration), which offers outstanding corrosion-resistance. A vast selection of colour and surface finish options provides almost limitless scope for design. A wide range of RAL colours is available, as well as the TitanColor finishes, to create architectural identity and harmony. New surface finishes such as the elegant, matt AluPlusPatina or AluPlusZinc with its sophisticated, classic appearance, create unique buildings with individual character. The AntiGraffiti coating is available for protecting high quality facades. All Kalzip colour and surface finishes have been developed and produced using the very latest processing technologies and maintain their striking appearance even under extreme conditions.

Unlimited application potential

- Suitable for ventilated and non-ventilated roof designs and all shapes and pitches of roof from 1.5°. Suitable for all substructures and supporting structures.
- Can be flexibly adjusted to suit the layout, geometry and dimensions of any building.
- Extremely strong and lightweight. Therefore ideal for large spans and for renovating old roofs.
- Continuous lengths of 100 m and more, when production takes place on-site.

Superior thermal and acoustic insulation

- Fulfills strict thermal insulation requirements. By choosing the appropriate thickness of insulating material, the roof structure can be adapted to suit the precise requirements of the building.
- Highly efficient thermal insulation can be achieved by means of constructive measures.

A high level of safety throughout the entire service life

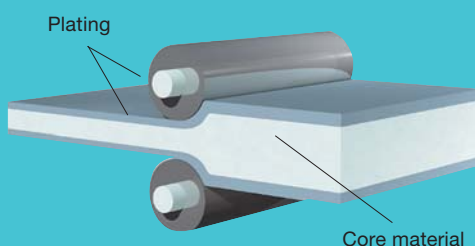
- Special clips are used to attach the profiles sheets to the substructure. These clips are locked into the seam and will be overlapped by the following Kalzip element so that the fixing elements are hidden under the roof. The roof skin is not punctured by any fixing elements.
- The mechanical zipping of the seams produces a load bearing, permanent connection.
- Pressure and suction loads are safely absorbed.
- Any residual moisture in the insulating layer can evaporate through the seam.
- Sophisticated detailed solutions for roof penetrations, joints and gable ends.
- Non-flammable. Resistant to flying sparks and radiant heat.
- Kalzip can be used as a lightning conductor in accordance with DIN VDE V0185-3.

Durability and economy

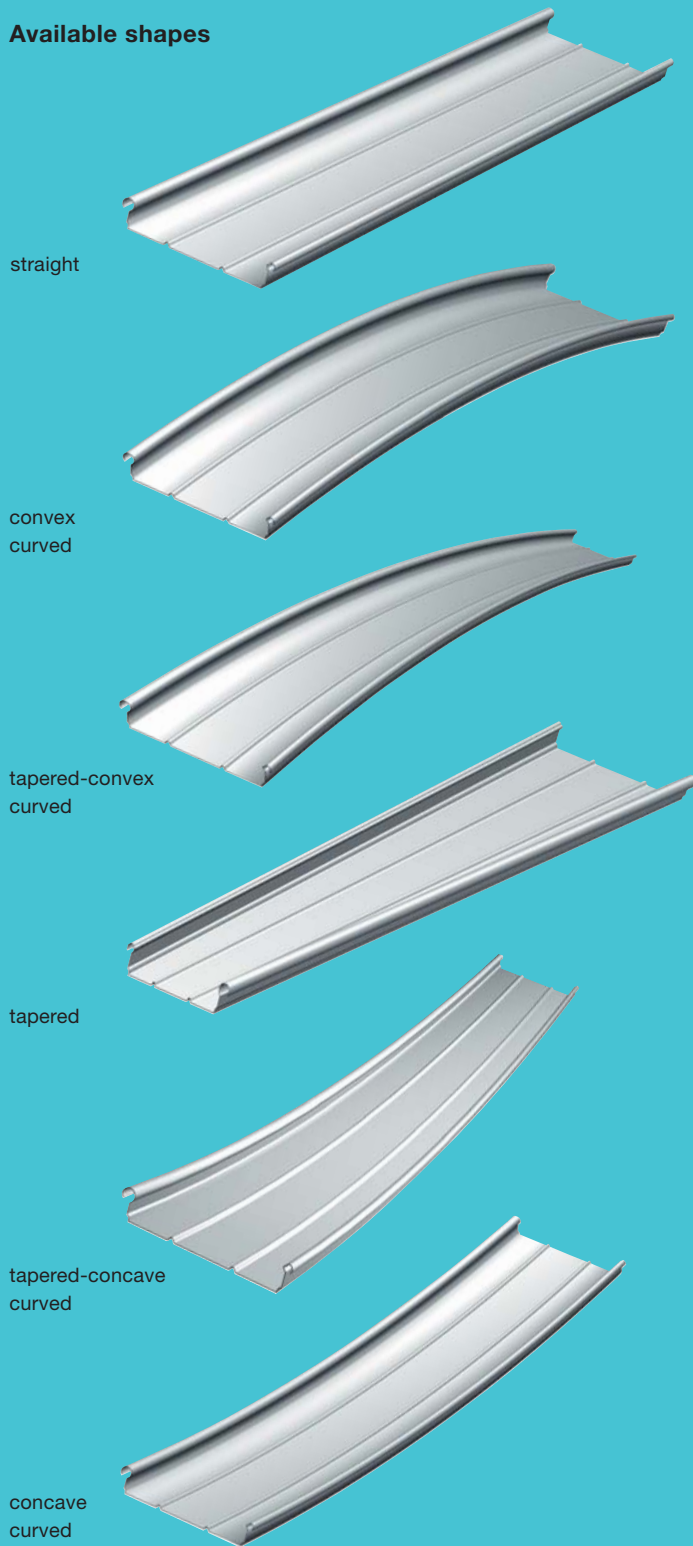
- Corrosion-resistant, weather-resistant aluminium alloy base material.
- Non-sensitive to UV rays, resistant to microorganisms, resistant to ageing.
- Installation is particularly quick and largely independent of weather. Cost savings through prefabricated components.

Valuable ecological properties

- As the third most commonly occurring element in the earth's crust, aluminium occurs everywhere in nature in combination with other elements.
- Once aluminium has been produced, it can be used for generations in recycled products.
- Can be easily re-used without limitation.
- Up to 95% of the energy required to manufacture the original aluminium material is saved through recycling.
- An insulated Kalzip roof structure contributes significantly to emissions reduction.

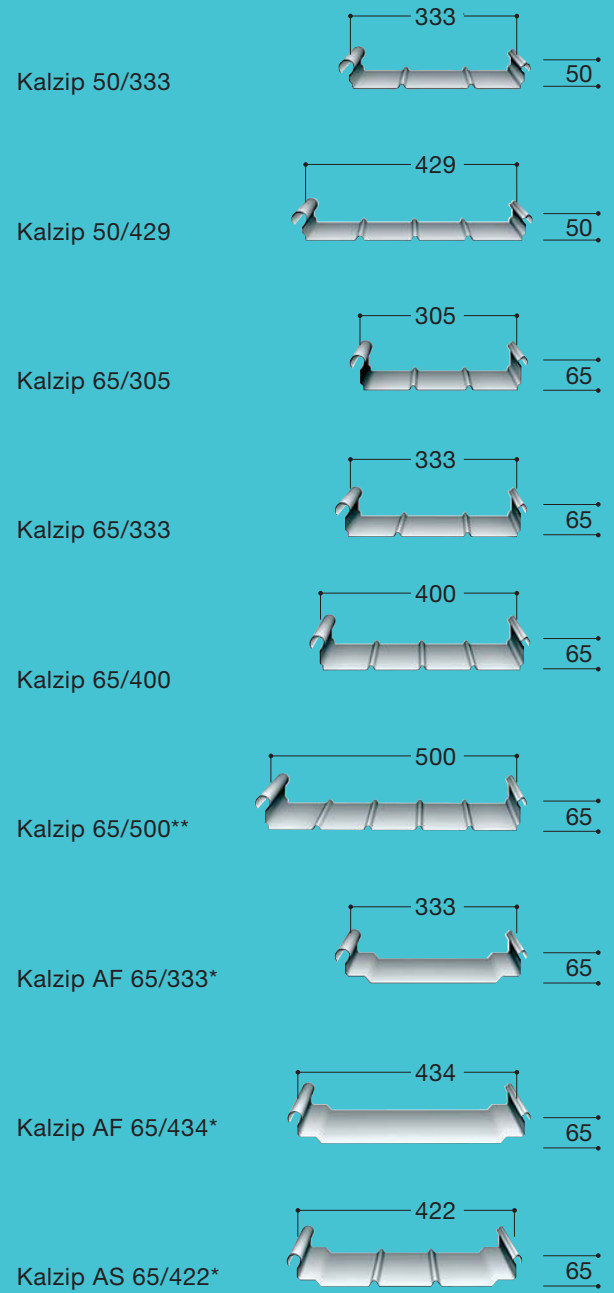


Available shapes



Widths of Kalzip profiled sheets

Kalzip dimensions:



* only when used with rigid thermal insulation or timber lining

** recommended for facade cladding (thickness ± 0.9 mm)



left: Scheper Ziekenhuis **Emmen (NL)**
 Architect: A/d Amstel Architecten Amsterdam

Perfection in roll-forming technology – unimaginable flexibility and freedom of design

The unique formability of Kalzip aluminium profiled sheets enables design and functionality to be combined with technical perfection. The range of shapes available – convex, concave, elliptically or hyperbolically curved – opens up a whole variety of fascinating options for creating stunning architectural designs.

Perfection in production – anywhere in the world – just in time

The high-precision Kalzip components can be produced using the very latest equipment in the factory and also on mobile roll formers. We can even guarantee a large variety of complex shape and geometry options. Numerous patents and utility models are clear evidence of the unique features and technological preeminence of this system. Even unconventional roof shapes are subject to no restriction.

In addition to aluminium, it is also possible to process other materials such as stainless steel. The large number of mobile roll formers which are in operation throughout the world, guarantees an economical and sophisticated complete solution with minimum logistical costs and without having to compromise on creative architectural design. The unique advantages of on-site production are clearly evident when extremely long lengths are used to cover large spans.



Kalzip XT Profiles

– the advent of a new architectural era

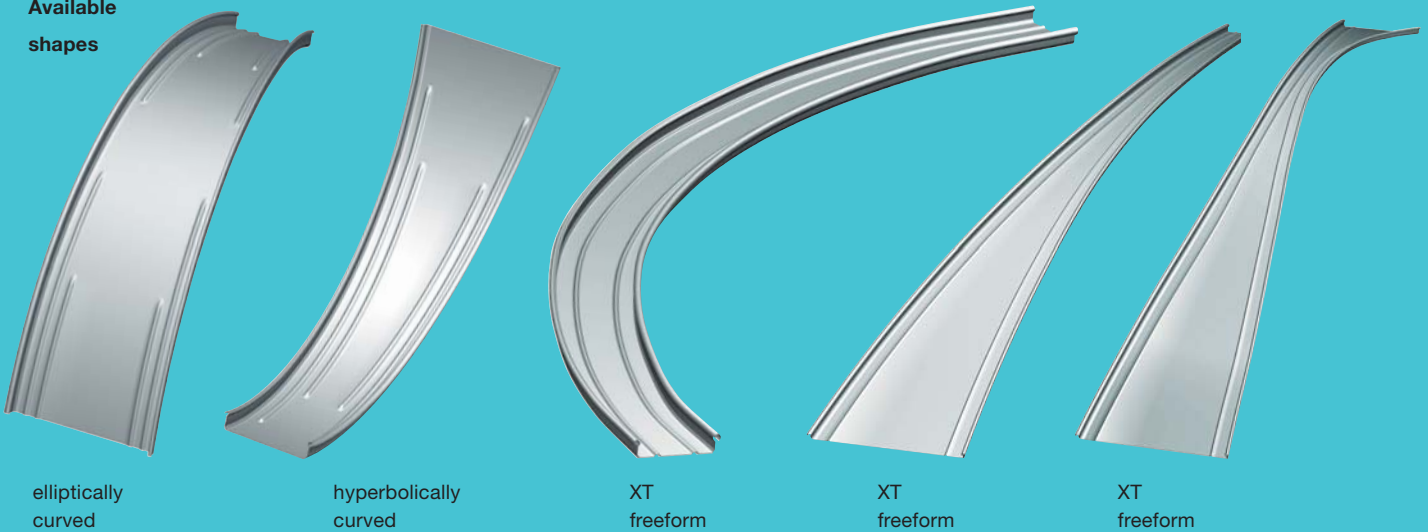
Kalzip XT profiled sheets now make it possible to transform computer-generated designs and structural principles into reality. These evolutionary animations, visualized in 3D objects, enable new architectural, organic shapes and forms to be created – achieving a fusion of biology and architecture.

Revolutionary roll forming technology now makes it possible to produce freely shaped profiled sheets to create stunning technomorphic buildings. As production is computer-controlled for the very first time, the length of the XT profiled sheets is not limited. Extremely small bending radii guarantee unusual shapes of buildings, including: ellipses, cones, semi-spheres, prisms, pyramids, as well as classic geometrical shapes – both horizontal and vertical.

The benefits at a glance

- Patented revolutionary roll forming technology for freely shaped aluminium standing seam profiled sheets
- As production is computer-controlled for the very first time, the length of the XT profiled sheets is not subject to limitation
- It is possible to produce horizontal and vertical profiled sheets in convex and concave shapes
- XT freeform profiled sheets create new variations of geometrical designs
- Extremely small bending radii guarantee ingenious architectural shapes

Available shapes



elliptically curved

hyperbolically curved

XT freeform

XT freeform

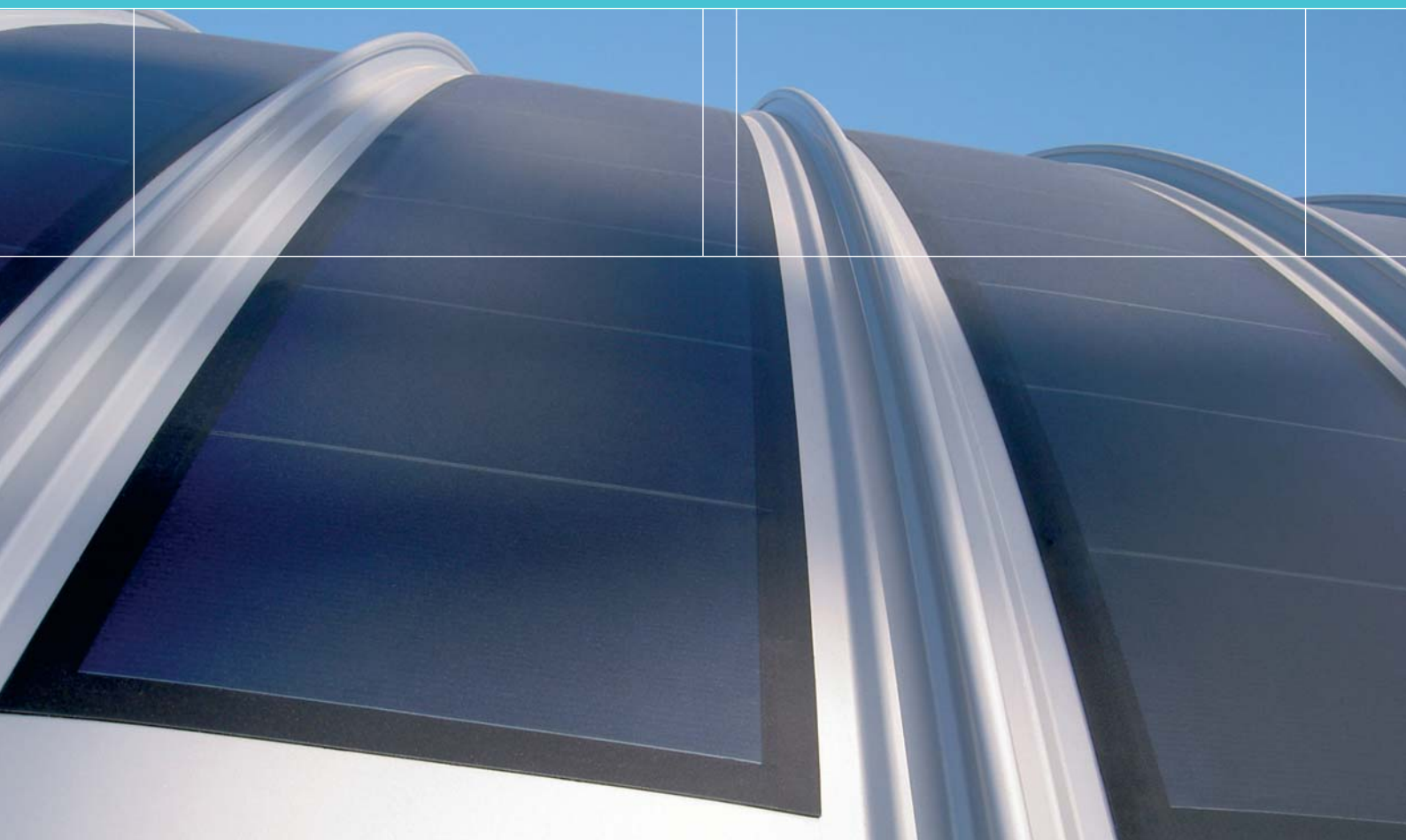
XT freeform

left: Imperial War Museum North **Manchester (GB)**
Architect: Daniel Libeskind

right: BMW central building **Leipzig (D)**
Winner of the German Architecture Award 2005
Architect: Zaha Hadid
with Patrik Schumacher



Kalzip AluPlusSolar – architecture with stunning aesthetics



For roof-integrated, renewable power generation using thin-film solar modules

The new Kalzip AluPlusSolar profiled sheets now make it possible for the first time ever to combine a system of solar power generation using roof-integrated, photovoltaics with the maximum freedom of architectural design to create stunning buildings.

The solar laminates are flexible and extremely durable. Depending on the particular roof design, they are permanently bonded to straight, convex or concave Kalzip aluminium profiled sheets. The flexibility of Kalzip AluPlusSolar can accommodate barrel vault or mono-pitch roofs, as well as individual roof designs. The combination of thin-film solar cells with the characteristics of Kalzip profiled sheets guarantees the architects and planners of photovoltaic systems a truly integrated solar solution, which optimises both roof design and energy generation.

Kalzip AluPlusSolar is available as a fully integrated system, including inverter and accessories, on the AF 65/537/1.0 mm profiled sheet with an RAL 9006

coating. The solar film, available in two lengths, is laminated in the factory and then permanently bonded to the outer surface of the Kalzip profiled sheets. This film will subsequently generate the power in the photovoltaic system. Kalzip profiled sheets which have already been installed cannot be retrofitted with laminated solar film. However, existing Kalzip roofs can be retrofitted with Kalzip SolarClad.

In addition to a roof-integrated, regenerative method of energy production, Kalzip solar systems also offer the opportunity of generating energy in the facade. We can send you detailed information on request. The silicon solar cells use triple-junction technology to generate more energy in diffuse light conditions than crystalline solar cells of the same rated power and are therefore ideal for use in European regions.

The durability of the Kalzip profiled sheets and the guaranteed efficiency of the solar modules now make it possible to create contemporary, modern buildings which combine maximum freedom of architectural design with the integration of ecological concepts.

left: Detail Kalzip AluPlusSolar
right: Satdtwerke **Butzbach (D)**
Architect: Fischer Consult GmbH

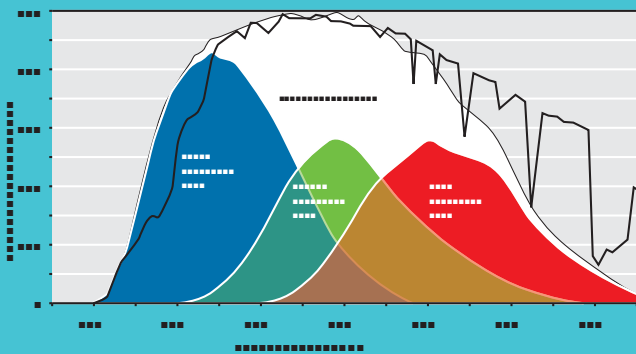


Product advantages

- Attractive, roof-integrated photovoltaics without additional fixing elements
- Optimum utilization of solar energy even in weaker light conditions through triple-junction technology
- Greater shade tolerance than crystalline modules through narrow-meshed bypass circuit
- Economical – supplied with a 20-year performance guarantee
- Self-cleaning surface – therefore low-maintenance
- Suitable for use as an insulated or non-insulated roof
- Ideal for the most challenging architectural design
- Available as a complete system inclusive of inverter and accessories
- Advice and planning support provided by Kalzip, also project management support on request

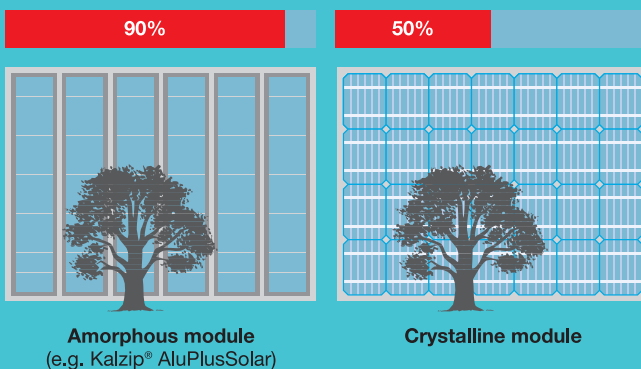
Triple-junction technology

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.

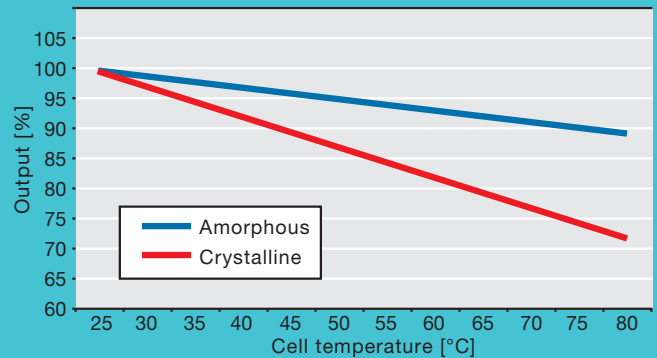


Environmentally friendly

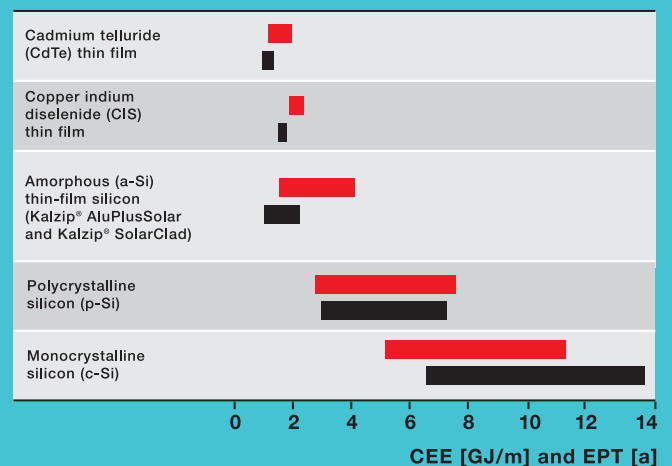
The low energy demands during the manufacture and the high yields result in an energy payback time of approximately 3 years. This is a fraction of the required energy payback times for crystalline modules.

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.



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 m
- Black bar: Energy payback time (EPT) in years

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

Areas of use

Kalzip AluPlusSolar is suitable for all roof designs with a pitch of up to 60°. In case of a combined roof and facade via a curved or continuous eaves detail, advice should be obtained from your local office.

Kalzip AluPlusSolar is available with a choice of two different photovoltaic thin-film solar modules PVL-68 and PVL-136, each with different performance characteristics. Roof and facade surfaces can therefore be used to their optimum potential.

Technical Data	PVL-68	PVL-136
Surface required per kWp [m ²]		from 22 onwards
Module length [m]	2.85	5.50
Rated power [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
Series fuse rating/blocking diode rating [A]	8.0	8.0
Maximum system voltage DC [V]	1000	1000

Please note: The values specified $\pm 5\%$ represent stabilised values. During the first 8-10 weeks of operation, power output may be higher by 15 %, operating voltage may be higher by 11% and operating current may be higher by 4 %.

right: Aldi Energy Store **Beilngries (D)**
Architect: Kehrbach Planwerk



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

Planning tips

- Kalzip profiled sheets cannot be laminated once installed with thin-film solar modules, for retrofitting we recommend the use of Kalzip SolarClad.
- Minimum radius in the area of the profiled sheets fitted with modules > 10 m.
- Kalzip AluPlusSolar profiled sheets are optionally available with an anti-condensation coating (Aquasine).
- Recommended roof pitch min. 5% (3°).

Further options

On request, Kalzip can supply a large format solar display, which outlines the current power, the amount of energy produced and the CO₂ reduction.

Design suitability and approval in accordance with IEC 61646

TÜV Rheinland, Cologne, Germany

More information: www.aluplussolar.com

UNI-SOLAR
United Solar Ovonic

Kalzip SolarClad Light and flexible

right: Three-court school **Frechen (D)**
Architect: Reich

The ideal retrofitting solution for all metal roofs

Kalzip SolarClad is a photovoltaic cladding which has been optimised for use in building envelopes. Its flexibility and versatility enables the solar modules to be fixed onto all standing seam systems made from a variety of materials. It can be retrofitted to existing installations or used in new builds.

The system consists of extremely robust thin-film modules made from amorphous silicon (a-Si), bonded onto aluminium carrier plates, which can be installed on any metal roof system in a non-penetrative manner.

These extremely lightweight module units are suitable for all roof shapes and guarantee maximum freedom of design for planners and architects.

Kalzip SolarClad is supplied as a complete system, including inverters, for different standing seam designs. The solar film, available in two different lengths, is laminated onto Kalzip carrier plates in the factory to ensure high quality and fast installation. The solar laminates generate power from the sun as soon as they are connected.

Product Advantages

State-of-the-art, amorphous thin-film modules allow electricity to be generated from solar energy in a highly efficient and regenerative manner. Modern thin-film technology offers the following benefits:

- Generates up to 20 % more energy than conventional crystalline modules as a result of Triple-Junction-Technology
- Greater shade tolerance through narrow-meshed bypass circuit
- Extremely light-weight – between 4 kg/m²-8 kg/m² incl. fixing elements
- Suitable for all standing seam systems and variants as a result of the variable fixing system
- For max. power density and optimum energy generation, SolarClad can be installed as a stand-off mounting at a range of orientations and pitch.
- Extremely economical – non-penetrative, quick installation

- Environmentally-friendly due to short energy amortisation period < 3 years
- Improved thermal protection – shades roof in summertime
- The system is extremely lightweight and does not add significant additional demands on the roof

Areas of Use

- Suitable for all roof shapes with a pitch up to a maximum of 60° from horizontal.
- Can be retrofitted to existing Kalzip roofs
- Suitable for all standing seam materials, e.g. titanium zinc and copper
- Attractively priced PV solution for new builds with Kalzip standard constructional widths
- Ideal for all roof shapes, in the case of barrel-vaulted roofs, follows contours up to 10 m radius
- Normally no additional static demands on the substructure





Kalzip SolarClad is laminated onto carrier plates which are available in two lengths and is supplied ready for installation. In this way, optimum utilisation of the roof surface can be achieved.

Technical Data	PVL-68	PVL-136
Surface required per kWp (installation parallel to standing seams) [m ²]	> 18.50	> 18.50
Module length [m]	2.85	5.50
Rated power [W]	68.00	136.00
Operating voltage V_{MPP} [V]	16.50	33.00
Operating current I_{MPP} [A]	4.13	4.13
Open-circuit voltage V_{OC} [V]	23.10	46.20
Open-circuit voltage V_{OC} at -10°C and 1250 W/m ² [V]	26.30	52.70
Short-circuit current I_{SC} [A]	5.10	5.10
Short-circuit current I_{SC} bei 75°C and 1250 W/m ² [A]	6.70	6.70
Series fuse rating nom. / blocking diode nom. [A]	8.00	8.00
Maximum system voltage DC [V]	1000.00	1000.00

Please note: The values specified represent stabilised values. During the first 8-10 weeks of operation, power output may be higher by 15 %, operating voltage may be higher by 11 % and operating current may be higher by 4 %.





Possible methods of installation

above left: Kalzip SolarClad parallel to standing seams

above middle: Kalzip SolarClad perpendicular to standing seams

above right: Kalzip SolarClad elevated from roof

Planning guidance

- The Kalzip AluPlusSolar roof integrated photovoltaic system is also suitable for new Kalzip roofs
- Recommended roof pitch min. 5 % (3°)
- Specification (electricity and attachment) in accordance with Kalzip SolarSystems installation instructions

Safety Class II, design suitability and approval in accordance with IEC 61646

TÜV Rheinland, Cologne, Germany

UNI-SOLAR
United Solar Ovonics



right and left: Schiller School **Bretten (D)**

Kalzip AluPlusPatina Discreet and elegant

left: Kalzip profiled sheet with
Kalzip AluPlusPatina surface
right: Kalzip profiled sheet with
standard surface, untreated

Kalzip aluminium sheets are available in a wide range of different surfaces and colours, offering architects and planners almost unlimited freedom in the design of roofs and facades. In addition to the conventional robust, stucco-embossed aluminium finish, Kalzip has now extended the design potential of Kalzip with their introduction of Kalzip AluPlusPatina, which provides yet another attractive metallic design option with a high-quality appearance.

The pre-weathered profiled sheets are made from resistant stucco-embossed aluminium with additional surface treatment. With this treatment, the aluminium surface loses its natural shine and significantly reduces diffuse light reflection.

Depending on the angle of incidence, the level of sheen can be reduced by up to 20 %. The characteristics of this surface finish are comparable to those of an aluminium profiled sheet which has been weathered over years.

The natural ageing process, which the profiled sheets undergo during exposure to weathering, is not hindered and proceeds in the usual manner.

The product advantages

- A robust surface which is highly resistant to weathering
- Significantly reduced light reflection
- Pre-weathered surface creates an elegant and matt appearance
- Ideal for cladding
- High level of inherent stability makes it suitable for large spans
- A variety of profile forms are available
- Sophisticated detailed solutions and fittings

Areas of use

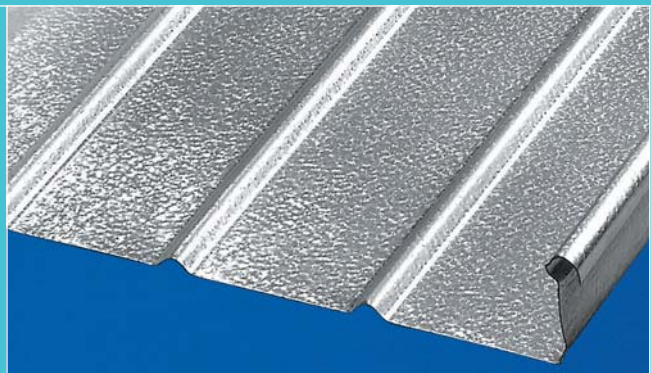
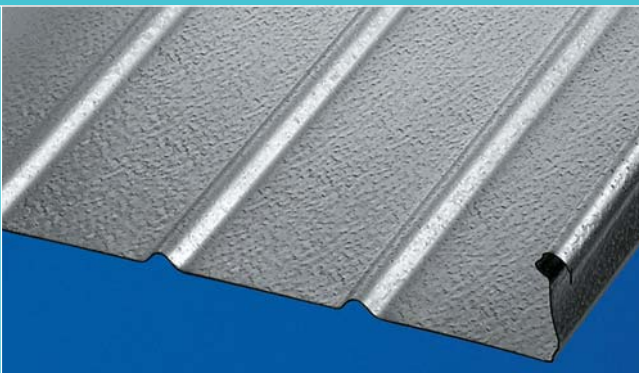
Kalzip AluPlusPatina is ideal for projects where the architects and planners are looking to achieve a distinctive design of roof and facade through the use of a discreet matt finish, whilst at the same time reducing the typical level of light reflection.

Technical Data

Kalzip dimensions:

Kalzip 50/333	Kalzip 65/305	Kalzip AF 65/333
Kalzip 50/429	Kalzip 65/333	Kalzip AF 65/434
	Kalzip 65/400	Kalzip AS 65/422

Thickness: 1.00 mm



Kalzip AluPlusZinc Timeless aesthetics with a zinc-patinated finish



left: Stile Bertone Museum **Capri (I)**

Architect: Flavio Pacchioni

right: Arcam **Amsterdam (NL)**

Architect: René van Zuuk

There is nothing more impressive than a perfect product with unique advantages

Kalzip AluPlusZinc has been specially developed for planners and architects who are looking for something exceptional and who demand the very best products and materials to enable them to create unique roofs and facades.

This technically advanced product has a matt, zinc-patinated finish and is manufactured according to the strictest quality standards using a patented method.

The timeless appearance of the pre-weathered zinc patina makes it ideal for use in a wide range of architectural applications and it is particularly suitable for subtle integration with existing buildings, where high-quality aesthetics and harmonious design are a priority.

Kalzip AluPlusZinc has the capacity to evolve new depths and shades of patina with exposure to atmospheric conditions and will maintain its stunning appearance as time goes by.



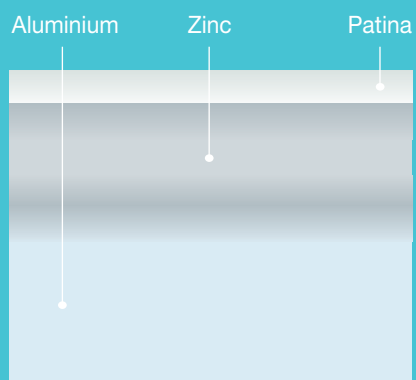
The product advantages of Kalzip AluPlusZinc

- The zinc patina is applied according to the patented PEGAL process, and provides exceptional resistance to corrosion. The performance characteristics of the saltwater-resistant aluminium core are fully retained.
- The weather-related corrosion rate is significantly lower than conventional zinc (see diagram of HCT test)
- Smooth surface.
- Intrinsically strong – therefore suitable for larger spans.
- Discreet appearance and evenness of colour across the entire surface.
- Increased resistance to weathering ensures long service life.
- Lightweight, just 3.5 – 4.5 kg/m² - therefore cost-saving.
- Savings can be made on materials used in supporting steelwork.
- Continuous sheet lengths of 100 m and more.
- Installation is particularly quick and largely independent of weather. Cost savings through prefabricated components.
- Functional fittings for joints.



above:
Stile Bertone Museum **Capri (I)**
Architect: Flavio Pacchioni

A diagrammatic representation
of Kalzip AluPlusZinc (PEGAL)



Areas of use

Kalzip AluPlusZinc can be used for creating high quality roofs and walls, and is suitable for both new builds and the renovation of existing buildings. AluPlusZinc is ideal for city landscapes where subtle integration is a prerequisite.

Kalzip AluPlusZinc is highly resistant against corrosion.

The patented PEGAL process produces a durable fusion between aluminium and zinc. Additional surface treatment creates a stable patina with exceptionally high resistance to the effects of weathering.

The fusion of aluminium and zinc

Zinc corrosion rate

The graph below shows the zinc corrosion rate for pre-exposed titanium zinc in comparison to AluPlusZinc on the basis of HCT-tests carried out by Kalzip.

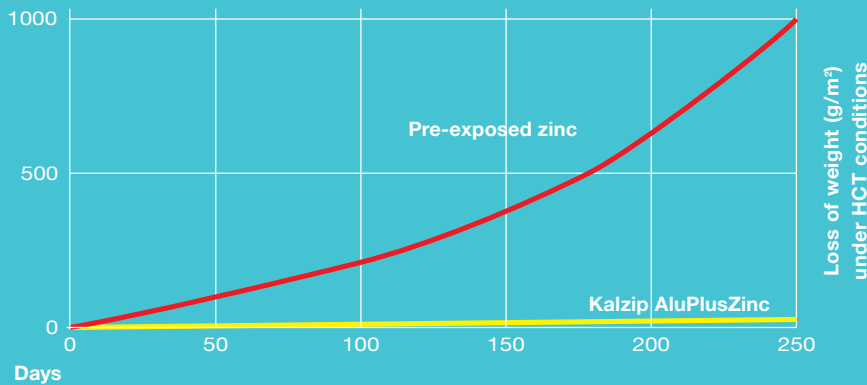
The HCT-test uses a salt spray test with a high ionic concentration to simulate accelerated ageing. Under

these conditions the zinc corrosion rate of pre-exposed titanium zinc is much higher than that of AluPlusZinc.

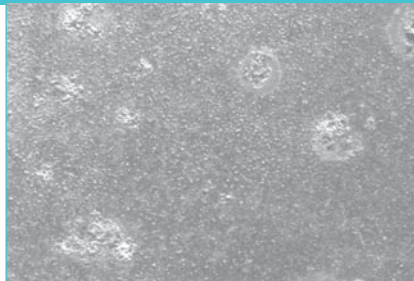
Outdoor weathering tests conducted in an urban atmosphere and in a very aggressive combination of industrial and North Sea climate, confirm that AluPlusZinc has exceptional weathering characteristics.

Kalzip dimensions

- Available in 1 mm
- Kalzip 50/333
- Kalzip 50/429
- Kalzip 65/305
- Kalzip 65/400
- Kalzip AF 65/333
- Kalzip AF 65/434
- Kalzip AS 65/422

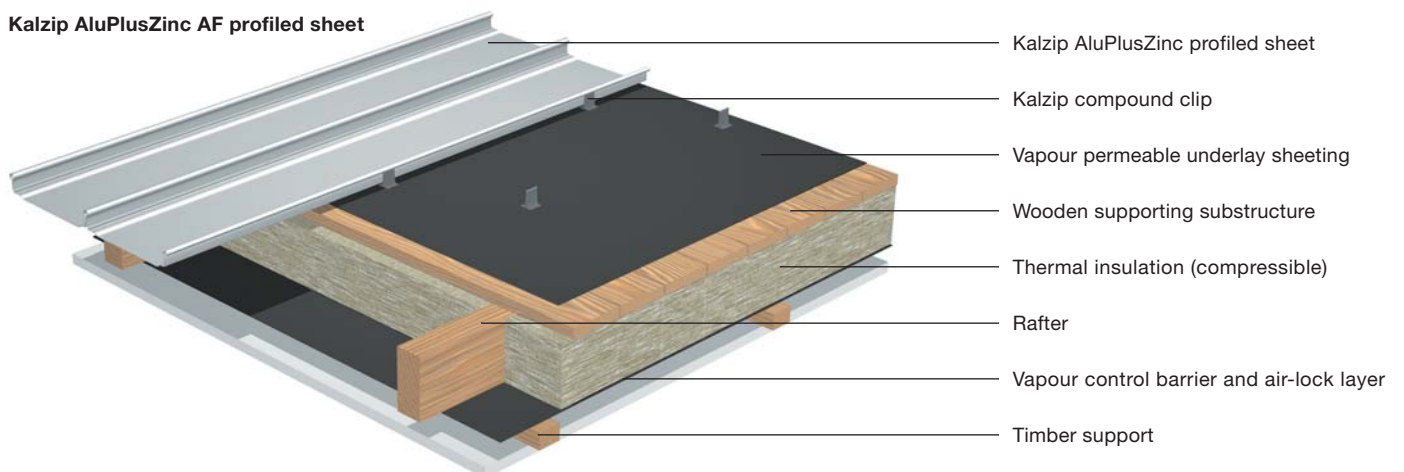


HCT-test showing loss of material weight due to corrosion. A comparison between pre-exposed zinc and AluPlusZinc



far left: **zinc, pre-exposed to weathering** (macro-shot HCT-test 250 days)
left: **Kalzip AluPlusZinc, produced by the PEGAL process** (macro-shot HCT-test 250 days)

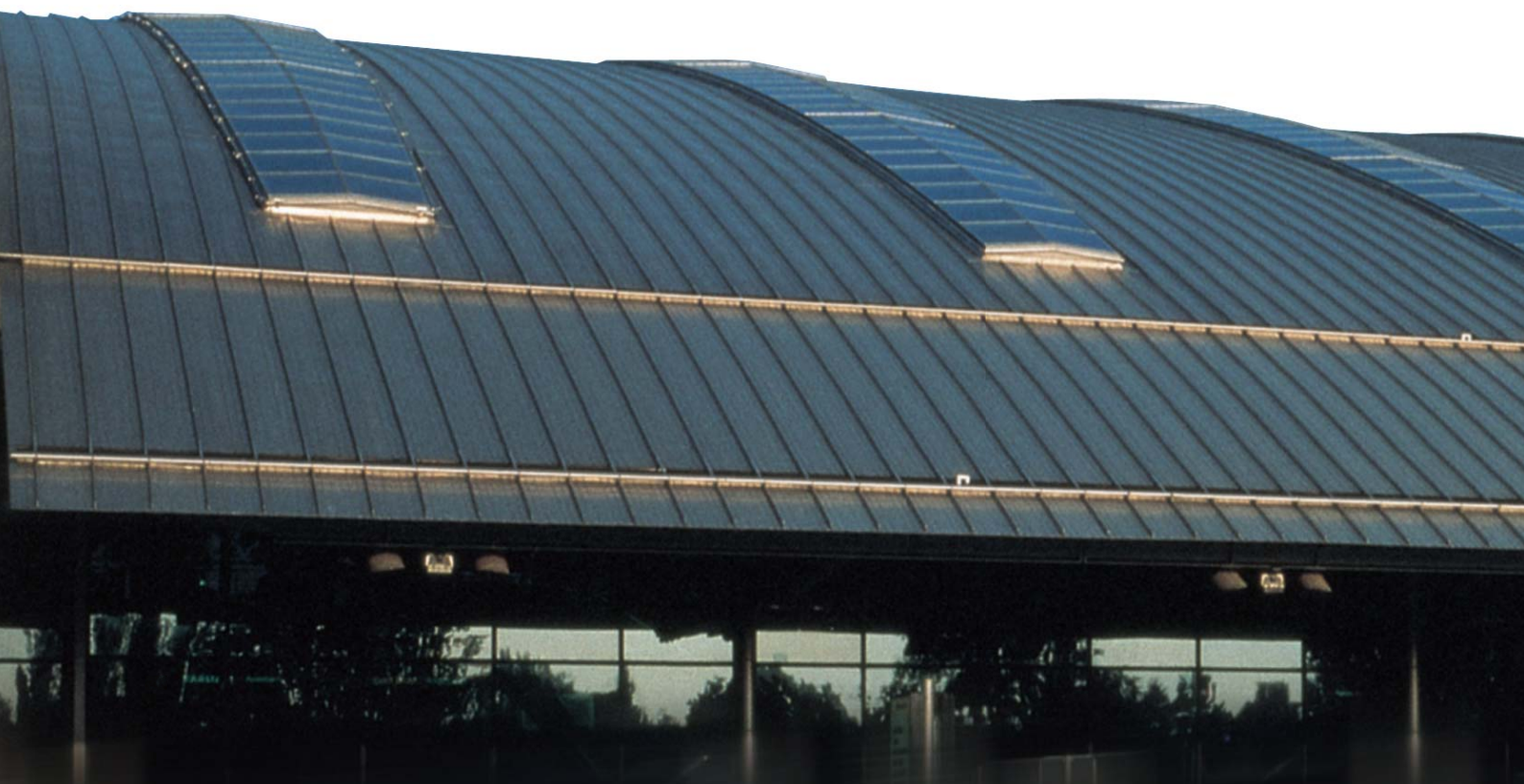
Example: Kalzip rafter roof construction with Kalzip AluPlusZinc AF profiled sheet

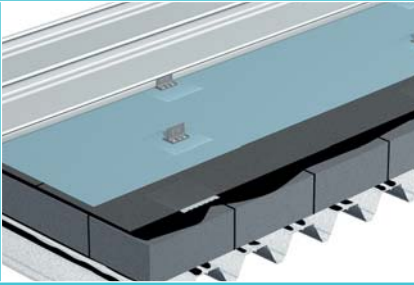


Kalzip Foamglas System Provides the perfect roofing solution

Our partner:

FOAMGLAS®
DER SICHERHEITS-DÄMMSTOFF





below: Airport Terminal
Hamburg-Fuhlsbüttel (D)
 Architects: von Gerkan, Marg & Partner

left: Schematic view of roof structure featuring the Kalzip Foamglas system

right: Laying the Foamglas slabs

The perfect roofing system for the toughest demands

Aluminium is the perfect building material for creating contemporary architecture with stunning aesthetics. Architects and planners are inspired by the virtually unlimited scope for design offered by Kalzip aluminium profiled sheets. Builders value the functionality of this sophisticated roofing and facade system.

Our aim is to continuously improve and perfect the Kalzip system. Our many years of research, ongoing quality assurance and orientation towards the needs of architects and engineers, ensure that we are able to achieve this.

Kalzip offers innovations and leading-edge technology which shape the architectural landscape of the future.

The Kalzip Foamglas System represents the development of a roof design with extremely versatile insulation and therefore exceptional performance characteristics. The end result is a building envelope which is completely safe, durable and maintenance-free.

Particularly suitable for buildings which need to withstand the toughest demands:

- swimming pools, ice stadiums
- production halls for high-quality goods, as well as industrial buildings with strict hygiene requirements

this roofing concept is ideal for high-quality administrative buildings and schools as it provides the perfect roofing solution which is safe and durable.

Because Kalzip Foamglas is:

- completely water-tight and impervious to water vapour (suitable as emergency insulation)
- has no capillarity
- non-combustible (materials class A1 / Euro class A)
- coldbridge-free
- windproof and air-tight
- resistant to vermin
- dimensionally stable
- resistant to rotting
- does not expand, shrink or warp
- suitable as secondary insulation
- extremely temperature-resistant and offers optimum sound insulating properties.





Areas of use

The Kalzip Foamglas System is ideal for building projects where the hygro-thermal conditions place particularly challenging demands on ensuring that a roof system is free from condensation and where there is a permanent risk of condensation formation. The system is also ideal for sensitive production areas, e.g. clean rooms for producing or storing electronic components, where a perfectly sealed building envelope is essential.

The combination of Kalzip and Foamglas means double the security, as the insulation also has a sealing effect. The high compressive

strength of the insulation ensures that roof edges and connections are durable and free from coldbridging. Virtually every shape of roof can be achieved with Foamglas as the foam glass slabs are easy to install and adapt.

Product advantages

- high level of energy efficiency as the thermal insulation is airtight and impervious to water vapour, coldbridging is also eliminated
- additional security provided by watertight substructure (the system is secure against moisture penetration)
- roof design has only a few functional layers

- no additional vapour barrier
- no mechanical attachment into the supporting structure
- additional support provided by insulating layer
- also suitable for stiffening trapezoidal profiles
- economical roof system which offers a wide variety of roofing options
- suitable for Kalzip folding aluminium roof coverings formed with skilled craftsmanship
- ideal for renovating roofs, also for roofs with a low pitch
- prevents the build-up of water, e.g. from melting ice

Kalzip Foamglas System description

Foamglas is made from 100% pure glass and is therefore totally inorganic. It is manufactured from recycled glass products and the natural mineral materials sand, dolomite and chalk in the thermal foaming process. It contains no CFCs, flame retardants or binders, does not release any emissions and does not shed any fibres.

Fire protection

Foamglas is non-combustible and when used in combination with the fixing system and the Kalzip aluminium profiled sheets contributes towards fire protection.

Fire cannot spread across the foam glass insulating layer. Foamglas insulating materials, the L-shaped claw plate and the Kalzip profiled sheets are non-combustible and as so-called "hard roofing" are resistant to flying sparks and radiating heat ("fire from the outside").

A roof featuring a design made from Foamglas and Kalzip specified by the manufacturer, is able to meet DIN 18234-1 requirements and can therefore be used in accordance with the construction standards for industrial buildings.

Sound insulation

The weighted apparent sound reduction index R'w for the roof design outlined below is approx 36 dB

- Steel trapezoidal profile 106/250-1.0 unperforated
- Adhesive
- 100 mm Foamglas, with L-shaped claw plate installed above
- 3 mm hot bitumen top coat
- 5 mm bitumen sheeting
- 20 mm air space
- E clips
- Kalzip > 0.9 mm

Depending on the structural design, the roof system can achieve a sound reduction value R'w of up to 56 dBa.

below: Perforated trapezoidal profile on a sports hall roof with soundproofing inserts. The Foamglas slabs are bonded to the upper flange using a cold bitumen adhesive; the butt joint is sealed in the edge dipping process and then coated with hot bitumen.

left: Airport Terminal **Hamburg-Fuhlsbüttel (D)**
Architects: von Gerkan, Marg & Partner



Curved roofs

All roof shapes are possible. In the case of large radii, the insulated slabs are connected in a polygonal manner or, in the case of smaller radii and freely shaped designs, they are delivered already in the respective shapes or cut to size at the construction site. The suppliers have a team of technical advisors who will be delighted to advise you on these roof shapes. We recommend that you seek their advice at the earliest possible stage.

The reference values for the radii (r) are:

$r \geq 12$ m: slabs installed in a polygonal manner
(grind edges if necessary))

$r \geq 6$ m: half slabs installed in a polygonal manner

$r < 6$ m: special roof shape with formed parts from factory

Safe and speedy installation

Kalzip Foamglas slabs are available in different formats and are suitable for substructures such as:

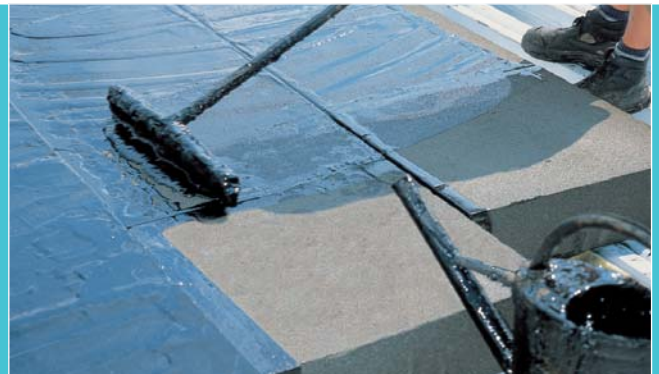
- steel trapezoidal profiles
- timber lining
- concrete slabs

The slabs are bonded to the substructure using either a cold-bonding agent or hot bitumen and the bonding process can be carried out in an external temperature as low as $+5^{\circ}$ C. In lower temperatures the substructure should be prewarmed accordingly.

In the case of trapezoidal profiles, bonding is carried out on the upper flanges. When the substructure is closed, the entire surface of the Foamglas and all joints are sealed with hot bitumen. The butt joints of the plates are completely sealed using the edge dipping process.



The insulating slabs are cold bonded to the substructure



The insulating slabs are sealed with hot bitumen

A hot bitumen top coat seals the surface and creates a prepared base for the subsequent construction work.

Coldbridge-free attachment on L-shaped claw plates

In order to attach the Kalzip compound clips, the newly developed, galvanized L-shaped steel claw plates are inserted under heat in a fixed grid, taking into account the respective roof geometry and wind/suction load.

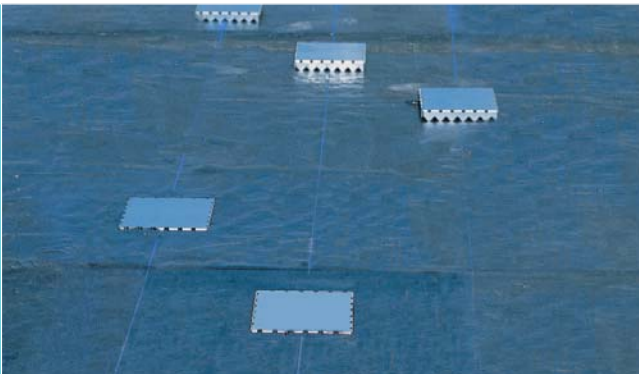
A friction-fit, coldbridge-free connection is created with the insulation layer (in accordance with building approval Z-14.4-475 issued by the Institute for Building Technology). In addition to this, a layer of bitumen with polyester fleece should also be applied above the insulation layer and claw plates.

The Kalzip compound clips are installed on the claw plates using the recommended fastening elements. A durable PE film used as a separating layer, ensures that the Kalzip AF profiled sheets maintain their freedom of movement. The Kalzip profiled sheets are installed in the usual manner.

When attaching sheets made from Kalzip folding aluminium with stainless steel clips, please observe the specific instructions and rules.

Welding Kalzip onto a bituminous seal/PE film

When Kalzip AF is used, the Kalzip backing strip should be used during welding.



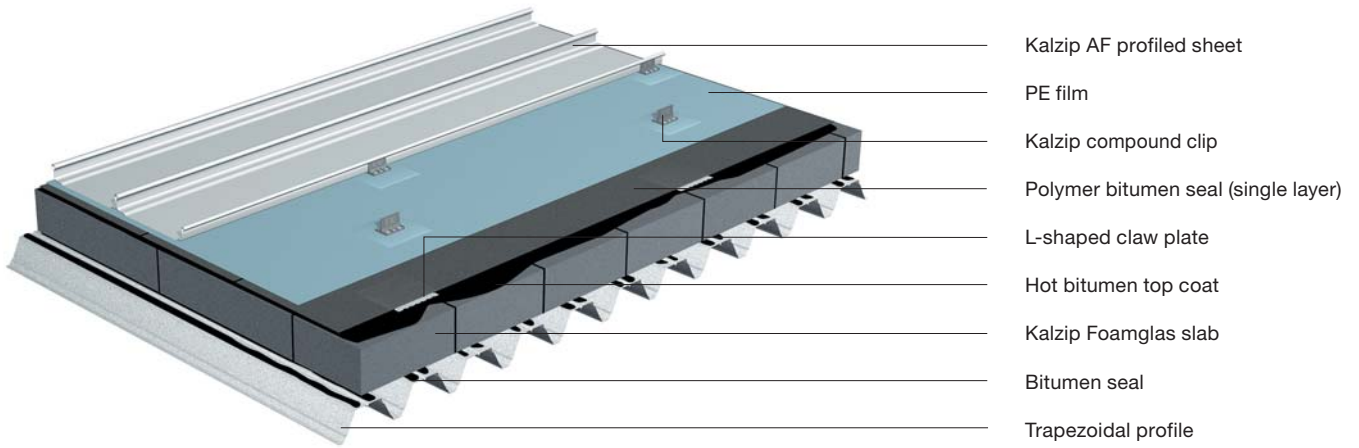
Installing the L-shaped claw plates



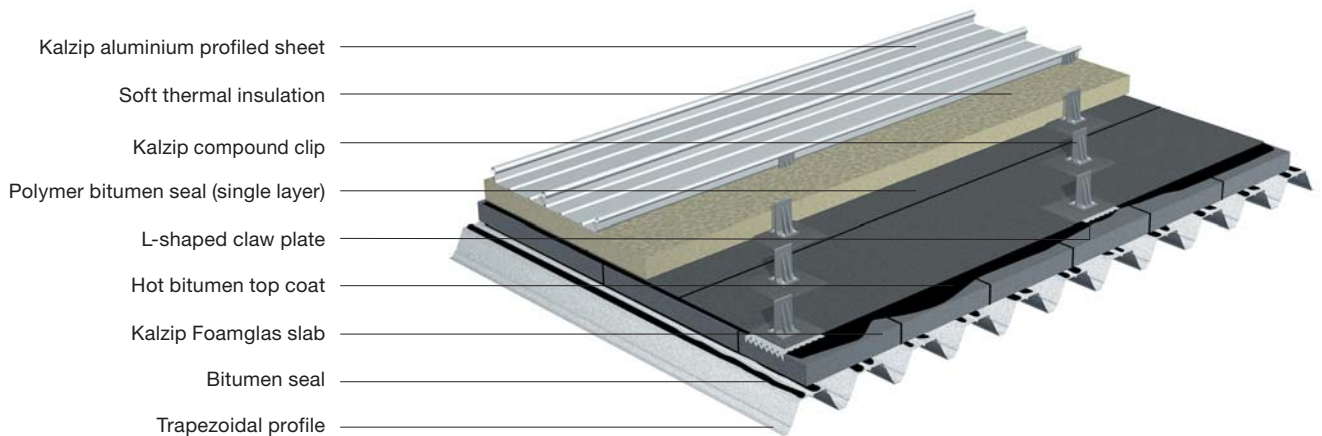
Kalzip compound clips on L-shaped claw plates with secondary sealing

Roof structures featuring the Kalzip Foamglas System

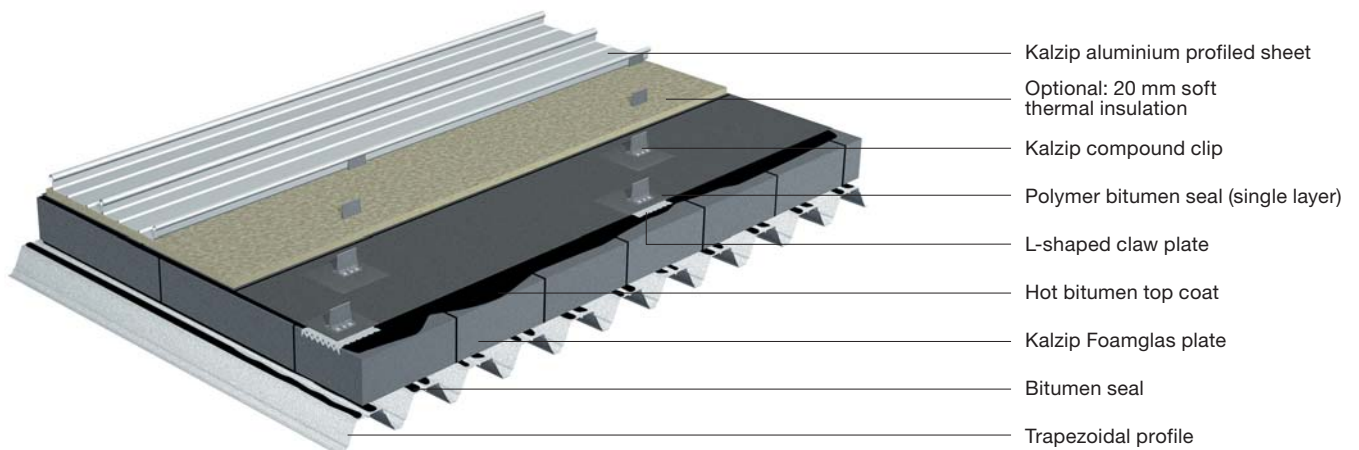
Kalzip Foamglas System with Kalzip AF Profile



Kalzip Foamglas System as a combined solution



Kalzip Foamglas System as a standard roof design



Relevant characteristics when Foamglas is used as thermal insulation in a Kalzip roof:

Technical data Foamglas insulation board T4 WDS

Density	$\rho = 110 \text{ kg/m}^3$
Thermal conductivity	$\lambda = 0.04 \text{ W/(m}\cdot\text{K)}$
Fire protection	German building material class A1 / Euroclass A (non-combustible)
Compressive strength	allowable $\sigma = 0.23 \text{ N/mm}^2$
Coefficient of thermal expansion	$\alpha_{\text{th}} = 8.5 \cdot 10^{-6} \text{ 1/K}$
Resistance to water vapour transmission	$\infty = (\text{impervious to water vapour})$
Watertight	Permanently watertight
Installation/processing temperature	minimum $+5^\circ \text{ C}$
Temperature resistance	$-260^\circ \text{ C to } +430^\circ \text{ C}$

Dimensions and delivery forms:

Formats:	600 x 450 mm	Slab thickness:	80–180 mm
	300 x 450 mm		
	600 x 600 mm		
	600 x 300 mm		

General approval issued by the German Institute of Building Technology Z-23.34-1311

L-shaped claw plate

Bonded into the upper side of the Foamglas insulating layer. Permissible tensile load 1.8 kN per fixing point.

Materials and dimensions

S235 steel in accordance with DIN 10025-2, galvanized

Thickness: $t = 1.5 \text{ mm}$

Size: $l \times b = 200 \times 200 \text{ mm}$

General approval issued by the German Institute of Building Technology Z-14.4-475

Fixing the L-shaped claw plates in the Foamglas cell structure

- Bonded with unfilled oxide bitumen in accordance with EN 18195-2 (hot bitumen type 100/25)
- Seal should consist of talcum powderd or slated polymer bitumen sheeting with a minimum thickness of 5 mm, made from elastomer bitumen or plastic modified polymer bitumen with 200 g/m² polyester fleece insert in accordance with DIN 52133 or EN 13707
- When Kalzip AF is directly attached, a polyethylene film should be installed at the very least as a separating layer between the Kalzip and the bitumen sheeting. The film must be weatherproof and temperature-resistant. The joints do not need to be connected.
- The galvanized claw plate is additionally covered with the bitumen sheeting and this creates a secondary sealing layer.

Kalzip Duo 100 und DuoPlus 100

The energy- saving roof systems



The new dimension for exceptional thermal insulation and a high level of sound insulation.

Kalzip Duo 100 and Kalzip DuoPlus 100 make it easy to comply with the statutory guidelines set out in national and international energy-saving directives. The components of Kalzip Duo 100 and Kalzip DuoPlus 100 roofs are designed to work perfectly together, offering a complete building system which guarantees optimum thermal insulation with a minimum of thermal bridging. Heat transfer is minimized, therefore allowing full compliance with the strict guidelines stipulated by the energy-saving directives.

All components in the Kalzip Duo 100 and Kalzip DuoPlus 100 range are intelligently designed to create a comprehensive system, right down to the last detail. The variable mounting system is fully integrated for speedy, efficient and safe installation, therefore reducing both time and costs. Kalzip Duo 100 and Kalzip DuoPlus 100 guarantee all the advantages of a fully compatible system supplied as a package and offer architects not only the freedom to meet the individual creative needs of their clients – from the functional to the spectacular – but also full compliance with the highest technical standards.

In the conflict that exists between innovative architecture and legislative requirements, Kalzip Duo 100 and Kalzip DuoPlus 100 offer an ideal solution which is both practical and visually stunning. Kalzip Duo 100 and Kalzip DuoPlus 100 provide a complete structural system for roofs and walls, enabling architects to design the ultimate building with no restriction on creativity.

Kalzip Duo 100 and Kalzip DuoPlus 100 can be used in the following areas:

- Public sector
- Transport and communications
- Commercial
- Stadiums, exhibition halls and leisure facilities
- Utilities
- Industrial
- Private developments
- Retail

The perfect solution for compliance with the new energy-saving directives.

The new energy-saving directives represent a significant step forward in energy efficiency in the built environment. They tighten the limiting values for thermal protection and demand a new verification procedure, which should reduce the allowable heat requirement of heated buildings by 25 to 30 percent. So how will this affect the design and construction of new roofs and facades?

In order to confidently fulfill the optimum requirements set out in the energy-saving directives, there is a need for new high performance roof and facade systems which take into account all the criteria stipulated in these directives. Kalzip is virtually cold-bridge free and therefore guarantees achievement of the required energy savings, meeting and exceeding the new standards stipulated in the energy-saving directives. Not only does Kalzip achieve full compliance with legislative directives, it also provides the freedom to create striking, individual buildings.

There are many good reasons for using Kalzip Duo 100 and Kalzip DuoPlus 100:

- Virtually cold-bridge free – therefore extremely low heat transfer coefficients.
- High level of thermal insulation – fulfills the requirements of the energy-saving directives.
- Outstanding acoustic insulation values up to $R'w = 43 \text{ dB (A)}$ (depending on roof design).
- Lightweight – very suitable for long spans.
- Complete system from one supplier.
- Perfectly matched system components, in terms of both form and function.
- Variable fixing system.
- Variable thicknesses of insulation.
- Particularly fast installation, largely unaffected by the weather conditions.
- Extremely economical, with short installation times due to prefabricated system components.
- For substructures made from steel trapezoidal profiles, concrete, aerated concrete and timber.

Kalzip Duo 100 and Kalzip DuoPlus 100

Construction – design – components

The design of the Kalzip Duo 100 and Kalzip DuoPlus 100 roof systems is based on a conventional roof truss framework with a steel trapezoidal substructure, whereby the supporting structure for the Kalzip roof is placed on the thermal partition of the external and internal shells.

The steel trapezoidal profiles extend from truss to truss or are laid over purlins and transmit the external loads into the supporting structure of the building. Their design takes into consideration the specific load introduction by the roof structure. The subsequent Kalzip vapour barrier controls the humidity of the building envelope as stipulated by the energy-saving directives.

Kalzip DuoPlus 100

The full layer of rigid thermal insulation subsequently installed on top of the thermal control barrier prevents thermal conduction by individual metal components in the roof structure. The specially developed DuoPlus rail is fixed onto this thermal insulation by means of suitable and approved fixing elements. The rail diverts the external load from the clip and onto the thermal insulation and substructure below and also acts as the fixing surface for the Kalzip aluminium clips. The thickness of the insulation is based on the requirements for thermal protection (U value) and is dependent on the number of clips (see diagram).

The number of clips is dependent on the external load and the load-bearing capacity of Kalzip and is decided by the Application Technology Department in Koblenz on an individual basis with regard to each particular project. The same applies to the span widths of the steel trapezoidal profiles.

The structure installed above this, with soft, compressible thermal insulation, is the conventional, tried and tested roof structure (see Kalzip Systems Handbook of Technology, Planning and Construction). This type of thermal separation allows cold-bridges to be minimized without a problem in accordance with the new energy-saving directives.

Kalzip Duo 100

The Kalzip Duo 100 system represents a particularly economical option. This attractively priced design does not require a full layer of rigid thermal insulation. The base for the Kalzip DuoPlus 100 is simply provided by rigid insulation strips with a width of 24 cm and a thickness of 10 cm.

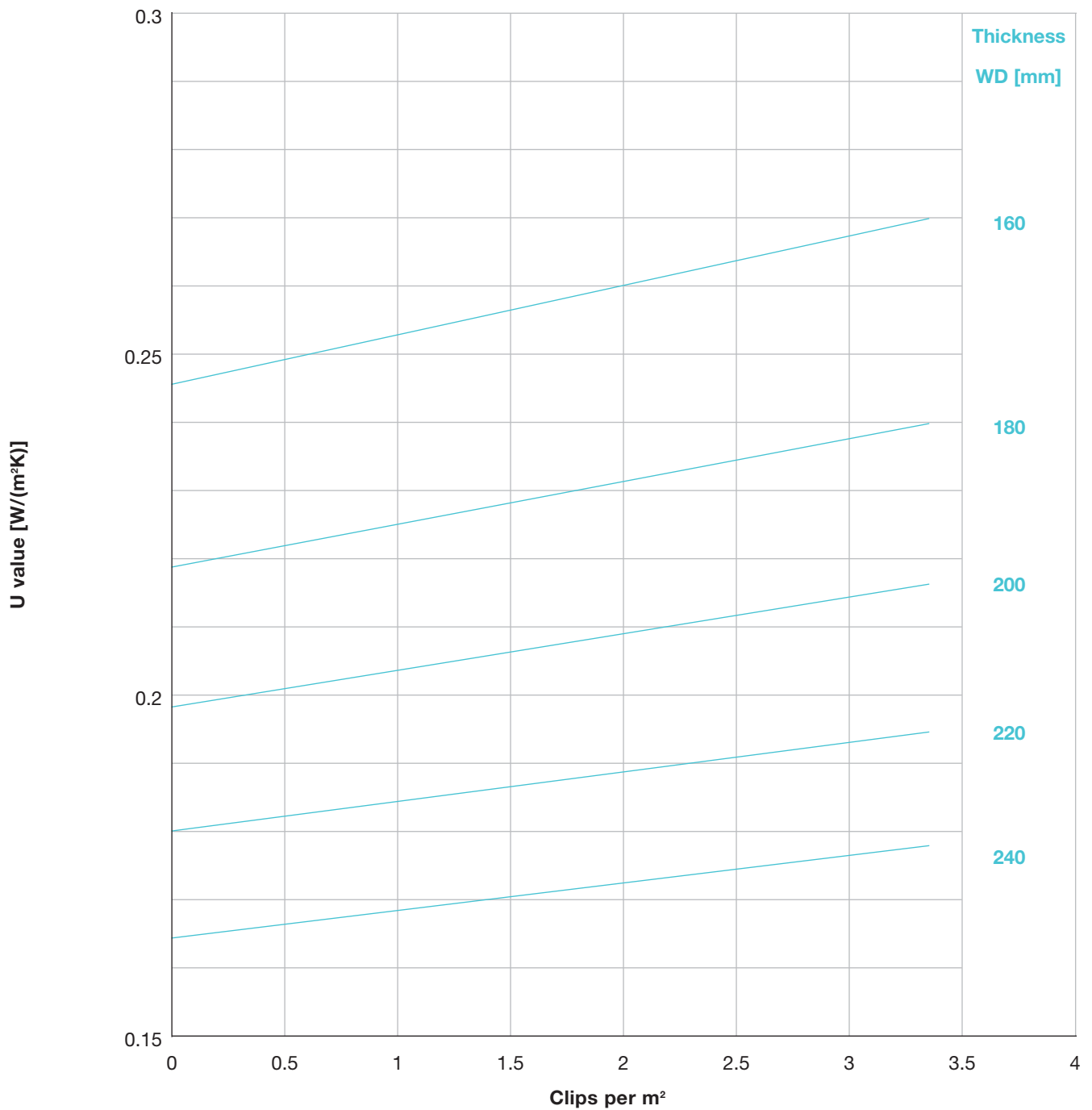
The remaining spaces are then filled with soft thermal insulation or low-priced rigid insulation. As normal, the compressed insulation is in contact with the underside of the Kalzip vapour seal. This economical solution can also be used in the case of all Kalzip profiles.

In comparison to the classic DuoPlus roof, the use of rigid thermal insulation is minimized in line with the static requirements and is replaced by a layer of soft insulation in all areas where no reduction in snow loads is required. This roof design is recommended when there are no specific sound insulation requirements. Heat transfer and loading ratio are not affected.

The Kalzip Duo 100 roof does not require the time-consuming task of marking-up to be carried out during installation of the rigid spacer strips underneath the DuoPlus rails, as the contours of the steel trapezoidal profiles are visible through the vapour control barrier. The spacing of the strips can be a multiple of the standard width of the thermal insulation, but must not exceed the allowable value stipulated by the type statics.

If preferred, the width of the soft insulation inserts can be prefabricated to prevent the soft intermediate insulation from being punctured by the clips. In the case of 24 cm wide, rigid thermal insulating strips, the type statics can be applied in accordance with the defined load reduction.

Heat transfer coefficients for Kalzip Duo 100 and DuoPlus 100 roof – thermal conductivity group (WLG) 040



So much more than the sum of its parts. The ultimate ease of installation – right down to the very last detail.

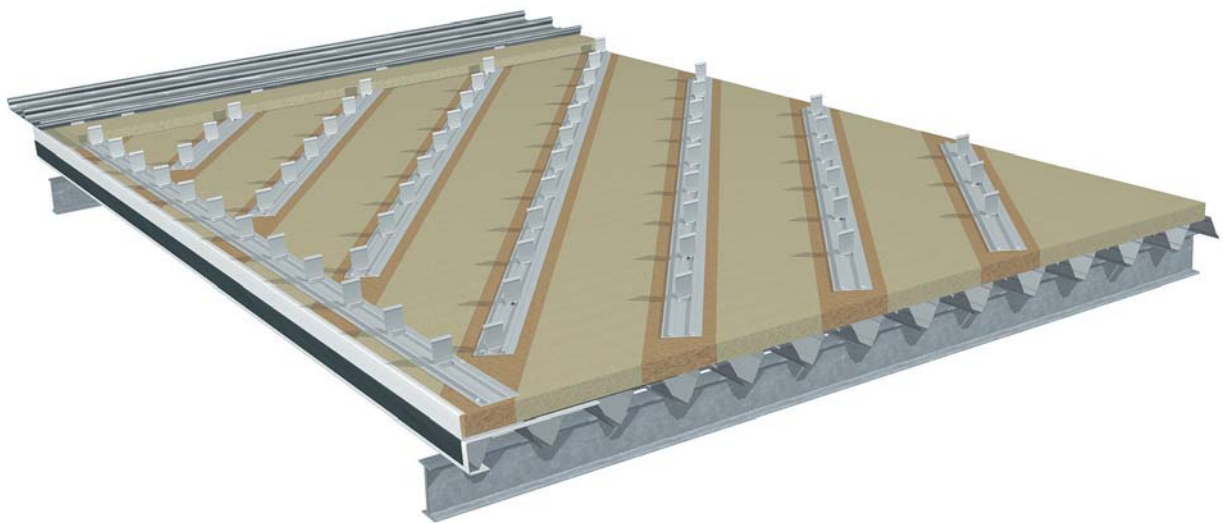
The task of ensuring that Kalzip roof systems are installed safely and in accordance with the plans and calculations becomes even more important in view of the new energy-saving directives. In order to fulfill the stipulations relating to buildings, for example air density and insulation, particular care must be taken during installation of the Kalzip Duo 100 and Kalzip DuoPlus 100 roof structure. With the development of the DuoPlus rail and the DuoPlus clip, a solution has been found to the safe installation of the fixing elements for Kalzip profiled sheets, which significantly increases the ease of installation.

The DuoPlus rails are arranged in accordance with the static calculations on the full layer of rigid insulation in the case of Kalzip DuoPlus 100, and the 24 cm wide insulation strips in the case of Kalzip Duo 100.

The DuoPlus rails are secured in the liner sheet of the steel trapezoidal profile by means of the SFS intec SD2-S16-6.0 x L connecting element. The DuoPlus clips are then inserted by hand. As these remain adjustable, whilst the DuoPlus rail still offers a firm hold, the DuoPlus clips can be adjusted to the respective conditions, depending on profile dimension and/or tolerance. In this way, a smooth and variable installation can always be guaranteed.

In the case of a Kalzip Duo 100 roof, the spaces between the rigid strips are then filled in and, in the case of both options, a full layer of insulation is installed. Installation of the Kalzip profiled sheets then takes place and these are connected in a friction-locked manner to the DuoPlus clips using a 'zipping' machine.

Positioning scheme Kalzip Duo 100

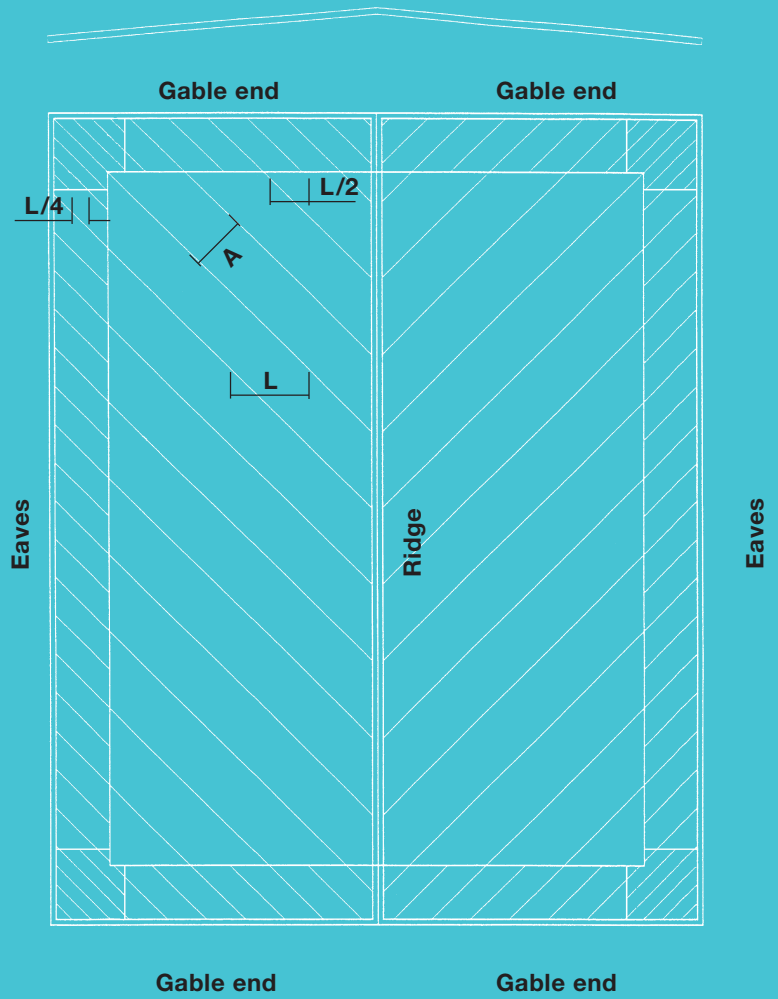


Schematic alignment of the DuoPlus rails:

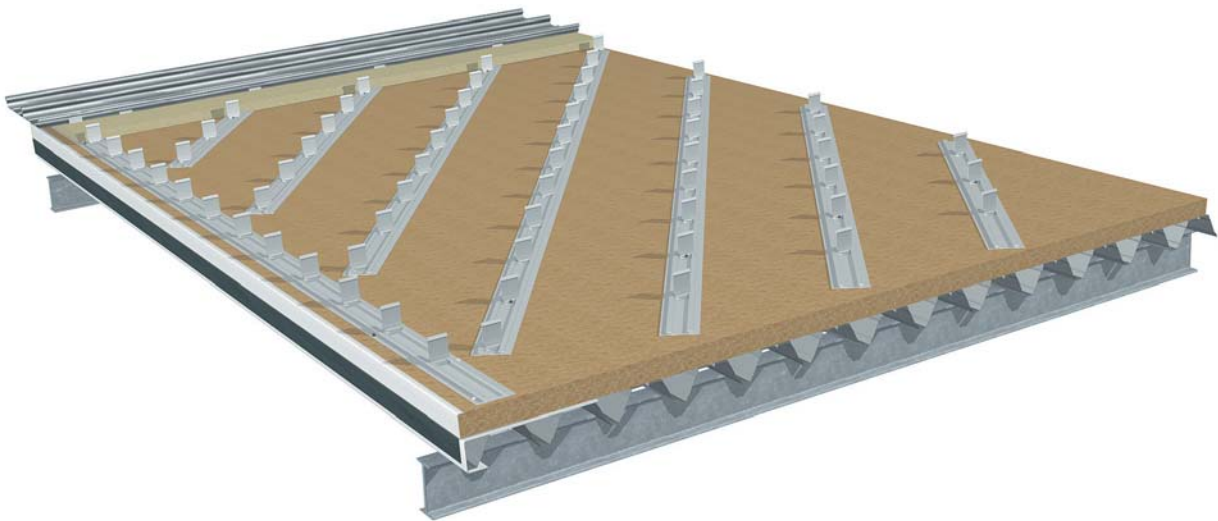
L = Distance of the DuoPlus clips

A = Rail distance = $L \times 0.71$

Size and shape of the edge and corner areas according to DIN 1055 T4.
Observe the installation plan.



Positioning scheme Kalzip DuoPlus 100



Perfectly matched elements and system components provide optimum thermal performance.

Kalzip Duo 100 or Kalzip DuoPlus 100 on steel trapezoidal profile

- **Liner sheet**

Fischer trapezoidal liner sheets

Sheet thicknesses $t =$ 0.88 mm
1.00 mm
1.25 mm
1.50 mm

Cross sections: FI 90/305
FI 100/275
FI 135/310
FI 144/287
FI 150/280
FI 165/250

Alternative Fischer acoustic sheets, perforated: AK 100/275
AK 135/310
AK 150/280
AK 165/250

- **Kalzip vapour barrier, self adhesive and cold-bonded**

- **High-density thermal insulation with a highly compressed surface in accordance with DIN EN 13162**
Euro Class A1 in accordance with DIN EN 13501
– non-combustible
Application type: WD in accordance with DIN 18165
Thermal conductivity group (WLG) 040
Compressive strength: $\sigma_{10} \geq 70 \text{ kN/m}^2$
Thickness: 100 mm
Kalzip Duo 100 – installed in 24 cm wide strips
Kalzip DuoPlus 100 – installed as a full layer

- **DuoPlus rails**
Hole diameter 6.8 mm

- **DuoPlus clips**
Clip type complies with the requirements of the energy-saving directives

- **Connecting elements for DuoPlus rails**
SFS intec SD2-S16-6.0 x L

(In the case of a Kalzip Duo 100 roof, the spaces between the 24 cm wide strips should be filled with insulating felt.)

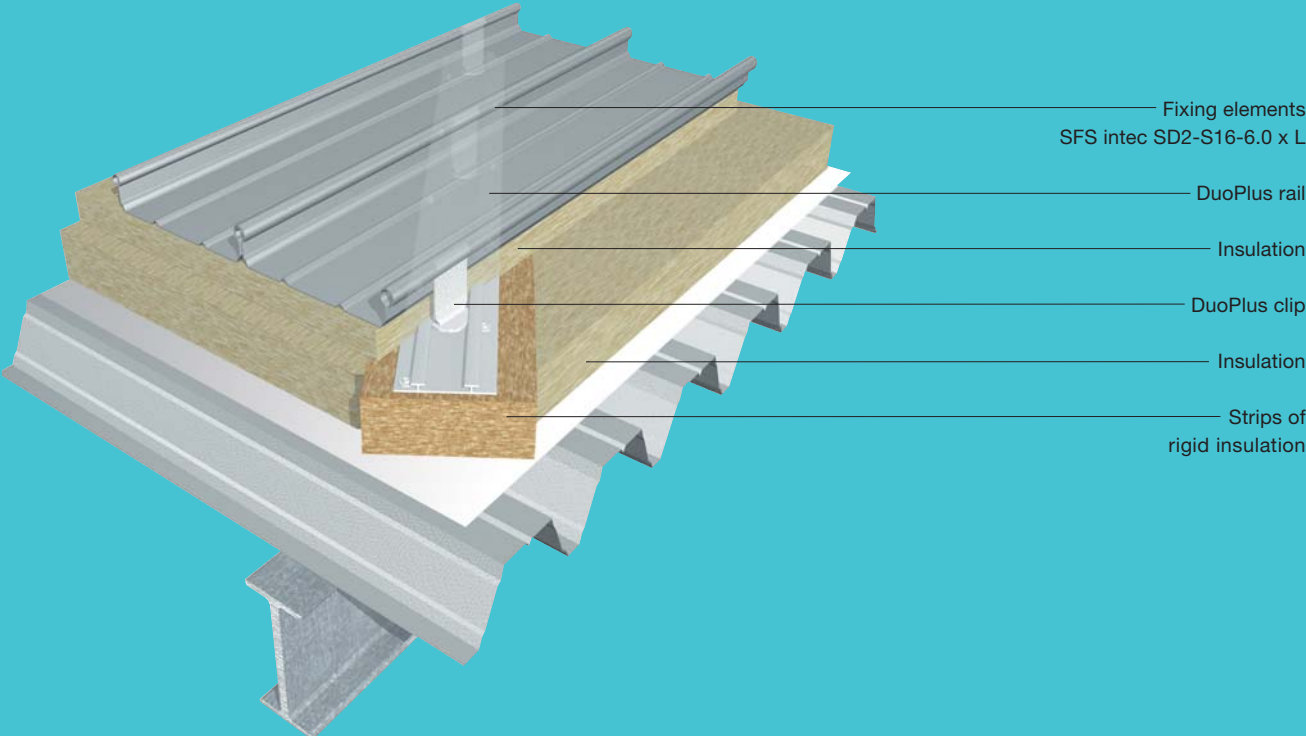
- **Rockwool insulation in accordance with DIN EN 13162**
Euro Class A1 in accordance with DIN EN 13501
– non-combustible
Application type: WD in accordance with 18165
Thermal conductivity group (WLG) 040
Thickness complies with the requirements of the energy-saving directives

- **Kalzip aluminium profiled sheets**

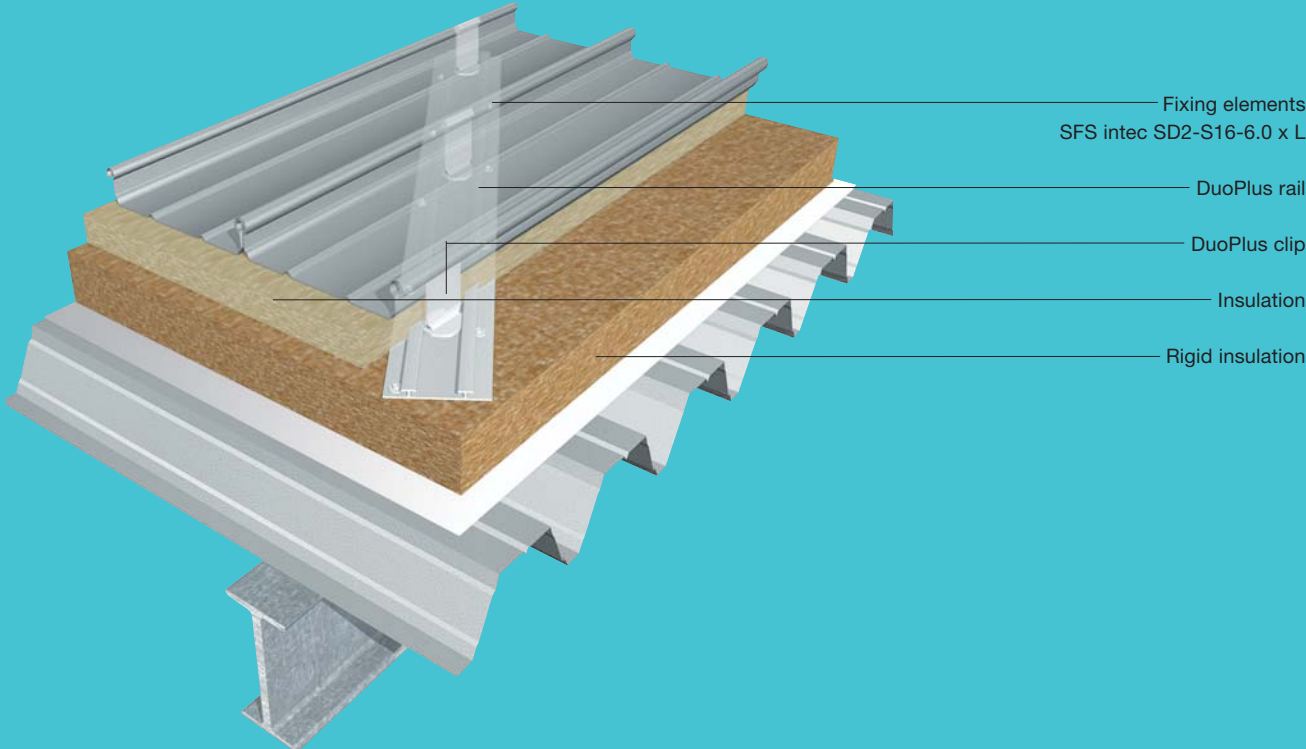


Left: DuoPlus rail with thermal insulation

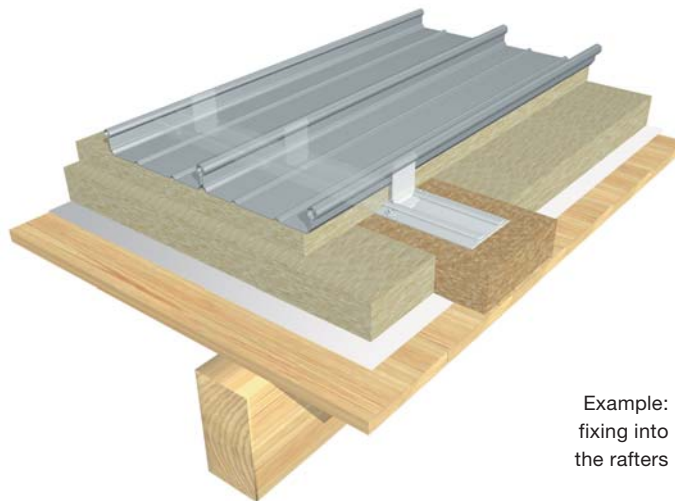
Kalzip Duo 100 on a trapezoidal steel deck



Kalzip DuoPlus 100 on a trapezoidal steel deck



Kalzip Duo 100 or Kalzip DuoPlus 100 on timber



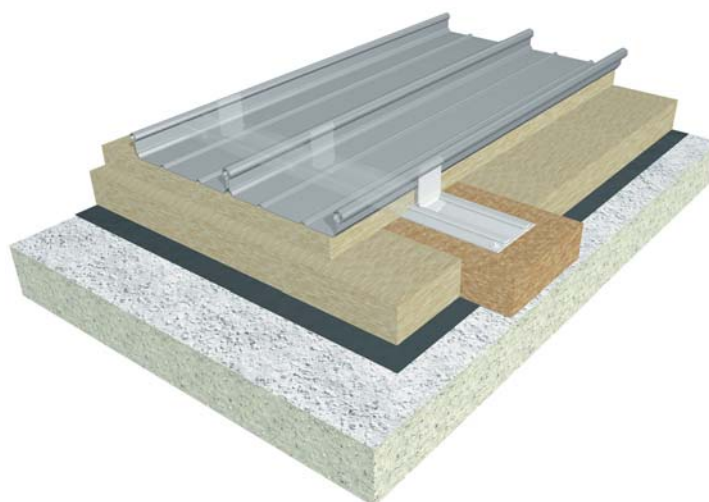
Example:
fixing into
the rafters

- **Liner sheet:**
Soft wood minimum sorting class S 10
- **Kalzip vapour control barrier H**
- **High density thermal insulation with highly compressed surface in accordance with DIN EN 13162**
Euro Class A1 – non-combustible
Application type: WD in accordance with DIN 18165
Thermal conductivity group (WLG) 040
Compressive strength: $\sigma_{10} \geq 70 \text{ kN/m}^2$
Thickness: 100 mm
Kalzip Duo 100 – installed in 24 cm wide strips
Kalzip DuoPlus 100 – installed as a full layer
- **DuoPlus rail**
Hole diameter 6.8 mm
- **DuoPlus clip**
Clip type complies with the requirements of the energy-saving directives
- **Fasteners for the DuoPlus rail:**
SFS SD2-S-S16-6.0 x 165 fastener (for timber liner)
or wood fasteners in accordance with DIN 1052
or thread forming fasteners suitable for wood in accordance with DIN 18807 or local building standards.
Sealing washer diameter min. 16 mm
Fasteners depth min. 26 mm
- **Installation:**
The max. fastener spacing is 50 cm.
The fasteners must be arranged in a staggered manner or on both sides in the rail holes. The rails should be orientated at a right angle or at least at an angle of 45° to the Kalzip ribs. In the case of fixing through the timber liner into the rafters, the rail can be installed vertically with respect to Kalzip (see picture). The fastener length must be adjusted in accordance with structural calculations. Two fasteners should be used per fixing point in the edge and corner areas of the roof.

If the rail is to act as a single-span support (e.g. fitting piece at the end of a row), then it must be no longer than 40 cm.

(In the case of Kalzip Duo 100 roofs, the spaces between the 24 cm wide strips should be filled with insulating felt.)
- **Rockwool insulating felt in accordance with DIN EN 13162**
Euro Class A1 – non-combustible
Application type: WL in accordance with DIN 18165
Thermal conductivity group 040
Thickness complies with the requirements of the energy-saving directives
- **Kalzip aluminium profiled sheets**

Kalzip Duo 100 or Kalzip DuoPlus 100 on concrete



- **Installed on 10 cm rigid thermal insulation or directly onto concrete \geq B 15 liner**

- **Vapour control barrier**

- **High-density thermal insulation with a highly compressed surface in accordance with DIN EN 13162**

Euro Class A1 – non-combustible

Application type: WD in accordance with DIN 18165

Thermal conductivity group (WLG) 040

Compressive strength: $\sigma_{10} \geq 70$ kN/m²

Thickness: 100 mm

Kalzip Duo 100 – installed in 24 cm wide strips

Kalzip DuoPlus 100 – installed as a full layer.

Avoid contact corrosion when fixing directly onto concrete. On account of the rough concrete surface, a 20 mm thick layer of rigid thermal insulation is recommended.

- **DuoPlus rail**

Hole diameter 10.5 mm

- **DuoPlus clip**

Clip type complies with the requirements of the energy-saving directives

- **Fasteners for the DuoPlus rail:**

SFS MBRK-X-S4-H18-10x80 and

SFS MBR-X-S4-HX-10x160

Pilot drill diameter 10 mm

The shorter length of the dowel is designed for thermal insulation having a thickness of 20 mm.

(or equivalent dowel with permissible $F_z \geq 1.2$ kN).

- **Installation:**

Maximum dowel spacing 50 cm.

The fasteners should be arranged in a staggered manner in the rail holes. The rails should be orientated at a right angle to the Kalzip ribs. The rail spacing is given by the structural calculation.

Individual verification is required for other specifications.

If the rail is to act as a single-span support, then it must be no longer than 40 cm.

(In the case of Kalzip Duo 100 roofs, the spaces between the 24 cm wide strips should be filled with insulating felt.)

- **Rockwool insulating felt in accordance with DIN EN 13162**

Euro Class A1 – non-combustible

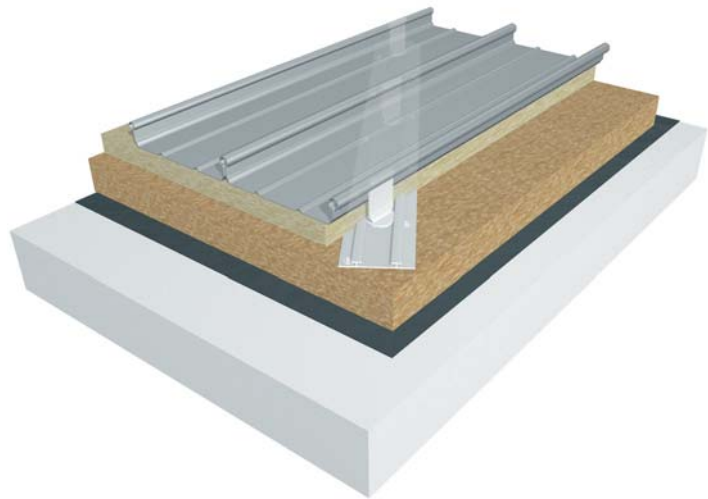
Application type: WL in accordance with DIN 18165

Thermal conductivity group 040

Thickness complies with the requirements of the energy-saving directives

- **Kalzip aluminium profiled sheets**

Kalzip Duo 100 or Kalzip DuoPlus 100 on aerated concrete



- **Design on 10 cm rigid thermal insulation or direct on concrete \geq B 15 inner deck.**
- **Vapour control barrier**
- **High-density thermal insulation with a highly compressed surface in accordance with DIN EN 13162**
Euro Class A1 – non-combustible
Application type: WD in accordance with DIN 18165
Thermal conductivity group (WLG) 040
Compressive strength: $\sigma_{10} \geq 70$ kN/m²
Thickness: 100 mm
Kalzip Duo 100 – installed in 24 cm wide strips
Kalzip DuoPlus 100 – installed as a full layer
Avoid contact corrosion when fixing directly onto aerated concrete.
- **DuoPlus rail**
Hole diameter 10.5 mm
- **DuoPlus clip**
Clip type complies with the requirements of the energy-saving directives
- **Fasteners for the DuoPlus rail**
SFS MB-S4-HX-10x120 and
SFS MB-S4-HX-10x200
Pilot drill diameter 9 mm
The shorter length of the dowels is designed for thermal insulation having a thickness of 20 mm.
(or equivalent plug with permissible $F_z \geq 0.5$ kN, building authority approved, stainless steel screw)
- **Installation**
Maximum plug spacing 50 cm. The screws should be arranged in the rail holes in a staggered manner. The rails should be orientated at a right angle or at least an angle of 45° to both the Kalzip ribs and the aerated concrete slabs. The rail spacings correspond to the load carrying capacity of the Kalzip profiled sheets. The number of plugs used should be doubled in the edge and corner areas of the roof. If the rail is to act as a single-span support (e.g. fitting piece at the end of a row), then it must be no longer than 40 cm.
- **Special features**
The anchor has 4 wings which act as a locking element and these protrude by approx. 1 mm. The expanding bolt is larger than the hole in the DuoPlus rail therefore the bolt should be attached to the rail assembly and then placed into the pre-drilled hole for tightening – the locking element is partially abraded (common practice, also works with DuoPlus rail).

(In the case of Kalzip Duo 100 roofs, the areas between the 24 cm wide strips should be filled with insulating quilt.)
- **Rockwool insulating felt in accordance with DIN EN 13162**
Euro Class A1 – non-combustible
Application type: WL in accordance with DIN 18165
Thermal conductivity group 040
Thickness complies with the requirements of the energy-saving directives
- **Kalzip aluminium profiled sheets**

Ridge, eaves, gable end

Boards or alternatively edge profiles should be installed between the fixed point clip and the substructure (illustration shows steel trapezoidal profile and fixed point in ridge) to transmit the transverse loads of the roof into the substructure. To fasten boards with a thickness of up to 60 mm onto steel plates with a thickness of up to 1.25 mm, we recommend using the SFS intec SD2/60-S-6.0 x 84 connecting element. For other specifications please refer to the technical requirements outlined in the Kalzip Handbook for Technical Planning and Construction.

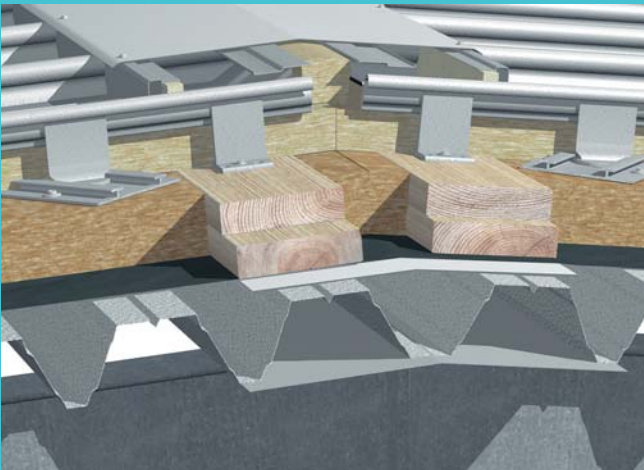
Fixed point on roof ridge

The fixed point is required for static reasons and is the point on each Kalzip sheet where no length change is experienced and the horizontal load is diverted into the substructure. Unless stated in the installation plan, each Kalzip sheet should be secured at the fixed point against displacement. Each Kalzip sheet must only have one fixed point (see Kalzip Handbook for Technical Planning and Construction).

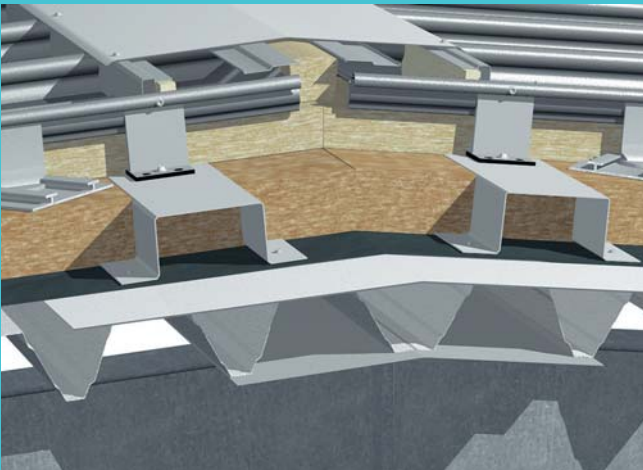
Structural analysis and installation

The structural calculation and the necessary installation planning are carried out by the Application Technology Department in Koblenz on an individual basis with regard to each particular project.

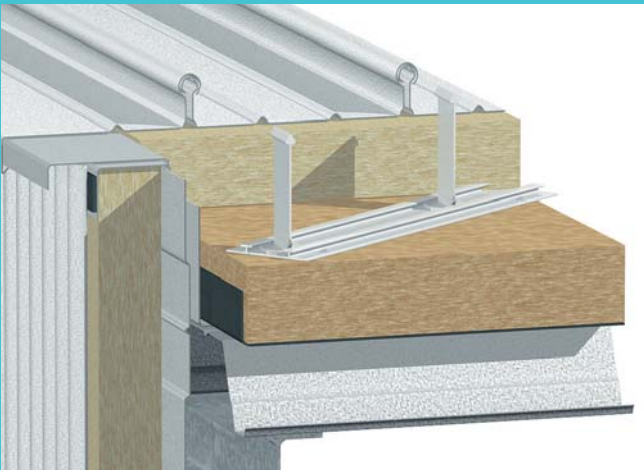
Ridge with timber spacer



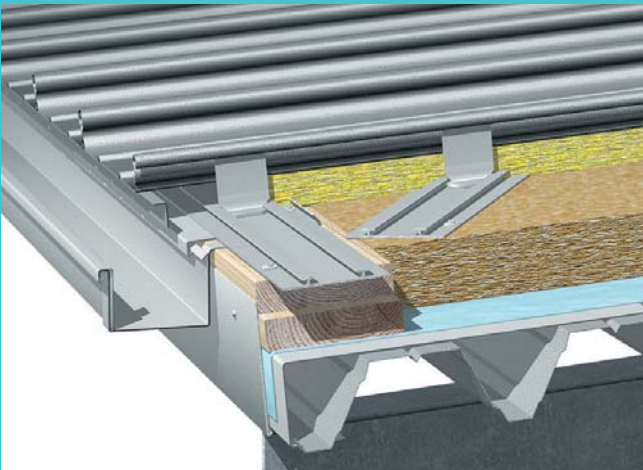
Ridge with top hat spacer



Verge detail



Eaves detail



Kalzip ProDach

Functionality and design

below right: Sport athletics hall
Bayer Leverkusen **Leverkusen (D)**
Architect: D. Moors

Combining the innovative expertise of two major brands

The use of Kalzip AF profiled sheets in conjunction with a load-transmitting layer of insulation simplifies the installation procedure to a considerable extent.

With the “ProDach” insulating system, Rockwool offers a rigid, waterrepellent rockwool insulation board with a special fixing system.

The insulation board provides an ideal base for Kalzip AF profiled sheets.

It is non-combustible, offers very efficient thermal insulation and sound absorption properties, it is dimensionally stable and dampens vibration, and is vapour-permeable. The top layer of the double-layer “Prorock” insulation board is extremely strong and resistant to mechanical stress.

Its high load transmitting capabilities contribute considerably to the static function of the roofing. Kalzip AF profiled sheets without stiffening ribs have been specially developed for rigid bases. Kalzip AF roof system creates a discreet surface finish which is the epitome of subtle elegance.

With Kalzip AF aluminium profiled sheets, even smaller buildings can enjoy a perfectly proportioned and stylishly designed roof covering.

ProDach provides a complete roofing solution which is not only high quality and energy-efficient, but also visually stunning.

The product advantages

- Low intrinsic weight – therefore highly suitable for the renovation of old roofs.
- Vapour-permeable insulation. Water vapour diffusion resistance coefficient μ 1.4
- The roof structure can be precisely adapted to the requirements of the building by means of insulating

boards with thicknesses of up to 220 mm. Calculated value for thermal conductivity $\lambda_D = 0.040 \text{ W/(mK)}$.

- Outstanding sound insulating properties due to the open-pored structure of the insulating material. Sound insulating values of 38 to 42 dB can be easily achieved with this roof system.

Areas of use Kalzip ProDach

Kalzip ProDach is suitable for all common types of substructures or supporting structures in steel, concrete and timber, for all structural engineering applications and for the renovation of old roofs.

The static design can be precisely adapted to suit the specific requirements of the building by means of the quantity and alignment of the fixing points.

Suction loads are safely transferred onto the supporting structure by means of the Kalzip fixing clips. Special system fixings are available for all types of substructures. The Prorock insulation board offers a high level of “walkability” during installation and maintenance.



Outstanding thermal as well as acoustic properties

Installation

The corrosion-proof and weather resistant Kalzip AF aluminium external skin is fixed with clips in the usual way. However, the special feature of the ProDach insulation system is that rather than being fixed directly to the substructure, the skin is fixed instead to special corrosion-proof steel U-rails embedded in the insulation material. The stainless steel system fasteners connecting the U-rails to the substructure of the roof penetrate

the insulation material only locally. This offers outstanding benefits in terms of acoustic and thermal insulation.

Service

The ProDach insulation system service package includes computer-assisted preparation of installation plans, static evidence and the calculation of dimensions for the planned project. The costings procedure and preparation of the quotation are significantly simplified.

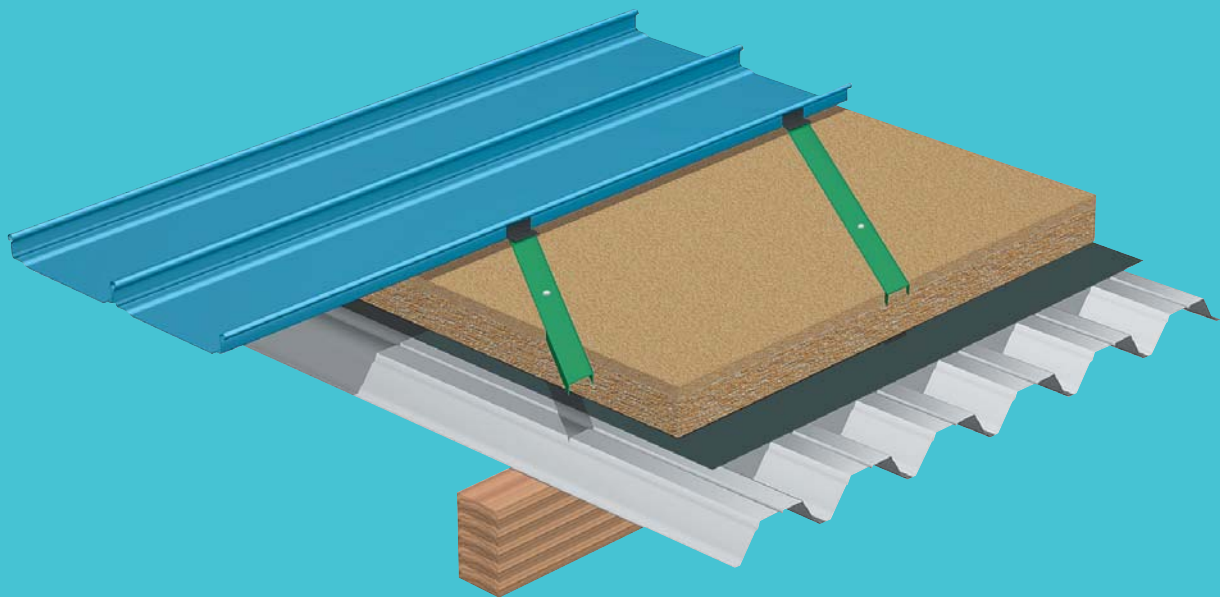
What's more, a high level of constructional quality is guaranteed and all energy-efficiency benefits are achieved to their full potential.

We keep a planning sheet for recording characteristic data. Why not contact us before you make your decision. We would be delighted to discuss any plans you may have. What's more, our team of specialist advisors is available to offer you their support - right from the initial planning phase.

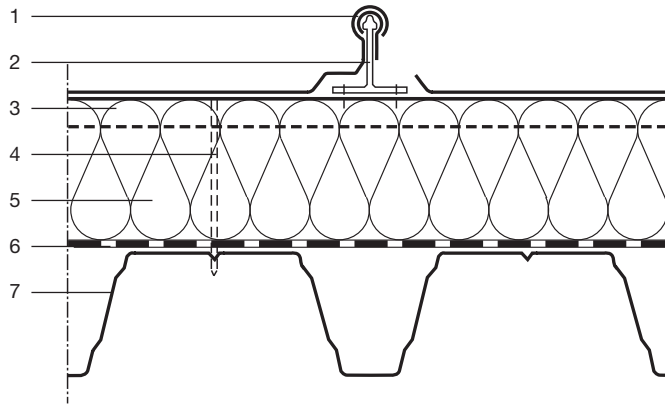


left: clips installed on the fixing rails
right: expanding rivets are used to fix the rails in position

Kalzip ProDach as a truss roof structure

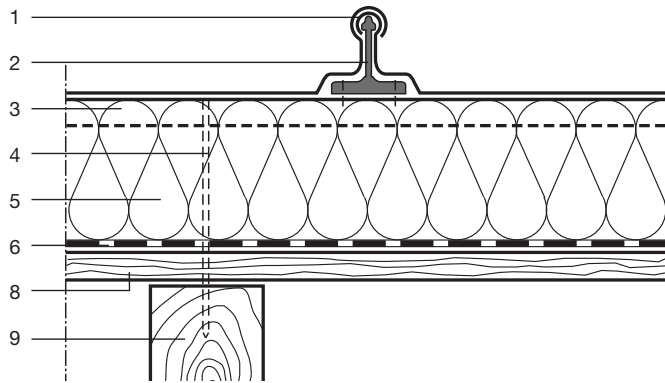


Kalzip ProDach on a trapezoidal steel decking system as substructure

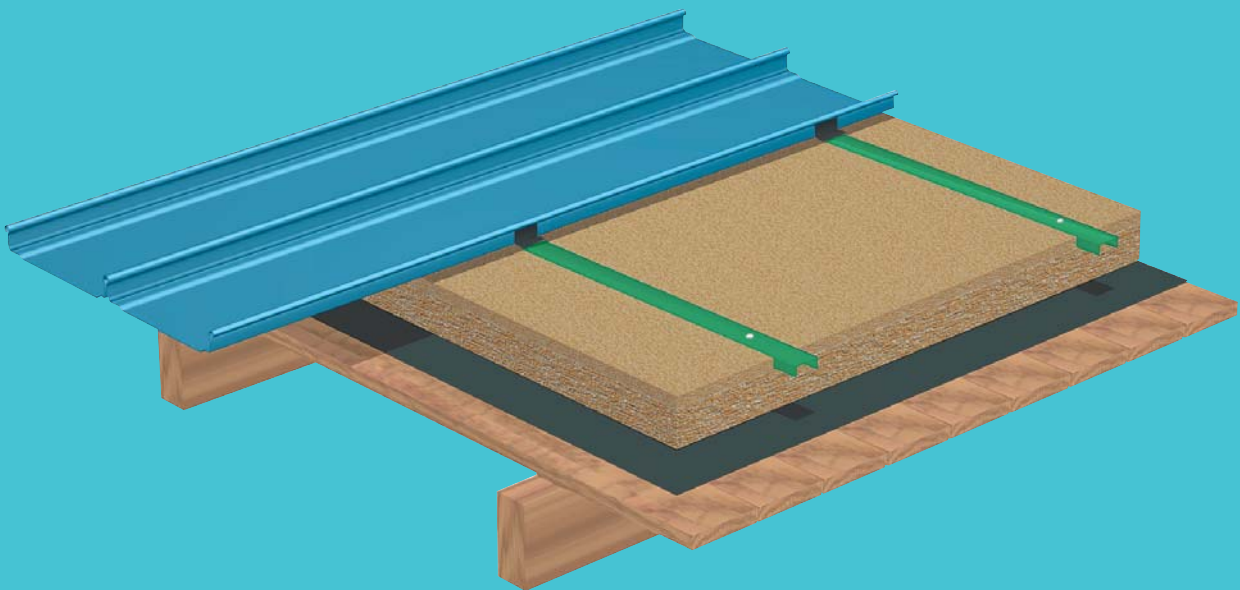


Kalzip ProDach on timber rafters with timber lining

- 1 Kalzip AF profiled sheet
- 2 Kalzip E-clip 5
- 3 Aluminium fixing rail
- 4 System fixings, depending on substructure
- 5 Prorock insulation board (rigid)
- 6 Vapour control barrier and air-lock layer
- 7 Structural steel decking system
- 8 Timber lining
- 9 Rafter



Kalzip ProDach as rafter roof structure



Kalzip NatureRoof

A safe and
durable green
roof system
with important
environmental
benefits.

right: Panoramique apartment complex **Almere (NL)**
Architect: Architecten Cie Amsterdam

Technology and design, hand in hand with nature.

There is nothing to compare with the fascinating wonders of nature. In this day and age, the preservation of our natural environment has become more important than ever before. Kalzip offers a perfectly balanced and complete solution – it not only enhances the aesthetic appeal of a building, but also provides important environmental benefits.

The Kalzip NatureRoof meets high environmental, technical and design requirements. This lightweight roofing system improves thermal insulation and is kind on resources – essential features for intelligent and environmentally-friendly architecture.

The Kalzip NatureRoof provides extensive greening and is low-maintenance. This roofing system successfully combines environmental benefits with stunning architectural design. The NatureRoof provides almost total plant cover – a natural carpet of colours which changes with the seasons.

Low-growing, self-regenerating, drought-resistant sedum plants transform dreary roofscapes into an oasis of colour. Sedums are extremely hardy, they can withstand smoke and exhaust fumes and are resistant to both frost and wind.

The product advantages of Kalzip NatureRoof

- The NatureRoof is constructed directly onto the Kalzip profile panels without the need for additional sealing work.
- The aluminium surface offers lasting protection against rooting and moisture penetration.
- The complete modular package features a highly economical, modular design, guaranteeing quick and easy installation.
- NatureRoof offers the same level of planning security, ease of handling and recognised performance characteristics as you would expect from the Kalzip building system.
- Anti-slip devices ensure that even sloping or curved roofs can be landscaped.
- The roof still acts as a lightning conductor.
- All components are environmentally friendly and can be recycled.
- Uniform planning – even if only sections of a roof are to be landscaped.
- Kalzip can be easily converted into a NatureRoof, by taking into account the static requirements.
- When the greenery has been removed, Kalzip makes an excellent, attractive roof covering.
- The Kalzip aluminium profiles offer a high level of protection against mechanical damage of the roof during installation of the NatureRoof components.
- Kalzip is resistant to flying sparks and radiant heat. These properties are maintained if the corresponding installation requirements and local construction regulations are followed.

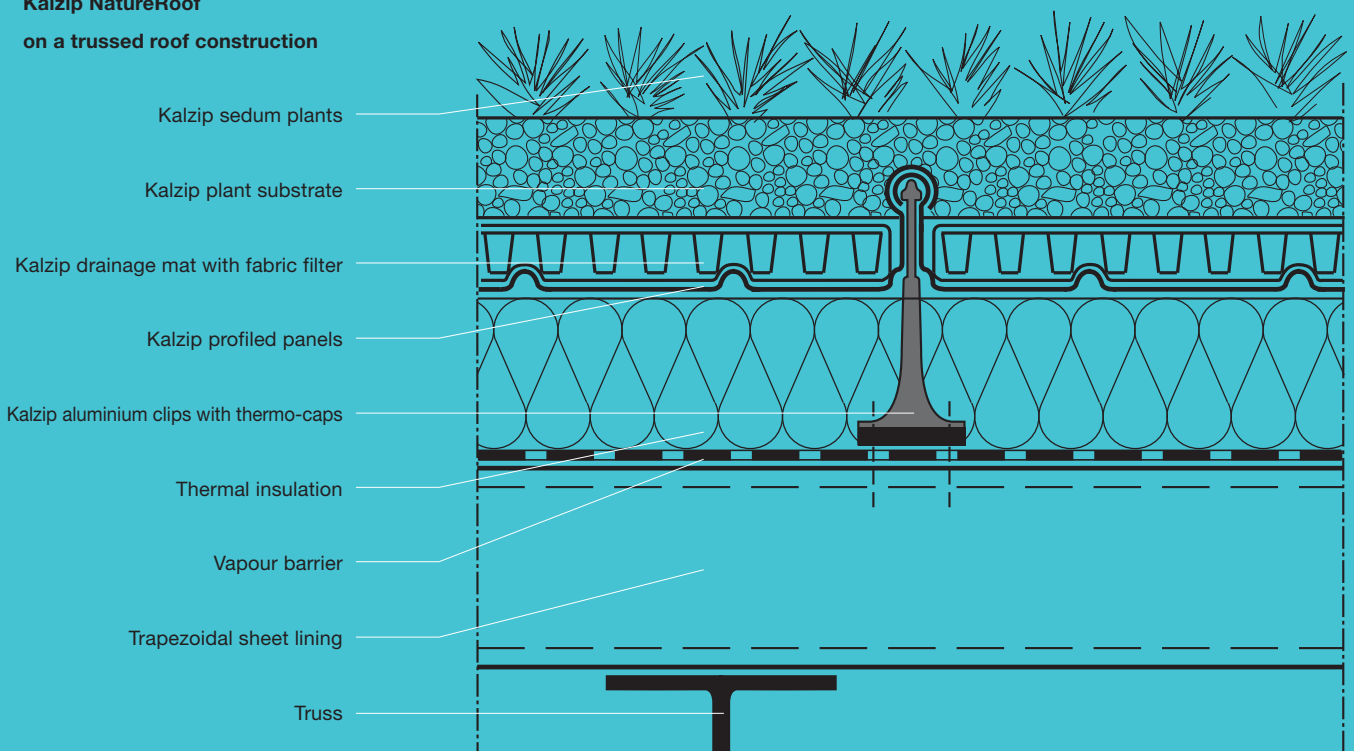


The Kalzip NatureRoof is unique both in terms of its construction and design

The additional features of the Kalzip NatureRoof are certainly impressive:

- Significant reduction in the load placed on the drainage system and time delayed release of excess rainwater into the local and domestic drainage systems.
- Reduced load placed on the drainage culverts, storage tanks, sewage plants and rivers.
- Considerable reduction in waste water and sewage costs.
- Approximately 50% of the rainwater is stored.
- Approximately 30 % of the rainwater retained by Kalzip NatureRoof is returned to the natural cycle by evaporation.
- Improved oxygen levels, improved microclimate and air humidity in the area surrounding the building.
- Absorption of dust and pollution such as CO₂.
- Thermal and mechanical protection against the effects of temperature, weather and radiation.
- Improvement of sound insulation, internal and external noise is reduced.
- Improved thermal insulation and room climate throughout the year.
- Temperature peaks are levelled out and temperature variations caused by temperature fluctuations are reduced.
- Creates a more attractive and comfortable place in which to live and work.
- Reduced temperature-related deformation processes which affect components.
- Increases the value of the building.
- Provides an ecological balance in the face of increasing urbanisation.

Kalzip NatureRoof on a trussed roof construction



Green roofs provide both economic and environmental benefits.

Environmentally conscious towns and authorities are offering financial incentives for creating “green” roofs. They are granting significant discounts on the tax rates for surface water and rain water drainage. Roof landscaping is being increasingly regarded as a balancing measure for nature conservation in building plans. The roofs of industrial buildings, sports halls, etc. are ideally suited to the Kalzip NatureRoof.

The water retention effect is particularly impressive in the case of flat roofs. The creation of landscaped roofs provides lasting enrichment for plants, animals and humans alike.

The Kalzip NatureRoof provides a valuable contribution to rainwater management and to the improvement of air quality.

Depending on the design and pitch of the roof, up to 50% of the rainfall can be stored in the system. Studies carried out at the “Schule für Technik und Architektur” in Bonn, Germany, proved that extensive roof greenery can return 33% of the rainwater back into natural rainwater cycle through absorption, transpiration and evaporation.

Renaturalisation provides a balance to urbanisation and plays an impor-

tant role in the preservation of our environment and in the improvement of our living conditions. The typical city climate – low air humidity, high dust levels, pollution and overheating – can be effectively improved by the creation of green roofing systems.

Reduction of pollutants through extensive greenery.

Cd	Zn	Cu	Pb	N
96%	16%	99%	99%	97%

Pollutants in the air, in undissolved and particle form, such as acid rain and soot, are greatly reduced by the filtering effect in the root area of the Nature Roof structure.



- Kalzip sedum plants. Low-growing, self-regenerating, resistant to drought and frost
- Kalzip planting substrate. Quality controlled natural soil with official test certificate (German FFL)
- Kalzip drainage mat with an integral woven fabric filter supplied in rolls
- Kalzip 65/333 – the aluminium panel is completely resistant to moisture and root penetration
- The thermal insulation can be perfectly adapted to the individual requirements of each and every building or climate
- Vapour control layer provides lasting protection against moisture from above and below.
- The trapezoidal profile provides a stable and lightweight superstructure for trussed and purlin roofs. Wooden lining is also possible.

The Kalzip NatureRoof provides extensive greenery with minimum installation work and minimum maintenance.

The components of the Kalzip NatureRoof are delivered to the construction site as a separate unit. The functional layers are designed to form an interactive system. They combine to make a unit which corresponds with DIN 4095, along with the roof landscaping guidelines specified by the FLL (Forschungsgesellschaft Landschaftsentwicklung, Landschaftsbau – i.e. the German research association for land development and landscaping).

A roof which is extensively planted with thinly layered sedum is extremely lightweight and requires minimal installation and maintenance work, making it ideal for all types of roofs and all sizes of buildings.

The Kalzip drainage mat has a filter web covering and is supplied in handy rolls. The width corresponds with the Kalzip 65/333 aluminium profile panels. Each strip is 30.5 m in length. The linear drainage system, which corresponds to DIN 4095, has drainage holes and water storage cavities. It is made of expanded polystyrene and is biologically neutral, resistant to weathering and recyclable. The Kalzip drainage mat absorbs water, carries away excess water and provides additional aeration of the planting bed. The water storage cavities retain up to 3.2 litres of rainwater per m². This serves as a source of nutrition for the plants and a valuable evaporation reservoir for the natural cycle.

The filter web prevents finer particles of soil and substrate from draining out of the vegetation layer and blocking the system.

Kalzip planting substrate is a quality assured, natural product with test certification. Kalzip planting substrate is supplied in the form of pumice and lava. It has a pH value which is well suited to the aluminium base material. It is placed onto the drainage mat. Due to settlement, once planted, the layer thickness will reduce to 6 cm (15-20% compaction is taken into consideration).

The Kalzip sedum planting consists of a mixture of low-growing mosses, succulents and herbs.



The Kalzip NatureRoof package and its components. Planning data.

Kalzip profiled aluminium sheets 65/333

Thickness: 1.0 mm
Surface weight: approx. 4.0 kg/m²

Kalzip NatureRoof design

Surface load: approx. 90 kg/m² when saturated with water
Drainage coefficient for roof slopes up to 5 %: $\Psi = 0.5$
Drainage rate at a precipitation of 0.03 l/sec/m² and a pitch of 3 %: 2.41 l/sec/m²

Kalzip KD 33

Linear drainage system

Width : 30 cm
Thickness: approx. 2.5 cm
Surface load: 4.5 kg/m²

Drainage mat

Expanded polystyrene with a compressive strength of 383 kN/m²
Drainage capacity: 4 l/sec/m²
Water retention: 3.2 l/m²

Woven filter

Polypropylene woven staple fibres
Puncturing force (CBR test): 1400 N
Pore opening width (Dw): 0.14 mm

Kalzip NDS 60

NatureRoof substrate, pH = 5-7

Lava and pumice stones
Thickness: 6 cm
Surface load: approx. 75 kg/m²

Loose material delivered by truck or bulk goods vehicle. One load is sufficient to cover 380m², a large bag containing 1,000 litres covers 14 m².

Kalzip sedum flat ball plants

Nine common types of plants/varieties depending on the season.
Each bag contains 50 plants per tray.

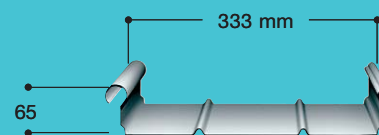
Kalzip sedum seedlings

5-7 common plant types/varieties, depending on the season.
Each bag contains 2-10 kg.

Kalzip Nerotec 60

Erosion protection adhesive

(to be used in combination with seedlings) in sacks containing 60 litres
1 bag covers 25 m² which is equivalent to 0.4 kg/m².



Kalzip profiled aluminium sheets 65/333



Kalzip KD 33 linear drainage system



Kalzip NDS 60 NatureRoof substrate



Sedum acre
Biting Stonecrop
5 cm high, in blossom: June to August



Sedum album
Coral carpet
5 cm high, in blossom: June to August



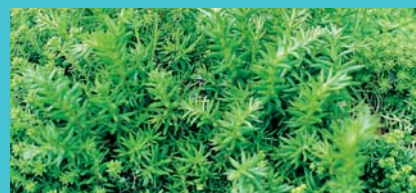
Sedum floriferum
'Weihenstephaner Gold'
15 cm high, in blossom: June to August



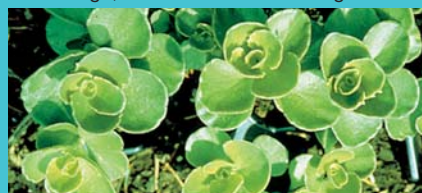
Sedum hybridum
Evergreen stonecrop
10 cm high, in blossom: June to August



Sedum reflexum
Tripmadam, reflexed stonecrop
15 cm high, in blossom: June to August



Sedum reflexum Subspecies rupestre
Blue spruce stonecrop
10 cm high, in blossom: June to August



Sedum spurium
'Album superbum'
10 cm high, in blossom: July to August



Sedum spurium
'Fulda glow'
10 cm high, in blossom: July to August



Sedum sexangulare
'Mild wallpepper'
5 cm high, in blossom: June to August

Components and accessories

Intelligent and technically refined

Perfectly matched system components and ingenious accessories provide the ideal complement to Kalzip's unlimited design potential.

The materials are manufactured according to the strictest technical

standards with regard to long-life, easy handling, safe installation and recyclability.

Components and accessories feature the renowned and outstanding quality of Kalzip products – perfect and reliable right through to the very

last detail. And, of course, these products comply with the current regulations relating to the thermal insulation of building envelopes, the required fire protection class and the relevant European norms.



Kalzip vapour barrier

The Kalzip vapour barrier is a cold-bond, self-adhesive, elastomeric bitumen vapour barrier strip with an alkaline resistant aluminium combination inlay. Production method and self-monitoring by the manufacturer are certified according to EN ISO 9001.

Product Advantages

- Self-adhesive
- Clean and quick to install
- Rigid
- Vapour-tight and air-tight

Areas of application

It is recommended that the Kalzip vapour barrier is used as a vapour barrier strip on steel trapezoidal sheets in accordance with the local directives and standards.

Method of installation

Following removal of the separating foil on the underside, the self-adhesive Kalzip vapour barrier is cold-bonded to the base with an 8 cm seam and joint overlap. The seam overlap should be cold-bonded under pressure to the top flange of the steel section.

Installation instructions

To achieve correct adhesion, the surfaces which are to be bonded must be dry, dustfree and clean. Steel trapezoidal sheets must be either plastic coated or pre-coated. The Kalzip vapour barrier should only be installed in the following temperature conditions:

- Ambient air temperature: min. 5 °C
- Temperature of substructure: min 5 °C
- Material temperature of vapour barrier: min. 5 °C.
- Installation is possible at < 5 °C by prewarming the substructure or vapour barrier.

Storage instructions

The Kalzip vapour barrier must be protected against heat and moisture during storage. In the cold season, the rolls should only be taken out of the frost-protected intermediate storage location and transported to the installation site just before the installation work is carried out. The vapour barrier can be installed up to 1 year after production.

Technical Data

Thickness	[mm]	approx. 1.20
Weight	[kg/m ²]	approx. 1.20
Dimensions	[m]	approx. 1.00 x 25.00
Roll weight	[kg]	approx. 29
Underside	cold-bond, self-adhesive, elastomeric bitumen with tear-off separating foil	
Upper side	rigid, alkaline resistant aluminium combination inlay	
Behaviour in fire		B2
Heat resistance	[°C]	up to + 100
Cold bending behaviour	[°C]	up to - 30
Vapour lock value $s_{d,e} = \mu \times s$	[m]	> 1500
Maximum tensile strength	N/5 cm	400 / 400
Elongation at maximum tensile strength	[%]	2 / 2

Tested in accordance with DIN 52123

Unless otherwise stated, the numerical values are nominal values which correspond to the mean values of statistical quality control. All information contained in this publication is provided to the best of our knowledge and is based on our experience and studies. However, this cannot be regarded as a guarantee. We reserve the right to make any changes which we feel are necessary in terms of progress and manufacturing technology.

Kalzip H vapour barrier

The Kalzip H vapour barrier is a cold-bond, self-adhesive, elastomeric bitumen vapour barrier strip which is highly resistant to nail perforation. Production and self-monitoring are certified in accordance with EN ISO 9001.

Product Advantages

- Particularly resistant to nail perforation
- Clean and quick to install
- Cold-bond, self-adhesive seams with tear-off strip on underside
- Vapour-tight and airtight
- Ideal vapour barrier for subsequent installation of the Kalzip roof

Areas of use

It is recommended that the Kalzip H vapour barrier is nailed onto timber boarding in accordance with the local directives and standards.

Method of installation

The Kalzip H vapour barrier is securely fixed onto timber boarding by means of concealed nails in the overlap. Following removal of the separating foil along the perforated line on the longitudinal seam on the underside, the vapour barrier is firmly cold-bonded to the base with an 8-cm seam overlap. The joint overlap is also securely cold-bonded under pressure following removal of the protective foil on the underside. The protective foil outside the longitudinal and cross seam remains as a separating layer to the timber boarding under the vapour barrier strip.

Installation instructions

The Kalzip vapour barrier should only be installed in the following temperatures conditions:

- Air temperature: min. 5 °C
- Temperature of substructure: min. 5 °C
- Material temperature of the Kalzip vapour barrier: min. 5 °C
- Installation is possible at < 5 °C by prewarming the substructure or vapour barrier.



Technical data and characteristics according to DIN EN 13970, section

Thickness	DIN EN 1849-1	[mm]	1.2
Weight	-	[kg/m ²]	ca. 1.2
Dimensions	DIN EN 1848-1	[m]	1.00 x 25.00
Underside	cold-bond self-adhesive elastomer bitumen, covered with a removable film and longitudinal edge perforation		
Upper side	alkaline resistant aluminium combination, non-glare installation		
Visible defects	DIN EN 1850-1	-	no defects
Straightness	DIN EN 1848-1	[mm/10m]	≤ 20 fulfilled
Water tightness	DIN EN 1928	[kPa]	≥ 200 (24 hours)
Resistance to impulsive loads	DIN EN 12691	[mm ø]	20 at h = 300 mm
Artificial aging under constant load due to increased temperature	DIN EN 1296 -> DIN EN 1931	[°C]	12 weeks $s_d = \mu \times s \geq 1500$ m
Water vapour resistance			
Durability 12 weeks	DIN EN 1847 ->	-	12 weeks
Chemicals	DIN EN 1931		KLF*
Cold bending behaviour	DIN EN 1109	[°C]	≤ - 30
Tear propagation resistance lengthwise/crosswise	DIN EN 12310-1	[N]	80/100
Shear resistance of the groove welds	DIN EN 12317-1	[N/50 mm]	340
Water vapour permeability	DIN EN 1931	-	$s_d = \mu \times s \geq 1500$ m
Tensile behaviour: max. tensile force lengthwise/crosswise	DIN EN 12311-1	[N/50 mm]	400/400
Tensile behaviour: elongatio lengthwise/crosswise	DIN EN 12311-1	[%]	2/2
Fire behaviour	EN ISO 11925-2 EN 13501-1	-	Class E

* no performance determine

The numerical values are nominal values, which are subject to statistical fluctuations. Subject to technical changes. It is the user's duty to judge the suitability of the product for the specific building and to ensure that he has the valid version of the data sheet. All information are given to the best of our knowledge. However no warranty claim can be made on this basis.

Dated: January 2008

Kalzip E clip – the thermal-bridge-optimised hybrid system fastener for Kalzip profiled sheets for achieving roof superstructures conforming to EnEV 2009

Within the context of the amendment of the German energy saving regulations (EnEV 2009), the energetic requirements of external structural components are an important component of the new energy saving regulations for improving the sustainable energy efficiency of buildings in the context of economic viability and in accordance with the state of the art. The new Kalzip E clip for the attachment of Kalzip aluminium profiled sheets complies with this demand in an exemplary manner, avoids thermal bridges (see diagram) and enables a roof superstructure to be achieved whose heat transfer is determined exclusively by the thermal insulation.

All characteristics and functions relating to the load carrying capacity and attachment to structure or decking are fulfilled and are documented in the approval granted by the state construction supervisors. The clip has a glass-fibre reinforced PA structure which is reinforced with a steel core.

Product Advantages

- Minimal heat transfer means that the roof design is free from thermal bridges
- Complies with European heating requirements
- The new clip has excellent properties to facilitate thermal movement which is particularly important in the case of very long sheet lengths
- Fully tested & proven for long life durable performance
- Guaranteed durability, can withstand UV rays, long-term loads, temperature fluctuations, etc
- Quickly and simply installed using the tried and tested SFS SDK fastener system
- Safe load transmission from Kalzip to the substructure

Areas of use

The Kalzip compound clip is suitable for connecting all Kalzip roof and wall installations and can be used wherever the requirements of the heating standards need to be fulfilled.



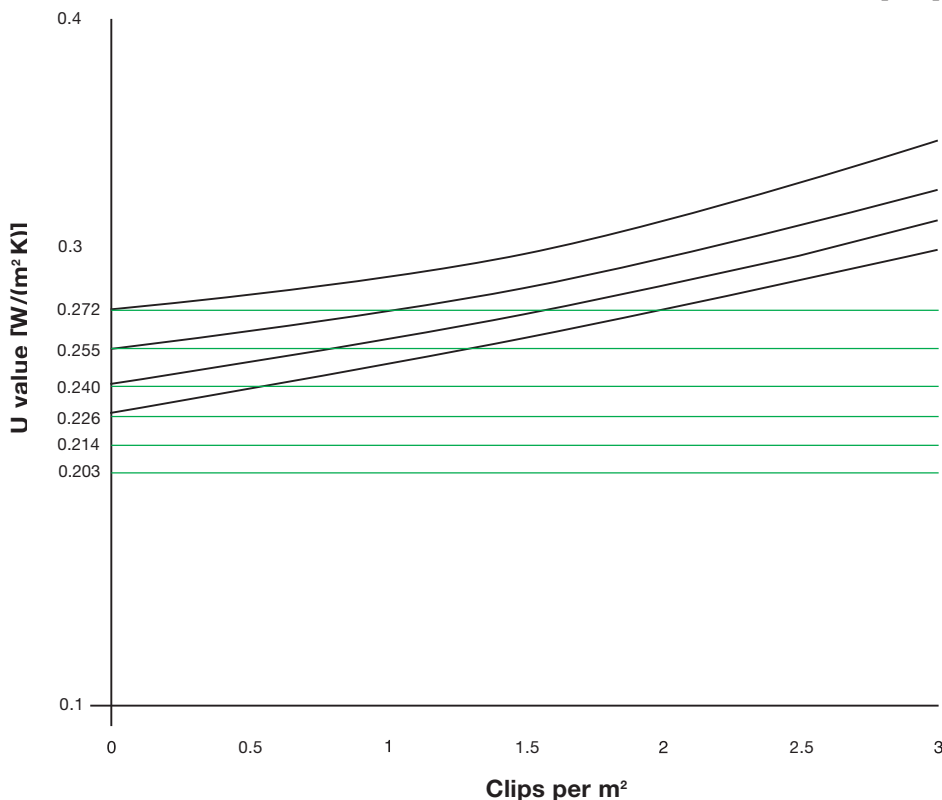
Technical data

E clip type	in combination with spacer cap (DK)	E clip height (mm)
E 5	-	66
E 20	-	81
	E 20 + DK 10	91
E 40	-	101
	E 40 + DK 10	111
E 60	-	121
	E 60 + DK 10	131
E 80	-	141
	E 80 + DK 10	151
E 100	-	161
	E 100 + DK 10	171
E 120	-	181
	E 120 + DK 10	191
E 140	-	201
	E 140 + DK 10	211
E 160	-	221
	E 160 + DK 10	231
E 180	-	241

thickness of insulation [mm]

thermal conductivity coefficients $\lambda \leq 0.040$ [W/(m · K)]

Heat transfer coefficients Kalzip clips



WD Thickness [mm]



- 140
- 150
- 160
- 170
- Kalzip E 140 with WD = 140 mm**
- Kalzip E 140 + DK 10 mit WD = 150 mm**
- Kalzip E 160 with WD = 160 mm**
- Kalzip E 160 + DK 10 with WD = 170 mm**
- Kalzip E 180 with WD = 180 mm**
- Kalzip E 180 + DK 10 with WD = 190 mm**

Note: It is clearly apparent that when Kalzip compound clips are used, the U values are not dependent on the number of clips. The heat transfer is related to the thickness of the heat insulation.

Materials

Plastic structure: polyamide 6 GF 30
 Core: galvanized steel

Installation instructions

The Kalzip compound clip is attached to the roof substructure using the tried and tested SFS fastener system in accordance with Kalzip recommendations.

Examination of the load bearing capacity

The resistance to mechanical and chemical short and long-term loads has been examined by the SKZ Süddeutsche Kunststoff-Zentrum/Würzburg. Test report No. 51246/02

Certification

Supplement to the Kalzip certificate, No. Z-14, 1-181.

Patent

Application no. EP-1 236 840 B1

Kalzip Aquasine

Anticondensation coating for aluminium profiles

Kalzip Aquasine is a relatively non-flammable, chemical-free anticondensation fabric made from polyester fibres, which absorbs condensation on the underside of the Kalzip profiled sheets, stores it and directs it outwards in a controlled manner. It is particularly suitable for ventilated roofs. Condensation is effectively prevented from dripping down onto the structure below.

The anticondensation coating has a fleece-like, light grey upper surface structure and depending on the specific project requirements is applied in the factory on the underside of the profiled sheets.

The fleece is not susceptible to fungal attack in accordance with DIN EN 14119:2003-12 "Testing of textiles: evaluation of the action of microscopic fungi (microfungi)". This means that fungal growth corresponds with the rating 0 of the rating scheme "no growth visible...".

Product advantages

Kalzip Aquasine absorbs condensation water on the underside of ventilated roofs in order to prevent it dripping down onto the structure below. Kalzip Aquasine has a sound-absorbing effect – this means less noise from rain and hail. Kalzip Aquasine is not susceptible to fungal attack.

Use

Can be used with all metal roof structures where there is an increased risk of condensation.

Installation instructions

The capillary action of the anticondensation layer should be deactivated on-site at the profile ends before attaching fitting the eaves drip angle. We recommend Duplicolor Prisma 7001, clear acrylic enamel (expanded polystyrene-proof), available from building merchants. Drying time approx. 15 min.

Technical data

Thickness	approx. 1.0 mm
Weight	110 g/m ²
Colour	grey-beige (other colours on request)
Water absorption properties	700 - 900 g/m ²
Thermal stability	between -30 °C and +90 °C
Building materials class in accordance with DIN 4102	B1
Base	stucco design, plain rolled, colour coated, enamel protection on reverse side
Profile cross sections available bis 1.0 mm	Kalzip: 50/333, 50/429, 65/305, 65/333, 65/400, AF 65/333, AF 65/434, AS 65/422 Kalzip trapezoidal and corrugated profiles: W 18/76, 30/167, 35/200, 40/185, 50/167 (Fleece on wall side)

Condensation

Depending on the room temperature, the ambient air in a room can only absorb a specific amount of water vapour. The higher the temperature, the greater the maximum amount of water vapour that could exist in the air.

For example, at 20 °C the air contains a maximum of 17.3 g/m³ water and at 10 °C only 9.4 g/m³.

In most cases, the air contains a lower level of water vapour than the maximum level possible. The amount of water in the air, relative to the amount which the air can hold, is called relative humidity. We use the concept of relative humidity φ (phi) to determine the water content in air. Relative humidity is expressed as a percentage. Relative air humidity φ is calculated from the amount of water vapour in the air W (g/m³), divided by the maximum amount of water vapour that could exist in the air, the amount absorbed at saturation W_s [g/m³].

$$\varphi = \frac{W}{W_s} \times 100.$$

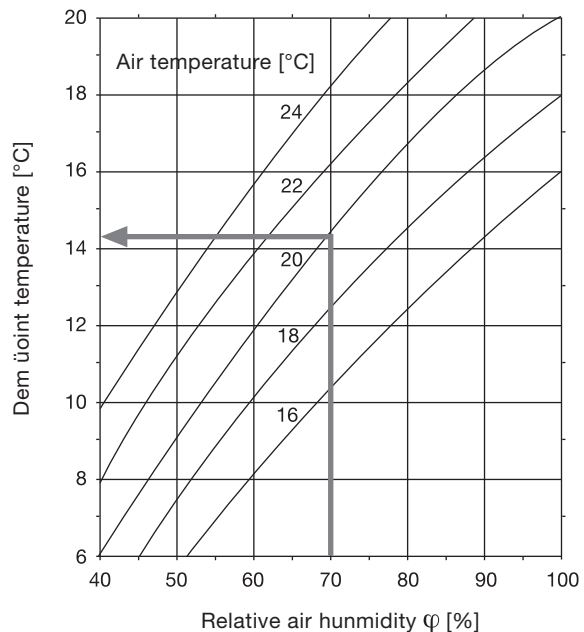
Air which is saturated with water vapour therefore has a relative humidity of 100%.

When moist air is warmed, and the water vapour content in g/m³ remains the same, the relative air humidity drops, as the amount absorbed at saturation W_s rises. In the reverse situation, i.e. when moist air cools down, the relative air humidity will therefore rise. If the room temperature is cooled to the point where the relative humidity has reached 100%, the air can no longer hold the water content in the form of vapour and some of the moisture will condense as "dew".

The temperature at which water vapour turns into condensation water is called the dew point temperature or dew point. If moist air comes into contact with a surface at or below its dew-point temperature, condensation will occur on that surface. The dew point temperature is calculated from the respective air temperature and the relative air humidity (see diagram).

Dew point temperature dependent on the relative air humidity and air temperature

Example: relative air humidity of 70% at an air temperature of 20 °C will give a dew point temperature of approx. 14.2 °C. This means that dew will form when the underside of the profile sheet has a temperature of ≤ 14.2 °C.



Kalzip treads and continuous walkways for sloping roofs

The Product

Kalzip aluminium continuous access grids have been specially developed to provide safe and regular access to sloping Kalzip roofs. They should be used in all situations where recurrent maintenance work is required, e.g. on building installations such as chimneys, skylights, heating and solar systems.

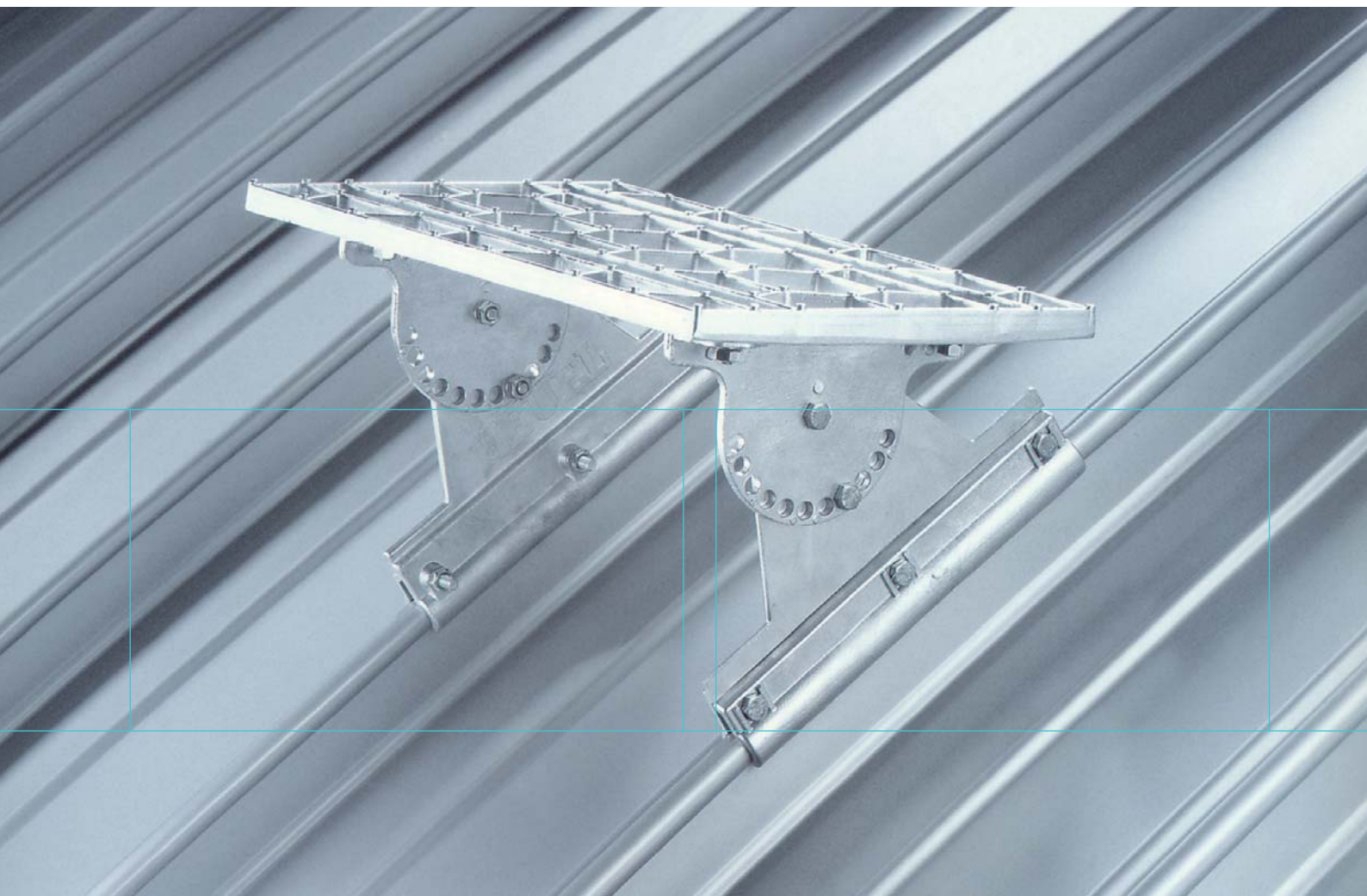
In addition to the grid mounting brackets, the system consists of a short step, a standing step and a continuous access grid. These grids are securely attached and are fully adaptable to suit any roof angle up to a maximum of 45° by means of semicircular mounting brackets. Installation of the access and standing grids is carried out by means of sturdy mounting brackets made from cast aluminium which are fixed on to the edges of the Kalzip roof seams by means of stainless steel clamping screws. The roof skin is not punctured. This means that even these areas are guaranteed to be weather-proof.

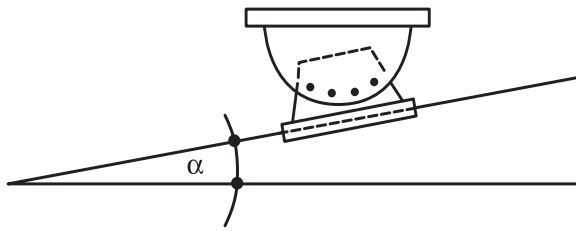
Product advantages

- Safe access to sloping Kalzip roofs
- Fully adjustable from 0° to 45°
- Choice of natural aluminium finish or RAL colour coating – fits in perfectly with the appearance of the roof surface
- Non-penetrative attachment – fixes onto the edges of the roof seams
- Tested and certified in accordance with DIN EN 516

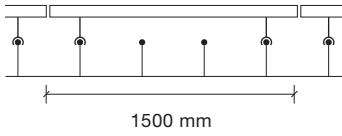
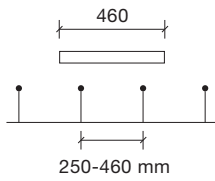
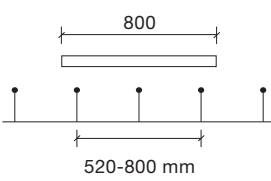
Areas of use

Kalzip roof coverings with a roof pitch up to 45°.





Roof pitch 0°-45° fully adaptable

Installation	Short grid 460 x 250 mm	Standing grid 800 x 250 mm	Continuous walkways 1500 x 250 mm Attachment by means of mounting brackets on each seam to left and right of the continuous walkways ends or joints  - max. spacing of mounting brackets 1200 mm - min. 2 mounting brackets per continuous access grid Number of mounting brackets calculated per 1500 x 250 mm continuous walkways Kalzip 65/305: 3 mounting brackets Kalzip .../333/429/434: 2.5 mounting brackets Kalzip .../400: 2 mounting brackets
			

Surface finish Natural aluminium, clean cast and machined. RAL colour coating also available on request.

Materials Grid and mounting device made from aluminium, stainless steel fasteners.

Static load test in accordance with DIN EN 516 The roof treads are tested by a German Institute of Health and Safety Protection (Test report no. 2000 20262-01), the treads and continuous walkways tested by the MPA-NRW (Test certificate no. 120640 496-02)

Installation instructions for treads and continuous walkways To ensure a smooth running thermal elongation the joints of the continuous walkways should be loosely connected (do not rivet or fasten).



Kalzip roof anchors

The Kalzip Kalzip roof anchors for straight and tapered Kalzip sheets have been specially designed as a Class A individual fixing device in accordance with DIN EN 795 for use with personal fall arrest systems. Kalzip roof anchors can also be used as external and intermediate anchors for Class C design-approved fixing devices in accordance with DIN EN 795. On grounds of technical safety they are recommended for all buildings, in particular for recurrent maintenance work (e.g. for building facilities services). Kalzip roof anchors must only be attached onto Kalzip aluminium sheets.

Areas of application

Kalzip roof anchors are only authorised for personal safety systems (they are not suitable for attaching loads) and depending on specification can be used for straight and tapered Kalzip sheets

- with straight Kalzip sheets:
 - suitable for all approved construction widths between 305 and 434 mm
- with tapered Kalzip sheets with a seam spacing of max. 600 mm (tested only up to 434 mm)
- minimum sheet thickness 0.8 mm
- clip spacing 2.5 m

When used as an external anchor the maximum load must not exceed 6.5 kN.

Technical Data

Roof pitch: 0°-45°

Materials: stainless steel/aluminium

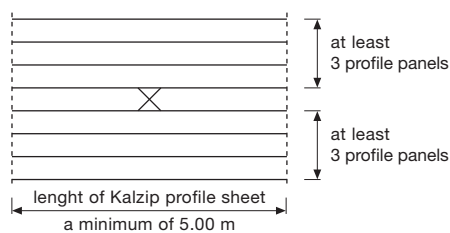
Installation of the Kalzip roof anchor and Kalzip tapered roof anchor

The Kalzip roof anchor is attached to the seams of the Kalzip roof by means of the extruded sections (tightening torque 20 Nm).

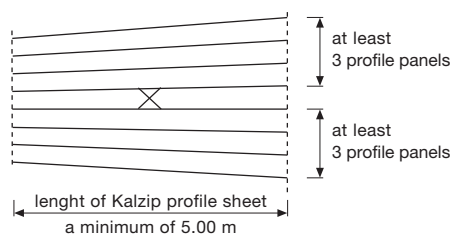
Product advantages

- Tested in accordance with DIN EN 795 (EXAM (previously known as the DMT))
- High level of safety due to large load bearing capacity
- Large safety reserves
- Versatile, depending on specification can be used for straight and tapered sheets
- Quick and simple assembly
- Penetration-free attachment

Minimum spacings Kalzip roof anchor



Minimum spacings Kalzip tapered roof anchor



Testing

The Kalzip roof anchors have been tested by EXAM (previously known as the DMT) in accordance with EN 795 Test Report No.: 01/052/SIG (for straight Kalzip sheets) Test Report No.: 02/024/SIG (for tapered Kalzip sheets) The test reports can be requested if necessary (only in German).

right: Kalzip roof anchor
far right: Kalzip tapered roof anchor



Kalzip fall arrest system

The System

Kalzip roof systems are not only setting new standards in design and function, but also in safety. Kalzip is offering a fall arrest system which has been specially developed to provide safe access onto Kalzip roof surfaces and guarantees the user maximum freedom of movement and safety. Two designs are available depending on the different requirements:

Fall restraint system

The fall restraint system consists of personal protective equipment (PPE) and additional mechanical components which together form a system. The user takes personal responsibility for adjusting the length of the fastening device (i.e. the connection between himself and the attachment point) so that it is not possible to fall over the roof edge, because the fastening

device does not in any way allow the user to even reach the roof edge.

A fall restraint system can be secured to attachment equipment with one or several attachment points. It is recommended for buildings with a fall height < 6 m.

Fall arrest system

Fall arrest systems consist of personal protective equipment (PPE) and additional mechanical components, which together form a cable system which is used for the purposes of fall protection. In the case of the fall arrest system, as with the fall restraint system, the user takes personal responsibility for adjusting the length of the fastening device (i.e. the connection between the user and the attachment point) to suit the conditions on-site with regard to fall height, so that in the event of a fall, the user

would survive the fall unharmed.

A fall arrest system can be secured to attachment equipment with one or several attachment points. When used correctly, the harness of the personal protective equipment (PPE) catches the falling person, transfers the resulting forces onto the suitable parts of the body and holds the body in an upright position. A shock absorber in the fall arrest system reduces the impact forces created by the fall which are exerted on the user, harness and attachment equipment.

Kalzip fall arrest systems are suitable for profile thicknesses of 0.8 mm and above, and a max. clip spacing of 2.50 m with

- straight Kalzip profiled sheets in all allowable construction widths between 305 and 434.
- conical Kalzip profiled sheets with a border spacing of max. 600 mm.



Areas of Use

The Kalzip fall arrest system is used for height safety. It is recommended, for example, for servicing technical installations on buildings, for cleaning gutters and skylights or for other assembly tasks.

Design and Planning

The use of a fall arrest system should already be taken into consideration at the planning phase. Kalzip roof anchors provide the attachment points between the fall arrest system and the Kalzip roof structure. The system is designed for a maximum load of two people. The loads exerted on the roof anchors must be determined individually for each particular application. The maximum permissible load for a roof anchor will always be limited to the weakest link in the whole structure. For this reason, the fixing of the substructure (including clip spacings) is an important factor which must be taken into consideration when planning a fall arrest system. Kalzip will carry out the planning work and the necessary static strength calculations.

System variants for fall restraint and fall arrest systems

A) System designed as single fixing device Class A2 in accordance with DIN EN 795

With this system, the user secures his personal protective equipment to a single attachment point, the Kalzip roof anchor, by means of the fastening device. The user is able to move within a circle around the chosen attachment point defined by the length of the fastening device. Single attachment points are planned and designed in accordance with DIN EN 795.

B) System designed as cable-based system for fall restraint and fall arrest systems Class C in accordance with DIN EN 795

With a cable system, a stainless steel cable is led over several roof anchors and secured. The user guides his personal protective equipment (PPE) with the fastening device and cable shuttle along the tensioned steel cable. Movement can take place freely along the tensioned steel cable, whereby the distance to the steel cable can be selected via the length adjustment

of the fastening device. Any loads which occur are distributed via the steel cable onto several roof anchors, which generally means that the system places lower demands on the substructure than single attachment points.

Deciding on whether the Kalzip fall arrest system should be an individual attachment point or cable system depends essentially on the intended use and this should already be taken into consideration at the planning stage. The Kalzip fall arrest system can only be retrofitted following a detailed static strength and structural inspection of the respective roof structure with corresponding costs.

The components used with the Kalzip fall arrest systems are products supplied by:

Skylootec GmbH
Im Bruch 11-15
D-56567 Neuwied
Germany

www.skylootec.de



Safety instructions and warranty

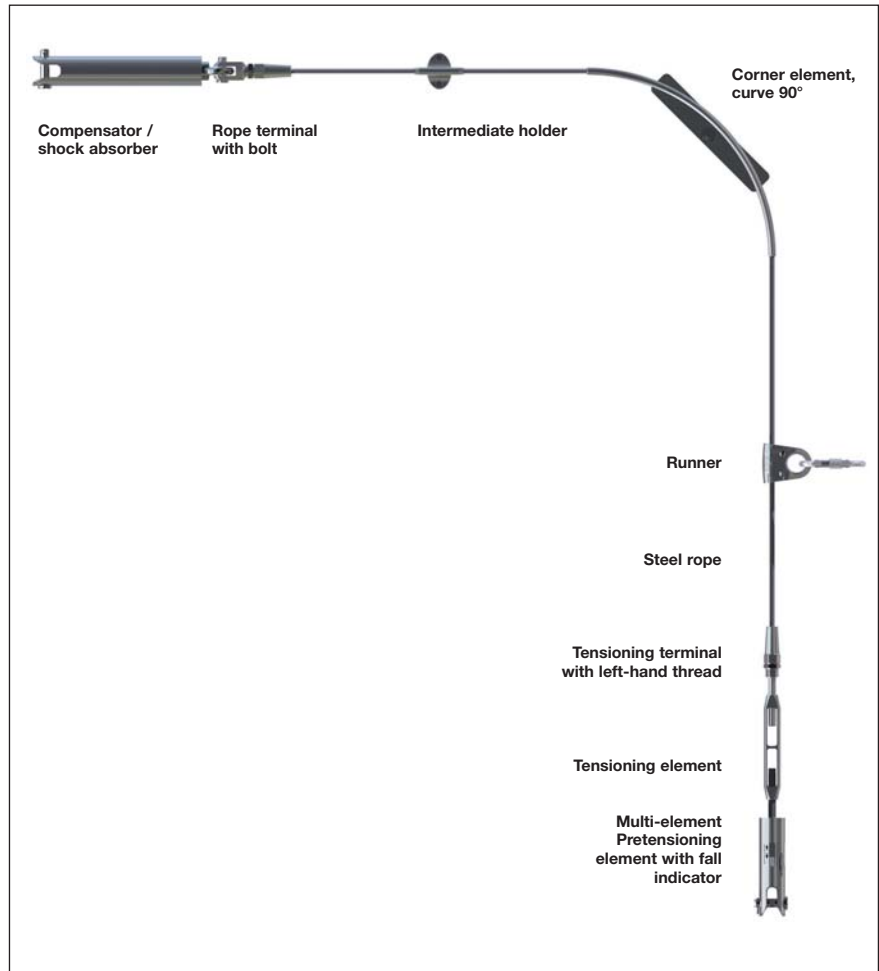
The installation of a Kalzip fall arrest system must only be carried out by installation companies who have been authorized and trained by Skylotec, and must take place in accordance with the EN 795 directives taking into consideration the instructions from Skylotec.

Kalzip system components and accessories

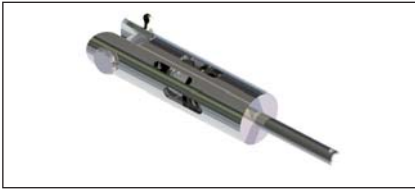
All components of the Kalzip fall arrest system, including personal protective equipment, must be inspected on an annual basis to ensure that they are safe and suitable for use. This inspection must only be carried out by experts. A service certificate must be obtained in writing. It is recommended that an inspection contract is concluded between the installation company and the builders for the annual inspection of the Kalzip fall arrest system. Kalzip accepts no responsibility for the use of systems and/or components which are not approved.

In collaboration with Skylotec, Kalzip is offering the opportunity to take part in one of the specialist installa-

tion training seminars for the Kalzip fall arrest system. Further information can be obtained on request.



Kalzip Components and Accessories



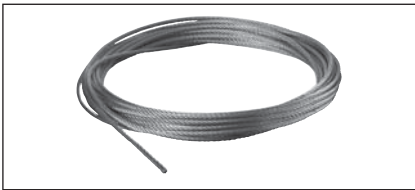
**Multi-element
Pretensioning element with fall indicator**
Allows checking of the pretensioning of the wire rope, stainless steel AISI 316L
Min. breaking load >40 kN



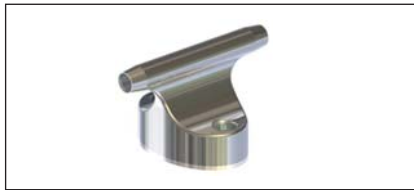
Tensioning element
Allows checking of the pretensioning of the steel rope, stainless steel AISI 316L
Min. breaking load >40 kN



Tensioning terminal with left-hand thread
Stainless steel AISI 316L,
Min. breaking load >40 kN



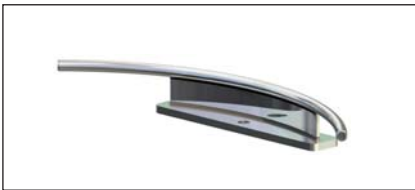
Steel rope
8 mm, length according to requirement



Intermediate holder
fixed, stainless steel AISI 316L



Runner
according to EN 795 class C, stainless steel
Min. breaking load >20 kN



Corner element, curve 135°
For corners from 30° to 60°
(in combination with intermediate holder = 90°)
Stainless steel, min. breaking load >40 kN



Rope terminal with bolt
Stainless steel AISI 316L,
Min. breaking load >40 kN



Compensator / shock absorber
Shock absorber for reducing extreme loads
(reduces the loads at the end anchor to max. 6.0 kN)



Kalzip roof anchor
Kalzip roof anchor, conical
(see page 66)

PSE Fall arrest system
Personal safety equipment
Consisting of mobile runner, harness, self-locking snap-hook, guided type fall arrester, rope bag.

Take advantage of our wealth of experience and the comprehensive range of Kalzip services

Through perfection and quality, continual product development and the installation of more than 80 million square metres of Kalzip profile sheets, Kalzip has established itself as the market leader in the field of industrially produced standing seam systems made from aluminium. Spectacular buildings created by renowned architects and planners provide clear proof of the virtually limitless application potential of Kalzip systems.

DIN ISO 14001 and DIN ISO 9001:2000 certification, along with the internationally recognised DNV safety certification ISRS Level 8, guarantee reliability and ensure that our customers have the utmost confidence in our products.

Kalzip has independent companies in Germany, Belgium, Great Britain, France, Italy, Spain, Portugal, Dubai, Singapore, China and Australia. Furthermore, more than 25 sales and representative offices throughout the world provide comprehensive advice and support. Skilled engineers are available to offer help and advise you right from the earliest planning phase of your project.

We will prepare detailed estimates and documentation – specially tailored to your specific building or renovation project – for the calculation of static requirements and, where necessary, certification.

Our technical service department can provide you with:

- Tender documentation relating specifically to project
- Technical support in finding detailed solutions
- Help and support in all matters relating to Kalzip

In our own seminar centres we organise:

- Practice-oriented seminars for architects
- Installation training
- Training courses on aluminium thin sheet welding (WIG), in collaboration with local chambers of trade

For personal help and advice, please contact your local sales office or telephone our hotline. Further information on Kalzip systems can also be obtained on the internet.

www.kalzip.com



www.kalzip.com

The product and technical information contained in this document is accurate according to our knowledge at the time of publication. Details do not refer to any specific application and cannot give rise to any claim for compensation. From time to time our product range may alter as a result of our continued commitment to product innovation and development. Kalzip cannot guarantee that printed literature will contain the most recent updates; the latest editions are available to download at www.kalzip.com.

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