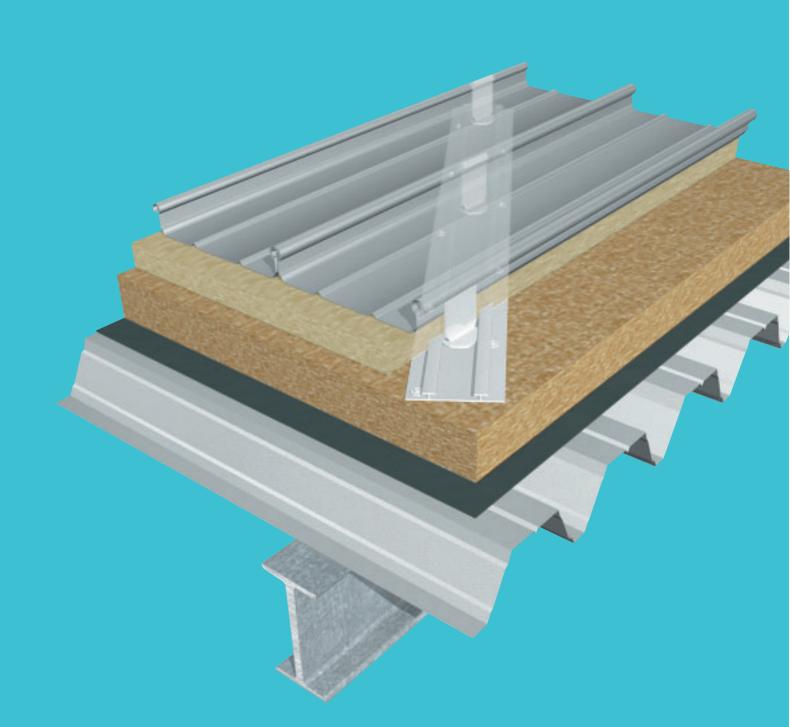
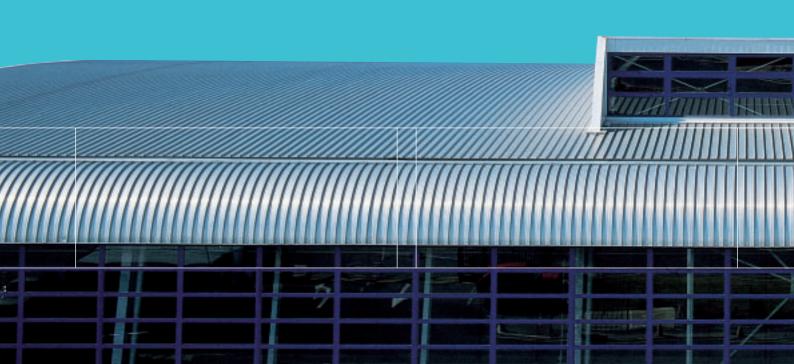


Kalzip Duo® and Kalzip DuoPlus®

The energy-saving roof systems



Kalzip Duo® and DuoPlus® Setting new standards in thermal performance.



Kalzip Duo® and Kalzip DuoPlus®

- The perfect solution for compliance.

Kalzip Duo® and Kalzip DuoPlus® make it easy to comply with the statutory guidelines set out in national and international energy-saving directives. The components of Kalzip Duo® and Kalzip DuoPlus® 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® and Kalzip DuoPlus® 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® and Kalzip DuoPlus® 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® and Kalzip DuoPlus® offer an ideal solution which is both practical and visually stunning. Kalzip Duo® and Kalzip DuoPlus® provide a complete structural system for roofs and walls, enabling architects to design the ultimate building with no restriction on creativity.

Kalzip Duo® and Kalzip DuoPlus® – offer high-performance and state-of-the-art thermal insulation – ideal for the following building sectors:

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

The ultimate roof design

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 fulfil 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.



An innovative system of components perfectly integrated with each other.

The design of the Kalzip Duo® and Kalzip DuoPlus® 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®

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 Pg. 5).

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®

The Kalzip Duo® 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® is simply provided by rigid insulation strips with a width of 24 cm and a thickness of 10 cm.

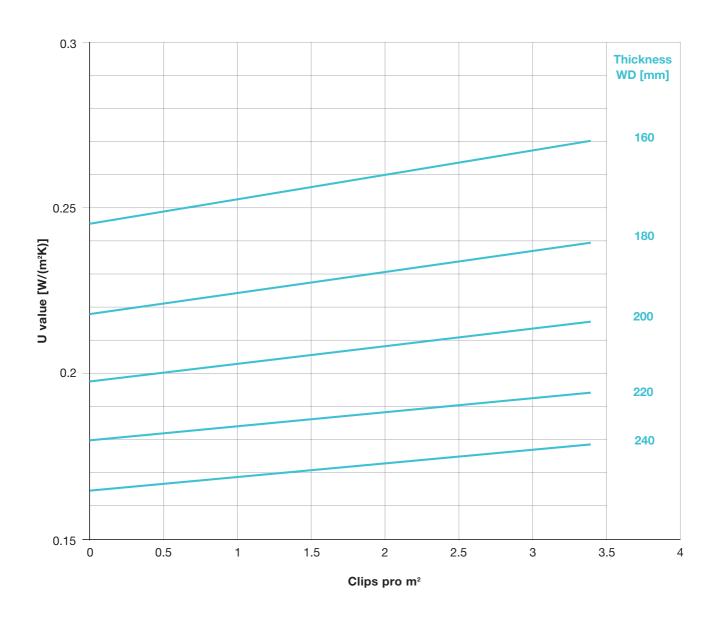
The remaining spaces are then filled with soft thermal insulation or low-priced rigid insulation. As normal, the compressed insulation is in contact with the underside of the Kalzip® vapour seal. This economical solution can also be used in the case of all Kalzip® profiles.

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® 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® and DuoPlus® roof – Thermal conductivity group (WLG) 040



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

- Virtually cold-bridge free therefore extremely low heat transfer coefficients
- High level of thermal insulation fulfils the requirements of the energy-saving directives
- Outstanding sound insulation values up to R'w = 43 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 components such as fall arrest systems can be added
- 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.

So much more that 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® and Kalzip DuoPlus® 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®, and the 24 cm wide insulation strips in the case of Kalzip Duo®.

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® roof, the spaces between the rigid strips are then filled in and, in the case of both options, a full layer of Kalzip® rockwool 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.

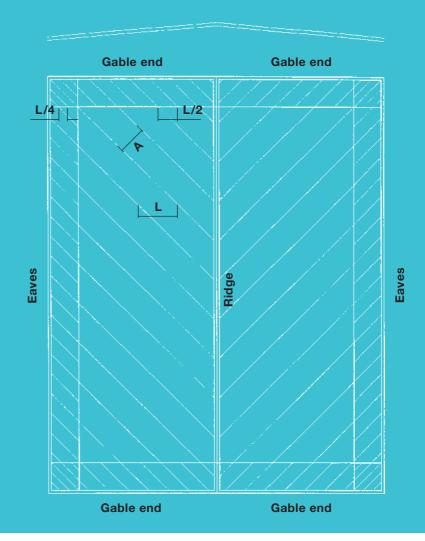
Positioning scheme Kalzip Duo®



Schematic alignment of the DuoPlus rails:

L = Distance of the DuoPlus clips

A = Rail distance = L x 0.71



Positioning scheme Kalzip DuoPlus®



Perfectly matched elements and system components provide optimum thermal performance.

Kalzip Duo® or Kalzip DuoPlus® 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 (cold bonded and sealed to the structural deck)

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

Application type: WD in accordance with DIN 18165 Euro Class A1 in accordance with DIN EN 13501

- non-combustible

Thermal conductivity group (WLG) 040 Compressive strength: $\sigma_{10} \ge 70 \text{ kN/m}^2$

Thickness: 100 mm

Kalzip Duo® – installed in 24 cm wide strips Kalzip DuoPlus® – installed as a full layer

DuoPlus rails

Hole diameter 6.5 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® roof, the spaces between the 24 cm wide strips should be filled with Kalzip® rockwool insulating felt.)

Kalzip® rockwool insulation 040 in accordance with DIN EN 13162

Application type: WD in accordance with 18165 Euro Class A1 in accordance with DIN EN 13501

- non-combustible

Thermal conductivity group (WLG) 040

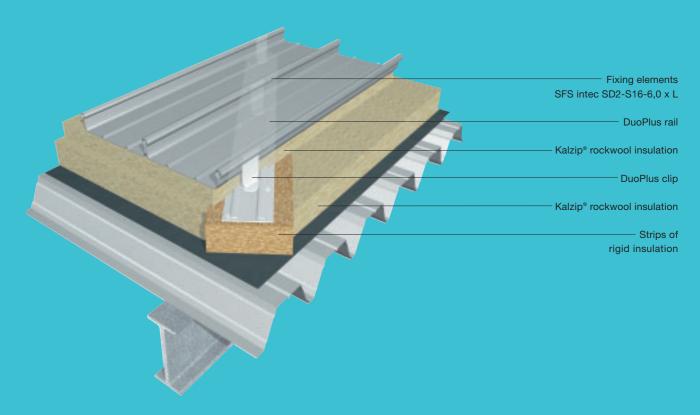
Thickness complies with the requirements of the energy-saving directives

• Kalzip® aluminium profiled sheets

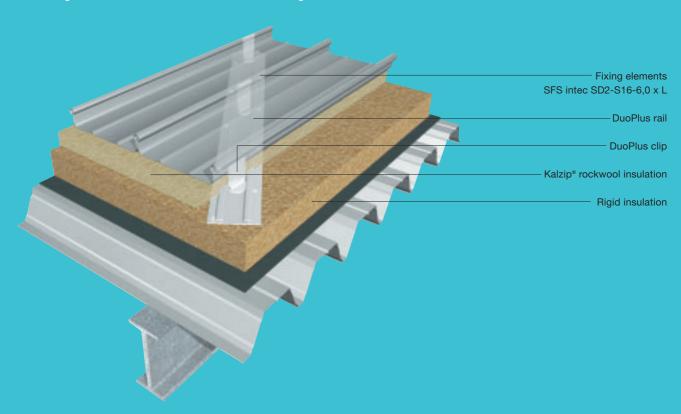


Left: DuoPlus rail with thermal insulation

Kalzip Duo® on a trapezoidal steel deck:



Kalzip DuoPlus® on a trapezoidal steel deck:



Kalzip Duo[®] or Kalzip DuoPlus[®] on timber



• 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: $\sigma_{10} \ge 70 \text{ kN/m}^2$

Thickness: 100 mm

Kalzip Duo® – installed in 24 cm wide strips Kalzip DuoPlus® – installed as a full layer

DuoPlus rail

Hole diameter 6.5 mm

• DuoPlus clip

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

• Connecting elements for DuoPlus rail:

SFS SD2-S-S16-6.0 x 165 screw or wood screws in accordance with DIN 1052 or thread forming screws suitable for wood in accordance with DIN 18807 or local building standards Sealing washer diameter min. 16 mm Screw depth min. 26 mm

• Installation:

The max. screw spacing is 50 cm.

The screws should be arranged in a staggered manner in the rail holes.

The rails should be orientated at a right angle or at least at an angle of 450 to the Kalzip® ribs.

The rail spacings correspond to the load carrying capacity of the Kalzip® profiled sheets.

Two screws 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.

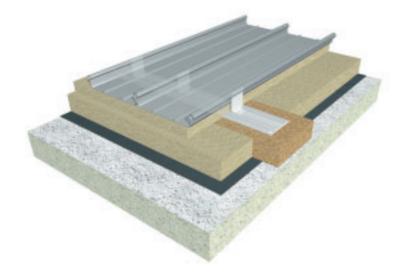
(In the case of Kalzip Duo® roofs, the spaces between the 24 cm wide strips should be filled with Kalzip® rockwool insulating felt.)

Kalzip® 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[®] or Kalzip DuoPlus[®] on concrete



- Installed on 10 cm rigid thermal insulation or directly onto concrete ≥ 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: $\sigma_{10} \ge 70 \text{ kN/m}^2$

Thickness: 100 mm

Kalzip Duo® – installed in 24 cm wide strips Kalzip DuoPlus® – installed as a full layer Avoid contact corrosion when fixing directly onto concrete.

DuoPlus rail

Hole diameter 10.5 mm

DuoPlus clip

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

• Connecting elements for DuoPlus rail:

Plug EJOT SDF-KB 10 x 160-E for 100 mm rigid WD Plug EJOT SDF-KB 10 x 60-E for direct attachment (or equivalent plug with minimum permissible Fz \geq 1.2 KN, approved by building authorities, stainless steel, collar diameter \geq 18 mm)

• Installation:

Maximum plug spacing 50 cm.

The screws 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 spacings correspond to the load carrying capacity of the Kalzip® profiled sheets (see Kalzip® Technical Brochure).

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.

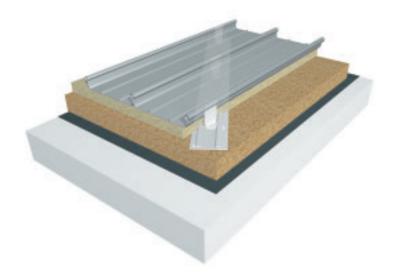
(In the case of Kalzip Duo® roofs, the spaces between the 24 cm wide strips should be filled with Kalzip® rockwool insulating felt.)

Kalzip® 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® or Kalzip DuoPlus® on aerated concrete



- Installed on 10 cm rigid thermal insulation or directly onto aerated cement liner sheet strength class PP4 or P4.4, in accordance with DIN
- 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: $\sigma_{10} \ge 70 \text{ kN/m}^2$

Thickness: 100 mm

Kalzip Duo® – installed in 24 cm wide strips
Kalzip DuoPlus® – 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

• Connecting elements for DuoPlus rail:

Plug EJOT SDF-KB 10S x 180-E for 100 mm WD Plug EJOT SDF-KB 10S x 80-E for direct attachment (or equivalent plug with minimum permissible $Fz \ge 1.2$ KN, approved by building authorities, stainless steel, collar diameter ≥ 18 mm)

• 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 plug 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 plate therefore the bolt should be attached to the plate 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® roofs, the spaces between the 24 cm wide strips should be filled with rockwool insulating felt.)

Kalzip® 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 into steel plate with a thickness of up to 1.25 mm, we recommend using the SFS intec SD2/60-S-6.0 x 84 connecting element.

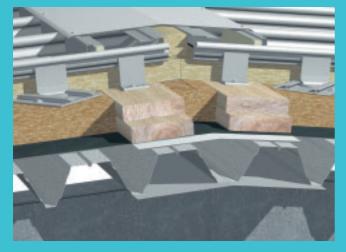
Fixed point on roof ridge

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).

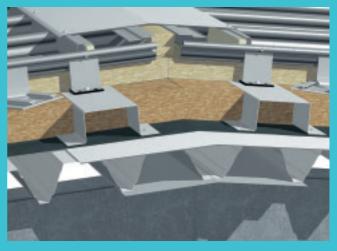
Structural analysis and installation

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 Duo® and Kalzip DuoPlus® The perfect, economical and complete solution

Kalzip Duo® and Kalzip DuoPlus®.

The advanced solution for lasting building protection.

Unlimited applications, superior design quality and flexibility

- Suitable for all roof shapes and pitches from 1.5 degrees, for all substructures and supporting framework.
- Can be flexibly adjusted to suit the requirements of the industrial, private and public sectors, regardless of layout, building geometry and size.
- High level of strength and low individual weight.
 Therefore extremely suitable for large spans and for the renovation of old roofs.
- Complete lengths of up to 80 m and more where roll-formed on site.
- Many variations in shape are possible. Straight, convex or concave curved, tapered, tapered-convex, conical-convex, rolled – our increasing expertise in the mouldability of the aluminium base material is constantly opening up new design perspectives.
- In the case of roof pitches > 25 degrees, a special certificate is required for the load exerted by wind pressure.
- In the case of rounded roofs, radii of up to ≥ 15 m are possible.

Durability and economy

- Corrosion-resistant aluminium alloy as base material
- Assembly is particularly quick and largely independent of weather conditions – ergonomic and cost-saving as a result of prefabricated components.

A high level of safety throughout the entire service life

- The profiled sheets are connected to the substructure by means of special clips, which lock into place in the flanges and are covered by the next element. The attachment points are therefore under the roof skin. They are non-penetrative.
- Pressure and suction loads are safely absorbed.
- Vapour diffusion is guaranteed via the standing seams.

Any existing residual moisture of the insulating layer can escape.

- Sophisticated detailed solutions for roof penetrations, connections and enclosures for roof edges.
- Non-flammable. Resistant to flying sparks and radiant heat.
- Kalzip® acts as a lightning conductor.

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.
- The Kalzip® roof cover can be reused without limitation.
- A heat insulated Kalzip® roof structure contributes significantly to emissions reduction and therefore to the conservation of a our habitat.

Right: Office building Würth **Den Bosch (NL)**Architect: De Twee Snoeken



www.kalzip.com

www.roofway.com

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