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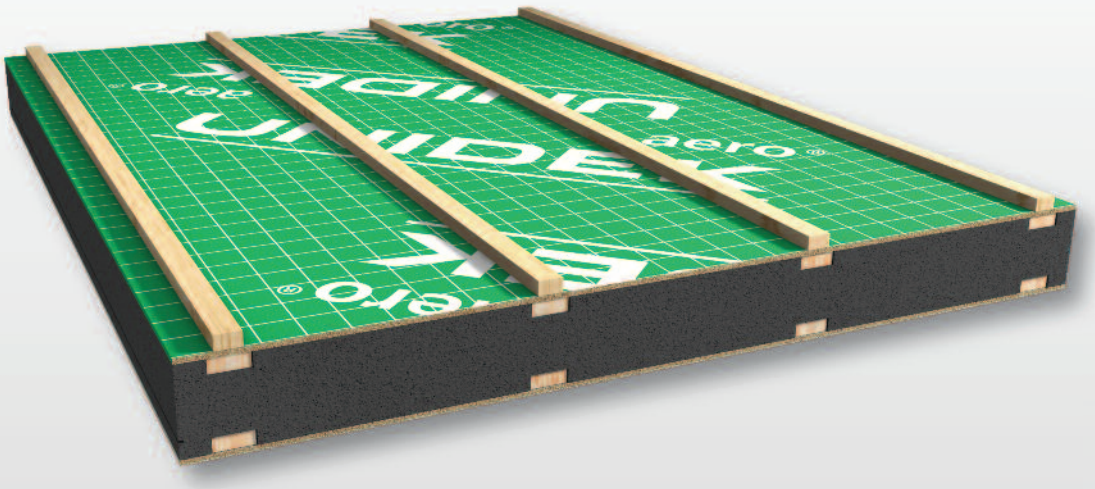
Kingspan UNIDEK aero®

STRUCTURALLY INSULATED PANEL (SIP) ROOFING SYSTEM FOR USE IN PITCHED ROOF APPLICATIONS



- Can achieve U-values of 0.18 - 0.14 W/m²·K or better
- Virtually eliminates repeated thermal bridging
- Can help achieve very low air leakage rates
- Insulation core manufactured with a blowing agent that has zero ODP and low GWP
- Quick and safe to build
- Internal works can start earlier
- Significant savings on labour costs and crane rental due to the speed of installation
- Minimal on site waste
- The strength of the element makes large clear spans possible
- When used in a pitched roof the provision of a room in the roof provides a more practical use of space

Kingspan®

Low Energy – Low Carbon Buildings

Introduction

Summary

Kingspan UNIDEK aero® comprises 190 - 254 mm thick structural insulated panels (SIPs) with unique structural rib reinforcements, for use in pitched roof applications.

Kingspan UNIDEK aero® panels comprise a high performance rigid graphite coated expanded polystyrene (EPS) insulation core, manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP), fully bonded between two layers of P5 particleboard.

Kingspan UNIDEK aero® panels are a structural composite. This composite assembly provides stiffness, strength and predictable responses to applied loads.

Kingspan UNIDEK aero® retains all of the familiar benefits associated with SIP technology, such as ease of installation and excellent thermal performance characteristics. Where *Kingspan* UNIDEK aero® differs from typical SIPs is that through timbers, normally fixed along the edges of the SIPs to improve structural integrity, are replaced with a series of structural timber ribs fixed to the inner surface of the particleboard facings. The ribs are fully bonded to the insulation during manufacture. This process results in a panel that can offer clear span lengths easily equivalent to, and in some cases greater than, most conventional SIPs.

The absence of through timbers from *Kingspan* UNIDEK aero® panels gives a continuous layer of insulation at panel joints which virtually eliminates repeating thermal bridges. This benefits the overall thermal performance of the completed roof and can help designers working towards low and zero carbon buildings, such as those designed to the upper levels of the Code for Sustainable Homes or Passivhaus standard.

Design Flexibility

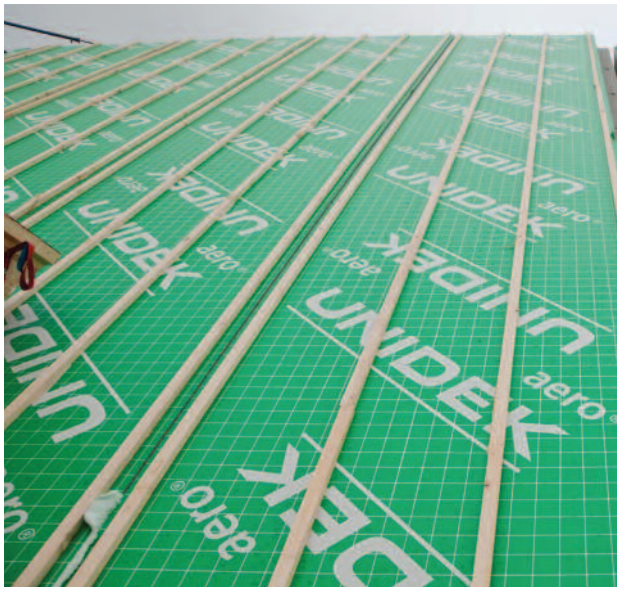
Kingspan UNIDEK aero® panels leave ample scope for individual design. The panels are pre-cut to match a project's engineering and design specifications, and the complete roofing kit is delivered to site ready for erection.

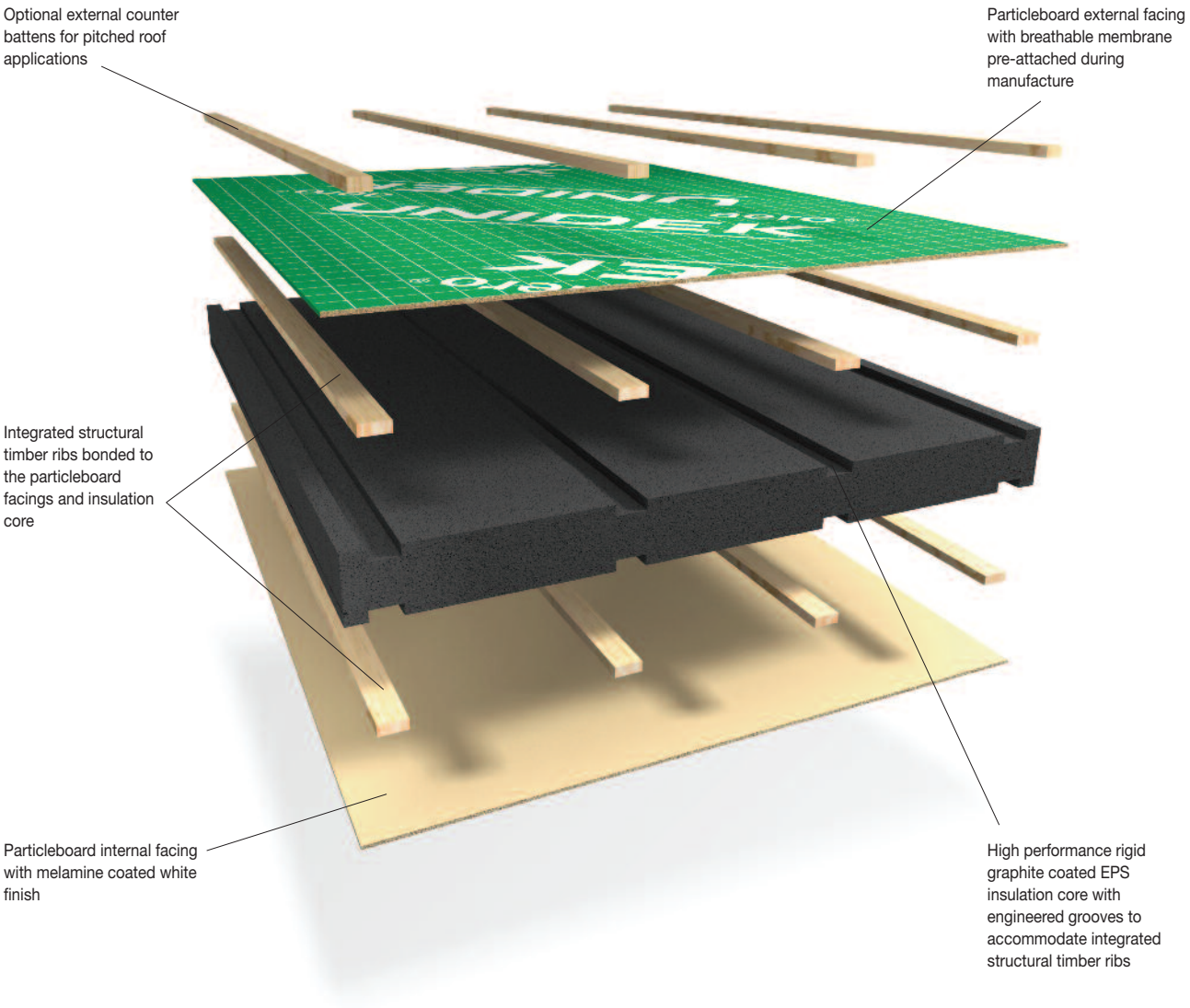
Kingspan UNIDEK aero® can be used to create the pitched roof structure of most buildings. The panels can be erected on virtually any wall construction, however the walls must have specific tolerances as per guidance available from the Kingspan Insulation Technical Services Department (see rear cover).

Kingspan UNIDEK aero® panels can be cut to an angle at ridge and eaves to provide a vertical surface for ridge junctions and fascias. The panels can accommodate large cut outs, provided that two of the four rows of structural ribs remain intact. Apertures e.g. dormers, roof lights etc, can be created in any position.

The panels are lightweight compared with traditional roofing structures, e.g. timber rafters. Panels typically weigh 13 -14 kg/m^2, and are ideal for use where heavy constructions are not possible. The panels can also provide an immediate safe working platform for following trades.

As with all construction methods, a long lasting external weather proofing is a necessary part of roofs constructed using *Kingspan* UNIDEK aero® panels. The panels can accept virtually any type of roof finish, from traditional tiles to metal standing seam systems and single-ply membranes.





Applications

Kingspan UNIDEK aero® can be used to create the pitched roofs of both domestic and non-domestic buildings.

Kingspan UNIDEK aero® panels should be installed with their long edges running ridge to eaves. Joints between panels are sealed with a continuous bead of silicone sealant. Sealing the joint in this way can enable the roof structure to be very air-tight.

Kingspan UNIDEK aero® panels should be fixed at the ridge, eaves and to any intermediate purlins. The number, type and location of mechanical fixings required to fix the panels will vary with the geographical location of the building, the local topography, and the specific structure of the pitched roof concerned.

For tiled and slated pitched roofs, *Kingspan* UNIDEK aero® panels can be provided with 20 x 30 mm C18 treated softwood timber counter battens, bonded to the top surface of the panel.

The spanning capability of *Kingspan* UNIDEK aero® panels means that in some cases they can be installed without the additional support of intermediate purlins. The requirement for intermediate purlins should be assessed against the following:

- wind load calculations in accordance with BS 6399–2: 1997 (Loadings for buildings. Code of practice for wind loads) or BS EN 1991–1.4: 2005 (UK National Annex to Eurocode 1. Actions on structures, General Actions, Wind Actions);
- the thickness of *Kingspan* UNIDEK aero® panel being installed; and
- the length of span the panel is required meet.

Please contact the Kingspan Insulation Technical Services Department (see rear cover) for further information.

CO_2 Emissions

The first step in minimising the CO_2 emissions of a building is to reduce its space heating demand. The most effective way to reduce the space heating demand of a building is to improve the performance of its envelope by specifying low U-values, low air leakage and by avoiding significant thermal bridging wherever possible.

Kingspan UNIDEK aero® panels yield worst case roof U-values of 0.18 W/m²·K or 0.14 W/m²·K, depending on the thickness of panel chosen. Extremely low U-values, e.g. 0.10 W/m²·K, can easily be achieved with the addition of an insulated lining, e.g. *Kingspan* **Kool**therm® K17 Insulated Dry–lining Board, on the inside of the *Kingspan* UNIDEK aero® panels.

In addition to the excellent U-values that can be achieved by roofs constructed using *Kingspan* UNIDEK aero®, the closed cell structure of the product's rigid graphite coated EPS insulation core does not allow movement of air within the panels. The insulation will not sag or physically deteriorate over time, as may be the case with other insulating materials.

The *Kingspan* UNIDEK aero® jointing system can create a very air-tight structure. Air leakage levels can be significantly better than the 10 m³/hour/m² at 50 Pa maximum required by the 2010 edition of Approved Documents L to the Building Regulations (England & Wales), the 2010 Editions of Technical Handbooks Section 6 (Scotland), the 2006 Editions of Technical Booklets F (Northern Ireland), or the 2008 Editions of Technical Guidance Documents L (Republic of Ireland).

Thermal bridges occur where a material of poor thermal conductivity interrupts the insulation layer in a construction. U-value calculations for conventional roof constructions take into account the effects of repeating thermal bridges, i.e. timber rafters etc. The insulation layer in *Kingspan* UNIDEK aero® panels is not interrupted by repeating thermal bridges.

Linear thermal bridges occur at junctions, e.g. roof verge, and openings, e.g. windows, in the building fabric, and are expressed as psi (ψ) values. ψ-values are an important factor in the calculation methodologies used to assess the operational CO_2 emissions of buildings.

The above features mean that *Kingspan* UNIDEK aero® panels can help achieve the requirements of the Building Regulations / Standards, and credits in the Code for Sustainable Homes section Ene 1 & Ene 2 and BREEAM section Ene 1.

Zero ODP and Low GWP

The insulation core of *Kingspan* UNIDEK aero® panels is manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

zero o.d.p

This can help achieve credits in the Code for Sustainable Homes section Pol 1.

Delivery Partners

Kingspan UNIDEK aero® panels are available via a network of Delivery Partners that are responsible for the design, production and erection of each specific project. Roofing systems are produced to the exact dimensions and performance standards required, and should be erected to schedule and in accordance with all relevant site safety procedures. Delivery Partners are located across the UK and are able to deliver buildings of any scale in virtually any location. For further information about your local Delivery Partner, please contact the Kingspan Insulation Sales Department (see rear cover).

Enquiries should be directed to a Delivery Partner for:

- project specific structural engineering and design advice;
- conversion of plans into a *Kingspan* UNIDEK aero® scheme; and
- quotations and lead times.

Panel Data

Composition

Kingspan UNIDEK aero® panels comprise a high performance rigid graphite coated expanded polystyrene (EPS) insulation core, manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP), sandwiched between two layers of P5 particleboard. The EPS insulation core is manufactured to NEN EN 13163: 2008 (Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specification) and is fully bonded to the facings and structural timber ribs during manufacture.

Panel Dimensions

Kingspan UNIDEK aero® panels are 1200 mm wide, and can be supplied in lengths up to 8000 mm. *Kingspan* UNIDEK aero® panels are supplied in two insulation component thicknesses,184 mm and 234 mm. See Figure 1 and Table 1 below for dimensions of *Kingspan* UNIDEK aero® panel components.

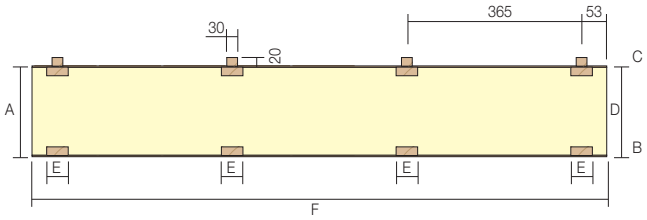


Figure 1 - Illustration of UNIDEK aero® panel components. See Table 1 for component dimensions.

Facings & Spanning Capabilities

Kingspan UNIDEK aero® panels can be supplied with a variety of P5 particleboard facing thickness.

Standard *Kingspan* UNIDEK aero® panels are supplied with 3 mm thick particleboard upper and lower facings. This standard panel can provide sufficient clear spanning capability for most domestic pitched roof applications, for example up to 5 metres.

If a larger spanning capability is required, *Kingspan* UNIDEK aero® panels can also be manufactured with a 12 mm thick upper particleboard facing, and 8 mm thick lower particleboard facing. The thicker facings provide increased strength and stiffness to the panel, allowing the potential for greater clear spans, for example up to 7 metres. For further advice regarding the spanning capability of *Kingspan* UNIDEK aero® panels please contact the Kingspan Insulation Technical Services Department (see rear cover).

In all cases the lower facing of *Kingspan* UNIDEK aero® panels has a melamine coated white internal finish.

Integrated Structural Timber Ribs

The EPS insulation core is engineered to accommodate 18 mm x 45 mm C18 grade timber structural ribs. The structural ribs are fully bonded to the upper and lower facings and insulation core. The composite assembly of *Kingspan* UNIDEK aero® panels provides stiffness, strength and predictable response to loads. These structural ribs also provide secure fixing locations for ceiling finishes or hanging services.

Letter key for Figure 1	*Kingspan* UNIDEK aero® Panel Component	*Kingspan* UNIDEK aero® Panel Component Details			
A	Overall Panel Thickness (mm)	190	204	236	250
N/A	Typical U-value ($W/m^2 \cdot K$)	0.18*	0.18*	0.14*	0.14*
B	Lower Facing Thickness (mm)	3	8	3	8
C	Upper Facing Thickness (mm)	3	12	3	12
D	Insulation Depth (mm)	184	184	230	230
E	Integrated Timber Structural Ribs (mm)	18 x 45	18 x 45	18 x 45	18 x 45
F	Overall Width (mm)	1200	1200	1200	1200
N/A	Weight (kg/m^2)	11.2	21.0	12.2	21.9

Table 1 - Details of *Kingspan* UNIDEK aero® components and U-values for different *Kingspan* UNIDEK aero® panel thicknesses.

** The U-values quoted in Table 1 are for guidance purposes only, and are based on the Kingspan UNIDEK aero® panel with no internal or external finish. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project. Please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).*

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK – Tel: +44 (0) 1544 388 601
– Fax: +44 (0) 1544 388 888
– email: customerservice@kingspanunidek.co.uk

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Technical Advice

Kingspan Insulation supports all of its products with a comprehensive Technical Advisory Service for specifiers, stockists and contractors. This includes a computer–aided service designed to give fast, accurate technical advice. Simply phone the *Kingspan* UNIDEK® Technical Service Department with your project specification. Calculations can be carried out to provide U–values, condensation / dew point risk, required insulation thicknesses etc… Thereafter any number of permutations can be provided to help you achieve your desired targets.

The *Kingspan* UNIDEK® Technical Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The *Kingspan* UNIDEK® British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U–value and Condensation Risk Calculations.

Please contact the *Kingspan* UNIDEK® Technical Service Department on the numbers below:

UK – Tel: +44 (0) 1544 387 382
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Literature & Samples

Kingspan Insulation produces a comprehensive range of technical literature for specifiers, contractors, stockists and end users. The literature contains clear ‘user friendly’ advice on typical design; design considerations; thermal properties; sitework and product data.

Kingspan UNIDEK® technical literature is an essential specification tool. For copies please contact the *Kingspan* UNIDEK® Marketing Department or visit the *Kingspan* UNIDEK® website, using the details below:

UK – Tel: +44 (0) 1544 387 384
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– www.kingspanunidek.ie/literature

General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

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