Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020

UK Technical Assessment	UKTA-0836-22/0029 of 13 September 2022
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	Kingspan OPTIM-R®
Product family to which the construction product belongs:	Product Area Code 4 Thermal Insulation Products
Manufacturer:	Kingspan Insulation Ltd. Pembridge, Leominster HR6 9LA
Manufacturing plant(s):	Kingspan Insulation Ltd. Pembridge, Leominster HR6 9LA
This UK Technical Assessment contains:	8 pages
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 on the basis of:	UKAD 040011-00-1201 Vacuum insulation panels (VIP) with factory applied protection layers

1. Technical description of the product

This UK Technical Assessment applies to the thermal insulation boards with the trade name Kingspan Optim-R®, hereinafter referred to as the product.

The product is a rectangular shaped Vacuum Insulation Panel (VIP) without protection layers, containing a micro-porous (fumed silica based) core material, within an envelope of a three-layer laminate of metallized polyester film and linear low-density polyethylene (LLDPE) heat seal layer, where the internal pressure within the envelope is much lower than the ambient air pressure.

The product has the following dimensional properties (nominal values):

• working length (min., max.)	300, 1200 mm
• working width (min., max.)	300, 600 mm
• thickness (range)	20 – 50 mm
• product weight per unit area*	
- 20 mm thickness	3.80 $kg.m^{-2}$
- 25 mm thickness	4.75 $kg.m^{-2}$
- 30 mm thickness	5.70 $kg.m^{-2}$
- 40 mm thickness	7.60 $kg.m^{-2}$
- 50 mm thickness	9.50 $kg.m^{-2}$

* Other incremental thicknesses between 20 mm and 50 mm are available on request

2. Specification of the intended use(s) in accordance with the applicable UK Assessment Document (hereinafter UKAD)

2.1 Intended use

The product is used for insulation of roofs, walls and floors in buildings. The assessment of the product only applies when the product is used in structures where it is protected from weathering.

The provisions made in this UKTA are based on an assumed working life of the product of a minimum of 25 years, provided that the conditions for packaging, transport, storage, installation and use are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2.2 General assumptions

It is the responsibility of the holder of this UKTA to ensure that all necessary information on design and installation is submitted to those responsible for specification and installation of the construction.

Only constructions where the product is well-protected as shown in the technical information of the manufacturer are allowed under this UKTA; in all cases, the specifier will have to cooperate closely with the holder of this UKTA.

2.3 Manufacture of the product

The UKTA has been issued for the product on the basis of agreed data/information, deposited with the BBA which identifies the product that has been assessed.

Changes to the product / production process, which could result in this deposited data being incorrect, should be notified to the BBA before the changes are introduced. BBA will decide whether or not such changes affect this UKTA and consequently the validity of the UKCA marking and if so whether further assessment/alterations to the UKTA, shall be necessary.

2.4 Packaging, transport and storage of the product

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the holder of this UKTA to undertake the appropriate measures and to advise their clients on the transport, storage, maintenance, replacement and repair of the product as they consider necessary.

2.5 Installation and use of the product in the works

Only undamaged/intact insulation boards which have been protected from wetting, weathering, sunlight and mechanical damage of the used multilayer high barrier foil shall be used.

When installing, the manufacturer's installation instructions shall be followed. The manufacturer's installation instructions have been assessed by the BBA. The insulation board shall only be installed in structures where it is protected from weathering.

The product shall not be damaged (e.g. by cutting or drilling) during installation and be protected against damage during the working life by suitable constructional arrangements.

The product shall only be installed by competent and/or trained individuals or companies approved by the manufacturer. These companies shall have adequate experience in installing the product.

Before installation, the product shall be checked by the installation contractor by means of visual control. The substrate shall be sufficiently flat and clean of construction debris and sharp objects.

As to the application of the product and the design values of thermal conductivity/thermal resistance, the respective national regulations shall be observed.

3. Performance of the product and references to the methods used for its assessment

3.1. Mechanical resistance and stability (BWR 1)

Not relevant.

3.2. Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

Classification of reaction to fire performance in accordance with EN 13501-1 is E/E_{FL}.

3.3 Health, hygiene and the environment

Not relevant.

3.4 Safety and accessibility in use (BWR 4)

Not relevant.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal conductivity

3.6.1.1 Thermal conductivity $\lambda_{90/90}$

The thermal conductivity $\lambda_{90/90}$ has been determined with the following results:

for t = 20 mm $\lambda_{90/90}$ = 0.0044 $W.m^{-1}.K^{-1}$ and
for t = 25 - 50 mm $\lambda_{90/90}$ = 0.0041 $W.m^{-1}.K^{-1}$

3.6.1.2 Thermal conductivity after ageing

The thermal conductivity after ageing has been measured according to EN 12667 with the following results concerning the increase of λ after ageing ($\Delta\lambda_a$):

for t = 20 mm $\Delta\lambda_a$ = 0.001 $W.m^{-1}.K^{-1}$ and for t = 50 mm $\Delta\lambda_a$ = 0.001 $W.m^{-1}.K^{-1}$

3.6.1.3 Thermal conductivity λ_D ($W.m^{-1}.K^{-1}$)

The thermal conductivity for external and internal application (Category 1) for panels with minimum dimensions of 400 mm x 300 mm, considering the influence of ageing and the effect of thermal bridges has been determined, according to Annex A, clause A.2, taking the effect of the thermal bridging correction factor F_{tb} = 1.10:

Thickness (t)	$\lambda_{90/90}$	λ_D (calculated)	λ_D (as taken)
20 mm	0.0044	0.00594	0.007
25, 30, 40 and 50 mm	0.0041	0.00561	0.007

A panel of 300 mm x 300 mm (the smallest product which is put on the market) has been calculated according to Annex A, clause A.3 of the UKAD, with the following results for λ_D:

Thickness (t)	$F_{td} . \Delta\lambda_a$	λ_D (calculated)	λ_D (as taken)
20 mm	0.001	0.006102	0.007
25 mm	0.001	0.005779	0.007
30 mm	0.001	0.005796	0.007
40 mm	0.001	0.005830	0.007
50 mm	0.001	0.005865	0.007

Table 1: Summary of λ_D values for different product sizes

Thickness (mm)	Product sizes (mm x mm)	
	300 x 300	≥ 300 x 400
	λ_D ($W.m^{-1}.K^{-1}$)	λ_D ($W.m^{-1}.K^{-1}$)
20	0.007	0.007
25	0.007	0.007
30	0.007	0.007
40	0.007	0.007
50	0.007	0.007

3.6.2 Thickness

When measured according to the principles of EN 823 with a pressure of 250 Pa (± 5 Pa) the thicknesses as given in clause 1.1 show no greater deviation than the tolerances -2 mm/+2 mm.

3.6.3 Water vapour resistance

The water vapour resistance could not be determined according to EN 12086. Therefore, vapour resistance of 100000 MN·s/g shall be used in calculations.

3.6.4 Squareness

The squareness S_b as determined in accordance with the principles of method described in EN 824 does not exceed 5 $mm.m^{-1}$.

3.6.5 Flatness

The flatness S_{max} as determined in accordance with the principles of method described in EN 825 does not exceed 5 $mm.m^{-1}$.

3.6.6 Density

The range of density is 170 $kg.m^{-3}$ to 210 $kg.m^{-3}$ when determined according to EN 1602.

3.6.7 Mass per square metre of the multilayer high barrier foil of the product

The mass per unit area of the multilayer high barrier foil of product ranges from 100 $g.m^{-2}$ to 110 $g.m^{-2}$.

3.6.8 Length and width

When determined according to the principles of EN 822 the tolerances on length (l) and width (w) are as follows:

For	l ≤ 1000 mm: -3 mm/+3 mm (minimum length = 300 mm)
	l > 1000 mm: -5 mm/+5 mm
For	w ≤ 1000 mm: -3 mm/+3 mm (minimum width = 300 mm)
	w > 1000 mm: -5 mm/+5 mm

3.6.9 Oxygen permeability of the multilayer high barrier foil of the product (OTR)

The oxygen gas transmission rate (OTR) through the film at 23±2 °C, 0±5%rh was determined in accordance with ASTM D3985-05 using Oxtran 2/21 apparatus with computer control. This resulted in a level of $OTR_{decl.}$ < 0.5 $\mu l.m^{-2}.day^{-1}$

3.6.10 Compressive stress/strength at 10% deformation

The compressive stress at 10% deformation, when determined according to the principles of EN 826, σ_{10} ≥150 kPa (class CS(10\Y)150).

3.6.11 Dimensional stability under specified temperature and humidity

The dimensional stability under specified temperature and humidity conditions have been determined in accordance with the principles of method described in EN 1603 and EN 1604, with the following results:

Dimensional stability (EN 1603):		
at 23±2 °C and 50±5%		
requirement: change <[± 0.5] % (L/L)		
- change length and width	: 0	% (L/L)
Dimensional stability (EN 1604):		
at 70±2 °C and 90±5%		
requirement: change <[± 1.0] % (L/L)		
- change length	: -0.3	% (L/L)
- change width	: 0	% (L/L)
- change thickness	: -0.3	% (L/L)
at 40 kPa and 70±1 °C		
requirement: change ≤ 5% (L/L)		
- change thickness	: -1.5	% (L/L)

3.6.12 Deformation under specified load and temperature

The deformation in thickness under specified load and temperature when determined according to EN 1605 with at least three test samples for test condition 2 (40 kPa / 70 °C / 168 h) is less than 5% (class DLT(2)5).

3.6.13 Tensile strength of the multilayer high barrier foil of the product

The tensile strength of the multilayer high barrier foil has been determined with test specimen "type 2" according to EN ISO 527-3 before and after ageing according to Annex B of UKAD 040011-00-2101 2014. For each test condition, five test pieces 25 mm wide by 150 mm in length were cut from the material in the machine and transverse directions, in general accordance with EN ISO 527-3: 1996.

The test results are given in Tables 2 and 3.

Table 2: Tensile strength and elongation at different conditions – machine direction, mean

Test condition	Tensile strength (MPa)	Elongation (%)
Unaged	87	96
3 days 70 ºC	85	96
7 days 70 ºC	90	108
14 days 70 ºC	88	104
30 days 70 ºC	88	99
90 days 70 ºC	84	86

Table 3: Tensile strength and elongation at different conditions – transverse direction, mean

Test condition	Tensile strength (MPa)	Elongation (%)
Unaged	75	94
3 days 70 ºC	74	78
7 days 70 ºC	74	85
14 days 70 ºC	76	91
30 days 70 ºC	76	90
90 days 70 ºC	73	74

3.6.14 Internal pressure

The internal pressure has been determined 24 h after the product was manufactured (PL), using a foil lift-off procedure, in which the product was exposed to negative pressure either with a foil-lift device or in a vacuum chamber until it was lifted off the product core. The distance between the product core and the foil was measured with the help of a laser distance measuring device and used to determine the internal pressure of the product.

The internal pressure PL $\leq$ 5 mbar.

3.6.15 Tensile strength perpendicular to the faces of the thermal insulation boards

The tensile strength perpendicular to the faces (σ_{mt}) of the thermal insulation boards has been determined in accordance with the principles of the method described in EN 1607.

The tensile strength perpendicular to the faces $\sigma_{mt} \geq$ 80 kPa.

3.6.16 Behaviour under point load

Not applicable – see clause 1.1 of this UKTA (there are no protection layers).

3.6.17 Shear strength of the thermal insulation boards

Not applicable – see clause 1.1 of this UKTA (there are no protection layers).

3.7 Sustainable use of natural resources (BWR 7)

No performance assessed.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1 System of assessment and verification of constancy of performance

According to UKAD 040011-00-1201 Annex V of the Construction Products Regulation (Regulation (EU) 305/2011 as bought into UK law and amended, the system of assessment and verification of constancy of performance 3 (AVCP) applies.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable UKAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1 UKCA marking for the product/ system must contain the following information:

- Identification number of the Approved Body
- Name/address of the manufacturer of the product
- Marking with intention of clarification of intended use
- Date of marking
- UKTA number.

On behalf of the British Board of Agrément 	
Date of Issue: 13 September 2022	**Hardy Giesler** Chief Executive Officer

British Board of Agrément,
1st Floor Building 3
Hatters Lane
Croxley Park
Watford
WD18 8YG