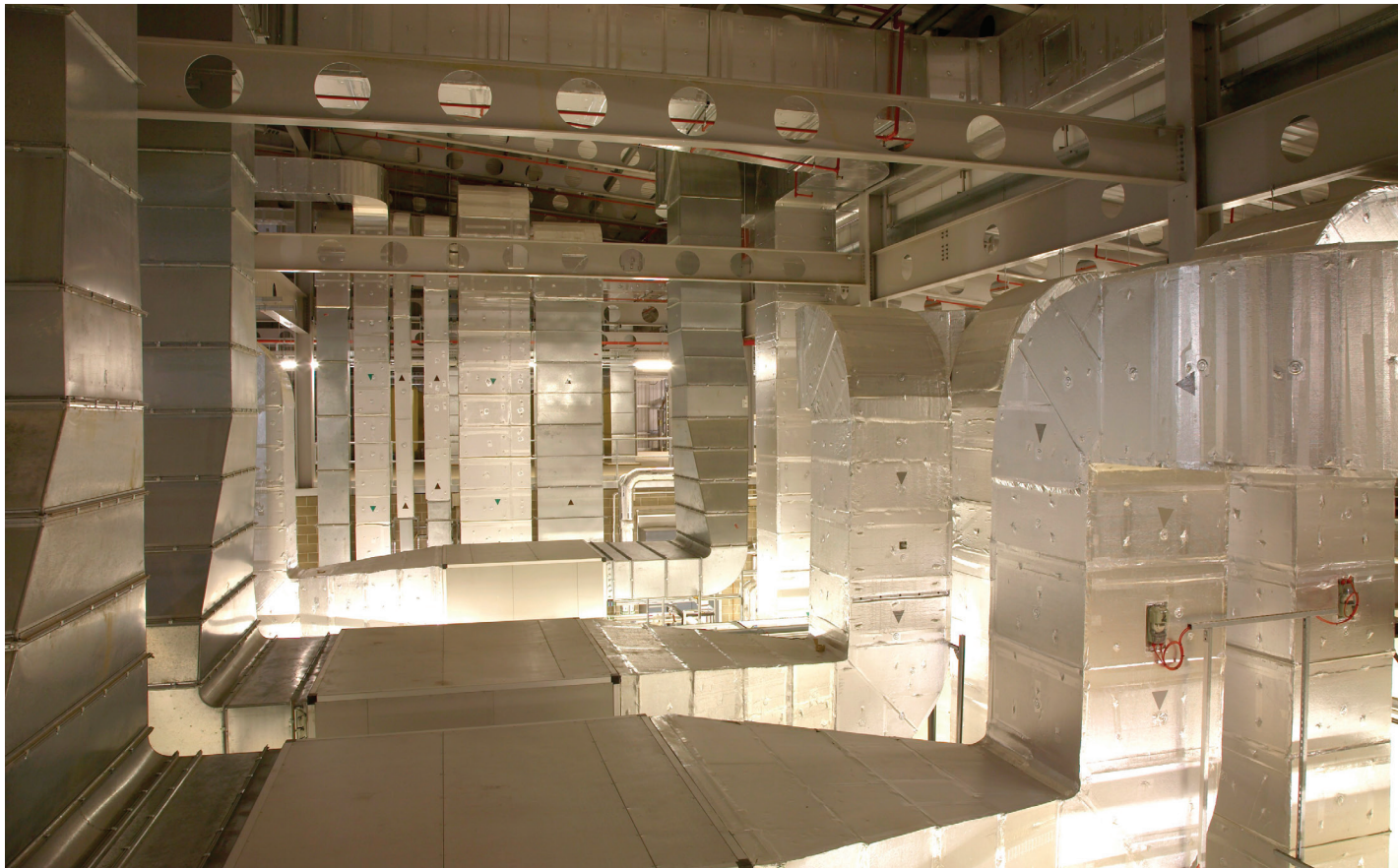


Technical Insulation

Great Britain & Ireland

Kooltherm[®] Duct Insulation

Rigid Insulation for Rectangular, Circular and Flat Oval HVAC Ductwork



Product Details

Introduction

Kingspan Kooltherm® Duct Insulation is a premium performance thermal insulation designed for use on rectangular, circular and flat oval ductwork in HVAC / building services applications. It can be used to insulate ductwork, plenums and associated equipment, installed both indoors and outdoors, operating within the temperature range of - 20°C to + 80°C.

Kingspan Kooltherm® Duct Insulation is suitable for both new build and refurbishment projects in the residential, commercial, institutional, light industrial and leisure sectors.

Moreover, it is especially suitable for high specification projects where non-fibrous insulants may be preferred, for example: in the food, beverage and pharmaceutical industries; communication / server rooms in data centres; high relative humidity environments such as swimming pools; and clean air and hygiene controlled environments such as sterile areas of hospitals or laboratories.

Kingspan Kooltherm® Duct Insulation is CE marked in conformance with BS EN 14314: 2009 + A1: 2013 (Thermal insulation products for building equipment and industrial installations. Factory made phenolic foam (PF) products. Specification) and a Declaration of Performance (DoP) is available to download from www.kingspanductwork.co.uk/kdi. The performance declared in the DoP, corresponds to that of flat boards (not slotted / not curved).

General Properties

Kingspan Kooltherm® Duct Insulation comprises a fibre-free rigid thermoset phenolic insulation core, faced on one side (external face) with an aluminium vapour barrier foil, and faced on the other side (internal face) with a glass tissue based facing. Both facings are autohesively bonded to the insulation core during manufacture.

The insulation core is manufactured with a blowing agent that has negligible Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

Kingspan Kooltherm® Duct Insulation has a 90% (or greater) closed cell structure and a compressive strength that typically exceeds 100 kPa at 10 % compression. Solutions are available to accommodate the surface curvature of circular and flat oval ductwork with an outside diameter (OD) of 80 mm or greater.

The rigid nature of Kingspan Kooltherm® Duct Insulation enables the specified thickness of insulation to be maintained at the corners of rectangular ductwork, and at locations where HVAC / building services equipment is specified. Non-rigid glass and rock mineral fibre duct wrap products, on the other hand, risk being overstretched and compressed in these locations, potentially leading to a reduction in thermal performance.

Its rigidity also enables the straightforward application of vapour barrier tape and finishing materials which, in turn, facilitates the creation of a continuous and fully sealed vapour barrier. This can provide a neater, closer fitting and more aesthetically pleasing finish than that achievable with non-rigid glass or rock mineral fibre duct wrap products.

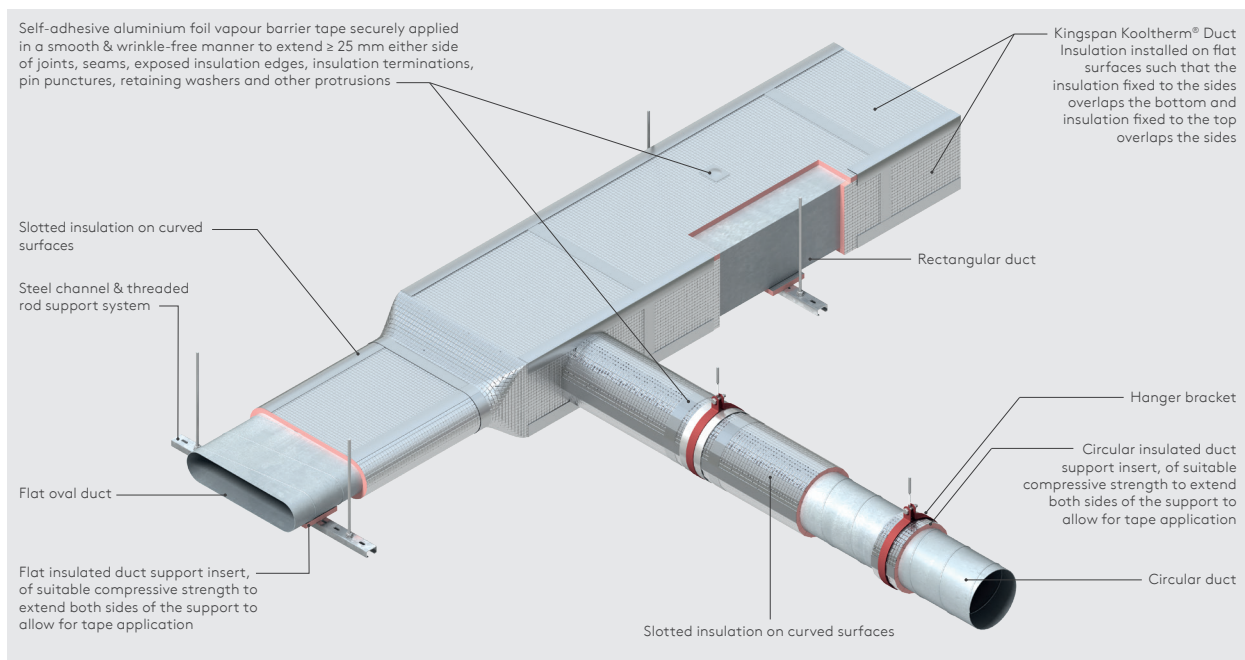


Figure 1: Fixing Details

Product Details

Insulated Duct Support Inserts

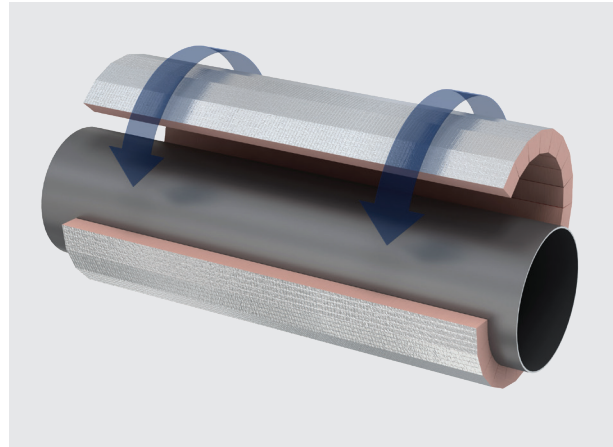
During the installation of ductwork, the contractor should place insulated support inserts between ducts and supports, to extend both sides of the support to allow for tape application. Insulated duct support inserts should be of suitable compressive strength to carry the loads transmitted to the supports and should be of the same thickness as that of the adjacent duct insulation.

Insulated duct support inserts enable a more consistent run of ductwork insulation, by allowing specified insulation levels to be maintained at ductwork support and hanger locations.

Interruptions in insulation continuity, by materials with significantly worse thermal conductivities, or no insulation at all, can result in thermal bridging (sometimes referred to as cold bridging). This can reduce the efficacy of the insulation through consequential heat losses / gains. The use of non-insulated duct supports can result in a relevant area of a ductwork system being seriously under-insulated.

Insulation on Curved Surfaces

Slotted duct insulation is recommended for curved surfaces.



Design Considerations

Environmental Impact

Environmental Product Declaration (EPD)

Kingspan Kooltherm® Duct Insulation has a verified Environmental Product Declaration (EPD) published online at www.kingspanductwork.co.uk/kdi.

NB The above information is correct at the time of writing. Please confirm at the point of need by contacting Kingspan Technical Insulation's Technical Service Department (see rear cover), from which copies of certificates can be obtained.

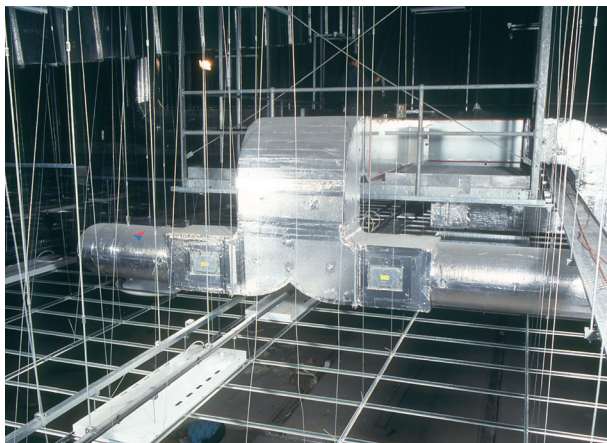
Sustainability & Responsibility

Kingspan Technical Insulation has a long-term commitment to sustainability and responsibility: as a manufacturer and supplier of insulation products; as an employer; as a substantial landholder; and as a key member of its neighbouring communities.

Further information can be found at www.kingspan.com/gb/en/about-us/sustainable-buildings-hub/.

Management System Certifications

Kingspan Kooltherm® Duct Insulation is manufactured under a management system certified to BS EN ISO 9001: 2015 (Quality management systems. Requirements), BS EN ISO 14001: 2015 (Environmental Management Systems. Requirements), BS ISO 45001: 2018 (Occupational health and safety management systems) and BS EN ISO 50001: 2018 (Energy management systems. Requirements with guidance for use).



Fire Performance

Properties

Kingspan Kooltherm® Duct Insulation is FM Approved per Approval Standard 4924 as a low fire hazard, which does not require automatic sprinkler protection of itself.

The insulation core of Kingspan Kooltherm® Duct Insulation is a rigid thermoset material and, unlike thermoplastic materials, it does not melt, drip or produce flaming droplets. Its intricately cross-linked structure makes it difficult to ignite and, when subjected to fire, its outer surface forms a strong carbonaceous layer that limits heat generation and retards further flame spread.

In addition, the insulation core has a resistance to burning and spread of flame far superior to that of flexible elastomeric foam (FEF), rigid polyurethane (PUR) and rigid polyisocyanurate (PIR) insulants.

The excellent fire performance characteristics of Kingspan Kooltherm® Duct Insulation clearly demonstrates its suitability for the designated application.

Kingspan Kooltherm® Duct Insulation, when subjected to the fire and smoke tests of the standards specified in Table 1, has achieved the results shown.

Standard	Result
BS EN 13501-1: 2018 (Fire classification of construction products and building elements - Classification using data from reaction to fire tests)	B-s2,d0 - exposed foil face E - non exposed tissue face

Table 1: Reaction to fire classification of Kingspan Kooltherm® Duct Insulation

Note: The reaction to fire declared corresponds to that of flat boards (not slotted / not curved).

Design Considerations

Certification by FM Approvals

Kingspan Kooltherm® Duct Insulation is certified to Approval Standard for Pipe and Duct Insulation Class Number 4924 when manufactured and installed in accordance with the conditions defined by the approval report. The test program indicates that Kingspan Kooltherm® Duct Insulation is a low fire hazard product, acceptable in and of itself, without needing automatic sprinkler protection.



This certification is valid for thermal insulation produced at Kingspan Insulation's Pembrokeshire, UK, manufacturing facility.

It allows Kingspan Kooltherm® Duct Insulation to be installed in single or multiple arrays, in thicknesses up to 90 mm, on rectangular, circular and flat oval ductwork, operating at temperatures not exceeding 104°C*, in HVAC / building services applications.

Further details of the FM Approval listing for Kingspan Kooltherm® Duct Insulation are published on the FM Global website at: www.approvalguide.com. To view the listing, search Keyword(s): Kooltherm duct.

* Although the approval allows Kingspan Kooltherm® Duct Insulation to be used on ductwork operating at temperatures up to 104°C, the upper limit should not exceed 80°C.



Thermal Properties

The thermal conductivities (λ -values) detailed below are quoted in accordance with BS EN 14314: 2009 + A1: 2013 (Thermal insulation products for building equipment and industrial installations. Factory made phenolic foam (PF) products).

Temperature (°C)	Thermal Conductivity (W/mK)
-20°C	0.024
10°C	0.022
19°C	0.023
25°C	0.023
50°C	0.026
80°C	0.031

Table 2: Thermal conductivity of Kingspan Kooltherm® Duct Insulation

Note: The thermal conductivity declared corresponds to that of flat boards (not slotted / not curved).

Space Saving

The low thermal conductivity of Kingspan Kooltherm® Duct Insulation makes it the most thermally efficient, and hence the thinnest, insulation product commonly used to insulate ductwork in HVAC / building services applications.

Thin insulation can contribute towards space savings. This can be particularly useful where space is often at a premium, e.g. service runs, raised floors and pre-fabricated modules. Increased space can facilitate installation, cleaning and maintenance operations in confined areas. Furthermore, thinner insulation can result in a reduction in surface area and therefore savings in finishing materials.

Recommended Thickness

For recommended thicknesses, please see Appendix 1.

Sitework

Introduction

In addition to the information given in this section, it is recommended that reference is also made to BS 5970: 2012 (Thermal insulation of pipework, ductwork, associated equipment and other industrial installations in the temperature range of - 100°C to + 870°C - Code of practice).

Installation

- Care should be taken when handling and transporting insulation products to prevent physical damage.
- During the installation of galvanised steel ductwork, the contractor should place insulated support inserts between ducts and supports, to extend both sides of the support to allow for tape application. Insulation at supports should be with a product of suitable compressive strength to carry the loads transmitted to the supports and should be of the same thickness as that of the adjacent duct insulation.
- In addition to the surfaces of ductwork, plenums and associated HVAC equipment - flanged joints, stiffeners, fasteners and connections must also be effectively insulated in order to reduce heat loss, heat gain and / or to control condensation.
- To facilitate inspection, testing, adjustment, balancing, maintenance and cleaning, a removable and fully vapour sealed piece of insulation, of sufficient size, must be provided at access door locations, if the door is not already pre-insulated.
- Insulation must not be installed at locations where the ductwork penetrates fire resistance rated walls, partitions, floors and ceiling-floor assemblies. Consideration should be given to current Buildings Regulations / Standards with regard to the requirements for, and provision of, fire stops.
- The reaction to fire of Kingspan Kooltherm® Duct Insulation is in accordance with the fire performance requirements for commercial applications and dwellings of Fire Safety: Approved Document B and BS 5422: 2023 (Thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40 °C to +700 °C. Method for specifying) and is in accordance with one specific requirement of BS 9999: 2017 (Fire safety in the design, management and use of buildings. Code of practice) for external insulation (32.5.10.2 item b). Consideration should be given when installing this product within 500 mm of a fire damper as the European class of this material is not A1 or A2 (see 32.5.10.2 item c).
- Before being insulated, surfaces must be made clean, dry and free from grease, dust, dirt, loose rust, scale and all other foreign matter.
- The insulation should be installed to achieve a close fit between the insulation and substrate, as well as between insulation joints.
- The ingress of moisture, or other foreign matter, either into the insulation or between the insulation and substrate, should be prevented during installation.
- When insulating rectangular ductwork, the thickness of insulation that has been specified should be maintained at all four corners of the duct.
- On horizontally orientated ducts, the insulation fixed to the sides overlaps the bottom and insulation fixed to the top overlaps the sides (see Figure 1 on page 2 of this document).
- The insulation must be securely fixed to the substrate by means of adhesive, by mechanical fixings or by a combination of both.
- When adhesive is used, a compatible high-strength contact adhesive must be applied in accordance with the manufacturer's recommendations. For suitable adhesives, please contact the Kingspan Technical Insulation Technical Service Department (see rear cover).
- Bands (preferably aluminium) and matching seals are used as additional mechanical means on circular ductwork. The banding must be no less than 15 mm wide and should be applied circumferentially at least three per section of insulation or at maximum 400 mm centres.
- On rectangular ductwork the selection of compatible mechanical fixings will be dependent upon: the substrate material; operating temperatures, size and orientation of the duct and the duct wall; and the degree of vibration to which the duct is subjected during operation.
- Mechanical fixings, if used, must be corrosion resistant, capable of sustaining the calculated tensile dead load perpendicular to the duct wall, and securely fixed so that they do not detach from the duct during its service life.
- Mechanical fixings should be positioned so that they are neatly and evenly distributed under each piece of insulation. They should be located no less than 75 mm, and no greater than 150 mm, from insulation edges and corners.

Vapour Barrier

- The vapour barrier over the insulation should be continuous and fully sealed.
- A high strength self-adhesive aluminium foil vapour barrier tape should be applied to all discontinuities in the vapour barrier. This includes those between insulated duct support inserts and abutting duct insulation, joints, seams, exposed insulation edges, insulation terminations, pin punctures, retaining washers and other protrusions.
- The self-adhesive vapour barrier tape should be applied in a smooth and wrinkle-free manner. It should extend no less than 25 mm either side of joints, seams, insulation edges and terminations, as well as in all directions of pin punctures, retaining washers and other protrusions.
- To ensure successful adhesion, all surfaces to receive self-adhesive vapour barrier tape should be made clean, dry and free from grease, dust, dirt and all other foreign matter prior to application. If required, surfaces may be primed with a thin coat of compatible high-strength contact adhesive. A gentle pressure may also be exerted using a soft spatula tool, whilst applying the tape.

Sitework

Protection & Finishes

- The factory-applied aluminium foil vapour barrier facing is normally the standard finish for concealed indoor areas, e.g. ceiling voids, floor voids, modules and risers.
- Although the factory-applied aluminium foil vapour barrier facing is normally the standard finish for open-to-view indoor applications, an additional cosmetic finish, e.g. paint may be provided. Consideration should, however, be given to any effect that it might have on the thermal and fire performance of the finished ductwork.
- When ductwork is located indoors up to 2 m from the floor, or at risk of being subjected to mechanical or physical abuse, e.g. in plant rooms, boiler houses, service areas or publicly accessible areas, an additional protective finish should be applied over the insulation. Suitable finishes include: aluminium or stainless steel sheet; aluminium-zinc alloy coated steel sheet; heavy-duty, self-adhesive laminate; synthetic elastomeric jacketing, systems; reinforcing glass / synthetic cloth embedded between two coats of appropriate coating; or glass reinforced polyester / epoxy (GRP / GRE) cladding systems, (all applied in accordance with the manufacturer's recommendations and the project's specification requirements).
- When ductwork is located outdoors, the insulation must be adequately protected with an additional weatherproof and water / vapour tight finish that shields against the effects of wind and sunlight. The finish must also be capable of providing suitable protection if at risk of being subjected to mechanical or physical abuse e.g. birds. Suitable finishes include: aluminium or stainless steel sheet; aluminium-zinc alloy coated steel sheet; heavy-duty, self-adhesive laminate; synthetic elastomeric jacketing, systems; reinforcing glass / synthetic cloth embedded, between two coats of appropriate coating; or UV resistant glass reinforced polyester / epoxy (GRP / GRE) cladding systems (all applied in accordance with the manufacturer's recommendations and the project's specification requirements).
- When installing an additional finish over the standard factory-applied aluminium foil vapour barrier facing, care must be taken to preserve the integrity of the vapour barrier at all times.
- For additional details regarding swimming pool applications please contact Kingspan Technical Insulation's Technical Service Department.

Identification of Services

- Both insulated and non-insulated services should be clearly identifiable.
- The identification system should be in accordance with the project specification e.g. BS 1710: 2014 (Specification for identification of pipelines and services).
- The identification system and its method of application should be compatible with the finish. They should also be suitable for the operating and ambient conditions.

General

Cutting

- Manual cutting of the insulation boards should be carried out either by using a fine toothed saw, or by scoring the surface with a sharp knife and cutting through the full thickness of insulation.
- Ensure accurate trimming to achieve close-butting joints and continuity of insulation.
- Automated computer aided cutting may be carried out using CNC blade / router machinery.

Availability

- Kingspan Kooltherm® Duct Insulation is available through specialist insulation distributors throughout the UK and Ireland.

Packaging & Storage

- The polyethylene packaging of Kingspan Insulation products, which is recyclable, should not be considered adequate for outdoor protection.
- Insulation products should be maintained in good condition throughout the duration of the works and should not be unpacked onsite until required for immediate use. They should be returned to storage at the end of each workday.
- Insulation materials should be adequately protected from the weather, humidity, abrasive matter, contaminants and all other foreign matter.
- Ideally, products should be stored inside a building. If, however, outside storage cannot be avoided, they should be stored in a dry atmosphere, clear of the ground, out of direct sunlight and covered with an opaque and weatherproof material. Products that have been allowed to get wet should not be used.

Health & Safety

- Kingspan Kooltherm® Duct Insulation is chemically inert and safe to use.
- A Safety Information Data Sheet is available from www.kingspanductwork.co.uk/kdi.

NB The reflective surfaces on this product are designed to enhance the thermal performance. As such, they will reflect light as well as heat, including ultraviolet (UV) light. Therefore, if this product is being installed during very bright or sunny weather, it is advisable to wear UV protective sunglasses or goggles, and if the skin is exposed for a significant period of time, to protect the bare skin with a UV block sun cream. The reflective facing used on this product can be slippery underfoot when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard. Warning - do not stand on or otherwise support your weight on this product.

Appendix 1

Recommended Thickness

Indicative thickness of duct insulation to comply with:

- BS 5422: 2023 (Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C), Tables 12, 13 and 14; and
- Building Regulations Approved Document Part L; Northern Ireland Technical Booklet F2; Scottish Non Domestic Technical Handbook.

Notes:

All calculations according to BS EN ISO 12241: 2022. (Thermal insulation for building equipment and industrial installations. Calculation rules).

When a calculated thickness is not commercially available, a thicker product or double layer will be required (as indicated in brackets below).

Minimum Thickness of Kingspan Kooltherm® Duct Insulation (mm) for Condensation Control on Ductwork Carrying Chilled Air in Ambient Condition			
Indoor Still Air Temperature +25°C, Relative Humidity 80%, Dewpoint Temperature 21.3°C			
Minimum Air Temperature Inside Duct (°C)	Minimum Thickness of Insulating Material (mm)		
	Low Emissivity: 0.05 (e.g. Bright Alum. Foil)	Medium Emissivity: 0.44 (e.g. Dusty Galvanised Steel)	High Emissivity: 0.90 (e.g. Steel, Black Painted)
15	20	20	20
10	30	20	20
5	50	25	20
0	54 (30 + 25)*	30	20

Table 3: Minimum thickness of Kingspan Kooltherm® Duct Insulation (mm) for condensation control on ductwork carrying chilled air in ambient condition

Assumptions: horizontal duct, with 600 mm vertical sidewall in still air.
Aged thermal conductivity of insulation: 0.022 W/mK at 10°C; 0.023 W/mK at 19°C (λ-value).
Note that the factory applied bright aluminium foil is a low emissivity facing (ε = 0.05).

Minimum Thickness Of Kingspan Kooltherm® Duct Insulation (mm) For Ductwork Carrying Warm Air To Control Heat Loss			
Air Temperature 35°C; Ambient Temperature 15°C			
Low Emissivity: 0.05 (e.g. Bright Alum. Foil)	Medium Emissivity: 0.44 (e.g. Dusty Galv. Steel)	High Emissivity: 0.90 (e.g. Steel, Black Painted)	Max Permissible Heat Loss (W/m²)
20	25	25	16.34

Table 4: Minimum thickness of Kingspan Kooltherm® Duct Insulation (mm) for ductwork carrying warm air to control heat loss

Assumptions: horizontal duct, with 600 mm vertical sidewall in still air.
Aged thermal conductivity of insulation: 0.023 W/mK at 25°C (λ-value).
Note that the factory applied bright aluminium foil is a low emissivity facing (ε = 0.05).

Minimum Thickness Of Kingspan Kooltherm® Duct Insulation (mm) For Chilled / Dual Purpose Ductwork To Control Heat Gain			
Air Temperature 13°C; Ambient Temperature 25°C			
Low Emissivity: 0.05 (e.g. Bright Alum. Foil)	Medium Emissivity: 0.44 (e.g. Dusty Galv. Steel)	High Emissivity: 0.90 (e.g. Steel, Black Painted)	Max Permissible Heat Gain (W/m²)
35	40	40	-6.45

Table 5: Minimum Thickness of Kingspan Kooltherm® Duct Insulation (mm) for chilled / dual purpose ductwork to control heat gain

Assumptions: horizontal duct, with 600 mm vertical sidewall in still air.
Aged thermal conductivity of insulation: 0.023 W/mK at 19°C (λ-value).
Note that the factory applied bright aluminium foil is a low emissivity facing (ε = 0.05).

Contact Details

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