ISO-C1®/2.0 Polyisocyanurate Insulation

2.0 lb/ft³ (32 kg/m³) Density Foam

ISO-C1/2.0 is Kingspan Insulation, LLC's polyisocyanurate rigid, closed cell foam insulation within its broad ISO line of products. ISO-C1/2.0 is independently tested and audited, and is also listed with FM as a Specification Tested Identified Component - Combustible Core for Insulated Building Panels under FM 4880. ISO-C1 has higher thermal efficiency than competing polyiso, EPS, XPS, fiberglass, or cellular glass insulation, offering exceptional performance in both piping and panel applications from -297 to +300°F (-183 to +149°C). ISO-C1 physical properties are superior in other areas, achieving code compliance plus levels of dimensional stability, closed cell content, and moisture resistance otherwise unattainable. ISO-C1/2.0 meets the demanding requirements of ASTM C591 for Type IV classification, including thermal conductivity measured at -200°F (-129°C).

Polyisocyanurate has exceptional R-value (insulating value) per unit cost. Ideal for low-temperature and cryogenic applications, ISO-C1 offers superior performance when compared to polystyrene, polyurethane, phenolic, fiberglass, and cellular glass alternatives. Our ISO-C1 product line is also available in 2.5, 3.0, 4.0, and 6.0 lb/ft³ densities, which each provide successively improved strength and other attributes. See ISO-HT/2.5 for higher temperature applications.

ISO-C1 is produced as a continuous foam bun stock with the ability to custom size the bun in order to provide for efficient fabrication to virtually any shape or size, thus reducing waste. For specific stock bun sizes contact the sales department at 1-800-433-5551 or logon to our website for ISO-C1 sizing. Our proprietary production process utilizes hydrocarbon blowing agents (which are low-GDP and zero-ODP - not covered or targeted by the Montreal Protocol) creating a portfolio of ISO-C1 products with physical properties superior to prior generation formulations.

Thermal Efficiency

With its high R-value of R-5.26 (at +75°F), ISO-C1/2.0 can achieve the same insulating value with as little as half the thickness required by alternative insulating materials. Less insulation leads to thinner walls, less weight, more space, and fewer and tighter energy-losing seams - further enhanced by the availability of larger pieces (for example, 24-foot panels or blocks). Less insulation in mechanical applications also equates to reduced quantities of expensive vapor retarders, jackets, and mastics. The lighter weight of ISO-C1/2.0 compared to cellular glass (less than one-third) reduces structural support requirements.

Long Term R-Value

High thermal insulation efficiency is achieved by infusing cells with gases having low thermal conductivity. All such rigid foam insulation (including polyurethanes and extruded polystyrene) thus lose a small amount of their insulating value over time as air displaces insulating gases. ISO-C1's smaller, stronger cell structure and our proprietary cell-gas formulation work together to impede gas transfer across cell boundaries, thus reducing loss of thermal efficiency. It is important to note that ISO-C1/2.0's service temperatures are normally well below 75°F, and that thermal aging is reduced considerably at lower operating temperatures. Thicker insulation, vapor barriers, and metal jacket constraints also limit gas diffusion.

Condensation

For optimum performance and longevity, insulation systems for low temperature applications must be designed to control condensation. One primary design strategy is to specify high insulation efficiency since if the surface temperature of the insulation system can be maintained above the dewpoint, condensation will not occur. Since a minimal amount of condensation may be acceptable (or unavoidable) in humid environments, a secondary design strategy is to also demand insulation with low water vapor transmission.

Water Absorption

Water absorption by insulation can degrade thermal insulating performance, although the correlation between WA and loss of thermal efficiency varies considerably between insulants. ISO-C1/2.0's extraordinary resistance to water absorption (<1.0%) helps ensure long-term thermal performance, and remains superior to polystyrenes, phenolic foams, and fiberglass. Proper installation of vapor barriers can further improve performance of the complete ISO-C1/2.0 insulating system.

Surface Burning Characteristics

The National Fire Protection Association Life Safety Code, NFPA No. 101 defines Class 1 insulation as meeting the ≤25/450 flame spread/smoke development rating. ISO-C1/2.0 performs well within this range with a ≤25/250 rating. When comparing surface burning characteristics of alternative products, care must be taken to consider the installed insulation system as a whole, including sprinkler systems. For example, a well-designed ISO-C1 insulation system can improve overall fire/smoke performance of the polyiso insulation.

Features and Benefits

- Dimensionally stable
- Insulation value
- Moisture Resistance (see 12.5 and 12.6 in table)
- Easy to handle, shape in the field
- Sheets can be cut to 1/32" tolerance
- Variable bun stock sizing in 3 dimensions
- Fabrication flexibility to virtually any shape/size
- High flexural strength (52psi parallel/37psi perpendicular)
- Light-weight

Applications

Pipe, tank, and vessel mechanical insulation; panels for refrigeration and freezers; core material for architectural and panelized construction; panel insulation for shipping containers and rail cars; insulated metal panels; flat panels for duct and air plenum insulation.

Industries

Cryogenic facilities such as liquid natural gas (LNG), liquid oxygen, (LOX), etc.; refrigeration/freezer manufacture; commercial HVAC and chill water systems; low temperature steam; hot water; insulated metal panels for commercial building construction; and panels for refrigerated transportation.

Installation

(See Kingspan's Installation Guidelines at technical.kingspaninsulation.us)

Compliances and Approvals

ISO-C1/2.0 has been tested by independent laboratories to meet or exceed the requirements of the ASTM C591, the Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation. In addition, we have FM Approval for ISO-C1/2.0 as a Specified Tested Identified Component under Approval Standard 4880 for Insulated Building Panels. ISO-C1/2.0 also has received a Notice of Acceptance from Miami-Dade.

Note to Engineers

Visit technical.kingspaninsulation.us.

Typical Physical Properties [1,2,3]	ISO-C1®/2.0	ASTM C591 Max or Min
Service Temperature °F (°C)		
Maximum[4]	300 (149)	300 (149)
Minimum	-297 (-183)	-297 (-183)
12.1[5] Nominal Density, D1622, lb/ft^3 (kg/m^3)	2.02 (33)	≥2.0 (32)
12.2 Compressive Resistance (Strength), D1621 psi (kPa)		
Parallel	29.2 (201)	≥22 (150)
Perpendicular (Length)	26.8 (185)	Not specified
Perpendicular (Width)	18 (124)	Not specified
12.3 Apparent Thermal Conductivity, C177[6] (aged 6 months @ 73 +/- 4˚F) Btu.in/hr.ft^2.˚F (W/m.˚K)		
Mean temp of measure -265°F (-165°C)	0.07 (0.010)	Not specified
Mean temp of measure -200°F (-129°C)	0.11 (0.016)	≤0.13 (0.019)
Mean temp of measure -150°F (-101°C)	0.13 (0.019)	≤0.15 (0.022)
Mean temp of measure -100°F (-73°C)	0.16 (0.023)	≤0.17 (0.025)
Mean temp of measure -50°F (-45°C)	0.18 (0.026)	≤0.19 (0.027)
Mean temp of measure -0°F (-17°C)	0.19 (0.028)	≤0.19 (0.027)
Mean temp of measure +50°F (+10°C)	0.18 (0.026)	≤0.18 (0.026)
Mean temp of measure +75°F (+24°C)	0.19 (0.027)	≤0.19 (0.027)
Mean temp of measure +150°F (+66°C)	0.23 (0.033)	≤0.23 (0.033)
Mean temp of measure +200°F (+93°C)	0.26 (0.037)	≤0.26 (0.037)
Apparent Thermal Conductivity C518, aged, +75°F (+24°C)	0.19 (0.027)	≤0.19 (0.027)
12.4 Hot-Surface Performance, C411 at 300°F (149°C) Deflection inches (mm)	Pass @ 0.15 (3.8)	≤0.25 (6)
12.5 Water Absorption, C272, % by volume	0.47	≤2.0
12.6 Water Vapor Permeability (Transmission), E96, Perm-in (ng/Pa.s.m)	2.49(3.6)	≤4.0 (5.8)
12.7 Dimensional Stability[7], D2126, % linear change		
-40°F, 14 days	-0.8	≤1
158°F, 97% RH, 14 days	1.1	≤4
212°F, 14 days	0.4	≤2
12.8 Closed Cell Content, D6226, %	97	≥90

[1] All properties were measured at temperatures at or near 75° unless otherwise indicated, and all test values were obtained from independent certified testing laboratories.
[2] These are nominal values obtained from representative product samples, and are subject to normal manufacturing variances.
[3] Average value through the foam cross section of tested sample.
[4] Above 300°F, discoloration and charring will occur, potentially resulting in an increased k-factor in the discolored area.
[5] Table 1 includes the paragraph numbering system utilized within Section 12 of ASTM C591.
[6] Thermal Conductivities (k-factors) at Low Temperatures: ASTM C591 is the Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal, and is arguably the key Standard used by insulation system end-users and engineer/specifiers to guide decision-making. Compliance with ASTM C591 is often a prerequisite within an insulation Request for Proposal.
[7] Frequent and severe thermal cycling can produce dimensional changes significantly greater than those listed here. Special design considerations must be made in systems subject to severe cycling.

The following properties are not specified by ASTM C591, yet are often reported	
Surface Burning Characteristics[8], E84	
Flame Spread (@ 4 inch thickness)	≤25
Smoke Density (@ 4 inch thickness)	≤250
Leachable Chloride, C871, ppm	84
Shear Strength, C273, Average of 3 directions in psi (kPa)	22.9 (157.9)
Shear Modulus, C273, psi (kPa)	284 (1960)
Tensile Strength, D1623, psi (kPa)	
Parallel	44.9 (309.6)
Perpendicular	28.3 (195.1)
Tensile Modulus, D1623, psi (kPa)	
Parallel	1601 (11040)
Perpendicular (average)	928 (6400)
Flexural Strength, C203, psi (kPa)	
Parallel	52 (360)
Perpendicular	37 (255)
Flexural Modulus, C203, psi (kPa)	
Parallel	972 (6702)
Perpendicular	545 (3760)
Coefficient of Linear Expansion, E228, Average Value in/in.°F (m/m.°C)	35×10^{-6} (63×10^{-6})
Color	Tan

[8] This numerical flame spread data is not intended to reflect hazards presented by this or any other material under actual fire conditions.

SCAN ME

Please scan the QR code for the most recent product information

Kingspan Insulation, LLC
12501 NW 38th Ave.
Miami, FL 33054
T: 800 433-5551
E: info.dyplast@kingspan.com
https://technical.kingspaninsulation.us

kingspan-iso-c1-2.0-product-data-sheet-en-us-v1.0
Version 1.0 – 04/2023