

DATA SHEET

## Cryogel Z

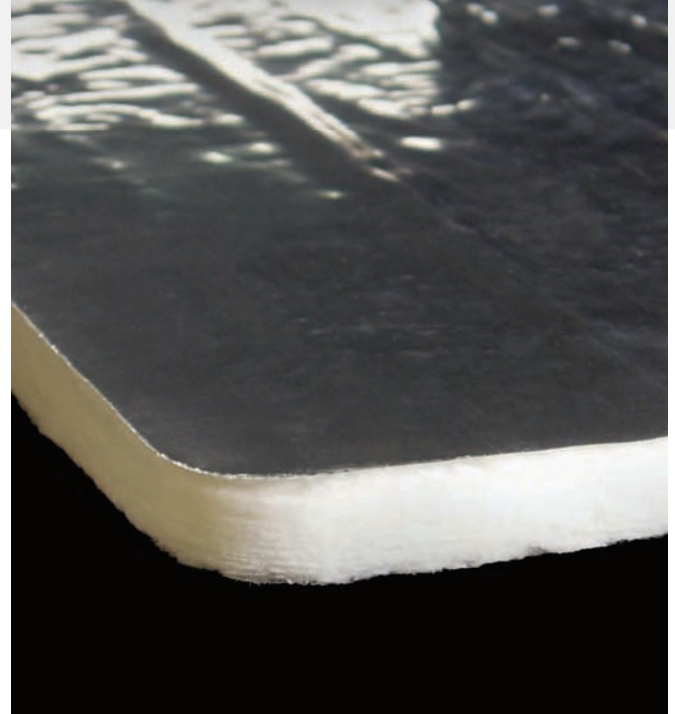
### FLEXIBLE INDUSTRIAL INSULATION WITH VAPOR BARRIER FOR SUB-AMBIENT AND CRYOGENIC APPLICATIONS

Cryogel™ Z is flexible aerogel blanket insulation with an integral vapor barrier. It is engineered to deliver maximum thermal protection with minimal weight and thickness and zero water vapor permeability.

Cryogel Z's unique properties – extremely low thermal conductivity, superior flexibility, compression resistance, hydrophobicity, and ease of use – make it essential for those seeking the ultimate in thermal protection for cryogenic applications.

Using patented nanotechnology, Cryogel Z insulation combines a silica aerogel with reinforcing fibers to deliver industry-leading thermal performance in an easy-to-handle and environmentally safe product.

Cryogel Z's extremely low thermal conductivity reduces heat gain and liquid boil-off, its blanket form minimizes installation labor, and its inherent flexibility makes the product durable and resistant to mechanical abuse.



### Physical Properties

<b>Thicknesses*</b>	0.20 in (5 mm)	0.40 in (10 mm)
<b>Material Form*</b>	57 in (1,450 mm) wide x 211 ft (64 m) long rolls	57 in (1,450 mm) wide x 126 ft (38 m) long rolls
<b>Max. Use Temp.</b>	194°F (90°C)	
<b>Color</b>	White	
<b>Density*</b>	8.0 lb/ft <sup>3</sup> (0.13 g/cc)	
<b>Hydrophobic</b>	Yes	

\*Nominal Values

### Advantages

#### Superior Thermal Performance

2 to 3 times more efficient than competing insulation products

#### Reduced Thickness and Profile

Equal thermal resistance at a fraction of the thickness

#### Less Time and Labor to Install

Easily cut and conformed to complex shapes, tight curvatures, and spaces with restricted access

#### Zero Permeability Due to Integral Vapor Barrier

Provides redundant moisture protection in an easy-to-install package

#### Physically Robust

Soft and flexible but with excellent springback, Cryogel Z recovers its thermal performance even after compression events as high as 850 psi

#### Shipping and Warehousing Savings

Reduced material volume, high packing density, and low scrap rates can reduce logistics costs by a factor of five or more compared to rigid, pre-formed insulations

#### Eliminates Contraction Joints

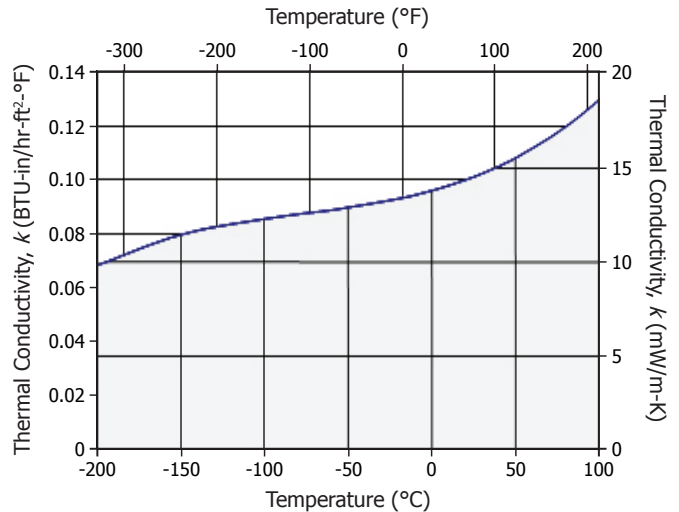
Because it remains flexible even at cryogenic temperatures, Cryogel Z eliminates the contraction joints used to prevent compressive failure in other insulation materials

#### Environmentally Safe

Landfill disposable, shot-free, with no respirable fiber content

### Thermal Conductivity<sup>†</sup>

ASTM C 177 Results



Mean Temp. °C	-200	-150	-100	-50	0	50	100
°F	-328	-238	-148	-58	32	122	212
<b>k</b> mW/m-K	9.8	11.4	12.3	12.9	13.8	15.5	18.6
BTU-in/hr-ft²-°F	0.0681	0.0793	0.0852	0.0894	0.0956	0.1076	0.1291

<sup>†</sup>Thermal conductivity measurements taken at a compressive load of 2 psi.



# Cryogel Z

## Thicknesses Required to Prevent Surface Condensation\*

Design conditions: ambient temperature = 80°F (26.7°C), relative humidity = 70%, dew point temperature = 69.3°F (20.7°C), wind speed = 0, surface emissivity = 0.9  
Includes 10% safety factor.

Cryogel Z Thickness (in) vs. Temperature (°F)																		
NPS (in)	50	32	14	-4	-22	-40	-58	-76	-94	-112	-130	-148	-166	-184	-202	-220	-238	-256
1/2	0.2	0.4	0.4	0.4	0.6	0.6	0.6	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.2	1.2	1.2
3/4	0.2	0.4	0.4	0.4	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2
1	0.2	0.4	0.4	0.4	0.6	0.6	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.4
1 1/2	0.2	0.4	0.4	0.6	0.6	0.6	0.8	0.8	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.4	1.4	1.4
2	0.2	0.4	0.4	0.6	0.6	0.8	0.8	0.8	1.0	1.0	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.6
3	0.2	0.4	0.4	0.6	0.6	0.8	0.8	1.0	1.0	1.2	1.2	1.2	1.4	1.4	1.4	1.6	1.6	1.6
4	0.2	0.4	0.4	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	1.6	1.6	2.0
6	0.2	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0
8	0.2	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0
10	0.2	0.4	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0
12	0.2	0.4	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0
14	0.2	0.4	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0
16	0.2	0.4	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0
18	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4
20	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4
24	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.4
28	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4	2.4
30	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4	2.4
36	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4	2.4
48	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4	2.4
Flat	0.2	0.4	0.8	0.8	0.8	1.2	1.2	1.2	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.4

Cryogel Z Thickness (mm) vs. Temperature (°C)																		
NPS (mm)	10	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160
15	5	10	10	10	15	15	15	20	20	20	20	25	25	25	25	30	30	30
20	5	10	10	10	15	15	15	20	20	20	20	25	25	25	25	30	30	30
25	5	10	10	10	15	15	20	20	20	25	25	25	25	30	30	30	30	35
40	5	10	10	15	15	15	20	20	25	25	25	30	30	30	30	35	35	35
50	5	10	10	15	15	20	20	20	25	25	30	30	30	30	35	35	35	40
80	5	10	10	15	15	20	20	25	25	30	30	30	35	35	35	40	40	40
100	5	10	10	20	20	20	20	30	30	30	30	40	40	40	40	40	40	50
150	5	10	10	20	20	20	30	30	30	30	30	40	40	40	40	50	50	50
200	5	10	10	20	20	20	30	30	30	30	40	40	40	40	40	50	50	50
250	5	10	20	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50
300	5	10	20	20	20	20	30	30	30	40	40	40	40	40	50	50	50	50
350	5	10	20	20	20	20	30	30	30	40	40	40	40	50	50	50	50	50
400	5	10	20	20	20	20	30	30	30	40	40	40	40	50	50	50	50	50
450	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
500	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
600	5	10	20	20	20	30	30	30	30	40	40	40	50	50	50	50	50	60
700	5	10	20	20	20	30	30	30	30	40	40	40	50	50	50	50	60	60
750	5	10	20	20	20	30	30	30	30	40	40	40	50	50	50	50	60	60
900	5	10	20	20	20	30	30	30	30	40	40	40	50	50	50	50	60	60
1200	5	10	20	20	20	30	30	30	30	40	40	40	50	50	50	50	60	60
Flat	5	10	20	20	20	30	30	30	40	40	40	40	50	50	50	60	60	60

\*These data are provided as an example only. Actual performance should be determined using the parameters relevant to the particular application. Please contact Aspen Aerogels for technical assistance.



# Cryogel Z

## Thicknesses Required to Prevent Surface Condensation\*

Design conditions: ambient temperature = 80°F (26.7°C), relative humidity = 80%, dew point temperature = 73.3°F (22.9°C), wind speed = 0, surface emissivity = 0.9  
Includes 10% safety factor.

Cryogel Z Thickness (in) vs. Temperature (°F)																		
NPS (in)	50	32	14	-4	-22	-40	-58	-76	-94	-112	-130	-148	-166	-184	-202	-220	-238	-256
1/2	0.4	0.4	0.6	0.6	0.8	0.8	1.0	1.0	1.2	1.2	1.4	1.4	1.4	1.6	1.6	1.6	1.8	1.8
3/4	0.4	0.4	0.6	0.8	0.8	1.0	1.0	1.2	1.2	1.2	1.4	1.4	1.6	1.6	1.6	1.8	1.8	1.8
1	0.4	0.4	0.6	0.8	0.8	1.0	1.0	1.2	1.2	1.4	1.4	1.6	1.6	1.6	1.8	1.8	2.0	2.0
1 1/2	0.4	0.6	0.6	0.8	1.0	1.0	1.2	1.2	1.4	1.4	1.6	1.6	1.8	1.8	2.0	2.0	2.0	2.2
2	0.4	0.6	0.6	0.8	1.0	1.0	1.2	1.4	1.4	1.6	1.6	1.8	1.8	2.0	2.0	2.0	2.2	2.2
3	0.4	0.6	0.8	0.8	1.0	1.2	1.2	1.4	1.6	1.6	1.8	1.8	2.0	2.0	2.2	2.2	2.4	2.4
4	0.4	0.8	0.8	0.8	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.4	2.4	2.4	2.4	2.8
6	0.4	0.8	0.8	1.2	1.2	1.2	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.4	2.4	2.8	2.8	2.8
8	0.4	0.8	0.8	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.4	2.8	2.8	2.8	3.1
10	0.4	0.8	0.8	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.4	2.4	2.4	2.8	2.8	2.8	3.1	3.1
12	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.4	2.8	2.8	2.8	3.1	3.1
14	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.1
16	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.1
18	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.1
20	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.4	2.8	2.8	3.1	3.1	3.1	3.5
24	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.1	3.5
28	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.1	3.5
30	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.5	3.5
36	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.5	3.5
48	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	3.1	3.1	3.1	3.5	3.5
Flat	0.4	0.8	0.8	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8	3.1	3.1	3.5	3.5	3.9

Cryogel Z Thickness (mm) vs. Temperature (°C)																		
NPS (mm)	10	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160
15	10	10	15	15	20	20	25	25	30	30	35	35	35	40	40	40	45	45
20	10	10	15	20	20	25	25	30	30	30	35	35	40	40	40	45	45	45
25	10	10	15	20	20	25	25	30	30	35	35	40	40	40	45	45	50	50
40	10	15	15	20	25	25	30	30	35	35	40	40	45	45	50	50	50	55
50	10	15	15	20	25	25	30	35	35	40	40	45	45	50	50	50	55	55
80	10	15	20	20	25	30	30	35	40	40	45	45	50	50	55	55	60	60
100	10	20	20	20	30	30	40	40	40	50	50	50	50	60	60	60	60	70
150	10	20	20	30	30	30	40	40	50	50	50	60	60	60	60	70	70	70
200	10	20	20	30	30	40	40	40	50	50	50	60	60	60	70	70	70	80
250	10	20	20	30	30	40	40	40	50	50	60	60	60	70	70	70	80	80
300	10	20	20	30	30	40	40	50	50	50	60	60	60	70	70	70	80	80
350	10	20	20	30	30	40	40	50	50	50	60	60	70	70	70	80	80	80
400	10	20	20	30	30	40	40	50	50	50	60	60	70	70	70	80	80	80
450	10	20	20	30	30	40	40	50	50	60	60	60	70	70	70	80	80	80
500	10	20	20	30	30	40	40	50	50	60	60	60	70	70	80	80	80	90
600	10	20	20	30	30	40	40	50	50	60	60	70	70	70	80	80	80	90
700	10	20	20	30	30	40	40	50	50	60	60	70	70	70	80	80	80	90
750	10	20	20	30	30	40	40	50	50	60	60	70	70	70	80	80	80	90
900	10	20	20	30	30	40	40	50	50	60	60	70	70	70	80	80	80	90
1200	10	20	20	30	30	40	40	50	50	60	60	70	70	80	80	80	90	90
Flat	10	20	20	30	40	40	50	50	60	60	70	70	70	80	80	90	90	100

\*These data are provided as an example only. Actual performance should be determined using the parameters relevant to the particular application. Please contact Aspen Aerogels for technical assistance.



# Cryogel Z

## Specification Compliance and Performance

Test Procedure	Property	Inch-Pound	Metric	
ASTM C165	Compressive Resistance at room temperature: 73.4°F (23°C)	@ 10% compression	7.7 psi	52.9 kPa
		@ 25% compression	18.9 psi	130 kPa
ASTM C165	Compressive Resistance at cryogenic temperature: -319°F (-195°C)	@ 10% compression	8.4 psi	58.0 kPa
		@ 25% compression	21.7 psi	150 kPa
ASTM C795	Insulation for Use Over Austenitic Stainless Steel	Conforms		
ASTM C1101	Classifying the Flexibility of Insulation Blankets at room temperature: 73.4°F (23°C)	Flexible		
ASTM C1101	Classifying the Flexibility of Insulation Blankets at cryogenic temperature: -319°F (-195°C)	Flexible		
ASTM C1104	Water Vapor Sorption of Unfaced Insulation, Procedure A	< 0.5%		
ASTM C1511	Liquid Water Retention after Submersion in Water (Water Repellency)	< 2%		
ASTM E84	Surface Burning Characterization	Class A		
		Flame Spread	< 25	
		Smoke Developed	< 50	
ASTM E228	Coefficient of Thermal Expansion [-256°F (-160°C) to 68°F (20°C)]	7.1 x 10 <sup>-6</sup> /°F	13.1 x 10 <sup>-6</sup> /°C	
ASTM E96	Water Vapor Permeability (for complete product with laminate foil)	Approx. 0.00 g/m <sup>2</sup> -hr-mmHg		

## Characteristics

Cryogel Z can be cut using conventional cutting tools including scissors, tin snips, razor knives, and hot knives. The material can be dusty, and it is recommended gloves, safety glasses, and dust mask be worn when handling material. See MSDS for complete health and safety information.

## Other Available Materials

Aspen Aerogels produces several types of flexible aerogel blanket materials for hot and cold applications. Please contact us for additional information on these products.

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