



DATA SHEET

# Cryogel® Z

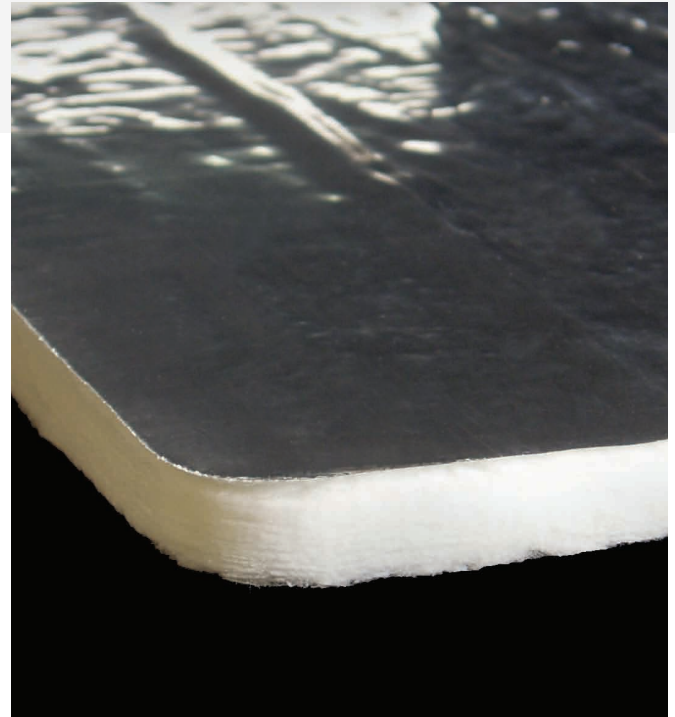
## FLEXIBLE INDUSTRIAL INSULATION WITH INTEGRAL VAPOR BARRIER FOR SUB-AMBIENT AND CRYOGENIC APPLICATIONS

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

Up to five times better thermal performance 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

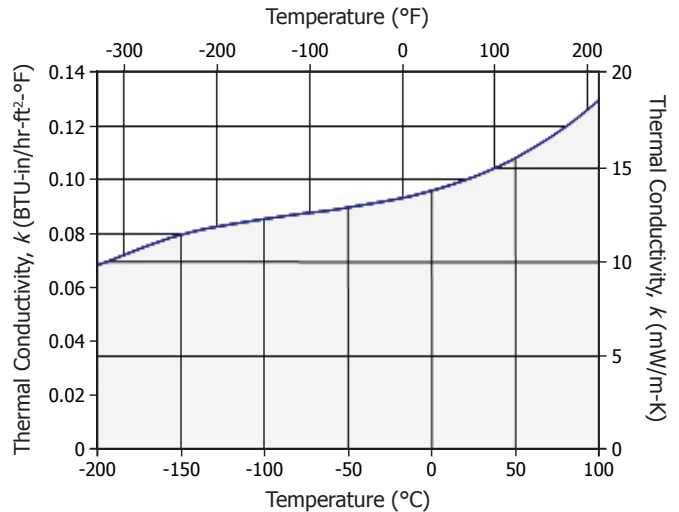
Because it remains flexible even at cryogenic temperatures, Cryogel® Z eliminates the contraction joints used to prevent compressive failure in other insulation materials

#### 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	20	25	25	25	25	30	30	30	35
40	5	10	10	15	15	15	20	20	20	25	25	25	30	30	30	30	35	35
50	5	10	10	15	15	20	20	20	20	25	25	30	30	30	30	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	40	50	50	50	50
400	5	10	20	20	20	20	30	30	30	40	40	40	40	40	50	50	50	50
450	5	10	20	20	20	30	30	30	30	40	40	40	40	40	50	50	50	60
500	5	10	20	20	20	30	30	30	30	40	40	40	40	40	50	50	50	60
600	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
700	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
750	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
900	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
1200	5	10	20	20	20	30	30	30	30	40	40	40	40	50	50	50	50	60
Flat	5	10	20	20	20	30	30	30	40	40	40	40	40	50	50	50	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	0.2 inch product
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	0.2 inch and/or 0.4 inch product
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	5 mm product
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	5 mm and/or 10 mm product
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	80	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	Results
ASTM C 165	Compressive Stress Strain	7.5 psi @ 10%, 25.0 psi @ 25%
ASTM C 871	Standard Specification for Thermal Insulation for Use in Contact With Austenitic Steel	PASS
ASTM C 1101	Flexibility	Flexible
ASTM C 1101	Flexibility at Cryogenic Temperature	Resilient Flexible
ASTM C 1104	Water Vapor Sorption	<1.1% (mass)
ASTM C 1511	Water Retention after Submersion in Water	<4% (mass)
ASTM E 84	Flame and Smoke Spread	Class A: FSI <5 SDI 20
ASTM E 96	Water Vapor Transmission Rate (with vapor barrier)	0.00 perm
ASTM E 228	Linear Coefficient of Thermal Expansion (@ -150°C)	x $1.26 \times 10^{-5} \text{ K}^{-1}$ y $1.34 \times 10^{-5} \text{ K}^{-1}$
UL 1709	Structural Steel Fire Protection	30 mm → 47 min    75 mm → 173 min 50 mm → 109 min    100 mm → 180* min

## 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.

Information presented herein is typical and representative of material performance. Any and all warranties, either expressed or implied, are disclaimed. All products or materials supplied, including any recommendations or suggestions must be evaluated by the user to determine applicability and suitability for a particular use. Values should not be used directly for specification purposes. Aspen Aerogels, Inc. does not assume any liability for use or misuse of any products produced or supplied. This information replaces all previous information. As a result of the constant development of our products, we reserve the right to make alterations to this information without notice.