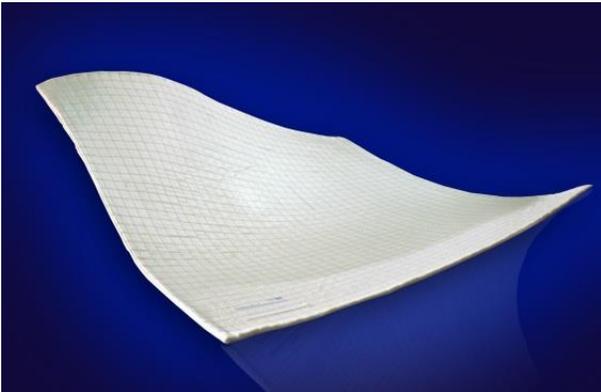


Flexible Min-K[®]

Datasheet Code US: 6-14-120



Features

- Very low thermal conductivity
- Benefits weight and space constraints
- Flexible and lightweight
- Composite temperature use limit ranges 500 - 1832°F (260 – 1000°C)

Product Description

Flexible Min-K is a composite system consisting of a microporous core encapsulated between layers of high temperature cloth and quilted in 1" squares. The quilting maintains core distribution in high vibration environments and allows the insulation to be wrapped or bent to conform to unique geometric shapes during installation. Product thickness, core density and composition, and cloth selection vary with application.

Core and Textile Facing Selection

While thermal management requirements often dictate material thickness and core density, the maximum continuous use temperature seen in the application is the deciding factor for core and cloth selection. Because this is a composite material, the use limit is decided by the lowest use limit associated with the materials incorporated into the design.

Core

Maximum temperature use limit of the microporous core is a function of both shrinkage and degradation of thermal conductivity. At elevated temperatures, the cellular structure of the microporous insulation, which is responsible for the extremely

low thermal conductivity, is compromised. The core components, including SiO₂ particles, metal oxides and re-enforcement fibres, may melt or sinter together at elevated temperatures increasing both the solid conduction due to material contact, and molecular conduction of air due to the degradation of the microporous structure.

Core Formulations

- **Mix F182** is utilized for temperatures up to 1832°F (1000°C) and where high vibration environments are seen.
- **Mix F150** is used for applications at 1200°F (649°C) and lower.
- **Mix F382** is utilized for temperatures up to 1832°F (1000°C) and where high vibration environments are seen
- **Mix F351** is utilized for temperatures up to 1832°F (1000°C) and where high vibration environments are seen

Thread

Selection is based on maximum continuous use limit of the application and consistent with the cloth.

- **E-Glass** Standard with 2116 E-Glass and S-Glass cloths
- **Quartz** Standard with higher temperature cloths

Cloth

Cloth selection is based on the maximum temperature use limit required by the application, but may also be determined according to other physical characteristics such as rigidity, permeability or durability. Some cloths (Nextel[®]) are also used due to their qualification as an industry approved fire barrier. The maximum temperature use limit is based on the degradation of the strength of the material. Some cloths are rated for higher temperature use in other industries, the use limits here reflect the survivability of the Min-K product in demanding aerospace environments.

- **2116 E-Glass** Maximum use limit of 500°F (in harsh aerospace environments) used in 501 series of materials or Standard Flexible Min-K.
- **S-Glass** Maximum use limit of 1200°F (in harsh aerospace environments) used in 1201 series of materials or Mid-Range Flexible Min-K.
- **Quartz 503** Maximum use limit of 1958°F and used in 1801 (limited by core) series of materials.
- **Quartz 593** Maximum use limit of 1958°F. Offers increased durability over Quartz 503 due to increased thickness.
- **Nextel** Maximum use limit of 2200-2500°F. Excellent strength and durability at elevated temperatures.

The values given herein are typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Therefore, the data contained herein should not be used for specification purposes. Check with your Thermal Ceramics office to obtain current information.

Flexible Min-K®

	<u>Flexible Min-K 501</u>	<u>Flexible Min-K 1801</u>	<u>Flexible Min-K 1231</u>	<u>Flexible Min-K 1221</u>
Physical Properties, core material composition				
Core material formulation	F150	F182	F382	F351
Density, pcf (kg/m ³)	8, 10, 16 (128, 160, 256)			
Standard Tolerances				
Thickness, in (mm)	+ 0.03/- 0.0 (+0.762 / -0.0)			
Length x Width, fabricated parts, in (mm)	= - ± 0.125 (3.175)			
Length x Width, standard sheets, in (mm)	= +2.0/- 0.0 (+50.8/-0.0)			
Size Availability				
Thickness, in (mm) *1/2 in (12.7mm) available max. 16 pcf (256 kg/m ³)	1/8, 1/4, 3/16, 3/8, 1/2 (3.175, 6.35, 4.76, 9.52, 12.7)			
Variations of the cloth facing, hot or cold, core material, thread, and density are available. Material is supplied in 3' x 3' or 4' x 3', square stitched (1"centers) sheets. Fabricated strips, referred to as tapes, are available in widths of 1", 1-1/2" and 2-1/2", in 6 ft lengths. Customized sheet sizes and fabricated shapes are available upon request.				
Specific Heat, BTU/lb°F				
Temperature, °F (°C)				
100 (38)	0.18			
400 (204)	0.23			
800 (427)	0.26			
Acoustic performance, Hz, material 0.25 in (6.35 mm)				
Sound absorption values range from 0 to 1.0 with 0 representing no absorption (perfect reflections) and 1.0 representing 100 percent absorption				
	8 pcf	16 pcf		8 pcf
125	0.025	0.027		0.028
150	0.032	0.025		0.028
500	0.066	0.060		0.052
1000	0.272	0.157		0.132
2000	0.331	0.355		0.322
4000	0.253	0.306		0.258

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Thermal Conductivity, BTU•in/hr•ft²•°F Per ASTM C-177

Density, pcf	Flexible Min-K F150 ¹			Flexible Min-K182 ²			Flexible Min-K382 ³	Flexible Min-K351 ⁴
	8	10	16	8	10	16	16	16
200°F	0.20	0.20	0.20	0.22	0.22	0.21	0.19	0.19
400°F	0.25	0.23	0.22	0.24	0.24	0.23	0.19	0.19
600°F	0.30	0.27	0.26	0.26	0.26	0.25	0.20	0.20
800°F	0.37	0.33	0.32	0.33	0.29	0.28	0.23	0.23
1000°F	0.45	0.40	0.37	0.39	0.34	0.31	0.26	0.27
1200°F	0.53	0.49	0.45	0.44	0.39	0.35	0.30	0.33
1400°F	0.65	0.59	0.55	0.53	0.47	0.41	0.35	0.39
1600°F				0.64	0.56	0.50	0.44	0.45
1800°F				0.75	0.66	0.59	0.60	0.61

Thermal Conductivity, W/(m •K) Per ASTM C-177

Density, pcf (kg/m ³)	Flexible Min-K F150 ¹			Flexible Min-K182 ²			Flexible Min-K382 ³	Flexible Min-K351 ⁴
	8 (128)	10 (160)	16 (256)	8 (128)	10 (160)	16 (256)	16 (256)	16 (256)
200°C	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
400°C	0.05	0.05	0.05	0.03	0.03	0.03	0.03	0.03
600°C	0.07	0.07	0.06	0.06	0.06	0.06	0.04	0.04
800°C				0.08	0.07	0.06	0.05	0.06

Considerations

1. F 150 core, S-Glass facing, 8,10,16 pcf density
2. F 182 core, Quartz 503 facing, 8,10,16 pcf density
3. F 382 core, S-Glass facing, 16 pcf density
4. F 351 core, S-Glass facing, 16 pcf density

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