

## LTC HSA™ Systems

### Introduction

Fiberfrax® LTC HSA™ Systems is a unique ceramic fiber insulation constructed from multiple layers of ceramic fiber paper encapsulated between an outer covering of high-temperature woven textile cloth and parallel stitched to form a flexible insulation pad.

The excellent thermal resistance properties exhibited by LTC HSA Systems are a result of the unique lightweight ceramic fiber paper core material composed of fine diameter fibers. This core paper has a small cell structure; in addition, all unfiberized particles have been eliminated. This results in very low thermal conductivity and superb high-temperature insulation values. The high fiber index results in high resistance to mechanical and acoustical vibration. If wet by water or steam, all LTC HSA Systems thermal and physical properties are restored upon drying. It also exhibits excellent chemical stability and resistance to attack from most corrosive agents. Exceptions include hydrofluoric acid, phosphoric acid and strong alkalis. Key performance features of LTC HSA Systems include:

- Very low thermal conductivity
- Lightweight
- High-temperature insulating values
- Excellent vibration resistance
- Unaffected by moisture
- Superior flexural integrity

### Product Forms

LTC HSA Systems is manufactured at a nominal core density of 10 lbs./ft<sup>3</sup> and is encapsulated in a high-temperature woven textile cloth, parallel stitched one inch on centers. The stitching pattern allows the material to be supplied in roll form, up to 20 feet long, enabling fabricators to maximize material usage and minimize waste. The standard textile covering is E-Grade Fiberglass (EG) for continuous use up to 1200°F. The textile covering provides added strength while still allowing the insulation pad to remain flexible and be easily fabricated. The textile is chosen based upon expected exposure temperature and design requirements. Various non-standard textiles are available upon request. Contact Unifrax for additional details.

Refer to the product Material Safety Data Sheet (MSDS) for recommended work practices and other product safety information.



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### Applications

The lightweight, excellent thermal and vibration resistance of LTC HSA Systems allow it to provide maximum insulating value while utilizing the least amount of weight and space. These features make LTC HSA Systems an ideal choice for high-performance applications where critical areas are exposed to high operating temperatures, high vibration environments or are at risk from potential fire damage. Typical high-performance applications include:

- Heat shield insulation on missiles, rockets and space exploration equipment
- Thermal insulation on commercial and military aircraft – engine struts, thrust reversers, nacelles
- Insulation liners for fire protection of hazardous material storage containers
- Expansion joints for engine and turbine exhaust ducts

### Typical Product Properties (Core Insulation)

Temperature Grade	2300°F (1260°C)
Recommended Operating Temperature	2300°F (1260°C)

The recommended operating temperature of LTC HSA Systems is determined by irreversible linear change criteria, not melting point.

### Typical Product Parameters

Chemical Analysis	Weight Percent
Alumina-Silica Fiber	70%
Glass Fiber	14%
Inorganic Binder	2%
Others	14%
Nominal Core Density	10 lbs./ft <sup>3</sup> (160 kg/m <sup>3</sup> )
LOI (Loss on Ignition) Total	1.03%
Free Moisture Content	0.50%
Product Dimensions	48" x 20 LF
Standard Thickness	1/8", 1/4", 3/8", 1/2"

For availability of non-standard sizes, contact our Customer Service Department at 716-278-3800.

## Insulating Value

The superior performance of LTC HSA Systems under high operating temperatures and fire protection conditions are illustrated by the data shown below.

Thermal Conductivity (per ASTM C518) BTU Inch/hr ft 2°F			Boeing Specification Std. (BSS) 7338 Powerplant Flame Penetration Test
Temperature	1/8", 3/16"	1/4", 3/8", 1/2"	<b>Conditions:</b> Fire Exposure Temperature = 2000°F Exposure Time = 15 minutes Product Thickness = 1/2" Maximum Cold Side Temperature = 400°F
200°F	0.35	0.33	
400°F	0.40	0.39	
600°F	0.46	0.44	
800°F	0.50	0.48	
1000°F	0.55	0.52	
1200°F	0.59	0.56	
1400°F	0.62	0.59	
1600°F	0.65	0.62	
1800°F	0.68	0.64	
2000°F	0.70	0.66	

Data are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes.

## Vibration Resistance

In independent lab tests, LTC HSA Systems demonstrated that it can withstand even the most severe vibration conditions required for engine nacelle and struts on all Boeing commercial aircraft models. Samples of LTC HSA Systems were subjected to a Gaussian Random Vibration Test per Boeing Specification D6-81926, using the frequencies defined in the table below for a period of 5 hours per axis. The material showed no signs of degradation, material packing, change in thermal performance or variation in thickness as a result of the vibration exposure.

### ENGINE/NACELLE

FREQUENCY – HZ	PSD – G <sup>2</sup> /HZ
10	0.012
60	0.4
350	0.4
2000	0.07
OVERALL ACCELERATION – 19.2 G <sub>rms</sub>	

For additional information about product performance or to identify the recommended product for your application, please contact the Unifrax Application Engineering Group at 716-278-3888.

### STRUT

FREQUENCY – HZ	PSD – G <sup>2</sup> /HZ
10	0.012
50	0.4
200	0.4
2000	0.04
OVERALL ACCELERATION – 15.8 G <sub>rms</sub>	

Data are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes.

