



## DynaGuard® XB Insulation Thermal Runaway Protection

### DynaGuard® XB Insulation Systems

DynaGuard® XB Insulation Systems are designed to deal with the many demands of today's most stringent applications. The diverse thermal aspects of batteries for example as an application are wide, from runaway conditions to maintaining battery temperatures of liquid metal batteries or maintaining the temperature of high temperature thermal batteries. The superior thermal performance of DynaGuard® insulation allows the maximum amount of thermal protection to be provided within minimum space and weight requirements. DynaGuard® microporous insulation is a blend of ceramic powders, opacifiers, and fibers combined to produce a high temperature material that provides excellent thermal stability, low thermal diffusivity and the lowest thermal conductivity. DynaGuard® is specially formulated to block all three forms of heat transfer. Conduction is minimized through the use of a ceramic powder which intrinsically has low thermal conductivity. In addition, the powder is formed to create a porous structure, minimizing the energy conducted through the solid material. Convection is minimized by using a powder with an extremely fine particle size which forms void spaces too small for convection currents to exist. Radiation increasingly becomes the dominant mode of heat transfer as application temperature increases. The infrared heat transmission through the insulation is reduced to the lowest levels possible with the addition of special opacifiers in the DynaGuard® formulation.

### Materials of Construction

DynaGuard® XB Insulation materials are designed for more specific applications versus some of our other industrial materials that are used for a wide variety of industrial applications. These are available in a variety of densities, sizes, thicknesses, and configurations. Most of all these applications are engineered systems of some kind to meet the need of a host of applications and design criteria. These materials can be used as they are as a material or as most of the applications there are other materials involved in the configuration that we develop and supply. Typically there are coverings that can seal the material and make it extremely clean and much stronger for applications where millions of parts are transferred with pick and place robots.

### DynaGuard® Insulation Systems Advantages

Our materials are typically engineered into assemblies that are ready to be installed in an upstream system or sub assembly. Any type of configurations can be engineered and produced. Many additional materials can and are typically intergraded together. Stainless steel, Inconel, titanium, aluminized mylar coverings are typically intergraded in.

### Lowest Thermal Conductivity for the configuration

Our formulations work together to form a material with the lowest possible thermal conductivity, thermal diffusivity and heat storage. This enables DynaGuard® XB to provide the maximum thermal protection utilizing the least amount of weight and space.

### Lightweight and Saves Space

Low core densities result in mass savings for weight sensitive applications commonly encountered in the aerospace, automotive, commercial, and electronics industry. In applications where space is a problem, low thermal conductivity means less material thickness is required to achieve the desired insulation value saving space.

### High Temperature Capability

DynaGuard® can be made to meet high temperature requirements including intermittent exposure up to 2300°F. Other average temperature applications are 1600F and 1800F.

### Physicality of this material

This material is good in compression, generally poor in tension, can withstand environments with high vibration so encasement or an entombed final configuration is recommended.

### Assemblies

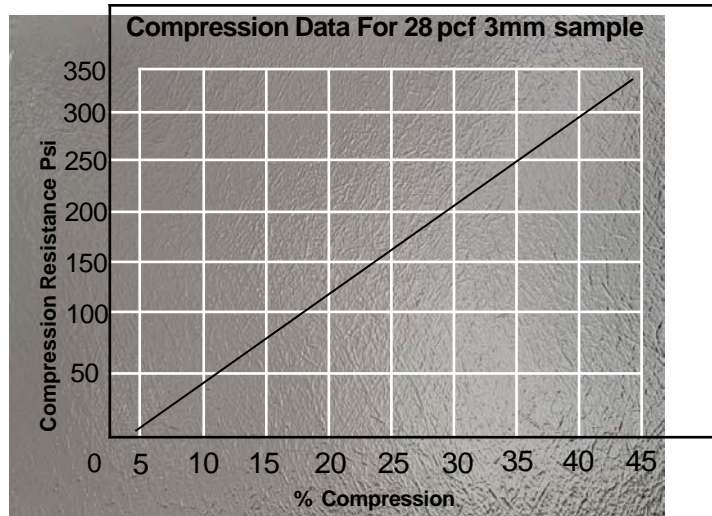
Complex shapes can be produced and intergraded into designs. Most times we design all the components we produce for our customers.



## Thermal Conductivity Data (Btu-in/hr-ft<sup>2</sup>-°F)\*

### Typical Characteristics

<b>Densities</b>	28 lbs/cuft, 448 kg/cuM	
<b>Thickness</b>	28pcf: 2mm, 3mm, 4mm, 5mm, 10mm	
<b>Temp. °C</b>	<b>(°F)</b>	<b>Thermal Conductivity [Btu-in/hr-sqft-F]</b>
0°C	(32°F)	(.018 W/m·K) [.130]
100°C	(212°F)	(.019 W/m·K) [.135]
200°C	(392°F)	(.023 W/m·K) [.160]
300°C	(572°F)	(.026 W/m·K) [.180]
400°C	(752°F)	(.027 W/m·K) [.190]
500°C	(932°F)	(.032 W/m·K) [.220]
600°C	(1112°F)	(.039 W/m·K) [.270]
700°C	(1292°F)	(.046 W/m·K) [.320]
800°C	(1472°F)	(.055 W/m·K) [.380]
900°C	(1652°F)	(.065 W/m·K) [.450]
1,000°C	(1832°F)	(.075 W/m·K) [.520]
<b>Standard Sizes</b>	<b>Most Any Engineered Size</b>	



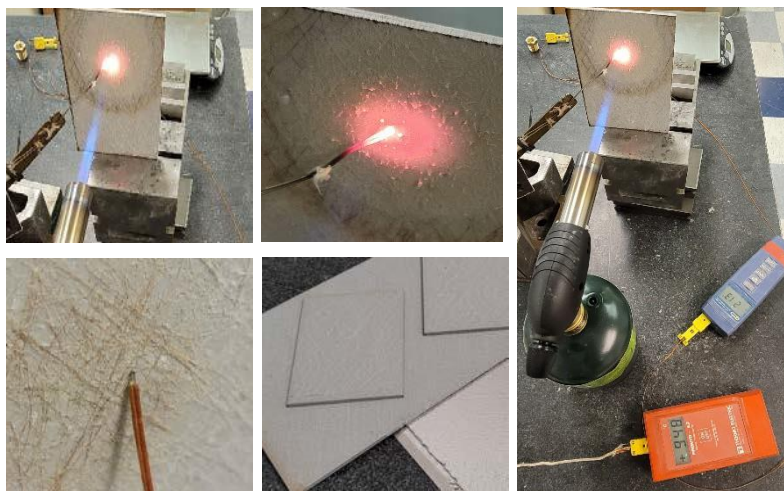
Compression characteristics can be Engineered

Material returns to starting thickness after compression

### Thermal Performance Data

### Environmental Related Compliances

- RoHS-2
- REACH SVHC
- ELV
- Halogen free (BR, C, I, F)
- Siloxane (D3-D10)
- Sulfur



\*NOTE: Thermal conductivity values have been measured in accordance with ASTM Test Procedure C-177 and extrapolated for the higher temperatures. When comparing similar data, it is advisable to check the validity of all thermal conductivity values and ensure the resulting heat flow calculations are based on the same condition factors. Variations in any of these factors will result in significant differences in the calculated data.

Technical and installation support for Dyna Guard® microporous insulation is provided by ThermoDyne's application engineering team. For more information on Dynaguard® insulation, contact ThermoDyne at 574.522.3606 or Fax 574.293.0047



## Aerospace/Defense

- Flight recorders
- Nose cones
- Fire walls
- APU's

## Batteries

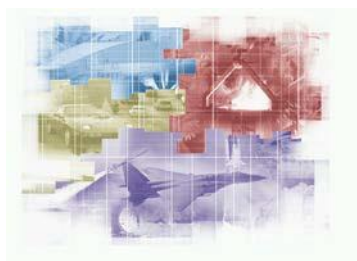
- Molten electric batteries
- Thermal runaway protection
- Thermal electric batteries
- Thermal mass batteries

## Transportation

- Exhaust systems
- Automotive batteries
- Bicycle batteries
- Motorcycle batteries

## Commercial

- High performance ovens
- High performance furnaces
- High performance ovens
- Night storage heaters



# ThermoDyne

Cage code 3D8W8

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