

Product Information Sheet

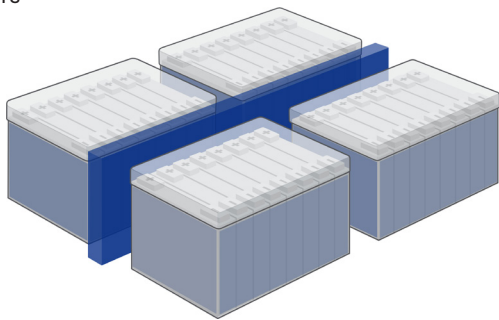
FyreWrap® LiB Nonwovens

INTRODUCTION

FyreWrap® LiB (Lithium-ion Battery) Nonwovens from Alkegen are engineered to provide thermal insulation from fire and thermal events. The nonwoven insulation is thermally efficient, strong, electrically insulating, and resistant to both high temperatures and high velocity gases. FyreWrap LiB nonwovens are composed of fire resistant synthetic fibers which do not pose health and safety risks during normal processing. The FyreWrap LiB insulations can be designed with varying degrees of stiffness and density serving as a thermal sealing system or as a self-supporting rigid panel. These materials are ideal solutions for improving safety in modern lithium-ion battery systems, fuel systems, and other fire safety applications.

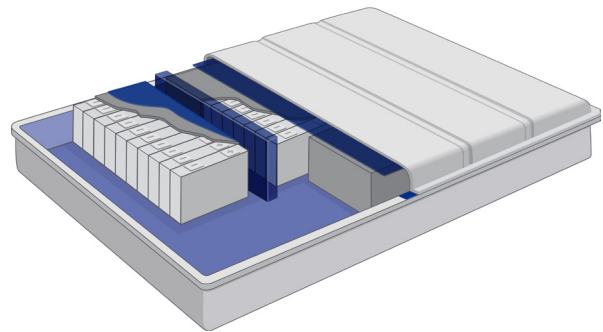
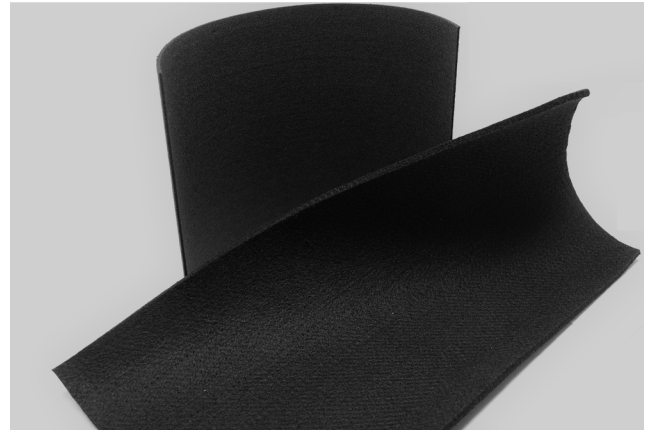
PROPERTIES

- Stable performance during flame exposure to 1250°C
- Low thermal conductivity that provides a high temperature drop across the insulator
- Dimensionally stable with minimal high temperature shrinkage
- Felt structure resists burn through from battery fires
- High dielectric strength and electrically non-conductive
- No health and safety risks from synthetic fiber blend
- Made from non-irritating and non-respirable synthetic fibers



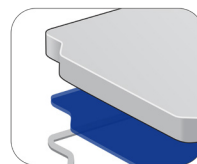
APPLICATIONS

- Between battery modules to mitigate a thermal runaway event
- Protect battery tray and cover by providing a significant temperature decrease across insulator
- Create a thermal barrier between sensitive electrical components
- Use in proximity of cable to provide dielectric insulation in case of dysfunction
- Pass-thru insulation for wiring and coolant lines



VALUE PROPOSITION

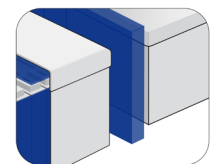
- Tested and validated for lithium-ion batteries
- Easily retrofitted to existing and new pack designs
- Improves safety in thermal runaway failure events
- Provides thermal sealing to direct hot gases away from critical components
- Permeable insulation design allows pressure relief while providing thermal and fire protection
- Self-supporting rigid panel designs for 3D installations utilizing simple 2D designs
- Compressible insulation allows for interference fit for applications mitigating assembly variation risk and hot gas leakage
- Additional fastener systems generally not required
- Low tooling costs, short lead times and quick assembly



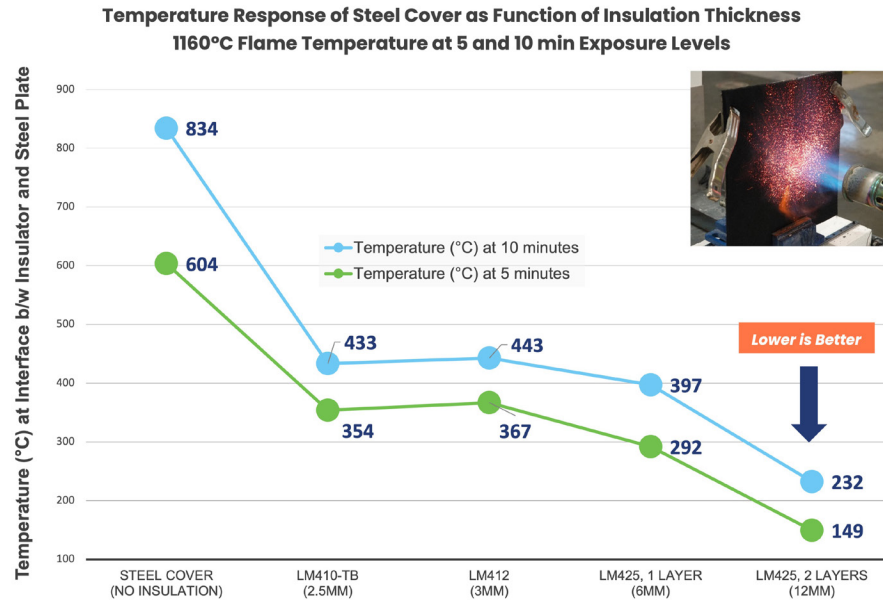
Lid Protection



Flexible Solutions for Bespoke Part Shapes



Module to Module and Venting Channel



Typical Property	Test Method	Units	LM410-TB	LM412	LM425
Insulation Style	N/A	N/A	Self-supporting	Flexible Insulation	Flexible Insulation
Thickness	ASTM D1777	mm	2.4 +/- 0.3	3 +/- 0.4	6 +/- 0.8
Surface Mass	Calculated	g/cc	475	382	763
Flammability	FMVSS302 / SAE J369	N/A	DNI	DNI	DNI
Flammability	UL94	Rating	V-0	V-0	V-0
Thermal Conductivity	ASTM C518	W/m-K @ 25°C	0.036	0.035	.035
Tensile Strength	ASTM D5034	N/cm	MD = 45 CD = 22	MD = 15 CD = 10	MD = 36 CD = 28
Tear Strength	ASTM D5733	N	MD = 55 CD = 42	MD = 52 CD = 71	MD = 131 CD = 138
Dielectric Strength	ASTM D149 Method C	V/mil 10 ⁶ V/mil	>27 >1.1	>30 >1.18	>35 >1.38
Thermal Stability	<i>Internal Bunsen Burner High Intensity Flame</i>	Time vs. °C	>1100°C for minimum of 10min.	>1100°C for minimum of 10min.	>1100°C for minimum of 10min.
Puncture Resistance	MIL-DTL-6396F	N	98	75	135
Limiting Oxygen Index	ASTM D2863	%	45	46	49

Please contact Alkegen for your specific design requirements.

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The test data shown are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes. Product Information Sheets are periodically updated by Alkegen. Before relying on any data or other information in this Product Information Sheet, you should confirm that it is still current and has not been superseded. A Product Information Sheet that has been superseded may contain incorrect, obsolete and/or irrelevant data and other information.

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