

# OUTLAST® LATENT HEAT SYSTEMS® (LHS) – FILL & FLOW FIRE RETARDANT (F&F-FR)



INFORMATION SHEET | March 2018 | Rev: 1

Outlast® Latent Heat System (LHS®) thermal management materials provide energy absorption and heat dissipation characteristics for passive thermal control. These materials are designed to prevent lithium ion battery thermal runaway, while providing passive thermal management to the pack. LHS provides for homogenous and lower pack/cell temperatures which leads to longer cell life and lower overall energy and replacement costs.

## OUTLAST® LHS F&F-FR – Typical Properties

LHS® FR F&F PRODUCT	LHS F&F FR-88	LHS F&F FR-88/89	LHS F&F FR-89	LHS F&F FR-89/90	LHS F&F FR -90	LHS F&F FR-91
Phase Transition Temperature (PPT):	30-35°C	30-40°C	35-40°C	35-48°C	44-48°C	55-60°C
Latent Heat:	160-170 kJ/kg	155-165 kJ/kg	160-170 kJ/kg	155-165 kJ/kg	160-170 kJ/kg	160-170 kJ/kg
Specific Gravity @ 22°C:	1.1	1.1	1.1	1.1	1.1	1.1
Viscosity above PPT(cps):	20-40	20-40	20-40	30-60	30-60	50-90
Operating Temperature Range:	-10-120°C	-10-120°C	-10-120°C	-10-120°C	-10-120°C	-10-120°C
Thermal Conductivity:	<0.5 W/mK					
Volume Resistivity:	5.9x10 <sup>9</sup> Ω cm					
Dielectric Constant:	4.62	4.62	4.62	4.62	4.62	4.62
RoHS Compliance:	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
Shore A Hardness:	55-80	55-80	55-80	70-95	70-95	70-95
Flammability:	UL94	UL94	UL94	UL94	UL94	UL94

## PROCESSING

The most suitable material for storage is either bags, pails or drums as supplied. Bulk storage tanks can be used and preferred materials are stainless steel, pure aluminum, rubber, polyethylene, polypropylene or polyethylene-lined containers and storage tanks made from glass-fiber-reinforced polyester (GRP). The tank should be ventilated by means of a silica gel dryer. Conventional steel tanks are of limited suitability because after prolonged storage the product may become discolored owing to traces of iron.

## PROCESSING, Continued

F&F FR materials are supplied as solids and must be melted before use. This is best carried out in heating chambers, but the temperature should not exceed about 85°C. This must also be ensured when electrical drum heaters are used, and preferably blanket heaters are used and not band heaters.

Electrical immersion heaters are not suitable for melting owing to the high thermal stress occurring (hot spots leading to concentrated degradation).

The recommended method of melting and storing LHS® F&F FR materials is in stainless steel or aluminum containers in heating chambers or fitted with an external heating blanket/coils. The storage temperature should not exceed 70°C, and it is advisable to thoroughly mix the contents of the storage container with a dry nitrogen stream or a circulating pump.

Enclosure or Pack filling: The most suitable method is to completely melt the material at 10-20°C above its transition temperature in one of the preferred material containers mentioned above. If material is supplied in drums or pails, it can be melted and used directly from these containers but should not be used for long term storage.

## PRODUCT DETAILS

**SUPPLIER:** Outlast Technologies LLC

**PRODUCT:** Li-ion cell thermal runaway protection and thermal management

**END-USE:** Thermal management for enclosed energy, battery and electronics systems.

**STORAGE:** Store in a cool, dry place away from sunlight, preferably 0-30°C. Best if used within 12 months

**HANDLING PRECAUTIONS:** Even though this product is considered safe and nontoxic, product safety information for safe use is not included, please refer to MSDS or inquire with qualified technical person at Outlast Technologies LLC.

Note: Outlast® thermal management materials are developmental products that are furnished for R&D purposes only. The information contained herein is merely preliminary data due to continued development. Further information, including data changes, may occur as testing, process optimization, and formulation changes occur and development proceeds. The user/purchaser agrees that: use is undertaken at the users sole risk, that the material is furnished "asis, with all faults", without any warranty or guarantee; and that Outlast Technologies LLC, Outlast Europe, or Outlast Asia shall not be liable for any damages, of whatever nature, arising out of the user's / purchaser's receipt and/or use of this material. Commercialization and continued supply are not assured.

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