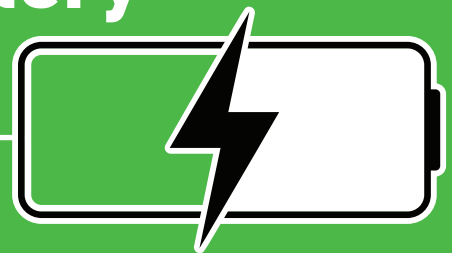


- 1 REMOVE SAFETY PIN.
  - 2 FROM 1 METRE AIM NOZZLE AT BATTERY / BASE OF FIRE.
  - 3 SQUEEZE HANDLES.
- SAFE FOR USE ON EQUIPMENT UP TO A DISTANCE OF 10 METRES.



# Jactone Lithium-ion Battery Fire Extinguishers

Incorporating  
**FIREBLOCK LITHIUM**





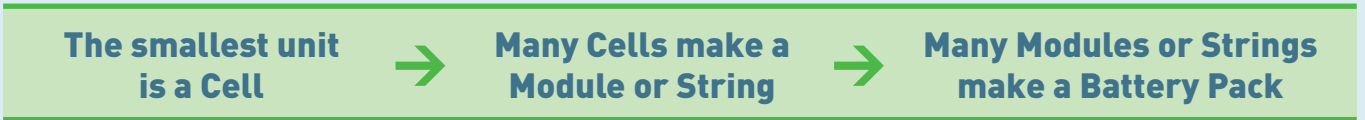
## Lithium-ion Batteries

### > What are they?

Lithium-ion battery packaging consists of the following generally recognised formats :



Units of construction within lithium-ion batteries?

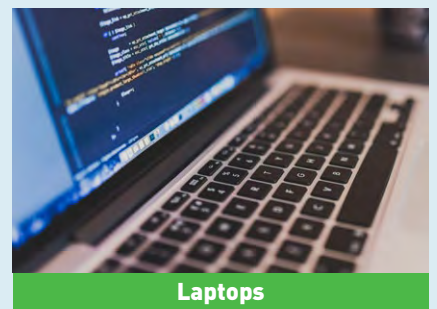
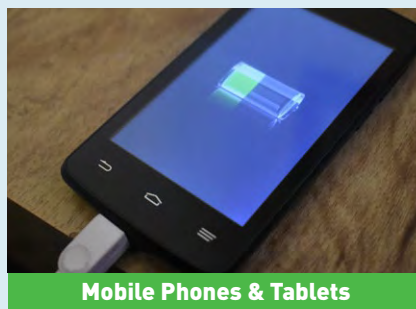


There are a variety of lithium-ion battery chemistries, including :

- Lithium Nickel Manganese Cobalt Oxide (NMC) • Lithium Iron Phosphate (LFP) • Lithium Nickel Cobalt Aluminium Oxide (NCA)
- Lithium Nickel Cobalt Manganese Aluminium Oxide (NCMA) • Lithium Cobalt Oxide (LCO) • Lithium Manganese Oxide (LMO)

### > Where are they?

Lithium-ion batteries are present in an extremely wide and diverse range of equipment, including :





## Lithium-ion Battery Fires

### › How are they caused and what are the risks?

#### Causes

In a world where there is an increasing use of lithium-ion batteries for energy storage, it is clear that this has led to a corresponding increase in the specific fire risk from devices that contain them.

Fire risks from lithium-ion batteries can be the result of a variety of abuse events impacting on batteries, including :

- **Overheating**
- **Penetration / Mechanical damage**
- **Overcharging**

#### Risks

Fires involving lithium-ion batteries are caused by the release and subsequent ignition of flammable organic solvents / gases and plastic components contained in battery constructions.

In addition to the release of flammable materials, is the associated release of toxic compounds that, in themselves, present a significant risk, both during a fire and also during subsequent post-fire clean-up operations.

Such toxic compounds can include, but are not limited to : **Hydrogen Fluoride Hydrogen Cyanide, Hydrogen Chloride, Sulphur Dioxide and Nitrogen Oxides.**

The presence of such materials presents a significant personnel risk and risk assessments should consider best practice and safe clear-up methods after any toxic agent discharges.

### › How do they develop?

**Lithium-ion battery fires, once initiated by any of the abuse mechanisms often develop in several distinct phases. It is important in determining how we can tackle such fires to have a clear understanding of those phases, which will determine what is achievable in any extinguishing action.**

Lithium-ion battery fires often start at an individual cell level. Any abuse can lead to the **stable electrochemical processes** within a battery being replaced by **unstable chemical processes**.

It is those chemical processes that can lead to the instability of **'Thermal Runaway'**. Chemical processes generate gases and produce heat. Increased heat leads to a chemical process producing more heat and more off-gassing. When heat generation exceeds the ability to dissipate heat, this leads to thermal runaway.

Once individual cell thermal runaway is firmly established, it is often difficult to interrupt, but there is a window of opportunity where suitable agents can increase heat dissipation and arrest the process.

Should thermal runaway not be prevented or arrested at individual cell level, then the next opportunity for intervention is to prevent **'Thermal Propagation'** to adjacent cells.

By focusing on these two mechanisms of enhanced heat dissipation and prevention of thermal propagation, we can see that agents that have advanced performance in these two areas will provide an opportunity to tackle lithium-ion battery fires.

### What is the solution...



# FIREBLOCK LITHIUM

## What is it and how does it work?

**FIREBLOCK LITHIUM** is a specialised gel that is used to extinguish lithium-ion battery fires with different chemistries and cell types.

**FIREBLOCK LITHIUM** is PFAS free.

**FIREBLOCK LITHIUM's** unique composition has a tremendously strong flame knockdown and cooling effect.

**FIREBLOCK LITHIUM** has the ability to attach to surfaces with a low run off property.

**FIREBLOCK LITHIUM** reduces the temperature significantly of the battery pack.

Tests have shown that on all lithium-ion battery fire tests, where **FIREBLOCK LITHIUM** has been applied, the battery temperature has been reduced in under a minute.

After spraying a lithium cell/module/battery, it has been shown that thermal runaway can be arrested, and the temperature of the battery has been shown to cool dramatically.

**FIREBLOCK LITHIUM** can act as a 'fireblock' between adjacent cells in a battery pack preventing thermal propagation.

Runoff with **FIREBLOCK LITHIUM** is minimal with less than 10% runoff of the amount sprayed on a flat surface.

With minimal runoff there is less chance that the product will contaminate the surrounding environment with chemicals from the lithium batteries by running into drains and / or water sources.

The toxic smoke emitted, after applying **FIREBLOCK LITHIUM** on a lithium-ion battery fire is reduced, limiting the effect on the environment.

Due to reduced off-gassing, **FIREBLOCK LITHIUM** will reduce the risk of explosion events, particularly in enclosed spaces.

## Product Information

### Visual Identification

**FIREBLOCK LITHIUM** can be identified by its colour and texture.

- It is green in colour
- High viscosity gel
- Odourless

### Other Characteristics

pH level : 6.5 – 7.5

Flash Point : Non-flammable product

Freezing Point : 0 Degrees Celsius

See **FIREBLOCK LITHIUM** Safety Data Sheet - available separately





# Lithium-ion Battery Fire Extinguishers

The Jactone range of Lithium-ion Battery Fire Extinguishers incorporating **FIREBLOCK LITHIUM** gel, are manufactured in the UK, Kitemark certified to BS EN 3\* and carry both the UKCA and CE marks.



MADE IN THE UK

COLOUR CODED

GUARANTEE



› EGS2 : 2 Litre Lithium-ion

› EGS6 : 6 Litre Lithium-ion

› EGS9 : 9 Litre Lithium-ion

## Product Certification and Specification

- › **CAPACITY :**
- › **MEDIUM :**
- › **FIRE RATING :**
- › **PROPELLANT :**
- › **FILLED & EMPTY WEIGHTS :**
- › **NOMINAL DISCHARGE TIME :**
- › **OPERATING PRESSURE :**
- › **TEST PRESSURE :**
- › **OPERATING TEMP RANGE :**
- › **PACKING SPEC (HxWxD) :**

EGS2
2 Litres
FIREBLOCK LITHIUM Gel
N/A
Nitrogen gas
Filled 3.4kg   Empty 1.4kg
9 seconds
15 bar at 20 °C
27 bar
+5°C to +60°C
460 x 160 x 108mm

EGS6
6 Litres
FIREBLOCK LITHIUM Gel
8A
Nitrogen gas
Filled 9.9kg   Empty 3.85kg
37 seconds
15 bar at 20 °C
27 bar
+5°C to +60°C
529 x 177 x 177mm

EGS9
9 Litres
FIREBLOCK LITHIUM Gel
13A
Nitrogen gas
Filled 14kg   Empty 4.9kg
54 seconds
15 bar at 20 °C
27 bar
+5°C to +60°C
552 x 205 x 205mm



\* EGS6 and EGS9 models only



# Performance

## > Fire tests

The performance of our Lithium-ion Battery Fire Extinguisher range has been assessed in a comprehensive series of fire test scenarios, demonstrating the clear benefits of **FIREBLOCK LITHIUM** gel in operation.

Fire testing has been performed on all cell types, **Cylindrical**, **Prismatic** and **Pouch**. We provide a series of links below to videos, which detail the cell types and total energy capacity of cells / modules used in each test.

### Cylindrical



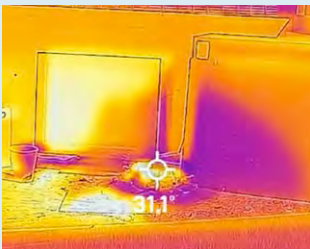
Small Cluster | 150Wh | 2 litre Fire Extinguisher



Battery and Temperature



Quick Flame Knockdown



Immediate Cooling Effect



Outcome

### Prismatic



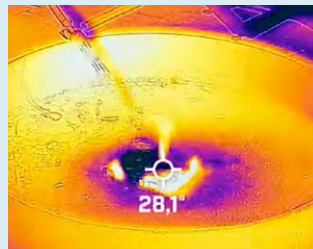
320Wh | 6 litre Fire Extinguisher



Battery and Temperature



Quick Flame Knockdown



Immediate Cooling Effect



Outcome

### Cylindrical



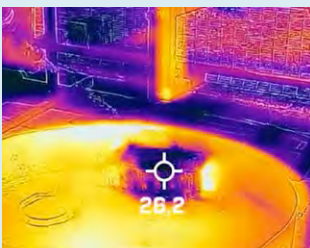
Large Cluster | 2000Wh | 9 litre Fire Extinguisher



Battery and Temperature



Quick Flame Knockdown



Immediate Cooling Effect



Outcome

### E-Scooter Fire



Case Study | 9 litre Fire Extinguisher



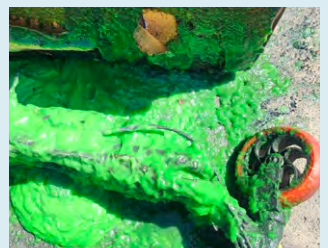
Battery and Temperature



Quick Flame Knockdown



Immediate Cooling Effect



Outcome



# Performance

## Applications Use the below as a guide for selecting the appropriate unit for your protection.

**EGS2 - 2 litre**

Mobile phones and tablets

Laptops

Small power tools



Typical Battery Capacity Ranges:  
Up to 150Wh

**EGS6 - 6 litre**

Power tools

Some E-scooters and E-bikes



Typical Battery Capacity Ranges:  
Up to 500Wh

**EGS9 - 9 litre**

Large E-scooters





Large E-bikes



Typical Battery Capacity Ranges:  
Up to 1000Wh

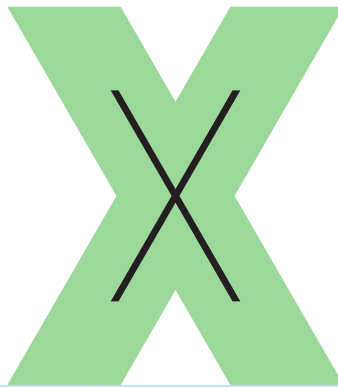
**NOTE :** Battery capacity above is given as a guide. The ability to extinguish any fire will be impacted by battery configuration and cell exposure to the cooling capacity and thermal insulation properties of the **FIREBLOCK LITHIUM** gel.

## Lithium-ion fire fighting event opportunities

	EVENT 1 Thermal Runaway	EVENT 2 Thermal Propagation	EVENT 3 Containment
<b>AGENT ACTION REQUIRED :</b>	Cooling	Thermal resistance / Thermal insulation Non-draining characteristic	Thermal resistance / Thermal insulation Non-draining and venting characteristic
<b>COMMENT :</b>	<b>Objective:</b> To inhibit / stop thermal runaway at battery cell level. Requires early intervention.	<b>Objective:</b> To prevent thermal propagation between: • Cell to Cell • Module to Module • Battery to Battery Assumes agent can gain access between adjacent elements.	<b>Objective:</b> To contain and prevent breakout from battery case. Agents that remain porous will allow venting of residual off-gases.
<b>AGENT 1 : FIREBLOCK LITHIUM</b> 	Good, with quick flame knock-down.	Good, if agent can gain access.	Good – Agent remains as porous gel, allowing venting. Minimal run-off means environmental clear-up is reduced.
<b>EVIDENCE FOR FIREBLOCK LITHIUM :</b>	 Cooling Performance <b>Watch the video</b>	 Thermal Insulation Performance <b>Watch the video</b>	 Thermal Insulation Performance <b>Watch the video</b>
<b>AGENT 2 :</b>	No significant cooling action.	Good, if agent can gain access.	Good – However, agent hardens, limiting off-gas venting.
<b>AGENT 3 :</b>	Good	No action – Agent is fully liquid and drains away.	No action – Agent is fully liquid and drains away.

**EVENT 3 - Containment :** The final opportunity to make safe.

Agents that have good Thermal resistance / Thermal insulation properties, together with a consistency that allows the agent to stay in place and vent off-gases, provide vital extra re-assurance that a lithium-ion battery fire has been contained.



**A SPECIALISED GEL USED  
TO EXTINGUISH LITHIUM-ION  
BATTERY FIRES**

**PFAS FREE**

**COOLS BATTERY  
TEMPERATURE  
WITHIN SECONDS**

**CAN ARREST AND PREVENT  
THERMAL RUNAWAY AND  
THERMAL PROPAGATION**

**REDUCES EMISSIONS OF  
TOXIC SMOKE, LOWERING  
EXPLOSION RISKS**

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