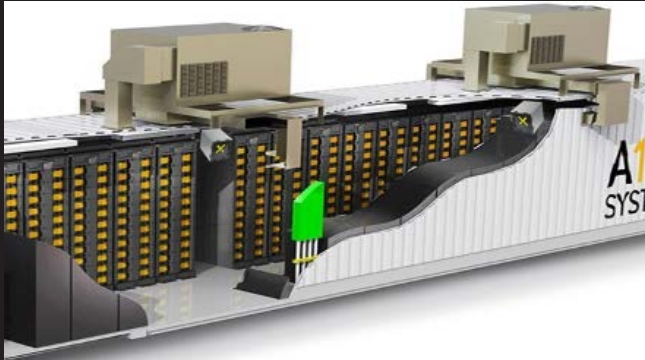


Energy storage fire suppression.

With af-x fireblocker.



AF-X Fireblocker condensed aerosol fire suppression is a solution for battery storage systems and energy storage systems (ESS) applications. This includes containerized and in-cabinet applications in buildings.



What is a lithium battery?

A lithium ion battery or li-ion battery is a type of rechargeable battery in which lithium ions move back (during discharge) and forth (during charge) from the negative electrode to the positive electrode

What is the Risk?

The bursting of cells due to heating and ignition of the liquid electrolyte is the greatest risk of starting a fire. Too fast release of the stored chemical energy, due to a technical defect, also causes the release of thermal energy, which can cause a short circuit or the emission of electrolytes. The battery can then thermally runaway.

Because lithium in combination with water produces a highly explosive gas, conventional extinguishing systems that use water may not be suitable for fighting a lithium-ion fire.





Nano Technology.

On activation of the AF-X Fireblocker, the compound within is transformed into a rapidly expanding fire extinguishing condensed aerosol.

The dry compound used in AF-X Nano generators is Potassium based (K). The aerosol compound binds quicker with the unstable free radicals O (oxygen) & H (hydrogen) than a fire reaction. Forming stable products such as KOH (making unstable radicals, stable). This action extinguishes fire without depleting the ambient oxygen content.

The solid particles of Potassium (K) have a diameter of less than two ppm (parts per million) and remain in suspension in the protected room/enclosure for at least 30 minutes, preventing further re-ignition of the fire. This holding time can be extended by adding more aerosol.

What are the main advantages of using AF-X Fireblocker?

Without water, without pressure and without taking away oxygen from the air.

AF-X Fireblocker fire suppression technology offers the lightest, most compact, and economical fire extinguishing solution available. Our AF-X Fireblocker generator is an extremely rugged, hermetically sealed, stainless steel canister containing a stable, solid compound.

The AF-X Fireblocker aerosol remains buoyant in the protected space creating a holding time, which in case of an event, creates time for the emergency services to intervene.

Modular and flexible.

AF-X Fireblocker is a truly modular system. Any size can be protected and in the future the system can be economically adapted, extended or relocated.



Characteristics and Applications.

There are many applications for AF-X Fireblocker fixed systems in numerous industries including energy storage and energy supply. In these industries, there is a hazard of lithium ion battery fire, thermal runaway is an extremely difficult fire to extinguish and control with several issues.

For example:

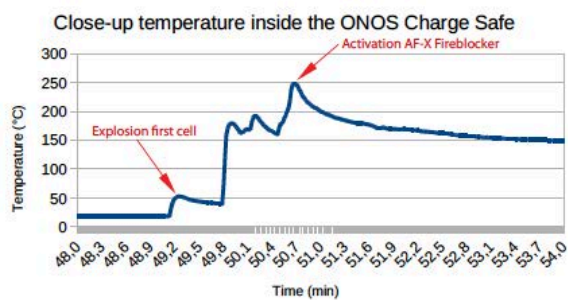
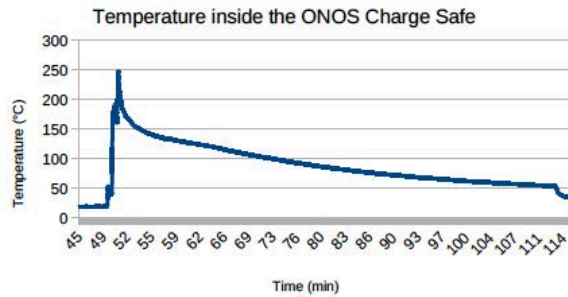
- High risk of ignition associated with the electrolyte released through exposure to heat.
- Fire creates undesirable disruption to operations, potential serious and environmental damage.
- Prevention of dynamic fire propagation through the ignition of closely packed, neighboring batteries.
- Risk of explosion through exposure to heat or short-circuits in the batteries.
- The protected area does not have to be airtight when using AF-X Fireblocker Nano aerosol suppression.
- Rising combustion gases ignite fire.
- Only minutes are required for fire penetration right up to the underside of the ceiling.
- AF-X Fireblocker Nano aerosol does not damage equipment, products or stock.

Advantages of AF-X Fireblocker aerosol systems for ESS or BESS battery area's containing lithium ion.

- The protected area does not have to be airtight.
- AF-X Fireblocker has 15-year service life with low maintenance.
- Residual AF-X Fireblocker aerosol in protected area after discharge prevents re-flash typical with lithium-ion battery fires.
- AF-X Fireblocker systems are mounted isolated from the surface within the area on the ceiling or walls taking no valuable floor space within the room.
- There is no piping or pressure release required reducing installation labour and material costs.
- There is no cylinder hydro-static testing or weighing required.
- AF-X Fireblocker covers large volumes and are equipped with plug & play connectors.
- When using environmentally friendly AF-X Fireblocker there is no global warming potential (GWP) and zero ozone depletion (ODP).
- AF-X Fireblocker does not lower oxygen level upon activation.

Appendix 4 Graphs

PEUTZ



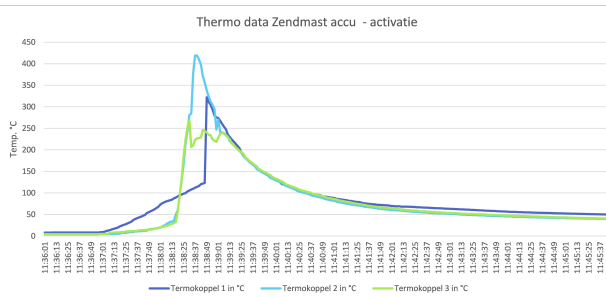
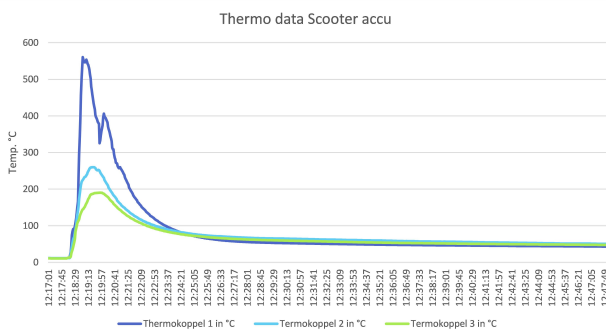
Test Results.

The AF-X Fireblocker has been tested for effectiveness in suppressing Lithium battery fires. These tests have been successfully performed and documented in collaboration with the Peutz Fire Laboratory and KIWA. The extensive test reports and KIWA Certificate can be requested.

Main conclusions from the KIWA-certificate K-0210557/01, which is tested in accordance with BRL-K21045 and the Specific Certification Program 05 for Fire Protection of Lithium-ion batteries storage.

1. Significant and rapid temperature reduction
2. Batteries up until 160AH - 48V
3. Major control phase of the Thermal Runaway with suppression of minimal 90 minutes
4. Creating a stable situation in lithium-ion battery storage (BESS). No spread of fire to surrounding batteries.

kiwa





What about certifications?

In compliance & certified.

AF-X Fireblocker has been developed, tested & certified according to the EN 15276-1, ISO 15779, UL 2775, NFPA 2010, ISO 9094-2017, AS 4487-2013, AS 5062-2016 and BRL-K21045 with the Specific Certification Program 05 for Fire Protection of Lithium-ion batteries storage - regulations.

AF-X Fireblocker has been tested and certified by several renowned Dutch and French Institutes such as KIWA, TNO, Ineris, Technical University of Delft, Peutz and Aerospace Propulsion Products (part of Ariane Group).

The main benefits of af-x fireblocker:

Simple

- easy installation
- no constructional provisions (no distribution piping, manifold or nozzles)
- no system pressurization or room integrity tests required

Compact and modular

- lightweight
- space saving
- easily transported
- no room for high pressure gas cylinders
- modular system build-up

Effective

- waterless
- effective extinguishing does not take away oxygen
- environment friendly

No damage

- harmless to humans and animals
- non toxic
- no usage of water
- no extinguishing damage
- no consequential loss (no damage to equipment and storage)

Economical

- more cost-effective than most other solutions
- long service life
- low maintenance cost
- 316 stainless steel casing
- low total cost of ownership

Questions? Need more information? Tailor-made advice?

Please contact one of our authorised partners.

af.x fireblocker | faster than fire.

