



APPLICATION-AREA DOSSIER, AUGUST 2026

Application area battery storage: Stopping thermal runaway at the smallest level

A thermal runaway always begins in a single cell: an internal short circuit or overheating sets off an exothermic chain reaction that can ignite neighbouring cells. Whether this becomes a module fire, a rack fire or the loss of the entire container is decided by the thermal barrier at every level. The planning principle is therefore: stop propagation at the smallest possible level — ideally already between cell and module.

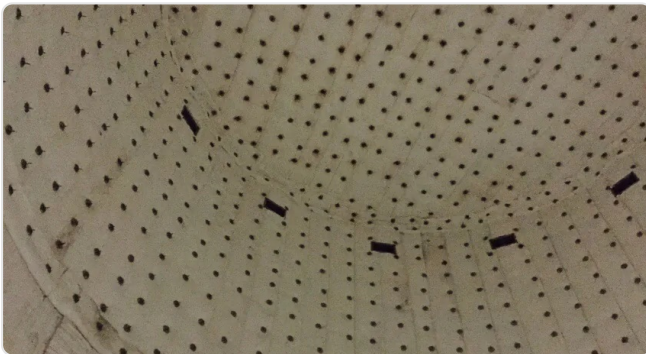
The test framework for this is clearly regulated. UL 9540A examines propagation behaviour at four levels — cell, module, unit and installation — and provides the data basis for clearances, ventilation and fire-fighting technology. In its current edition, NFPA 855 additionally requires systems to prevent propagation as well as large-scale fire tests as evidence. In Germany, VdS Guideline 3103 adds requirements for the storage and separation of lithium batteries, which insurers also use as a reference.

Three proven material classes are available for the thermal barrier itself: bio-soluble high-temperature fibres for flexible joints and irregular geometries, microporous panels with extremely low thermal conductivity for thin barriers directly between cells and modules, and compression-resistant calcium silicate for partition walls, floors and doors. The choice depends on thermal load, installation space and mechanical stress — and stands or falls with properly sealed penetrations.

Ten points for planning and execution

- ☐ **Propagation levels** Plan the thermal barrier separately for cell, module, rack and container; every level needs its own barrier with its own evidence.
- ☐ **UL 9540A** Request test data from the cell and system manufacturer; it is the basis for clearances, pressure relief and the fire-fighting concept.
- ☐ **NFPA 855** Alongside clearances and gas detection, it now explicitly requires systems against propagation as well as large-scale fire tests as evidence.
- ☐ **VdS 3103** German guideline for the storage and separation of lithium batteries; the decisive reference point for insurers and risk assessment.
- ☐ **Bio-soluble fibre** Flexible mats and papers for joints, gaps and complex geometries; considerably less critical in occupational hygiene terms than classic ceramic fibre.

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| ☐ Microporous panels | The lowest thermal conductivity of all classes; a few millimetres are enough as a barrier between cells and between modules. |
| ☐ Calcium silicate | Compression-resistant, dimensionally stable and non-combustible; suitable for partition walls, floors, doors and mechanically loaded fittings. |
| ☐ Penetrations | Carry out cable, busbar and pipe penetrations only with approved sealing systems; they determine the effectiveness of the entire barrier. |
| ☐ Pressure relief | Plan the thermal barrier and venting together; barriers must not block the controlled discharge of hot gases. |
| ☐ Documentation | Record system approvals, installation records and maintenance access early; test bodies and insurers ask for exactly this. |


Bio-soluble fibre insulation for the thermal barrier

Calcium silicate boards for load-bearing partitions

Common mistakes

- The thermal barrier is only considered at container level — by then propagation has long since reached module and rack, and the barrier takes effect too late.
- Materials are chosen solely on the basis of the limiting temperature in the data sheet; vibration, ageing and mechanical loads in operation are left out of account.
- Penetrations are sealed afterwards with expanding foam or untested materials — this deprives the entire thermal barrier of its verified effectiveness.

PRACTICAL NOTE

Whether a new container system or a retrofit in an existing installation: an effective thermal barrier is created when material selection, penetrations and evidence are planned together from the outset. Have your concept reviewed early by refractory practitioners — that is cheaper than any rectification after handover. The detailed guide can be found at sbs-rs.de/fachwissen.

Questions about your furnace?

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