



New lithium-ion battery cabinet passes UL 9540A test

Lithium-ion batteries have risen quickly in popularity for Uninterruptible Power Supply (UPS) applications because of their smaller size and weight, and longer service life.

Eaton is seeing lithium batteries as the first choice for clients about 30% of the time for new UPS quotations. For 3-phase applications, lithium offers a 10-year performance guarantee, provides an exceptional total cost of ownership (TCO) and has a payback of <5-years compared to monitored valve regulated lead acid (VRLA) UPS batteries.

Lithium batteries are more versatile than traditional VRLA batteries, which has added to their popularity. Not only are traditional data center applications more often utilizing lithium battery solutions, but Eaton is now able to expand the applications for UPSs because of lithium, i.e. energy storage applications like Eaton's EnergyAware solution.

To give you a broader perspective, here's a list of the most common places lithium is now being used.

- 1. Any UPS application (data center or industrial) where footprint and weight are important**
 - Mobile UPS applications
 - Medical imaging trailers
 - Portable temporary UPS
 - Battery retrofits (replacements) for existing UPSs, including the 9390, 93PM and 9395 UPS product families
 - Outdoor UPS and battery installations
- 2. Anywhere clients require battery monitoring and/or management**
- 3. When frequent charge and discharge cycles and/or a long battery life are required**
 - Energy storage or peak shaving applications like EnergyAware
 - Edge datacenters requiring a "set and forget" type of installation
 - Green sustainable installations, requiring fewer battery replacements over the UPS life

While the value proposition for lithium is compelling, there are still challenges. Lithium is a new technology for many customers, system designers, and installing contractors. Also, new versions of the NEC and fire codes may apply, depending on adoption of new codes by location, state or municipalities. All of which may present hurdles for specific projects to overcome.

Regarding ever changing codes, the fire codes NFPA standard 855 and IFC 1206 contain new requirements specific to lithium-ion stationary battery design and installation. For example, these codes require 3 ft. spacing on all sides of a battery cabinet, 50kWh or less cabinet capacity, and 600kWh maximum allowable quantity (MAQ) in a room. On their own, these stringent requirements would be a deal breaker for lithium. Fortunately these sections also come with exceptions that allow the electrical inspector, fire inspector, or



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Authority Having Jurisdiction (AHJ) to approve a more traditional UPS and battery installation. These exceptions typically allow the AHJ to waive a requirement based on “large scale fire testing, and a failure modes and effects analysis (FMEA).” A FMEA by the user is commonly required for VRLA battery installations as well, but the fire testing is generally assumed to mean a successful UL9540A test has been conducted by UL. The results of the test are provided to the AHJ to assist in his/her decision.

UL9540A, unlike UL9540, is not a ‘listing’ and does not result in a UL mark placed on the UPS or battery. Officially, UL9540A is the Test Method for Evaluating the Thermal Runaway Fire Propagation in Battery Energy Storage Systems. This test is intended to prove that a fire or thermal runaway condition in a single battery module or cabinet will NOT propagate outside of the cabinet to adjacent cabinets or walls.

A successful test result gives the AHJ a good level of comfort that battery cabinets may be mounted adjacent or front-to-back with other battery cabinets or the walls of the room. With this test report and the FMEA analysis, the AHJ can waive the cabinet spacing and MAQ requirements for a given installation.

The Samsung-built lithium battery cabinets that Eaton offers have passed this test, and the test report is available to be given to the AHJ. Eaton strongly recommends sharing test results and consulting the AHJ early in the system design process to ensure a smooth installation and subsequent inspection.

The UL9540A test required some minor modifications to the original Samsung battery cabinets. This new design is now offered as standard for new orders.

What’s changed between the original Samsung design and the new design?

- New cabinets are black in color, instead of white, so they can be easily identified as fire-tested designs.
- The cabinet depth is slightly reduced from the original design
- The front cover has been changed from a door to a 2-piece cover—a hinged door over the circuit breaker handle and a bolted cover over the battery tray area.

Need help?

We recognize that the lithium battery approval process can be somewhat subjective and will depend on the comfort level of the AHJ. However, the earlier they are consulted, the easier the process will be. Eaton is available and ready to support consultations to provide answers to any questions the authorities may have.

Learn more at, go to: [Eaton.com/lithium](https://www.eaton.com/lithium)

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