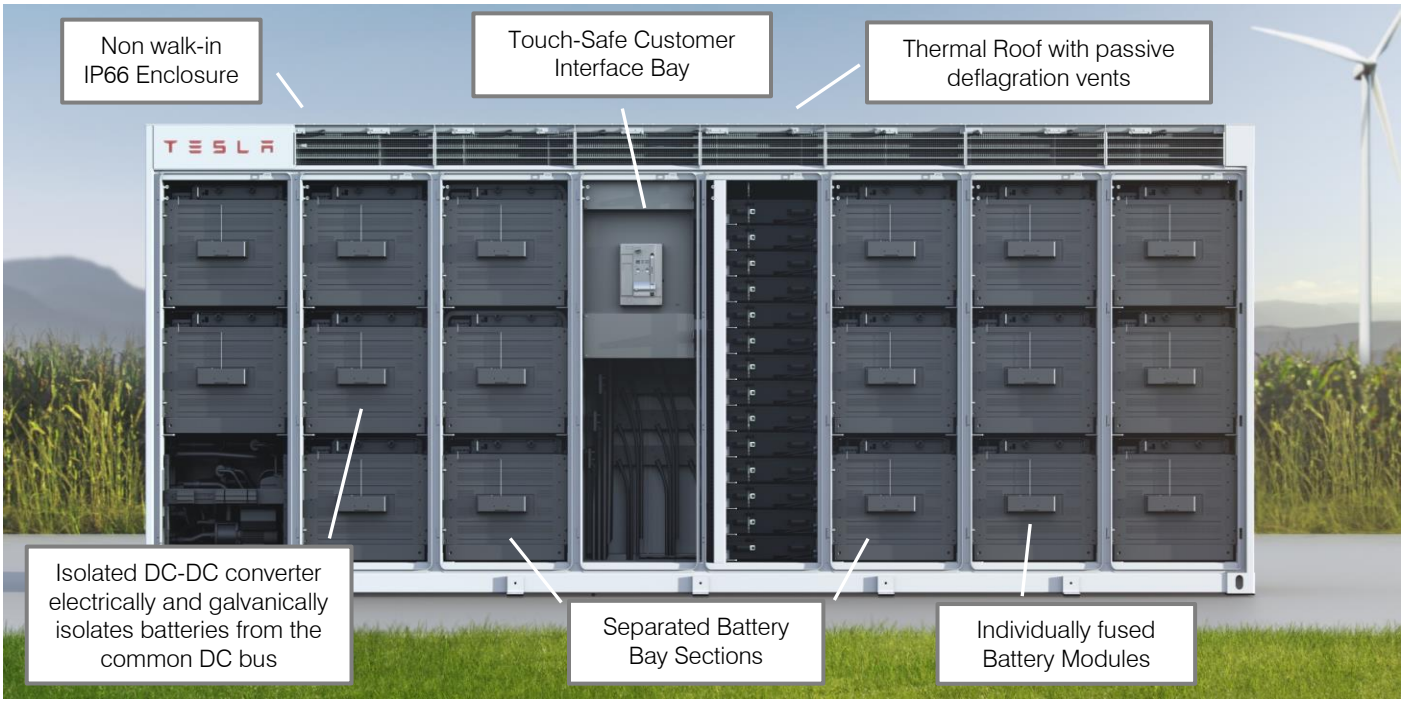
ENHANCED SAFETY ARCHITECTURE

Tesla's commitment to safety and 15+ years of experience in battery module design and manufacturing for both vehicle and energy storage applications guides every Megapack design decision. Megapack is designed from the ground up with safety as the top priority, including features that make the product safe throughout the entire product lifecycle – during transit, installation, commissioning, operation, maintenance and decommissioning.

Safety at Every Level

Tesla's approach to safety involves comprehensive design and testing at each level of the Megapack. Vertical integration across design, manufacturing, and testing ensures that safety features of the cell, battery module, inverter, thermal system, and overall system-level components are closely linked and not decoupled.



Cell safety: Tesla uses the highest quality lithium-ion cells, but recognizes that in rare instances a cell can be flawed. For this reason, each cell in Tesla products is individually inspected and tested prior to module assembly. Flawed cells are discarded and used to drive further cell manufacturing improvements.

Battery module safety: Each Megapack battery module includes individually-fused cells and dedicated power electronics that electrically and galvanically isolate the batteries from the common DC bus, similar to the Pod architecture in Powerpack. Unlike racked battery systems, the battery modules arrive pre-installed without the need to connect live high voltage DC elements on site. Each battery module includes a built-in isolated DC-DC converter and an active fuse that provides an added layer of protection in case of hazardous conditions, allowing for multiple levels of isolation. All of these features are controlled by the module's dedicated Battery Management System (BMS), which ensures that the cells are operated within approved limits.

System-level safety: Numerous dedicated safety measures ensure that Megapack provides the highest level of safety:

- A parallel battery module architecture (up to 17 per Megapack) provides optimized performance and redundant safety control, reducing the risk of cascading failures. Combined with the isolated DC-DC architecture in each module, this parallel design greatly reduces the risk of events such as electrical fault propagation, arc flash, or cascading thermal runaway. Battery modules are sealed to prevent touch access to the battery cells, power electronics, and terminals.
- Dedicated deflagration vents in the enclosure's roof are designed to mitigate the impact of thermal runaway on surrounding exposures and personnel. These pressure-sensitive vents direct all gases, smoke, and flame out of the top of the Megapack in the event of extremely hazardous conditions.
- The Customer Interface Bay is a touch-safe bay located at the center of the enclosure. It is designed to be the only interface required for installation, operation, and maintenance. Megapack's pre-assembled and pre-tested nature ensures that minimal installation and commissioning scope is required on site, minimizing risk of hazards to all personnel interfacing with the equipment.
- Megapack's weatherproof steel enclosure is rated to IP66 (NEMA 4) and provides robust protection against extreme environmental, chemical, and physical exposures. It cannot be entered by personnel, further limiting the possible interaction between maintenance personnel and internal components.

Enhanced Approach to Fire Safety

When it comes to hazards such as thermal runaway and external fires, the Megapack is safe by design, without the need for costly additional active protective measures such as built-in fire detection or suppression. All Tesla products undergo rigorous testing to standards such as UL 1973 and IEC 62619 that ensure the battery modules are resistant to single cell thermal runaway propagation. This virtually eliminates all likelihood of a thermal event originating from an internal product failure. To date, Tesla has deployed over 1.5 GWh of stationary energy storage products globally without a single recorded thermal runaway event – a strong testament to the intrinsic safety design of our battery products.

To create a significant fire in Tesla energy products, the enclosures need to be subject to an extreme external event, such as direct exposure to a large prolonged fire or severe physical impact. In the event of a fire, rigorous full-scale fire testing has shown that Tesla energy products perform in a safe and controlled manner, consuming themselves slowly without explosive bursts or unexpected hazards, and without propagating to neighboring enclosure units. Megapack includes dedicated deflagrations vents built into the roof to mitigate damage to the equipment and surrounding personnel and exposures in case of hazardous thermal runaway or arc flash events. Hazards are vented upwards, ensuring response personnel and exposures on the ground are not directly exposed.

In practice, the hazards of a Tesla battery fire at the site-level are easily managed by standard fire service response equipment, and if suppression is desired, Tesla's recommendation is to apply water to neighboring enclosures and exposures to further limit the risk of external propagation. The cells used in Tesla products do not contain solid metallic lithium and thus do not react with water. Tesla recommends fire detection at the site-level with the use of third party multispectrum IR cameras that can capture early signs of thermal runaway, as well as other non-battery equipment fires on site.