

Battery Terminal Cover - Turnkey Hardware Integration & Safety Specification:

Battery Terminal Cover

TURNKEY HARDWARE INTEGRATION & SAFETY SPECIFICATION: BATTERY TERMINAL COVER

PRODUCT IDENTIFICATION & INTENDED USE

The Battery Terminal Cover (BTC) is a critical safety-critical mechanical safeguard engineered for the power connection points of high-voltage, high-capacity Battery Energy Storage Systems (BESS). This component is an integral part of our comprehensive turnkey hardware solution, designed to provide a robust, insulated, and environmentally sealed barrier for all exposed DC and AC terminal connections. The primary objective of the BTC is to prevent accidental contact with live parts, mitigate the risk of electrical arcing and short circuits, and ensure the long-term integrity of the primary power interface. Suitable for deployment in utility-scale storage farms, commercial & industrial (C&I) micro-grids, and containerized ESS platforms, the cover is manufactured to meet the most stringent international safety standards, guaranteeing a secure and reliable link between the battery rack and the Power Conversion System (PCS).



INTERNAL BESS TOPOLOGY & INTEGRATION POINT

Within the overall BESS architecture, the Battery Terminal Cover serves as the final protective interface at the battery cluster or module level. It is installed directly over the primary positive and negative busbar connection points, as well as the grounding terminal, immediately after the BMS-controlled contactors and fuses. This positioning ensures that all high-voltage cabling to the PCS or DC combiner box is fully protected at its source. The BTC is designed to integrate seamlessly with standardized cabinet layouts and is compatible with various cable entry configurations, including top-entry, bottom-entry, and side-entry options. The cover integrates a clear, transparent inspection window that allows for visual confirmation of proper lug torque and cable seating without requiring removal, thus significantly reducing the risk of human error during routine inspections. By providing a physical barrier that is both robust

and transparent, the BTC becomes an indispensable element of the overall safety chain, complementing the BMS's electrical protections (overcurrent, overvoltage) with a paramount physical safeguard.

THERMAL PROTECTION & ENVIRONMENTAL SEALING MECHANISMS

The design of the Battery Terminal Cover is a meticulous balance of electrical insulation, thermal management, and environmental resilience. Its construction utilizes UL94 V-0 flame-retardant, high-Comparative Tracking Index (CTI) engineering plastic, ensuring that it will not propagate a fire and maintains its insulating properties even under extreme conditions. Beyond its dielectric strength, the BTC incorporates a sophisticated sealing system. The cover base integrates a continuous, closed-cell EPDM gasket that, when compressed with the captive stainless-steel hardware, achieves an ingress protection rating of IP65. This seals the terminal cavity against dust, salt spray, and low-pressure water jets, preventing corrosion and leakage current paths. Furthermore, the cover's internal geometry is designed to create an isolated air cavity around the terminals, effectively managing heat dissipation and preventing the build-up of condensation. A silicone breather valve is integrated to equalize pressure and expel moisture vapor, ensuring a stable, dry micro-environment for the critical power connections. This multi-layered approach to thermal and environmental protection is essential for maximizing the operational lifespan and reliability of

the battery system in diverse outdoor conditions.

OPERATIONAL ADVANTAGES & SERVICEABILITY

The Battery Terminal Cover provides substantial operational and safety benefits.

Its key user-centric features are:

KEY FEATURES

- Feature 1: Tool-Free Inspection: The integrated transparent window allows for rapid, visual verification of terminal health, lug torque indicators, and cable seating without needing to dismantle the safety barrier, minimizing outage times.
- Feature 2: High Voltage Safety: Engineered to provide a minimum clearance and creepage distance, ensuring safe isolation for system voltages up to 1500V DC, meeting the requirements for modern high-voltage ESS.
- Feature 3: Multi-Layer Sealing: The ingress protection (IP65) and internal passive cooling channels protect against dust, moisture, and contamination, which are the primary causes of connection degradation and hotspots.
- Feature 4: Chemical Resistance: The cover material is formulated to be resistant to battery acid, coolant vapors, and corrosive atmospheres, ensuring longevity and durability in all environments.
- Feature 5: Secure Fastening: Uses tamper-proof, high-torque captive screws to

ensure the cover remains securely fastened under vibration and prevents accidental or unauthorized access.

- Feature 6: Interlock Compatibility: Designed with a physical interface that can be integrated with an optional safety interlock switch to de-energize the circuit automatically if the cover is improperly removed, adding an essential layer of personnel safety during maintenance.

TECHNICAL SPECIFICATIONS

Parameter	Specification (Standard Model)
Material	High-CTI UL94 V-0 Flame-Retardant Engineering Plastic
Maximum System Voltage	1500 V DC
Ingress Protection (IP) Rating	IP65 (IEC 60529)
Color	RAL 7035 (Light Grey) / Customizable
Operating Temperature	-40°C to +70°C
Relative Humidity (Operating)	0% to 100% (Non-Condensing)
Flammability Standard	UL 94 V-0
Chemical Resistance	Resistant to battery acid, coolant, salt spray
Mounting	Captive Stainless-Steel Screws (Torque spec: 4.0 Nm)

Standards Met	UL 9540, IEC 62619, IEC 60947-1, RoHS, REACH
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REGULATORY COMPLIANCE & STANDARDS

The Battery Terminal Cover is designed and rigorously tested to meet a comprehensive suite of global safety and performance standards, ensuring its suitability for any international project. It fully complies with the requirements of UL 9540 (Safety of Energy Storage Systems and Equipment), providing a key component of the system's overall safety certification. The product is also in full alignment with the safety requirements of IEC 62619 (Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for industrial secondary cells and batteries). The cover materials are certified to UL 94 V-0 for flame retardancy, guaranteeing the highest level of fire safety. Furthermore, the BTC is compliant with RoHS (Restriction of Hazardous Substances) and REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) regulations, affirming our commitment to environmental responsibility. The product's IP65 rating is certified according to IEC 60529, and its dielectric withstand and impulse voltage test results meet or exceed the criteria set by IEC 60947-1 (Low-voltage switchgear and controlgear). This comprehensive compliance and the use of third-party

certified materials provide our clients with the assurance of a product that is safe, reliable, and ready for global deployment.

