

High-voltage air distribution box



Overview

A High Voltage Power Distribution Unit is an electrical assembly designed to route, protect, and monitor high-voltage circuits.

Key Takeaways

A high-voltage air distribution box is a critical component that safely collects, distributes, and protects high-voltage DC power in energy storage systems or electric vehicles. Function and Purpose

A high-voltage air distribution box, also known as a high-voltage distribution cabinet, serves as the central hub for high-voltage DC power. It collects outputs from multiple battery clusters or high-voltage sources, provides electrical protection, monitors system status, and delivers stable power to downstream systems such as power conversion units or vehicle loads. It ensures safe operation under high-voltage conditions and prevents faults from propagating through the system.

Types

High-voltage boxes vary depending on system design and cooling method:

- Standard DC High-Voltage Boxes: Typically used in modular, air-cooled energy storage systems ranging from 100 kWh to 241 kWh.
- Integrated High-Voltage Boxes: Found in liquid-cooled systems (e.g., 215 kWh or 372 kWh), featuring advanced insulation and monitoring.



- **Container-Level High-Voltage Cabinets:** Designed for large containerized energy storage systems (3.35 MWh to 5 MWh), handling complex grid integration and fault management .
- **Vehicle High-Voltage Power Boxes:** Combine Onboard Charger (OBC), DC/DC converter, and Power Distribution Unit (PDU) to manage energy flow between high-voltage and low-voltage networks in electric vehicles .

Key Features

- **Power Collection and Distribution:** Aggregates outputs from multiple battery racks or high-voltage sources into a single bus .
- **Electrical Protection:** Equipped with DC breakers, fuses, isolation switches, and insulation monitoring devices to prevent overcurrent, short circuits, and insulation failures .
- **Monitoring and Safety:** Includes interlocks, voltage sensors, and fault detection to ensure safe operation and compliance with standards .
- **Modular Design:** Some boxes allow flexible connections for multiple loads, with shielded housings for EMC protection in vehicles or industrial applications .

Applications

- **Energy Storage Systems (ESS):** Air-cooled or liquid-cooled high-voltage boxes are used in residential, commercial, and utility-scale battery storage .
- **Electric Vehicles (EVs):** High-voltage power boxes manage energy distribution between the battery, motor, and auxiliary systems like lights and infotainment .
- **Industrial and Building Automation:** High-voltage distribution boxes can also be applied in industrial plants or smart buildings for centralized or decentralized power distribution .

Design Considerations

- **Cooling:** Air-cooled boxes rely on natural or forced airflow, while liquid-cooled boxes use coolant channels for higher power densities .
- **Safety Compliance:** Must meet standards for insulation, interlocks, and fault protection to prevent hazards in high-voltage environments .
- **Accessibility:** Internal components should be accessible for commissioning, maintenance, and troubleshooting .
- **Scalability:** Modular designs allow expansion of battery clusters or loads without redesigning the entire system . In summary, a high-voltage air distribution box is a safety-critical, multifunctional unit that ensures efficient, reliable, and protected distribution of high-voltage power in energy storage systems, electric vehicles, and industrial applications. Its design balances protection, monitoring, and scalability while accommodating air-cooled or liquid-cooled configurations.

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Integrating the high-voltage distribution box with other components can maximize space saving. In the integrated layout scheme,

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The Supplier of High Voltage Boxes High voltage boxes are usually supplied as part of integrated energy storage

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Distribution boxes are mainly used for high-voltage switchgear, transformers and other electrical equipment in indoor or outdoor

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