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Additionally, a BMS may calculate values based on the items listed below, such as:[1][4]

The central controller of a BMS communicates internally with its hardware operating at a cell level, or externally with high level hardware such as laptops or an HMI.[clarification needed]

High level external communication is simple and uses several methods:[citation needed]

A BMS may protect its battery by preventing it from operating outside its safe operating area, such as:[1][10]

A BMS may also feature a precharge system allowing a safe way to connect the battery to different loads and eliminating the excessive inrush currents to load capacitors.

In order to maximize the battery"s capacity, and to prevent localized under-charging or over-charging, the BMS may actively ensure that all the cells that compose the battery are kept at the same voltage or State of Charge, through balancing. The BMS can balance the cells by:

Some chargers accomplish the balance by charging each cell independently. This is often performed by the BMS and not the charger (which typically provides only the bulk charge current, and does not interact with the pack at the cell-group level), e.g., e-bike and hoverboard chargers. In this method, the BMS will request a lower charge current (such as EV batteries), or will shut-off the charging input (typical in portable electronics) through the use of transistor circuitry while balancing is in effect (to prevent over-charging cells).

Centralized BMSs are the most economical, least expandable, and are plagued by a multitude of wires.Distributed BMSs are the most expensive, simplest to install, and offer the cleanest assembly.Modular BMSes offer a compromise of the features and problems of the other two topologies.

All of the battery cells or modules in a battery pack are monitored and managed by a single controller in a centralized BMS system. The primary functions of a BMS are carried out by this controller, these functions include data collecting, processing, and command execution. It typically performs tasks including controlling charge/discharge rates, monitoring voltage, current, and temperature, safeguarding the battery cells from operating outside of their safe working range, and carrying out balancing algorithms.

A wiring harness connects the battery modules or cells to this central controller. A centralized BMS typically has a more straightforward design, less complicated assembly, and lower costs than other types of BMS architectures due to its solitary control system.

Various applications frequently adopt centralized BMS topologies. They are especially well-suited for smaller, less complex battery systems with a low cell count because of their simplicity and cost-effectiveness. Electric bikes, scooters, and other light electric vehicles are prominent examples of applications for them.

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