

# Battery Management System (BMS) for



## For kW and MW-scale Storage

### Remote Monitoring of Every Battery, for Security and Performance

On-site or on the road, your real-time system information is always available. Reports, alerts and alarms can be sent via SMS or internet channels for instant access and quick response.



### Human-Machine Interface (HMI)

Each battery system is equipped with an on-board web server. This means that all you need to access highly manageable reporting is your password and a web browser – which can be the browser on your phone, tablet or laptop – connected through ethernet, WiFi or internet. No software downloads or installations are needed, and system updates occur instantaneously throughout our network.



### Access to System Information

Our monitoring hardware and software continuously measure key parameters of voltage, current and cell temperature and can also be configured to monitor ambient temperature and gas concentrations for enhanced safety and performance.

A monitor is paired to each battery at the factory for life, and stores a full history of that battery's individual performance. Each individual cell's or monobloc's data is transmitted to a local BMS Concentrator via an optically isolated protocol (avoiding possible earthing faults), which then makes the data accessible to other third-party systems.



Ecoult's HMI gives users and installers access via the internet to historical and real-time information for the entire system and each individual battery.

## Light and Robust Design

The BMS is built to minimize parasitic losses and maintain reliability, offering functions such as sleep mode, error correction, ultra-low power consumption and remote firmware updates.

### BMS Architecture

- Level 0 – Battery (cell or monobloc) Monitoring
- Level 1 – String Monitoring
- Level 2 – Storage Block (multiple strings) Management
- Level 3 – integration with a power conversion system
- Level 4 – Full master control of all power system assets

This architecture allows Ecoult to manage the flow of data being transmitted at all stages in the management system. Data is encapsulated to maintain integrity and security, as well as to optimize system latency.

The BMS Concentrator calculates critical system information such as instantaneous available energy and efficiency, and communicates between the battery system and the site, either controlling or responding to the power control system for the application.



Ecoult's customized reporting gives quick access to key information.

## Benefits of Ecoult's UltraBattery® Monitoring

Key Features	Benefits
<b>Remote Access</b> Enables remote analysis of battery data to determine system performance and perform support and diagnosis without travelling to site	Minimizes travel and time on site for support
<b>Battery Balancing</b> Precise equalization between cells and Monoblocs	Maximizes longevity and performance of the entire battery system
<b>Runtime Supervisor</b> Provides feedback on operation of the battery system to ensure the batteries are in an optimal state while avoiding detrimental zones of operation	Provides surety that your investment is being used for lowest total cost of ownership
<b>Instantaneous Reserve</b> Reports the total energy available and runtime for a reserve event	During emergency events when power is down, system operators can manage the outage and minimize disruption
<b>Battery Monitor</b> Records treatment of the battery to allow warranty claim validation	Makes real-time status information of every battery available to upstream control systems
<b>Multiplexer Module</b> Provides optically isolated communications to a group of battery monitors, allowing the electronics to be used on long battery strings (e.g. 960 V) and enabling multiple nodes with deterministic latency (e.g. 480 batteries in a storage block)	Allows "daisy-chains" of groups of monitors in a single control path (so no need to wire many batteries individually back to the master module)
<b>Master Module</b> Enables control and reporting on multiple battery strings in partial-state-of-charge (PSoC) operation, and provides Modbus interface to power control systems	Offers optional capability of a webserver to log in and view the device's historical and real-time performance

### Energy Storage Excellence – Partners

Ecoult™ is the global energy storage arm of the world's largest single-site lead battery manufacturing facility, East Penn Manufacturing (EPM), known worldwide for its quality and environmental excellence. Ecoult™ provides software, hardware, systems integration and engineering to monitor and control the energy storage systems and maximize their capabilities. EPM manufactures the Deka® UltraBattery® cells inside every system.



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