NUVATION BMS™

Grid Battery Controller

NUV100-GBC

Datasheet

2017-12-08, Rev. 1.2

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System Overview

When multiple stacks managed by Nuvation BMS™ are connected in parallel to form a large system, a Nuvation BMS™ Grid Battery Controller is required to aggregate information from each stack in the system and to provide a unified interface to the large battery system.

An example multi-stack configuration is shown in Figure 1.
Grid Battery Controller Module

Software Overview

The Nuvation BMS™ Grid Battery Controller (GBC) module manages all cells and stacks across the entire battery from a single device. This device provides a unified view of the multi-stack battery, enables data analytics, and pushes BMS configuration and firmware updates across the entire battery.

Designed in compliance with MESA (Modular Energy Storage Architecture) Open Standards for Energy Storage (mesastandards.org, draft 3), the Grid Battery Controller was created specifically for integration with a wide range of grid batteries and inverters.

The Grid Battery Controller provides the following important features for large-scale multi-stack energy storage systems:

**Main Functions**

*Manages multiple stacks*

Up to 24 stacks can be managed.

*Provides Unified View of Entire Battery*

Access diagnostics and performance data of entire multi-stack battery from one user interface.

*Provides Remote Access*

Allows remote access for data analytics and capture. Users can view or adjust battery operation remotely via Internet browser on PC or tablet computer.

*Automates System-Wide Fault Response*

Identifies and acts upon faults anywhere in the battery pack.

*Communications*

Hardened BMS communications bus over Ethernet.

Battery Level Control interface for Site controllers provides current limiting functionality across multi stacks.

**Unified View Operator Interface**

Browser user interface, which supports Chrome and Firefox, provides a view of:

*Statistics View*

Provides pack-level voltage, temperature, and current statistics for all cells.

*Real-Time View*

Streams measurements and control signals for real-time display.

*Aggregate SOC and SOH*

Calculates and displays State of Charge and State of Health for the entire battery.
Flow-Through I/O
Provides a single entry point to all measurement and control points in the BMS.

Communications Status
Makes available measurements, control signals, and other data to external systems.

Faults and Warnings
Aggregates faults and warnings to provide a system-wide overview and provides a detailed drill-down of battery pack diagnostics.

Communications & Data Analytics

Data Capture Support
Streams data in real time to external servers for analytics and trend data capture.

Isolated BMS Network Traffic
Two Gigabit Ethernet ports isolate BMS network traffic from external network traffic.

Inverter Support
Modbus TCP supports MESA storage models for connection to Power Conversion Systems as well as other external systems through multiple concurrent client connections.

Maintenance and Management

Multi-Stack Current Limiting
Determines operating current for entire pack and uses this data to control the inverter and protect the battery pack from over charging or discharging.

Pack-Level Safety
Identifies faults anywhere in the battery pack and initiates preventive action to operate the battery within configured parameters.

Servicing
Brings stacks offline or online for service, maintenance, modifications, etc. Enables connection of multiple stacks onto the DC power bus.

Network Environment Flexibility
Multi-socket Ethernet interface allows concurrent operation of both local and remote operator panels, data analytics streaming, and Modbus TCP inverter control.

Battery Performance Tuning
Low-level fine tuning controls enables optimization and on-the-fly experimentation.
Hardware Overview

The Grid Battery Controller contains an industrial server that handles all the aggregation processes and system-level decision-making required by Nuvation BMS™.

The Grid Battery Controller does not have high-voltage connectors and does not connect to any battery stack-referenced signals, making it safe to handle and connect to external equipment.

For wiring/pin-out information, please refer to the *Nuvation High-Voltage BMS Installation Guide*.

**Ethernet – 2 ports**

The Ethernet jack is a standard RJ45 Cat5e rated jack. The ETH1 interface is used as the primary means of connecting the Grid Battery Controller to each Stack Controller. The ETH2 interface is used as the primary means of connecting an external system to the BMS to configure the operating parameters, receive MESA control messages and observe the status. The two LEDs on the Ethernet jack indicate link status (green LED) and network activity (yellow LED).

**DisplayPort**

The DisplayPort connector is a standard DisplayPort connector. Not used.

**DC Power**

The DC Power connector is a Phoenix Contact™ VARIOSUB D-SUB POWER-SUBCON® 3-position receptacle, providing an entry point for the Grid Battery Controller operating power. The G Grid Battery Controller requires a nominal 24VDC power supply for. A mating connector for this is a Phoenix Contact™ 3-position terminal block plug, part number 1841909.

**USB 2.0 & 3.0 Host**

The USB 3.0 Host connector is a standard Type-A connector. Not used.

**RS232**

The RS232 connector is a Male DE-9 connector. Not used.

**Indicator LEDs**

The Power LED indicates that the Grid Battery Controller is operational and the HDD LED indicates read/write activity to the internal storage media.
Operating Limits

This section states the operating limits of the Grid Battery Controller module.

**WARNING:** Exceeding the maximum ratings will damage the module.

### Table 1: Grid Battery Controller Electrical Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
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### Table 2: Grid Battery Controller Environmental Conditions

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<td>%</td>
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</table>

The Grid Battery Controller meets industry standards CISPR 22 Class A and IEC/EN 61000-4-2 for EMC/EMI and ESD respectively. All components are EU RoHS/China RoHS compliant.
Mechanical Overview

The overall dimensions of the Grid Battery Controller are 210mm X 65mm X 140mm. It comes standard with a DIN clip, enabling it to be securely mounted to EN50022-compliant DIN rail. Extra space should be provided around the module to allow for easy installation/maintenance.

The Grid Battery Controller weighs approximately 2.5kg.

![Figure 2: Grid Battery Controller DIN Clip Location](image)

The Grid Battery Controller requires free space around its enclosure to provide adequate cooling.
Figure 3: Grid Battery Controller Restricted Areas
Ordering Information

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
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<td>NUV100-GBC</td>
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DISCLAIMER: From time to time Nuvation Energy will make updates to the Nuvation BMS™ in response to changes in available technologies, client requests, emerging energy storage standards and other industry requirements. The product specifications in this document therefore, are subject to change without notice.