



Nuvation Energy Grid Battery Controller

NUV100-GBC Datasheet

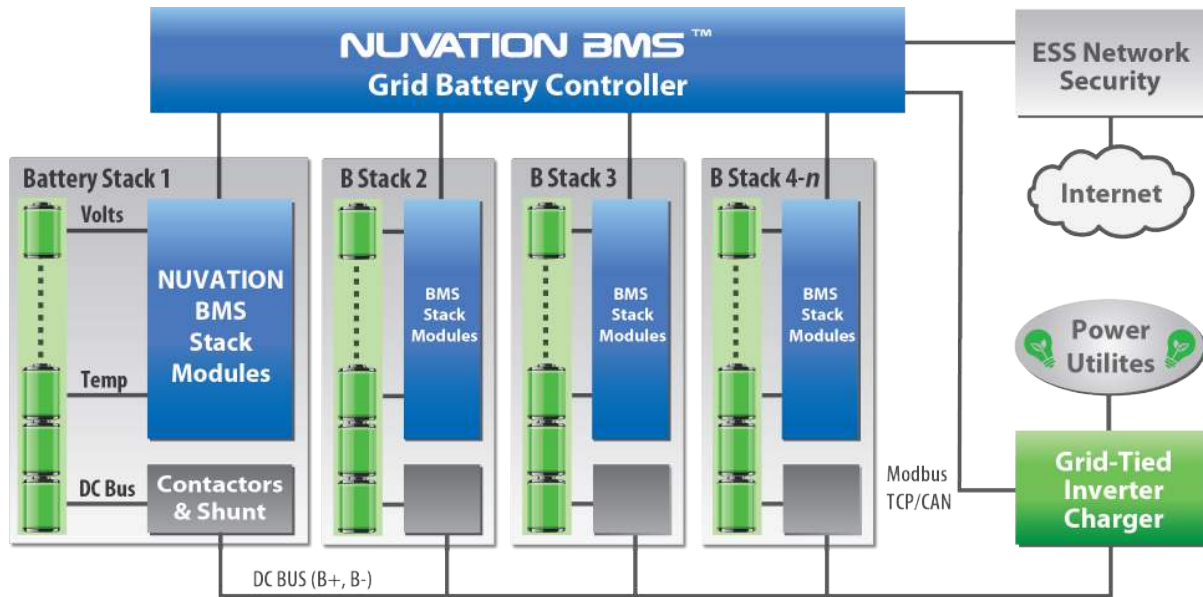
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1. System Overview

Nuvation Energy Grid Battery Controller aggregates information in a multi-stack energy storage system and provides a unified interface for monitoring, updating and controlling the individual stacks and even external hardware.

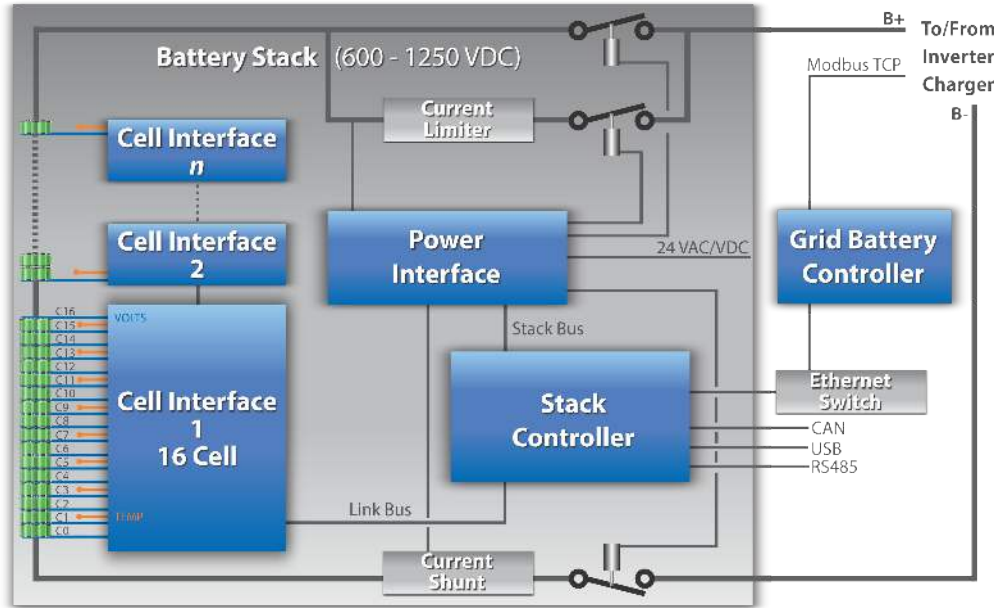


Multi-Stack View: Grid ESS Managed by Nuvation BMS

Figure 1. Example Nuvation Energy BMS multi-stack configuration

Depending on the system, the individual stacks will be managed by either a Nuvation Energy High-Voltage BMS (via the Stack Controller) or a Nuvation Energy Low-Voltage BMS (via the Battery Controller).

The Grid Battery Controller aggregates information from each of the Stack Controller modules or Battery Controller modules in the system and provides a unified interface to the pack as a whole.



BMS Single Stack Detail - Energy Storage System (ESS)

Figure 2. Example single-stack managed by a Stack Controller and connected to a Grid Battery Controller

2. Nuvation Energy Grid Battery Controller

2.1. Software Overview

Nuvation Energy Grid Battery Controller manages all cells and stacks across the entire battery from a single device. The Grid Battery Controller provides a unified view of a 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 batteries and inverters, and is designed to work with both Nuvation Energy Low-Voltage BMS and Nuvation Energy High-Voltage BMS.

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

2.1.1. Main Functions

Manages multiple stacks

Manage up to 36 stacks

Provides Unified View of Entire Battery

Access diagnostics and performance data of entire multi-stack battery from a single unified user interface

Provides Remote Access

Remote access for data analytics or for viewing and adjusting battery operation remotely via web browser on a PC, tablet computer or even on a smartphone

Automates System-Wide Fault Response

Manually or automatically identify and act upon faults anywhere in the battery pack

Communications

Communicate securely over Ethernet. Provides unified interface for Site controllers to multiple stacks.

Automatic Pack Connection

Allows the BMS to manage the connected state of all battery stacks within the pack. When requested, the Grid Battery Controller will connect all stacks if they do not violate the pack connection current limit. Stacks are automatically connected when the limit is no longer violated (e.g. when the stack voltage becomes close enough to the pack voltage that is safe to connect).

Maximize Pack Uptime and Connection

Provides a flexible configuration to manage battery stack faults at a pack level. An operator can configure a battery pack to tolerate a specified number of stacks that fault and disconnect from the DC bus. The Grid Battery Controller allows the pack to remain operational and manage the reduced power capacity of the battery.

2.1.2. Unified View Operator Interface

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

Statistics View

Monitor pack-level statistics for voltage, temperature, and current across all cells

Real-Time View

Monitor measurement and control information in real-time

Aggregate State-of-Charge

View State-of-Charge calculated values for the entire battery

Flow-Through I/O

Control all points in the BMS from a single interface

Communications Status

Reports networking communication status and communication issues from stacks within the pack.

Faults and Warnings

Monitor all system-wide faults and warnings or, for a finer level of control, drill down into detailed battery pack diagnostics.

2.1.3. Communications & Data Analytics

Isolated BMS Network Traffic

Two Gigabit Ethernet ports isolate BMS network traffic from external network traffic, helping ensure your energy storage system is hardened and reliable

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.

2.1.4. Maintenance and Management

Multi-Stack Current Limiting

Determine operating current for entire pack and use this data to control the inverter, protecting the battery pack from over-charging or discharging

Pack-Level Safety

A highly configurable architecture allows the operator to specify system faults and desired responses. The Grid Battery Controller flags faults anywhere in the battery pack and automatically takes preventive action to keep the battery safe and healthy.

Servicing

Bring stacks on and offline for service, maintenance, modifications, etc. Selectively connect multiple stacks to the DC power bus.

Network Environment Flexibility

A multi-socket Ethernet interface allows concurrent operation of both local and remote operator panels, monitoring data and controlling inverters over Modbus TCP.

Battery Performance Tuning

Low-level, fine tuning controls enable optimization and on-the-fly experimentation. Update fault voltages, temperature levels and more in seconds from the Operator Interface GUI.

Provides Remote Support

The GBC provides a secure VPN connection to a Nuvation Energy server and grants Nuvation Energy support engineers remote access to check on the health of the battery pack and aid the local site commissioning team.

2.2. Hardware Overview

Nuvation Energy Grid Battery Controller uses an industrial-grade server that handles all data aggregation and system-level decision-making required by Nuvation Energy 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 Energy Grid Battery Controller: Installation Guide* available online at <https://www.nuvationenergy.com/technical-resources>

2.2.1. Ethernet – 2 ports

Two standard RJ45, Cat5e-rated Ethernet jacks are provided. ETH1 connects Grid Battery Controller to a Stack Controller or to a network switch that in turn connects to multiple Stack Controller modules. ETH2 connects an external device or network to the Grid Battery Controller to configure the operating parameters, receive MESA control messages and observe the status. Two LEDs on each Ethernet jack indicate link status (solid green LED for Gigabit connection, solid yellow LED for 100Mbps connection) and network activity (flashing green LED).

2.2.2. DC Power

Power is provided to the Grid Battery Controller through the 24VDC power connector. This is a Phoenix Contact™ VARIOSUB D-SUB POWER-SUBCON® 3-position receptacle. The Grid Battery Controller requires a nominal 24 V DC power supply. A mating connector for this is a Phoenix Contact™ 3-position terminal block plug, part number 1841909.

2.2.3. Indicator LEDs

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

2.3. Operating Limits

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



Exceeding the maximum ratings will damage the module.

2.3.1. Power Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
+Vin	Input Voltage		19.2	24	28.8	Vdc
	Input Current	+VSYS = 24Vdc	-	-	2.5	Adc

2.3.2. USB 3.0 Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
+5V_USB3.0	USB Current		-	-	900	mAdc
USB3.0_Data	USB supported data rates		1	-	3	

2.3.3. USB 2.0 Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
+5V_USB2.0	USB Current		-	-	500	mAdc
USB2.0_Data	USB supported data rates		1	-	2	

2.3.4. Ethernet Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
ETH_Protocol	Ethernet data speeds		10	-	1000	Base-T
ETH_Connector	Ethernet jack rating		-	Cat5e	-	

2.4. Environmental Conditions

2.4.1. Thermal Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Ta	Operating Temperature		-10	25	60	°C
	Storage Temperature		-10	25	60	°C

2.4.2. Humidity Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
RH	Operational RH		5	-	85	%
	Storage RH		5	-	85	%

2.4.3. Shock and Vibration Specifications

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Vertical	Vertical shock/vibration		-	-	1	m/s ²
Longitudinal	Longitudinal shock/vibration		-	-	1	m/s ²
Transverse	Transverse shock/vibration		-	-	1	m/s ²

Nuvation Energy 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.

2.5. Mechanical Overview

The overall dimensions of the Grid Battery Controller are 210 mm X 65 mm X 140 mm. It is sold 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 cable connections, easy installation/maintenance and to provide adequate fan-less cooling. The spatial clearance is illustrated on the [restricted area diagram](#)

The Grid Battery Controller weighs approximately 2.5 kg.

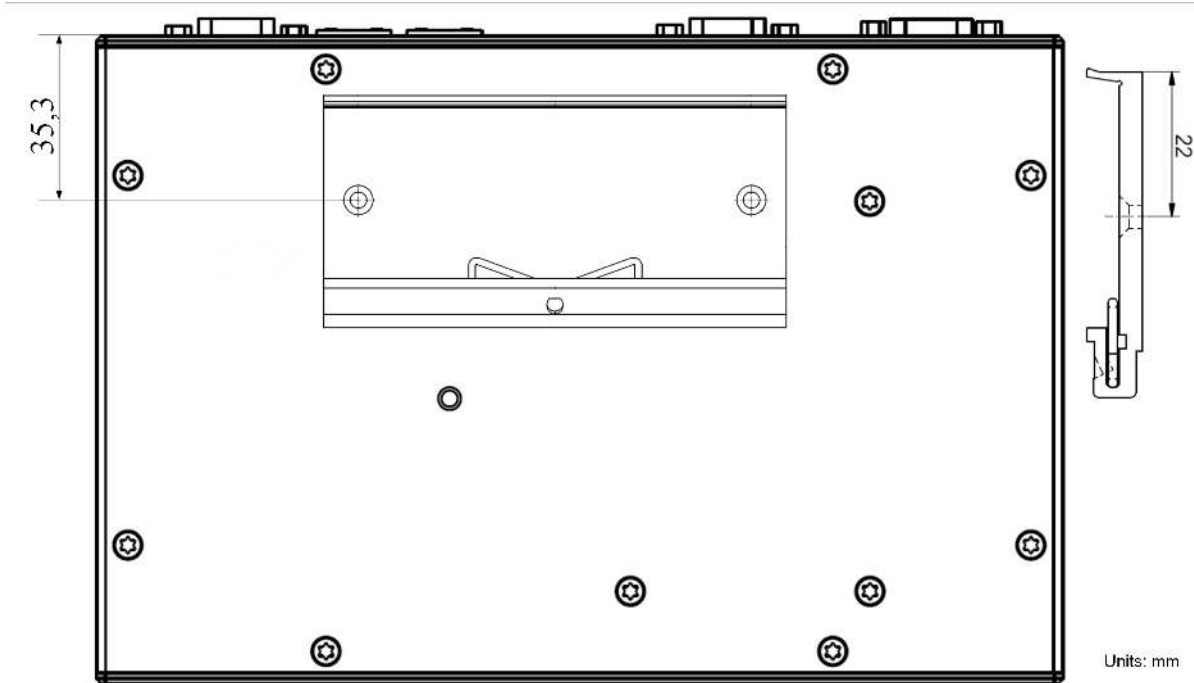


Figure 3. Grid Battery Controller DIN Clip Location

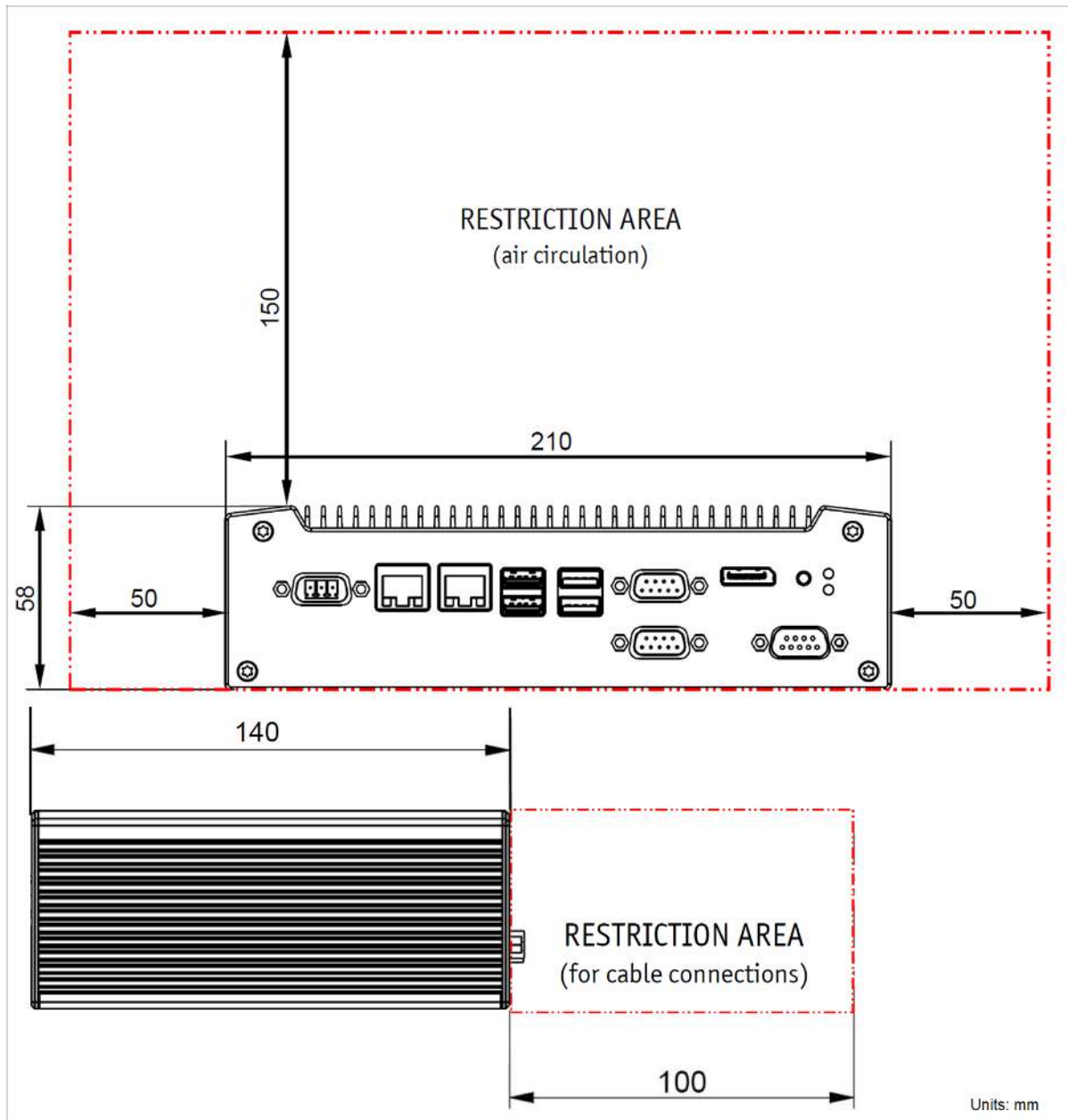


Figure 4. Grid Battery Controller Restricted Areas

3. Ordering Information

Product Part Number	Product Name
NUV100-GBC-4S	Grid Battery Controller, up to 4 stacks
NUV100-GBC-8S	Grid Battery Controller, up to 8 stacks
NUV100-GBC-12S	Grid Battery Controller, up to 12 stacks
NUV100-GBC-16s	Grid Battery Controller, up to 16 stacks
NUV100-GBC-20S	Grid Battery Controller, up to 20 stacks
NUV100-GBC-24S	Grid Battery Controller, up to 24 stacks
NUV100-GBC-28S	Grid Battery Controller, up to 28 stacks
NUV100-GBC-32S	Grid Battery Controller, up to 32 stacks
NUV100-GBC-36S	Grid Battery Controller, up to 36 stacks
NUV100-GBC-A4S	Grid Battery Controller, each additional 4 stacks

Note Regarding Software Licenses



The Nuvation Energy Grid Battery Controller is sold with software support for up to 4 stacks. Software license upgrades allow a Grid Battery Controller to support up to a maximum of 36 stacks. Please contact support@nuvationenergy.com regarding Nuvation Energy Grid Battery Controller purchasing and licensing.

From time to time Nuvation Energy will make updates to Nuvation Energy 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.

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