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Nuvation Energy nController® Datasheet

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1. System Overview

Thank you for choosing Nuvation Energy.

The nController® controls and monitors a Battery Energy Storage System (BESS).

The nController® provides a unified control interface. It integrates a single- or multi-stack battery with a power conversion system (PCS). The nController® enables the BESS to be used as an AC-coupled asset for grid attached and microgrid applications.

The nController® has the following product features:

- Provides dispatch interface for higher-level controls
- Enables load shifting
- Enables backup power applications
- Enables battery maintenance policy management and execution
- Provides parallel battery stack management
  - Provides parallel stack aggregation and intelligent control
  - Manages 1-16 parallel battery stacks on a DC-bus
  - Each battery stack is managed by Nuvation Energy G4 or G5 Stack Switch Gear
  - Collects pack-level voltage, temperature, and current statistics for all cells
  - Calculates State-of-Charge (SOC)and State-of-Health (SOH) of the unified energy storage system
  - Aggregates system-wide faults and warnings and provides battery pack diagnostics
  - Ensures that measurements and control signals are propagating though all BMS modules
  - Functions as a data analytics gateway by providing access to battery measurements for data capture
- Provides unified control for one PCS, selectable from multiple supported models
- Provides monitoring and control of BESS auxiliary systems via networked digital IO module
- Local data logging
- Remote support monitoring to facilitate pilot system integration support
- Optional Touch Screen HMI (Hardware not included)
- Two form factor options:
  - 1U Rack-Mount Server
  - Compact Form Factor, ruggedized (SAE J2464, SAE J2380), suitable for use in "mobile applications"

The nController® provides a dispatch interface for an AC-couple BESS and can also enable load shifting and some resiliency applications as a stand alone controller.

To discuss more advanced applications or support for additional equipment, please contact our sales

team via the get a Quote form on the Nuvation website.

1.1. Specifications

This product is a standard offering of nController®, design to control an AC-block with the associated auxiliary equipment.

The core functions of the BESS are to provide charging and discharging on demand while attached to the utility grid.

This system controls and monitors up to 1x power conversion systems (PCS) with the ability to operate in grid-following and some microgrid configurations dependent on PCS and supporting equipment capabilities. The system also manages up to 16x stacks of Nuvation Energy Battery Management System and battery strings.

The system provides:

Provides charge and discharge API for higher-level controller

- Follow set points for real and reactive power

Timed dispatch with recovery

- Triggerable dispatch at a set power for a set duration of time
- Rest period after dispatch with zero power
- Recovery after going back to a configured SOE setpoint

Target SOE schedules

- Autonomous operation to maintain energy capacities
- Set target energy capacities for available energy for charge and available energy for discharge
- Set schedules based on time of day and time of year for load-shifting applications

Test patterns

- Test patterns based on SOC and time durations

Manages battery maintenance charge

- Perform maintenance charge when authorized
- Remove request for maintenance charge when complete

Enables forming of islanded power grid (not supported by all PCSs)

- Enabling/disabling of islanding
- Provide set points for frequency and voltage while grid-forming
- Enable transition from grid-forming to grid-connected

Human Machine Interface (HMI)

- Connection to external human machine interface (HMI)

BESS status reporting

- BESS status over Modbus TCP
- BESS status over browser based user interface

IO Controller

- Used to monitor BESS subsystems via GPI
  - Input examples: smoke detectors, hydrogen detectors, door sensors, E-stop, etc.
- Use to control BESS subsystems via GPO
  - Output examples: ventilation fans, HVAC, etc.

1.2. nController® Extension Program

For projects with more complex requirements, Nuvation also offers an nController® Extension Program that can add advanced features such as demand charge management, integration of local generation, and custom control logic. Nuvation Energy works directly with clients to create system-specific extensions to the standard nController® product. Contact Nuvation Energy to learn more.

2. Operating Limits

2.1. nController® Compact Operating Limits

Exceeding the maximum ratings will damage the module.

2.1.1. Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
		Power Specifications				
+Vin	Input Voltage	-	11.4	12	12.6	V DC
	Input Current	+Vin = 12 V DC	-	7.5	12.5	A DC
		Ethernet Specifications				
ETH RJ45: 1-4	Ethernet Connection Speed	10BASE-T 100BASE-TX 1000BASE-T	10	-	1000	Mb/s
ETH RJ45: 5,7	Ethernet Connection Speed	1GBASE-T 10GBASE-T	1	-	10	Gb/s
ETH Twisted_Pair: 1-4	Ethernet Cable Rating	-	Cat 5e	-	Cat 6	
ETH Twisted_Pair: 5,7	Ethernet Cable Rating	-	Cat 6	-	-	
ETH SFP+: 6,8	SFP+ Port Speed	-	1	-	10	Gb/s
ETH_Connector	Ethernet jack rating	-	-	Cat6	-	

2.1.2. Environmental Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Units
		Thermal Specifications				
T_a	Operating Temperature	-	5	25	40	°C
	Storage Temperature	-	-40	25	70	°C
		Humidity Specifications				
RH	Operational RH	Non-Condensing	8	-	90	%
	Storage RH	Non-Condensing	5	-	95	%
		Shock and Vibration Specifications				
Vertical	Vertical Shock/Vibration	-	-	-	10	m/s^2
Longitudinal	Longitudinal Shock/Vibration	-	-	-	10	m/s^2
Transverse	Transverse Shock/Vibration	-	-	-	10	m/s^2

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Pulse Vibration	On each axis	-	-	-	245	m/s^2

If the nController® is stored at temperatures below 5 °C, it must be warmed up in a 20 °C or warmer environment for 45 minutes before applying power. Powering the unit below 5 °C may impact data logging or cause other unexpected behaviour.

2.1.3. Standards and Certifications

The nController® has been designed to meet the requirements of SAE J2464 (shock) and SAE J2380 (random vibration).

The following directives and standards apply to the nController®:

- EMC/EMI: 2014/30/EU (EMC Directive)
- Electromagnetic Compatibility Regulations 2016
- FCC Part 15 Subpart B
- ICES-003
- VCCI 32-1
- AS/NZS CISPR 32
- BS/EN55032
- BS/EN55035
- BS/EN 61000-3-2
- BS/EN 61000-3-3
- BS/EN 61000-4-2
- BS/EN 61000-4-3
- BS/EN 61000-4-4
- BS/EN 61000-4-5
- BS/EN 61000-4-6
- BS/EN 61000-4-8
- BS/EN 61000-4-11
- Green Environment: 2011/65/EU (RoHS Directive)
- EC 1907/2006 (REACH)
- 2012/19/EU (WEEE Directive)
- Product Safety: 2014/35/EU (LVD Directive)
- Electrical Equipment (Safety) Regulations 2016
- UL/CSA 62368-1 (USA and Canada)
- IEC 62368-1

2.2. nController® Rack Mount Operating Limits

Exceeding the maximum ratings will damage the module.

2.2.1. Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
		Power Specifications				
$+V_{in}$	Input Voltage	-	100	-	240	V AC
	Input Frequency	-	50	-	60	Hz
	Input Current	V_{in} = 120 V AC	0.41	0.83	1.25	A AC
		V_{in} = 240 V AC	0.2	0.41	0.62	A AC
		Ethernet Specifications				
RJ45 Port 1-9	Connection Speed	10BASE-T 100BASE-TX 1000BASE-T	10	-	1000	Mb/s
	Twisted-pair cable rating	-	Cat 5e	-	Cat 6	
	Ethernet jack rating	-	-	Cat6	-	
RJ45 Port 10-11	Connection Speed	1GBASE-T 10GBASE-T	1	-	10	Gb/s
	Twisted-paid cable rating	-	Cat 6	-	-	
	Ethernet jack rating	-	-	Cat6	-	
SFP+ Port 12-13	SFP+ Port Speed	-	1	-	10	Gb/s

Systems involving more than 10 Ethernet connected ports for equipment will require an external network Ethernet switch to be connected to the nController®.

This external switch is not provided. An industrial grade, un-managed switch is recommended.

2.2.2. Environmental Conditions

Symbol	Parameter	Conditions	Min	Max	Units
		Thermal Specifications			
T_a	Operating Temperature	-	5	45	°C
	Storage Temperature	-	-40	70	°C
		Humidity Specifications			
RH	Operational Relative Humidity	Non-Condensing	8	90	%
	Storage Relative Humidity	Non-Condensing	5	95	%

If the nController® is stored at temperatures below 5 °C, it must be warmed up in a

20 °C or warmer environment for 45 minutes before applying power.

Powering the unit below 5 °C may impact data logging or cause other unexpected behaviour.

The nController® unit should not be shipped while installed in a rack.

2.2.3. Regulatory Compliance

Standard	Name
	Electromagnetic Emissions
FCC Class B	US Federal electromagnetic radiation limits
EN 55032 Class B	European Electromagnetic compliance testing of multimedia equipment
EN 61000-3-2/3-3	European Electromagnetic limits for harmonic current emissions
CISPR 32 Class B	International Electromagnetic compatibility of multimedia equipment
	Electromagnetic Immunity
EN 55024/CISPR 24	European information technology equipment immunity characteristics
	Safety
CSA/EN/IEC/UL 60950-1 Compliant	Information technology equipment safety general requirements
CE Marking	Compliant with European Union (EU) directives and regulations

3. Mechanical Overview

3.1. Compact

The nController® is designed for indoor use.

For best thermal performance, the nController® should be mounted to a flat vertical surface such that the face with the Ethernet / Power connectors is pointing up.

The unit weighs 4.5 kg (9.9 lb).

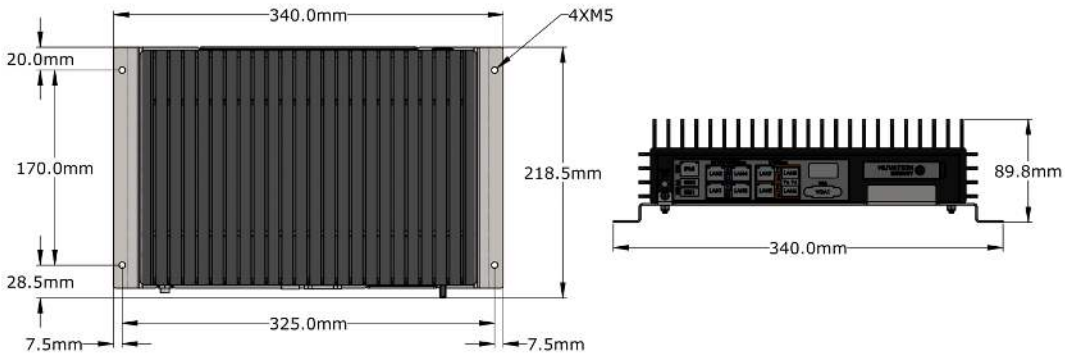

Figure 1. nController® Compact Dimensions

3.2. Rack Mount

The nController® is designed for indoor use. It is 1U (rack-units) tall and fits in a standard 19" server rack. The unit ships with the Rack Mount hardware needed to install it into the rack. The sliding rails on the nController® are adjustable to fit any 19" server rack depth between 26" to 30".

A clearance of approximately 762 mm [30 in] in the back of the rack is recommended to allow sufficient space for airflow, cable connections, and access when servicing.

The overall dimensions of the nController® are 484 × 419 × 44 mm [19.1 x 16.5 x 1.7 in].

The unit weighs 6.5 kg [14.3 lb].

The nController® Rack Mount must be shipped in it’s own package and cannot be shipped while installed in a rack.

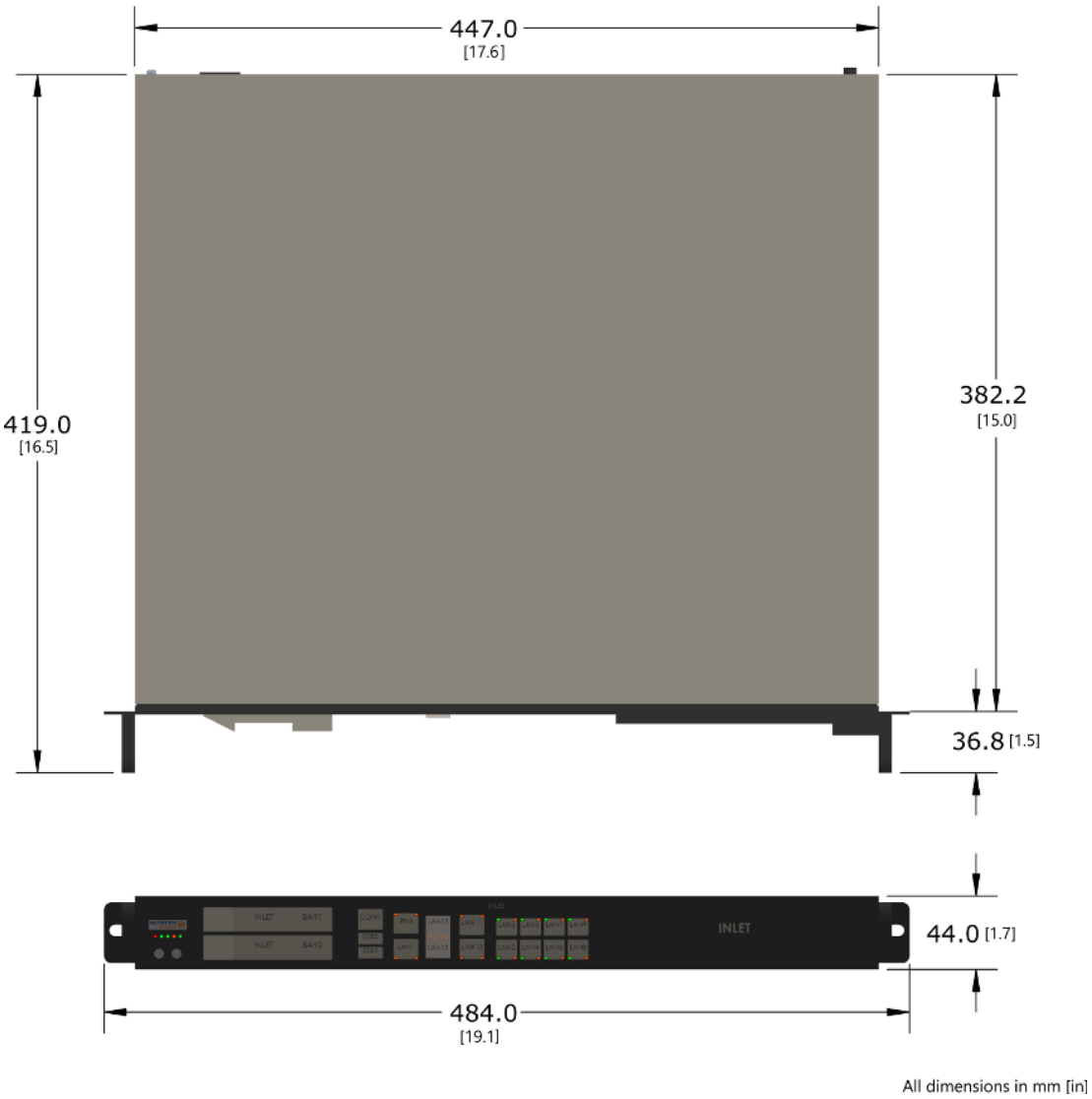

Figure 2. nController® Rack Mount Dimensions

4. Ordering Information

This section provides orderable part numbers for Nuvation Energy's offerings of nController® modules and related accessories.

Product Part Number	Product Name
NUVNC-3C-01S	nController®, Compact, single stack
NUVNC-3C-02S	nController®, Compact, up to 2 stacks
NUVNC-3C-04S	nController®, Compact, up to 4 stacks
NUVNC-3C-06S	nController®, Compact, up to 6 stacks
NUVNC-3C-08S	nController®, Compact, up to 8 stacks
NUVNC-3C-10S	nController®, Compact, up to 10 stacks
NUVNC-3C-12S	nController®, Compact, up to 12 stacks
NUVNC-3C-14S	nController®, Compact, up to 14 stacks
NUVNC-3C-16S	nController®, Compact, up to 16 stacks
NUVNC-3R-01S	nController®, Rack Mount, single stack
NUVNC-3R-02S	nController®, Rack Mount, up to 2 stacks
NUVNC-3R-04S	nController®, Rack Mount, up to 4 stacks
NUVNC-3R-06S	nController®, Rack Mount, up to 6 stacks
NUVNC-3R-08S	nController®, Rack Mount, up to 8 stacks
NUVNC-3R-10S	nController®, Rack Mount, up to 10 stacks
NUVNC-3R-12S	nController®, Rack Mount, up to 12 stacks
NUVNC-3R-14S	nController®, Rack Mount, up to 14 stacks
NUVNC-3R-16S	nController®, Rack Mount, up to 16 stacks

Depending on the region the product is shipped to, either a NEMA 5-15P or CEE 7/7 12V power connector is included in the box.

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