



# Nuvation Energy G4 High-Voltage BMS

## Datasheet

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## 1. Product Overview

The Nuvation Energy G4 High-Voltage BMS provides cell-level and stack-level control for battery stacks up to 1250 VDC. The UL 1973 Recognized BMS modules in each stack ensure safe battery operation and significantly reduce the effort of certifying the energy storage solution to meet UL 1973 and UL 9540. For more information, please contact [support@nuvationenergy.com](mailto:support@nuvationenergy.com)



**Figure 1. G4 High-Voltage BMS**

A single Nuvation Energy G4 Stack Switchgear unit manages each stack and connects it to the DC bus of the energy storage system. The Nuvation Energy G4 Stack Switchgear, is a pre-configured assembly that incorporates the major functions of Nuvation Energy G4 High-Voltage BMS into a rack-mountable unit which includes stack monitoring, electrical disconnects, pre-charging, current sensing, fuses, and a safety relay for E-Stop. It also includes supporting components like power supplies, indicator LEDs, and external-facing connectors.

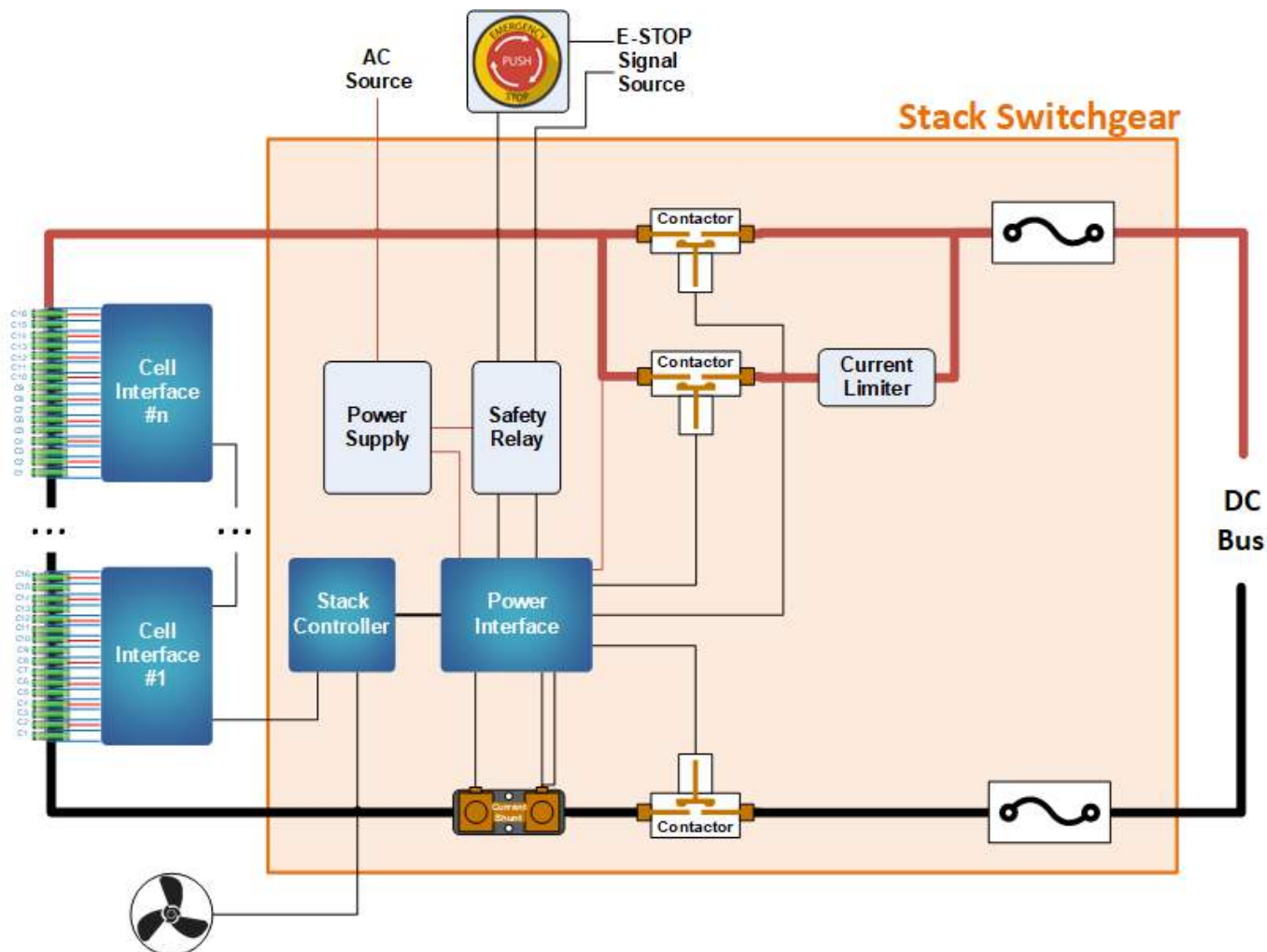
G4 Cell Interface modules in each stack connect directly to battery cells to measure cell voltages and temperatures and provide cell balancing.

The G4 Stack Switchgear and G4 Cell Interface modules operate together as a complete system called the G4 High-Voltage BMS. Available units/modules are listed below.

**Table 1. G4 Stack Switchgear and G4 Cell Interface Modules**

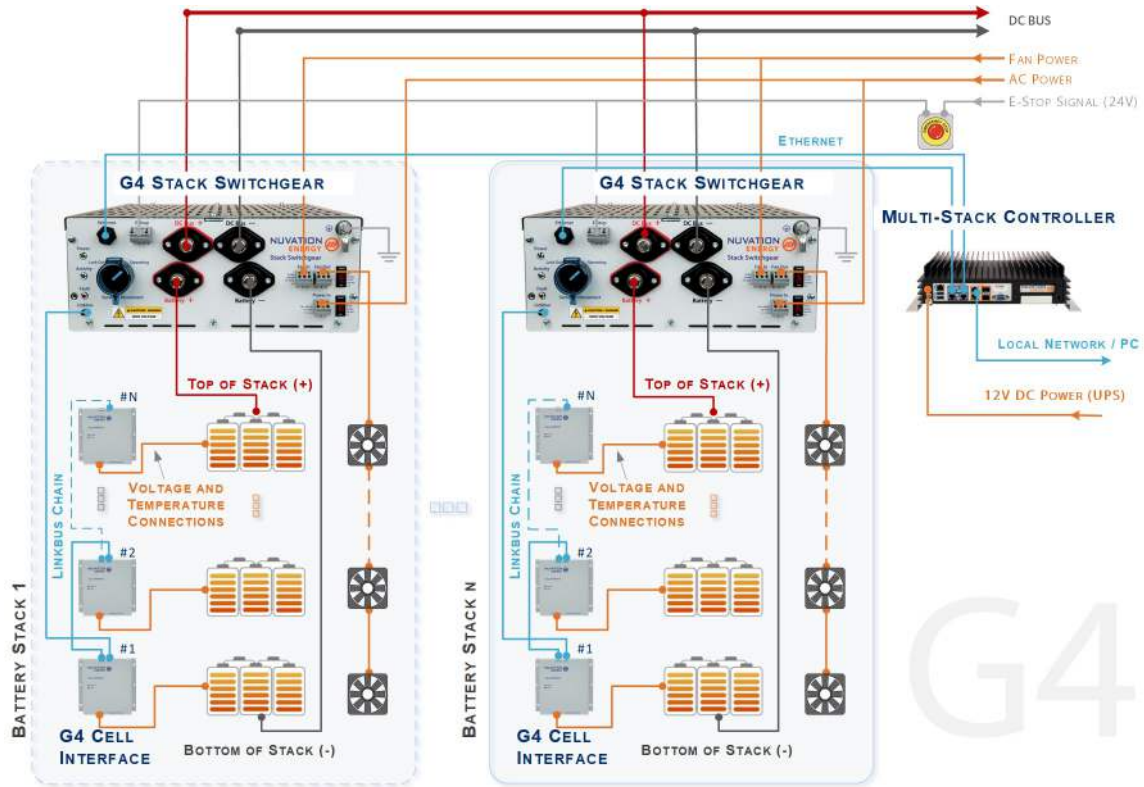
Model	Unit/Module Name
NUVSSG-1250	G4 Stack Switchgear, 1250 V
NUV100-CI-12-1	G4 Cell Interface - 12 channel
NUV100-CI-16-1	G4 Cell Interface - 16 channel
NUV100-CI-4M12-1	G4 Cell Interface - 12V 4 channel

Generally, a single battery stack uses one G4 Stack Switchgear and one or more G4 Cell Interface modules. A breakdown of a single battery stack is shown in [Figure 2, "G4 High-Voltage BMS single system diagram"](#)



**Figure 2. G4 High-Voltage BMS single system diagram**

In a multi-stack G4 High-Voltage BMS configuration, as shown in [Figure 3, "G4 High-Voltage BMS multi-stack diagram"](#), each G4 Stack Switchgear unit is responsible for monitoring the state and safety of one battery stack. All G4 Stack Switchgear units connected to a single common DC bus in the system may be managed by a single Nuvation Energy Multi-Stack Controller, where an Operator Interface provides a unified view and central control of the multi-stack system.



**Figure 3. G4 High-Voltage BMS multi-stack diagram**

## 1.1. G4 Stack Switchgear

The high-level system design of G4 Stack Switchgear is shown in [Figure 2, "G4 High-Voltage BMS single system diagram"](#). Within a battery stack, the G4 Stack Switchgear connects to the daisy-chained Nuvation Energy G4 Cell Interface modules. The G4 Cell Interface modules convert cell voltage and temperature measurements to digital values to be relayed to the G4 Stack Switchgear, and enable or disable cell balancing as required. Daisy-chaining the G4 Cell Interface modules facilitates the design of flexible and scalable Battery Energy Storage Systems.

The G4 Stack Switchgear has high-voltage, high-current connectors that are accessible on the front of the unit. These connect the battery stack to the rest of the system, which is typically a common DC bus. Safety precautions are required to handle and connect cables into this unit.



**Figure 4. Nuvation Energy G4 Stack Switchgear Unit**

The external interfaces to this unit are:

- Battery Stack and DC Bus connectors
- Service Disconnect Switch
- 10/100 Base-T Ethernet RJ45 jack (Modbus-TCP)
- Link Bus connector
- E-stop connector
- Fan control connectors with breaker switch
- Power In connector with breaker switch
- Status LEDs (Power, Activity, and Fault)
- Earth bonding connection (grounding stud)

The G4 Stack Switchgear (NUVSSG-1250) supports 1250 VDC. There are multiple options for current rating (from 100 A to 350 A) and fuse rating (from 200 A to 500 A). The G4 Stack Switchgear fuse rating is determined by the application power profile which is based on continuous power, cycle duration, and cycle frequency.

For ordering details, please refer to [G4 Stack Switchgear Ordering Information](#).

## 1.2. G4 Cell Interface

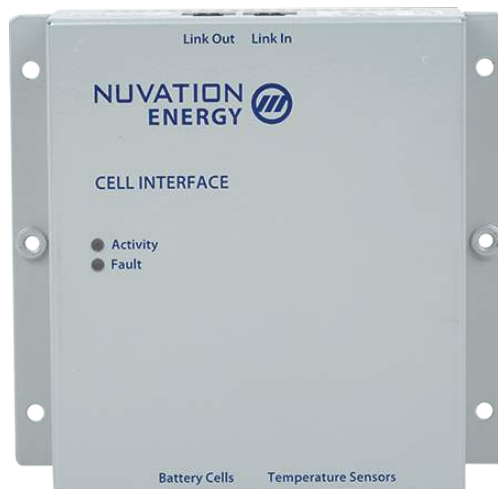
The Nuvation Energy G4 Cell Interface is the direct link between the individual battery stack cells and the rest of the Battery Management System. It facilitates battery monitoring and balancing functionalities.

In a stack managed by the G4 Stack Switchgear, one or more G4 Cell Interface modules are used to convert and relay cell voltage and temperature measurements digitally to the G4 Stack Switchgear. When using multiple G4 Cell Interface modules, the same G4 Cell Interface variant must be used—i.e. all NUV100-CI-12-1, or all NUV100-CI-16-1, or all NUV100-CI-4M12-1. The firmware does not support a mixed chain of different Cell Interface variants.

For systems that require UL 1973 compliance, the G4 Cell Interface supports up to 7 temperature sensors. For systems that do not require UL 1973 compliance, the G4 Cell Interface can support up to 8 temperature sensors.

The following are variants of the Nuvation Energy G4 Cell Interface:

- The NUV100-CI-12-1, G4 Cell Interface - 12 channel can monitor up to 12 series-connected cells
- The NUV100-CI-16-1, G4 Cell Interface - 16 channel can monitor up to 16 series-connected cells
- The NUV100-CI-4M12-1, G4 Cell Interface - 12V 4 channel can monitor up to 4 series-connected 12V lead-acid cells. Note that cell balancing is not supported in G4 Cell Interface - 12V 4 channel.



**Figure 5. Nuvation Energy G4 Cell Interface Module**

The external interfaces to this module are:

- Battery cells connector
- Temperature sensors connector
- 2 Link Bus connectors
- 2 Indicator LEDs



The G4 Cell Interface connects to the battery stack-referenced signals through high voltage rated connectors. Safety precautions are required to handle and connect cables into this module.



## 1.3. G4 BMS Software

The Nuvation Energy G4 BMS Software is composed of two parts: the Operator Interface and the G4 BMS Firmware.

### 1.3.1. Operator Interface



**Figure 6. Operator Interface Dashboard**

The Operator Interface is a browser-based graphical view of the system state, data, and configuration.

### Key Features

- **Provides Unified View of Entire Battery** - Access diagnostics and performance data of the battery stack
- **Statistics** - Provides stack-level voltage, temperature & current statistics for all cells
- **Real-Time** - Streams measurements and control signals for real-time display and recording
- **Faults and Warnings** - Aggregated for system-wide overview, plus detail drill-down for battery pack diagnostics
- **SOC and SOH** - Calculates State of Charge (SoC) and State of Health (SoH) for the battery stack
- **Communications Status** - Ensures that measurements, control signals, and other data are propagating properly throughout the entire system for safe operation
- **Flow-Through I/O** - Provides a single entry point to all measurement and control points in the BMS

### 1.3.2. G4 BMS Firmware

The G4 BMS Firmware is a highly configurable software that manages the stack operation and

controls. It enables the BMS to be used as a protection device against unsafe voltage, temperature, and current conditions in battery systems.

## Key Features

- **Configuration Registers** - Numerous configuration options, called 'registers', to tune the G4 High-Voltage BMS for the specific end-application.
- **Functional Safety** - Functional safety according to UL 1998 specification is accomplished through several key capabilities of the software.
  - **Protection Functions** - Provides protection functions for a battery against hazardous voltage, temperature, and current conditions.
  - **Sensor Fault Detection** - Detects sensor faults in cell voltage, temperature, stack voltage, and stack current.
  - **Shorted Shunt Detection**- Detects short circuit failures, and wiring defects.
  - **Contactors Life Tracking** - Monitors the life of the contactors during the operation of the G4 Stack Switchgear. Contactor life is degraded when the contactors are opened at elevated load currents.

## 2. Operating Limits

### 2.1. G4 Stack Switchgear



Exceeding the ratings will damage the system.

#### 2.1.1. External Specifications

Symbol	Parameter	Min	Typ	Max	Units
$V_{input}$	Input Voltage	100	-	240	V AC
$P_{input}$	Input Power	-	33.7	60	W
$f_{input}$	Input Frequency	45	50/60	65	Hz
$V_{fan\_DC}$	Cooling Fan DC Voltage	-	-	50	V DC
$V_{fan\_AC}$	Cooling Fan AC Voltage	-	-	250	V AC
$I_{fan}$	Cooling Fan Current	-	-	5	A DC/AC
$I_{E-Stop}$	E-Stop Input Current Rating	-	-	9.6	mA DC
$V_{E-Stop}$	E-Stop Input Voltage Rating	19.2	24	28.8	V DC

#### 2.1.2. Electrical Characteristics

The part number of the G4 Stack Switchgear captures its product rating. Refer to [G4 Stack Switchgear Ordering Information](#) for the relevant voltage, current and fuse ratings available for the G4 Stack Switchgear part numbers. The voltage rating is an absolute maximum rating, and the current rating is a continuous rating (also referred to as the 'nominal' rating).

##### 2.1.2.1. Voltage and Temperature Specifications

###### 2.1.2.1.1. NUVSSG-1250-x

Symbol	Parameter	Min	Typ	Max	Units
<b>Stack Voltage Specifications</b>					
$V_{stack\_ov}$	Stack Over-Voltage Threshold (triggers contactors to open)	0	Configurable	1250	V DC
$V_{stack\_uv}$	Stack Under-Voltage Threshold (triggers contactors to open)	0	Configurable	-	V DC
<b>Battery Cell Specifications</b>					
$C_{ov}$	Cell Over-Voltage Threshold (triggers contactors to open)	-	Configurable	-	V
$C_{uv}$	Cell Under-Voltage Threshold (triggers contactors to open)	-	Configurable	-	V
<b>Temperature Sensors Specifications</b>					

Symbol	Parameter	Min	Typ	Max	Units
T <sub>ut</sub>	Under-Temperature Threshold (triggers contactors to open)	-	Configurable	-	°C
T <sub>ot</sub>	Over-Temperature Threshold (triggers contactors to open)	-	Configurable	-	°C
T <sub>fan_en</sub>	Fan Enable Temperature Threshold	-	Configurable	-	°C
Overvoltage Category Specifications					
CAT <sub>II</sub>	Phase to Ground Rated System Voltage (RMS or DC)	-	-	300	V
CAT <sub>III</sub>	Phase to Ground Rated System Voltage (RMS or DC)	-	-	150	V

## 2.1.2.2. Continuous and Maximum Current Ratings

Symbol	Parameter	Continuous	Absolute Max	Units
G4 Stack Switchgear Configuration: 1250 V DC, 100 A				
I <sub>discharge_oc</sub>	Stack Discharging Over-Current (triggers contactors to open)	100	150	A DC
I <sub>charge_oc</sub>	Stack Charging Over-Current (triggers contactors to open)	100	150	A DC
G4 Stack Switchgear Configuration: 1250 V DC, 200 A				
I <sub>discharge_oc</sub>	Stack Discharging Over-Current (triggers contactors to open)	200	250	A DC
I <sub>charge_oc</sub>	Stack Charging Over-Current (triggers contactors to open)	200	250	A DC
G4 Stack Switchgear Configuration: 1250 V DC, 300 A				
I <sub>discharge_oc</sub>	Stack Discharging Over-Current (triggers contactors to open)	300	350	A DC
I <sub>charge_oc</sub>	Stack Charging Over-Current (triggers contactors to open)	300	350	A DC
G4 Stack Switchgear Configuration: 1250 V DC, 350 A				
I <sub>discharge_oc</sub>	Stack Discharging Over-Current (triggers contactors to open)	350	400	A DC
I <sub>charge_oc</sub>	Stack Charging Over-Current (triggers contactors to open)	350	400	A DC



The G4 Stack Switchgear can handle short current overages above the continuous rating. Any charge or discharge current above the continuous rating must not exceed 5 minutes per hour and must not exceed the specified absolute max rating. Sufficient time to allow the system to cool down afterward is required.

## 2.1.2.3. Contactor Life Ratings

**Table 2. Contactor Life Ratings : NUVSSG-1250-100-x**

Symbol	Parameter	Min	Max	Absolute Max	Units
I <sub>min_breaking</sub>	Minimum breaking current of contactors	100	-	-	A DC
N <sub>min</sub>	Number of contactor opening cycles below the minimum breaking current	6000	-	-	cycles
I <sub>max_breaking</sub>	Maximum breaking current of contactors	-	150	-	A DC
N <sub>life</sub>	Number of contactor opening cycles between the minimum and maximum breaking currents	-	100	-	cycles

Symbol	Parameter	Min	Max	Absolute Max	Units
$N_{max}$	Number of contactor opening cycles above the maximum breaking current	-	1	-	cycle
$I_{max}$	One time contactor maximum breaking current	-	-	1260	A DC

**Table 3. Contactor Life Ratings : NUVSSG-1250-200-x**

Symbol	Parameter	Min	Max	Absolute Max	Units
$I_{min\_breaking}$	Minimum breaking current of contactors	100	-	-	A DC
$N_{min}$	Number of contactor opening cycles below the minimum breaking current	6000	-	-	cycles
$I_{max\_breaking}$	Maximum breaking current of contactors	-	250	-	A DC
$N_{life}$	Number of contactor opening cycles between the minimum and maximum breaking currents	-	100	-	cycles
$N_{max}$	Number of contactor opening cycles above the maximum breaking current	-	1	-	cycle
$I_{max}$	One time contactor maximum breaking current	-	-	1260	A DC

**Table 4. Contactor Life Ratings : NUVSSG-1250-300-x**

Symbol	Parameter	Min	Max	Absolute Max	Units
$I_{min\_breaking}$	Minimum breaking current of contactors	100	-	-	A DC
$N_{min}$	Number of contactor opening cycles below the minimum breaking current	6000	-	-	cycles
$I_{max\_breaking}$	Maximum breaking current of contactors	-	350	-	A DC
$N_{life}$	Number of contactor opening cycles between the minimum and maximum breaking currents	-	100	-	cycles
$N_{max}$	Number of contactor opening cycles above the maximum breaking current	-	1	-	cycle
$I_{max}$	One time contactor maximum breaking current	-	-	1260	A DC

**Table 5. Contactor Life Ratings : NUVSSG-1250-350-x**

Symbol	Parameter	Min	Max	Absolute Max	Units
$I_{min\_breaking}$	Minimum breaking current of contactors	100	-	-	A DC
$N_{min}$	Number of contactor opening cycles below the minimum breaking current	6000	-	-	cycles
$I_{max\_breaking}$	Maximum breaking current of contactors	-	400	-	A DC
$N_{life}$	Number of contactor opening cycles between the minimum and maximum breaking currents	-	100	-	cycles
$N_{max}$	Number of contactor opening cycles above the maximum breaking current	-	1	-	cycle
$I_{max}$	One time contactor maximum breaking current	-	-	1260	A DC



To extend the lifetime of the G4 Stack Switchgear, a disconnect delay can be configured to allow time for the PCS controller to reduce the current flowing through

the battery stack before the G4 Stack Switchgear will open contactors, which will avoid exposing the contactors to high breaking currents.



Contactors will open immediately for the following conditions which will bypass the disconnection delay:

1. Powering the G4 Stack Switchgear

## 2.1.3. Environmental Conditions

Symbol	Parameter	Min	Typ	Max	Units
<b>Thermal Specifications</b>					
T <sub>a</sub>	Operating Temperature: G4 Stack Switchgear Accessible*	10	25	40	°C
	Operating Temperature: G4 Stack Switchgear Inaccessible*	-10	25	50	°C
	Storage Temperature	-10	25	50	°C
<b>Humidity Specifications</b>					
RH	Operating Relative Humidity	5	-	85	%
	Storage Relative Humidity	5	-	85	%
<b>Shock and Vibration Specifications</b>					
Vertical	Vertical shock/vibration	-	-	10	m/s <sup>2</sup>
Longitudinal	Longitudinal shock/vibration	-	-	10	m/s <sup>2</sup>
Transverse	Transverse shock/vibration	-	-	10	m/s <sup>2</sup>
Pulse vibration	On each axis	-	-	245	m/s <sup>2</sup>
<b>Altitude Specifications</b>					
A <sub>a</sub>	Operating Altitude	-	-	2000	m

\*To use the Nuvation Energy G4 Stack Switchgear in the temperature range of -10 to 50 °C, the G4 Stack Switchgear must not be accessible in the end product installation. In an installation where the G4 Stack Switchgear is accessible, the operating temperature is reduced to 10 to 40 °C.

For transportation, it is recommended that the G4 Stack Switchgear be shipped in its original packaging via pallet whenever possible.

## 2.1.4. Standards and Certifications

Certification/Report	
Stationary Battery Safety	UL Recognized (internal Power Interface and Stack Controller modules) - UL 1973 (file no. MH64071)

**Certification/Report**

Functional Safety (components)	UL Recognized (internal Power Interface and Stack Controller modules) - UL Recognized - UL 991 (file no. MH64071) - UL Recognized - UL 1998 (file no. MH64071)
Electrical Safety (components)	Internal Power Interface and Stack Controller modules - IEC 62368-1:2014 (Second Edition) - IEC 62368-3:2017
Shock and Vibration	Designed to meet the requirements of SAE J2464 and SAE J2380

UL 1973 recognition ensures safe battery operation and significantly reduces the effort of certifying the energy storage solution to meet UL 1973 and UL 9540.

## 2.2. G4 Cell Interface



Exceeding the maximum ratings will damage the G4 Cell Interface module.

### 2.2.1. Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Link In Specifications</b>						
+V <sub>BUS</sub>	Input Voltage	-	9	24	60	V DC
	Input Current, CI-12	+VBUS = 24 V DC, Link Out disconnected	-	-	25.5	mA DC
	Input Current, CI-16 and CI-4M12	+VBUS = 24 V DC, Link Out disconnected	-	-	31.7	mA DC
I <sub>P_LINK</sub>	Output Current	-	-	-	20	mA DC
I <sub>N_LINK</sub>	Output Current	-	-	-	20	mA DC
<b>Link Out Specifications</b>						
+V <sub>BUS</sub>	Output Voltage	-	-	+VBUS	-	V DC
	Output Current per CI-12	+VBUS = 24 V DC	-	-	25.5	mA DC
	Output Current per CI-16 and CI-4M12	+VBUS = 24 V DC	-	-	31.7	mA DC
I <sub>P_LINK</sub>	Output Current	-	-	-	20	mA DC
I <sub>N_LINK</sub>	Output Current	-	-	-	20	mA DC
<b>Battery Cells Specifications</b>						
C <sub>(n)</sub> - C <sub>(n-1)</sub>	Input Cell Voltage Range	CI-12, CI-16	0	-	5	V DC
B <sub>(n)</sub> - B <sub>(n-1)</sub>	Input Block Voltage Range	CI-4M12	5	-	20	V DC
V <sub>sum</sub>	Voltage between C0 and C12	CI-12, +VBUS = 0 V DC	11	-	60	V DC
	Voltage between C0 and C8	CI-16, +VBUS = 0 V DC	11	-	40	V DC
	Voltage between C8 and C16	CI-16, +VBUS = 0 V DC	11	-	40	V DC
	Voltage between B0 and B2	CI-4M12, +VBUS = 0 V DC	11	-	40	V DC
	Voltage between B2 and B4	CI-4M12, +VBUS = 0 V DC	11	-	40	V DC
TME	Total Measurement Error	CI-12, CI-16, +VBUS = 24 V DC	±0.1	±1.2	±1.6	mV DC
	Total Measurement Error	CI-4M12, +VBUS = 24 V DC	±2.0	±8.0	±10.0	mV DC
I <sub>(n)</sub>	Cell Balancing Current (only for CI-12 and CI-16)	C <sub>(n)</sub> - C <sub>(n-1)</sub> = 4 V DC	304	307	310	mA DC
V <sub>bal</sub>	Cell Voltage for Balancing	CI-12 and CI-16	1.1	-	-	V DC



Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{ins}$	Internal reinforced insulation rating from Chassis/COM	-	-	-	1250	V DC
CAT <sub>II</sub>	Overvoltage category	Phase to Ground Rated System Voltage (RMS or DC)	-	-	300	V
CAT <sub>III</sub>	Overvoltage category	Phase to Ground Rated System Voltage (RMS or DC)	-	-	150	V
Temperature Sensors Specifications						
$I_{(n)}$	Output Current to Temperature Sensor	-	-	-	300	$\mu$ A
$R_{t(n)}$	Temperature Sensor Resistance at 25 °C	-	-	10	-	k $\Omega$
$T_{(n)}$	Input Temperature Sensor Voltage Range	Cell 0 or Block 0 = 0 V	0	-	3	V
$V_{ins}$	Internal reinforced insulation rating from Chassis/COM	-	-	-	1250	V DC
CAT <sub>II</sub>	Overvoltage category	Phase to Ground Rated System Voltage (RMS or DC)	-	-	300	V
CAT <sub>III</sub>	Overvoltage category	Phase to Ground Rated System Voltage (RMS or DC)	-	-	150	V

## 2.2.2. Environmental Conditions

Symbol	Parameter	Min	Typ	Max	Units
Thermal Specifications					
$T_a$	Operating Temperature	-10	25	60	°C
	Storage Temperature	-20	25	60	°C
Humidity Specifications					
RH	Operational RH	5	-	85	%
	Storage RH	5	-	85	%
Shock and Vibration Specifications					
Vertical	Vertical shock/vibration	-	-	10	m/s <sup>2</sup>
Longitudinal	Longitudinal shock/vibration	-	-	10	m/s <sup>2</sup>
Transverse	Transverse shock/vibration	-	-	10	m/s <sup>2</sup>
Pulse vibration	On each axis	-	-	245	m/s <sup>2</sup>
Altitude Specifications					
$A_a$	Operating Altitude	-	-	2000	m

### 2.2.3. Standards and Certifications

The G4 Cell Interface meets industry standards CISPR 22 Class A and IEC/EN 61000-4-2 for EMC/EMI and ESD respectively. It has been designed to meet EN 60950 high voltage creepage/clearance distances for reinforced insulation rated to 1250 V DC. All components are EU RoHS / China RoHS compliant.

Certification/Report	
Stationary Battery Safety	UL Recognized - UL 1973 (file no. MH64071)
Functional Safety	- UL Recognized - UL 991 (file no. MH64071) - UL Recognized - UL 1998 (file no. MH64071)
Electrical Safety	IEC 62368-1:2014 (Second Edition), IEC 62368-3:2017
Industrial Immunity	EN/IEC 61000-6-2 2019
Shock and Vibration	Designed to meet the requirements of SAE J2464 and SAE J2380

UL 1973 recognition ensures safe battery operation and significantly reduces the effort of certifying the energy storage solution to meet UL 1973 and UL 9540.

### 2.2.4. Maximum Stack Deployment

G4 Cell Interface modules are deployed as a daisy chain to monitor the cells of a stack. The maximum number of modules that are supported in a stack are listed in [Table 6, "Maximum G4 Cell Interface Chain Length"](#).

**Table 6. Maximum G4 Cell Interface Chain Length**

G4 Cell Interface Type	Maximum Chain Length
CI-12	40
CI-16	30
CI-4M12	30

#### 2.2.4.1. Cell Voltage Scan Rate

The following are approximate cell voltage scan rates for different lengths of G4 Cell Interface daisy chains where all cells are installed. On the G4 Stack Switchgear, the Measurement Anti-Aliasing Filter is set to OFF.

**Table 7. Cell Voltage Scan Rates for CI-16 and CI-4M12**

Measurement Anti-Aliasing Filter	G4 Cell Interface Chain Length	Scan Rate [Hz]
Off	1	5.53
Off	5	3.32
Off	10	2.22
Off	15	1.74
Off	20	1.38
Off	25	1.15

Measurement Anti-Aliasing Filter	G4 Cell Interface Chain Length	Scan Rate [Hz]
Off	30	0.91

**Table 8. Cell Voltage Scan Rates for CI-12**

Measurement Anti-Aliasing Filter	G4 Cell Interface Chain Length	Scan Rate [Hz]
Off	1	6.01
Off	5	3.94
Off	10	3.03
Off	15	2.59
Off	20	1.97
Off	25	1.63
Off	30	1.44
Off	35	1.30
Off	40	1.08

## 3. Mechanical Overview

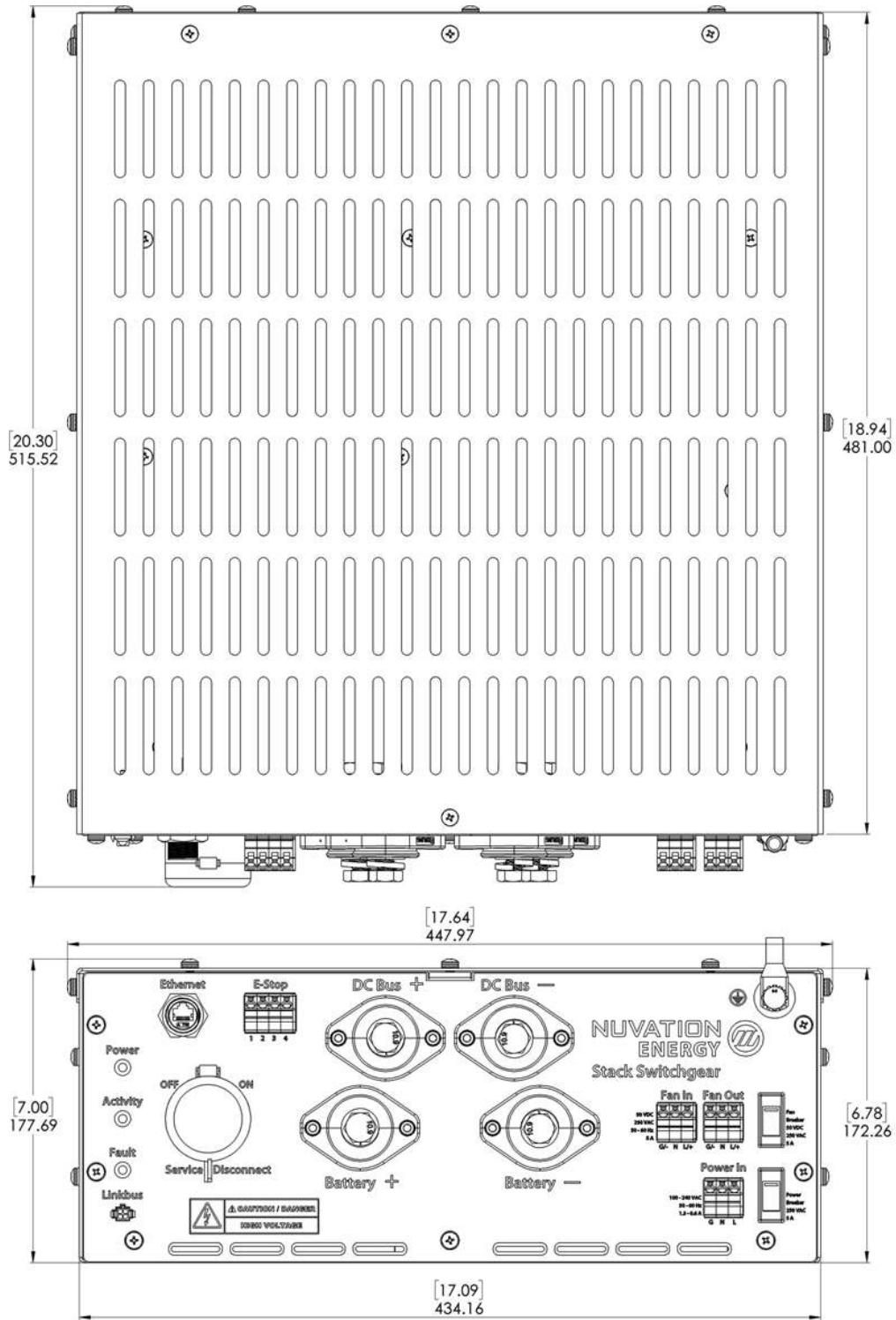
### 3.1. G4 Stack Switchgear

The G4 Stack Switchgear is primarily designed to fit in a standard 19" rack with a 23"-deep cabinet. However, other mounting possibilities are supported, as the following subsections discuss. Depending on the desired application, brackets can be ordered with part numbers listed in [G4 Stack Switchgear Ordering Information](#).

The G4 Stack Switchgear must be installed in a horizontal orientation with the vent-slots pointing up to the sky. The G4 Stack Switchgear is not designed to be installed in any other orientation.

The G4 Stack Switchgear is 4U (rack-units) tall. To maintain safe operating temperatures, it is recommended to leave 1U of space above the unit for airflow. Depending on the environment, active airflow, and ambient temperature, some installations may require additional space.

The unit weighs 23 kg [50.7 lbs].



ALL DIMENSIONS IN MM [IN]

**Figure 7. Dimensions, overall**



Please refer to <https://www.nuvationenergy.com/technical-resources> for access to CAD files.

### 3.1.1. Front-securing Rack-Mount, 19"



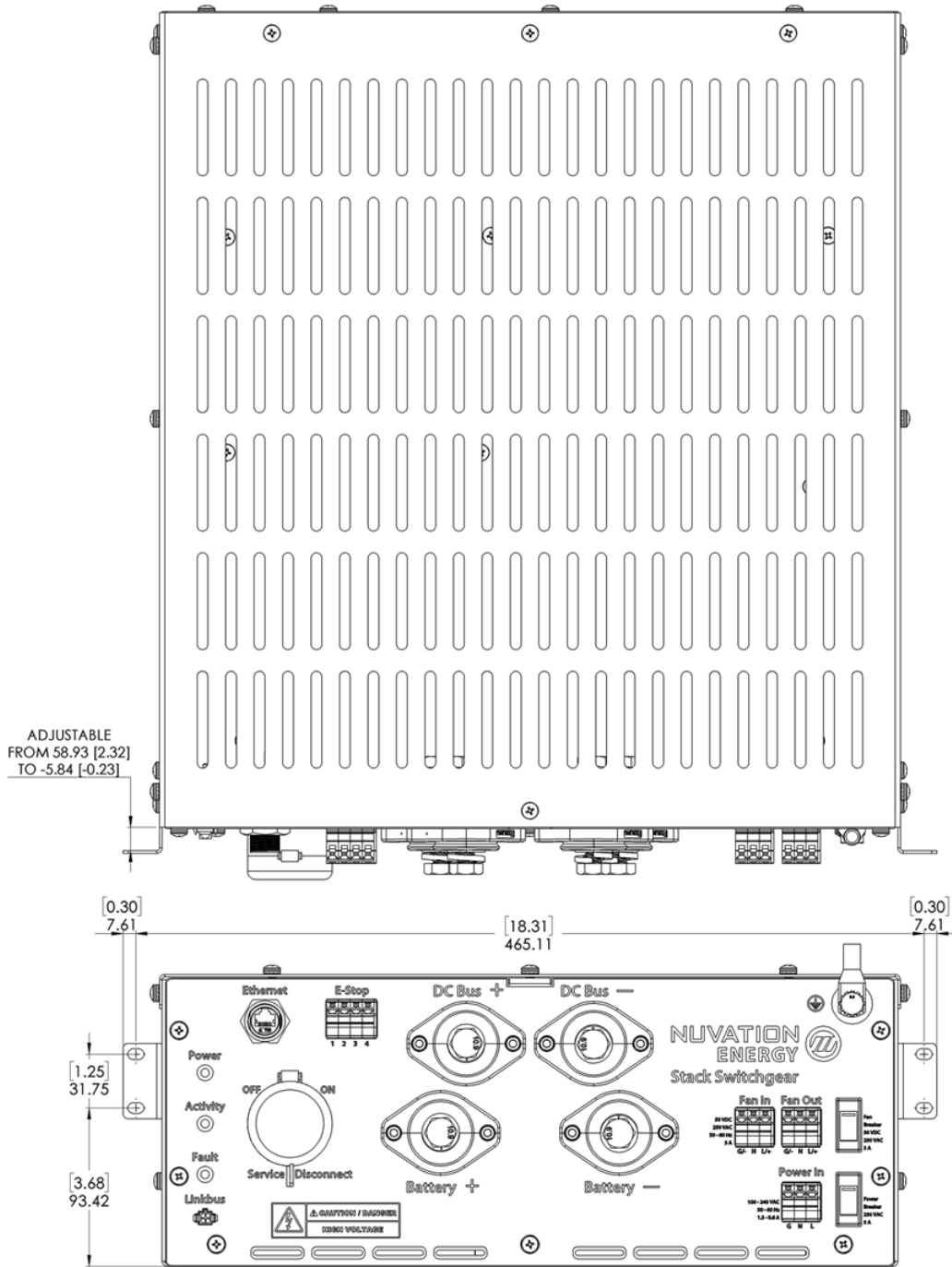
**Figure 8. Rack-mount, 19", front-securing**

This is the most common use-case for mounting the G4 Stack Switchgear. The mounting brackets allow for adjusting how far the unit protrudes or recedes from the front of the rack. These brackets are designed to secure the front of the unit with respect to the front of the rack.



Third-party side-support angle brackets are necessary to uphold the weight of the unit, in this mounting application.

Some examples include RASA22BK3 or RAAB2436BK products by Hammond Manufacturing (<https://www.hamfg.com/>).



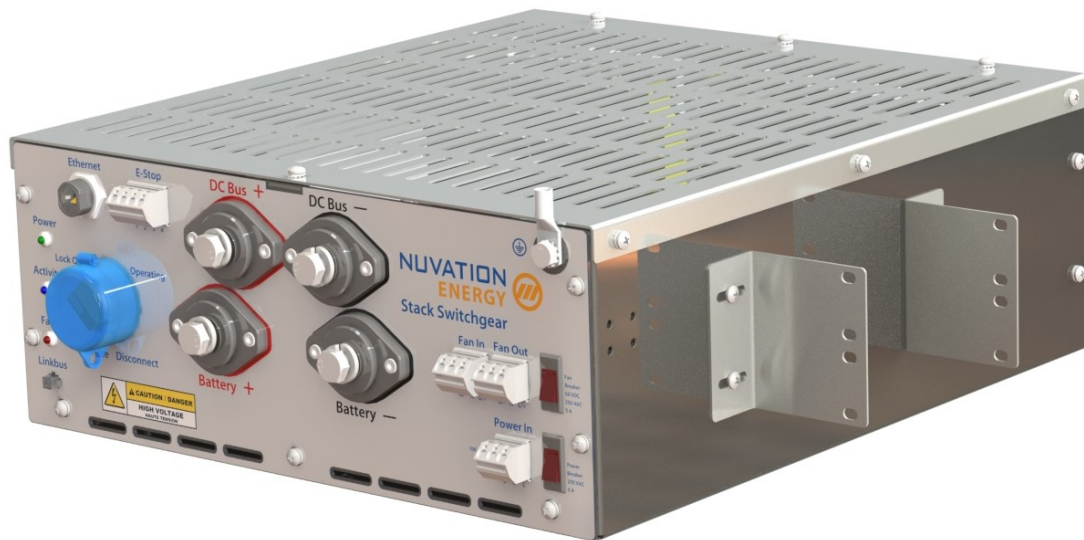
ALL DIMENSIONS IN MM [IN]

**Figure 9. Dimensions, rack-mount, 19", front-securing**

## 3.1.2. 2-Post Rack-Mount, 19" And 23"



**Figure 10. Rack-mount, 2-post, 19"**

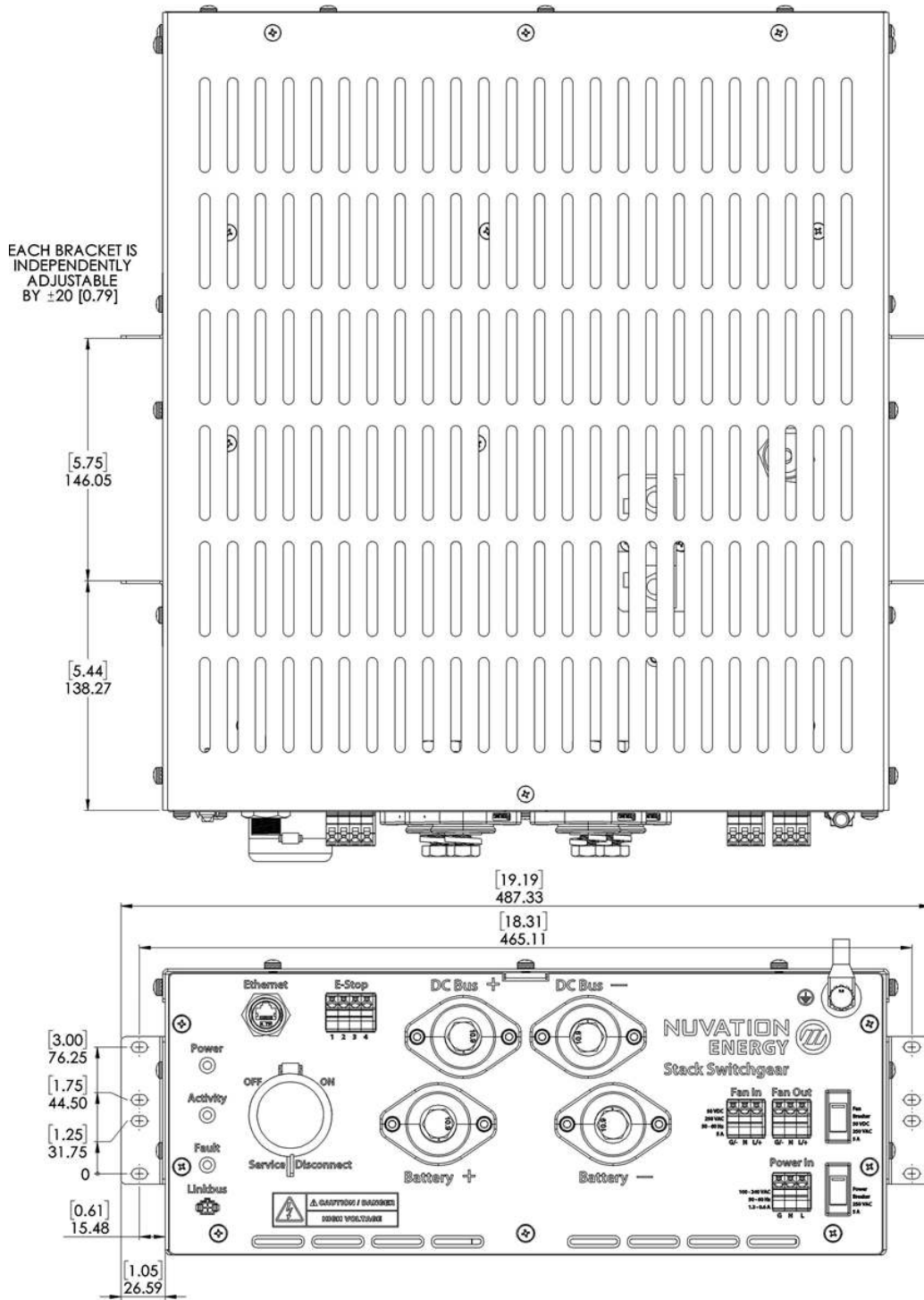


**Figure 11. Rack-mount, 2-post, 23"**

Brackets are available for 2-post open-frame racks.

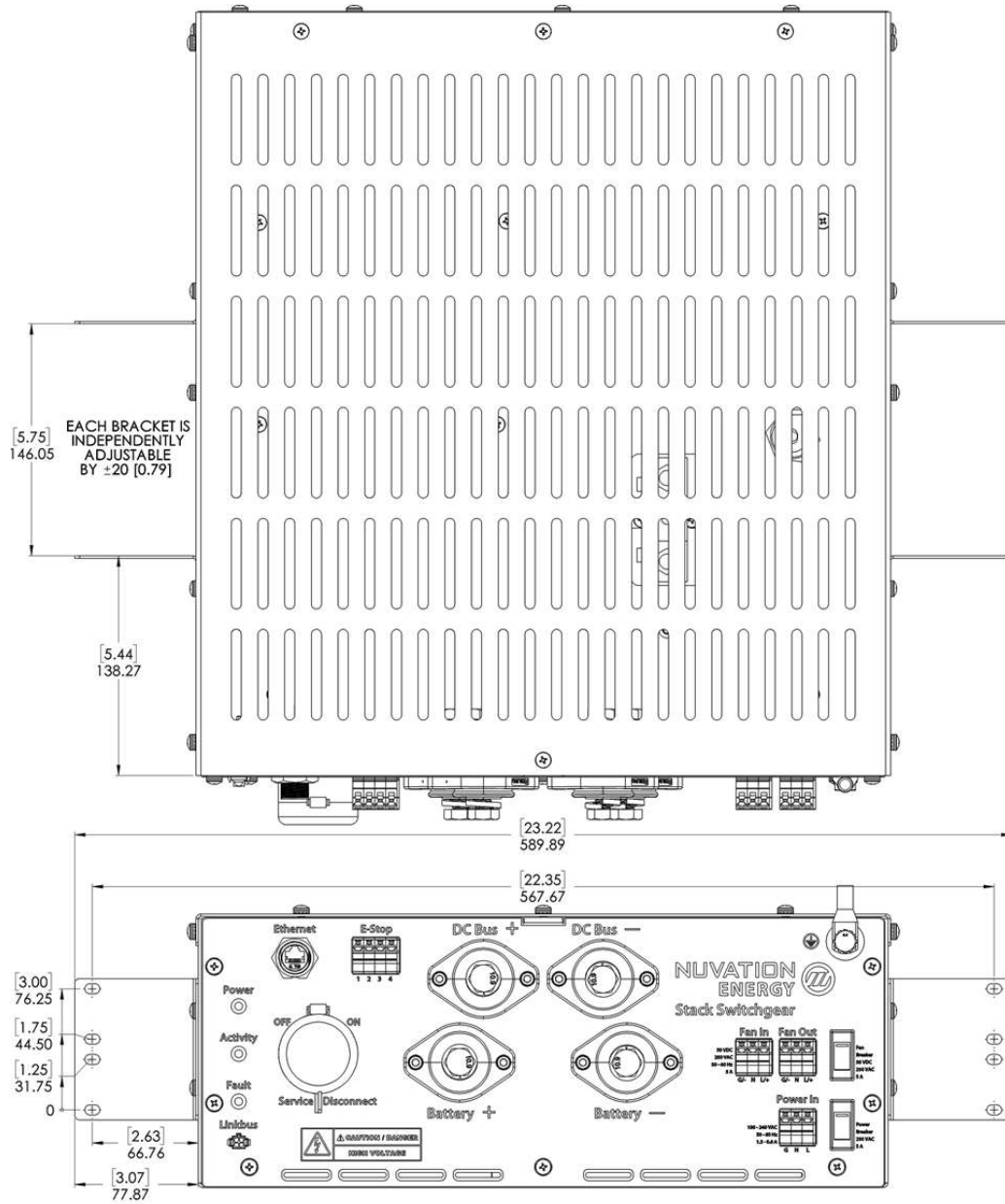
Note that third-party side-support 2-post-extension brackets are available, *though not necessary*. One example is the RDAB2U26 product by Hammond Manufacturing (<https://www.hammmfg.com/>).





ALL DIMENSIONS IN MM [IN]

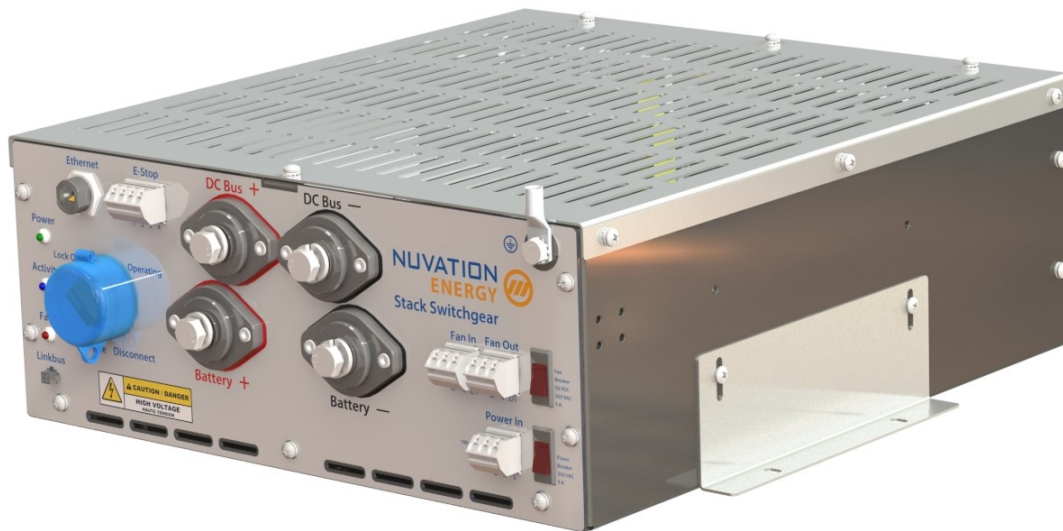
**Figure 12. Dimensions, 2-post rack-mount, 19"**



ALL DIMENSIONS IN MM [IN]

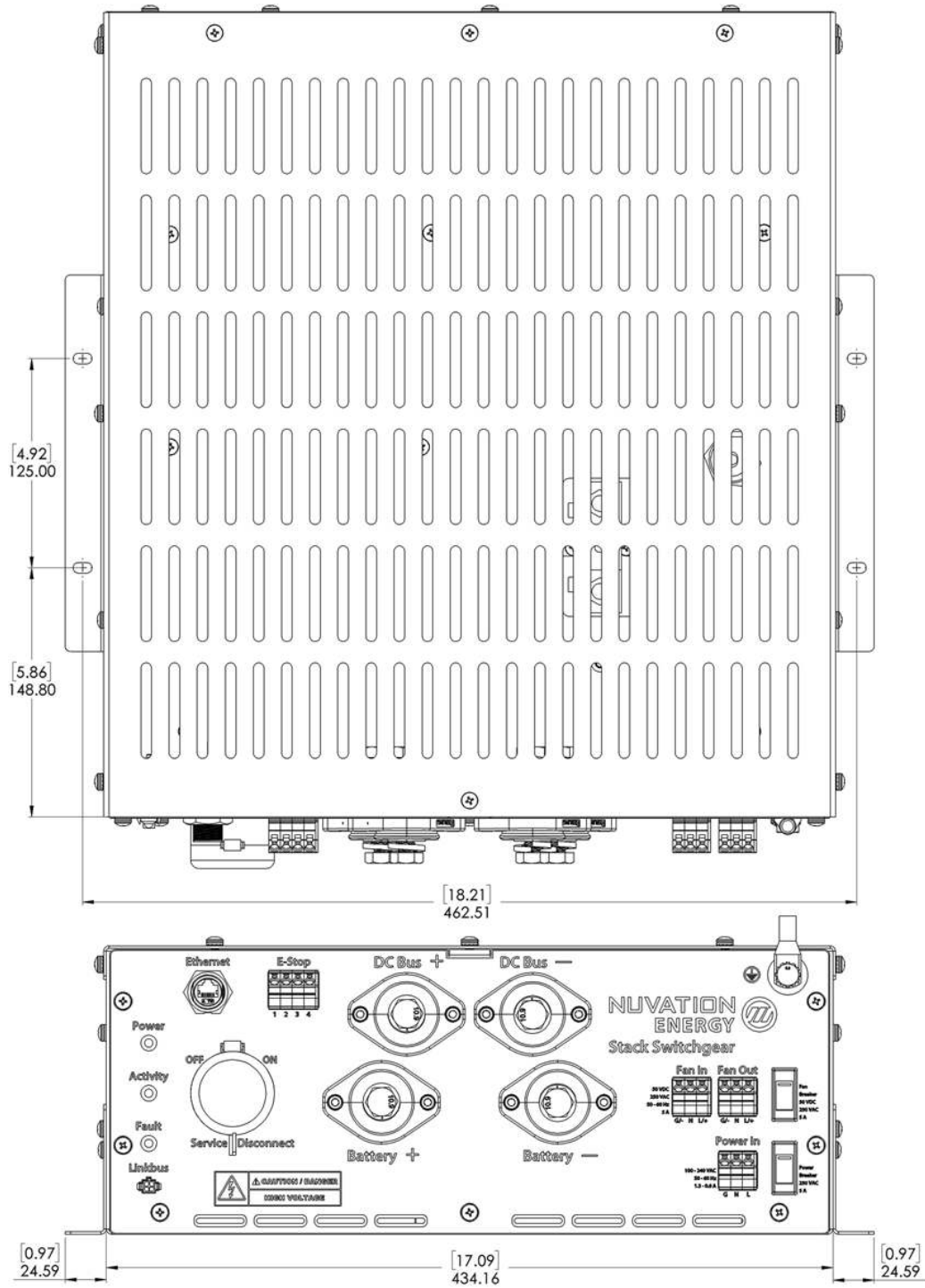
**Figure 13. Dimensions, 2-post rack-mount, 23"**

## 3.1.3. Shelf-Mount



**Figure 14. Shelf-mount**

A G4 Stack Switchgear may also be mounted to the surface on which it rests, with the aid of shelf-mount brackets, as shown above.



ALL DIMENSIONS IN MM [IN]

**Figure 15. Dimensions, shelf-mount**

### 3.2. G4 Cell Interface

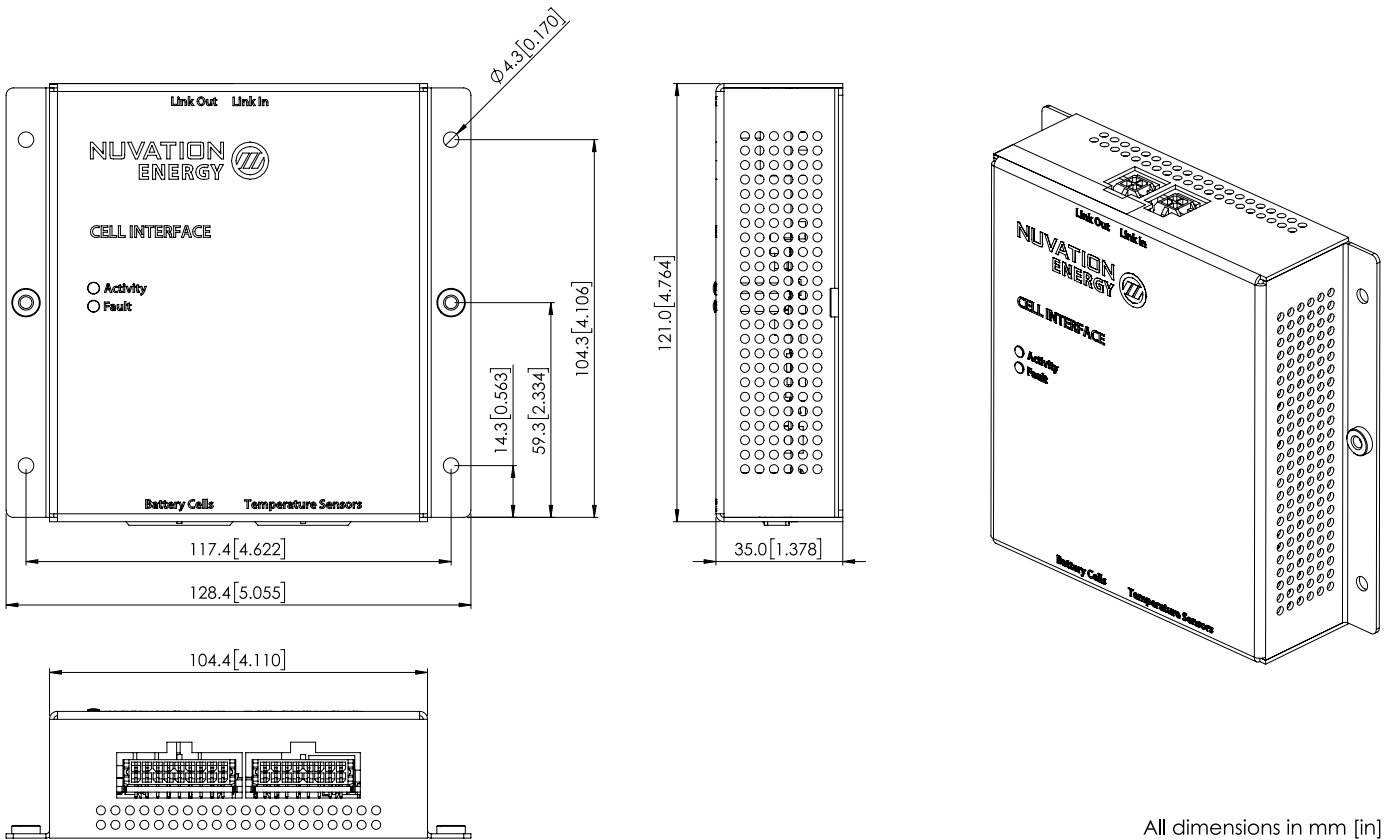
The overall dimensions of the G4 Cell Interface are 104.4 mm × 121.58 mm × 40.6 mm. The standard G4 Cell Interface (i.e. with bulkhead) weighs approximately 450 g.

The G4 Cell Interface is available in a bulkhead-mountable enclosure as shown in [Figure 16, "Mechanical Drawing of G4 Cell Interface with Bulkhead Enclosure"](#). The enclosure has five metal walls, leaving the back of the unit fully exposed.

It must be mounted to a metal bulkhead panel such that the panel covers the exposed back.

The NUV100-CI-12-1 and NUV100-CI-16-1 variants produce up to 24 W and 32 W, respectively, during cell balancing. A portion of this heat is transferred to the bulkhead.

Extra space should be provided around the module to allow for sufficient heat dissipation, and cable installation.



All dimensions in mm [in]

**Figure 16. Mechanical Drawing of G4 Cell Interface with Bulkhead Enclosure**

#### 3.2.1. Optional DIN rail mounting Kit

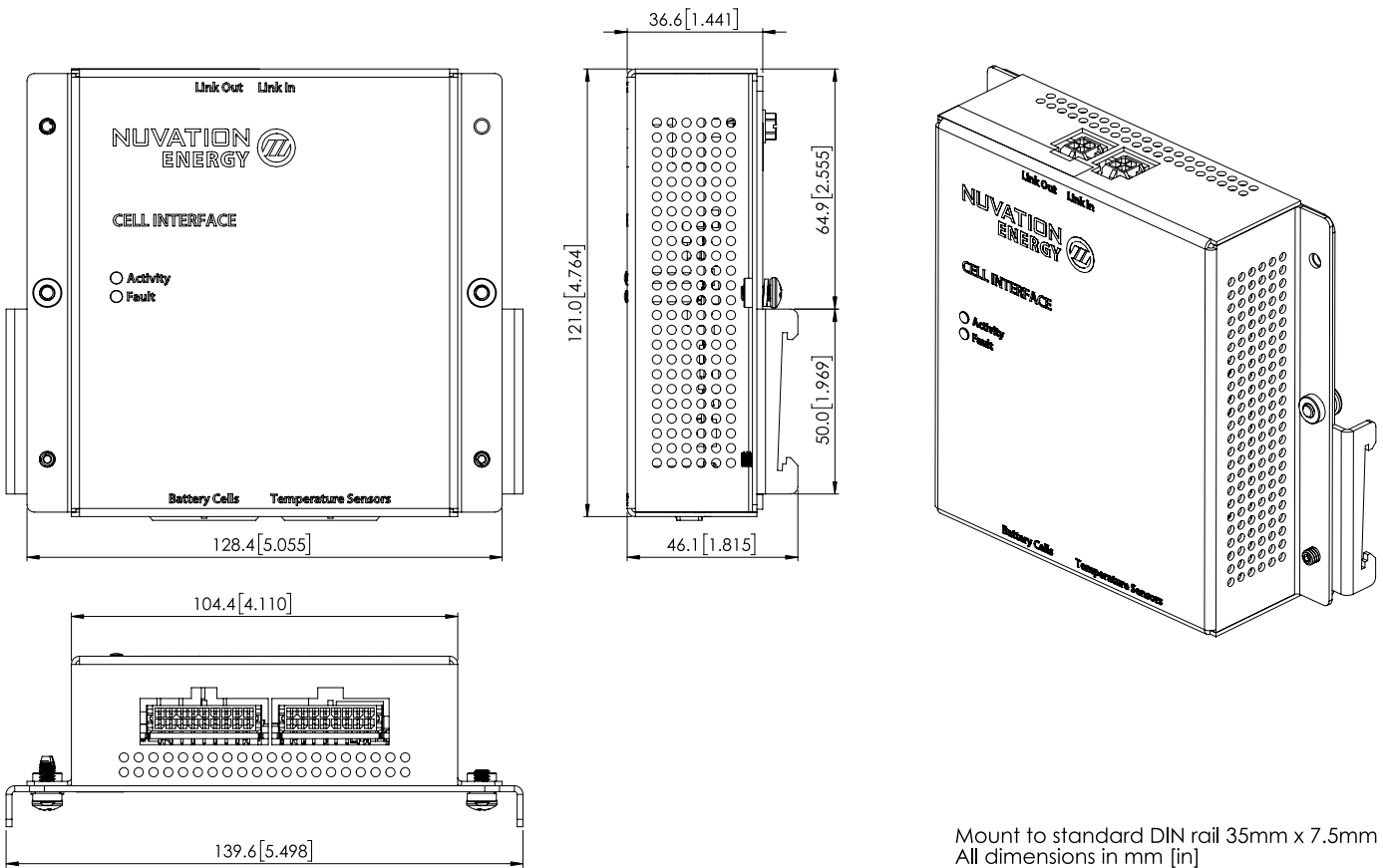
For applications requiring DIN rail mounting, the G4 Cell Interface may be ordered with the G4 Cell Interface Mounting Bracket (Bulkhead-to-DIN) kit. This kit is sold separately, and includes a metal plate and the necessary hardware to securely mount the standard G4 Cell Interface (i.e. with bulkhead enclosure) to EN50022-compliant DIN rails, as shown in [Figure 17, "Mechanical Drawing of](#)

[G4 Cell Interface with G4 Cell Interface Mounting Bracket \(Bulkhead-to-DIN\)™](#).

The Mounting Bracket kit assembly adds an extra 14.2 mm to the overall width of the G4 Cell Interface module, bringing it from 104.4 mm to 118.6 mm. The kit assembly holds the module approximately 7 mm away from the inside lip of the DIN rail.

The Mounting Bracket offsets the G4 Cell Interface module from the center of the DIN rail approximately 30 mm upwards as shown in [Figure 17, “Mechanical Drawing of G4 Cell Interface with G4 Cell Interface Mounting Bracket \(Bulkhead-to-DIN\)”](#).

A G4 Cell Interface with the Mounting Bracket weighs approximately 540 g.



**Figure 17. Mechanical Drawing of G4 Cell Interface with G4 Cell Interface Mounting Bracket (Bulkhead-to-DIN)**

## 4. Ordering Information

### 4.1. G4 Stack Switchgear

This section provides orderable part numbers for Nuvation Energy’s offerings of G4 Stack Switchgear units and mounting accessories.

These options are suffixed to the product part number in the format: NUVSSG-1250-<current-rating>-<fuse-rating-code>.

**Table 9. G4 Stack Switchgear Unit Ordering Information**

Part Number	Product Name	Compatible Fuse Rating
NUVSSG-1250-100-x	G4 Stack Switchgear, 1250 V, 100 A	200 A
NUVSSG-1250-200-x	G4 Stack Switchgear, 1250 V, 200 A	250 A, 315 A, 350 A
NUVSSG-1250-300-x	G4 Stack Switchgear, 1250 V, 300 A	350 A, 400 A, 450 A, 500 A
NUVSSG-1250-350-x	G4 Stack Switchgear, 1250 V, 350 A	400 A, 450 A, 500 A

\* x = fuse rating code.

#### Fuse Rating Code

The fuse rating code is denoted by the x at the end of the product part number. The G4 Stack Switchgear fuse rating is determined by the application power profile, which is based on continuous power, cycle duration, and cycle frequency.

A Nuvation Energy Application Engineer will assist with determining a suitable fuse rating when an order is placed.

**Table 10. Fuse rating and code**

Fuse Rating	Code
200 A	1
250 A	2
315 A	3
350 A	4
400 A	5
450 A	6
500 A	7

For e.g., a NUVSSG-1250-100-1 is a "1250 V DC, 100 A" G4 Stack Switchgear, with a 200 A fuse rating.

#### 4.1.1. Mounting Bracket

By default, the G4 Stack Switchgear ships with bracket NUVP-SSG-SB for shelf-mounting. The following mounting bracket options are available upon request.

**Table 11. Mounting Bracket Ordering Information**

Part Number	Product Name
NUVP-SSG-SB	Part, Stack Switchgear, Brackets for shelf-mounting
NUVP-SSG-RB-19	Part, Stack Switchgear, Front-securing Brackets for 19" Rack
NUVP-SSG-RB-19-2P	Part, Stack Switchgear, Brackets for 2-post 19" Rack
NUVP-SSG-RB-23-2P	Part, Stack Switchgear, Brackets for 2-post 23" Rack

Fasteners for attaching the brackets to the unit are included.



Bracket CAD files are available online at <https://www.nuvationenergy.com/technical-resources>.

## 4.2. G4 Cell Interface

Product part numbers for ordering a G4 Cell Interface are listed in [Table 12, "G4 Cell Interface Ordering Information"](#). Accessory kits are listed in [Table 13, "G4 Cell Interface Accessory Kits Ordering Information"](#).



G4 Cell Interface kits—which include the G4 Cell Interface module and cables—are available to get you started quickly. Please visit <https://nstore.nuvationenergy.com> for more details.

**Table 12. G4 Cell Interface Ordering Information**

Part Number	Product Name
NUV100-CI-12-1	G4 Cell Interface - 12 channel, Bulkhead
NUV100-CI-12-U	G4 Cell Interface - 12 channel, PCB assembly only (no enclosure)
NUV100-CI-12-KIT	G4 Cell Interface Kit - 12 channel
NUV100-CI-16-1	G4 Cell Interface - 16 channel, Bulkhead
NUV100-CI-16-U	G4 Cell Interface - 16 channel, PCB assembly only (no enclosure)
NUV100-CI-16-KIT	G4 Cell Interface Kit - 16 channel
NUV100-CI-4M12-1	G4 Cell Interface - 12V 4 channel, Bulkhead
NUV100-CI-4M12-U	G4 Cell Interface - 12V 4 channel, PCB assembly only (no enclosure)
NUV100-CI-4M12-KIT	G4 Cell Interface Kit - 12V 4 channel



If mounting a G4 Cell Interface, PCB assembly only (no enclosure), note that the G4 Cell Interface contains high-voltage signals reaching as high as 1250 V DC. Care must be taken when mounting the PCB into a metal enclosure to ensure that the metal walls remain a safe distance from the exposed conductor on the PCB. Using 1250 V DC as an example, the metal walls of the enclosure must be at least 4.2 mm from the nearest exposed conductor and must not touch the PCB or any component on the PCB, including the connector housings.



**Table 13. G4 Cell Interface Accessory Kits Ordering Information**

Part Number	Product Name
NUVP-CI-DIN-MB	G4 Cell Interface Mounting Bracket (Bulkhead-to-DIN)

## 5. Document Revision History

Revision	Date	Details
2.4	2021-03-04	Initial Release
2.5	2021-08-13	PCN005 updates
2.6	2021-10-08	Added compatible fuse ratings to ordering information table
2.7	2022-01-11	Updated contactor specifications
2.8	2022-04-13	Updated G4 Cell Interface specifications
2.9	2022-05-27	Updated system overview
2.10	2023-06-30	Updated UL Recognized status
2.11	2024-05-01	Added contactor life tracking
3.0	2024-07-26	<ul style="list-style-type: none"> <li>- Added software functional overview</li> <li>- Added Altitude specifications</li> <li>- Clarified max stack deployment</li> </ul>

*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.*

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