



Nuvation Energy Stack Switchgear

NUVSSG Datasheet

Document ID: NE-DS-005 | Revision: 2.2, 2020-07-23

Table of Contents

- 1. System Overview 1
- 2. Operating Limits 4
 - 2.1. External Specifications 4
 - 2.2. Electrical Characteristics 4
 - 2.3. Environmental Conditions 5
- 3. Mechanical Overview 6
 - 3.1. Rack-Mount, 19" 6
 - 3.2. 2-Post Rack-Mount, 19" And 23" 7
 - 3.3. Shelf-Mount 8
 - 3.4. Dimensions 8
- 4. Ordering Information 14
 - 4.1. Nuvation Energy Stack Switchgear Variants 14
 - 4.2. Mounting Brackets 14

1. System Overview

The Nuvation Energy Stack Switchgear, shown in [Figure 1](#), is a pre-configured assembly that incorporates the major functions of Nuvation Energy battery management system 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.

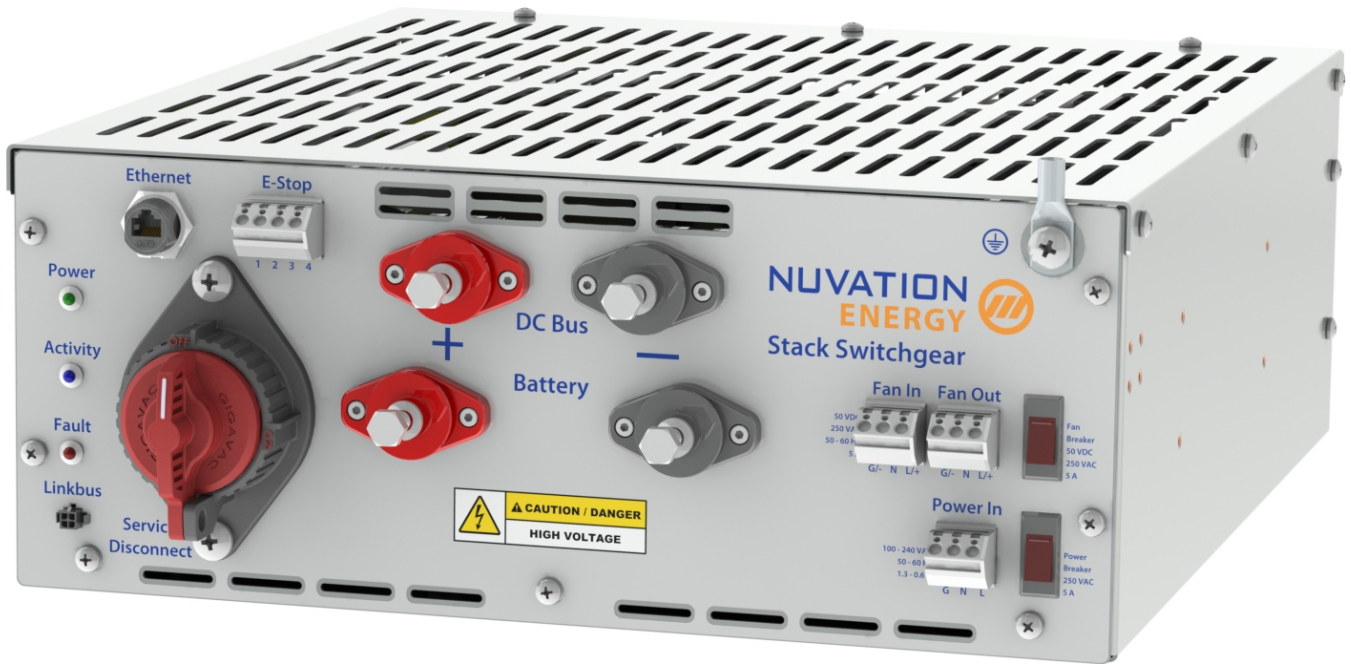


Figure 1. Nuvation Energy Stack Switchgear

There are different amperage configurations available for the base Stack Switchgear unit, listed in [Table 1](#). Orderable part numbers are listed in [Section 4](#).

Table 1. Nuvation Energy Stack Switchgear variants

Maximum Voltage Rating	Maximum Current Rating
1250 V DC	100 A
	200 A
	300 A

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

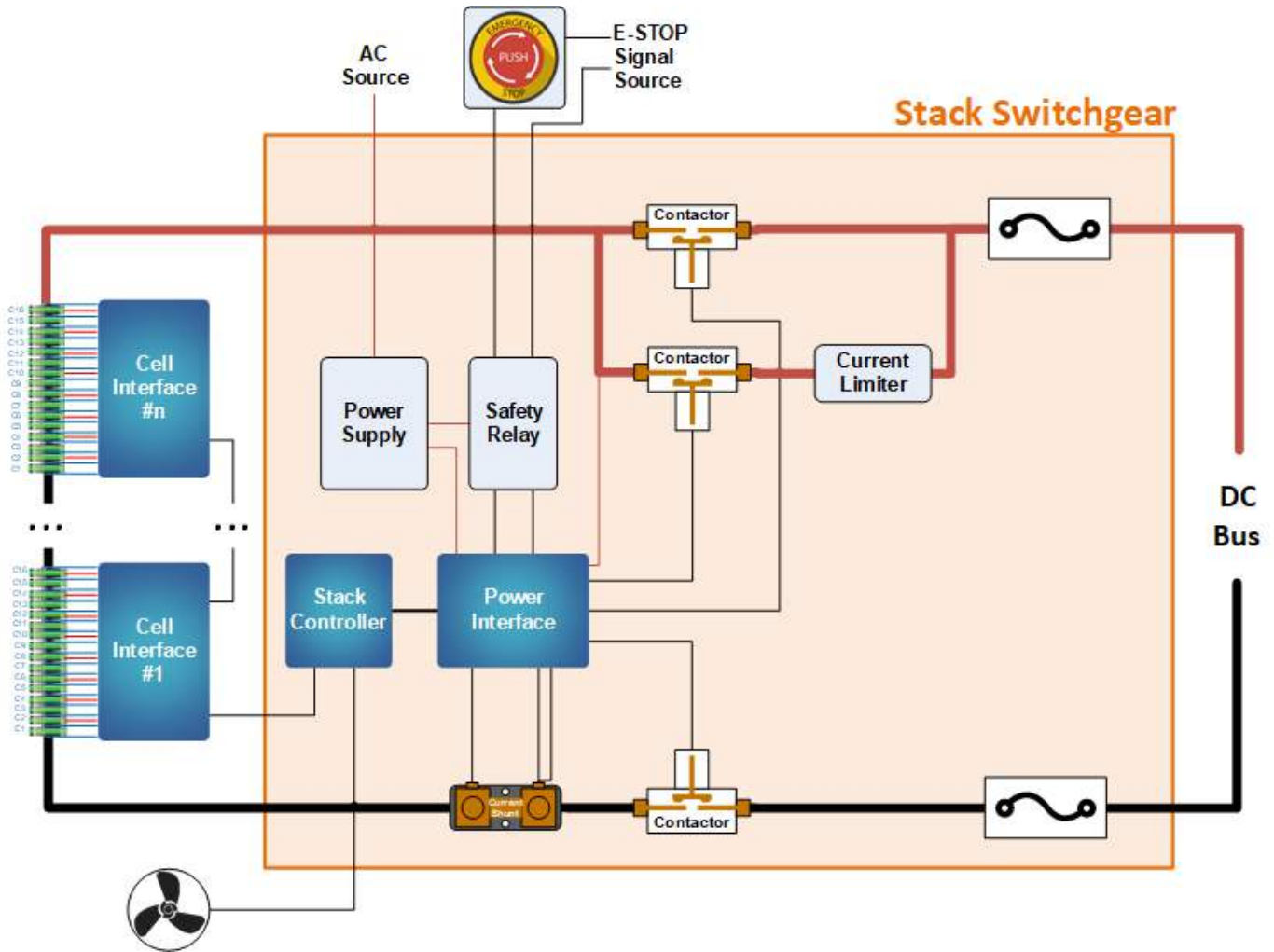


Figure 2. Stack Switchgear system diagram

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



Nuvation Energy Cell Interface and Nuvation Energy Battery Control Panel are sold separately. Datasheets are available online at <https://www.nuvationenergy.com/technical-resources>.

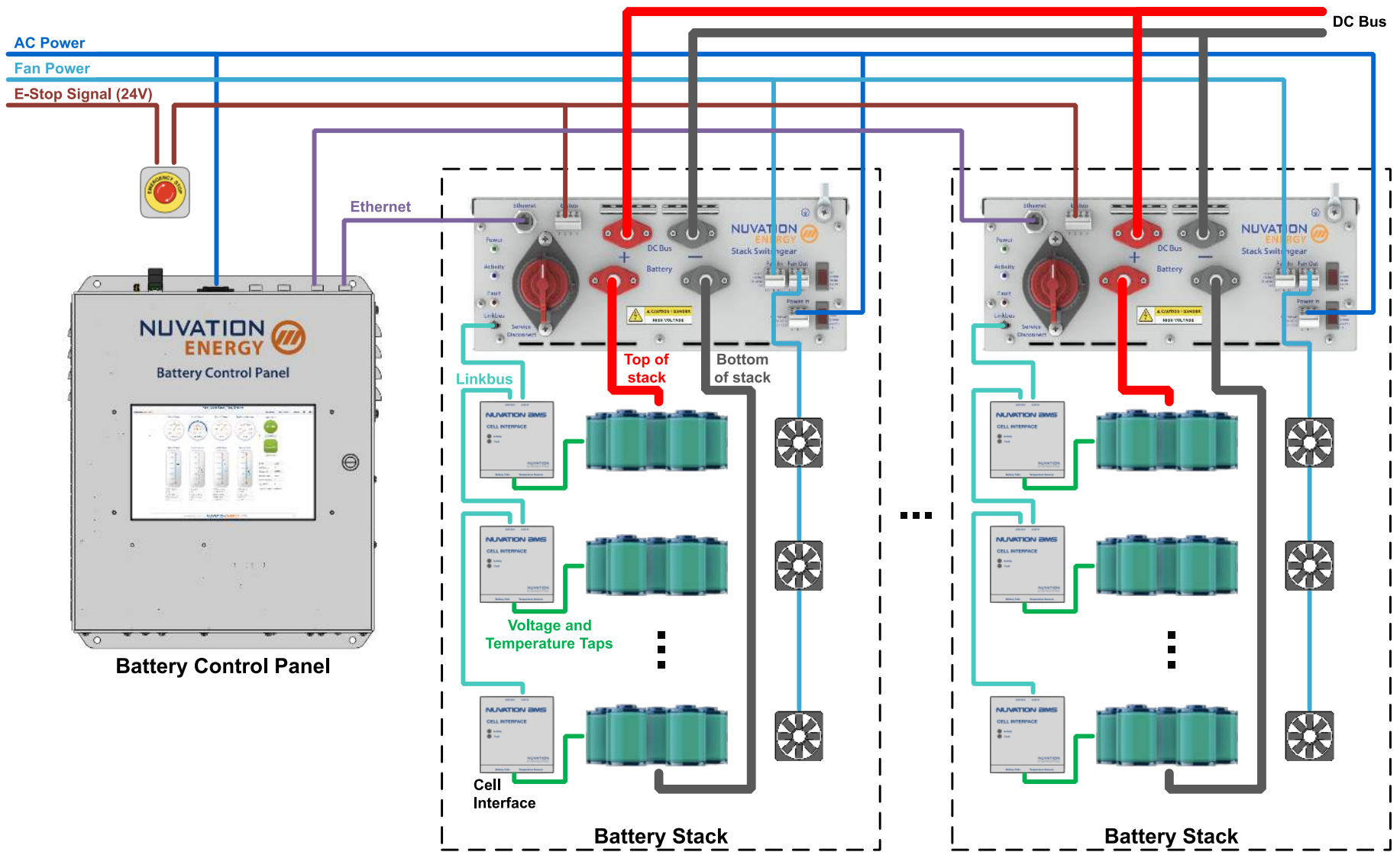


Figure 3. Stack Switchgear multi-stack diagram

2. Operating Limits

This section outlines the operating limits of the Stack Switchgear.



Exceeding the ratings may damage the system.

2.1. External Specifications

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{input}	Stack Switchgear Input Supply AC Voltage	60 Hz	85	-	250	V AC
I_{input}	Stack Switchgear Input Supply AC Current	60 Hz	0.6	1.1	1.3	A AC
P_{input}	Stack Switchgear Input Supply AC Power	-	-	33.7	60	W
f_{input}	Stack Switchgear Input Supply AC Frequency	-	45	50/60	65	Hz
V_{fan_AC}	Cooling Fan AC Voltage	-	-	-	250	V AC
V_{fan_DC}	Cooling Fan DC Voltage	-	-	-	50	V DC
I_{fan}	Cooling Fan Current	-	-	-	5	A DC/AC
V_{E-Stop}	E-Stop Input Voltage Rating	-	19.2	24	28.8	V DC
I_{E-Stop}	E-Stop Input Current Rating	-	-	-	9.6	mA DC

2.2. Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Units
Stack Switchgear Configuration: 1250 V DC, XXX A*					
V_{stack_ov}	Stack Over-Voltage Threshold (contactors open)	0	Configurable	1250	V DC
V_{stack_uv}	Stack Under-Voltage Threshold (contactors open)	0	Configurable	-	V DC
$I_{discharge_oc}$	Stack Discharging Over-Current (contactors open)	0	Configurable	XXX	A DC
I_{charge_oc}	Stack Charging Over-Current (contactors open)	0	Configurable	XXX	A DC
Battery Cell Specifications					
C_{ov}	Cell Over-Voltage Threshold (contactors open)	-	Configurable	-	V
C_{uv}	Cell Under-Voltage Threshold (contactors open)	-	Configurable	-	V
Temperature Sensors Specifications					
T_{ut}	Under-Temperature Threshold (contactors open)	-	Configurable	-	°C
T_{ot}	Over-Temperature Threshold (contactors open)	-	Configurable	-	°C
T_{fan_en}	Fan Enable Temperature Threshold	-	Configurable	-	°C

* The current configurations available are as follows:

- 100 A
- 200 A
- 300 A

2.3. Environmental Conditions

Symbol	Parameter	Min	Typ	Max	Units
Thermal Specifications					
T _a	Operating Temperature	10	25	40	°C
	Storage Temperature	10	25	40	°C
Humidity Specifications					
RH	Operating Relative Humidity	5	-	65	%
	Storage Relative Humidity	5	-	65	%

3. Mechanical Overview

The 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 [Section 4.2](#).

The 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 cases may require additional space.

The unit weighs 23 kg (50.7 lbs). Its overall dimensions, as well as mounting-specific ones, are shown in [Section 3.4](#). Please refer to <https://www.nuvationenergy.com/technical-resources> for access to CAD files.

3.1. Rack-Mount, 19"

As mentioned above, this is the most common use-case for mounting the Stack Switchgear, shown in [Figure 4](#). The mounting brackets allow for adjusting how far the unit protrudes or recedes from the front of the rack; see [Figure 9](#) for precise dimensions. Also, these brackets are designed to secure the front of the unit with respect to the front of the rack. As such, the following note is important.



Third-party side-support angle brackets are necessary to uphold the weight of the unit, in this mounting application. Some examples include Hammond Manufacturing's [RASA22BK3](#) or [RAAB2436BK](#) products; details are available on their website.

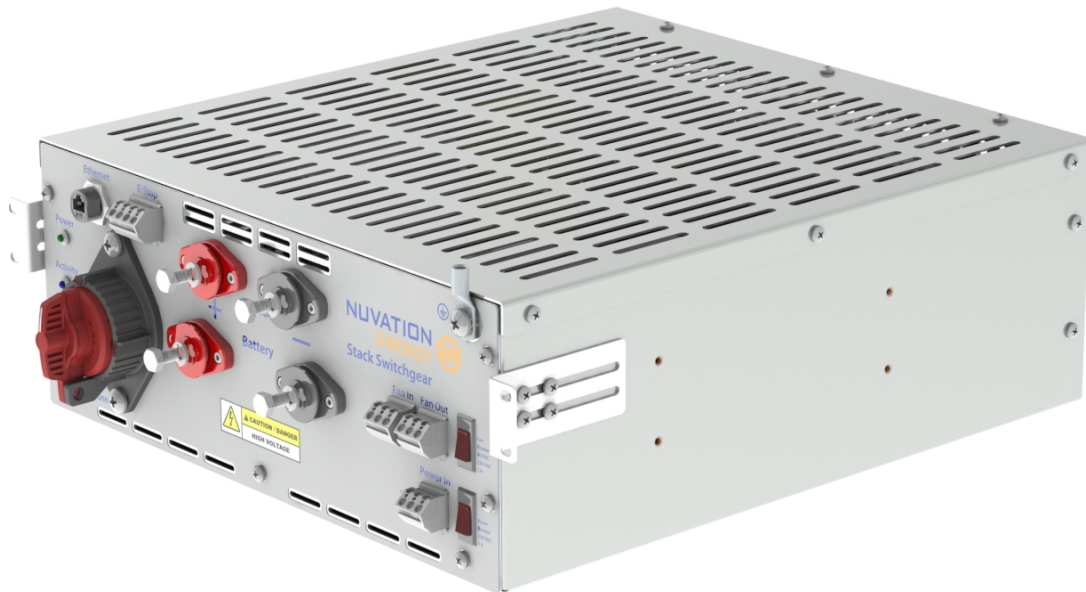


Figure 4. Rack-mount, 19"

3.2. 2-Post Rack-Mount, 19" And 23"

Brackets are available for 2-post open-frame racks. Mounting widths of 19" and 23" are supported, as shown in [Figure 5](#) and [Figure 6](#), respectively.

Note that third-party side-support 2-post-extension brackets are available, *though not necessary*. One example is Hammond Manufacturing's [RDAB2U26](#) product; details are available on their website.



Figure 5. Rack-mount, 2-post, 19"



Figure 6. Rack-mount, 2-post, 23"

3.3. Shelf-Mount

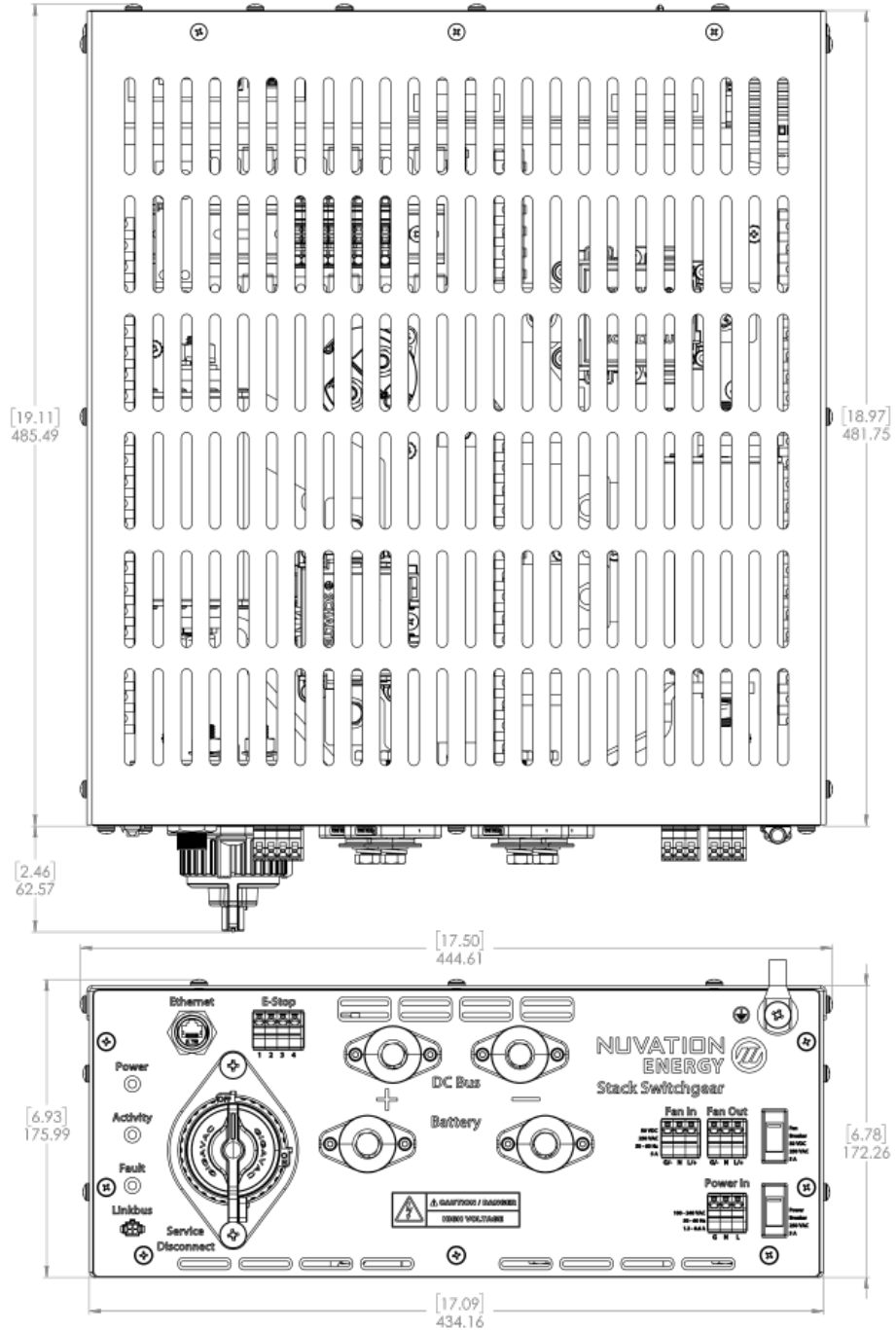
A Stack Switchgear may also be mounted to the surface on which it rests, with the aid of shelf-mount brackets, as shown in [Figure 7](#)



Figure 7. Shelf-mount

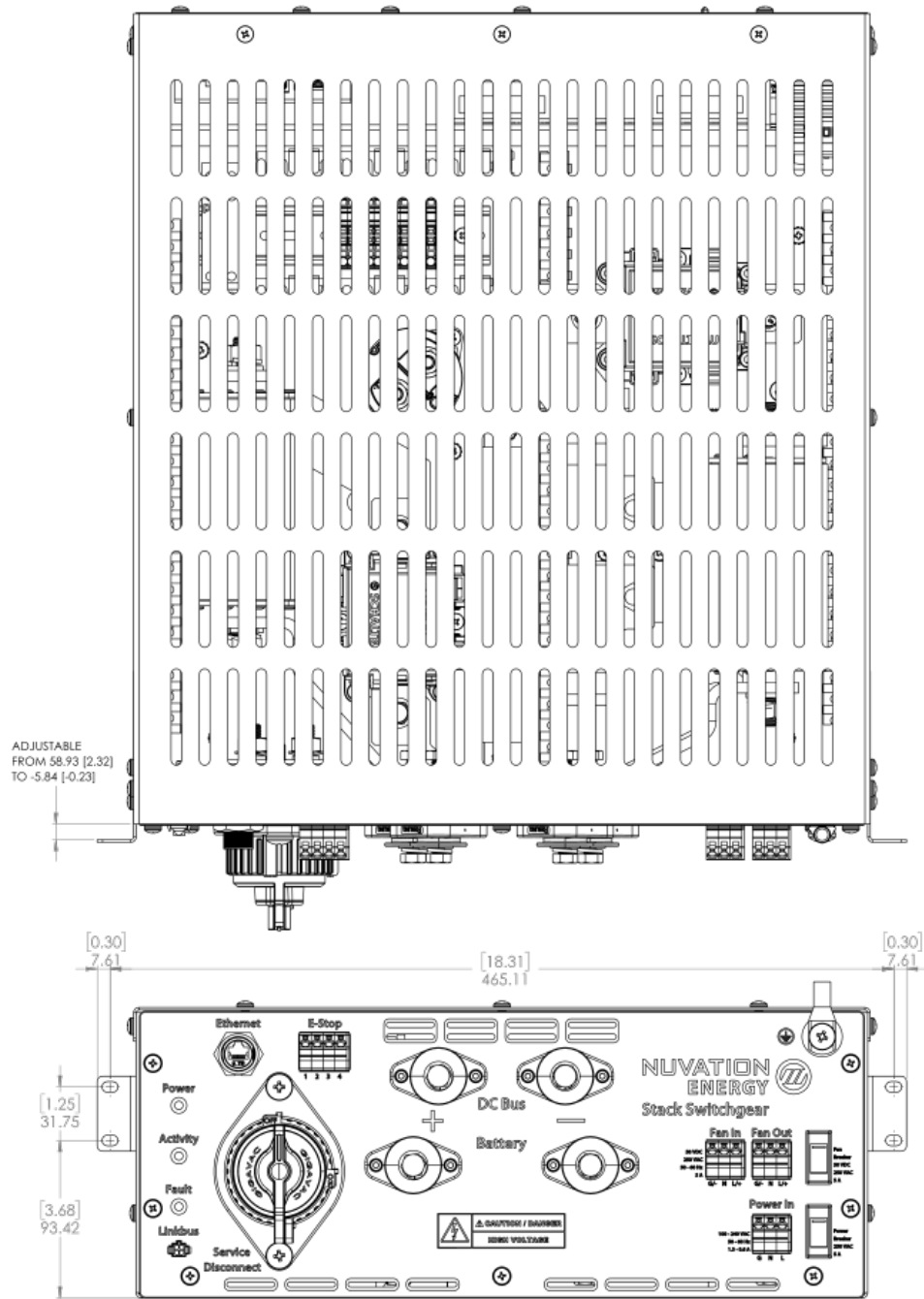
3.4. Dimensions

This section provides detailed drawings of the Stack Switchgear and its mounting provisions.



ALL DIMENSIONS IN MM [IN]

Figure 8. Dimensions, overall



ALL DIMENSIONS IN MM [IN]

Figure 9. Dimensions, rack-mount, 19"

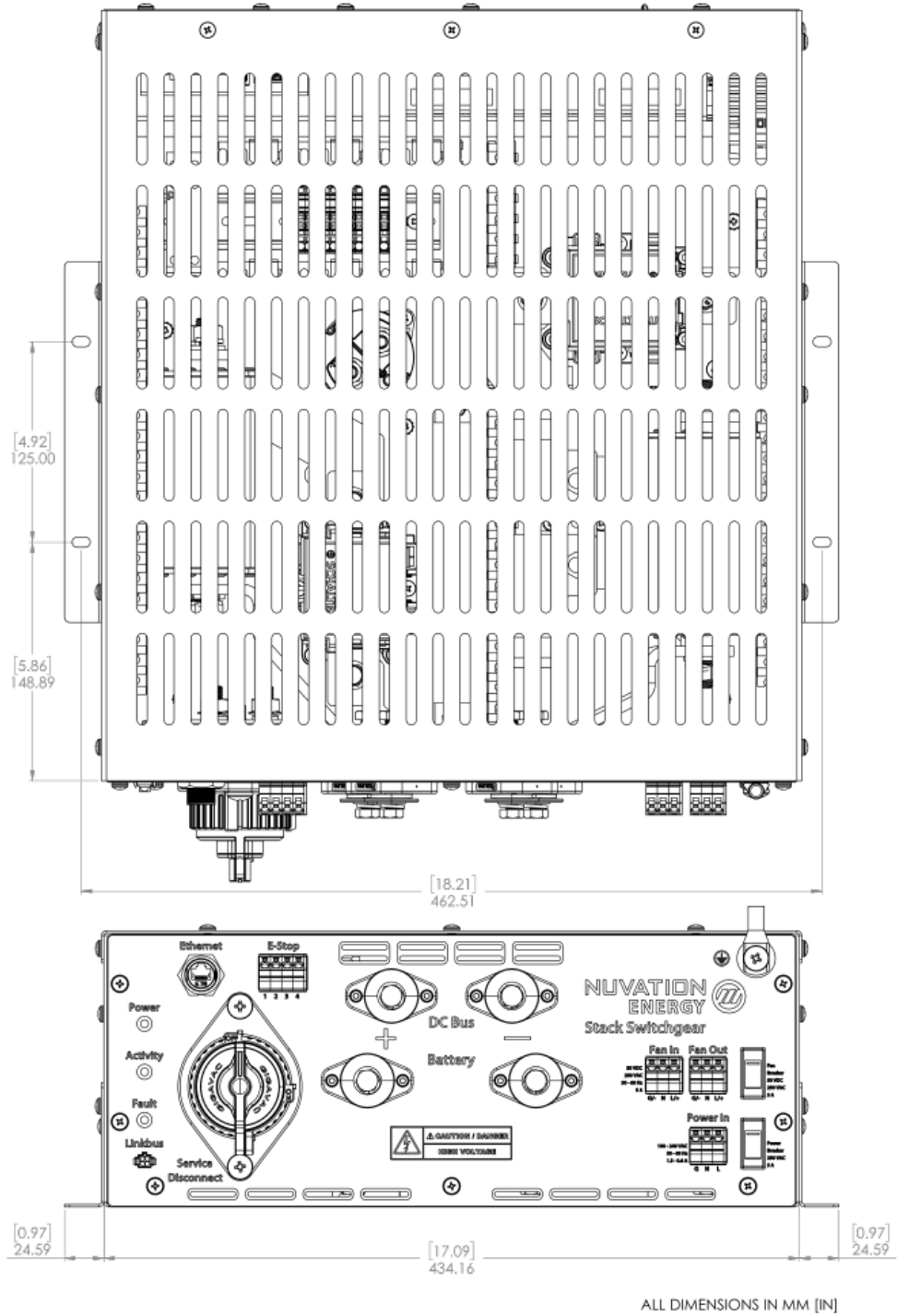


Figure 10. Dimensions, shelf-mount

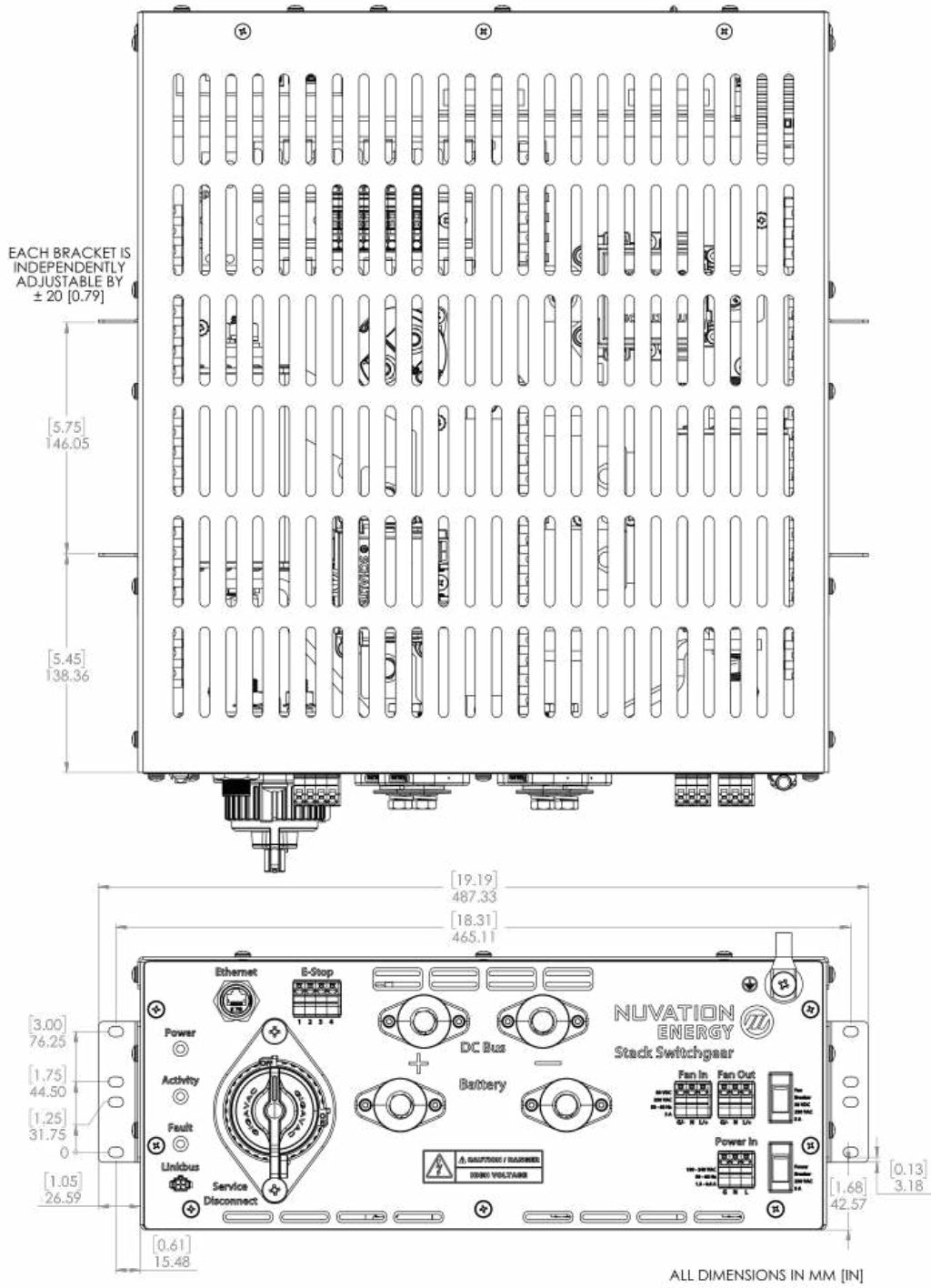


Figure 11. Dimensions, 2-post rack-mount, 19"

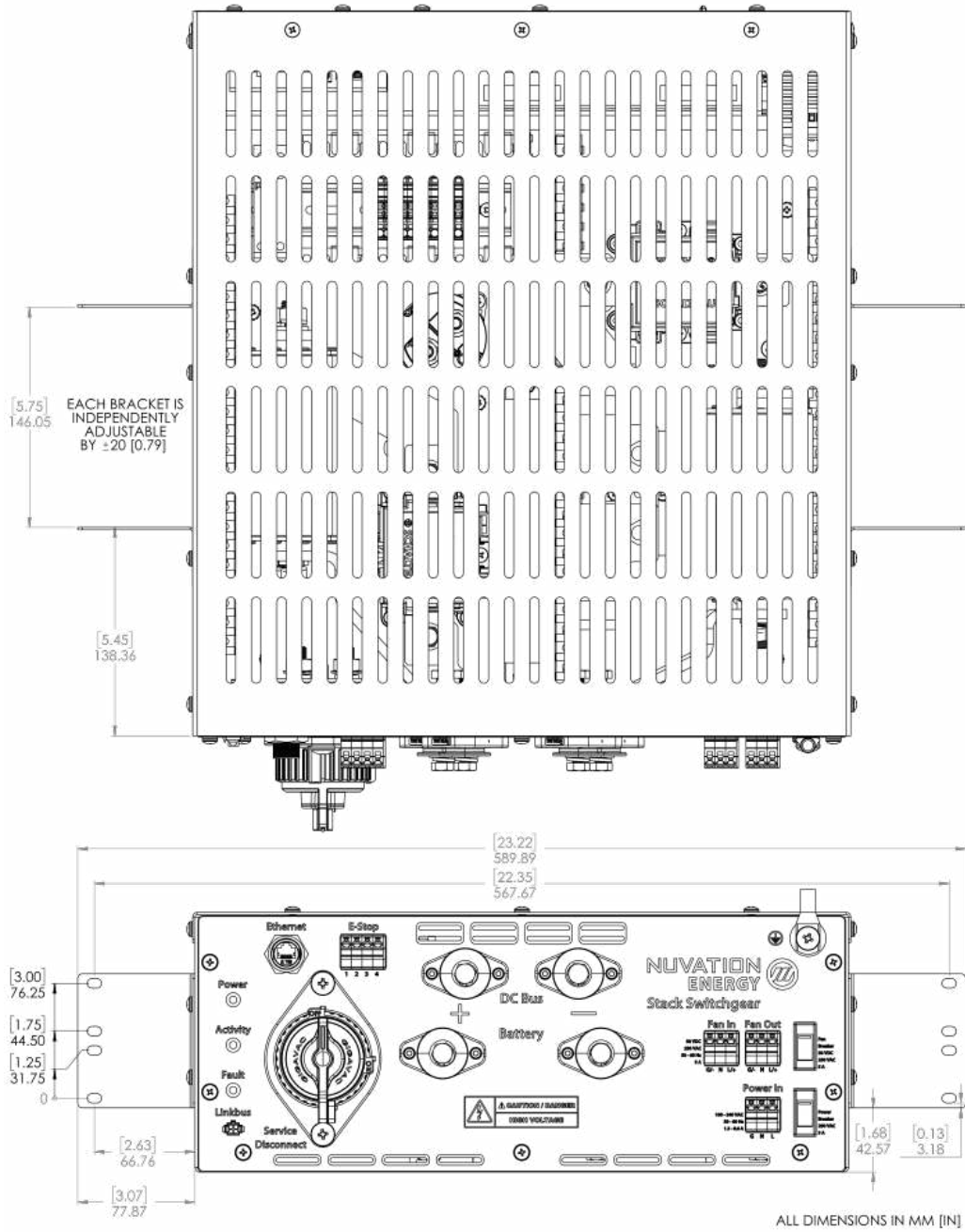


Figure 12. Dimensions, 2-post rack-mount, 23"

4. Ordering Information

This section provides orderable part numbers for Nuvation Energy's offerings of Stack Switchgears and mounting accessories.

4.1. Nuvation Energy Stack Switchgear Variants

Part Number	Product Name
NUVSSG-1250-100	Stack Switchgear, 1250 V, 100 A
NUVSSG-1250-200	Stack Switchgear, 1250 V, 200 A
NUVSSG-1250-300	Stack Switchgear, 1250 V, 300 A

The following options may be offered depending on Stack Switchgear order volumes. Please contact Nuvation Energy for more information.

- Omission of E-Stop feature
- Substitution of 100-240 V AC input power voltage with 24 V DC input power instead

4.2. Mounting Brackets

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

To attach these brackets to the unit, fasteners (M5 x 6 mm) are included with any mounting bracket orders. Fasteners for attaching the brackets to the end desired surface are not provided, due to the application-specific nature. In order to source these fasteners however, note that the corresponding bracket slots have widths of 6.35 mm.

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.

© 2020 Nuvation Energy