

# Vertiv™ Edge Lithium Ion 1500-3000VA UPS 230V IEC GUIDE SPECIFICATIONS

## 1.0 GENERAL

### 1.1 Summary

This specification shall define the electrical and mechanical characteristics and requirements for a continuous-duty, single-phase, line interactive (sinewave), solid-state uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

### 1.2 Standards

The UPS shall be designed in accordance with applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

- CE compliance mark
- UKCA compliance mark
- RCM compliance mark
- EAC compliance mark
- IEC62040-1:2017
- EN62040-1:2019
- IEC62040-1:2008 + A1:2013
- EN62040-1:2008 + A1:2013
- IEC62040-2:2018
- EN61000-3-2:2014
- EN61000-3-3:2013
- IEC61000-4-2:2008
- IEC61000-4-3:2006
- IEC61000-4-4:2012
- IEC61000-4-5:2014
- IEC61000-4-6:2013
- IEC61000-4-8:2009
- IEC61000-2-2:2002
- IEC62619:2017
- UN38.3
- ISTA 2A Procedure
- RoHS2, REACH, and WEEE Compliant
- CB test

## 1.3 System Description

### 1.3.1 Modes of Operation

The UPS shall be designed to operate as a line-interactive system in the following modes:

#### 1. Normal

The UPS input is plugged into a stable, nominal source, and the critical AC load is continuously supplied with filtered power. The battery charger maintains a float-charge on the battery.

#### 2. Automatic Voltage Regulation (AVR) Boost / Buck

During input power source abnormalities (sags and swells), the AC output power is corrected by means of boost (sag correction) or buck (swell correction) taps. Operation of the compensation taps automatically maintains the proper output voltage for the connected critical equipment.

The compensation taps (x2 boost, x1 buck) are designed for indefinite operation to their limits. Operation of the compensation taps will not discharge the battery.

#### 3. Recharge

Upon restoration of utility/mains AC power, after a utility/mains AC power outage and complete or partial battery discharge, the unit automatically restarts and resumes supplying power to the critical AC load; and the battery charger recharges the battery. The battery is charged from the utility whether the UPS is ON or OFF.

#### 4. Battery

When the input power source exceeds the parameters defined in section AC input to UPS, the critical AC load is supplied power by the inverter, which obtains its power from the battery.

Typical detection and transfer time is 4-6 ms typical.

#### 5. Fault mode

An error of fault condition has occurred. The outlets are shut off.

#### 6. Battery self-test

The UPS enters a cycle of approximately 10 seconds during which it tests

the internal battery. The outlets are still temporarily powered by the internal battery. Self-test mode occurs at the following instances:

- At start-up turning the UPS ON
- Automatically every 8 weeks as a self-check
- When selecting the Start/Stop battery manual test option in the LCD menu

### 1.3.2 Design Requirements

#### 1. Voltage

Input/output voltage specifications of the UPS shall be:

- **Input:** 0 - 300VAC, 50/60Hz, single-phase, 2-wire-plus-earth.
- **Output:** 230VAC default (user configurable: 200V, 208V, 220V, 230V, 240V), 50/60Hz, single phase, 2-wire-plus-earth.

#### 2. Output Load Capacity

Specified output load capacity of the UPS shall be:

- 1500VA/1350 Watts at 0.9 power factor.

- 2200VA/1980 Watts at 0.9 power factor.
- 3000VA/2700 Watts at 0.9 power factor.

### 3. Internal Battery

The UPS shall utilize maintenance free, sealed, lithium ion (LiFePO<sub>4</sub>) cells. The internal battery is user-replaceable and hot swappable.

### 4. Reserve Time (with internal battery)

- **1500VA:** 8.7 minutes
- **2200VA:** 9.3 minutes
- **3000VA:** 10.5 minutes

These times shall be at full load (PF=0.9) with ambient temperature of 25°C (77°F) with resistive loading and internal batteries fully recharged.

### 5. Battery Recharge

The UPS shall contain an internal battery charger designed to prolong battery life. This battery charger will be a high performance 2 stage charger with temperature compensation..

Recharge time for UPS internal batteries shall be 2-2.5 hours to 90% capacity (typical, internal batteries) after a complete discharge with full load connected.

## 1.3.3 Performance Requirements

The solid-state power components, magnetic, electronic devices and over current protection devices will operate within the manufacturer's recommended temperature when the UPS is operating at 100% critical load and maintain battery charging under either of the following conditions:

- Any altitude within the specified operating range  $\leq 3000\text{m}$  elevation.
- Any ambient temperature within the specified operating range of 0°C to 50°C (up to 40°C at full power, and up to 50°C ambient temperature with derating applied).

### 1. AC Input to UPS

#### a. Voltage Configuration

The UPS shall incorporate a variable input voltage (line detection) window feature that shall operate at the values of the nominal output voltage in the following table, without drawing power from the batteries.

- **200 VAC setting:** single phase, 2-wire-plus-earth: 144-241 VAC ( $\pm 10\text{VAC}$ )
  - Boost1 compensation: 144 VAC ( $\pm 5\%$ )
  - Boost2 compensation: 180 VAC ( $\pm 5\%$ )
  - Buck compensation: 241 VAC ( $\pm 5\%$ )
- **208 VAC setting:** single phase, 2-wire-plus-earth: 150-251 VAC ( $\pm 10\text{VAC}$ )
  - Boost1 compensation: 150 VAC ( $\pm 5\%$ )
  - Boost2 compensation: 187 VAC ( $\pm 5\%$ )
  - Buck compensation: 251 VAC ( $\pm 5\%$ )
- **220 VAC setting:** single phase, 2-wire-plus-earth: 158-266 VAC ( $\pm 10\text{VAC}$ )
  - Boost1 compensation: 158 VAC ( $\pm 5\%$ )
  - Boost2 compensation: 198 VAC ( $\pm 5\%$ )
  - Buck compensation: 266 VAC ( $\pm 5\%$ )

- **230 VAC setting:** single phase, 2-wire-plus-earth: 166-278 VAC ( $\pm 10\text{VAC}$ )
  - Boost1 compensation: 166 VAC ( $\pm 5\%$ )
  - Boost2 compensation: 207 VAC ( $\pm 5\%$ )
  - Buck compensation: 278 VAC ( $\pm 5\%$ )
- **240 VAC setting:** single phase, 2-wire-plus-earth: 173-290 VAC ( $\pm 10\text{VAC}$ )
  - Boost1 compensation: 173 VAC ( $\pm 5\%$ )
  - Boost2 compensation: 216 VAC ( $\pm 5\%$ )
  - Buck Compensation: 290 VAC ( $\pm 5\%$ )

**b. Frequency**

UPS shall auto-sense input frequency when first powered up and shall operate within the following frequency specifications. UPS shall be capable of cold start with default frequency of 50Hz @ 230V. Once started the input frequency operating window shall be 47-53Hz  $\pm 0.2\text{Hz}$  for 50Hz systems and 57-63Hz  $\pm 0.2\text{Hz}$  for 60Hz systems.

**c. Nominal Input Current Ratings**

The nominal RMS input current will be as disclosed in the table below, assuming internal batteries fully charged and nominal input voltage.

UPS rating	Nominal RMS input current
1500VA	6.7A
2200VA	9.8A
3000VA	13.3A

**d. Inrush Current**

The UPS shall have a maximum inrush time of  $< 30\text{ms}$ , assuming initial start-up, no load and 230V nominal input voltage.

**e. Surge Protection**

The UPS shall include MOV ratings at 624 Joules minimum connected L-N, L-G, N-G.

The UPS shall comply with EN61000-4-5; Line to Line: Level 2; Line to Earth: Level 3 standards.

**f. Input power cord:**

UPS rating	Input power socket
1500VA	IEC 60320 C14
2200VA	IEC 60320 C20
3000VA	IEC 60320 C20

**2. AC Output****a. Voltage Configuration**

230VAC default, 50/60Hz, single-phase, 2-wire-plus-earth, selectable through LCD (200V, 208V, 220V, 230V, 240V AC).

**b. Voltage Regulation**

±1% in battery mode operation and steady state.

**c. Frequency Regulation**

Synchronized with input frequency in line mode operation.

±1% for battery mode operation.

**d. Voltage Distortion**

- ≤2% total harmonic distortion (THD) typical into a 100% linear load (230V output) and battery mode.
- <3% THD typical into a 100% non-linear (RCD) load and battery mode. The values above, in both cases, are before battery low alarm condition.

**e. Output Power Rating**

Output power rating shall be 0.9 lagging power factor as follows:

- 1500VA / 1350 Watts
- 2200VA / 1980 Watts
- 3000VA / 2700 Watts

**Note:** Power derating in VA and Watts shall be applied when output is programmed at 200V or 208V nominal output voltage.

**f. Inverter Overload Capability**

Nominal output voltage	Overload capability
230V AC	<111% Continuous 111% to 120% - 10 seconds >120% - immediate shutdown

The time periods described above are for VA or W ratings, in line or battery mode operation.

**g. AC-AC Efficiency**

The UPS will perform with the efficiencies as below, assuming full load, nominal input voltage and batteries fully charged:

- **1500VA:** 97.5% AC - AC at full rated linear load (96% Boost1 / 97% Buck)
- **2200VA:** 98.5% AC - AC at full rated linear load (96.5% Boost1 / 97% Buck)

- **3000VA:** 98.5% AC -AC at full rated linear load (96% Boost1 / 97% Buck)

#### h. Programmable & Controllable Outlets:

The UPS units shall have two groups of sockets, one of these groups programmable and controllable. These shall be user customizable to program through LCD display to perform load shedding based selected criteria. The user shall also be able to configure these groups for restart of connected equipment based upon time after input power is restored.

## 1.4 Environmental conditions

### 1. Ambient Temperature

- **Operating:** The ambient temperature range, when UPS is operational, shall be from 0-40°C. There shall not be any degradation in the performance when operating in this range. Automatic derating shall occur for operation in higher ambient temperatures based on the following table.

<b>Ambient Temperature</b>	0°C - 40°C	41°C - 50°C
<b>Maximum output load (for nominal conditions)</b>	100% load	90% derating

- **Storage:**
  - -10°C to 45°C, with batteries inside the UPS.
  - -20°C to 50°C, without batteries inside the UPS.

### 2. Relative Humidity

- **Operating:** 8% to 90% non-condensing.
- **Storage:** 0% to 90% non-condensing.

### 3. Altitude

3,000m maximum without power derating.

### 4. Audible Noise

The audible noise of the UPS shall be:

- <40dBA normal and AVR mode, <70% load
- <45dBA AVR mode, >70% load
- <55dBA Battery mode
- Assuming batteries fully charged without alarm.

## 1.5 User Documentation and Items Bundled

The specified UPS system shall be supplied with the items described in the chart below. Additionally, a full user manual will be available for download Vertiv's website. The user manual shall include installation instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations, step-by-step operating procedures and general maintenance guidelines. Additionally, monitoring software shall be available for download on Vertiv's website.

Model	Items bundled
EDGELI-1500IRT2U	Safety Instructions
	Quick Installation Guide (QIG) for ease of installation and UPS startup
	Plastic feet for mounting in tower form
	Rail kit for 4 post rack mounting
	USB type A to B communication cable
	<ul style="list-style-type: none"> <li>• Three input cables:</li> <li>• One IEC Schuko to IEC C13</li> <li>• One BS1362 to IEC C13</li> <li>• One AUS to IEC C13</li> </ul>
	Two output cables IEC 13 to IEC C14
EDGELI-2200IRT2U EDGELI-3000IRT2U	Safety Instructions
	<ul style="list-style-type: none"> <li>• Quick Installation Guide (QIG) for ease of installation and UPS startup</li> <li>• startup</li> </ul>
	Plastic feet for mounting in tower form
	Rail kit for 4 post rack mounting
	USB type A to B communication cable
	<ul style="list-style-type: none"> <li>• Three input cables:</li> <li>• One IEC Schuko to IEC C19</li> <li>• One BS1362 to IEC C19</li> <li>• One AUS to IEC C19</li> </ul>
	Two output cables IEC 13 to IEC C14

## 1.6 Warranty

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for five years. The no-hassle replacement warranty shall include shipping costs to the customer site for the new replacement.

## 1.7 Quality Assurance

### 1.7.1 Manufacturer Qualifications

More than 40 years of experience in the design, manufacture, and testing of solid-state UPS system shall be required. The manufacturer shall be quality certified to ISO 9001:2015 (or applicable).

### 1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to ensure compliance with the specification.

## 2.0 PRODUCT

### 2.1 Fabrication

All materials and components making up the UPS shall be new, of current manufacture and shall not have been in prior service except as required during factory testing.

#### 2.1.1 Wiring

Wiring practices, materials and coding shall be in accordance with the requirements the standards listed in Section 1.2 and other applicable codes and standards. All wiring shall be copper.

#### 2.1.2 Cabinet

The UPS unit comprised of: TVSS & EMI/RFI filters, relays, Automatic Voltage Regulator (AVR), battery charger, battery consisting of the appropriate number of sealed battery cells, and inverter is housed in a tower, rack, or rack/tower enclosure (depending on UPS model). The UPS Cabinet shall be cleaner, primed and painted black.

UPS rating	Dimensions W x D x H (mm)	Net Weight(kgs)
1500VA	438 x 410 x 86	12.8
2200VA	438 x 510 x 86	17.5
3000VA	438 x 630 x 86	24.3

The UPS shall be capable for rack or tower mounting using the included accessories.

#### 2.1.3 Cooling

The UPS shall be forced-air cooled by an internally mounted, fan with variable speed control depending on load and environmental conditions. Fan power shall be provided from the internal DC supply. Air intake shall be through the front of the unit and exhausted out the rear of the unit.

## 2.2 Components

### 2.2.1 UPS Input

#### Input Protection

The UPS shall have built-in protection against under voltage, over current and over voltage conditions including low-energy lightning surges, introduced on the primary AC source. The UPS shall have resettable input circuit breakers.

### 2.2.2 Battery charger

The UPS shall contain an internal battery charger designed to prolong battery life. Recharge time for the internal UPS batteries shall be 2-2.5 hours to 90% capacity (full load discharge rate, internal batteries). There shall be DC over voltage protection so that if the DC voltage exceeds the pre-set limit, the UPS will shut down automatically and the critical load will be transferred to bypass.

### 2.2.3 Inverter

#### 1. General

The UPS inverter shall be a pulse-width-modulated (PWM) design capable of providing the specified AC output. The inverter shall convert DC power from the input converter output or the battery into precise sine wave AC power for supporting the critical AC load.



## 2. Overload

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 120% of full load current. A visual indicator and audible alarm shall indicate overload operation. For greater currents or longer time duration, the inverter shall have electronic current limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective devices.

## 3. Output Protection

The UPS inverter shall employ electronic current limiting circuitry with firmware by load detection.

## 4. Battery Deep Discharge Protection

To prevent battery damage from over discharging, the UPS control logic shall automatically raise the shutdown voltage set point; depending on output load and connected battery system at the onset of battery operation.

### 2.2.4 Display and Controls

#### 1. General


The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. The monitoring functions such as voltages, currents, UPS status and alarm indicators shall be displayed on an LCD display.

#### 2. Controls

UPS startup and shutdown operations shall be accomplished by using push buttons on the front panel of the UPS. The LCD display shall use four control buttons for ease of navigation and selection of the configurable parameters.

##### a. Control Buttons

The UPS display control button functionality shall be as follows:

- **ESC/MUTE button:**
  - Mute the Alarm. Press and hold this button at least two seconds to mute an active alarm.
  - Esc Key. Press this button to exist form menu or cancel the setting.
- **UP/RIGHT:**
  - Press this button to select the upper or right item in the menu or previous page in the screen or increase the number in the setting.
- **DOWN/LEFT:**
  - Press this button to select the lower of left item in the menu or next page in the screen or decrease the number in the setting
- **ENTER/ **:
  - **Turn on/off the UPS:** press this button for at least 2 seconds to turn on (with confirmation dialog if not a cold start) the UPS when it is off, or turn off (with confirmation dialog) the UPS when it is on.
  - **Enter main menu:** press this button to enter main menu from the flow screen.
  - **Enter key:** press this button to confirm the selection.

### b. Display and System Indicators

The UPS shall include two LED indicators on the front-panel display to indicate operation and alarm status of the UPS.

- Run indicator (green)
- Alarm indicator (red)

In addition, the UPS LCD display shall include company branding and show the relevant UPS status information, including the following menus:

- Status, with display of voltages, currents, load, battery information, etc.
- Settings, for UPS settings for configuration and adjusting parameters, languages, etc.
- Control, for UPS control options
- Log, for listing the current alarms and events, history, etc.
- About, for providing the relevant product information (serial number, FW versions, etc.)
- Maintenance, to restore factory defaults
- LCD size will be 2,8" with 65k true color range and with text in multiple languages.

## 2.3 Internal Battery

Lithium-ion (LiFePO<sub>4</sub>) battery cells are used as a stored-energy source for the specified UPS system. The batteries are as specified in LiFe-485000 and LiFe-722500. The battery cells are housed internal to the UPS cabinet and sized to support the inverter at rated load and power factor, with ambient temperature of 77 °F (25 °C) for a minimum of 8.7 to 10.5 minutes reservetime (depending on model). The expected life of the battery is 5 - 10 years

### 2.3.1 Automatic Battery Test

The UPS shall feature an automatic battery test with the factory default test interval set at everyeight weeks. The battery test shall ensure the capability of the battery to supply power to the inverter while loaded. If the battery fails the test, the UPS shall display a warning message to indicate the internal batteries need replaced. The battery test feature shall be user accessible by the push button on the front of the unit and with communication software.

## 2.4 Output Distribution

Output distribution shall be integral to the UPS and located on the rear of the unit, according to the following description.

UPS rating	Output power sockets
1500VA	(3+3) EN60320-C13
2200VA	<ul style="list-style-type: none"> <li>• (3+3) EN60320-C13</li> <li>• (1) EN60320-C19</li> </ul>
3000VA	<ul style="list-style-type: none"> <li>• (3+3) EN60320-C13</li> <li>• (1) EN60320-C19</li> </ul>

## 2.5 Communication Options

### 1. Communication slot

The UPS shall include one Vertiv™ Liebert® IntelliSlot communication port to allow the user to install an optional communication card. An interface card may be installed during any state of UPS operation (On, Standby or Off states). Available optional cards are described below:

#### a. Liebert® IntelliSlot Communications Card

The optional Liebert® IntelliSlot communications card shall deliver SNMP and web management to the UPS when connected to any 10 or 100 Mbit Ethernet network.

#### b. Dry-contacts (relay) Card

The optional Vertiv Dry-contacts (relay) card shall provide contact closure for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery, Bypass Active, Low Battery, UPSFault and On UPS.

### 2. USB Port

The UPS will have one USB port. The USB connector is a standard 4 pin Type B. The USB

port shall allow connection to a computer to use with a monitoring and shutdown software and for use with the UPS shutdown program.

### 3. EPO Port

The UPS shall include in the rear panel an EPO (Emergency Power Off) to allow to turn off the output voltage.