

# Liebert® GXT5™ Lithium-Ion

## 1000-3000VA Rack-Tower 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, 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.

- Listed to UL Standard 1778, 5th Edition; and c-UL Listed
- UL 1973& UL1642 (for battery pack and cell)
- IEC62619 Edition 1.0 (for battery pack and cell)
- CSA 22.2 No. 107.3
- ANSI C62.41, Category B
- IEC 61000-3-2
- IEC 61000-3-12
- EN62040-2
- EN61000-4-2
- EN61000-4-3
- EN61000-4-4
- EN61000-4-5
- EN61000-4-6
- FCC Part 15, Class A
- ISTA Procedure 2A/3E
- RoHS2 (6 by 6) Compliant
- REACH and WEEE Compliant

#### 1.3 SYSTEM DESCRIPTION

##### 1.3.1 Modes of Operation

The UPS shall be designed to operate as a true on-line double-conversion system in the following modes:

- Normal** - In normal operation incoming AC power shall be fed to the input power factor corrected (PFC) rectifier that converts the AC power to DC power for the inverter. In this mode, power shall also be derived from utility power for the battery charger. The inverter shall derive DC power from the PFC rectifier to regenerate filtered and regulated AC sinewave power for the connected load. The unit shall begin charging the battery once the UPS is connected to utility power, regardless of whether the UPS is on or off. In the event of a utility outage or severe abnormality (sag or swell), the inverter shall support the connected load from battery power until the battery is discharged or the utility power returns, whichever occurs first.
- Battery** - Upon failure of utility / mains AC power, the critical AC load shall be supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility / mains AC source.

- C. Recharge** - Upon restoration of utility / mains AC power, after a utility / mains AC power outage, the input converter shall automatically restart and resume supplying power to the inverter and the battery charger begins to recharge the battery.
- D. Automatic Restart** - Upon restoration of utility / mains AC power, after a utility / mains AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load and the battery charger automatically recharges the battery. This feature shall be capable of being disabled by the user.
- E. Bypass** - The integral bypass shall perform an automatic transfer of the critical AC load from the inverter to the bypass source, in the event of an overload, PFC failure, internal over temperature, DC bus overvoltage or inverter failure conditions.
- F. ECO** – The UPS shall allow the user to enable and place the UPS in ECO mode of operation to reduce electrical consumption. The ECO mode operation shall be an Active type, whereas the UPS will power the connected equipment through the bypass path and the UPS inverter shall be on and operating at no load in order to stay synchronized to the bypass to ensure rapid transfers to inverter power when input power falls outside of the user customizable parameters. The UPS shall also have a user customizable requalification time that input power must remain within the ECO mode parameters before transferring back to ECO operation. This is to minimize the number of transfers between bypass and inverter.

### 1.3.2 Design Requirements

#### A. Voltage

Input/output voltage specifications of the UPS shall be:

##### Input

- **120V units:** 0 - 150VAC, 50/60Hz, single-phase, 2-wire-plus-ground.

##### Output

- **120V units:** 120VAC (user configurable: 110V, 115V, 120V, 125V) ±3%, 50/60Hz, single-phase, 2-wire-plus-ground.

#### B. Output Load Capacity

Specified output load capacity of the UPS shall be according to the following table:

Model	Output (VAC)	VA	W	Power Factor
GXT5LI-1000LVRT2UXL	115/120/125	1000	1000	0.9
	110	1000	900	0.9
	100	1000	800	0.8
GXT5LI-1500LVRT2UXL	120/125	1500	1350	0.9
	115	1425	1282	0.9
	110	1275	1147	0.9
	100	1250	1000	0.8
GXT5LI-2000LVRT2UXL	120/125	2000	1800	0.9
	115	1860	1674	0.9
	110	1710	1539	0.9
	100	1500	1200	0.8
GXT5LI-3000LVRT2UXL	120/125	3000	2700	0.9
	115	2850	2565	0.9
	110	2700	2430	0.9
	100	2500	2000	0.8

#### C. Internal Battery

The UPS shall utilize LiFePO4 lithium ion batteries

**D. Reserve Time**

- **1000VA:** 13 minutes
- **1500VA:** 14 minutes
- **2000VA:** 10 minutes
- **3000VA:** 6 minutes

These times shall be at full load with new batteries at an ambient temperature of 77°F (25°C) and resistive loading.

**E. Battery Recharge**

The UPS shall contain a four-stage battery charger designed to prolong battery life. Recharge time for UPS internal batteries shall be 2 hours to 90% capacity after a complete discharge with full load connected.

**1.3.3 Performance Requirements**

**1.3.2.1 AC Input to UPS**

- A. Voltage Configuration:** The UPS shall incorporate a variable input voltage window feature. Typical operating voltage is 120V, the range is 60-150V.
- B. Frequency:** UPS shall auto-sense input frequency when first powered up and shall operate within the following frequency specifications. Once started the frequency operating window shall be 40-70Hz. Three frequency settings shall be available in the LCD menu: Auto - bypass enabled (factory default setting), Auto – bypass disabled, 50Hz frequency conversion and 60Hz frequency conversion.
- C. Input Power Factor:** >0.99 lagging at rated load.
- D. Input Current Harmonic Distortion:** THDi shall be less than or equal to 5%
- E. Input Current Ratings**

UPS Model #	120VAC Units
1000LVRT2UXL	10A
1500LVRT2UXL	12A
2000LVRT2UXL	16A
3000LVRT2UXL	24A

- F. Inrush Current (initial startup, no load):** The UPS shall have a maximum inrush current of 6 times the full load peak input current.
- G. Surge Immunity:**  
UPS shall conform to ANSI C62.41, Category B
- H. Surge Protection**
  - MOV ratings shall be 190V, 80 Joules minimum connected L-N and L-G.

**1.3.2.2 AC Output, UPS Inverter**

- A. Voltage Configuration**
  - 120VAC default, 50/60Hz, single-phase, 2-wire-plus-ground, configuration program selectable (100V, 110V, 115V, 120V, 125V).
- B. Voltage Regulation**  
± 1% steady state.
- C. Frequency Regulation**  
±3.5Hz synchronized to utility / mains. ±0.1Hz free running or on-battery operation.
- D. Frequency Slew Rate**  
1.0Hz per second maximum
- E. Voltage Distortion**  
<2% total harmonic distortion (THD) typical into a 100% linear load, <5% THD typical into a 100% non-linear load. For parallel units, <3% total harmonic distortion (THD) typical into a 100% linear load, <6% THD typical into a 100% non-linear load.

**F. Load Power Factor Range**

The load power factor range shall be 0.65 lagging to 1.0 (unity) without power derating.

**G. Output Power Rating**

Output power rating shall be 1000VA/1000 Watts, 1500VA/1350 Watts, 2000VA/1800 Watts and 3000VA/2700 Watts.

**H. Inverter Overload Capability**

1000VA - 2000VA	3000VA
105% to 125% - 60 seconds	105% to 125% - 15 seconds
125% to 150% - 50 seconds	125% to 150% - 10 seconds
150% to 200% - 2 seconds	150% to 200% - 2 seconds
>200% - 250ms	>200% - 250ms

**I. Voltage Transient Response**

The transient response of the output voltage with resistor step loading will be +/-5% for input supply from off to on and for a load from 0% to 100% and 100% to 0%. Transient response in the output voltage with resistor step loading will be +/-4% for input supply from off to on and for a load from 20% to 100% and 100% to 20%.

**J. Transient Recovery Time**

To nominal voltage within 60 milliseconds.

**K. AC-AC Efficiency:**

The 1000VA-3000VA 120V models shall be EPA ENERGY STAR qualified and labeled.

- **GXT5LI-1000LVRT2UXL:** 91% AC –AC at full rated linear load
- **GXT5LI-1500LVRT2UXL:** 91.5% AC –AC at full rated linear load
- **GXT5LI-2000LVRT2UXL:** 92% AC –AC at full rated linear load
- **GXT5LI-3000LVRT2UXL:** 92% AC –AC at full rated linear load

**L. Programmable & Controllable Outlets:**

- The UPS units shall have 4 programmable outlets that can be controlled individually. These shall be user customizable to program to perform load shedding based upon battery capacity remaining, time on battery operation, battery time remaining, and overload condition when on battery power. The user shall also be able to program these groups for sequential restart of connected equipment based upon time after input power is restored. The user can also program these to always be turned off to prevent unauthorized equipment from being plugged into the UPS.

**1.4 ENVIRONMENTAL CONDITIONS**

**A. Ambient Temperature**

**Operating:** The ambient temperature range, when UPS is operational, shall be from 32°F to 104°F (0°C to 40°C). Automatic derating shall occur for operation in higher ambient temperatures based on the following table.

Temperature	Derating
105.8°F (41°C)	99%
107.6°F (42°C)	98%
109.4°F (43°C)	97%
111.2°F (44°C)	96%
113.0°F (45°C)	95%
114.8°F (46°C)	94%
116.6°F (47°C)	93%
118.4°F (48°C)	92%
120.2°F (49°C)	91%
122.0°F (50°C)	90%

**Storage:** -4°F to 113°F (-20°C to 45°C)

**B. Relative Humidity**

Operating: 0 to 95% non-condensing.

Storage: 0 to 95% non-condensing.

**C. Altitude**

10,000 ft. (3,000m) max., without power derating when operated within the temperature specified in Section 1.4, Item A. Ambient temperature shall be derated 9°F (5°C) for each additional 1600 ft. (500m) above 10,000 ft. (3,000m).

**D. Audible Noise**

The audible noise of the UPS shall be:

- **1000VA:** <46dBA max @ 1 meter from front and sides, <43dBA max @ 1 meter from rear
- **1500VA:** <46dBA max @ 1 meter from front and sides, <45dBA max @ 1 meter from rear
- **2000VA - 3000VA:** <48dBA max @ 1 meter from front sides, and rear

**1.5 USER DOCUMENTATION**

The specified UPS system shall be supplied with Safety Instruction & Warning Sheet, WEEE recycling sheet (ISO 14001 compliance), printed copy of quick start guide, printed copy of factory test report. The user manual shall be downloaded from the web and includes installation instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations, step-by-step operating procedures and general maintenance guidelines.

**1.6 WARRANTY**

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The no-hassle replacement warranty shall include shipping costs to the customer site for the new replacement unit and shipping costs from the customer site for the return of the failed unit. Optional two (2) year full coverage extension warranties shall be available from the manufacturer. The manufacturer’s standard and extended warranties shall cover all parts, including the battery.

**1.7 QUALITY ASSURANCE**

**1.7.1 Manufacturer Qualifications**

More than 40 years’ experience in the design, manufacture, and testing of solid-state UPS systems shall be required. The manufacturer shall be certified to ISO 9001:2008.

**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. All relays shall be provided with dust covers.

#### 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 shall be composed of: input PFC converter, IGBT inverter, battery charger, input filter and internal bypass circuit; and batteries consisting of the appropriate number of sealed battery cells; and shall be housed in a rack-tower NEMA type 1 enclosure and shall meet the requirements of IP20. The UPS cabinet shall be cleaned, primed and painted RAL 7021 Black. Unit dimensions and weights shall be (rack mount orientation):

Model	Dimensions W x D x H, in. (mm)	Weight lb. (kg)
GXT5LI-1000LVRT2UXL	16.9 x 17.5 x 3.3 (430 x 446 x 85)	36.4 (16.5)
GXT5LI-1500LVRT2UXL	16.9 x 18.7 x 3.3 (430 x 476 x 85)	40.8 (18.5)
GXT5LI-2000LVRT2UXL	16.9 x 18.7 x 3.3 (430 x 476 x 85)	40.8 (18.5)
GXT5LI-3000LVRT2UXL	16.9 x 21.5 x 3.3 (430 x 546 x 85)	47.4 (21.5)

#### 2.1.3 Cooling

The UPS shall be forced-air cooled by an internally mounted, continuously operating fan. Fan speed shall be controlled by the UPS from 50% to 100%. Air intake shall be through the front of the unit and exhausted out the rear of the unit.

### 2.2 COMPONENTS

#### 2.2.1 Input Converter

##### 2.2.1.1 General

Incoming AC power shall be converted to a regulated DC output by the input converter supplying DC power to the inverter. The input converter shall provide input power factor correction (PFC) and input current distortion reduction.

##### 2.2.1.2 AC Input Current Limit

The input converter shall be provided with AC input current limiting whereby the maximum input current is limited to 110% of the full load input current rating other than in brief overload cases.

##### 2.2.1.3 Input Protection

The UPS shall have built-in protection against under voltage, over current and overvoltage conditions including low-energy lightning surges, introduced on the primary AC source. The UPS shall be able to sustain input surges without damage per criteria listed in ANSI C62.41, Category B.

##### 2.2.1.4 Battery Recharge

The UPS shall contain a four-stage battery charger designed to prolong battery life. Recharge time for the internal UPS batteries shall be 2 hours maximum to 90% capacity (full-load discharge rate). There shall be DC

overvoltage 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.

## **2.2.2 Inverter**

### **2.2.2.1 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 sinewave AC power for supporting the critical AC load.

### **2.2.2.2 Overload**

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 200% 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.

### **2.2.2.3 Inverter DC Protection**

The inverter shall be protected by the following DC shutdown levels:

- DC Overvoltage Shutdown
- DC Under voltage Shutdown (End of Discharge)
- DC Under voltage Warning (Low Battery Reserve); factory default set at 2 minutes (user configurable 2 to 30 minutes).

### **2.2.2.4 Output Frequency**

An oscillator shall control the output frequency of the UPS. The inverter shall maintain the output frequency to  $\pm 0.1$ Hz of nominal frequency during Battery mode, Frequency Converter mode or when otherwise not synchronized to the utility/mains source.

### **2.2.2.5 Output Protection**

The UPS inverter shall employ electronic current limiting circuitry.

### **2.2.2.6 Battery Over 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.

## 2.2.3 Display and Controls

### 2.2.3.1 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 a full color graphical LCD display.

### 2.2.3.2 System

- UPS display shall also include LED based system indicators. The system level indicators shall be: run indicator, and alarm indicator:

• Indicator	• LED Color	• LED State	• Indication:
• Run Indicator	• Green	• On	• UPS has output
		• Blinking	• Inverter is starting
	• N/A	• Off	• UPS has no output
• Alarm Indicator	• Yellow	• On	• Alarm occurs
	• Red	• On	• Fault occurs
	• N/A	• Off	• No alarm, no fault

### 2.2.3.3 Controls

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

#### 2.2.3.3.1 Control Buttons

The UPS display control button functionality shall be as follows:

**ESC button:** This button shall return to the previous menu or abort any change before confirming the change

**Up/Left arrow button:** This button shall move the cursor up or left, or increase the value displayed when changing parameters. This button shall also be used to scroll up for navigating the screens

**Down/Right arrow button:** This button shall move the cursor down or right, or decrease the value displayed when changing parameters. This button shall also be used to scroll down for navigating the screens

**Enter button:** This button shall enter the next level menu or confirm the parameter changes

#### 2.2.3.3.2 Display Menu Structure

The UPS display shall have the following menu structure with the following status and configuration screens

##### 2.2.3.3.2.1 UPS Flow Screen (Default screen)

The UPS flow screen shall be the default screen after system start-up. It shall display an overview screen showing status information, the active (green) power path, and non-working power path (gray). Details in this default screen include operating mode, the input voltage and frequency; output voltage, frequency, and loading percentage; battery status, voltage, capacity, and estimated run time remaining. To prolong display life, the UPS LCD display will dim and display a screen saver after two minutes of no user interaction if there is no active alarm. Pressing the ENTER shall wake up the display and this action shall not perform any operation. If an alarm or fault occurs the display shall also wake up the display.



### 2.2.3.3.2.2 Main Menu

The main menu shall list 6 submenu selections, from left to right, then top to bottom:

Status  
Settings  
Control  
Log  
About  
Maintenance

### 2.2.3.3.2.3 Status

The UPS status screens shall provide the following information:

#### Input

- L-N voltage (V)
- L-N current (A)
- Frequency (Hz)
- Power Factor
- Energy (kWh)
- Input black count (count of input voltage lost)
- Input brown count (count of PFC overload to battery)

#### Bypass

- L-N voltage (V)
- Frequency (Hz)

#### Battery

- Battery status
- Battery voltage (V)
- Battery current (A)
- Backup time (min)
- Remaining capacity (%)
- External battery cabinets
- Battery average temp (°F)
- Battery highest temp (°F)
- Battery lowest temp (°F)
- Max cell volt (mV)
- Min cell volt (mV)

#### BMS

- Lithium Battery# Status
- Lithium Battery# SOC (%)
- Lithium Battery# SOH (%)

#### Output

- L-N voltage (V)
- L-N current (A)
- Frequency (Hz)
- Energy (kWh)

#### Load

- Sout (apparent output power, kVA)
- Pout (active output power, kVA)
- Power Factor
- Load Percent (%)

#### 2.2.3.3.2.4 Settings

The UPS Configuration screens shall provide the following customizable parameters (default values are listed first):

##### Output

- Voltage selection (Autodetect, 100V, 110V, 115V, 120V, 125V)
- Startup on Bypass (Disable, Enable)
- Frequency Selection (Auto bypass Enable, Auto bypass disable, 50Hz no bypass, 60Hz no bypass)
- Bypass voltage upper limit (+10%, +15%, +20%)
- Bypass voltage lower limit (-15%, -20%, -10%)
- Run mode (Normal mode, or ECO mode)
- ECO voltage range\* ( $\pm 10\%$ ,  $\pm 15\%$ ,  $\pm 5\%$ )
- ECO frequency range\* ( $\pm 3\text{Hz}$ ,  $\pm 2\text{Hz}$ ,  $\pm 1\text{Hz}$ )
- ECO requalification time\* (1 min, 5 min, 15 min, 30 min)

\*Only available when Run mode is set to ECO mode

##### Battery

- External battery cabinets (Autodetect, 0-8)
- Low battery time (2 min, 2-30 min)
- Battery periodic test (Enable, Disable)
- Battery periodic test interval (8 weeks, 12 weeks, 16 weeks, 20 weeks, 26 weeks)
- Battery periodic test weekday (Wednesday, Monday-Sunday)
- Battery periodic test time (00:00, 00:00-23:59)
- Dischg protect time (4320 min, 1-4320 min)
- Max chg curr\* (3.0A/4.5A, 0.6-3.0/4.5A)

\*3.0A max for GXT5LI-1000LVRT2UXL, 4.5A max for GXT5LI-1500/2000/3000LVRT2UXL

##### Monitor

- Language (English, French, Portuguese, Spanish, Chinese, German, Japanese, Russian, Italian, Czech)
- Date
- Time
- Display Orientation (Auto-rotate, Horizontal, Vertical)
- Audible Alarm (Enable, Disable)
- Temperature (Fahrenheit, Celsius)
- Change settings password

##### System

- Auto restart (Enable, Disable)
- Auto restart delay (0 seconds, 0-999 seconds)
- Guaranteed shutdown (Disable, Enable)
- Start with no battery (Disable, Enable)
- Remote control (Enable, Disable)
- Any mode shutdown auto restart enable (Enable, Disable)
- Output contact NO/NC (NO, NC)
- Input contact NO/NC (NO, NC)
- Dry contact 5 Output (Low battery, On bypass, On battery, UPS fault)
- Dry contact 6 Output (UPS fault, On bypass, On battery, Low battery)
- Dry contact 1 Input (Disable, Any mode shutdown, Battery mode shutdown)
- Dry contact 2 Input (Disable, Any mode shutdown, Battery mode shutdown)
- Sleep mode (Disable, Enable)

- Power on day of week\* (Monday, Monday-Sunday)
- Power on time\* (00:00, 00:00-24:00)
- Power off day of week\* (Saturday, Monday-Sunday)
- Power off time\* (00:00, 00:00-24:00)
- IT system compatibility (Disable, Enable)

\*Only available when Sleep mode is set to Enable.

#### Outlet Parameter Options (Outlets 1-4)

- Apply same settings as Outlet1\* (No, Yes)
- Turn on delay (0 min, 0-30 min)
- Settings Based on Discharging Time
  - Threshold of turning off the outlet (Disable, Enable), (5 min, 0-30 min)
  - Turn on when power returns for (Enable, Disable), (0 min, 0-30 min)
- Settings based on backup time
  - Threshold of turning off the outlet (Disable, Enable), (5 min, 0-30 min)
  - Turn on when power returns for (Disable, Enable), (0 min, 0-30 min)
- Settings based on capacity
  - Threshold of turning off the outlet (Disable, Enable), (20%, 20-80%)
  - Turn on when power returns for (Disable, Enable), (0 min, 0-30 min)

\*Applicable for Outlets2-4. Not applicable for Outlet1

#### **2.2.3.3.2.5 Control**

The UPS shall have the following controls from the display:

- Turn on/off/to bypass
- Mute/Unmute audible alarm
- Start/Stop battery manual test
- Clear faults
- Battery wake up manually
- Reset power statistics

#### **2.2.3.3.2.6 Log**

The UPS shall have an event log to record 2000 events and shall be viewable from the display:

##### Current

- View log of current events

##### History

- View log of past events

The event log once full will begin to replace the first event logged to provide a FIFO process for maintaining event history. The event history shall record and display the number of events out of the 2000 (xxxx/2000) as well as the date and time (date, hh:mm:ss) when the event that occurred.

#### **2.2.3.3.2.7 About**

The UPS shall have an about screen to display information about the UPS and battery:

##### Product

- Product type (UPS model number)
- Serial number (UPS serial number)
- Time since startup (Days, hours and minutes since startup)
- Boot FW version (UPS boot firmware version)
- Monitor FW version (UPS MCU firmware version)
- DSP FW version (UPS DSP firmware version)

- MAC address (Network card MAC address, if installed)
- IPv4 address (Network card IPv4 address, if installed)
- Subnet mask (Network card subnet mask, if installed)
- Gateway address (Network card gateway address, if installed)

Efficiency

- Efficiency (%) vs load (%) graph

BMS FW Version

- Lithium Battery # (firmware version of internal battery, additional lines will populate if external battery cabinets are connected)

BMS SN

- Lithium Battery # (serial number of internal battery, additional lines will populate if external battery cabinets are connected)

**2.2.3.3.2.8 Maintenance**

The UPS shall have a method to restore factory defaults

**2.2.3.4 Automatic Battery Test**

The UPS shall feature an automatic battery test with the factory default test interval set at every 8 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 Automatic Battery test feature shall be capable of being disabled or configured to operate every 8, 12, 16, 20, or 26 weeks through the network card interface or from the LCD display.

**2.3 BYPASS**

**2.3.1 General**

A bypass circuit shall be provided as an integral part of the UPS. The bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarms conditions. This control circuit shall provide a transfer of the load to the bypass source if available and if the inverter is capable of powering the load (i.e., if there is an overload condition, if the unit is in Manual Bypass mode, or if the voltage or frequency is out of tolerance).

**2.3.2 Automatic Transfers**

The transfer control logic shall activate the bypass automatically, transferring the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:

- UPS overload
- UPS over temperature
- PFC failure
- Inverter failure
- DC bus overvoltage
- ECO mode is enabled and bypass voltage and frequency within the set range

Once the overload condition is reduced, the load shall be automatically transferred back to inverter power.

**2.4 INTERNAL BATTERY**

Lithium ion (LiFePO4) battery cells are used as a stored-energy source for the specified UPS system. The battery shall be housed internal to the UPS cabinet and sized to support the inverter at rated load and power factor, with ambient temperature of 25°C (77°F) for a minimum of 6 minutes reserve time. The expected life of the battery

shall be 7-10 years or a minimum 2000 complete discharge cycles. The UPS units have the capability to allow the operator to replace the internal battery.

All UPS models shall allow connection of up to 8 external battery cabinets to provide extended run time capability. External battery cabinets shall match the UPS in aesthetics and color.

## **2.5 OUTPUT DISTRIBUTION**

Output distribution shall be integral to the UPS and located on the rear of the unit. There shall be 4 of the identified outlets listed below that are programmable and controllable as defined in this specification:

<b>Model</b>	<b>Output Receptacles</b>		
	<b>Total</b>	<b>Programmable</b>	<b>Non-Programmable</b>
1000LVRT2UXL	(6) NEMA 5-15R	(4) NEMA 5-15R	(2) NEMA 5-15R
1500LVRT2UXL	(6) NEMA 5-15R	(4) NEMA 5-15R	(2) NEMA 5-15R
2000LVRT2UXL	(6) NEMA 5-15/20R (T-Slot) (1) NEMA L5-20R	(4) NEMA 5-15/20R (T-Slot)	(2) NEMA 5-15/20R (T-Slot) (1) NEMA L5-20R
3000LVRT2UXL	(6) NEMA 5-15/20R (T-Slot) (1) NEMA L5-30R	(4) NEMA 5-15/20R (T-Slot)	(2) NEMA 5-15/20R (T-Slot) (1) NEMA L5-30R

## **2.6 COMMUNICATION OPTIONS**

### **2.6.1.1 Liebert IntelliSlot® Communication**

The UPS shall include one Liebert IntelliSlot communication port to allow the operator to field-install an optional Liebert IntelliSlot communication card. A Liebert IntelliSlot card may be installed during any state of UPS operation (On, Standby or Off states). Available Liebert IntelliSlot options are described below.

#### **Liebert Intellislot RDU101 Communications Card**

The optional Liebert Intellislot RDU101 card shall deliver SNMP and web access to the UPS via 10/100 Mb/s ethernet port. This card shall enable remote or local field upgrades of the SNMP firmware, and managed device firmware and configuration updates. This card shall support environmental monitoring via Liebert SN Sensors.

#### **Liebert IntelliSlot Relay Interface Card (IS-RELAY)**

The optional Liebert IntelliSlot Relay Interface Card shall provide contact closure for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS. The contacts shall be rated for 24VAC or 24VDC at 1A. Connections shall be to a terminal block connector with cable provided by the end user.

### **2.6.1.2 Terminal Block Connections**

The UPS shall contain on the rear panel a terminal block to provide low voltage signals for On Battery, Low Battery, Any Mode Shutdown and Battery Mode Shutdown

#### **Any-mode Shutdown**

The purpose of Any-Mode Shutdown shall be to shut down the UPS output by turning off the rectifier, inverter and bypass so that there is no power to the loads.

Any-Mode Shutdown can be operated locally and remotely, as described as follows:

- Local Any-Mode Shutdown can be entered from the Any-Mode shutdown contact on the back of the unit.
- Remote Any-Mode Shutdown can be initiated by an Any-Mode shutdown switch connected to the contact on the back of the unit and mounted at a remote location.

Remote Power Off shall be performed either by NO or NC contact of Any-mode Shutdown, depending on the settings in the configuration program.

A current-limited source (+12VDC, 50mA) shall be available from the UPS.

The connection to the UPS for remote connection shall be via terminal block connector.

Any-mode Shutdown wiring shall conform to all national, regional and local wiring regulations.

### **Battery Mode Shutdown**

- Battery Mode Shutdown shall permit shutting down the UPS by turning off the rectifier, inverter and bypass so that there is no power to the load when the UPS is on Battery. Battery Mode Shutdown shall be able to be performed locally or remotely.
- Local Battery Mode Shutdown can be entered from the battery mode shutdown contact on the back of the unit.
- Remote Battery Mode Shutdown can be initiated by a battery mode shutdown switch connected to the contact on the back of the unit and mounted at a remote location.
- The actuation of the battery mode shutdown shall be logged as an event in the event history log.
- Remote power off shall be performed by a NC/NO contact.
- The remote connection shall be provided via terminal block connector.
- A 12Vdc, 50mA current limited source shall be available from the UPS for relay drive.
- The battery shutdown signal will not cause an immediate shutdown, it will instead start a 2 minute shutdown timer. This timer cannot be stopped once it is triggered. If the utility voltage returns during this count down timer then the UPS will still shutdown and must remain shut down for 10 seconds. The auto-restart setting shall then dictate whether the UPS turns back ON when the power is restored.

Battery Mode Shutdown wiring shall conform to all national, regional and local wiring regulations.

#### **2.6.1.3 USB Port**

The USB communications port (Version 2.0) shall meet the HID Power Device standard, version 1.0 or later. All models shall work with the Power Management system in Microsoft® Windows® XP or later. They shall also support the equivalent functions in Linux, and Mac OSX®.

#### **2.6.1.4 Serial Port**

A serial port (RS-232) shall be provided on the rear of the UPS, with an RJ-45 connector. This connector shall enable use of the Vertiv UPS Command Line Interface.