PRODUCT GUIDE SPECIFICATIONS

Vertiv™ Liebert® GXT5

5,000VA – 10,000VA High-voltage Rack-Tower Convertible

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 mains power for sensitive, electronic equipment loads. The UPS is not designed to support large inductive or half-wave rectified loads, for example: motors, compressors, vacuum pumps, electric drills, laser printers and hair dryers.

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.

230 Volt Nominal Units

- EN 62040-1:2008+A1:2013
- TUV/GS and CE compliance mark and Australia C-tick (C√) mark
- EN62040-2, 2nd Ed, Category C2
- EN61000-4-2
- EN61000-4-3
- EN61000-4-4
- EN61000-4-5
- EN61000-4-6
- EN61000-3-2
- RoHS2 (6 by 6) Compliant
- REACH and WEEE Compliant
- ISTA Procedure 1E
- Energy Star 2.0

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1.3 SYSTEM DESCRIPTION

1.3.1 Modes of Operation

The UPS shall be designed to operate in the following modes:

A. **Normal Mode** - 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 battery shall be charged once the unit 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 returns, whichever occurs first.

B. **Bypass Mode** - 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.

C. **Battery Mode** - 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.

D. **Active ECO Mode** – 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.

E. **Maintenance Bypass Mode** - Maintenance Bypass mode shall provide an alternate path for utility power to the connected with utility power while electrically isolating the internal UPS components. This mode shall be capable within the frame space of the UPS.

F. **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 assume 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.

G. **Frequency Converter Mode** - The UPS shall be able to be configured to maintain a user selected output frequency regardless of the UPS input until battery mode is required to support the connected equipment. The UPS internal bypass may not be available during frequency conversion mode.

1.3.2 Design Requirements

A. **Voltage**: Nominal mains/output voltage specifications of the UPS at rated load shall be:

- Mains—The UPS shall operate from 230V, 50/60Hz without the use of selector switches or voltage taps. Mains wiring must be 2-wire (L, N) plus earth ground.
- Output—Output voltage is present at terminals L and N. The output voltage shall be automatically set to match mains voltage upon initial startup. The UPS shall be configurable to provide the following alternate voltages:

  200, 208, 220V or 240V, all voltages ±1% at 50/60Hz

  (If the UPS is started on battery with no mains power present, the default output voltage shall be 230V, 50Hz from the factory. After the UPS has been started from mains, the output voltage/frequency shall match the last known mains voltage/frequency that was applied.)

B. **Output Load Capacity**: Specified output load capacity of the UPS shall be:

VA	Watts
5000	5000
6000	6000
8000	8000
10,000	10,000

C. **Internal Battery**: Valve-regulated, non-spillable, lead acid cells. 1 String of 16 batteries internally.

D. **Battery Reserve Time**:

- 5000VA: Full Load 7 minutes; Half Load 18.5 minutes
- 6000VA: Full Load 5.5 minutes; Half Load 14.5 minutes
- 8000VA: Full Load 3.5 minutes; Half Load 9.5 minutes
- 10000VA: Full Load 2 minutes; Half Load 7 minutes

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

E. **Battery Recharge**: The UPS shall contain a three-stage battery charger with temperature compensation designed to prolong battery life. Recharge time for UPS internal batteries shall be 3 hours maximum to 90% capacity after a complete discharge into full load.

Default charger current is 2.5 Amps, with a maximum of 5Amps for 5-6kVA ratings, and 8Amps for 8-10kVA ratings.

F. **Recharge** - Upon restoration of utility/mains AC power, after a utility/mains AC power outage, the input converter shall automatically restart and assume supplying power to the inverter and the battery charger to recharge the battery.

1.3.3 Performance Requirements

1.3.3.1 Mains to UPS

A. **Voltage**: The point at which the UPS transfers to battery operation shall be dependent on the amount of load that the UPS is supporting. The following range defines where the UPS will transfer to battery and where it returns to operating from mains:

Low Line Voltage Range

Low Line Voltage		GXT5 (230V Nominal)
100% to 91%	L/L Transfer	176 ± 5.0VAC
	L/L Comeback	188 ± 5.0VAC
90% to 71%	L/L Transfer	161 ± 5.0VAC
	L/L Comeback	173 ± 5.0VAC
70% to 31%	L/L Transfer	130 ± 5.0VAC
	L/L Comeback	142 ± 5.0VAC
30% to 0%	L/L Transfer	100 ± 5.0VAC
	L/L Comeback	112 ± 5.0VAC

High Line Voltage Range

High Line Voltage	230V Models
High Line Transfer	288 ± 5.0VAC
High Line Comeback	276 ± 5.0VAC

B. **Frequency**: The UPS shall auto-sense mains frequency of 50Hz or 60Hz when first powered up and shall use this frequency as the default output frequency. Once started the mains frequency operating window shall be 40-70Hz without going to batteries. The UPS shall be capable of cold start with a default output frequency of 50Hz.

C. **Input Power Factor**: >0.99 lagging at rated load.

D. **Input Current reflected distortion**: 5% THD maximum at rated load.

E. **Input Current Ratings (230V Nominal)**:

UPS Model #	VA	Watt	Total Amps
GXT5-5000IRT5UXLE	5000	5000	24
GXT5-6000IRT5UXLE	6000	6000	28
GXT5-8000IRTL5UXLE	8000	8000	37
GXT5-10KIRT5UXLE	10,000	10,000	47

F. **Surge Protection**: The UPS shall utilize metal oxide varistors (MOVs) rated at 385VAC(rms) @ 320 Joules.

G. **Electrical Specifications**:

UPS Model #	Recommended External Overcurrent Protection	Recommended Wire (Including ground wire) (75°C copper wire)	Maximum Wire Accepted by Terminal Block	Terminal Tightening Torque
GXT5-5000IRT5UXL GXT5-6000IRT5UXL	1 pole 32A	$4mm^2$ (10AWG)	$16mm^2$ (4AWG)	2.26 Nm (20 in-lb)
GXT5-10KIRT5UXL GXT5-8000IRT5UXL	1 pole 63A	$10mm^2$ (6AWG)	$16mm^2$ (4AWG)	2.26 Nm (20 in-lb)

1.3.3.2 Mains Output, UPS Inverters

A. **Voltage Configuration**: 50Hz, single-phase, 2-wire-plus-ground.

- Default setting 230V. Output L-N voltage shall be selectable
- Optional settings shall be 200V, 208V, 220V or 240V. The UPS shall adjust sinewave amplitude to produce the selected voltage to match the mains input value.

B. **Voltage Regulation**: L-N: 1 % steady state.

C. **Frequency Regulation**:

- ±3.5Hz synchronized to mains.
- ±0.1Hz free running or on battery operation.

D. **Frequency Slew Rate**: 1.0Hz per second maximum

E. **Load Power Factor Range**: 0.65 lagging to 0.9 leading

F. **Voltage Distortion**: Sinusoidal Waveform; ≤2% total harmonic distortion (THD) into a 100% linear load; ≤5% THD into a 100% non-linear load with a crest factor ratio of 3:1.

G. **Inverter Overload Capability**:

Overload Percent	Duration Inverter shall support rated load
< 105%	Continuous
105% to 125%	5 minutes
126% to 150%	60 seconds
>151%	200 mS

H. **Voltage Transient Response**: ±5% on-line or Battery mode for 0%-100%-0% step resistive loading of the UPS, ±4% on-line or Battery mode for 20-100-20 % loading of the UPS.

I. **Transient Recovery Time**: To nominal voltage within 60 milliseconds.

J. **AC-AC Efficiency**:

The UPS shall be EPA ENERGY STAR 2.0 Qualified

- 5 kVA: 94% AC-AC at full rated linear load
- 6 kVA: 94% AC-AC at full rated linear load
- 8 kVA: 94.5% AC-AC at full rated linear load
- 10 kVA: 95% AC-AC at full rated linear load

1.3.4 ENVIRONMENTAL CONDITIONS

A. **Ambient Temperature**

Operating:

- 0°C to 40°C (32°F to 104°F) – without capacity de-rating
- Up to 50°C (122°F) – 90% maximum load

Storage:

- -15°C to +40°C (5°F to 104°F) with battery, up to 60°C electronics only
- 20-25°C (68-77°F) for optimum battery life

Relative Humidity

- Operating: 0 to 95% non-condensing.
- Storage: 0 to 95% non-condensing.

B. **Altitude**

- Up to 3000m (10,000 ft.) at 25°C (77°F) without power derating
- Above 3000m, derating is per IEC62040-3 specification

C. **Audible Noise**

Noise generated by the UPS under normal operation shall not exceed 55dBA at 1 meter from the front and <50dBA at 1 meter from the rear or sides.

D. **Electrostatic Discharge**

The UPS shall be able to withstand an electrostatic discharge compliant to EN61000-4-2, level 4, Criteria A, without damage and shall not affect the connected load.

1.4 USER DOCUMENTATION

The specified UPS system shall be supplied with a Safety Warning Sheet. The specified UPS system shall be supplied with quick start guides for ease of installation and UPS start up. Each UPS will also contain a full user manual available for download from the manufacturer 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.

1.4.1 Manufacturer Warranty

The UPS and accessories shall be warranted against defects in materials and workmanship for two (2) years. An optional extended warranty shall be available from the manufacturer. The manufacturer's standard and extended warranty shall cover all parts excluding the battery. Labor is not included in the standard warranty coverage.

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer's Qualifications

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

1.5.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to ensure compliance with the specification. Factory test reports shall be available upon request per customer requirements.

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: mains PFC converter, battery charger, dual-inverter, mains 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 and painted RAL 7021 Black.

2.1.3 Matching Battery Cabinets

The optional Rack-Tower external battery cabinet shall contain valve-regulated, non-spillable, lead acid cells, housed in a separate cabinet that matches the UPS cabinet styling. The cabinet shall be cleaned and painted Black RAL 7021. The matching battery cabinet shall include an 18" (0.45m) detachable, molded interconnect cable, circuit breaker over current protection and provisions for daisy-chain connection of additional battery cabinets. External battery cabinets shall include a means of automatic detection and UPS runtime shall adjust accordingly.

2.1.4 Cooling

The UPS shall be forced air cooled by internally mounted, continuous fans. Fan power shall be provided from the internal supply. Air intake shall be through the front of the unit, and air exhaust shall be out the rear of the unit. Optional particle filters shall be optional for harsh environmental conditions

2.2 COMPONENTS

2.2.1 Input Converter

2.2.1.1 General

Incoming mains power shall be converted to regulated DC power by the input converter for 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 Input Current Limit

The input shall use the power necessary to operate the load attached to the output before going to batteries. The UPS shall not use electronic input current limiting.

- The 5000VA / 6000VA model shall include a 1-pole, 32A input circuit breaker.
- The 8000VA / 10000VA model shall include a 1-pole, 63A input circuit breaker.

2.2.1.3 Input Surge Protection

The UPS shall have built-in protection against over current and overvoltage conditions including low-energy lightning surges, introduced on the primary input source. The UPS shall sustain input surges without damage per criteria listed in 61000-4-5 Surges/Lightning.

2.2.1.4 Battery Recharge

The UPS shall contain a battery charging methodology designed to prolong battery life. The battery shall be constant current charged to restore capacity, then shall be constant voltage charged to maintain the battery in a fully charged state. Recharge time for the internal battery shall be 3 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 inverter shall shut down automatically and the critical load shall be transferred to internal bypass.

2.2.2 Inverter

2.2.2.1 General

The UPS inverter shall be of a pulse-width-modulated (PWM), IGBT three-level inverter design capable of providing the specified mains output. The inverters shall convert DC power from the input rectifier output or the battery into precise sinewave mains power for supporting the critical load.

2.2.2.2 Overload

The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. For loads up to 105% continuous support. For loads between 105-125% for 5 minutes, 126-150% for 60 seconds, to >150% for 200mS 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 on the output 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 Undervoltage 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 ±0.1Hz of nominal frequency during Battery mode, Frequency Converter mode or when otherwise not synchronized to the mains source.

2.2.2.5 Output Protection

The UPS inverter shall employ electronic current limiting circuitry for protection during Normal mode and battery operation and the UPS shall employ input circuit breaker protection during Bypass mode operation.

2.2.2.6 Parallel operation

The UPS inverter shall be able to operate in parallel or redundant operation, at least for the 10kvA rating.

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 an LCD display.

2.2.3.2 System Indicators

UPS display shall also include LED based system indicators. Indicators shall include Run and Fault notification

2.2.3.3 Controls

UPS startup and shutdown operations shall be accomplished by using push buttons 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 arrow button: This button shall move the cursor up or increase the value displayed when changing parameters. This button shall also be used to scroll up for navigating the screens
- DOWN arrow button: This button shall move the cursor down 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
- POWER button: This button shall power on/off the UPS and enable transfer to internal bypass.

2.2.3.3.2 Display Menu Structure

The UPS display shall have an icon graphic menu structure and include: Status, Settings, Control, Log, About and Maintenance options.

UPS Flow screen shall detail relevant UPS condition and parameters including: input voltage, frequency; output voltage, frequency, and load percentage; battery capacity and estimated battery time remaining.

To prolong display life, the UPS LCD display shall go into “sleep” mode after two minutes of no user interaction. Pressing the ENTER shall wake up the display and this action shall not perform any operation.

2.2.3.3.2.1 Status Menu

The status menu shall provide real time details for Input, Bypass, Battery and Output Selections:

2.2.3.3.2.2 Configuration

The UPS Configuration screens shall provide the capability to review the UPS settings and make adjustments where available to the UPS configuration.

2.2.3.3.2.3 LCD Settings

Language, English Default. Other available languages selectable from the display. Language selection does not require the UPS to be offline. Languages Available include: English, French, Portuguese, Spanish, Chinese, German, Japanese and Russian

2.2.3.3.2.4 Factory Settings

The factory settings screens shall provide a NO/YES selection to reset the UPS back to all factory setting

2.2.3.3.2.5 Control Settings

The UPS shall have the following controls from the display:

UPS ON/OFF

- Turn UPS ON
- Turn UPS OFF
- Turn ON Bypass (manually transfer to bypass power)

Audible Alarm

- Turn audible alarm ON (test alarm)
- Turn audible alarm OFF (alarm silence)

Battery Test

- Start manual battery test
- Cancel manual battery test
- View last battery test results

2.2.3.3.2.6 Event Log

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

Clear Log

- User shall be able to clear the event log

2.2.3.3.2.7 About

The UPS shall have an about screen to display the UPS model number, serial number, hardware version, and firmware version

2.3 AUTOMATIC BATTERY TEST

The UPS shall feature an automatic battery test with the factory default test interval set at every eight 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. The Automatic Battery test feature shall be capable of being disabled or configured to operate at multiple intervals.

2.4 BYPASS

2.4.1 General

A maintenance bypass circuit shall be provided as an integral part of the UPS. The maintenance bypass shall have a break-before-make transfer, shall have a maximum detect and transfer time of 4-6 milliseconds and shall be a double-pole device. The maintenance bypass shall be configured to wrap around the PFC converter, battery charger, DC-DC converter, inverter and battery. The maintenance bypass circuit shall use the rear-panel mounted UPS mains circuit breaker and route bypass power through the UPS input filters and surge suppression circuit. The maintenance bypass circuit default position shall be in the Bypass mode (mains).

2.4.2 Automatic Transfers

The transfer control logic shall activate the bypass automatically, transferring the critical mains 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

Once the overload condition is reduced, the load shall be automatically transferred back to inverter power. An over temperature requires manual transfer back to inverter power after cooling.

2.5 INTERNAL BATTERY

Valve-regulated, non-spillable, lead acid cells shall be used as a stored-energy source for the specified UPS system. The battery kit shall be internal to the UPS cabinet and sized to support the inverter at rated load and power factor with an ambient temperature of 77°F (25°C). The expected life of the battery shall be 3-5 years or a minimum 260 complete discharge cycles at ambient temperature of 77°F (25°C). To promote battery service life and eliminate over-discharge of the battery, the end-of-discharge DC shutdown voltage shall be automatically adjusted by the microprocessor based upon the percentage load at the onset of battery operation.

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

2.6 OUTPUT DISTRIBUTION

Output distribution shall be integral to the UPS cabinet and located on the rear of the unit.

The UPS will have at least 2 groups of programmable power sockets that can be disabled under several conditions. They will include settings for a pre-defined number of minutes, a pre-defined backup remaining time, battery capacity or overload condition,

2.7 ON-BOARD COMMUNICATION

The Liebert GXT5 shall offer multiple communication options such as:

A. **USB**: All models shall work with the Power Management system in Microsoft® Windows® 2000, Windows XP, Windows Vista®, Linux and Mac OS® X.

B. **Remote Emergency Power Off (REPO)**: The UPS shall be equipped with rear-panel terminal connections for interface with a normally closed (N.C.) field-supplied switch. The remote emergency power off function shall allow the user to disable all UPS outputs in an emergency situation. Connections must not exceed NEC Class 2 limits. Activation of the REPO circuit shall disable the UPS until the following occurs:

   - REPO contacts are reset.
   - User restart of the UPS using the front control panel.

C. **Terminal Block Communication**: The UPS shall include 4 terminal block positions and offer up to 4 user definable status signals.

D. **Liebert IntelliSlot® Port**: Simultaneous communication shall be available via terminal block (EPO), USB and Liebert IntelliSlot.

2.8 LIEBERT INTELLISLOT COMMUNICATION OPTIONS

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

Liebert IntelliSlot Relay Interface Card (RELAYCARD-INT)

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. Connection shall be to a terminal block connector with cable provided by the end user.

Liebert IntelliSlot SNMP Network Communications (RDU101)

The Vertiv™ RDU101 Communications Card enables communication between Vertiv products such as Trellis™ Enterprise, Trellis™ Power Insight, and Vertiv™ LIFE™ Service. It provides web access, data via SNMP for Vertiv equipment and environmental sensors.