Liebert® GXT RT+

1000 to 3000 VA (120 V NEMA)
Guide Specifications

Liebert® GXT RT+
1000-3000 VA
Rack-Tower 120 V NEMA
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, on-line double conversion, 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.

SAFETY	IEC/EN 62040-1: 2019
RFI/EMI	EN62040-2: 2018, Category C2; EN61000-3-2:2014; EN61000-3-3:2013
SURGE IMMUNITY	EN 61000-4-5: 2014
TRANSPORTATION	ISTA 2A

The Quality management grade pertaining to the engineering and manufacturing facility is certificated to conform to the ISO 9001 international standards, specifically catering to the design and production of power protection systems for computers and other sensitive electronic devices.

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:

A. **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.

B. **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 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.

1.3.2 Design Requirements

A. Voltage

Input/output voltage specifications of the UPS shall be:

- **Input:** 60 - 150VAC, 50/60Hz, single-phase, 2-wire-plus-earth.
- **Output:** 110VAC default (user configurable: 110V, 120V, 127V) ±1%, 50/60Hz, single-phase, 2-wire-plus-earth.

B. Output Load Capacity

Specified output load capacity of the UPS shall be:

- 1000VA/900 Watts at 0.9 power factor.
- 1500VA/1350 Watts at 0.9 power factor.
- 2000VA/1800 Watts at 0.9 power factor.
- 3000VA/2700 Watts at 0.9 power factor.

C. Internal Battery

The UPS shall utilize valve-regulated, non-spillable, lead acid cells.

D. Reserve Time (with internal battery)

- 1000VA: 3 minutes
- 1500VA: 3 minutes
- 2000VA: 3 minutes
- 3000VA: 3 minutes

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

E. Battery Recharge

The UPS shall contain an internal battery charger designed to prolong battery life. Recharge time for UPS internal batteries shall be 4 hours to 90% capacity (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 ≤2000m elevation.
- Any ambient temperature within the specified operating range of 0°C to 40°C

1.3.3.1 AC Input to UPS

A. Voltage Configuration

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

Load Level	110 VAC Input Voltage <35ºC Amb. Temp.	110 VAC Input Voltage 35º < Amb. Temp. < 40ºC
81% - 100%	90VAC	100VAC
71% - 80%	80VAC	90VAC
61% - 70%	70VAC	80VAC
<60%	60VAC	70VAC

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 60Hz. Once started the input frequency operating window shall be 40-70Hz.

The UPS will be able to operate in frequency converter mode, so that it is will be able to deliver an output frequency at the output (50Hz or 60Hz) even if a different frequency is at the UPS input (within operation range).

C. **Input Power Factor:** ≥0.95 at nominal input and full load condition.

D. **Input Current reflected distortion:** ≤12% THDi maximum, with nominal input and full resistive load condition

E. **Input power cord:**

UPS rating	Input power cord
1000VA	NEMA 5-15P
1500VA	NEMA 5-15P
2000VA	NEMA L5-20P
3000VA	NEMA L5-30P

F. 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
1000VA	9.3A
1500VA	13.9A
2000VA	18.6A
3000VA	27.3A

G. Inrush Current (initial startup, no load)

The UPS shall have a maximum inrush time of <1ms.

H. Surge Protection

UPS shall include MOV ratings at 440 Joules minimum connected L-N.

I. Input voltage in bypass mode

Input voltage for operation in bypass mode will be between 90V and 132V.

1.3.3.2 AC Output, UPS Inverter

A. Voltage Configuration
110VAC default, 50/60Hz, single-phase, 2-wire-plus-earth, LCD or configuration program selectable (110V, 120V, 127V).

B. Voltage Regulation
± 1% steady state.

C. Frequency Regulation
±3Hz synchronized to utility / mains, or ±0.5% for on-battery operation.

D. Frequency Slew Rate
1.0Hz per second maximum

E. Voltage Distortion
<3% total harmonic distortion (THD) typical into a 100% linear load,
<6% THD typical into a 100% non-linear (RCD) load with crest factor ratio of 3:1 (100% VA, PF=0.9).

F. Output Power Rating
Output power rating shall be 0.9 lagging power factor as follows:

- 1000VA / 900Watts
- 1500VA / 1350Watts
- 2000VA / 1800Watts
- 3000VA / 2700Watts

UPS will show power derating to 70% for operation in frequency converter mode.

G. Inverter Overload Capability

Nominal output voltage	Overload capability
110V AC	<105% Continuous 105% to 110% transfer to bypass after 10 minutes 110% to 130% transfer to bypass after 30 seconds >130% transfer to bypass after 3 seconds

For either VA or W detection. Warning and transfer to bypass in the periods described.
For on-line or battery mode operation. Assuming ambient temperature <35ºC.

H. Voltage Transient Response
±6% in line mode 20%-100%-20% loading of the UPS
±9% in battery mode for 20%-100%-20% loading of the UPS rating.

I. Transient Recovery Time
To nominal voltage within 200 milliseconds to recover status regulation after full resistive load take on/off.

J. AC-AC Efficiency
The UPS will perform with the efficiencies as below, assuming full resistive load, nominal input voltage and batteries fully charged:

- **1000VA:** 88% AC –AC at full rated linear load
- **1500VA:** 88% AC –AC at full rated linear load
- **2000VA:** 89% AC –AC at full rated linear load
- **3000VA:** 90% AC –AC at full rated linear load

K. Eco mode efficiency: Up to 95%

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature

Operating: The ambient temperature range, when UPS is operational, shall be from 0 – 40ºC. 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.

Ambient Temperature	0 – 40ºC	41ºC – 50ºC
Maximum output load (for nominal conditions)	100% load	70% derating

Storage: -20°C to 50°C

B. Relative Humidity

Operating: 8% to 80% non-condensing.
Storage: 5% to 95% non-condensing.

C. Altitude

3,000m maximum, within the temperature specified in Section 1.4, Item A, and with power derating (1% for every 100 m) when operated >2000m.

D. Audible Noise

The audible noise of the UPS shall be 55 dBA Max @ 1 Meter, assuming batteries fully charged.

1.5 USER DOCUMENTATION AND ITEMS BUNDLED

The specified UPS system shall be supplied with a Safety Instruction & Quick Installation Guide (QIG) for ease of installation and UPS start up. A full user manual will be available for download from a 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.

SW will be available for download from a website in order to allow user customization of UPS operating parameters and UPS local port monitoring and computer/server shutdown. USB data cable is included (type B to type A).

It will include plastic feet for mounting in tower form factor, as well as rail kit for rack mounting.

1.6 WARRANTY

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The replacement for a unit under warranty will follow the country warranty policy in terms of procedure. This includes shipment to the Authorized Service Center (CAS), for diagnostic of the warranty claim and replacement of the equipment when applicable. Optional one (1) and three (3) year full coverage extension warranties shall be available from the manufacturer (depending on country).

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 systems 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 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 enclosure and shall meet the requirements of IP20. The UPS cabinet shall be cleaned, primed and painted RAL 9004 Black.

Unit dimensions and weights shall be (rack mount orientation):

UPS rating	Dimensions D x W x H (mm)	Weight (kgs.)
1000VA	310 x 438 x 86	11.4
1500VA	410 x 438 x 86	16.7
2000VA		19.5
3000VA	630 x 438 x 86	27.9

The UPS shall be able for mounting in rack or in tower form factor, using the accessories that may be required.

2.1.3 Matching Battery Cabinets

The optional Rack-Tower battery cabinet shall contain valve-regulated, non-spill able, lead acid cells, housed in a separate cabinet that matches the UPS cabinet styling. The cabinet shall be cleaned and painted Black RAL 9004. The external battery system shall be sized to provide an additional reserve power specified in section 1.3.2 to the load. The matching battery cabinet shall include detachable, molded interconnect cable, circuit breaker over current protection and provisions for daisy-chain connection of additional battery cabinets. The dimensions and weight information of each optional external battery cabinet shall not exceed below values.

UPS rating	Compatible External Battery Cabinet Dimensions D x W x H (mm)	Weight (kgs.)
1000VA	410 x 438 x 86	16.2
1500VA	410 x 438 x 86	21.2
2000VA	510 x 438 x 86	28.6
3000VA	630 x 438 x 86	40.8

2.1.4 Cooling

The UPS shall be forced-air cooled by an internally mounted, continuously operating fan and variable speed depending on the load 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 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 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 have resettable input circuit breakers.

2.2.1.3 Battery Recharge

The UPS shall contain an internal battery charger designed to prolong battery life. Recharge time for the internal UPS batteries shall be 4 hours to 90% capacity (full load discharge rate, internal batteries). 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 130% 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 Output Frequency

An oscillator shall control the output frequency of the UPS. The inverter shall maintain the output frequency to ±0.5% of nominal frequency during Battery mode, Frequency Converter mode or when otherwise not synchronized to the utility/mains source.

2.2.2.4 Output Protection

The UPS inverter shall employ electronic current limiting circuitry.

2.2.2.5 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 an LCD display.

2.2.3.2 Controls

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

2.2.3.2.1 Control Buttons

The UPS display control button functionality shall be as follows

ON / Mute button:

- Turn on the UPS: Press and hold ON/Mute button for at least 2 seconds to turn on the UPS.
- Mute the alarm: When the UPS is on battery mode, press and hold this button for at least 5 seconds to disable or enable the alarm system. The alarm will be automatically enabled when next warnings or errors occur.
- Up key: Press this button to display previous selection in UPS setting mode.
- Switch to UPS self-test mode: Press and hold ON/Mute button for 5 seconds to enter UPS self-testing while in AC mode, ECO mode, or converter mode.

OFF / Enter button:

- Turn off the UPS: Press and hold this button at least 2 seconds to turn off the UPS. UPS will be in standby mode under power normal or transfer to Bypass mode if the Bypass mode setting is enabled.
- Confirm selection key: Press this button to confirm selection in UPS setting mode.

Select button:

- Switch LCD message: Press this button to change the LCD message for input voltage, input frequency, battery voltage, load percentage, temperature, output voltage and output frequency.
- Setting mode: Press and hold this button for 5 seconds to enter UPS setting mode when UPS is in standby mode or bypass mode.
- Down key: Press this button to display next selection in UPS setting mode.

ON/Mute + Select buttons:

- Switch to bypass mode: When the main power is normal, press ON/Mute and Select buttons simultaneously for 5 seconds. Then UPS will enter to bypass mode. This action will be ineffective when the input voltage is out of acceptable range.

2.2.3.2.2 Display and System Indicators

The UPS display will include company brand and it show the relevant UPS status information, including the following points:

- Load information
- Operation mode information (on-line, bypass, ECO, battery, etc)
- Warning indicator and fault information
- Most relevant UPS information (input voltage, output voltage, frequency, etc)
- Battery information
- Remaining backup time

2.2.3.2.3 Alarms/warning

The following warnings shall be displayed on the display (either in words / codes)

- Low battery
- Overload
- Battery is not connected
- Overcharge
- Charger failure
- Battery fault
- Out of bypass voltage range
- Bypass frequency unstable
- EEPROM error

2.2.3.2.4 Configuration

The UPS Configuration screens shall be provided with the following customizable parameters:

- Output voltage setting
- Frequency converter enable/disable
- Output frequency setting
- ECO enable/disable
- Bypass enable/disable when UPS is off
- Backup time settings
- Battery total AH setting

2.2.4 Bypass

2.2.4.1 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 not 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).

2.2.4.2 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

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

2.2.5 Internal Battery

Valve-regulated, non-spillable, lead acid cells (VRLA) shall be 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 3 minutes reserve time. The expected life of the battery shall be 3-5 years. The UPS units have the capability to allow the operator to replace the internal battery (user replaceable) online without shutting down the UPS system or connected loads.

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.

2.2.5.1 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 to be replaced. The battery test feature shall be user accessible by the push button on the front of the unit and with communication software.

2.3 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
1000VA	(8) NEMA 5-15R
1500VA	(8) NEMA 5-20R
2000VA	(8) NEMA 5-20R
3000VA	(6) NEMA 5-20R (1) NEMA 5-30R

2.4 COMMUNICATION OPTIONS

2.4.1 Communication slot

The UPS shall include one (x1) communication port to allow the user to field-install an optional communication card. A Vertiv interface card may be installed during any state of UPS operation (On, Standby or Off states). Available Vertiv optional cards are described below:

Vertiv Web Card

The optional Vertiv Web Card shall deliver SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network.

Vertiv 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 (Utility failure), Bypass Active, Low Battery, UPS Fault and On UPS. The contacts shall be rated for 24VDC at 1A. Connections shall be to a DB9 female connector with cable provided by the end user.

2.4.2 USB Port

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

2.4.3 Serial Port

A serial port shall be made available with a DB9F connector on the rear of the UPS. This connector shall communicate with a monitoring and shutdown software for use with the UPS configuration program.