

Liebert® GXT3™

500-3000VA Rack-Tower & 1000VA Mini-Tower models 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.

120 and 208V Nominal Units

- UL Standard 1778, c-UL
- CSA 22.2 No. 107.1
- ANSI C62.41, Category A, Level 3
- IEC 61000-3-2
- EN62040-2
- EN61000-4-2
- EN61000-4-3
- EN61000-4-4
- EN61000-4-5
- EN61000-4-6
- FCC Part 15, Class A
- ISTA Procedure 1A
- RoHS Compliant

230 Volt Nominal Units

- EN 62040-1:2008
- CE compliance mark
- EN50091-1-1
- EN50091-2, Class B
- EN50082-1
- EN62040-2
- EN61000-4-2
- EN61000-4-3
- EN61000-4-4
- EN61000-4-5
- EN61000-4-6
- EN61000-3-2
- ISTA Procedure 1A
- RoHS Compliant
- 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:

- 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 either the PFC rectifier or the battery and 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. 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 assume 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 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.
- 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, overtemperature, DC bus overvoltage or inverter failure conditions.

1.3.2 Design Requirements

A. Voltage: Input/output voltage specifications of the UPS shall be:

Input

- **120V units:** 0 - 140VAC, 50/60Hz, single-phase, 2-wire-plus-ground.
- **208V units:** 0 - 280VAC, 50/60Hz, single-phase, 2-wire-plus-ground.
- **230V units:** 0 - 280VAC, 50/60Hz, single-phase, 2-wire-plus-earth.

Output

- **120V units:** 120VAC (user configurable: 110V, 115V, 120V, 127V) $\pm 3\%$, 50/60Hz, single-phase, 2-wire-plus-ground.
- **208V units:** 208VAC (user configurable: 208V, 220V, 230V, 240V) $\pm 3\%$, 50/60Hz, single-phase, 2-wire-plus-ground.
- **230V units:** 230VAC (user configurable: 220V, 230V, 240V) $\pm 3\%$, 50/60Hz, single-phase, 2-wire-plus-earth.

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

- 500VA/450 Watts at 0.9 lagging power factor.
- 700VA/630 Watts at 0.9 lagging power factor.
- 1000VA/900 Watts at 0.9 lagging power factor.
- 1500VA/1350 Watts at 0.9 lagging power factor.
- 2000VA/1800 Watts at 0.9 lagging power factor.
- 3000VA/2700 Watts at 0.9 lagging power factor.

C. Internal Battery: Valve-regulated, non-spillable, lead acid cells.

D. Reserve Time:

- 500VA minimum: 14 minutes
- 700VA minimum: 9 minutes
- 1000VA minimum: 5 minutes
- 1500VA minimum: 4 minutes
- 2000VA minimum: 4 minutes
- 3000VA minimum: 4 minutes

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

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

1.3.3 Performance Requirements

1.3.3.1 AC Input to UPS

A. Voltage Configuration: The UPS shall operate at these values without drawing power from the batteries.

- **120VAC** - Single phase, 2 wire plus ground nominal; variable based upon output loading:

500/700/1000/1000MT VA 120VAC Models

Load	Transfer Voltage	Comeback Voltage
0%	86VAC	93VAC
70%	78VAC	85VAC
30%	60VAC	68VAC

1500/2000/3000VA 120VAC Models

Load	Transfer Voltage	Comeback Voltage
90%	97VAC	104VAC
70%	78VAC	85VAC
30%	61VAC	68VAC

- **208VAC** - Single phase, 2 wire plus ground nominal; variable based upon output loading:

Load	Transfer Voltage	Comeback Voltage
90%	169VAC	183VAC
70%	151VAC	165VAC
30%	116VAC	130VAC

- **230VAC** - Single phase, 2 wire plus earth nominal; variable based upon output loading:

700/1000/1500/2000VA Models

Load	Transfer Voltage	Comeback Voltage
90%	169VAC	183VAC
70%	151VAC	165VAC
30%	116VAC	130VAC

3000VA Model

Load	Transfer Voltage	Comeback Voltage
90%	185VAC	199VAC
70%	162VAC	176VAC
30%	116VAC	130VAC

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 (120VAC and 208VAC units) and 50Hz (230VAC units). Once started the frequency operating window shall be 40-70Hz.

Three frequency settings shall be available in the Liebert GXT3 Configuration program: Auto frequency sensing (factory default setting), 50Hz frequency conversion and 60Hz frequency conversion.

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

D. Input Current reflected distortion: 5% THD typical.

E. Input Current Ratings

UPS Model #	120VAC Units	230VAC Units	208VAC Units
500RT	4.2A	N/A	N/A
700RT	5.8A	2.9A	N/A
1000RT	8.3A	3.9A	N/A
1000MT	8.3A	N/A	N/A
1500RT	12A	5.9A	N/A
2000RT	16A	7.8A	N/A
3000RT120	24A	11.7A	N/A
3000RT208	N/A	N/A	12.9A

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. Input Line Transient Immunity: UPS shall conform to an input line transient conforming to IEEE C62.41, Category A, Level 3 tests for 120VAC and 208VAC models. The 230VAC models shall meet EN61000-4-5.

H. Surge Protection

- **120VAC units:** MOV ratings shall be 175V, 80 Joules minimum connected L-N.
- **208VAC units:** MOV ratings shall NOT BE LESS THAN 320V, 80 Joules minimum connected L1-L2, L1-G and L2-G.
- **230VAC units:** MOV ratings shall NOT BE LESS THAN 320V, 80 Joules minimum connected L-N.

1.3.3.2 AC Output, UPS Inverter**A. Voltage Configuration**

- **120V units:** 120VAC, 50/60Hz, single-phase, 2-wire-plus-ground, configuration program selectable (110V, 115V, 120V, 127V).
- **208V units:** 208VAC, 50/60Hz, single-phase, 2-wire-plus-ground, configuration program selectable (208V, 220V, 230V, 240V).
- **230V units:** 230VAC, 50/60Hz, single-phase, 2-wire-plus-earth, configuration program selectable (220V, 230V, 240V).

B. Voltage Regulation: +3% steady state.

C. Frequency Regulation: $\pm 5\%$ synchronized to utility / mains. $\pm 0.1\text{Hz}$ free running or 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, $< 5\%$ THD typical into a 100% non-linear load with crest factor ratio of 3:1.

F. Load Power Factor Range: The rated load power factor will be 0.9 lag.

G. Output Power Rating: 500VA/450 Watts, 700VA/630 Watts, 1000VA/900 Watts, 1500VA/1350 Watts, 2000VA/1800 Watts and 3000VA/2700 Watts at 0.9 lagging power factor.

H. Inverter Overload Capability: 105% - 125% for 5 minutes
125% - 150% for 1 minute
150% - 200% for 2 seconds
>200% for 0.25 seconds

I. Voltage Transient Response: $\pm 7\%$ in line mode 0-100-0 % loading of the UPS
 $\pm 7\%$ in battery mode for 0-100-0% loading of the UPS rating.

J. Transient Recovery Time: To nominal voltage within 90 milliseconds.

K. Efficiency: $\geq 89\%$ AC to AC, minimum

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature

Operating: The ambient temperature range, when UPS is operational, shall be from 32°F to 77°F (0°C to 25°C). There shall not be any degradation in the performance when operating in this range.

Ambient Temperature	78-86°F ±5°F (26-30°C ±3°C)	87-95°F ±5°F (31-35°C ±3°C)	96-104°F ±5°F (36-40°C ±3°C)
Max Output Power Factor degradation @ max load	100%-93%	92%-86%	85%-79%

Storage: 5°F to 122°F (-15°C to 40°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:

- **500/700/1000VA:** <43dBA max @ 1 meter front and side
- **1500VA:** <45dBA max @ 1 meter from front and side, <46dBA max @ 1 meter from rear
- **2000VA - 3000VA:** <48dBA max @ 1 meter from front and side, <48dBA max @ 1 meter from rear

E. Electrostatic Discharge

The UPS shall be able to withstand an electrostatic discharge compliant to ENC61000-4-2.

1.5 USER DOCUMENTATION

The specified UPS system shall be supplied with one (1) user manual. The user manual shall include installation drawings and 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 to and from the customer site. Optional one (1) and three (3) year full coverage extension warranties shall be available from Emerson Network Power.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer Qualifications

More than 30 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. These tests shall include operational discharge and recharge tests on the internal battery to ensure performance.

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, 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. The internal battery unit shall be shipped separately and shall be installed during the UPS installation process.

Dimensions and weights shall be:

Model	Dimensions W x D x H, in. (mm)	Weight lb. (kg)
500RT	16.9 x 19.7 x 3.4 (430 x 497 x 85)	37 (16.8)
700RT	16.9 x 19.7 x 3.4 (430 x 497 x 85)	37 (16.8)
1000RT	16.9 x 19.7 x 3.4 (430 x 497 x 85)	37 (16.8)
1000MT	6.9 x 15.4 x 8.9 (175 x 390 x 225)	38 (17)
1500RT	16.9 x 19.7 x 3.4 (430 x 497 x 85)	51 (23.2)
2000RT	16.9 x 19.7 x 3.4 (430 x 497 x 85)	52 (26)
3000RT	16.9 x 23.7 x 3.4 (430 x 602 x 85)	71 (32.4)

2.1.3 Cooling

The UPS shall be forced air cooled by an internally mounted, continuous fan. 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 AC Input Current Limit

The input converter shall be provided with AC input current limiting whereby the maximum input current is limited to 125% of the full load input current rating.

2.2.1.3 Input Protection

The UPS shall have built-in protection against undervoltage, overcurrent and overvoltage conditions including low-energy lightning surges, introduced on the primary AC source. The 120 and 208VAC models shall be able to sustain input surges without damage per criteria listed in ANSI C62.41, Category A, Level 3. The 230VAC UPS shall be able to sustain input surges without damage per criteria listed in EN61000-4-5. The 120V, 208V and 230V models shall have circuit breakers.

2.2.1.4 Battery Recharge

The UPS shall contain a three-stage battery charger designed to prolong battery life. Recharge time for the internal UPS batteries 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 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 Undervoltage Shutdown (End of Discharge)
- DC Undervoltage Warning (Low Battery Reserve); factory default set at 2 minutes (user configurable 2 to 30 minutes).

2.2.2.4 Output Frequency

The inverter shall hold the output frequency to ± 0.1 Hz of nominal when 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 overdischarging, the UPS control logic shall automatically raise the shutdown voltage setpoint; depending on output load 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 status and alarm indicators shall be displayed on an LED display.

2.2.3.2 System Indicators

UPS status shall be indicated by five symbols: fault indicator, AC input indicator, battery indicator, inverter indicator and bypass indicator.

- The **Fault Indicator** shall illuminate Red if the UPS has detected a fault; and shall be Off if there is no fault.
- The **AC Input Indicator** shall illuminate Green when the utility input power is normal; shall be Off during utility failure; and shall flash when a Line-to-Neutral reversal occurs in the AC input power supply or when there is a loss of proper grounding for the UPS.
- The **Battery Indicator** shall illuminate Amber when the battery is supplying power; and shall be Off when the battery is not supplying power.
- The **Inverter Indicator** shall illuminate Green when the inverter is supplying power; and shall be Off when the inverter is not supplying power.
- The **Bypass Indicator** shall illuminate Amber when the bypass is supplying power; shall be Off when the inverter is not supplying power; and shall flash when utility power is outside specifications.

2.2.3.3 Controls

UPS startup and shutdown operations shall be accomplished by the ON and OFF push buttons on the front panel of the UPS. The ON push button shall be a means to turn the UPS on and also to manually test the battery and reset active visual and audible alarms. Pressing the OFF push button once shall allow manual transfers of the load from the inverter to bypass power. Pressing the OFF push button twice within a four-second time period when the UPS is in Bypass mode shall completely shut down the UPS and its connected load in normal and battery mode.

2.3 ON-LINE BATTERY TEST

The UPS shall feature an automatic battery test with the factory default test interval set at every 2 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 every 7, 14, 21 or 28 days through the GXT3 User Configuration Program.

2.4 BYPASS

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 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).

2.4.2 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 overtemperature PFC failure
- Inverter failure
- DC bus overvoltage

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

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 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 7 minutes reserve time. The expected life of the battery shall be 3-5 years or a minimum 250 complete discharge cycles. The UPS units have the capability to allow the operator to replace the internal battery.

2.6 OUTPUT DISTRIBUTION

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

Model	120VAC Units	230VAC Units	208VAC Units
500RT	(6) NEMA 5-15R	N/A	N/A
700RT	(6) NEMA 5-15R	(6) EN60320/C13	N/A
1000RT	(6) NEMA 5-15R	(6) EN60320/C13	N/A
1000MT	(6) NEMA 5-15R	N/A	N/A
1500RT	(6) NEMA 5-15R	(6) EN60320/C13	N/A
2000RT	(6) 5-20R (T-Slot)	(6) EN60320/03	N/A
3000RT120	(6) 5-20R (T-Slot) (1) NEMA L5-30R	(6) EN60320/03 (1) EN60320/09	N/A
3000RT208	N/A	N/A	(2) NEMA L6-15R (1) NEMA L6-20

2.7 COMMUNICATION OPTIONS

2.7.1.1 Liebert IntelliSlot® Communications

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 Web Card (IS-WEBCARD)

The optional Liebert IntelliSlot Web Card shall deliver SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network. The card shall support 10 and 100 Mbit Ethernet and shall provide for in-the-field upgrade of SNMP firmware. The kit shall include the Liebert IntelliSlot card, MIB, configuration cable and user manual.

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. Connections shall be to a DB25F connector with cable provided by the end user.

2.7.1.2 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 performed by shorting Pin 1 and Pin 2
- Remote Any-Mode Shutdown can be performed by a switch connected to Pin 1 and Pin 2 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.

2.7.1.3 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 can be performed locally or remotely:

- Local Any-Mode Shutdown can be performed by shorting Pin 3 and Pin 4.
- Remote Any-Mode Shutdown can be achieved by a switch connected to Pin 3 and Pin 4 and mounted at a remote location.

On Battery

On Battery signal shall be a Normally Open (NO) dry contact. When the UPS is supplying output power from the battery this dry contact shall be closed.

Low Battery

Low Battery signal shall be a Normally Open (NO) dry contact. When the UPS is supplying output power from the battery and has reached the Low Battery Warning time selected in the configuration program, this dry contact shall be closed.

The rated values for the dry contacts shall be:

- Rated Voltage: 5V
- Working Voltage Range: 4.5-10V
- Rated Current: 30mA

2.8 LIEBERT GXT3 CONFIGURATION PROGRAM

An included Microsoft® Windows®-based (Windows 95 or later) Configuration Program and cable shall allow configuration of UPS features and operating parameters to meet specific application requirements, if required. Options that are configurable via this program shall include:

- Select one of five input/output voltages to match voltages found around the world.
- Enable / Disable Auto-Restart.
- Disable the Line-Neutral-Reversal/Missing-Ground receptacle wiring alarm.
- Select frequency converter operation with a fixed output frequency of 50 or 60Hz.
- Set the Low Battery Warning alarm time from 2 to 30 minutes.
- Disable the Auto-Battery test.
- Set the Auto-Battery test to 7, 14, 21 or 28 days.
- Select the number of external battery cabinets connected to the UPS to adjust the remaining run-time calculations reported by the UPS Liebert software products.