



## Liebert GXT3 UPS

### GUIDE SPECIFICATIONS

500 to 3000VA Rack/Tower

1000VA Mini Tower

Single-Phase Uninterruptible Power Supply

## 1.0 GENERAL

### 1.1 SUMMARY

This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty single-phase, solid-state, uninterruptible power system. The uninterruptible power system hereafter referred to as the UPS, will provide high-quality AC power for sensitive electronic equipment loads.

### 1.2 STANDARDS

The UPS is designed in accordance with the 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 Units*

- UL Standard 1778, u-UL
- CSA 22.2, No. 107.1
- ANSI C62.41 Cat A Level 3
- IEC 61000-3-2
- EN 62040-2
- 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 Units*

- EN 62040-1:2008
- CE compliance mark
- EN50091-1-1
- EN50091-2, Class B
- EN50082-1
- EN 62040-2
- 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 is designed to operate as a true on-line double conversion system in the following modes:

**A. Normal** - In normal operation incoming AC power is fed to the input power factor corrected (PFC) rectifier that converts the AC power to DC power for the inverter. In this mode, power is also derived from utility power for the battery charger. The inverter derives DC power from either the PFC rectifier or the battery and regenerates filtered and regulated AC sinewave power for the connected load. The battery will 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 will 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 is supplied by the inverter, which obtains power from the battery. There is 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 automatically restarts and assumes 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 automatically restarts and assumes 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 performs an automatic transfer of the critical AC load from the inverter to the bypass source, in the event of an overload, PFC failure, over temperature, DC Bus over voltage, or inverter failure conditions.

#### 1.3.2 Design Requirements

**A. Voltage:** Input/output voltage specifications of the UPS are:

**Input:**

120V Units: 0 - 140 VAC, 60/50 Hz, single-phase, 2-wire-plus-ground.

208V Units: 0 - 280 VAC, 60/50 Hz, single-phase, 2-wire-plus-ground.

230V Units: 0 - 280 VAC, 50/60 Hz, single-phase, 2-wire-plus-earth.

**Output:**

120 V Units: 120 VAC (user configurable: 110V, 115V, 120V, 127V)  $\pm 3\%$ , 60/50 Hz, single-phase, 2-wire-plus-ground.

208 V Units: 208 VAC (The 208V units can't be reprogrammed for different output voltages)  $\pm 3\%$ , 60/50 Hz, single-phase, 2-wire-plus-ground.

230 V Units: 230 VAC (user configurable: 220V, 230V, 240V)  $\pm 3\%$ , 50/60 Hz, single-phase, 2-wire-plus-earth.

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

500 VA/450 Watts at 0.9 lagging power factor.

700 VA/630 Watts at 0.9 lagging power factor.

1000 VA/900 Watts at 0.9 lagging power factor.

1500 VA/1350 Watts at 0.9 lagging power factor.

2000 VA/1800 Watts at 0.9 lagging power factor.

3000 VA/2700 Watts at 0.9 lagging power factor.

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

**D. Reserve Time:** 500 VA minimum 8 minutes, 700 VA minimum 6 minutes, 1000 VA minimum 4 minutes, 1500 VA minimum 4 minutes, 2000 VA minimum 4 minutes, 3000 VA minimum 4 minutes. These times are at full load with ambient temperature of 25°C (77°F).

**E. Battery Recharge:** The UPS contains a battery recharge rate designed to prolong battery life. Recharge time for UPS internal batteries is 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 operates at these values without drawing power from the batteries.

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

##### 500/700/1000/1000MT VA 120 VAC MODELS

LOAD	TRANSFER VOLTAGE	COMEBACK VOLTAGE
90%	86 VAC	93 VAC
70%	78 VAC	85 VAC
30%	60 VAC	68 VAC

##### 1500/2000/3000 VA 120 VAC MODELS

LOAD	TRANSFER VOLTAGE	COMEBACK VOLTAGE
90%	97 VAC	104 VAC
70%	78 VAC	85 VAC
30%	61 VAC	68 VAC

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

LOAD	TRANSFER VOLTAGE	COMEBACK VOLTAGE
90%	169 VAC	183 VAC
70%	151 VAC	165 VAC
30%	116 VAC	130 VAC

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

##### 700/1000/1500/2000 VA MODELS

LOAD	TRANSFER VOLTAGE	COMEBACK VOLTAGE
90%	169 VAC	183 VAC
70%	151 VAC	165 VAC
30%	116 VAC	130 VAC

##### 3000 VA MODEL

LOAD	TRANSFER VOLTAGE	COMEBACK VOLTAGE
90%	185 VAC	199 VAC
70%	162 VAC	176 VAC
30%	116 VAC	130 VAC

**B. Frequency:** UPS auto senses input frequency when first powered up and will operate within the following frequency specifications. UPS is capable of Cold Start with default frequency of 60 Hz/ 120 VAC and 208 VAC units and 50 Hz/ 230 VAC. Once started frequency operating window

is 40-70 Hz. There are 3 different frequency settings available in the Liebert GXT3 Configuration program: Auto frequency sensing (factory default setting), 50 Hz. frequency conversion, and 60 Hz. frequency conversion.

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

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

**E. Input Current Ratings:**

MODEL	120 VAC Units	230 VAC Units	208 VAC 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	12.0A	5.9A	N/A
2000RT	16.0A	7.8A	N/A
3000RT120	24.0A	11.7A	N/A
3000RT208	N/A	N/A	12.9A

**F. Inrush Current (initial start up, no load):** The UPS has a maximum inrush current of 6 times the full load peak input current.

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

**H. Surge Protection:**

**120 VAC units:** MOV ratings are 175 Volt, 80 Joules minimum connected L-N.

**208 VAC units:** MOV ratings will **NOT BE LESS THAN** 320 Volt, 80 Joules minimum connected L1-L2, L1-G and L2-G.

**230 VAC units:** MOV ratings will **NOT BE LESS THAN** 320 Volt, 80 Joules minimum. They will be connected L-N.

**1.3.3.2 AC Output, UPS Inverter**

**A. Voltage Configuration:**

**120 V Units:** 120 VAC, 60/50 Hz, single-phase, 2-wire-plus-ground, configuration program selectable (110V, 115V, 120V, 127V).

**208 V Units:** 208 VAC, 60/50 Hz, single-phase, 2-wire-plus-ground, configuration program selectable (The 208V unit can't be reprogrammed for any other voltage configuration).

**230 V Units:** 230 VAC, 50/60 Hz, single-phase, 2-wire-plus-earth, configuration program selectable (220V, 230V, 240V).

**B. Voltage Regulation:**  $\pm 3\%$  steady state.

**C. Frequency Regulation:**  $\pm 5\%$  Synchronized to utility / mains.  $\pm 0.1$  Hz free running or on battery operation.

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

**E. Voltage Distortion:**  $\leq 3\%$  total harmonic distortion (THD) typical into a 100% linear load,  $\leq 5\%$  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, 700 VA/630 Watts, 1000 VA/900 Watts, 1500 VA/1350 Watts, 2000 VA/1800 Watts, and 3000 VA/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 secs, and > 200% for .25 seconds.

**I. Voltage Transient Response:** ± 7% in line mode 0-100-0 % loading of the UPS, ± 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:** ≥ 89% AC to AC, minimum

**1.4 ENVIRONMENTAL CONDITIONS**

**A. Ambient Temperature:**

The ambient temperature range, when UPS is operational, will be from 0 deg. C to 25 deg. C. There will not be any degradation in the performance when operating in this range.

Ambient Temperature	25-30 deg C +/- 3 deg C	30-35 deg C +/- 3 deg C	35-40 deg C +/- 3 deg C
Max Output Power Factor degradation @ max load	100%-93%	93%-86%	86%-79%

Storage: -15<sup>0</sup> C to +40<sup>0</sup> C (+ 5<sup>0</sup> F to +122<sup>0</sup> F)

**B. Relative Humidity:**

Operating: 0 to 95% non-condensing.

Storage: 0 to 95% non-condensing.

**C. Altitude:**

3,000 m / 10,000 ft. max., without power derating when operated within the temperature specified in section 1.4.A. ambient temperature will be derated 5° C for each additional 500 meters.

**D. Audible Noise:**

The audible noise of the UPS will 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 is able to withstand an electrostatic discharge compliant to ENC61000-4-2.

**1.5 USER DOCUMENTATION**

The specified UPS system is supplied with one (1) user manual. The user manual includes 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 warrants the UPS against defects in materials and workmanship for two (2) years. The no-hassle replacement warranty includes shipping to and from the customer site. Optional one (1) and three (3) year full coverage extension warranties are available.

## 1.7 QUALITY ASSURANCE

### 1.7.1 Manufacturer Qualifications

A minimum of thirty year's experience in the design, manufacture, and testing of solid-state UPS systems is required. The manufacturer is certified to ISO 9001:2008.

### 1.7.2 Factory Testing

Before shipment, the manufacturer fully and completely tests the system to assure compliance with the specification. These tests include operational discharge and recharge tests on the internal battery to assure performance.

## 2.0 PRODUCT

### 2.1 FABRICATION

All materials and components making up the UPS are new, of current manufacture, and have not been in prior service except as required during factory testing. All relays are provided with dust covers.

#### 2.1.2 Wiring

Wiring practices, materials, and coding are in accordance with the requirements the standards listed in section 1.2 and other applicable codes and standards. All wiring is copper.

#### 2.1.3 Cabinet

The UPS unit is comprised of: input converter, battery charger, inverter, and battery consisting of the appropriate number of sealed battery cells; and is housed in a rack - tower NEMA type 1 enclosure and meet the requirements of IP20. The UPS cabinet is painted RAL7021 (black). Dimensions and weights are:

MODEL	DIMENSIONS (D x W x H)	WEIGHT
500RT	19.7" x 16.9" x 3.4" (497mm x 430mm x 85mm)	37lbs (16.8kg)
700RT	19.7" x 16.9" x 3.4" (497mm x 430mm x 85mm)	37lbs (16.8kg)
1000RT	19.7" x 16.9" x 3.4" (497mm x 430mm x 85mm)	37lbs (16.8kg)
1000MT	15.4" x 6.9" x 8.9" (390mm x 175mm x 225mm)	38lbs (17kg)
1500RT	19.7" x 16.9" x 3.4" (497mm x 430mm x 85mm)	52lbs (26kg)
2000RT	19.7" x 16.9" x 3.4" (497mm x 430mm x 85mm)	52lbs (26kg)
3000RT	23.7" x 16.9" x 3.4" (602mm x 430mm x 85mm)	72lbs (32.4kg)

#### 2.1.4 Cooling

The UPS is forced air cooled by an internally mounted, continuous fan. Fan power is provided from the internal DC supply. Air intake is 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 is converted to a regulated DC output by the input converter for supplying DC power to the inverter. The input converter provides input power factor correction and input current distortion reduction.

#### 2.2.1.2 AC Input Current Limit

The input converter is 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 has built-in protection against undervoltage, overcurrent, and overvoltage conditions including low-energy lightning surges, introduced on the primary AC source. The 120 and 208 VAC models can sustain input surges without damage per criteria listed in ANSI C62.41 Cat A Lev3. The 230 VAC UPS can sustain input surges without damage per criteria listed in EN61000-4-5. The 120V, 208 V and 230V models have circuit breakers.

#### 2.2.1.4 Battery Recharge

The UPS contains a battery recharge rate designed to prolong battery life. The battery is 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 UPS batteries shall be five (3) hours maximum to 90% capacity (full load discharge rate). There is DC overvoltage protection so that if the DC voltage exceeds the pre-set limit, the UPS will shutdown automatically and the critical load is transferred to bypass.

### 2.2.2 Inverter

#### 2.2.2.1 General

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

#### 2.2.2.2 Overload

The inverter is capable of supplying current and voltage for overloads exceeding 100% and up to 200% of full load current. A visual indicator and audible alarm indicates overload operation. For greater currents or longer time duration, the inverter has electronic current-limiting protection to prevent damage to components. The inverter is self-protecting against any magnitude of connected output overload. Inverter control logic senses and disconnects the inverter from the critical AC load without the requirement to clear protective devices.

#### 2.2.2.3 Inverter DC Protection

The inverter is 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 holds the output frequency to  $\pm 0.1$  Hz of nominal when not synchronized to the utility/mains source.

#### 2.2.2.5 Output Protection

The UPS inverter employs electronic current limiting circuitry.

#### 2.2.2.6 Battery Over Discharge Protection

To prevent battery damage from over discharging, the UPS control logic automatically raises the shutdown voltage set point; dependent upon output load at the onset of battery operation.

### **2.2.3 Display and Controls**

#### **2.2.3.1 General**

The UPS is 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 are displayed on an LED display.

#### **2.2.3.2 System Indicators**

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

The "Fault" Indicator illuminates Red if the UPS has detected a fault; and is Off if there is no fault.

The "AC Input" Indicator illuminates Green when the utility input power is normal; is Off during utility failure; and flashes when a Line-to-neutral reversal in the AC input power supply or a loss of proper grounding for the UPS.

The "Battery" Indicator illuminates Amber when the battery is supplying power; and is Off when the battery is not supplying power.

The "Inverter" Indicator illuminates Green when the inverter is supplying power; and is Off when the inverter is not supplying power.

The "Bypass" Indicator illuminates Amber when the bypass is supplying power; is Off when the inverter is not supplying power; and flashes when utility power is outside specifications.

#### **2.2.3.3 Controls**

UPS start-up and shutdown operations are accomplished by the "ON" and "OFF" push buttons located on the front panel of the UPS. The "ON" push button is a means to turn the UPS on and also serve as a means to manually test the battery and to reset active visual and audible alarms. The "OFF" push button once allows 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 will completely shut down the UPS and its connected load in normal and battery mode.

### **2.2.4 On-Line Battery Test**

The UPS is provided with an automatic biweekly battery test feature (factory default). Via the GXT3 configuration program on a Windows based PC the automatic battery test can be disabled or configured to operate every 7, 14, 21, or 28 days.

The battery test will ensure the capability of the battery to supply power to the inverter while loaded. If the battery fails the test, the UPS will display a warning message to indicate the internal batteries need replaced. The battery test feature is user accessible by the push button located on the front of the unit and with Communications Software. The Automatic Battery test feature is capable of being disabled through the GXT3 User Configuration Program.

### **2.2.5 Bypass**

#### **2.2.5.1 General**

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

#### **2.2.5.2 Automatic Transfers**

The transfer control logic automatically activates the bypass, 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

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

**2.2.6. Internal Battery**

Valve regulated, non-spillable, flame-retardant lead acid cells are used as a stored-energy source for the specified UPS system. The battery is 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.

**2.2.7. Output Distribution**

Output distribution is integral to the UPS, and located on the rear of the unit.

MODEL	120 VAC Units	230 VAC Units	208 VAC Units
500RT	(6) NEMA 5-15R	N/A	N/A
700RT	(6) NEMA 5-15R	(6) EN 60320/C13	N/A
1000RT	(6) NEMA 5-15R	(6) EN 60320/C13	N/A
1000MT	(6) NEMA 5-15R	N/A	N/A
1500RT	(6) NEMA 5-15R	(6) EN 60320/C13	N/A
2000RT	(6) NEMA 5-20R T-slot	(6) EN 60320/C13	N/A
3000RT120	(6) NEMA 5-20R T-slot, (1) NEMA L5-30R	(6) EN 60320/C13, (1) EN 60320/C19	N/A
3000RT208	N/A	N/A	(2) NEMA L6-15R, (1) NEMA L6-20

**2.2.8 Communication Options**

**2.2.8.1 Liebert Intellislot™ Communications**

The UPS includes 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 IS-WEBCARD**

The IS-WEBCARD option delivers SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network. The card supports 10 and 100 Mbit Ethernet and provides for in-the-field upgrade of SNMP firmware. The kit includes the Intellislot card, MIB, configuration cable and installation manual.

**Liebert Relay Interface Card**

This RELAYCARD-INT option provides contact closures 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 are rated for 24 volts AC or DC at 1A. Connections are to a DB25F connector with cable provided by the end user.

**2.8.8.2 Any-Mode Shutdown**

The purpose of Any Mode Shutdown is 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 Pin1 and Pin 2
- Remote Any Mode Shutdown can be performed by a switch connected to Pin1 and Pin2 and mounted at a remote location.

Remote Power Off will 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) will be available from the UPS.

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

Any Mode Shutdown wiring must conform to all national, regional and local wiring regulations.

### **2.8.8.3. Battery Mode Shutdown**

Battery Mode Shutdown permits 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 is a Normally Open (NO) dry contact. When the UPS is supplying output power from the battery this dry contact will be closed.

#### **Low Battery**

Low Battery signal is 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 will be closed.

The rated values for the dry contacts are:

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

## **2.2.9 Liebert GXT3 Configuration Program**

An included Windows<sup>™</sup> based (Win95 or later) Configuration Program and cable allows for configuration of UPS features and operating parameters to meet specific application requirements, if required. Options that are configurable via this program 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 60 Hz.
- 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, 28 days.
- Select the number of external battery cabinets connected to the UPS to adjust the remaining runtime calculations reported by the UPS Liebert software products.