Liebert® PSA5™ UPS

GUIDE SPECIFICATIONS  
500VA to 1500VA  
Single-Phase Uninterruptible Power Supply Systems

# GENERAL

## 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.

## 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 will govern.

500-1500VA, 120V Models

cTUVus Listed and Labeled (certified to UL STD 1778 5th Edition and CSA 22.2 No. 107.3:2014)

FCC Part 15, Subpart B, Class B

EN61000-4-5, Level 2 (L-N), Level 3 (L-G)

ISTA Procedure 1A

RoHS2/REACH/WEEE

Energy Star Qualified

## SYSTEM DESCRIPTION

### Modes of Operation

The UPS is designed to operate as a line-interactive system in the following modes:

1. **On/Normal Mode** – The UPS input is plugged into a stable, nominal source. The critical AC load is continuously supplied with filtered power. The internal batteries are charging.
2. **On/Automatic Voltage Regulation (AVR) Mode** - During input power source abnormalities, the AC output power is corrected by means of automatic voltage regulator (AVR). Operation of the AVR circuitry automatically maintains appropriate output voltage for the connected equipment. Operation of the AVR circuitry shall not discharge the battery.
3. **On/Battery Mode** – The UPS Input is not plugged in, or the source has become extremely low or unusable. The UPS automatically switches to the internal battery to provide normal, usable voltage to the battery-backed outlets.
4. **Fault Mode** – An error or fault condition has occurred. The battery-backed outlets are shut off and the internal batteries are not charging.  
   The surge only outlets may still have power if the UPS input is plugged in.
5. **Battery Self-test Mode**- The UPS enters a cycle of approximately 10 seconds which it tests the internal battery. The battery-backed outlets are still temporarily powered by the internal battery. Self-test mode occurs at start up and regular intervals during operation.

### Design Requirements

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

120VAC Models:

Input: 86-143 VAC, 60Hz, single-phase, 2-wire-plus-ground.

Output (on utility): 120 VAC, -15/+23 VAC, 60Hz, single-phase, 2-wire-plus-ground.

Output (on battery): 120 VAC, ±5%, 60Hz, single-phase, 2-wire-plus-ground.

1. Output Load Capacity: Maximum specified output load capacity of the UPS, regardless of load power factor, is:
   * + 500VA / 300W
     + 700VA / 420W
     + 1000VA / 600W
     + 1500VA / 900W
2. Internal Battery: The battery consists of valve regulated, non-spillable, maintenance-free, sealed, lead-acid cells. The battery is user replaceable and hot swappable, not requiring the UPS to be powered off.
3. Battery Reserve Time: Run times are approximate. Based upon new, fully charged standard battery models at a temperature of 77°F (25°C).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Model Rating | | | |
| Load % Capacity | 500VA/300W | 700VA/420W | 1000VA/600W | 1500VA/900W |
| 50% | 8 | 8 | 7 | 11 |
| 100% | 2 | 2 | 2 | 3 |

1. Battery Recharge: The UPS contains a battery recharge rate designed to prolong battery life. Recharge time is 12 hours to 90% capacity after a complete discharge into full resistive load.

### Performance Requirements

#### AC Input to UPS

1. Voltage Configuration: The UPS operates at these values without drawing power from the batteries.

120 VAC nominal: single phase, 2-wire-plus-ground: 86 - 143 VAC (±5%)

1. Frequency: The UPS automatically senses the input frequency and operates within the following frequency specifications without drawing power from the batteries.

60 Hz Applications: 55 - 65 Hz (±1 Hz)

1. Surge Protection:   
   The UPS units can withstand input surges of up to 316J without damage per criteria listed in EN61000-4-4, Category B, Level 2 on the AC input for 120VAC models.
2. Input Connections:   
   The 120 VAC units shall have an attached input cord 6 feet (1.8 meters) in length, with a NEMA 5-15 plug.

#### AC Output

1. Voltage Configuration:

120 VAC units: 120 VAC, 60 Hz, single-phase, 2-wire-plus-ground

1. Voltage Regulation: ±5% steady state, battery operation.
2. Frequency Regulation: Same as utility / mains in normal mode operation, + 1.0% while in battery mode operation.
3. Load Power Factor Range: 0.5 lagging to 1.0 (unity).
4. Inverter Overload Capability:

All Models (Normal or AVR Mode)

* + - 105% - Alarm warning
    - 120% - Alarm warning and shutdown after 1 minute
    - 130% - Alarm warning and shutdown after 10 seconds
    - 150% - Alarm warning and immediate shutdown

All Models (Battery Mode)

* + - 120% - Alarm warning and shutdown after 20 seconds
    - 130% - Alarm warning and shutdown after 10 seconds
    - 150% - Alarm warning and immediate shutdown

1. Tranfer Time: 6ms Typical, 10 ms Max
2. Efficiency:

All Models: >90% (On/Normal Mode)

## ENVIRONMENTAL CONDITIONS

1. Ambient Temperature

**Operating**:

32 - 104°F (0 - 40°C) for altitudes 0 – 9,842 ft. (0 - 3000 meters) above sea level, no derating

77o F (25oC) for optimum battery performance

**Storage**:

5 - 113°F (-15 to 45°C) with batteries for altitudes 0 - 49,210 ft. (0 - 15000 meters) above sea level

68oF (20oC) for optimum battery storage and battery shelf life

1. Relative Humidity: 0 - 95% non-condensing
2. Altitude: 10,000 ft. (3,000 m) maximum without power derating when operated within the temperature specified in section 1.4.A. Ambient temperature shall need to be reduced 41°F (5°C) for each additional 1640 ft. (500 m) above 10,000 ft. to avoid power derating.
3. Audible Noise

Noise generated by the UPS shall be < 40dBA during normal operation and < 45dBA during battery mode operation, when measured at 1 meter from any surface of the UPS.

1. Electrostatic Discharge

The UPS units shall be able to withstand an electrostatic discharge compliant to EN61000-4-2, level 3 for air discharge; EN61000-4-2, level 2 for contact discharge without damage and without affecting the connected load.

## USER Accessories and Packaging

The specified UPS system shall be supplied with a printed Quick-Start guide/manual. The manual includes drawings and instructions, a functional description of the equipment, safety precautions, illustrations, operating procedures, and general maintenance guidelines.

The UPS shall also be supplied with (1) USB cable (6-ft; 1.8m). The 660-850VA models shall also include (1) Coax cable (3-ft; 1m). The packaging shall meet the requirements of ISTA Procedure 1A

## WARRANTY

The manufacturer warrants the UPS against defects in materials and workmanship for three (3) years. The warranty covers all parts. An optional one (1) or three (3) year extended warranty is available from the manufacturer.

The user shall not have to pay freight or provide a credit card number for the manufacturer’s standard warranty support. The manufacturer shall cover any freight to ship the replacement unit (next day freight) and shall provide a return call tag to cover freight to have the original unit returned to the manufacturer.

## QUALITY ASSURANCE

### Manufacturer Qualifications

The manufacturer shall have more than forty-five (45) years’ experience in the design, manufacture, and testing of solid-state UPS systems and the company shall be certified to ISO 9001.

### Factory Testing

Before shipment, each product shall be tested to assure compliance with the specification.

# PRODUCT

## 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.

### Wiring

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

### Cabinet

The UPS unit comprised of: TVSS & EMI/RFI Filters, Battery Charger, Inverter, Automatic Voltage Regulator and Battery consisting of the appropriate number of sealed battery cells; is housed in a mini-tower NEMA type 1 enclosure with IP20 protection. The UPS cabinet shall be injection-molded in the manufacture’s standard color. Dimensions and weights shall be:

|  |  |  |
| --- | --- | --- |
| 120 VAC MODEL | UNIT DIMENSIONS  W x D x H in (mm) | UNIT WEIGHT  lb (kg) |
| 500VA | 3.9 x 11.4 x 11 (99 x 290 x 280) | 13 (5.9) |
| 700VA | 15.2 (6.9) |
| 1000VA | 18 (8.2) |
| 1500VA | 3.9 x 16.2 x 11 (99 x 412 x 280) | 25.7 (11.7) |

### Cooling

The 500-1000VA models shall be convection cooled, the 1500VA shall be forced air cooled.

## COMPONENTS and operation

### Input Protection

The UPS has built-in protection against under voltage, over current, and over voltage conditions including low-energy lightning surges introduced on the primary input power source. The UPS shall be provided with an input circuit protector.

### Converters

#### Inverter

The inverter incorporates solid-state devices and control circuitry to convert DC power from the battery. The inverter shall use IGBT devices and shall utilize a pulse width modulated (PWM) design to provide regulated and conditioned simulated-sine wave AC power for supporting the critical load.

#### Battery Charger

The battery charger shall be provided to convert AC power to regulated DC power for battery charging. The UPS contains a battery recharge rate designed to prolong battery life. The battery is constant voltage charged to recharge and maintain the battery in a fully charged state. Recharge time is 8 hours to 90% rated capacity after discharge into full resistive load. The battery charger shall begin to charge batteries once the UPS is connected to an AC source that is within the input specifications defined in section 1.3.3.1.A of this specification whether the UPS is ON or OFF.

#### DC Protection

The following DC shutdown levels protect the UPS:

* DC Over voltage Shutdown
* DC Under voltage Shutdown (End of Discharge)
* DC Under voltage Warning (Low Battery Reserve)

#### Output Protection

For output faults including short circuits and overloads, the UPS is protected by the input circuit protector during Normal mode operation and by electronic current limiting during Battery mode operation.

#### Overload

The UPS shall be capable of supplying power for overloads as specified in section 1.3.3.2- E. A visual indicator and audible alarm indicate overload operation.

#### Output Frequency

An oscillator controls the output frequency of the UPS. The oscillator maintains the output frequency to + 0.5 Hz of nominal when operating from battery power

#### Battery Over-Discharge Protection

To prevent battery damage due to excessive discharge levels, the UPS control logic automatically monitors the battery voltage and load level and switches off the output at the predetermined battery shutdown voltage set point.

### Display and Controls

#### General

The UPS is provided with a microprocessor-based unit status and control display designed for convenient and reliable user operation. The status and alarm indicators are displayed on a status indicator display

#### System Indicators

There shall be an LCD display on all models

The LCD shall provide numerical values of the input voltage and frequency, output voltage and frequency, output watts, battery voltage, and the estimated battery time remaining. There shall also be a separate load capacity bar and battery capacity bar that display in 20% increments.

#### On/Off Controls

UPS start-up and shutdown operations are accomplished by the "On/Off" push button located on the front panel of the UPS. Depressing the button for more than 2 seconds will start-up the UPS and to turn the UPS off the button will need to be depressed for 2 seconds.

#### Scroll

The scroll button shall allow the user to navigate through the numerical parameters on the LCD display.

#### Alarm Silence

There shall be a separate alarm silence button shall also allow the user to silence the audible alarm when unit in battery mode except when operating in overload/low battery/fault condition.

#### Fault Code Indications

The UPS shall indicate a basic fault code for enhanced troubleshooting and diagnostic information in the event of a failure or event.

### Internal Battery

Valve regulated, non-spillable, lead-acid (VRLA) 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 full rated load for the duration provided in section 1.3.2 D. The expected life of the battery shall be 3 - 5 years or 250 complete discharge cycles.

The battery shall be user replaceable, hot-swappable not requiring the connected equipment or the UPS unit itself to be shutdown to replace the internal battery.

### Output Distribution

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

All 120 VAC units shall have (5) NEMA 5-15 receptacles that are surge and battery protected and also have (5) NEMA 5-15 receptacles that are surge protected only.

### Communications – USB Interface Port

The UPS shall have (1) USB Interface Port. The USB connector shall be a Type B connector. The USB interface port shall always be active. The UPS shall be capable of communicating system status and system shutdown via the USB. Hardware shall support and allow operating system communication for Windows 98 and newer. USB port shall be capable of communicating via Liebert MultiLink Shutdown software, which is available. The UPS shall also be provided with a 6 ft. (1.8m) USB cable that is USB Type A to USB Type B for connection between the UPS and a computer.

### Surge Protection – Telephone / Network

The UPS shall have built in surge protection for telephone or computer network connection. The UPS shall contain (2) RJ11/45 connectors to allow either RJ11 (telephone) or RJ45 (network) cables. The UPS shall be capable of proper operation whether this feature is used or not.

### Surge Protection – Coax Cable

The UPS shall have built in surge protection for cable modem, DSS receiver or cable TV converter box connection. The UPS shall contain (2) Coax Cable connectors and shall include (1) 3 ft. (1m) RJ59/U (75 Ohm) coax cable. The UPS shall be capable of proper operation whether this feature is used or not.

### USB Charging Port

The UPS models shall have (2) USB Type A charging port rated for 5 VDC, with a total current of 2.1A max to allow users to charge their mobile devices. The USB charging port shall be able to charge customer’s devices in an ON Mode of operation.