

Uninterruptible Power Supply Systems - Sola 2000
Guide Specifications for a Sola2000 250 to 600 VA
Single - Phase Uninterruptible Power Supply System

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 supply system. The uninterruptible power supply system, hereafter referred to as the UPS, shall provide continuous AC power for sensitive electronic equipment loads.

1.2 STANDARDS

The UPS shall be 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.

115V Units

- UL Standard 1778
- UL Standard 1449
- FCC Part 15, Subpart B, Class B
- IEEE 587, Category A and B
- C-UL (CAN\CSA 22.2 No. 107.1)

230V Units

- EN 50091-1
- EN 55022, Class B
- IEC 801-2
- IEC 801-3
- IEC 801-4
- IEC 801-5
- EN60950
- EN50091-1
- CE compliance mark
- EMC Directive 89/336/EEC

1.3 SYSTEM DESCRIPTION

1.3.1 Modes of Operation

The UPS shall be designed to operate as an off-line system in the following modes:

- A. **Normal** - The critical AC load is continuously supplied with filtered power. The battery charger shall maintain a float-charge on the battery.
- B. **Emergency** - Upon failure of utility AC power, the critical AC load is supplied by the inverter which obtains power from the battery.
- C. **Recharge** - Upon restoration of utility AC power, after a utility AC power outage, the critical AC load shall be supplied with filtered power and the battery charger shall simultaneously recharge the battery automatically. The unit shall recharge whether the switch is in the on or off position (off state charging).
- E. **Dark Start** - (400/600 VA only) The UPS shall have the ability to startup in the back-up mode without the presence of utility power.

1.3.2 Design Requirements

- A. **Voltage:** Input/Output voltage specifications of the UPS shall be:

Input:

115V units: 0 to 135 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.

230V units: 0 to 270 VAC, 50/60 Hz, single phase, 2-wire-plus-ground

Output:

115V units: 115 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.

230V units: 230 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground

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

- 250VA/150W
- 400VA/240W
- 600VA/360W

- C. **Internal Battery:** The battery shall consist of sealed, valve regulated, reduced maintenance, lead acid cells. The batteries shall be user-replaceable.

- D. **Reserve Time:** Minimum 5 minutes at full load with ambient temperature between 20° and 30° C.

- E. **Battery Recharge:** The recharge time shall be the following, to 90% capacity after discharge into a full load.

- 250VA 12-14hrs maximum
- 400/600VA 6-8hrs maximum

1.3.3 Performance Requirements

1.3.3.1. AC Input to UPS

A. Voltage Configuration:

115VAC; +10%, -25% (90 to 135 VAC), single phase, 2-wire-plus-ground

230VAC; +15%, -22% (180 to 270 VAC), single phase, 2-wire-plus-ground

B. Frequency: 50 Hz or 60 Hz. UPS frequency is set via a DIP switch

C. Surge Protection: Sustains input surges without damage per criteria listed below:

115VAC - IEEE587, Category A & B; 240 Joules

230VAC - IEC 801-5 (Draft); 80 Joules

D. Input:

115 VAC units

All models shall have a 6 foot input power cord with a NEMA 5-15P plug.

230 VAC units

The input for all models shall be a CEE 22 recessed plug on the UPS. Specific country receptacles shall be accommodated by using the computer's input cord to feed the UPS.

1.3.3.2. AC Output, UPS Inverter (On Backup)

A. Voltage Configuration: 115VAC, single-phase-2-wire-plus-ground.

B. Voltage Regulation: +/- 5% for entire battery voltage range.

C. Frequency Regulation: +/- 2Hz

D. Output Power Rating: .6pf for all models

E. Overload Capability: 115% of power rating

F. Transient Recovery Response Time: 100% step load to within 90% of nominal output voltage within 500 milliseconds.

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature

Operating: 0° C to +40° C

Storage: -35° C to +50° C w/o battery
-20° C to 40° C for optimum battery performance

B. Relative Humidity

Operating: 0 to 95% non-condensing

Storage: 0 to 95% non-condensing

C. Altitude

Operating: 3000 m (10,000 ft max.)

D. Audible Noise

Noise generated by the UPS during battery operation shall not exceed 40 dB measured at 1 meter from the surface of the UPS.

1.5 USER DOCUMENTATION

The specified UPS shall be supplied with one (1) user’s manual. Manuals 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. User manual for the 230V models shall be multi-lingual.

1.6 WARRANTY

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The warranty shall cover all parts and labor. An optional one (1) or three (3) year extended warranty shall be available from the manufacturer.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer Qualifications

A minimum of twenty years experience in the design, manufacture, and testing of solid-state UPS systems is required.

1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to assure 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. All active electronic devices shall be solid-state. All relays shall be provided with dust covers.

2.1.1 Cabinet

The UPS unit shall be comprised of: battery charger, inverter, transfer switches, all associated controls, monitoring, major protection devices and battery consisting of the appropriate number of sealed battery cells. The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. Dimensions shall be:

250 VA	3.51" (90mm) W x 10.18" (261mm) D x 6.79" (174mm) H
400 VA	4.25" (108mm) W x 10.18" (261mm) D x 7.02" (186mm) H
600 VA	4.85" (124mm) W x 10.18" (261mm) D x 8.15" (215mm) H

2.1.2 Cooling

The UPS shall be convection cooled.

2.2 COMPONENTS

2.2.1 Power Train

A. Input Protection

The UPS shall employ an input circuit breaker. The UPS shall sustain input surges without damage per criteria listed in:

115VAC - IEEE587, Category A & B; 240 Joules

230VAC - IEC 801-5 (Draft); 80 Joules

B. Battery Recharge

The battery shall use constant voltage charging to recharge and maintain the battery.

C. Unit DC Protection

The unit shall be protected by the following DC shutdown levels:

- DC Undervoltage Shutdown (End of Discharge)
- DC Undervoltage Warning (Low Battery Reserve)

D. Overload

The UPS shall be capable of supplying current and voltage for overloads exceeding 115% of full load current for 30 minutes. A visual indicator and audible alarm shall indicate overload operation. The 400/600VA models shall provide a visual indicator and audible alarm.

E. Output Frequency

The output frequency during normal operation shall follow the incoming AC frequency within a +/- 3Hz window.

F. Battery Over Discharge Protection

To prevent battery damage from over discharging, the UPS control logic shall automatically raise the shutdown voltage set point based on lighter loading.

2.2.2 Display and Controls

A. General

The UPS shall provide the operator with both visual and audible status indicators and shall indicate the following conditions:

400 & 600 VA Units

- Fail startup battery test
- Input L-N reversed
- Input frequency mismatch with DIP switch setting
- Input line voltage below threshold
- Output overload - short circuit
- Normal Mode
- Charger fail
- Battery test fail
- Input line overvoltage

- Output overload - short circuit
- Low battery
- UPS shutdown (end of discharge)
- UPS shutdown via communication port

250 VA Units

- Fail startup battery test
- Input L-N reversed
- Input frequency mismatch with DIP switch setting
- Input line voltage below threshold
- Output overload - short circuit
- Normal Mode
- Battery test fail
- Input line over voltage
- Output Overload - short circuit
- Low Battery
- UPS shutdown (end of discharge)

B. Controls

The UPS shall contain a front panel mounted main On/Off switch. The UPS shall also contain microcontroller-based monitoring and controls for reliable operation.

C. DIP Switch Operation

The UPS shall contain four user-selectable DIP switches that will allow the following:

Switch 1	50/60Hz selection
Switch 2	Enable or Disable High Line Alarm
Switch 3	Transfer to Battery Setpoint
Switch 4	Enable/Disable line to neutral reversal alarm

D. Alarm Silence

On 400 and 600 VA models, the alarm silence switch shall be used to silence the On Battery alarm only, whether utility power is present or not, except when operating in a low battery condition.

2.2.3 Automatic self diagnostic tests

The UPS shall perform three (3) different automatic self-diagnostic tests as described below:

A. Automatic self-diagnostic test: Power ON

The UPS must qualify the utility line voltage before initiating start-up. Qualification of the utility shall consist of verifying utility power is within start-up voltage range.

Once the utility power has been qualified and followed by the UPS being switched ON, the UPS shall perform start-up tests, consisting of an electronics and battery test, prior to enabling output power from the inverter. Should the UPS fail any start-up test, the output power shall not be enabled and fault signals (visual and audible) shall be enunciated.

B. Automatic self-diagnostic test: Auto-restart

The UPS must qualify the utility line voltage before auto-restarting. Auto-restart shall be defined as the restart of the UPS once utility power has returned (and qualified) after the UPS has shutdown due to battery depletion.

Once the utility power has been qualified, the UPS shall perform auto-restart tests, consisting of an electronics and battery test, prior to enabling output power from the unit. Should the UPS fail any test, the output power shall not be enabled and fault signals (visual, audible, and remote via communications port) shall be enunciated.

C. Automatic self-diagnostic test: Weekly

The UPS contains a counter which will initiate a battery test after seven days (168 hrs) of continuous normal mode operation. The test duration shall be approximately 15 seconds. Should a failure of the battery occur, the UPS will immediately return to normal mode and fault signals (visual, audible, and remote via communications port) shall be enunciated. The seven day timer shall be reset after a manual battery test, back-up mode operation or if the UPS is switched OFF. No audible or remote (via communications port/contact closures) indication of the battery test shall be enunciated during the duration of the automatic battery test.

2.2.4 Manual Battery Test (400 and 600 VA only)

The manual battery test switch on the back of the 400 & 600 VA units shall initiate a manual battery test only when utility power is present and no alarm conditions are present. The test shall operate the same as the automatic weekly test described in section 2.2.3 of this specification. Should the UPS batteries not be capable of supporting the connected load for the test duration, the UPS shall immediately return to normal operation, without loss of connected load and fault signals (visual, audible, and remote via communication port) shall be enunciated. No audible or remote (via communication port/contact closures) indication of the battery test shall be enunciated during the duration of the manual battery test.

2.2.5 Internal Battery

Sealed, valve-regulated, reduced-maintenance, 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 between 20° and 30° C, for a minimum of 5 minutes reserve time. The batteries shall be user-replaceable.

2.2.6 Output Distribution

115 VAC units

Output distribution shall be integral to the UPS and located on the rear of the unit with the following receptacles:

250VA	(2) NEMA 5-15
400VA	(4) NEMA 5-15
600VA	(4) NEMA 5-15

230 VAC units

Output distribution shall be integral to the UPS and located on the rear of the unit with the following receptacles:

250VA	(2) CEE-22
400VA	(4) CEE-22
600VA	(4) CEE-22

(2) cords shall be provided with each unit to connect the UPS output to the load.

2.2.7 Communications

The 400 and 600 VA models shall contain a DB25 connector on the rear panel to allow UPS status communications to a computer system. The DB25 shall contain contact closures to signal on battery and low battery operational status. The UPS shall also be capable of receiving a signal from the connected host system to initiate a UPS shutdown. This signal shall be a + 5 V to +12 V (RS232 level) that must remain for > 0.1 second duration.