Uninterruptible Power Systems

Sola 3000 Line-Interactive Uninterruptible Power Systems (UPS)

For blackout protection coupled with advanced power conditioning, Sola 3000 UPS's with sophisticated line-interactive technology will filter utility power to eliminate spikes, noise and other transients. A voltage buck and boost circuit corrects input voltage as low as 25% below nominal, and as high as 23% above nominal, and does it without switching to battery back-up. This reduces battery demand and increases battery life. CE approval for 230 VAC products only.

- Two-year warranty with optional extensions to five years.
- $25,000 UPS Power Protection Promise.

Selection Table

<table>
<thead>
<tr>
<th>Capacity (VA/W)</th>
<th>Catalog Number</th>
<th>Volts, Frequency In/Out</th>
<th>Typical Runtime (minutes)*</th>
<th>Input Plug/Output Receptacle</th>
<th>Approx. Ship Weight lbs (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>700/450</td>
<td>S3700</td>
<td>120/120, 50/60 Hz</td>
<td>6/18</td>
<td>5-15P/ (4)5-15R</td>
<td>29.9 (13.6)</td>
</tr>
<tr>
<td>1000/670</td>
<td>S31000</td>
<td>120/120, 50/60 Hz</td>
<td>7/18</td>
<td>5-15P/ (6)5-15R</td>
<td>43.4 (19.7)</td>
</tr>
<tr>
<td>1400/950</td>
<td>S31400</td>
<td>120/120, 50/60 Hz</td>
<td>5/20</td>
<td>5-15P/ (6)5-15R</td>
<td>49.4 (22.5)</td>
</tr>
<tr>
<td>2200/1600</td>
<td>S32200</td>
<td>120/120, 50/60 Hz</td>
<td>5/19</td>
<td>L5-30P/ (6)5-15R &amp; (2)5-20R</td>
<td>81.7 (37.1)</td>
</tr>
<tr>
<td>700/450-5</td>
<td>S3700-5</td>
<td>230/230, 50/60 Hz</td>
<td>8/19</td>
<td>IEC320/C14/ (4)EC320/C13</td>
<td>29.9 (13.6)</td>
</tr>
<tr>
<td>1000/670-5</td>
<td>S31000-5</td>
<td>230/230, 50/60 Hz</td>
<td>8/20</td>
<td>IEC320/C14/ (4)EC320/C13</td>
<td>43.4 (19.7)</td>
</tr>
<tr>
<td>1400/950-5</td>
<td>S31400-5</td>
<td>230/230, 50/60 Hz</td>
<td>7/16</td>
<td>IEC320/C14/ (4)EC320/C13</td>
<td>49.4 (22.5)</td>
</tr>
<tr>
<td>2200/1600-5</td>
<td>S32200-5</td>
<td>230/230, 50/60 Hz</td>
<td>5/20</td>
<td>IEC320/C20/ (4)EC320/C13 and (1)IEC320/C19</td>
<td>81.7 (37.1)</td>
</tr>
</tbody>
</table>

* Full/Half Load (in minutes).

Power A/C Distribution (PAD) and Associate Receptacles/Line Cord Options for the 3000 Series and 3000 Rackmount Series

PADs provide output distribution receptacle, input connection and a rotary maintenance bypass switch. The PAD is field installable by the customer. Use of the PAD allows the UPS to be removed without interrupting power to the load.

**Note:** PADs can only be used with units having matching receptacles for the line cords provided.

---

Fax-on-Demand #: (877) 888-9329, Document #: 8372
Contact Technical Services at (800) 377-4384 with any questions.

Courtesy of Steven Engineering, Inc. • 230 Ryan Way, South San Francisco, CA 94080-6370 • Main Office: (650) 588-9200 • Outside Local Area: (800) 258-9200 • www.stevenengineering.com
Uninterruptible Power Systems

Sola 3000 Battery Run Time Charts

S3700, S3700-5, S3700R and S3700R-5 Models

S31000, S31000-5, S31000R and S31000R-5 Models

S31400, S31400-5, S31400R and S31400R-5 Models

S32200, S32200-5, S32200R and S32200R-5 Models

Fax-on-Demand #: (877) 888-9329, Document #: 8372
Contact Technical Services at (800) 377-4384 with any questions.
# Uninterruptible Power Systems

## Sola 3000, 120 VAC Specifications

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>S3700R</th>
<th>S31000R</th>
<th>S31400R</th>
<th>S32200R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Rating (VA/Watts)</td>
<td>700/450</td>
<td>1000/670</td>
<td>1400/950</td>
<td>2200/1600</td>
</tr>
</tbody>
</table>

### Dimensions inches (mm)

<table>
<thead>
<tr>
<th>Unit (H x W x D)</th>
<th>18.0 x 5.25 x 19.0 (457.0 x 133.0 x 483.0)</th>
<th>18.0 x 7.0 x 19.0 (457.0 x 178.0 x 483)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping (H x W x D)</td>
<td>24.0 x 11.0 x 27.5 (610 x 279 x 699)</td>
<td>24.0 x 12.0 x 27.5 (610 x 305 x 699)</td>
</tr>
<tr>
<td>Approx. Shipping Weight - lbs (kg)</td>
<td>41.5 (18.9)</td>
<td>51.3 (23.3)</td>
</tr>
</tbody>
</table>

### Input AC Parameters

<table>
<thead>
<tr>
<th>Voltage Range</th>
<th>-25%, +23%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug</td>
<td>6 ft detachable with NEMA 5-15P</td>
</tr>
<tr>
<td>Voltage Raise</td>
<td>Maintains output to 120 VAC; -14%, when input is 120 VAC, -25%</td>
</tr>
<tr>
<td>Voltage Lower</td>
<td>Maintains output to 120 VAC; +10%, when input is 120 VAC, +23%</td>
</tr>
<tr>
<td>Frequency</td>
<td>45-55 Hz or 55-65 Hz; auto sensing</td>
</tr>
</tbody>
</table>

### Output AC Parameters

<table>
<thead>
<tr>
<th>Voltage</th>
<th>103 VAC to 132 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptacles</td>
<td>(4) NEMA 5-15R</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz or 60 Hz</td>
</tr>
<tr>
<td>Waveform</td>
<td>Sinewave</td>
</tr>
<tr>
<td>Utility Mode Overload</td>
<td>200% for &gt; 2 cycles; 110% for &gt; 5 minutes</td>
</tr>
<tr>
<td>Battery Mode Overload</td>
<td>150% for &gt; 1 cycle; 110% for &gt; 30 seconds</td>
</tr>
</tbody>
</table>

### Battery Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Valve-regulated, nonspillable, lead acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Time (mins) (FL/HL)</td>
<td>6/18</td>
</tr>
<tr>
<td>Qty x Voltage x Rating</td>
<td>2 x 12 V x 7.0 or 7.2 AH</td>
</tr>
<tr>
<td>Battery Mfg./Part Number</td>
<td>CSB: GP1270F2 or Panasonic LC-R127R2CH1</td>
</tr>
<tr>
<td>Transfer Time</td>
<td>2-6 ms typical</td>
</tr>
<tr>
<td>Back-up Time</td>
<td>See Battery Run Time Charts</td>
</tr>
<tr>
<td>Recharge Time</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

### Environmental

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>+32 °F to + 104 °F (0 °C to +40 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>+5 °F to + 122 °F (-15 °C to +50 °C)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 95%, non-condensing</td>
</tr>
<tr>
<td>Operating Elevation</td>
<td>Up to 10,000 ft. (3000 m) at 35 °C without derating</td>
</tr>
<tr>
<td>Storage Elevation</td>
<td>50,000 ft. (15,000 m) maximum</td>
</tr>
<tr>
<td>Audible Noise</td>
<td>&lt;45 dBA, at 1 meter</td>
</tr>
</tbody>
</table>

### Agency

<table>
<thead>
<tr>
<th>Safety</th>
<th>UL 1778, c-UL Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFI/EMI</td>
<td>FCC Part 15, Subpart B, Class A</td>
</tr>
<tr>
<td>Immunity</td>
<td>IEC 801-2, Level 4 / IEC 801-4, Level 4 / IEEE 587 Category A</td>
</tr>
</tbody>
</table>
## Sola 3000, 230 VAC Specifications

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>S3700R-5</th>
<th>S31000R-5</th>
<th>S31400R-5</th>
<th>S32200R-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Rating (VA/Watts)</strong></td>
<td>700/450</td>
<td>1000/670</td>
<td>1400/950</td>
<td>2200/1600</td>
</tr>
<tr>
<td><strong>Dimensions (in/mm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unit (H x W x D)</strong></td>
<td>5.25 x 19.0 x 18.0 (133 x 483 x 457)</td>
<td>7.0 x 19.0 x 18.0 (178 x 483 x 457)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shipping (H x W x D)</strong></td>
<td>11.0 x 27.5 x 24.0 (279 x 699 x 610)</td>
<td>12.0 x 27.5 x 24.0 (305 x 699 x 610)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approx. Shipping Weight - lbs (kg)</strong></td>
<td>41.5 (18.9)</td>
<td>51.3 (23.3)</td>
<td>57.2 (26.0)</td>
<td>86.0 (39.1)</td>
</tr>
</tbody>
</table>

### Input AC Parameters

- **Voltage Range**: 230 VAC; -27%, +18%
- **Voltage Raise**: Maintains output to 230 VAC; -19%, when input is 230 VAC; -27%
- **Voltage Lower**: Maintains output to 230 VAC; +8%, when input is 230 VAC; +18%
- **Frequency**: 45-55 Hz or 55-65 Hz; auto sensing
- **Input Plug**: IEC 320-10A, IEC-320-16A

### Output AC Parameters

- **Voltage**: 184 VAC to 248 VAC
- **Receptacles**: (4) IEC 320-10A, (1) IEC320-10A
- **Max. Current Rating**: 3.0 A, 4.6 A, 6.1 A, 9.6 A
- **Frequency**: 50 Hz or 60 Hz
- **Waveform**: Sinewave
- **Utility Mode Overload**: 200% for > 2 cycles; 110% for > 5 minutes
- **Battery Mode Overload**: 150% for > 1 cycle; 110% for > 30 seconds

### Battery Parameters

- **Type**: Valve-regulated, nonspillable, lead acid
- **Battery Time (mins) (FL/HL)**: 8/19, 8/20, 7/16, 5/20
- **Qty x Voltage x Rating**: 2 x 12 V x 7.0 or 7.2 AH, 3 x 12 V x 7.0 or 7.2 AH, 4 x 12 V x 7.0 or 7.2 AH, 8 x 6 V x 12 AH
- **Batt. Mfg./Part Number**: CSB: GP1270F2 or Panasonic LC-R127R2CH1, Panasonic LC-R0612CH1
- **Transfer Time**: 2-6 ms typical
- **Back-up Time**: See Battery Run Time Charts
- **Recharge Time**: 3 hours to 95% capacity, after full discharge into 100% load

### Environmental

- **Operating Temperature**: 0 °C to +40 °C (+32 °F to +104 °F)
- **Storage Temperature**: -15 °C to +50 °C (+5 °F to +122 °F)
- **Relative Humidity**: 0% to 95%, non-condensing
- **Operating Elevation**: Up to 10,000 ft. (3000 m) at 35 °C without derating
- **Storage Elevation**: 15,000 m (50,000 ft.) maximum
- **Audible Noise**: <45 dBA at 1 meter, <55 dBA at 1 meter

### Agency

- **Safety**: TUV/GS Listed, CE Low Voltage Directive compliant
- **RFI/EMI**: EN 55022, Class B; CE EMC Directive compliant

---

For more information, contact Technical Services at (800) 377-4384 with any questions.
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, shall provide high-quality AC power for 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.

120V Units

- UL Standard 1778
- FCC Part 15, Class A
- IEEE 587, Category A
- C-UL (to CSA 22.2 No. 107.1)
- National Electrical Code (NFPA 70)
- ISTA Project 1A

230V Units

- EN 50091-1 (Incorporating EN60950)
  TUV/GS Listed
- EMC- EN50091-2 (Incorporating)
  EN 55022, Class B
  IEC 801-2, Level 4
  IEC 801-3, Level 3
  IEC 801-5, Level 2
- CE compliance mark, For both Low Voltage and EMC Directives
- ISTA Project 1A

1.3 SYSTEM DESCRIPTION

1.3.1 Modes of Operation

The UPS shall be designed to operate as a line interactive 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. **Voltage Boost/Buck** - During input power source abnormalities (sags and swells), the AC output power shall be corrected by means of boost (sag correction) or buck (swell correction) compensation taps. Operation of the compensation taps shall be seamless and automatically maintain the proper output voltage for the connected critical equipment. The compensation taps shall be designed for indefinite operation to their limits, operation of the compensation taps shall not discharge the battery.

C. **Battery** - When the input power source exceeds the parameters defined in section 1.3.3.1.A, the critical AC load shall be supplied power by the inverter which obtains its power from the battery. Detection and transfer time shall be 2 - 6 ms.

D. **Recharge** - Upon restoration of utility the input power source within specified parameters, the critical AC load shall be supplied with filtered power and the battery charger shall simultaneously recharge the battery.

E. **Automatic Restart** - Upon restoration of the input power source, after a complete battery discharge, the UPS shall automatically restart and supply filtered power to the critical load. The bi-directional converter shall simultaneously recharge the battery.

F. **Dark Start** - The UPS shall be capable of starting without input power available. The unit shall start up and operate from the battery.

### 1.3.2 Design Requirements

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

**Input**

- 120V units: 0 to 160 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.
- 230V units: 0 to 300 VAC, 50/60 Hz, single phase, 2-wire-plus-ground

**Output**

- 120V units: 103 - 132 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground.
- 230V units: 186 - 248 VAC, 50/60 Hz, single-phase, 2-wire-plus-ground

B. **Output Load Capacity**: Maximum specified output load capacity of the UPS, regardless of load power factor, shall be:

- 700VA/450W
- 1000VA/670W
- 1400VA/950W
- 2200VA/1600W

C. **Internal Battery**: The battery shall consist of valve regulated, lead acid cells.

D. **Backup Time**: 5 minutes at full load with ambient temperature at 25 deg C (77 deg F).

E. **Battery Recharge**: The recharge time shall be 3 hours (5 hours for 1400 VA / 120 VAC) to 95% capacity after discharged into a full load.
1.3.3 Performance Requirements

1.3.3.1. AC Input to UPS

A. Voltage Configuration:

120VAC; +23%, -25% (90 to 148 VAC), single phase, 2-wire-plus-ground
230VAC; +17%, -27% (166 to 272 VAC), single phase, 2-wire-plus-ground

B. Frequency: UPS auto senses input frequency and will operate within the following frequency specifications.

50 Hz Units: 45 - 55 Hz
60 Hz Unit: 55 - 65 Hz

When the input frequency exceeds these parameters, the UPS shall operate from the battery.

C. Surge Protection: 120 VAC Nominal units shall sustain input surges without damage per criteria listed in ANSI C62.41 - 1980 IEEE 587, Category A. 230 VAC nominal units shall sustain input surge without damage per criteria Listed in IEC 801 - 5, Level 3.

D. Input:

120 VAC units

The 700 VA model shall have a detachable input cord. The detachable input cord with the 700 VA shall be 6.0 feet (1.8 meters) in length, measured between the inside edges of the connectors. The detachable cord shall contain an IEC 320 - 10A type receptacle on one end and a NEMA 5-15 plug on the other. The 1000 and 1400 VA models shall have an attached cord with a NEMA 5-15P plug. The 2200 VA model shall have an attached cord with a NEMA L5-30P plug. The attached cord shall be 6.0 feet (1.8 meters) in length, measured from the outside edge of the UPS case to the nearest edge of the plug connector.

230 VAC units

The input for the 700, 1000, and 1400 VA models shall have a IEC 320 - 10A recessed plug. The input for the 2200 VA model shall have an IEC 320 - 16A recessed plug.

1.3.3.2. AC Output, Normal Operation

A. Voltage Configuration:

120V unit: 103 - 132 VAC, single-phase, 2-wire-plus-ground.

B. Voltage Regulation:

120V Units: +10/-14%
230V Units: +8/-19%

C. Frequency Regulation:

50 Hz Operation: 50Hz +/- 10%
0 Hz +/- 8%

D. Load Power Factor Range: 0.5 lagging to 1.0 unity
E. **Output Power Rating:** Maximum specified output load capacity of the UPS, regardless of load power factor, shall be:

- 700VA/450W
- 1000VA/670W
- 1400VA/950W
- 2200VA/1600W

F. **Overload Capability:** 110% for 5 minutes

1.3.3.3. AC Output, UPS Inverter

A. **Voltage Configuration:** 120 or 230VAC units, single-phase-2-wire- plus-ground.

B. **Voltage Regulation:** +/- 7% RMS for entire battery voltage range.

C. **Frequency Regulation:** +/- 0.5 Hz

D. **Frequency Sync. Rate:** +/-5 Hz

E. **Frequency Slew Rate:** 1 Hz per second

F. **Voltage Distortion:**

   Resistive Loads: 10% before (2) minute warning; 15% after pre-alarm
   Switching Mode Power Supply (SMPS): 16% before 2 minute warning, 20% after pre-alarm

G. **Load Power Factor Range:** 0.5 lagging to 1.0 unity

H. **Output Power Rating:** Maximum specified output load capacity of the UPS, regardless of load power factor, shall be:

- 700VA/450W
- 1000VA/670W
- 1400VA/950W
- 2200VA/1600W

I. **Overload Capability:** 110% for 30 seconds

J. **Voltage Transient Response:** +/- 7% maximum for 20%-100%-20% load step

K. **Transient Recovery Time:** To within nominal voltage within 30 milliseconds.

1.4 **ENVIRONMENTAL CONDITIONS**

A. **Ambient Temperature**

   **Operating:** 0 °C to +40 °C (+32 °F to +104 °F) for altitudes 0 to 1500 meters (0 to 5000 ft.) above sea level

   0 °C to +35 °C (+32 °F to +95 °F) for altitudes 1500 to 3000 meters (5000 to 10,000 ft.) above sea level

   25 °C (+77 °F) for optimum battery performance
Storage: 15 °C to +50 °C (+5 °F to +122 °F)
        20 °C (+68 °F) for optimum battery storage.

B. Relative Humidity

   Operating: 0 to 95% non-condensing
   Storage: 0 to 95% non-condensing

C. Altitude

   Operating: 3000 m (10,000 ft max.) without power derating when operated within the
temperature range specified in 1.4.A.
   Storage: 10000 m (32,808 ft max)

D. Audible Noise

   Noise generated by the UPS during any mode of operation shall not exceed 45 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.

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. The manufacturer shall be certified to ISO 9001.

   1.7.2 Factory Testing

   Before shipment, the manufacturer shall fully and completely test the system to assure compliance with
the specification. These tests shall 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 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.

   2.1.2 Wiring

   Wiring practices, materials, and coding shall be in accordance with the requirements of the standards
listed in section 1.2 and other applicable codes and standards. All power wiring shall be copper.
2.1.3 Cabinet

The UPS unit, comprised of: bi-directional converter, regulating circuit, and battery consisting of the appropriate number of valve regulated battery cells, shall be housed in either a free-standing NEMA type 1 enclosure and shall meet the requirements of IP21. The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. Dimensions shall be:

- **700 VA**: 5.51” (140mm) W x 14.41” (366mm) D x 7” (178mm) H
- **1000 VA**: 6.77” (172mm) W x 18.31” (465mm) D x 8.94” (227mm) H
- **1400 VA**: 6.77” (172mm) W x 18.31” (465mm) D x 8.94” (227mm) H
- **2000 VA**: 7.56” (192mm) W x 19.76” (502mm) D x 12.52” (318mm) H

2.1.4 Cooling

The UPS shall be forced air cooled when required. Air intake shall be through the sides of the unit and exit out the rear.

2.2 COMPONENTS

2.2.1 Power Train

A. Input Protection

The UPS shall have built-in protection against undervoltage, overcurrent, and overvoltage conditions including low-energy lightning surges, introduced on the primary input power source. The 120 VAC UPS modes shall sustain input surges without damage per criteria listed in ANSI C62.41-1980; IEEE 587, Cat. A. The 230 VAC UPS modes shall sustain input surges without damage per criteria listed in IEC 801 - 05, Level 3.

B. Bi-Directional Converter

The bi-directional converter shall denote the solid-state equipment and controls to convert AC power to regulated DC power for battery charging and convert DC power from the battery to regulated and conditioned sinewave AC power for supporting the critical load. The bi-directional converter shall be transistorized, pulse width modulated (PWM) design. The bi-directional converter shall operate in the following modes:

1. In the normal mode of operation, the bi-directional converter shall maintain the battery system at a float charge.