

TECHNICAL SPECIFICATIONS for
Single Phase, 100 Watts to 1600 Watts
Harsh Environment Outdoor Application
NEMA 3R & NEMA 4 Cabinets



Mini Harsh Environment UPS

HEU6502B 6/2/09

1 Scope

- 1.0 This Product Specification describes a continuous duty, on-line, solid state, uninterruptible power system (UPS). The UPS shall operate as a rectifier / battery charger, solid-state inverter, and integral battery subsystem. The specified equipment herein shall be referred to as a "Mini Harsh Environment UPS" or Mini-HEUPS System, Model LU0.4, LU0.7, LU1.5, and LU1.6.
- 1.1 Transfers to and from battery operation shall be uninterrupted. Furthermore, there shall be no mechanical switching when the UPS transfer to and from battery operation.
- 1.2 The UPS and batteries shall be designed to fit into a NEMA 3R (for Inland applications) or NEMA 4 (For Island, and Oceanside Applications). Both enclosures are intended for outdoor installations. It shall be of modular construction for ease of servicing in the field.
- 1.3 The primary application of the UPS is to provide emergency power. The UPS systems must provide from 100 Watts to 1600 Watts in power in various configurations. It shall be single-phase 120, 208, 240, 277, or 480 volts input, 60 or 50 Hz. All systems must provide a 120V terminal block for Security Equipment.
- 1.4 The primary input power source to the UPS shall be utility power.

2 Applicable Documents

2.1 The following documents given below form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered superseding requirements. The following documents shall be for reference purpose only.

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|---------------------------|---|
| - UL 1778 & CUL | Underwriters Laboratories Inc. standard for UPS systems and Rectifying Equipment and Specialty Transformers |
| - IEEE C62.41-1991 | IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits |
| - ANSI NFPA 70 | National Electrical Code |
| - UL 50 and NEMA 250-1991 | Enclosures for Electrical Equipment |
| - UL1449 | Standard for Safety Transient Voltage Surge Suppressors |
| - BELLCORE GR-63-CORE | Network Equipment Building System Requirements: Physical Protection |
| - BELLCORE GR-487-CORE | Generic Requirements for Electronic Equipment Cabinets |

- BELLCORE GR-1089-CORE Electromagnetic Compatibility and Electrical Safety-Generic Criteria for Network Telecommunications Equipment
- BELLCORE TR-332 Reliability Prediction Procedure for Electronic Equipment
- IEC 1000-4-3 Radiated Radio Frequency Electromagnetic Field Immunity Test
- EN55022 (CISPR22) Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment

3 System Description and Operation

3.1 System Definition

The UPS shall consist of a rectifier / battery charger, inverter, batteries, protective devices, and monitoring circuitry as specified herein which shall automatically assure no interruption, upon failure or deterioration of the input AC power source. Continuity of conditioned and regulated power to the critical load shall be maintained when input power is lost and until input power returns within specifications or until the batteries have been discharged.

3.2 Modes of Operation

3.2.1 Normal: The unit shall continuously supply power to the critical load. The charger shall derive power from the utility and supply DC power to the batteries. The charger shall maintain the batteries in a fully charged state even at low input voltage conditions.

3.2.2 Emergency: Upon failure of the input AC power source, the critical load shall be supplied by the inverter, which, without any mechanical switching, shall obtain its power from the battery. There shall be no interruption or disturbances to the critical load upon failure or restoration of the input AC power source.

3.2.3 Recharge: Upon restoration of the input AC power source (prior to complete battery discharge), the UPS shall automatically return to normal operation.

If the batteries become completely discharged (batteries have reached the DC cutoff point) before the input power is restored the UPS will shut down systematically and automatically. The UPS shall resume to normal operation including the automatic recharge of the batteries upon utility return.

3.2.4 Downgrade: If the battery only is to be taken out of service for maintenance, it shall be disconnected from the UPS by means of a battery circuit breaker. The UPS shall continue to function as specified, except for power outage protection.

3.3 Major Components

3.3.1 Main Unit: The unit shall provide conditioned, regulated, sine wave power to the critical load during all modes of operation (except when the UPS is in bypass). The unit shall be configured such that there are no direct electrical connections between the input and output.

3.3.2 Charger: The charger shall be of solid-state construction. The charger shall rectify AC power supplied by the utility to regulated DC power for the batteries. This shall be an automatic function. The charger shall be a temperature-compensated charger so that the charge level for the batteries is automatically adjusted based on internal ambient temperature.

3.3.3 Inverter: The inverter shall be of solid-state construction. In case of the loss of input power, the inverter shall convert DC power from the batteries to AC power.

3.3.4 Batteries: Upon loss of input power, the batteries shall supply DC power to the inverter.

3.3.5 System Indicator and Monitoring

- a) Monitoring and metering for Model LU0.4, LU0.7, and LU1.5.

Status Indicators:

AC On: A Green LED is illuminated when utility present.
 Inverter On: A green LED is illuminated when the Inverter is operating.
 Alarm: A red LED is illuminated if the inverter malfunctions
 Battery: Five Green LED's and One Red LED. Each green LED represents 20% battery life. The Red LED Represents a low battery condition and the Mini-HEUPS will discontinue operation shortly.
 Load: Five Green LED's and One Red LED. Each green LED represents 20% of the full load. The Red LED Represents an overload condition and the Mini-HEUPS will discontinue operation shortly.

Monitoring:

Remote monitoring capabilities shall be form C dry contacts for the following conditions:

Input power present
 Summary Alarm
 UPS on battery operation
 Low battery condition
 UPS on bypass

- b) Monitoring and metering for Model LU1.6.

Status Indicators:

AC On: A Green LED is illuminated when utility present.
 Inverter On: A green LED is illuminated when the Inverter is operating.
 Summary Alarm: A red LED is illuminated for various alarm conditions
 Battery: Two Green LEDs and One Red LED. One green LED represents full charge and one half charge. The Red LED represents a low battery condition and the Mini-HEUPS will discontinue operation shortly.
 Load: Four Green LEDs and One Red LED. Each green LED represents 25% of the full load. The Red LED Represent an overload condition.
 On Battery: Green LED indicates battery is on and output is supplied from battery
 Bypass On: Green LED indicates unit is running in Bypass.
 Off S1: Use for battery run mode only to shut off UPS.
 On S2: Use for battery run mode only to turn UPS on.

Monitoring:

Remote monitoring capabilities shall be form C dry contacts for the following conditions:

Input power present
 Summary Alarm
 UPS on battery operation
 Low battery condition

3.3.6 Mini-HEUPS Features:

a. Door Switch – Intrusion Switch:

An intrusion alarm switch resides within the cabinet to relay that the unwanted entrance into the cabinet has occurred. The plunger of the switch is in by the door when it is closed.

b. ESD Receptacle and Wrist Strap:

The ED wrist strap plugs into the red connector receptacle on the front panel of the Electronic Tray. An ESD wrist strap is in the bottom of the cabinet. The strap plugs into the red banana plug to minimize damage to sensitive electronics during maintenance.

c. Ruggedized Features:

The Mini-HEUPS is designed to operate in most outdoor harsh environments. The unit has been subjected to outside independent labs to demonstrate that they are capable of

withstanding severe outdoor operating conditions.

d. Wide Temperature Range:

The Mini-HEUPS is designed and tested to operate in the outdoors over a wide range of temperatures from -40C to +52C plus a solar load of 70 Watts/sq. ft. The Mini-HEUPS has an option for internal heaters for the batteries to allow full operation over the temperature range.

e. Shock and Vibration:

The Mini-HEUPS is designed and tested to meet Bellcore specification GR-63-Core Issue 1 section 4.3 and GR-63-Core Issue 1 section 4.4 and earthquake zone 4 for shock and vibration.

f. High Input Voltage Surge Withstand Capability:

The Mini-HEUPS is designed with Internal AC Surge Withstand Protection to ensure that lightning strikes or other high voltage surges do not damage the Mini-HEUPS. These meet IEEE 62.41 1991 (UL1449) level C3 input voltage surge of 20000 Volts @ 10,000 amps.

g. External Padlock:

The cabinet possesses an external padlock receptacle to prevent unauthorized personnel from gaining access to the interior of the cabinet.

h. Over Temperature Shutdown:

While the Mini-HEUPS has sophisticated cooling technology to prevent over heating, in the event of an over temperature condition the Mini-HEUPS will shut down. The Mini-HEUPS has an auto recovery feature, which turns the unit "On" when temperatures have cooled sufficiently. The Mini-HEUPS has built-in hysteresis feature to prevent oscillation at the cut off temperature of 85C.

i. Over Current Protection:

The Mini-HEUPS is designed to limit current and prevent internal damage. For loads in excess of 160% the Mini-HEUPS will shut down (if breakers do not trip). Overloads of 120% to 160% will trigger an alarm condition.

j. Auto Bypass Feature:

This feature allows input power to bypass the electronics of the Mini-HEUPS Unit automatically. The Mini-HEUPS detects low or no output voltage and energizes the auto-bypass relay. These contacts provide output power from either batteries or input power to the main output breaker.

k. Corrosion and Rain Resistant Cabinet

NEMA 4 cabinets are made of anodized aluminum with paint and coat system specifically designed to resist harsh corrosive environments including ocean spray. The fully sealed NEMA 4 cabinet is impervious to rain.

l. Mounting Features:

The Mini-HEUPS systems can be pad mount, pole mount or wall mounted.

4 System Package and Construction

4.1 Materials and Process

- 4.1.1 The open frame, supporting the UPS electronics, transformer, I/O connections, logic board, display, etc., shall be steel. Steel parts shall be zinc washed. The cabinet must be anodized aluminum or stainless steel with customized coating system.
- 4.1.2 Completely sealed NEMA 4 Cabinets shall be selected for all outdoor harsh applications (Oceanside, High Humidity, Storm Areas, Tropical Areas etc).
- 4.1.3 Ventilated NEMA 3R Cabinets shall be selected for Inland back up applications.
- 4.1.4 All cabinet systems must be tamper-resistant and padlock protected.

4.2 Standard Parts

- 4.2.1 Except as otherwise specified herein or authorized, commercial-grade parts shall be used.
- 4.2.2 External hardware shall be tamper-resistant.

4.3 Shock and Vibration: The UPS shall meet the following requirements:

Shock: GR-63-CORE issue 1 section 4.3

Vibration: GR-63-CORE issue 1 section 4.4

The UPS shall be used in all 50 states and shall be tested to Earthquake zone 4.

5 Electrical Specifications

5.1 Input Specifications

- 5.1.1 Nominal input voltage: 120, 208, 240, 277 or 480 Volts single phase (specified at time of order).
- 5.1.2 Input voltage range: Nominal +15%, -20%.
- 5.1.3 Input frequency: 50Hz or 60Hz +/-5%.
- 5.1.4 Input frequency slew rate: 3 Hz per second maximum.
- 5.1.5 Input configuration: 2 wire plus ground.
- 5.1.6 Walk-in Delay: The UPS shall wait a minimum of five (5) seconds before returning to normal mode of operation upon restoration of input power.
- 5.1.7 Input protection: Circuit Breaker
- 5.1.8 Input connection: Hard Wired (terminal block).

5.2 Output Specifications

- 5.2.1 Power rating (continuous) at 1.0 power factor:
 - LU0.4XXX: 100, 200, and 400 Watts
 - LU0.7XXX: 100, 200, 400, 500, 600, and 700 Watts
 - LU1.5XXX: 500, 600, 700, 1000, 1300, and 1400 Watts
 - LU1.6XXX: 500, 700, 800, 1000, 1300, 1400, and 1600 Watts

Output power rating shall be the same regardless of whether or not the UPS are in normal mode or emergency mode of operation.

- 5.2.2 Number of phase: One
- 5.2.3 Nominal output voltage: $\pm 3\%$ no load to full load, $\pm 3\%$ high line to low line.
- 5.2.4 Output configuration: 2 wire plus ground, Voltage to be 120, 208, 240, 277 or 480 Volts.

- 5.2.5 Output frequency 50HZ or 60HZ (to be specified):
 - 60 HZ \pm 3 Hz when synchronized with the input power.
 - 60 HZ \pm 0.5 Hz when UPS is running on internal clock.
- 5.2.6 Output wave shape: Sine wave.
- 5.2.7 Output voltage distortion: 5% maximum THD, with any single harmonic no greater than 3%.
- 5.2.8 Crest factor: 3:1.
- 5.2.9 Overload capability: 125% for ten (10) minutes; 150% surge.
- 5.2.10 Fault condition: UPS shall withstand a short circuit on the output with no damage.
- 5.2.11 Load connection: Terminal block or circuit breaker.

5.3 Battery Specifications

- 5.3.1 DC bus voltage: 48, 72, 96 volts nominal (depending on unit kVA rating).
- 5.3.2 Configuration: Sealed, lead acid, maintenance-free, type AGM, batteries.
- 5.3.3 Low battery warning signal.
- 5.3.4 DC under voltage shunt-off: factory adjustable as required by battery manufacturer.
- 5.3.5 Battery discharges time: Based on specific battery configuration. Engineering to specify the run times based on actual test data and empirical calculations. Times to be based upon an ambient temperature of between 70° and 80° F.
- 5.3.6 Battery charger: Current-limited to a maximum of 5 amperes.
- 5.3.7 The battery charger shall be a temperature-compensated charger.
 - The charging voltage shall be based upon the ambient temperature within the UPS enclosure. Actual volts per cell shall be determined by best engineering practice to maximize battery life. This setting shall be factory set.
- 5.3.8 Protection: Circuit breaker.

5.4 Lightning Protection and Grounding

The UPS shall be protected from surges resulting from lightning strikes. AC and DC connections fed by utility shall be protected. The User Alarm interface shall also be protected from such surges to the same specifications as telecommunication protector block usage.

The UPS shall be equipped with adequate grounding systems (in accordance with article 250 of the NEC and section 10 of the Canadian Electrical Code Part I) and shall have at least two external grounding pad locations, free of paint or other substance, unless space consideration allow for only one. The grounding pad shall be a 2 hole NEMA standard drilling of .75" spacing, and provision for .25" bolts.

6 Physical Specifications

6.1 The UPS system shall consist of a single cabinet housing both the electronic sub-assemblies and the batteries.

6.1.1 Maximum dimensions: The overall dimensions shall not exceed

23"H x 19.5"W x 21"D for LU0.4, LU0.7, and LU1.5 Units.

42"H x 33"W x 17.25"D for LU1.6 Unit.

Note: Cabinets are interchangeable depending on the battery backup time requested.

6.1.2 Approximate UPS weight (without battery):

LU0.4: 165 lbs. (75 kgs.)

LU0.7: 240 lbs. (109 kgs.)

LU1.5: 260 lbs. (118 kgs.)

LU1.6: 900 lbs. (408 kgs.)

NOTE: Actual UPS weight varies depend on output power rating and options. Battery tray weight varies by model and is proximally 200 to 290 lbs and installed in the same cabinet.

6.1.3 For Non-harsh Inland Applications: The UPS enclosure shall be weatherproof and shall be NEMA 3R type Construction.

- a. The cabinet shall be ventilated. Intake air shall be from the lower area of the front door. Exhaust air shall be through the front and rear near the top.
- b. Forced cooling shall be provided. Screening shall be used to keep insects and debris from entering the UPS through the fan exhaust.
- c. Intake air vent shall be screened and shall prevent water from entering the enclosure. Replaceable dust filters, readily available, shall be utilized.
- d. The front door shall have a gasket to protect against moisture.

6.1.4 For Harsh Oceanside, Island, Tropical and Storm Applications: The UPS enclosure shall be weatherproof and shall be NEMA 4 type construction.

- a. The cabinet shall be sealed.
- b. Forced cooling shall be provided internally. Heat shall be dissipated through convection technology. A Gore Vent System shall insure balanced battery gas conditions and internal/ambient temperature equilibrium.
- c. The front door shall have a gasket to firmly seal the system.

6.1.5 The door assembly shall consist of a continuous hinge, three point door latch with a padlock hasp.

6.1.6 The cabinet shall be painted (power coated) steel or zinc anodized aluminum or stainless steel.

6.1.7 The cabinet is designed to be anchored to a single foundation, or pole or wall mounted. The pole mounting brackets shall accommodate pole diameters from 6" to 15".

- a. Others shall provide the foundation including the anchor bolts.
- b. Skirting with tamper-proof hardware shall be provided so that debris and animals cannot enter through the bottom of the cabinet.
- c. The mounting of the UPS to the concrete pad (supplied by others) shall be such that the nuts (holding the UPS to the anchor bolts embedded in the concrete pad) are not accessible from the outside.

6.2 Power and control cable entry: Bottom entry or side entry.

6.3 Printed circuit boards shall be conformal coated.

6.4 Labels shall be located inside the enclosure.

7 Operating Environment

7.1 Temperature:

7.1.1 The UPS shall operate satisfactorily when the ambient temperature is at -40°F (-40°C).

7.1.2 The UPS shall operate satisfactorily when the ambient temperature is at +125.6°F (+52°C).

Important note for paragraphs 7.1.1 and 7.1.2: Battery run times are based upon ambient temperatures of 70 to 80°F (21°C to 26.5°C). Outside of this range, battery capacity and/or life shall be affected. The operating range as stated is applicable to the UPS electronics systems. The battery manufacturer shall define the battery operating temperature range.

7.1.3 The UPS cabinet shall be fan-cooled or free convection cooled between 104°F (40°C) and 125.6°F (52°C) with a 70W/ft² solar load. It shall be capable of operating at -40°F (-40°C) with a 20-MPH wind.

7.1.4 Unit shall operate with a rate of temperature change: 30°C/hour (86°F/hour)

7.2 Relative humidity: 5% to 100% relative operating humidity. 0 to 95% non-condensing inside the cabinet

7.3 Operating Altitude (referenced to sea level): -1000 ft to +8,000 ft

8 Storage Environment

8.1 Temperature: -40°F (-40°C) to +140°F (+60°C).

This storage temperature shall be acceptable only when the batteries are in a fully charged state.

9 Reliability and Maintainability

9.1 Mean-Time-Between-Failure (MTBF) shall be 150,000 hours.

9.2 The batteries are expected to have a life exceeding 10 years with a prorated warranty.

9.3 The UPS shall be designed for ease of maintenance and serviceability.

9.3.1 All components shall be front-accessible. No side or rear access shall be required.

9.3.2 All electronics must be "works in a drawer" to allow for easy Field Replacement.

9.3.3 Rear wall components shall be accessible.

9.4 Design concept for all Mini-HEUPS Units must be Field Replaceable Unit (FRU). This allows all required service to be done in the field with a minimum of difficulty. In each case the complete UPS System shall be housed on a replaceable Tray. All batteries must be easily replaced in the field.

10 Approved Manufacturer

10.1 The specified product shall be manufactured by:

OnLine Power, Inc.
5701 Smithway Street, Commerce, CA 90040
Phone: (800) 227-8899 or (323) 721-5017

- a. The manufacturer shall be ISO 9001-2000 certified.
- b. The equipment must be Bellcore certified.
- c. The manufacturer must have a minimum of 500 units installed for design validation.
- d. The manufacturer must have a minimum of 25 years experience in Power Back up design and manufacture.