MINUTEMAN UPS
EnterprisePlus Series
Product Specifications
750VA – 3000VA
Single-Phase Uninterruptible Power Supply

1.0 GENERAL

1.1 SUMMARY

This product specification will outline and define the electrical and mechanical features for line-interactive, true sinewave, solid-state, uninterruptible power supply (UPS) systems. The UPS shall provide high-quality, regulated AC power to sensitive electronic equipment connected to the system.

1.2 STANDARDS

The UPS shall be designed and manufactured in accordance with the applicable sections of the current revision of the following regulatory organizations codes. Where a conflict may arise between these standards made herein, the statements in this specification shall govern.

- IEEE/ANSI C62.41 Category A3 (120VAC models)
  EN61000-4-5: 6KVA (120VAC and 208VAC models)
- FCC Part 15/ANSI C63.4 Class B
- ISO 9001 & 14001
- UL 1778 4th Edition
- cUL CSA C22.2 No. 107.3-05 2nd Edition
- RoHS WEEE 2002/95/EC Directive

The UPS shall be UL listed per UL Standard 1778, and shall be cUL, and CE certified.
1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements – UPS Module

A. Voltage – Input/output voltage specifications of the UPS shall be:
(The voltages in parenthesis are for the 208/240V models):

   System Input: 0 – 165VAC, (0 – 300VAC) single-phase, two-wire plus ground.

   System Output: 120, 127VAC, (208/240VAC) single-phase, two-wire plus ground.

B. Output Load Capacity – The specified output load capacity of the UPS shall range between 750-3000VA. 750-1500VA models will have a 0.8 lagging power factor. The 2000VA model will have a 0.88 lagging power factor and the 3000VA model will have a 0.853 lagging power factor.

1.3.2 Design Requirements

A. Battery Cells: Maintenance-free, sealed, non-spillable, lead acid, valve regulated.

B. Reserve Time: A minimum of 3 minutes with a full, non-linear, load, 0.8 - 0.88 power factor, with ambient temperature between 20 and 30 degrees Celsius.

C. Recharge Time: To 90% capacity within six hours after return of nominal AC power from low battery cut-off.

1.3.3 Modes of Operation

The UPS shall be designed to operate as a line-interactive, extended runtime system in the following modes:

A. Normal – The critical AC load is supplied by the utility power source. Any non-hazardous harmonics and/or anomalies are filtered through internal electronics. Internal batteries are simultaneously float-charging through a two-stage process.

B. Boost – During a sag in utility power starting at 105VAC (189/210VAC) down to 80VAC (150/170VAC), the internal two-stage transformer of the UPS will provide a boost of utility AC voltage, depending on the level of the sag, to a nominal AC voltage output level without the use of internal batteries. The UPS must be able to operate indefinitely in this mode until utility AC voltage rises to 109VAC (196/217VAC).

C. Buck - With a surge in utility power starting at 134VAC (236/260VAC) and continuing up to 164VAC (271/290VAC), an internal, two-stage buck transformer will suppress, or buck, the utility AC voltage to nominal AC output voltages without the use of internal batteries. The UPS must be able to operate indefinitely in this mode until utility AC voltage drops to 130VAC (229/253VAC).

D. On Battery – Upon failure or overvoltage of utility AC power, the connected AC load is supplied power by the UPS switching from Normal mode to the inverter while using the internal batteries. There shall be a minimum interruption in power lasting, typically, no more than 6 milliseconds. When utility AC power returns, the UPS will return to Normal mode with an interruption of, typically, no more than 6 milliseconds.
E. **Recharge** – Upon restoration of AC utility power, after a utility AC power outage, the internal charger shall automatically start recharging the internal batteries.

F. **DC cold start** – The UPS shall start and operate without AC utility power applied.

### 1.3.4 Performance Requirements

#### 1.3.4.1 AC Input to UPS

A. **Voltage Configuration for Standard Units:** Single-phase, 2-wire plus ground.

B. **Voltage Range (Non-Battery mode):** 80 – 164VAC (150 – 271/170 – 290VAC).

C. **Frequency:** Auto-Select 50/60Hz (+/- 6Hz.).

D. **Power Factor:** 0.8 – 0.88 lagging minimum at nominal input voltage and full rated UPS output load.

E. **Inrush Current:** 120VAC models

- 750VA 120VAC model – 35 Amps for 5mS
- 1000VA 120VAC model – 35 Amps for 5mS
- 1500VA 120VAC model – 150 Amps for 5mS
- 2000VA 120VAC model – 181 Amps for 5mS
- 3000VA 120VAC model – 158 Amps for 8.3mS

208VAC models

- 1500VA 208/240VAC model – 48.5 Amps for 1.24mS
- 3000VA 208/240VAC model – 69 Amps for 2.1mS

F. **Current Limit:** 120VAC models

- 750VA 120VAC model – 12 Amp input circuit breaker
- 1000 VA 120VAC model – 15 Amp input circuit breaker.
- 1500VA 120VAC model – 20 Amp input circuit breaker.
- 2000VA 120VAC model – 30 Amp input circuit breaker.
- 3000VA 120VAC model – 40 Amp input circuit breaker.

208VAC models

- 1500VA 208/240VAC model – 15 Amp input circuit breaker
- 3000VA 208/240VAC model – 20 Amp input circuit breaker

G. **Surge Energy Rating:** The UPS shall have Metal Oxide Varistors for surge energy protection with a rating of:

- 800 Joules – 120VAC models
- 600 Joules – 208/240VAC models

H. **Surge Protection:** 120VAC models: Sustains input surges without damage per ANSI C62.41 standard.

All models: EN61000-4-5: 6KVA
I. **Voltage Transient Response:** 0nS – Normal mode. <5nS – Common Mode.

J. **Transient Recovery Time:** <25mS.

### 1.3.4.2 AC Output, UPS Inverter

A. **Voltage Configuration:** Single-phase, 2-wire plus ground.

B. **Output Waveform:** True Sinewave.

C. **Voltage Regulation:** 120VAC (208/240VAC) models: Not to exceed +/-5% until Low Battery Warning.

D. **Frequency:** Nominal Frequency +/- 0.1Hz. unless synchronized to the line

E. **Voltage Distortion:** 120VAC models: Not to exceed 5% at full linear load.
   1. 208/240VAC models: Not to exceed 5% at full linear load

F. **Current Distortion:** 120VAC models: Not to exceed 5% at 50% linear load.
   1.208/240VAC models: Not to exceed 5% at 50% linear load.

G. **Load Power Factor Range:** 1.0 to 0.8 lagging without de-rating.

H. **Output Power Rating:** Rated KVA at 0.8 – 0.88 lagging power factor depending on model.

I. **Overload Capacity:** AC Mode or DC Mode - All models; 110% for 20 seconds/125% for 10 seconds/ 150% Immediate.

J. **Inverter Output Manual Adjustment:** 120, 127VAC (208/240VAC).

K. **Efficiency:** AC Mode >93% at full load, DC Mode >83% at full load.

L. **Dynamic Response:** +/- 10% at 100% load change in 30 milliseconds.

M. **Transfer time:** 6-milliseconds, typical.

### 1.3.4.3 Independent Battery Bypass

The UPS design must allow it to start-up and operate in Normal, Boost, or Buck mode with utility AC power available when internal batteries, (and external battery packs), have failed, are removed, or produce insufficient power for the UPS to operate in battery mode. The device must provide spike and surge protection during this stage, as well. It shall not be necessary to remove power or unplug the UPS in order to replace the internal batteries.

### 1.3.5 Output Load Shedding

The 750 – 3000VAC models will have output receptacles electrically wired into two independent circuits. Each circuit must have the ability to be individually controlled via management software.
1.3.6 **Current Monitoring**

All units will have current monitoring circuitry on the UPS output receptacles to measure the combined total load of all the receptacles. This circuitry shall be used to calculate actual load.

1.3.7 **Hot-Swappable Batteries**

All units must have hot-swappable battery function. When the unit is operating in the normal AC, Boost and Buck modes, the user must be able to replace the batteries without turning off the UPS.

1.4 **ENVIRONMENTAL CONDITIONS**

The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

A. **Operating Ambient Temperature**: UPS Module: 32°F to 104°F (0°C to 40°C). Battery Module: 32°F to 104°F (0°C to 40°C).

B. **Storage/Transport Ambient Temperatures**: 5°F to 113°F (-15°C to +45°C).

C. **Relative Humidity**: 0 to 95% non-condensing.

D. **Altitude**: Operating: 0 to 3,000 meters (0 to 10,000 feet). Storage/Transport: 0 to 15,000 meters (0 to 50,000 feet).

E. **Audible Noise**: 750-1500VA models: ≤45dBA  
2000 – 3000VA models: ≤60dBA

1.5 **SUBMITTALS**

1.5.1 **Proposal Submittals**

Submittals with the proposal shall include:

- System configuration and description.
- Functional relationship of equipment including weights, and dimensions.
- Descriptions of equipment to be furnished, including deviations from these specifications.
- Size and weight of shipping units to be handled by installing contractor.

1.5.2 **UPS Delivery Submittals**

Submittals upon UPS delivery shall include one (1) User’s manual that shall include a functional description of the equipment, safety precautions, instructions, operating procedures and battery replacement instructions.
1.6 WARRANTY

1.6.1 UPS Module

The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 36 months from purchase date or 42 months from date of manufacture, whichever period expires first.

1.6.2 Battery

The UPS manufacturer shall warrant the UPS battery module(s) against defects in materials and workmanship for 36 months from purchase date or 42 months from date of manufacture, whichever period expires first.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer Qualifications

A minimum of twenty-five year’s experience in the design, manufacture, and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. All production manufacturing facilities shall be ISO9001 and ISO14001 certified.

1.7.2 Factory Testing

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

1.7.3 Mean Time Between Failure

The UPS shall have a mean time between failure, (excluding batteries), of 100,000 hours.

2.0 PRODUCT

2.1 FABRICATION

2.1.1 Materials

All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

The maximum working voltage, current, and di/dt of all solid-state power components and electronic devices shall not exceed 90% of the ratings established by their manufacturer. The operating temperature of solid-state component sub-assembly shall not be greater than 90% of their ratings.
2.1.2 Wiring

Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (ANSI/NFPA 70).

2.1.3 Construction and Mounting

The UPS enclosure shall be adaptable for standing vertically or mounting on a wall with appropriate mounting hardware supplied by the manufacturer of the UPS. The UPS enclosure can be mounted horizontally on the floor using brackets supplied by the manufacturer. It shall also be capable of mounting within a 19” or 23” wide rack or cabinet structure with the appropriate mounting hardware supplied by the manufacturer.

The UPS shall be constructed of replaceable subassemblies. Any internal battery modules shall be replaceable by removing the front bezel and detaching the retaining bracket.

2.1.4 Physical Dimensions:

750 – 1500VA models – Height: 3.5 inches (2U), Width: 17.3 inches, Depth: 17 inches.
2000 – 3000VA models – Height: 3.5 inches (2U), Width: 17.3 inches, Depth: 24 inches.

2.1.5 UPS Heat Dissipation

A. AC Mode:  
750VA Models: (100 – 150) BTUs
1000VA Models: (150 – 200) BTUs
1500VA Models: (250 – 300) BTUs
2KVA Models: (300 – 350) BTUs
3KVA Models: (500 – 550) BTUs

B. Inverter Mode:  
750VA Models: (300 – 350) BTUs
1000VA Models: (400 – 450) BTUs
1500VA Models: (600 – 650) BTUs
2KVA Models: (900 – 950) BTUs
3KVA Models: (1,300 – 1,350) BTUs

2.1.6 Cooling

Cooling of the UPS shall be by forced air. High quality fans shall be used to minimize audible noise.

2.1.7 Grounding

The UPS chassis shall provide proper grounding to all output receptacles for reducing the risk of electrical shock hazard. The UPS will also provide an external grounding stud.

2.1.8 Input Power Cord

The UPS shall come included with a power cord of no less than ten (10)-feet in length. The cord for all 120VAC models will be connected to the UPS using a strain-relief assembly. All 208VAC models will be connected to the UPS using an IEC connector input.
2.1.9  **Input Power Plug/Connector**

750 – 1500VA 120VAC models: NEMA 5-15P straight blade plug.
2000VA 120VAC model: NEMA 5-20P straight blade plug.
3000VA 120VAC model: NEMA L5-30P locking plug.
1500VA 208VAC model: IEC320 C14 power inlet connector on the unit with a power cord with an IEC320 C13 to NEMA 6-15P straight blade plug.
3000VA 208VAC model: IEC320 C20 power inlet connector on the unit with a power cord with an IEC320 C19 to NEMA L6-30P locking plug.

2.1.10  **Output Power Receptacles**

750 – 1500VA 120VAC models: 6-Battery Backup receptacles (6-NEMA 5-15R).
2000VA 120VAC model: 7-Battery Backup receptacles (6-NEMA 5-15/20R / 1-NEMA L5-20R).
3000VA 120VAC model: 7-Battery Backup receptacles (6-NEMA 5-15/20R / 1-NEMA L5-30R).
1500VA 208VAC model: 6-Battery Backup receptacles (6-NEMA 6-15R).
3000VA 208VAC model: 7-Battery Backup receptacles (6-NEMA 6-15/20R / 1-NEMA L6-30R).

2.1.11  **Telephone/Network Protection**

The UPS shall have a RJ11/45 connector on the rear panel for protecting a single line phone/fax/modem or 10/100-base T network.

2.1.12  **Remote Emergency Power Off (REPO) Port**

The UPS shall have a RJ11 connector on the rear panel of the UPS for the exclusive purpose of providing a REPO communication port. The REPO port connects the UPS to a user-installed REPO switch. In the AC or Battery mode, short pin4 to pin5 for approximately 0.5 seconds in order to shutdown the UPS. The UPS must be powered off and then back on via the ON/OFF switch located on the front panel to restart the UPS.

2.2  **COMPONENTS**

2.2.1  **Charger**

2.2.1.1  **General**

The term charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for battery charging. The charger shall be a pulse-width modulated, switching-type with constant voltage/current limiting control circuitry.

2.2.1.2  **DC Filter**

The charger shall have an output filter to minimize ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS. The filter shall be adequate to insure that the DC output of the charger will meet the input requirements of the inverter.
2.2.1.3 Automatic Restart

Upon restoration of utility AC power, after a utility AC power outage, the UPS shall automatically restart and resume the battery recharge mode.

2.2.1.4 Battery Recharge

The charger shall be capable of producing battery-charging current sufficient to replace 90% of the battery-discharged power within six hours. After the battery is recharged, the charger shall maintain the battery at full charge until the next emergency operation.

2.2.1.5 Overvoltage Protection

There shall be charger over-voltage protection so that if the charger voltage rises to the pre-set limit, the charger will turn off and issue a fault alarm.

2.2.2 Inverter

2.2.2.1 General

The term inverter shall denote the solid-state equipment and controls to convert DC power from the Converter or the DC/DC Booster circuits to regulated AC power for supporting the critical load.

2.2.2.2 Overload Capability

The inverter shall be capable of supplying current and voltage for overloads exceeding 105% and up to 110% of full load current for 20 seconds. A status indicator and audible alarm shall indicate overload operation.

2.2.2.3 Fault Clearing and Current Limit

The inverter shall be capable of supplying an overload current of 110% of its full-load rating for 20 seconds. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

2.2.2.4 Output Power Transformer

A dry-type power transformer shall be provided for the inverter AC output. It shall have copper wiring exclusively. The transformers hottest spot winding temperature shall not exceed the temperature limit of the transformer insulation class of material when operating at full load at maximum ambient temperature.

2.2.2.5 Inverter Output Voltage Adjustment

The inverter shall have adjustable output voltages of 120 and 127VAC (208/240VAC).
2.2.2.6 **Fuse Failure Protection**

Power semiconductors in the inverter unit shall be fused so that loss of any one power semiconductor will not cause cascading failures.

2.2.2.7 **Inverter DC Protection**

The inverter shall be protected by the following disconnect levels:

- DC Overvoltage Shutdown.
- DC Over-current Shutdown
- DC under-voltage Warning (Low Battery Reserve).
- DC under-voltage Shutdown (End of Discharge).

2.2.2.8 **Over-discharge Protection**

To prevent battery damage from over-discharging, the UPS control logic shall automatically turn off the inverter at a predetermined level as to not damage the batteries.

2.2.2.9 **Output Frequency**

The output frequency of the inverter shall be microprocessor controlled. The microprocessor shall regulate the inverter output frequency to +/- 0.1% for steady state and transient conditions. Total frequency deviation, including short time fluctuations and drift, shall not exceed 0.1% from the rated frequency unless synchronized to utility power.

2.2.3 **Display and Controls**

2.2.3.1 **Monitoring and Control**

The UPS shall be provided with a microprocessor based unit status display and controls section designed for the convenient and reliable user operation. A multi-LED display shall be used to show status of the UPS, and shall be provided as part of the monitoring and controls sections of the UPS. The power controls and monitors shall be located on the front of the UPS cabinet.

2.2.3.2 **Load and Battery Metering**

The UPS shall utilize a five-LED display that will provide load and battery metering. In AC mode, the UPS, as a default, will display the total amount of connected load to the UPS. In battery mode, the UPS, as a default, will display the power status of the internal batteries, and connected external battery packs.

2.2.3.3 **Controls**

UPS start-up operations shall be accomplished through the front panel pushbutton control. To initiate a complete shutdown of the 120VAC models, the input power cord must be removed from AC utility power. The 208/240VAC models have an input circuit breaker that must be turned off to completely shut off the UPS unit.
2.2.3.4 Power Monitoring Software

The UPS shall be provided with Power Monitoring Software to report important status information concerning the UPS and the utility power.

2.2.3.5 Communications Ports

The UPS shall have a 9-pin subminiature D-shell connector on the rear panel of the UPS for connecting a RS232 communication cable between the UPS and the computer for RS232 communications. The 9-pin D-shell connector shall also provide simulated contact closure, for AC Fail and Low Battery Warning alarms. The UPS will also have a USB port for connecting a USB cable between the UPS and a computer for USB communications. Both the RS232 and USB ports must be capable of operating simultaneously.

2.2.3.6 Alarm Messages

The following alarm messages shall be displayed via LED indicators located on the front panel:

- AC Normal: When the UPS is operating in AC, Buck or Boost mode the AC Normal LED will illuminate.
- On Battery: When the UPS is operating with the use of battery power, the battery LED will illuminate and the audible alarm will sound every 10 seconds.
- Boost Mode: When the UPS is operating in the Boost mode the Boost LED will flash.
- Buck Mode: When the UPS is operating in the Buck mode the Buck LED will flash.
- UPS Fault: When the UPS detects an internal hardware fault, the fault LED will illuminate and the UPS will emit a sustained tone.
- Weak/Bad Battery: When the UPS detects a weak, bad, or disconnected battery, the Weak/Bad Battery LED will illuminate and the audible alarm will sound three times every five minutes.
- Site Wiring Fault (120VAC models only): When the UPS detects a utility service wiring problem, the Site Wiring Fault Indicator will illuminate.

2.2.4 Accessories (Optional)
2.2.4.1 Optional Battery Power Pack(s)

The battery power pack shall include sealed, non-spillable, lead-acid, valve regulated battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system lineup. Each battery power pack shall be designed with the ability to be daisy chained, in an unlimited number, from the UPS, for unlimited runtimes while operating in battery mode. Battery cells shall be mounted in metal cases designed to exactly match the width and height dimensions and installation of the control UPS. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module. Brackets shall be provided for installation into a 19’ rack or cabinet. Also, a set of stands shall be included for installation of the UPS in a vertical format for use on a floor. The set of stands shall be of a design so as to interconnect with the control UPS to form a solid configuration. Each battery power pack will have an independent charger with the ability to operate with a utility input voltage of 115VAC or 230VAC. The charger shall be capable of producing battery-charging current sufficient to replace 90% of the battery discharge power within six hours. After the battery is recharged, the charger shall maintain the battery at full charge until the next emergency operation.

2.2.4.2 Optional SNMP Card

The UPS shall come equipped with an internal SNMP adapter card slot located on the backplane of the unit, which will connect the UPS directly to any IP based network using Ethernet communications. The UPS will become a managed device on the network. From a network management station, the system administrator shall be capable of monitoring important system measurements, alarm status, and alarm history data. The network administrator shall also be capable of executing battery tests, observing the results of such tests, and turning the UPS on and off via his SNMP communication network. In the event of a utility failure, the SNMP shall continue with live communication without the requirement of additional or separate UPS equipment until such time as the UPS shuts down for Low Battery. On resumption of utility power, the SNMP card shall resume full SNMP communication automatically. The optional SNMP card shall also be capable of HTTP communications when SNMP management is not available or practical. Using most industry standard web browsers as an interface, the system administrator shall have access to all information available through the web interface. Included with the optional SNMP Card will be SNMP Manager software. The software will be able to monitor and control an unlimited number of UPS, using installed SNMP cards, through a single management window on a networked computer platform.

2.2.4.3 Programmable Relay Card

A Programmable Relay Card shall be provided, as an option, to the UPS. The Programmable Relay Card is installed using the internal card slot in the UPS. When installed, the card will provide a configurable dry-contact closure communication port between the UPS and an attached device. A terminal block with a ground, common and six relay contacts are used for monitoring alarm events on the UPS to an attached device through a user-customized cable. The card is programmed using a Hyper-terminal application. An included feature will be the ability of the card to provide signals to Windows NT4/2000/XP/2003 for notification of power failure and low battery status on the connected UPS. Up to three computers may be configured for both the power failure and low battery status. Up to six computers may be configured for a single signal.
3.0 Manufacturers Warranty and Service

3.1 Manufacturer’s Warranty Procedure

Within the first thirty-six (36) months, any defect or malfunction of the UPS device shall require contact with the manufacturer for diagnosis. If required the manufacturer will provide the customer with a Return Materials Authorization, (RMA), number to send the defective product to the factory for repair or replacement, at the discretion of the manufacturer. It will be the responsibility of the customer to provide transportation of the unit to the factory. Once repaired, or replaced, the manufacturer will incur ground freight expense to return the product to the customer.

3.2 Maintenance Contracts

A complete offering of optional, extended replacement and parts and labor maintenance contracts for both the UPS system and the battery system shall be available. An extended warranty package shall be available to either replace the defective equipment or repair it for a total of 3, 5 or 6-year lengths.