



**Illuminator®
Series EM**

**GUIDE SPECIFICATIONS
And
TECHNICAL DESCRIPTION**

1000, 1600, 2200 and 2800W
Single-Phase Uninterruptible Power System

This description contains all the necessary functional and technical information for the **Illuminator EM** family of uninterruptible power supplies.

This specification also provides electrical and mechanical characteristics and an overall description of the typical operation of an **Illuminator Series EM** uninterruptible line interactive power supply.

For any further information, please contact our Authorized Sales Representative or **Myers Power Products, Inc.** directly.

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**Myers Power Products, Inc.
44 South Commerce Way
Bethlehem, PA 18017
U.S.A.**

**Tel: 610-868-3500
Fax: 610-868-8686**

Toll Free: 1-800-526-5088

SECTION 1.0 GENERAL

1.1 SPECIFICATION

This specification defines the electrical and mechanical characteristics and requirements for a line interactive, single-phase, solid-state uninterruptible power supply, and hereafter referred to as the UPS system. The UPS shall provide high quality, computer grade AC power for today's electronic lighting loads (power factor corrected and self-ballast fluorescent, incandescent, quartz re-strike, halogen, LED and HID) during emergency backup.

The UPS shall incorporate a high frequency pulse width modulated (PWM) sine wave inverter utilizing IGBT technology, a microprocessor controlled inverter and a temperature compensating battery charger, communication port, and a user friendly control panel with audible and visual alarms.

1.2 DESIGN 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 supersede.

- UL 924 Standard Emergency Lighting and Power Equipment
- UL 924A Auxiliary Lighting
- ANSI C62.41 (IEEE 587)
- ANSI C62.42.45 (Cat. A & B)
- National Electrical Code
- NFPA- 101 (Life Safety Code)
- OSHA

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements - Electronics Module

A. Nominal input/output Voltage

The Input and Output voltage of the UPS shall be pre-configured to match the user specified input and load requirements. Available voltages are 120, 208, 240, 277 or 480 Vac.

Input: _____ VAC, 1-phase, ___ -wire-plus-ground

Output: _____ VAC, 1-phase, ___ -wire-plus-ground

B. Output Load Capacity

The output load capacity of the UPS shall be rated in kVA at unity power factor. The UPS shall be able to supply the rated kW from .5 lagging to .5 leading.

Rating: _____ kVA / kW

1.3.2 Design Requirement - Battery System

A. Battery Cells

The UPS shall be provided with sealed, valve regulated, lead acid batteries.

B. Reserve Time

The battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a mains failure.

Battery Reserve time: ___ minutes

C. Recharge Time

The battery charger shall recharge the fully discharged batteries within a 24-hour period. The charger shall be an integrated 3-step, microprocessor controlled and temperature compensating.

1.3.2 Design Requirement - Transformer Module

For systems with mixed input voltages the use of an isolation and / or autotransformer may be required. The transformer(s) is not bypassed when optional maintenance bypass circuit is activated.

1.3.3 Modes of Operation

The UPS shall be designed to operate with less than a 2-millisecond transfer time:

A. Normal

The UPS Inverter is a line interactive standby system and the commercial AC power continuously supplies the critical load. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies to the inverter while simultaneously providing floating charge to the batteries.

B. Emergency

Upon failure of the commercial AC power the inverter instantaneously with a maximum of a 2-millisecond break, switches its power supply from the input converter to the battery system. There shall be no loss of power to the critical load upon the failure or restoration of the utility source.

C. Recharge

Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

1.3.4 Performance Requirements

1.3.4.1 AC Input to UPS

- A. Voltage Configuration for Standard Units:** 1-phase, 2-wire-plus-ground.
- B. Voltage Range:** (+10%, -10%)
- C. Frequency:** 60 Hz (+/- 3Hz)
- D. Power Factor:** .5 lagging / leading
- E. Inrush Current:** 1.25 times nominal input current, 10 times 1 line cycle for incandescent loads
- F. Current Limit:** 125% of nominal input current
- G. Current Distortion:** 10% THD maximum from 50% to full load
- H. Surge Protection:** Sustains input surges without damage per standards set in ANSI C62.41 (IEEE 587) & ANSI C62.42.45 (Cat. A&B)

1.3.4.2 AC Output, UPS Inverter

- A. Voltage Configuration for Standard Units:** 1-phase, 2-wire-plus-ground
- B. Static Voltage Stability:** Load current changes +/- 2%, battery discharge +/- 12.5%
- C. Dynamic Voltage Stability:** +/- 2% (25% step load), +/- 3% (50% step load)
- D. Dynamic Recovery Time to within 1% of nominal:** 3 cycles (0-100% load step)
- E. Output Harmonic Distortion:** < 3% (with linear load)
- F. Frequency:** 60 Hz (+/- .05Hz during emergency mode)
- G. Load Power Factor Range:** 0.5 lagging to 0.5 leading
- H. Output Power Rating:** kVA = kW
- I. Overload Capability:** to 100% continuous rating
to 115% for 10 minutes
to 150% for 16 line cycles
- J. Crest Factor:** <= 4.5
- K. Efficiency** 97 - 98%

1.4 ENVIRONMENTAL CONDITIONS

The UPS shall be capable to operate within the specified design and performance criteria provided that the following environmental conditions are met:

A. Storage/Transport Temperature:

-4 to 158 deg. F (-20 to 70 deg. C) without batteries

0 to 104 deg. F (-18 to 40 deg. C) with batteries*

- Maximum recommended storage temperature for batteries is 77 deg. F for up to six months. Storage at up to 104 deg. F is acceptable for a maximum of three months.

B. Operating Temperatures: 32° to 104° F (0° to 40° C); UL rating 68° to 86° F (20° to 30° C).

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

D. Audible Noise: 45 dBA @ 1 meter from surface of the UPS
During Emergency Mode

1.5 SUBMITTALS

1.5.1 Proposal Submittals

Submittals with the proposal shall include the following:

- A. System configuration with single-line diagrams
- B. Functional relationship of equipment including weights dimensions and heat Dissipation
- C. Descriptions of equipment to be furnished, including deviations from these specifications
- D. Size and weight of units to be handled by installing contractor

1.5.2 UPS Delivery Submittals

Submittals upon UPS delivery shall include:

- A. A complete set of submittal drawings
- B. One set of instruction manuals. Manuals shall include a functional description of the equipment, installation, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.6 WARRANTY

1.6.1 UPS Module

The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship date, whichever occurs first. The standard warranty will be increased to 2 years with the purchase of a factory start-up.

1.6.2 Battery

The battery manufacturer's standard warranty shall be passed through to the end user. Sealed Lead Calcium VRLA, 10-year life expectancy – one-year full replacement warranty plus an additional nine years pro-rata.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer Qualifications

A minimum of 35 years experience in the design, manufacture, and testing of emergency power 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.

SECTION 2.0 PRODUCT

2.1 FABRICATION

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

The UPS module and batteries shall be housed in a single freestanding NEMA type 1 enclosure. Front access only shall be required for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service.

The UPS shall be powder painted with the manufacturer's standard color. The UPS shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

Cooling of the UPS shall be forced-air in emergency mode with internally mounted fans to minimize audible noise. Fans shall not operate in the standby mode. The UPS shall provide fan power. No air filters shall be required.

2.2 COMPONENTS

The UPS shall be comprised of the following components:

- A. **UPS Module** - The UPS module shall contain an inverter, an AC distribution module with an input circuit breaker, back-feed relay, control, and monitoring subsystems.
- B. **Battery Module** - The battery module shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions. The 90 - minute battery module shall be contained in same cabinet as electronics regardless of the system VA.

2.2.1 Battery Charger

A. General

In the standard configuration the charger converts ac voltage to dc voltage. With commercial power present, the inverter power transformer is powered and the IGBT modules are microprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit supplies constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at maximum level. Recharge time is 24 hours maximum at nominal ac input voltage. The ac ripple current of the dc output meets the battery manufacturer specification, thus ensuring the maximum battery lifetime.

B. AC Input Current

The charger unit is provided with an ac input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.

C. Automatic Restart

Upon restoration of utility AC power, after a utility AC power outage and after a full UPS automatic end-of-discharge shutdown, the UPS will automatically restart, performing the normal UPS start up.

D. DC Filter

The charger shall have an output filter to minimize AC ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS.

E. Battery Recharge

The charger is capable of producing battery-charging current sufficient enough to recharge the fully discharge battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

F. Over-voltage Protection

The charger is equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger shuts down automatically and initiates an alarm condition.

2.2.2 Inverter

A. General

The inverter converts dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment. The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capacitors, ensure a very low distortion of the output voltage (THD<3% on linear loads).

B. Overload Capability

The inverter during emergency modes shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current for 16 line cycles, 115% for 10 minutes.

C. Output Power Transformer

A dry type power transformer provides the inverter AC output. The transformer is built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.

2.2.3 Display and Controls

A. Monitoring and Control

The UPS system provides operation monitoring and control, audible alarms, and diagnostics. The front-mounted control panel includes a 4-line by 20-character vacuum fluorescent display and a keypad for user interface. The display will be menu driven. The system will have a continuous scrolling display of the following: Date & time, System Status (AC Status, Battery Status, Charger Status) and any system faults: This allows the operator to easily “watch” system functions as they occur and check on virtually any aspect of the system’s operation. Monitoring and control are microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system is multi-level password protected for all control functions and parameter changes.

B. Metering

Scrolling through the meter functions can monitor the following measurements:

- Utility input voltage
- System output voltage
- Battery voltage

- Battery current
- System output current
- System output VA
- Inverter wattage
- System temperature
- Date & time
- System Days

C. Audible Alarm

Audible alarm will activate with any of the following conditions and automatically store the 75 most recent events.

- High battery charger voltage
- Charger Fault
- High AC input voltage
- Low AC input voltage
- Near low battery voltage
- Low battery voltage
- Load reduction fault
- High Ambient temperature
- Inverter fault
- Output fault
- Output overload
- Output Overload shutdown

2.2.4 RS-232 Interface

The system shall be equipped with an RS-232 serial port (DB9) for remote communications.

2.2.5 Manual and Programmable Testing

The system shall incorporate a manual test function and two automatic test modes. The system will perform a programmable, self-diagnostic monthly test for 5 minutes, which is preset, for the 15th of every month and the user can program the event day and time. The yearly self-diagnostic test is for 90 minutes and the user can program the day and time the event is to take place. The microprocessor automatically records the last 75 test events in its own separate test result log.

2.2.6 Battery Assembly

The batteries are a sealed, lead-acid valve regulated battery cells with a one-year full, nine year prorated warranty. Batteries shall be interconnected via cables and will be provided with shelf interconnects where required. A disconnect means shall be included for isolation of battery assembly from the UPS module.

2.2.7 System Options

Output Circuit Breakers:

Distribution circuit breakers are for output load protection - Protection for the normally on and/or for the optional normally off loads. A maximum of 10 unsupervised 1-pole and a maximum of 6 supervised 1-pole circuit breakers are available. All circuit breakers are rated for 10,000 AIC @120VAC.

Output Circuit Breaker Trip Alarm:

An audible and visual alarm activates when an output distribution circuit breaker is open or has tripped.

Email Modem:

The email/fax/voice modem option can be configured to send a system status report via any combination of email, fax, or voice message upon completion of a preprogrammed monthly or yearly test and upon any customer selected alarm condition. Meets NFPA requirements. Bi-directional communications allows system diagnostics and data retrieval through the RS-232 serial communications port.

Summary Form “C” Contacts:

Form “C” contacts rated at 5 amps maximum at 250VAC/30VDC. Dry contacts will change state when any system alarm activates. Contacts change states with the following alarms: High battery charger fault, near low battery, low battery, load reduction fault, output overload, high/low AC input volts, high ambient temperature, inverter fault, and with optional circuit breaker trip alarm.

Maintenance Bypass Switch:

This device is internally mounted in the system and permits maintenance personnel to easily bypass the protected equipment directly to the AC utility power. The make before break switch isolates the system to perform routine maintenance or servicing.

Status Monitoring Contacts:

Form “C” dry contacts capable of monitoring system and option statuses (Inverter On, Inverter Off, AC Present, High Temperature, Summary Alarm, System Bypass* and OTA*)
*Requires purchase of Maintenance Bypass and/or Output Trip Alarm options.

Seismic Mounting:

Additional base to provide for seismic mounting increases system height by 4”

- **Normally Off Output:**

This output circuit is dedicated for the “emergency only” equipment. “Emergency only” equipment operates during power outages and when the system is on battery back up. This option leaves the load circuits off during normal utility power conditions.

2.2.8 Accessories

- **Remote Meter Panel:**

This allows greater flexibility to monitor all the system parameters from a remote location, up to 150 feet away from the system. This allows the user to remotely monitor the status of the inverter. Also allows user to control and program the inverter from a remote location. See section 2.2.3 “Display and Controls” for specific details.

- **Modem:**

Modems are devices that boost the signal level of the RS-232 diagnostic interface communications to a remote location that is more than 100 feet away from the system.

- **External Maintenance Bypass Switch:**

This maintenance bypass switch is mounted in a NEMA 1 enclosure with a hinged door measuring 11-3/8” high by 9-3/8” wide by 8-1/2” deep and permits maintenance personnel to easily bypass the protected equipment directly to the AC utility power. The make before break switch isolates the system to perform routine maintenance or servicing. This accessory cannot be used in conjunction with more than one output circuit breaker in the system and the output circuit breaker must be sized for the total system current.

- **Remote Summary Alarm Panel**

A 4” high by 4” wide by 2 1/4” deep box containing a red alarm light and buzzer with a silence switch will activate on any alarm condition.

SECTION 3.0 EXECUTION

3.1 WIRING

All wiring shall be installed in conduit. Input and output wiring shall enter the cabinet in separate conduits.

3.2 UNIT START-UP and SITE TESTING

Site start-up and testing shall be provided by the manufacturer’s field service representative during normal working hours (Mon. - Fri. 8 a.m. - 5 p.m.). Individual scheduling requirements can usually be met with 7 working days advance notice. Site testing shall consist of a complete test of the UPS and accessories by the UPS manufacturer in accordance with manufacturer’s standards. Manufacturer’s approved service representative must perform commissioning for two-year warranty to apply.

3.3 REPLACEMENT PARTS

Parts shall be available through Field Service Centers throughout the country. Recommended spare parts shall be fully stocked by local field service personnel with back up available from manufacturing location.

3.4 MAINTENANCE CONTRACTS

A complete offering of preventive and full-service maintenance contracts for both the UPS system and batteries shall be available. An extended warranty and preventive maintenance packages shall be available. Factory-trained service personnel shall perform warranty and preventive maintenance service. A five-year maintenance contract will include a unit start-up and site testing.