

Lifeway II Series
GUIDE SPECIFICATIONS
And
TECHNICAL DESCRIPTION

For 3.0, 4.0, 5.0, 6.5, 8.0kVA / kW
Series CR - Single Phase Uninterruptible Power System

This description contains all the necessary functional and technical information for the **Lifeway II** series of uninterruptible power supplies.

This specification also provides electrical and mechanical characteristics and an overall description of the typical operation of an **Lifeway II** system.

SECTION 1.0 GENERAL

1.1 SPECIFICATION

This specification defines the electrical and mechanical characteristics and requirements for a stand-by, single-phase, solid-state uninterruptible power supply, and hereafter referred to as the C system. The C 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 and/or HID) during emergency backup.

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

1.2 DESIGN STANDARDS

The C 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
- ANSI C62.41 (IEEE 587)
- ANSI C62.42.45 (Cat. A & B)
- National Electrical Code
- NFPA- 101
- OSHA and Life Safety Code
- Seismic Zone 4

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements - Electronics Module

A. Nominal input/output Voltage

The Input and Output voltage of the C shall be pre-configured to match the user specified input and load requirements. Available single-phase input voltages are 120, 208, 240, 277 or 480 VAC with output voltages of 120, 277 or 120/277VAC. Some combinations of input and output voltages may not be available.

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

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

B. Output Load Capacity

The output load capacity of the C shall be rated in kVA at unity power factor. The C 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 CR 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 discharge 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 single-phase systems with input main voltages of 208, 240, or 480VAC, the use of an isolation transformer is required. The transformer is housed within the electronics enclosure. The isolation transformer is not bypassed when maintenance bypass circuit is activated.

1.3.3 Modes of Operation

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

A. Normal

The C Inverter is a 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 C

A. Voltage Configuration for Standard Units: 1-phase, 2-wire-plus-ground

B. Voltage Range: (+10%, -15%)

C. Frequency: 60 Hz. (+/- 3%)

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, C 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 125% for 5 minutes
 - to 150% for 12 line cycles
- J. Crest Factor:** <= 2.8

1.4 ENVIRONMENTAL CONDITIONS

The C 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 25 deg. C for up to six months. Storage at up to 40 deg. C is acceptable for a maximum of three months.
- B. Operating Temperature:** Standard system: 50 to 104 deg. F (10 to 40 deg. C);
- C. Relative Humidity:** 0 to 95% non-condensing
- D. Altitude:**
 - Operating: to 10,000 ft. (3,000 m) above sea level
 - De-rated 5% per Km above 3 Km
 - Storage/Transport: to 40,000 ft. (12.2 Km) above sea level
- E. Audible Noise:** 45 dBA @ 1 meter from surface of the C

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
- E. Detailed layouts of customer power and control connections
- F. Detailed installation drawings including all terminal locations

1.5.2 CR Delivery Submittals

Submittals upon C 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 C Module

The C manufacturer shall warrant the C module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship date, whichever occurs first.

1.6.2 Battery

Sealed Lead Calcium VRLA, 5-year life expectancy – one-year full replacement warranty plus an additional four years pro-rata.

1.7 QUALITY ASSURANCE

1.7.1 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 CR 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 C module and a 90-minute battery bank shall be housed in a single freestanding NEMA type 3R enclosure. The cabinet shall incorporate 2 doors to minimize frontal clearance requirements, lockable via a 3-point latch system, keyed with Corbin 60 locks. Battery cabinets shall not be required, thus minimizing the overall system's footprint. 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 C shall be powered painted with the manufacturer's standard color. Standard cabinet shall be painted with weather resistant powder coat paint; stainless steel cabinet shall be available optionally. All circuit boards shall be conformal coated and all internal metal parts shall be either painted with weather resistant paint or plated. The C shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

Cooling of the C shall be forced-air in emergency mode, powered by the C. In normal mode, the system shall be continually cooled as required via temperature-controlled fans. All fans shall be mounted internal to the enclosure minimize audible noise.

2.2 COMPONENTS

The C shall be comprised of the following components:

- A. C Module** - The C module shall contain an inverter, an AC distribution 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 battery module is contained within the system cabinet on all system VA's.

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 C automatic end-of-discharge shutdown, the C will automatically restart, performing the normal C startup.

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 discharged 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 is to shut down automatically and initiate 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 12 line cycles, 125% for 5 minutes and 110% 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 C system provides operation monitoring and control, audible alarms, LED indicators, and diagnostics. The internally mounted control panel includes a 2-line 20-character LCD display, a keypad to control and monitor the internal operation of the system. 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.

- **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.

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- **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/low 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.

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

C. LED Indication

The internally mounted panel with integrated LEDs allows a quick check of the C operating status.

- AC Present (Green)
- System Ready (Green)
- Battery Charging (Yellow)
- Battery Power (Yellow)
- Fault (Red)

D. Audible Alarm

Audible alarm will activate with any of the following conditions and automatically store the 50 most recent events.

- High battery charger voltage

- Low battery charger voltage
- 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

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 that is preset for the 15th of every month and the user can program the event time of day. The yearly self-diagnostic test is for 90 minutes and the user can program the time of the day 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 sealed, lead-acid valve regulated battery cells with a five-year prorated warranty. Precut cable wires are included to provide easy installation. A disconnect means shall be included for isolation of battery assembly from the C 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 14 unsupervised 1-pole and a maximum of 8 supervised 1-pole circuit breakers are available for all systems. A maximum of 6 unsupervised 2-pole and a maximum of 4 supervised 2-pole circuit breakers are available for all systems. All circuit breakers are rated for 10,000 AIC.
- **Output Circuit Breaker Trip Alarm:**
An audible and visual alarm activates when an output distribution circuit breaker has tripped.
- **Normally Off Output:**
This output circuit is dedicated for the emergency equipment only. Emergency equipment only operates during power outages and when the system is on battery backup. 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 300 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.

- **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.

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 C and accessories by the C manufacturer in accordance with manufacturers standards. Manufacturer's approved service representative must perform commissioning for 2-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 C system and batteries shall be available. An extended warranty and preventive maintenance package 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.