



# **Product Specifications**

**Guide Specification for FirstLine® P<sub>E</sub>  
50kVA, 65kVA, 80kVA, 100kVA,  
125kVA, 160kVA, 200kVA**

**Three-Phase, On-Line  
Uninterruptible Power Supply**

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## **SECTION 1.0 SCOPE**

### **1.1 Summary**

- A.** This Specification defines the electrical and mechanical characteristics and requirements for the FirstLine P<sub>E</sub> Series UPS as manufactured by Staco Energy Products Co. located in Miamisburg, OH.
- B.** The UPS shall a continuous duty; three-phase, uninterruptible power system, hereafter referred to as the UPS designed to operate with the building supply to provide conditioned power as well as power back up for the critical loads.

### **1.2 Qualifications**

The manufacturer shall have a minimum of 20 years' experience in the design, manufacture, and testing of solid-state transistorized UPS systems of similar capacity.

### **1.3 Standards**

- A.** The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where conflict arises between these documents and statements made herein, the statements in this specification shall prevail.
  - 1. UL Standard 1778
  - 2. CSA 22.2, No. 107.3
  - 3. NEMA PE-1
  - 4. FCC PT 15, Class A
  - 5. National Electric Code
  - 6. OSHA
  - 7. IEEE C62.41-1991
  - 8. ISO 9001
  - 9. Seismic Withstand Certification (IBC Site Specific A – F)

### **1.4 System Description**

- A.** The UPS shall be a true double conversion, "On-Line" system consisting of the following major components:
  - 1. 3 Level PWM Rectifier utilizing IGBTs (Insulated Gate Bipolar Transistor) complete with power factor correction
  - 2. Battery charger
  - 3. 3 Level PWM Inverter utilizing IGBTs (Insulated Gate Bipolar Transistor)
  - 4. Continuous duty rated Static Switch
  - 5. (Optional) Input Isolation switch (SWIN)
  - 6. (Optional) Output Isolation switch (SWOUT)
  - 7. (Optional) Maintenance Isolation switch (SWMB)
  - 8. DSP Control and Monitoring Panel with Graphic display
  - 9. Matching Battery Cabinets with varying back up times and integral DC Circuit Breaker with UVR Trip.

### **1.5 Warranty**

#### **A. UPS Warranty**

The UPS warranty shall be in effect for 48 months after initial start-up but no more than 54 months after shipment, whichever occurs first. The warranty shall cover all parts and labor for units commissioned by manufacturer's approved service representative.

#### **B. Battery Limited Warranty**

Three (3) Year full limited warranty passed through from the battery manufacturer, controlled environment required @ 77°F (25°C).

## SECTION 2.0 PRODUCT

### 2.1 Modes of Operation

- A. The UPS can start on bypass or rectifier provided the source is qualified (voltage, frequency, phase sequence) for the mode required.
- B. The UPS shall be designed to operate as an on-line, reverse transfer system in the following modes:
- 1. On-Line (Normal)**  
The load shall always powered by the inverter, with stabilized voltage and frequency, using the energy from the mains power supply (INPUT). If there is a fault on the INPUT, the UPS shall switch to the batteries in zero time and the batteries shall supply energy to the inverter to keep the load powered (for the backup time of the batteries). When the INPUT is restored the batteries shall be automatically recharged by the rectifier.
  - 2. Eco Mode**  
The load shall be powered from the bypass line (if the power supply line is within the specified limits); if there is a fault on the power supply line, the load shall switch automatically onto the inverter, powered by the battery.  
  
In Eco mode, the rectifier remains powered and keeps the batteries charged. If the bypass line voltage or the frequency moves out of the specified limit, the load shall be automatically switched onto the inverter output. With Stand-By On operation, the energy dissipated by the system shall be reduced, leading to considerable savings.
  - 3. Battery System**  
Configurations with one (1) battery system for each UPS  
Each unit shall draw the energy from its own battery. At the end of its backup time each UPS shall shutdown. The load shall then remain unpowered if the duration of the power source outage is greater than the backup time of the connected battery system. When the power source is restored the system shall restart automatically. Each UPS shall recharge its own battery system.
  - 4. Overload**  
If the load condition to the system is not reduced, the UPS system shall switch onto the bypass line. When the overload is removed, the UPS shall automatically return to normal operation. If the overload is continuous, this shall trigger the external protection devices located at the UPS input on the bypass line. In this case the load shall remain unpowered.
- C. Paralleling - The UPS shall have expansion capabilities for up to 8 modules paralleled for capacity or redundancy in group module configurations as required to support future growth. The UPS units shall be connected in parallel and shall share the connected load. (See Section 6.0)

### 2.2 Components

#### A. Rectifier

The IGBT rectifier shall be capable of receiving utility input and rectifying it to produce Direct Current (DC) power at levels sufficient enough to supply the load via the inverter and charge the batteries.

- 1. Input Protection**  
The rectifier shall include protection against primary power surges, (except for lightning transients) including under or over voltage conditions. This protection is provided via fuses, Circuit Breakers, and Microprocessor Control of the rectifier.
- 2. Filtering**  
Sufficient filtering of the rectifier/charger output shall be provided to prevent damage to the battery. Ripple voltage shall not exceed  $\leq 2\%$  RMS.
- 3. In-Rush Limiting**  
When the primary power is applied to the rectifier, the current surge shall be limited to no more than nominal input current when the UPS is operating at 480VAC input.

**4. Power Walk-In**

When the utility power is applied to the rectifier, the current shall be <25% of the full load current and shall gradually increase to full load rating within 10 seconds (adjustable 2-30 sec.).

**5. Automatic Restart**

Upon restoration of utility AC power after a power outage, the rectifier shall automatically restart and assume the inverter and battery recharge loads.

**6. Charger**

An integral charging circuit shall be capable of recharging the batteries during normal operation to ensure maximum life from the battery system.

**7. Charger Capacity**

The charger shall have sufficient capacity to recharge a fully discharged battery to 90% capacity within ten times discharge time.

**8. Battery Test**

The UPS shall periodically check the battery system for an open cell. If the UPS detects an open cell, an alarm condition shall be displayed, and an audible alarm shall sound.

**B. Inverter**

The inverter section of the power converter module shall utilize Insulated Gate Bipolar Transistors (IGBT's). This solid-state device that incorporates digital signal processing (DSP) pulse width modulation (PWM) technology capable of accepting the output of the rectifier or the battery system voltage and delivering AC power within specified limits to the critical load bus. The inverter shall be microprocessor controlled and include all necessary timing logic and control circuits.

**C. Inverter Start-Up**

The inverter shall automatically startup when a start command is generated and shall be stable and ready to deliver power to the load.

**1. Inverter Protection**

Inverter IGBT's shall be protected by current limiting circuits. The inverter shall be capable of running indefinitely with the batteries disconnected. For rapid removal of the inverter from the critical load, the inverter's control electronics shall instantaneously turn off the inverter when the inverter's capacity is exceeded. Simultaneously, the static transfer switch shall transfer the load to utility power without interruption to maintain continuous power to the critical load.

**2. Inverter Oscillator**

The inverter shall contain an oscillator capable of operating and maintaining the output frequency of the inverter within specified limits. The inverter oscillator shall be capable of frequency synchronization and phase locking to the bypass utility power source frequency. When operating as a slave to the utility power and a failure occurs in the slaving signal, the inverter oscillator shall automatically revert to a free running state and maintain the specified limits. The oscillator shall not drift more than 0.05% while operating at maximum rated operating temperature.

**3. Phase Balance**

Electronic controls shall be provided to regulate each phase so that an unbalanced load will not cause the output voltage to go outside of the specified voltage unbalance or phase displacement limits.

**D. Static Transfer Switch – 100% Rated, Continuous Duty**

An internally mounted static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be naturally commutated high-speed devices rated to conduct full load current continuously while on bypass power. The static switch shall be designed to avoid back-feed into the utility supply. Failure of one device shall not affect the operation of the UPS and the failure shall be shown on the LCD display.

**1. Bypass Transfer**

The static switch shall automatically and successfully transfer the critical load from the inverter to the bypass source under the following conditions:

- DC voltage out-of-limits
- Inverter failure
- Critical load current exceeds inverter overload rating
- Over-temperature develops within the inverter
- Manual command is given

Transfer shall be automatically inhibited whenever bypass source parameters are outside predetermined (adjustable)

limits, or UPS output and bypass are not synchronized, and phase locked.

**2. Retransfer**

The static switch shall automatically and successfully retransfer the critical load from the bypass source to the inverter under the following conditions:

- Inverter output voltage returns to within specified limits.
- Critical load current reduces to within inverter limits.

**E. Battery**

**1. General**

The UPS module shall use a valve-regulated sealed lead acid (VRLA) heavy duty industrial battery, designed for auxiliary power service in an UPS application. The primary battery shall be housed in a line up and match cabinet(s) installed both adjacent to and/or standalone versions. (UPS shall have options for Nickel Cadmium and Lithium Batteries)

**2. Protection against Deep Discharge and Self-Discharge**

The UPS shall be equipped with an undervoltage device designed to protect the battery against deep discharge, depending on discharge conditions, with isolation of the battery by a circuit breaker. This will prohibit auto-restart if used. In particular, a monitoring device shall adjust the battery shutdown voltage as a function of a discharge coefficient to avoid excessive discharge at less than the rated output. A second device shall avoid self-discharge of the battery into the UPS control circuits during an extended shutdown of the UPS (over two hours).

**3. Battery Tests**

1. Battery tests are push to test:

- Programmable
- Results saved in memory
- Alarms when battery degradation detected.

2. Test modes: Standard test (programmable time in seconds) and Deep Test (low voltage warning.)

**3. Battery Cycle Monitor**

1. The system shall be capable of monitoring and retrieving Battery Cycle information from the Front Display Panel.

The information provided shall be:

- a. Time spent operating on battery
- b. Number of discharges
- c. Number of full discharges

**F. Manual Maintenance Bypass (Optional)**

Bypass switching shall allow the critical load to be fed from the bypass power source, while providing isolation of the static switch during maintenance.

## 2.3 Electrical Specifications

### A. Ratings

1. The UPS shall be available in power ratings of (kVA/kW):  
50kVA/kW, 65kVA/kW, 80kVA/kW, 100kVA/kW, 125kVA/kW, 160kVA/kW, 200kVA/kW
2. A wide range of battery backup time(s) shall be available with Extended Battery Cabinet(s).

### 3. AC Input Characteristics

The UPS shall be capable of accepting power from two (2) sources as standard (Dual Input).

- a. **Nominal Voltage:** 480 VAC, 3 Phase, 60Hz, 3-wire + ground (Standard Voltage)  
**or**  
208Y/120 VAC, 60Hz, 3 Phase, 4-wire + ground - with external line up and match transformer cabinet (**Optional**)  
**or**  
208V VAC, 60Hz, 3 Phase, 3-wire + ground - with external line up and match transformer cabinet (**Optional**)
- b. **Nominal Voltage Range:** +15/-20% from nominal voltage during battery recharge.
- c. **Frequency Range:** 45 - 65 Hz
- d. **Power Factor:** > 0.99 at full load, nominal conditions.
- e. **Current Harmonic Distortion (THDi):** < 3%
- f. **Inrush current:** Less than nominal input current for less than one cycle
- g. **Input Surge Protection:** Per ANSI/IEEE C62.41.
- h. **Rectifier Walk-in:** Progressive from 2 to 30 seconds (adjustable.)
- i. **Rectifier Walk-in Delay Timer:** Progressive start of rectifier from 0 to 600 seconds (adjustable.)

### 4. AC Output Characteristics

- a. **Voltage:** 480 VAC Delta,  $\pm 1\%$  steady state variation phase-to-phase voltage volts AC, 3 Phase, 60Hz, 3 wire plus ground (Standard Voltage).  
**or**  
208Y/120 VAC, 3 Phase, 60Hz, 4-wire + ground - with external line up and match transformer cabinet (**Optional**)  
**or**  
400V to 415V, 3 Phase, 50Hz (Voltage adjusted in 1-volt increments), Programmable from the front Panel.
- b. **Frequency:** 60Hz, + 2%, 60Hz, + .01% when free running. (Programmable 50 Hz for frequency converter)
- c. **Voltage regulation:**  $\pm 1\%$  for balanced load,  $\pm 2\%$  for 100% unbalanced load.
- d. **Voltage Distortion:** Maximum 2% total (THD).
- e. **Voltage Transient (Step Load) Response:** + 5% for 100% step load change.
- f. **Voltage Recovery Time:** Return to within 1% of nominal value within 20 milliseconds.
- g. **Phase Angle Displacement:** 120 degrees + 1° for balanced load; 120°, + 1° for 100% unbalanced load.

- h. **Non-Linear Load Capability:** Output voltage total harmonic distortion shall be less than 2% when connected to a 100% non-linear load with a crest factor not to exceed 3%.
- i. **Slew Rate:** Programmable (.5 Hz/sec to 2.5 Hz/sec)
- j. **Power Factor:** 1 Unity at the rated volt amperes (VA).
- k. **Inverter Overload Capability:** 110% of rated load continuous, 125% of rated load for 10 minutes and 150% of rated load for 1 minute.
- l. **Bypass Overload Capability:** 110% continuous, 125% for 10 minutes, 150% for 1 minute.
- m. **Output Waveform:** Sinusoidal
- n. **Efficiency:** (DC-AC): Minimum - >95% at Full Load, (AC-AC): Minimum – >96% at Full Load

## 5. Battery

- a. **Battery Voltage:** 400 volts DC minimum before cutoff, 540 volts float.
- b. **Maximum DC Current:** Maximum DC current at cutoff voltage shall be:  
50kVA- 131A, 65kVA- 171A, 80kVA- 210A, 100kVA– 262A, 125kVA– 328A, 160kVA– 415A, 200kVA– 518A

## 2.4 Mechanical Design and Ventilation

- A. Enclosure: The UPS shall be housed in a freestanding NEMA 1 enclosure with dead front construction. The mechanical structure of the UPS shall be sufficiently strong and rigid to withstand handling and installation operations without risk and have provisions for forklift handling. The sheet metal elements in the structure shall be protected against corrosion by a suitable treatment, primed and powder coat painted black with a textured finish.
- B. Combined Convection and Redundant, forced air-cooling shall be provided to ensure that all components are operated within specification with air entry at the front with 36" clearance, lower sides. At least one of the three side walls, right, left or back, shall be free with 24" top clearance for air to exit.
- C. Cable Access: The standard UPS available shall accommodate bottom entry cables (top or side cable entry shall be optional).
- D. Cabinet Dimensions: The width of the UPS shall be:  
50kVA to 125kVA: 70.98" (1803mm) H x 27.65" (702.4mm) W x 31.69" (805mm) D  
160kVA to 200kVA: 70.98" (1803mm) H x 31.5" (800mm) W x 31.5" (800mm) D
- E. Cabinet Weights: The UPS shall have a maximum weight of 991 lbs. @ 50kVA-125kVA, 1,268 lbs. @ 160kVA-200kVA
- F. Ventilation and Heat Rejection: The UPS shall be designed for forced air cooling. Air inlets shall be provided from the front and bottom of the UPS enclosure. Air exhaust shall be from the top portion of the unit. Full load heat rejection shall be 9,067 BTU/hr. @ 50kVA, 11,027 BTU/hr. @ 65kVA 11,847 BTU/hr. @ 80kVA, 12,977 BTU/hr. @ 100kVA, 17,075 BTU/hr. @ 125kVA, 19,466 BTU/hr. @160kVA, 22,198 BTU/hr. @ 200kVA

## 2.5 Environmental Requirements

- A. The System shall withstand any combination of the following external environmental conditions without operational degradation.
  1. Operating Temperature Range: 32°F (0°C) to 104°F (40°C) for the electronics, however the batteries should not be exposed to prolonged periods of temperature above 77°F (25°C). For every 15°F (8°C) above 77°F battery life is cut in half and may void the battery warranty.
  2. Storage Temperature Range: -25°F (-32°C) to 122°F (50°C) however batteries should not be exposed to temperatures above 77°F (25°C). For every 15°F (9.5°C) above 77°F battery life is cut in half and may void the battery warranty.
  3. Relative Humidity: Continuous operation with a relative humidity up to 90% non-condensing at 77°F (25°C).
  4. Altitude: Normal operation without de-rating is 3,281 feet.
  5. Audible Noise: Audible noise generated by the UPS shall not exceed 69 dBA when measured at 1 meter in front of the power converter using scale "A" of a standard ASA sound level-measuring device.

## 2.6 System Controls and indicators

The UPS unit shall incorporate the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, as well as take any appropriate action. The UPS shall meet, at a minimum the following requirements:

### A. Panel Functions

#### 1. LED Control Panel Functions

- Menu Selections
- Mimic Screen
- Function Indicator LED's
- Dual ON / OFF Selection Keys – Provided Safe Redundant Control From LCD
- EPO Button

#### 2. Graphic Display

A full color graphic display shall be on the UPS door, which provides the user to have a close-up, detailed overview in real time of the status of the UPS. The user shall be able to switch the UPS on and off, consult electrical mains, output, and battery measurements and perform the main UPS settings. The display shall be divided into four main areas, each with its own specific role.

- a. **HOME "S"- General Information:** Area of the display where the status of the UPS, Time & Date and critical data such as input, output or battery data can be easily reviewed.
- b. **Status "Lookup" Display/Menu Navigation:** Allowing the detail and viewing of critical information such as the status of all critical parameters, event logs, user logs, waveform capture screens and product information; serial number and firmware revision status. (4-channel on screen oscilloscope like display for inverter, bypass voltage and current waveforms)
- c. **Login Screen:** Providing screen and system operation protection for User, Administrator and Field Engineer. User and Administrator passwords may be reset and custom by the end user.
- d. **Warning & Fault Indication:** Quick access to any warning and fault message being experienced by the UPS.
- e. **Silence Active Alarm:** Touch screen button used to silence an active warning or fault alarm.
- f. **ON/OFF:** Soft screen key, dual action for redundant operation of the hardware keys.

#### 3. Menu Display

- System Diagram
- Measures
- Waveforms
- Commands
  - Battery Test
  - Command
  - Bypass
  - System
  - Stand-By Mode ON
  - Smart Mode ON
- Customizing
  - Date/Time
  - Normal Output Voltage
  - Battery Capacity
- History
- Firmware
- Language

#### 4. LED Status Indication

- Bypass Line
- Main Power
- On Battery
- Load on Bypass
- Normal Output
- Alarm for Internal Fault



## 5. Alarm Messages/Events

The Display Panel shall provide the following alarm and event messages.

Description	Condition
Mains abnormal	Mains Abnormal Alarm is active
Bypass abnormal	Bypass Abnormal Alarm is active
Battery abnormal	Battery Abnormal Alarm is active
Rectifier abnormal	Rectifier Abnormal Alarm is active
Internal communication fault	Control board internal communication abnormal
PFC power limited	Mains input current reach the current-limit setting value
PFC flash read error	Internal Flash read error
Battery over temperature alarm	Battery temperature over the setting value
Environment over temperature alarm	Environment temperature over the setting value
Output circuit abnormal	External output breaker disconnected (output dry contact)
Output overload alarm	Output load larger than 100%
Output over voltage alarm	Output overvoltage
Output under voltage alarm	Output undervoltage
Inverter assistant point fault	Output contactor abnormal
Inverter abnormal	Inverter Abnormal Alarm is active
Rectifier locked inverter	Rectifier abnormal prohibit inverter working
Parallel mode with non-redundancy	While system is in redundancy mode, system load above redundancy level
Enter ECO state	Enter ECO mode
Exit ECO state	Exit ECO mode
Fan fault	Fan fault
ECO fault	Bypass abnormal or Bypass overload protection or bypass voltage larger than ECO voltage upper limit setting value or bypass voltage less than ECO voltage lower limit setting value
Inverter bus fault	Inverter detect DC link voltage abnormal
Inverter losing synchronization fault	Inverter synchronization loss
Inverter debug mode on	Inverter debug mode started
Emergency power off	Panel EPO active or input dry contact EPO active
Impact load startup fault	System is in impact load mode inverter slow-start process abnormal
Parallel wire 1 abnormal	Parallel wire 1 abnormal lost connection
Parallel wire 2 abnormal	Parallel wire 2 abnormal lost connection
System power on parameter mismatch	Parallel system machine parameters mismatch or Parallel address is the same parameters system rated power, rated voltage, rated frequency, working mode, impact load mode setting, frequency conversion mode setting
System overload	Inverter output overload protection
Waiting invert together	Parallel system waiting for bypass switch to invert together
System emergency power off	EPO fault
Parameter mismatch fault	One of parallel parameters is incorrect
Battery abnormal (Remote)	Input dry contact-Battery abnormal action

**B. Control Functions**

**1. Configurable Alarms**

The UPS shall have the following user configurable control functions accessible from the Display Panel.

Description	Condition
Alternate input power level	Input dry contact-Alternate input power level action
Remote EPO	Input dry contact-Remote EPO action
On generator	Input dry contact-On generator action
Remote online	Input dry contact-Remote online action
Remote bypass	Input dry contact-Remote bypass action
Battery breaker off	Input dry contact-Battery breaker off action
Output breaker off	Input dry contact-Output breaker off action
Inverter inhibit	Input dry contact-Inverter inhibit action
Charging inhibit	Input dry contact-Charging inhibit action
External alarm	Input dry contact-External alarm action
Battery ground fault	Input dry contact-Battery ground fault action

**A. Remote Emergency Power Off (EPO)**

The UPS shall be equipped with provisions for local and remote emergency power off and Dry Contact input that shall be used to command UPS shutdown remotely.

**B. Dry Contacts:** The UPS shall be provided standard with a programmable input/output Relay board. This board shall have 8 dry contacts (i.e., 8 for input signals and 8 for output signals).

1. Remote Input Contacts shall be programmable to allow for positive or inverse logic for the following:

- a. OFF
- b. Battery Abnormal
- c. Alternate Input Line Voltage
- d. Remote EPO
- e. On Generator
- f. Remote Online
- g. Remote Bypass
- h. Battery Breaker Closed
- i. Output Breaker Closed
- j. Inverter Inhibit
- k. Charger Inhibit
- l. Battery Ground Fault
- m. External Alarm

2. Remote Output Contacts shall be programmable to allows for positive or inverse logic for the following:

- a. OFF
- b. Online Operation
- c. Bypass Operation
- d. Redundant Bypass Operation
- e. Battery Operation
- f. Battery Low Voltage
- g. Battery Shutdown
- h. Output Overload
- i. General Alarm
- j. General Warning
- k. UVR 24VDC
- l. Battery Abnormal
- m. Input Abnormal

3. The contacts shall capable of switching up to 277VAC max 10A/30VDC max 5A.

## 2.7 Parallel Configuration

- A. The UPS shall have expansion capabilities for up to 8 modules (same rating) in a parallel configuration for capacity or redundancy as required to support future growth and to increase both the reliability of the to the load. The UPS units shall be connected in parallel and shall share the connected load.

Having a redundant unit means having one more UPS than the minimum number of elements required to power the load, so that if a faulty unit is automatically excluded, power is still supplied correctly. The UPSs connected in parallel are coordinated by a card which ensures the interchange of information. The information shall be exchanged between the UPSs via a cable connecting them in a loop. The loop connection provides redundancy in the connection cable (communication in the cables between the individual units). This is the most reliable means of connecting the UPS and also allows the hot insertion or disconnection of a UPS. Each UPS has its own controller that continuously communicates with the whole system so as to guarantee the operation of the system. The cable transmits the signals from a "Master" UPS to the other "Slaves" using an isolated system in order to keep the control systems electrically isolated from each other. The operating logic envisages that the first unit that is activated becomes the "Master" and takes control of the other "Slaves". In the event of a fault in the "Master" unit, control is immediately switched to a "Slave" which then becomes the "Master". The current system provides basic operation, each unit having its own battery.

In a system with several UPS units connected in parallel, there shall be a single MASTER unit and the remaining units shall be SLAVE units. The UPS units shall all be the same rating and the MASTER is chosen on start-up. The MASTER and SLAVE units shall be capable of exchanging roles. If a unit is being serviced, e.g. due to an inverter fault, it will automatically be excluded. The load at this point shall be shared between the units that are still active; if the power in the output is excessive for the remaining UPSs, the system logic shall switch all the units, including the UPS that was excluded, onto the bypass line.

### 1. Single Module Paralleling

Each UPS has installed communication boards to allow for paralleling. Up to 8 modules can be paralleled.

### 2. Dual Bus Paralleling

The system can synchronize the outputs from two separate groups of parallel UPS Modules which may be supplied from separate AC sources. It shall enable the outputs from the groups to be configured into a dual bus format.

The UPS maintains synchronization between the outputs of the parallel groups, regardless of input supply variations. For example, one group may be on battery power or standby power and the other powered by the mains power supply. The device can be generally used with up to eight UPS modules between two separate groups.

### 3. Hot Insertion/Removal

The system shall have the capability to insert or remove additional UPS modules without disconnecting the load. The hot insertion and removal of the UPS shall make technical support easier and improves the reliability of the system.

## B. Battery System

The parallel configuration shall be capable of using (1) battery system per UPS.

1. Configurations with one (1) battery system for each UPS  
Each unit shall draw the energy from its own battery. At the end of its backup time each UPS shall shutdown. The load shall then remain unpowered if the duration of the power source outage is greater than the backup time of the connected battery system. When the power source is restored the system shall restart automatically. Each UPS shall recharge its own battery system.

## 2.8 Options

### A. UPS Options

#### 1. Top or Side Cable Entry

Standard cable entry shall be from the bottom with optional provisions for top or side entry using a matching side car cabinet not to exceed 15.85" (402.5mm) W x 31.69" (805mm) D x 70.98" (1803mm) H.

#### 2. Input / Output Transformer Cabinet with Maintenance Bypass (Make-Before-Break)

The UPS shall have optional provisions to accept an input power source of 208 VAC and /or output of 208/120V. An input Auto or Isolation transformer 208 VAC to 480 VAC and/or 480V to 208/120V output transformer shall be housed in a single cabinet. As an integral part of the cabinet, it shall also accept a three (3) Breaker Maintenance Bypass with electronic interlocks and top cable entry capability. The cabinet shall match the UPS cabinet.

#### 3. Output Distribution Unit (PDU)

The UPS shall have provisions to provide a 208Y/120 VAC output distribution unit (PDU) to distribute power to the load. The PDU shall contain up to 4 distribution panels in a cabinet not to exceed 74.75" (1899mm) H x 44.8" (1138mm) W x 39" (991mm) D. Branch circuit breakers shall be provided by others.

#### 4. Output Parallel Cabinet

An Output Parallel Cabinet shall be available for connection of all UPS System connected in parallel.

### B. Battery System Options

#### 1. External Battery Cabinet System

Extended run time battery cabinet(s) shall be furnished in both adjacent and/or standalone versions. The battery cabinet shall be capable of accepting a minimum of (40) each of VRLA Maintenance Free Cell type batteries, wired and installed. Interconnecting cables and lugs shall be provided by others.

#### 2. Open Rack Battery System

The UPS shall be capable of utilizing Wet Cell or NiCad batteries installed in an open type seismic qualified rack construction.

#### 3. String and Cell Level Battery Monitoring

The battery shall have provisions to accept a battery monitoring system (BMS) that monitors each battery or string. It shall also be capable of monitoring the battery cabinet internal temperature and provide cycle data and other reports and graphs.

### C. External Maintenance Bypass

#### 1. Wrap-Around System Maintenance Bypass Switch

An External Maintenance Bypass (MBS), (make-before-break) shall be available: The MBS shall provide a means to isolate the load for removal of the UPS. For 480V x 480V power requirements, the maintenance bypass option shall provide for three (3) circuit breakers mounted in a matching cabinet with electronic interlocks.

The total enclosure shall provide a wrap-around bypass configuration for total UPS isolation during maintenance or removal of the UPS. Maintenance bypass transfers shall be without interruption and shall have electronic interlocks to protect the UPS from damage in the event of out-of-sequence transfers.

### D. Communications

#### A. Communication Cards

1. Internal SNMP Card with network communication protocols - TCP/IP, HTTP and network interface (SNMP).
2. Internal MODBUS is provided via RS485 or RJ-45 over TCP/IP.

#### B. Monitoring and Shutdown Software

1. The UPS shall have Monitoring and Shutdown Software available to provide communication across a LAN network.) Netility shutdown/monitoring software shall enable the UPS to integrate easily into medium and large sized networks and provide reliable communications between the UPS and management systems employed.

**C. Battery Sensor Module**

**FLE-Sensor:** The Battery Sensor Module shall monitor the battery internal cabinet environmental conditions of one (1) Battery Cabinet connected to the UPS and displayed on the UPS front mimic panel. For units with multiple battery cabinets, only the first cabinet will be monitored.

**D. Remote Status Alarm Panel (RSAP)**

**FLE-RSAP:** An optional Remote Status Alarm Panel device shall provide remote monitoring of the basic operation of the UPS. It shall have (1) independent hardwired panel which will connect to the remote output contacts of the UPS indicating online, bypass, battery operation and alarm status of the UPS.

**E. IBC Seismic Withstand Certification**

Site specific Seismic Withstand Certification per IBC (International Building Code) Areas A through F. Bracing hardware with drawings shall be available. All unit shall have bolt down capability without the use of external brackets.

**F. Harsh Environment Enclosure**

The UPS and any accessory cabinet(s) shall have the capability to be mounted and completely wired internal to, include AC cooling, inside any NEMA type enclosure (NEMA 12, 3R, 4X) by the manufacturer.

**G. Spare Parts**

Shall be available in three levels, Level 1. Minor, Level 2. Medium and Level 3. Major.

**H. Service Agreements**

Multi-level service and maintenance agreements shall be available.

## **Section 3.0 Execution**

### **3.1 Factory Testing**

Before shipment, the manufacturer shall fully and completely test the system to factory standards to assure compliance with the specification. Each subassembly shall undergo thorough testing prior to installation in the system. The total system shall be exposed to a functional load test and shall be subjected to a minimum of 4 hours "burn-in" test prior to shipment.

A complete test report shall be available for each unit and kept on file for future reference.

### **3.2 Site Start-Up**

Site start-up and testing shall be provided by the manufacturer's field service representative during normal working hours (Mon-Fri- 8a/5p). Individual scheduling requirements shall be met with ten 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. Commissioning must be performed by manufacturer's approved service representative for warranty to apply.

### **3.3 Field Engineering Support**

The UPS manufacturer shall have available a nationwide field service organization staffed by factory trained Field Service Engineers dedicated to the start-up, maintenance and repair of UPS equipment. The manufacturer shall have a toll-free service telephone number answered 24 hours a day / 365 days a year.

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