

Vertiv™ Liebert® ITA2
GUIDE SPECIFICATIONS
5-20kVA, 208/220VAC
Three-Phase, Rack/Tower UPS

1.0 GENERAL

1.1 Summary

These specifications shall define the electrical and mechanical characteristics and requirements for a continuous-duty, three-phase, solid-state, uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

1.2 Standards

The UPS shall be designed in accordance with 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 govern.

220 and 208V Nominal Units

- Listed to UL Standard 1778, 5th Edition; CSA 22.2 No. 107.3; and cULus labeled
- ANSI C62.41, Category A, Level 3
- IEC 62040-1+ A1:2013
- IEC 62040-3
- FCC Part 15, Class A
- ISTA Procedure 1A/1E/3B
- RoHS2 (6 by 6) Compliant
- REACH and WEEE Compliant
- USA EPA Energy Star Qualified

1.3 System Description

1.3.1 Modes of Operation

The UPS shall be designed to operate as a true on-line double-conversion system in the following modes:

1. **Normal** - In normal operation, incoming AC power shall be fed to the input power factor-corrected (PFC) rectifier that converts the AC power to DC power for the inverter. In this mode, power shall also be derived from utility power for the battery charger. The inverter shall derive DC power from the PFC rectifier to regenerate filtered and regulated AC sinewave power for the connected load. The unit shall begin charging the battery once the UPS is connected to utility power, regardless of whether the UPS is On or Off. In the event of a utility outage or severe abnormality (sag or swell), the inverter shall support the connected load from battery power until the battery is discharged or until the utility power returns, whichever occurs first.
2. **Battery** - Upon failure of utility/mains AC power, the critical AC load shall be supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility/mains AC source.

3. **Recharge** - Upon restoration of utility/mains AC power, after a utility/mains AC power outage, the input converter shall automatically restart and resume supplying power to the inverter and the battery charger to recharge the battery.
4. **Automatic Restart** - Upon restoration of utility/mains AC power, after a utility/mains AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load and the battery charger automatically recharges the battery. This feature shall be capable of being disabled by the user.
5. **Bypass** - The integral bypass shall perform an automatic transfer of the critical AC load from the inverter to the bypass source in the event of an overload, PFC failure, internal overtemperature, DC bus overvoltage or inverter failure.
6. **Eco** - The UPS shall allow the user to enable and place the UPS in Eco mode of operation to reduce electrical consumption. Eco mode operation shall be an active type, wherein the UPS will power the connected equipment through the bypass path and the UPS inverter shall be On and operating at no load in order to stay synchronized to the bypass to ensure rapid transfers to inverter power when input power falls outside of the user-customizable parameters. The UPS shall also have a user-customizable requalification time that input power must remain within the Eco mode parameters before transferring back to Eco mode operation. This is to minimize the number of transfers between bypass and inverter.

1.3.2 Design Requirements

1. **Voltage** - Input/output voltage specifications of the UPS shall be:
 - a. **Input**
 - **208V Units:** 0-280VAC, 50/60Hz, three-phase, 4-wire-plus-ground
 - **220V Units:** 0-280VAC, 50/60Hz, three-phase, 4-wire-plus-ground
 - b. **Output**
 - **208V Units:** 208VAC (user configurable: 208V, 220V) $\pm 2\%$, 50/60Hz, three-phase, 4 wire plus-ground
 - **220V Units:** 220VAC (user configurable: 208V, 220V) $\pm 2\%$, 50/60Hz, three-phase, 4 wire plus-ground
2. **Output Load Capacity** - Specified output load capacity of the UPS shall be:
 - 5kVA/5 kW at 1.0 power factor
 - 8kVA/8 kW at 0.9 power factor
 - 10kVA/10 kW at 1.0 power factor
 - 15kVA/15 kW at 1.0 power factor
 - 20kVA/20 kW at 1.0 power factor
3. **Battery** - The UPS shall utilize either valve-regulated, non-spillable, lead acid cells with a design life of 3-5 years or Lithium Iron Phosphate cells, with a design life of 10 years.

4. Reserve Time

- **5000VA:** 15 minutes
- **8000VA:** 13 minutes
- **10000VA:** 8 minutes
- **15000VA:** 8 minutes
- **20000VA:** 5 minutes

These time shall be at full load with an ambient temperature of 77 °F (25 °C) with resistive loading with 1 battery string for 5000kVA to 10000kVA and 2 battery string for 15000kVA and 20000kVA.

5. **Battery Recharge** - The UPS shall contain a three-stage battery charger designed to prolong battery life. Recharge time for UPS internal batteries shall be 5.5 hours to 90% capacity after a complete discharge with full load connected.

1.3.3 Performance Requirements

AC Input to UPS

1. **Voltage Configuration** - The UPS shall require three-phase, four-wire plus ground input wiring. The input voltage range without drawing power from the batteries shall be:
 - a. **5kVA Models**
 - 166 VAC - 249 VAC for 100% to 0% load levels
 - b. **8kVA Models**
 - 187 VAC - 249 VAC for 100% to 50.1% load levels
 - 166 VAC - 249 VAC for 50% to 0% load levels
 - c. **10kVA Models**
 - 166 VAC - 249 VAC for 100% to 0% load levels
 - d. **15kVA Models**
 - 166 VAC - 249 VAC for 100% to 0% load levels
 - e. **20kVA Models**
 - 166 VAC - 249 VAC for 100% to 0% load levels
2. **Frequency** – The UPS shall auto-sense input frequency when first powered up and shall operate within the following frequency specifications. The UPS shall be capable of cold start with default frequency of 60Hz. Once started the input frequency operating window shall be 40-70Hz.

Three frequency settings shall be customizable: Auto frequency sensing (factory default setting), 50Hz frequency conversion and 60Hz frequency conversion. Frequency conversion settings shall disable the static bypass switch operation.
3. **Input Power Factor** - >0.99 lagging at rated load.
4. **Input Current Reflected Distortion** - 5% THD typical.

5. Input Current Ratings

UPS Model	208VAC Units
5kVA	20A
8kVA	24A
10kVA	37A
15kVA	54A
20kVA	73A

6. **Inrush Current (initial startup, no load)** - The UPS shall have a maximum inrush current of six times the full load peak input current.
7. **Input Line Transient Immunity** – The UPS shall conform to an input line transient conforming to IEEE C62.41, Category A, Level 3 tests for 208VAC models.
8. **Surge Protection** - MOV ratings shall be 385V, 80 Joules minimum connected L1-L2-L3, L1-G, L2-G and L3-G.
9. **Dual Input** - The UPS shall be capable of conversion from a single-input design to a dual-input design to provide separate feeds for the rectifier and bypass circuits. Conversion shall be designed to take 5 minutes or less by the installing contractor; use of manufacturer’s service personnel shall not be required.

AC Output, UPS Inverter

1. Voltage Configuration

- **208V Units:** 208VAC, 50/60Hz, three-phase, four-wire-plus-ground
- **220V Units:** 220VAC, 50/60Hz, three-phase, four-wire-plus-ground

2. **Voltage Regulation** - $\pm 2\%$ steady state for balanced loading; $\pm 8\%$ for 100% unbalanced loading.
3. **Frequency Regulation** - $\pm 5\%$ synchronized to utility / mains. $\pm 0.25\text{Hz}$ free running or on-battery operation.
4. **Frequency Slew Rate** - 0.5Hz per second default; user selectable for 0.2, 0.5 or 1.0Hz per second
5. **Voltage Distortion** - 4% Total Harmonic Distortion (THD) typical into a 100% linear load; 5% THD typical into a 100% non-linear load with crest factor ratio of 3:1.
6. **Load Power Factor Range** - The load power factor range shall be 0.5 lagging to 0.50 leading.

7. Output Power Rating

- 5kVA/5kW at unity (1.0) power factor
- 8kVA/7.2kW at 0.9 lagging power factor
- 10kVA/10kW at unity (1.0) power factor
- 15kVA/15kW at unity (1.0) power factor
- 20kVA/20kW at unity (1.0) power factor

8. Inverter Overload Capability

- Inverter overload capability while operating on utility/mains power shall be 105%-125% for 5 min, 125%-150% for 1 min, 150% or greater for 200ms
- Inverter overload capability while operating on battery power shall be 105%-125% for 30sec-1 min, 125% or greater for 200ms

9. Voltage Transient Response

- ±5% in line mode 0-100-0 % loading of the UPS rating
- ±5% in battery mode for 0-100-0% loading of the UPS rating

10. Transient Recovery Time - To nominal voltage within 60 milliseconds.**11. AC-AC Efficiency:** The UPS models shall be U.S. EPA ENERGY STAR qualified and labeled.

- 5kVA: 93% AC –AC at full rated linear load in double-conversion mode
- 8kVA: 93.2% AC–AC at full rated linear load in double-conversion mode
- 10kVA: 93.1% AC–AC at full rated linear load in double-conversion mode
- 15kVA: 93% AC –AC at full rated linear load in double-conversion mode
- 20kVA: 93% AC –AC at full rated linear load in double-conversion mode
- 5kVA to 20kVA: 99% AC-AC at full rated load in Eco mode

12. Programmable and Controllable Output - The UPS unit shall have two output terminal block connections. One output terminal block shall be non-controllable and one shall be programmable and controllable. The user shall be able to program to perform load shedding based upon battery capacity remaining, time on battery operation, battery time remaining, and overload condition when on battery power. The user shall also be able to program the terminal block for sequential restart of connected equipment based upon time after input power is restored.**1.4 Environmental Conditions****1. Ambient Temperature**

- **Operating:** 32 °F to 122 °F (0 °C to 50 °C). Derating required above 104 °F (40 °C). For optimum battery performance and battery life operating temperature shall be 68 °F to 77 °F (20 °C to 25 °C)
- **Storage:** 5 °F to 131 °F (-25 °C to 55 °C)

2. Relative Humidity

- **Operating:** 0 to 95% non-condensing
- **Storage:** 0 to 95% non-condensing

3. Altitude - 10,000 ft. (3,000 m) maximum without power derating when operated within the temperature specified in Section 1.4, Item 1. Ambient temperature shall be derated 9 °F (5 °C) for each additional 1600 ft. (500 m) above 10,000 ft. (3,000 m)

4. Audible Noise

- 5kVA: <55dBA maximum at 1 meter from front sides, and rear
- 8kVA: <58dBA maximum at 1 meter from front sides, and rear
- 10kVA: <60dBA maximum at 1 meter from front sides, and rear
- 15kVA: <63dBA maximum at 1 meter from front sides, and rear
- 20kVA: <63dBA maximum at 1 meter from front sides, and rear

5. **Electrostatic Discharge** - The UPS shall be able to withstand an electrostatic discharge compliant to ENC61000-4-2.

1.5 User Documentation

The specified UPS system shall be supplied with a Safety Instruction and Warning Sheet. The specified UPS system shall be supplied with a quick-start guide for ease of installation and UPS startup. Each UPS shall also contain a full user manual on the included CD. The user manual shall include installation instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations, step-by-step operating procedures and general maintenance guidelines.

1.6 Warranty

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The no-hassle replacement warranty shall include shipping costs to the customer site for the new replacement unit and shipping costs from the customer site for the return of the failed unit. Optional one (1) and three (3) year full coverage extension warranties shall be available from the manufacturer. The manufacturer's standard and extended warranties shall cover all parts, including the battery.

1.7 Quality Assurance

1.7.1 Manufacturer Qualifications

More than 40 years experience in the design, manufacture and testing of solid-state UPS systems shall be required. The manufacturer shall be certified to ISO 9001:2015.

1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the UPS system to ensure compliance with the specifications.

2.0 PRODUCT

2.1 Fabrication

All materials and components making up the UPS shall be new, of current manufacture and shall not have been in prior service except as required during factory testing. All relays shall be provided with dust covers.

2.1.1 Wiring

Wiring practices, materials and coding shall be in accordance with the requirements the standards listed in Section 1.2 and other applicable codes and standards. All wiring shall be copper.

2.1.2 Cabinet

The UPS unit shall be composed of: input PFC converter, IGBT inverter, battery charger, input filter and internal bypass circuit; shall be housed in a rack-tower NEMA Type 1 enclosure and shall meet the requirements of IP20. The UPS cabinet shall be cleaned, primed and painted RAL 7021 Black.

The external battery cabinet (EBC) shall be composed of: sealed, valve-regulated, lead acid battery cells or Lithium Iron Phosphate cells, and shall be housed in a rack-tower NEMA Type 1 enclosure and shall meet the requirements of IP20. The battery cabinet shall be cleaned, primed and painted RAL 7021 Black.

The maintenance bypass cabinet (MBC) shall be composed of: input, output and maintenance bypass circuit breakers with two (2) optional integral output distribution ports and shall be housed in a rack-tower NEMA Type 1 enclosure and shall meet the requirements of IP20. The MBC shall be cleaned, primed and painted RAL 7021 Black.

Unit Dimensions and Weights shall be (rack-mount orientation):

Model	Dimensions W x D x H, in. (mm)	Weight lb. (kg)
UPS	16.9 x 19.7 x 5.1 (430 x 500 x 130)	50.7 (23)
VRLA EBC	16.9 x 19.7 x 5.1 (430 x 500 x 130)	121.3 (55)
1U Li-Ion EBC	16.9 x 29.13 x 1.67 (430 x 740 x 42.5)	44.09 (20)
2U Li-Ion EBC	16.9 x 26.77 x 3.35 (430 x 680 x 85)	70.5 (32)
MBC	16.9 x 22.4 x 10.3 (430 x 570 x 261)	39.7 (18.2)

2.1.3 Cooling

The UPS shall be forced-air cooled by an internally mounted, continuously operating fan. Fan power shall be provided from the internal DC supply. Air intake shall be through the front of the unit and exhaust shall be out the rear of the unit.

2.1.4 Plug-n-Play Cord Sets

The UPS manufacturer shall offer optional AC power cable kits to provide plug-n-play functionality. The cord sets shall be field-installed by the installing contractor. The AC input cord shall be 10 ft. (3 m) in length to provide adequate cord length for rack-mount installations and output cord length of 1.5 ft. (0.46 m) The cord set for the 8kVA rated unit shall contain NEMA L21-30 plug and receptacle and the 10kVA model shall have IEC30960-60 connectors.

2.2 Components

2.2.1 Input Converter

1. General

Incoming AC power shall be converted to a regulated DC output by the input converter supplying DC power to the inverter. The input converter shall provide input power factor-correction (PFC) and input current distortion reduction.

2. AC Input Current Limit

The input converter shall be provided with AC input current limiting whereby the maximum input current is limited to 125% of the full load input current rating.

3. Input Protection

The UPS shall have built-in protection against undervoltage, overcurrent and overvoltage conditions including low-energy lightning surges introduced on the primary AC source. The UPS models shall be able to sustain input surges without damage per criteria listed in ANSI C62.41, Category A, Level 3.

4. Battery Recharge

The UPS shall contain a three-stage battery charger designed to prolong battery life. Recharge time for the internal UPS batteries shall be 5.5 hours to 90% capacity (full load discharge rate). There shall be DC overvoltage protection so that if the DC voltage exceeds the pre-set limit, the UPS will shut down automatically and the critical load will be transferred to bypass.

2.2.2 Inverter

1. General

The UPS inverter shall be a Pulse-Width-Modulated (PWM) design capable of providing the specified AC output. The inverter shall convert DC power from the input converter output or the battery into precise sinewave AC power for supporting the critical AC load.

2. Overload

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current. A visual indicator and audible alarm shall indicate overload operation. For greater currents or longer 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 devices.

3. Inverter DC Protection

The inverter shall be protected by the following DC shutdown levels:

- DC Overvoltage Shutdown
- DC Undervoltage Shutdown (end of discharge)
- DC Undervoltage Warning (low battery reserve); factory default set at 2 minutes (user-configurable 2 to 30 minutes)

4. Output Frequency

An oscillator shall control the output frequency of the UPS. The inverter shall maintain the output frequency to $\pm 0.25\text{Hz}$ of nominal frequency during Battery mode, Frequency Converter mode or when otherwise not synchronized to the utility/mains source.

5. Output Protection

The UPS inverter shall employ electronic current limiting circuitry.

6. Battery Overdischarge Protection

To prevent battery damage from overdischarging, the UPS control logic shall automatically raise the battery shutdown voltage setpoint; depending on output load and connected battery system at the onset of battery operation.

2.2.3 Display and Controls

1. General

The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. The monitoring functions such as voltages, currents, UPS status and alarm indicators shall be displayed on a Liquid Crystal Display (LCD). The LCD shall present text in any of five languages (English, French, Portuguese, Spanish, and Chinese) for user selection.

2. System Indicators

The UPS display shall also include two LED-based system indicators. The system level indicators shall be: fault indicator and UPS operating status.

3. Controls

UPS startup and shutdown operations shall be accomplished by using push buttons on the front panel of the UPS. The display shall be menu driven and shall use four control buttons for ease of navigation and selection of the configurable parameters.

- a. **Control Buttons** - The UPS display control button functionality shall be:
 - **ESC Button:** This button shall return to the previous menu or abort any change before confirming the change.
 - **UP Arrow Button:** This button shall move the cursor up or increase the value displayed when changing parameters. This button shall also be used to scroll up for navigating the screens.
 - **DOWN Arrow Button:** This button shall move the cursor down or decrease the value displayed when changing parameters. This button shall also be used to scroll down for navigating the screens.
 - **ENTER Button:** This button shall enter the next level menu or confirm the parameter changes.
- b. **Display Menu Structure** - The UPS display shall have the following menu structure with the following status and configuration screens.
- c. **System Status (Default Screen)** - The system status screen shall be the default screen to display a mimic diagram and shall include the input voltage and frequency; bypass voltage and frequency; output voltage, frequency, and load percentage; battery charge state, voltage, capacity and estimated battery time remaining. To prolong display life, the UPS display shall go into “sleep” mode after two minutes of no user interaction. Pressing any of the four functional buttons shall wake up the display and this action shall not perform any operation.

Main Menu the main menu shall list the submenu selections:

- UPS Status Screens
- Configuration Settings Screens
- Control Settings Screens
- Event Log Screens
- About Screens
- Maintenance Screens

d. **UPS Status** - The UPS status screens shall provide the following information:

Input

- Voltage
- Frequency
- Amperage
- Power Factor
- Power (KWH)

Bypass

- Voltage
- Frequency
- Amperage

Battery

- Capacity
- Runtime (Minutes)
- Voltage

Output

- Voltage
- Frequency
- Amperage

Load

- Capacity
- Wattage
- Volt-Amperes
- Power Factor

- e. **Configuration Settings** - The UPS Configuration settings screens shall provide the following customizable parameters (default values are listed first):

Output

- Voltage Selection (120/208V or 127/220V)
- Startup on Bypass (Disable, Enable)
- Frequency Selection (Auto bypass Enable/Auto bypass Disable/50Hz no bypass/60Hz no bypass)
- Inverter Sync Range ($\pm 3\text{Hz}$, $\pm 5\text{Hz}$, $\pm 4\text{Hz}$, $\pm 2\text{Hz}$, $\pm 1\text{Hz}$, $\pm 0.5\text{Hz}$)
- Bypass Voltage Upper Limit (+20%, +15%, +10%)
- Bypass Voltage Lower Limit (-40%, -30%, -20%, -10%)
- Bypass Frequency Range ($\pm 10\text{Hz}$, $\pm 5\text{Hz}$)
- Run Mode (Normal, ECO)
- Eco Voltage Range ($\pm 10\%$, $\pm 5\%$, $\pm 15\%$)
- Eco Frequency Range ($\pm 3\text{Hz}$, $\pm 2\text{Hz}$, $\pm 1\text{Hz}$)
- Eco Requalification Time (30min, 15min, 5min)

Battery

- Shared Battery (Disable, Enable)
- Local Battery Total AH
- External Battery Cabinets (Auto Detect, 1, 2, 3, 4, 5)
- Low Battery Warning (2 to 30 minutes in 1 minute increments)
- Battery Replacement Reminder (Year/Month/Day; Hour/Minutes/Seconds)
- Battery Test Interval (Disable, 8, 12, 16, 20, 26 weeks)
- Battery Test Weekday (Wednesday, Sunday, Monday, Tuesday, Thursday, Friday, Saturday)
- Battery Test Time (Hour/Minutes/Seconds)
- Battery Series (32)
- Discharge Protection Time
- Equalize Charge (Disable, Enable)
- Temperature Compensation (Disable, Enable)
- Replace Battery

Monitor

- Language (English, Chinese, French, Portuguese, Spanish)
- Date (Year/Month/Day)
- Time (Hour/Minutes/Seconds)
- Display Orientation (Auto-rotate, Horizontal, Vertical)

- Audible Alarm (Enable, Disable)
- UPS Comms Address (1)
- Multifunction Port Protocol (Sensor, Modbus)
- Modbus Address (1, 1-128)
- Change Settings Password (111111, up to six numbers, 0-9)

System

- Auto Restart (Enable, Disable)
- Auto Restart Delay (Seconds)
- Guarantee Shutdown (Enable, Disable)
- Voltage Selection (120/208, 127/220)
- Remote Control (Enable, Disable)
- Remote Power On Delay (Seconds)
- Remote Shutdown Delay (Seconds)
- Redundant (No, Yes)
- LBS Select (Disable, Enable)
- IT Earthing System Compatibility (Disable, Enable)
- Dry Contact Output 1 (Low Battery)
- Dry Contact Output 2 (UPS Fault)
- Dry Contact Input 3 (Maintain)
- Dry Contact Input 4 (Maintain)

Outlet

- Turn UPS On
- Turn UPS Off
- Reboot Outlet
- Turn Off on Battery when Output is Overloaded (OFF/ON)
- Turn Off when on Battery Power (2, 0-4320 Minutes)
- Turn Off when on Battery Time Remaining less than (0, 0-4320 Minutes)
- Turn Off when on Battery Capacity (30%, 20-80 %)
- Turn On when on Input Power Returns (0-4320 Minutes)

Control Settings

The UPS display shall have the following controls:

- Turn UPS On
- Turn UPS Off
- Turn On Bypass (Manually Transfer to Bypass Power)
- Start Manual Battery Test
- Cancel Manual Battery Test
- Clear Faults
- Power-On Time (Year/Month/Day; Hour/Minutes/Seconds)
- Power-Off Time (Year/Month/Day; Hour/Minutes/Seconds)

Event Log

The UPS shall have an event log to record 1024 events and shall be viewable from the display. The event log, once full, shall begin to replace the first event logged to provide a FIFO process for maintaining event history. The event history shall record and display the number of events out of the 1024 (xxx/1024) as well as the event description, time (date/time when the event that occurred), event code.

- **Current** - Navigate the event log to view the last 1024 events
- **History** - Navigate the event log to view the last 1024 events

About

The UPS shall have an About screen to display the UPS model number, serial number, hardware version, and firmware version. Additionally, if fitted with a network monitoring card (SNMP) and connected to a network, the network information provided shall be at least the MAC address and IP address.

Maintain

The UPS shall have the ability to work with either a make-before-break or break-before-make external maintenance bypass.

4. Automatic Battery Test

The UPS shall feature an automatic battery test. The battery test shall ensure the capability of the battery to supply power to the inverter while loaded. If the battery fails the test, the UPS shall display a warning message to indicate the internal batteries need replaced. The battery test feature shall be user-accessible with communication software. The Automatic Battery test feature shall be capable of being disabled or configured from the LCD to operate every 8, 12, 16, 20 or 26 weeks.

2.3 Bypass

2.3.1 General

A bypass circuit shall be provided as an integral part of the UPS. Bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarms conditions. This control circuit shall provide a transfer of the load to the bypass source if available and if the inverter is incapable of powering the load (that is if there is an overload condition, if the unit is in Manual Bypass mode or if the voltage or frequency is out of tolerance).

2.3.2 Automatic Transfers

The transfer control logic shall activate the bypass automatically, transferring the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:

- UPS Overload
- UPS Overtemperature
- PFC Failure
- Inverter Failure
- DC Bus Overvoltage

Once the overload condition is reduced, the load shall be automatically transferred back to inverter power.

2.4 Battery System

Either valve-regulated, non-spillable, lead acid cells (VRLA) or Lithium Iron Phosphate (LFP) shall be used as a stored-energy source for the specified UPS system. The battery shall be housed in a matching cabinet to the UPS in aesthetics and color. The battery shall be sized to support the inverter at rated load and power factor, with ambient temperature of 25 °C (77 °F) for a minimum of 8 minutes of reserve time. The VRLA battery's expected life shall be 3-5 years or a minimum 260 complete discharge cycles. The Li-Ion battery shall have a life expectancy of no less than 10 years. All UPS models shall allow connection of up to five external battery cabinets for VRLA and up to 8 external battery cabinets for li-ion to provide extended run time capability. External battery cabinets shall be UL-listed.

2.5 Maintenance Bypass

The UPS system shall include an optional rack-tower external maintenance bypass. The maintenance bypass shall be housed in a matching cabinet to the UPS in aesthetics and color. The maintenance bypass shall be a make-before-break type with integrated interlock to prevent miss-operation. The maintenance bypass shall easily allow conversion to provide a separate bypass feeder like the design of the UPS. The maintenance bypass shall contain two (2) ports for optional integrated distribution configurations in addition to hardwire output to a customer supplied distribution panel.

2.5.1 Optional Output Distribution

Optional output distribution shall be integral to the maintenance bypass and located on the rear of the unit. Two ports shall be available for use of any combination of the following.

Model	Phases	Distribution
PD3-001	3	(2) L21-30R
PD3-002	3	(6) L6-30R
PD3-003	3	(6) L5-30R
PD3-004	3	(1) IEC60309 - 60A (4W+G)
PD3-005	3	(6) L5-20R
PD3-006	3	(6) L6-20R
PD3-009	3	(2) L21-20R
PD3-011	3	(1) IEC60309 - 60A (3W+G)

PD2-101	2	(8) 5-15/20R T-slot, (2) L6-30R
PD2-102	2	(4) 5-15/20R T-slot, (4) L6-20R
PD2-103	2	(4) 5-15/20R T-slot, (4) L6-30R
PD2-104	2	(4) 5-15/20R T-slot, (2) L6-30R, (2) L6-20R
PD2-105	2	(4) 5-15/20R T-slot, (2) L5-30R, (2) L5-20R
PD2-106	2	(4) L5-20R, (4) L6-20R
PD2-107	2	(4) L5-20R, (4) 5-15/20R T-slot
PD2-108	2	(2) L6-30R, (2) L6-20R
PD2-109	2	(2) L14-30R
PD2-200	2	(4) IEC320-C19, (4) IEC320-C13
PD2-201	2	(2) IEC320-C19, (8) IEC320-C13
PD2-202	2	(12) IEC320-C13
PD2-204	2	(2) IEC309-32A, (4) IEC320-C13

2.6 Communication Options

2.6.1 Vertiv™ Liebert® IntelliSlot™ Communication

The UPS shall include one Liebert® IntelliSlot™ communication port to allow the operator to field-install an optional Vertiv™ Liebert® IntelliSlot™ communication card. A Liebert® IntelliSlot™ card may be installed during any state of UPS operation (On, Standby or Off states). Available Liebert® IntelliSlot™ options are described below.

1. Vertiv™ Liebert® IntelliSlot™ Web Card (IS-UNITY-DP)

The factory-installed Liebert® IntelliSlot™ Web Card shall deliver SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network. The card shall support 10/100 Mbit Ethernet, IPv4 and IPv6, HTTP/HTTPS, SNMPv1/v2/v3 for device Web page access and deliver Web, Vertiv™ LIFE™ Services support, SNMP, e mail, text messaging, and Telnet communication and control capabilities and shall provide for in-the-field upgrade of SNMP firmware. The kit shall include the Liebert® IntelliSlot™ card, MIB, configuration cable and user manual.

The Vertiv™ Liebert® IS-UNITY-DP Web card shall also support external environmental sensors for monitoring environmental conditions around the UPS units. The Liebert® IS-UNITY-DP is a hot-installable card.

2. Vertiv™ Liebert® IntelliSlot™ Relay Interface Card (IS-RELAY)

The optional Liebert® IntelliSlot™ Relay Interface Card shall provide contact closure for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and on UPS. The contacts shall be rated for 24VAC or 24VDC at 1A. Connections shall be to a terminal block connector with cable provided by the end user.

3. Vertiv™ Liebert® IntelliSlot™ MultiPort Card (IS-MULTIPOINT)

The optional Liebert® IntelliSlot™ Multiport Card shall provide four sets of contact closure for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery and Low Battery for connection to up to four servers/computers for use with Vertiv™ Liebert® *Trellis™* Power Insight software. The contacts shall be rated for 24VAC or 24VDC at 1A. Connections shall be to a terminal block connector with cable provided by the end user.

2.6.2 USB Port

The USB port shall allow connection to a computer to use with Vertiv™ Liebert® *Trellis™* Power Insight software and for use with the UPS configuration program. The USB port shall be HID1 compliant and shall work with the Power Management system in Microsoft Windows XP or later, Linux and Mac OSX. The USB port shall be by a Type B connector.

2.6.3 Serial Port

A serial port shall be made available with a DB-9F connector on the rear of the UPS. This connector shall communicate using Vertiv proprietary protocol for use with Liebert® *Trellis™* Power Insight software. This port will provide more data points for use with Liebert® *Trellis™* Power Insight software that is not part of the USB HID1 protocol.

2.6.4 Terminal Block Connections

The UPS shall contain on the rear panel a terminal block to provide two (2) dry contact output signals and two (2) dry contact input signals.

- **Output Contact Port 1** - Low Battery signal shall be the default setting for this port and shall be a Normally Open (NO) dry contact. When the UPS is supplying output power from the battery and has reached the Low Battery Warning time selected in the configuration program, this dry contact shall be closed. This port can be configured for On Battery, On Bypass, UPS Fault.
- **Output Contact Port 2** - UPS Fault signal shall be the default setting for this port and shall be a Normally Open (NO) dry contact. This port can be configured for On Battery, On Bypass, Low Battery.
- **Input Contact Port 1** - Maintain Mode is the default setting for this port and shall be a Normally Open (NO) dry contact. This port can be configured for Any Mode Shutdown or Battery Mode Shutdown.
- **Input Contact Port 2** - Maintain Mode shall be the default setting for this port and shall be a Normally Open (NO) dry contact. This port can be configured for Any Mode Shutdown or Battery Mode Shutdown.

The dry contacts shall be rated at 125VAC, 0.5A; 30VDC, 1A.

2.6.5 Remote Emergency Power Off

The UPS shall contain an interface for a Remote Emergency Power Off (REPO) circuit. The REPO shall interface with both Normally Open and Normally Closed REPO systems.

2.6.6 Multifunction Port

The UPS shall contain a multifunction port (RJ-45 connection) for use with auto-detection of the matching battery cabinets, or addition of a Vertiv temperature sensor, temperature/humidity sensor, or provide integrated Modbus communication. The user shall be able to set the use of this port from the LCD.