GUIDE FORM SPECIFICATIONS

FOR

ABB
CONCEPTPOWER DPA 500 480V, UL UPS SYSTEM
THREE-PHASE UNINTERRUPTIBLE POWER SUPPLY SYSTEM

100 KW TO 500 KW
MODULAR UPS CABINET

500 KW TO 3 MW
UPS SYSTEM

1. General

1.1. Scope

The Uninterruptible Power Supply (UPS) systems are required to provide continuous, regulated AC power to the equipment of The Organization, irrespective of any disturbances or disruptions occurring on the main power supply.

This specification describes the ABB Conceptpower DPA 500 480V, UL series modular UPS, a modular uninterruptible power supply system for datacenter, network, telecom and other critical equipment applications. It defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, uninterruptible power supply system. The uninterruptible power supply system, hereafter referred to as the UPS, shall provide high-quality AC power.

1.2. Related Work

The UPS shall be installed by others in accordance with the manufacturer's recommendations.

1.3. STANDARDS

The UPS shall be listed to the following UL/CSA standards. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

Subject	**Standard Reference**	**Standard Title**
Safety	UL 1778 5th edition	UL Standard for Safety for Uninterruptible Power Systems, UL 1778
Safety	CSA C22.2 No. 107.3-14 Third Edition	UL Standard for Safety for Uninterruptible Power Systems, UL 1778

The UPS shall be designed in accordance with the applicable sections of the current revision of the following standards. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

Subject	**Standard Reference**	**Standard Title**
Electromagnetic Compatibility (EMC)	IEC/EN 62040-2	Uninterruptible power systems (UPS) – Part 2: Electromagnetic compatibility (EMC) requirements

1.4. SYSTEM DESCRIPTION

The UPS system shall consist of the following main components:

1. UPS frame (also called cabinet) and
2. UPS modules.

The UPS cabinet shall be configurable up to 500kW, with the ability to host up to 5 UPS module sets.

The UPS modules shall be parallel-connected inside the frame. Each UPS module shall operate in double-conversion mode and shall be of the voltage and frequency independent (VFI) type. Each UPS module shall have an equal rating of 100 kW and shall be made up of the following components:

A. Rectifier
B. Inverter
C. Battery charger
D. Static bypass
E. Back-feed protection
F. Control logic
G. User interface (display + buttons + mimic diagram)

1.4.1. Parallel Installation

1.4.1.1. Capacity (non-redundant) system

All the UPS modules connected in parallel are required to supply the full rated load within the same cabinet. The UPS cabinet shall be supporting multi-cabinet parallel configuration up to six (6) cabinets in parallel. If a UPS power unit or control module should malfunction, the load is to be transferred automatically to the bypass line via each of the UPS units with their static bypass switches being triggered simultaneously.

1.4.1.2. Redundant operation

The UPS system will operate in an N+n configuration where N is the number of UPS units connected in parallel to support the load and n is the number of UPS units connected in parallel to provide the co-efficiency of redundancy.

The parallel UPS units shall be capable of operation from a common DC bus or with a separate DC supply for each UPS unit. In either case the batteries should be configured so that the failure of one battery string (common DC bus) or the failure of one battery set (separate DC supply for each UPS) provides battery redundancy whereby the specified autonomy at full load is maintained.

The malfunction of one of the UPS unit's power or control modules shall cause that particular UPS unit to be automatically isolated from the system and the remaining UPS units shall continue to support the load.

Replacement or repair of a UPS unit shall be achieved without disturbance to the connected load, while the remaining modules continue operating in online mode (online swappability).

1.4.1.3. Modes of Operation

The UPS shall be designed to operate as a true on-line, double conversion Voltage and Frequency Independent (VFI) system in the following modes:

A. Normal - The critical AC load is continuously supplied by the UPS inverter. The input converter derives power from the utility AC source and supplies DC power to the inverter. The battery charger shall maintain a float-charge on the battery.

B. Battery - Upon failure of utility AC power the critical AC load is 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 AC source.

C. Recharge - Upon restoration of utility AC power, after a utility AC power outage, the input converter shall automatically restart and resume supplying power to the inverter. Also the battery charger shall recharge the battery.

D. In addition to the input conversion soft start of each UPS module, when a mains recovery occurs, all single input converters shall switch on in a sequential way with a delay of 2-5 seconds from each to the other module within the system configuration.

E. Automatic Restart - Upon restoration of utility AC power, after a utility AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load on inverter.

F. Static-bypass - The static-bypass shall provide an alternate path for power to the critical load that shall be capable of operating in the following manner:

    a. Automatic - In the event of an internal failure or should the inverter overload capacity be exceeded, all UPS modules shall perform an automatic transfer of the critical AC load from the inverter to the bypass source.

    b. Eco-Mode – The UPS module(s) shall be able to operate in Eco-Mode when the power quality parameters of the by-pass source are within the permissible tolerances. The UPS system shall automatically transfer the load to normal mode if the by-pass source goes out of permissible tolerances. Transfer in both directions shall take place very rapidly (< 5ms) and shall not affect the supplied load.

    c. Manual - Manual activation of the bypass shall cause an immediate transfer of the critical AC load from the inverter to the bypass source on all modules of the system.

1.4.2. Performance Requirements

The UPS shall be a true on-line double conversion, belonging to the classification VFI in accordance with UL 1778, UL 60950-1, and IEC/EN 62040-3.

1.4.2.1. Input Specifications

Voltage (steady-state, r.m.s), rated:	3x480 + G	VAC
tolerance, referred to 480V	-10/+15 at <100% load -30/+15 at <80% load -40/+15 at <60% load	%
Frequency, rated	60 ±5%	Hz
tolerance, referred to 60Hz	-/+ 5	%
total harmonic distortion (THDi)	< 3.5	%
In-rush current	< 100% of rated current	%
Power factor	0.99 @ 100% load	

Output Specifications

Voltage (steady state, r.m.s.), rated:	3x480 + G	VAC
variation in normal mode / battery mode	± 1.5 / ± 1.5	%
Total harmonic distortion (THDu), 100% load, normal mode:		
linear	< 2.0	%
non-linear (according to IEC 62040-3)	< 4.0	
Total harmonic distortion, 100 % load, battery mode:		
linear	< 2.0	%
non-linear (according to IEC 62040-3)	< 4.0	
Voltage unbalance and phase displacement, 100 % load unbalance	0	%
Voltage transient and recovery time, 100% step load:		
linear	± 4	%
non-linear (according to IEC 62040-3)	± 4	%
transfer normal mode --> battery mode	0	%
Frequency (steady-state), rated:	60	Hz
Frequency tolerance variation in normal mode (frq. Synchronized with mains)	± 2 / ± 4	%
Frequency tolerance in battery mode (free-running)	± 0.1	
Max synch phase error (referred to a 360° cycle)	0	°
Max slew-rate	1	Hz/s
Load power factor, rated	1.0	
displacement (permissible lead-lag range)	(all range) 0	%, s

1.4.2.2. UPS Efficiency

Overall efficiency in double conversion mode (AC/AC), shall be greater than or equal to 95.5% from 50% load to full rated load.

1.4.2.3. Batteries

A. The battery system shall be sized to support a connected load of XX kW for a minimum of XX minutes at an ambient temperature of 25 °C. The UPS shall interface with an external battery cabinet or battery shelves to extend reserve time capabilities.

B. The battery system shall consist of valve regulated, lead acid batteries (or open lead acid cells or Nickel Cadmium cells). Flame retardant batteries shall be provided, which renders the UPS suitable for installation inside a computer room.

C. The UPS battery charging circuit shall comprise of a separate battery charger and not depend on a charge voltage being derived from the UPS input rectifier. Consequently the battery charging voltage shall have r.m.s. ripple content of <2%.

D. The battery system shall consist either:

   1) A separate battery system for each individual UPS module. In this case each separate battery system may consist of one protected string or multiple protected strings of multiple cells.

   Or

   2) A common battery feeding all the UPS units. In this case the battery system shall consist of a minimum of two parallel strings of multiple cells. Each individual string shall have its own dedicated means of electrical circuit protection.

E. The batteries shall be housed in cabinet/s comprising a floor-standing steel enclosure with dimensions and paint finish to match the UPS system cabinet/s to form a continuous suite when standing immediately adjacent to the UPS system cabinet/s.

   The battery cabinet/s shall have full width opening doors to permit ease of access for the purposes of maintenance and/or repair of the batteries. Additional options available with the battery cabinets. Contact factory for availability.

F. A fully discharged battery system shall be capable of being recharged to 80% of the UPS output capacity within a maximum period of 10 times the normal total discharge time period.

G. The UPS DC bus voltage shall be fixed whereby the number of battery blocks (12V blocks) is 45 blocks to enable the battery system to be optimized for size and cost.

1.5. ENVIRONMENTAL CONDITIONS

A. The UPS system shall be designed to operate continuously at full load without degradation of its reliability, operating characteristics or service life in the following environmental conditions:

- UPS operation ambient temperature range is 0°C to 40°C,
- Battery ambient temperature range is 20°C to 25°C
- Humidity (relative) ≤ 95% non-condensing
- Storage: UPS -25 deg C to +70 deg °C; Battery -20 deg C to 25 deg °C for maximum 6 months

B. The UPS system shall be designed for operation in altitudes up to 1000 meters, without the need for de-rating or reduction of the above environmental operating temperatures.

C. To permit access through a standard single doorway opening, either the width or the depth of the UPS and battery cabinets shall not exceed 37.5 in [952.5 mm].

D. The UPS system cabinet shall comprise of a floor standing steel enclosure to house the power system, control systems, battery connections and all associated necessary connections for the correct operation of the UPS in accordance with the requirement of the specifications. All switchgear and interconnections must be adequately protected to enable an isolated section to be safely maintained or repaired whilst the remaining system supports the load.

E. The UPS system shall be designed to limit the injection of current harmonics in to the incoming utility supply and as such the maximum total input current harmonic distortion should not exceed <3.5% THDi when the UPS system is operating at the UPS manufacturer's specified rating.

1.6. USER DOCUMENTATION

The specified UPS system shall be supplied with one (1) user's manual. The manual shall include installation instructions, a functional description of the equipment with block diagrams, safety precautions, illustrations and step by step operating procedures.

1.7. WARRANTY

The UPS manufacturer shall guarantee warrant the UPS against defective materials and workmanship for period of one (1) year from date of shipment. With the purchase of factory start-up services, the manufacturer shall include labor and expenses for a period of one (1) year from date of factory start-up, not to exceed eighteen (18) months from date of factory shipment. Warranty coverage is provided Monday-Friday, from 8 AM - 5 PM. Warranty applies only to equipment manufactured by Thomas & Betts Power Solutions. Other

equipment is covered by the warranty of its manufacturer. Maintenance contract packages shall also be available.

1.8. QUALITY ASSURANCE

1.8.1. Manufacturer Qualifications

A minimum of 10 years' experience in the design, manufacture, and testing of solid-state UPS systems is required.

1.8.2. Factory Testing

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

1.9. Submittals

1.9.1. With Proposals – Brochures, one-line digram, outline drawings and/or data sheets describing the proposed equipment shall be submitted with the proposal. All deviations to this specification shall be listed and included with the proposal.

1.9.2. After Receipt of Order – Optional project custom drawing packages are available. These include installation drawings showing outline dimensions, weights, connections and a one-line diagram of the UPS shall be sent to the purchaser to be used in planning the installation of the system.

1.9.3. After Construction of Equipment.

1.9.3.1. One copy of drawings shall be furnished for each of the following:

a. Equipment installation outline including external cabling termination locations.
b. Equipment internal wiring diagram.

1.9.3.2. One instruction manual shall be furnished and shall include as a minimum the following:

c. Safety instructions
d. System description, specifications and control
e. Installation planning
f. Installation and start-up
g. Operators guide
h. Control panel reference
i. Warranty and service information

1.9.3.3. A copy of the final test report shall be furnished with the equipment.Certified copy of the final test is an available added option.

1.9.3.4. Factory witness test available as an added option. After Installation of Equipment - A signed field service report describing start-up and on-site testing shall be furnished with the invoice for the service trip.

2. 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. The UPS shall be constructed of replaceable subassemblies.

2.2. Wiring

Wiring practices, materials, and coding shall be in accordance with the requirements of UL 1778 and other applicable codes and standards. Input, output and battery wiring terminal shall support top cable entry or bottom cable entry as a standard configuration. Common input (rectifier and bypass) or dual input (rectifier and bypass separate) and separate and common battery wiring shall be supported.

2.2.1. UPS Cabinet

The UPS cabinet shall be constructed in such a way to guarantee font access only for installation and maintenance.

The UPS system comprised of: power modules, Input, output and battery connections (distribution) and user interface module housed in a single free-standing enclosure (cabinet) and meets the requirements of IP20. The UPS cabinet shall not exceed the following dimensions:

Width (W)	Height (H)	Depth (D)
70 in [1778 mm]	77.75 in [1975 mm]	35.00 in [889mm]

2.2.2. UPS module

The UPS modules shall be of double conversion, continuous duty (true on-line), plug-in and hot swappable technology, in redundant- parallel operation, accommodated in the UPS system rack/cabinet. Each UPS module shall basically consist of a rectifier/charger, a solid state inverter, a static transfer switch and, preferably, its controller. Additionally each module shall have built-in back-feed protection. The incorporation of the UPS controller and/or control panel into every individual module shall be considered as a serious advantage. If one

UPS module fails, the UPS system shall have the capability to replace the faulty UPS module without transfer the load on by-pass. UPS modules shall not exceed the following dimensions:

Width (W)	Height (H)	Depth (D)
27.80 in [706mm]	6.90 in [175mm]	29.5 in [750mm]

2.2.3. Cooling

The UPS shall be forced air cooled by internally mounted fans.

2.3. COMPONENTS

2.3.1. Rectifier AFE (Boost Converter)

A. General

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

C. Input Protection

The UPS shall have built-in protection against undervoltage, overcurrent, and overvoltage conditions including low-energy surges introduced on the primary AC source and the bypass source. The UPS cabinet shall not contain an input breaker. The customer shall supply an input breaker sized to supply the rated load and to recharge the battery at the same time.

D. Battery Recharge

To prolong battery life, optional temperature-compensated battery charging equipment can be incorporated in the System. The battery charger shall be ripple-free avoiding premature battery aging.

2.3.2. Inverter

A. General

The inverter shall convert DC power from the input converter output, or the battery, into precise regulated sine wave AC power for supporting the critical AC load.

B. Overload

The inverter shall be capable of supplying current and voltage for overloads as below:

- 110% load @ 20 minutes
- 125% load @ 5 minutes
- 150% load @ 0.5 minutes

A visual indicator and audible alarm shall indicate overload operation. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses. The load shall be transferred to bypass when any of the above conditions are exceeded.

C. Output Frequency

The output frequency of the inverter shall be controlled by an oscillator. The oscillator shall hold the inverter output frequency to +/- 0.1% for steady state and transient conditions. The inverter shall track the bypass continuously providing the bypass source maintains a frequency within the user selected synchronization range. If the bypass source fails to remain within the selected range, the inverter shall revert to the internal oscillator.

D. Output Protection

The UPS inverter shall employ electronic current limiting.

E. Battery over Discharge Protection

To prevent battery damage from over discharging, the UPS control logic shall control the end of discharge voltage set point. This point is determined by an end of cell voltage level and takes into account the number of jars and backup time the battery system nominally provides. This information is configured on each active module display. This shall be configured at the factory or by authorized service personnel only.

2.3.3. Display and Controls

A. General

The front panel shall be an individual panel per module and consist of multiple status LEDs (one for each UPS module), switches, and a two line by twenty character backlit LCD display for additional alarm/configuration

information (one for each UPS module). During normal operation (on-line), all mimic display LEDs shall be green in color and indicate the following:

- Line 1 (AC Input rectifier)
- Line 2 (AC Input by-pass)
- Battery (Load supplied from the battery)
- On Inverter (Load supplied from the inverter)
- On Bypass (Load supplied from the by-pass)

The UPS fault indicator is used with additional indicators and audible alarms to notify the user that a UPS fault condition has occurred. During mains failure the color of the indicator LED shall be as follows:

- Line 1 (AC Input rectifier) red color
- Line 2 (AC Input by-pass) red color
- Battery (Load supplied from the battery) green color
- On Inverter (Load supplied from the inverter) green color
- On Bypass (Load supplied from the by-pass) off (no color)

If there is a fault condition, the UPS shall attempt to maintain conditioned power to the load or at minimum transfer to bypass.

There shall also be indication on each module should the module fail and need to be replaced.

In addition to a visual fault signal (alarm), the UPS shall also record fault occurrences in a rolling event log. The event log on the standard unit shall record up to 99 occurrences, with the oldest events discarded first, etc. The user shall have access to the event log through the LCD display. Every alarm and/or event recorded in the event log will contain a time and date stamp.

B. Audible Alarms

The sound pressure level of all audible alarms shall be 68 dBA (50% load) and 75 dBA (100% load) at a distance of one meter. An audible alarm shall be used in conjunction with the LED/LCD indication to indicate a change in UPS status.

The audible alarms shall warn for utility line loss, low battery (while on battery), and all other alarm conditions. For all alarm conditions, the user must look at the display to determine the cause of error/alarm. All alarm tones shall be a continual tone until the condition rectifies itself or the alarm is silenced. Once silenced, the audible

alarm shall not sound until a new alarm condition is present, but the LED indication still warning the alarm condition.

C. Alarm Silence Button

In addition to the double load on/off switch, the user interface shall include an audible ‘Reset’ switch. If the alarm silence (Reset) switch is pressed for one second, all current audible alarms shall be disabled. If a new alarm occurs, or a cancelled alarm condition disappears and then re-appears, the audible alarm is re-enabled.

D. System Display (on the cabinet)

The system display shall be colored, graphical and used to provide system level as well as module level information to the user.

The display shall be able to provide the UPS status (module and system) with a dynamic and colored mimic diagram as well as provide the same measurements like the LCD display. Measurements as listed in the following subsection 2.3.3.E LCD Display.

E. LCD Display (on the module)

The LCD display shall be used to provide information to the user. The display shall be able to provide the following measurements information:

Voltages: Input converter (Phase 1-2-3)

Input by-pass (Phase 1-2-3)

UPS output (Phase 1-2-3)

Battery

Current: UPS output (PH1-2-3)

Battery charging/discharging

Frequency: UPS input

UPS output

Battery: Remaining back-up time (minutes)

Capacity (%)

Others: UPS output active power (kW), (Phase 1-2-3)

UPS output reactive power (Kvar), (Phase 1-2-3)

UPS output apparent power (kVA), (Phase 1-2-3)

UPS load (%), (Phase 1-2-3)

2.3.4. Automatic Battery Test

The UPS shall initiate an automatic battery testing sequence periodically (once a month), at a programmed day and time of day, configurable by the end user. The user will be able to able and disable the automatic battery test.

Should a failure of the battery occur, the UPS will immediately return to normal mode and fault signals (visual, audible, and remote via serial) shall be communicated. No audible or remote (via serial/contact closures) indication of the battery test shall be communicated during the duration of the automatic battery test.

The automatic battery test shall be able to operate only if no alarms conditions affect the UPS and if the battery is at least 90% of its full capacity.

2.3.5. Remote shut down

The remote shut down function shall allow the user to disable all UPS (Modules) outputs in an emergency situation. The Remote shut down shall be able to interface with normally closed (N.C.) systems. The Remote shut down shall be activated when a pair of contacts, external to the UPS, are activated. The Remote shut down connection shall be through a simple terminal block type connector.

The Remote shut down function shall not operate if no system control modules are present in the UPS or if the manual bypass switch is in the bypass position. The user must also supply a means of interfacing with the Remote shut down circuit to allow disconnecting the UPS input feeder breaker to remove all sources of power to the UPS and the connected equipment to comply with local wiring codes/regulations.

2.3.6. Generator-on contact

A dry contact shall be provided to indicate that a generator is running and supplying input power to UPS. The Generator ON input must use a normally open contact that closes to indicate the generator is running and supplying input power to UPS. It is located at the bottom of the Conceptpower DPA 500 480V UL frame.

When used, this feature disables the UPS static bypass and prevents the UPS from transferring the load on to the generator power supply and/or blocks the battery charger during the time the UPS is supplied from the Generator.

Specific functions are:

- reduce the battery charging (programmable)
- prevent (lock) the by-pass transfer (programmable)

2.3.7. Bypass

A. General

A bypass circuit shall be provided (common input (rectifier and bypass) or dual input (rectifier and bypass separate) as an integral part of the UPS module. The bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals, and operating and alarm conditions. This

control circuit shall provide a transfer of the load to the bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS.

B. Automatic Transfers

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

- Inverter overload capacity exceeded
- Inverter over temperature
- UPS fault condition (non-redundant configuration)

For inverter overload conditions, the transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if one of the following conditions exists:

- Inverter/Bypass voltage difference exceeding preset limits
- (-20/+15 % of nominal load @ 100 % load)
- Bypass frequency out of preset limits (± 4% or ± 2% of nominal frequency)

C. Automatic Retransfer

- Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:
  - Bypass out-of-synchronization range with inverter output
- Overload condition exists in excess of inverter full load rating
- UPS fault condition present (non-redundant configuration)

D. Manual Transfer (optional)

In addition to the internal bypass function, the UPS shall have a manual bypass function. The manual bypass function shall be provided via a separate maintenance bypass cabinet (line match to UPS).

In case of wrong manual by-pass manipulation (transferring the load on manual by-pass when the load is supplied by the inverter (Normal-mode)), the UPS module(s) shall be auto protected avoiding any UPS damage.

The UPS shall initiate an audible alarm upon transfer to manual bypass. The audible alarm shall be capable of being silenced by the user. The alarm shall continue to sound (unless silenced) while in bypass mode. This shall provide a reminder to the user that the load continues to be powered from utility supply alone.

2.3.8. External Battery

Flame retardant, valve regulated, lead acid batteries or open lead acid cells or Nickel Cadmium cells as a stored-energy source for the specified UPS system. The battery shall be housed in separate replaceable modules that slide into any open bay of the UPS cabinet or external battery cabinets (optional), and sized to support the inverter at rated load and power factor, in an ambient temperature between 20° and 25° C, for an xx minutes back-up time. Pre-configured battery backup time solutions are available based on load requirements. Please contact factory for more information. The expected life of the battery shall be 3 to 5 years

or a minimum 250 complete discharge cycles. For extended battery reserve time, additional battery modules may be added, if the frame size allows.

2.4. COMMUNICATIONS

The UPS shall allow for flexibility in communications. The UPS shall be able to communicate through two communications ports simultaneously; the media of either communications port may change without affecting the operation of the UPS. The use of relay contacts shall not affect the operation of the two communications ports.

2.4.1. Relay Contacts

The relay contacts (Max 250VAC/8A; 30VDC/8A; 220Vdc/0.12A) shall be available through terminals with wires sizes of max.1.5 mm2

The UPS shall communicate via relay contact closure the following information:

NO MAINS_OK Mains Present
NC ALARM Mains Failure
C Common

NO LOAD_ON_INV Load on Inverter
NC Message (Load on Mains bypass)
C Common

NO BATT_LOW Battery Low
NC ALARM Battery OK
C Common

NO LOAD_ON_MAINS Load on bypass (Mains)
NC Message (Load on Inverter)
C Common

NO COMMON_ALARM Common Alarm (System)
NC ALARM NO Alarm Condition
C Common

Additionally the UPS shall be provided with one (1) relay contact whose function can be defined on request to the manufacturer.

Serial Communications

The UPS shall be able to communicate through RS232 and USB.

2.4.2. Network Communications

The user shall have the option of installing an optional SNMP card to provide SNMP communication over a local area network. 10/100Mbit Ethernet support shall be included.

Options:
Modbus TCP/IP - through optional converter
SNMP - through optional converter
Bacnet – through optional converter
Profibus – through optional converter

2.4.3. UPS Status Information

The software shall be able to retrieve status information present in the UPS. Retrieval of data shall be through either serial communications or through a network connection.

2.5. ACCESSORIES (OPTIONAL COMPONENTS)

2.5.1. External Battery Cabinets

The UPS shall have the capability to optionally add external battery cabinets to the base product. These external battery cabinets with front access battery terminals shall be installed in parallel to provide backup times as required. The connections between the UPS and the extended battery cabinets shall contain DC power only. All of these shall be able to be connected or disconnected safely by the user without interrupting power to the load. Contact factory for more information.

3. FIELD SERVICES (OPTIONAL)

3.1.1. FIELD QUALITY CONTROL

The following inspections and test procedures shall be performed by factory trained field service personnel during the UPS start-up.

3.1.2. Visual Inspection

A. Inspect equipment for signs of shipping or installation damage.
B. Verify installation per drawings.
C. Inspect cabinets for foreign objects.
D. Verify neutral and ground conductors are properly sized and configured.

3.1.3. Mechanical Inspection

A. Check all power modules are correctly fitted.
B. Check all battery modules are correctly fitted.
C. Check all terminal screws, nuts, and/or spade lugs for tightness.

3.1.4. Electrical Inspection

A. Confirm input voltage and phase rotation is correct.
B. Verify bypass voltage jumper is correct for voltages being used.

3.2. UNIT START-UP AND SITE TESTING

The manufacturer's field service personnel shall provide site testing if requested. Site testing shall consist of a complete test of the UPS system and the associated accessories supplied by the manufacturer. A partial battery discharge test shall be provided as part of the standard start-up procedure. The test results shall be documented, signed, and dated for future reference.

3.3. MANUFACTURER'S FIELD SERVICE

3.3.1. Service Personnel

The UPS manufacturer shall directly employ a nationwide service organization, consisting of factory trained Customer Engineers dedicated to the start-up, maintenance, and repair of UPS and power equipment. The organization shall consist of factory-trained Field Engineers working out of most major cities.

The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours/day, 7 days/week, and 365 days/year. If emergency service is required, call back response time from a local Customer Engineer shall be 30 Minutes or less.

3.3.2. Maintenance Contracts

A complete offering of preventive and full service maintenance contracts for both the UPS system and battery system shall be available. An extended warranty and preventive maintenance package shall be available. Warranty and preventive maintenance service shall be performed by factory trained Customer Engineers.

4 COMPLIANCY CHECK LIST

Characteristic	Compliancy		Comments
Rated output power (kVA) = PF 1.0	☐yes	☐ no	
Manufacturer			
Range of products			
Performance classification: VFI-SS-111	☐yes	☐ no	
Parallel connection of up to six (6) UPS cabinets XXKVA/XXkW max.	☐yes	☐ no	
Alarm signalling loss of redundancy within the UPS system	☐yes	☐ no	
Maximum footprint dimensions X x X x X in (mm)			
Rectifier			
Input voltage range +/- 10 at <= 100% load	☐yes	☐ no	
Phase sequence Check on phase sequence	☐yes	☐ no	
Sinusoidal input current THDi upstream < 3.5% 100%load	☐yes	☐ no	
Input power factor PF = 0.99 at 100% load	☐yes	☐ no	
No inrush or start-up current	☐yes	☐ no	
Rapid battery recharging in ≤ 8 hours	☐yes	☐ no	
Voltage regulation ± 1%	☐yes	☐ no	
Transformer-less	☐yes	☐ no	
Independent regulation/monitoring systems for the charger	☐yes	☐ no	
Battery			
Type standard sealed lead acid in a cabinet	☐yes	☐ no	
Expectance life 10 years	☐yes	☐ no	
Backup time XX minutes	☐yes	☐ no	
Battery management and protection	☐yes	☐ no	
Recharge as a function of the temperature	☐yes	☐ no	
Ripple free on battery through dedicated DC/DC battery charger	☐yes	☐ no	
Measurement of actual backup time, depending on: load, temperature	☐yes	☐ no	
Programmable battery test	☐yes	☐ no	
Inverter			
Three-phase output voltage Volts adjustable within limits ± 3%	☐yes	☐ no	
Steady-state conditions ± 1%	☐yes	☐ no	
Voltage transients ± 4% (load from 0 to 100% or 100 to 0%)	☐yes	☐ no	
Output voltage distortion at THDU < 2% (linear load)	☐yes	☐ no	
100% unbalanced load possible	☐yes	☐ no	
Frequency synchronization with an external reference	☐yes	☐ no	
Source ± 2% to ± 4% of rated frequency	☐yes	☐ no	

Characteristic	Compliancy		Comments
Overload capacity 125% In for 5 minutes	☐yes	☐ no	
Overload capacity 150% In for 0.5 minute	☐yes	☐ no	
Bypass functions			
Automatic bypass of each UPS With static switch	☐yes	☐ no	
Wrap around, external, maintenance bypass cabinet option	☐yes	☐ no	
Efficiency AC/AC			
≥ 95.6% at 100% load	☐yes	☐ no	
≥ 95.8% at 75% load	☐yes	☐ no	
≥ 95.6% at 50% load	☐yes	☐ no	
≥ 95.2% at 25% load	☐yes	☐ no	
User interface			
Graphical colored touchscreen system display (on frame)	☐yes	☐ no	
LCD display selection of operating language (on module)	☐yes	☐ no	
service menu with password	☐yes	☐ no	
display measurements, status, events	☐yes	☐ no	
event log up to 1000 time- events	☐yes	☐ no	
Controls ON, OFF, EPO terminal block	☐yes	☐ no	
Status indications with mimic panel Audio alarm, LEDs	☐yes	☐ no	
Communication			
Programmable relay card	☐yes	☐ no	
RS232 on USB port	☐yes	☐ no	
RS232 on D-Sub 9P port	☐yes	☐ no	
2 x RS485 on RJ45 port	☐yes	☐ no	
Optional SNMP slot for Ethernet with shutdown mgt	☐yes	☐ no	
Certification			
UL Listed Product	☐yes	☐ no	
Quality certification ISO 9001	☐yes	☐ no	
Services	☐yes	☐ no	
International Technical Support	☐yes	☐ no	
Operation, Maintainability			
Front access only necessary?	☐yes	☐ no	
Availability			
Availability of original replacement parts (Globally)	☐yes	☐ no	
Response time of Service teams <X hours	☐yes	☐ no	
Preventative Maintenance program	☐yes	☐ no	
Emergency services 24/7/365	☐yes	☐ no	