guide specification

TLE High Power 480V UL UPS

625 kVA to 1000 kVA

Single or parallel module – decentralized parallel

# General

## Summary

1. This specification describes the continuously rated, solid state Uninterruptible Power System for maximum efficiency and power density. These systems provide continuous, regulated AC power to the equipment of datacenter, network, telecom and other critical equipment applications without any disturbances or disruptions occurring on the main power supply.
2. Specification 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. The manufacturer shall design and furnish all materials and equipment to be fully compatible with electrical, environmental and space conditions at the site.

## Standards

1. 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.
2. UL 1778 – 5th Edition, Uninterruptible Power Supply Equipment
3. NFPA 70 - National Electrical Code
4. IEEE 446 - Recommended Practice for Standby Power Systems
5. IEEE C62.41 - Recommended Practice for Surge Withstand ability
6. NEMA PE 1 - Uninterruptible Power Systems
7. OSHA - Occupational Safety and Health Administration
8. IBC – International Building Code (IBC2016)
9. Quality System Standard ISO 9001

## System description

1. General characteristics
2. The UPS shall be of transformer-free design, requiring no internal transformer in the main power path for the basic operation of the module.
3. The UPS shall be sized to provide a minimum of [choose (1) [625, 750, 1000kVA/kW output (unity load power factor rating).
4. The UPS shall be able to supply all required power to full rated output kVA loads with power factor from 0.7 leading to 0.4 lagging.
5. Battery [ choose (1): VRLA, PURE LEAD, LITHIUM] shall support the UPS at 100% rated kW load for at least \_\_\_\_\_\_\_ minutes at startup (initial run time) OR \_\_\_\_\_ minutes at end of life (EOL run time) at 77°F (25°C).
6. The UPS shall have an active power factor corrected three-level IGBT rectifier, capable of maintaining input power factor and input THDi within specifications without an additional input filter.

## Modes of operation

1. The UPS shall be designed to operate as a true on-line, double conversion Voltage and Frequency Independent (VFI) system in the following modes:
2. 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.
3. 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.
4. 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.
5. 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.
6. 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:
7. Automatic - In the event of an internal failure or should the inverter overload exceed its capacity, UPS module shall perform an automatic transfer of the critical AC load from the inverter to the bypass source.
8. eBoost – The UPS module shall be able to operate in eBoost (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 (< 3ms) and shall not affect the supplied load.
9. 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.
10. Parallel operation
11. Parallel configurations – up to six UPS module outputs may be connected in parallel to provide capacity and/or redundancy. Each UPS module shall contain its own static bypass switch. Operation of each UPS module’s static bypass switch will be controlled through the RPA parallel system. External, centralized control or static bypass circuits shall not be used.
12. Module to module communications
13. Redundancy shall be seen in multiple control electronics not centralized. Each UPS module shall have its own independent controller. These individual controllers will intercommunicate continuously to manage the overall system in a democratic way. A programmed “Master-Slave” arrangement shall not be used. If any module’s controller malfunctions, the remaining controllers shall manage the UPS system’s operation. A redundant control connection is done between the UPS.
14. Parallel Tie Cabinet
15. The UPS module outputs shall be connected to an output switchboard/ switchgear containing a common bus. This switchboard/switchgear needs to contain individual UPS module output breakers. These breakers would allow modules to be isolated from the parallel board during maintenance operation. Breakers shall include 1A/1B auxiliary contacts to communicate breaker status with the UPS module controls.
16. Load sharing on Inverter
17. Individual module inverter regulation shall be based on an index value related to the power exchange between, and the total number of active modules in the system, thus reducing the load sharing error to virtually zero.
18. Cable Saver Inductor/ Load sharing on Bypass
19. UPS shall be equipped Cable Saver inductor upstream of static bypass circuit of each module. The inductor shall be designed to minimize the influence of external conductor length on bypass current sharing, allowing external cable length differences of up to +/-25%.

## Performance requirements

1. General
2. UPS shall be located in well-ventilated areas, free from excess humidity, dust and dirt and from hazardous materials.
3. The UPS shall be designed for indoor installation with ambient temperatures from 32° - 104°F (0 - 40°C), 77°F ±5°F (25°C) for the battery and relative humidity from 0 - 95% non-condensing.
4. The UPS shall be designed for operation at an altitude of up to 1000 meters without derating.
5. For systems intended to be operated in eBoost mode, the installation shall be protected with suitable surge protection devices (SPDs) on the AC bus feeding the UPSs.
6. 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.
7. AC input
8. Voltage: 480 VAC, 3-phase, 3 or 4-wire + ground
9. Voltage Range: +/-15% without discharging the battery.
10. Frequency: 60 Hertz +/-10% continuous.
11. Current Walk-In: 30 seconds to full load rating (from 2 to 30)
12. Maximum Input Current: 120% of nominal full load current.
13. Power Factor: 0.99 at full load and nominal voltage.
14. Current Distortion (THDi): <= 3% input current THD at full load at nominal input voltage.
15. Rectifier and Bypass Surge Protection: module shall withstand tested according to IEC 62040-2:2016 that requires 1kV L-L and 2kV L-PE
16. Withstand Rating: UPS module shall carry 65kA standard for short circuit withstanding, with an option for 100kAIC. System has been tested under the guidance of U.L. as to meet National Electrical Code.

AC output

1. UPS Loading: 100% continuous load rating at 104F (40C)
2. Voltage: 480VAC, 3-phase, 3-wire + ground
3. Voltage Regulation: +/- 1% nominal voltage at balance load.
4. Voltage Adjustability: +/- 5% adjustable
5. Dynamic Regulation: +/- 3% from nominal for 0 to 100% step load. Recovering to within 1% in less than 1 cycle.
6. Efficiency: VFI mode at unity power factor load, with battery fully charged and floating ready for emergency backup:

| UPS Rating | 25% | 50% | 75% | 100% |
| --- | --- | --- | --- | --- |
| 625 kVA/kw | 94.7% | 96.4% | 96.3% | 96.2% |
| 750 kVA/kw | 95.4% | 96.5% | 96.5% | 96.3% |
| 1000 kVA/kw | 95.5% | 96.4% | 96.5% | 96.2% |

1. Voltage unbalance: ±3% of nominal for 100% unbalanced loads
2. Phase Imbalance:

120° ±1% of nominal for 100% balanced loads.

120° ±2% of nominal for 100% unbalanced loads

1. Voltage Harmonic Distortion @Linear Load: <3% THD at 100% load
2. Voltage Harmonic Distortion @non-Linear Load: <5% THD at 100% load (per - IEC62040)
3. Frequency Stability: 60 HZ ±0.01% free running.
4. Phase-lock Window: 60 HZ, +/- 4% (adjustable).
5. Frequency Slew Rate: 0.1 Hz to 20 Hz/second, selectable in 0.1 Hz increments.

Inverter Overload:

1. 103% continuous operation
2. 110% for 10 minutes
3. 125% for 1 minute
4. 150% for 30 seconds
5. Static Bypass Overload:
6. 110% Continuous (at 25°C Ambient temperature)
7. 150% for 1 minute
8. Fault Clearing Capability Inverter:
9. 200% for 200ms
10. 220% for 100mSeconds
11. 700% for 1.2mSeconds
12. Fault Clearing Capability Bypass
13. 1000% for half cycle
14. Crest Factor: 3:1 with THD <3%
15. Grounding
16. UPS cabinet shall have a grounding terminal.

## Environmental conditions

1. 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:
2. UPS operation ambient temperature range 0°C to 40°C,
3. Battery ambient temperature range 20°C to 25°C
4. Humidity (relative) ≤ 95% non-condensing
5. Storage: UPS -25 deg C to +70 deg °C; Battery -20 deg C to 25 deg °C for maximum 6 months
6. 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.
7. 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.

## Submittals

1. With proposals, brochures, one-line diagram, 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.
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.
3. After Construction of Equipment – one copy of drawings shall be furnished for each of the following:
4. Equipment installation outline including external cabling termination locations.
5. Equipment internal wiring diagram.
6. One instruction manual shall be furnished and shall include as a minimum the following:
7. Safety instructions
8. System description, specification, and control
9. Installation planning
10. Installation and start-up
11. Operators guide
12. Control panel reference
13. Warranty and service information
14. A copy of the final test report shall be furnished with the equipment certified copy of the final test is an available added option.
15. 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.

## User documentation

1. 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.

## Warranty

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

## Quality assurance

1. Manufacturer Qualifications
2. A minimum of 10 years’ experience in the design, manufacture, and testing of solid-state UPS systems is required.

## Factory testing

1. Prior to shipment the manufacturer shall complete a documented test procedure to test functions of the UPS module, and warrant compliance with this specification. The manufacturer shall provide a copy of the test report.

## Factory acceptance testing - optional

1. UPS manufacture shall offer factory testing capability in the presence of the Owner providing the manufacturer at additional cost with adequate prior notice. The manufacturer shall provide a copy of the test report upon completion of the acceptance testing.

# Product

## Fabrication

1. 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.

## Wiring

1. 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).

## UPS system

1. The UPS system shall consist of a UPS module and a battery. UPS modules shall be of double conversion, and continuous duty (true on-line). The AC output of the UPS module shall be connected to the critical loads. The battery shall be connected to the DC input of the UPS. The UPS configuration shall be a single module or multiple paralleled UPS modules rated to supply the load as specified herein. Special paralleling cabinets, control cabinets and centralized static bypass circuits shall not be required for parallel systems. Up to six (6) modules may be paralleled in any combination for capacity or redundancy. UPS module shall **have built-in back-feed protection** standard and not relying on upstream switchboard/switchgear. UPS system comprised of power section, input/output landing section with user interface module housed in a free-standing enclosure and meets the requirements of IP20 or NEMA1.
2. The UPS cabinet shall not exceed the following dimensions, and shall include Rectifier, Inverter, Static Bypass, Integrated Back-feed protection, Input & Output isolation contactors, and **cable saver parallel sharing inductors**:

| UPS Rating | Width | Depth | Height | Weight |
| --- | --- | --- | --- | --- |
| 625 kVA/kw | 118” | 34” | 75” | 4850 lbs. |
| 750 kVA/kw | 118” | 34” | 75” | 4850 lbs. |
| 1000 kVA/kw | 144” | 34” | 75” | 5732 lbs. |

1. Construction and Mounting
2. UPS shall be in a NEMA Type 1 enclosure, designed for indoor floor mounting. Enclosure shall have adequate provisions for lifting via forklift and jacking procedures. Enclosure shall not excel 75” height as this maximum allowed in most electrical spaces.
3. Capacitor Assemblies
4. All power, AC and DC capacitors shall be mounted allowing field replacement of the capacitors separately from power switching controls and components.
5. Cooling
6. The UPS shall be forced air cooled by internally mounted fans.

## Components

1. Rectifier
2. 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.
3. Input Protection
4. 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 system cabinet shall always contain an input isolation contactor.
5. Battery Recharge
6. The Booster shall consist of DC choke and IGBT with control circuitry to provide constant voltage and constant current regulation to UPS DC link when working in battery mode. The booster shall recharge battery when the mains is available at the input of the UPS.
7. Battery charge current is normally limited to the lesser of:
8. 20% of the battery amp-hour rating (expressed in amps) and the difference in maximum rectifier output current and actual inverter input current. This will assure minimal battery recharge time while ensuring maximum battery life by limiting charge current to a safe level.
9. Allowable battery charge current may be increased beyond 20% of the battery amp-hour rating for those applications requiring faster recharge times. Actual available charge current will still depend on output load level and power factor.
10. Battery charging may be disabled via external contact closure, signaling operation on engine generator
11. The rectifier/booster shall have sufficient capacity to supply the inverter at 100%, 1.0 PF load plus recharge a battery (sized for up to 30 minutes) to 95% of full capacity within ten (10) times the discharge time.
12. Inverter
13. 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.
14. Overload
15. The inverter shall be capable of supplying current and voltage for overloads as below:

103% continuous operation

110% for 10 minutes

125% for 1 minute

150% for 30 seconds

1. 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.
2. Output Frequency
3. 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 via ABB field service engineer for the synchronization range. If the bypass source fails to remain within the selected range, the inverter shall revert to the internal oscillator.
4. Output Protection
5. The UPS system cabinet shall always contain an output isolation contactor.
6. Battery over Discharge Protection
7. 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 considers 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.
8. Static Bypass
9. A 100% rated continuous duty static bypass circuit shall be provided 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.
10. Automatic Transfers
11. 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:
12. Inverter overload capacity exceeded
13. Inverter over temperature
14. UPS fault condition
15. 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:
16. Inverter voltage less than 95% of nominal (adjustable).
17. Inverter voltage greater than 105% of nominal (adjustable).
18. Inverter overload period expired.
19. Inverter shutdown for any reason
20. Automatic Retransfer
21. The automatic retransfer of the load to the inverter provided all the following conditions are met:
22. The inverter logic and the bypass AC power source are synchronized and in phase.
23. Inverter conditions are normal.
24. The UPS output is not overloaded.
25. Transfer Time
26. Maximum transfer time to switch from inverter to bypass AC power source shall be 100 microseconds.
27. Typical transfer time to switch from bypass to inverter is less than 2 mSec.
28. Display and Controls
29. The following parameters shall be measured and displayed by a graphical display on the UPS front panel. Each screen shall have the nomenclature of the parameter indicated with the associated value. AC voltage and current values shall be measured in true RMS units.
30. Battery Display
31. Battery voltage
32. Battery current with flow direction
33. Battery temperature
34. Battery charge level
35. Estimated backup time at present load
36. Main Display
37. Frequency
38. Voltage – Phase-Neutral
39. Bypass Status – Free/Locked
40. Rectifier Display
41. AC input voltage - phase to phase
42. DC Bus voltage
43. DC output current
44. Input frequency
45. Inverter Display
46. Voltage
47. Output frequency.
48. Synchronization status.
49. Temperature
50. Systems Load – Screen 1
51. Voltage
52. Phase current
53. Load on Bypass
54. Load on Inverter (VFI) Mode
55. Load on eBoost (VI)Mode
56. Load OFF/On Battery
57. Load in percentage
58. Systems Load – Screen 2
59. Overall Load in KVA
60. Overall Load in kW
61. Load on Bypass
62. Load on Inverter (VFI) Mode
63. Load on eBoost (VI) Mode
64. Load OFF/On Battery
65. Power factor or Load in percentage (selectable)
66. Statistics display
67. Bypass Failure
68. Utility Failure
69. Overloads
70. UPS operating hours
71. Inverter operating hours (VFI) Mode
72. eBoost operating hours (VI) Mode
73. Audible Alarm and History
74. UPS alarm/event history shall be available through the alphanumeric display on the front panel. The event history shall store a minimum of 1,000 previous status and alarm events with the date and time of each occurrence. No software or external remote monitoring equipment shall be necessary to access the alarm/event history.
75. 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.
76. Internal Diagnostic Memory
77. The UPS shall also include an internal “black box” for field service forensics and diagnostics. The black box shall be capable of internal waveform capture with pre- and post- trigger memory in order to aid in trouble shooting and forensics of on-site service issues and events.
78. External Interface
79. The UPS shall have 6 [optional 18] alarm contacts for remote signaling. UPS to provide wetting voltage for contacts from auxiliary power supply. These alarm contacts shall each be programmable with any of the following signals:
80. No information
81. Audible alarm
82. Summary alarm
83. Load on utility
84. Stop operation
85. Load on inverter
86. Utility failure
87. DC over voltage
88. Low battery
89. Overload
90. Over temperature
91. Inverter not synched
92. Bypass locked
93. Bypass utility failure
94. Rectifier utility failure
95. Battery discharge
96. Manual bypass on
97. Rectifier on
98. Inverter on
99. Equalize boost charge
100. Battery ground fault
101. Battery fault
102. eBoost/IEMi mode on
103. User input 1
104. User input 2
105. Programming of the alarm contacts requires access with the appropriate password. The alarm contacts shall be accessible through standard form “C” wiring terminal block.
106. The UPS shall have two programmable inputs for connection to external contact closures. The status of these external contacts can be monitored from the front panel of the UPS. The default configuration for these external signals shall be as follows:
107. Aux. Input No. 1/’On Generator’
108. Aux. Input No. 2/not defined remote shut down function shall allow the user to disable all UPS (Modules) outputs in an emergency situation via EPO. The Remote shut down shall be able to interface with normally closed (N.C.) systems.
109. Remote shut down
110. The remote shut down function shall allow the user to disable all UPS (Modules) outputs in an emergency situation via EPO. 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.
111. Generator-on contact
112. The ‘On Generator’ signal shall be used to optimize operation of the UPS while AC power is being supplied from an engine-generator. The following parameters shall be programmable in this mode:
113. Inverter synchronization with generator (enable/disable). This parameter (disabled) shall protect the critical load from all frequency transients associated with engine-generator operation.
114. Static bypass to generator (enable/disable). This parameter shall allow the user to prevent transfer of the critical load directly to the output of the engine-generator.
115. Inverter output frequency slew-rate. This parameter shall allow the user to specify the maximum frequency rate-of-change when the inverter is phase-locked to an engine-generator. Adjustment range shall be 0.1 to 20.0 Hz/second, in 0.1 increments. This adjustment shall be independent of normal operation slew-rate.
116. Recharge capability (enable/disable/delay). This parameter shall allow the user to select whether or not, and/or when the battery will be recharged while the UPS is powered from an engine-generator. This parameter shall be programmable directly in minutes, with zero disabling battery charging. This will conserve fuel and allow closer sizing of the engine-generator. The UPS rectifier shall also include a soft-start circuit to limit inrush current and apply load to the engine-generator gradually. Or stagger rectifier start times in order to gradually step multiple UPS’s onto the generator in case of transfer to emergency generator after a utility failure.

## Communications

1. 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. RS-232/RJ45 port
3. The UPS shall provide at least one RS-232 port, allowing full remote monitoring, control and management of the UPS system. All access to control functions through this port shall be protected from unauthorized access.
4. The RS-232 port shall allow access to critical UPS measurements, functions and historical data through the UPS Management Software suite.
5. Connectivity slot
6. The UPS shall be equipped with Connectivity slot(s) allowing the installation of the following plug-in options:
7. Additional Customer Interface Card (CIC) option, providing: six alarm contacts for remote signaling, two inputs for connection of external contact closures and one RS-232 port.
8. SNMP/Web adapter option, providing the following functionalities over an Ethernet connection:
9. SNMP Agent for integration into SNMP-based Network Management Systems (NMS)
10. Web server for remote monitoring using a standard Web browser
11. Modbus TCP or 485 slave for integration into Modbus-based Building Management Systems (BMS)
12. Configurable alarm notification via e-mail or SNMP Traps
13. Network shutdown of controlled servers following prolonged power outages via UPS Management Software suite.
14. Remote monitoring and diagnostics
15. UPS shall have a secure TCP/IP based RMD feature available as an option. Activation of this feature is standard and no charge for the first 12months. The feature provides remote monitoring and diagnostics via an in house 24x7 service team, and provides quarterly diagnostics reports, alarm history and power quality trending of the UPS.

## Accessories – optional components

1. External Battery Cabinets (VRLA or Pure Lead)
2. Battery cabinet shall be in a NEMA Type 1 enclosure with front access only. The battery cabinet shall feature valve regulated lead-acid or pure lead batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The connections between the UPS and the extended battery cabinets shall contain DC power only. Each battery cabinet must include its own DC breaker to allow isolation with 24VUVR, and A/B aux contacts.
3. External Battery Cabinets (Lithium ION)
4. Battery cabinet shall be in a NEMA Type 1 enclosure with front access only. The battery cabinet shall feature Lithium Ion batteries which provide energy to the support the critical load during a momentary loss of input power to the rectifier. The connections between the UPS and the extended battery cabinets shall contain DC power only. Each battery cabinet must include its own DC breaker to allow isolation with 24VUVR, and A/B aux contacts.
5. Battery Monitoring – Jar Level
6. Battery jar to jar monitoring solution of all critical parameters to help identify aging and/or premature battery life, simplifying maintenance, and increasing reliability.
7. Centralized DC Disconnect
8. Cabinet shall be in a NEMA Type 1 enclosure with front access only.
9. Flywheel Storage
10. The DC Flywheel shall deliver power and energy to the DC bus of the UPS system when input power sags or is interrupted. The DC Flywheel shall store energy kinetically in a high-speed rotor. When a voltage sag or failure of the utility AC power source results in a reduction of voltage on the UPS system DC bus, the DC Flywheel enter the Discharging mode and supply power to the critical load by maintaining a pre-set voltage level on the DC bus. The DC Flywheel shall be in the Discharging mode until the DC bus voltage rises (when the AC power returns) or until the DC flywheel reaches its minimum operating speed
11. Maintenance Bypass Cabinet (Single Module)
12. Maintenance bypass shall be provided to isolate the UPS output, including, but not limited to, the module static switch, for maintenance. The maintenance bypass shall be interlocked with the UPS module to protect the system from damage in the event of out of service phase transfer. The maintenance bypass shall be housed in a separate free-standing enclosure
13. Parallel Coupling Cabinets
14. Parallel Coupling Cabinets shall be equipped with two system level circuit breakers with keyed interlocks for safe operation. No logic or controls shall be provided for UPS operations within this cabinet. Parallel Coupling Cabinet shall be capable of routing the utility or bypass source completely around up to up to four UPS modules with their own UPS isolation breakers for maintenance procedures.
15. Seismic anchoring provisions

# Field Services

## Field quality control

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

## Visual inspection

1. Verify that UPS modules are ready to install
2. Verify that required utilities are available, in proper location and ready for use
3. Inspect equipment for signs of shipping or installation damage.
4. Verify installation per drawings and installation manuals.
5. Inspect cabinets for foreign objects.
6. Verify neutral and ground conductors are properly sized and configured.

## Mechanical inspection

1. Check all control wiring connections.
2. Check all battery cabinet power and control wirings are correctly configured.
3. Check all terminal screws, nuts, and/or spade lugs for tightness.
4. Clean interiors to remove construction debris, dirt, and shipping materials.
5. Repaint scratched or marred exterior surfaces to match original finish

## Electrical inspection

1. Confirm input voltage and phase rotation is correct.
2. Verify that required utilities are available, in proper location and ready for use
3. Verify bypass voltage jumper is correct for voltages being used.
4. Check all fuses for continuity
5. Verify connection and battery voltages are correct.

## Unit start-up and site testing

1. 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.

## Manufacturer’s field service

1. Service Personnel
2. 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.
3. 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.

## Maintenance & service contracts – optional

1. 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.

## Maintenance training – optional

1. The manufacturer shall make available to the customer various levels of training ranging from basic UPS operation to UPS maintenance

## Spare parts kits – optional

1. Customer and Field Engineers must have immediate access to recommended spare parts with additional parts storage located in regional depots. Additional spare parts shall be accessible on a 7 x 24 basis from the national depot and must be expedited on a next available flight basis or via direct courier.

**END OF SECTION**

***Changes to the product or to the information contained in this document are reserved; so are errors and omissions.***

***Please reference ABB order confirmations and submittal documentation packages for job specific configurations.***

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