APC by Schneider Electric

MGE GALAXY 300

Data Center Grade Three Phase Uninterruptible Power Supply

MGE Galaxy 300

Guide Specification for 3×400 in / 1x 230V out Solutions

10kVA to 30Kva UPS

THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS.
WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", SUBMIT", ETC., UNLESS OTHERWISE INDICATED.
THIS SECTION IS WRITTEN TO INCLUDE THE 2004 MASTERFORMAT AND THE 1995 MASTERFORMAT VERSIONS. WHERE APPLICABLE, THESE ITEMS ARE BRACKETED AND, IN EACH CASE, UNLESS OTHERWISE INDICATED, THE FIRST CHOICE APPLIES TO THE 2004 MASTERFORMAT AND THE SECOND CHOICE APPLIES TO THE 1995 MASTERFORMAT.

SECTION [26 33 63] [16611]

SOLID STATE UNINTERRUPTIBLE POWER SUPPLY

Part 1 GENERAL

1.1. RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions, [Division 01 - GENERAL REQUIREMENTS] [Division 1 - GENERAL REQUIREMENTS], and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2. SUMMARY

A. Scope: Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for a solid state uninterruptible power supply (UPS) as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section includes: The work specified in this Section includes, but shall not be limited to, a three-phase, on-line, continuous operation, solid-state uninterruptible power supply (UPS). The UPS shall operate as an active power control system, working in conjunction with the building electrical system to provide power conditioning and on-line power protection for the critical loads.

1.3. REFERENCES

A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. ANSI/IEEE C62.41, "Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits" (copyrighted by IEEE, ANSI approved).

C. International Organization for Standardization (ISO):

1. ISO 9001, "Quality Management Systems - Requirements."

D. National Electrical Manufacturers Association (NEMA):

1. NEMA PE 1, " Uninterruptible Power Systems (UPS) - Specification and Performance Verification."

E. National Fire Protection Association (NFPA):

1. NFPA 70, "National Electrical Code" (copyrighted by NFPA, ANSI approved) - hereinafter referred to as NEC.

F. Underwriters Laboratories, Inc. (UL):

1. UL 1778, "Standard for Uninterruptible Power Supply Equipment" (copyrighted by UL, ANSI approved).

1.4. SYSTEM DESCRIPTION

A. The UPS shall consist of the following easy to repair rectifier/inverter sections and easy to install internal and external battery units.

B. The UPS shall be provided with separate feeds for rectifier/inverter section and the static bypass switch.

C. Modes of operation: The UPS shall operate as an on-line system in the following modes:

i. *Normal*: The inverter and the rectifier shall operate in an on-line manner to continuously regulate the power to the critical load. The rectifier shall derive power from the AC input source and supply DC power to float charge the battery.

ii. *Battery*: Upon failure of the AC input source, the critical load shall continue being supplied by the inverter without any switching. The inverter shall obtain its power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the AC input source.

iii. *Frequency converter*: The output frequency will be fixed to 50Hz or 60Hz depending on the output voltage setting which is fixed to 220Vac, 230Vac, or 240Vac for 50Hz and 220Vac or 230Vac for 60Hz.

iv. *Recharge:* Upon restoration of the AC input source, the UPS shall simultaneously recharge the battery and regulate the power to the critical load.

v. *Bypass*: The static bypass switch shall be used for transferring the critical load to input supply without interruption. Automatic re-transfer to normal operation shall also be accomplished with no interruption in power to the critical load. The static bypass switch shall be fully rated and shall be capable of manual operation.
The UPS shall be able to recharge the batteries while supplying full power to the load via the static bypass switch.

vi. *Internal maintenance bypass*: The UPS shall be provided with an internal manual bypass to simplify maintenance and shall be used for supplying the load directly from the mains supply, while the UPS is taken out for maintenance.

D. The UPS shall be provided with RS-232 signaling and WEB/SNMP integration. This system must provide a means for logging and alarming of all monitored points.

E. The UPS shall have nominal voltage of 3×400/230V (adjustable for 3×380/220V, 3×415/240V), 50Hz 3 and 4-wire + earth configurations.

1.5. STANDARDS

A. Safety: IEC 62040-1-1
B. Emissions: EN62040-2/IEC 62040-2
C. Performance: EN/IEC 62040-3

1.6. CLASSIFICATION

A. Classification according to EN/IEC 62040-3: VFI-SS-112. The MGE Galaxy 300 Certificate of Conformity lists the following classification: EN62040-1-1:2003 and EN62040-2: 2006.

1.7. SUBMITTALS

A. Proposal Submittals

i. System bill of materials (level one)
ii. Product catalogue sheets or equipment brochures
iii. Product specifications
iv. System operation diagram
v. Installation guide
vi. Drawings for requested optional accessories

B. Delivery Submittals

i. Unpacking manual, which includes instructions on storage, handling, examination, and preparation of the system.
ii. Installation manual, which includes, installation of all systems.
iii. Operation manual, which includes start-up and operating instructions.

1.8. QUALITY ASSURANCE

A. Qualifications

1. Manufacturer experience: The manufacturer shall have a minimum of 20 years experience in the design, manufacture, and testing of UPS systems.

2. ISO 9001 Certification: The manufacturer shall be ISO 9001 & 14001 certified. Certification assures that the vendor's quality control & environmental measures have been certified by an accredited registrar and meet internationally recognized standards.

3. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing solid state UPS similar in type and scope to that required for this Project.

B. Regulatory requirements

Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Factory testing

Prior to shipment the manufacturer shall complete a documented test procedure to test functions of the UPS module and batteries (via a discharge test), when supplied by the UPS manufacturer, and warrant compliance with this Section.

D. Pre-Installation Conference: Conduct pre-installation conference in accordance with [Section 01 31 19 - PROJECT MEETINGS] [Section 01200 - PROJECT MEETINGS]. Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect/Engineer.

E. Source Responsibility: Materials and parts comprising the UPS shall be new, of current manufacture, and shall not have been in prior service, except as required during factory testing. Active electronic devices shall be solid state and shall not exceed the manufacturer's recommended tolerances for temperature or current to ensure maximum reliability. Semiconductor devices shall be sealed. Relays shall be provided with dust covers. The manufacturer shall conduct inspections on incoming parts, modular assemblies, and final products.

1.9. DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

C. Products shall be packaged in a manner to prevent penetration by debris and to allow safe delivery by modes of ground transportation and air transportation where specified.

D. Prior to shipping, products shall be inspected at the factory for damage.

E. Equipment shall be protected against extreme temperature and humidity and shall be stored in a conditioned or protected environment.

F. Equipment containing batteries shall not be stored for a period exceeding three months without powering up the equipment for a period of eight hours to recharge the batteries.

1.10. PROJECT CONDITIONS

A. Environmental requirements

1. Storage ambient temperature: -10°C to 60°C (UPS), –10°C to 45°C (batteries).
2. Operating ambient temperature: 0°C to 35°C for batteries and UPS. Up to 40°C with -12.5% load derating and 45°C with -25% load derating.
3. Relative humidity: 0 to 90%, non-condensing.
4. Storage altitude: 0 to 10000 m.
5. Operating altitude with no derating: 0 to 1000 m above sea level.

1.11. WARRANTY

A. General: See [Section 01 77 00 - CLOSEOUT PROCEDURES] [Section 01770 - CLOSEOUT PROCEDURES].

B. Special Warranty: The Contractor shall warrant the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for period indicated below. This special warranty shall extend the one year period of limitations contained in the General Conditions. The special warranty shall be countersigned by the Installer and the manufacturer.

1. **UPS Module:** The UPS shall be covered by a full parts and labor warranty from the manufacturer for a period of 12 months from date of installation or acceptance by the Owner or 18 months from date of shipment from the manufacturer, whichever occurs first.
2. **Battery:** The battery manufacturer's warranty shall be passed through to the final Owner and shall have a minimum period of one year.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.12. MAINTENANCE

A. The manufacturer shall, upon request, provide spare parts kits for the UPS module in a timely manner as well as provide access to qualified factory-trained first party service personnel to provide preventative maintenance and service on the UPS module when required.

B. UPS subassemblies, as well as the battery, shall be accessible from the front. UPS design shall provide maximum reliability and minimum MTTR (mean time to repair). To that end, the UPS shall be equipped with a self-test function to verify correct system operation. The self-test function shall identify the subassembly requiring repair in the event of a fault. The electronic UPS control and monitoring assembly shall therefore be fully microprocessor-based, thus doing away with potentiometer settings. This shall allow:

1. Auto-compensation of component drift.
2. Self-adjustment of replaced subassemblies.
3. Extensive acquisition of information vital for computer-aided diagnostics (local or remote).
4. Socket connection to interface with computer-aided diagnostics system.

C. The UPS shall be repairable by replacing standard subassemblies requiring no adjustments. Communication via a modem with a remote maintenance system shall be possible.

D. The manufacturer shall offer additional preventative maintenance and service contracts covering both the UPS and the battery bank. Accredited professional service engineers employed exclusively in the field of critical power systems service shall perform maintenance and service. The manufacturer shall also offer extended warranty contracts.

Part 2 PRODUCT

2.1. MANUFACTURER

A. Provide APC by Schneider Electric: MGE GALAXY 300 system. No substitutes will be considered.

OR

B. APC by Schneider Electric: MGE GALAXY 300 system or approved equal. However, if a brand other than APC by Schneider is proposed, the decision of the Engineer shall be final and a “differentiation report” must be submitted. This report shall address each paragraph of the specification individually and list any and all differences from what is specified. If there are no differences, provide a report so stating. If, after installation, omitted differences are found, the Contractor shall correct differences to the satisfaction of the Owner and Engineer or unsatisfactory equipment shall be removed and equipment acceptable to the Owner and Engineer shall be installed at no additional cost to the project. Also, make modifications to the facilities infrastructure as needed to accommodate the substitute, at no additional cost to the project. Examples of modifications include, but are not limited to the following:

i. Structural reinforcement to accommodate heavier equipment.
ii. Increased sizes of circuit breakers, raceways and wiring.
iii. Larger back-up generators (including upgraded accessories and wiring) to avoid instability caused by most double conversion UPS systems.
iv. Larger HVAC equipment (including duct work and wiring) to accommodate increased heat dissipation of less efficient UPS systems.

2.2. STATIC UPS

A. General

i. The UPS shall be housed in a freestanding enclosure. The cabinet shall be equipped for fork truck lifting. Maintenance bypass shall be accessible from the front. Installation access shall be from the backside of the system.
The maintenance bypass shall provide isolation of each part of the system individually: Input1, Input 2, Output, Maintenance, Battery breaker.
ii. The UPS shall be in a self contained cabinet and comprise of a 10 kVA 15kVA, 20kVA and 30kVA power section; a bypass static switch; a battery for standard run time and an interface LCD display. The power section shall be of the double conversion on-line topology with power factor corrected inputs.
    1. The UPS shall be sized for _____ kVA and _____ kW load.
    2. The UPS battery shall be sized for ____ at a power factor of ____ for _____ minutes.
iii. The UPS shall have a short circuit withstand capability of 30kA

B. System input

i. Nominal Input voltage rating: 3×400/230V (adjustable for 3×380/220V or 3×415/240V)
ii. AC input voltage window: 100% load without charging at 342Vac input phase-phase voltage.
iii. AC input voltage window: 60% load at 285Vac input phase-phase voltage.

iv. Earthing principle: [TN-S] [TN-C] [TT] or [IT].
v. Input frequency: 45-65 Hz (auto sensing)
vi. Input power factor: 10 kVA: 0.92, 15-20 kVA: 0.98, 30-40 kVA: 0.99
vii. Input current distortion with no additional filters: < 9% THDI at 100% load

C. System output

i. Nominal Output voltage rating: 230V Single Phase
ii. Output voltage regulation for steady state and transient variations (at default parameter settings):
    1. ± 2% steady state for a static 100% balanced load.
    2. ± 2% steady state for a static 100% unbalanced load.
    3. ± 5% for a 0 to 100% load step.
iii. The system returns to +/- 4% range in rms value in less than 100 ms.
iv. Output frequency regulation:
    1. The synchronized range is +/- 2% Hz while mains2 voltage is in tolerance
    2. 50/60 Hz ± 0.1 Hz in battery operation.
v. Output voltage harmonic distortion:
    1. <3.0% THD for linear load
    2. <5% 100% unbalanced 100% non-linear loads
vi. Overload capability:
    1. <=125%: 120 seconds.
    2. <=150%: 10 seconds.
    3. >150%: 100 milliseconds.

    Note! Battery operation cannot support overload.
vii. Output Power Factor Rating: For loads exhibiting a power factor of 0.5 leading to 0.5 lagging, no derating of the UPS shall be required.
viii. Short circuit withstand: The UPS must withstand a bolted-fault short circuit on the output without damage to the UPS module.
ix. System AC-to-AC efficiency 100% load.
    1. 10kVA 91.88%
    2. 15kVA 91.99%
    3. 20kVA 92.96%
    4. 30kVA 92.75%

x. System AC-to-AC efficiency 50% load
    1. 10kVA 89.63%
    2. 15kVA 91.13%
    3. 20kVA 92.89%
    4. 30kVA 92.10%

xi. Acoustical noise at full RL load: dB(A) of noise, typically, measured at 1 meter from the operator surface:
    1. 10kVA 55
    2. 15kVA 55
    3. 20kVA 56
    4. 30kVA 56

D. Components

i. Rectifier
    1. The input current limiter must be designed to support 150% load at 342Va input voltage, charge batteries at 10% of the UPS output rating, and provide regulation with mains deviation of up/down to+/-15% of the

nominal input voltage. During an overload condition the input current must be limited to maximum 125% of the nominal output current..

2. Each UPS power module shall include an active power factor corrected, Insulated Gated Bipolar Transistor (IGBT) rectifier.
3. DC Bus voltage shall be ± 360Vdc nominal. ±360/375/390 Vdc based on different input and output voltage. If 230Vac is regarded as nominal value, the bus voltage should be ±375Vdc.
4. The battery charging shall keep the float voltage of +/- 218V (16 blocks), +/-204V (15 blocks).
5. The battery charging voltage shall be compensated against temperature variations (battery temperature compensation) to always maintain optimal battery float charging voltage for temperature excursions above or below 25°C. Temperature compensation rate shall be 3mV/degree/cell for ambient temperatures > 25°C and 0mV/°C for ambient temperatures < 25°C.
6. Input power factor shall be 0.98 lagging at 100% load with out the use of passive filters. Rectifier shall employ electronic waveform control technology to maintain the current sinusoidal.
7. Pulse Width Modulation (PWM) current control shall be used. Digital Signal Processors (DSP) shall be used for all monitoring and control tasks. Analog control is not acceptable.
8. Reflected input current Total Harmonic Distortion (THD) shall not exceed 9% at 100% load.
9. Typical battery recharge time per IEEE 485.

ii. Batteries

1. Standard battery technology shall be Valve Regulated Lead Acid (VRLA).
2. Batteries shall be housed in the same rack as the power section. Batteries shall be on shelves for quick replacement and servicing.
3. Battery voltage shall be battery temperature compensated as outlined in the rectifier section above.
4. End of discharge: 158.4Vdc for 16*2 blocks, 148.5Vdc for 15*2 blocks.
5. For longer runtimes, external battery frames in the same design should be offered.
6. Battery charge current limit: Software and hardware current limit. The selection shall be made from the UPS Soft Tuner.
7. The battery charging circuit shall remain active when the PFC operates normally.

iii. Inverter

1. The inverter shall consist of fast switching IGBT power module.
2. Inverter shall be PWM controlled using DSP logic. Analog control shall not be acceptable.
3. The inverter modules shall be rated for an output power factor at 0.8.
4. Nominal output voltage shall be 1×230V and adjustable for 1×240V, 50/60Hz, L1,N,PE.
5. Efficiency of each UPS at full load: Not less than
    1. 10kVA 91.88%
    2. 15kVA 91.99%
    3. 20kVA 92.96%
    4. 30kVA 92.75%
6. Output Voltage Total Harmonic Distortion at full load:
    5. Less than 3% for 100% resistive load.
    6. Less than 5% for computer load as defined by EN62040-3/IEC 62040-3.
7. Output voltage regulation

7. Static: +/- 2% at full linear load.
8. Dynamic for full linear load: +/- 5% at step load.
9. Dynamic for non-linear load: +/- 10%

8. Output frequency: 50Hz or 60Hz free running.
9. Crest factor: Unlimited but regulates it down to crest factor 2.0.
   - Remote Emergency Power Off (EPO) is provided by a dry connector.

iv. Static Bypass Switch

1. The static switch shall consist of fully rated Silicon Controlled Rectifiers (SCRs). Part rated SCRs with a wrap around contactor are not acceptable.
2. The static bypass switch shall automatically transfer the critical load to bypass input supply without interruption after the logic senses one of the following conditions:
   10. Inverter overload beyond rating.
   11. Battery runtime expired and bypass available.
   12. Inverter failure.
   13. Fatal error in control system.
3. The static bypass switch shall automatically retransfer from bypass to the inverter, when one of the following conditions occurs:
   14. The inverter is active (on).
4. The static bypass switch shall be equipped with a manual means of transferring the load to bypass and back to inverter.

E. Mechanical

i. MGE GALAXY 300

1. MGE Galaxy 300 provides an external battery enclosure option. The UPS has an included static bypass switch and a maintenance bypass switch. The enclosure shall have the following specifications:
   - Dead front construction.
   - Heavy-duty design with an all-metal construction.
   - Caster fitted for mobility.
   - The cable entry shall be from the back of the UPS.
   - The MGE GALAXY 300 UPS enclosure shall meet an ingress level of min. IP20.

Standard 0 min version

G3HT10K3I-INS	1300x400x950
G3HT15K3I-INS	1300x400x950
G3HT20K3I-INS	1300x500x950
G3HT30K3I-INS	1300x500x950

With CLA (Strong charger for longer runtimes)

G3HT10K3IL-INS	1300x400x950
G3HT15K3IL-INS	1300x400x950
G3HT20K3IL-INS	1300x500x950
G3HT30K3IL-INS	1300x500x950

F. Display, controls, and alarms

i. A microprocessor controlled display unit shall be located on the front of the system. The display shall consist of an alphanumeric display with backlight, an alarm LED, and a keypad consisting of pushbutton switches.

ii. The following metered data, shall be available on the alphanumeric display:

1. Year, month, day, hour, minute, second of occurring events
2. Input AC voltage
3. Output AC voltage

4. Output AC current
5. Input Frequency
6. Battery voltage
7. Real-time battery temperature (internal or external)

iii. The display unit shall allow the user to display all active alarms and the 100 most recent status and alarm events.
The following minimum set of alarm conditions shall be available:

1. AC bypass overload
2. AC normal is in derating
3. AC normal fault
4. AC normal voltage low
5. Battery breaker is open
6. Battery charger incompatible
7. Battery deep discharge
8. Battery fuse blown fault
9. Battery not connected
10. Battery SCR short circuit
11. Battery over voltage
12. Battery test fault
13. Battery temperature fault
14. Static bypass breaker is open
15. Output breaker is open
16. Bypass frequency out of tolerance
17. Bypass/Inverter sync fault
18. Bypass phase order fault
19. Bypass SCR fault
20. Bypass volt out of tolerance
21. Charger type setting conflict
22. Charger fault
23. Communication fault
24. DC bus fault
25. End of backup time
26. End of battery life
27. End of battery life (LCM)
28. End of wear part life
29. End of warranty
30. Entry service test mode
31. EPO active
32. Fan fault
33. Inverter SCR fault
34. Inverter thermal overload
35. Inverter current limitation
36. Inverter fault
37. Inverter overload
38. LCM has not been set
39. Load short circuit
40. Neutral loss fault
41. Normal frequency out of tolerance
42. Normal phase order fault
43. Nor voltage out of tolerance
44. Overload in battery mode
45. Personalization fault
46. PFC fault
47. PFC overload
48. PFC thermal overload
49. Power supply 2 fault

50. Pre end of backup time
51. Pre end of battery life
52. Pre end of warranty
53. Pre end of wear part life
54. Setting fault
55. Synchronization source fault
56. Transfer to bypass denied
57. Wrong batt +/- connection
58. Static bypass breaker closed in F-C mode

iv. The following controls or programming functions shall be accomplished by use of the display unit. Push button membrane switches shall facilitate these operations.

1. Silence audible Alarm
2. Set the alphanumeric display language
3. Display or set the date and time
4. Enable or disable the automatic restart feature
5. Transfer critical load to and from static bypass
6. Test battery condition on demand
7. Set intervals for automatic battery tests

v. The following shall make up the UPS front panel user interface.

1. Indicating LED's

15. Load	When Green, this LED indicates that the inverter supports the load or the load is supported by the AC bypass source. When Red, this LED indicates that the inverter is not connected to the load and that the load is not supported by the AC bypass source. When OFF, this LED indicates that the maintenance bypass breaker is ON (closed).
16. Battery	When Green, this LED indicates that the UPS is in battery operation. When Red, this LED indicates that a major fault in the battery or the charger has occurred, or the battery circuit breaker is OFF. When OFF, this LED indicates that the batteries are charging or ready to supply the load if the AC power fails.
17. Bypass	When Green, this LED indicates that the load is supported by the AC bypass source. When Red, this LED indicates that a major fault in the bypass has occurred, the static bypass breaker is OFF in normal mode, the static bypass breaker is ON in frequency converter mode, or that a transfer to bypass is unavailable. When OFF, this LED indicates that the load is not supported by the AC bypass source.
18. PFC	When Green, this LED indicates that the power factor correction works on normal AC input. When Red, this LED indicates that an AC normal fault, a DC BUS fault, or a major PFC fault has occurred. When OFF, this LED indicates that the PFC is not working.
19. Inverter	When Green, this LED indicates that the inverter is operating. When Red, this LED indicates that a major fault in the inverter or a fault in the static switch has occurred. When OFF, this LED indicates that the inverter is OFF.

20. Environment & minor fault LED: When Orange, this LED indicates that a minor fault has occurred. When OFF, this LED indicates that no minor fault is present.
21. Load unprotected: When Red, this LED indicates that a major fault has occurred, or that the load is unprotected (and may be supplied by the AC bypass source). When OFF, this LED indicates that no major faults are present and that the load is protected.
22. Load protected: When Green, the load is protected. When OFF, the load is not protected.

2. Push Button User Controls
    23. Up Arrow
    24. Down Arrow
    25. Escape Key
    26. Enter Key
    27. ON Key
    28. OFF Key

vi. For purposes of remote communications with the UPS the following shall be available and contained within the UPS on a removable, “hot swappable” “smart slot” interface card:
1. RJ-11 Interface port for remote communications with a network via web browser or SNMP.

G. Battery

i. The batteries shall be of the YUASA or CSB type.

2.3. ACCESSORIES

A. StruxureWare Data Center Expert: A centralized infrastructure management platform hereafter referred to as Data Center Expert shall be available for purposes of complete system monitoring and management of all components outlined in this specification used as a single solution for small IT or part of the StruxureWare software stack providing data to systems such as Data Center Operation.

1. **Monitoring** - Data Center Expert shall be capable of monitoring a PDU through a network of Cat 5 cable and a switch supplied by the user. This switch shall relay information to Data Center Expert, which in turn shall allow access to this information via the user’s public network via a single IP address.
2. **Monitored Values**: Data Center Expert shall be capable of monitoring alarms, general status parameters, voltage and current of the PDU.
3. **Thresholds**: For individualized customer needs, Data Center Expert shall allow for user configurable thresholds for alarm notification. With this feature, Data Center Expert can notify clients of reaching thresholds for PDU capacity, or branch circuit breaker capacity. Other custom programmable alarm points for non- APC products shall also be available via dry contact input signal.
4. **Public Network Monitoring**: Data Center Expert shall also be capable of monitoring other APC devices that are connected to the client’s public network.

B. Battery cabinet option (only for CLA version)

i. For purposes of extending the UPS battery runtime, external extended runtime options shall be available. The extended runtime option shall be

housed in “line up and match” type enclosures and shall contain necessary hardware and cables to connect to the UPS, or between XR enclosures. Each XR enclosure shall be equipped with removable batteries.

ii. The extended runtime system shall have a 250 VDC rated, thermal magnetic trip molded case circuit breaker. Each circuit breaker shall be equipped with shunt trip mechanisms and 1A/1B auxiliary contacts.

C. Software and connectivity

i. The Ethernet Web/SNMP Adaptor shall allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS and UNIX "tar" formats. The SNMP interface adaptor shall be connected to the UPS via the RS232 serial port on the standard communication interface board.

ii. Unattended Shutdown

D. Remote UPS monitoring

i. Three methods of remote UPS monitoring shall be available:

1. Web Monitoring: Remote monitoring shall be available via a web browser such as Internet Explorer.
2. RS232 Monitoring: Remote UPS monitoring shall be possible via either RS232 or contact closure signals from the UPS.
3. Simple Network Management Protocol (SNMP): Remote UPS Monitoring shall be possible through a standard MIB II compliant platform.

E. Software compatibility

i. The UPS manufacturer shall have available software to support graceful shutdown and or remote monitoring for the following systems:

1. Microsoft Windows 95/98/XP
2. Microsoft Windows NT 4.0 SP6/2000
3. OS/2
4. Netware 3.2 – 5.1
5. MAC OS 9.04, 9.22, 10
6. Digital Unix/True 64
7. SGI 6.0-6.5
8. SCO UNIX
9. SVR4 2.3, 2.41
10. SCO Unix Ware 7.0 - 7.11
11. SUN Solaris 2.6-2.8
12. SUN OS 4.13, 4.14
13. IBM AIX 4.3x-4.33g, 5.1
14. HP-UX 9.x-11.i

Part 3 EXECUTION

3.1. EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect/Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2. INSTALLATION

Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings.

3.3. FACTORY ASSISTED START-UP

A factory assisted UPS start-up shall be included with the product, factory trained service personnel shall perform the following inspections, test procedures, and on-site training:

A. Visual Inspection:

1. Inspect equipment for signs of damage.
2. Verify installation per manufacturer's instructions.
3. Inspect cabinets for foreign objects.
4. Inspect batteries.
5. Inspect the PFC, the AC caps and DC caps.
6. Measure board voltages.

B. Mechanical Inspection:

1. Check all UPS, external battery enclosures internal power wiring connections.
2. Check all UPS, external battery enclosures terminal screws, nuts, and/or spade lugs for tightness.

C. Electrical Inspection:

1. Verify correct input and bypass voltage.
2. Verify correct phase rotation of all mains connections.
3. Verify correct UPS control wiring and terminations.
4. Verify voltage of batteries.
5. Verify neutral and ground conductors are properly landed.

D. Site Testing:

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper maintenance bypass switch operation.
5. Verify system set points.

6. Verify proper inverter operation and regulation circuits.

7. Simulate utility power failure.

8. Verify proper charger operation.

9. Document, sign, and date all test results.

E. On-Site Operational Training:
During the factory assisted start-up, operational training for site personnel shall include key pad operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

3.4. MANUFACTURER FIELD SERVICE

A. Worldwide service:
The UPS manufacturer shall have a worldwide service organization. Available, consisting of factory trained field service personnel to perform start-up, preventative maintenance, and service of the UPS system and power equipment. The service organization shall offer 24 hours a day, 7 days a week, 365 days a year service support.

B. Replacement parts:
Parts shall be available through the worldwide service organization 24 hours a day, 7 days a week, 365 days a year. The worldwide service organization shall be capable of shipping parts within 4 working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours.

3.5. DEMONSTRATION

A. Provide the services of a factory-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.
1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
2. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in operation and maintenance manuals with the Owner's personnel.
4. Schedule training with the Owner, through the Architect/Engineer, with at least seven day's advanced notice.

3.6. PROTECTION
Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the solid state UPS shall be without damage at time of Substantial Completion.

3.7. MAINTENANCE CONTRACTS
A complete offering of preventative and full service maintenance contracts for the UPS system and the battery system shall be available. All contract work shall be performed by APC factory trained service personnel.

3.8. TRAINING

UPS service training workshop: A UPS service training workshop shall be available from the UPS manufacturer. The service training workshop shall include a combination of lecture and practical instruction with hands-on laboratory sessions. The service training workshop shall include instruction about safety procedures, UPS operational theory, sub-assembly identification and operation, system controls and adjustment, preventative maintenance, and troubleshooting.

END OF SECTION