

APC by Schneider Electric

APC Modular Power Distribution Unit, 300mm, 400A, 277kW, 400V Output **277kW PDU/Distribution**

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 26 00]

POWER DISTRIBUTION UNITS

PART 1 - GENERAL

1.1 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 power distribution unit (PDU) 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, requirements for a complete modular power distribution system for powering IT loads.
 - 1. This specification describes the operation and functionality of a continuous duty, three-phase Modular Power Distribution Unit for Data Center and Infrastructure Equipment Room installation, hereafter referred to as the PDU.
 - 2. The PDU shall provide a mechanical means of complete isolation of the input source from the critical output distribution.
 - 3. The PDU shall contain the appropriate modular distribution panel within a Rack enclosure suitable for installation in a data center environment. The distribution panel shall be intrinsically finger safe, and shall be suitable for the installation of single or three phase modular circuit breaker assemblies without the need for hand tools.
 - 4. Distribution for each 400V PDU shall be comprised of factory assembled and tested circuit breakers which shall require no tools to install.
 - 5. All of the above system components are housed in a NetShelter™ SX Rack, 300mm (W) x 1070mm (D) x 2000mm (H).
 - 6. The PDU and associated equipment shall operate in conjunction with a primary power supply to provide quality uninterrupted power for mission critical, electronic equipment load.
 - 7. All programming and miscellaneous components for a fully operational system as described in this Section shall be available as part of the PDU.

1.2 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. **Electronic Industries Association (EIA):**
1. EIA 310, "Racks, Panels, and Associated Equipment" (copyrighted by EIA, ANSI approved).
- C. **Institute of Electrical and Electronics Engineers (IEEE):**
1. IEEE 519-1992 Standard Practices and Requirements for Harmonic Control in Electrical Power Systems.
- D. **International Organization for Standardization (ISO):**
1. ISO 9001, "Quality Management Systems - Requirements."
 2. ISO 14001, "Environmental Management Systems - Requirements With Guidance for Use."
- E. **Underwriters Laboratories, Inc. (UL):**
1. UL 60950, "Standard for Information Technology Equipment."
 2. ULc CSA 60950-1
- F. Where applicable, the PDU shall also be designed in accordance with publications from the following organizations and committees:
1. NFPA- National Fire Protection Associations
 2. OSHA - Occupational Safety and Health Administration

1.3 SYSTEM DESCRIPTION

A. Design Requirements

SELECT OR INSERT APPLICABLE VALUE BELOW.

1. The PDU shall be sized for [_____] kVA load.

B. System Characteristics

1. **System Capacity: 277kW**
The PDPM277H PDU shall support 400A at 400V maximum input and provide 277kW output.
2. **Upstream Breaker Protection:** Upstream breaker protection rated at 400A is recommended.
3. **Input:** The system input shall be configurable as single mains derived from a three phase wye source. Standard cable entry shall be through the top. Bottom cable entry shall also be facilitated.
 - a. **AC Nominal Input Voltage:** 400V/230V 3-phase, 3-Wire+N+G, 60Hz
 - b. **Maximum Input Current:** 400A
 - c. **Short Circuit Withstand Rating:** 10kA Symmetrical
 - d. **Rated Impulse Withstand Voltage (UCC):** 4kV
4. **Output:**
 - a. **Nominal Output:** 277kW, 400V 3-phase, 400A maximum, 3-wire + N + G

1.4 SUBMITTALS

- A. **Product Data:** Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Product data shall include, but shall not be limited to, the following:
 - 1. As bid system bill of materials.
 - 2. Product catalog sheets or equipment brochures.
 - 3. Product guide specifications.
- B. **Shop Drawings:** Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data, including, but not limited to, the following:
 - 1. Installation information, including, but not limited to, weights and dimensions.
 - 2. Information about terminal locations for power and control connections.
 - 3. Drawings for requested optional accessories.
- C. **Wiring Diagrams:** Submit wiring diagrams detailing power systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.
 - 1. Submit system single-line diagram.
- D. **Operation and Maintenance Data:** Submit operation and maintenance data to include in operation and maintenance manuals including, but not limited to, safe and correct operation of PDU functions.
 - 1. Submit an installation manual, which shall include, but shall not be limited to, instructions for storage, handling, examination, preparation, installation, and start-up of PDU.
 - 2. Submit an operation and maintenance manual, which shall include, but shall not be limited to, operating instructions.

1.5 QUALITY ASSURANCE

- A. **Qualifications:**
 - 1. **Manufacturer Qualifications:** Manufacturer shall be a firm engaged in the manufacture of modular PDUs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 20 years.
 - a. The manufacturer shall be ISO 9001 certified and shall be designed to internationally accepted standards.
- 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.
 - 1. Work shall also be designed in accordance with the following:
 - a. NFPA 70
 - 2. Where applicable, the PDU shall also be designed in accordance with publications from the following organizations and committees:
 - a. National Fire Protection Association (NFPA).
 - b. National Electrical Manufacturers Association (NEMA).
 - c. Occupational Safety and Health Administration (OSHA).
 - d. Institute of Electrical and Electronics Engineers, Inc. (IEEE); ANSI/IEEE 519.
 - e. ISO 9001
 - f. ISO 14001
 - g. FCC

1.6 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. The customer shall store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 PROJECT CONDITIONS

- A. **Environmental Requirements:** Do not install PDUs until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
 - 1. **Environmental:**
 - a. **Storage Ambient Temperature:** 0 to +45°C
 - b. **Operating Ambient Temperature:** 0 to 30°C (0 to 40°C derated)
 - c. **Relative Humidity:** 0 percent to 95 percent, non-condensing.
 - d. **Altitude:** 0 – 10,000 m

1.8 WARRANTY

- A. **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. **Power Distribution Unit:** The PDU 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.
- B. **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.

1.9 MAINTENANCE

- A. A complete offering of preventative and full service maintenance contracts for the Power Distribution Unit shall be available from the manufacturer. Contract work shall be performed by factory trained service personnel.

PART 2 – PRODUCT

2.1 MANUFACTURERS

- A. **Basis of Design:** Product specified is “APC Modular Power Distribution Unit, 277kW” as manufactured by APC by Schneider Electric. Items specified are to establish a standard of quality for design, function, materials, and appearance.

2.2 DESIGN REQUIREMENTS

As a minimum, the PDU shall contain the following features and accessories:

- A. **Input voltage:** The PDU shall be available for a 400/230Y input.
- B. **Distribution Board:** Also included in the PDU shall be one 72 pole distribution board connected to the output bus of the PDU to serve as critical load distribution.
- C. **Enclosure with locking mechanism:** The PDU shall also have a full-length hinged front door, with locking mechanism, to allow access to the panelboard circuits. There shall also be a hinged rear door to allow access to the back of the unit.
- D. **Flexible Distribution Conductors:** For purposes of overhead distribution wiring of datacenter branch circuits, flexible conductors of TC-ER, DP-1 type shall be available as a distribution means. Flexible conductors shall be equipped with NEMA or IEC style cord caps and shall be agency approved under UL60950 as part of the InfraStruxure system.
- E. **Testing and quality assurance:** All circuit breakers shall be 100% factory tested to ensure the highest quality for the PDU. In addition the PDU shall be tested with 100% load and all panel circuit breakers shall be 100% tested. The PDU shall also be Hipot tested per UL 60950-1 guidelines.

2.3 DISPLAYS AND CONTROLS

- A. **Display unit:** For purposes of providing local annunciation of status and alarm messages, the PDU shall have a microprocessor-controlled display unit located on a hinged door in front of the system. The display shall consist of an alphanumeric display with pushbutton switches, allowing retrieval of active alarms, system level programming, and event history of the PDU.
- B. **Metered Data:** The following data shall be available on the alphanumeric display:
 1. Year, month, day, hour, minute, second of occurring events
 2. Output voltage by phase
 3. Power distribution module status and manufacturing information
 4. Current and power used by the load
 5. Load as a percentage of capacity
 6. Total energy usage
 7. Volt meter
 8. Circuit configuration, including individual load configuration and global alarm configuration
 9. Alarms
 10. Log
 11. Network configuration
 12. Help files
- C. **Event log:** The display unit shall allow trained personnel to display a time and date stamped log.

- D. **Alarms:** The display unit shall allow the Owner to display a log of active alarms. The following minimum set of alarm conditions shall be available:
1. High Module Current
 2. High Subfeed Current
 3. Low Module Current
 4. Low Subfeed Current
 5. Maximum Module Current
 6. Maximum Subfeed Current
 7. Minimum Module Current
 8. Minimum Subfeed Current
 9. Modular Distribution Communication
 10. Module Breaker Open
 11. Subfeed Breaker Open
- E. **Controls:** The following controls or programming functions shall be accomplished by the use of the display unit. Push-button membrane switches shall facilitate these operations:
1. Silence audible alarm.
 2. Display or set the date and time.
 3. Adjust set points for different alarms.

2.4 REMOTE SYSTEM MONITORING

- A. The following methods of remote PDU monitoring shall be available:
1. Web Monitoring: Remote monitoring shall be available via a web browser such as Internet Explorer.
 2. RS232 Monitoring: Remote PDU monitoring shall be possible via RS232 serial port connection.
 3. Simple Network Management Protocol (SNMP): Remote PDU Monitoring shall be possible through a standard MIB II compliant platform.

2.5 OPTIONS

- A. **Power Distribution Modules:** A variety of Power Distribution Modules shall be available for the Power Distribution Unit.
- B. **Floor Anchor Brackets:** To meet the requirements of NFPA 70 110.13, floor anchor brackets shall be available to solidly connect the PDU to minimize unintended moving of the equipment.
- C. **Seismic Anchor Brackets:** To meet the requirements of OSHPD pre-approval, seismic brackets shall be available to solidly connect the PDU to minimize unintended moving of the equipment during seismic activity.
- D. **Cable Ladder:** For purposes of routing data and power cables between rows in a datacenter aisle layout, cable ladders shall be available to span the gap between rows. Cable ladders shall be agency approved under UL60950 as part of the InfraStruxure system. The use of over head cable management shall minimize the need to run data and power cable beneath a raised flo^or, thus minimizing potential air flow obstructions for down-flow type precision cooling solutions. This means of cable management shall also facilitate ease of installation of power and data cabling in datacenters not utilizing raised floor. Optional covers shall be available for ladders as a means of adhering to local codes requiring such.

- E. **Cable Trough:** For purposes of routing data and power cable along the length of a row of IT enclosures in a data center environment, cable troughs shall be available as a means of separating and housing data and power cable. Optional covers shall be available for troughs as a means of adhering to local codes requiring such. The use of over head cable management shall minimize the need to run data and power cable beneath a raised floor, thus minimizing potential air flow obstructions for down-flow type precision cooling solutions. This means of cable management shall also facilitate ease of installation of power and data cabling in datacenters not utilizing raised floor.

- F. **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 hub, supplied by the PDU manufacturer. This hub 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.

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

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

- B. **Factory-Assisted Start-Up:** Factory trained service personnel shall perform the following inspections, test procedures, and on-site training:
1. **Visual Inspection:**
 - a. Inspect equipment for signs of damage.
 - b. Verify installation per manufacturer's instructions.
 - c. Inspect cabinets for foreign objects.
 2. **Mechanical Inspection:**
 - a. Check all internal control wiring connections.
 - b. Check all internal power wiring connections.
 - c. Check all terminal screws, nuts, and/or spade lugs for tightness.
 3. **Electrical Inspection:**
 - a. Verify correct input voltage.
 - b. Verify correct phase rotation of all mains connections.
 - c. Verify correct control wiring and terminations.
 - d. Verify neutral and ground conductors are properly landed.
 4. **Site Testing:**
 - a. Ensure proper system start-up.
 - b. Verify proper firmware control functions.
 - c. Verify system set points.
 - d. Document, sign, and date all test results.
 5. **On-Site Operational Training:** During the factory assisted start-up, operational training for site personnel shall include keypad operation, LED indicator definitions, start-up and shutdown procedures, AC disconnect operation, and alarm information.

3.3 FIELD QUALITY CONTROL

A. MANUFACTURER FIELD SERVICE

1. Worldwide service: The PDU 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 PDU system and power equipment. Standard offering is Next Business Day under the original one-year warranty. The service organization shall offer 24 hours a day, 7 days a week, 365 days a year, 4-hour response time service support.
2. Replacement parts: Parts shall be available through the worldwide service organization 24 hours a day, 7 days a week, and 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.

3.4 DEMONSTRATION

- A. **General:** 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 at time of startup.
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.

END OF SECTION