

SECTION 260913 - ELECTRICAL POWER MONITORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Attach copies of approved Product Data submittals for products switchboards that describe power monitoring to illustrate coordination among related equipment and power monitoring.
- B. Shop Drawings: For power monitoring meter. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Outline Drawings: Indicate arrangement of components and clearance and access requirements.
 - 2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
 - 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Wiring Diagrams: Power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For power monitoring units, to include operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Operating and applications software documentation.
 - 2. Software licenses.
 - 3. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.

4. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.

E. Other Informational Submittals:

1. System installation and setup guides, with data forms to plan and record options and setup decisions.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing power equipment similar to that indicated for this Project and with a record of successful in-service performance.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 COORDINATION

- A. Coordinate features of distribution equipment and power monitoring components to form an integrated interconnection of compatible components.
 1. Match components and interconnections to the existing building monitoring system.
- B. Coordinate Work of this Section with those in Sections specifying distribution components that are monitored or by power monitoring and control equipment.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Addressable Relays: One for every 1 installed. Furnish at least one of each type.
 2. Data Line Surge Suppressors: One for every 2 of each type installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements. Power monitoring meters shall be compatible with the existing building power monitoring system.

2.2 FUNCTIONAL DESCRIPTION

- A. Power Quality Monitoring: Identify power system anomalies and measure, display, and record trends and alarms of the following power quality parameters:
 - 1. Voltage regulation and unbalance.
 - 2. Continuous three-phase rms voltage.
 - 3. Periodic max./min./avg. samples.
 - 4. Harmonics.
 - 5. Voltage excursions.
 - 6. Kilowatt hours

2.3 SYSTEM REQUIREMENTS

- A. Monitoring: Meters shall be compatible with existing, operating system and application software, connected to data transmission network.
- B. Addressable Devices: All transmitters and receivers shall communicate unique device identification and status reports to monitoring and control clients.

2.4 OPERATING SYSTEM

- A. Software: Configured to run on existing monitoring system.

2.5 COMMUNICATION COMPONENTS AND NETWORKS

- A. Transient Voltage Surge Suppression and Electromagnetic-Interference Immunity: Include in solid-state equipment. Comply with IEEE C37.90.
- B. Network Configuration: High-speed, multi-access, open nonproprietary, industry standard communication protocol; LANs complying with EIA 485, 100 Base-T Ethernet, and Modbus TCP/IP.

2.6 POWER MONITORS

- A. Separately mounted, permanently installed instrument for power monitoring and control.
 - 1. Enclosure: NEMA 250, Type 1.
- B. Environmental Conditions: System components shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 - 1. Indoor installation in spaces that have environmental controls to maintain ambient conditions of 32 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.

C. rms Real-Time Measurements:

1. Current: Each phase, neutral, average of three phases, percent unbalance.
2. Voltage: Line-to-line each phase, line-to-line average of three phases, line-to-neutral each phase, line-to-neutral average of three phases, line-to-neutral percent unbalance.
3. Power: Per phase and three-phase total.
4. Reactive Power: Per phase and three-phase total.
5. Apparent Power: Per phase and three-phase total.
6. Power Factor: Per phase and three-phase total.
7. Displacement Power Factor: Per phase and three-phase total.
8. Frequency.
9. THD: Current and voltage.
10. Accumulated Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).
11. Incremental Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).
12. Conditional Energy: Real kWh, reactive kVARh, apparent kVAh (signed/absolute).

D. Average Power Factor Calculations, Demand Coincident, Three-Phase Total:

1. Last completed interval.
2. Coincident with kW peak.
3. Coincident with kVAR peak.
4. Coincident with kVA peak.

E. Minimum and Maximum Values: Record monthly minimum and maximum values, including date and time of record. For three-phase measurements, identify phase of recorded value. Record the following parameters:

1. Line-to-line voltage.
2. Line-to-neutral voltage.
3. Current per phase.
4. Line-to-line voltage unbalance.
5. Line-to-neutral voltage unbalance.
6. Power factor.
7. Displacement power factor.
8. Total power.
9. Total reactive power.
10. Total apparent power.
11. THD voltage L-L.
12. THD voltage L-N.
13. THD current.
14. Frequency.

F. Harmonic Calculation: Display and record the following:

1. Harmonic magnitude reported as a percentage of the fundamental or as a percentage of rms values, as selected by user.

G. Current and Voltage Ratings:

1. Designed for use with current inputs from standard instrument current transformers with 5-A secondary and shall have a metering range of 0-10 A.
2. Withstand ratings shall be not less than 15 A, continuous; 50 A, lasting over 10 seconds, no more frequently than once per hour; 500 A, lasting 1 second, no more frequently than once per hour.
3. Designed for use with voltage inputs from standard instrument potential transformers with a 120-V secondary.

H. Alarms.

1. User Options:
 - a. Define pickup, dropout, and delay.
 - b. Assign one of four severity levels to make it easier for user to respond to the most important events first.
2. Alarm Events:
 - a. Over/undercurrent.
 - b. Over/undervoltage.
 - c. Current imbalance.
 - d. Phase loss, current.
 - e. Phase loss, voltage.
 - f. Voltage imbalance.
 - g. Over kW demand.
 - h. Phase reversal.
 - i. Digital input off/on.

I. Control Power: 90- to 457-V ac or 100- to 300-V dc.

J. Communications:

1. Power monitor shall be permanently connected to communicate with the existing building monitoring system.

K. Display Monitor:

1. Backlighted LCD to display metered data with touch-pad selecting device.
2. Display four values on one screen at same time.
 - a. Current, per phase rms, three-phase average and neutral.
 - b. Voltage, phase to phase, phase to neutral, and three-phase averages of phase to phase and phase to neutral.
 - c. Real power, per phase and three-phase total.
 - d. Reactive power, per phase and three-phase total.
 - e. Apparent power, per phase and three-phase total.
 - f. Power factor, per phase and three-phase total.
 - g. Frequency.
 - h. Demand current, per phase and three-phase average.
 - i. Demand real power, three-phase total.

- j. Demand apparent power, three-phase total.
 - k. Accumulated energy (MWh and MVARh).
 - l. THD, current and voltage, per phase.
3. Reset: Allow reset of the following parameters at the display:
- a. Peak demand current.
 - b. Peak demand power (kW) and peak demand apparent power (kVA).
 - c. Energy (MWh) and reactive energy (MVARh).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABLING

- A. Comply with NECA 1.
- B. Wiring Method: Install wiring in raceway except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
- C. Install cables without damaging conductors, shield, or jacket.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
- B. Label each power monitoring and control module with a unique designation.

3.4 GROUNDING

- A. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
1. Electrical Tests: Use caution when testing devices containing solid-state components.
 2. Continuity tests of circuits.
 3. Operational Tests: Set and operate monitoring at existing workstation. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Submit sequences for approval. Note response to each test command and operation. Note time intervals between initiation of alarm conditions and registration of alarms at central-processing workstation.
 - a. Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled.
 - b. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of calculated battery operating time.
 - c. Verify accuracy of graphic screens and icons.
 - d. Metering Test: Load feeders, measure loads on feeder conductor with an rms reading clamp-on ammeter, and simultaneously read indicated current on the same phase at central-processing workstation. Record and compare values measured at the two locations. Resolve discrepancies greater than 5 percent and record resolution method and results.
 - e. Record metered values, control settings, operations, cues, time intervals, and functional observations and submit test reports printed by workstation printer.
- C. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
- D. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- E. Remove and replace malfunctioning devices and circuits and retest as specified above.

END OF SECTION 260913