

SECTION 26 09 13 03 00 ELECTRICAL POWER MONITORING

PART 1 - GENERAL

1.1 SCOPE

- A. This section defines the low voltage metering solution for use in the AC electrical equipment as outlined in the one-line and/or riser drawings. **[These meters are for use in general applications other than tenant sub-billing. For tenant sub-billing specifications use Section 26 09 13 03 50.]** These solutions will provide a low voltage metering system integrated into the electrical equipment. The metering system shall provide the ability to report energy information remotely using a web based software platform. The system must be expandable to accept non-electrical meter input.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
1. ***[Section 26 09 26.03 – Lighting Control Devices]***
 2. ***[Section 26 23 00 – Low Voltage Switchgear]***
 3. ***[Section 26 24 13 – Switchboard]***
 4. ***[Section 26 24 16 – Panelboards]***
 5. ***[Section 26 24 19 – Motor Control Centers]***
 6. ***[Section 26 xx xx – Electrical Installation]***

1.3 SUBMITTALS

- A. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location and customer order number shall identify all transmittals.
- B. ***[Final Documents: Record documentation to include but not limited to: as-built wiring diagrams, meter/breaker/load schedule, factory test results and certificate(s), system commission report, manufacturers contact information, operation and installation manuals.]***

1.4 RELATED STANDARDS AND COMPLIANCE

- A. Meet the following recognized standards and approvals for applications:
1. Accuracy:
 - a. ANSI C12.1
 - b. ANSI C12.20/0.5
 2. Safety/Construction/EMC
 - a. CSA C22.2 No. 1010-1 Safety Requirements for Electrical Equipment for
 - b. Measurement
 - c. UL 61010-1 (IEC 61010-1) Safety Requirements for Electrical Equipment for Test & Measurement. UL 916 is replaced by UL 61010-1 and UL 61010-2-03
 - d. IEC 62052-11; IEC 62053-22 Class 0.5S; EMC Directive. These standards are only applicable if the product is installed outside of USA and needs to have CE mark.
 3. Approvals/Certification
 - a. New York State PSC (Public Service Commission) approved Meter
 - b. ANSI C12.20 certification done through NRTL (Nationally Recognized Test Lab)
 - c. BTL Certified (BACnet Test Laboratories) – Easy Integration with BMS systems only if BACnet native Protocol shall be required

- d. CTEP Certified (California Type Evaluation Program) by CDFA (California Department of Food and Agriculture), a division of Measurement Standards, CA
- 4. Electro Magnetic Compatibility
 - a. IEC 61000-4-2 Electrostatic Discharge (B)
 - b. IEC 61000-4-3 Radiated Immunity (A)
 - c. IEC 61000-4-4 Electric Fast Transient (B)
 - d. IEC 61000-4-5 Surge Immunity (B)
 - e. IEC 61000-4-6 Conducted Immunity
 - f. FCC Part 15 subpart B, Class A Digital Device, Radiated Emissions
- 5. Environmental Conditions
 - a. Altitude up to 3000 meters
 - b. Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
 - c. Pollution Degree 3

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years' experience producing electronic sub-metering system equipment.
- B. Manufacturer shall provide both external and embedded metering solutions.
- C. Manufacturer shall offer both a 1% and 0.2% accuracy solution.
- D. Comply with requirements of latest revisions of applicable industry standards.
- E. Manufacturer shall have remote web based tenant billing software solutions.
- F. Metering hardware shall be designed, factory installed and tested before shipping to site.
- G. Embedded solution must be a standard product offering by the panel manufacturer. Custom "one off" installed metering solutions are not acceptable.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. If the meters are installed in equipment, store the equipment so condensation will not form on or in it. If necessary, apply temporary heat where required to obtain suitable service conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. *[The low voltage power meter shall be a SEM3 metering solution by Siemens or pre-approved equal. Approved manufacturers are as follows:*
 - 1. **SIEMENS**
 - 2. **.J**

2.2 HARDWARE OVERVIEW

- A. The meters and the ancillary equipment shall meet revenue approval by the recognized authorities in Section 1.4.A *[and the authorities having jurisdiction]*.
- B. Current Transformers (CT) - Manufacturer shall offer solid core or split core (Retrofit applications) designs and be rated for at least the following maximum amperage ratings; 50,125, 250, 400, 600, 800, 1200, 1600, and 2000 amps. Solid core CT shall meet Accuracy standard IEC 60044-1, Class 0.2s. Split core CT shall meet accuracy down to 0.5%.
 - 1. CT's shall only have milliamp (100mA) output and measure accurately down to 1% of the maximum range.
 - 2. CT's shall be self-protecting and not require shorting blocks.

3. CT's shall be rated for (CAT IV UL metering - evaluated for installation within equipment on the load side of the service equipment overcurrent device). CT's shall be Pollution Degree 3
 4. CT's shall be compliance to UL 2808, a new UL safety standard released in 2012 under category code XOBA.
 5. CT's shall be rated for 600VAC.
 6. CT wire length shall be extended up to 500 feet
 7. CT wire shall be 18awg twisted pair wire (UL 1015 600v)
- C. Micro Meter Modules – Individual micro metering modules shall be provided, one for each phase of the metered circuit. These meter modules will tie to the milliamp CT's. The CT's must be supplied by the manufacturer of the Meter Modules.
1. Meter modules shall measure data at **[1%] [0.2%]** accuracy as tested in accordance with ANSI C12.20
 2. When grouped together, the Meter Modules shall allow for measurement of 1, 2 and 3 phase circuits.
 3. Meter Modules shall incorporate a dip switch selector to select phase A, B, or C, and have a LED indicator to indicate the phase.
 4. The Meter Module shall be able to accept inputs from all available milliamp CTs ranging from 50 to 2000A.
 5. Setup for the CT sizing on each Meter Module shall be done through the controller web page.
 6. Meter modules shall plug directly into the metering rack without any additional installation work or tools needed.
 7. All embedded metering solutions shall have the metering modules installed at the electrical equipment manufactures factory. No field installation shall be required.
 8. Meter modules shall be pre-calibrated and will never need future calibration.
 9. Meter modules shall provide a kwhr pulse indicator to reflect active energy usage pulse indication. The meter module pulse output is 5 Wh On and 5 Wh Off.
 10. Micro Metering module shall record the kWh reading and retain up to 40 years without external power.
- D. Racks – Micro Meter Modules are to be mounted on scalable Racks. The Rack Assembly shall be designed to allow the Micro Meter Modules to be snapped into the Rack without use of any tools.
1. Rack Assemblies shall be available in sizes of 3, 6, 9, 15 and 21 Micro Meter Modules.
 2. Rack Assemblies shall be sized to meter all circuits denoted for metering on the drawings accept up to 3, 6, 9, 15 or 21 Micro Meter Modules.
 3. Rack Assemblies will allow for open slots to accommodate future expansion as noted on the drawings.
 4. Rack Assemblies shall be connected to the controller using a 600v rated communications cable.
- E. Controller – The controller shall function as the collection, processing and setup location for the Micro metering units with a built-in web page interface.
1. The controller shall support up to 4 concurrent Modbus TCP connections including one of the connections would be accessing the built-in webpages through standard browsers such as Chrome and Internet Explorer.
 2. The Controller shall be synchronized with NTP server for Date & Time.
 3. Built-in Web page configuration and real-time data screens will include:
 - a. System settings: IP Configuration, CT Ratios, PT Ratios, System type, SMTP email configuration, Modbus RTU slave configuration, Utility Software sealing, and System Time Setup.
 - b. Global settings: for threshold and set-point alarms.

- c. Branch Meter configuration: for one, two or three pole; and individual meter warnings, CT ratings, and labels. Dynamic logic shall be built-in to the web configuration tool as to prevent the user from setting up an incorrect arrangement.
 - d. Real-Time data monitoring for voltage, current, power, energy, water & gas
 - e. Grouping of multiple circuits totalized logging and alarming
 - f. Real-time data logs, alarm event logs and system event logs for historical trending dashboard (Today, Yesterday, DTD, WTW, MTM, YTY comparisons), emailing, download in CSV format, and alarm notifications.
 - g. User Profile and User Configuration
 - h. Diagnostics indications to be used to identify CT or phase angle misalignment of the configured meter module and allow user to download monitored Modbus register address information being passed to other monitoring or control systems.
 - i. Firmware upgrade and webpage upgrade done through built-in web pages. No external software tool required to upgrade the firmware on the hardware.
 - j. Meter Module serial numbers and Controller serial number display.
 - k. Import and export of saved configurations in a file format.
 - l. Support of English, German, French, and Spanish languages on all built-In webpages.
 - m. No additional software shall be required to configure the Controller or Micro Metering modules.
4. The Controller shall communicate metered values to external/third-party systems by:
 - a. HTML Web page interface, Modbus RTU, Modbus TCP, BACnet IP, BACnet MSTP, and SNMP.
 5. Controller webpages shall allow user to configure BACnet settings, BACnet Object Map Configuration, BACnet Foreign Device Register and Object configuration.
 6. One Controller shall be able to manage up to 45 Micro Meter Modules from the same voltage source.
 7. The Controller shall have two digital pulse inputs for receiving pulse inputs from other metering devices, such as gas and water.
 8. The Controller shall have one configurable (KY or KYZ) digital pulse output that can be used to output total Kwh data from one or more Micro Metering modules totalized together.
 9. The Controller shall be powered from its own voltage inputs and rated suitable for 480V, 240V, 208V and 120V AC applications.
- F. Service Types
1. ***[Single Phase Two Wire]***
 2. ***[Single Phase Three Wire]***
 3. ***[Two Phase Network]***
 4. ***[Poly- Phase Four Wire]***
- G. Metering Data – Data recorded and calculated that can be passed on to an external system or displayed on the Controllers web page shall include for each breaker:
1. Energy: The meters shall provide true RMS, fully bi-directional and either 4-quadrant, revenue accurate or revenue certified energy metering for the following parameters.
 - a. kWh (Active Energy)
 - b. kVARh (Reactive Energy)
 - c. KVAh (Apparent Energy)
 - d. kWh Export
 - e. kWh Import
 - f. kW Demand
 - g. Integration of any instantaneous measurement
 2. Instantaneous: The meters shall provide high accuracy of 0.2%, including true RMS per phase and total for the following parameters.
 - a. Voltage and current
 - b. Active, Reactive, and Apparent power (kW, kVAR, kVA)
 - c. Phase Angle

- d. Power Factor
- e. Current Demand
- f. kW Demand
- 3. Instantaneous Max: The meters shall record each new maximum value for the following parameters:
 - a. Current Demand
 - b. Current
 - c. kW Demand
 - d. kW
- 4. Alarming/Monitoring: The system shall display and configure alarming for the following parameters
 - a. Phase Loss
 - b. Over Current Warning
 - c. Over Current Alarm
 - d. Over kW Demand Alarm
 - e. Under/Over Voltage Alarm
- H. Onboard Data Logging
 - 1. System shall data log up to 6 months for selected data registers.
 - 2. System shall allow maximum of 16 data logs
 - 3. System shall have a selectable option for logging the data at different interval time.
 - 4. System shall have an option to down the Data log file in .CSV format in one-click download
 - 5. System shall have an option to data log by created groups.
- I. Onboard Dashboards
 - 1. System shall display the trending of various data points for individual meters
 - 2. System shall have maximum of 4 data points to display in trending graphs.
 - 3. System shall have an option to select historical trending by Today, Yesterday, Day to Day, Week to Week, Month to Month and Year to Year comparison.
 - 4. System shall have onboard default dashboard is fed from automatic data logging and compression, not from customer defined data logging.
- J. Grouping
 - 1. System shall have an option to data logs by created groups.
 - 2. System shall display trending of various grouped data points
- K. E-mailing
 - 1. System shall have an option to configure sending the log files via valid email address and schedule notification
- L. ***[Display***
 - 1. ***A touch screen display of at least 7" diagonal shall be provided in a central location for viewing each SEM3 sub-metered circuit's data.***
 - a. ***The touch screen shall be mounted in a separate NEMA 1 enclosure for mounting in the designated location as shown in the drawings.***
 - b. ***The touch screen shall come prewired for 120VAC control power. Electrical Contractor to power from a designated control power circuit as shown in the drawings.***
 - c. ***The touch screen shall be able to communicate to (6) six SEM3 sub-meter controllers to allow viewing and navigation from circuit to circuit for (6) six panelboard or switchboards meter data.***
 - d. ***The touch screen shall show circuit naming and designations as configured in each SEM3 controller specific to the panel [ie – HVAC #4, Hall Lighting, etc.]. Standard numbering is not acceptable [ie – Panel 1, Ckt. 5].***
 - e. ***An Ethernet communications switch for connecting the SEM3 controllers to the touch screen display shall be mounted and pre-wired into the enclosure.]***

2.3 Water and Gas Logging integration

- A. System shall monitor Water and Gas meters
- B. System shall have an option to configure S7-1200 PLC to monitor additional Water & Gas pulse inputs.
- C. System shall have an option to configure pulse inputs type, name, start pulse count, scale Type, scale factor, and units.
- D. Controller shall communicate with S71200 PLC over Modbus TCP communication in the same network

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall furnish, install and terminate all communication conductors and associated conduits external to any factory supplied equipment.
- B. All communications conductor wiring and routing shall be per the manufacturer's recommendations and as shown on the contract drawings.
- C. Additional connections to metering systems, where applicable, shall be done in the field by *[the manufacturer's start-up service group] [the installing contractor]*.

3.2 ADJUSTING AND CLEANING

- A. The meters and CT's shall be pre-calibrated and require only basic setup via the embedded web pages.
- B. Clean exposed surfaces using manufacturer recommended materials and methods.

3.3 TESTING

- A. Perform factory and installation tests in accordance with applicable NEC, NEMA, UL, IEC, ANSI, Weights and Measures California requirements.

3.4 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service of the metering system. The representative shall be trained and qualified for metering systems.
- B. Provide a qualified tradesman to assist in the commissioning of system.
- C. Obtain and submit as part of final documents a field commissioning report.
- D. Verify that the *[meter is] [meters are]* installed and connected according to the Contract Documents.
- E. Complete installation and startup checks according to manufacturer's written instructions.

3.6 SUPPORT

- A. The electrical equipment manufacturer shall provide a 1-800 number for telephone support.
- B. The vendor shall provide training at a dedicated training facility, complete with software, devices and demonstrations or offer remote training services if required.
- C. The vendor shall also provide on-line support for technical information and literature.

END OF SECTION