SECTION 26 09 13 32 20
ELECTRICAL POWER MONITORING AND CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This section defines low voltage power metering for use in AC systems. These low voltage power meters may be applied on systems direct voltage measurements rated up to 690V (L-L) and 480V (L-N) without Potential Transformers (PT's).

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]***

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 wiring diagrams, [certified test reports,] instruction and installation manuals.]***

1.4 RELATED STANDARDS

A. Meet the following recognized standards for application in hardened environments:
   1. Device must meet all international standards for Safety and Construction applicable to this type of device:
      a. ANSI C12.20, and IEC60687 0.2S, 0.5% Revenue requirements
      b. IEC 61557-12 (Class 0.5%) - Electrical safety in low voltage distribution systems. Equipment for testing, measuring or monitoring of protective measures - Part 12: Performance measuring and monitoring devices (PMD)
      c. IEC 62053-22/23 accuracy certified samples at over 64 samples per cycle
   2. The meter shall also meet the followings standard compliances:
      a. UL, CSA and CE Approvals:
         1.) UL 61010-1, 2nd Ed.
         2.) CAN/CSA-C22.2 NO. 61010-1-04, 2nd Ed.
         3.) CE approved.
      b. Class 0.5 S acc. to IEC62053-22.
   3. The meter shall meet the following Safety / Construction Standards:
      a. IEC61010-1 (EN61010-1): Safety Requirements for Electrical Equipment, Control and Laboratory Use.
      b. CAN/CSA C22.2 No. 61010-1-04, 2nd Ed.: Safety requirements of Canadian Standard Association.

1.5 QUALITY ASSURANCE.

A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years experience producing similar electrical equipment.
   1. Comply with requirements of latest revisions of applicable industry standards.
   2. No recalibration shall be required.

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 type SENTRON PAC3220 by Siemens Industry Inc. or pre-approved equal. Approved manufacturers are as follows:***
   1. ***SIEMENS (ACCESS)***
   2. ***.]***

2.2 COMPONENTS

A. Revenue accurate multifunction power meter.
   1. Provide a high accuracy power meter meeting the requirements set forth in this specification. Note any exceptions taken with a detailed description.
      a. Meter shall be Siemens PAC3220 Power Meter with options and features described in this section.
   2. The meter shall have at least the following features:
      a. Current inputs: The meter shall accept three 1A or 5A nominal current inputs. The current inputs are capable of measuring up to 5A RMS (300V RMS maximum voltage). All current inputs provide:
         1.) Dielectric withstand of 3000Vrms 45-65Hz for 1 minute.
         2.) Surge protection of 120A RMS for 1 second, non-recurring.
      b. The meter shall have three voltage inputs (V1, V2, and V3). The voltage inputs can measure from 0 to 480 Vrms (line-to-neutral) or from 0 to 690 Vrms (line-to-line).
      c. The meter shall have provisions for direct connection (**require no PTs**) for Wye (Star) systems up to 480VAC (line-to-neutral) or 690VAC (line-to-line). All voltage inputs provide:
         1.) Dielectric withstand of 3250VAC RMS, 60Hz for 1 minute.
         2.) Overload protection of 1500VAC RMS continuous.
      d. Power supply:
         1.) ***[95-240VAC ± 10% 50/60Hz / 110-340VDC± 10%]***
         2.) ***[DC Model: 22-65VDC ±10% (power supply unit with extra-low voltage)]***
      e. Typical burden is 6VA, maximum burden is 8VA. Dielectric withstand is 2000VAC RMS, 60Hz for 1 minute.
      f. Operating frequency: 45 to 64Hz.
      g. Standard Communications port shall be a RJ45 Modbus TCP 10 and 100 Mbit/s Copper Ethernet communication.
      h. Meter shall have dual RJ45 port for daisy chain over ethernet
      i. Meter shall have optional RS-485 communication expansion module.
      j. The meter shall have one of the following communications ports:
         1.) ***[Profibus DP***
             Profibus DP will be programmable to communicate 9600 BPS to 12 MPBS with supplied .GSD file.]
         2.) ***[Modbus RTU (RS-485) serial***
             Modbus will be programmable to communicate at speeds from 4800 to 38.4 bits per second]
         3.) ***[ProfiNet***
             ProfiNet will be programmable to communicate 10 and 100 Mbit/s with supplied .GSD file.]
         4) [Expanded I/O with four Digital In and two digital out - both wet contacts]

5) [Expansion module "I(N), I(Diff), analog expansion" possible to have a neutral current measurement, and 2 analog inputs.]

k. The meter shall support broadcast messages from three (3) master control systems at the same time.

l. The meter shall have two additional expansion slots for add-on modules.

m. Inputs/Outputs: The meter shall have:
   1.) Two Dry Digital Inputs – rated at 30VDC / 2.5mA
   2.) Two Wet Digital Outputs – rated 0-30VDC max, 10-27mA; 130mA max

n. A universal counter shall be designed into the meter to count pulses coming into the digital inputs for measuring variables such as Water, Air, Gas, Electric and Steam

o. The meter shall have the following optional I/O module:
   1.) Expansion module with eight additional digital Inputs and four additional digital outputs.

p. Sample Rate shall be at least 135K samples per cycle.

q. Meter shall support multiple languages including English, German, French, Spanish, Italian, Portuguese, Turkish, Chinese and Russian.

r. Meter design shall be:
   1.) A background-illuminated graphic LCD sized 128 x 96mm.
   2.) High degree of protection IP65
   3.) An overview size of 3.78"H x 3.78"W (96 x 96mm) and 2.00"D (51mm), with an optional module added the depth shall be 2.87"D (73mm).

2.3 OVERVIEW

A. The meter shall be able to be upgraded in the field without removing the meter.

B. The meter shall measure the following variables as standard without optional plug in modules or optional cards:
   1. Basic Measurements
      a. Voltage (l-n) per phase, Voltage (l-l) per phase, Voltage (l-l) average, Voltage (l-n) average, Current per phase, Current average total, Active Power (kW) per phase and total, Apparent Power (kVa) per phase and total, Reactive Power (kVAR) per phase and Total.
   2. Advanced Measurements (Included)
      a. Power factor (per phase and total), Voltage THD per phase, Current THD per phase, Frequency, Total active power demand import/export, Meter running counter, Universal counter and Limit alarming for 6 values.
   3. Min/Max Values
      a. Voltage (l-n) per phase, Voltage (l-l) per phase, Average Voltage (l-l) and (l-n) total, Current per phase, Active Power (kW) per phase and total, Apparent Power (kVa) per phase and total, Reactive Power (kVAR) per phase and total, Power factor (per phase and total), Voltage THD per phase, Current THD per phase and Frequency.
   4. Energy Measurements
      a. Energy (kWh) import/export high/low tariff, Apparent energy (kVAh) high/low tariff, Reactive energy (kVARh) import/export high/low tariff, Peak power demand (kW), Current demand, Peak current demand, Neutral current, Reactive power (kVAR) peak demand and Apparent power (kVA) peak demand.

C. The meter shall calculate the following information for any reading at 1-second intervals:
   1. Sliding window demands for any parameter with user-programmable length of demand period.
   2. Number of sub-periods to match local utility billing method.

D. The meter shall display "actual" readings on the display. No manual calculation shall be required to obtain actual readings.

E. The meter shall display all measured parameters on the front display. Simultaneous access to all parameters is available through the communications port by three Master systems.

F. The meter shall have integrated web pages to display real-time data.

G. The meter shall have calculation of average values for current, voltage, power for two intervals (e.g. 10 secs, 15 mins.)

H. The meter shall have multi-colored LED (The multi-colored LED works like a normal digital output. The user shall configure the function, the color and the brightness of the LED.) Colors shall be: White, Yellow, Green, Blue, Red, Orange, Cyan and Violet.

I. The meter shall have hardware write protection prevents write access to the device, both via the communication interface and on the display.

J. The meter shall have the ability to monitor as least six (6) different set points for alarming. These include: V, I, Power, VAR, VA, Freq, THD and PF. Limit value monitoring.

K. Standard logic functionality shall be available in the meter for setting up custom alarms that can be sent out via the digital output or through the communications port.

L. The meter shall be field programmable as follows:
   1. Basic parameters: Voltage input scale, voltage mode (Wye, Delta, single phase), current input scale, auxiliary input and output scales, and communications setup parameters are programmable from the front panel.
   2. All basic parameters described above may be programmed via the communications port using a portable or remotely located computer terminal.
   3. Provisions must be made to ensure that programming through a computer can be secured by user ID and password.
   4. Provisions must be made to ensure that programming through the front panel is secured by password.

2.4 DESIGN ***[Select either 2.4.A.1 or 2.4.A.4. For 2.4.A.4, select a, b, c, d, e, f or g]***

A. The SENTRON PAC3220 meter shall be available in the following unit design configurations:
   1. ***[One-piece design that fits into an 96mm x 96mm cutout.]***
   2. ***Din Rail Mountable Version***
   3. ***Watt-hour draw out configuration for retrofit locations***
   4. ***[Multi Meter Pack Enclosure (NEMA 1) with the following sizes:***
      a. ***[One meter]***
      b. ***[Up to Two meters]***
      c. ***[Up to Four meters]***
      d. ***[Up to Six meters]***
      e. ***[Up to Eight meters]***
      f. ***[Up to Ten meters]***
      g. ***[Up to Twelve meters]]***

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 communication 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 shall be adjusted so that accurate readings appear on the front of the meter and that the readings are within the meter's accuracy range.

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 and UL 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.***

B. ***Train Owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules.***

C. ***Verify that the [meter is] [meters are] installed and connected according to the Contract Documents.***

D. ***Verify that electrical control wiring installation complies with manufacturer's submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division [26] [16] Sections.***

E. ***Complete installation and startup checks according to manufacturer's written instructions.]***

3.6 SUPPORT

A. The electrical equipment manufacturer shall provide a 24x7, 1-800 number for telephone support.

B. PMCS Vendor shall provide training at a dedicated training facility within their Power Monitoring Headquarters, complete with software, devices and demonstrations.

C. The PMCS vendor shall also provide on-line support for technical information and literature.

END OF SECTION