**SECTION 26 09 13**

**ELECTRICAL POWER MONITORING AND CONTROL**

**PART 1 – GENERAL**

* 1. **SUMMARY**
1. This section includes electrical power monitoring device (PMD).
	1. **SUBMITTALS**
2. Product data: Include rated capacities, weights, operating characteristics, furnished specialties and accessories.
3. Shop drawings: Dimensioned plans, elevations, sections, conductor entry provisions, installed features and devices and material lists for each PMD specified.
4. Field quality control test reports.
5. Operation and maintenance data specified by the manufacturer.
	1. **QUALITY ASSURANCE**
6. The PMD shall be product of same manufacturer.
7. The manufacturer shall be certified ISO 9001 : 2008 International Quality Standard and the manufacturer shall have third party certification verifying its quality assurance in design and production in accordance with ISO 9001.

**PART 2 – PRODUCT**

**2.01 MANUFACTURERS**

1. Subject to compliance with requirements, provide Socomec, Diris A40.

**2.02 POWER MONITORING DEVICE**

1. **STANDARD FUNCTIONALITIES:**

The PMD shall provide true RMS values and allow multi measuring and monitoring of electrical parameters including energy metering, quality of energy analysis and transmission of this information through communication.

All information provided shall be updated at the same rate and include :

1. Frequency,
2. Current measurement per phase and neutral and 3 phase average, demand current,
3. Voltage L-L and L-N per phase and L-L, L-N and 3 phase average,
4. Active power, reactive power, apparent power, demand power, (per phase and total),
5. Power factor (per phase, 3 phase total),
6. Accumulated active energy, accumulated reactive energy, accumulated apparent energy (EA+,EA-,ER+,ER-,ES),
7. Total harmonic distortion (THD) of each current and voltage,
8. Harmonics spectrum analysis up to row 63rd of each current and voltage,
9. Record of the 60 last events and waveform capture of 40 associated voltage and current curves (sag, swell, outage, current overloads),
10. Minimum/maximum value for 3 currents, L-L L-N voltages, powers, frequency,
11. **ADVANCED FUNCTIONALITIES : TRENDING / MAXIMUM DEMAND**

The PMD shall be able to display predictive powers (P, Q, S) calculated through the evolution of the power the 10/15/30/60 past minutes. An alarm can be set on these predictive powers.

1. **INPUTS / SAMPLING**
2. Currents inputs : The PMD shall accept 3 current inputs from industry standard instrument transformers (5A or 1A secondary current transformers).
3. The sustained overload capacity of the current input shall be no less than 6A.
4. The short time overload shall be no less than ten times In during one second.
5. Voltage inputs: The PMD shall be applied in any single-phase, two-phase or balanced/unbalanced three-phase systems. In four-wire connection, the PMD shall utilize the circuit neutral common reference and not earth ground to provide metering accuracy.
6. The voltage input for PMD shall be able to accept from 50Va.c to 700Va.c without using potential transformers. It shall be able to withstand continuous overload condition of up to 760 Va.c RMS.
7. The PMD shall be suitable for high voltage networks through a voltage transformer (VT). The VT ratio shall be programmable on the front end and through communication.
8. VT primaries through 500kVa.c shall be supported and CT primaries up to 11 kA shall be supported.
9. The current and voltage signals shall be digitally sampled at a rate high enough to provide valid data for waveform analysis and true-RMS metering accurate beyond the 63rd harmonic (fundamental of 50Hz). The sampling frequency shall be 10.24kHz.
10. The auxiliary power supply shall be available from 110 to 240 Va.c or 120 to 250V.d.c.
11. The PMD shall calculate power load curves with a adjustable integrated period from 5 to 60 minutes (ie: 60 days integrated for a period of 10 minutes). (P+/- and Q+/-).
12. **LOGGING**
13. Events

The PMD shall have at least 2Mbits of onboard data logging. It shall store all critical internal and revenue data upon sudden power loss.

The PMD shall have non-volatile memory.

The PMD shall have a time-stamped event log with the following features:

Support at least 60 events and 40 curves logging for the following measurements :

* Phase/Phase voltages,
* Phase/neutral voltages,
* Phase currents,
* Neutral current.

Each event shall be recorded with the date and time of the event. (sag, swell, outage, over current).

All time stamps shall have a resolution of 10 millisecond.

Minimum event recording response time shall be 1/2 cycle for high speed events and 1 second for other events.

1. Alarms

See E. ALARMS.

1. Load curves

The PMD shall store load curves for the following measurements : P+, P-, Q+, Q- .(ie: 30 days in period 10min). These load curves shall also be managed through external synchronization top.

1. **ALARMS**

Alarms on all electrical parameters:

1. Over/under current & voltage,
2. Phase loss, current & voltage,
3. Over kVA,
4. Over kW or kVAR into/out of load,
5. Over/under frequency,
6. Under power factor
7. Predictive powers,
8. THD,

For each over/under metered value alarm, the user shall be able to define a pick-up, drop-out and delay.

Indication of an alarm condition shall be given on the local display as well as reported to the Power Monitoring Software (PMS).

The 10 last alarms shall be logged in the memory like the events.

1. **ACCURACY**

The PMD shall meet the following requirements:

Voltage and current for all phases shall be sampled simultaneously to ensure high accuracy in conditions of low power factor or large waveform distortions (harmonics).

The PMD shall be capable of being applied without modification at nominal frequency from 45 to 65Hz.

The meter shall meet the IEC 62053-22 Class 0.5 S (for Active Energy),

The meter shall meet the IEC 62053-23 Class 2 (for Reactive Energy),

The meter shall meet the IEC 61557-12,

1. **COMMUNICATION**

The PMD shall be able to communicate with the PMS by means of plugging in a communication module and without further modification of the basic unit.

The PMD shall be accessible through the following protocol options :

1. Jbus/Modbus (RS485)

Each PMD shall have optional RS-485 data communications to allow communication to computer workstations, programmable controllers, and other host devices, up to a data rate of 38400 bds.

All information shall be available from RS-485 communications. It shall be possible to perform the communication setup via the display. Dip switches shall be required to set up termination resistances.

The RS-485 communications shall provide communications links up to 10,000 feet long. The PMD shall communicate using the Modbus RTU protocol (or compatible) and connect to any host devices with a Modbus-compatible port. The power meter shall communicate using Jbus protocol (or compatible) and connect to any host devices with a J-bus compatible port.

1. Modbus TCP/IP (RJ45 Ethernet)

The PMD that are equipped with an Ethernet port shall be internet enabled and shall have built in web pages in their memory giving access to real-time values and basic power quality information using a standard web browser.

Whenever required, Ethernet gateway shall be provided, it shall feature one 10/100 Mbit UTP port. The Ethernet Gateway shall feature one RS-485 serial port. A single Ethernet Gateway shall provide high speed Ethernet support for at least up to 246 devices. It shall allows users to access power monitoring information from any location on a local area network (LAN) or a wide area network (WAN).

When it is fitted with an Ethernet/Ethernet RS485 gateway module, the device shall display his measures and configuration on an embedded web server reachable by entering the IP address of the device in an internet browser.

1. **ERGONOMY**

The PMD shall have an integral, continuous duty, long-life display and provide direct access keys to the following metered quantities which shall be updated every second:

1. Current, per phase, three-phase average and neutral,
2. Voltage, phase-to-phase, phase to neutral, and three-phase average (phase-to-phase and phase-to-neutral),
3. Real 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. Predictive power (P, Q, S),
8. Frequency,
9. Demand current, per phase and three-phase average ,
10. Demand real power, three-phase,
11. Demand apparent power, three-phase,
12. Accumulated energy (kWh, kVARh and kVAh) (EA+; EA-; ER+; ER-; ES),
13. THD, current and voltage, per phase,

All the above values shall be easily accessed through direct access keys (no sub menus).

Reset of the following electrical parameters shall also be allowed from the front of the digital PMD:

1. Peak demand current,
2. Peak demand power (kW) and peak demand apparent power (kVA),
3. Predictive powers,
4. Energy (kWh), reactive energy (kVARh) and apparent energy.

The PMD shall have a 10 year life.

The microprocessor-base shall be designed to have allowable replacement with the latest model without a complete change of the power analyzers.

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

1. Preparation shall be in accordance with reviewed product data, final shop drawing and manufacturer recommendations.
2. Installation shall be in accordance with manufacturer instructions.
3. Identify components according to Division 26 section “Identification for Electrical Systems”.
4. Label each PMD with a unique designation.

**3.02 CONNECTION**

1. Connect wiring shall be in accordance with manufacturer instructions.
2. Connect wiring according to Division 26 section “low-Voltage Electrical Power Conductors and cables”.

**3.02 MAINTENANCE & TRAINING**

1. No annual recalibration by users shall be required to maintain accuracies of the PMD.
2. Operation and Maintenance Instruction: Personnel shall also be formally trained by the manufacturer authorized representative as to the proper operation and maintenance of the PMD.

**3.03 TESTING**

1. After installing equipment, execute test reports in accordance with manufacturer’s instructions.

**END OF SECTION 26 09 13**