SECTION 26 09 13

**ELECTRICAL POWER MONITORING**

**PART 1 – GENERAL**

* 1. **SUMMARY**
1. This specification describes a multi-function, multi-circuit power monitoring system and its associated current sensors designed for measuring, monitoring and managing DC electrical installations.
2. The technical benchmark reference is SOCOMEC DIRIS Digiware DC or a similar solution that has been approved by us.
	1. **SUBMITTALS**
3. Product data: Include rated capacities, weights, operating characteristics, furnished specialties and accessories.
4. Shop drawings: Dimensioned plans, elevations, sections, conductor entry provisions, installed features and devices and material lists for each switch specified.
5. Field quality control test reports.
6. Operation and maintenance data specified by the manufacturer.
7. Product certificates: Signed by manufacturer certifying that products comply with requirements mentioned.
	1. **RELATED STANDARDS**
8. **IEC 61557-12***: Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 12: Power Metering and monitoring devices (PMD)*
9. **UL 61010-1:** *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use*
	1. **QUALITY ASSURANCE**
10. The components of the measuring system shall be of the same manufacturer.
11. Comply with requirements of latest revisions of applicable industry standards.

**PART 2 – PRODUCTS**

1. **MANUFACTURERS**
2. Subject to compliance with requirements, provide products by one of the following  :
3. Multi-circuit DC power metering and monitoring system:
4. SOCOMEC DIRIS Digiware DC
5. …
6. **Power Metering and Monitoring Device REQUIREMENTS**
7. **GENERAL:**

The system shall be CE marked, cULus listed and shall be a multi-circuit modular PMD\* compliant with the IEC 61557-12 standard.

*\*PMD: Power Metering and Monitoring Device in accordance with IEC standard 61557-12.*

1. It shall provide voltage, current, power, energy and power quality measurements of multiple DC loads simultaneously.
2. The Plug & Play system will be based on modules that can be interconnected (without tools).
3. The power monitoring system shall comprise:
* One 24VDC Power supply for the whole system
* One system interface centralizing the 24VDC power supply and communication inputs for the entire system and allowing the visualization of all the products connected downstream directly on the display, remotely on its webserver or via multiple communication protocols (Modbus, BACnet, SNMP v1, v2, v3)
* Voltage measurement, current measurement and Input-Output modules:
* One dedicated voltage measurement module. The voltage connection shall be direct up to 180 VDC or via the addition of voltage adaptors up to 1650 VDC.
* Multiple current measurement modules connected to DC sensors using RJ12/terminal cables provided by the manufacturer of the measuring system. The current measurement module shall have at least 3 inputs enabling the measurement of up to 3 DC loads per module. The system will accept up to 6 DC current modules allowing the monitoring of 18 DC loads. Repeaters can be used in order to add additional current measurement modules.
* Input-Output modules
* The modules will be interconnected by an RJ45 bus. This bus will distribute power supply & communication to all the modules and will synchronize the single voltage measurement with the current measurements for all the loads with the same voltage reference, in order to avoid repeating the voltage connection for each load.
* Measurement modules can be fitted on a DIN rail or on a back-plate.
* The measuring system shall have a minimal accuracy of class 1 for power and energy according to IEC 61557-12 up to 180 VDC.
* Any type of current sensors complying with the following characteristics :
* Open-loop Hall-effect sensors
* Power supply voltage: +/- 15V SELV (Safety Extra Low Voltage)
* Power Supply current: +/- 25mA depending on the sensor
* Output voltage: +/- 4V SELV
* Molex 4-point male terminal
* Measurement range: 16 to 6000 A
* Enable a risk free connection and on-load opening of the sensor’s secondary

The power monitoring system shall be suited for any type of new or existing installation using solid-core sensors from 50A to 5000A, or split-core sensors from 50A to 2000A.

1. **FUNCTIONS AND PERFORMANCE**

In terms of functions, the measuring system must respect the following requirements:

1. **General measurements:**
* Voltage from 19.2 VDC up to 1650 VDC
* Current
* Power (import/export)
* Predictive power
* The measurements will be available with the following values:
* Instantaneous
* max instantaneous (timestamped)
* min instantaneous (timestamped)
* average
* max average (timestamped)
* min average (timestamped)
1. **Metering**
* Energies (bidirectional)
* Demand profiles
1. **Power Quality analysis**
* RMS voltage and current
* Ripple voltage and current
1. **ACCURACY**

The combination of the measuring devices and sensors allows the following overall accuracy of the measurement chain to be ensured for power and energy (kWh):

* **Minimal accuracy of class 0.5 for current in accordance with IEC 61557-12:** from 10% to 120% of the rated current
* **Minimal accuracy of class 1 for power and energy in accordance with IEC 61557-12:** from 2 to 120% of the rated current for direct measurement up to 180 VDC
1. **DATA LOGGING**
* Recording of average electrical values (configurable with a variable integration period)
* Recording and time-stamping of min/max electrical values
* Recording of alarms
1. **INPUT/OUTPUT**

Digital input/output modules can be added to the system. Each module should have at least 4 inputs and 2 outputs enabling the following:

* Pulse centralization from multi-fluid meters with a pulse output
* Status identification of 3rd party device (breaker position, trip status etc.)
* Manual command of 3rd party equipment

Analog input modules can be added to the system. Each module should have at least 2 inputs, 0/4 – 20mA type, enabling the following:

* Data collection from analogue sensors (pressure, humidity sensors)
* Monitoring of levels by setting up alarms on chosen thresholds
1. **ALARMS**
* Timestamped alarms for the instantaneous or average values for an electrical measurement
* Alarms when a digital input changes status
* Boolean combinations of alarms
1. **OPTIONAL DISPLAY**

The remote display shall have the following characteristics:

* 24 VDC power supply to prevent dangerous voltage on the door
* High-resolution & graphical views
* 10 direct access keys to the configuration and measuring information
* IP65 degree of protection for the front panel
* Embedded web server for remote visualization of measurements on a web browser
* Communication via multiple protocols (Modbus TCP; Modbus RTU; BACnet IP; SNMP v1, v2, v3)
* SNTP synchronization of downstream products
* SMTP e-mail transmission in case of alarms
1. **WEBSERVER**

All data from the measuring system shall be visualized in a web based interface embedded either in a dedicated Ethernet gateway or in the optional Display. The webserver shall allow:

* Display of real-time and historical measurements
* Display of on-going alarms and log of finished alarms
* Manual or automatic FTPS data export in .CSV format
1. **INTEGRATION / COMMUNICATION PROTOCOLS**

The measuring system must allow integration with any external software through the following communication protocols:

* Modbus TCP over Ethernet
* Modbus RTU over RS485
* BACnet IP over Ethernet
* SNMP v1, v2 & v3 over Ethernet
1. **CONFIGURATION**

The measuring system can be configured from the remote display or using a free dedicated configuration software installed on a PC connected to the measuring system via a USB connection or via the communication network (RS485/Ethernet).

In addition, the system shall allow:

* **Automatic detection and addressing**

An auto-addressing function automatically allocates Modbus addresses to the modules connected to the optional display or Ethernet gateway (see separate technical specification document).

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

1. Preparation shall be in accordance with reviewed product data, final shop drawing and manufacturer’s recommendations.
2. Installation shall be in accordance with manufacturer’s instructions.
3. Identify components according to Division 26 section “Identification for Electrical Systems”.

**3.02 CONNECTION**

1. Wiring connection shall be in accordance with manufacturer’s instructions.
2. Wiring connection shall be according to Division 26 section “Low-Voltage Electrical Power Conductors and cables”.

**3.03 MAINTENANCE & TRAINING**

1. Operation and Maintenance Instruction: Personnel shall also be formally trained by the manufacturer’s authorized representative as to the proper operation and maintenance of the PMD.
2. The PMD shall not require a new calibration for a period of 10 years minimum if the environment and installation conditions are conform to manufacturer’s instructions.

**3.04 TESTING**

1. The PMD shall be declared conform to the IEC and UL standards by a testing laboratory having the CBTL (Certification Body Testing Laboratory) qualification delivered by a National Certification Body under the IEC Electrotechnical Equipment (IECEE) certification body scheme and/or the NRTL (National Recognized Testing Laboratory) qualification.
2. After installing equipment, execute test reports in accordance with manufacturer’s instructions.

**END OF SECTION 26 09 13**