CITY OF FORT WAYNE MASTER UPDATED: 11/16/18

SECTION 26 09 13

ELECTRICAL POWER MONITORING

1. GENERAL
   1. DESCRIPTION
      1. Scope:
         1. Contractor shall provide all labor, materials, equipment, services, and incidentals as shown, specified, and required to furnish and install electrical power monitoring systems.

NTS: List below only sections covering products, construction, and equipment specifically identified in this section and specified in another section and directly referenced in this specification. Do not list administrative and procedural division 01 sections.

* + 1. Related Documents
       1. Section 26 24 13, Switchboards
       2. Section 26 24 19, Motor Control Centers
       3. Section 26 29 13 Motor Controllers
       4. Section 26 29 23, Low-Voltage Variable Frequency Drives
  1. REFERENCES
     1. Standards referenced in this Section are:
        1. ANSI C12.20 -2010 Class 1 Clause 5.5.4 - American National Standard for Electricity Meters – accuracy and performance
        2. EN 62053-21 -2003 Class 1 Accuracy - Electricity metering equipment (AC) – Static meters for active energy
        3. 2006/95/EC: Low Voltage Directive
        4. 2004/108/EC: Electromagnetic Compatibility (EMC) Directive
        5. EN 61010-1:2001:Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
        6. EN 61326-1:2006 - Electrical equipment for measurement, control and laboratory use – EMC requirements
        7. EN 61000-6-4:2001 - Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
        8. EN 61000-6-2:2001 - Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments

NTS: Edit article “1.3” below to suit the Project. DO NOT DELETE (NOT USED) ITEMS.

* 1. SUBMITTALS
     1. Action Submittals: Submit the following:
        1. Product Data
           1. Manufacturer’s literature and technical information indicating compliance with the Contract Documents
        2. Shop Drawings (NOT USED)
        3. Samples (NOT USED)
     2. Informational Submittals: Submit the following:
        1. Certificates (NOT USED)
        2. Delegated Design Submittal (NOT USED)
        3. Test and Evaluation Reports
           1. Report stating that the energy and/or power quality monitor settings have been properly adjusted, tested and verified as operational.
        4. Manufacturers’ Instructions
           1. A copy of the manufacturer’s installation instructions, including receiving, handling and storage instructions.
        5. Source Quality Control Submittals (NOT USED)
        6. Field Quality Control Submittals (NOT USED)
        7. Manufacturer Reports (NOT USED)
        8. Sustainable Design Submittals (NOT USED)
        9. Special Procedure Submittals (NOT USED)
        10. Qualifications Statements (NOT USED)
     3. Closeout Submittals. (NOT USED)
        1. Maintenance Contracts (NOT USED)
        2. Operation and Maintenance Data
           1. Energy or power quality monitor installation instructions and User Manual.
           2. Parameter listing.
           3. IP address and network diagram.
           4. Copy of latest firmware/software on a flash drive installed with each energy or power quality monitor.
        3. Bonds (NOT USED)
        4. Warranty Documentation
           1. Written copy of warranty from manufacturer complying with this document.
        5. Record Documentation (NOT USED)
        6. Sustainable Design Closeout (NOT USED)
        7. Software
           1. Updated to latest available software version at substantial completion.
           2. Copy of latest firmware/software on a flash drive.
     4. Maintenance Material Submittals.
        1. Spare Parts:
           1. One spare set of fuses for each type used for the installation.
           2. One spare shorting block for each type used for the installation.
        2. Extra Stock Materials (NOT USED)
        3. Tools (NOT USED)
  2. QUALITY ASSURANCE
     1. Provide energy or power quality monitor system components by a single manufacturer:
        1. Only energy or power quality monitor manufacturers-approved hardware, including cables, mounting hardware, connectors, enclosures, racks, communication cables, splitters, terminators, taps and removable media, may be used.
     2. All energy or power quality monitor system components shall be new, free from defects and produced by manufacturers regularly engaged in the manufacture of these products.
     3. The energy monitor shall adhere to the following certifications and approvals:
        1. UL 508 Listed, File E96956, for Industrial Control Equipment and CUL Certified.
        2. CE marked, tested to meet:
           1. Council Directive 89/336/EEC Electromagnetic Compatibility and the following standards:

EN55011 – Radiated Electromagnetic Emissions

EN55011 – Conducted Emissions

ENV50204 – RF 900MHz Keyed Carrier

EN61000 – Immunity

* + - * 1. Council Directive 73/23/EEC Low Voltage
        2. IP10 degree of protection per IEC 529 / NEMA/UL 508 – open device, must be installed in an enclosure
      1. ANSI/IEEE Tested, Surge Withstand Capability (SWC) C37.90.1 – 2002 for protective relays and relay systems.
    1. The power quality meter shall adhere to the following certifications, approvals and standards:
       1. cULus Certified.
          1. Meets UL61010-1, CSA C22.2 No. 61010-1
          2. UL 61010 Listed, File E345550, for Measuring, Testing and Signal-Generation Equipment.
       2. CE Compliant, tested to meet:
          1. Council Directive 2004/108/EC Electromagnetic Compatibility
          2. Council Directive 2006/95/EC Low Voltage
          3. IP10 degree of protection per IEC 60529 / NEMA/UL 61010
       3. IEEE 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
       4. IEEE 1159 - Recommended Practice for Monitoring Electric Power Quality
       5. IEC 61000-4-30 - Testing and measurement techniques – Power quality measurement methods
       6. ANSI C12.20 -2010 Class 0.2 Clause 5.5.4 - American National Standard for Electricity Meters – accuracy and performance
       7. EN 62053-22 -2003 Class 0.2 Accuracy - Electricity metering equipment (AC) – Static meters for active energy
       8. EN 61010-1:2001 - Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
       9. EN 61326-1:2006 - Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
       10. EN 61000-6-4:2007 - Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments (Class A)
       11. EN 61000-6-2:2005 - Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
       12. AS/NZS CISPR 11:2002, Group 1, Class A - Limits and Methods of Measurement of electronic disturbance characteristic of industrial, scientific and medical (ISM) radio frequency equipment
    2. The power quality meter’s control relay outputs shall be ANSI/IEEE tested to meet or exceed C37.90 Trip Duty: 2005 for protective relays and relay systems on all power-connection circuit terminations.
    3. The optional display module shall be designed to meet the following agency approvals.
       1. c-UL-us listed, Hazardous Locations Class I, Division II, Groups A,B,C,D certified
       2. CE marked for all applicable directives
  1. DELIVERY, STORAGE AND HANDLING
     1. Energy or power quality monitor components shall be delivered in packaging designed to prevent damage from static electricity and physical damage.
     2. Equipment shall be stored according to manufacturer requirements and in a clean and dry space at an ambient temperature range of -40 to 85°C (-40° to 185°F).
     3. Components shall be protected from exposure to dirt, water, fumes, corrosive substances and physical damage.
  2. WARRANTY
     1. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of substantial completion, whichever occurs first.

1. PRODUCTS
   1. MANUFACTURERS
      1. Allen-Bradley:
         1. For Motors 20 HP and above:
            1. PowerMonitor 1000™ Energy Monitor
         2. For Switchboards and Motor Control Centers:
            1. PowerMonitor 5000™ M6 Power Quality Monitor
   2. ENERGY MONITOR
      1. General:
         1. The energy monitor shall:
            1. Connect to a three-phase or single-phase AC power system.
            2. Convert instantaneous voltage and current values to digital values and use the digital values to calculate parameters.
            3. Produce logs of metering, status and event data.
            4. Communicate data to compatible applications and its integrated LCD display.
         2. The energy monitor shall have DIN-rail mounting clips and panel mounting capability for mounting in a suitable enclosure.
            1. The enclosure shall protect:

The energy monitor from atmospheric contaminants.

The user against personal contact with energized circuits.

* + - * 1. The energy monitor shall be designed to operate in:

An industrial environment with an ambient temperature of -10° to 60°C (14° to 140°F), and with a relative humidity range of 5% to 95%, non-condensing.

A free airflow environment (convection cooling only, no fans or other air moving devices shall be required).

* + - 1. The energy monitor shall operate with control power electrical service (4 VA max.) of:
         1. 85 - 264 VAC, 47 - 63 Hz (38 VA)
         2. 125 - 250 VDC
      2. The energy monitor shall include adequate memory to store all necessary data.
      3. Readily accessible on the energy monitor shall be several hardware features, including:
         1. Standard RJ45 Ethernet jack with LNK and ACT indicators.
         2. Serial port with 3-pin RS-485 connector.
         3. Serial port status indicators.
         4. LCD display and interface buttons.
         5. Module and network status indicators.
         6. Status input and KYZ output wiring terminals.
         7. Voltage sensing and current sensing wiring terminals.
         8. Control power and ground wiring terminals.
      4. The energy monitor shall have wiring terminals to apply a configuration lock.
    1. Voltage and Current Sensing
       1. The energy monitor shall connect to a 3-phase or single-phase AC power system directly or through instrument transformers.
       2. The voltage sensing connections shall be selected to match the configuration of the monitored circuit, including:
          1. 3-phase, 4-wire Wye, direct connect (up to 600V L-L, 347V L-N)
          2. 3-phase, 3-wire grounded Wye, direct connect (up to 600V L-L, 347V L-N)
          3. 3-phase, 4-wire Wye, with potential transformers
          4. 3-phase, 3-wire grounded Wye, with potential transformers
          5. 3-phase, 3-wire Open Delta, with 2 potential transformers
          6. Single-phase, direct connect (up to 600V L-L, 347V L-N)
          7. Single-phase, with potential transformers
          8. 3-phase, 3-wire Delta, direct connect (up to 600V L-L, 347V L-G)
          9. 3-phase, 4-wire grounded B-phase Open Delta, direct connect (up to 347V L-G)
       3. The current sensing connections shall be selected to match the configuration of the monitored circuit, including:
          1. 3-phase, 3- or 4-wire, 3-current transformers
          2. 3-phase, 3-wire, 2-current transformers
          3. Single-phase, 2-current transformers
       4. Special wiring modes shall be selected for use in capacitor bank controllers:
          1. 1PT, 1CT Line-to-Line
          2. 1PT, 1CT Line-to-Neutral
       5. Voltage sense inputs (V1, V2, V3) shall be rated:
          1. Accuracy in percent of reading at 25°C: ±0.5%, nominal ranges:

Line-Neutral RMS 347V / 15 - 399V

Line-Line RMS 600V / 26 – 691V

* + - * 1. Input impedance: 5 MΩ minimum.
        2. Input current: 2 mA maximum.
        3. Dielectric withstand: 2500V.
      1. Current sense inputs (I1, I2, I3) shall be rated:
         1. Accuracy in percent of reading at 25°C: ±0.5%, nominal range 5 A RMS.
         2. Overload withstand: 15 A continuous, 200 A for 1/2 sec.
         3. Burden: 0.05 VA.
         4. Impedance: 0.002 ohms.
         5. Maximum crest factor at 5 A: 3.0.
         6. Starting current: 5 mA.
         7. Dielectric withstand: 2500V.
    1. Status Inputs
       1. On energy-measuring models, the energy monitor’s status inputs shall be able to connect to up to 2 non-powered contacts for data collection. The status inputs are contact closure (internal 24 VDC).
       2. The input’s dielectric withstand rating is 2500V.
    2. Functions
       1. The energy monitor shall be one of three model types:
          1. Transducer models that measure voltage, current and power (optional).
          2. Energy-measuring models that measure consumption values, such as real, reactive and apparent energy.
          3. Energy-measuring models that measure voltage, current and power, along with consumption values.
       2. Measured parameters shall include:

|  |  |
| --- | --- |
| Voltage  Current | kVARh  kVAh |
| Frequency | Real power demand, kW |
| Voltage imbalance | Reactive power demand, kVAR |
| Current imbalance  Real power, kW  Reactive power, kVAR  Apparent power, kVA  True power factor  Real energy, kWh | Apparent power demand, kVA  Projected kW demand  Projected kVAR demand  Projected kVA demand  Demand power factor |

* + - 1. Logging functions shall include:

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| --- | --- |
| Energy log | Time of use logs |
| Min/max log | Status log |
| Load factor log |  |

* + - 1. Other functions shall include:

|  |  |
| --- | --- |
| Date and time | Network time synchronization |
| Wiring diagnostics | Metering result averaging |
|  |  |

* + - 1. Coordinate with programmer on parameters to be gathered in PLC or control system.
    1. Relay Outputs
       1. A KYZ solid-state relay output shall be available for low current (80 mA maximum) switching at up to 240 VAC or 300 VDC. The output shall be available for:
          1. Forced operation.
          2. Energy pulse on energy-measuring models.
       2. The output’s dielectric withstand rating is 2500V.
    2. Communication
       1. Using communications networks, the operator shall be able to:
          1. Configure analog input parameters.
          2. Configure communication parameters.
          3. Read real-time power and energy data.
          4. Read energy logs.
       2. The energy monitor shall have:
          1. Ethernet network communications port, which supports 10 or 100 Mbps data rate, half-duplex or full-duplex, and has access to the energy monitor’s internal webpage.
          2. The energy shall be equipped with an EtherNet/IP port, bearing the EtherNet/IP Conformance Testing mark.
          3. The connection protocol shall be EtherNet/IP.
    3. Configuration
       1. The energy monitor shall have 3 methods of configuration:
          1. Using the LCD display.
          2. Using an Internet browser.
          3. Using optional software or communication.
       2. The energy monitor’s 5 setup menus shall be:
          1. Analog input
          2. Advanced
          3. RS-485 communications
          4. Ethernet network communications
          5. Date and time
       3. The energy monitor shall perform wiring diagnostics on command to detect and report wiring errors.
       4. The energy monitor shall:
          1. Integrate easily into existing information networks.
          2. Communicate with compatible PLC families.
    4. LCD Display
       1. The energy monitor shall have an integrated LCD display to provide viewing, configuration and access to programming.
          1. The operator input shall be 4 buttons: Up Arrow, Down Arrow, Enter and Escape.
          2. The LCD display shall operate in 3 modes: Display, Program and Edit.
       2. Navigation on the energy monitor’s application shall begin on the chosen default screen, from which 2 other screens can be selected:
          1. Display – allows viewing of metering, wiring diagnostics and status data and access to display setup. Metering data available shall be model-dependent.
          2. Program – allows password-protected access to programming commands and parameter changes.
    5. General Ratings
       1. The energy monitor shall be able to withstand:

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| --- | --- |
| Vibration | 2 g |
| Shock, Operating  Shock, Non-operating | 30 g  50 g |
| Dielectric Withstand,  Control Power | 2500V |

* 1. POWER QUALITY MONITOR
     1. Construction
        1. The power quality monitor shall consist of:
           1. Power quality meter
           2. Display module
        2. The power quality meter shall:
           1. Connect to a three-phase or single-phase AC power system.
           2. Convert instantaneous voltage and current values to digital values and use the digital values to calculate parameters.
           3. Maintain internal datalogs and record metering, status, event and alarm data into these logs as specified in the logging configuration.
           4. Communicate developed data to controllers, HMI software, applications or its display module (optional).
        3. The power quality meter shall be mounted in a suitable enclosure.
           1. The enclosure shall protect:

The power quality meter from atmospheric contaminants.

The user against personal contact with energized circuits.

* + - * 1. When installed within a substation or switchgear lineup, the power quality meter shall be mounted within a low-voltage cubicle, isolated from medium and high-voltage circuits.
        2. The power quality meter shall be designed to operate in:

An industrial environment with an ambient temperature of -20° to 70°C (-4° to 158°F), and with a relative humidity range of 5% to 95%, non-condensing.

A free airflow environment (convection cooling only, no fans or other air moving devices shall be required).

* + - * 1. The power quality meter shall be mounted to a well-grounded surface to limit the effects of noise due to electromagnetic interference (EMI).
      1. The power quality meter shall operate with control power electrical service of:
         1. (L1, L2) 120/240 VAC, 50/60 Hz (38 VA) [or 120/240 VDC (26 VA)] nominal
         2. 24 VDC (12 VA) nominal
      2. The power quality meter shall include adequate memory to store all necessary data.
      3. Readily accessible on the power quality meter shall be several ports, status indicators and terminal connections, including:
         1. Standard RJ45 Ethernet jack with LNK and ACT indicators.
         2. Optional communications port.
         3. USB Mini-B device port for connection to a host device.
         4. Device and network status indicators.
         5. Power status indicator.
         6. Status input, KYZ output and control relay wiring terminals.
         7. Voltage sensing wiring terminals and current sensing wiring openings.
         8. Virtual wiring connection indicator.
      4. The power quality meter shall have a configuration lock switch.
      5. The optional display module shall be mounted separately and shall be capable of displaying data for up to 3 power quality meters.
    1. Voltage and Current Sensing
       1. The power quality meter shall monitor 4 voltage and 4 current channels for each electrical cycle.
          1. Provides 1024 samples across 8 channels every cycle.
          2. Measures up to the 127th harmonic.
       2. The voltage sensing connections, current sensing wiring and metering mode shall be selected to match the configuration of the monitored circuit, including:
          1. 3-phase, 4-wire Wye
          2. 3-phase, 3-wire grounded Wye
          3. 3-phase, 4-wire impedance grounded Wye
          4. 3-phase, 3-wire Delta or ungrounded Wye
          5. Split-phase/Single-phase
          6. 3-phase, 3-wire Delta, grounded B phase (up to 690V L-L)
          7. 3-phase, 4-wire high-leg (wildcat)
       3. For voltage sensing, the power quality meter shall be connected:
          1. Directly, for circuits up to 690V L-L.
          2. With potential transformers (voltage transformers), for circuits above 690V L-L.
       4. Voltage sense inputs (V1, V2, V3, VN) shall be rated:
          1. Accuracy in percent of reading at 25°C: ±0.1%.
          2. Input impedance: 5 MΩ minimum.
          3. Input current: 1 mA maximum.
       5. Current sense inputs (I1, I2, I3, I4) shall be rated:
          1. Accuracy in percent of reading at 25°C: ±0.1%.
          2. Overload withstand: 22 A continuous, 200 A for 1 sec.
          3. Burden and Impedance: Negligible.
          4. Maximum crest factor at 5 A: 4.0.
          5. Starting current: 5 mA.
    2. Status Inputs
       1. The power quality meter’s status inputs shall be able to connect to up to 4 non-powered contacts for data collection. The status inputs are contact closure (internal 24 VDC).
    3. Functions
       1. Measured parameters shall include:

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| --- | --- |
| Voltage, L-L and L-N | Apparent energy, kVAh |
| Current, per phase and total | Real power demand, kW | |
| Frequency, last cycle and average | Reactive power demand, kVAR | |
| Voltage imbalance | Apparent power demand, kVA | |
| Current imbalance | Projected kW demand | |
| Real power, kW | Projected kVAR demand | |
| Symmetrical Component Analysis | Projected kVA demand | |
| Reactive power, kVAR | Demand power factor | |
| Apparent power, kVA | Crest factor, V and I – phase | |
| True power factor – phase, total | IEEE THD %, V and I – phase, avg | |
| Displacement PF – phase, total | IEC THD %, V and I – phase, avg | |
| Reactive energy, kVARh | Harmonic content, V and I to 63rd | |
| Real energy, kWh | K-factor, I – phase | |

* + - 1. Logging functions shall include:

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| --- | --- |
| Energy log | Trigger data log |
| Data log | Setpoint log |
| Min/max log | Alarm log |
| Load factor log | Power quality log |
| Time of use logs | * Sag/swell events |
| Event log | * Oscillography |
| Waveform log | * Harmonic analysis |
| Snapshot log |  |

* + - 1. Other functions shall include:

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| --- | --- |
| Security | Logical setpoint programming |
| Wiring diagnostics | Waveform synchronization broadcast |
| Virtual wiring correction | User-configurable sag/swell detection |
| Network time synchronization | CIP energy object |
| Network demand synchronization | IEEE 519 harmonics pass/fail |
| Setpoint programming | IEEE 519 TDD (Total Demand Distortion) |
|  |  |

* + - 1. Coordinate with programmer on parameters to be gathered in PLC or control system.
    1. Relay Outputs
       1. 3 relay outputs shall be available for applications including: control of loads, switching of circuit breakers and signaling. The outputs are rated:
          1. Maximum resistive load switching:

50/60 Hz AC RMS: 10 A at 240V (2400 VA)

DC: 10 A at 24V; 0.25 A at 125V

* + - * 1. Minimum load switching:

50/60 Hz AC RMS: 10 mA at 5V

DC: 10 mA at 5V

* + - * 1. UL 508, CSA 22.2, IC rating class:

50/60 Hz AC RMS: B300

DC: Q300

* + - * 1. Maximum make values (inductive load):

50/60 Hz AC RMS: 30 A at 120V; 15 A at 240V (3600 VA)

DC: 0.55 A at 125V; 0.27 A at 240V (69 VA)

* + - * 1. Maximum break values (inductive load):

50/60 Hz AC RMS: 3 A at 120V; 1.5 A at 240V (360 VA)

DC: 0.55 A at 125V; 0.27 A at 240V (69 VA)

* + - * 1. Maximum motor load switching:

50/60 Hz AC RMS: 1/3 HP at 125V; 1/2 HP at 240V

* + - * 1. Protective relays/relay systems rating: ANSI C37.90 Trip Duty: 2005
      1. A KYZ solid-state relay output shall be available for connection to an external pulse accumulator or controller. The output is rated 80 mA at 240 VAC / VDC.
    1. Communication
       1. The power quality meter shall have at least:
          1. USB Mini-B connection for a host PC to access the unit’s built-in web pages.
          2. Shall be equipped with an EtherNet/IP port, bearing the EtherNet/IP Conformance Testing mark.
          3. Ethernet connection to support:

EtherNet/IP network.

Access to built-in web pages.

* + 1. Configuration
       1. The power quality meter shall have internal web pages for configuration, real-time data viewing, diagnostics and maintenance.
       2. The power quality meter shall have configurable alarms for up to 20 events (setpoints), including:
          1. Standard setpoints.
          2. Relative setpoints that can be calculated, such as rolling averages over intervals.
          3. Logical setpoints that can use standard and relative setpoints as inputs, then be configured using 10 logic gates (each with up to 4 inputs), supporting AND, NAND, OR, NOR, XOR and XNOR functions.
       3. The power quality meter shall provide 5 configurable threshold values for voltage sags and 4 values for voltage swells and shall, at sag/swell detection, record event time, event duration, configured threshold and minimum sag/maximum swell, providing sufficient information to classify each event per IEEE 1159 and EN 50160.
       4. The power quality meter shall be configurable to alert other monitors in the system whenever a power quality event is triggered.
       5. The power quality meter shall be configurable to record waveforms for current and voltage inputs, automatically when an RMS voltage variation occurs or when a manual capture command is issued.
       6. The power quality meter shall have virtual wiring correction capability to correct mis-wiring during commissioning.
       7. The power quality meter shall be scalable and capable of full integration into a plant-wide network.
          1. When connected with other equal power quality meters, its system event snapshot tool contributes to a system-wide event picture.
          2. When used with FactoryTalk EnergyMetrix software, the power quality meter provides data for power quality analytics.
    2. Display Module
       1. The display module shall have a flat panel display to provide visualization for data from up to 3 power control meters, using built-in software.
          1. The display area shall be 95 mm wide by 53.9 mm high (3.74 inches wide by 2.12 inches high).
          2. The display shall be 4-inch transmissive TFT.
          3. The operator input shall be touch screen and 4 function keys.
          4. Communication shall be both:

RS-232 (DF1), RS-232 (DH-485), RS-485.

Ethernet.

* + - * 1. The back of the display module shall have a diagnostic status indicator.
        2. The display module shall have a real-time clock with battery backup. The battery is replaceable.
      1. The display module shall be designed to operate in a temperature range of 0 to 50 ºC (32 to 122 ºF) and a humidity range of 5 to 95% non-condensing.
      2. The display module shall operate on power input of 18 to 30 VDC (24 VDC nominal). A DIN-rail-mounted, AC-to-DC power supply 85 to 265 VAC, 47 to 63 Hz option shall be available.
      3. The operator interface terminal shall have one Universal Serial Bus (USB) type-A connector port to connect to removable USB flash drives for external storage.
      4. The operator interface terminal shall have one Universal Serial Bus (USB) type-B connector port (device port) to connect to a host computer using TCP/IP communication and the USB function RNDIS client.
      5. The display module shall be capable of being configured by using the PanelView Explorer Startup window on a browser, using either its USB port or an Ethernet network connection.
      6. Navigation on the display module’s application shall begin on the Main screen, from which 5 other screens can be selected:
         1. Overview – shows snapshot of the average voltage, average current, total power and average true power factor for up to 3 connected power quality meters.
         2. V.I.F. – shows voltage, current, frequency data.
         3. Power – shows power data for each line.
         4. Power Quality – shows sequence data, K-factors and IEEE/IEC averages.
         5. Energy Demand – shows energy, demand and projected demand.
    1. General Rating
       1. The power quality meter shall be able to withstand:

|  |  |
| --- | --- |
| Vibration | 2 g |
| Shock, Operating  Shock, Non-operating | 30 g  50 g |
| Dielectric Withstand | As outlined in UL61010, EN61010 |
| Installation Location | Indoor use |
| Altitude | 2000 m (6560 ft) |

* + - 1. The display module (optional) shall be able to withstand conducted susceptibility tests as outlined in:

|  |  |
| --- | --- |
| Vibration | IEC 60068-2-6 |
| Shock | IEC 60068-2-27 |
| Radiated Emissions | CISPR 11: Group 1, Class A |
| ESD Immunity | EN 61000-4-2 |
| Radiated RF Immunity | EN 61000-4-3 |
| EFT/B Immunity | EN 61000-4-4 |
| Surge Immunity | EN 61000-4-5 |
| Conducted RF Immunity | EN 61000-4-6 |

1. EXECUTION
   1. INSTALLATION
      1. Where Contract Documents require a power monitor to be installed in electrical equipment manufactured by a third party; power monitor shall be sent to and installed by equipment manufacturer at the time of equipment fabrication. Equipment shall be shipped to the site after power monitor has been installed and tested.
      2. Installation shall be in compliance with all manufacturer requirements, instructions and contract drawings, including:
         1. Rotation of motor shall be correct prior to installing CT’s for power monitoring equipment.
         2. Space surrounding the energy or power quality monitor to maintain adequate cooling.
         3. Conditioning of space surrounding the energy or power quality monitor enclosure to maintain the manufacturer’s ambient temperature and humidity ranges.
         4. Accessibility of energy or power quality monitor diagnostic lights and communication ports – these components shall be free from obstructions at all times.
         5. Startup of Power Monitoring Equipment shall be completed by manufacturer. Configure as required.
         6. Power Monitor Equipment shall be provided with proper fusing and shorting blocks.
      3. Interface
         1. The supplier shall provide all required cables and connectors to interface with other equipment.
         2. The supplier shall coordinate size and configuration of enclosure to meet project requirements.
         3. The supplier shall ensure that communication connections and wiring are properly protected in accordance with manufacturer recommendations.

+ + END OF SECTION + +