SECTION 26 09 13.11 [16295]
ELECTRICAL POWER MONITORING AND CONTROL EQUIPMENT

Schneider Electric
PowerLogic HDPM6000 Specifications
High Density Power Meter

PART 1 GENERAL

1.1 SUMMARY

A. Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for electrical power monitoring and control equipment as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

1.2 REFERENCES

A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

C. Canadian Standards Association (CSA):

1. CAN/CSA C22.2 No. 61010-1, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements.”

2. CAN/CSA C22.2 No. 61010-2-030, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits.”

D. CENELEC (European) Standards (EN):

2. EN 55011/CISPR11, “Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement.”

7. EN 61326-1, “Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements.”

E. Federal Communications Commission (FCC):

1. Title 47 CFR Part 15, Subpart B, "Radio Frequency Devices."

H. International Electrotechnical Commission (IEC):

4. IEC 61000-4-2, “Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.”

5. IEC 61000-4-3, “Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.”

6. IEC 61000-4-4, “Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.”

7. IEC 61000-4-5, “Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.”

8. IEC 61000-4-6, “Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.”

11. IEC 61000-4-11 “Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests."

15. IEC 61010-1, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements.”

16. IEC 61010-030, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits”

I. Underwriters Laboratories, Inc. (UL):

1. UL. 61010-1, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements.”

2. UL 61010-2-030, “Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits.”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 01 - General Requirements.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer’s standard product data.

D. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.

E. Operation and Maintenance Data: Submit operation and maintenance data for electrical power monitoring and control equipment to include in operation and maintenance manuals specified in Division 01 - General Requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of electrical power monitoring and control equipment of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years. The product test and calibration process shall be part of a quality program that is certified to ISO 9001.

2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing electrical power monitoring and control equipment similar in type and scope to that required for this Project and shall be approved by the manufacturer.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Pre-Installation Conference: Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect.

D. Single Source Responsibility: Obtain electrical power monitoring and control equipment and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The HDPM (High Density Power Metering) instrument shall be a "PowerLogic™ HDPM6000" manufactured by Schneider Electric or equivalent.

2.2 HIGH DENSITY POWER QUALITY METER

A. General Provisions:

1. Setup parameters required by the HDPM instrument shall be stored in nonvolatile memory and retained in the event of a control power interruption.

2. The HDPM instrument may be applied in [single phase (2) wire plus ground], [three (3) wire plus ground or four (4) wire plus ground]

3. The HDPM instrument shall be supported by PM software.

B. Markings:

1. The HDPM instrument shall be CE marked and comply with the applicable EU directives.

2. The HDPM instrument shall be marked as UL compliant with the applicable UL standards.

C. Standards Compliance:

1. The HDPM instrument shall comply to the following safety/construction standards:

a. CAN/CSA C22.2 No. 61010-1.

b. CAN/CSA C22.2 No. 61010-2-030.

c. IEC 61010-1.

d. IEC 61010-2-030.

e. UL 916.Fourth Addition

2. The HDPM instrument shall comply to the following electromagnetic immunity standards at levels consistent with those outlined in the construction standards:

a. IEC 61000-4-2 (Electrostatic discharge immunity).

b. IEC 61000-4-3 (Radiated, radio-frequency, electromagnetic field immunity).

c. IEC 61000-4-4 (Electrical fast transient/burst immunity).

d. IEC 61000-4-5 (Surge immunity).

e. IEC 61000-4-6 (Immunity to conducted disturbances, induced by RF fields).

f. IEC 61000-4-11 (Voltage dips, short interruptions and voltage variations immunity).

3. The HDPM instrument shall comply to the following electromagnetic emission standards:

a. FCC Title 47 CFR Part 15 (Subpart B, Class B: Class B digital device, radiated emissions).

4. The HDPM instrument shall comply to the following communications standards with third party compliance certification as noted:

a. EIA/TIA-485.

b. Modbus Interoperability.

D. Voltage Inputs:

1. The HDPM instrument shall have no less than five (5) voltage measurement terminals including three (3) phase, one (1) neutral and one (1) earth / ground inputs.

2. The HDPM instrument, in its standard configuration, shall be able to accept direct low voltage connections up 277 VLN / 480 VLL (UL) without need for potential transformers.

3. The HDPM instrument shall be able to withstand 2300 volts AC RMS for 2 seconds without damaging the device.

E. Current Inputs:

1. The HDPM instrument shall have no less than four (4) current inputs.

2. The HDPM instrument in its standard configuration shall accept CT sizes from 20 Amp to 4000 Amp with internal burdened resister and 250mVac signal. (No shorting blocks required). The CT's shall be [solid core] [split core] type current transformers that have a [0.2%] [0.5] [1.0%] accuracy with a max voltage of 600V.

F. Control Power:

1. The HDPM instrument shall be able to accept a 24V DC power supply input.

G. Mechanical:

1. HDPM instrument shall support mounting configurations including DIN rail mounting without a display, DIN rail mounting with a remotely mounted display.

2. The HDPM instrument shall utilize manufacturer supplied mounting plate to accommodate a variety of manufactures' wall panelboards, power distribution units (PDUs), or remote power panels (RPPs).

H. Environmental:

1. The HDPM instrument shall have an operating temperature rating of -20 to 60 ºC (-4 to 140 ºF).

2. The HDPM instrument display shall have an operating temperature rating of 0 to 45 ºC (32 to 113 ºF).

3. The HDPM instrument shall be installable in environments up to 2000 meters (6561 feet), relative humidity of 5% to 90% non-condensing, pollution degree 2.

4. The HDPM instrument and accessories shall be fully compliant with RoHS European directive ensuring the product does not include any of the six (6) substances stated in the directive.

I. Measured Values:

1. The HDPM instrument shall provide at a minimum the following voltage values:

a. Voltage L–L per-phase.

b. Voltage L-L three-phase average.

c. Voltage L–N per-phase.

d. Voltage L-N three-phase average.

2. The HDPM instrument shall provide at a minimum the following current values:

a. Current per phase.

b. Current neutral (measured).

c. Current three-phase average.

3. The HDPM instrument shall provide at a minimum the following power values:

a. Real power (per phase, three-phase total)

b. Reactive power (per phase, three-phase total)

c. Apparent power (per phase, three-phase total)

d. Power factor - true (per phase, three-phase average)

e. Maximum real power (per phase, three-phase total)

4. The HDPM instrument shall provide at a minimum the following energy values:

a. Accumulated real kWh energy

b. Accumulated reactive kVARh energy

c. Directional real kWh energy (import/export)

d. Directional reactive kVARh energy (import/export)

J. Demand:

1. The HDPM instrument shall be able to provide last completed interval demand per phase and total

2. The HDPM instrument shall provide demand for real power, apparent power and current, per phase and total

3. The HDPM instrument shall be able to perform block demand with user-programmable demand period length.

K. Sampling:

1. The HDPM instrument shall sample continuously at more than 128 samples per cycle for nominal frequencies of 50Hz and 60Hz.

2. The HDPM instrument shall be able to perform sag/swell detection of voltage disturbances on a half-cycle basis, providing the duration of the disturbance and phase of the disturbance. Disturbances less than one cycle in duration can be detected.

L. Logging:

1. The HDPM instrument shall have a minimum of 8 GB of non-volatile memory for events, log data and waveform captures

2. The HDPM instrument shall provide a real-time clock (RTC) that can be synchronized via Network Time Protocol (NTP)

3. The HDPM instrument shall have a time-stamped event log with the following features:

   a. Each event shall be recorded with the date and time of the event and the cause of the event

   b. Changes to the log or demand configuration shall be recorded in the event log.

   c. System restarts shall be recorded in the event log.

   d. Time stamps shall have a resolution of 1 millisecond.

   e. Communication failures with attached branch circuit modules shall be recorded in the event log

4. The HDPM instrument shall be able to log any parameter in the meter available over Modbus

5. The HDPM instrument shall be capable of supporting a minimum of 20 independent data logs that support the following configuration options:

   a. Recording method of Fill and Hold or First In First Out (FIFO).

   b. Selection of up to 72 parameters per log.

   c. Independent logging interval for each data log of 30 seconds to 48 days.

M. Alarming:

1. The HDPM instrument shall have the ability to support user configurable alarms for the following values:

   a. Low Voltage per phase

   b. High Voltage per phase

   c. Over current warning

   d. Over current alarm

   e. Tripped breaker detection (zero crossing timeout)

   f. Total Power

g. Neutral current mismatch

2. The HDPM instrument shall provide both latching and non-latching alarms. Non-latching alarms shall reset when the condition no longer exists. Latching alarms shall stay raised until manually reset by the user.

3. The HDPM instrument shall have the ability to support disturbance alarms for detecting voltage and current dips and swells on all monitored phases.

4. The HDPM instrument shall append alarms to the event log with a millisecond time stamp resolution on alarm entries.

5. The HDPM instrument shall be able to operate relays on alarm conditions.

6. The HDPM instrument shall be able to initiate waveform captures on alarm conditions.

N. Communications:

1. The HDPM instrument shall be capable of supporting the following physical, communications methods simultaneously and independently:

a. Ethernet switch.

1) 10/100 Base-TX (port 1).

2) 10/100 Base-TX (port 2).

b Serial.

1) RS-485 (port 1).

2. The HDPM instrument shall support multiple concurrent Ethernet communication protocols over an Ethernet network at any one time:

a. Modbus TCP/IP.

b. HTTP / HTTPS (web interface).

c. NTP / SNTP (time synchronization).

d. SNMP (network management).

e. DHCP (automatic IP address assignment).

3. The HDPM instrument shall support the following serial communications protocols:

a. Modbus:

1) Modbus RTU.

4. The HDPM instrument shall be able to support at least 4 concurrent Modbus TCP/IP connections.

5. The HDPM instrument shall serve web pages with the following capabilities to:

a. Provide real-time data

b. Provide the ability to visualize all voltage and current phases of captured waveforms concurrently using a standard web browser. Waveform viewer allows waveform selection, voltage and current phase selection and saving as an image or comma separated variable (CSV) file.

c. Provide options to configure the meter, including the following:

1) Communication settings

2) Voltage mode (wye, delta)

3) Current transformer selection

4) Alarm thresholds

5) Waveform capture triggers

6. The HDPM instrument shall have two (2) Ethernet ports that support both IPv4 and IPv6.

7. The HDPM instrument shall be able to automatically acquire an IPv4 and IPv6 address assignment from a DHCP server.

8. The HDPM instrument shall provide the ability to enable or disable BACnet and SNMP protocols.

O. Display:

1. The HDPM instrument shall have two (2) graphical color display options: a 4.3” (480x272 resolution) or 7” (800x480 resolution) TFT touch screen backlit display

2. The two (2) HDPM instrument display options shall both support panel mounting.

4. The HDPM instrument displays shall have a 0 to 45 ^{o}C operating temperature at <= 2000 meters (6561 ft) above sea level.

8. The HDPM instrument display shall be capable of presenting real-time parameters on the instrument’s display.

P. Power Quality Monitoring:

1. The HDPM instrument shall be able to calculate total harmonic distortion (THD) for each voltage phase and the average of all phases

2. The HDPM instrument shall be able to calculate total harmonic distortion (THD) for each current phase and the average of all phases

3. The HDPM instrument shall provide current harmonic magnitudes for each odd harmonic up to the 63rd.

4. The HDPM instrument shall provide voltage harmonic magnitudes for each odd harmonic up to the 63rd.

Q. Fault recording and Waveform Capture:

1. The HDPM instrument shall simultaneously capture all voltage and current channels for 12 cycles when a waveform capture is triggered

2. Each channel of a waveform capture shall have at least 128 samples per cycle

3. The HDPM instrument shall support the following waveform capture triggers:

    a. Voltage Sag

    b. Voltage Swell

    c. Overcurrent

    d. Manual

    e. Tripped breaker detected by zero crossing timeout

4. Waveform capture data shall be accessible using the following methods:

    a. Visual graph on the HDPM instrument web page

    b. Image download from the HDPM instrument web page

    c. Comma Separated Variable (CSV) file download from the HDPM instrument webpage

    d. Modbus file record read (most recent waveform capture only)

5. Conditions that trigger a waveform capture shall be appended to the HDPM instrument's event log including a timestamp and capture cause.

R. Bus Modules:

1. The HDPM instrument shall have an RJ45 bus port for connection to optional modules using CAT5 or CAT6 ethernet cable

2. The HDPM instrument shall be able to power downstream modules on its bus using the CAT5/CAT6 cable.

3. The modules the HDPM instrument shall support are the following:

    a. Branch Circuit Retrofit Module as described in section 2.3

    b. Branch Circuit Strip Module as described in section 2.4

    c. Busway meter as described in section 2.5.

    d. I/O Module as described in section 2.6.

2.3 BRANCH CIRCUIT RETROFIT MODULE (OPTIONAL)

A. General Provisions:

1. The Retrofit Module shall be a microprocessor based branch monitoring system supporting direct reading metered or calculated values for up to one hundred ninety-two (192) branch circuits or a combination of panelboards and sub-feed breakers.

B. Markings:

1. The Retrofit Module shall be CE marked and comply with the applicable EU directives.

2. The Retrofit Module shall be marked as UL compliant with the applicable UL standards.

C. Standards Compliance:

1. The Retrofit Module shall comply to the following safety/construction standards:

   a. CSA C22.2 No. 20

   b. UL 916.Fourth Addition

2. The Retrofit Module shall comply to the following electromagnetic immunity standards at levels consistent with those outlined in the construction standards:

   a. IEC 61000-4-2 (Electrostatic discharge immunity).

   b. IEC 61000-4-3 (Radiated, radio-frequency, electromagnetic field immunity).

   c. IEC 61000-4-4 (Electrical fast transient/burst immunity).

   d. IEC 61000-4-5 (Surge immunity).

   e. IEC 61000-4-6 (Immunity to conducted disturbances, induced by RF fields).

   f. IEC 61000-4-11 (Voltage dips, short interruptions and voltage variations immunity).

3. The Retrofit Module shall comply to the following electromagnetic emission standards:

   a. FCC Title 47 CFR Part 15 (Subpart B, Class B: Class B digital device, radiated emissions).

D. Current Inputs:

1. The Retrofit Module shall be available in 24, 42, and 84 circuit options.

2. Multiple Retrofit Modules shall be allowed to attach to the HDPM instrument bus to monitor up to 192 branch circuits.

3. The Retrofit Module in its standard configuration shall accept CT sizes from 20 Amp to 4000 Amp with internal burdened resister and 250mVac signal. (No shorting blocks required). The CT’s shall be [solid core] [split core] type current transformers that have a [0.2%] [0.5] [1.0%] accuracy with a max voltage of 600V.

4. The Retrofit Module shall have removable insulation displacement connectors to terminate all CT leads to the module

E. Control Power:

1. The Retrofit Module shall be able to accept a 24V DC power supply input from the HDPM instrument utilizing the CAT5/CAT6 bus cable.

F. Mechanical:

1. The Retrofit Module shall support configurations for DIN rail mounting.

2. The Retrofit Module shall utilize manufacturer supplied mounting plate to accommodate a variety of manufactures' wall panelboards, power distribution units (PDUs), or remote power panels (RPPs).

G. Environmental:

1. The Retrofit Module shall have an operating temperature rating of -20 to 60 ºC (-4 to 140 ºF).

2. The HDPM instrument shall be installable in environments up to 2000 meters (6561 feet), relative humidity of 5% to 90% non-condensing, pollution degree 2.

H. Measured Values:

1. The Retrofit Module shall be able to support 1, 2, and 3 pole breakers

2. All the Retrofit Module measured values shall be available through the HDPM Modbus interface.

3. The Retrofit Module shall provide at a minimum the following current values:

a. Current per branch channel.

b. Current total per circuit.

4. The Retrofit Module shall provide at a minimum the following power values:

a. Real power (per channel, circuit total)

b. Reactive power (per channel, circuit total)

c. Apparent power (per channel, circuit total)

d. Power factor - true (per channel, circuit total)

e. Maximum real power (per channel, circuit total)

5. The Retrofit Module shall provide at a minimum the following energy values:

a. Accumulated real kWh energy (per channel, circuit total)

I. Sampling:

1. The Retrofit Module shall sample continuously at more than 128 samples per cycle for nominal frequencies of 50Hz and 60Hz.

J. Logging:

1. All of the Retrofit Module's measured values shall be available to be logged using the HDPM instrument's logging mechanism.

K. Alarming:

1. The Retrofit Module shall have the ability to support user configurable alarms for the following values:

   a. Over current warning

   b. Over current alarm

   c. Tripped breaker detection (zero crossing timeout)

2. The Retrofit Module shall provide both latching and non-latching alarms. Non-latching alarms shall reset when the condition no longer exists. Latching alarms shall stay raised until manually reset by the user.

3. The Retrofit Module alarms shall be appended to the HDPM instrument event log with a millisecond time stamp resolution on alarm entries.

4. The Retrofit Module shall be able to operate relays on alarm conditions.

5. The Retrofit Module shall be able to initiate waveform captures on alarm conditions.

L. Power Quality Monitoring:

1. The Retrofit Module shall be able to calculate total harmonic distortion (THD) for each current circuit and phase.

2. The Retrofit Module shall provide current harmonic magnitudes for each odd harmonic up to the 63rd.

M. Waveform Capture:

1. The Retrofit Module shall trigger a waveform capture on tripped breaker detection (zero crossing timeout).

2. Each channel of a waveform capture shall have at least 128 samples per cycle.

3. Waveforms captured by the Retrofit Module shall be available through the HDPM instrument's waveform capture feature.

2.4 BRANCH CIRCUIT STRIP MODULE (OPTIONAL)

A. General Provisions:

1. The Strip Module shall be a microprocessor based branch monitoring system supporting direct reading metered or calculated values for up to one hundred sixty-eight (168) branch circuits. The Strip Module monitoring boards shall be available in 21-circuit strips to align with the panelboard branch circuit breakers.

B. Markings:

1. The Strip Module shall be CE marked and comply with the applicable EU directives.

2. The Strip Module shall be marked as UL compliant with the applicable UL standards.

C. Standards Compliance:

1. The Strip Module shall comply to the following safety/construction standards:

   a. CSA C22.2 No. 20

   b. UL 916.Fourth Addition

2. The Strip Module shall comply to the following electromagnetic immunity standards at levels consistent with those outlined in the construction standards:

   a. IEC 61000-4-2 (Electrostatic discharge immunity).

   b. IEC 61000-4-3 (Radiated, radio-frequency, electromagnetic field immunity).

   c. IEC 61000-4-4 (Electrical fast transient/burst immunity).

   d. IEC 61000-4-5 (Surge immunity).

   e. IEC 61000-4-6 (Immunity to conducted disturbances, induced by RF fields).

   f. IEC 61000-4-11 (Voltage dips, short interruptions and voltage variations immunity).

3. The Strip Module shall comply to the following electromagnetic emission standards:

   a. FCC Title 47 CFR Part 15 (Subpart B, Class B: Class B digital device, radiated emissions).

D. Current Inputs:

1. The Strip Module shall have no less than twenty-one (21) current inputs.

2. Multiple Retrofit Modules shall be allowed to attach to the HDPM instrument bus to monitor up to 168 branch circuits.

2. The Strip Module in its standard configuration shall accept CT sizes from 75 Amp to 4000 Amp with internal burdened resister and 250mVac signal. (No shorting blocks required).

The CT's shall be [solid core] [split core] type current transformers that have a [0.2%] [0.5] [1.0%] accuracy with a max voltage of 600V.

E. Control Power:

1. The Strip Module shall be able to accept a 24V DC power supply input from the HDPM instrument utilizing the CAT5/CAT6 bus cable.

F. Mechanical:

1. The Strip Module shall support configurations for DIN rail mounting.

2. The Strip Module shall utilize manufacturer supplied mounting plate to accommodate a variety of manufactures' wall panelboards, power distribution units (PDUs), or remote power panels (RPPs).

G. Environmental:

1. The Strip Module shall have an operating temperature rating of -20 to 60 ºC (-4 to 140 ºF).

2. The HDPS instrument shall be installable in environments up to 2000 meters (6561 feet), relative humidity of 5% to 90% non-condensing, pollution degree 2.

H. Measured Values:

1. The Strip Module shall be able to support 1, 2, and 3 pole breakers

2. All the Strip Module measured values shall be available through the HDPM Modbus interface.

3. The Strip Module shall provide at a minimum the following current values:

a. Current per branch channel.

b. Current total per circuit.

4. The Strip Module shall provide at a minimum the following power values:

a. Real power (per channel, circuit total)

b. Reactive power (per channel, circuit total)

c. Apparent power (per channel, circuit total)

d. Power factor - true (per channel, circuit total)

e. Maximum real power (per channel, circuit total)

5. The Strip Module shall provide at a minimum the following energy values:

a. Accumulated real kWh energy (per channel, circuit total)

I. Sampling:

1. The Strip Module shall sample continuously at more than 128 samples per cycle for nominal frequencies of 50Hz and 60Hz.

J. Logging:

1. All of the Strip Module's measured values shall be available to be logged using the HDPM instrument's logging mechanism.

K. Alarming:

1. The Strip Module shall have the ability to support user configurable alarms for the following values:

   a. Over current warning

   b. Over current alarm

   c. Tripped breaker detection (zero crossing timeout)

2. The Strip Module shall provide both latching and non-latching alarms. Non-latching alarms shall reset when the condition no longer exists. Latching alarms shall stay raised until manually reset by the user.

3. The Strip Module alarms shall be appended to the HDPM instrument event log with a millisecond time stamp resolution on alarm entries.

4. The Strip Module shall be able to operate relays on alarm conditions.

5. The Strip Module shall be able to initiate waveform captures on alarm conditions.

L. Power Quality Monitoring:

1. The Strip Module shall be able to calculate total harmonic distortion (THD) for each current circuit and phase.

2. The Strip Module shall provide current harmonic magnitudes for each odd harmonic up to the 63rd.

M. Waveform Capture (optional):

1. The Strip Module shall trigger a waveform capture on tripped breaker detection (zero crossing timeout).

2. Each channel of a waveform capture shall have at least 128 samples per cycle.

3. Waveforms captured by the Strip Module shall be available through the HDPM instrument's waveform capture feature.

2.5 BUSWAY METER (OPTIONAL)

A. General Provisions:

1. The Busway Meter shall be a microprocessor-based branch monitoring system supporting direct reading metered or calculated values for up to one hundred ninety-two (192) branch circuits. The Busway Meter monitoring boards shall be available in 4/8-circuit tap boxes.

B. Markings:

1. The Busway Meter shall be CE marked and comply with the applicable EU directives.

2. The Busway Meter shall be marked as UL compliant with the applicable UL standards.

C. Standards Compliance:

1. The Busway Meter shall comply to the following safety/construction standards:

a. CSA C22.2 No. 20

b. UL 916.Fourth Addition

2. The Busway Meter shall comply to the following electromagnetic immunity standards at levels consistent with those outlined in the construction standards:

a. IEC 61000-4-2 (Electrostatic discharge immunity).

b. IEC 61000-4-3 (Radiated, radio-frequency, electromagnetic field immunity).

c. IEC 61000-4-4 (Electrical fast transient/burst immunity).

d. IEC 61000-4-5 (Surge immunity).

e. IEC 61000-4-6 (Immunity to conducted disturbances, induced by RF fields).

f. IEC 61000-4-11 (Voltage dips, short interruptions and voltage variations immunity).

3. The Busway Meter shall comply to the following electromagnetic emission standards:

a. FCC Title 47 CFR Part 15 (Subpart B, Class B: Class B digital device, radiated emissions).

D. Current Inputs:

1. The Busway Meter shall have no less than four current inputs and an eight input option shall be available.

2. Multiple Busway Meters shall be allowed to attach to the HDPM instrument bus to monitor up to 192 branch circuits

3. The Busway Meter in its standard configuration shall accept CT sizes from 20 Amp to 4000 Amp with internal burdened resister and 250mVac signal. (No shorting blocks required). The CT’s shall be [solid core] [split core] type current transformers that have a [0.2%] [0.5] [1.0%] accuracy with a max voltage of 600V.

E. Control Power:

1. The Busway Meter shall be able to accept a 24V DC power supply input from the HDPM instrument utilizing the CAT5/CAT6 bus cable.

F. Mechanical:

1. Busway Meter shall support configurations for DIN rail mounting.

2. The Busway Meter shall utilize manufacturer supplied mounting plate to accommodate a variety of manufactures' wall panelboards, power distribution units (PDUs), or remote power panels (RPPs).

G. Environmental:

1. The Strip Module shall have an operating temperature rating of -20 to 60 ºC (-4 to 140 ºF).

2. The HDPS instrument shall be installable in environments up to 2000 meters (6561 feet), relative humidity of 5% to 90% non-condensing, pollution degree 2.

H. Measured Values:

1. The Busway Meter shall be able to support 1, 2, and 3 pole breakers

2. All the Busway Meter measured values shall be available through the HDPM Modbus interface.

3. The Busway Meter shall provide at a minimum the following current values:

   a. Current per branch channel.

   b. Current total per circuit.

4. The Busway Meter shall provide at a minimum the following power values:

   a. Real power (per channel, circuit total)

   b. Reactive power (per channel, circuit total)

   c. Apparent power (per channel, circuit total)

   d. Power factor - true (per channel, circuit total)

   e. Maximum real power (per channel, circuit total)

5. The Busway Meter shall provide at a minimum the following energy values:

   a. Accumulated real kWh energy (per channel, circuit total)

I. Sampling:

1. The Busway Meter shall sample continuously at more than 128 samples per cycle for nominal frequencies of 50Hz and 60Hz.

J. Logging:

1. All of the Busway Meter's measured values shall be available to be logged using the HDPM instrument's logging mechanism.

K. Alarming:

1. The Busway Meter shall have the ability to support user configurable alarms for the following values:

a. Over current warning

b. Over current alarm

c. Tripped breaker detection (zero crossing timeout)

2. The Busway Meter shall provide both latching and non-latching alarms. Non-latching alarms shall reset when the condition no longer exists. Latching alarms shall stay raised until manually reset by the user.

3. The Busway Meter alarms shall be appended to the HDPM instrument event log with a millisecond time stamp resolution on alarm entries.

4. The Busway Meter shall be able to operate relays on alarm conditions.

5. The Busway Meter shall be able to initiate waveform captures on alarm conditions.

L. Power Quality Monitoring:

1. The Busway Meter shall be able to calculate total harmonic distortion (THD) for each current circuit and phase.

2. The Busway Meter shall provide current harmonic magnitudes for each odd harmonic up to the 63rd.

M. Waveform Capture (optional):

1. The Busway Meter shall trigger a waveform capture on tripped breaker detection (zero crossing timeout).

2. Each channel of a waveform capture shall have at least 128 samples per cycle.

3. Waveforms captured by the Busway Meter shall be available through the HDPM instrument's waveform capture feature.

2.6 I/O Module (OPTIONAL)

A. General Provisions:

1. The I/O (input/output) Module shall be a microprocessor based IO system supporting two Digital inputs, 1 Analog input, 1 Current input and 1 relay output

B. Markings:

1. The I/O Module instrument shall be marked as UL compliant with the applicable UL standards.

C. Standards Compliance:

1. The I/O Module instrument shall comply to the following safety/construction standards:

a. CSA C22.2 No. 20

b. UL 916.Fourth Addition

D. Input/Outputs

1. The I/O Module shall have no less than one (1) current inputs.

2. The I/O Module in its standard configuration shall accept CT sizes from 20 Amp to 4000 Amp with internal burdened resister and 250mVac signal. (No shorting blocks required). The CT's shall be [solid core] [split core] type current transformers that have a [0.2%] [0.5] [1.0%] accuracy with a max voltage of 600V.

3. The I/O Module shall support two (2) Digital inputs. The inputs shall support 5V DC with a max of 11 mA supplied across dry contacts

4. The I/O Module shall support one (1) Analog input. The input shall support a range of 0-10V.

5. The I/O Module shall support one (1) Form C relay output. The relay output shall have a rating of 30V DC @ 1A or 48V AC @ 0.5A.

E. Control Power:

1. The I/O Module instrument shall be able to accept a 24V DC power supply input from the HDPM instrument utilizing the CAT5/CAT6 bus cable.

F. Mechanical:

1. I/O Module instrument shall support configurations for DIN rail mounting.

2. The Busway Meter shall utilize manufacturer supplied mounting plate to accommodate a variety of manufactures' wall panelboards, power distribution units (PDUs), or remote power panels (RPPs).

G. Environmental:

1. The I/O Module instrument shall have an operating temperature rating of -20 to 60 ºC (-4 to 140 ºF).

2. The HDPS instrument shall be installable in environments up to 2000 meters (6561 feet), relative humidity of 5% to 90% non-condensing, pollution degree 2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

A. Install electrical power monitoring and control equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

3.3 DEMONSTRATION

A. Provide the services of a factory-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.

1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

2. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in operation and maintenance manuals with the Owner's personnel.

4. Schedule training with the Owner, through the Architect, with at least seven day's advanced notice.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the electrical power monitoring and control equipment shall be without damage at time of Substantial Completion.

END OF SECTION