PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Eaton products
B. 
C. 

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 MICROPROCESSOR-BASED METERING EQUIPMENT

A. Power Xpert Meter Series, PXM4000/6000/8000

1. Where indicated on the drawings, provide a microprocessor based line of Power Quality Meter(s), designated (PQM), equal to Eaton PXM4000, PXM6000, or PXM8000 series meters.

2. A complete PQM combination meter base and/or display shall be have the following minimum listings and/or certifications:
   a. Safety: UL 61010-1, EN 610101.
   b. Accuracy: ANSI C12.20 Class 0.2, IEC/EN60687 0.2 for revenue meters.
   c. EMC: FCC Part 15 Subpart B Class A immunity.
   d. IEC Standards: 50081-2, 61000-3, 61000-4, and 61326.

3. The PQM shall be supplied suitable for standard 120/240 Vac or 110/250 Vdc inputs as required or indicated on the drawings.

4. Current inputs for each channel shall be from standard instrument current transformers.
   a. The analog current input shall be converted to 4096 samples per cycle with a delta-sigma converter digitally filtered down to 512 samples per cycle for anti-aliasing.
   b. Meter burden shall be less than 10 milliohm.
   c. Overload withstand capability shall be a minimum of 500A for 1 second, non-repeating.
   d. Input range capability shall be 0.005 to 20 amperes.

5. Voltage inputs for each channel shall allow for connection into circuits with the following parameters:
   a. Input range of 600V L-L, 347V L-N direct connected.
   b. PT primary input of 120 volts to 500,000 volts.

· Note to Spec. Writer – Insert data in blanks
c. Nominal full-scale value of 700 volts rms.
d. Input impedance of 2 mega ohms.
e. The analog voltage input shall be converted to 4096 samples per cycle by means of a delta sigma converter and digitally filtered down to 512 samples per cycle for anti-phasing.

6. The PQM shall be capable of monitoring, displaying, and communicating the below true rms minimum information where applicable with the accuracy as indicated of read or calculated values based on 3 to 300% full scale. The PQM shall be suitable for installation in single phase, two or three wire systems or in three phase, three or four wire systems.

a. AC current (amperes) in A, B and C phase, 3-phase average, Neutral (N) and Ground (G). A total of five (5) current inputs shall be provided. Accuracy of all current inputs shall be 0.05% reading, +/- 0.01% of full scale. Provide neutral and ground current transformers. The 5 ampere current inputs shall withstand 40 amperes continuous and 300 amperes for 1 second. Current transformer ratios shall be selectable.

b. AC voltage (volts) for A-B, B-C and C-A, phase average, A-N, B-N and C-N, average phase to N, and N to G. Accuracy of all voltage inputs shall be +/- 0.1% reading, +/- 0.05% maximum of full scale. Capable of metering up to 600 volt without external Potential Transformers (PTs) and up to 500 kV with appropriate PTs.

c. Auxiliary AC voltage (volts) for A2-B2, B2-C2, and C2-A2, phase average. Accuracy of all voltage inputs shall be +/- 0.1% reading, +/-0.05% maximum of full scale. Capable of metering up to 600 volt without external Potential Transformers (PTs) and up to 500 kV with appropriate PTs.

d. Real Power (Watts), Reactive Power (vars), Apparent Power (VA), for each phase and system. Accuracy +/- 0.10% reading and +/- 0.0025% full scale. Forward/Reverse indication shall be provided.

e. Accumulated, Incremental and conditional measurement for Real Energy (WH), Reactive Energy (VARH), Apparent Energy (VAH) for each phase and system. Accuracy +/- 0.10% reading and +/- 0.0025% full scale. Forward/Reverse and Net difference indication shall be provided.

f. Frequency (Hz) Accuracy +/- 0.01 hertz.

g. Demand values including present, running average, last complete interval and peak for System Current (Amperes). Demand values including present, running average, last complete interval, peak and coincident with peak kVA and kW demand for System Real Power (Watts), System Reactive Power (vars), and System Apparent Power (VA).

h. Power Factor for both Displacement only 60-cycle fundamental Watts to VA and Apparent total Watts to total vars including harmonics for A, B and C phase and 3 phase average. Accuracy +/- 0.10% at unity PF and +/-0.30% at 0.5 PF.

i. Current percent Total Harmonic Distortion (THD) in A, B and C phase and N.

j. Voltage percent THD in A-B, B-C and C-A phase, A-N, B-N and C-N.

k. K-Factor (sum of the squares of harmonic currents times the square of their harmonic numbers).

l. Transformer Derating Factor (1.414 divided by the Crest Factor).

m. Crest Factor (ratio of peak current to rms current).

n. * (PXM 6000/8000 only)CBEMA (ITIC) curve data

o. * (PXM 6000/8000 only)Flicker data

Ⅳ Note to Spec. Writer – Optional
p. Nines (9's) availability data.
q. Power Quality Index

7. The PQM shall provide the following sampling capabilities:
   a. A/D technology, sampling at 4096 samples per cycle.
   b. Over-sampling and quantizing filtering to eliminate false signal noise.
   c. *(PXM 6000/8000 only)* ITIC representation of power events.
   d. *(PXM 8000 only)* DV/dt triggers for sub-cycle oscillatory transients.
   e. *(PXM 8000 only)* Six (6) MHz/ one (1) MHz capture of impulsive transients.
   f. Waveform recorded at *(512 standard samples-PXM 4000/6000) (100,000 high rate samples-PXM 8000)* per cycle.
   g. *(PXM 8000 only)* Three-phase voltage and neutral-to-ground fast transient capture.
   h. *(PXM 8000 only)* Absolute threshold and dV/dt triggering.

8. The PQM shall provide the following advanced analysis features:
   a. Calculation of harmonic magnitudes and phase angle for each phase voltage and current through the 85th harmonic.
   b. Waveforms shall be available in non-volatile memory and retrievable via file transfer protocol (ftp) in COMTRADE file format over the Internet network.
   c. Historical Trending: Historical trend logging for graphical viewing from the Local PX-D display or from an embedded WEB server. The graphical views of historical data shall support both pan and zoom functions. All standard metering parameters shall be logged as part of the standard meter functionality including minimum, maximum and average for each metered parameter. The minimum and maximum readings shall be based on 200ms calculations. The averages shall be calculated over the user selected time interval period. Minimum storage capacity for standard trend plots shall be as follows:
      1. Five-minute intervals for 48 hours (2 days).
      2. Fifteen-minute intervals for 192 hours (8 days)
      3. One-hour intervals for 28 days
      4. Eight-hour intervals for 56 weeks
      5. One-week intervals for 44 months
      6. Data storage available in *(2GB-PXM 4000 only), (4GB-PXM 6000 only), or (8GB-PXM 8000 only).*

9. Time of Use Monitoring: Time of use monitoring shall include:
   a. Four rate periods for time of use revenue metering.
   b. Total rate independent of time of use.
   c. Up to 4 rate schedules (weekdays and weekends).
   d. Energy Profile: Energy profile data shall include recording of real and reactive energy forward, reverse, net and absolute sum as well as apparent energy (KVAH). Up to eight (8) status inputs shall be configurable as energy accumulators for counting KYZ pulse inputs. These readings shall be stored over a configurable interval from 1 to 60 minutes as well as in daily and weekly totals. Storage capacity shall be as follows:

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· Note to Spec. Writer – Select one
1. Sixty-two (62) days of fifteen (15) minute interval energy and pulse interval data. (Fixed interval capacity shall equal 5,952 intervals configurable from 1 to 60 minutes).
2. Three hundred and seventy-two (372) days of 1 day accumulated energy and pulse interval data.
3. Two Hundred and eight (208) weeks of one (1) week accumulated energy and pulse interval data.

e. Event Triggers: The PX-M shall have a quantity of five (5) types of configurable event triggers consisting of 1) Out of limits, 2) Demand overload, 3) ITIC, 4) Sub-Cycle disturbance and 5) Fast Transient. These triggers shall permit pickup, reset and pickup delay to be user configurable. When a trigger occurs, actions shall include Performance monitoring (Nines (9s) analysis, Capturing Waveform, Capture all metered parameters, and ability to send by email and/or activate a relay output. The meter graphic display PX-D shall flash an LED to annunciate the alarm condition and an audible alarm shall be available. The following trigger options shall be included:
   1. Out of limits – one hundred and five (105) triggers.
   2. Demand overload – Ten (10) triggers.
   4:(PXM 6000/8000 only)ITIC curve display sag or swell voltage events – Eight (8) triggers.
   5:(PXM 8000 only)Fast transient – dV/dt and absolute per phase.

f. Event Logging: The PX-M or embedded WEB Server shall allow the user to view a list of triggered events along with any captured parameters, event details, and triggered waveforms. In addition, a separate event log shall include logging of activities including acknowledged triggers, new minimum and maximum events, and systems operations, such as resets. The size of each event log shall be virtually unlimited based only on the memory option selected.

g. (PXM 6000/8000 only)ITIC Analysis Plot: The PX-D or embedded WEB Server shall include a graphic display of the Information Technology Industry Council (ITIC) plot with counts of disturbances and transients that have occurred. The ITIC plot shall organize events into eight (8) distinct disturbance zones corresponding to the severity of the event and a ninth (9th) zone for transients. A pass/fail count shall be displayed to indicate how many events are outside the ITIC limits. Operator clicking of any counter in the ITIC WEB page shall link the user to the event view and display all triggered events in the selected zone making it easy to view disturbance waveforms associated with the ITIC plot.

h. Sag/Swell and Waveform recording: Sixty (60) cycles of waveform shall be recorded at 512 samples per cycle including 30 cycles of pre and post event data. The embedded WEB server shall be capable of supporting viewing of all triggered waveforms one channel at a time and shall include the ability to zoom and to scroll horizontally using a slider bar. Waveforms shall be stored in non-volatile flash memory using industry standard COMTRADE format. Waveforms shall have the capability to be automatically sent out as COMTRADE attachments to an email following an event, or shall be retrievable from a ftp directory structure from the meter's memory.

i. Minimum and Maximum values for the following parameters:
   1. Voltage L-L and L-N

· Note to Spec. Writer – Optional
2. Current per phase
3. Apparent Power Factor and Displacement Power Factor
4. Real, Reactive, and Apparent total Power
5. THD voltage L-L and L-N
6. THD Current per phase
7. Frequency

9. The PQM shall have *(provisions for)* a digital Input/Output (I/O) card which shall include:
   a. Eight (8) digital inputs – self sourced 24 Vdc. These shall be interrupt driven, allowing for 1ms accuracy of digital events time stamps when utilizing local NTP server. Inputs shall be configurable for demand synch, and pulse counting. Inputs selected for pulse counting shall be scalable. Interval by interval pulse recordings shall be maintained in the PX-M/PX-B profile memory and shall be capable of being displayed graphically.
   b. Three (3) relay outputs – 5A maximum form C continuous, 380Vac maximum, 125Vdc maximum. Outputs shall be suitable for KYX or alarm annunciation. Relay outputs shall have the following minimum ratings:
      1. Make: 30A, 30 Vdc, 120-240 Vac.
      3. Resistive load: 0.5A, 125Vdc; 0.25A, 250 Vdc.
      4. Mechanical Operations: 1,000,000 no-load and 100,000 under rated voltage and current.
      5. Output Relay when event triggered shall be capable of operating in timed, normal or latched mode.
   c. Two (2) solid state outputs – 80 mA maximum continuous, 30 Vdc maximum.

10. The PQM shall be provided with multiple communications ports and protocols, including the following capability:
   a. RS-485 remote display port
   b. RS-485 Modbus RTU
   c. RJ-45 10/100 baseT Local Ethernet Configuration Port for local WEB server connection
   d. HTML web pages
   e. File transfer protocol (ftp)
   f. *RS-45 Selectable 100FX or 10/100Base-T Ethernet network port
   g. *RS-232
   h. *RS-485 Modbus RTU selectable master/slave port
   i. *Modbus TCP
   j. *SMTP(Simple Mail Transfer Protocol) for email support
   k. *SNMP(Simple Network Management Protocol) MIB support
   l. *Ethernet TCP/IP
   m. *NTP(Network Time Protocol) support

11. The PXM468K-DISP-6 graphical display shall utilize a 6 inch color touch screen interface to easily navigate the menus, select links to related pages, and to drill down into increasing levels of further details. A “back” key shall be provided for easy navigation to higher level screens. The graphical display shall have the following features:

* Note to Spec. Writer – Optional
a. 6 inch backlight color LCD remote graphics display with 320 x 240 pixels.
b. Capable of being mounted to the Meter base unit with optional mounting bracket or remote mounting of display up to 2000 ft away.
c. A set of screens including Meter, Quality, I/O and Events.
d. Present, Minimum, and Maximum values, Trends and Events.

c. The PXM468K-DISP-12 color touch screen display shall provide full access to all measured and stored parameters in the meter. It shall also provide graphical real time information, trend charts of key circuit measurements, waveform, harmonics and calendar displays.
a. 12 inch 1024 x 768 pixel backlit LCD graphic touch screen display
b. IP65 aluminum front panel

13. The WEB server shall provide the user with remote WEB access to all the metered, trend and waveform information. The WEB server shall include real time monitored information in both numeric and graphical visual formats.

14. A reset button shall be provided on the PX-M and PX-B to be able to reset communications to factory defaults. Reset capabilities shall be provided in conjunction with various lockable dip switch settings.

15. The 12 inch display and meter shall be capable of providing the graphically display of the following Main Meter Menu Screens:

a. Overview Tab providing:
   1. Volts: L-L and L-N, and average
   2. Frequency
   3. Current and average phase A, B, and C, N & G
   4. Power Quality Index
   5. Demand Comparison
   6. Events Summary

b. Trends Tab providing:
   1. Meter
   2. Power
   3. Quality
   4. Phasor

c. Energy Tab providing:
   1. Energy and Demand Data
   2. Time of Use Information

d. Timeline Tab providing:
   1. Latest events
   2. Enabled Triggers
   3. Historical Events
   4. Calendar view of Events
   5. Events Timeline screen
   6. ITIC Curve

e. *(For meters with a PXMIO card) I/O Tab providing:
   1. Discrete input status
   2. Relay output status

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Counter data

B. The Power Xpert Meter 2000 series, PXM2250/2260/2270/2280/2290:

1. Where indicated on the drawings, provide a microprocessor based line of multifunction, power meter(s), designated (PM), equal to Eaton PXM2250, PXM2260, PXM2270, PXM2280, or PXM2290 series meters. The meter device shall be UL listed. All meters shall have the following ratings, features, and functions; unless a specific meter type is designated.

2. The meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The Meter shall support 3-Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.

3. The meter surge withstand shall conform to IEEE C37.90.1 and ANSI C62.41 (6KV)

4. The meter shall be user programmable for voltage range to any PT ratio.

5. The meter shall have a burden of up to .36VA per phase, Max at 600V, 0.014VA at 120 Volts.

6. The meter shall accept a direct voltage input range of up to 576 Volts Line to Neutral, and a range of up to 721 Volts Line to Line.

7. The meter shall accept a current input of up to 10 amps continuous. Start up current for a 5 Amp input shall be no greater than .005 Amps.

8. The meter shall be capable of a dual input method for current inputs. As standard the meter shall be designed to allow the CT circuit to pass directly through the meter without any physical termination on the meter, ensuring the meter cannot be a point of failure on the CT circuit. As an option where indicated on the drawing or required for the application, provide additional termination pass-through bars, allowing the CT leads to be terminated on the meter. The meter must be capable of supporting both termination methods.

9. The meter shall have the following additional ratings and features:

10. Fault Current Withstand shall be 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.

11. Meter shall be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios shall not be acceptable.

12. Meter shall have a maximum burden of 0.005VA per phase, at the maximum at 11 Amperes.

13. Meter to accept a pass through wire gauge dimension of 0.177" / 4.5 mm.

14. All inputs and outputs shall be galvanically isolated to 2500 Volts AC.

15. The meter shall accept current inputs of class 10: (0 to 10A), 5 Amp Nominal, and class 2 (0 to 2A), 1A Nominal Secondary.

16. The meter shall have an accuracy of +/- 0.1% or better for volts and amps, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC687 (class 0.2%) and ANSI C12.20 (Class 0.2%).

17. The meter shall provide true RMS measurements of voltage, phase to neutral and phase to phase; current, per phase and neutral.

18. The meter shall provide sampling at 400+ samples per cycle on all channels measured readings simultaneously.
The meter shall utilize 24 bit Analog to Digital conversion.

Type PXM2250 meters shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVARh, and 1 KYZ pulse output, and 256 Megabytes for data logging.

Type PXM2260 meters shall provide per phase % THD (Total Harmonic Distortion) monitoring to the 40th order for voltage (reference to neutral only) and current, and shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVARh and 1 KYZ pulse output, on board meter limit exceeded alarms, and 512 Megabytes for data logging.

Type PXM2270 meters shall provide per phase % THD (Total Harmonic Distortion) and individual harmonic monitoring to the 40th order for voltage (reference to neutral only) and current, and shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVARh, 1 KYZ pulse output, on board meter limit exceeded alarms, provide a waveform view of real time harmonic distortion on a PC from the embedded WEB server and 768 Megabytes for data logging.

Type PXM2280 meters shall provide per phase % THD (Total Harmonic Distortion) and individual harmonic monitoring to the 40th order for voltage (reference to neutral only) and current, and shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVARh, 1 KYZ pulse output, on board meter limit exceeded alarms, provide a waveform view of real time harmonic distortion on a PC from the embedded WEB server, record waveforms up to 64 samples per cycle, and 768 Megabytes for data logging.

Type PXM2290 meters shall provide per phase % THD (Total Harmonic Distortion) and individual harmonic monitoring to the 40th order for voltage (reference to neutral only) and current, and shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVARh, 1 KYZ pulse output, on board meter limit exceeded alarms, provide a waveform view of real time harmonic distortion on a PC from the embedded WEB server, record waveforms up to 512 samples per cycle, and 768 Megabytes for data logging.

Type PXM2280 and PXM2290 meters shall provide a simultaneous voltage and current waveform recorder.

Type PXM2280 meter shall be capable of recording 64 samples per cycle for a voltage sag or swell or a current fault event.

Type PXM2290 meter shall be capable of recording 512 samples per cycle for a voltage sag or swell or a current fault event.

The meter shall provide pre- and post-event recording capability.

The meter shall have a programmable sampling rate for the waveform recorder.

The meter shall have an advanced DSP design that allows power quality triggers to be based on a 1 cycle updated RMS.

The meter shall allow up to 1500 events to be recorded.

The meter shall store waveform data on the meter ftp server in COMTRADE format and be accessible via a web browser.

The meter shall be able to be configured and viewed from the on-board web server without the need for external software.

The meter shall include a three-line, bright red, .56" LED display.

The meter shall fit in both DIN 92mm and ANSI C39.1 Round cut-outs.

The meter must display a % of Load Bar on the front panel to provide an analog feel. The % Load Bar shall have not less than 10 segments.
37. The meter shall be available in transducer only version, which shall not include a display. The transducer version shall mount directly to a DIN rail.

38. Meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.

39. The meter shall include 2 independent communication ports on the back with multiple protocols, including the following minimum capability:
   a. Serial Communication Format
      1. Connection Type: RS-485
      2. Protocols: Modbus RTU, Modbus ASCII, DNP 3.0
      3. Baud rates shall be from 9600 to 57,600 baud
   b. Network Communication Format
      1. Connection Type: RJ-45 10/100 Base-T Ethernet Network port
      2. Ethernet card shall allow auto transmit/receive detection for straight or null RJ45 cables.
      3. Protocols: Ethernet TCP/IP, Modbus TCP, BACnet/IP, SNMP v1 & v3 (Network), SMTP (email), HTTP, HTTPS, Atom Feed

40. The meter shall provide user configured fixed window or sliding window demand. This shall allow the user to set up the particular utility demand profile.

41. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features.

42. All other parameters shall offer max and min capability over the user selectable averaging period.

43. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.

44. The meter shall be capable of operating on a power supply of 90 to 265 Volts AC and 100 to 370 Volts DC. Universal Power AC/DC Supply shall be available and shall have a burden of less than 11VA. An option shall also be available to operate on a power supply from 18-60 VDC.

45. Meter shall provide update rate of 100msec for Watts, Var and VA. All other parameters shall be 1 second.

46. (PXM2260/2270/2280/2290 only) The meter shall provide on board meter Limits Alarms and Control Capability as follows:
   a. Limit ranges can be set for any measured parameter.
   b. Up to 16 limit ranges can be set.
   c. Limit ranges shall be based on % of Full Scale settings.
   d. Manual relay control shall be available using Modbus RTU command when used with optional relay card
   e. Relay set delays and reset delays shall be available

47. The PXM 2000 series shall provide the following advanced analysis features:
   a. (PXM2260/2270/2280/2290 only) Calculation of harmonic magnitudes and phase angle for each phase voltage and current through the 40th harmonic.
   b. (PXM2270/2280/2290 only) Waveform view of real time harmonic distortion and individual harmonic monitoring on a PC from the embedded WEB server
Historical Trending: Historical trend logging for graphical viewing from an embedded WEB server. The graphical views of historical data shall support both pan and zoom functions. All standard metering parameters (42 real-time measures) shall be logged as part of the standard meter functionality including minimum, maximum and average for each metered parameter. The averages shall be calculated over the time interval period. Minimum storage capacity for standard trend plots shall be as follows for PXM2250, PXM2260, and PXM2270/2280/2290, respectively:

1. Five-minute intervals for 90, 180, 365 days.
2. Fifteen-minute intervals for 1, 2, 3 years
3. Sixty-minute intervals for 5, 10, 15 years
4. Data storage up to 256, 512, 768 MB.

Event Triggers: The meter shall have a quantity of two (2) types of configurable event triggers consisting of:

a. (PXM2260/2270/2280/2290 Only) On board meter out of limits, the on board meter out of limits can be set for any measured parameter, for up to 16 limits. If any of the 16 limits are exceeded, an alarm condition will be present and illuminate one of the LEDs on the meter faceplate. The on board meter out of limits can also be used to energize a relay output, if so equipped. These triggers shall permit pickup, reset and pickup delay to be user configurable.

b. On board gateway card out of limits. The on board gateway limits can trigger an alarm off of any measured parameter on any of the PXM 2000 model series. Upper and lower cautionary and critical limits shall be available for each of the measured parameters. On board Gateway card Out of limits – Up to One Hundred and Sixty Eight (168) triggers

Event Logging: The embedded WEB Server shall allow the user to view a list of triggered events along with event details. In addition, a separate system log shall store logging of activities including acknowledged triggers, and systems operations, such as resets. Storage shall be reserved for 100,000 events.

Minimum and Maximum values for the following parameters:

a. Voltage L-L and L-N
b. Current per phase
c. Apparent Power Factor
d. Real, Reactive, and Apparent total Power
e. %THD voltage L-N
f. %THD Current per phase
g. Frequency

The WEB server shall provide the user with remote WEB access to all the metered and trend information. The WEB server shall include real time monitored information in both numeric and graphical visual formats.

The meter shall have a real-time clock with the added capability to synchronize with a network time server to maintain time accuracy.

The meter shall have I/O expandability through one Option card slot on the back.

The card shall be capable of being installed in the field, without removing the meter from installation.

The meter shall auto-detect the presence of any I/O Option card.
56. The Option card slot shall accept I/O card in all of the following formats: Four channel bi-directional 0-1mA Output Card; Four Channel 4-20mA Output Card; Two Relay Outputs/2 Status Inputs Card; and Four KYZ Pulses/4 Status Inputs Card.

57. The 0-1mA Output Option Card shall provide the following features:
   a. Bi-directional from 0-1mA Outputs.
   b. Assignable to any measured parameter.
   c. 0.1% of full scale.
   d. Maximum load impedance to 10k Ohms, with no accuracy losses.

58. The 4-20mA Output Option Card shall provide the following features:
   a. Assignable to any measured parameter.
   b. 0.1% of full scale.
   c. Maximum load impedance to 500 Ohms, with no accuracy losses.
   d. Loop powered using up to 24 Volts DC.

59. The Two Relay Outputs/2 Status Inputs Option Card shall provide the following features:
   a. Status Inputs – Wet/Dry Auto Detect up to 300 VDC
   b. Trigger on User Set Limits/Alarms (with MM2260/2270/2280/2290)
   c. Set delays and reset delays

60. The Four KYZ Pulses/4 Status Inputs Option Card shall provide the following features:
   a. Programmable to any Energy parameter and pulse value
   b. Programmable to End of Interval Pulse
   c. Can function for manual relay control and limit based control (with MM2260/2270/2280/2290)
   d. 120mA continuous load current

61. Power meter shall be able to be stored in (-20 to +70) degrees C.

62. Operating temperature shall be (-20 to +70) degrees C.

63. A NEMA 12 faceplate rating shall be available for the meter.

C. The IQ-250/260 series

1. Where indicated on the drawings, provide a microprocessor based line of multifunction, power meter(s), designated (PM) equal to Eaton type IQ-250 or IQ-260 series. The meter device shall be UL listed. All meters shall have the following ratings, features, and functions, unless a specific meter type is designated.
   a. Meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The Meter shall support 3-Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.
   b. Meter surge withstand shall conform to IEEE C37.90.1 and ANSI C62.41 (6KV)
   c. The meter shall be user programmable for voltage range to any PT ratio.
   d. The meter shall have a burden of up to .36VA per phase, Max at 600V, 0.014VA at 120 Volts.
   e. The meter shall accept a direct voltage input range of up to 576 Volts Line to Neutral, and a range of up to 721 Volts Line to Line.
f. Meter shall accept a current input of up to 10 amps continuous. Start up current for a 5 Amp input shall be no greater than .005 Amps.

2. Meter shall be capable of a dual input method for current inputs. As standard the meter shall be designed to allow the CT circuit to pass directly through the meter without any physical termination on the meter, ensuring the meter cannot be a point of failure on the CT circuit. As an option where indicated on the drawing or required for the application, provide additional termination pass-through bars, allowing the CT leads to be terminated on the meter. The meter must be capable of supporting both termination methods.

3. The meter shall have the following additional ratings and features:
   a. Fault Current Withstand shall be 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.
   b. Meter shall be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios shall not be acceptable.
   c. Meter shall have a maximum burden of 0.005VA per phase, at the maximum at 11 Amperes continuous input.
   d. Meter to accept a pass through wire gauge dimension of 0.177" / 4.5 mm.
   e. All inputs and outputs shall be galvanically isolated to 2500 Volts AC.
   f. The meter shall accept current inputs of class 10: (0 to 11A), 5 Amp Nominal, and class 2 (0 to 2A), 1A Nominal Secondary.

4. The meter shall have an accuracy of +/- 0.1% or better for volts and amps, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC687 (class 0.2%) and ANSI C12.20 (Class 0.2%).
   a. The meter shall provide true RMS measurements of voltage, phase to neutral and phase to phase; current, per phase and neutral.
   b. The meter shall provide sampling at 400+ samples per cycle on all channels measured simultaneously.
   c. The meter shall utilize 24 bit Analog to Digital conversion.
   d. Model IQ250 meters shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVArh and 1 KYZ pulse output.
   e. Model IQ260 meters shall provide total % THD (Total Harmonic Distortion) Monitoring to the 40th order for Voltage and current per phase, and shall provide Volts, Amps, kW, kVAR, PF, kVA, Frequency, kWh, kVAh, kVArh and 1 KYZ pulse output and limit exceeded alarms.

5. The meter shall include a three-line, bright red, .56" LED display.
   a. The meter shall fit in both DIN 92mm and ANSI C39.1 Round cut-outs.
   b. The meter must display a % of FULL SCALE on the front panel to provide an analog feel. The % FULL SCALE shall have not less than 10 segments.

6. The meter shall be available in transducer only version, which shall not include a display. The transducer version shall mount directly to a DIN rail.

7. The Transducer portion of the meter shall be capable of RS485 Modbus or DNP 3.0 communications.

8. Meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.
9. The meter shall include 1 independent communications port on the back, with advanced features.
   a. The port shall provide RS485 communication speaking Modbus ASCII, Modbus RTU, or DNP 3.0 protocol through back plate.
   b. Baud rates shall be from 9600 baud to 57,600 baud.

10. The meter shall provide user configured fixed window or sliding window demand. This shall allow the user to set up the particular utility demand profile.
   a. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features.
   b. All other parameters shall offer max and min capability over the user selectable averaging period.
   c. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.

11. The meter shall be capable of operating on a power supply of 90 to 265 Volts AC and 100 to 370 Volts DC. Universal Power AC/DC Supply shall be available. An option shall also be available to operate on a power supply from 18-60 VDC.
   a. Meter AC/DC power supply shall accept burden of 10VA max.

12. Meter shall provide update rate of 100msec for Watts, Var and VA. All other parameters shall be 1 second.

13. (IQ260 only) The meter shall provide Limits Alarms and Control Capability as follows:
   a. Limit ranges can be set for any measured parameter.
   b. Up to 16 limit ranges per parameter can be set.
   c. Limit ranges shall be based on % of Full Scale settings.
   d. Manual relay control shall be available through software
   e. Relay set delays and reset delays shall be available

14. The meter shall have an option for data-logging capability with 128 Kilobyte memory. The meter shall have a real-time clock that allows for time stamping of all the data in the meter when log events are created. The meter shall have two logs:
   a. The meter shall have one historical log for trending profiles. The log shall be capable of being programmed with up to 64 parameters. The user shall have the ability to adjust logging intervals between the total logged parameters in order to increase or decrease the time allotted to the log.
   b. The meter shall have a log for System Events. The System Events log shall record the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, Programmable Settings Changes.

15. The meter shall have I/O expandability through two Option card slots on the back.
   a. The cards shall be capable of being installed in the field, without removing the meter from installation.
   b. The meter shall auto-detect the presence of any I/O Option cards.
   c. The Option card slots shall accept I/O cards in all of the following formats: Four channel bi-directional 0-1mA Output Card; Four Channel 4-20mA Output Card; Two Relay Outputs/2 Status Inputs Card; Four KYZ Pulses/4 Status Inputs Card.
   d. The meter shall be capable of accepting any combination of up to two cards.
   e. The 0-1mA Output Option Card shall provide the following features:
1. Bi-directional from 0-1mA Outputs.
2. Assignable to any measured parameter.
3. 0.1% of full scale.
4. Maximum load impedance to 10k Ohms, with no accuracy losses.

f. The 4-20mA Output Option Card shall provide the following features:
1. Assignable to any measured parameter.
2. 0.1% of full scale.
3. Maximum load impedance to 500 Ohms, with no accuracy losses.
4. Loop powered using up to 24 Volts DC.

g. The Two Relay Outputs/2 Status Inputs Option Card shall provide the following features:
1. Status Inputs – Wet/Dry Auto Detect up to 300 VDC
2. Trigger on User Set Limits/Alarms (with MM260)
3. Set delays and reset delays

h. The Four KYZ Pulses/4 Status Inputs Option Card shall provide the following features:
1. Programmable to any Energy parameter and pulse value
2. Programmable to End of Interval Pulse
3. Can function for manual relay control and limit based control (MM260)
4. 120mA continuous load current

16. Power meter shall be able to be stored in (-20 to +70) degrees C.
   a. Operating temperature shall be (-20 to +70) degrees C.
17. A NEMA 12 faceplate rating shall be available for the meter.

D. The IQ-100 series:
1. Where indicated on the drawings, provide a microprocessor based line of multifunction, power meter(s), designated (PM) is equal to Eaton type IQ-130, IQ-140 or IQ-150 series meters. The meter device shall be UL listed. All meters shall have the following ratings, features, and functions, unless a specific meter type is designated.
2. Meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The Meter shall support 3-Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.
3. Meter surge withstand shall conform to ANSI C62.41 (6KV)
4. The meter shall be user programmable for voltage range to any PT ratio.
5. The meter shall have a burden of up to .36VA per phase, Max at 600V, 0.014VA at 120 Volts.
6. The meter shall accept a direct voltage input range of up to 416 Volts Line to Neutral, and a range of up to 721 Volts Line to Line.
7. Meter shall accept a current input of up to 11 amps continuous. Start up current for a 5 Amp input shall be no greater than .005 Amps.

8. Meter shall be capable of a dual input method for current inputs. As standard the meter shall be designed to allow the CT circuit to pass directly through the meter without any physical termination on the meter, ensuring the meter cannot be a point of failure on the CT circuit. As an option where indicated on the drawing or required for the application,
provide additional termination pass-through bars, allowing the CT leads to be terminated on the meter. The meter must be capable of supporting both termination methods.

9. The meter shall have the following additional ratings and features:
   a. Fault Current Withstand shall be 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.
   b. Meter shall be programmable for current to any CT ratio. The use of DIP switches for selecting fixed ratios shall not be acceptable
   c. Meter shall have a maximum burden of 0.005VA per phase, at the maximum at 11 Amperes continuous input.
   d. Meter to accept a pass through wire gauge dimension of 0.177" / 4.5 mm.
   e. All inputs and outputs shall be galvanically isolated to 2500 Volts AC.
   f. The meter shall accept current inputs of class 10: (0 to 11A), 5 Amp Nominal, and class 2 (0 to 2A), 1A Nominal Secondary.

10. The meter shall have an accuracy of +/- 0.25% or better for volts and amps, and 0.5% for power and energy functions. The meter shall meet the accuracy requirements of IEC687 (class 0.5%) and ANSI C12.20 (Class 0.5%).
   a. The meter shall provide true RMS measurements of voltage, phase to neutral and phase to phase; current, per phase and neutral.
   b. The meter shall provide sampling at 400+ samples per cycle on all channels measured readings simultaneously.
   c. The meter shall utilize 24 bit Analog to Digital conversion.
   d. Type MM130 meters shall provide the ability to monitor current and voltage.
   e. Type MM140 meters shall provide the ability to monitor current, voltage, power (apparent, reactive, and real), power factor, and frequency.
   f. Type MM150 meters shall provide the ability to monitor current, voltage, power (apparent, reactive and real), power factor, frequency, and energy (apparent, reactive, and real).

11. The meter shall include a three-line, bright red, .56" LED display.
   a. The meter shall fit in both DIN 92mm and ANSI C39.1 Round cut-outs.
   b. The meter must display a % of FULL SCALE on the front panel to provide an analog feel. The % FULL SCALE shall have not less than 10 segments.

12. The meter shall be available in transducer only version, which shall not include a display. The transducer version shall mount directly to a DIN rail.

13. The Transducer portion of the meter shall be capable of RS485 Modbus RTU or RJ45 Modbus TCP communications.

14. Meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.

15. The meter shall include 1 optional independent communications port on the back, with advanced features.
   a. The port shall provide RS485 communication speaking Modbus ASCII or Modbus RTU protocol or RJ45 communication speaking Modbus TCP through back plate.
   b. Baud rates shall be from 9600 baud to 57,600 baud.
16. (IQ140/150 only) The meter shall provide user configured fixed window or sliding window demand. This shall allow the user to set up the particular utility demand profile.
   a. Readings for power (apparent, reactive, and real) and power factor shall be calculated using utility demand features.
   b. All other parameters shall offer max and min capability over the user selectable averaging period.
   c. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.

17. The meter shall be capable of operating on a power supply of 90 to 265 Volts AC and 100 to 370 Volts DC. Universal Power AC/DC Supply shall be available. An option shall also be available to operate on a power supply from 18-60 VDC.

18. Meter AC/DC power supply shall accept burden of 10VA max.

19. Meter shall provide update rate of 100msec for Watts, Var and VA. All other parameters shall be 1 second.

20. Power meter shall be able to be stored in (-20 to +70) degrees C.

21. Operating temperature shall be (-20 to +70) degrees C.

22. A NEMA 12 faceplate rating shall be available for the meter.

E. The IQ-35M series:

1. Where indicated on the drawings, provide a microprocessor based line of multifunction energy meter(s), designated (EM) is equal to Eaton model IQ-35M series meter. The meter device shall be UL/CUL listed and RoHS compliant. All meters shall have the following ratings, features, and functions, unless a specific meter type is designated.

2. Meter shall be designed for Multifunction Electrical Measurement on single or 3 phase power systems. The Meter shall support Single Phase (AN or AB), Split Phase (ABN), Delta (ABC), and Wye (ABCN) systems.

3. The meter shall be user programmable for voltage range up to 32000 volts for use with Potential Transformers.

4. The meter shall accept a direct voltage input over the range of 90 to 600 VAC (50 or 60 Hz).

5. Meter shall accept a current input of 0 to 0.333 VAC or 0 to 1 VAC from up to three current transducers to 32000 amps.

6. The meter shall have the following additional ratings and features:
   a. The measured energy consumption shall be retained in non-volatile ferromagnetic memory.
   b. The power meter shall support alerts for low power factor (phase current or voltage mis-wired), current over range, voltage over range, and frequency out of range.
   c. Meter shall have automatic phase reversal compensation such that it is insensitive to the CT’s load orientation.
   d. Meter shall have Phase Loss Alarm contacts with a user configurable phase loss threshold.
   e. Meter shall have a configurable pulse weight in units of 10, 100, 1000, 10000 Wh.
   f. Meter shall calculate a maximum threshold system power using the configuration parameters to set the slowest pulse duration needed for current power level. If the
selected pulse weight does not allow the meter to find a pulse duration suitable for the current power level, the meter shall indicate an alert.

g. Meter shall support alerts for pulse output overrun and pulse output configuration.

h. Meter shall log and retain in non-volatile memory up to 5760 (up to 60 days at 15 minute intervals) measurement records at time intervals determined by the Demand Interval duration setting.

1. Models IQ35MA13 and IQ35MA23 meter records shall contain any 10 16-bit data values that the user selects from the base Modbus point map. These logged data records shall be readable over Modbus via additional registers.

2. Model IQ35MA15 meter records shall contain any three 32-bit data values that the user selects from the list of supported Analog_Input objects. These logged data records shall be readable over BACnet via three Trend_Log objects.

7. The meter shall be able to monitor and display phase and average current and voltage, frequency, phase and average power factor, and phase and total power (apparent, reactive, and real).

a. Model IQ35MA1 meters shall be able to monitor and display present and peak power demand (Real, reactive and apparent), and per phase and total energy (real, reactive and apparent)

b. Model IQ35MA2 meters shall be able to monitor and display present and peak (positive and negative) power demand (real, reactive and apparent), per phase real energy (signed net & total positive & negative), reactive energy (positive and negative per quadrant as per IEEE 1459-2000), and apparent energy (signed net & total positive & negative).

8. The meter shall meet the accuracy requirements of ANSI C12.20 (Class 0.5%) and IEC62053-22 Class .5S for real power and energy and Class 2 for reactive power and energy accuracy specifications.

a. The meter shall provide true RMS measurements of voltage, phase to neutral and phase to phase; current, per phase.

b. The meter shall provide sampling at 42 samples per cycle on all channels measured readings simultaneously.

c. Meter shall provide update rate for parameters of 1 second.

9. The meter shall include a multi-line backlit LCD display showing measured parameters as well as alarm functions and pulse output.

a. The meter shall be suitable for installation on T35 (35mm) DIN rail according to standard EN50022 or screw mounted to a panel.

b. The meter shall be optionally available in an outdoor NEMA 4X enclosure.

c. The meter shall have dimensions not exceeding 4.2” wide x 3.6” high x 2.3” deep.

d. An IP40 faceplate rating shall be available for the meter.

10. The meter shall include 1 optional independent communication port.

a. Models IQ35MA12, IQ35MA13 and IQ35MA2 meter ports shall provide RS485 communication speaking Modbus RTU protocol.

b. Models IQ35MA12, IQ35MA13 and IQ35MA2 meter baud rates shall be from 1200 baud to 38,400 baud; odd, even, or no parity.

c. Model IQ35MA15 meter port shall provide RS485 communication speaking BACnet MS/TP protocol.
d. Model IQ35MA15 meter baud rates shall be from 9600 baud to 115,200 baud; no parity. The meter shall provide a BACnet Device object, a set of writable Analog Value objects for remote configuration, a set of Analog Input objects to provide access to scaled 32-bit measurement values and their unit types, and a set of Binary input objects for indicating individual alarm conditions.

11. The meter shall provide user configured fixed window or sliding window demand. This shall allow the user to set up the particular utility demand profile.
   a. Readings and peak for kW, kVAR, and kVA shall be calculated using utility demand features.
   b. The power meter shall have demand measurement programmable for up to 6 sub-intervals of 10 seconds to 546 minutes duration.

12. The meter shall be capable of operating on a power supply of 90 to 600 Volts AC and 125 to 300 Volts DC.
   a. The power meter shall have separate control power inputs such that may be powered from a different service than it measures.

13. Meter shall be able to be stored in (-40 to +85) degrees C and (-10 to +60) degrees C for the display
   a. Operating temperature for the meter shall be (-30 to +70) degrees C and (10 to 50) degrees C for the display.

F. Power Xpert Multipoint Meter

1. Where shown on the drawings, supply a UL listed microprocessor-based Multi-Point Metering System (MPM), Eaton type PX Multipoint Meter or approved equal having the specified features. This system shall consist of current sensors, meter base, and meter module(s) as described below

2. The MPM shall have the capability to monitor 60 single-phase two-wire ac loads, 30 single-phase three-wire ac loads or 20 three-phase four-wire ac loads or any combination thereof by use of current sensors

3. All connections to the MPM shall be through removable plugs

4. The device shall be capable of accepting input from current sensors by connecting with factory installed plug connectors

5. The device shall automatically sense the rating of the current sensor

6. The device shall provide a mechanism for detecting tampering with the current sensors. Tamper detection shall be accessible remotely by computer

7. The MPM shall be available to accept service type rating from 120-600 Vac voltage rating

8. The device shall calculate power and energy consumption in accordance with ANSI C12.20 (0.5%) metering specification and stored in non-volatile memory

9. The device shall store the following per phase and system total for each metering point
   a. Voltage, Current, and Frequency (system total only)
   b. Real Power in Watts, Reactive power in Var, Apparent energy in VA, and power factor
   c. Real Energy in Watt hours including forward and reverse, Reactive energy in Var hours in Q1-Q4, Apparent energy in VA hours in Q1/Q4, Q2/Q3

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10. The MPM shall store energy profile information for each metering point in non-volatile memory. The demand profile time period shall be adjustable from 1, 5, 15, 30 and 60 minutes for fixed method and 1, 5, and 15 minutes for sliding method. The MPM shall have the ability to sync with external input to the onboard demand input. The MPM shall be able to save a minimum of 1 year of load profile data for all 60 meter points on a 15 minutes basis.

11. The device shall be suitable for mounting within a panelboard or switchboard. The device may also be mounted in a separate enclosure.

12. The MPM shall have the capability to scale the number of metering points from 6 to 60 in increments of 6.

13. The MPM shall be UL and cUL listed.

14. The MPM shall have LEDs that can be easily viewed when the unit is installed to aid in the installation and operation of the device with the following functionality:
   a. Each meter base shall have: an LED to indicate power is applied to the unit; an LED to indicate the proper functioning of the system; an LED to indicate the proper functioning of the system; three LEDs, one per phase, to indicate the voltage is within the range of the set nominal voltage; LEDs to indicate Delta and Wye operation; and LEDs to indicate transmit and receive status on RS 485 link.
   b. Each meter module shall have: two programmable LEDs that shall flash in proportion to the amount of energy flowing in the measures circuit with each LED can be assigned to one, two, or three phases; six LEDs that indicate the direction of energy flow per phase; an LED to indicate the proper functioning of the module; and an LED to indicate the proper functioning of communication between the meter base and the meter module.
   c. Each pulse input module shall have: eight LEDs, one per input, to indicate the pulse input status; an LED to indicate the proper functioning of the module; an LED to indicate the proper functioning of communication between the meter base and the input module; and eight LEDs, one per output, to indicate the pulse output status.
   d. Each pulse output module shall have: an LED to indicate the proper functioning of the module; and an LED to indicate the proper functioning of communication between the meter base and the output module.

15. The MPM shall have rotary address switches that are easily accessible that set the unit address on the communication network.

16. The MPM shall have two Modbus RTU ports. The communication speed at the device level shall be a minimum of 9,600 baud and maximum 57,600 baud. Devices shall communicate at their maximum baud rate regardless of the number of devices on the network.

17. Meter modules shall be available with support for two three-pole circuits, three two-pole circuits, or six single-pole circuits.

18. Meter modules shall be available to accept 10 mA, 100 mA or 333 mV input signals.

19. Current sensors shall be provided with a toroidal winding over solid core. The winding shall be mounted over the circuit to be monitored by inserting the load conductor through a hole in the center of the current transformers. The current in the load conductor shall be made available to an electronic monitoring device through a four-conductor cable and terminated to a removable plug on the current sensor. The current sensor shall have two LEDs, one red for indicating loss of connection and one blue for verification to connected load. The current sensors shall be suitable for use with circuits rated 125 A.
through 400 A. Extension cables, with a length of 8 and 16 feet and factory installed connectors shall be available for installations where the standard cable is too short for proper installation. The current sensors shall have 600 V rated cable insulation and shall be UL listed with the MPM.

20. The MPM shall be provided with multiple communications ports and protocols, including the following capability:
   a. RS-485 remote display port
   b. RS-485 Modbus RTU
   c. USB Local Configuration Port
   d. HTML web pages
   e. File transfer protocol (ftp)
   f. RJ-45 10/100Base-T Ethernet network port
   g. Modbus TCP
   h. BACnet/IP
   i. SMTP(Simple Mail Transfer Protocol) for email support
   j. SNMP(Simple Network Management Protocol) MIB support
   k. Ethernet TCP/IP
   l. NTP(Network Time Protocol) support

21. The WEB server shall provide the user with remote WEB access to all the metered and trend information with the optional Energy Portal Module. The WEB server shall include real time monitored information in both numeric and graphical visual formats.
   a. Administrators shall have the following capabilities: add, remove and configure the user accounts; view all the energy, demand, power, voltage, current and power factor measurements available in the meter; and ability to map the meters to the accounts and users.
   b. User accounts shall have the following capabilities: view the energy and demand measurements specific to their account; and display the event logs, system logs and load profile data.

22. The meter shall have a real-time clock with the added capability to synchronize with a network time server to maintain time accuracy.

23. The MPM shall have a configuration utility installed on a disc or downloadable from the manufacturer’s website to install on a PC.
   a. The configuration utility shall be able to provide online and offline configuration.
   b. The configuration utility shall have a wizard to guide the user in step by step setup.
   c. The configuration utility shall be able to load a previously saved configuration, save a configuration, and print a configuration.
   d. The configuration utility shall be able to configure the service type, set PT and CT ratios, set demand type and intervals along with reset capability on a specific day, configure inputs and outputs, set time, add admin and users with different authorization levels, assign meters to tenants, set alarms and limits, and set network parameters for optional energy portal module.

24. The meter display shall be capable of providing the following Main Meter Menu Screens:

   · Note to Spec. Writer – Optional
a. System Meter Screen providing:
   1. Current per phase and average phase for A, B, and C
   2. Volts: L-L and L-N
   3. Power, Power Factor and Frequency
   4. Power per phase
   5. Demand
   6. Peak Demand and Timestamp
   7. Energy
b. Sub Meter Screen providing:
   1. Configuration
   2. Power, Power Factor and Frequency
   3. Demand
   4. Peak Demand and Timestamp
   5. Energy
c. Events Screen providing:
   1. Latest 20 events with date and timestamps
d. System Information Screen providing:
   1. Name
   2. Part Number
   3. Serial Number and Date Code
e. Module Information Screen providing:
   1. Name
   2. Part Number
   3. Serial Number and Date Code
f. Set-up screen providing:
   1. View set-up
   2. Edit set-up
   3. Login
   4. Logout

G. Power Xpert Branch Circuit Monitor
   1. Where shown on the drawings, supply a UL listed microprocessor-based Branch Circuit Monitoring System (PXBCM), or approved equal having the specified features. This system shall consist of meter base, and meter module(s) as described below
   2. The Branch Circuit Monitor shall measure the following operational data for up to 84 branch load circuits:
      a. Forward and Reverse kWh
      b. Watts, VA, Amps, Power Factor
      c. Present and Peak demand readings for Amps, Forward and Reverse Watts
      d. Maximum Watts, VA, Amps
   3. The Branch Circuit Monitor shall support alarms for current that can be set based on percent of Breaker Rating and alarms for voltage based on percent of nominal voltage.
      a. High, High-High, Low, Low-Low non-latching alarms for current.
      b. High and Low latching alarms for current, resettable via Modbus or the WEB interface
c. High and Low latching and non-latching voltage alarms for each meter module input voltage.

d. Alarm Status and alarm counters shall be available via Modbus communications

4. Branch Circuit monitor shall support upgradeable firmware via communications.

5. The Branch Circuit Monitor shall have the following ratings

a. Elevation: 0 – 9843 ft (0 – 3000M)
b. Pollution degree: 2 (IEC 60644-1)
c. Ambient temperature range: -20°C – +70°C (-4° – +158°F)
d. Storage temperature range: -40°C to +85°C (-40°F - +185°F)
e. Humidity: 5% – 95% non-condensing.

f. PXBCM as a component shall have a NEMA 1 rating. When installed in an enclosure it shall have the same rating as its enclosure NEMA [1] [3R] [4] [4X] [12].

g. Housing ingress protection: IP20 as a component, in an enclosure the same as the enclosure

h. CE Mark

i. EMC (Electromagnetic Compatibility)

   1. IEC61326: EMI IEC61000-4-X level 3
   2. CISPR 11: Class B emissions, CISPR 22 (Ethernet) class B emissions
   3. FCC part 15 Class B emissions

j. UL/cUL 61010-1 3rd edition

k. EN61010-1

6. PXBCM Meter Base

a. Each PXBCM-MB Meter Base shall support connection of up to 4 Meter Modules in either a MMS Strip or MME External configuration monitoring a total of up to 100 single-phase two-wire AC loads, 48 single-phase three-wire AC loads or 32 three-phase four-wire AC loads or combinations not to exceed 25 poles per meter module.

b. The PXBCM-MB shall be equipped with 4 meter module ports. Each port shall provide control power and communications to either a PXBCM-MMS Meter Module Strip or a PXBCM-MME Meter Module External with a maximum cable length of 28ft between each Meter Base and each Meter Module.

c. Each PXBCM-MB shall support connection to up to 4 PXBCM-MMS Meter Module Strip or 4 PXBCM-MME Meter Module External, or a combination of up to 4 total PXBCM-MMS and PXBCM-MME each meter module with independent single or three phase voltage metering circuits with inputs up to 277V L-N and 480V L-L.

d. PXBCM-MB Power Supply shall be rated for 100-277VAC L:N +/-10% CAT III, 47-63 Hz , 6W

e. The PXBCM-MB shall include a 3 terminal RS-485 serial port for Modbus RTU communications and an RJ-45 port for Ethernet communications. The Ethernet port shall support Modbus TCP communications as well as an Embedded WEB server.

f. The PXBCM-MB embedded WEB server shall support device configuration for to up to 4 PXBCM-MMS Meter Module Strip or 4 PXBCM-MME Meter Module External, or a combination of up to 4 total PXBCM-MMS and PXBCM-MME and display of up to 100 points of metering data. It shall be possible to save device configuration information to a file for archiving and for uploading to PXBCM.
The PXBCM-MB shall support connection to a pre-configured HMI via RS-485 serial port. The HMI shall not require configuration.

The PXBCM-MB shall be equipped with LED’s to indicate communications activity and Device/Alarm Status. An LED shall also indicate if Ethernet is configured for DHCP (automatically assigned IP address) or Fixed IP (manually assigned IP address). The PXBCM-MB shall be equipped with 2 rotary switches to assign Modbus Slave ID 1-99.

The PXBCM-MB shall be equipped with security mode switches to enable the device to operate in a secure mode to prevent tampering with device configuration and resets over comms.

The PXBCM Meter Base shall automatically sense the type of PXBCM Meter Module connected to each of its 4 meter module ports.

The Configuration wizard shall support naming and configuration of up 100 virtual meters by assigning 1-3 channels of current to 1, 2 or 3 pole meters. Virtual meters shall aggregate the channel data assigned to each virtual meter and report the aggregated virtual meter values for:

1. Forward and Reverse Energy
2. Watts, VA, Average Amps and Power Factor
3. Average and Peak demand for Watts and VA

7. PXBCM-MMS Meter Module Strip

a. PXBCM-MMS Meter Module Strips shall be available in configurations to mount on either the left or right of a panelboard and contain 9, 15, or 21 CTs. Four additional 333mV connections shall be provided on each PXBCM-MMS for Auxiliary 333mV CT connections which can be used to monitor the panel mains or branch circuits. The MMS shall include both load current and voltage metering circuits providing meter data to the Meter Base.

b. The PXBCM Meter Module Strip shall be available with either 9 CT’s, 15 CT’s or 21 CT’s per assembly for factory assembly into Panelboards with 18, 30 or 42 poles. PXBCM MMS CT’s shall have be rated for up to 100A continuous current monitoring and designed to mount in an Eaton PRL-1a, PRS-2a or PRL-3e Panelboard with 1 inch breaker pole spacing.

c. PXBCM Meter Module Strip 1 inch center CTs shall have a window opening sufficient for insulated Aluminum conductor rated for 100A capacity

d. The PXBCM Meter Module Strip shall support direct connection of one set of 3 phase nominal metering voltage inputs up to 277V L-N and 480V L-L voltages and shall be rated as Cat III.

e. The Meter Modules can also monitor voltage in the following configurations:
   1. Three Phase, four wire wye
   2. Three phase, three wire delta
   3. Three phase, center tapped delta
   4. Three phase, three wire
   5. Single phase, two wire

f. Power and Energy metering shall be performed based on the voltage assignment for each 100A strip mounted CT and 333mV Aux CT current input as configured using the embedded WEB server.

g. PXBCM MMS Accuracy of kWh metering on branch circuits shall be rated for ANSI C12.20 0.5 accuracy class as a system, including 100A rated strip mounted solid core
current transformers. kWh accuracy for 333mV input auxiliary circuits shall satisfy ANSI C12.20 0.5 class excluding external 333mV sensor performance.

h. The PXBCM MMS shall be UL approved for mounting to the panelboard interior with no interference. Strip placement shall line up 1 inch center CT’s with breaker poles and not impede the normal routing of branch circuit conductors in the panel enclosure.

i. The PXBCM MMS shall connect to the PXBCM MB using factory supplied cables.

8. PXBCM-MME Meter Module External
   a. The PXBCM-MME provides the same metering functionality as the PXBCM-MMS but is used for retrofit or non-uniform/high-mix load applications where the PXBCM-MMS strip mounted 100A CT’s cannot be applied.
   b. The PXBCM Meter Module external shall support 25 channels of current using external 333mV current sensors connected to terminal strips on the PXBCM-MME.
   c. The PXBCM Meter Module External shall support direct connection of one set of 3 phase nominal metering voltage inputs up to 277V L-N and 480V L-L voltages and shall be rated as Cat III.
   d. The Meter Modules can also monitor voltage in the following configurations:
      1. Three Phase, four wire wye
      2. Three phase, three wire delta
      3. Three phase, center tapped delta
      4. Three phase, three wire
      5. Single phase, two wire
   e. Power and Energy metering shall be performed based on the voltage assignment for each 333mV current sensor input as configured using the embedded WEB server.
   f. PXBCM MMS Accuracy of kWh metering on 333mV input circuits shall satisfy ANSI C12.20 0.5 class excluding external 333mV sensor performance.

9. Optional HMI Display shall display data for all configured sub-meters.
   a. HMI configuration shall not be required for each sub-meter. The HMI shall discover the configuration information automatically.
   b. Displayed information shall include;
   c. Sub-meter name, current, voltage, energy consumption, demand, and power factor for up to 100 load circuits. Aggregated Power and Energy readings for any 1, 2 or 3 pole meters.