

Advanced and Electronic Metering

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Advanced and Electronic Metering

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Specifications

See Eaton's *Product Specification Guide*, available on CD or on the Web.

CSI Format	1995	2010
	Section 16901	Section 26 27 13.11
Power Xpert Meter 4000/6000/8000 Series	Paragraph 2.02.A	Paragraph 2.02.A
Power Xpert Meter 2000 Series	Paragraph 2.02.B	Paragraph 2.02.B
IQ 250/260 Series	Paragraph 2.02.E	Paragraph 2.02.E
IQ 100 Series	Paragraph 2.02.D	Paragraph 2.02.D
IQ Energy Sentinel	Paragraph 2.02.G	Paragraph 2.02.G
IQ 35M	Paragraph 2.02.I	Paragraph 2.02.I
Breaker Power Monitoring and Metering Module	Paragraph 2.02.J	Paragraph 2.02.J
IQ 150S/250S	Paragraph 2.02K	Paragraph 2.02K
Power Xpert Multi-Point Meter	Paragraph 2.02L	Paragraph 2.02L



Metering Products Family

General Description

General Description

Eaton's metering products provide solutions needed to monitor and manage all aspects of an electrical distribution system.

When seeking greater reliability, increased productivity and significant cost savings to remain competitive in today's market, Eaton's metering products fit the bill. These innovative meters and communications systems, along with Power Management software, make it possible to successfully take control of the electrical distribution system.

Power Xpert® Meters

Power Xpert Meters are the benchmark for intelligent Web-enabled top-quality metering devices for the power chain. Power Xpert Meters provide measurement of the critical elements found in the power chain whether that be voltage, power, current, transients, harmonics or even time. Power Xpert Meters provide Web-enabled high definition communications for use with the Power Xpert Software. All Power Xpert Meters provide a standard communications protocol for easy integration into other systems.

Greater Reliability

Eaton metering products permit receiving an early warning of potential problems, eliminate unnecessary trips, isolate faults to ensure minimum downtime and shed or equalize loads while a problem is being corrected.

Increased Productivity

Equipment downtime resulting from voltage or frequency variations can be very costly to an operation. Monitoring power quality with Eaton's metering products throughout the electrical distribution system provides data to identify, isolate and correct problems quickly and efficiently.



Metering Products Family

Reduced Energy and Operating Costs

When we think about meters and power quality, the common thread throughout the basket of solutions is information. Collecting, monitoring, and managing data from the electrical distribution system can help reduce costs for those facilities prepared to define and analyze present electrical energy usage levels and patterns. Data provided by Eaton metering products comprise the data for verifying utility bills for energy management and lowering operating costs. Deregulation in some geographical locations permits energy users to select a utility provider and negotiate rate structures. For large users with heavy utility bills this may be an incentive to verify the utility bill, identify an opportunity for savings, negotiate a better utility rate, and apply the savings directly to the bottom line. Users are also empowered to decrease energy consumption, thereby lowering peak demand charges and decreasing operating costs.

When an Eaton meter is used with Eaton trip units and relays incorporating built-in metering capabilities, the entire electrical distribution system can be cost-effectively managed.

Eaton is an industry leader offering a complete integrated solution to oversee your entire electrical distribution system. As a global manufacturer of low and medium voltage electrical distribution system equipment and components, Eaton is an experienced innovator of Metering Products that incorporate leading-edge technology. These innovations result from our scientific and engineering expertise, physical resources and the ongoing R&D programs at our technology centers.

Selection Chart

Table 3.0-1. Metering Selection Chart—Dimensions in Inches (mm)

Device Name Accessories See Page 3.1-18	Power Xpert Meter 4000/6000/8000 Series	Power Xpert Meter 2000 Series	IQ 250/260 Series
			
Section Page Number	3.1-1	3.1-20	3.1-32
Electrical Parameters			
Volts	0.1% of RV + 0.02% FS	0.1% of RV	0.1% of RV
Amperes	0.05% of RV + 0.01% FS	0.1% of RV	0.1% of RV
Current range (% of nominal)	0.005–20A (400%)	0.1–200%	0.1–200%
Watts	0.1% of RV + 0.0025% FS	0.2% of RV	0.2% of RV
VARs	0.1% of RV + 0.0025% FS	0.2% of RV	0.2% of RV
VA	0.1% of RV + 0.0025% FS	0.2% of RV	0.2% of RV
PF-apparent	0.1%	0.2% of RV	0.2% of RV
PF-displacement	0.1%	—	—
Frequency	±0.01 Hz	±0.03 Hz	±0.03 Hz
THD-voltage	127th	40th ^{②③④⑤}	40th ^⑥
THD-current	127th	40th ^{②③④⑤}	40th ^⑥
Watthours	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
VAR-hours	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
VA-hours	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
Ampere-demand	0.05% of RV + 0.01% FS	±0.1% per ANSI C12.20 0.2 Class	±0.1% per ANSI C12.20 0.2 Class
Watt-demand	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
VAR-demand	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
VA-demand	±0.2% per ANSI C12.20 0.2 Class ^①	±0.2% per ANSI C12.20 0.2 Class	±0.2% per ANSI C12.20 0.2 Class
Revenue accuracy	±0.2% per ANSI C12.20 0.2 Class ^①	ANSI C12.20 (0.2%)	ANSI C12.20 (0.2%)
Individual ampere harmonics	85th ^⑦	40th ^{③④⑤}	—
Individual voltage harmonics	85th ^⑦	40th ^{③④⑤}	—
Interharmonics	Yes ^{⑧⑨}	—	—
Minimum and/or Maximum Values			
Volts	L-L, L-N, N-G, VAUX L-L	L-L, L-N	L-L, L-N
Current	A, B, C, N, G	A, B, C, N	A, B, C
Power	Watt, VAR, VA	Watt, VAR, VA	Watt, VAR, VA
Power factor	Apparent/displacement	Apparent	Apparent
Frequency	Hertz	Hertz	Hertz
THD	Amperes/volts (L-L, L-N, AUX L-L)	Amperes/volts ^{②③④⑤}	Amperes/volts ^⑥
Demand values	kW, kVAR, kVA, amperes	kW, kVAR, kVA, amperes	kW, kVAR, kVA, amperes
Trend analysis	2/4 ^{⑧⑨} GB	256/512 ^{②/768} ^{③④⑤} MB	128 KB ^⑩
Event logging	2/4 ^{⑧⑨} GB	100,000 alarms/events with timestamp	—
Disturbance recording	2/4 ^{⑧⑨} GB, 60 cycles per event	768 MB, up to 64 cycles per event ^{④⑤}	—
Other Features			
Storage	2/4 ^{⑧⑨} GB	256/512 ^{②/768} ^{③④⑤} MB	128 KB for logging, up to 8 parameters every 15 minutes for 30 days ^⑩
PG output relays	5 maximum	Optional (2) Form C, 5 A or (4) Form A, 120 mA	Optional (2) Form C, 5 A or (4) Form A, 120 mA
PG analog outputs	—	Optional (4) 4–20 mA or (4) 0–1 mA	Optional (4) 4–20 mA or (4) 0–1 mA
Discrete contact inputs	8	Optional (2) or (4)	Optional (2) or (4)
Analog inputs	—	—	—
Synch-input kW utility	Via status input	Via end of interval pulse with optional digital inputs	Via end of interval pulse with optional digital inputs
Auxiliary voltage	Yes	—	—
kWh pulse initiator	Yes	Yes	Yes
Waveform display	Local/computer	^⑩	—
Waveform capture, samples/cycle	Yes, 512	Yes, up to 64 ^④ , up to 512 ^⑤	—
Frequency distribution display	—	—	—
Display type	LCD ^⑪	Red LED	Red LED
Display lines/character	Graphic (320 x 240 pixels)	3 lines, 4 characters	3 lines, 4 characters
Display character height	5.5 mm H x 4 mm W	0.56 (14.2) H	0.56 (14.2) H
Communications	Serial: Modbus RTU, Modbus ASCII, ^⑪ Network: Modbus TCP, Ethernet TCP/IP, HTTP, SNMP, SMTP, FTP, DNP 3.0	Serial: Modbus RTU, Modbus ASCII, DNP 3.0 Network: Modbus TCP, BACnet/IP, Ethernet TCP/IP, HTTP, HTTPS, SNMP, SMTP, ^{④⑤} Waveform FTP	Serial: Modbus RTU, Modbus ASCII, DNP 3.0 Network: Modbus TCP via Power Xpert Gateway
Setup configuration	Via Web browser/display	Via Web browser/display	Via configuration software/display
Dimensions inches (mm)	Meter: 8.82 (224.0) H x 8.22 (208.8) W x 6.72 (170.7) D Display: 9.02 (229.1) H x 7.80 (198.1) W x 2.49 (63.2) D	4.85 (123.2) H x 4.85 (123.2) W x 4.97 (126.2) D (see Page 3.1-26)	4.85 (123.2) H x 4.85 (123.2) W x 4.97 (126.2) D (see Page 3.1-34)
Operating temperature range	–20° to 60°C display unit –20° to 70°C meter base unit ^⑩	–20° to 70°C	–20° to 70°C
Reference literature	TD02601007E	TD02601017E	TD02601016E

① Under typical operating conditions.

② PXM 2260 only.

③ PXM 2270 only.

④ PXM 2280 only.

⑤ PXM 2290 only.

⑥ IQ 260 only.

⑦ Individual values reported to 85th harmonic; anti-alias filtering prevents higher frequencies from distorting readings (see IEC 61000-4-7).

⑧ PXM 6000 only.

⑨ PXM 8000 only.

⑩ At computer only.

⑪ Optional.

⑫ The auxiliary voltage option adds three additional voltage input channels to Power Xpert Meters.

⑬ Using <10 VA meter sourced 24V power.

Legend: PG = Programmable
FS = Full scale
RV = Read value

Auxiliary Voltage (Optional) = Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.
Interharmonics = Power Xpert Meter 6000/8000 supported.

Selection Chart

Table 3.0-1. Metering Selection Chart—Dimensions in Inches (mm) (Continued)

Device Name Accessories See Page 3.1-18	IQ Analyzer 6000 Series 	IQ DP-4000 Series 	IQ 230 Series 
Section Page Number	3.3-1	—	—

Electrical Parameters

Volts	±0.2% FS ^①	±0.3% FS	±0.5% FS
Amperes	±0.2% FS ^①	±0.3% FS	±0.5% FS
Current range (% of nominal)	3–800%	10–250%	1–200%
Watts	0.4% FS, 6 RV ^②	±0.6% FS	±1.0% FS
VARs	0.4% FS, 6 RV ^③	±0.6% FS	±1.0% FS
VA	0.4% FS, 6 RV ^②	±0.6% FS	±1.0% FS
PF-apparent	0.8% FS ^①	±1.0% FS	±2.0% FS
PF-displacement	0.8% FS ^①	±1.0% FS	±2.0% FS
Frequency	0.04% ^① or 0.01 Hz	±0.17% FS	±0.1% Hz
THD-voltage	50th	31st	—
THD-current	50th	31st	—
Watt-hours	0.5% RV ^②	±0.6% FS	±1.0% per ANSI C12
VAR-hours	1% RV ^③	±0.6% FS	±1.0% per ANSI C12
VA-hours	0.5% RV ^②	±0.6% FS	±1.0% per ANSI C12
Ampere-demand	±0.2% FS ^①	±0.3%	±0.5% per ANSI C12
Watt-demand	±0.4% FS ^①	±0.6%	±1.0% per ANSI C12
VAR-demand	±0.4% FS ^①	±0.6%	±1.0% per ANSI C12
VA-demand	±0.4% FS ^①	±0.6%	±1.0% per ANSI C12
Revenue accuracy	ANSI C12.20 (0.5%)	—	ANSI C12.1 (1%)
Individual ampere harmonics	50th	—	—
Individual voltage harmonics	50th	—	—
Interharmonics	—	—	—

Minimum and/or Maximum Values

Volts	L-L, L-N	L-L, L-N	L-L, L-N
Current	A, B, C, N, G	A, B, C	A, B, C
Power	Watt, VAR, VA	Watt, VAR, VA	Watt, VAR, VA
Power factor	Apparent/displacement	Apparent/displacement	Apparent/displacement
Frequency	Hertz	Hertz	Hertz
THD	Amperes/volts	Amperes/volts	—
Demand values	All	All	All
Trend analysis	Time/date	2 Alarms	④
Event logging	504 events w/timestamp	④	④
Disturbance recording	10 waveform events	—	—

Other Features

Storage	90 kB	15 Parameters	—
PG output relays	(4) 10A Form C ^⑤	(3) 10A Form C ^⑤	(2) 100 mA Form A
PG analog outputs	(4) 0–10/4–20 mA	—	—
Discrete contact inputs	(3) +30 Vdc Differential	(1) kW Demand ^⑤	(2) +30 Vdc differential
Analog inputs	(1) 0–20/4–20 mA	—	(1) 4–20 mA
Synch-input kW utility	At device or via communications	At device or via communications ^⑥	Via communications only
Auxiliary voltage ^⑦	—	—	—
kWh pulse initiator	Yes	Yes ^⑥	Yes
Waveform display	Local ^⑥ /computer	—	—
Waveform capture, samples/cycle	Yes, 128	—	—
Frequency distribution display	Local ^⑥ /computer	—	—
Display type	Graphic LCD with LED backlight	7 Segment LED	Backlit LCD
Display lines/character	7 lines, 147 characters	1 line, 7 characters	4 lines, 20 characters
Display character height	Up to 7 Lines	1 line	1.60 (40.6) H x 0.09 (2.3) W
Communications	Serial: INCOM ^⑧ Network: via Power Xpert Gateway ^⑧	Serial: INCOM ^⑧ Network: via Power Xpert Gateway ^⑧	Serial: INCOM, Modbus RTU ^⑧ Network: via Power Xpert Gateway
Setup configuration	Via configuration software/display	Via configuration software/display	Via configuration software/display
Dimensions inches (mm)	6.70 (170.2) W x 10.30 (261.6) H x 5.40 (137.2) D ^⑩	6.70 (170.2) W x 10.30 (261.6) H x 5.40 (137.2) D ^⑩	Refer to TD.17.06.T.E. (see Page 3.2-26)
Operating temperature range	–20° to 70°C	–20° to 70°C	0° to 50°C
Reference literature	TD1702BTE	TD1703ATE	TD1706TE

① From 3–300% of FS.

② At unity power factor and 5–300% of FS.

③ At a power factor < ±0.5 and 5–300% of FS.

④ At computer only.

⑤ Relays programmable to operate on any measured function.

⑥ Optional.

⑦ The auxiliary voltage option adds three additional voltage input channels to Power Xpert Meters.

⑧ An IPONI is required.

⑨ IQ 230M only.

⑩ Dimensions in mm = 170.2 W x 261.6 H x 137.2 D

Legend: PG = Programmable
FS = Full scale
RV = Read value

Auxiliary Voltage (Optional) = Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.

Interharmonics = Power Xpert Meter 6000/8000 supported.

Selection Chart

Table 3.0-1. Metering Selection Chart—Dimensions in Inches (mm) (Continued)

Device Name Accessories See Page 3.1-18	IQ 130/140/150 Series 	IQ 35M 	IQ 150S/250S Series 
Section Page Number	3.1-35	3.2-1	3.2-11

Electrical Parameters

Volts	0.25% of RV	0.4% +0.015% per °C deviation from 25°C	0.1% of RV
Amperes	0.25% of RV	0.4% (5–100%), 0.8% (1–5%) +0.015% per °C from 25°C	0.1% of RV
Current range (% of nominal)	0.1–200%	1–120%	0.1–200%
Watts	0.5% of RV ^①	0.5% per ANSI C12.20 and IEC 62053-22 Class 0.5S	0.2% of RV
VARs	0.5% of RV ^①	2.0% per IEC 62053-23 Class 2	0.2% of RV
VA	0.5% of RV ^①	Calculated: vector sum of watts and VARs	0.2% of RV
PF-apparent	0.5% of RV ^①	Calculated: watts/VAs	0.2% of RV
PF-displacement	—	—	—
Frequency	±0.03 Hz ^①	±0.02 Hz	±0.03 Hz
THD-voltage	—	—	—
THD-current	—	—	—
Watt-hours	±0.5% per ANSI C12.20 0.5 Class ^②	0.5% per ANSI C12.20 and IEC 62053-22 Class 0.5S	±0.2% per ANSI C12.20 0.2 Class
VAR-hours	±0.5% per ANSI C12.20 0.5 Class ^②	±2.0% per IEC 62053-23 Class 2	±0.2% per ANSI C12.20 0.2 Class
VA-hours	±0.5% per ANSI C12.20 0.5 Class ^②	—	±0.2% per ANSI C12.20 0.2 Class
Ampere-demand	±0.25% per ANSI C12.20 0.5 Class ^①	—	±0.1% per ANSI C12.20 0.2 Class
Watt-demand	±0.5% per ANSI C12.20 0.5 Class ^①	0.5% per ANSI C12.20 and IEC 62053-22 Class 0.5S	±0.2% per ANSI C12.20 0.2 Class
VAR-demand	±0.5% per ANSI C12.20 0.5 Class ^①	2.0% per IEC 62053-23 Class 2	±0.2% per ANSI C12.20 0.2 Class
VA-demand	±0.5% per ANSI C12.20 0.5 Class ^①	Calculated: vector sum of watts and VARs	±0.2% per ANSI C12.20 0.2 Class
Revenue accuracy	ANSI C12.20 (0.5%)	0.5% per ANSI C12.20 and IEC 62053-22 Class 0.5S	ANSI C12.20 (0.2%)
Individual ampere harmonics	—	—	—
Individual voltage harmonics	—	—	—
Interharmonics	—	—	—

Minimum and/or Maximum Values

Volts	L-L, L-N	—	L-L, L-N
Current	A, B, C	—	A, B, C,
Power	Watt, VAR, VA ^①	—	Watt, VAR, VA
Power factor	Apparent ^①	Apparent (low alert)	Apparent
Frequency	Hertz ^①	Hertz (out of range alert)	Hertz
THD	—	—	—
Demand values	kW, kVAR, kVA, amperes ^①	kW, kVAR, kVA; maximum kW, kVAR, kVA	kW, kVAR, kVA, amperes
Trend analysis	^③	—	2 MB ^⑤
Event logging	^③	Logging on demand interval or Modbus command ^④	2 MB ^⑤
Disturbance recording	—	—	—

Other Features

Storage	—	10 registers (16 bit) by 5760 entries each (115 KB) ^④	2 MB ^⑤
PG output relays	—	—	—
PG analog outputs	—	—	—
Discrete contact inputs	—	2-pulse inputs with BACnet	—
Analog inputs	—	—	—
Synch-input kW utility	—	Optional demand synchronization via Modbus	—
Auxiliary voltage ^⑥	—	—	—
kWh pulse initiator	^④	Yes	Yes
Waveform display	—	—	—
Waveform capture	—	—	—
Frequency distribution display	—	—	—
Display type	Red LED	Backlit LCD	Red LED
Display lines/character	3 lines, 4 characters	2 lines by 5 characters each (full alphanumeric top row)	3 lines, 4 characters
Display character height	0.56 (14.2) H	7.5 mm	0.56 (14.2) H
Communications	Serial: Modbus RTU, Modbus ASCII ^④ Network: Modbus TCP ^④	Serial: Modbus RTU ^④ , BACnet MS/TP ^④ Network: Modbus TCP via Power Xpert Gateway	Serial: Modbus RTU, Modbus ASCII, DNP 3.0 Network: Modbus TCP, wired or wireless
Setup configuration	Via configuration software/display	Via display/configuration software	Via configuration software/display
Dimensions inches (mm)	4.85 (123.2) H x 4.85 (123.2) W x 4.97 (126.2) D (see Page 3.1-37)	3.60 (91.4) H x 4.20 (106.7) W x 2.30 (58.4) D (see Page 3.2-4)	7.90 (200.7) H x 7.50 (190.5) W x 3.10 (78.7) D
Operating temperature range	–20° to 70°C	Meter: –30° to 70°C Display: –10° to 50°C	–20° to 70°C
Reference literature	TD02601016E	TD02601018E	TD02601019E

^① IQ 140/150.^② IQ 150 only.^③ At computer only.^④ Optional.^⑤ IQ 250S only.^⑥ The auxiliary voltage option adds three additional voltage input channels to Power Xpert Meters.

Legend: PG = Programmable

FS = Full scale

RV = Read value

Auxiliary Voltage

(Optional)

= Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.

Interharmonics

= Power Xpert Meter 6000/8000 supported.

Selection Chart

Table 3.0-1. Metering Selection Chart—Dimensions in Inches (mm) (Continued)

Device Name Accessories See Page 3.1-18	Power Xpert Multi-Point Meter	Power Monitoring/ Metering Module (PM3)	IQ Energy Sentinel
			
Section Page Number	3.2-16	3.2-33	3.2-27

Electrical Parameters

Volts	±0.2% RV	±0.5% of RV	—
Amperes	±0.2% RV	±0.5% of RV	—
Current range (% of nominal)	—	—	—
Watts	±0.5% RV	±1.0% of RV	±1.0% FS
VARs	±0.5% RV	±1.0% of RV	—
VA	±0.5% RV	±1.0% of RV	—
PF-apparent	±0.5% RV	±2.0% of RV	—
PF-displacement	—	—	—
Frequency	±0.1 Hz	±0.1 Hz	—
THD-voltage	—	—	—
THD-current	—	—	—
Watt-hours	±0.5% per ANSI C12.20 0.5 class	±1.0% per ANSI C12.1	±1.0% FS
VAR-hours	±0.5% per ANSI C12.20 0.5 class	±1.0% of RV	—
VA-hours	±0.5% per ANSI C12.20 0.5 class	±1.0% of RV	—
Ampere-demand	—	—	—
Watt-demand	±0.5% per ANSI C12.20 0.5 class	—	±1.0% FS
VAR-demand	±0.5% per ANSI C12.20 0.5 class	—	—
VA-demand	±0.5% per ANSI C12.20 0.5 class	—	—
Revenue accuracy	ANSI C12.20 (0.5%)	±1.0% per ANSI C12.1	—
Individual ampere harmonics	—	—	—
Individual voltage harmonics	—	—	—
Interharmonics	—	—	—

Minimum and/or Maximum Values

Volts	L-L, L-N	—	—
Current	A, B, C	—	—
Power	Watts, VAR, VA	—	—
Power factor	Apparent	—	—
Frequency	Hertz	—	—
THD	—	—	—
Demand values	Watts (Delivered & Received), Watts (Q1–Q4), VA (Q1, Q4), VA (Q2, Q3)	—	—
Trend analysis	Interval data	—	①
Event logging	20 latest events and historical	—	①
Disturbance recording	—	—	—

Other Features

Storage	256 MB standard, 2 GB optional	—	—
PG output relays	1 standard, 8 each module ③	—	—
PG analog outputs	—	—	—
Discrete contact inputs	3 standard, 8 each module ③	Circuit breaker status	—
Analog inputs	—	—	—
Synch-input kW utility	Via communications and digital input	—	Via communications only
Auxiliary voltage ②	—	—	—
kWh pulse initiator	Aggregate or main-digital output, LED output on meter modules (accuracy check)	—	—
Waveform display	—	—	—
Waveform capture	—	—	—
Frequency distribution display	—	—	—
Display type	LCD color touchscreen ③	—	—
Display lines/character	6-inch diagonal	—	—
Display character height	Graphics	—	—
Communications	Serial: Modbus RTU ③ Network: Modbus TCP, BACnet/IP, Ethernet TCP/IP, HTTP, HTTPS, SNMP, SMTF, SFTP	Serial: INCOM, Modbus RTU Network: via Power Xpert Gateway	Serial: INCOM Network: via Power Xpert Gateway
Setup configuration	Via PXMP configuration software	—	Via configuration software
Dimensions inches (mm)	Refer to TD150006EN (see Page 3.2-25)	Refer to IL01219085E	Refer to TD.17.07.T.E. (see Page 3.2-32)
Operating temperature range	–20° to 70°C	–25° to 70°C	–25° to 70°C
Reference literature	TD150006EN	IL01219085E	TD1707TE

① At computer only.

② The auxiliary voltage option adds three additional voltage input channels to Power Xpert Meters.

③ Optional.

Legend: PG = Programmable
FS = Full scale
RV = Read value

Auxiliary Voltage (Optional) = Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.

Interharmonics = Power Xpert Meter 6000/8000 supported.

Power Xpert Meter 4000/6000/8000 Series



**Power Xpert Meter 4000/6000/8000
Series Display and Meter Base**

General Description

The Power Xpert Meter 4000/6000/8000 Series monitors the critical aspects of an electrical distribution system. This premier power quality metering instrument is simple to use, powerful, scalable and highly flexible.

The Power Xpert Meter 4000/6000/8000 offers a new level of intuitive user interface design, presenting critical electrical distribution system information in simple-to-navigate and easy-to-understand information architecture. The Power Xpert Meter 4000/6000/8000 Graphic Display visualizes the information from up to 16 meter modules. The embedded Web server displays complex power quality data using standard Internet browsers and allows for device configuration from the browser.

Both the local graphic display and the embedded Web server present real time, historical and event information in a browser-style graphical format to help the user interpret key circuit information, such as:

- Current loading
- Voltage and power levels
- Power factor
- energy usage
- I/O status
- Power quality measurements
- Harmonic plots
- Disturbance and transient waveforms
- ITIC disturbance summary screen

The Power Xpert Meter 4000/6000/8000 Series Graphic Display uses a simple “twist and click” navigation control dial to easily navigate the menus and drill down into increasing levels of important detail. A “back” key enhances the browser-like navigation of the graphic display.

The Web server provides the energy and demand readings required to help manage the cost of energy. It also provides critical information regarding power quality, such as harmonic distortion, flicker, crest factor, K-Factor and more.

Note: Features and functionality may vary depending on the meter model and options being used. Review the Features and Benefits chart in **Table 3.1-2** for details.

Application Description

Identify Power Quality Problems to Help:

- Identify harmonics, sags, swells and transients damaging or disrupting sensitive, mission-critical IT equipment
- Boost IT equipment’s service life to the maximum
- Analyze sequence of events up to 1 millisecond time resolution
- Protect motors from damage
- Preserve the integrity of processes and batches
- Prevent blown capacitor bank fuses
- Protect transformers and conductors from overheating

Detect and Record High-Speed Transients to Help:

- Avoid equipment damage and disruption
- Identify equipment malfunction

Monitor Circuit Loading to Help:

- Avoid overloads and nuisance overload trips
- Maximize equipment utilization
- Manage emergency overloads

Manage Energy Utilization to Help:

- Reduce peak demand charges and power factor penalties
- Identify excessive energy consumption

Metered/Monitored Parameters

Note: See **Table 3.1-2**.

- Volts: L-L, L-N, Avg. L-L, Avg. L-N, N-G
- Phase neutral and ground currents
- Power: real, reactive and apparent
- Frequency
- Power factor: apparent and displacement
- Energy
- Demand
- % THD
- Minimum and maximum values
- Harmonics
- Flicker
- Individual harmonics
- Interharmonics
- % TDD
- ITIC events plot, duration, magnitude
- Energy comparisons
- Demand comparisons
- Event calendar
- Event timeline and sequence
- Number of 9’s of availability
- Phasors
- Sequence components
- Crest factor
- K-Factor
- PQ index

Accuracy

- Currents: 0.05% RV + 0.025%FS
- Voltage: 0.1% RV + 0.025% FS
- Energy, and demand power: 0.2% in accordance with ANSI C12.20
- Frequency: ± 0.01 Hz
- Power factor:
 - 0.10% at Unity PF
 - 0.30% at 0.5 PF

Power Xpert Meter 4000/6000/8000 Series

Communications

Multiple communications ports including:

Standard

- RS-485 remote display port
- RS-485 Modbus RTU Slave port
- RJ-45 10/100Base-T Local Configuration Port (local Web server connection)
- HTTP (local), FTP, COMTRADE

Optional

- Communications Expansion Card (CEC)
 - Selectable 100FX or 10/100Base-T Ethernet network port
 - RS-485 Modbus RTU Selectable Master/Slave port
 - RS-232 Modbus RTU Slave port
 - HTTP (remote), Modbus TCP, SNMP, SMTP, NTP, DNP 3.0

For Optional Graphic Display

Note: Display ports restrict access to up to 16 Power Xpert Meter 4000/6000/8000 meter modules located on the display RS-485 network.

- RS-485 meter display network port
- RJ-45 10/100Base-T for access to Local Display Power Xpert network

Communication Protocols Supported

- Modbus RTU
- Modbus TCP
- Ethernet TCP/IP
- HTML
- NTP (Network Time Protocol)
- FTP (File Transfer Protocol)
- SMTP (Simple Mail Transfer Protocol)
- SNMP (Simple Network Management Protocol)
- COMTRADE (IEEE C37.111-1999)
- DNP 3.0 over Ethernet (Distributed Network Protocol)

Physical Characteristics

Two-Piece Design

- Power Xpert Meter 4000/6000/8000 meter module
- Power Xpert Meter 4000/6000/8000 Graphic Display 320 x 240 pixel backlight LCD remote graphics display (supports up to 16 Power Xpert Meter 4000/6000/8000 meter modules)

Display/Meter Mounting Options

- Remotely mount the display up to 2000 ft (1210m) away from 1 to 16 Power Xpert Meter modules
- Mount the display and Power Xpert Meter module on opposite sides of a panel. 15 additional meter bases can be remotely mounted

Meter Base Unit Characteristics

- Height: 8.88 inches (225.6 mm)
- Width: 9.56 inches (242.8 mm)
- Depth: 6.72 inches (170.8 mm) including optional wall mounting brackets
- NEMA rating: NEMA 1, IP3Ø

Display Unit Characteristics

- Height: 9.02 inches (229.0 mm)
- Width: 7.80 inches (198.1 mm)
- Depth:
 - 1.45 inches (36.8 mm) behind panel surface
 - 1.04 (26.3 mm) projection in front of panel surface
- NEMA rating: NEMA 12, IP42 front of panel rating

Standards and Certifications

- Safety: EN61010-1, UL/cUL 61010-1
- Accuracy: IEC/EN60687 0.2 class, ANSI C12.20 0.2 Class
- EMC: FCC Part 15 Subpart B Class A EN55011 Class A
- Measurement Canada approval AE-1898 (4000/6000 meters)
- Immunity IEC 61326
- CE Mark

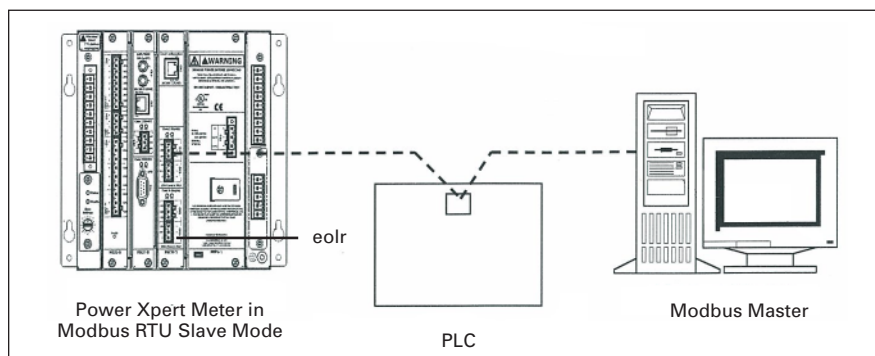


Figure 3.1-1. RS-485 Network

1. When using Modbus RTU over an RS-485 communications network, the data rate, data protocol (data bit, stop bit and parity) and wiring topology (two-wire or four-wire) must be the same for each of the devices.
2. Connections should be made using communication/control shielded cable equivalent to Belden cable p/n 9463.

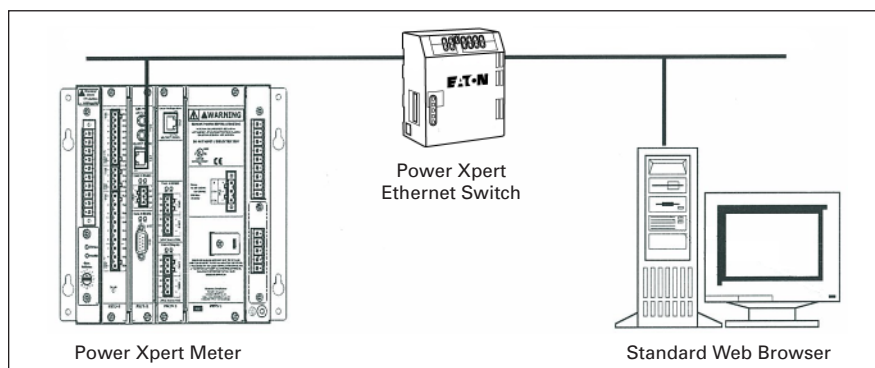


Figure 3.1-2. Ethernet Network

1. Optional Ethernet Communications Card must be ordered with the meter.
2. Available Ethernet connections are: 10Base-T and ST fiber.

Ease-of-Use—Power Xpert Meter 4000/6000/8000 Graphic Display (Option)

The Power Xpert Meter 4000/6000/8000 display features a large easy-to-read white backlit graphic LCD. The information presented by the display is organized into an information architecture that is easy-to-navigate and organized for simplicity. Screen navigation is accomplished using a navigation control dial and a “back” button. The user simply twists the knob on the navigation control dial to move between menu selections and drill down links on the screen. When the selection is highlighted, pressing the dial makes the selection. Information is displayed from a single meter or an RS-485 daisychain of up to 16 meters. The display features a rich set of screens including real-time data, trend plots, waveform views and an ITIC Plot. The graphic display allows basic device setup and password protected resets. An audible alarm is available to annunciate alarm conditions.

Power Xpert Meter 4000/6000/8000 Embedded Web Server

The Power Xpert Meter 4000/6000/8000 embedded Web server offers Eaton customers a new level of accessibility to the critical information required to manage their electrical distribution system. The Web server includes real-time circuit information in both numeric and graphical visual formats to help monitor circuit parameters such as current loading, voltage and power levels, power factor, THD, Flicker and more. The Web server also provides energy and demand readings with graphic usage plots to help analyze energy usage patterns. Energy readings include kWh, kVARh, delivered and received and kVAh with time of use and RTP displays. The interval energy usage plot includes the ability to do week-to-week and month-to-month energy consumption graphical comparisons for benchmarking purposes. The embedded Web server will also display in simplified Chinese if connected to a computer configured for Chinese language.

Both the Power Xpert Meter 4000/6000/8000 embedded Web server and the local graphic display support graphical trend charts of key circuit measurements such as current, voltage, power and energy. The trend chart supports a zoom feature that allows the user to view data over a short period of 16 hours up to 4 years. The trend chart includes zoom in/out buttons and a horizontal slider bar control to manage scrolling forward and backward through the data. Trend charts of basic readings include minimum, maximum and average readings. Trend charts of interval by interval energy data also display peak demand.

Note: For remote access and networking capabilities such as connecting to a LAN/WAN, use the optional Communications Expansion Card (CEC).

Sag/Swell/Transient Capture and Recording

60 cycles of waveform are oversampled at 4096 samples per cycle (Power Xpert Meter 4000/6000), filtered through anti-aliasing and recorded at 512 samples per cycle and post event data. The Power Xpert Meter 8000 samples at a rate of 100,000 samples per cycle. Embedded Web server supports viewing of triggered waveforms one channel at a time and includes the ability to zoom and to scroll horizontally using a slider bar.

The Power Xpert Meter 6000/8000 Series have preconfigured (600V and below) trigger settings for sags, swells and transients, and do not require additional setup by the user. Waveforms are stored in non-volatile flash memory using an industry standard COMTRADE format. Waveforms can be automatically sent out as COMTRADE attachments to an e-mail following an event, or can be retrieved from an FTP (File Transfer Protocol) directory structure in the Power Xpert meter module's memory.

Historical Trend Logging

The Power Xpert Meter 4000/6000/8000 records historical data for graphical viewing from the Local display or the embedded Web server. Graphical views of historical data support pan and zoom. 145 standard metering parameters are logged as part of the standard meter functionality including min./max. and average for each parameter. The averages are calculated over the interval period. The minimum and maximum readings are based on 200 ms calculations.

Storage capacity for standard trend plots includes all of the following intervals:

- Every 5 minutes for 48 hours (2 days)
- Every 15 minutes for 192 hours (8 days)
- Every hour for 28 days (4 weeks)
- Every 8 hours for 56 weeks
- Every week for 44 months

Note: Trend plot data can be easily exported to third-party applications, such as Microsoft Excel in csv-file format.

In addition, metered parameters are automatically stored on the built-in FTP Servers, where they can be easily copied and imported into third-party applications for benchmarking and analysis. Logs on the FTP Server include the min./max. and average for 145 standard metering parameters at 5-minute intervals.

Storage capacity for trend data: 63 days of 5-minute interval trend data. Capacity=18,144 intervals.

Power Xpert Meter 4000/6000/8000 Series

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Energy Profile Data

The Power Xpert Meter 4000/6000/8000 records Real and Reactive energy forward, reverse, net and absolute sum, as well as Apparent energy (kVAH). Up to eight status inputs can be configured as energy accumulators for counting KYZ pulse inputs (option). These readings are stored over a configurable interval from 1 to 60 minutes, as well as in daily and weekly totals.

With the optional LAN/WAN Ethernet Communication Expansion Card, users can easily configure the meters to send periodic e-mails at user-defined intervals of energy consumption and power demand. E-mails contain a summary of readings per rate structures and also have the actual measurements attached to the e-mail's body as a CSV file in a ZIP container.

In addition, metered parameters are automatically stored on the built-in FTP Server, where they can be easily copied and imported into third-party applications for benchmarking and analysis. Logs on the FTP Server include energy consumption logs, one for every month in CSV file format, trended measurement logs also in CSV file format and waveform captures in COMTRADE file format.

Storage capacity for energy profile data:

- 62 days of 15 minute interval energy and pulse interval data
- (Fixed interval capacity = 5952 intervals. Configurable intervals from 1 to 60 min)
- 372 days of 1 day accumulated energy and pulse interval data
- 208 weeks of 1 week accumulated energy and pulse interval data

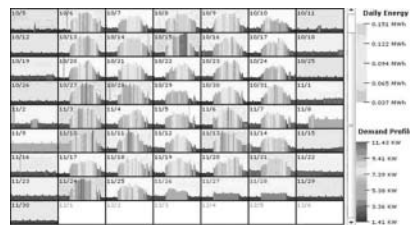
Energy and Demand Comparisons

Energy and demand usage patterns can be analyzed with the month-to-month, week-to-week comparison chart built into the meter. Raw data can be exported with the "Save Table" option to other applications, such as Excel, for further analysis and graphing.

Power Xpert Meter Profiler—Free Download

The Power Xpert Meter Profiler is a free energy-management software download, compatible with the Power Xpert Meter 4000/6000/8000, allowing a comparison of expected or baseline energy consumption patterns to actual usage, and flagging areas of concern using deviations from modeled energy patterns. These deviations point to targets as they hunt for energy consumption offenders in their facility.

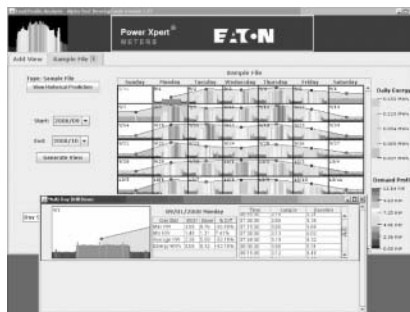
By applying pattern analysis techniques and intelligently using color and shape to convey the results, the Power Xpert Meter Profiler provides the user an easy-to-understand visualization of energy usage, thus offering information for proactive energy management.



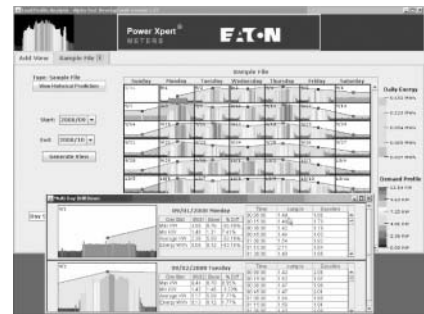
Calendar Usage View

Features and Benefits

- Develops a baseline of energy demand for management analysis
- Easily identifies periods of high energy demand at-a-glance by day, week and month
- Allows for a daily, weekly, monthly comparison of energy usage compared to baseline
- Allows for detailed comparison of multi days energy usage
- Offers multi views of energy usage and baseline comparisons to quickly identify anomalies



Daily Detailed Energy Usage View



Multi-Day Detail Comparison View

The Profiler uses the previous 9 weeks of data for the energy use baseline, but you can manually add more values to the baseline.

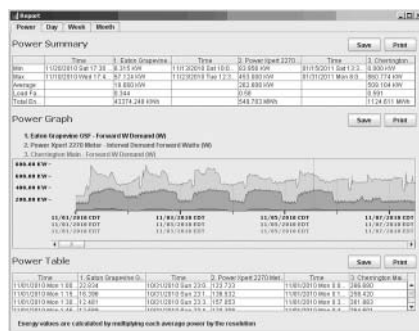
The Power Xpert Meter Profiler is also a predictor: It can predict what energy consumption would be expected later in a day. The Real-Time view generates a baseline from the last two months and makes a prediction of the future load. The view represents the current day (today), and shows three graphs: the baseline for the day, the historical data (up to present) and the predicted future data. Instantaneous data is retrieved and averaged to keep the graphs up-to-date. The averaged values are shown as shapes at the current time: Instantaneous, 1-minute average and 15-minute average.

In addition, users can add the data from two different Power Xpert Meter 4000/6000/8000s into one calendar view. The profiler will mathematically combine the two loads into a totalized view. It is also possible to change the percentage contribution of each meter, as well as subtract a portion of one meter from another.

To download the tool, go to www.eaton.com/pxm and click on the link for the Power Xpert Meter Profiler. Registration will be required to download.

Eaton Power Xpert Energy Viewer—Free Download

The Power Xpert Energy Viewer (PXEV) provides the means to develop an energy usage baseline for energy management programs, comparing interval logged data points. It is a free Web download for compatible Eaton product home pages. This tool allows easy interpretation of the data collected by compatible devices via graphical charts, graphs and reports without having to export the available .csv file into Microsoft® Excel® or another tool. See **Page 3.1-31** for more information.



Comparison Summary

Event Triggers

The Power Xpert Meter 4000/6000/8000 supports five types of configurable event triggers:

- Out of limits (4000/6000/8000)
- Demand overload (4000/6000/8000)
- Sub-cycle disturbance (4000/6000/8000)
- ITIC (6000/8000)
- Fast transient (8000)

These triggers permit pickup, reset and pickup delay to be configured by the user. When a trigger occurs, actions include Performance Monitoring (#9's analysis), Capturing Waveform, Capture Parameters, Send E-mail and Operate a Relay Output. The Graphic Display flashes an LED to annunciate the alarm condition. An audible alarm is also available.

Trigger options include:

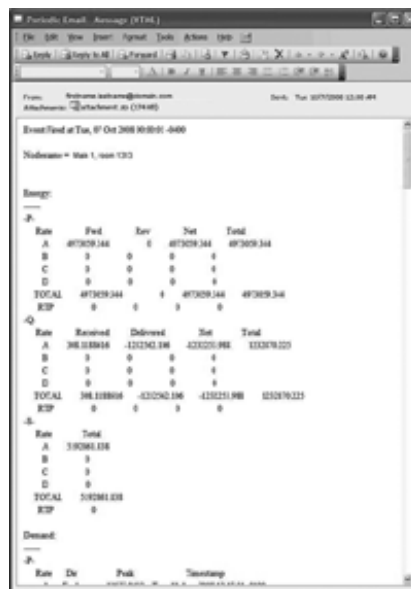
- Out of limits: over 100 triggers
- Demand overload: 10 triggers
- ITIC: eight triggers
- Fast transient: dV/dT and absolute per phase
- Sub-cycle disturbance—dV/dT and absolute

Event Logging

The Power Xpert Meter 4000/6000/8000 local graphic display or the embedded Web server both 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 includes a variety of activities including acknowledged triggers, new min. and max. events, and system operations such as resets. The size of the event log is virtually unlimited based only on the memory option selected.

E-mail Notification

With the optional LAN/WAN Ethernet Communication Expansion Card attached to the Power Xpert Meter 4000/6000/8000, the users can easily configure the meters to send periodic e-mails at user-defined intervals for energy consumption and power demand. E-mails contain a summary of readings per rate structures and also have the actual measurements attached to the e-mail's body as a CSV file in a ZIP container. Prompt alarm e-mails can also be sent for any event condition either standard in the meter or ones set up by the user based on thresholds, dV/dt triggers or IO status changes with the optional IO Card. Alarm e-mails can be configured to have the COMTRADE waveform capture attached to the e-mail's body.



Periodic E-mail Message

ITIC Analysis Plot

The Power Xpert Meter graphic display (option) and Web server (option) include a graphic representation of the ITIC plot (Power Xpert Meter 6000/8000) with counts of disturbances and transients that have occurred. The ITIC plot organizes events into eight distinct disturbance zones corresponding to severity and a 9th zone for transients. A pass/fail count is displayed to indicate how many events are outside the ITIC limits. Clicking on any counter in the ITIC Web page will link the user to the event view and display all triggered events in the selected zone. This makes it simple to view disturbance waveforms associated with the ITIC plot.

A separate ITIC graph is available to review individual ITIC events. This graph will show the user the event hit position on the graph and the event duration and magnitude.

Inputs and Outputs

Power Xpert Meter 4000/6000/8000 is available with an optional digital I/O card that includes:

- Eight digital inputs—self sourced 24 Vdc
- Three relay outputs—5A max. continuous, 240 Vac max., 30 Vdc max.
- Two solid-state outputs—80 mA max. continuous, 30 Vdc max.

Each of the eight inputs are interrupt driven, allowing for 1 ms accuracy of digital events time stamps (1 ms accuracy requires local NTP TimeServer). Inputs can also be configured for demand synch, and pulse counting. Inputs selected for pulse counting can be scaled. Interval by interval pulse recordings are maintained in profile memory and can be displayed graphically. Outputs can be used for KYZ, or alarm annunciation.

Power Xpert Meter 4000/6000/8000 Series

Ratings

- Application to 500 kV, no PTs to 600V
- CT ratios selectable from standard 120/600 Vac line
- CT inputs accept 5A secondary
- Power supply: standard 120/240 Vac or 110/250 Vdc

Storage Capacity

Table 3.1-1. Power Xpert Meter 4000/6000/8000 Estimated Memory and Storage Capacity with 2/4/8 GB Memory Capacity

Model	Memory	Event	File Size (KB)	Occurrence Per Month ^①		Memory Usage (MB)		Months of Capacity with 8 GB Memory ^②	
				Typical	Severe	Typical	Severe	Typical	Severe
PXM 4000	2 GB	Subcycle disturbance	1260	10	60	12.3	73.8	166	28
PXM 6000	4 GB	ITIC event	1260	5	20	6.2	24.6	666	166
		Subcycle disturbance	1260	10	60	12.3	73.8	333	55
		ITIC + subcycle disturbance	Total--->	15	80	18.5	98.4	222	42
PXM 8000	8 GB	ITIC event	1260	5	20	6.2	24.6	1332	333
		Subcycle disturbance	1260	10	60	12.3	73.8	666	111
		Transients	2048	3	30	6.0	60.0	1365	137
		ITIC + subcycle disturbance + transients	Total--->	18	110	24.5	158.4	335	52

^① The typical and severe power quality event occurrences are estimates and may vary depending on the electrical environment.

^② Memory is not allocated by event category; memory is used first come, first served.

Power Xpert Meter 4000/6000/8000 Series

Power Xpert Meter 4000

- Harmonics
- Disturbance capture
- Low frequency transient detection and capture
- Standard power quality index
- 2 GB data logging

Power Xpert Meter 6000

- Harmonics, including individual harmonics
- Flicker calculations
- ITIC performance curve
- Event calendar view
- Events timeline view
- Sequence of events waveform plot
- Enhanced power quality index
- 4 GB data logging

Power Xpert Meter 8000

- Impulsive transient capture at 6 MHz
- 100,000 samples per cycle
- Premium power quality index
- 8 GB data logging

3

Table 3.1-2. Power Xpert Meter 4000/6000/8000—Features and Benefits

Feature	Power Xpert Meter			Benefit
	4000	6000	8000	
General				
Embedded Web server	■	■	■	Use a standard Web browser to monitor and manage the meter over the network, Internet.
TOU metering support	■	■	■	Time of usage can be set up to support four different schedules.
Firmware flash update support	■	■	■	Enables you to flash the meter with the latest firmware updates.
Self-learning capability (characterizes “normal” per circuit)	■	■	■	The meter can automatically adjust to the environment and alarm only when “real” events occur.
Power, Energy and Demand				
Voltage, current: per phase minimum, maximum, average, trend graph analysis, export, print	■	■	■	Review voltage and current trends, export, print and analyze parameters right on the meter or external software.
Energy and demand plot comparisons month-to-month, week-to-week	■	■	■	Plot two months or two weeks for vivid energy or demand comparison.
Power: power factor, apparent, real, reactive, frequency	■	■	■	Review power usage and power factor and avoid potential PF penalties.
Energy, demand: forward, reverse, net, sum, TOU, profile, previous month comparison, graph analysis, export, print	■	■	■	Keep track of your energy usage, compare time of usage and usage against previous month, identify peaks to conserve energy usage.
Power Quality Analysis				
Statistical analysis (minimum, maximum, average)	■	■	■	Review statistical trends, identify past and future problem areas.
Sag and swell monitoring, management and recording	■	■	■	Capture electrical sags and swells and analyze the waveforms.
Symmetrical components: zero, negative, positive	■	■	■	Analyze possibly unbalanced three-phase power systems.
Low frequency transient detection and capture	■	■	■	Capture lower frequency transient waveforms for retrospective analysis or e-mailing.
Sampling rate, maximum samples/cycle	4096 ①	4096 ①	100,000	Extremely high sampling rate will effectively capture impulsive transients.
“Number of Nines” uptime data (e.g., 6 nines=99.9999%)	■	■	■	Review uptime availability per cent.
K-factor	■	■	■	Review the ratio of eddy current losses, e.g., when driving non-linear and linear loads.
Crest factor	■	■	■	Review the peak-to-average ratio of the waveform.
Security				
Secure 5 level user access privileges	■	■	■	Define appropriate security access level per user.

① Delta-Sigma A/D oversampling rate.

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

Power Xpert Meter 4000/6000/8000 Series

Table 3.1-2. Power Xpert Meter 4000/6000/8000—Features and Benefits (Continued)

Feature	Power Xpert Meter			Benefit
	4000	6000	8000	
Communications and I/O				
Modbus TCP	■	■	■	Easy integration with standard protocol to power management and other software.
Modbus RTU	■	■	■	Integrate meters to existing Modbus networks, daisy chain several (1–16) meters together.
HTML	■	■	■	Communicate to the meter over the Internet via standard Web browser.
SNMP (Simple Network Management Protocol)	■	■	■	Communicate with the meter via Simple Network Protocol; hook to existing NMS system.
SMTP (Simple Mail Transfer Protocol)	■	■	■	Send e-mail messages via standard Simple Mail Transfer Protocol.
FTP (File Transfer Protocol)	■	■	■	Access, copy, paste, cut waveform capture files on the meter with an FTP Client.
NTP (Network Time Protocol)	■	■	■	Network Time Protocol support enables the meter to synchronize time over the network up to the 1 millisecond resolution.
COMTRADE, open IEEE standard file format for waveform capture export	■	■	■	Import waveform captures in standard IEEE (C37.111-1999) COMTRADE file format to third-party software.
DNP 3.0 over Ethernet (Distributed Network Protocol)	■	■	■	Communicate with the meter via DNP 3.0 over Ethernet, hook to existing utility systems.
Trend measurements CSV file export	■	■	■	Easily export trend measurements to third-party applications, e.g., Microsoft Excel in standard CSV file format.
I/O (eight digital inputs, three relay outputs, two solid-state KYZ outputs)	■	■	■	The Power Xpert Meter I/O Card is extremely flexible and can be used in a large variety of different applications. Digital inputs and relay outputs can be programmed to interact during various conditions defined by the user. Various third-party devices, such as alarm, pulse meters, trip units, sensors can be easily integrated to the Power Xpert Meter. Triggers and events can be tied to the meters standard functions such as, e.g., e-mail, logs and trends.
Time Synchronization				
NTP time synchronization up to 1 millisecond accuracy	■	■	■	Network Time Protocol support enables the meter to synchronize time over the network up to the 1 millisecond resolution
GPS time synchronization up to 1 millisecond accuracy	■ ^①	■ ^①	■ ^①	The GPS option allows the meter to synchronize time over the GPS satellite positioning system up to the 1 millisecond resolution
Logs				
Trend logging	■	■	■	Log trend information for easy statistical analysis.
Load profile	■	■	■	Review the load profile graph to get a better understanding of your electrical load versus time.
Event logging	■	■	■	Log events for retrospective event analysis.
Memory and Storage				
Standard memory, GB	2	4	8	Store large amounts of waveform captures and events for historical analysis.
Harmonics				
Harmonic levels	127	127	127	Provides extremely fast, high resolution D/A conversion.
Total Harmonic Distortion (THD)	■	■	■	Review the total harmonic distortion level directly on the meter.
Delta-Sigma D/A conversion technology	■	■	■	Provides extremely fast, high resolution D/A conversion.
Harmonics over-sampling (4096 samples per cycle)	■	■	■	Over-sampling enables the usage of Anti-Aliasing technology, increasing accuracy.
Anti-alias filtering	■	■	■	Technology to remove out-of-band signal components resulting in more accurate data.
Individual harmonics	■	■	■	Review individual harmonic levels directly on the meter.
Total Demand Distortion (TDD)	■	■	■	Identify harmful harmonics in, e.g., lightly loaded variable-speed drive environments where THD may be high but not relative.
Interharmonics		■	■	Interharmonics allow you to see what is going on between the integer multiples of the fundamental. Zoom in on the harmonics trend graph and review frequency content every 5 Hz instead of every 60 Hz.

① When used with third-party device and I/O option.

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

Power Xpert Meter 4000/6000/8000 Series

Table 3.1-2. Power Xpert Meter 4000/6000/8000—Features and Benefits (Continued)

Feature	Power Xpert Meter			Benefit
	4000	6000	8000	
Highlights				
Subcycle disturbance capturing	■	■	■	Capture fast voltage changes/low frequency transient (e.g., capacitor switching transient).
dV/dt triggers for subcycle oscillatory transients	■	■	■	Detect and record a large magnitude oscillation transient resulting in equipment damage.
Absolute threshold and dV/dt triggering	■	■	■	Detect and record if a surge suppressor is necessary.
Power quality index—standard (includes dv/dt count, %TDDi and %THDv)	■	■	■	Complex power quality data put into simple graphic format.
Power quality index—enhanced (includes standard index plus Sag level, swell level and flicker)		■	■	Complex power quality data put into simple graphic format (includes ITIC events and flicker calculations).
Flicker calculations		■	■	Detect and quantify low frequency rms voltage variations causing incandescent lighting flicker.
Automatic trigger setting		■	■	Trigger thresholds are automatically set according to ITIC (CBEMA) standard, no need to figure this out by yourself.
Automatic event severity analysis		■	■	Automatically analyze the severity of the event with the ITIC (CBEMA) performance curve plot, see where the event actually hit.
Event severity counters		■	■	An ITIC (CBEMA) event counter keeps track of the number of all sags, swells and transients.
ITIC (Information Technology Industry Council), previously CBEMA performance curve		■	■	ITIC (Information Technology Industry Council), previously CBEMA performance curve for easy power problem evaluation.
Custom ITIC (CBEMA) plot with individual event magnitude and duration		■	■	Review custom ITIC (CBEMA) plots of individual events showing you the actual magnitude, duration and hit are in a simple graphical representation.
Event calendar view		■	■	The Events Timeline calendar view provides instant insight to the frequency of power events and helps detect reoccurring problems.
Events timeline view		■	■	View and understand the sequence of events that have occurred during a period of time.
Sequence of events and events plot on waveform		■	■	Plot color-coded events on a captured waveform to gain insight into the sequence of events cycle per cycle.
Power quality index—premium (includes enhanced index plus counts of impulsive transients)			■	Complex power quality data put into simple graphic format (includes ITIC events and flicker calculations).
High-Speed Transient Capture and Detection				
6 MHz capture of impulsive transients			■	Capture impulsive transients by taking six samples every millionth of a second.
Transient capture duration: ~20 ms/6M Hz ~120 ms/1 MHz			■	Record and analyze transients during a longer timeframe.
Waveform recorded at 100,000 samples per cycle			■	High-speed ensures impulsive transients are correctly captured (fast rise time).
Three-phase voltage and neutral-to-ground fast transient capture			■	Capture impulsive transients on all four channels.

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

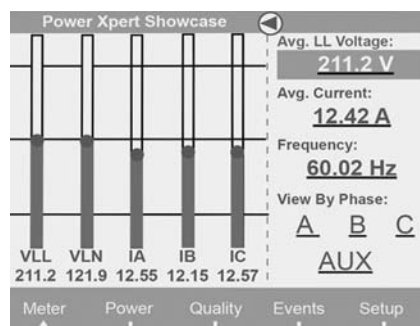
Power Xpert Meter 4000/6000/8000 Series

Power Xpert Meter 4000/6000/8000 Graphic Display (Option) Features

A menu-driven graphical display with information organized into a user-friendly information architecture.

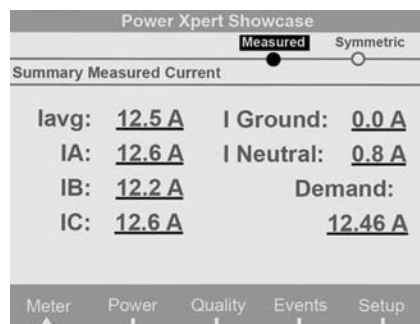
The Homepage (see below) offers:

- Graphical level indicator based on a statistical analysis for three-phase line-to-line and line-to-neutral voltage and per phase currents to quickly indicate out of normal readings
- Large easy-to-read average L-L voltage average phase currents and system frequency can be highlighted and selected using the navigation control dial to drill down for additional detail
- Menu selections for meter, power, quality, events and setup are shown for ease of navigation into display for more detail, or basic device setup



Homepage

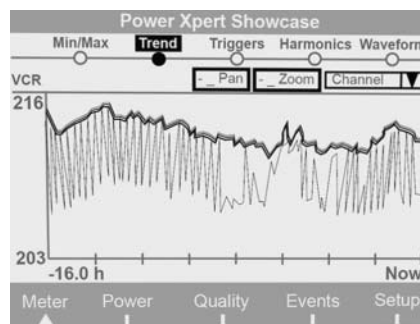
Highlighting a field such as the avg. current value and pressing the navigation control dial brings up a detail screen like the one below.



Current Summary

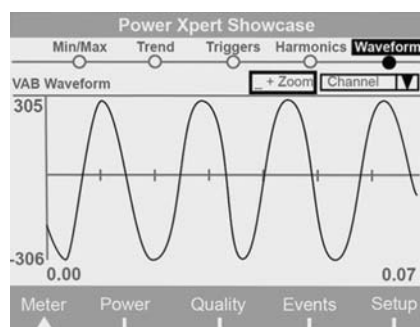
Highlighting an individual reading on the detail summary level screen and selecting it drills down to a level including links to min./max., historical trend plots, triggers, harmonic spectral data, and waveform viewing.

Selecting the trend plot for a given parameter displays a historical graph of the selected parameter over the last 16 hours. The zoom buttons change the time scale to one of several data views based on historical averages with min./max. The Pan button allows scrolling within the selected view.

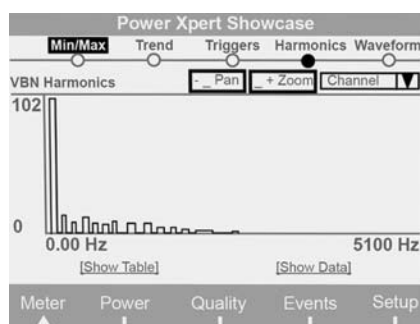


Trend Plot

Waveforms can be displayed for currents and voltages. The waveforms can be viewed on demand for steady-state conditions. Triggered waveforms can also be displayed to view sag/swell or transient data.

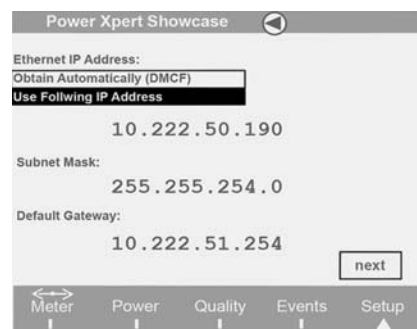


Waveform Viewer



Harmonic Spectrum

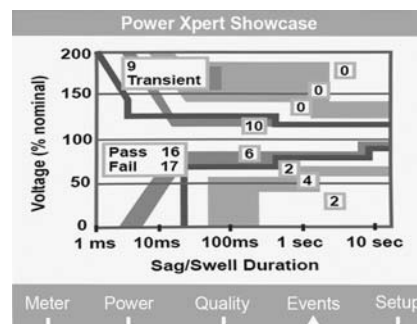
The harmonic spectral plot displays both harmonics and interharmonics up to the 85th order. A detailed table also includes individual magnitudes and angles of current and voltage harmonics, as well as a harmonic power calculation at each frequency.



Ethernet Settings

Ethernet and other settings can be input or verified via the Power Xpert LCD Display.

Note: Some of the other settings are specific only to the Web Browser GUI.



ITIC Plot (Power Xpert Meter 6000/8000)

The Power Xpert Meter classifies disturbances and summarizes the results graphically using the ITIC plot. The number of ITIC sags and swells are indicated for each of nine severity levels. A pass/fail summary is shown to indicate how many events are outside the ITIC pass zone.

**Power Xpert Meter
Graphic Display (Option) Screens****Meter Top Level Screen**

V-LL avg, V-LN avg, IA, IB, IC, Iavg, Freq.

Meter Detail Screens

Per phase detail L-L, L-N, Symmetrical Comp, Aux. Channels, Min./Max. with date/time of occurrence, Trend Plots, Triggers, Phasors.

Power Top Level Screen

Three-Phase Power Factor, kWhr, kWd, Real-Time kW, kVAR, kVA, Load Profile Link.

Power Detail Screens

Per phase detail, kVA, kVAR, kW, Min./Max. with date/time of occurrence, Trend Plots, Triggers.

Quality Top Level Screen

10 min. and 24 hr. PQIndex, THDI, THDV, K-Factor, Crest Factor, Flicker Pst, %9's of Reliability.

Quality Detail Screens

Per phase detail L-L, L-N, V aux, Odd, Even, Interharmonics, Present, Min/Max, Trend Plots, Harmonic spectrum plots, waveform plots.

Events Top Level Screen

Active/Acknowledged Event list, Trigger List, System Log, ITIC Curve Link.

Event Detail Screens

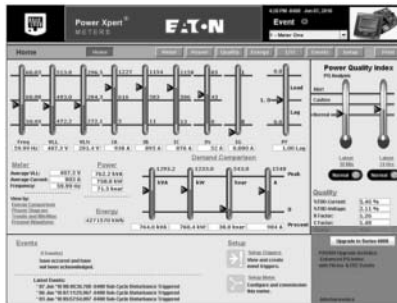
Event List, Condition, Acknowledge Button, Trigger Date/Time, Trigger description.

Setup Top Level Screen

View setup, Edit setup, Login, Logout.

Setup Detail Screens

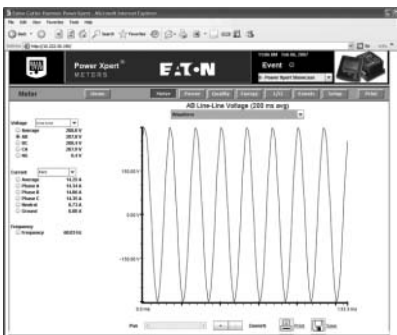
Quick Setup, Trigger setup, Detail setting.

**Power Xpert Meter 4000/6000/8000
Web Browser Views****Power Xpert Meter 4000/6000/8000
Web Browser Homepage (Note: 4000
does not include flicker, ITIC)**

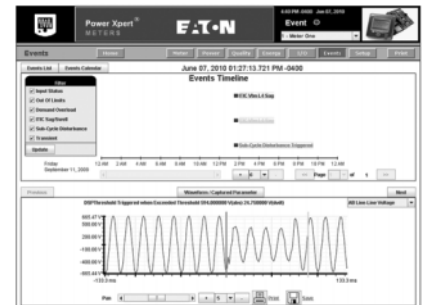
Power Xpert Meter 4000/6000/8000 embedded Web server offers Eaton customers a new level of accessibility to the critical information required to manage the electrical distribution system. The embedded Web server includes real time circuit information in both numeric and graphical formats to help monitor circuit parameters such as current loading, voltage and power levels, power factor.

The Web server also provides the energy and demand readings required to help manage the cost of energy. Readings include kWh, kVARh, delivered and received and kVAh with time-of-use and separate status input controlled energy accumulation to account for energy during special times such as rate alert periods or stand-by generator times of operation.

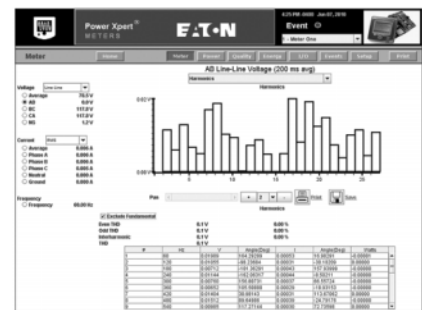
The Web server also includes critical information regarding Power Quality such as harmonic distortion, flicker (Power Xpert Meter 6000/8000), crest factor, K-Factor and more.

**Steady-State Waveform**

The Web server allows the user to view waveforms of the voltage and current to spot power quality problems such as notching.

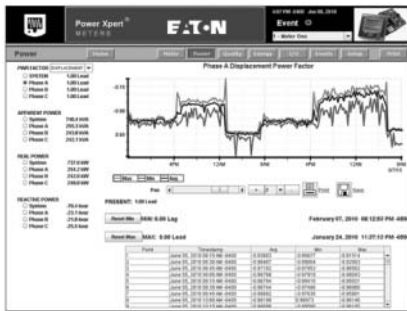
**Events Timeline
(Power Xpert Meter 6000/8000)**

View and understand the sequence of events that have occurred during a period of time. Plot color-coded events on captured waveforms to gain insight into the sequence of events from one single cycle to the next one. This provides the user an excellent vantage point to review and compare multiple events at an unprecedented resolution.

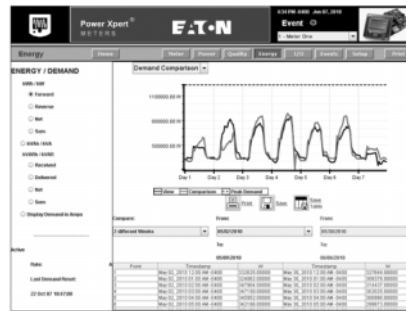
**Harmonic Spectral Plot**

The harmonic spectral plot displays both harmonics and interharmonics up to the 85th order. A detailed table also includes individual magnitudes and angles of current and voltage harmonics, as well as a harmonic power calculation at each frequency. Even, odd and total THD are displayed for diagnostic purposes. In addition, the Power Xpert Meter 6000/8000 provides interharmonics, which allow users to see what is going on between the integer multiples of the fundamental.

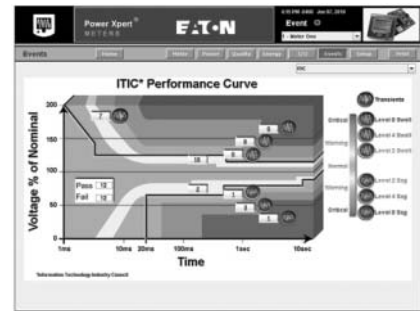
Power Xpert Meter 4000/6000/8000 Series



Historical Trend Plot



Demand Comparison

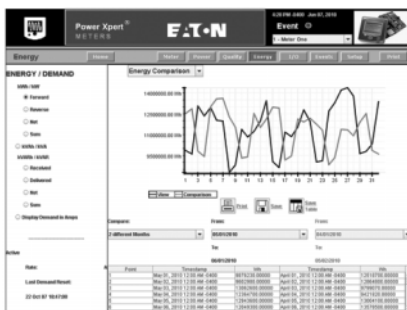


ITIC Analysis Plot (Power Xpert 6000/8000)

3

Graphical Trending of Data

The Power Xpert Meter 4000/6000/8000 embedded Web server supports graphical trend charts of key circuit measurements such as current, voltage, power and energy. The trend chart supports a zoom feature that allows the user to view data over a short period of 16 hours or a longer period of 48 months. The trend chart has a horizontal slider bar control to manage scrolling forward and backward through the data. Trend charts of basic readings include minimum, maximum and average readings. Trend charts of energy data also display demand values.

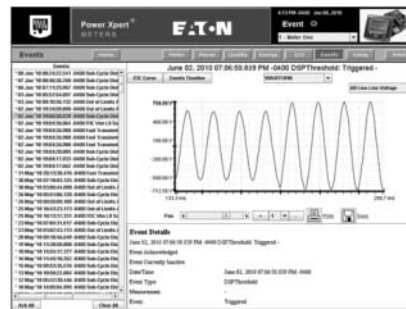


Energy Comparison

Energy usage patterns can be effortlessly analyzed with the month-to-month, week-to-week comparison chart. Raw data can be easily exported with the "Save Table" option to other applications such as Excel for further analysis or graphing (firmware version 12.x.x and higher only).

Note: All data logging for trend plotting is automatically preconfigured in the Power Xpert Meter 4000/6000/8000. In addition, the 6000 and 8000 Series Meters have sag, swell and transient triggers built-in according to the ITIC (CBEMA) standard.

Demand comparison compares power consumption day-to-day, month-to-month or week-to-week. Power Xpert Meters can set to measure demand at 1 to 60 minute intervals. Both sliding and fixed interval windows are supported for maximum flexibility.



Disturbance Recording

Sag/Swell Recording

60 cycles of waveform are recorded at 256 samples per cycle including 30 cycles of pre and post trigger data. The Power Xpert Meter 4000/6000/8000 embedded Web server supports viewing of triggered waveforms one channel at a time including the ability to zoom and to scroll horizontally using a slider bar. Waveforms are stored in Power Xpert Meter 4000/6000/8000 non-volatile flash memory using an industry standard Comtrade format. Waveforms can be automatically sent out by e-mail following an event, or can be retrieved from an FTP directory structure in the meter module's memory.

Events Calendar
(Power Xpert Meter 6000/8000)

The Events Timeline calendar view provides instant insight to the frequency of power events and helps detect reoccurring problems. Color-coded events can be filtered to detect specific issues.

Web Server Device Configuration

Special software is not required to configure a Power Xpert Meter 4000/6000/8000. The embedded Web server includes comprehensive device setup capability.

PQ Index

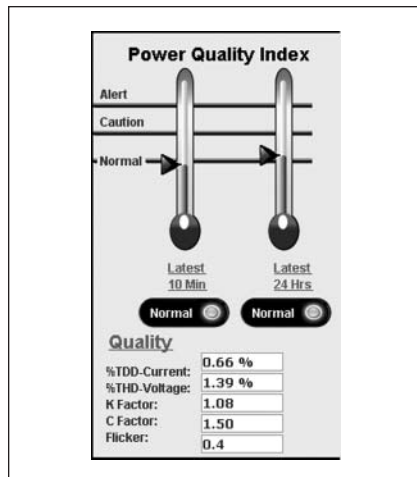


Figure 3.1-3. PQ Index

A statistical analysis comparing the last 10 minute and 24 hour periods' Power Quality to the historical norm for the circuit.

The PQ Index score results in a Power Quality rating of Normal, Caution and Alert for the period.

Flicker (EN61000-4-15; Power Xpert Meter 6000/8000)

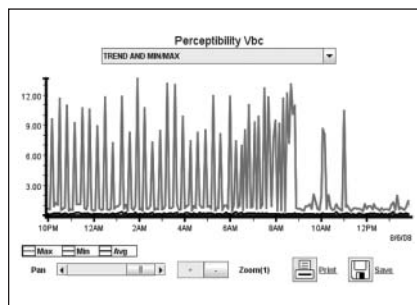


Figure 3.1-4. Flicker

Flicker values for Perceptibility, PST and PLT are calculated based on EN61000-4-15 guidelines.

Power at a Glance

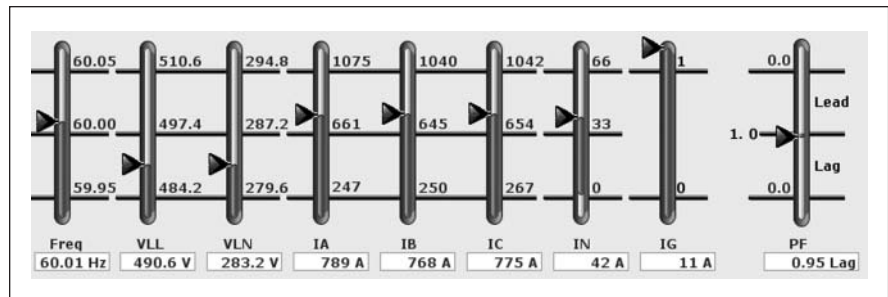


Figure 3.1-5. Power at a Glance

Easily Upgrade Your Power Xpert Meter 4000 to a 6000

Eaton understands that our customers' needs change over time. That's why we've developed meters that can grow with you. Once a Power Xpert Meter 4000 is purchased, you have the ability to upgrade to a Power Xpert Meter 6000, with no intervention from Eaton, when needed. All the features of the Power Xpert Meter 4000 that you have been using and depend on remain, however, once updated, all the additional features of the Power Xpert Meter 6000 are available. The self-upgrade is available on Eaton's Web site. You'll need a credit card, your Power Xpert Meter 4000 serial number and date code (you will be presented with this information if you are using the upgrade link directly from your Power Xpert Meter) and your e-mail address. Once you have completed the purchase, we will send you your new license key information via e-mail that will allow you to complete the upgrade.

- High-speed triggering of waveforms based on events such as breaker trips or static transfers
- Demand interval timing taken from a master utility meter end of interval pulse

Status inputs are self sourced providing a nominal 24 Vdc (20–30 Vdc) across the circuit.

Names can be configured for each input for ease of use.

Relay Outputs

The optional PXIO-B card includes three 5 A form C relay outputs rated for 240 Vac or 30 Vdc. These outputs can be used for applications such as:

- Alarm annunciation
- KYZ pulse output

Alarm outputs can be driven from triggers based on metering values. Output modes include:

- Normal—relay energized during alarm condition
- Latched—relay energized by event trigger, de-energized by acknowledgement
- Timed—relay energized by event trigger, maintained for a programmed interval

Auxiliary Voltage Option

The optional auxiliary voltage selection allows for sensing of another input voltage such as a transformer or UPS and secondary voltage from transformer or UPS output. This option permits waveform or harmonic comparisons across these devices.

Discrete Contact Inputs

The optional PXIO-B expansion card offers eight digital inputs that are useful for a variety of applications such as:

- Status indication with time stamping of transitions (1 ms precision)
- Pulse Counting of KYZ or other utility pulses such as air, water or gas

Communications Expansion Card (CEC)

The optional CEC Card offers two Ethernet connection options, 10/100Base-T and a fiber-optic port that can be used for the following applications:

- Monitoring, managing and configuring the meter remotely using a standard Web Browser interface like Microsoft Internet Explorer
- Alarm notifications via e-mail, SMTP
- Enabling access to the meter's FTP server (energy, trend and waveform logs)
- Providing Modbus TCP/IP or RTU communications to BMS systems
- Providing DNP 3.0 over Ethernet to utility systems
- Providing SNMP communications to NMS systems
- Synchronizing with an NTP server for 1ms timestamping resolution
- Asset management via SNMP to Network Management Systems
- Updating firmware on the meter

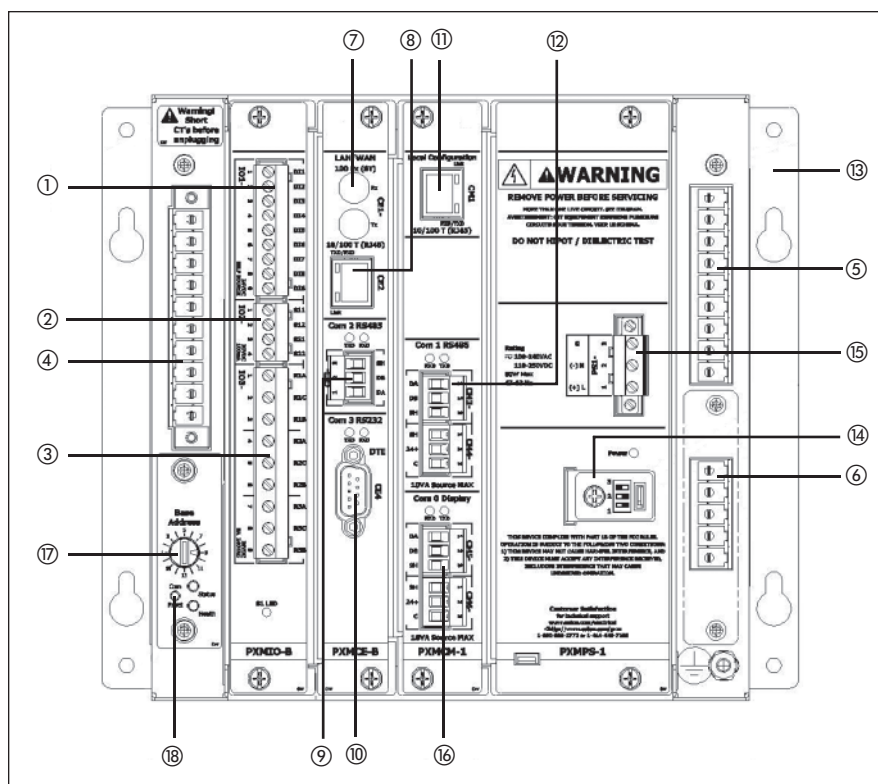


Figure 3.1-6. Power Xpert Meter 4000/6000/8000 Module Layout

I/O Card (option)

- ① Digital inputs 1-8.
- ② Solid-state outputs 1-2.
- ③ Relay outputs 1-3.

CT and Voltage Connections

- ④ CT input connections.
- ⑤ Standard three-phase voltage phase inputs.
- ⑥ Auxiliary channel voltage inputs (option).

Communication Expansion Card (LAN/WAN Ethernet Networking) (option)

- ⑦ 100FX ST-type Ethernet (multi-mode).
- ⑧ 10/100Base-T Ethernet.
- ⑨ RS-485 (two-wire w/shield)—24V accessory power (Com 2).
- ⑩ RS-232 (Tx Rx) Modbus RTU (Com 3).

Standard Features

- ⑪ Local RJ-45 config. port (non-networkable Ethernet).
- ⑫ RS-485 (two-wire w/shield) Modbus RTU (Com 1).
- ⑬ Meter mounting brackets.
- ⑭ Sealable mode switch cover.
- ⑮ Control power (100–240 Vac and 110–250 Vdc) ($\pm 20\%$).
- ⑯ Display RS-485 network port (up to 15 meters)—24V accessory power (Com 0).
- ⑰ Meter base address.
- ⑱ Com reset button.

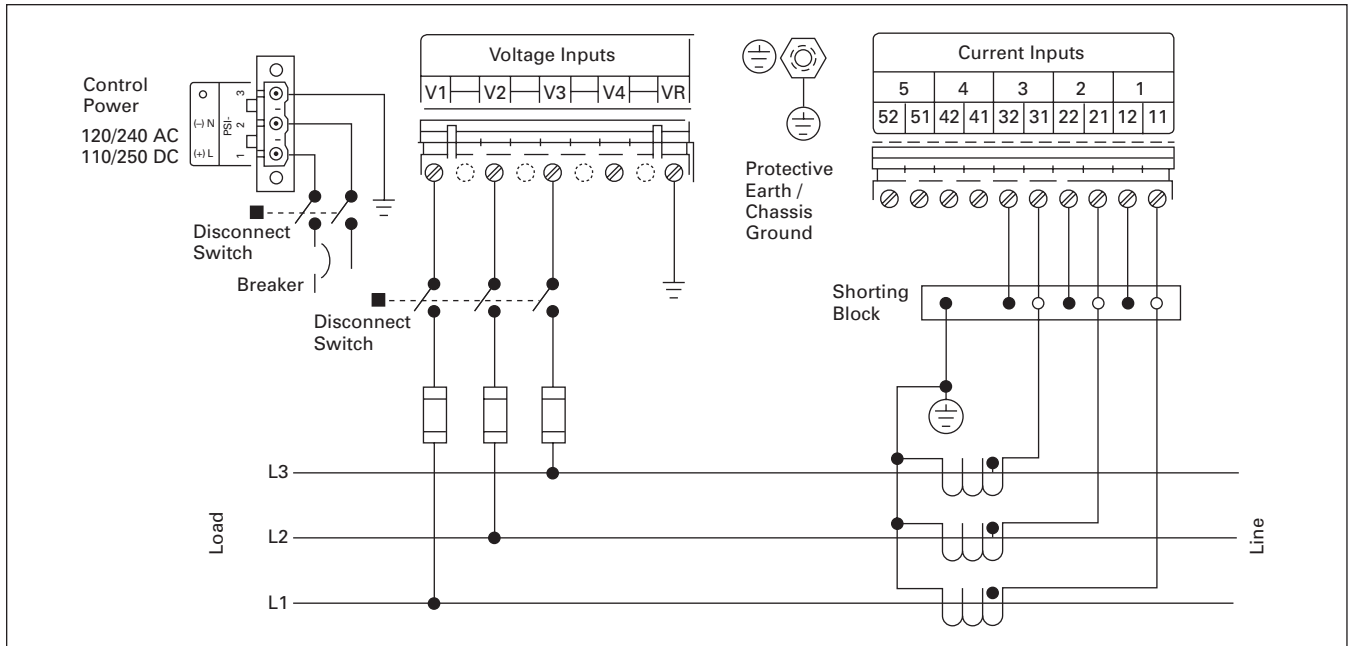


Figure 3.1-7. Three-Phase Three-Wire Delta (Up to 600V)

Note: Based upon the voltage rating, you may need a control power transformer for the control power.

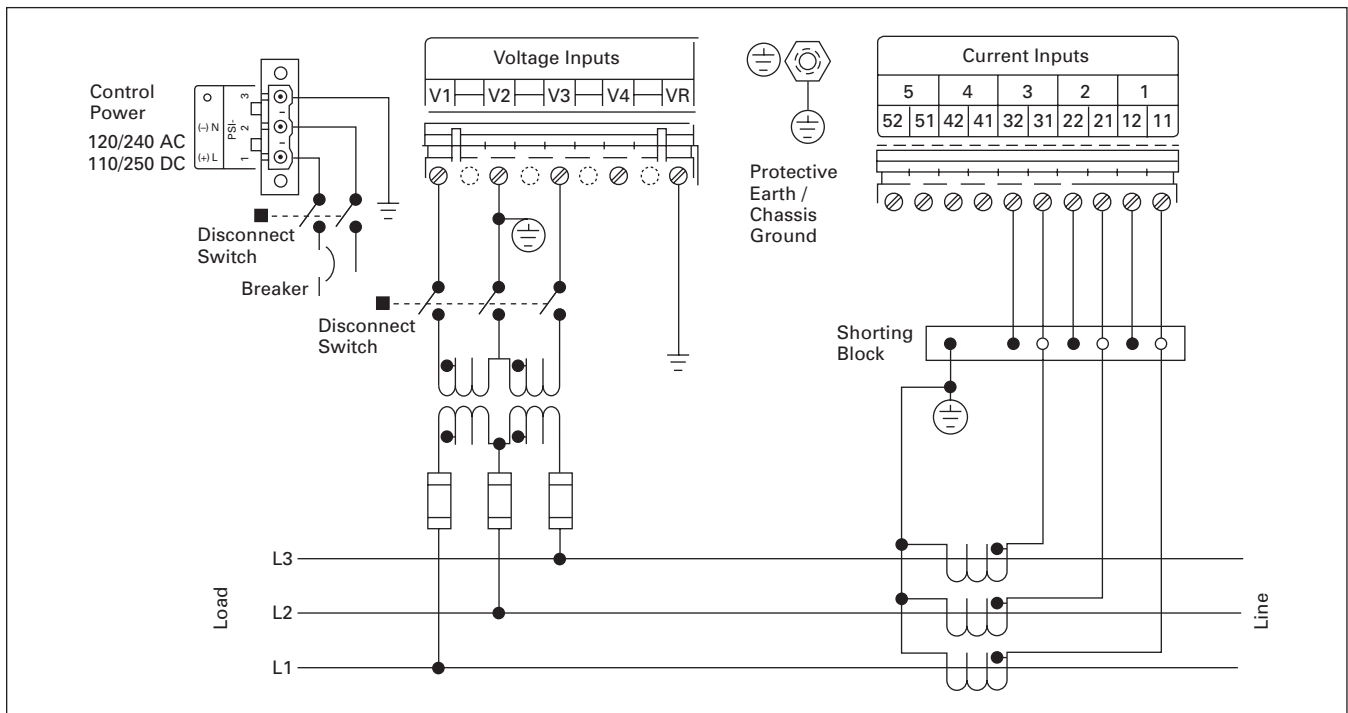


Figure 3.1-8. Three-Phase Three-Wire Delta (Above 600V)

Note: Based upon the voltage rating, you may need a control power transformer for the control power.

Power Xpert Meter 4000/6000/8000 Series

3

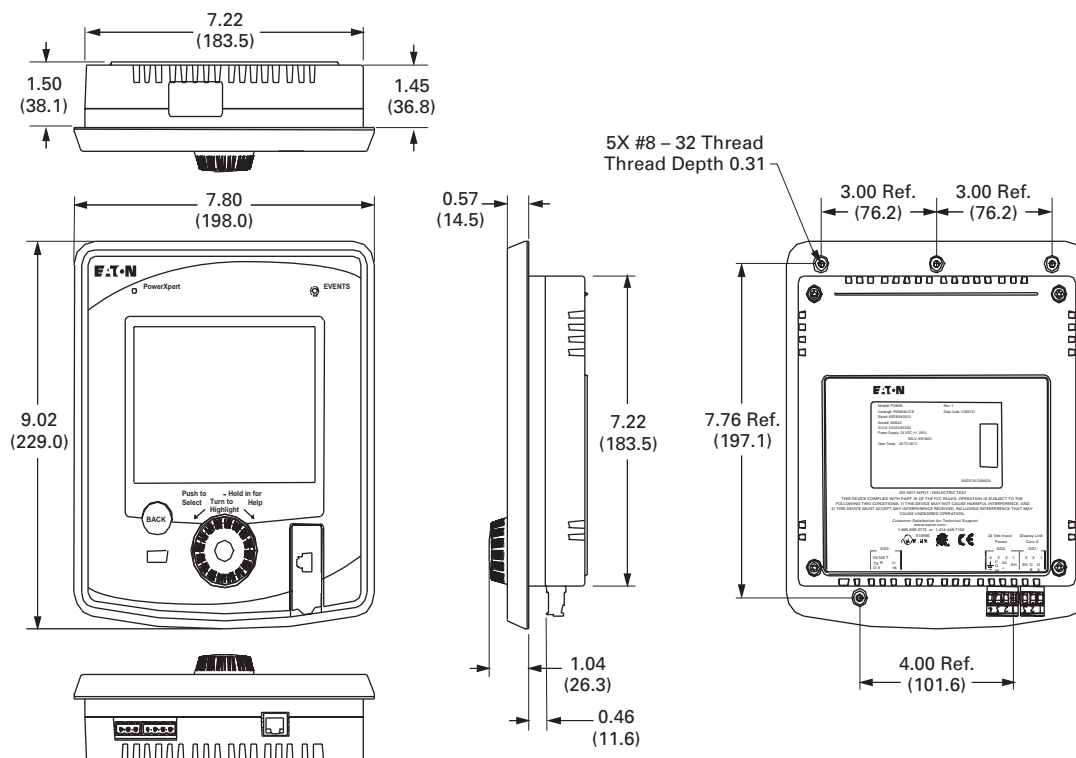


Figure 3.1-9. Power Xpert Meter 4000/6000/8000 Multimeter Graphic Display (PXD-MMG)—Sold Separately, Supports up to 16 Power Xpert Meter 4000/6000/8000 Modules

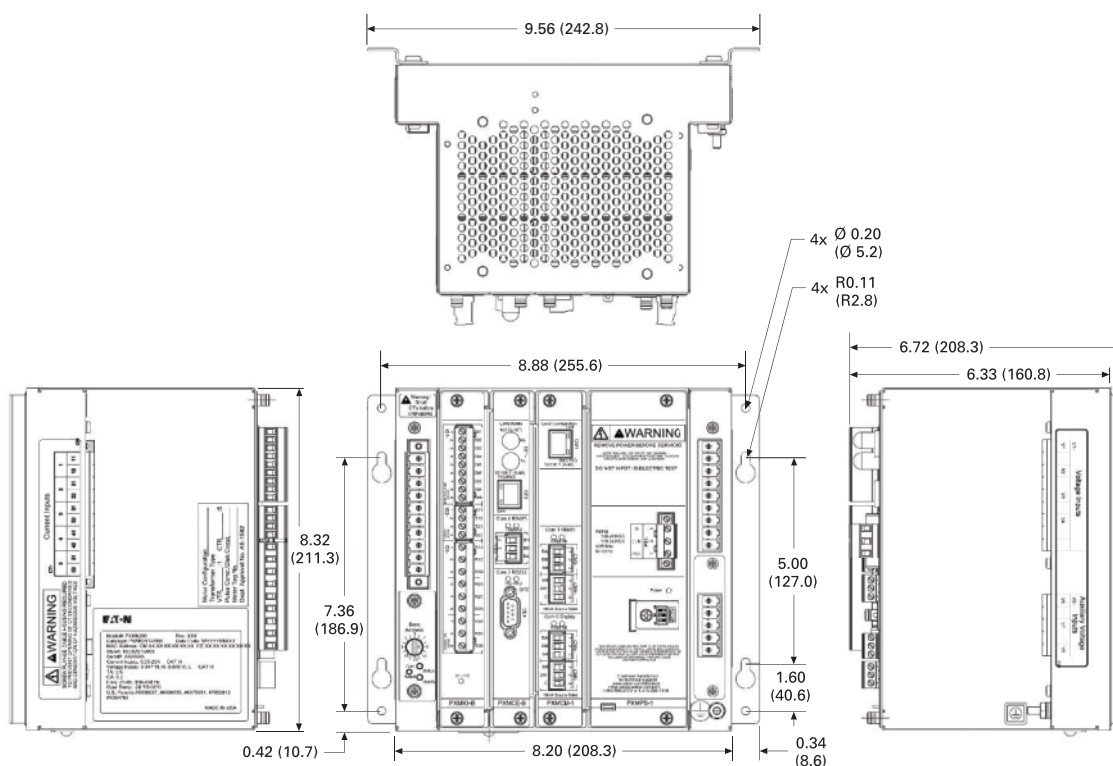


Figure 3.1-10. Power Xpert Meter 4000/6000/8000 Module

Power Xpert Meters Configuration and Wiring Examples

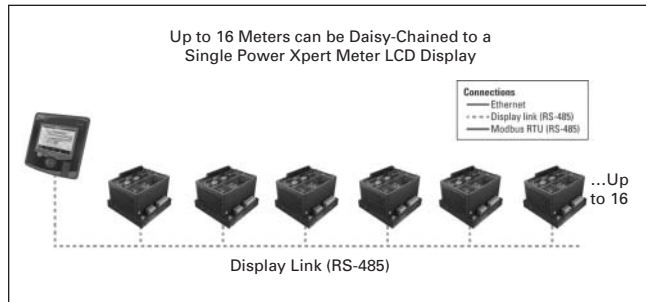


Figure 3.1-11. Display Link

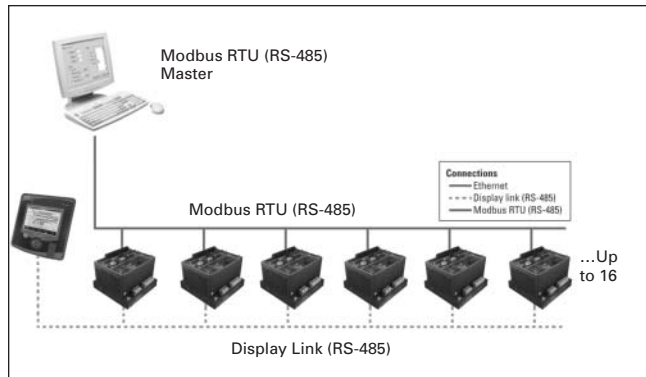


Figure 3.1-12. Modbus RTU (RS-485)—Non-Web Enabled

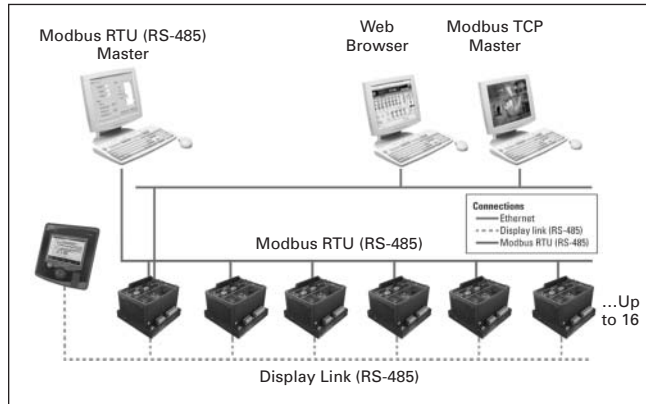


Figure 3.1-13. Web Enabled—Browser and Modbus TCP

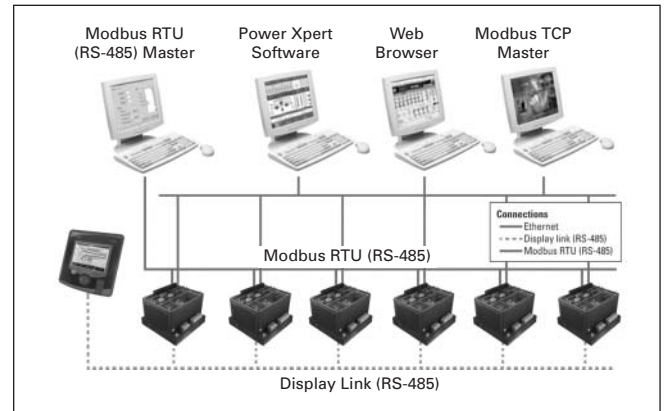


Figure 3.1-14. Web Enabled—Advanced System Functionality

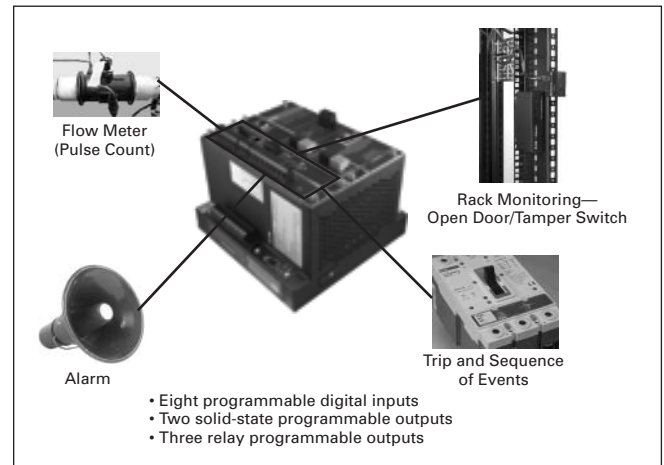


Figure 3.1-15. Accessories—I/O Card (Option)

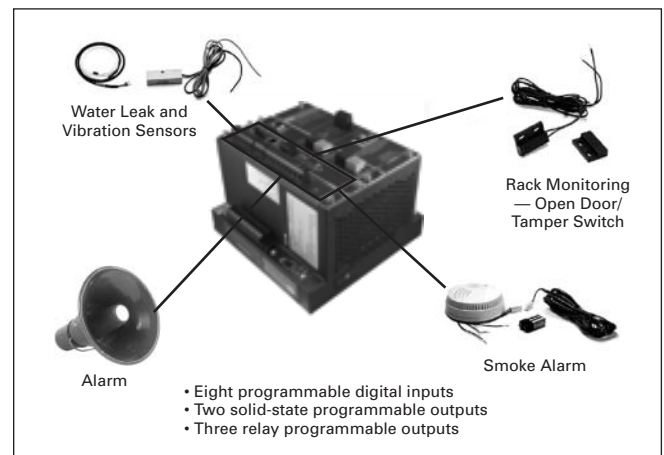


Figure 3.1-16. IT Configuration Examples—Accessories—I/O Card (Option)

Power Xpert Meter 4000/6000/8000 Series

Ordering Information

To order a Power Xpert Meter 4000/6000/8000, the catalog number should be determined using the chart shown in **Table 3.1-3**. The chart illustrates how to include the desired factory options as part of a catalog number. Option cards that are selected at time of order entry will be installed at the factory. Option cards are also field installable for field upgrades.

If a display is required, it should be ordered separately. The Multi-Meter Graphic Display is capable of displaying data from an RS-485 daisychain of

up to 16 Power Xpert Meter 4000/6000/8000 meter modules over a distance of up to 2000 ft. Power Xpert meter modules include panel mounting brackets. The Multi-Meter Graphic Display is designed to mount separately. If back-to-back meter to display panel mounting is desired, a mounting bracket kit is available (**PX-PMBA**).

Example 1: PXM8251A1BB
(PXM 8000 Meter, w/VAUX, Std. Pwr, Com. Exp. and I/O Cards)

Example 2: PXM6251A1BA
(PXM 6000 Meter, w/VAUX, Std. Pwr, Com. Exp. Card)

Table 3.1-3. Power Xpert 4000/6000/8000 Meter Catalog Numbering System

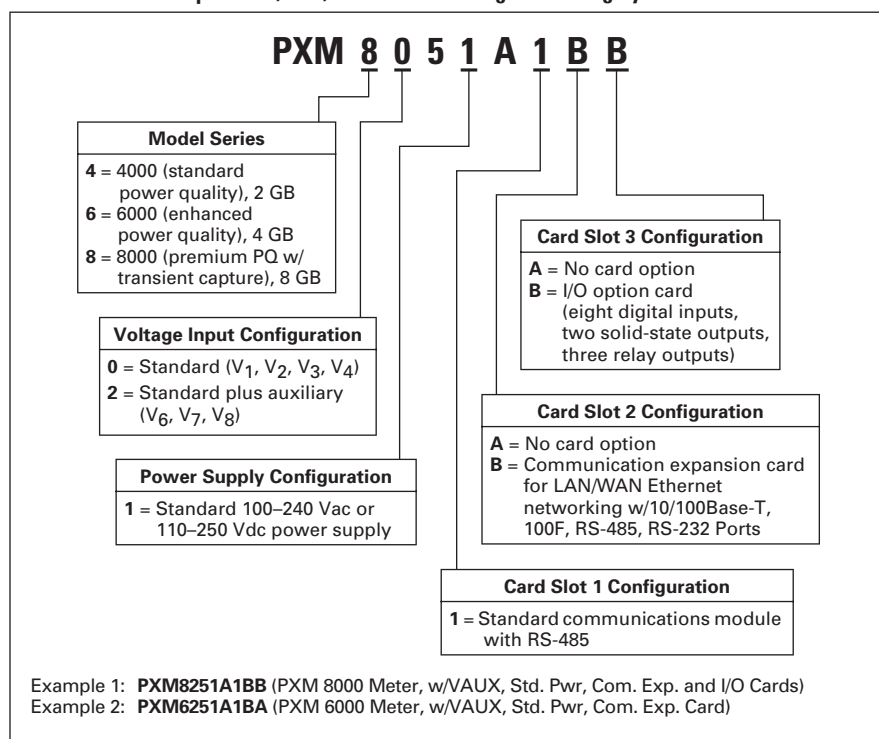


Table 3.1-4. Power Xpert Meter 4000/6000/8000 Accessories

Description	Catalog Number
Digital I/O Card: eight digital input, two solid-state output, three relay output	PXMIO-B
Communication expansion card for LAN/WAN Ethernet networking: 100FX fiber-optic, 10/100T, RS-485, RS-232	PXMCE-B
Graphic display module	PXD-MMG
Panel-mounting bracket assembly for back-to-back meter to graphic display mounting	PX-PMBA
Panel-mounting bracket assembly for retrofitting a graphic display to an IQ Analyzer cutout	PX-PMBB
Panel-mounting bracket assembly for reduced graphic display rear clearance	PX-PMBC
Power Xpert Meter 4000 to 6000 license upgrade key ^①	PXM-4KUPG

^① Applicable to PXM 4000 Meters only. Upgrade package to be field loaded by customer. Provides enhanced PXM 6000 functionality in an existing PXM 4000 Meter, including ITIC and calendar functions.

Note: Communication cable (standard Modbus RTU) is not included in the package for meter module connection.

Technical Data

Environmental Conditions

- Operating temperature:
 - Meter: -20° to $+70^{\circ}\text{C}$
 - Display: -20° to 60°C operating
 - Storage temperature: -40° to 85°C
- Operating humidity: 5–95% condensing
- Device weight: 7.1 lbs—meter, 2.1 lbs—display
- Meter and back of display are pollution degree 2
- Elevation to 6562 ft (2000m)

Current Inputs (Each Channel)

- Conversion: 4096 samples per cycle delta-sigma converter digitally filtered down to 512 samples per cycle
- CT Input: 4096 rms samples per cycle delta-sigma converter digitally filtered down to 512 samples per cycle for anti-aliasing
- Burden: less than 10 milliohms
- Overload withstand: 500A for 1 second, non-repeating
- Range: 0.005–20A continuous
- Accuracy: 0.05% or reading plus 0.01% of full scale (from 50 milliamps to 20A)

Voltage Inputs (Each Channel)

- Conversion: 4096 rms samples per cycle delta-sigma converter digitally filtered down to 512 samples per cycle for anti-aliasing
- PT input: 120–500,000V primary
- Input range: 600V L-L, 347 L-N direct connect
- Nominal full scale: 1000V rms
- Input impedance: 2 megohms

Frequency Range

- 47–63 Hz

Harmonic Response (Voltage, Current)

- 127th harmonic

Accuracy

- ANSI C12.20 0.2 Class
- IEC 687 0.2 Class

Discrete Inputs

- Self sourced: 24 Vdc

Relay Output Contacts

- 5A maximum, 240 Vac maximum, 30 Vdc maximum
- Lifetime: 1,000,000 no load operations
- 100,000 under rated voltage and load

Solid-State Outputs

- Maximum load: 100 milliamps
- Max. voltage: 30V (externally sourced)

Control Power Input

- Input range AC: 100–240 Vac ($\pm 20\%$)
- Frequency range: 47–63 Hz
- Input range DC: 110–250 Vdc $\pm 20\%$
- Burden 50 VA
- Ride-through: 1–5s

Ethernet-Ready Power Quality & Energy (PQ&E)—Power Xpert Meters

General Description

One or more Ethernet-ready PQ&E Power Xpert Meters may be deployed in various power distribution and motor control applications.

Equipment

- Power Xpert Meter 4000
- Power Xpert Meter 6000
- Power Xpert Meter 8000

Options

- Ethernet Expansion Card—CEC (recommended one per meter)
- Local display (one per 16 meters)

Communication Interfaces

- Modbus RTU (RS-485) (standard)
- Display link (RS-485) (standard)
- Modbus TCP/IP (with CEC)
- HTTP (with CEC)
- FTP (with CEC)
- SMTP (with CEC)
- SNMP (with CEC)
- XML/SOAP (with CEC)
- DNP 3.0 (with CEC)

Application Description

Metering/Monitoring Applications

- Identify power quality problems, view waveforms, monitor circuit loading, and manage energy use via standard Web browser (PXM 4000/6000/8000)
- View ITIC plots, Enhanced Power Quality Index (PQI), and event/calendar view via Web browser (PXM 6000/8000)
- Detect and record high-speed transients (PXM 8000)

Installation Applications

- Low voltage switchgear
- Medium voltage switchgear
- Low voltage motor control centers
- Medium voltage motor starters

Communications Applications

- Building Management System (BMS)
- Energy Management Systems
- Network Management Systems
- HMI
- Power Xpert Software
- Foreseer Software

Layout Diagrams

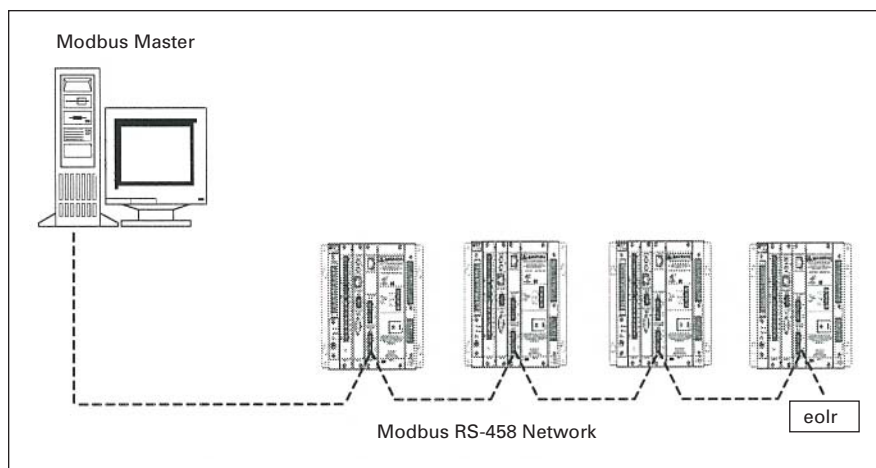


Figure 3.1-17. Power Xpert Meter Used in a Modbus RS-485 Network Application

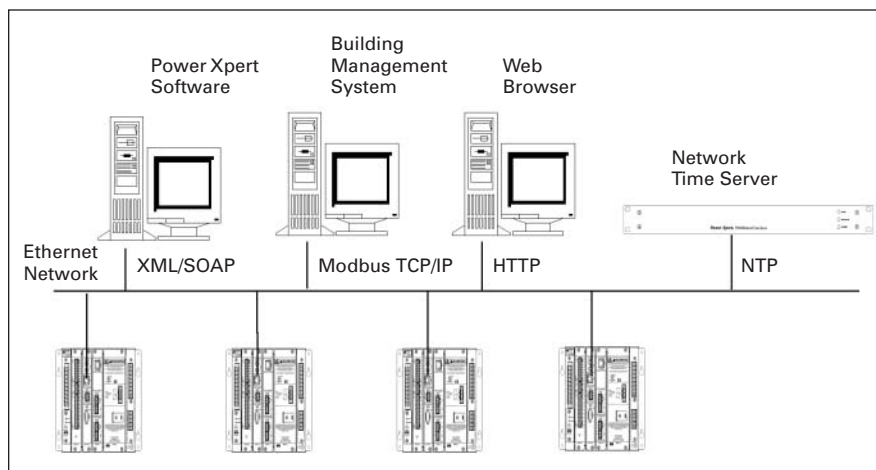
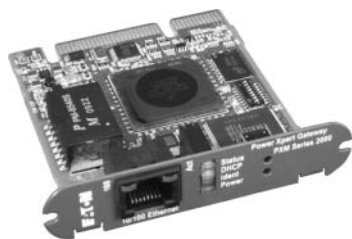


Figure 3.1-18. Power Xpert Meter Used in an Ethernet Network Application

Power Xpert Meter 2000 Series

Power Xpert Meter 2000 Series



Power Xpert Meter 2000 Series

General Description

The Power Xpert Meter 2000 Series power quality instrument monitors the most critical aspects of an electrical distribution system. This premier power quality metering instrument uses the latest in advanced technology to make it simple to use, powerful, scalable and highly flexible. The Power Xpert Meter 2000 offers the same level of intuitive user interface design as the Power Xpert Meter 4000/6000/8000, presenting critical electrical distribution system information in a simple to navigate and easy-to-understand information architecture.

The embedded Web server displays comprehensive power quality data using standard Internet browsers and allows for device configuration from the browser. The embedded Web server presents real time, historical, and event information in a browser-style graphical format to help the user interpret information such as current loading, voltage and power levels, power factor, energy usage, I/O status, power quality measurements, as well as harmonic plots. The embedded Web server also allows for waveform capture and for visualizing steady-state harmonic content that is critical for power quality analysis.

The Web server provides the energy and demand readings required to help manage the cost of energy.

Application Description

Identify Power Quality Problems to Help:

- Protect motors from damage
- Preserve the integrity of processes and batches
- Prevent blown capacitor bank fuses
- Protect transformers and conductors from overheating

Monitor Circuit Loading to Help:

- Avoid overloads and nuisance overload trips
- Maximize equipment utilization
- Manage emergency overloads

Manage Energy Utilization to Help:

- Reduce peak demand charges and power factor penalties
- Identify excessive energy consumption

Metered/Monitored Parameters

Note: See Table 3.1-8.

- Volts: L-L, L-N, Avg. L-L, Avg. L-N
- Phase and neutral currents
- Power: real, reactive and apparent
- Frequency
- Power factor: apparent
- Energy: real, forward, reverse, sum
- Demand: peak with date and time
- % THD
- Minimum and maximum values
- Harmonics
- Individual harmonics
- Demand comparisons
- Phasors

Accuracy

Note: Under typical operating conditions.

- Currents: 0.1% RV
- Voltage: 0.1% RV
- Energy, and demand power: 0.2% in accordance with ANSI C12.20
- Frequency: ± 0.03 hertz
- Power factor: 0.2% RV

Communications

Multiple communications ports including:

Standard

- RS-485 Modbus RTU Slave port
- 10/100Base-T Ethernet network port

Communication Protocols Supported

- Modbus RTU
- Modbus TCP
- BACnet/IP
- Ethernet TCP/IP
- HTTP, HTTPS
- NTP (Network Time Protocol)
- SMTP (Simple Mail Transfer Protocol)
- SNMP (Simple Network Management Protocol) v1, v3
- DNP 3.0

Physical Characteristics

- Power Xpert Meter 2000 with integral display
- Power Xpert Meter 2000 transducer only (no display) meter module
- NEMA rating: NEMA 12, IP42 front of panel rating

Meter with Integral Display Dimensions

- Height: 4.85 inches (123.2 mm)
- Width: 4.85 inches (123.2 mm)
- Depth:
 - 3.96 inches (100.5 mm) behind panel surface
 - 1.01 (25.6 mm) projection in front of panel surface

Standards and Certifications

- UL/cUL Electrical and Electronic Measuring and Test Equipment 22CZ
- Accuracy: IEC/EN60687 0.2 class, ANSI C12.20 0.2 Class
- ANSI C62.41 Burst
- CE Mark

Power Xpert Meter 2000 Embedded Web Server

The Power Xpert Meter 2000 embedded Web server offers Eaton customers a new level of accessibility to the critical information required to manage their electrical distribution system. The Web server includes real-time information in both numeric and graphical visual formats to help monitor parameters such as current loading, voltage and power levels, power factor, THD, and more. The Web server also provides energy and demand readings with graphic usage plots to help analyze energy usage patterns. Energy readings include kWh, kVARh, delivered and received and kVAh with time.

The Power Xpert Meter 2000 embedded Web server supports graphical trend charts of key measurements such as current, voltage, power and energy. The trend chart supports a zoom feature that allows the user to view data over predefined ranges from as little as 16 hours to as much as 4 years. The trend chart includes zoom in/out buttons and a horizontal slider bar control to manage scrolling forward and backward through the data. Trend charts of basic readings include minimum, maximum and average readings. Trend charts of interval by interval energy data also display peak demand.

Waveform Display

Sixty cycles of waveform are sampled at 400 samples per cycle. The Power Xpert Meter 2000 embedded Web server offers a view of a single-cycle waveform to visualize steady-state harmonic content. Waveforms are presented via a Web browser. By clicking refresh, the waveform is updated to that period in time.

Waveform Recording

The Power Xpert Meter 2000 can record waveforms at up to 512 samples per cycle. Waveform captures are automatically stored on the FTP server in the IEEE standard COMTRADE file format. This allows users to view and analyze the waveforms in any standard free-of-charge or commercial COMTRADE file viewer.

Historical Trend Logging

The Power Xpert Meter 2000 records historical data for graphical viewing from the embedded Web server. Graphical views of historical data support pan and zoom. Over 100 standard metering parameters are logged as part of the standard meter functionality including min./max. and average for each parameter. The averages are calculated over the interval period.

Energy Profile Data

The Power Xpert Meter 2000 records Real and Reactive energy forward, reverse, net and absolute sum, as well as Apparent energy (kVAh). These readings are stored on a fixed 5 minute interval. Up to 4 status inputs can be configured as energy accumulators for counting KYZ pulse inputs.

Demand Comparisons

Demand usage patterns can be analyzed with the month-to-month, week-to-week comparison chart built into the meter. Raw data can be exported as a .csv file with the "Save Table" option to other applications for further analysis and graphing.

Event Triggers

The Power Xpert Meter 2000 has two levels of configurable event triggers:

- On-board meter limits (PXM 2260/2270/2280/2290)
- On-board gateway card limits

The on-board meter limits can be set for any measured parameter, for up to 16 limits. If either 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.

The on board gateway limits can trigger an alarm off of any measured parameter on any of the PXM 2000 model series. These triggers permit pickup, reset and pickup delay to be configured by the user.

Event Logging

The Power Xpert Meter 2000 embedded Web server allows the user to view a list of triggered events. In addition, a separate system log records system operations such as resets.

E-mail

The Power Xpert Meter 2000 contains the ability to send e-mails based on an event that has been triggered or cleared along with the option to send an event or data log file. The Power Xpert Meter 2000 also has the ability to send a configurable periodic e-mail with meter information.

Inputs and Outputs

Power Xpert Meter 2000 is available with a standard KYZ output. The base meter also includes two expansion slots for plug-in cards. See **Figure 3.1-19** on **Page 3.1-23** for details. The Power Xpert Meter 2000 embedded Web server card takes up one of these option slots, leaving an additional slot that can be populated by one of the following I/O cards.

- Two relay outputs/two status inputs
- Four KYZ pulses/four status inputs
- Four analog outputs 0–1 mA
- Four analog outputs 4–20 mA

Inputs can also be configured for demand synch and pulse counting. Inputs selected for pulse counting can be scaled. Accumulated pulse recordings are maintained in profile memory. Outputs can be used for alarm annunciation.

Ratings

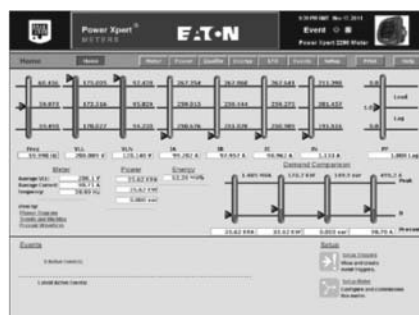
- Application to any PT ratio, no PTs required to 600 Vac
- CT ratios to any CT ratio
- CT inputs available as 5 or 1A secondary
- Separate Source Control Power Input:
 - 90–265 Vac or 100–370 Vdc
 - Low voltage 18–60 Vdc

Displayed Information

- Monitored information is available locally through the display, the Web browser or system power management software
- True rms values through 40th harmonic
- ANSI C12.20 Class 0.2% revenue metering specification

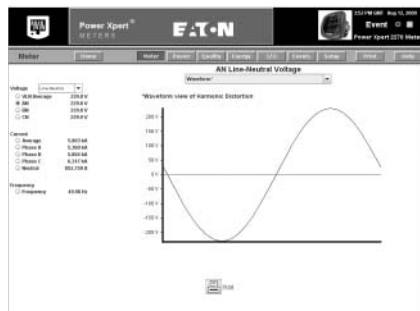
Power Xpert Meter 2000 Series

Power Xpert Meter 2000 Web Browser Views



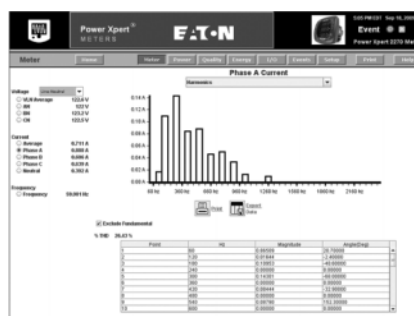
Power Xpert Meter 2000 Web Browser

Power Xpert Meter 2000's embedded Web server offers Eaton customers a new level of accessibility to the critical information required to manage the electrical distribution system. The embedded Web server includes real time circuit information in both numeric and graphical formats to help monitor parameters such as current loading, voltage and power levels and power factor. The Web server also provides the energy and demand readings required to help manage the cost of energy. Readings include kWh, kVARh, delivered and received and kVAh. The Web server also includes critical information regarding Power Quality such as harmonic distortion.



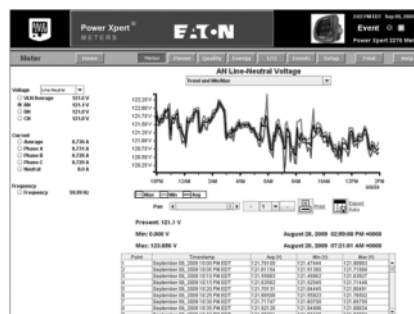
Real-Time Visualization of Harmonic Content

The Web server offers a waveform view to visualize steady-state harmonic content of the voltage and current to spot power quality problems.



Harmonic Spectral Plot

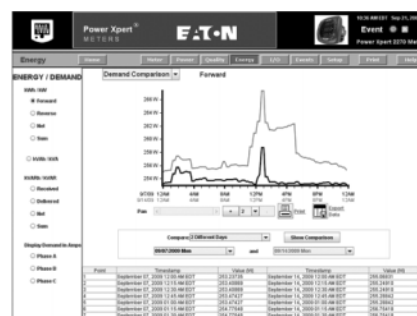
The harmonic spectral plot displays harmonics up to the 40th order. A detailed table also includes individual magnitudes and angles of current and voltage harmonics, at each frequency. Individual and total THD are displayed for diagnostic purposes.



Historical Trend Plot

Graphical Trending of Data

The Power Xpert Meter 2000 embedded Web server supports graphical trend charts of key circuit measurements such as current, voltage, power and energy. The trend chart supports a zoom feature that allows the user to view data over a short period of 16 hours or a longer period of 48 months. The trend chart has a horizontal slider bar control to manage scrolling forward and backward through the data. Trend charts of basic readings include minimum, maximum and average readings. Trend charts of energy data also display demand values.



Energy Manager View

Energy Managers can view load profile data compared against the peak demand. The plot allows comparison of present and past months' usage.

Web Server Device Configuration

Special software is not required to configure a Power Xpert Meter 2000. The embedded Web server includes a comprehensive device configuration engine.

Discrete Contact Inputs

The optional I/O expansion cards offers two or four digital inputs that are useful for a variety of applications such as:

- Pulse Counting of KYZ or other utility pulses such as air, water or gas
- Demand interval timing taken from a master utility meter end of interval pulse

Names can be configured for each input for ease of use.

Relay Outputs

The optional I/O card includes two 5A Form C relay outputs rated for 240 Vac or 30 Vdc or 4 Form A solid-state outputs. These outputs can be used for applications such as

- Alarm annunciation
- KYZ pulse output

Alarm outputs can be driven from triggers based on metering values.

Analog Outputs

The optional IO card includes either four 4–20 mA outputs or 0–1 mA outputs. These outputs can be used for applications such as:

- Input to BMS or PLC systems for tracking a measured meter parameter

Standard Communications Card

The standard communications card provides one Ethernet connection and 10/100Base-T port (copper only) that can be used for the following applications:

- Monitoring, managing and configuring the meter remotely using a standard Web Browser interface
- Alarm notifications via e-mail, SMTP
- Providing Modbus TCP/IP, RTU and BACnet/IP communications to BMS systems
- Providing SNMP communications to NMS systems
- Synchronizing with an NTP server
- Asset management
- Updating firmware on the meter

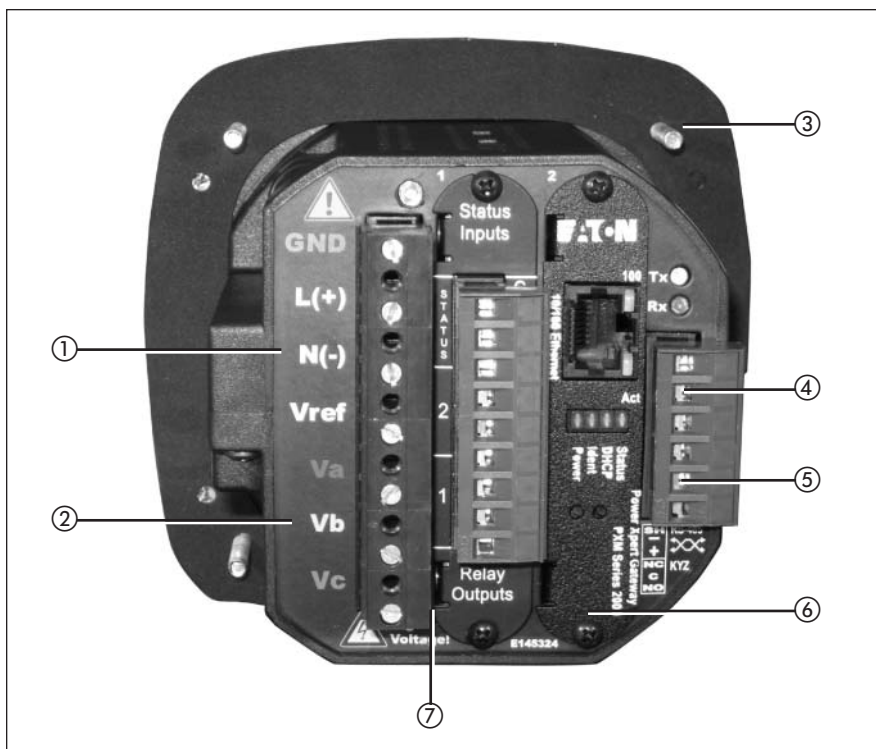


Figure 3.1-19. PXM 2000 Rear View

- ① Power supply inputs
- ② System voltage inputs
- ③ NEMA 12 gasket
- ④ RS-485
- ⑤ KYZ out
- ⑥ Meter gateway card
- ⑦ I/O slot

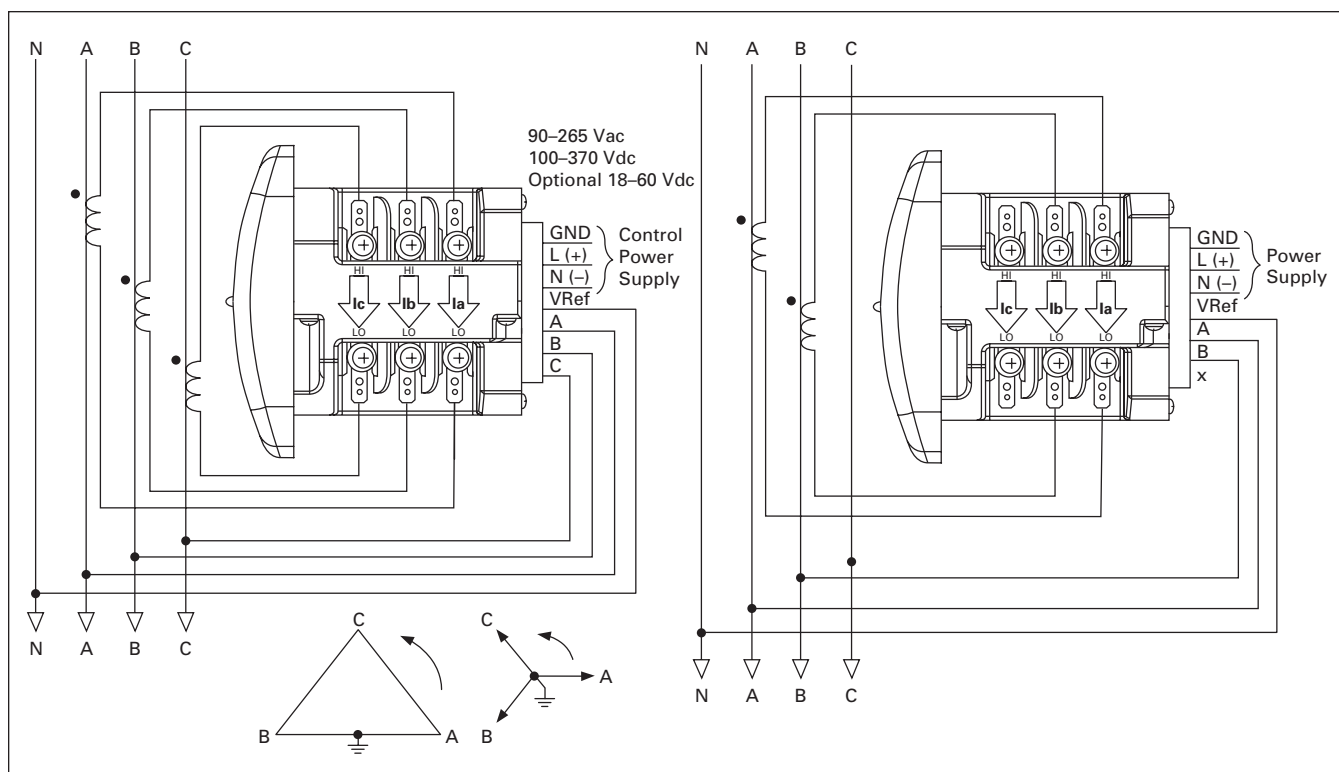


Figure 3.1-20. Service: Wye or Delta, Four-Wire with No PTs, Two or Three CTs

Note: Based upon the voltage rating, you may need a control power transformer for the control power.

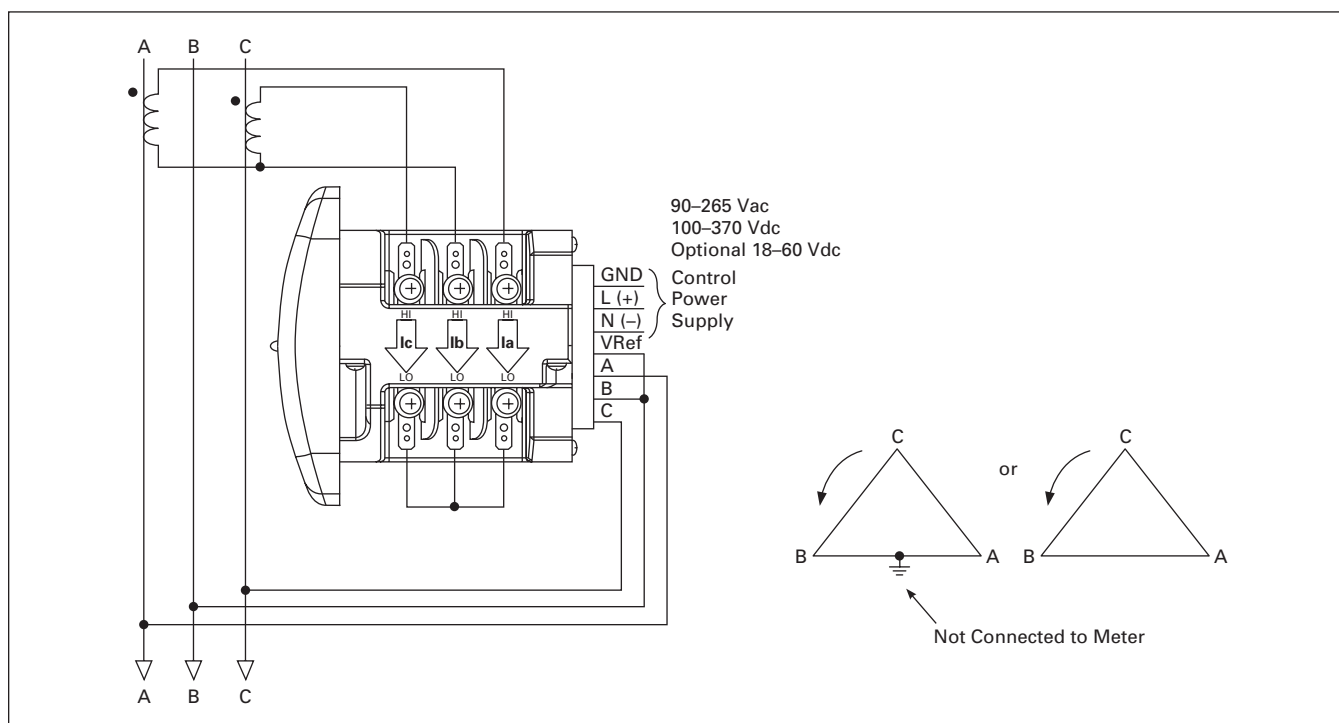


Figure 3.1-21. Service: Delta, Three-Wire with No PTs, 2 CTs

Note: Based upon the voltage rating, you may need a control power transformer for the control power.

Power Xpert Meters Configuration and Wiring Examples

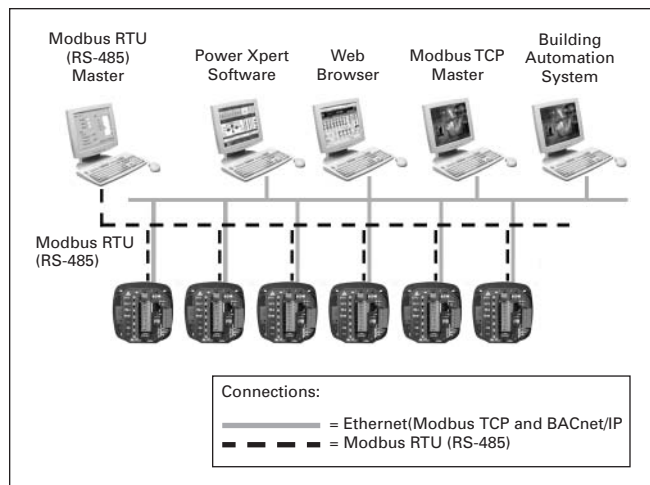


Figure 3.1-22. Web Enabled—Advanced System Functionality

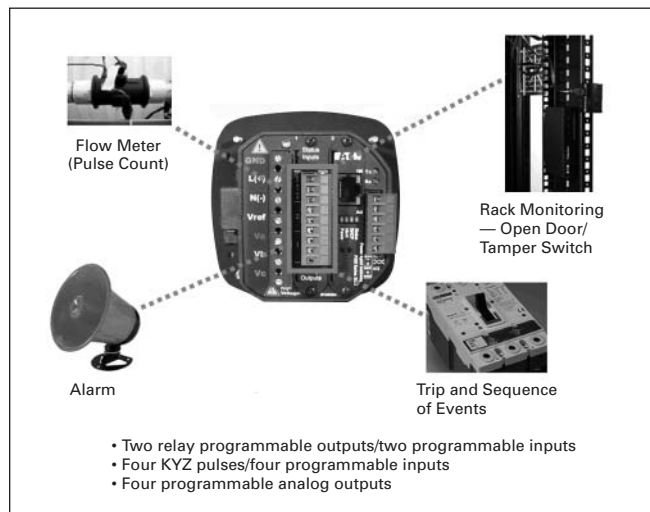


Figure 3.1-23. Accessories—I/O Cards (Option)

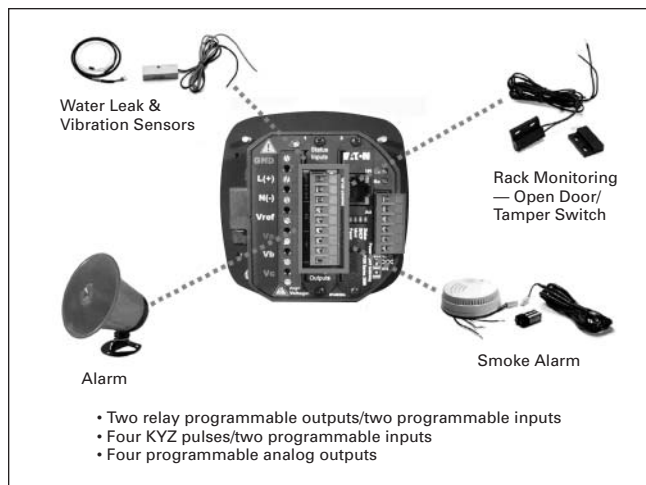


Figure 3.1-24. IT Configuration Examples—Accessories—I/O Cards (Option)

PXM 2000 Dimensions

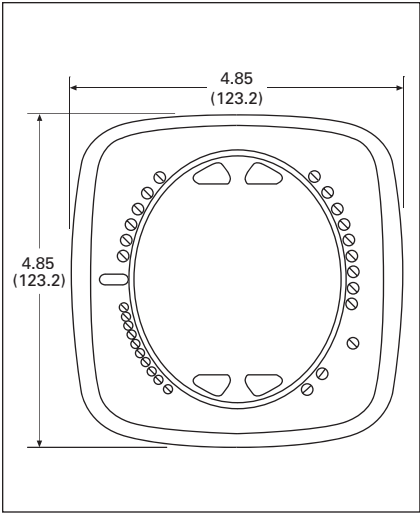


Figure 3.1-25. PXM 2000 Display Front View

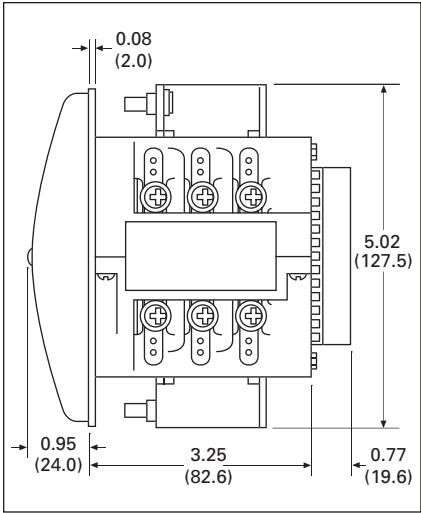


Figure 3.1-26. PXM 2000 Meter/Display Side View

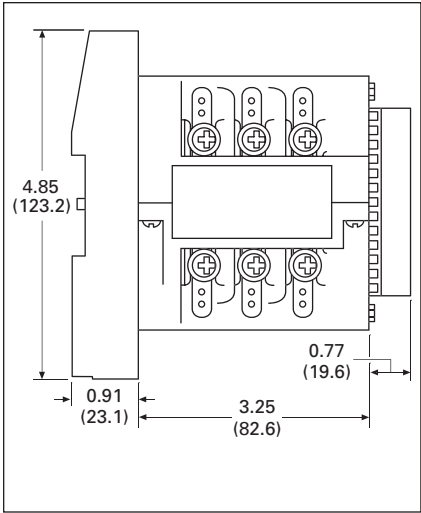


Figure 3.1-27. PXM 2000 Transducer Only Side View

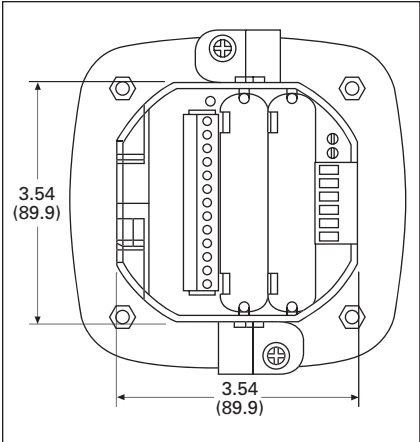


Figure 3.1-28. PXM 2000 Rear View

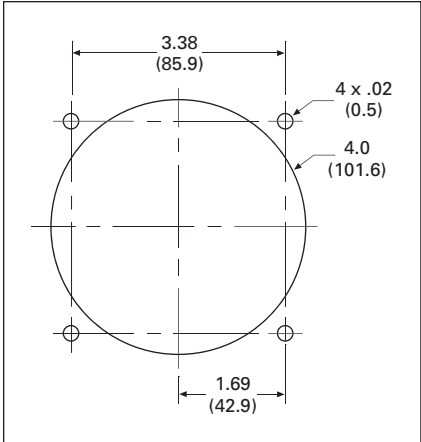


Figure 3.1-29. ANSI Mounting Panel Cutout

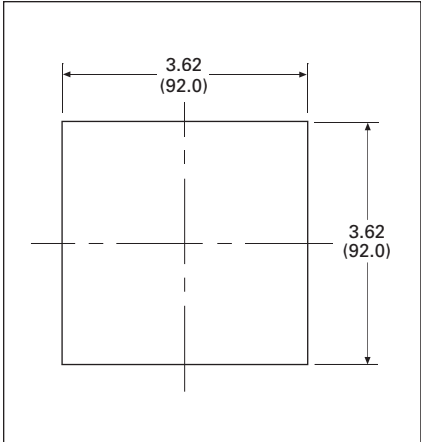


Figure 3.1-30. DIN Mounting Cutout

Power Xpert Meter 2000 Series

Ordering Information

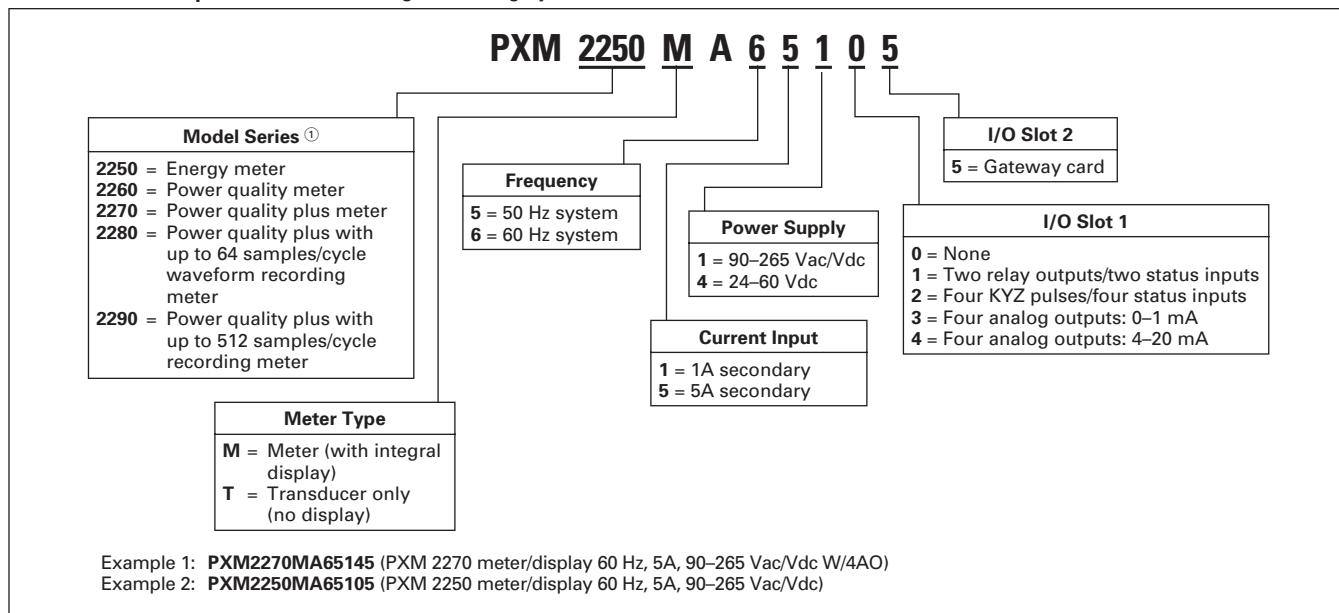
To order a Power Xpert Meter 2000, the catalog number should be determined using the chart shown in **Table 3.1-5**. The chart illustrates how to include the desired factory options as part of a catalog number. Option cards that are selected at time of order entry will be installed at the factory. Option cards are also field installable for future upgrades.

Power Xpert Meter modules include panel mounting brackets.

Example 1: PXM2270MA65145
(PXM 2270 Meter/Display 60 Hz, 5A, 90–265 Vac/Vdc W/4AO).

Example 2: PXM2250MA65105
(PXM 2250 Meter/Display 60 Hz, 5A, 90–265 Vac/Vdc).

Table 3.1-5. Power Xpert Meter 2000 Catalog Numbering System



① Refer to **Table 3.1-8** for model-specific features.

Table 3.1-6. Power Xpert 2000 Meter Accessories

Description	Catalog Number
Panel-mounting bracket assembly for retrofitting a PXM 2000 to an IQ Analyzer/IQ DP-4000/IQ data cutout	IQ250-PMAK
PXM 2000 gateway card kit to upgrade an IQ 250/260 to a PXM 2000	PXM2000-GCK

Table 3.1-7. Power Xpert Meter 2000 I/O Cards

Description	Catalog Number
PXM 2000 I/O card—2 relay outputs/2 status inputs	IQ250/260-IO1
PXM 2000 I/O card—4 KYZ pulses/4 status inputs	IQ250/260-IO2
PXM 2000 I/O card—4 analog outputs 0–1 mA	IQ250/260-IO3
PXM 2000 I/O card—4 analog outputs 4–20 mA	IQ250/260-IO4

Power Xpert Meter 2000 Series

Technical Data

PXM 2000 Series Electronic Power Meter Technical Information

Current Inputs

- Class 10: 5A nominal, 10A maximum
- Class 2: 1A nominal, 2A maximum
- Fault current withstand:
 - 100A for 10 seconds
 - 300A for 3 seconds
 - 500A for 1 second
- Continuous current withstand: 20A for screw terminated or pass-through connections
- Programmable current: full scale to any CT ratio
- Burden: 0.005 VA per phase maximum at 11A
- Pickup current: 0.1% of nominal
 - Class 10: 5 mA
 - Class 2: 1 mA
- Connections:
 - Pass-through wire gauge dimension: 0.177 inches (4.5 mm)
 - Quick connect: 0.25-inch (6.35 mm) male tab

Voltage Inputs

- Range:
 - Line-to-neutral 20–576 Vac
 - Line-to-line 0–721 Vac
- Programmable voltage range: full scale to any PT ratio
- Supported systems:
 - 3 element wye, 2.5 element wye
 - 2 element delta, four-wire delta systems
- Input impedance: 1 megohm/phase
- Burden: 0.36 VA/phase maximum at 600V; 0.014 VA at 120V
- Connection: 7-pin 0.400-inch pluggable terminal block, AWG #12–26 (0.129–3.31 mm²)

Isolation

- All inputs and outputs are galvanically isolated to 2500V

Environmental Ratings

- Operating temperature: –20° to 70°C
- Storage temperature: –20° to 70°C
- Operating humidity: to 95% RH noncondensing
- Faceplate rating:
 - NEMA 12
 - Mounting gasket included

Sensing Method

- Voltage, current: true rms
- Power: sampling at over 400 samples per cycle on all channels
- Harmonics Resolution: 40th order

Update Rate

- Watts, VAR and VA: 100 msec at 60 Hz
- All other parameters: 1 second at 60 Hz

Power Supply

- AC/DC voltage option: 90–265 Vac at 50/60 Hz or 100–370 Vdc, universal AC/DC supply
- Low voltage DC voltage option: 18–60 Vdc
- Burden: 10 VA maximum

Serial Communications Format

- Connection type: RS-485 (through back plate)
- Com port baud rate: 9600–57,600 bauds
- Com port address: 01–247
- Data format: 8-bit, no parity
- Protocols: Modbus ASCII, RTU or DNP 3.0

Network Communications Format

- Connection type: RJ-45 10/100Base-T Ethernet Network port
- Protocols: Ethernet TCP/IP, Modbus TCP, BACnet/IP, HTTP, HTTPS, NTP, SMTP, SNMP

KYZ Pulse

- Contacts: 1 Form A
- On resistance, maximum: 35 ohms
- Peak switching voltage: 350 Vdc
- Continuous load current: 120 mA
- Peak load current: 350 mA (10 ms)
- Off-state leakage current at 350 Vdc: 1 uA
- Opto-isolation: 3750 Vac

Dimensions and Shipping

- Weight: 2 lbs (0.91 kg)
- Basic unit: H 5.00 x W 4.90 x L 5.00 inches (H 127.0 x W 124.5 x L 127.0 mm)
- PXM 2000 Series: mounts in 3.62-inch (92.0 mm) DIN and ANSI C39.1 round cut-outs
- Shipping container dimensions: 6.00-inch (152.4 mm) cube
- Tolerance: ±0.1 inches (2.54 mm)

Compliance

- IEC/EN60687: 0.2% accuracy
- ANSI C12.20: 0.2% accuracy
- ANSI C62.41: burst
- UL/cUL: Electrical & Electronic Measuring & Test Equipment 22CZ
- CE

Power Xpert Meter 2000 Series

Power Xpert Meter 2250

- Measures basic meter parameters
- 256 MB for data logging
- Ethernet
- On-board gateway card limits/alarms

Power Xpert Meter 2260

Features of PXM 2250 plus:

- Harmonics
- On-board meter hardware limits to activate optional relay outputs
- Visual indication of limits exceeded at meter face
- 512 MB for data logging

Power Xpert Meter 2270

Features of PXM 2260 plus:

- Harmonics, including individual
- Waveform view to visualize steady-state harmonic content
- 768 MB for data logging

Power Xpert Meter 2280

Features of 2270 plus:

- Up to 64 samples per cycle for waveform recording
- Configuration of total, pre- and post-event cycles.

Power Xpert Meter 2290

Features of 2280 plus:

- Up to 512 samples per cycle for waveform recording

Table 3.1-8. Power Xpert Meters 2250/2260/2270—Features and Benefits

Feature	Power Xpert Meter					Benefit
	2250	2260	2270	2280	2290	
General						
Embedded Web Server	■	■	■	■	■	Use a standard Web browser to monitor and manage the meter over the network, Internet.
Firmware flash update support	■	■	■	■	■	Enables you to flash the meter with the latest firmware updates.
Power, Energy and Demand						
Voltage, current: per phase minimum, maximum, average, trend graph analysis, export, print	■	■	■	■	■	Review voltage and current trends, export, print and analyze parameters right on the meter or external software.
Demand plot comparisons month-to-month, week-to-week	■	■	■	■	■	Plot two months or two weeks for vivid demand comparison.
Power, apparent, real, reactive, power factor	■	■	■	■	■	Review power usage and power factor and avoid potential PF penalties.
Energy, demand: forward, reverse, net, sum, TOU, profile, export, print	■	■	■	■	■	Keep track of your energy usage, identify peaks to conserve energy usage.
Power Quality Analysis						
Statistical analysis (minimum, maximum, average)	■	■	■	■	■	Review statistical trends, identify past and future problem areas.
Sampling rate, maximum samples/cycle	400	400	400	400	400	High sampling rate resulting in high accuracy.
Security						
Secure two level user access privileges	■	■	■	■	■	Define appropriate security access level per user.
Communications						
Modbus TCP	■	■	■	■	■	Easy integration with standard protocol to power management and other software.
Modbus RTU	■	■	■	■	■	Integrate meters to existing Modbus networks, daisy chain several (1–32) meters together.
HTTP, HTTPS	■	■	■	■	■	Communicate to the meter over the Internet via standard Web browser.
SNMP (Simple Network Management Protocol)	■	■	■	■	■	Communicate with the meter via Simple Network Protocol; hook to existing NMS system.
SMTP (Simple Mail Transfer Protocol)	■	■	■	■	■	Send e-mail messages via standard Simple Mail Transfer Protocol.
NTP (Network Time Protocol)	■	■	■	■	■	Network Time Protocol support enables the meter to synchronize time over the network.
DNP 3.0	■	■	■	■	■	Easy integration with serial DNP networks.
Trend measurements CSV file export	■	■	■	■	■	Easily export trend measurements to third-party applications, in standard CSV file format.

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

Power Xpert Meter 2000 Series

Table 3.1-8. Power Xpert Meters 2250/2260/2270—Features and Benefits (Continued)

Feature	Power Xpert Meter					Benefit
	2250	2260	2270	2280	2290	
Logs						
Trend logging	■	■	■	■	■	Log trend information for easy statistical analysis.
Load profile	■	■	■	■	■	Review the load profile graph to get a better understanding of your electrical load versus time.
Event logging	■	■	■	■	■	Log events for retrospective event analysis.
Memory and Storage						
Standard memory, MB	256	512	768	768	768	Store trend data and events for historical analysis.
Harmonics						
Harmonic levels		40th	40th	40th	40th	Allows you to identify potential harmful harmonics.
Total Harmonic Distortion (THD)		■	■	■	■	Review the total harmonic distortion level directly on the meter.
Individual harmonics			■	■	■	Provides simple metric for power quality viewable from the embedded Web server.
Waveform						
Waveform display			■	■	■	Waveform view on a PC to visualize steady-state harmonic content through embedded Web server to identify power quality issues.
Waveform recording				64	512	Ability to record waveforms up to specified samples/cycle.
I/O						
I/O Two relay outputs/two status inputs Four KYZ pulses/four status inputs Four analog outputs 0–1 mA Four analog outputs 4–20 mA	Optional	Optional	Optional	Optional	Optional	The Power Xpert Meter 2000 I/O Cards are extremely flexible and can be used in a large variety of different applications. Digital inputs and relay outputs can be programmed to interact during various conditions defined by the user. Various third-party devices, such as alarms, pulse meters, trip units and sensors, can be easily integrated to the Power Xpert Meter 2000. Triggers and events can be tied to the meter's standard functions such as e-mail, logs and trends. Analog outputs can be programmed to output meter parameters to BMS or PLC systems.

Note: These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

Power Xpert Energy Viewer

Power Xpert Energy Viewer

General Description

The Power Xpert Energy Viewer (PXEV) provides the means to develop an energy usage baseline for energy management programs, comparing interval logged data points. It is a free Web download for compatible Eaton product home pages. This tool allows easy interpretation of the data collected by compatible devices via graphical charts, graphs and reports without having to export the available .csv file into Microsoft Excel or another tool.

Application Description

The PXEV is a versatile tool suited for a wide range of customer applications. Two basic examples are presented below.

Schools and Dormitories

An excellent application for the PXEV is a "Schools and/or Dormitory" scenario where each elementary school in a school district or college dorm (building) on a campus has a three-phase main meter. The PXEV could be used to graphically compare each building, thus determining which is the most energy efficient.

Monitoring Secondary Transformers

PXEV users can monitor the secondary of three-phase transformers (kVA) to compare transformer loading over time. This determines the unused, available capacity when expansion projects are planned and engineers need to determine if additional power transformers need to be purchased/installed. In the case where more transformers are not necessary to carry the expansion load, the information from the PXEV can assist in providing significant monetary savings.

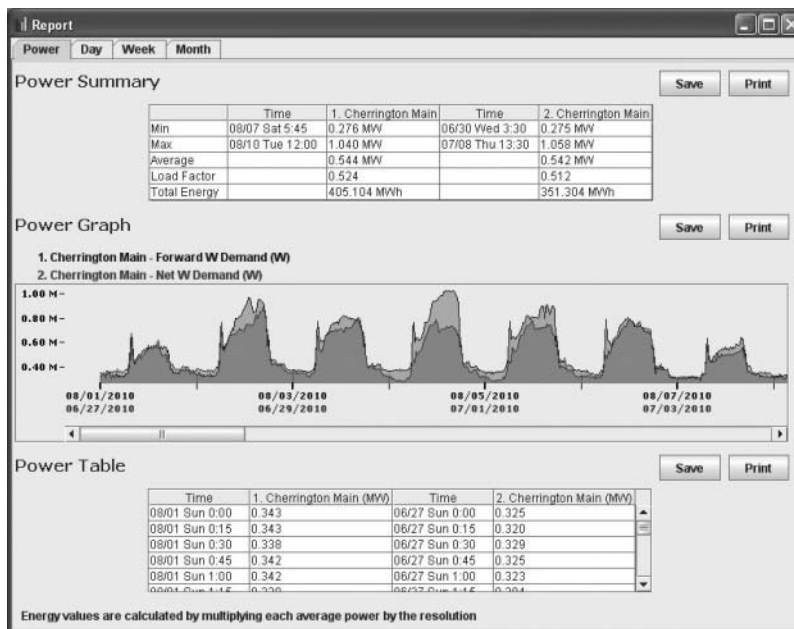
Features

- Quickly add an Eaton device specified above using its IP address
- Compare two devices' energy usage
- Compare last month to the current month
- Develop an energy baseline
- Customize/specify values from the source:
 - ☐ Invert values
 - ☐ Magnitude
 - ☐ Resolution
 - ☐ Interpolation
- Customize data range for summary data

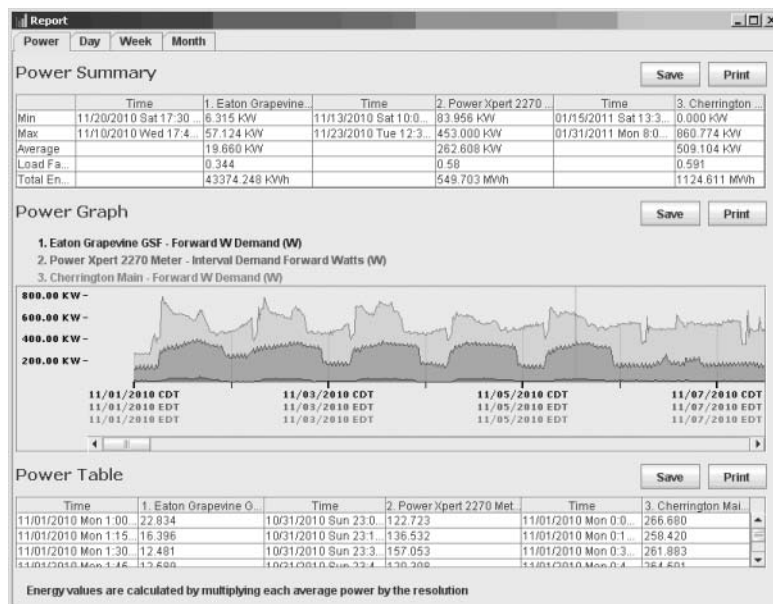
The final report consists of four tabs. The first tab, the Power tab, shows the statistics on the raw power data. The Day, Week and Month tabs show the statistics for energy, calculated by integrating the power over the corresponding interval duration. Users can select up to four different devices for energy comparison.

Compatible Devices

- Power Xpert Meter 2000 series
- Power Xpert Meter 4000/6000/8000 series
- Power Xpert Gateway 600A (connected devices that capture watt and kWh values, i.e., IQ 100 series)
- Power Xpert Gateway PDP card
- Power Xpert Gateway Series 1000 card



Summary Report: Select the different tabs to view the appropriate energy values. The Power tab shows kW or MW power on a 15-minute demand window (normal setting on our devices). The Day/Week/Month tabs show kWh or MWh for those time periods.



Comparison Summary: Users can select up to four different devices for energy comparison. This graphic shows two devices.

IQ 250/260 Series

IQ 250/260 Series Electronic Power Meters



IQ 250/260 Electronic Power Meter

General Description

The IQ 250 and IQ 260 meters provide capabilities you would not normally expect in affordable, ultra-compact meters, such as fast sampling rate and accurate metering for a full range of power attributes. Providing the first line of defense against costly power problems, Eaton's IQ 250 and IQ 260 electronic power meters can perform the work of an entire wall of legacy metering equipment using today's technology.

When space is at a premium, yet you need ANSI C12.20 accuracy, the IQ 250/260 series fit the bill. These meters are ideal for electrical equipment assemblies, machine control panels, such as panelboard and switchboard mains and feeders, low voltage metal-enclosed switchgear feeders and motor control centers. Requiring far less space than other meters with similar functionality, IQ 250/260 series fit into a standard ANSI or IEC cutout on a panelboard or other electrical equipment, and therefore fit easily into retrofit applications.

Application Description

- Utility and commercial metering
- Substations, industrial facilities, power generation sites and campuses
- Submetering
- Load studies and voltage recording
- Analog meter replacement

Features and Benefits

- Measure and display real-time information about critical power parameters with a sampling rate of 400 samples per cycle
- Monitor power utilization and quality with ANSI C12.20 accuracy (0.2%)
- Optional 128 KB for data logging, which guards against loss of historical data
- Verify meter accuracy with KYZ test pulse self-certification capabilities
- Standard Modbus RTU communications
- Available as transducer only or with display
- Field upgradeable to a Power Xpert Meter 2000
- Integrate into Eaton's Power Xpert Architecture for a holistic system-level view

Additional Features

Table 3.1-9. Features of IQ 250 and IQ 260 Electronic Power Meters

Features	IQ 250	IQ 260
Instrumentation		
Current, per phase	■	■
Current demand	■	■
Calculated neutral current	■	■
Voltage, per phase (L-L, L-N)	■	■
Frequency	■	■
Power, Energy and Demand		
Real, reactive and apparent power, total and per phase (kW, kVAR, kVA)	■	■
Real, reactive and apparent energy, total and per phase (kWh, kVARh, kVAh)	■	■
Real, reactive and apparent power demand	■	■
Power factor, total and per phase	■	■
Min./max. readings, I, V, PF, F, THD (IQ 260), kW, kVAR, kVA	■	■
Demand Methods		
Block interval (sliding, fixed)	■	■
Data Logging		
128 KB for data logging	Optional	Optional
Communications		
RS-485	■	■
KYZ output	■	■
Modbus RTU	■	■
Modbus ASCII	■	■
DNP 3.0	■	■
I/O		
Two digital in/two digital out ^①	Optional	Optional
Four digital in/four KYZ out	Optional	Optional
Four analog output (4–20 mA) ^②	Optional	Optional
Four analog output (0–1 mA)	Optional	Optional
Power Quality Analysis		
Total Harmonic Distortion (THD) voltage and current per phase		■
Alarming		
Set point driven alarm		■

^① Digital Out with IQ 250 requires external command.

^② Requires external power supply.

Technical Data and Specifications

Table 3.1-10. IQ 250/260 Electronic Power Meter Technical Information

Description	Specifications
Current Inputs	
Class 105	Amp. nominal, 10A maximum
Class 2	1A nominal, 2A maximum
Fault current withstand 100A for: 300A for: 500A for:	10 seconds 3 seconds 1 second
Continuous current withstand	20A for screw terminated or pass-through connections
Programmable current	Full scale to any CT ratio
Burden	0.005 VA per phase maximum at 11A
Pickup current Class 10 Class 2	0.1% of nominal 5 mA 1 mA
Connections Pass-through wire gauge dimension Quick connect	0.177 inches (4.5 mm) 0.25-inch male tab

Voltage Inputs

Range Line-to-neutral Line-to-line	20–576 Vac 0–721 Vac
Programmable voltage range	Full scale to any PT ratio
Supported systems	3 element wye, 2.5 element wye, 2 element delta, four-wire delta systems
Input impedance	1 megohm/phase
Burden	0.36 VA/phase maximum at 600V; 0.014 VA at 120 Volts
Connection	7-pin 0.400-inch pluggable terminal block, AWG #12–26 (0.129–3.31 mm ²)

Isolation

All inputs and outputs are galvanically isolated to 2500V

Environmental Ratings

Operating temperature	–20°C to +70°C
Storage temperature	–20° to +70°C
Operating humidity	To 95% RH noncondensing
Faceplate rating	NEMA 12 mounting gasket included

Description	Specifications
Sensing Method	
Voltage, current	True rms
Power	Sampling at over 400 samples per cycle on all channels
Harmonics resolution	40th order

Update Rate

Watts, VAR and VA	100 msec at 60 Hz
All other parameters	1 second at 60 Hz

Power Supply

AC/DC voltage option	90–265 Vac at 50/60 Hz or 100–370 Vdc, universal AC/DC supply
DC voltage option	18–60 Vdc
Burden	10 VA maximum

Standard Communications Format

Connection type	RS-485 (through back plate)
Com port baud rate	9600–57,600 bauds
Com port address	01–247
Data format	8-bit, no parity
Protocols	Modbus ASCII, RTU or DNP 3.0

KYZ Pulse

Contacts	1 Form A
On resistance, maximum	35 Ohms
Peak switching voltage	350 Vdc
Continuous load current	120 mA
Peak load current	350 mA (10 ms)
Off-state leakage current at 350 Vdc	1 uA
Opto-isolation	3750 Vac

Dimensions and Shipping

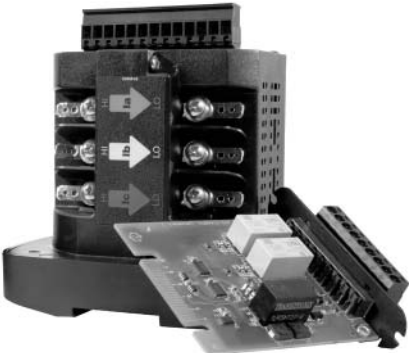
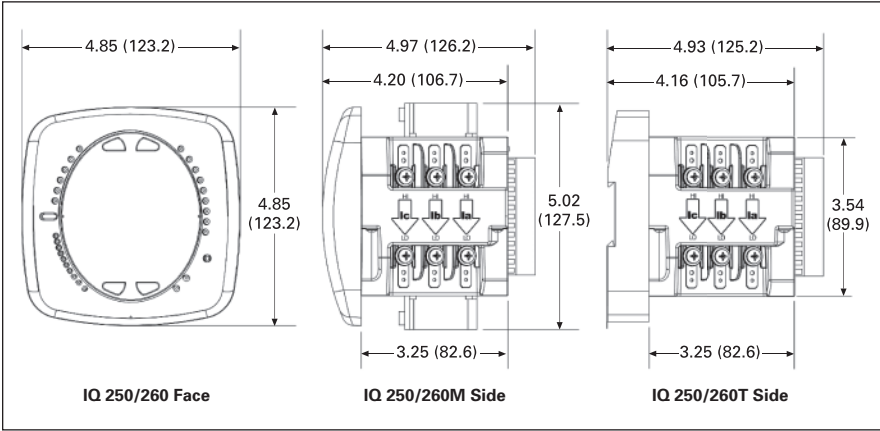
Weight	2 lbs
Basic unit	H 5.00 x W 4.90 x L 5.00 inches
IQ 250/260	Mounts in 92 mm DIN and ANSI C39.1 round cut-outs
Shipping container dimensions	6.00-inch cube
Tolerance	±0.1 inches (2.54 mm)

Compliance

IEC 687	0.2% accuracy
ANSI C12.20	0.2% accuracy
ANSI C62.41	Burst
UL/cUL	Electrical and electronic measuring and test equipment 22CZ
CE	Meets EU safety, health and environmental requirements

IQ 250/260 Series

IQ 250/260 Meter Dimensions



Expandable I/O Componentry

Figure 3.1-31. IQ 250/260 Meter Dimensions—Face and Side Views

Ordering Information

Table 3.1-11. IQ 250/260 Meter Catalog Numbering System

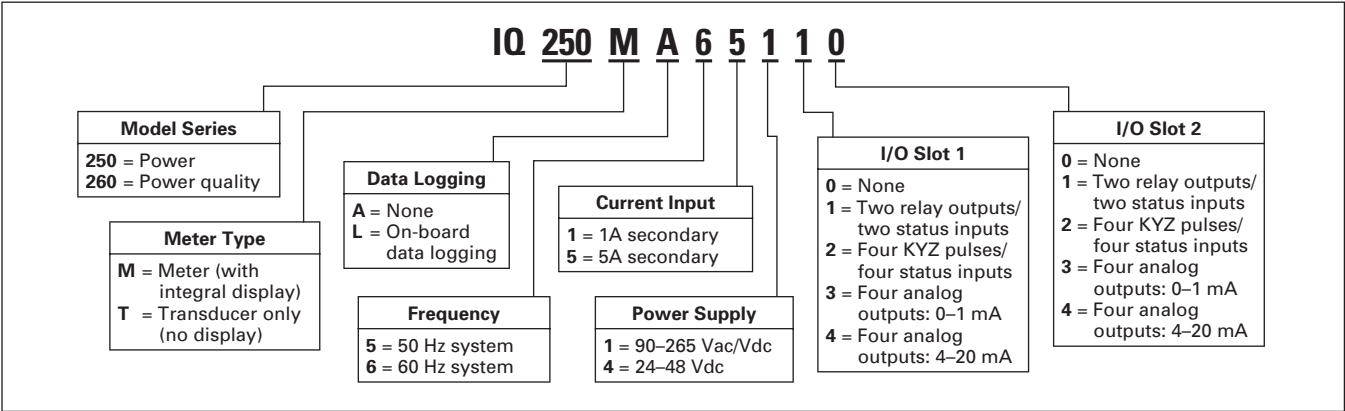


Table 3.1-12. IQ 250/260 Meter Accessories

Description	Catalog Number
Panel mounting adapter for retrofitting an IQ 250/260 to an IQ Analyzer/IQ DP-4000/IQ Data cutout	IQ250-PMAX
PXM 2000 Gateway card kit to upgrade an IQ 250/260 to a PXM 2000	PXM2000-GCK

Table 3.1-13. Power Xpert Meter 2000 I/O Cards

Description	Catalog Number
IQ 250/260 I/O card—2 relay outputs/2 status inputs	IQ250/260-IO1
IQ 250/260 I/O card—4 KYZ pulses/4 status inputs	IQ250/260-IO2
IQ 250/260 I/O card—4 analog outputs 0–1 mA	IQ250/260-IO3
IQ 250/260 I/O card—4 analog outputs 4–20 mA	IQ250/260-IO4

IQ 130/140/150 Series

IQ 130/140/150 Electronic
Power Meters

IQ 100 Electronic Power Meter

General Description

The IQ 100 meter family provides capabilities you would not normally expect in affordable, compact meters, such as fast sampling rate and accurate metering for a full range of power attributes. Providing the first line of defense against costly power problems, Eaton's IQ 100 series electronic power meters can perform the work of an entire wall of legacy metering equipment utilizing today's technology.

When space is at a premium, yet you need ANSI C12.20 accuracy, the IQ 100 series fits the bill. These meters are ideal for electrical equipment assemblies, machine control panels, such as panelboard and switchboard mains and feeders, low voltage metal-enclosed switchgear feeders and motor control centers. Requiring far less space than other meters with similar functionality, IQ 100 series meters fit into a standard ANSI or IEC cutout on a panelboard or other electrical equipment, and therefore fit easily into retrofit applications.

Application Description

- Utility and commercial metering
- Substations, industrial facilities, power generation sites and campuses
- Submetering
- Load studies and voltage recording
- Analog meter replacement

Features and Benefits

- Measure and display real-time information about critical power parameters with a sampling rate of 400 samples per cycle

- Monitor power utilization and quality with ANSI C12.20 accuracy (0.5%)
- Verify meter accuracy with KYZ test pulse self-certification capabilities
- Optional Modbus RTU or TCP communications
- Available as transducer only or with display
- Designed to accommodate upgrades
- Integrate into Eaton's Power Xpert Architecture for a holistic system-level view

Additional Features

Table 3.1-14. Features of IQ 100 Electronic Power Meters

Features	IQ 130	IQ 140	IQ 150
Instrumentation			
Current, per phase	■	■	■
Current demand	■	■	■
Calculated neutral current	■	■	■
Voltage, per phase (L-L, L-N)	■	■	■
Min./max. readings, I, V	■	■	■
Min./max. readings, I, V, PF, F, W, VAR, VA		■	■
Frequency		■	■
Power			
Real, reactive and apparent power, total (W, VAR, VA)		■	■
Power factor, total		■	■
Real, reactive and apparent power demand		■	■
Demand Methods			
Block interval (sliding, fixed)		■	■
Energy			
Real, reactive and apparent energy, total (Wh, VAR, VAh)			■
Communications			
RS-485, Modbus RTU, Modbus ASCII, KYZ output	Optional	Optional	Optional
RJ45, Modbus TCP, KYZ output	Optional	Optional	Optional

Technical Data and Specifications

Table 3.1-15. IQ 100 Electronic Power Meter Technical Information

Description	Specifications
Current Inputs	
Class 10	5A nominal, 10A maximum
Class 2	1A nominal, 2A maximum
Fault Current Withstand 100A for: 300A for: 500A for:	10 seconds 3 seconds 1 second
Continuous current withstand	20A for screw terminated or pass-through connections
Programmable current	Full scale to any CT ratio
Burden	0.005 VA per phase maximum at 11A
Pickup current	0.1% of nominal
Class 10	5 mA
Class 2	1 mA
Connections Pass-through wire gauge dimension Quick connect	0.177 inches (4.5 mm) 0.25-inch male tab

Voltage Inputs

Range Line-to-neutral Line-to-line	20–576 Vac 0–721 Vac
Programmable voltage range	Full scale to any PT ratio
Supported systems	3 element wye, 2.5 element wye, 2 element delta, four-wire delta systems
Input impedance	1 megohm/phase
Burden	0.36 VA/phase maximum at 600V; 0.014 VA at 120V
Connection	7-pin 0.400-inch pluggable terminal block, AWG #12–26 (0.129–3.31 mm ²)

Isolation

All inputs and outputs are galvanically isolated to 2500V

Environmental Ratings

Operating temperature	–20° to +70°C
Storage temperature	–40° to +85°C
Operating humidity	To 95% RH noncondensing
Faceplate rating	NEMA 12 water-resistant mounting gasket Included

Description	Specifications
Sensing Method	
Voltage, current	True rms
Power	Sampling at over 400 samples per cycle on all channels

Update Rate

Watts, VAR and VA	100 msec at 60 Hz
All other parameters	1 second at 60 Hz

Power Supply

AC/DC voltage option	90–265 Vac at 50/60 Hz or 100–370 Vdc, universal AC/DC supply
DC voltage option	18–60 Vdc
Burden	10 VA maximum

Optional Communications Format

Connection type	RS-485 or RJ45 (through back plate)
Com. port baud rate	9600–57,600 bauds
Com. port address	01–247
Data format	8-bit, no parity
Protocols	Modbus ASCII/RTU or TCP

Optional KYZ Pulse

Contacts	1 Form A
On resistance, maximum	35 Ohms
Peak switching voltage	350 Vdc
Continuous load current	120 mA
Peak load current	350 mA (10 ms)
Off-state leakage current at 350 Vdc	1 uA
Opto-isolation	3750 Vac

Dimensions and Shipping

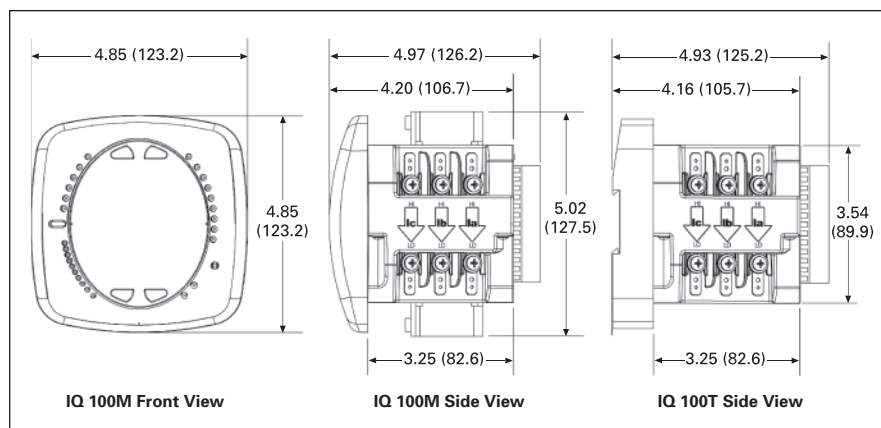
Weight	2 lbs
Basic unit	H 5.00 x W 4.90 x L 5.00 inches
IQ 100	Mounts in 92 mm DIN and ANSI C39.1 round cut-outs
Shipping container dimensions	6.00-inch cube
Tolerance	±0.10 inches (2.54 mm)

Compliance

IEC 687	0.5% accuracy
ANSI C12.20	0.5% accuracy
ANSI C62.41	Burst
UL/cUL/CE	Electrical and electronic measuring and test equipment 22CZ

IQ 130/140/150 Series

IQ 100 Meter Dimensions



IQ 100T Transducer Only

3

Figure 3.1-32. IQ 100 Meter Dimensions—Front and Side Views

Ordering Information

Table 3.1-16. IQ 100 Meter Catalog Numbering System

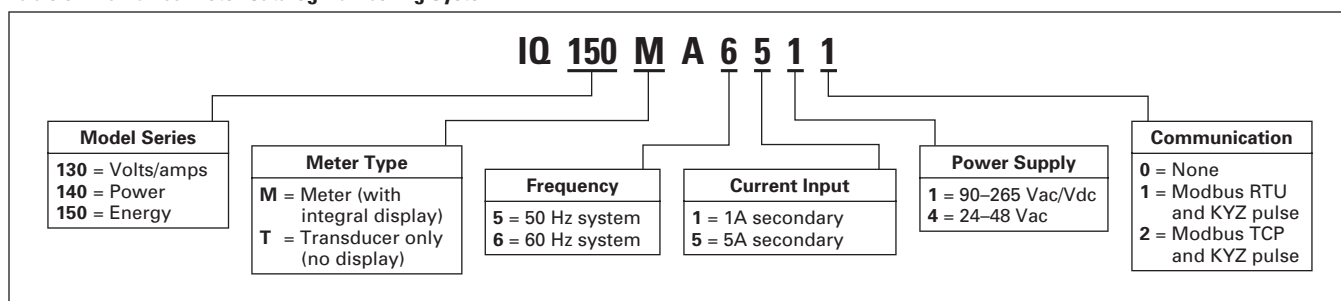


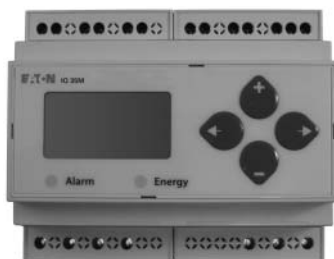
Table 3.1-17. IQ 100 Meter Accessories

Description	Catalog Number
Panel mounting adapter for retrofitting an IQ 100 to an IQ Analyzer/IQ DP-4000/IQ Data cutout	IQ250-PMAX

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IQ 35M

IQ 35M



IQ 35M

General Description

The Eaton IQ 35M Meter is a DIN rail meter that combines exceptional performance and easy installation to deliver a cost-effective solution for energy and power monitoring applications, as well as submetering applications. All models include pulse output and phase alarms for true versatility in all situations. The Modbus output options offer added flexibility for configuration and data analysis.

The IQ 35M allows you to:

- Verify energy bills
- Make informed load shifting and shedding decisions
- Fairly and accurately allocate energy costs to users
- Identify wasteful practices
- Decrease unnecessary usage
- Produce an energy profile
- Secure the optimum utility rate structure

Application Description

- Commercial submetering
- Energy management
- Industrial monitoring
- Cost allocation



IQ 35M mounted and wired in Eaton panelboard. Closeup photo showing IQ 35M panelboard integration and deadfront cover.

Note: Please refer to **Tab 22** for panelboard information.

Features and Benefits

- DIN rail or surface mounted watthour meter with demand
- Affordable, lightweight and compact meter providing watthours energy information
- Included backlit LCD display for local reading
- Power and energy readings
 - kW
 - kWh
 - Peak demand available
- Monitors
 - Watts, watthours, watt demand
 - Volts, amperes
 - PF, frequency
 - VARs, VA
- Optional data logging capability
- Optional serial communications (Modbus-RTU or BACnet MS/TP)
- Revenue grade, ANSI C12.20 0.5% accuracy, IEC 62053-22 Class 0.5S
- User-enabled password protection
- On-board diagnostics



IQ 35M in optional NEMA 4X enclosure. Enclosure shipped loose for field mounting of meter. Enclosure only model number: IQ35M-ENC.

IQ 35M

Product Selection

Table 3.2-1. Catalog Number Selection

IQ35M A 1 1			
Meter Series			
Enclosure Type			
1 = Standard energy			
2 = Four quadrant energy			
Output Option			
1 = Pulse output only			
2 = Pulse output + Modbus			
3 = Pulse output + Modbus + data logging			
5 = Pulse inputs + BACnet + data logging			

Accessories

- NEMA 4 enclosure
- Fuse kits
- DIN rail
- Replacement mounting clips
- CTs—solid and split core

Technical Data and Specifications

- Voltage input
UL: 90V (L-N) to 600V (L-L)
CE: 90V (L-N) to 300V (L-L)
- Current input
Scaling: 5–32,767A
Input range: 0–0.333V or 0–1V (selectable)
- Control power
UL: 90V (L-N) to 600V (L-L)
CE: 90V (L-N) to 300V (L-L)

Accuracy

- Real power and energy
0.5% (ANSI C12.20, IEC 62053-22 Class 0.5S)

Outputs

- IQ35MAx1 thru 3:
Real energy pulse: NO static;
alarm contacts: NC static
- IQ35MA11
Reactive energy pulse 30 Vac/dc
- IQ35MAx2, IQ35MAx3
RS-485 two-wire Modbus RTU
- IQ35MA15 RS-485 two-wire
BACnet MS/TP

Inputs

- IQ35MA15
Two pulse accumulators

Mechanical

- Mounting
DIN rail or 3-point screwmount

Environmental

- Operating temperature range
Meter: –30° to 70°C (–22° to 158°F)
Display: –10° to 50°C (14° to 122°F)
- Storage temperature range
Meter: –40° to 85°C (–40° to 185°F)
Display: –10° to 60°C (14° to 140°F)
- Humidity range
<95% RH noncondensing

Data Outputs

- kW, kWh: Total
- Current: Three-phase average and per phase
- Voltage: Three-phase average, per phase, and line-line and line-neutral
- Power: Real, reactive and apparent; Three-phase total and per phase
- Power factor: Three-phase average and per phase
- Frequency
- Power demand: most recent and peak
- Demand configuration: fixed, rolling block and external sync
- Data logging (IQ35MAx3)
10 configurable data buffers; configurable demand subinterval (when set at a 15-minute interval, buffers store data for 60 days)
- Data logging (IQ35MA15)
6 configurable data buffers; configurable demand subinterval (when set at a 15-minute interval, buffers store data for 60 days)
- Trending requires communication network to retrieve data

IQ 35M

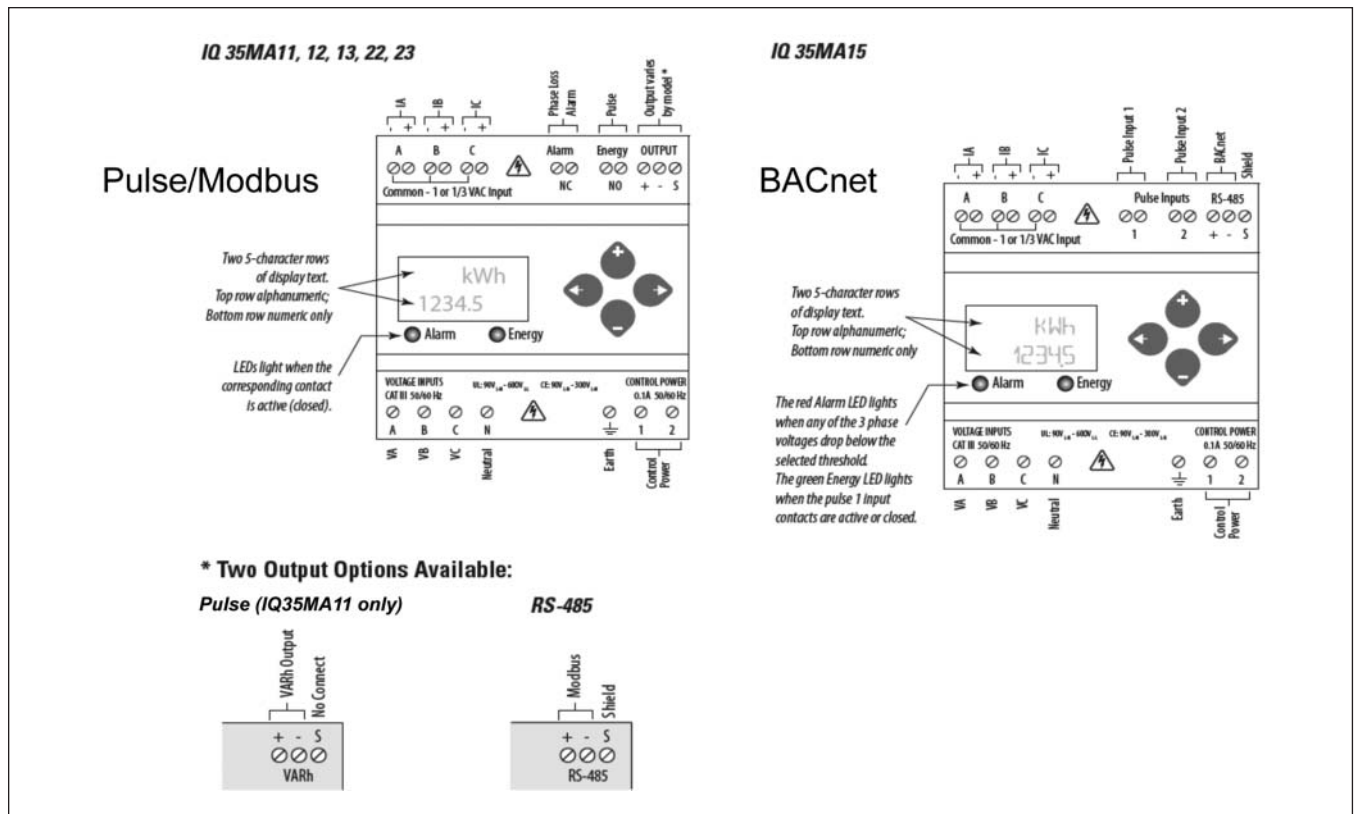


Figure 3.2-1. IQ 35M Product Diagram

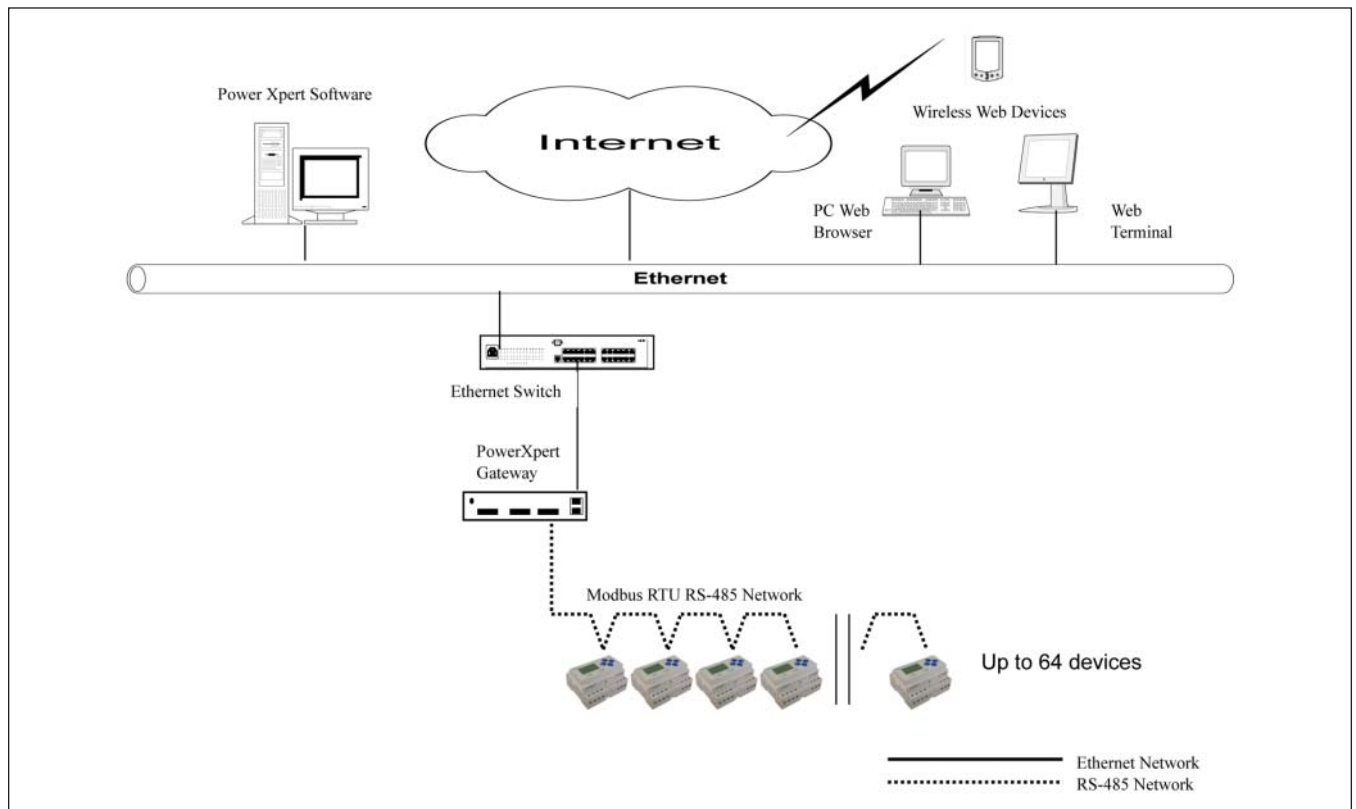


Figure 3.2-2. IQ 35M Advanced Communication—Modbus RTU

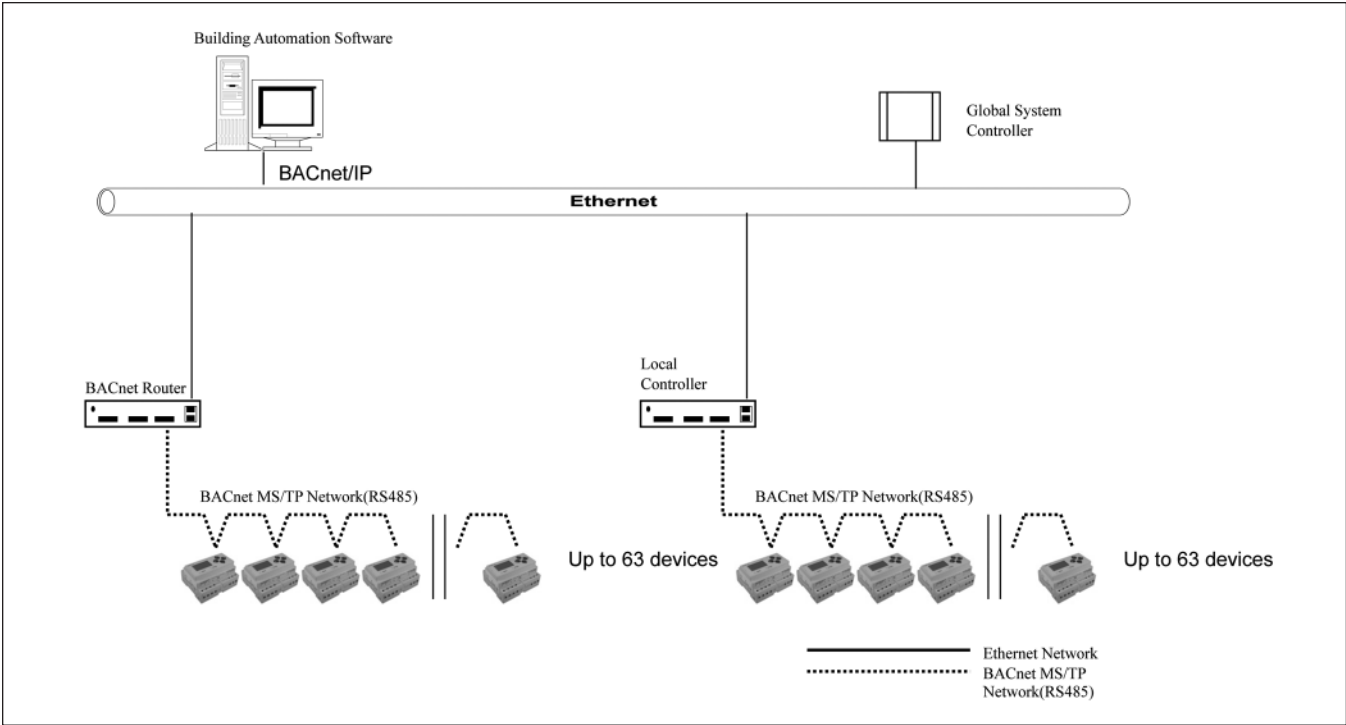


Figure 3.2-3. IQ 35M Advanced Communication—BACnet

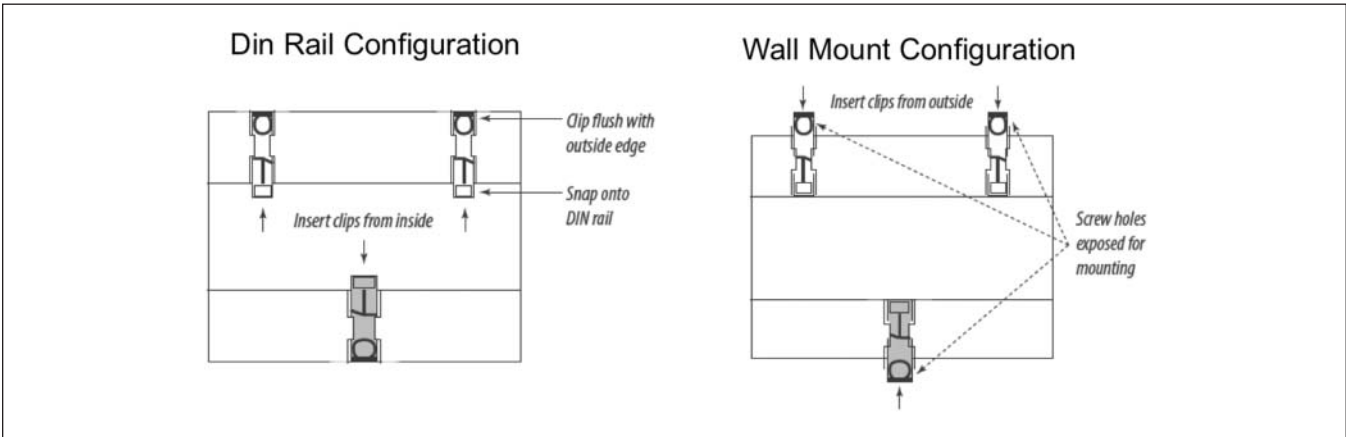
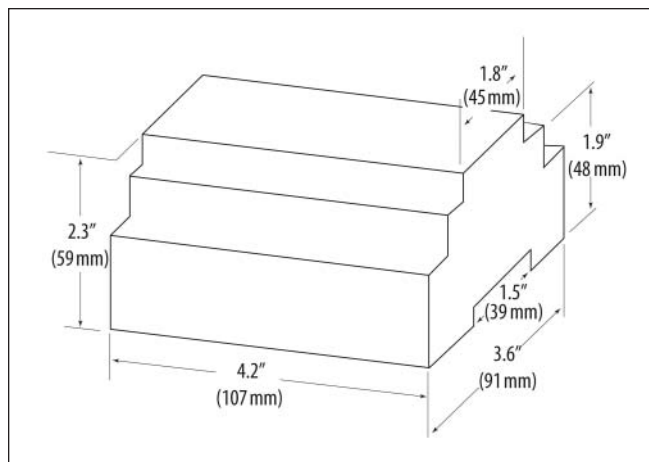
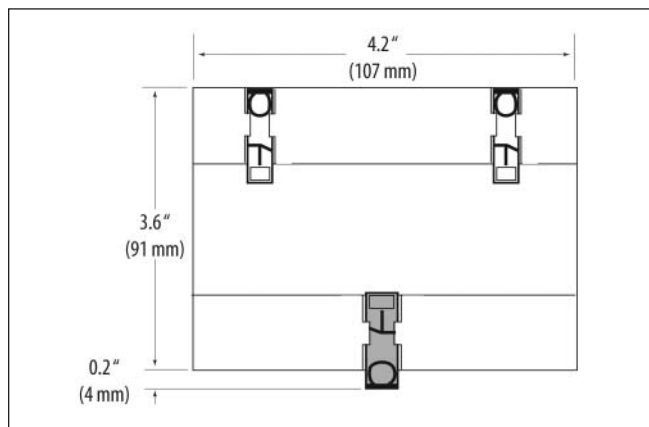
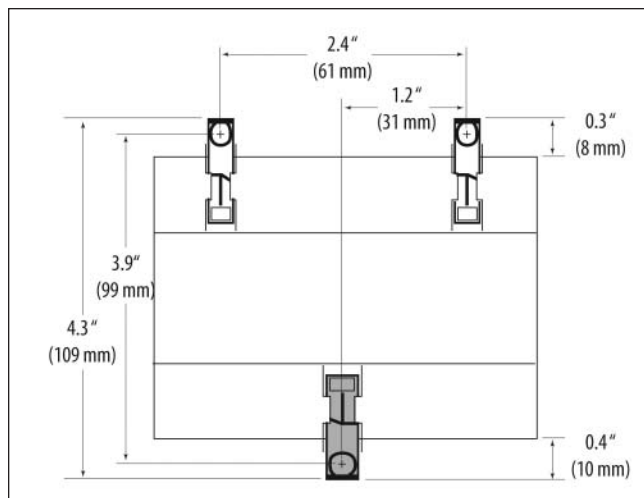


Figure 3.2-4. IQ 35M Mechanical Installation

Dimensions

Figure 3.2-5. Dimensional Drawing

Figure 3.2-6. DIN Rail Configuration

Figure 3.2-7. Wall Mount Configuration

IQ 35M

IQ 35M Current Transducers

Low Current Ranges

5–600A

General Description

Solid- and split-core AC current transducers have different hole sizes and current ratings to suit any application. The solid-core models are ideal for new construction projects. Split-core models are perfect for retrofits. Output is fixed at the industry standard of 0–0.333 Vac.

Application Description

- Data logging
- Recording
- Power monitoring
- Energy management
- Alternative energy monitoring
- Cost allocation

Features

- High accuracy: $\pm 1\%$ at 10% to 130% of rated current
- 0–0.333 Vac standard output
- Solid-core models have a rugged epoxy encapsulated construction, giving it outstanding durability
- Split-core models have interleaving joints for reliability with a self-locking mechanism and no exposed metal; a safe design

Standards and Certifications

- UR
- CE
- RoHS

Technical Data and Specifications

Inputs

- Frequency range: 50–400 Hz
- Accuracy: $\pm 1\%$ at 10% to 130% of rated current

Outputs

- At rated current: 0.333 Vac

Environmental

- Operating temperature range: -10° to 55°C (14° to 131°F)
- Storage temperature range: -40° to 70°C (-40° to 158°F)

Lead Length

- 8-foot twisted pair

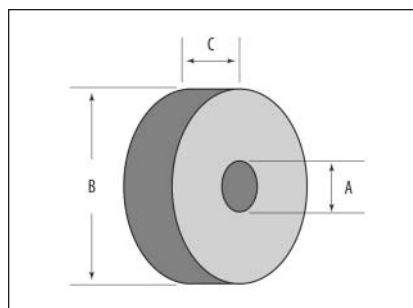


Figure 3.2-8. IQ 35M-SO Solid Core CT Dimensions

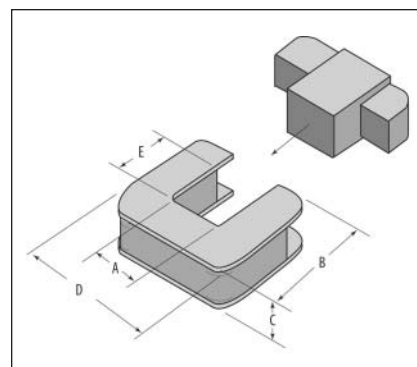


Figure 3.2-9. IQ 35M-SO Split-Core CT Dimensions

Table 3.2-2. IQ 35M—Dimensions in Inches (mm)

Description	A	B	C	D	E	Model Number
Solid Core						
IQ 35M CT, 5A:0.33 Vac, 0.30 inch	0.30 (8.0)	1.70 (44.0)	0.75 (19.0)	—	—	IQ35M-SO-30-5
IQ 35M CT, 20A:0.33 Vac, 0.30 inch	0.30 (8.0)	1.70 (44.0)	0.75 (19.0)	—	—	IQ35M-SO-030-20
IQ 35M CT, 50A:0.33 Vac, 0.50 inch	0.50 (13.0)	1.90 (49.0)	0.75 (19.0)	—	—	IQ35M-SO-050-50
IQ 35M CT, 50A:0.33 Vac, 0.75 inch	0.75 (19.0)	2.10 (54.0)	0.75 (19.0)	—	—	IQ35M-SO-075-50
IQ 35M CT, 100A:0.33 Vac, 1.25 inch	1.25 (32.0)	2.70 (69.0)	0.80 (21.0)	—	—	IQ35M-SO-125-100
IQ 35M CT, 200A:0.33 Vac, 1.25 inch	1.25 (32.0)	2.70 (69.0)	0.80 (21.0)	—	—	IQ35M-SO-125-200
IQ 35M CT, 250A:0.33 Vac, 1.25 inch	1.25 (32.0)	2.70 (69.0)	0.80 (21.0)	—	—	IQ35M-SO-125-250
IQ 35M CT, 300A:0.33 Vac, 1.25 inch	1.25 (32.0)	2.70 (69.0)	0.80 (21.0)	—	—	IQ35M-SO-125-300
IQ 35M CT, 400A:0.33 Vac, 1.25 inch	1.25 (32.0)	2.70 (69.0)	0.80 (21.0)	—	—	IQ35M-SO-125-400
Split Core						
IQ 35M CT, 5A:0.33 Vac, 0.75 inch	2.00 (51.0)	2.10 (54.0)	0.61 (16.0)	0.75 (20.0)	0.75 (20.0)	IQ35M-SP-075-5
IQ 35M CT, 30A:0.33 Vac, 0.75 inch	2.00 (51.0)	2.10 (54.0)	0.61 (16.0)	0.75 (20.0)	0.75 (20.0)	IQ35M-SP-075-30
IQ 35M CT, 50A:0.33 Vac, 0.75 inch	2.00 (51.0)	2.10 (54.0)	0.61 (16.0)	0.75 (20.0)	0.75 (20.0)	IQ35M-SP-075-50
IQ 35M CT, 100A:0.33 Vac, 0.75 inch	2.00 (51.0)	2.10 (54.0)	0.61 (16.0)	0.75 (20.0)	0.75 (20.0)	IQ35M-SP-075-100
IQ 35M CT, 200A:0.33 Vac, 0.75 inch	2.00 (51.0)	2.10 (54.0)	0.61 (16.0)	0.75 (20.0)	0.75 (20.0)	IQ35M-SP-075-200
IQ 35M CT, 250A:0.33 Vac, 1.25 inch	3.25 (83.0)	3.35 (86.0)	1.00 (26.0)	1.25 (32.0)	1.25 (32.0)	IQ35M-SP-125-250
IQ 35M CT, 300A:0.33 Vac, 1.25 inch	3.25 (83.0)	3.35 (86.0)	1.00 (26.0)	1.25 (32.0)	1.25 (32.0)	IQ35M-SP-125-300
IQ 35M CT, 400A:0.33 Vac, 1.25 inch	3.25 (83.0)	3.35 (86.0)	1.00 (26.0)	1.25 (32.0)	1.25 (32.0)	IQ35M-SP-125-400
IQ 35M CT, 600A:0.33 Vac, 1.25 inch	3.25 (83.0)	3.35 (86.0)	1.00 (26.0)	1.25 (32.0)	1.25 (32.0)	IQ35M-SP-125-600

IQ 35M

IQ 35M Current Transducers
High Current Ranges
800–2400A**General Description**

The IQ 35M split-core current transducers, high current ranges, provide a safe 0–0.333 Vac output for use with the IQ 35M energy meter.

Application Description

- Data logging
- Recording
- Power monitoring
- Energy management
- Alternative energy monitoring
- Cost allocation

Features

- High accuracy: 1% of reading from 10% to 100% of rated current
- 0–0.333V output

Standards and Certifications

- UR
- CE

Technical Data and Specifications**Inputs**

- Frequency range: 50/60 Hz
- Accuracy: 1% of reading from 10% to 100% of the rated current of the CTs

Outputs

- At rated current: 0.333

Mechanical

- Installation category: Cat II or Cat III

Environmental

- Operating temperature range: –15° to 60°C (5° to 140°F)
- Storage temperature range: –40° to 70°C (–40° to 158°F)
- Humidity range: 0–95% noncondensing

Lead Length

- 6-foot twisted pair

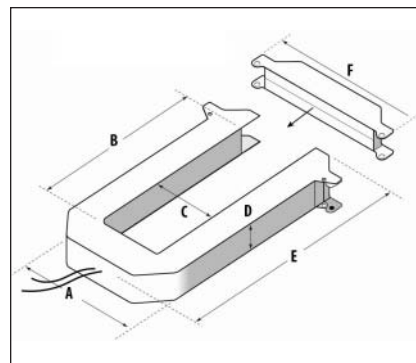


Figure 3.2-10. IQ 35M-SP-25X

Table 3.2-3. IQ 35M—Dimensions in Inches (mm)

Description	A	B	C	D	E	F	Model Number
Split Core							
IQ 35M CT, 800A:0.33 Vac, 2.50 inch	4.90 (125.0)	2.90 (73.0)	2.50 (62.0)	1.20 (30.0)	5.20 (132.0)	5.90 (151.0)	IQ35M-SP-253-800
IQ 35M CT, 1000A:0.33 Vac, 2.50 inch	4.90 (125.0)	5.50 (139.0)	2.50 (62.0)	1.20 (30.0)	7.90 (201.0)	6.00 (151.0)	IQ35M-SP-255-1000
IQ 35M CT, 1200A:0.33 Vac, 2.50 inch	4.90 (125.0)	5.50 (139.0)	2.50 (62.0)	1.20 (30.0)	7.90 (201.0)	6.00 (151.0)	IQ35M-SP-255-1200
IQ 35M CT, 1600A:0.33 Vac, 2.50 inch	4.90 (125.0)	5.50 (139.0)	2.50 (62.0)	1.20 (30.0)	7.90 (201.0)	6.00 (151.0)	IQ35M-SP-255-1600
IQ 35M CT, 2000A:0.33 Vac, 2.50 inch	4.90 (125.0)	5.50 (139.0)	2.50 (62.0)	1.20 (30.0)	7.90 (201.0)	6.00 (151.0)	IQ35M-SP-255-2000
IQ 35M CT, 2400A:0.33 Vac, 2.50 inch	4.90 (125.0)	5.50 (139.0)	2.50 (62.0)	1.20 (30.0)	7.90 (201.0)	6.00 (151.0)	IQ35M-SP-255-2400

Supported System Types

The IQ 35M power meters have a number of different possible system wiring configurations (see wiring diagrams on **Page 3.2-9**). To configure the meter, set the System Type via the User Interface or Modbus register 130 (if so equipped). The System Type tells the meter which of its current and

voltage inputs are valid, which are to be ignored, and whether neutral is connected. Setting the correct System Type prevents unwanted energy accumulation on unused inputs, selects the formula to calculate the Theoretical Maximum System Power, and determines which phase loss algorithm is to be used. The phase

loss algorithm is configured as a percent of the Line-to-Line System Voltage (except when in System Type 10) and also calculates the expected Line to Neutral voltages for system types that have Neutral (12 and 40).

Table 3.2-4. Supported System Types

Number of Wires	CTs		Voltage Connections			System Type		Phase Loss Measurements			Wiring Diagram Figure Number
	Qty	ID	Qty	ID	Type	Modbus Register 130	User Interface: SETUP>S SYS	VLL	VLN	Balance	
Single-Phase Wiring											
2	1	A	2	A, N	L-N	10	1L + 1n		AN		3.2-11
2	1	A	2	A, B	L-L	11	2L	AB			3.2-12
3	2	A, B	3	A, B, N	L-L with N	12	2L + 1n	AB	AN, BN	AN-BN	3.2-13
Three-Phase Wiring											
3	3	A, B, C	3	A, B, C	Delta	31	3L	AB, BC, CA		AB-BC-CA	3.2-14
4	3	A, B, C	4	A, B, C, N	Grounded wye	40	3L + 1n	AB, BC, CA	AN, BN, CN	AN-BN-CN and AB-BC-CA	3.2-15 3.2-16

Table 3.2-5. Wiring

Symbol	Description
	Voltage disconnect switch
	Fuse (installer is responsible for ensuring compliance with local requirements. No fuses are included with the device.)
	Earth ground
	Current transducer
	Potential transformer
	Protection containing a voltage disconnect switch with a fuse or disconnect circuit breaker. The protection device must be rated for the available short-circuit current at the connection point.

Note: IQ 35MA1x models are not polarity sensitive. No need to observe polarity when wiring. IQ 35MA2x models are polarity sensitive. Observe correct polarity when wiring.

Wiring Diagrams

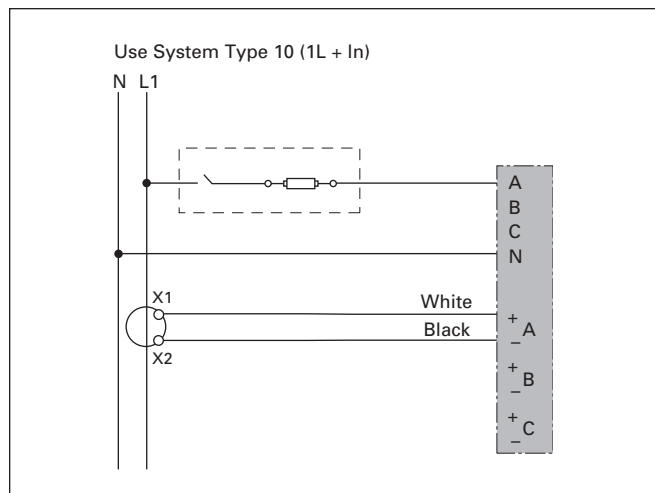


Figure 3.2-11. Single-Phase Line-to-Neutral Two-Wire System, 1 CT

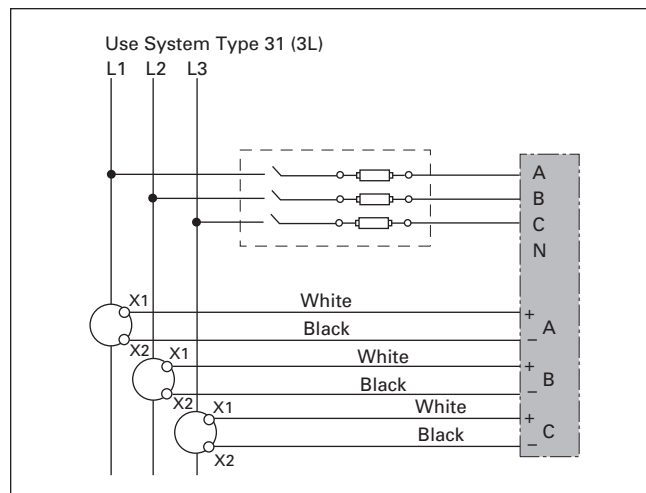


Figure 3.2-14. Three-Phase, Three-Wire, 3 CTs, No PT

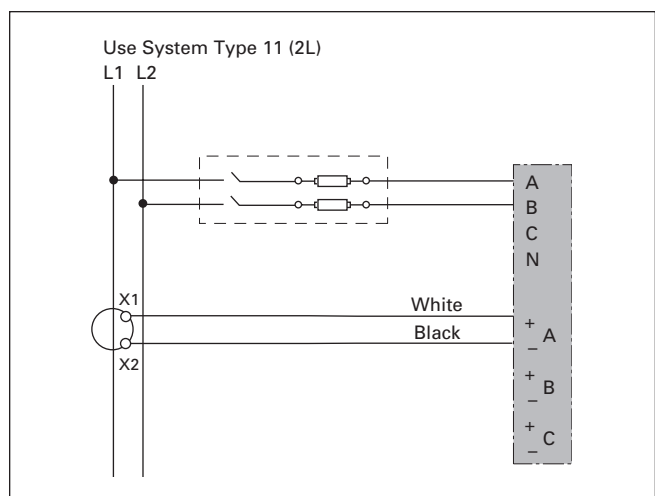


Figure 3.2-12. Single-Phase Line-to-Line Two-Wire System, 1 CT

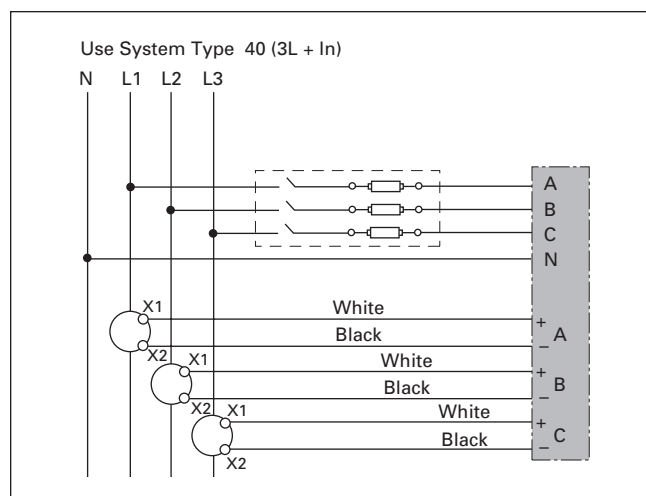


Figure 3.2-15. Three-Phase, Four-Wire Wye Direct Voltage Connection, 3 CTs

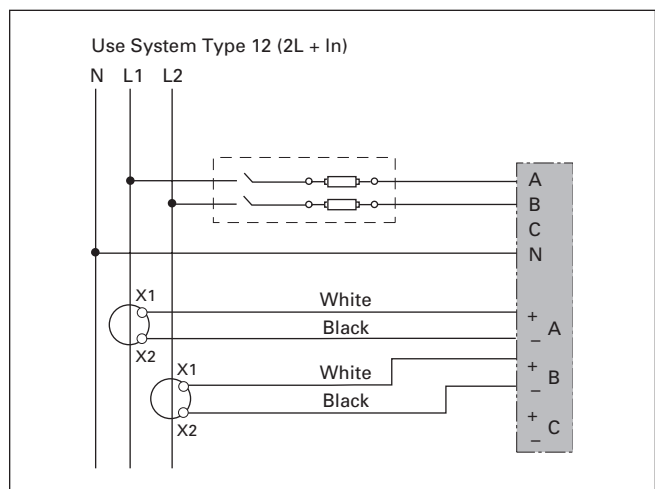


Figure 3.2-13. Single-Phase Direct Voltage Connection, 2 CTs

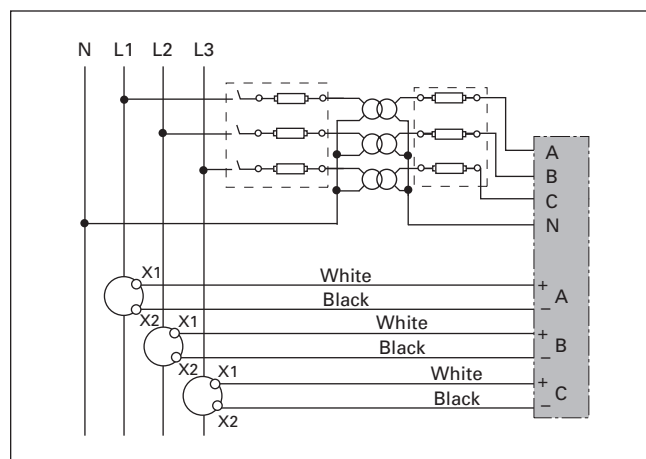


Figure 3.2-16. Three-Phase, Four-Wire Wye Connection, 3 CTs, 3 PTs

Control Power

3

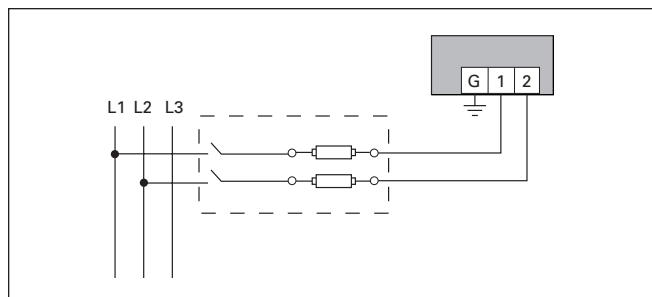


Figure 3.2-17. Direct Connect Control Power (Line-to-Line)
Line-to-Line from 90 Vac to 600 Vac (UL) (520 Vac CE). In UL installations, the lines may be floating (i.e., a delta). If any lines are tied to an earth (i.e., a corner grounded delta), see the Line-to-Neutral installation limits. In CE installations, the lines must be neutral (earth) referenced at less than 300 Vac L-N.

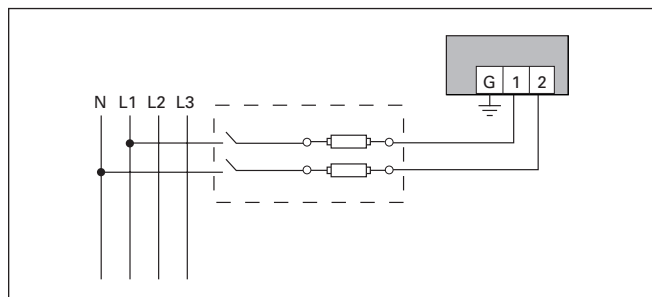


Figure 3.2-18. Direct Connect Control Power (Line-to-Neutral)
Line-to-Neutral from 90 Vac to 347 Vac (UL) or 300 Vac (CE).

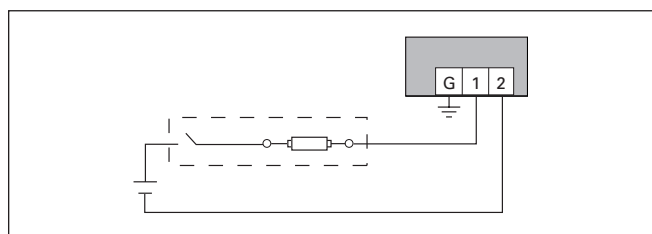


Figure 3.2-19. Direct Connect Control Power (DC)
DC control power from 125 Vdc to 300 Vdc (UL and CE max.).

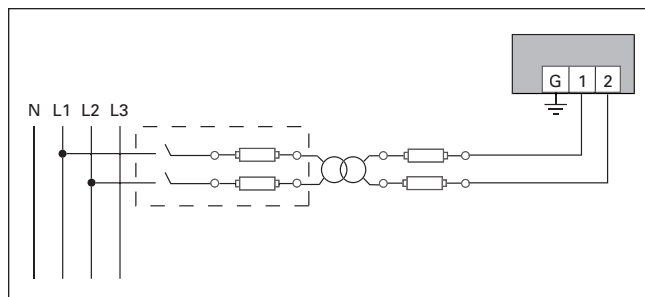


Figure 3.2-20. Control Power Transformer (CPT) Connection
The Control Power Transformer may be wired L-N or L-L. Output to meet meter input requirements

Fuse Recommendations

Keep the fuses close to the power source (obey local and national code requirements).

For selecting fuses and circuit breakers, use the following criteria:

- Current interrupt capacity should be selected based on the installation category and the fault current capability
- Overcurrent protection should be selected with a time delay
- The voltage rating should be sufficient for the input voltage applied
- Provide overcurrent protection and disconnecting means to protect the wiring. For DC installations, the installer must provide external circuit protection (suggested: 0.5A, time delay fuses)
- The earth connection is required for electromagnetic compatibility (EMC) and is not a protective earth ground

IQ 150S/250S Series

IQ 150S/250S Self-Enclosed
Electronic MetersIQ 150S/250S Self-Enclosed
Electronic Meter

General Description

With energy costs skyrocketing, you need the ability to verify the accuracy of utility billing and allocation of energy costs among business units, different manufacturing areas or facilities, and tenants. Production equipment and IT systems are vulnerable to power anomalies; therefore, you must ensure that power is always up to specifications. If your infrastructure is an established facility, you may not currently have metering or may have addressed these concerns by deploying a variety of analog gauges and meters—one for volts, one for amperes and so on, with separate meters for each measurement.

If you're planning an upgrade or a new power infrastructure, no doubt you would like to capitalize on the latest technology to improve upon that cumbersome architecture and its patchwork view.

Application Description

- Industrial and commercial buildings, metering and submetering
- Government facilities and military
- Universities and airports
- Load studies and voltage recording

Features and Benefits

- Self-enclosed, these meters are an ideal solution for surface mounting next to a selected piece of equipment for energy monitoring
- NEMA 12 enclosure with a large, easy-to-read faceplate, consistent with other Eaton meter models, designed with "knockouts" for easy installation
- Ethernet communications option for either wired or wireless setup, allowing for additional ease of installation and integration into existing networks
- Available data and alarm recording for historical records/trending
- Integrate into Eaton's Power Xpert® Architecture for a holistic system-level view

Wireless and High-End Capabilities you
would not Expect from a Self-Enclosed,
Compact Meter

Providing the first line of defense against costly power problems, Eaton's IQ 150S/250S electronic self-enclosed meters can perform the work of an entire wall of legacy metering equipment using today's secure wireless technology. Eaton's IQ 150S/250S meters use 24-bit AD converters that sample at more than 400 samples per cycle and meet IEC 687 (0.2% accuracy) and ANSI C12.20 (0.2% accuracy) standards. With such high-performance measurement capability, these meters can be confidently used for primary revenue metering and submetering applications.

Either model will help you monitor energy demand, while the IQ 250S provides the extra benefit of also monitoring and recording the changes in the characteristics of your power.

Eaton's IQ 150S/250S meters provide direct-reading metered values for the most critical power aspects, such as watts, watt demand, watthours, voltage amperes (VA), VA-hours, VARs, VAR-hours and power factor. They have high sampling speed and accuracy.

These meters are self-enclosed in a NEMA 12 enclosure with "knockouts" on the bottom for communication and power, providing for an easy installation.

Perhaps you don't have network drops in all the right places. The IQ 150S/250S offers a wireless communications option. The transmissions are encrypted using 128-bit Wired Equivalent Privacy (WEP) for security.

Industry-Standard Communication
Protocols

Standard Modbus RS-485 Communication

Standard communication includes an RS-485 output speaking Modbus protocol. This allows the unit to be connected to any serial RS-485 bus using the Modbus interface. The unit communicates easily with most building automation, Power Xpert Software or other software systems. Baud rates are up to 57.6K baud to provide fast update times.

Wi-Fi or Land-Based Ethernet

The unit offers an Ethernet option—configured either as an RJ45 or Wi-Fi connection. The Wi-Fi configuration allows the 150S/250S to be used on standard Wi-Fi base stations. The unit is assigned an IP address; it communicates Modbus protocol over Ethernet TCP/IP. Wireless Ethernet is reliable and easy to integrate, making it the superior solution for mass meter deployment.

KYZ Pulse

For applications in which a pulse is needed, the unit also provides a KYZ output that pulses proportional to the amount of energy consumed. This feature is used for pulse counting applications into building management systems where serial or Ethernet protocol is not available.

Verify Energy Bills

The IQ 150S/250S models provide a traceable watthour test pulse (used with a watthour pulse recorder or totalizer), so you can verify the accuracy of your meter and in turn, the accuracy of billing from your utility company and to internal customers.

Integrated with Eaton's Power Xpert Architecture

IQ 150S/250S meters integrate into Eaton's Power Xpert Architecture, where meters, gateways and monitoring devices collaborate to create a unified, centralized view of the end-to-end power and facility infrastructure.

When used in this architecture, either with a Power Xpert Gateway or directly via Ethernet, the meters with the Modbus RTU option can provide Web-based graphics of current power conditions. Simply connect your meter to a Power Xpert Gateway to translate Modbus-based information from the meter into HTML-based Web pages that are accessible from any standard Web browser. If you select a model with the Ethernet option, the meter can easily be monitored remotely via Power Xpert Software or another third-party monitoring system. With access to accurate, real-time information from IQ 150S/250S meters, Power Xpert Architecture can transform your power system into an integrated, agile system, and an easily managed entity that performs better and costs less.

Designed for the User

When space is at a premium, yet you need ANSI C12.20 accuracy, Eaton IQ 150S/250S meters fit the bill. These ultra-compact meters are ideal for surface mounting next to a selected piece of equipment for energy monitoring. Requiring far less space than other meters with similar functionality, and offering a NEMA 12 enclosure and a large, easy-to-read faceplate, consistent with other Eaton meter models, these meters are designed with "knockouts" for easy retrofit installation.

Most meters in this class have small or dark displays that can be hard to see, especially from a distance. Eaton's IQ 150S/250S meters have a large, bright red, three-line LED display, each line more than a half-inch tall. This display is very easy to read, even if the meter is installed at a height or distance. Using the keypad and menus on the local display, users can display a variety of electrical system values or program the meter.

Table 3.2-6. Features of IQ 150S/250S Electronic Power Meters

Features	IQ 150S	IQ 250S
Instrumentation		
Current, per phase	■	■
Calculated neutral current	■	■
Voltage, per phase (L-L, L-N)	■	■
Frequency	■	■
Minimum/maximum readings, I ^① , V ^① , PF, F, W, VAR, VA	Total	Total and per phase
Power		
Real, reactive and apparent power (W, VAR, VA)	Total	Total and per phase
Power factor	Average	Average and per phase
Demand Methods		
Block interval (fixed, sliding)	■	■
Current demand	■	■
Real, reactive and apparent power demand	Total	Total and per phase
Energy		
Real, reactive and apparent energy (Wh, VARh, VAh)	Total	Total and per phase
Real and reactive, net and positive and negative (Wh, VARh)	Total	Total and per phase
I/O		
Pulse output	■	■
Communications		
RS-485, Modbus RTU, DNP 3.0	■	■
RJ45 or 802.11b, Modbus TCP ^②	Optional	Optional
Data Logging		
2 MB for data logging		■
Alarming		
Set point driven alarm		■

^① Per phase only.

^② If configured for Ethernet, RS-485 not available.

Technical Data and Specifications

Table 3.2-7. IQ 150S/250S Electronic Meter Technical Information

Description	Specifications
Current Inputs	
Class 10	5A nominal, 10A maximum
Class 2	1A nominal, 2A maximum
Fault Current Withstand 20A for: 60A for: 100A for:	10 seconds 3 seconds 1 second
Programmable current	Full scale to any CT ratio
Burden	0.005 VA per phase maximum at 11A
Pickup Current Class 10 Class 2	0.1% of nominal 5 mA 1 mA
Connections Screw terminal	#6–32 screws
Voltage Inputs	
Range Line-to-neutral Line-to-line	20–416 Vac (IQ150S), 20–576 Vac (IQ250S) 20–721 Vac
Programmable voltage range	Full scale to any PT ratio
Supported systems	3 element wye, 2.5 element wye, 2 element delta, four-wire delta systems
Input impedance	1 megohm/phase
Burden	0.36 VA/phase maximum at 600V; 0.014 VA at 120V
Connection	7-pin, 0.400-inch screw terminal block, AWG #12–26 (0.129–3.31 mm ²)
Isolation	
All inputs and outputs are galvanically isolated to 2500V	
Environmental Ratings	
Operating temperature	–20° to +70°C
Storage temperature	–20° to +70°C
Operating humidity	To 95% RH noncondensing
Faceplate rating	NEMA 12
Sensing Method	
Voltage, current	rms
Power	Sampling at over 400 samples per cycle on all channels

Description	Specifications
Update Rate	
Watts, VAR and VA	100 msec at 60 Hz
All other parameters	1 second at 60 Hz
Power Supply	
AC/DC voltage option	90–400 Vac at 50/60 Hz or 100–370 Vdc, universal AC/DC supply
Burden	16 VA maximum
Standard Serial Communications Format	
Connection type	RS-485
Communications port baud rate	9600–57,600 Bauds
Communications port address	01–247
Data format	8-bit, no parity
Protocols	Modbus ASCII, RTU, DNP 3.0
Optional Ethernet Communications Format	
Connection type	RJ45 or 802.11b (wireless)
Protocols	Modbus TCP
KYZ Pulse	
Contacts	1 Form A
On resistance, maximum	35 Ohms
Peak switching voltage	350 Vdc
Continuous load current	120 mA
Peak load current	350 mA (10 ms)
Off-state leakage current at 350 Vdc	1 uA
Opto-isolation	3750 Vac
Dimensions and Shipping	
Weight	4 lbs
Basic unit	H 7.90 x W 7.50 x D 3.10 inches
Compliance	
IEC 687	0.2% accuracy
ANSI C12.20	0.2% accuracy
ANSI C62.41	Burst
ANSI (IEEE) C37.90.1	Surge withstand
UL/cUL	Electrical and electronic measuring and test equipment 22CZ

Note: Specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to User Manual for detailed specifications.

Wiring Diagram

3

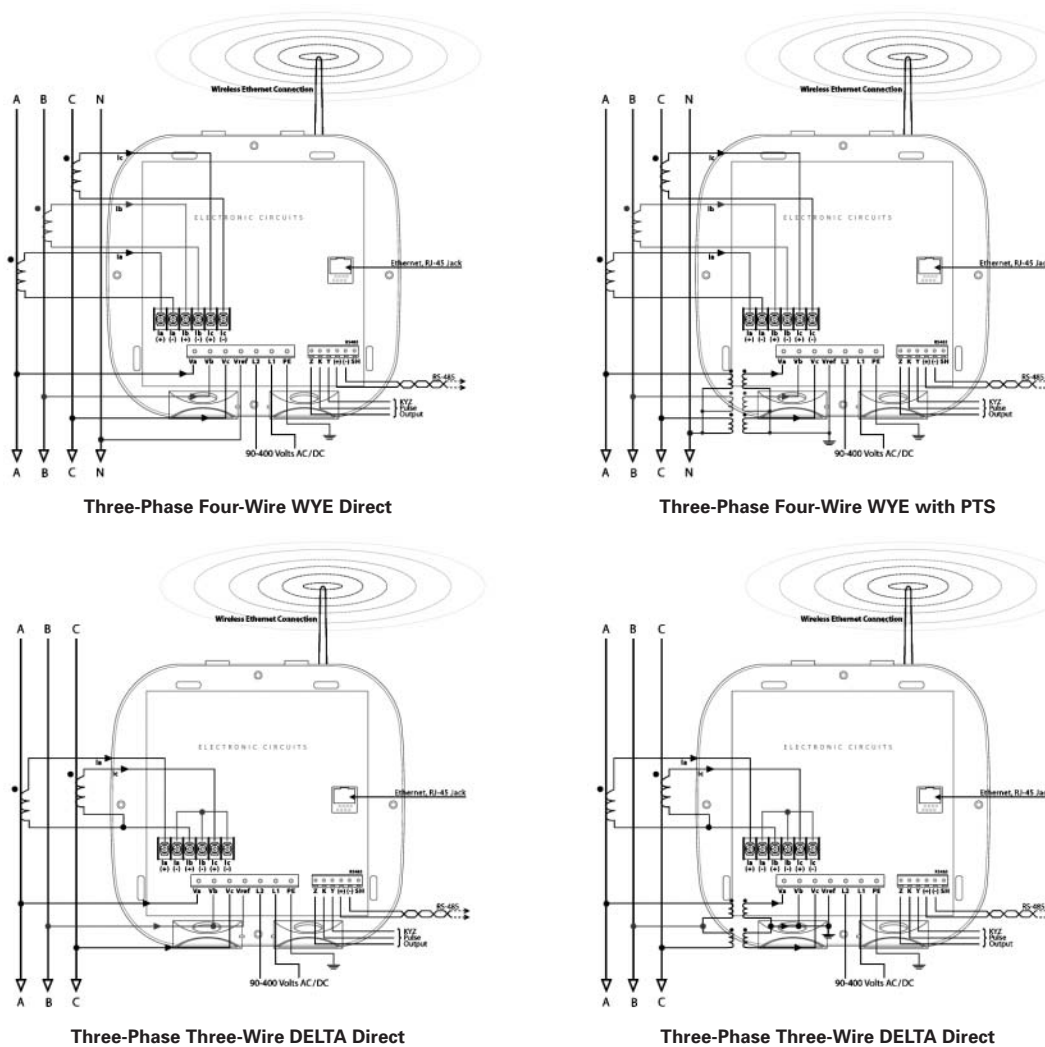


Figure 3.2-21. IQ 150S/250S Wiring Diagram

Installation Diagram

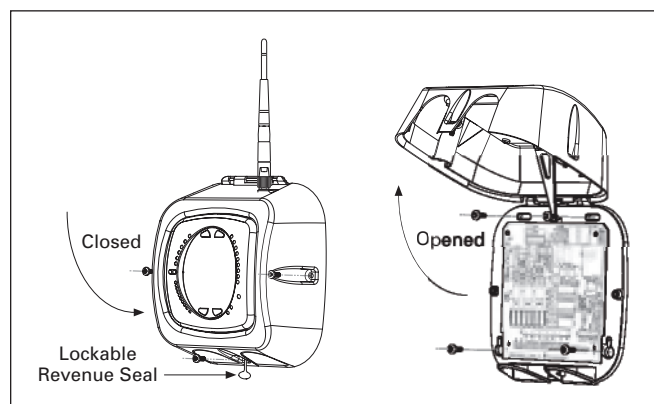


Figure 3.2-22. IQ 150S/250S Installation

Dimensions in Inches (mm)

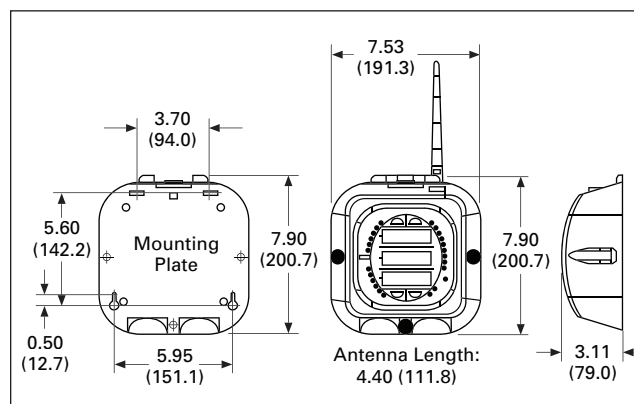
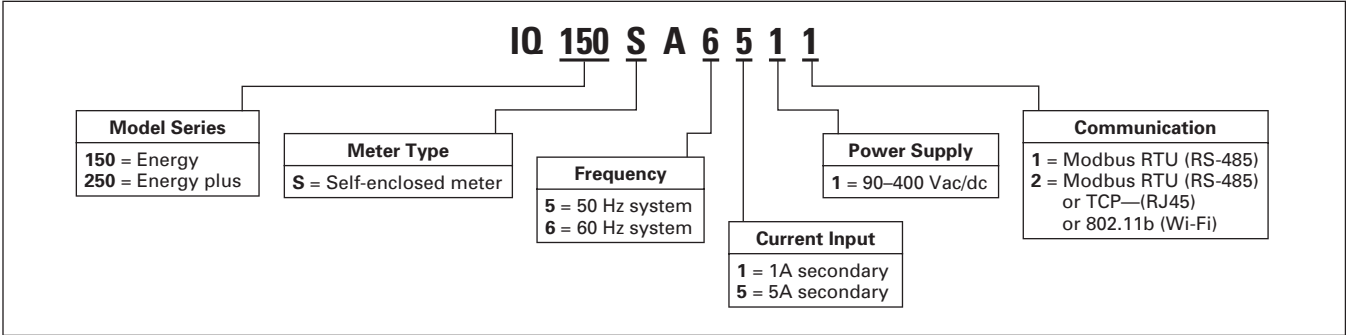


Figure 3.2-23. IQ 150S/250S Meter Dimensions

Ordering Information

Table 3.2-8. IQ 150S/250S Meter Catalog Numbering System



Power Xpert Multi-Point Meter

Power Xpert Multi-Point Meter —High-Density Metering



Power Xpert Multi-Point Meter

Eaton's Power Xpert™ Multi-Point Meter is an ANSI C12.20 revenue class Web enabled electronic submetering device that can be mounted in panelboards, switchboards or enclosures. When mounted in a panelboard or a switchboard, the Power Xpert Multi-Point Meter provides customers with an integrated power distribution and energy metering solution that saves space, reduces installation labor and lowers total cost.

The Eaton Power Xpert Multi-Point Meter (PXMP Meter) offers a highly modular approach to high-density metering applications in electrical power distribution systems. The PXMP Meter is compatible with most three-phase industrial, commercial and single-phase residential low voltage electrical power systems. The PXMP is equipped with two Modbus RTU communication ports for local display and remote serial communications. The PXMP also has optional pulse input and digital output modules along with one standard digital output and three digital inputs. The PXMP Energy Portal Module is Web enabled, making it suitable for use with Ethernet networks and modems.

General Description

The Power Xpert Multi-Point Meter can measure up to any of the following number of circuits:

- Sixty single-phase, two-wire (single-pole)
- Thirty single-phase, three-wire (two-pole)
- Twenty three-phase, four-wire (three-pole)

The circuits listed above can be mixed provided that the total number of current sensors does not exceed 60. The meter provides current; voltage; power factor; demand and active, reactive, and real power (VA, VAR, kW); and active, reactive and real energy (VA, VAR, kWh) measurements for each load. The unit also provides up to two years at 15-minute intervals or eight years at one-hour intervals of demand data logging storage in non-volatile memory for up to 60 submeters.

The Power Xpert Multi-Point Meter can be used with three different ratings of current sensors: 100 mA, 10 mA or 333 mV. Switchboard/ panelboard applications will use the 100 mA current sensors, which are highly accurate, self-protecting in the event of an open circuit condition under load and are supplied with an integral plug-in connector. The PXMP automatically detects the rating of the current sensor that is connected.

The PXMP can also use 10 mA current sensors that were previously installed for IQMESII retrofit applications. Additionally the PXMP can use 333 mV split core current sensors for retrofit applications where metering has not previously existed. The 10 mA and 333 mV current sensors are also self-protecting in the event of an open circuit condition under load.

Application Description

The Power Xpert Multi-Point Meter is ideally suited to handle submetering in low voltage power distribution equipment applications such as distribution boards in multi-tenant buildings, comprehensive main and feeder metering in commercial/industrial switchboards or medium voltage distribution equipment with the use of voltage and current transformers.

The Power Xpert Multi-Point Meter provides a cost-effective solution for residential or commercial metering installations. Typical installations include:

- High-rise buildings
- Government institutions
- K-12, universities and campuses
- Office buildings
- Medical facilities
- Apartment and condominium complexes
- Airports
- Shopping malls
- Industrial sites
- Mixed-use facilities

Features

- Monitors power and energy for up to 60 current sensors; spacesaving modular design allows measurement from 1 to 60 circuits
- Built-in communication interfaces
- Monitors single-phase and three-phase loads from 120 to 600 Vac
- Monitors current, voltage, power factor, frequency, power and energy
- Stores extensive energy profile data for each metering point; can be used to identify coincidental peak demand contribution
- LEDs provide status of unit communication activity and verify sensor connections
- Meets rigid ANSI C12.20 accuracy specifications for revenue meters
- Three standard digital inputs and eight pulse inputs per optional module to monitor WAGES (water, air, gas, electric or steam)
- One standard digital output and eight digital outputs per optional module for alarm indication
- Three types of meter modules to support 10 mA, 100 mA or 333 mV sensors
- Can be directly mounted in a UL Listed panelboard, switchboard or enclosure
- 256 MB of memory in meter base for up to two years of 15-minute interval data (eight years of one-hour interval data) for eight demand values up to 60 submeters

Communication Capabilities

With the Power Xpert Multi-Point Meter's built-in communication capabilities, remote meter reading and monitoring functions can be integrated into both new and retrofit applications.

- Standard Modbus RTU
- Optional Modbus TCP / BACnet/IP / SNMP / HTTP / SMTP / NTP / SFTP communications

Software Compatibility

The Power Xpert Multi-Point Meter:

- Can be used as part of an electrical energy monitoring and cost allocation system
- Can be remotely monitored via onboard Web pages with Eaton's optional Energy Portal Module
- Is compatible with third-party software platforms and interface devices

Power Xpert Multi-Point Meter

Configuration

- The Power Xpert Multi-Point Meter is fully configurable using Power Xpert Multi-Point configuration software that can be downloaded free from the Eaton website at www.eaton.com/meters
- Each Power Xpert Multi-Point Meter module can be configured for up to six metering points in any

combination of single-phase and three-phase metering points corresponding to the voltage wiring of the meter base

- Power Xpert Multi-Point configuration software simplifies system commissioning and startup; PXMP configuration software supports both online and offline configurations

Easy to Install

- UL Listed for mounting inside panelboards (e.g., PRL4), switchboards, and NEMA 12 enclosures
- Quick connect terminals for current sensors, Modbus communications, and bus voltages make wiring the unit quick and easy

Table 3.2-9. Power Xpert Multi-Point Meter Features

Description	Main/Aggregate	Channel Data	Tenant
Instrumentation			
Current, per phase	■ ①	■	—
Voltage, per phase (L-L, L-N)	■	■	—
Frequency	—	■	■
Minimum/maximum readings, V	Per phase	—	—
Minimum/maximum readings, W, VAR, VA	Total and per phase	—	—
Minimum/maximum readings, PF, F	Total	—	—
Power			
Real, reactive and apparent power (W, VAR, VA)	Total and per phase	Total and per phase	Total
Power factor	—	Average	Average
Demand			
Block interval (fixed, sliding)	■	—	—
Real, reactive and apparent power demand	Total and per phase	—	—
Minimum/maximum readings, PF, W, VAR, VA	Total and per phase	Total	—
Energy			
Real, reactive and apparent energy (Wh, VARh, VAh)	Total	—	Total
Real, forward and reverse, and total (Wh)	■	—	■

① Main only.

Product Selection

Table 3.2-10. Meter Selection

Meter Module	Meter Base		Typical Applications			
	Three-Phase Application or Single-Phase with ABCN	Single-Phase Application with ABN	New Switchboards PXMP Current Sensors, Solid Core, PXMP-CSXXX, Ampere Ratings	Retrofit Existing IQMESII Sensors, Solid Core, CS-XXX, Ampere Ratings	Enclosed PXMP 333MV Sensors, Split Core, CS-SP-X-XXXX-333MV, Ampere Ratings	Enclosed PXMP Interface Modules
PXMP-MM100MA	PXMP-MB	—	125, 250, 400	—	—	—
PXMP-MM333MV	PXMP-MB	—	—	—	100, 200, 300, 400, 600, 800, 1000, 1200, 1600, 2000 ②	PXMP-IM333MV
PXMP-MM10MA	PXMP-MB	—	—	5, 50, 70, 125, 200, 400	—	—
PXMP-MM100MA-AB	—	PXMP-MB-AB	125, 250, 400	—	—	—
PXMP-MM333MV-AB	—	PXMP-MB-AB	—	—	100, 200, 300, 400, 600, 800, 1000, 1200, 1600, 2000 ②	PXMP-IM333MV
PXMP-MM10MA-AB	—	PXMP-MB-AB	—	5, 50, 70, 125, 200, 400	—	—

② For applications requiring more than 2000A current sensors, use a CS005 with 5A CT in conjunction with PXMP-MM10MA.

Power Xpert Multi-Point Meter

Technical Data and Specifications

Environmental

The PXMP Meter and current sensors must be housed in a NEMA or UL enclosure that keeps the internal environment within the PXMP's environmental specification ranges and provides suitable fire and mechanical protection in the end product installation.

- Temperature range: -20 to +70°C (-4 to +158°F)
- Storage temperature range: -40 to +85°C
- Humidity: 5-95% noncondensing environment
- Pollution degree: II
- Elevation: 0 to 9843 ft (0 to 3000m)
- Housing: IP20
- CE Mark
- EMC EN61326

Emissions Conducted and Radiated

- FCC part 15 class B
- CISPR 11 class B

Table 3.2-11. Electromagnetic Immunity

Standard	Description	Level
EN61000-4-2	ESD	3
EN61000-4-3	RF radiated	3
EN61000-4-4	Electrical fast transient	3
EN61000-4-5	Surge	3 ①
EN61000-4-6	RF conducted	3
EN61000-4-11	Volt sag/swell/variation	—

① 24 Vdc PXMP inputs are for a local bus that is surge level 2. PXG60E AC mains connection will support level 3.

Product Safety

- IEC/EN61010-1
- UL 61010-1 File E185559
- CNL evaluation to CAN/C22.2 No 1010.1.92

Accuracy

- ANSI C12.20—Accuracy Class 0.5% with either CSXXX or PXMP-CSXXX sensors
 - Measurement Canada Approval Pending

External Circuit Group Specifications

PXMP-MB (-AB) Meter Base

Discrete Output

- Quantity 1—solid-state relay Form A NO Bidirectional FET
- Polarity of external source is not important
- Isolation circuit to ground 2 kV/1 min.
- Maximum external source voltage 28 Vdc
- Line-to-line TVS clamp across switching element at 32 Vdc
- Solid-state relay on resistance 35 ohms maximum
- Maximum load current 80 mA
- Minimum pulse width 20 milliseconds
- Fixed 25 milliseconds for pulse initiator function
- Maximum pulse rate 25 Hz
- Wiring to two-position removable terminal plug
 - 12-18 AWG (3.31-0.82 mm²), wire ferrules recommended
 - T1 (polarity not important)
 - T2 (polarity not important)

Discrete Inputs

- Quantity 3, common circuits inputs 1-3
- Group isolation 2 kV
 - No input-to-input circuit isolation
- All inputs per module share a common external
 - 24V (±10%) supply
 - 24V externally sourced between common and inputs
 - Design to interface with external dry contact
 - Input impedance ~2.2K ohms
 - Input current draw ~10 mA per input
- Minimum pulse width 10 milliseconds
- Maximum pulse rate 20 Hz
- Wiring to four-position removable terminal plug
 - 12-18 AWG (3.31-0.82 mm²), wire ferrules recommended
 - T3—Common (connect ext. 24 common here)
 - T4—Input 1 (dry contact to 24V hot)
 - T5—Input 2 (dry contact to 24V hot)
 - T6—Input 3 (dry contact to 24V hot)

COM1 and COM2 RS-485 Serial Ports

- No D+/D- biasing reliance on fail-safe driver and biasing at Master
- Baud rate configurable between 9600-115K baud (default)
- Use cable designed for RS-485 communications
 - Low L:L capacitance
 - Impedance of ~100-120 ohms
 - Shield—Mylar for high frequency; Braid for low frequency
 - Separate common and shield for best noise immunity
 - Maximum cable length is 4000 ft (1219.2m) with 32 nodes at 19.2K baud increased data rates will reduce maximum cable distance
 - 2000 ft (609.6m) with 32 total nodes at 115.2K baud
- Isolation 300V to ground due to TVS diode clamps
- Modbus RTU slave protocol, address defined by rotary switch
- Green Rx and Red Tx LEDs per channel
- Data + > Data—during idle marked, logic 1 state
- End of Line Termination resistance should match cable impedance (typ. 100-120 ohms)
- Four-position removable terminal plug 18-22 AWG (0.82-0.33 mm²) typical, wire ferrules recommended
 - COM1
 - T7—Shield
 - T8—RS-485 common
 - T9—Data -
 - T10—Data +
 - COM2
 - T11—Shield
 - T12—RS-485 common
 - T13—Data -
 - T14—Data +

Power Xpert Multi-Point Meter

PXMP-MB Power Supply Input

- 24 Vdc $\pm 20\%$
- 15W maximum load
- 1 kV isolation barrier internal to PXMP-MB
- Externally fuse circuit to protect wire
- Green power OK LED
- Three-position terminal block 16–12 AWG (1.31–3.31 mm²), wire ferrules recommended
 - T15—24 Vdc – (common)
 - T16—24 Vdc + (Hot)
 - T17—Shield (optional) capacitively referenced to chassis ground for enhanced EMC performance

Meter Voltage Inputs

- Overvoltage CAT III
- Maximum voltage rating
 - 480VL:G (corner grounded delta)
 - 347VL:N
 - 600VL:L
- Frequency rating 47–63 Hz
- Metering range (temporary transitions)
 - 30–700VL:N
 - 30–700VL:L
- Abuse withstand rating 1000V sustained
- High pot withstand rating 2500V/1min
- Input impedance 4M ohms
- Fuse inputs rated to protect wiring to mains. External fuses must be installed between the meter voltage terminal and the mains disconnect switch to the main lines to protect the lines. 600V 1A BUSS type KTK-R-1 Fast Acting or equivalent fuses are recommended.
- Wiring to removable terminal plug 10–18 AWG (5.26–0.82 mm²), wire ferrules recommended
 - T18—N (VR)
 - T19—C (V3)
 - T20—B (V2)
 - T21—A (V1)

PXMP Meter Modules (PXMP-MMs)

Compatible with all PXMP Meter Base slots 1–10 LED indicators:

- Health and status green, blink to show activity
- Pulse energy output one red per group of three loads
- Load energy direction red/green pair per load

All variations support six load inputs.

Current sensor connection is one 2 x 2 connector per load.

Compatible with PXMP-SCXX sensor cables, total cable length to the sensor should not exceed 28 ft (8.5m).

Note that -AB suffix only affects what voltage channels the loads are paired with for metering purposes.

PXMP-MM10MA supports the CSXXX series of 10 mA maximum secondary output current transformers.

PXMP-MM100MA supports the PXMP-CSXXX series of 100 mA maximum secondary output current transformers.

PXMP-MM333MV supports 333 mV maximum secondary output current transformers with the use of the PXMP-IM333MV interface module.

PXMP Digital Output Module (PXMP-DOM)

- Compatible with all PXMP-MB slots 1–10
- LED indicators
 - Health and status green, blink to show activity
 - Output On/Off status one green per output
 - Eight individual solid-state relay outputs
- Each circuit rated for 24 Vdc ($\pm 20\%$) with an 80 mA load maximum
- 24 Vdc is externally sourced
- Group isolation to ground 2 kV
- Each circuit has its own separate common, circuit-to-circuit isolation 120V
- 16-position removable terminal plug
- 12–18 AWG (3.31–0.82 mm²), wire ferrules recommended

PXMP Pulse Input Modules (PXMP-PIMs)

- Compatible with all PXMP-MB slots 1–10
- LED indicators
 - Health and status green, blink to show activity
 - Input On/Off status one green per pulse input
- Eight pulse inputs to external dry contacts
- Maximum pulse rate is 20 Hz
- Minimum pulse width is 20 milliseconds
- External circuit groups rated for 24 Vdc ($\pm 20\%$)
 - All circuits share the same electrical common
- External supply connects to the module with a two-position removable terminal plug
- The supply is internally fanned out to all circuits
- Group isolation limited to 300V to ground due to TVS diode clamp
- Input impedance $\sim 2.2K$ causing a 10 mA load per input when energized
- External circuit groups connect with a 16-position removable terminal plug
 - Terminals support 12–18 AWG (3.31–0.82 mm²), wire ferrules recommended

Power Xpert Multi-Point Meter

PXMP Energy Portal Module (PXMP-EPM)

- Only functionally compatible with PXMP-MB slot 10
- LED indicators
 - Top health and status green, blink to show activity
 - Com. reset button—reset to defaults
 - Local IP 192/10
 - RJ45 front-facing Ethernet configuration port LEDs
 - Link (Tx/Rx blink)
 - 10/100 speed

- LED four-stack for bottom LAN/WAN Ethernet port
 - Link (Tx/Rx blink)
 - 10/100 speed
 - DHCP/Fixed
 - TX active
- Config. Ethernet RJ45 Cat5 STP/UTP
 - 10Base-T/100Base-Tx
 - Auto crossover capability supported
 - Java Web browser interface

- Bottom facing LAN/WAN Ethernet port
 - RJ45 Cat5 STP/UTP 10Base-T/100Base-Tx
 - STP required for full electromagnetic immunity
 - Auto crossover capability supported
 - Supports Modbus TCP and Java Web browser interface
- Bottom-facing telephone modem interface
 - Modem type V92/56K baud
 - RJ11 field interface

Table 3.2-12. Power Xpert Multi-Point Meter System—Hardware Specifications

Components	Field Circuit	Power Source	Rated Voltage	Rated Current	Circuit Impedance	Isolation	Note 1	Note 2
PXMP-MB PXMP-MB-AB	Digital output	External	24 ±20% ①	0.080A maximum	35 ohms maximum	2.0 kV	—	—
	Digital input	External	24 ±20% ①	0.01A	2.22K	2.0 kV	Opto drops supply by 2V	Group are electrically common
	COM1 RS-485	Internal	5V ①	—	50–60 ohms	300V	TVS diode clamped to PE	—
	COM2 RS-485	Internal	5V ①	—	50–60 ohms	300V	TVS diode clamped to PE	—
	Power supply input	External	24 ±20% ①	0.7A maximum	N/A	1.0 kV	Installation Class II input	15W maximum
	Voltage inputs A (V1)/ B (V2)/ C (V3)/ N (VR)	External mains	480V L:G ②	0.12 mA	4M ohms	N/A	Installation Class III	High pot 2500V/1 minimum
			347V L:N ②	0.09 mA	4M ohms	N/A	Installation Class III	High pot 2500V/1 minimum
			600V L:L ②	0.09 mA	4M ohms	N/A	Installation Class III	High pot 2500V/1 minimum
PXMP-MM100MA	CT secondary	External	N/A	100 mA	14.6 ohms	N/A	20% over-range	See sensor for primary isolation
PXMP-MM10MA	CT secondary	External	N/A	10 mA	67 ohms	N/A	20% over-range	See sensor for primary isolation
PXMP-MM333MV	CT secondary	External	0.333V ②	N/A	50,000 ohms	N/A	20% over-range	See sensor for primary isolation
PXMP-DOM	Digital output	External	24 ±20% ①	0.080A maximum	10 ohms maximum	2 kV group	120V isolation circuit-to-circuit	Isolation dependent on external source
PXMP-PIM	Pulse input	External	24 ±20% ①	0.01A	2.22K ohms	300V to ground	TVS diode clamped to PE; group isolated, all circuits common to 24V external source	Note: Opto creates 2.2V drop sourced by 2.2K ohms; isolation dependent on external source
PXMP-EPM	Ethernet 100 Bt	Internal	—	N/A	N/A	1 kV	—	—
	POT modem	Internal	—	N/A	N/A	—	—	—

① DC.

② AC RMS.

Power Xpert Multi-Point Meter

Catalog Information

The Power Xpert Multi-Point Meter, current sensors and other accessories can be ordered from Eaton distributors. Refer to the following catalog numbers when ordering.

Table 3.2-13. Power Xpert Multi-Point Meter Products

Product Description	Catalog Number
---------------------	----------------

Meter Bases and Meter Modules with ABCN Voltage Inputs

PXMP meter base—three-phase with ABCN voltage inputs	PXMP-MB
PXMP meter module with six 100 mA inputs for use with PXMP current sensors	PXMP-MM100MA
PXMP meter module with six 10 mA inputs for use with IQMESII current sensors	PXMP-MM10MA
PXMP meter module with six 333 mV inputs for use with 333 mV current sensors	PXMP-MM333MV

Meter Bases and Meter Modules with ABN Voltage Inputs

PXMP meter base—single-phase, three-wire with ABN voltage inputs	PXMP-MB-AB
PXMP meter module with six 100 mA inputs for use with PXMP current sensors	PXMP-MM100MA-AB
PXMP meter module with six 10 mA inputs for use with IQMESII current sensors	PXMP-MM10MA-AB
PXMP meter module with six 333 mV inputs for use with 333 mV current sensors	PXMP-MM333MV-AB

IO Modules

PXMP meter pulse input module with eight inputs	PXMP-PIM
PXMP meter digital output module with eight outputs	PXMP-DOM

Communication Module

PXMP meter energy portal module	PXMP-EPM
---------------------------------	----------

Current Sensor Kits

KIT, PXMP CS125 sensor, quantity of 3	PXMP-CS125-3
KIT, PXMP CS250 sensor, quantity of 3	PXMP-CS250-3
KIT, PXMP CS400 sensor, quantity of 3	PXMP-CS400-3

Current Sensor Cable Kits

KIT, PXMP sensor cable, 4 ft (1.2m), quantity of 3	PXMP-SC4-3
KIT, PXMP sensor cable, 6 ft (1.8m), quantity of 3	PXMP-SC6-3
KIT, PXMP sensor cable, 8 ft (2.4m), quantity of 3	PXMP-SC8-3
KIT, PXMP sensor cable, 12 ft (3.7m), quantity of 3	PXMP-SC12-3

Current Sensor Extension Cable Kits

KIT, PXMP sensor extension cable, 8 ft (2.4m), quantity of 3	PXMP-SCE-8-3
KIT, PXMP sensor extension cable, 16 ft (4.9m), quantity of 3	PXMP-SCE-16-3

Interface Modules

PXMP current sensor interface module for 333 mV, kit X 3	PXMP-IM333MV-3
--	----------------

Note: Total sensor lead length must not exceed 28 ft (8.5m).

The Pulse Input Module (PXMP-PIM) can be used to totalize pulse outputs from water meters, gas meters, steam meters, or even old electrical meters with KZ pulse outputs. The PXMP-PIM can also be used for status monitoring in applications where status indication updates of 6 seconds over Modbus satisfies the application requirement.

Support products for the Power Xpert Multi-Point Meter include the HMI display, IMPCABLE and power supplies as described in Table 3.2-14.

Table 3.2-14. Power Xpert Multi-Point Meter Support Products

Product Description	Catalog Number
Communication cable, 1000 ft (305m), 600V insulation	IMPCABLE
PXMP meter display—6-inch color touchscreen (with cable)	PXMP-DISP-6
Power supply—single-phase 90–264 Vac, 24 Vdc at 2.5A	PSG60E
Power supply—three-phase 360–575 Vac, 24 Vdc at 2.5A	PSG60F
Power supply—three-phase 600 Vac, 24 Vdc	PSS55D

Power Xpert Multi-Point Meter

Wiring Diagrams

PXMB-MB

Note: For all voltage connections—Fuses should be sized in accordance with best practices to protect the instrumentation wire.

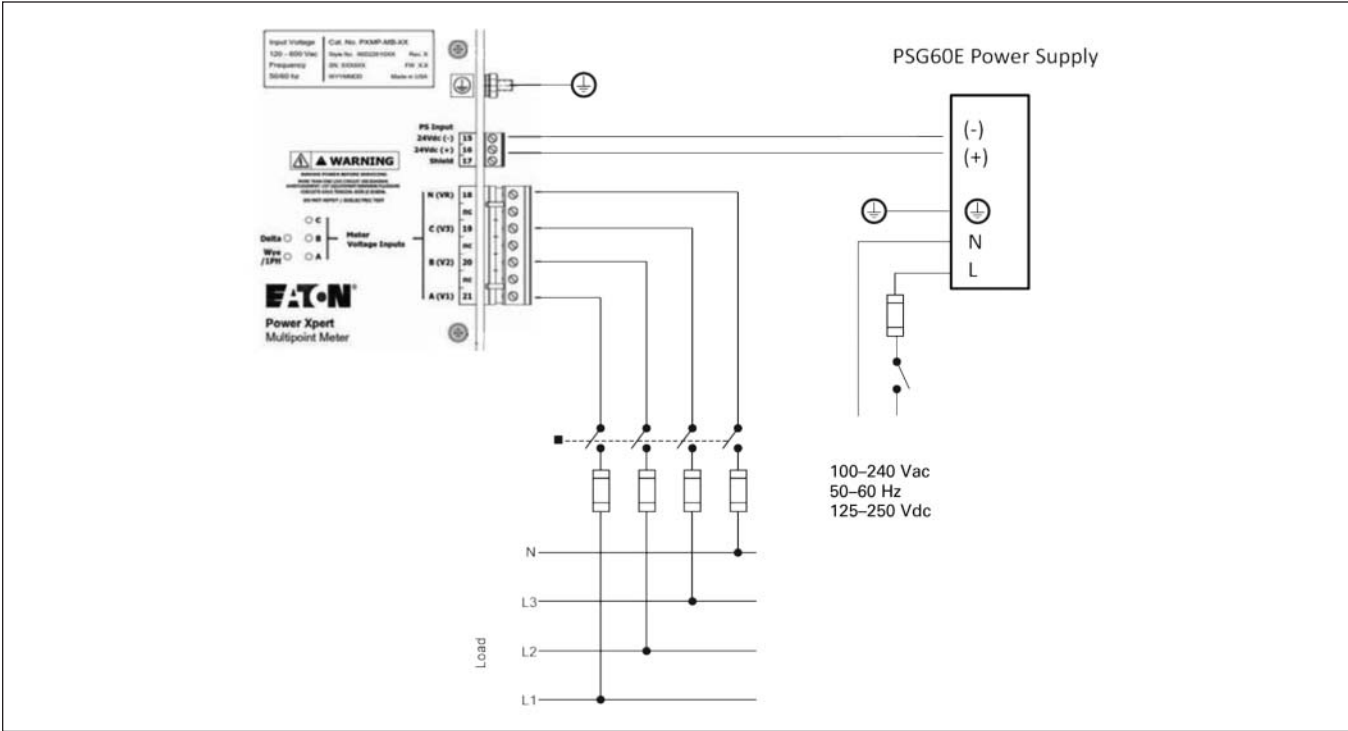


Figure 3.2-24. Four-Wire Wye Voltage Connection Inputs

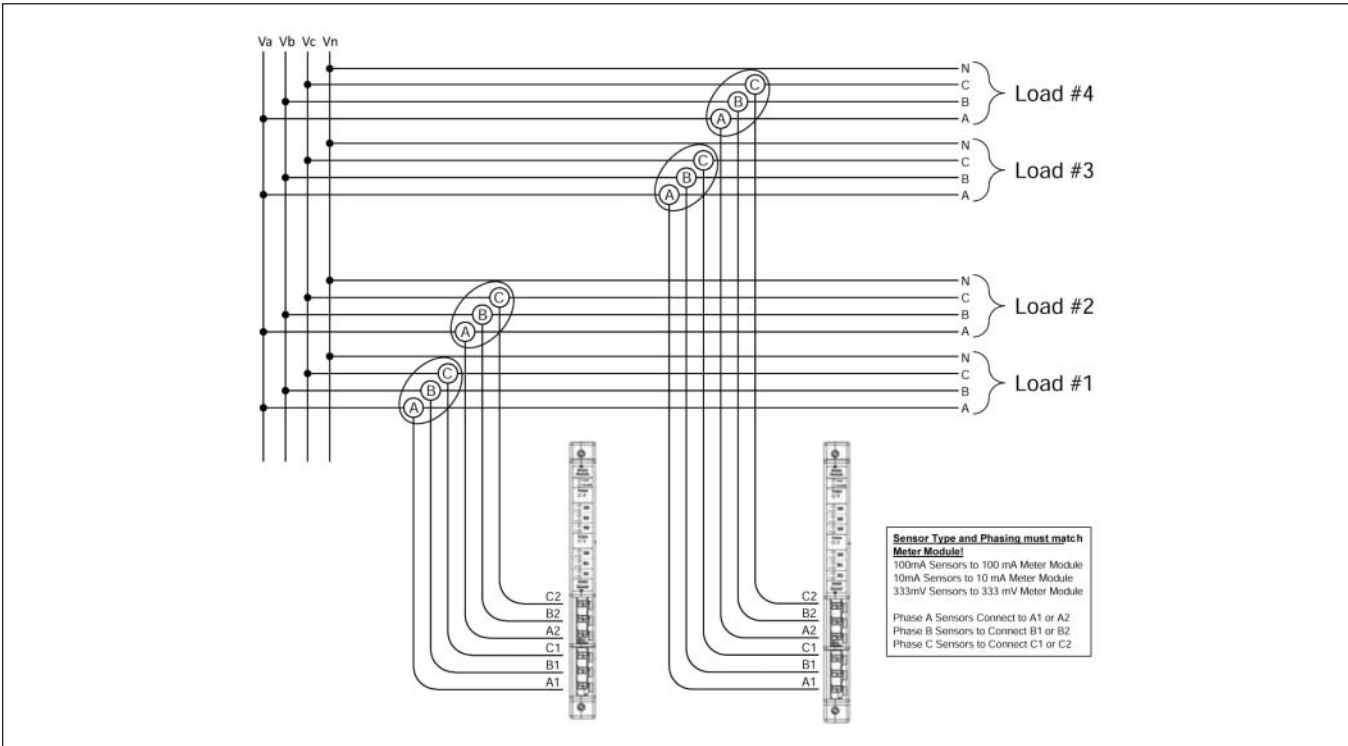


Figure 3.2-25. Three-Phase, Four-Wire Service Current Sensor Connections

Power Xpert Multi-Point Meter

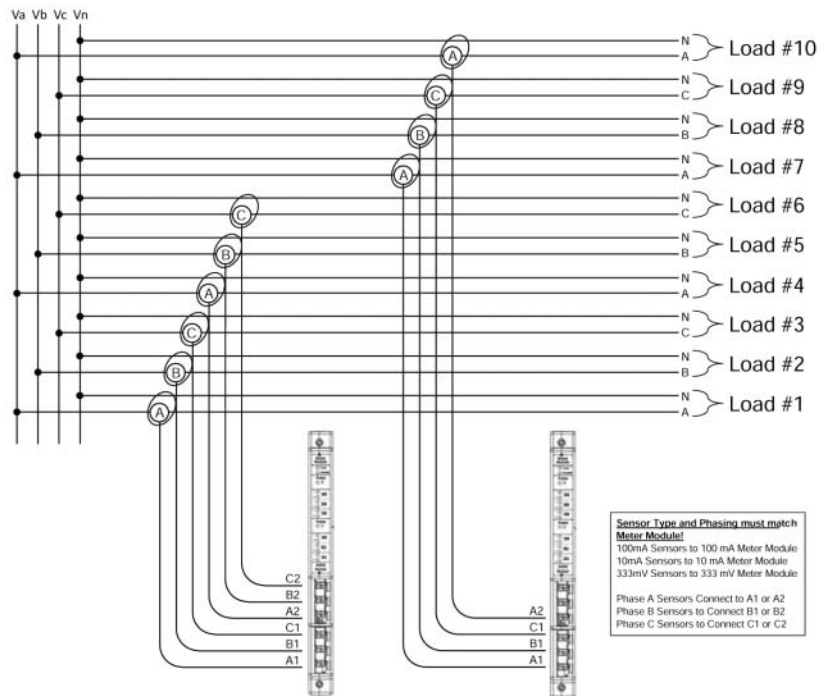


Figure 3.2-26. Three-Phase, Four-Wire Service (Ten Single-Phase, Single-Pole) Current Sensor Connections

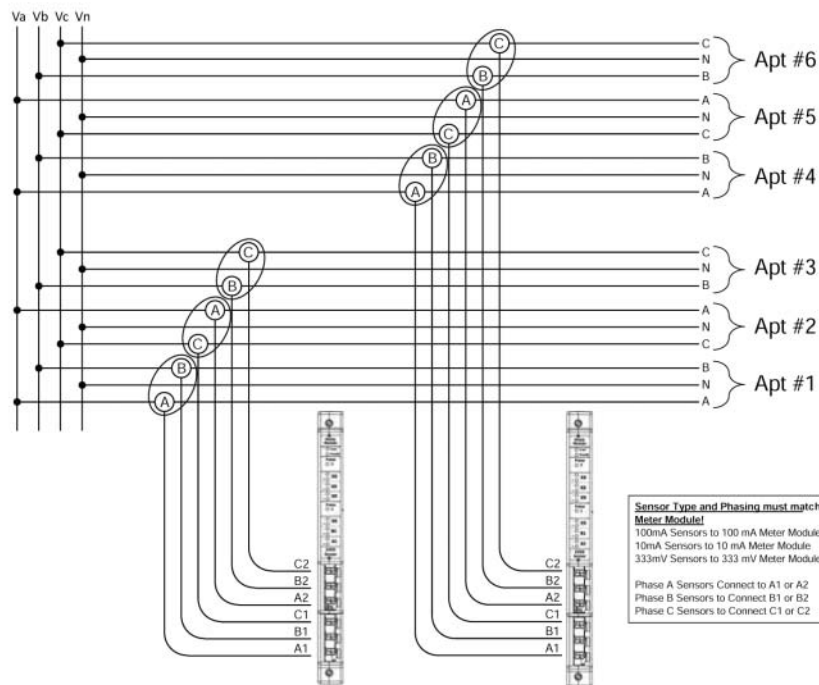


Figure 3.2-27. Network 120/208 Three-Wire Apartment Service Current Sensor Connections

Power Xpert Multi-Point Meter

PXMB-MB-AB

Note: For all voltage connections—Fuses should be sized in accordance with best practices to protect the instrumentation wire.

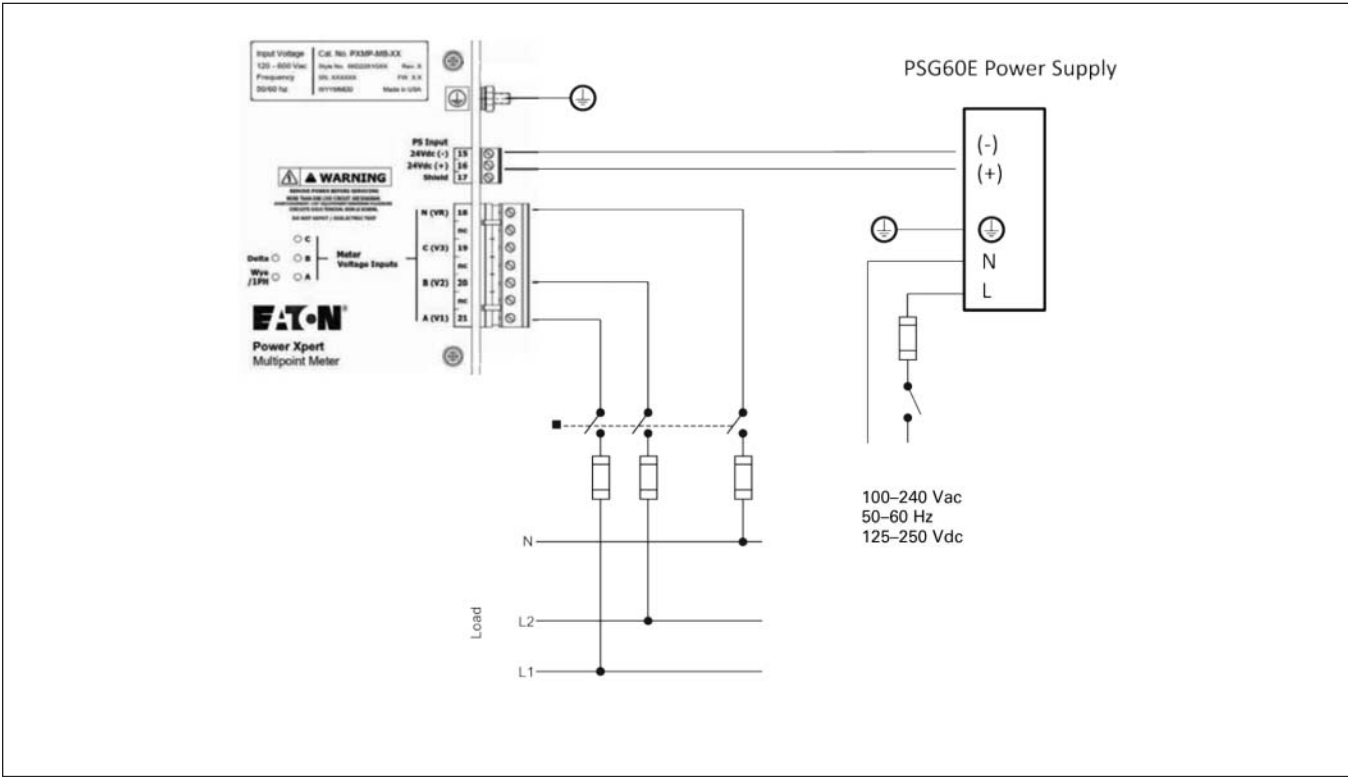


Figure 3.2-28. Single-Phase, Three-Wire 120/240 Voltage Connection Inputs

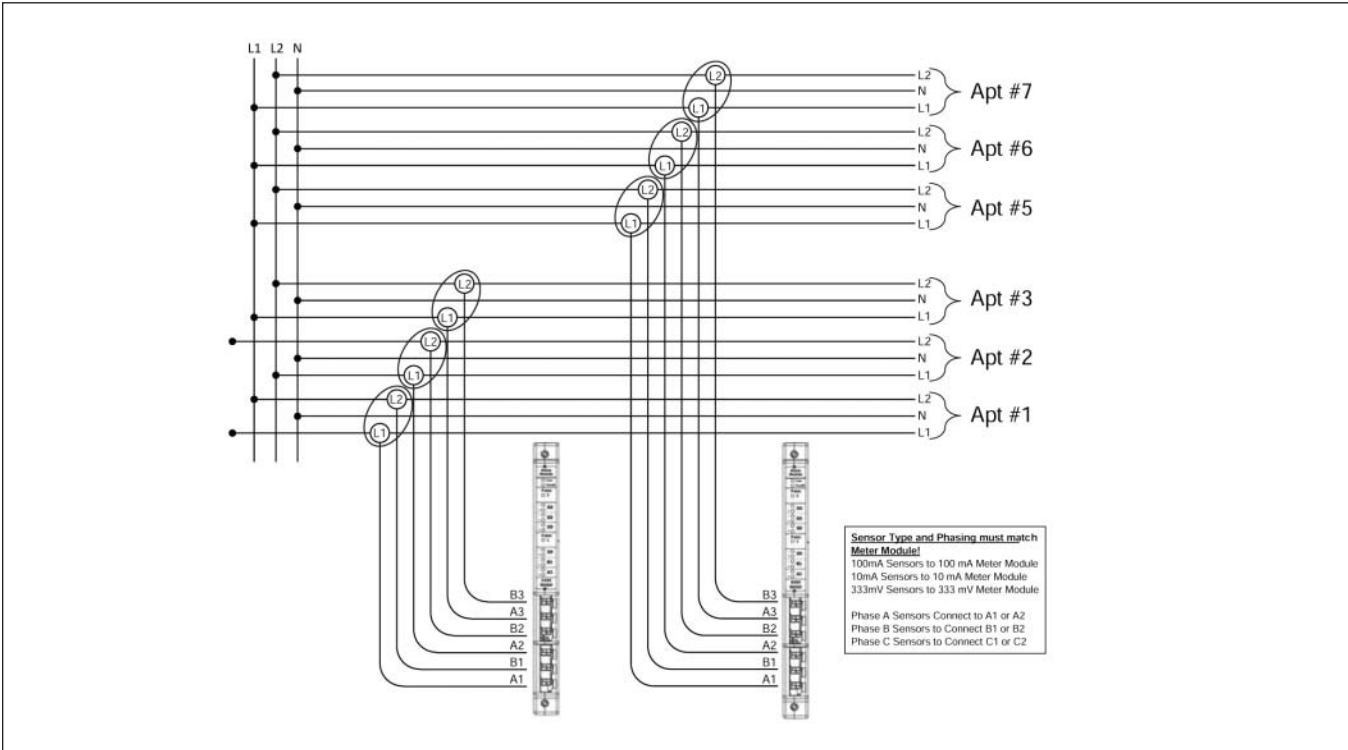


Figure 3.2-29. 120/240 Single-Phase, Three-Wire Service Current Sensor Connections

Power Xpert Multi-Point Meter

Dimensions in Inches (mm)

Mounting Dimensions

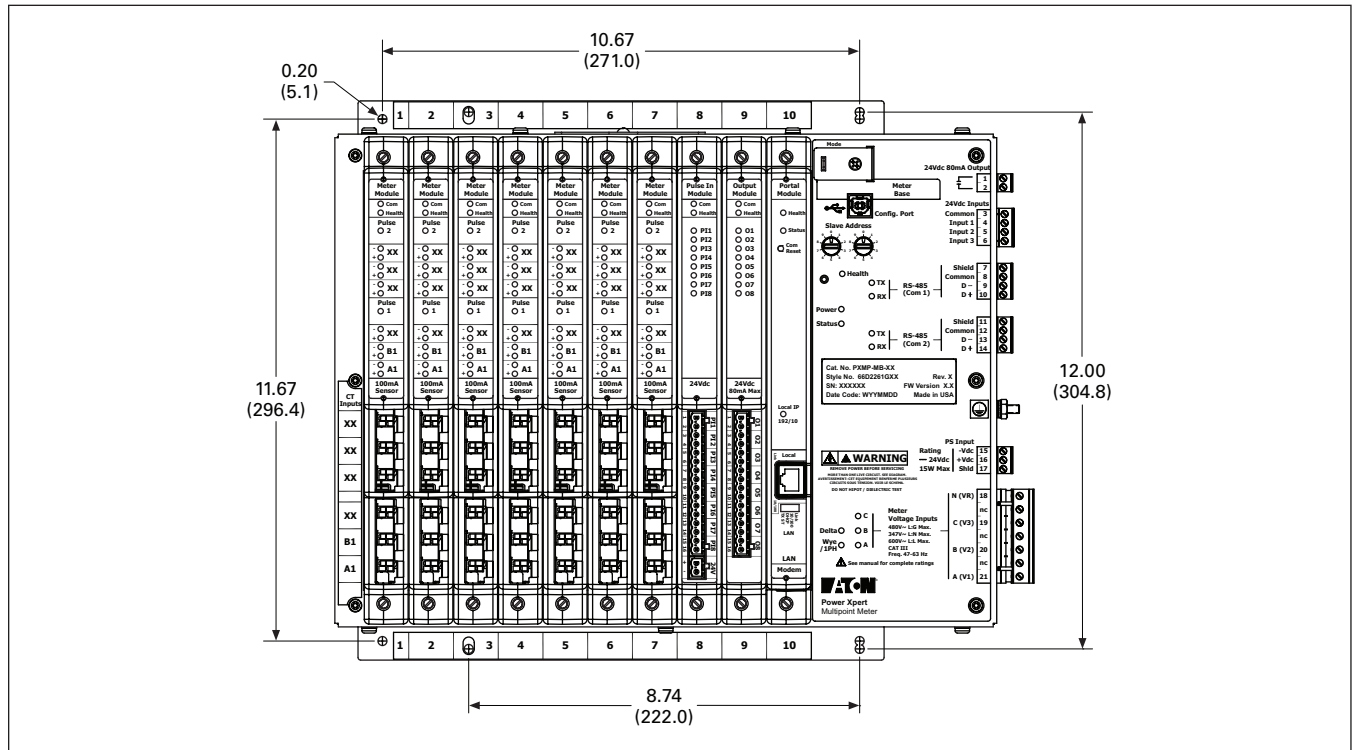


Figure 3.2-30. Single Unit—Front View

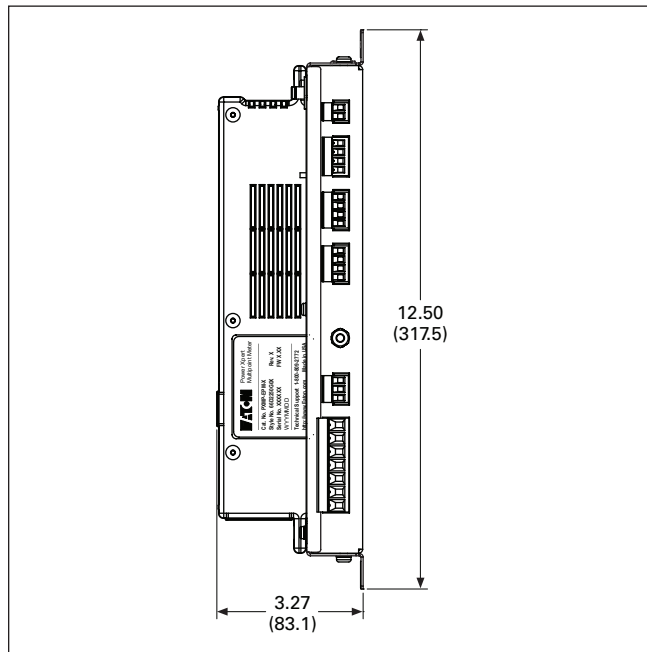


Figure 3.2-31. Single Unit—Side View

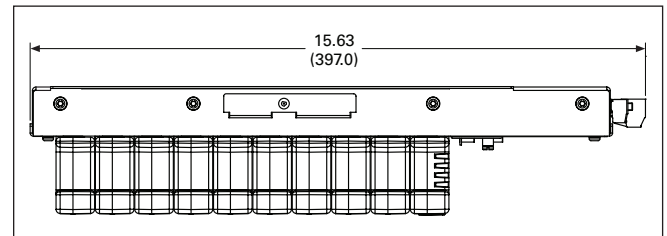


Figure 3.2-32. Single Unit—Top View

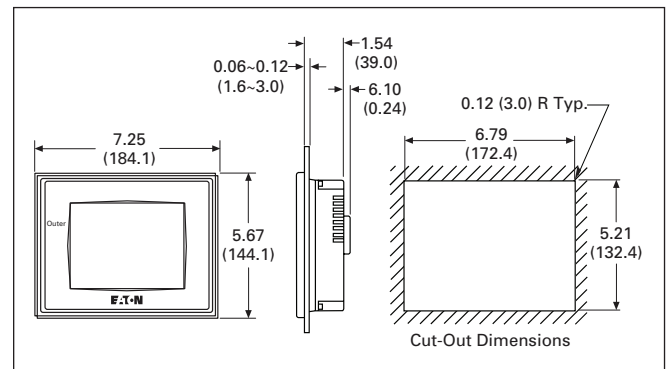


Figure 3.2-33. PXMP Color Touchscreen Display

Power Xpert Multi-Point Meter

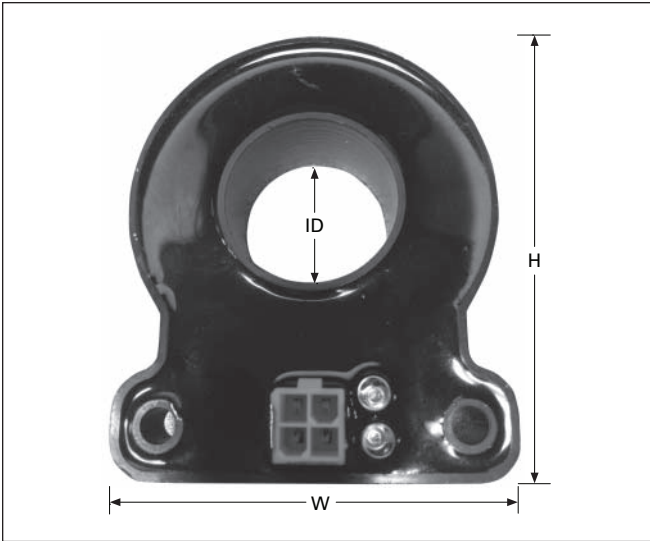


Figure 3.2-34. Current Sensor Dimensions

Table 3.2-15. Current Sensor Dimensions in Inches (mm)

Sensor	H	W	ID
PXMP-CS125	2.66 (67.6)	1.66 (42.1)	0.53 (13.5)
PXMP-CS250	2.96 (75.2)	2.42 (61.5)	1.12 (28.4)
PXMP-CS400	3.64 (92.5)	3.03 (73.2)	1.74 (44.2)

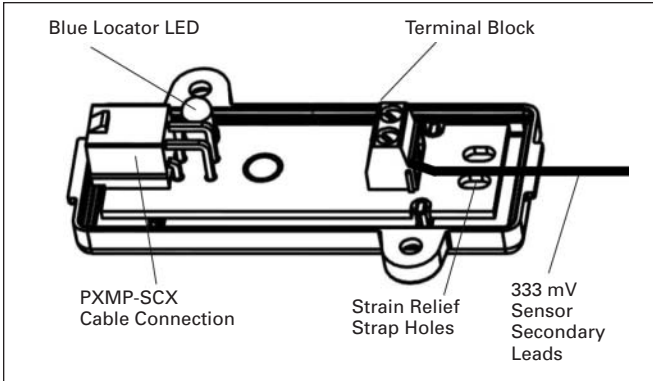


Figure 3.2-35. Open Interface Module (PXMP-IM333MV)

IQ Energy Sentinel

IQ Energy Sentinel



IQ Sentinel

IQ Sentinels

IQ Sentinels are microprocessor-based submeters, designed to monitor power and energy. They represent an alternative to installing separate wattmeters, watthour meters, and watt demand meters.

The IQ Energy Sentinel monitors watts, watthour and watt demand.

Key advantages include unmatched savings in space, lower installation costs, and the capability to communicate data readings in a variety of ways.

IQ Sentinels with built-in CTs and communications have the added benefit of greater overall system accuracy. Conventional metering often is less accurate since external CTs and separate transducers may each have inaccuracies of 1% or more.

Table 3.2-16. IQ Energy Sentinel Features

Features	Benefits
■ Monitors (accuracy stated full scale) - Kilowatts $\pm 1.0\%$ - Kilowatts demand $\pm 1.0\%$ - Kilowatt hour $\pm 1.0\%$ ■ Built-in CTs version up to 400A or external CTs version up to 4000A ■ Breaker, panel or DIN rail mounted ■ Powered directly off the line ■ Built-in communication capability - Address set by DIP switches - Communication at 9600 baud - Noise immune INCOM protocol ■ Choice of operator interfaces - Subnetwork master local display - Breaker Interface Module (BIM) - Power Management Energy Billing software - Power Management software ■ UL and CSA listed	■ One device replaces multiple meters and/or transducers ■ Improved system accuracy ■ Savings in product cost ■ Savings in space ■ Savings in installation cost ■ No external power source is needed ■ Permits remote monitoring and interconnection with programmable logic controllers and building management systems. For more information, see section on Power Management Software Systems ■ Designed to interface directly with Power Management Software Energy Billing software ■ Flexibility—displays what is needed where it is needed ■ Power Management Software

IQ Energy Sentinel

IQ Sentinels (Continued)

Eaton's IQ Sentinels provide a unique cost-effective method to implement energy submetering at lower levels in the distribution system.

The ability to monitor power distribution systems down to the machine or process level at an industrial facility has become essential to provide key benefits such as to verify the accuracy of the utility bill, identify and track energy usage to the loads that consume it, develop a facility energy profile to establish a baseline, allocate energy costs to create accountability and so on.

An optional door-mounted interface, the Subnetwork Master Local Display, is available to display the energy parameters monitored by the IQ Sentinels.

Submetering application examples for the IQ Sentinels include energy demand monitoring, product cost analysis, process machine tool efficiency and productivity improvement, and energy-cost allocation or tenant billing for commercial, industrial, recreational and residential facilities.

Note: For customer-billing applications, consult local utility for metering requirements.

Commercial applications include energy-cost allocation within convention halls, office buildings, shopping malls, hospitals, warehouses and storage facilities.

Industrial applications include departmental billing and process/assembly line energy cost analysis. IQ Energy Sentinels may be substituted for watt transducers when monitoring machine tool and equipment performance within plants.

Recreational facilities include sports arenas, camping grounds, trailer parks and marinas.

The IQ Sentinel may be applied on three-phase (three- or four-wire), as well as single-phase (three-wire) systems.

IQ Sentinels may be applied on either 50 or 60 Hz systems.

Application Description

The IQ Energy Sentinel is available in three different package versions: breaker mounted, universal breaker with internal CTs, and universal breaker with external CTs.

Designed for mounting on Series C® circuit breakers used in Eaton assemblies such as:

- Pow-R-Line four panelboards—feeder circuits
- Power-R-Line C™ switchboards—feeder circuits
- Motor control centers and enclosed control with circuit breaker disconnects—starter or feeder circuits
- Enclosed motor control
- Enclosed circuit breakers
- Pow-R-Way III® Bus Plugs with circuit breaker disconnects

Breaker Mount Applications New Equipment



F-Frame Breaker with IQ Sentinel

Retrofitting

The space-saving design characteristics of the breaker mount IQ Energy Sentinels allow them to be added to existing Eaton circuit breakers at any time...often with no additional space or modifications required.

Or they may be installed when upgrading from older circuit breakers...often with no additional space or modifications required.



Universal Mount with Internal CTs

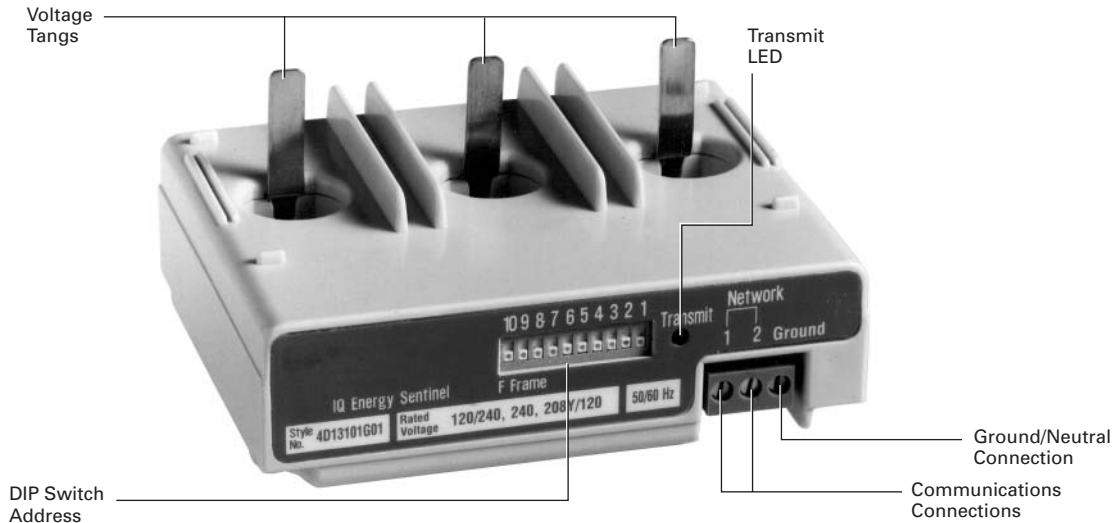
Universal Mount Applications

The universal mount IQ Energy Sentinel with internal CTs includes integral 400A CTs and may be applied on loads up to 400A. The universal mount IQ Energy Sentinels with internal CTs may be used wherever breaker mounting is not feasible or possible.

The universal mount IQ Energy Sentinel with provisions for external CTs may be applied on loads up to 4000A. They are usually used for monitoring loads larger than 400A, on power cable sizes larger than 500 kcmil or on circuits containing more than one conductor per phase.

Eaton Breaker Mount

Eaton's breaker mount IQ Energy Sentinel installs in less than 10 minutes on the load side of a Eaton Series C F-Frame (150A), J-Frame (250A), or K-Frame (400A) circuit breakers.



Energy Sentinel Features

Universal Mount with Internal CTs—(UI)

The Universal Mount IQ Energy Sentinel with internal CTs may be panel-mounted or DIN rail mounted on disconnects or other circuits up to 400A. A pull-apart terminal block is provided on the device for connection of the system voltage reference wiring.

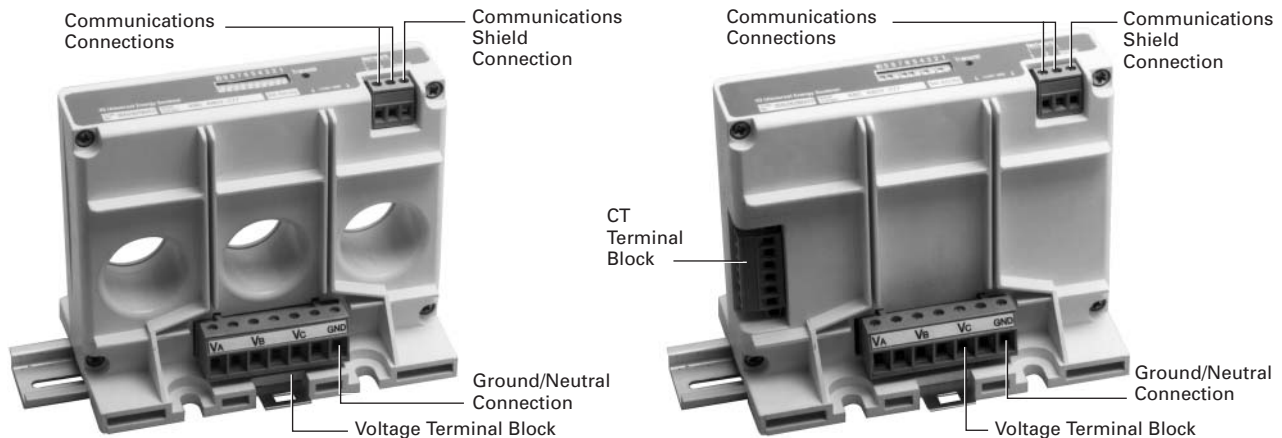
Note: The location of the ground/neutral connection differs on Breaker Mount IQ Energy Sentinels from the location of the ground/neutral connection on Universal Mount IQ Sentinels. Incorrect wiring to the ground/neutral and communications connections may result in accuracy and communication errors.

Universal Mount for External CTs—(UE)

The Universal Mount IQ Energy Sentinel for external CTs may be panel-mounted or DIN rail mounted on circuits up to 4000A.

A pull-apart terminal block is provided on the device for connection of the system voltage reference wiring as well as another terminal block for connection to the user's existing 5A secondary CTs that may range in standard ratios from 25:5 up to 4000:5.

Note: If the device will be disconnected without interruption of the monitored load, the use of a CT shorting block is advised.



Energy Sentinel Features

Technical Data and Specifications

Table 3.2-17. Energy Sentinel

Current Input Current Range: 1% to 125% of current rating Burden: 1 VA	
Voltage Input Voltage Range: ±20% of voltage rating	
Frequency 50 or 60 Hz	
Power Factor Range All (–1 to +1)	
Communications Protocol: INCOM Speed: 9600 baud Compatibility: Power Management Software compatible	
Environmental Conditions Operating temperature: –25° to 70°C ① (–13° to 158°F) Storage temperature: –40° to 85°C ① (–40° to 185°F) Operating humidity: 5% to 95% relative humidity noncondensing	
Dimensions D x W x H in Inches (mm) F 3.20 x 4.12 x 1.30 (81.3 x 104.6 x 33.0); CT window size ② 0.59 (15.0) J 4.04 x 4.12 x 1.28 (102.6 x 104.6 x 32.5); CT window size ② 0.77 (19.6) K 4.04 x 5.31 x 1.25 (102.6 x 134.9 x 31.8); CT window size ② 0.96 (24.4) UI 4.36 x 5.31 x 3.00 (110.7 x 134.9 x 76.2); hole clearance 1.17 (29.7) UE 4.36 x 5.31 x 3.00 (110.7 x 134.9 x 76.2)	
Weight in Lbs (kg): F 0.65 (0.30) J 0.69 (0.31) K 0.87 (0.39) UI 1.10 (0.50) UE 1.10 (0.50)	
Other Specifications UL File No. E64983 CSA File No. LR106359-1	

① 40°C (standard) maximum for Series C[®] circuit breakers.

② Acceptable for Universal IQ Energy Sentinels only.

System Voltage Considerations
(Application Note)

The Ground (GND) terminal of the IQ Energy Sentinel should be connected to the ground bus or other non-current- carrying ground with 600V rated wire to ensure accuracy.

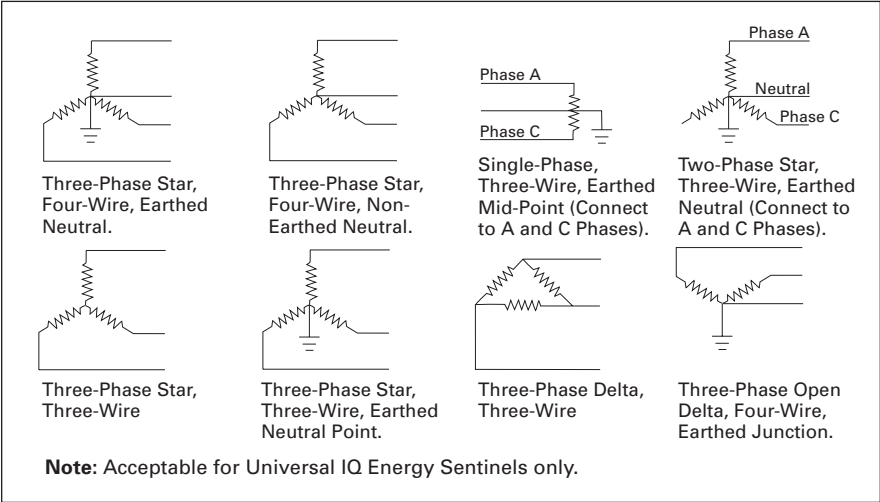


Figure 3.2-36. Acceptable System Configurations

IQ Energy Sentinel

Table 3.2-18. IQ Energy Sentinels Catalog Information

Description	Voltage Rating—Vac	Current Rating Maximum Amperes	Catalog Number
For F-Frame breakers	120/240, 240, 208Y/120	150	IQESF208
For F-Frame breakers	220/380, 230/400, 240/415	150	IQESF400
For F-Frame breakers	480, 480Y/277	150	IQESF480
For F-Frame breakers	600, 600Y/347	150	IQESF600
For J-Frame breakers	120/240, 240, 208Y/120	250	IQESJ208
For J-Frame breakers	220/380, 230/400, 240/415	250	IQESJ400
For J-Frame breakers	480, 480Y/277	250	IQESJ480
For J-Frame breakers	600, 600Y/347	250	IQESJ600
For K-Frame breakers	120/240, 240, 208Y/120	400	IQESK208
For K-Frame breakers	220/380, 230/400, 240/415	400	IQESK400
For K-Frame breakers	480, 480Y/277	400	IQESK480
For K-Frame breakers	600, 600Y/347	400	IQESK600
Universal with internal CTs	120/240, 240, 208Y/120	400	IQESUI208
Universal with internal CTs	220/380, 230/400, 240/415	400	IQESUI400
Universal with internal CTs	480, 480Y/277	400	IQESUI480
Universal with internal CTs	600, 600Y/347	400	IQESUI600
Universal for external CTs	120/240, 240, 208Y/120	4000	IQESUE208
Universal for external CTs	220/380, 230/400, 240/415	4000	IQESUE400
Universal for external CTs	480, 480Y/277	4000	IQESUE480
Universal for external CTs	600, 600Y/347	4000	IQESUE600

Table 3.2-19. Terminal, Cable and Wiring Guidelines

Sentinel	Eaton Series C Terminal	Wire Size Single Conductor
F-Frame	624B100G02, G17, G18, G19	#14–1/0, #4–4/0, #4–4/01, #14–1/0 AWG
J-Frame	T250KB, TA250KB	#4–350 kcmil
K-Frame	T350K, TA350KB	#250–500 kcmil
Universal with internal CTs		#250–500 kcmil
System voltage reference wiring		#24–#10 AWG
Current transformer wiring		#12 AWG (maximum)
Ground reference wiring		#22–#12 AWG (minimum 600V rated)
Communications wiring		Eaton IMPCABLE or Belden 9463 family

Dimensions in Inches (mm)

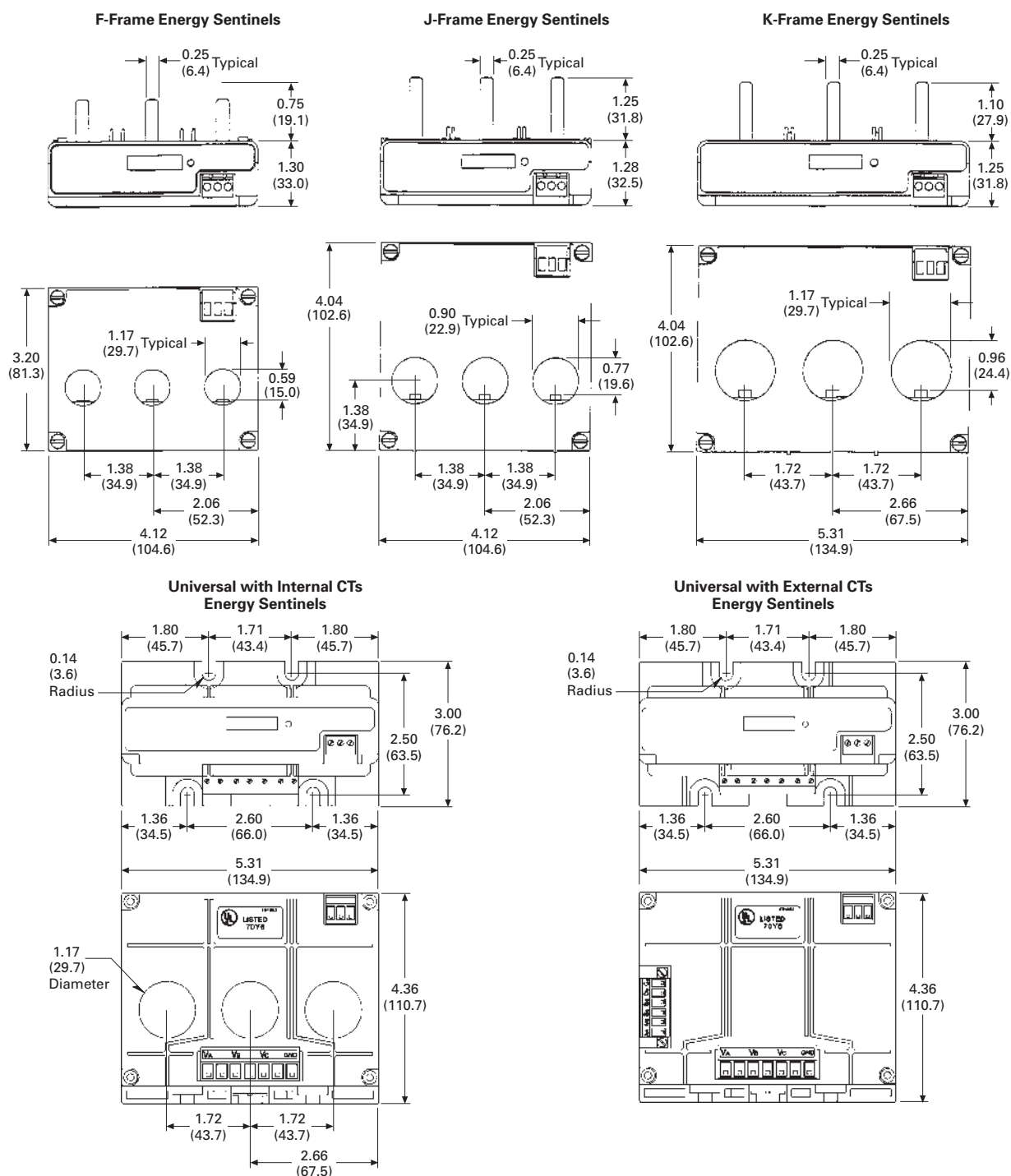


Figure 3.2-37. IQ Sentinel

Molded-Case Circuit Breaker Power Monitoring and Metering Module (PM3)



Power Monitoring/Metering Module (PM3)

General Description

The Power Monitoring and Metering Module (PM3) is a UL-listed add-on communications module that mounts directly to the load side of three-pole molded-case circuit breakers, similar to an earth leakage module. The PM3 adds revenue accurate power metering and breaker status monitoring to new and/or existing Series C and Series G breakers. Regardless of the type of trip unit (thermal-magnetic or electronic), the PM3 can be applied in applications where power metering, circuit breaker monitoring and/or communications is essential. The PM3 is extremely flexible and can be used in main breaker or feeder breaker applications. The automatic voltage sensing means that the same PM3 module can be used on 208, 240 or 480 Vac applications. It can also be installed in reverse-feed and reverse-phasing (CBA) applications.

Features and Functions

The PM3 provides the following metering, monitoring and communications functions:

Metering

- Phase currents (I_a , I_b , I_c , I_{avg})
- Phase-to-phase voltages (V_{ab} , V_{bc} , V_{ca} , V_{avg})
- Phase-to-neutral voltages (V_{an} , V_{bn} , V_{cn} , V_{avg})
- Real power (kW)—total and per phase
- Reactive power (kVAR)—total and per phase
- Apparent power (kVA)—total and per phase
- Power factor—total and per phase
- Real energy (WHR)—forward, reverse and net
- Reactive Energy (VARHr)—forward, reverse and net
- Apparent energy (VAHr)—forward, reverse and net

Accuracy

- Voltage and amperage: 0.5% of reading
- Watts, VARs, VA: 1% of reading
- Energy: 1% per ANSI C12.1
- Revenue Grade Accuracy: ANSI C12.1

Monitoring

- Breaker status ^①
 - Open/close status—thru breaker auxiliary contact
 - Tripped status—thru breaker bell alarm contact
 - Unit health—flashing status LED when module is powered
- ^① Breaker must include auxiliary contact and bell alarm contact accessory.

Communications

- INCOM and Modbus RTU communications
 - Shielded-twisted pair communications
 - Daisy-chaining of multiple units
 - Web-based communications available through a Power Xpert Gateway
 - TX and RX communication diagnostic LEDs



Metering Module

Control Power

The PM3 is powered directly from the circuit breaker voltage for applications 480 Vac and below. External control power is not required for these applications. However, an auxiliary 24 Vdc external power input is included for applications requiring communications capability even when the breaker circuit is de-energized.

Note: For 600V applications, external 24 Vdc auxiliary power is required.

Product Selection

Table 3.2-20. PM3 Product Selection

PM3 Modules Frame	Catalog Number	
	480V	600V
Modbus		
FD	—	PM3FM
JG	—	PM3JM
KD and LG	—	PM3LM
INCOM		
FD	PM3FI480	PM3FI600
JG	PM3JI480	PM3JI600
KD and LG	PM3LI480	PM3LI600

Molded-Case Circuit Breaker Power Monitoring and Metering Module**Technical Data and Specifications****Metered parameters**

- Ia, Ib, Ic
- Vab, Vbc, Vca, Van, Vbn, Vcn
- Apparent Energy, Forward Real Energy, Reverse Real Energy, Net Real Energy, Lagging Reactive Energy, Leading Reactive Energy, Net Reactive Energy
- Apparent Power A, B, C; Apparent Power Total; Reactive Power A, B, C; Reactive Power Total; Real Power A, B, C; Real Power Total
- Frequency, Apparent Power Factor, Apparent PFA, Apparent PFB, Apparent PFC

Table 3.2-21. PM3 Power Monitoring and Communications Module Technical Specifications for Modbus RTU

Description	Specification
Current Inputs	
Pickup current	0.3A rms
Maximum reported current	FD/JG 250A rms KD/LD 630A rms
Accuracy 0.5%	0.5% of reading
Voltage Inputs	
Range	Line-to-neutral 30–366 Vac Line-to-line 52–635 Vac
Supported systems	Three-element wye, three-element wye + neutral Two-element delta, four-wire delta systems
Input impedance	996 kilohm/phase
Burden per phase	0.36 VA/phase max. at 600V; 0.014 VA at 120V
Phase voltage connections	Internal via screw terminal to busbar. For wye system, a neutral is required to be connected to the PM3 on the right Phoenix connector.
Neutral connection	If neutral is not available, the meter will calculate a virtual neutral based on the phase-to-phase rms voltage. The system voltage must be balanced for this to be accurate.
Frequency	
Frequency	50/60 Hz
Accuracy	± 0.1 Hz
Resolution	0.1 Hz
Power and Energy	
Accuracy	1% of reading (ANSI C12.1)
Isolation	
All inputs and outputs are galvanically isolated to 2500V.	
Environmental Ratings	
Operating temperature	–20°C to +50°C
Storage temperature	–20°C to +50°C
Operating humidity	5 to 95% RH noncondensing
Sensing Method	
Voltage, current	True rms
Sampling rate	13.02K samples per second
Update Rate	
Watts, VAR and VA	1.03 sec at 60 Hz
All other parameters	1.07 sec at 60 Hz
Power Supply (External)	
DC voltage	18–30 Vdc
Maximum current	30 mA at 24 Vdc
Burden	0.72W
Standard Communication Format	
Connection type	Three-wire RS-485 (A, B, Common)
Com port baud rate	9600 or 19,200 bauds Default: 19,200 bauds
Modbus address range	01–247
Data format	Selectable (8, N, 1 8, N, 2 8, Even, 1 8, Odd, 1) Default: 8, N, 2
Protocols	Modbus RTU
Internal termination resistor selectable ON or OFF	Via DIP switch Default: Enabled

Dimensions and Weights

Approximate Dimensions in Inches (mm)

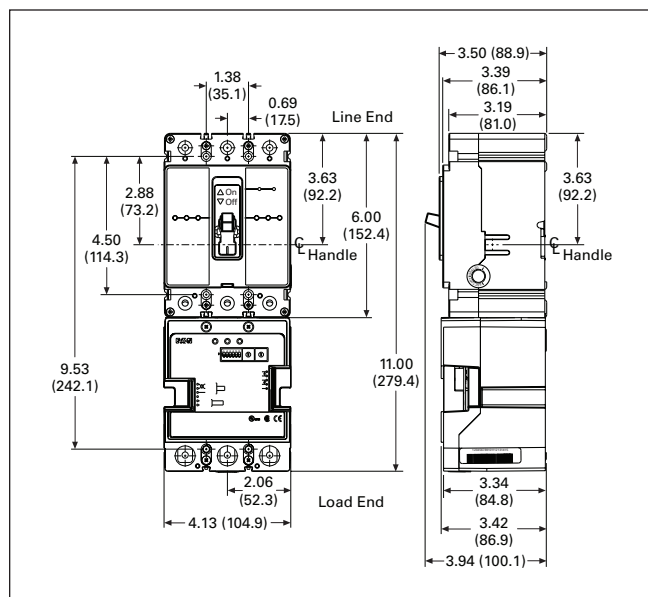


Figure 3.2-38. FD Three-Pole with PM3 Modbus

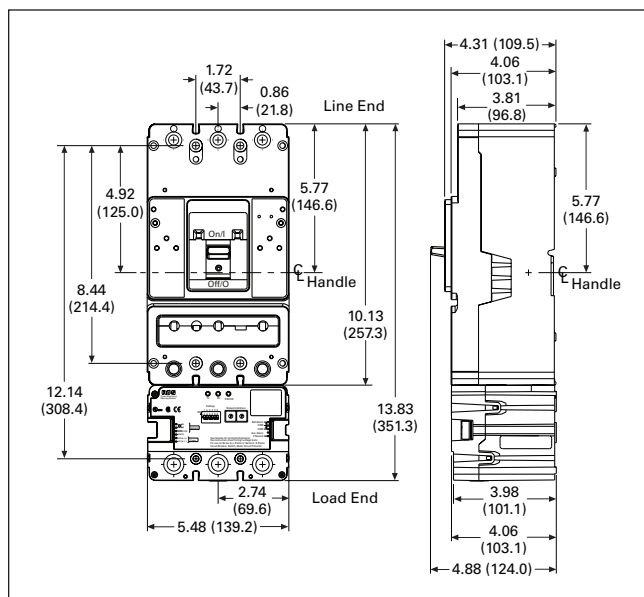


Figure 3.2-40. KD Three-Pole with PM3 Modbus

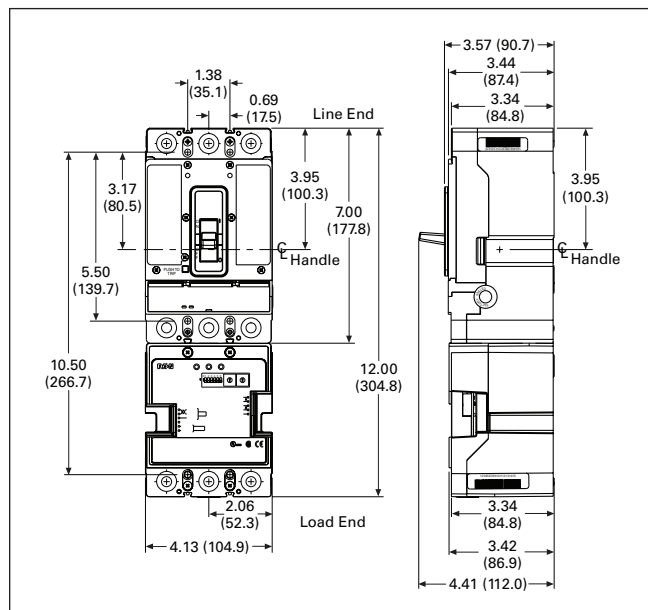


Figure 3.2-39. JG Three-Pole with PM3 Modbus

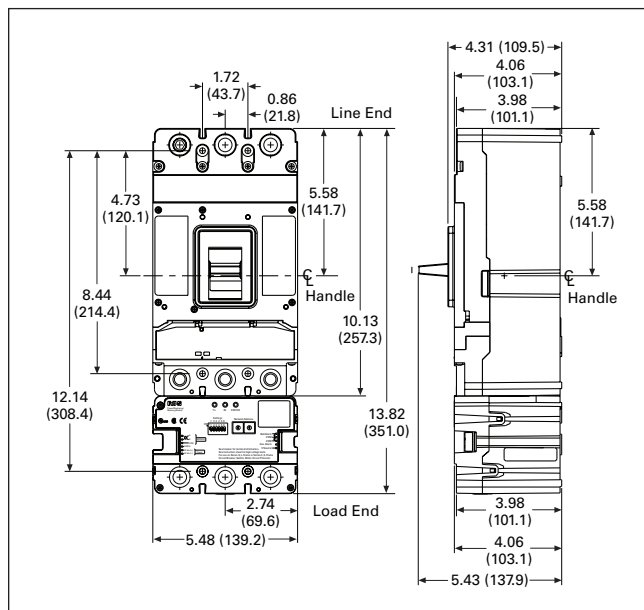


Figure 3.2-41. LG Three-Pole with PM3 Modbus

Table 3.2-22. PM3 Dimensions and Shipping Weights

Description	Frame	Dimensions and Weights
Weight in lbs (kg)	FD	1.26 (0.57)
	JG	1.60 (0.73)
	KD/LG	2.25 (1.02)
Basic unit in inches (mm)	FD	4.13 W x 5.00 L x 3.39 H (104.9 x 127.0 x 86.1)
	JG	4.13 W x 5.00 L x 3.39 H (104.9 x 127.0 x 86.1)
	KD/LG	5.48 W x 3.70 L x 4.06 H (139.2 x 94.0 x 103.2)
Shipping container dimensions in inches (mm)	FD/JG	8.00 x 5.13 x 5.50 (203.2 x 130.3 x 139.7)
	KD/LG	6.25 x 8.25 x 7.00 (158.7 x 209.5 x 177.8)

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**IQ Analyzer 6000 Series—
6400 Series without Wave-
form Display, 6600 Series
with Waveform Display****General Description****Applications**

- Monitoring of over 150 electrical parameters
- Power quality management
- Energy management

Metered/Monitored Parameters

- rms sensing
- Phase, neutral and ground currents
- Volts: L-L, L-N, Avg. L-L, Avg. L-N, N-G
- Power: real, reactive, apparent (system and per phase)
- Frequency
- Power factor: apparent and displacement (system and per phase)
- Energy and demand (forward, reverse, net) real, reactive apparent at four different utility rates
- Individual current and voltage harmonics: magnitude, phase angle
- % THD: current and voltage
- Waveform capture
- Minimum/maximum values
- Event logging/disturbance recording
- ANSI C12.20 Class 0.5% revenue metering accuracy, ANSI C12.16, IEC687 Class 0.5%

Accuracy

- Currents and voltages: $\pm 0.20\%$
- Power, energy and demand: 0.40%
- Frequency: 0.01 Hz
- Power factor: 0.80%
- Accuracy maintained from 3%–800% of full scale and from -0.50 to 1.00 to $+0.50$ power factor

*IQ Analyzer 6600 Series***Communications**

Optional interface capability to computer network for data collection, storage and/or printout via the Eaton Power Management software.

Physical Characteristics

- Graphical reverse-mode LCD display with LED backlight
- Up to seven lines of information
- Height: 10.25 inches (260.4 mm)
- Width: 6.72 inches (170.7 mm)
- Depth: 4.70 inches (119.4 mm) without PON1, 5.83 inches (148.1 mm) with PON1
- Membrane faceplate NEMA 3R and 12 rated

Listings/Certifications

- UL listed, File E62791, NKCR File E185559 (CE versions)
- cUL® listed #1010.1 C22.2
- CE mark EN61010-1 EN50082-2
- Measurement Canada Electricity Meter AE-0782
- CSA approved

Features**IQ Analyzer—Comprehensive Electrical Distribution Monitoring**

The IQ Analyzer is a complete solution to monitor and manage all aspects of the electrical distribution system.

Its high-performance metering exceeds ANSI C12.16 (0.5%) specification for revenue meters and meets ANSI C12.20 Class 0.5%, provides quality true rms readings through the 50th harmonic, accurately measures nonsinusoidal waveforms up to a 3.0 crest factor, and displays even and odd multiples of the fundamental current and voltage through the 50th harmonic. Both magnitude and phase angle of the harmonics are displayed.

Note: For definition of power quality terms, see **Page 3.3-7**.

The unique operator interface, which includes a reverse-mode LCD display, easy-to-use Meter Menu screens and detailed Analysis screens, is designed to allow a wealth of real-time and recorded information to be accessed easily by an operator. All programming can be accomplished through the faceplate or the communications port. The comprehensive online Help feature provides useful information on device operation, programming and troubleshooting.

IQ Analyzer—6000 Series

3

Disturbance Information

With the communications option and Eaton's Power Management software and Waveform Display software, a Waveform Analysis will construct waveforms of up to 56 cycles of all currents and voltages (including neutral and ground) to help troubleshoot undervoltage/sag and overvoltage/swell conditions. (See CBEMA Trend Logging section.) By programming a reset threshold, the duration of the voltage disturbance can also be indicated.

The IQ Analyzer 6600 series with Graphic Waveform Display offers the ability to view the captured waveform right at the device. The 6600 series also offers the ability to detect and capture sub-cycle voltage disturbances.

Extensive Harmonic Distortion Analysis

Current and voltage distortion data are displayed at the device and are accessible through the communications port. This includes % THD, K-Factor, crest factor, CBEMA factor, and both magnitudes and phase angles of all harmonics through the 50th. A snapshot sample of this information may be activated by user commands, discrete inputs or programmable thresholds to capture distortion data during conditions of real interest. To help eliminate nuisance alarms, harmonic distortion information can be captured and relay outputs activated when THD exceeds a programmable percentage of fundamental or a programmable magnitude (e.g., amperes) threshold.

Time-of-Use Metering

The IQ Analyzer offers the ability to store energy usage data for time of use revenue metering. It can be programmed for any combination of weekday, Saturday, Sunday, 22 holidays, 8 seasons, 32 schedules, and 10 time periods per schedule. The IQ Analyzer will keep track of the following parameters for four different utility rates:

- Watthours
- VAR-hours
- VA-hours
- Current demand
- Watt demand
- VA demand
- VAR demand

Historical Trend Logging

The IQ Analyzer is equipped with on-board logging capability, which includes the ability to log a total of 24 parameters with intervals ranging from 0.13 seconds (every 8 cycles) to twice a week (5040 minutes). The trending function can begin immediately or can be triggered upon receipt of a discrete input into the IQ Analyzer. On-board logging provides a cost-effective means of distributed data storage, where real-time communications may not be feasible or for applications where data storage redundancy is desired. Four trend data logs are stored in non-volatile memory aboard the IQ Analyzer and can be retrieved at the display or via communications for viewing using Eaton software.

- Up to 24 parameters with storage capacity for up to 90,000 data points
- Up to 234 days of data can be stored when recording a parameter every 15 minutes
- Trends 1, 2 and 3 can save data on a discrete contact input
- Trend 4 can save data on a power quality or meter event
- Minimum and maximum recording (min./max. three-phase average current, max. IG, min./max. three-phase average VLL and VLN, max. VNG, max. system watts, VARs and VA, min./max. apparent and displacement PF). Using this feature, minimum and maximums reached during each trend interval are recorded

ITIC (formerly CBEMA) Trend Logging

The IQ Analyzer can be configured to store the necessary data so that PowerNet can display a sag or swell voltage event on the industry standard ITIC (formerly CBEMA) curve for predictive maintenance and troubleshooting. This application uses the IQ Analyzer waveform capture for high-speed events along with historical trend logging for longer term voltage disturbances. Once this data is uploaded to a PC running the Power Management Software Event Viewer, the information is analyzed, displayed and stored. Automatic uploading of ITIC events can be selected in PowerNet. A three-phase event will be correctly displayed as a single point on the ITIC curve.

Event Logging

The IQ Analyzer will store in non-volatile memory the time and reason for last 504 events. These events can be viewed from the graphical display or accessed via communications. In addition to all of the meter events listed in the Event Conditions paragraph on **Page 3.3-4**, the following events are entered into the event log.

Time and date of:

- Alarms
- Meter power up
- All resets
- All setting changes
- Communications established or lost

Event logging is another powerful troubleshooting tool within the IQ Analyzer.

Extensive I/O and Communications Capability

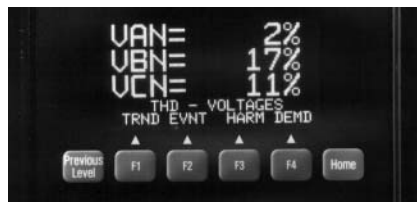
One analog and three digital inputs are provided to interface with sensors and transducers. Three analog outputs and four relay contacts are furnished to share data with PLCs and control systems and to actuate alarms and control relays. Terminals are captive clamp type and finger safe. With the communications option, the device can be remotely monitored, controlled and programmed.

Ratings

- Application to 500 kV, no PTs to 600V
- CT ratios selectable from 5: 5A to 10,000: 5A
- Standard 120/600 Vac line
- Three-phase power supply module, 100–600 Vac
- Separate source power supply module available, 100–240 Vac or 100–250 Vdc
- DC only separate source power module also available, 24–48 Vdc

Displayed Information Features

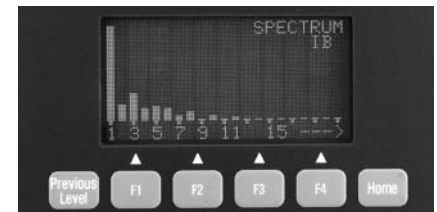
- All information is accessible at the device or through the communications port via Eaton's Power Management Software
- Quality true rms readings through 50th harmonic
- Complies with the accuracy portion of ANSI C12.20 Class 0.5% revenue metering specification
- Accurate readings for nonsinusoidal waveforms with up to 3.0 crest factor
- Screens display auto ranging units, kilo units, mega units as needed
- 10-digit energy readings
- Displays multiple parameters at the same time
- Programmable custom screens

Meter Menu Screens*Meter Menu**Examples of Meter Menu**Custom Screen**Custom Screen*

The IQ Analyzer allows a user to view commonly used parameters by scrolling through its LED indicator Meter Menu.

Meter Menu Displayed Information

- Current:
 - Phases A, B, C, average
 - Neutral
 - Ground (separate CT)
- Voltage:
 - Phases A-B, B-C, C-A, average
 - Phases A-N, B-N, C-N, average
 - Neutral-ground
- Power:
 - Real (watts)
 - Reactive (VARs)
 - Apparent (VA)
 - Phases A, B, C and system
- Energy (forward, reverse and net):
 - Real (kWh)
 - Reactive (kVARh) apparent (kVAh)—no reverse or net
- Frequency, time and date
- Demand:
 - System current (amperes)
 - Systems real power (kW)
 - System reactive power (kVAR)
 - System apparent power (kVA)
- Power factor:
 - Phases A, B, C and system
 - Displacement
 - Apparent
- % THD current:
 - Phases A, B, C, N
- % THD voltage:
 - Phases A-B, B-C, C-A
 - Phases A-N, B-N, C-N
- K-Factor
- ITIC (CBEMA) derating factor (displayed as "Z")
- Crest factor
- Discrete input and output status
- Analog input reading
- Custom—User may program four screens to show any combination of seven Meter Menu parameters per screen

Harmonic Analysis Screens*Harmonic Spectrum Available with Model 6600***Minimum and Maximum Values**

- Current:
 - Phases A, B, C, N, G
- Voltage:
 - Phases A-B, B-C, C-A
 - Phases A-N, B-N, C-N, N-G
- Power:
 - Real (watts)
 - Reactive (VARs)
 - Apparent (VA)
 - Phases A, B, C and system
- Power factor:
 - Apparent
 - Displacement (three-phase and system)
- Frequency.
- THD (amperes, volts, and %):
 - Current (phases A, B, C, N)
 - Voltage (phases A-B, B-C, C-A, A-N, B-N, C-N)

All minimum/maximum values may be reset via reset pushbutton on faceplate, discrete input or communications command. Values are updated at least once every 16 line cycles.

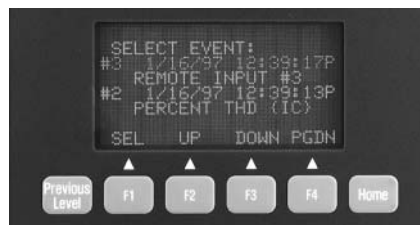
The F3 function key accesses the Harmonic Analysis screens. Two cycles of data sampled at 128 **samples/cycle** are **simultaneously** recorded for:

- Current:
 - Phases A, B, C, N, G
- Voltage:
 - Phases A-B, B-C, C-A
 - Phases A-N, B-N, C-N
 - Neutral to ground

Magnitudes (or % of fundamental) of odd **and even** multiples of the fundamental from 2nd–50th are displayed. The phase angle associated with each multiple of the fundamental is also displayed.

IQ Analyzer—6000 Series

Event/Alarm Analysis Screens



Example of Event Analysis Screens



Waveform Screen Available with Model 6600

Pressing the F2 function key accesses the Event Analysis screens. These display the following data for up to ten event/alarm conditions:

- Description, date, and time of event/alarm with 10 millisecond resolution
- Current, voltages, power readings, demand readings, frequency and % THD at time of event/alarm
- Current and voltage distortion information available on Harmonic Analysis screens

Event data is stored in non-volatile memory. If a reset threshold is programmed, the duration of the event (e.g., undervoltage) is also displayed. With Eaton's PowerNet communications option and Series III software, waveforms and harmonic profiles may be displayed on a PC.

Event Conditions

Events may be triggered by up to seven of any of the following conditions:

Voltage Disturbances

- Undervoltage/sag—any VL-L, VL-N (40%–100%)

Note: 60% minimum for self-powered unit.

- Overvoltage/swell—any VL-L, VL-N (100%–750%)

If zero time delay is programmed, any disturbance lasting two cycles (less if magnitude is sufficient to effect rms readings) will trigger a voltage disturbance event/alarm.

- Sub-cycle transient capture/excess dv/dt on VA-N, VB-N, VC-N

Note: 6600 Series only.

- Sub-cycle voltage interruption on VA-N, VB-N, VC-N

Note: 6600 Series only.

Maximum Threshold Exceeded

- Currents—phases A, B, C, neutral and ground
- Voltage—neutral to ground
- System power—watts, VA, VARs
- System power factor—displacement and apparent
- Demand
- Currents—phase A, B, C and AVG
- System power—watts, VARs, VA
- Frequency
- % THD or magnitude total harmonic distortion
 - Currents
 - Phases A, B, C, neutral
 - Voltage
 - VA-N, VB-N, VC-N, VA-B, VB-C, VC-A

Minimum Threshold Exceeded

- Currents—phases A, B, C
- System power—watts, VARs, VA
- System power factor—displacement and apparent
- Frequency

Voltage Phase Unbalance

- Voltage L-L, L-N

Current Phase Unbalance

- Current—Phases A, B, C

Discrete Input Energized

- Input 1, 2, 3

All trigger conditions have programmable time delays from 0.1 to 60 seconds in 0.1 second increments.

Demand Recording

Peak Demands are date and time stamped for:

- Current phases A, B, C, average
- System power:
 - Real (watts)
 - Reactive (VARs)
 - Apparent (VA)

Input/Output

Extensive input/output capability is standard on the IQ Analyzer. In addition to monitoring three-phase currents and voltages, separate inputs are provided for both ground and neutral currents. Voltage of neutral-to-ground is also monitored to indicate the presence of harmonics and potential downstream grounding problems. Analog and digital I/O provide interfaces for transducers, relays, PLCs and control systems.

Current Inputs

Five ampere secondary CT connections for:

- Phases A, B, C
- Ground
- Neutral
- Separate ground and neutral CT inputs
- CT range 5:5 to 10,000:5 (any integer)

Voltage Inputs

- Phases A, B, C (from 120 Vac–500 kV AC)
- 120/240 Vac control power input standard—not required with optional line power module
- Separate ground-to-neutral voltage reference
- PT range 120:120 to 500,000:120 (any integer)

External 120V secondary PTs are required above 600 Vac, optional from 120–600 Vac.

Discrete Contact Inputs

Three dry contact discrete inputs may be programmed by the user to:

- Trigger Event Analysis—the information described in “Event Analysis Screens,” including Harmonic Analysis information, can be recorded when external devices trip or change state by wiring their auxiliary contacts into these inputs
- Act as a synch.-pulse input to synchronize power demand windows with utility provided synch pulse
- Actuate a relay output
- Reset relay output, peak demands, Trend Analysis records and Event Analysis records
- With communications option, provide remote status indication on Eaton’s network

Status of input contacts is displayed in the Meter Menu Custom screen.

Relay Output Contacts

Four Form C NO/NC relay contacts may be independently programmed to:

- Act as a kWh, kVARh or kVAh pulse initiator output
- Actuate on one or more event conditions—including discrete input and Eaton Power Management Software command (through communications port)
- Reverse sequence alarm

Each Relay may be set for Auto or Manual Reset with 0–30 minute release delay (one second increments). Relays are Form C NO/NC. Relay(s) programmed to actuate on undervoltage also have a programmable 0–30 minute delay on power-up for transfer applications.

Analog Input and Outputs

One analog input and four analog outputs may be configured as 0–20 or 4–20 mA. The analog input is displayed at the device as a percentage and is accessible through the communications port. The analog input provides an interface with gas flow meters, temperature transducers or other analog devices.

The analog outputs may be programmed to reflect any of the following:

- Current—phases A, B, C, average, N, G
- Voltage—L-L, L-N, N-G
- Power:
 - Real (watts)
 - Reactive (VARs)
 - Apparent (VA)
 - Phases A, B, C and system
- % THD:
 - Current (phases A, B, C, N)
 - Voltage (L-L, L-N)
- Frequency—system
- Power factor:
 - System displacement PF
 - System apparent PF

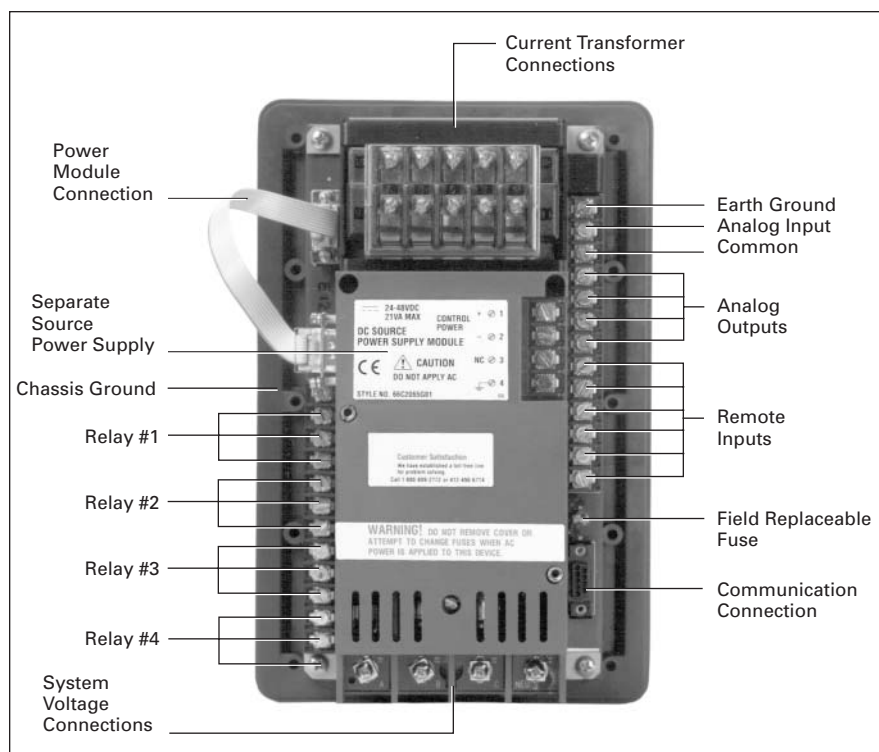


Figure 3.3-1. IQ Analyzer—Rear View

IQ Analyzer Wiring Diagram

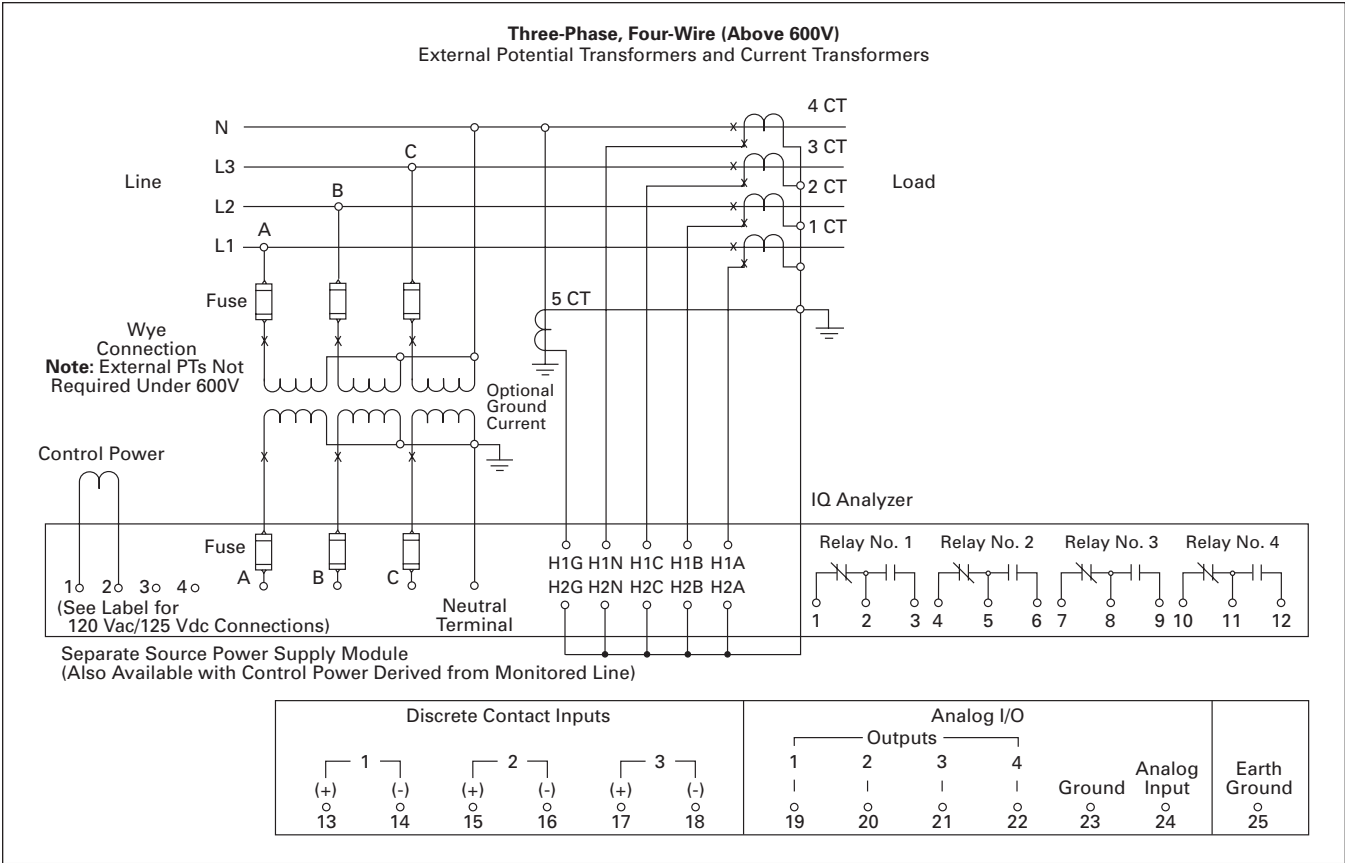


Figure 3.3-2. Sample Wiring Diagram for a Three-Phase, Four-Wire System

Definition of Power Quality Terms

Displacement Power Factor =

$$\frac{W}{\sqrt{W^2 + Var^2}}$$

- = Fundamental (60 Hz) watts to (60 Hz) VA.
- A ratio of fundamental (60 Hz) real power to apparent power.

Apparent Power Factor =

$$\frac{W}{VA}$$

- = Total rms watts to VA.
- A ratio of total real power (including harmonic component) to apparent power.

K-Factor =

$$\frac{\sum h_n^2 \left(\frac{I_n}{I_1} \right)^2}{\sum \left(\frac{I_n}{I_1} \right)^2}$$

- A derating factor that is related to the sum of the squares of harmonic currents times the squares of their harmonic numbers (multiples of the fundamental).

CBEMA Factor =

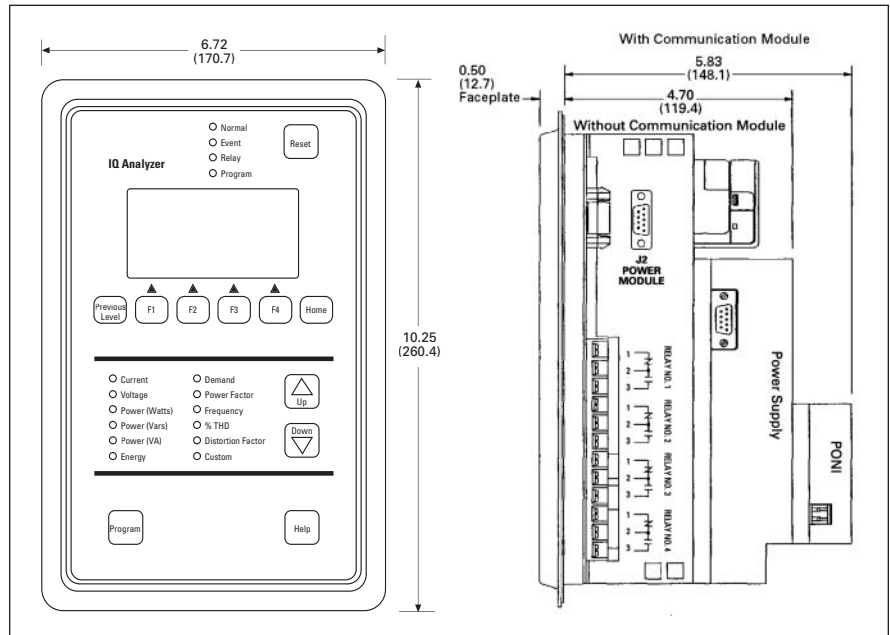
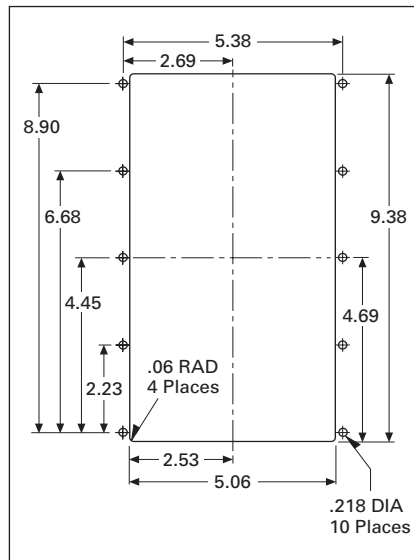
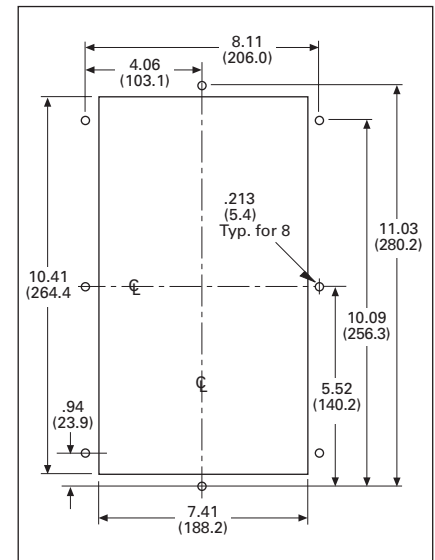
$$\frac{\sqrt{2}}{CF} = \frac{\sqrt{2} I_{rms}}{I_{Peak}}$$

- A transformer harmonic derating factor (THDF) defined as a pure sine wave's crest factor (1.4141) divided by the measured crest factor.

Crest Factor =

$$\frac{I_{Peak}}{I_{rms}}$$

- Ratio of peak current to rms current.

Figure 3.3-3. Definition of Power Quality Terms
Dimensions in Inches (mm)

Figure 3.3-4. Dimensions and Cutout

Figure 3.3-5. Drilling Pattern

Figure 3.3-6. Drilling Pattern for Flange Mounting

Technical Data and Specifications

Table 3.3-1. Input/Output Information

Fuses ■ Self-powered units with IQMSSPM have 0.75A, 600V Bus Type KTK-R-3/4 fuses (three required) ■ Separate source dual voltage units with IQMSSPM have a single 0.20 (5.0) x 0.79 (20.0) 0.25A fuse ■ Separate source DC units with IQMDCPM do not have user-replaceable fuses		Accuracy (in percent full scale) Accuracy from 3–300% of full scale and from –0.5. to 1.00 to 0.5 power factor. Current and voltage: ±0.20% Power, energy, and demand: ±0.40% Frequency: ±0.04% Power factor: ±0.80% THD: ±1.00% Specific current accuracies: ±0.20% of full scale to 200% of full scale and 150% crest factor ±0.20% of full scale to 150% of full scale and 200% crest factor ±0.20% of full scale to 100% of full scale and 300% crest factor ±0.40% of reading for currents to 800% of full scale Power and energy: start recording with an average of 3 mA secondary current	
Environmental Conditions Operating temperature: –20° to 70°C Storage temperature: –30° to 85°C Operating humidity: 5% to 95% relative humidity Device weight: 5.8 lbs (2.6 kg)		Discrete Inputs (dry contact) +30 Vdc differential across each discrete input pair of terminals. Minimum pulse width: 1.6 msec Optically isolated inputs to protect IQ Analyzer circuitry.	
Current Inputs (each channel) Conversion: True rms, 32 sample/cycle (all samples used in all rms calculations) CT input: 5A secondary (any integer 5:5 to 10,000:5) Burden: 0.05 VA Overload withstand: 40A AC continuous, 300A AC 1 second Range: 8 x CT continuous Accuracy: 0.1% of CT primary rating, 0.2% of reading above 150% of rating, sinusoidal (see accuracy below for non-sinusoidal specifications) Input impedance: 0.002 ohm		Analog Outputs (4) 0 to 20 mA/4 to 20 mA into maximum 750 ohm load. Accuracy: 1%.	
Voltage Inputs (each channel) Conversion: True rms, 32 samples/cycle (all samples used in all rms calculations) PT Input: Direct or any integer 120:120 to 500,000:120 Range: 30 to 660 Vac (separate source and DC source) Nominal Full Scale: 100–600 Vac Burden: 21 VA (self-powered only) Overload Withstand: 635 Vac, continuous 700 Vac, 1 second Input Impedance: 1 megohm		Analog Input (1) 0 to 20 mA/4 to 20 mA into 200 ohm load. Accuracy: 1%.	
Frequency Range 20–66 Hz fundamental (up to 50th harmonic)		Relay Output Contacts (4) Form C dry contact: 10A at 120/240 Vac (resistive) 10A at 30 Vdc (resistive) 30A make (50 ms) at 240 Vac/240 Vdc Minimum pulse width: Four cycles (68 ms) Withstand Rating: 1000 Vac, 1 minute across contacts 5000 Vac (contacts to coil, 1 minute) 10,000 Vac (contacts to coil, surge voltage)	
Harmonic Response (voltages, currents) 50th harmonic		Relay Response Time (excluding programmed time delays): 2 line cycles for discrete input, Power Xpert Software command (communications port) 4–5 line cycles for voltage disturbance, voltage unbalance 9–10 line cycles for all others	

Table 3.3-2. Control Power Input

Description	Separate Source	Self-Powered ^①	DC Source
Input range, AC Frequency range	110–240 Vac ±10% 45–66 Hz	110–600 Vac ±10% 45–66 Hz	N/A N/A
Input range, DC Burden	110–250 Vdc ±10% 21 VA	N/A 21 VA	24–48 Vdc ±20% 21 VA

^① When directly wired to 480 Vac, IQ Analyzer can ride through a continuous sag that is 20% of rated voltage.

Table 3.3-3. Catalog Information

Description	Catalog Number
IQ Analyzer, separate source power module	IQA6410 ^①
IQ Analyzer, 24–48 Vdc power module	IQA6420 ^①
IQ Analyzer, three-phase power module	IQA6430 ^①
IQ Analyzer, separate source power module with waveform display and sub-cycle voltage disturbance capture	IQA6610 ^①
IQ Analyzer, 24–48 Vdc power module with waveform display and sub-cycle voltage disturbance capture	IQA6620 ^①
IQ Analyzer, three-phase power module with waveform display and sub-cycle voltage disturbance capture	IQA6630 ^①
IQ Flange, to provide extra clearance when mounting	IQFLANGE ^②
36.00-inch (914.4 mm) extension cable for remote mounting of power module	IQACABLE ^②
45.00-inch (1143.0 mm) extension cable for remote mounting of power module	IQA45CABLE ^②
24–48 Vdc separate source power module	IQMDCPM ^②
100–240 Vac and 100–250 Vdc separate source power module	IQMSSPM ^②
Three-phase, self-powered power module	IQM3PPM ^②
INCOM communication module	IPONI ^②
RS-485 communication module with Modbus protocol	MPONI

^① Use three-phase power module if meter electronics are to be powered from the three-phase line voltage of 600V and below. Use separate source power module if the meter electronics is to be powered from a separate 110–240 Vac or 110–250 Vdc source. Use 24–48 Vdc power module if only 24–48 Vdc is available to power electronics.

^② Separate power modules can be ordered if an active meter needs to have the existing power supply changed to a different voltage.

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IQ Flange



IQ Flange

Retrofit Applications

For applications where extra door-mounting space is required, a flange-mounting unit is available. The IQ Flange provides an extra 2.50 inches (63.5 mm) of clearance for the device.

For use with the following products:

- IQ Analyzer
- IQ DP-4000
- MP-3000
- DT-3000

Product Selection

Table 3.4-1. Ordering Information

Description	Catalog Number
IQ Flange	IQFLANGE

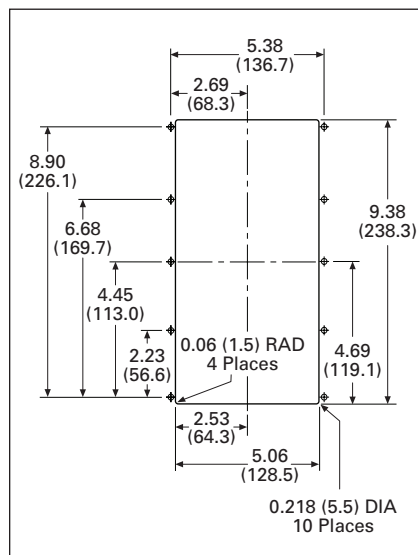


Figure 3.4-1. Typical IQ Flange Drilling Pattern

Panel Mounting Adapter Kit for IQ 100/200 Series and PXM 2000 Meters



Panel Mounting Adapter Kit

The flange adapter plate can be installed as follows:

1. Remove the old meter from the panel or door. Many IQ metering products use the typical IQ drilling pattern shown in **Figure 3.4-2** for mounting
2. Install the flange adapter plate. Mount it from the rear using the six screws provided in the kit. The flange adapter plate screw hole pattern shown in **Figure 3.4-2** should match the typical IQ drilling pattern. If not, perform the next step
3. Drill six holes in the panel or the door to mount the flange adapter plate. Follow the typical IQ drilling pattern. You need only the top, center and bottom sets of holes
4. Install the new IQ 100/200 Series or PXM 2000 meter in the flange adapter plate. Secure it from behind with four flat washers, lock washers and nuts provided with the meter

Product Selection

Table 3.4-2. Ordering Information

Description	Catalog Number
Panel mounting adapter kit IQ 100/200 and PXM 2000 Series adapter kit to IQ Analyzer/IQ DP-4000/IQ Data	IQ250-PMAX

Dimensions

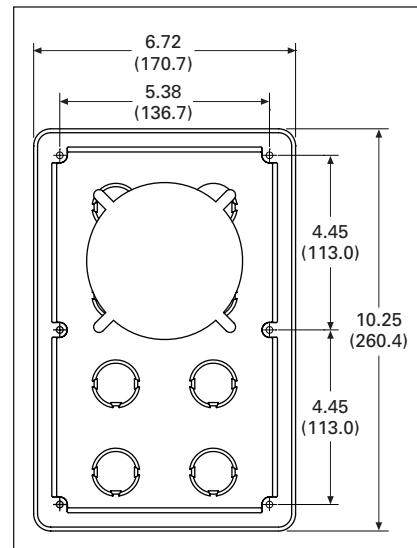


Figure 3.4-2. Flange Adapter Plate Screw Hole Pattern

Sub-Network Master Local Display

Sub-Network Master
Local Display (SMLD)

Sub-Network Master Local Display

General Description

Eaton's sub-network master local display (SMLD) is an electronic submetering device that provides users the ability to view information from sub-network connected devices locally at switchgear, switchboards, panelboards, motor control centers and control panels, nearby or thousands of feet away. The SMLD has a built-in LCD display with navigations for configuring, as well as monitoring. Auto-learn capabilities complete the configuration requirements, enabling customization by use of user-defined descriptions, as well as adding and deleting meters.

The SMLD can be operated standalone or in parallel with the new FetchIT™ software application or the Power Xpert complete energy monitoring system solution software.

Application Description

- Acquire and display data (no control) from up to 100 devices that can communicate on Eaton's INCOM network, used in the PowerNet monitoring system

Features, Benefits and Functions

- Auto-learn connected devices
- Configuration stored in non-volatile memory
- Host communications arbitration algorithm enables seamless integration into existing communication networks
- Functions standalone or networked

- Following devices are supported:
 - IQ 210/220/230
 - IQ Multipoint Energy Submeter II
 - IQ Energy Sentinel (F, J, K Frames)
 - Universal Internal Energy Sentinel
 - Universal External Energy Sentinel
 - Digitrip OPTIM 1050L

Physical Characteristics

- Keypad functions:
 - Menu
 - Scroll up
 - Scroll down
 - Enter
- Backlit LCD, 4-line x 20 character

Standards and Certifications

- Safety standards—UL 61010B-1
- EMC Susceptibility Standards—IEC 1000-4-3, 1995 Radiated RF Immunity
- EMC Emissions Standards—FCC Part 15, Class B Radiated Emissions

Product Selection

Table 3.4-3. Ordering Information

Description	Catalog Number
Local display (120 Vac)	LDISP120
Local display (24 Vac or Vdc)	LDISP24

Technical Data and Specifications

Frequency Range

- 50/60 Hz

Power

- Power consumption: 200 mA (maximum) at 24 Vac, 24 Vdc

- Power connector rating: 24 Vac or 24 Vdc at 1A
- Power source: 120 Vac or 24 Vdc, UL Class 2 or CSA Class III SELV transformer in accordance with C22.2 No. 1010-1. The voltage range is 18 to 24 Vac or Vdc, 200 mA (maximum)

Ratings

- Operating temperature: 0° to 60°C
- Storage temperature: -20° to 70°C
- Operating humidity: 5 to 90% maximum noncondensing
- Altitude: 10,000 feet (3048m)
 - Environment: indoor use only

Mounting Information

- 4.37 H x 4.37 W x 1.50 D inches (111.0 H x 111.0 W x 38.1 D mm)
- Door mount or panel mount

Communications

- INCOM Frequency Shift Key (FSK) network compatible 9600 baud
- Non-intrusive arbitration algorithm
- Passive monitoring automatically enabled by arbitration algorithm while host PC is communicating
- Master on INCOM network upon data request from front panel if host PC is not communicating
- Addresses for sub-network devices can be 001-044 hex (1-255 decimals)

Dimensions

Approximate dimensions in inches (mm)

Table 3.4-4. Meter Base Unit

Width	Height	Depth
4.37 (111.0)	4.37 (111.0)	1.50 (38.1)

Note: DIN (92 mm x 92 mm) access cutout.

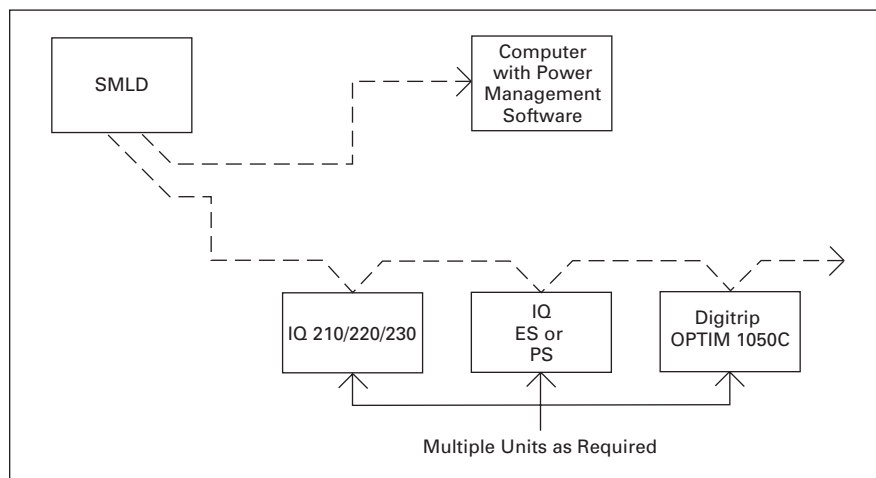


Figure 3.4-3. Typical Use Diagram of SMLD

Single and Multi Unit Enclosed Meters



Single and Multi Unit NEMA 12 Enclosed Meters—Front Views

General Description

The Eaton Enclosed Meter line provides a complete energy metering and data acquisition solution in a single enclosure. Designed for Eaton's IQ 35M, IQ 150, IQ 250/260 and Power Xpert 2000/4000/6000/8000 and Multi-Point Meters, Eaton's Enclosed Meter line offers mounting and installation flexibility, especially in retrofit applications where no metering compartment or mounting space is available in the existing electrical distribution equipment or where installation time is a premium. Factory designed and wired, Eaton's Enclosed Meter line offers savings in labor and installation costs because input current and voltage wiring, as well as I/O wiring, is pre-wired to terminal blocks inside the enclosure.

The Enclosed Meter line has two offerings; single, prewired unit (specific IQ 150, IQ 250/260 or PXM 2000/4000/6000/8000 or PXMP models) and a multi unit (specific IQ 150, IQ 250/260 or IQ 35M models). Because the multi unit automatically includes Eaton's Power Xpert Gateway 200E, it facilitates measurement and verification of the energy usage on processes and in buildings. This provides a convenient way to monitor energy usage from multiple points, collect and log specific energy use parameters, and display and generate logs for historical energy usage reports. Simply put, Eaton's multi unit enclosed meter solution helps meet any measurement and verification requirement to show energy efficiency improvements and results. In addition to the standard offering, Eaton can also provide an enclosed metering solution tailored around your project needs.

Application Description

Factory designed and wired to fit various Eaton power and energy meters at varying price points, Eaton's Enclosed Meter line offers savings in labor and installation costs because input current and voltage wiring, as well as I/O wiring, is pre-wired to terminal blocks inside the enclosure. Standalone, enclosed meters are ideal for new metering applications where no metering existed previously, retrofit installations where energy monitoring is a must or where ease of installation is required.

- Health care facilities
- Educational facilities and campuses
- Industrial facilities
- Commercial facilities
- Government facilities

The multi unit offering consolidates energy-related data available from the meters in the enclosure, but also allows for external meters to be added to the embedded Power Xpert Gateway 200E. Through the Power Xpert Gateway 200E's embedded Web server, information can be presented in a variety of ways, a standard Web browser being the most widely used method.

The enclosed product is a standalone solution that is ideal for many infrastructure designs. Further, as needs change and grow, the enclosed product can be integrated through Power Xpert Software into a broader solution that encompasses other intelligent hardware and can integrate with third-party network management systems (NMS) or building management systems (BMS) for system-wide monitoring and reporting of energy and power.

Features and Benefits

- Saves installation time and cost
- One part number to order; no need to worry that any part has been left out
- Pick the meter or meters you need as it is designed to fit various Eaton power and energy meters, at varying price points

Factory Wired

Most electrical contractors are very familiar with wiring meters. However, it does take time to place the disconnect, CT shorting blocks, terminal blocks, control power transformer, etc. and associated wiring. It is not uncommon for errors to be introduced during the installation of multiple meters; it's just inherent in wiring. With Eaton's Enclosed Meter line, everything is wired at the factory: the shorting block, terminal blocks, etc., assuring that it's done right. Further, to ensure safety, Eaton's Enclosed Meter line includes a primary fusible disconnect for line voltage that can be turned off during meter maintenance.

For applications with line voltages above the rated power supply of the meter, an optional control power transformer is supplied in the enclosure. Control voltage can also be supplied via a separate source that is wired to the field installation terminal block. CT inputs for the meter are wired directly to shorting terminal blocks for easy field installation. Factory wired products also save on installation time and costs. The meters are flush mounted on the enclosure door with all inputs/outputs factory-wired to terminal blocks.

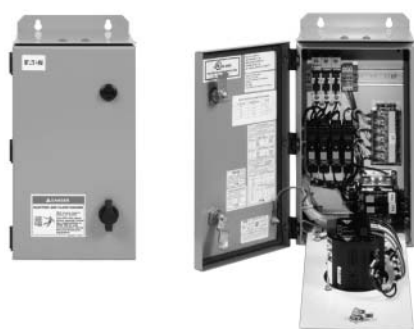
Note: A meter subpanel assembly is also available, which includes all the internal components of the single-unit enclosed meter for the IQ 150/250/260 and PXM 2000 Meters wired and mounted on a subpanel to be installed into an existing electrical structure. It comes with a 48-inch lead for flexibility in mounting the meters at various distances.

Single and Multi Unit Enclosed Meters

NEMA Rated

NEMA 12 enclosure prevents dust and other materials from entering. Internal gaskets also prevent air irritants from harming the vital equipment inside. This quality enclosure meets most indoor application needs. NEMA 3R enclosure is constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); and that will be undamaged by the external formation of ice on the enclosure. NEMA 4X enclosure provides the same degree of protection as the NEMA 3R with the additional protection against windblown dust, splashing and hose directed water, and protection against corrosion.

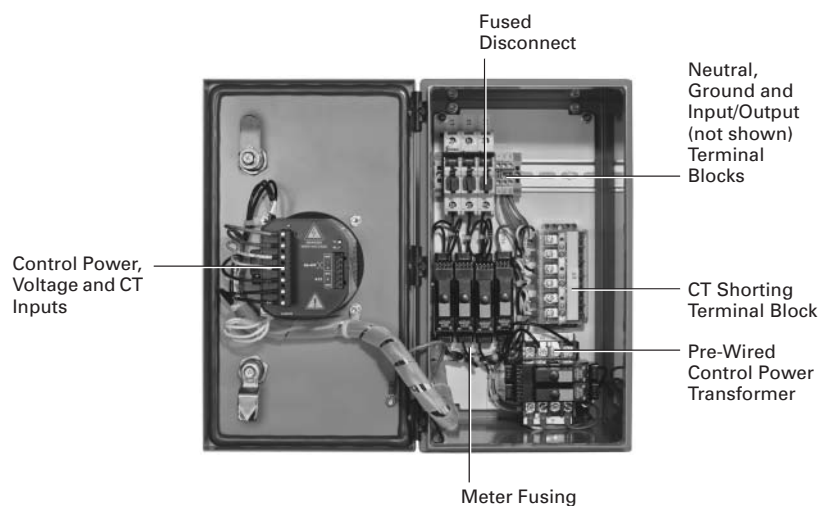
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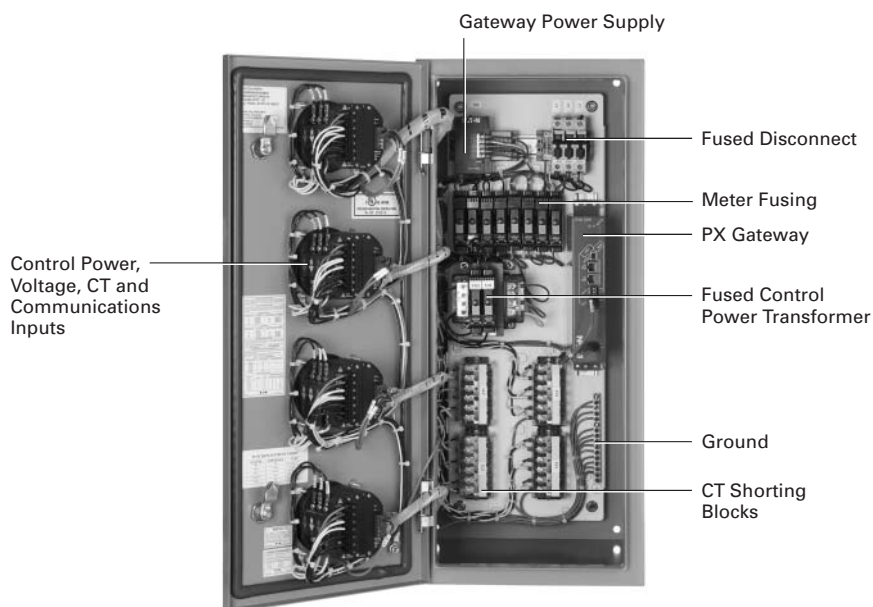
NEMA 3R Single Unit Closed and Open



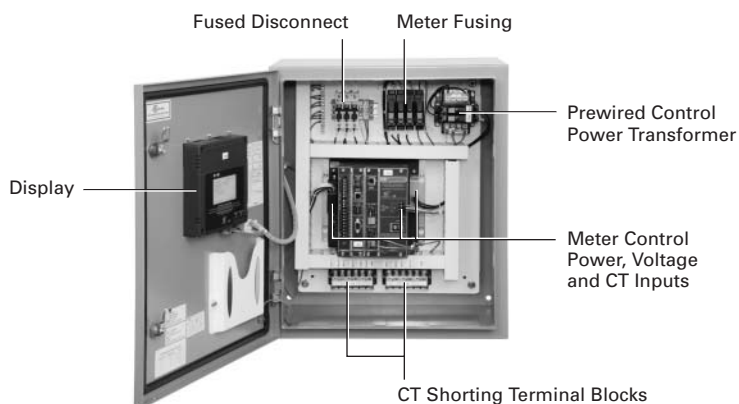
NEMA 4X Single Unit Closed and Open



NEMA 12 Front View, Door Open, Pre-Wired and Tested

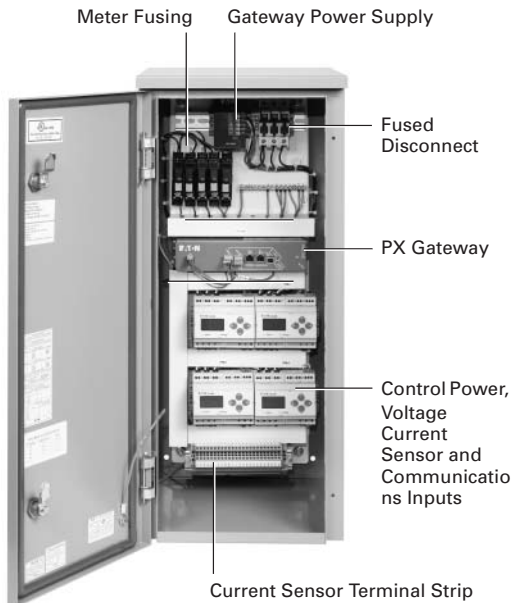


NEMA 12 Multi Unit View, Door Open, Pre-Wired and Tested

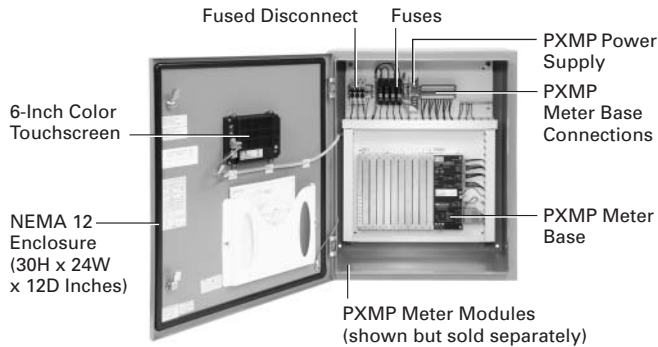


NEMA 12 Single-Unit Enclosed Meter Inside View, PXM 4000/6000/8000 Series

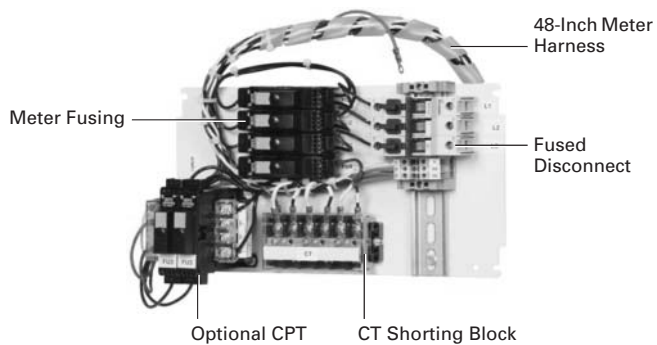
Single and Multi Unit Enclosed Meters



Multi-Unit Enclosed Meter, Inside View of IQ 35M



Enclosed Power Xpert Multi-Point Meter

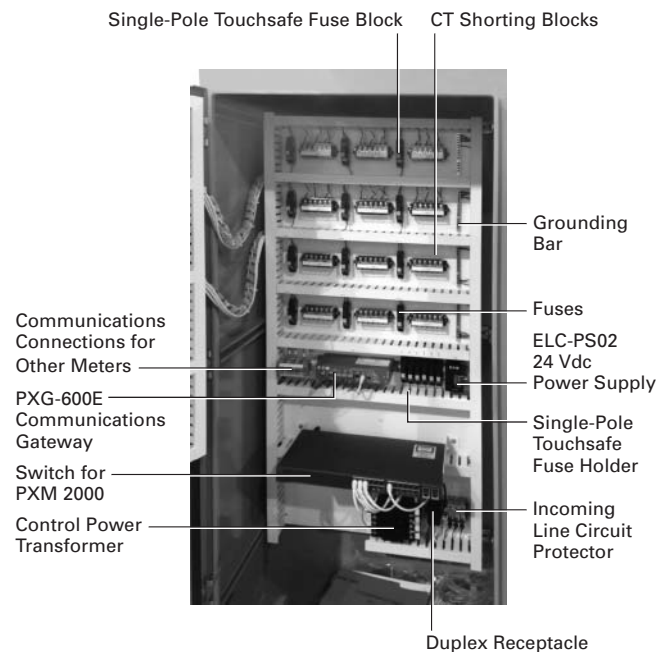
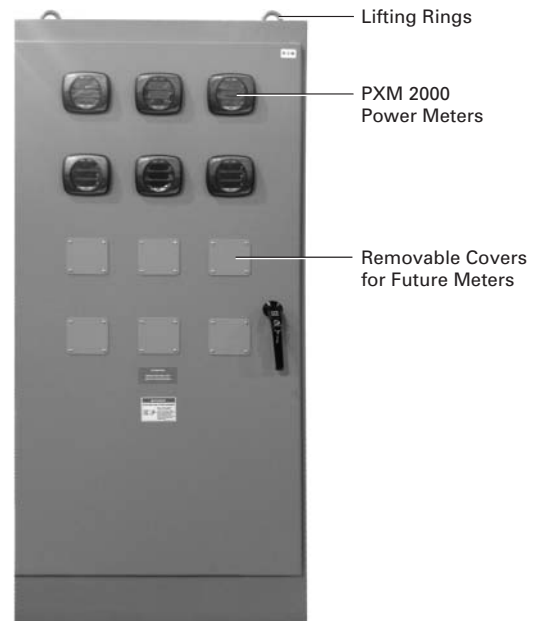


Prewired Meter Backpan, Single Unit

- Prewired panel to save installation time and cost for retrofits into existing equipment
- Designed for Eaton's:
 - IQ 100 Meter Series
 - 250/260
 - Power Xpert Meter 2000 Series
- With or without CPT, depending on voltage
- Order meters separately

Flex Center

Eaton's Meter Flex Center can provide above and beyond the standard meter enclosure offerings. The Meter Flex Center can tailor the enclosed solution to meet the specification requirements. Special requirements within the enclosures can be size, number of meters, differing meter models, special communication equipment, uninterruptible power supplies, electric heaters, power receptacles, or any other custom need. Below is an example of just a few of the Meter Flex Center capabilities.



NEMA 1 16 Meter Enclosure with PXM 2000 Front View and Door Open

Single and Multi Unit Enclosed Meters

Technical Data and Specifications

Table 3.4-5. Enclosed Meters

Description	Specification
Enclosure rating	NEMA 12, 3R, 4X
Enclosure operating temperature	–20°C to +40°C Note: Temperature range of meter is –20°C to +70°C. If applied outside, proper precautions should be taken to avoid exceeding the maximum and minimum temperature ratings of the meter.
Dimensions	Single unit (IQ 150/250/260 and PXM 2000): NEMA 12 (8.00W x 16.30H x 10.40D inches), NEMA 3R/4X (8.00W x 16.30H x 9.60D inches) Single unit (PXMP): NEMA 12/3R/4X (24.00W x 30.00H x 12.00D inches) Single unit (PXM 4000/6000/8000): NEMA 12 (20.00W x 24.00H x 14.10D inches), NEMA 3R/4X (20.20W x 24.00H x 13.90D inches) Multi unit: NEMA 12 (13.00W x 30.00H x 15.20D inches) NEMA 3R (13.20W x 30.10H x 14.60D inches) NEMA 4X (13.00W x 30.00H x 14.00D inches)
Meters	Single unit: IQ 150, IQ 250/260 and PXM 2000/4000/6000/8000 and PXMP models Multi unit: IQ 35M, IQ 150 and IQ 250/260
Communications (multi unit only)	Power Xpert Gateway 200E
Control voltage	120V–600V (PXMP)—power supply required Up to 240V (IQ 35M/150/250/260 and PXM 2000/4000/6000/8000)—no CPT required Greater than 240V (IQ 150/250/260 and PXM 2000)—CPT required Separate source control—no CPT required
Basic model	Fusible disconnect—primary voltage Shorting block(s) not required for IQ 35M or PXMP Ground terminal block Neutral terminal block Eight-point terminal block(s) for input/output modules for IQ 250/260 and PXM 2000
Wiring	Wired for three-phase, four-wire applications. Three-phase, three-wire applications—will need to change the wiring for both the voltage and current per the wiring diagram in the meter instruction manual.
Certifications	UL 508A and cUL
Source control	No separate source control voltage required for applications below 240 Vac (except PXMP)
Pre-wire	Pre-wired current transformer, shorting terminal block(s), neutral, ground, voltage, control power, fusible disconnect and input/output terminal block(s)
Latch	Padlocking latch provision
Optional features	Control power transformer —single unit: 50 VA (IQ 150/250/260 and 150 VA (PXM 4000/6000/8000); multi unit: 250 VA control power supply for meter where monitored voltage is 480 Vac (IQ 150/250/260 and PXM 2000/4000/6000/8000)

Note: Specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options, firmware version and product model. Please refer to the technical data sheet and user manual for detailed specifications.

Ordering Information

Table 3.4-6. Single Unit Enclosed Meter Catalog Numbering System

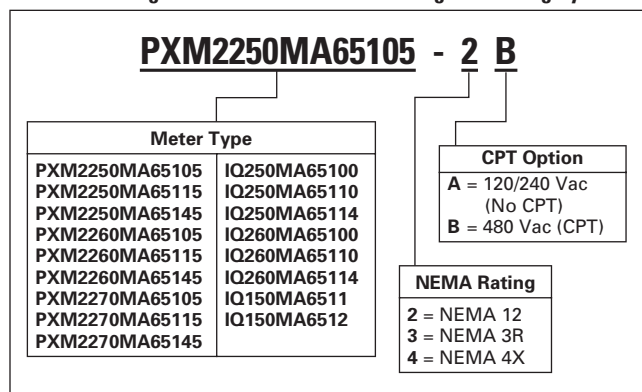


Table 3.4-7. Enclosed PXMP Meter Catalog Numbering System

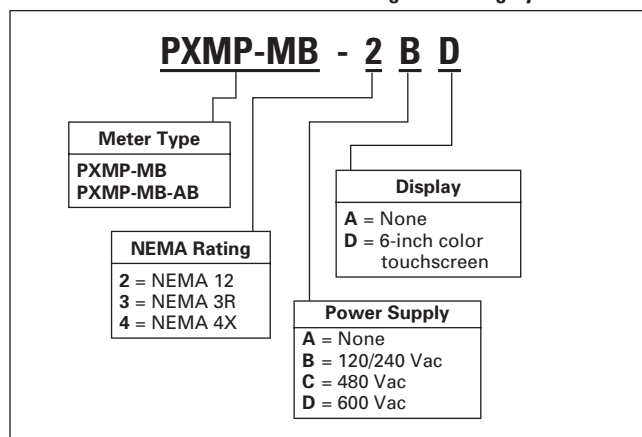
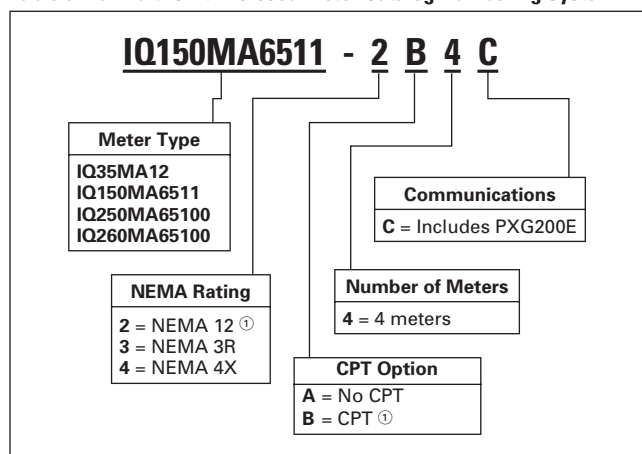


Table 3.4-8. Multi Unit Enclosed Meter Catalog Numbering System



① Not available with IQ 35M.

Dimensions in Inches (mm)

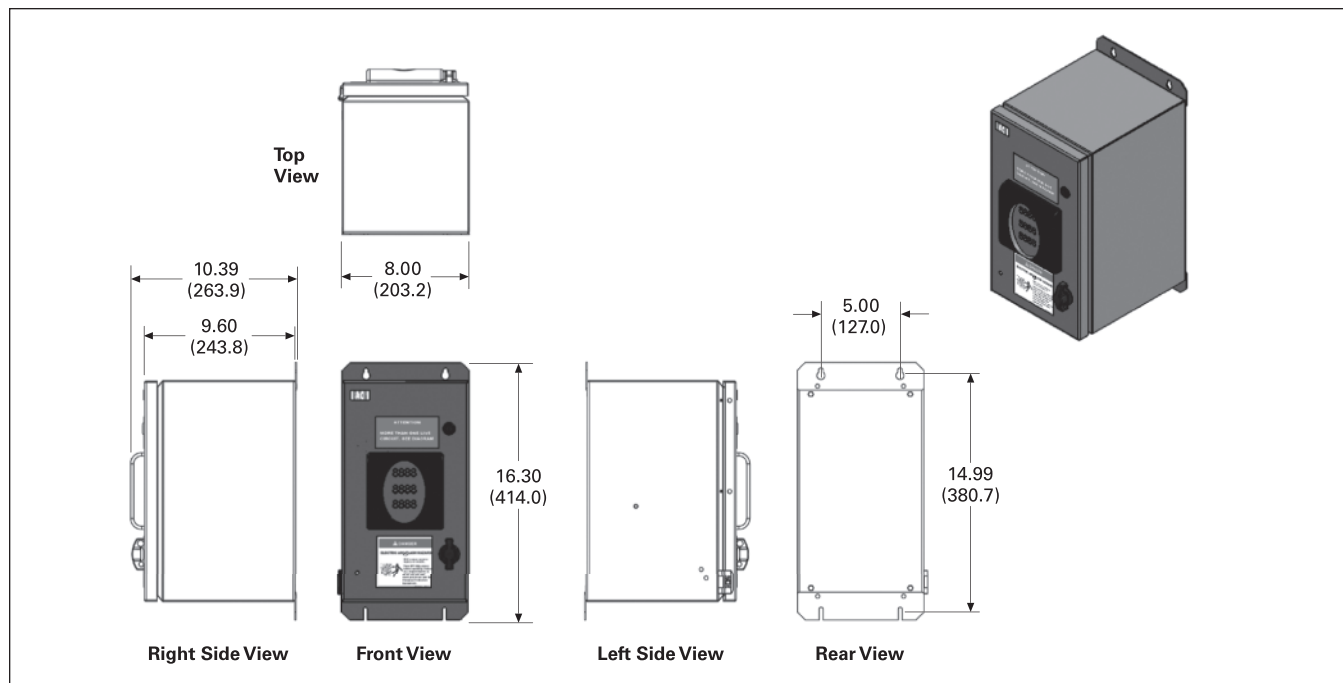


Figure 3.4-4. NEMA 12 Single Unit Enclosure

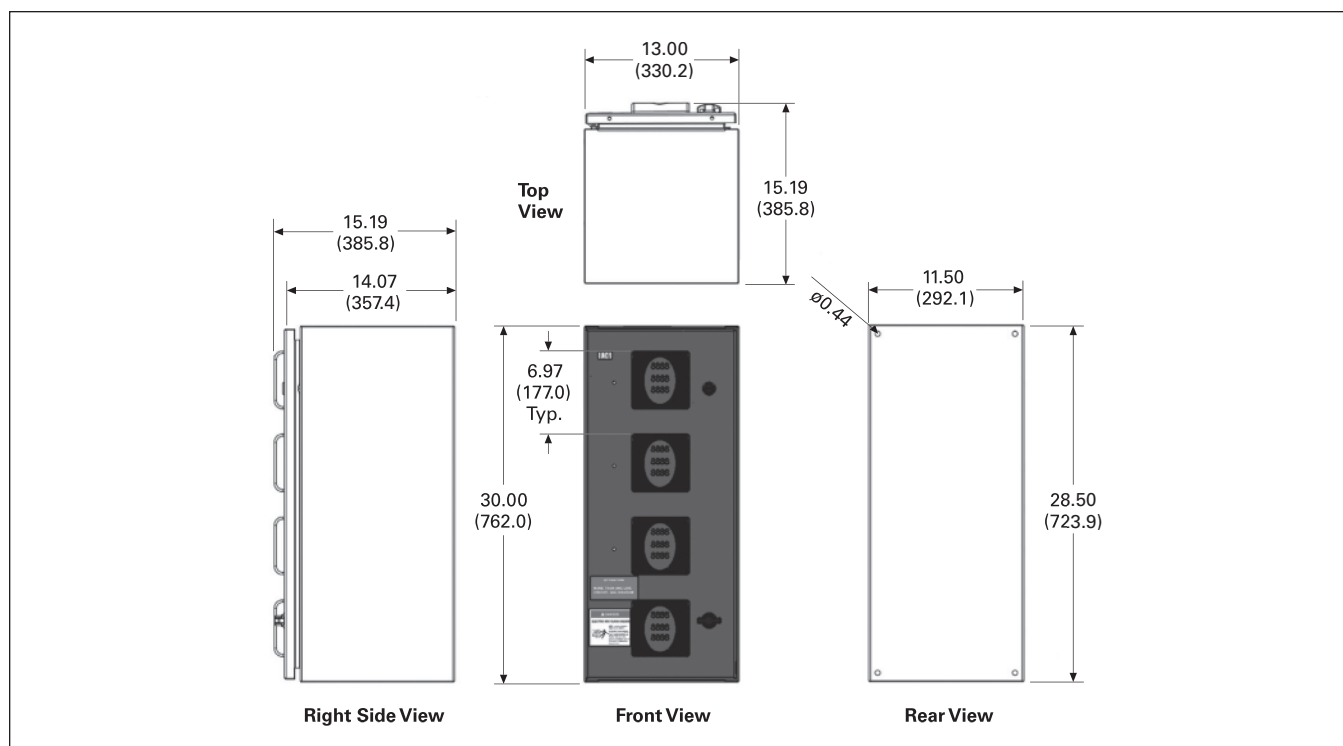


Figure 3.4-5. NEMA 12 Multi Unit Enclosure

Single and Multi Unit Enclosed Meters

3

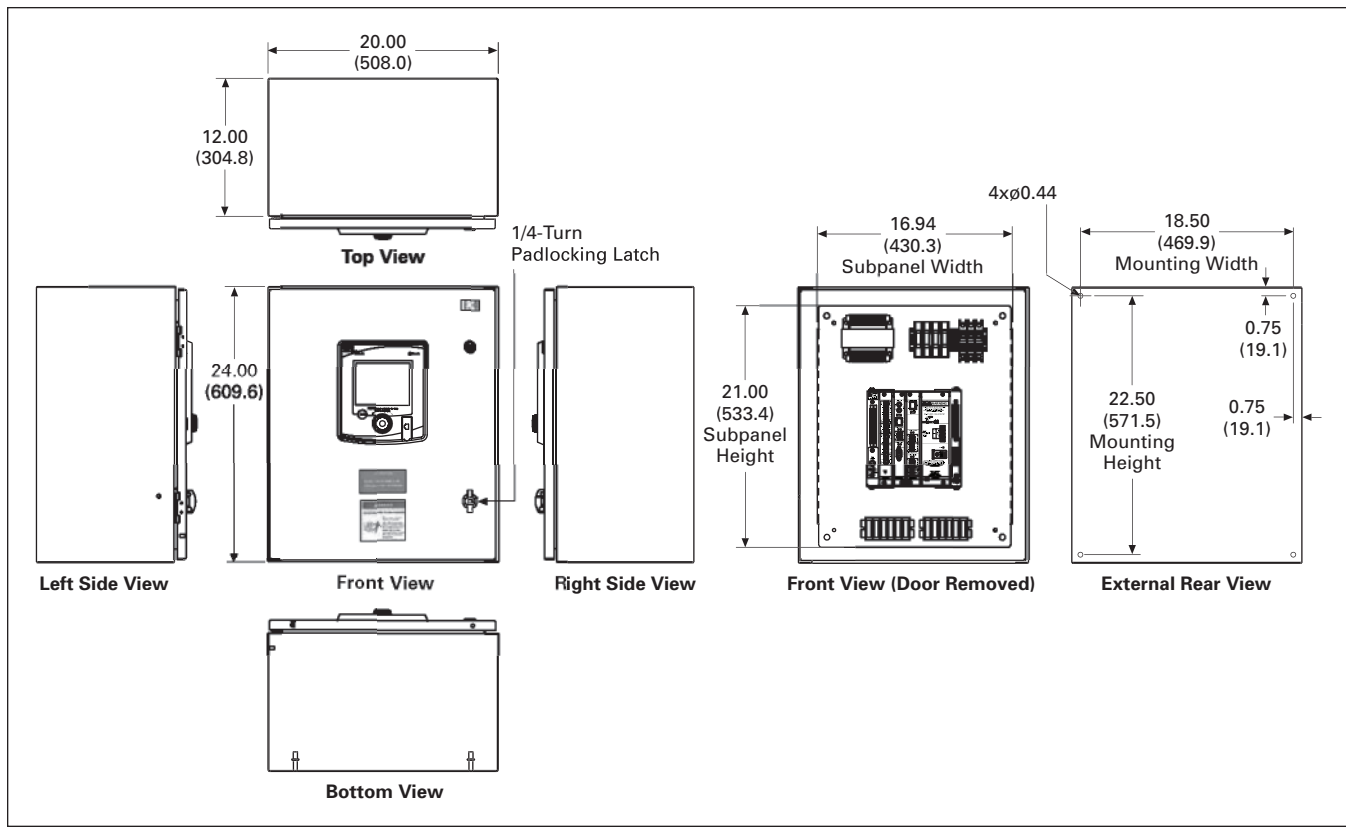


Figure 3.4-6. NEMA 12 PXM 4000/6000/8000 Unit Enclosure

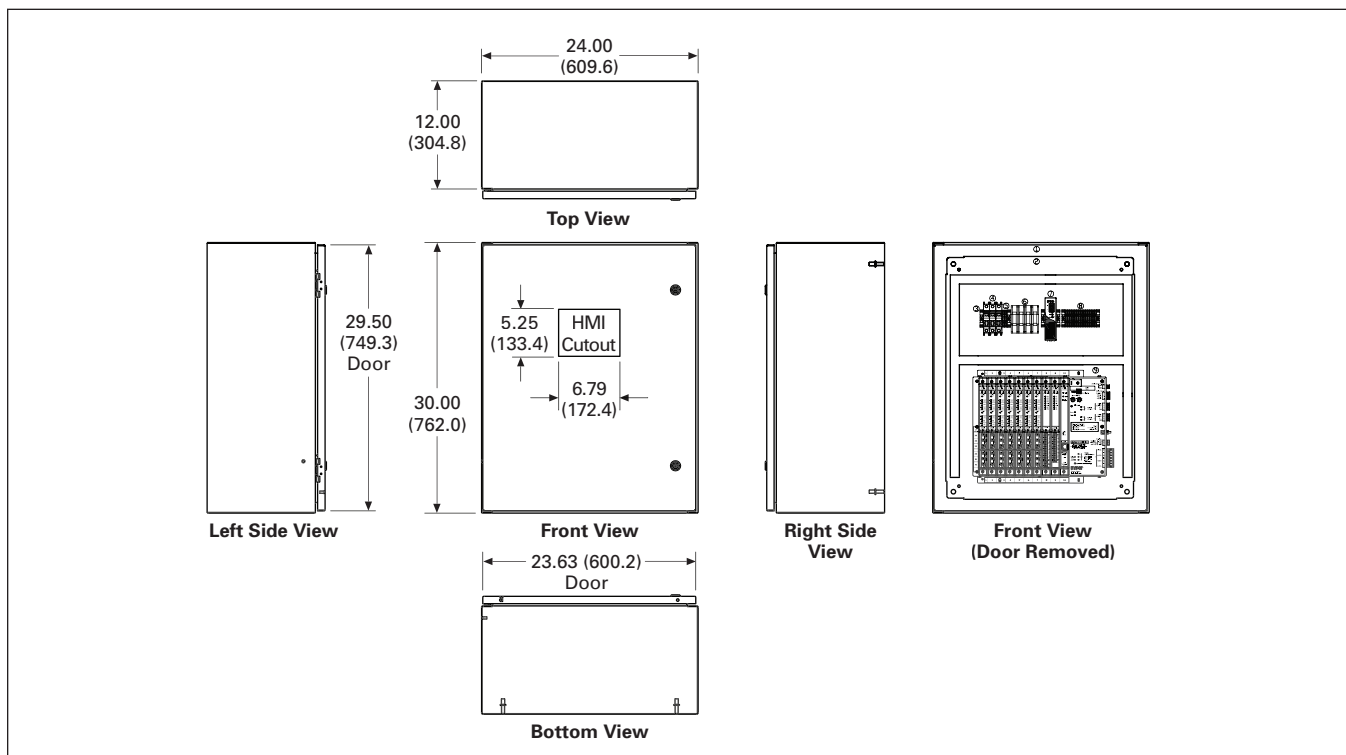


Figure 3.4-7. NEMA 12 PXMP Unit Enclosure

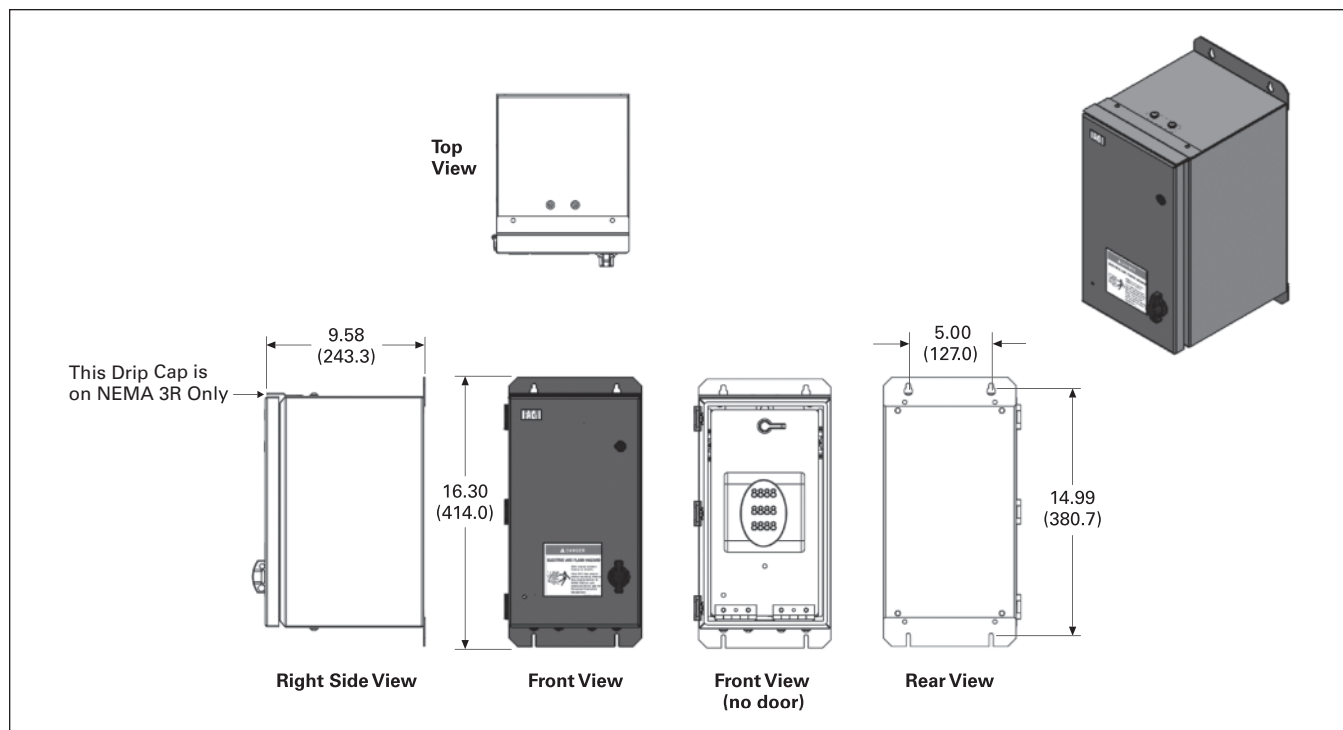


Figure 3.4-8. NEMA 3R/4X Single Unit Enclosure

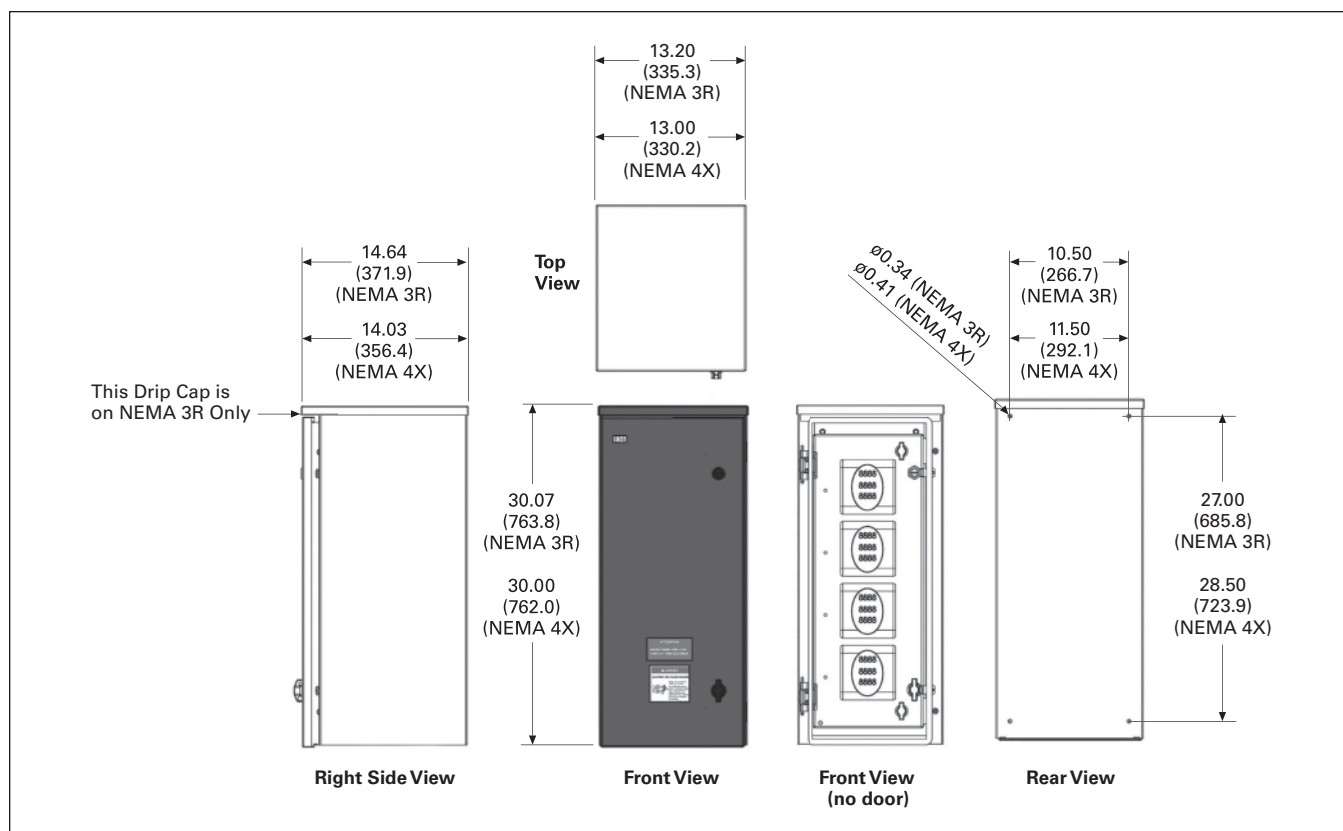


Figure 3.4-9. NEMA 3R/4X Multi Unit Enclosure

Single and Multi Unit Enclosed Meters

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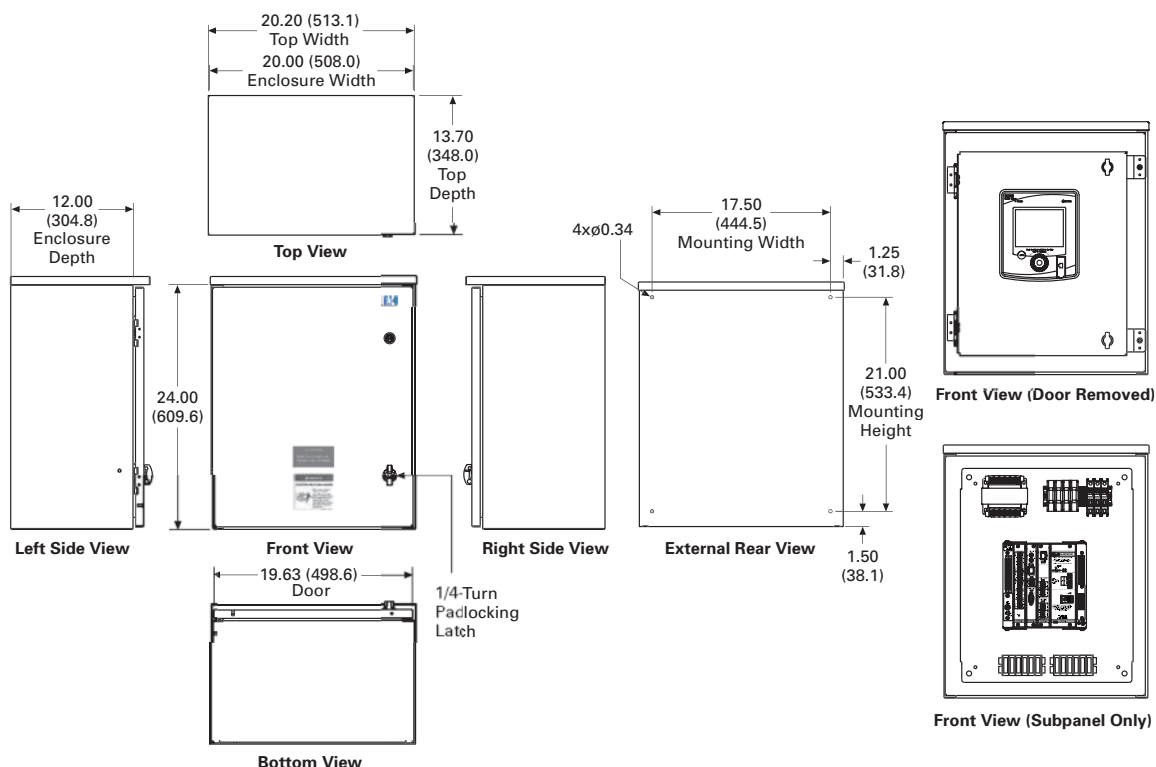


Figure 3.4-10. NEMA 3R PXM 4000/6000/8000 Unit Enclosure

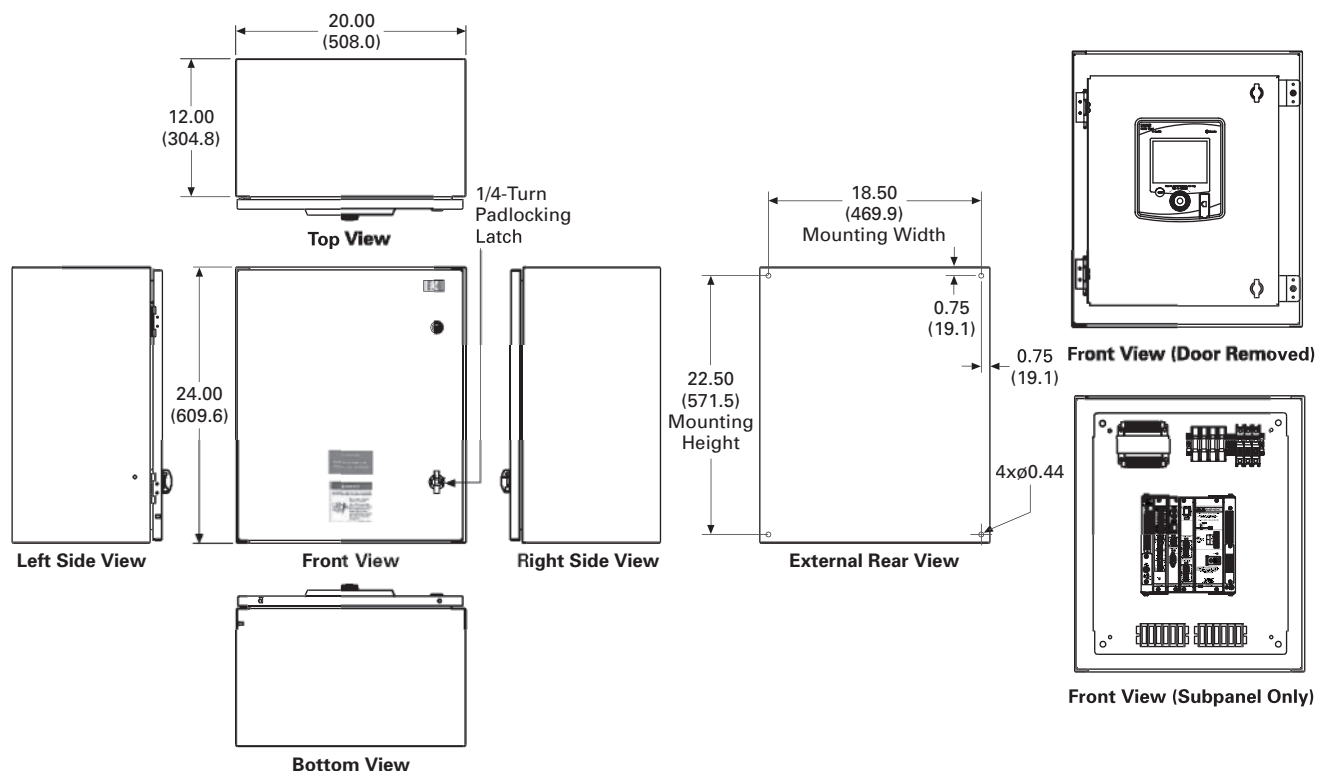


Figure 3.4-11. NEMA 4X PXM 4000/6000/8000 Unit Enclosure

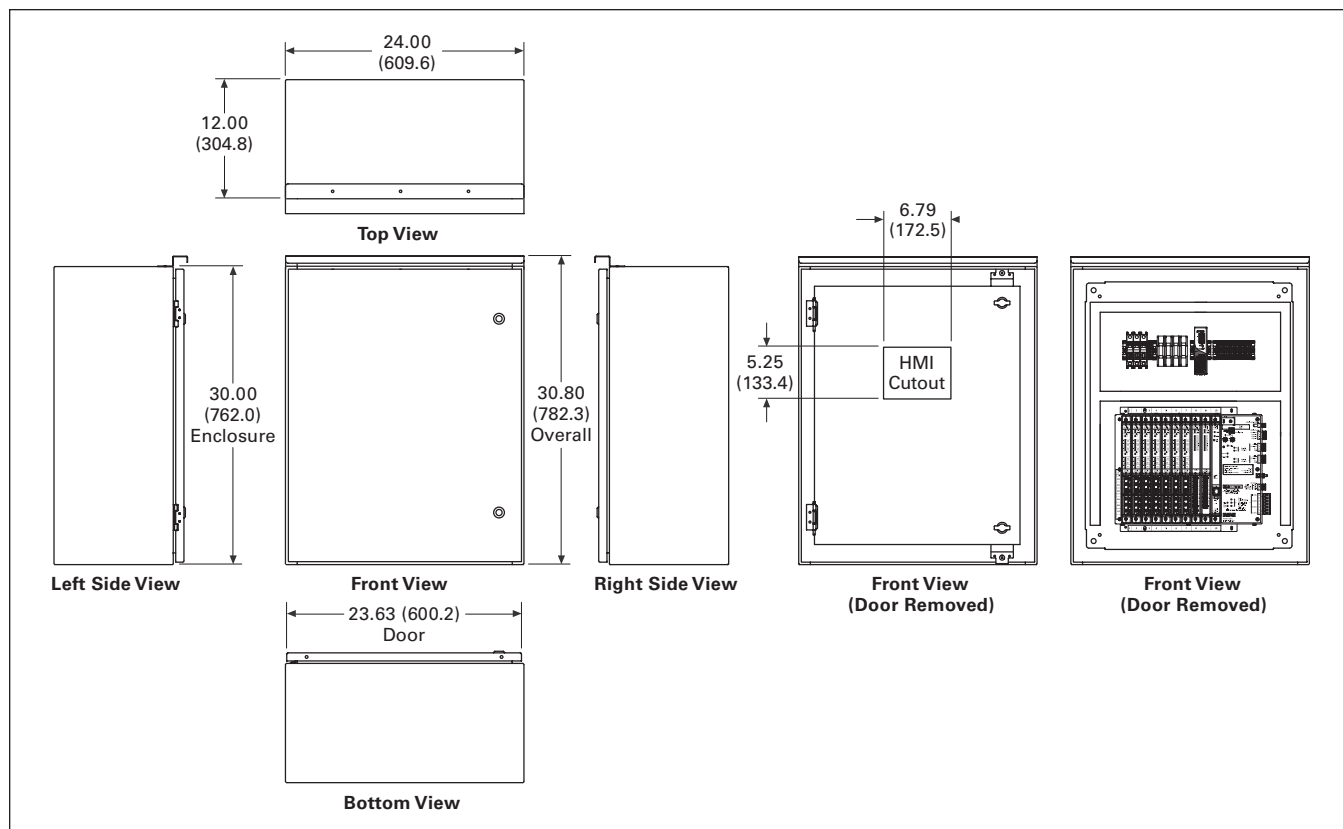


Figure 3.4-12. NEMA 3R PXMP Multi Unit Enclosure

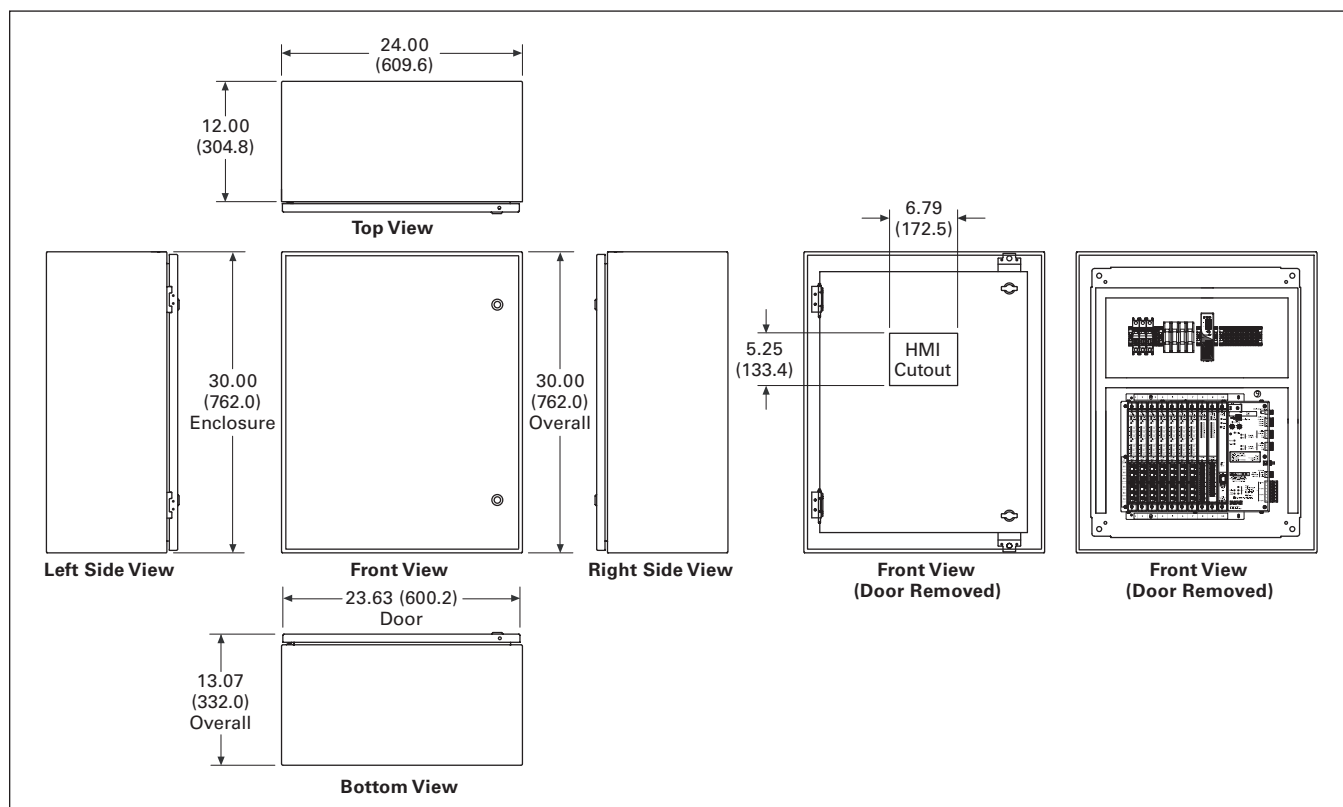


Figure 3.4-13. NEMA 4X PXMP Multi Unit Enclosure

Single and Multi Unit Enclosed Meters

3

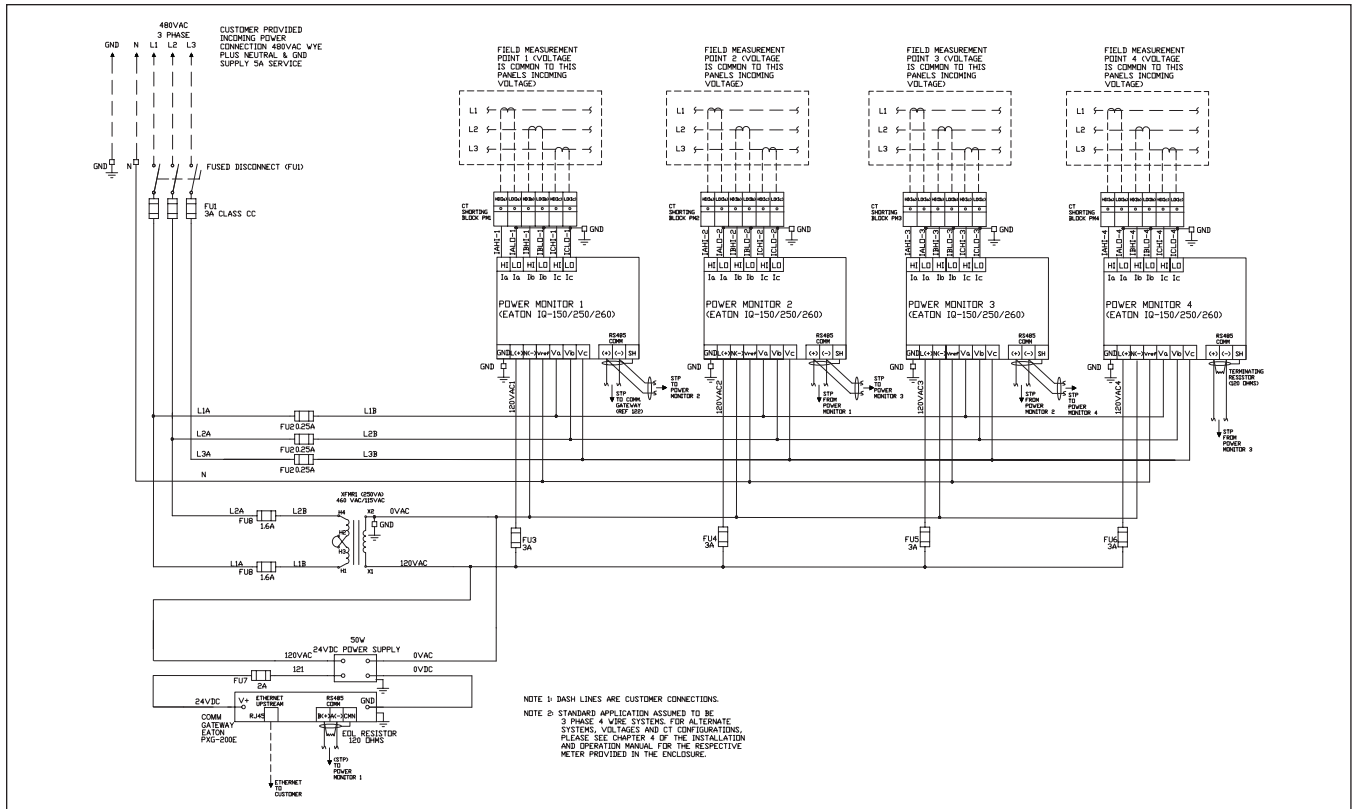


Figure 3.4-16. 480 Vac, 50/60 Hz, Three-Phase, Four-Wire System with Multi Unit IQ 150/250/260 Meters

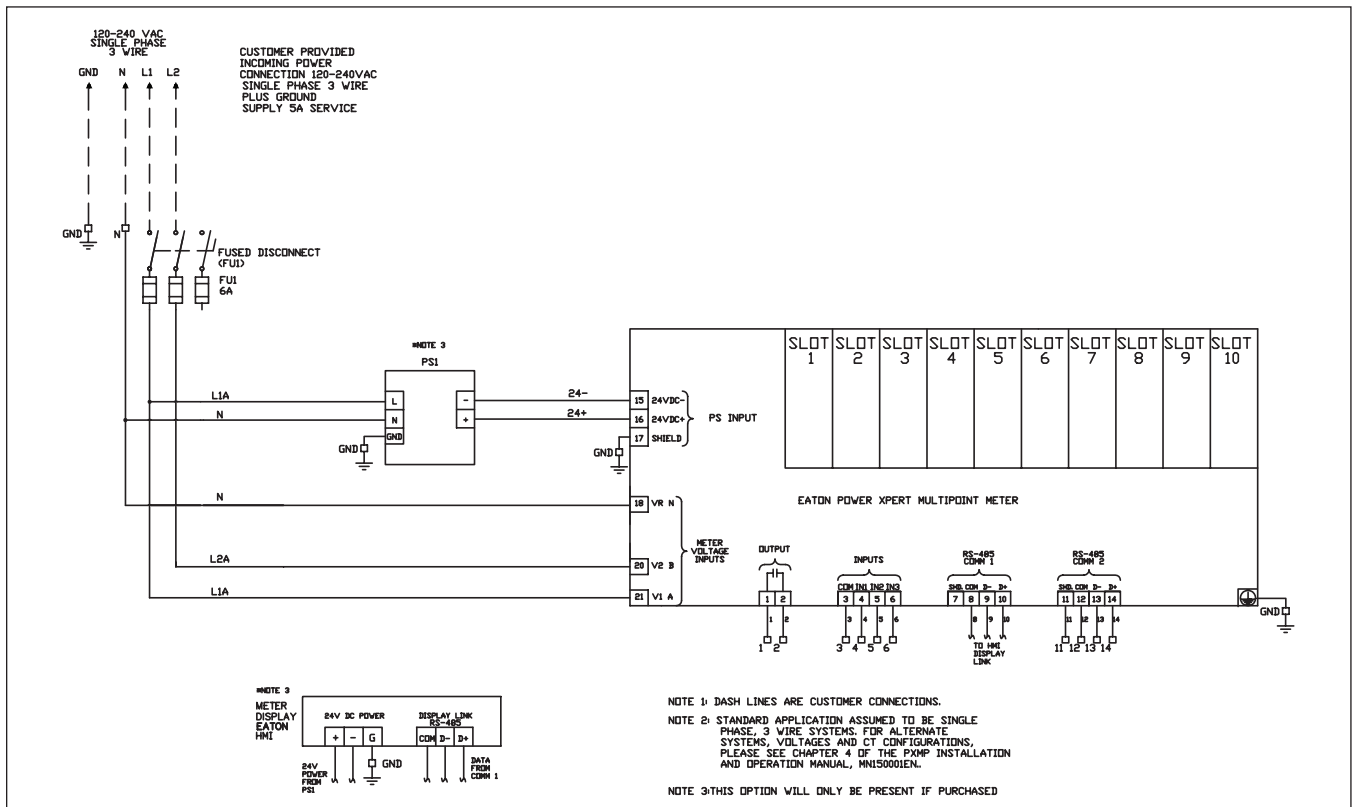


Figure 3.4-17. 120-240 Vac, 50/60 Hz, Single-Phase, Three-Wire System with Single PXMP Meter

Figure 3.4-18. 120–240 Vac, 50/60 Hz, Three-Phase, Four-Wire Wye System with Single PXMP Meter

Figure 3.4-19. 480–600 Vac, 50/60 Hz, Three-Phase, Four-Wire Wye System with Single PXMP Meter

Single and Multi Unit Enclosed Meters

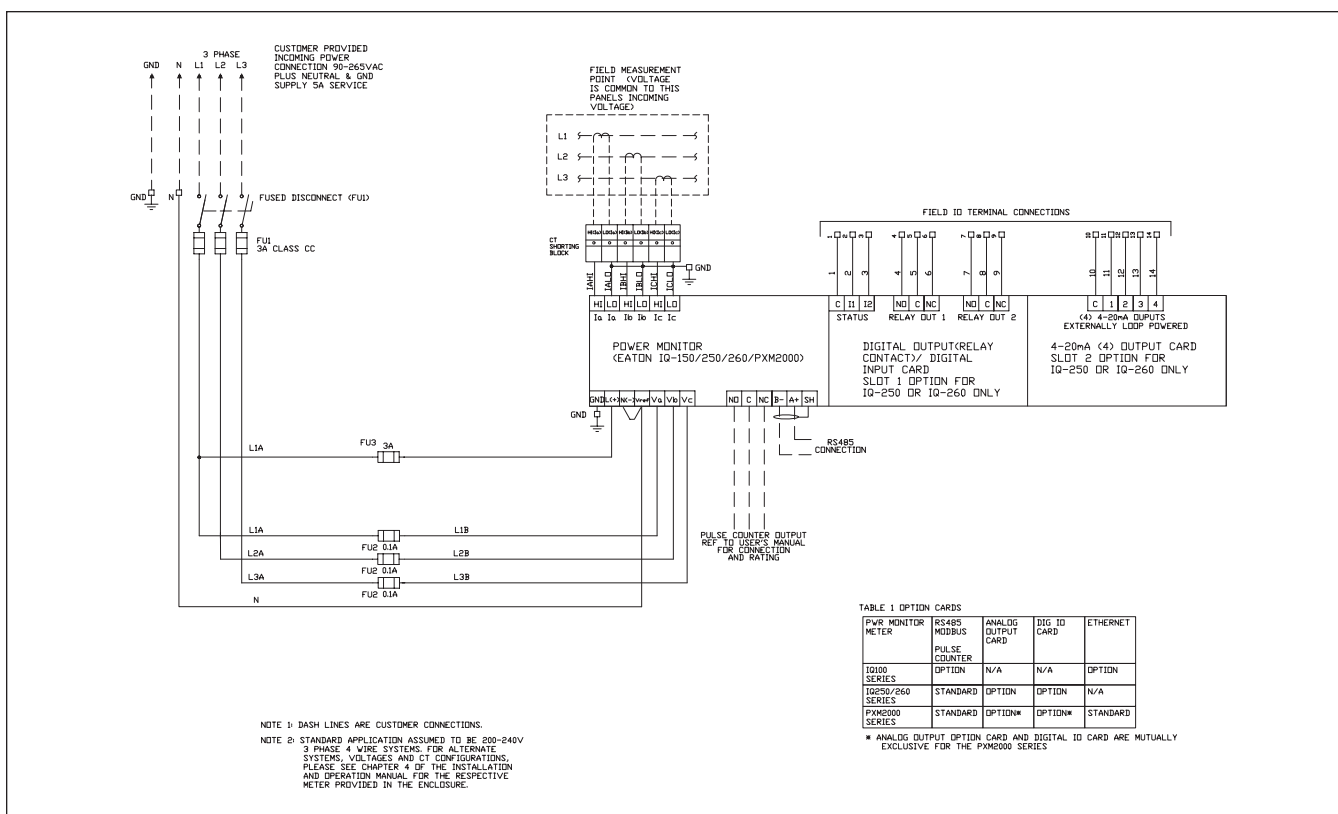


Figure 3.4-20. 200–240 Vac, 50/60 Hz, Three-Phase, Four-Wire System with Single Unit IQ 150/250/260 or PXM 2000 Meter

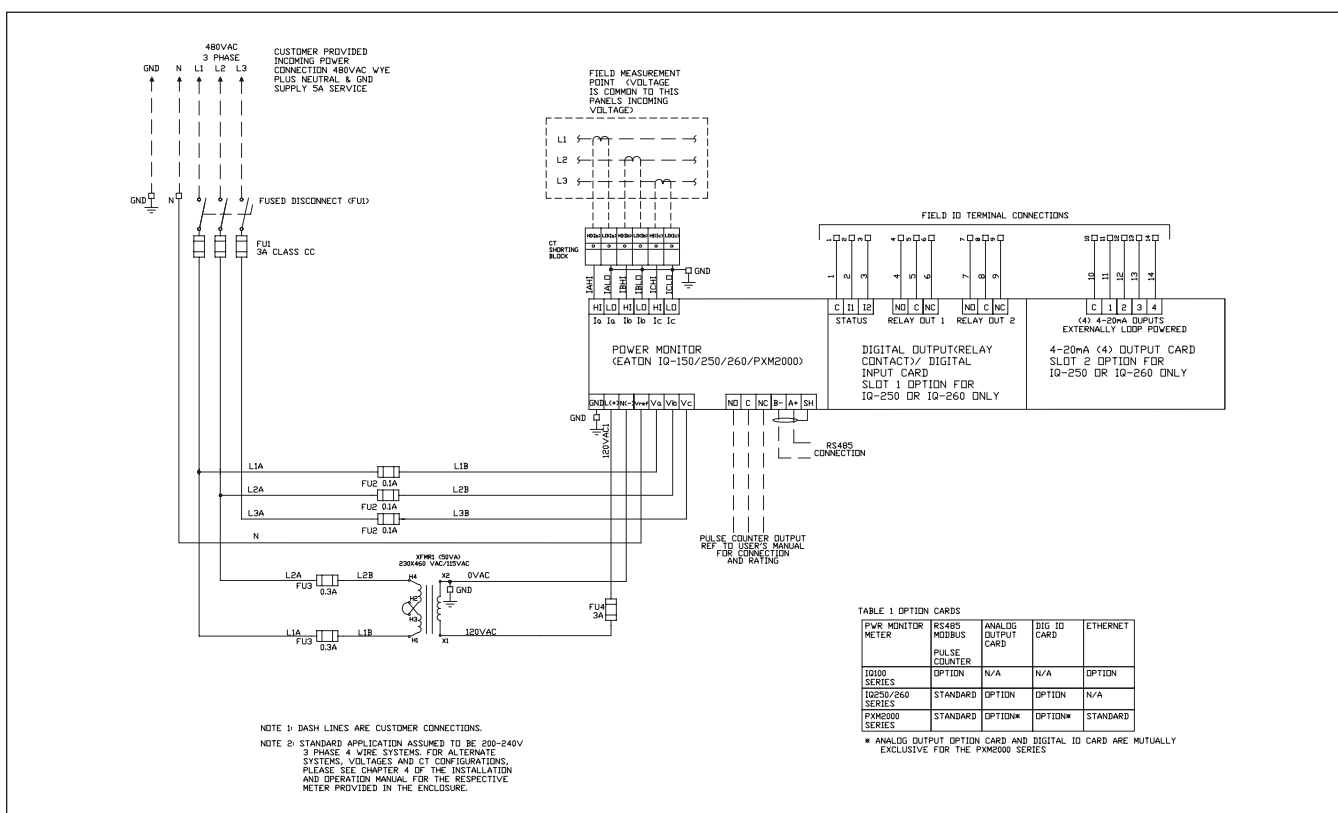


Figure 3.4-21. 480 Vac, 50/60 Hz, Three-Phase, Four-Wire System with Single Unit IQ 150/250/260 or PXM 2000 Meter

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Current Transformers

Current Transformers



Current Transformers

General Description

Eaton's low voltage current transformers are available in both solid core and split core designs. Engineered for electronic metering applications, all solid core designs and selected split core designs offer ANSI metering quality accuracy. The solid core designs also meet ANSI C57.13 relay accuracy requirements including over-ranging capabilities. The current transformer offering has a 5A secondary at the rated primary current.

Split core CTs are specifically designed to be installed around primary conductors without disconnecting wires or breaking the circuit to be monitored. These current transformers are perfect solutions for energy management applications and are manufactured for installation ease.

Application Description

For new construction and retrofit applications where no current transformer exists, Eaton offers a complete selection of low voltage (up to 600V) current transformers. These current transformers can be used in commercial grade applications such as control panels and panelboards. Additionally, they can be used for most industrial metering and relaying applications in switchboards, switchgear and motor control centers.

Note: Not for use with IQ 35M or IQ MESII.

Product Selection

Table 3.4-9. Solid Core ANSI Metering Accuracy

Primary Current Rating	ANSI B0.1 Metering Class at 60 Hz (Accuracy in %)	Window Size in Inches (mm) Diameter	Catalog Number
300	0.3	1.56 (39.6)	S050-301
400			S050-401
500			S050-501
600			S050-601
750			S050-751
800			S050-801
1000			S050-102
1200			S050-122
50	1.2	1.25 (31.8)	S060-500
100	0.6		S060-101
150	0.3		S060-151
200	0.3		S060-201
400	0.3	3.25 (82.6)	S080-401
500			S080-501
600			S080-601
750			S080-751
800			S080-801
1000			S080-102
1200			S080-122
500	0.3	4.25 (108.0)	S090-501
600			S090-601
750			S090-751
800			S090-801
1000			S090-102
1200			S090-122
1500			S090-152
1600			S090-162
2000			S090-202
2500			S090-252
3000			S090-302
600	0.3	6.31 (160.3)	S025-601
750			S025-751
800			S025-801
1000			S025-102
1200			S025-122
1500			S025-152
1600			S025-162
2000			S025-202
2500			S025-252
3000			S025-302
3500			S025-352
4000			S025-402
25	0.3	Wound Primary	W190-025
50			W190-050

Table 3.4-10. Split Core ANSI Metering Accuracy

Primary Current Rating	ANSI B0.1 Metering Class at 60 Hz (Accuracy in %)	Window Size in Inches (mm)	Catalog Number
400	2.4	2.00 x 5.50 (50.8 x 139.7)	M000-401
500	2.4		M000-501
600	2.4		M000-601
800	1.2		M000-801
1000	1.2		M000-102
1200	0.6		M000-122
1500	0.6		M000-152
1600	0.6	4.10 x 7.10 (104.1 x 180.3)	M000-162
2000	0.6		M000-202
600	4.8		M050-601
750	4.8		M050-751
800	2.4		M050-801
1000	2.4		M050-102
1200	1.2		M050-122
1500	1.2		M050-152
2000	0.6		M050-202
2500	0.6		M050-252
3000	0.6		M050-302
3500	0.6		M050-352
4000	0.3		M050-402

Table 3.4-11. Split Core Current Transformers

Primary Current Rating	Accuracy at 60 Hz (in %)	Window Size in Inches (mm)	Catalog Number
100	5.0	0.80 x 1.95 (20.3 x 49.5)	M030-101
150	5.0		M030-151
200	4.0		M030-201
300	2.0		M030-301
400	2.0		M030-401
100	5.0	1.42 x 1.53 (36.1 x 38.9)	M040-101
150	4.0		M040-151
200	1.5		M040-201
300	1.5		M040-301
400	1.5		M040-401
200	1.0	2.60 x 2.75 (66.0 x 69.9)	M060-201
300			M060-301
400			M060-401
500			M060-501
600			M060-601
750			M060-751
800			M060-801
1000			M060-102
1200			M060-122
500		2.60 x 6.25 (66.0 x 158.8)	M080-501
600			M080-601
800			M080-801
1000			M080-102
1200			M080-122
1500			M080-152
1600			M080-162
2000			M080-202
2500			M080-252
3000			M080-302

Dimensions in Inches (mm)

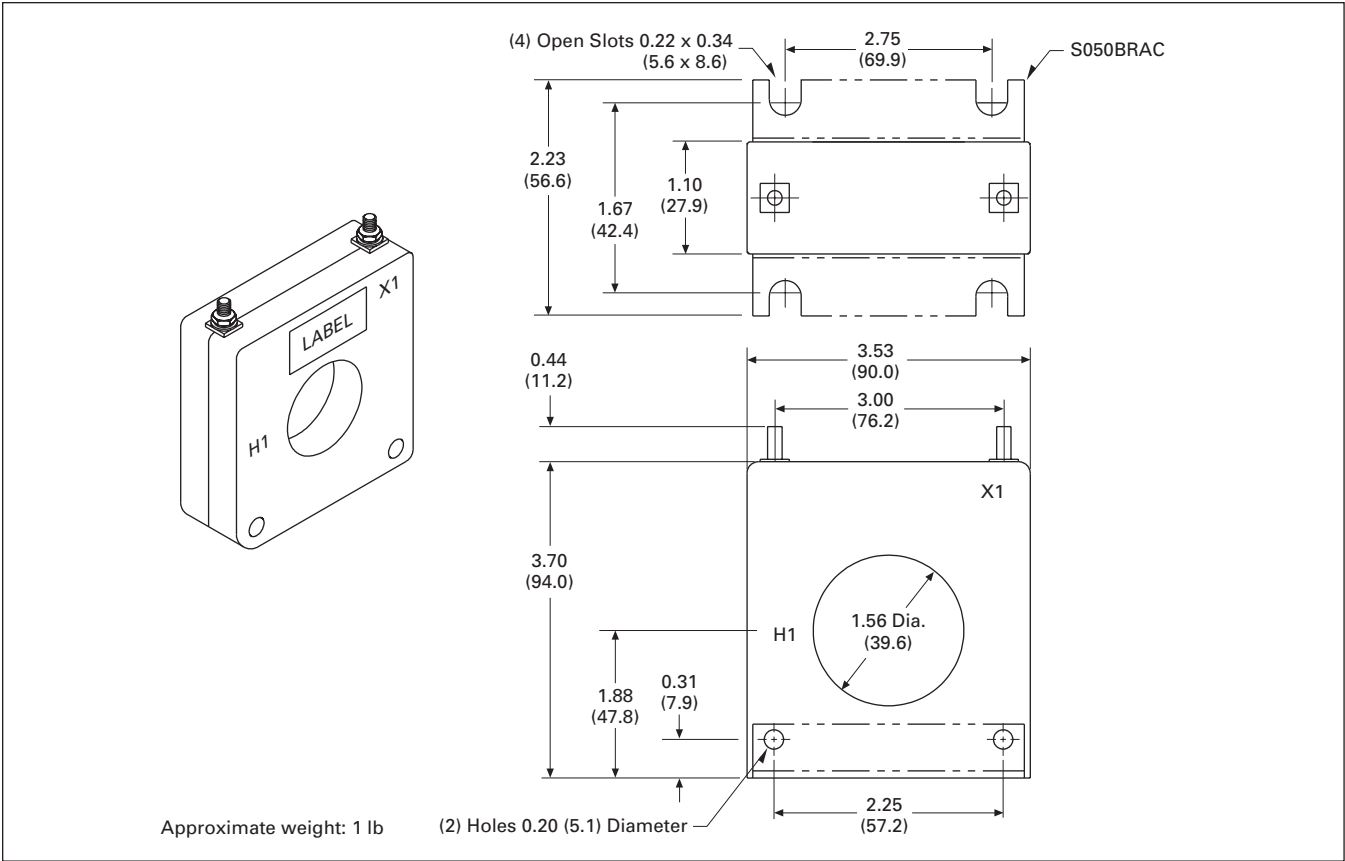


Figure 3.4-24. S050—Approximate Dimensions

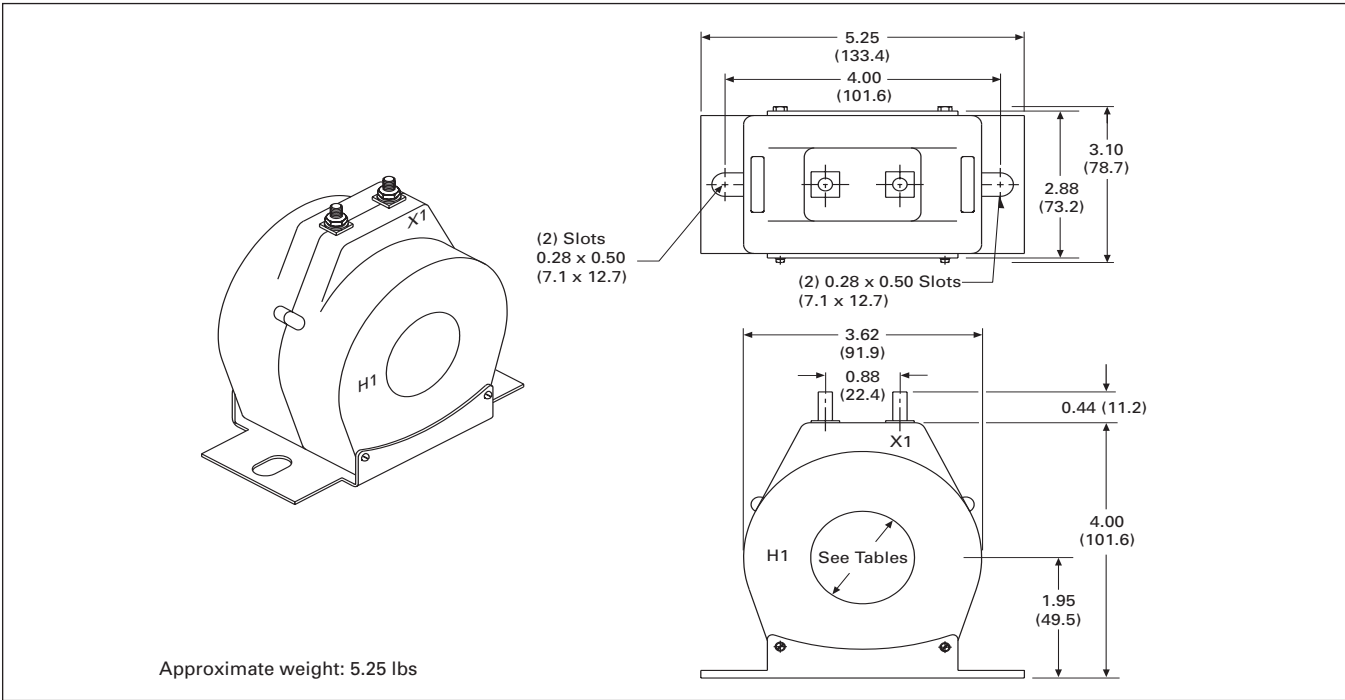


Figure 3.4-25. S060—Approximate Dimensions

Current Transformers

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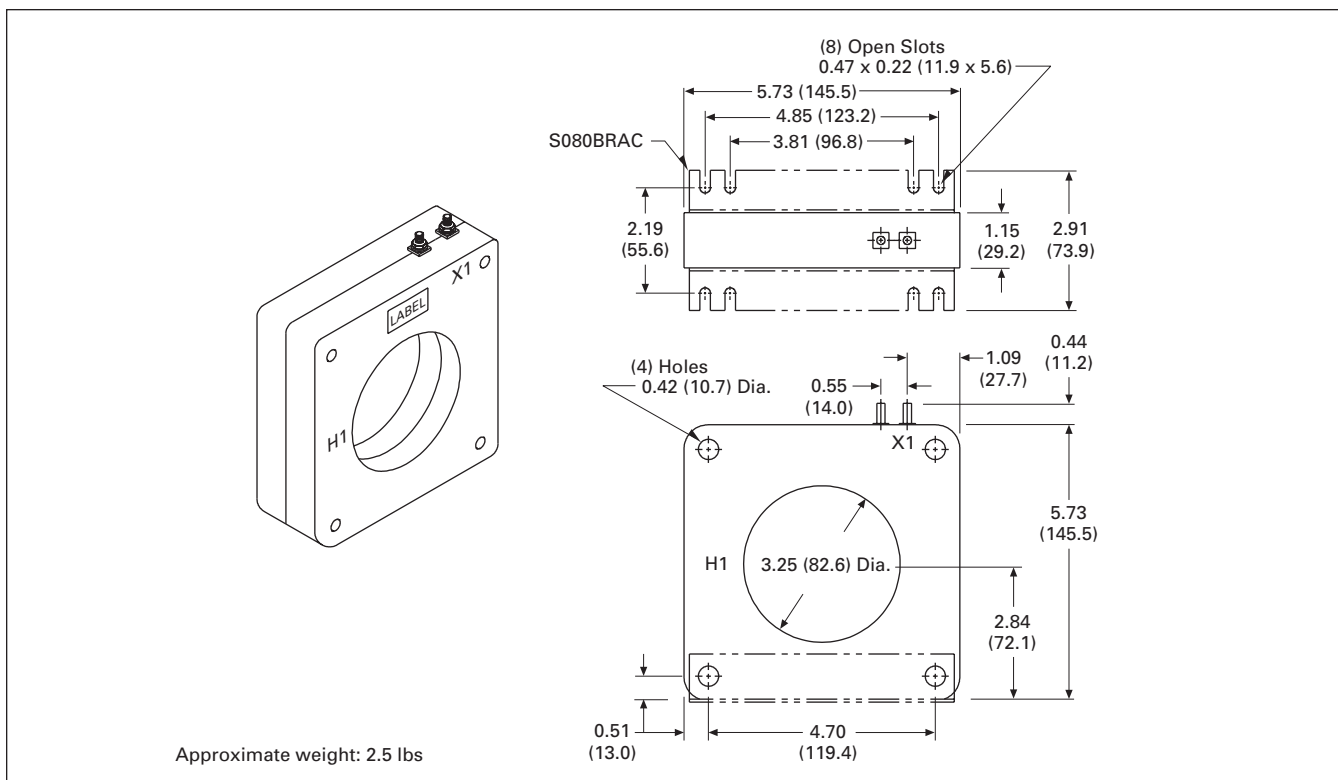


Figure 3.4-26. S080—Approximate Dimensions

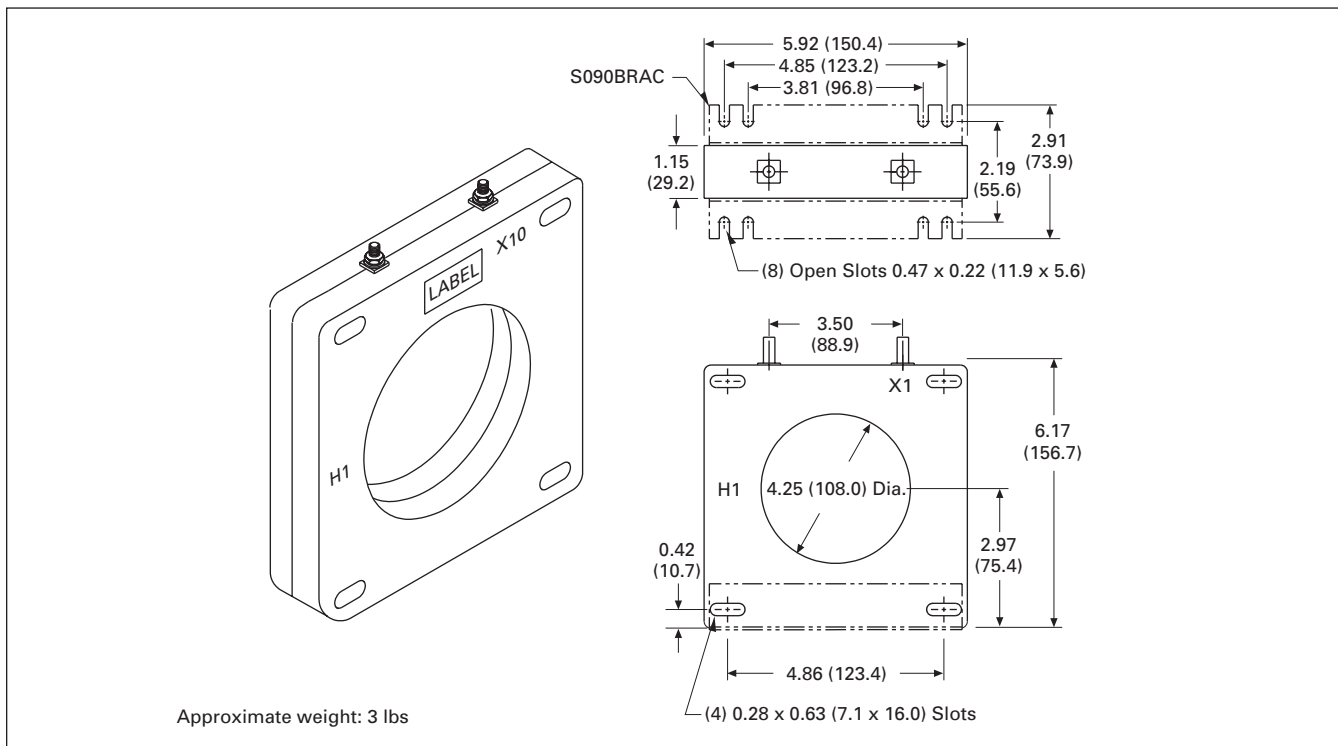
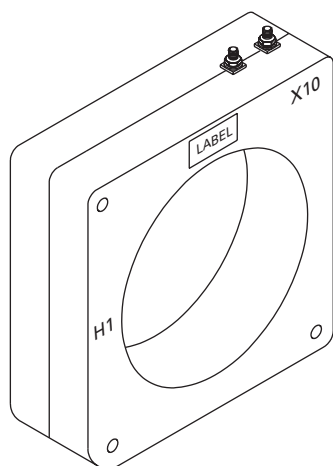


Figure 3.4-27. S090—Approximate Dimensions

Current Transformers

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Approximate weight: 3 lbs

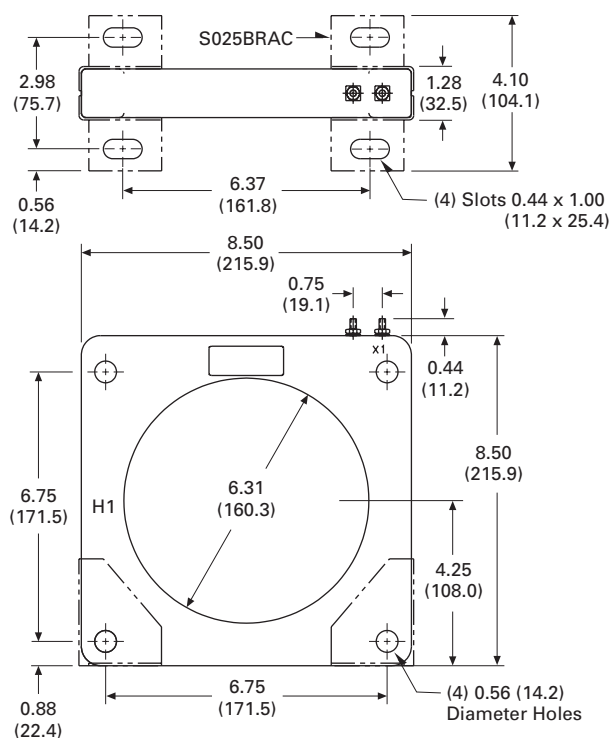
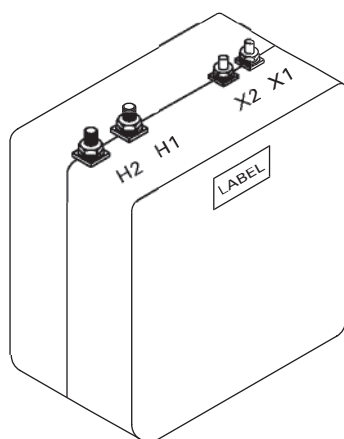


Figure 3.4-28. S025—Approximate Dimensions



Approximate weight: 4 lbs

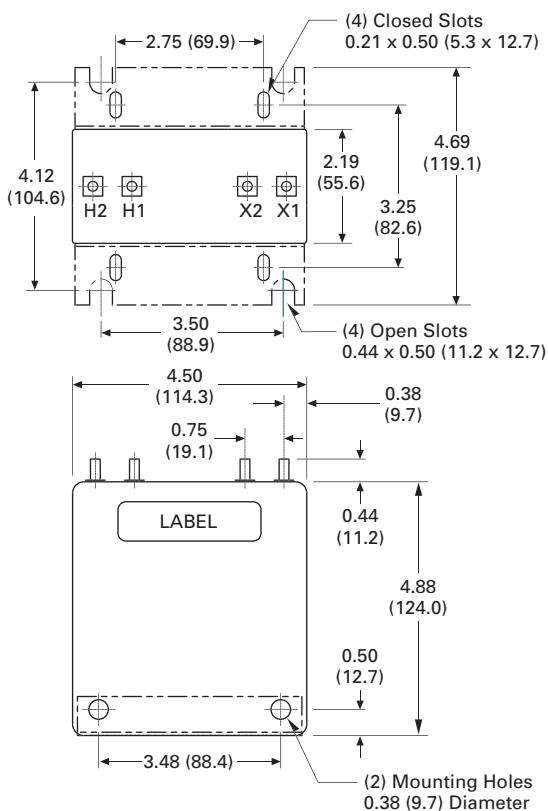


Figure 3.4-29. W190—Approximate Dimensions

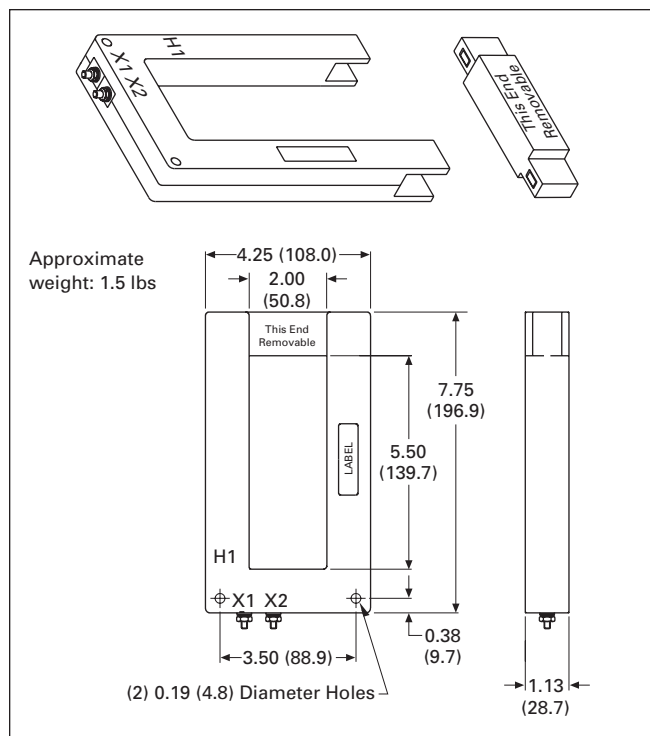


Figure 3.4-30. M000—Approximate Dimensions

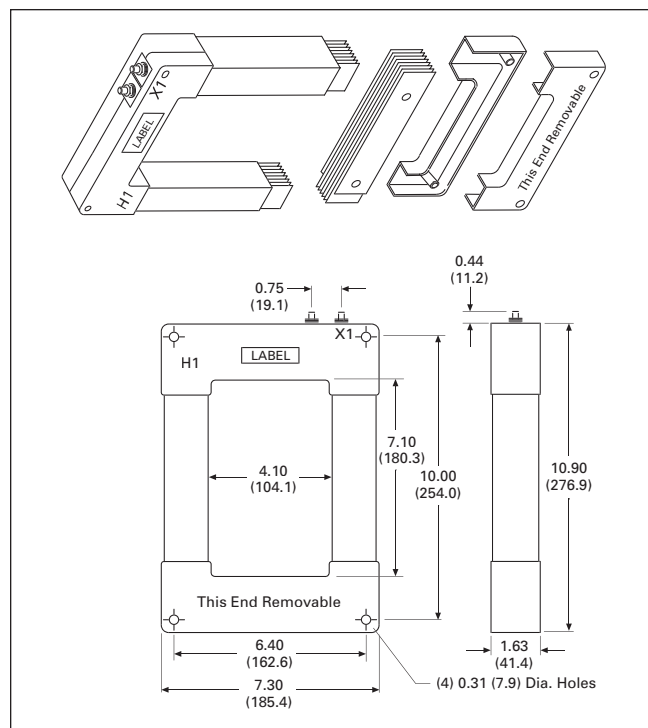


Figure 3.4-31. M050—Approximate Dimensions

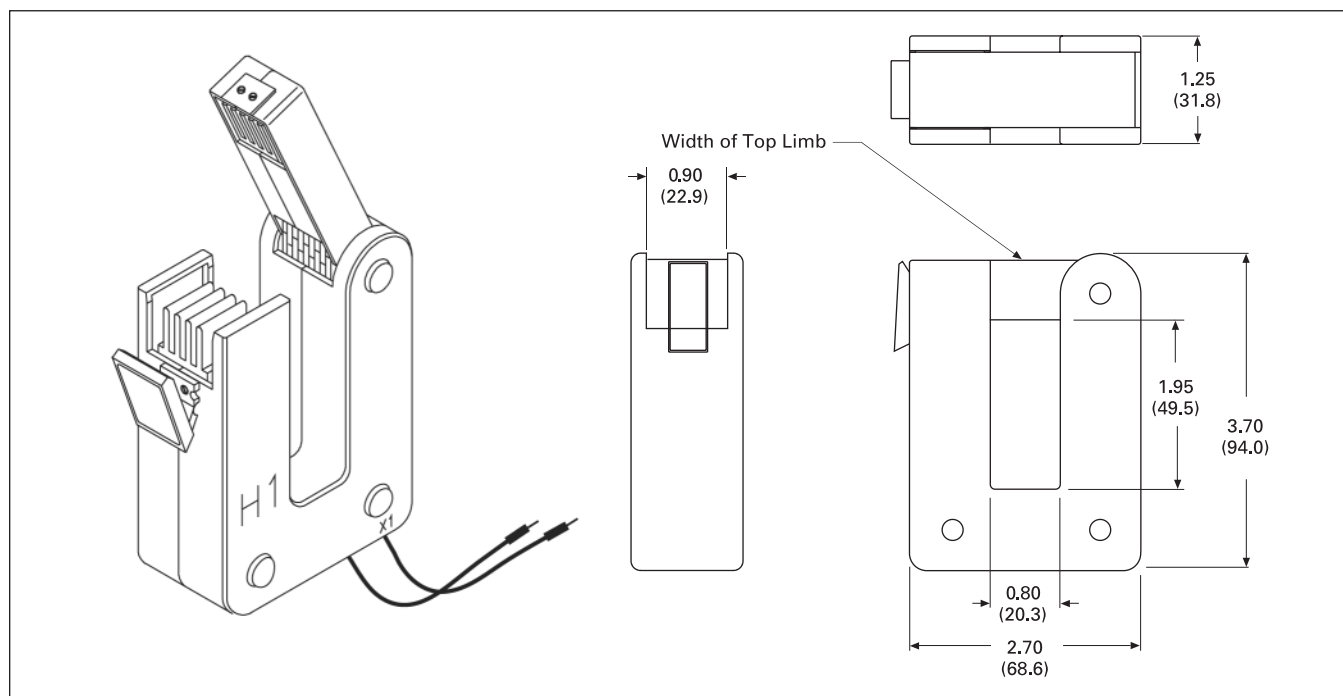


Figure 3.4-32. M030—Approximate Dimensions

Current Transformers

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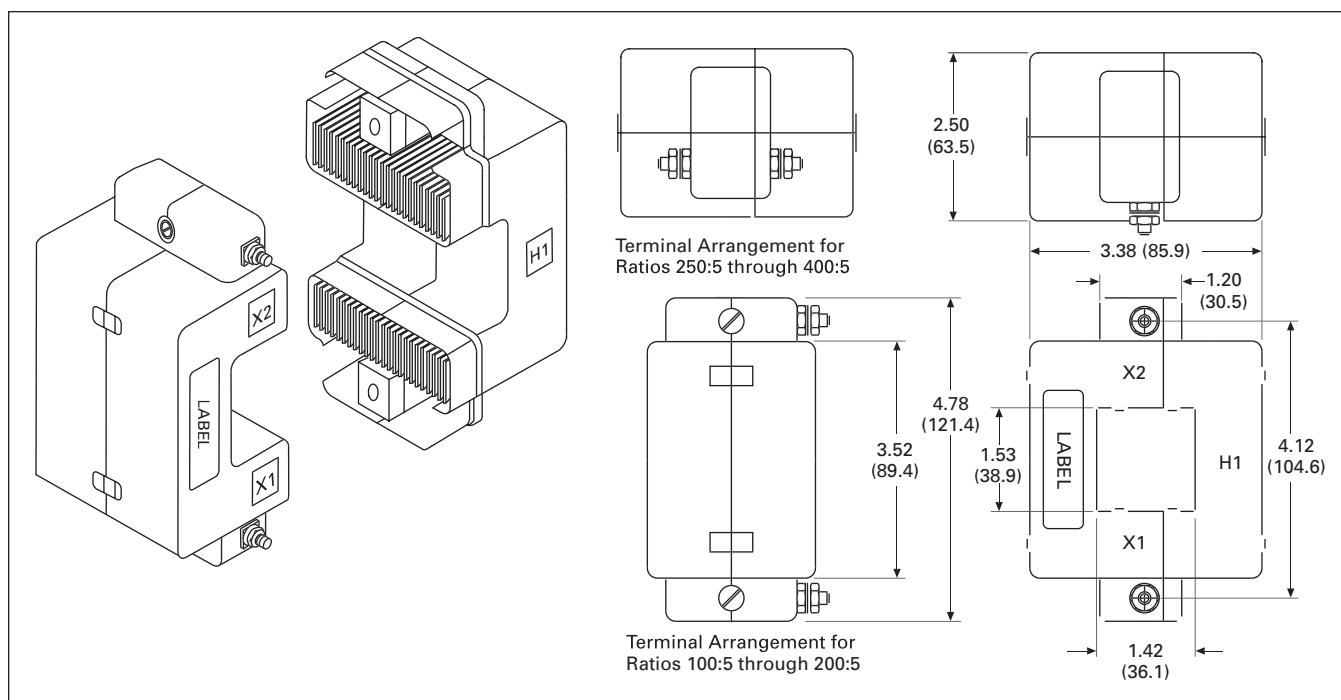


Figure 3.4-33. M040—Approximate Dimensions

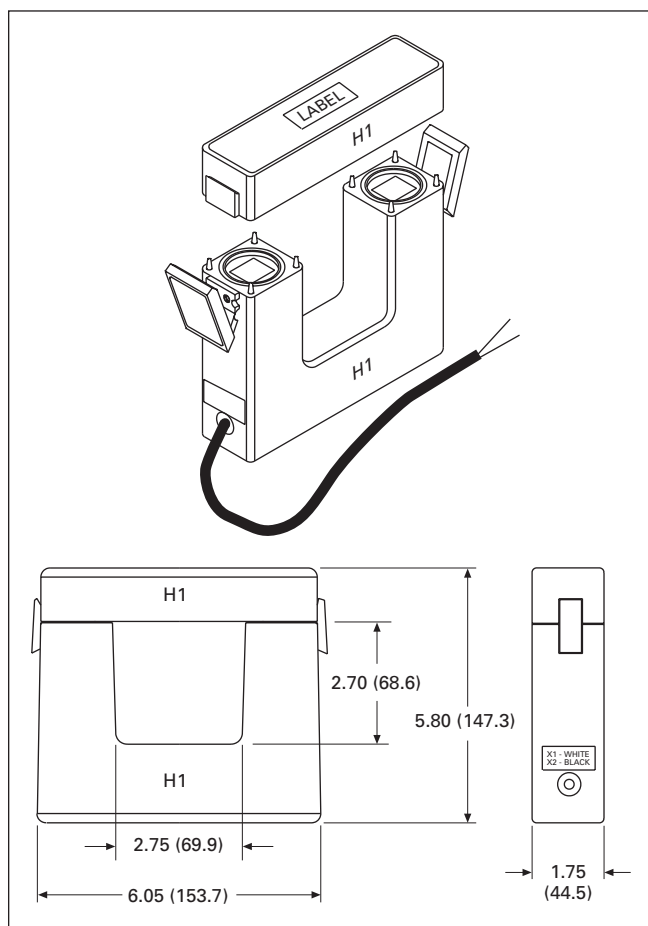


Figure 3.4-34. M060—Approximate Dimensions

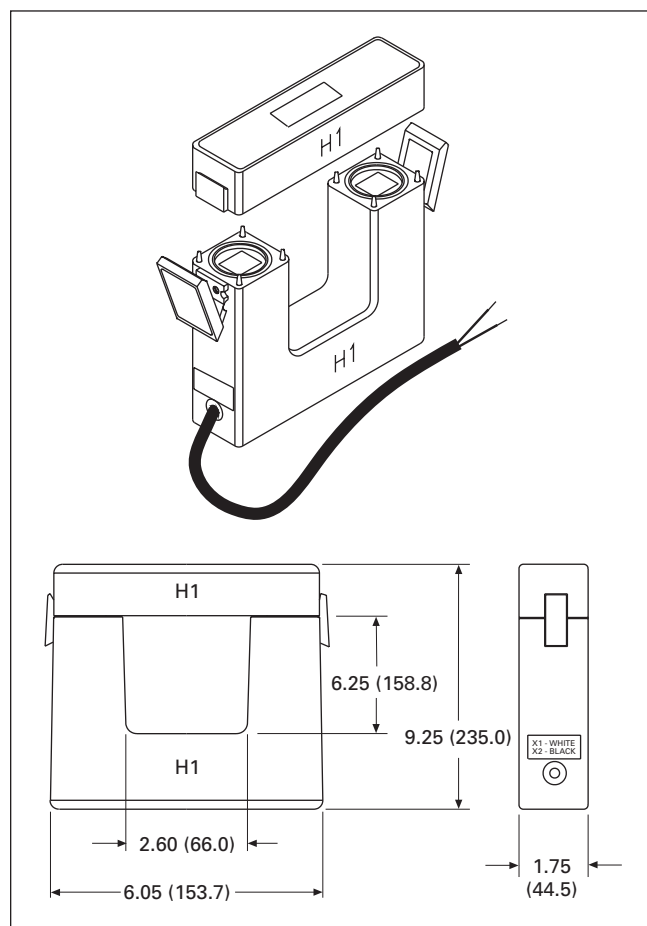


Figure 3.4-35. M080—Approximate Dimensions