Power Xpert Meter 3000 Series

General description

The Power Xpert® Meter 3000 Series power quality and energy meters monitor the most critical aspects of an electrical distribution system. This premier metering instrument uses the latest in advanced technology to make it simple to use, powerful, scalable, and highly flexible.

Applications

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

Features

- 100 ms refresh, true rms measurement
- ANSI C12.20 (0.2 Class) and IEC 62053-22 (0.2S Class)
- 1.5 GB onboard memory
- Power quality analysis - Sag/Swell recording
- Over/under limit alarm
- Supports Modbus® RTU, DNP 3.0 via RS-485
- Modbus TCP and BACnet/IP
- Digital Input status monitoring via webpage and remote communication
- Waveform capture (128 points per cycle), waveform captures in COMTRADE file format.
- Measure individual harmonics from 2nd to 63rd
- 50/60 Hz rated frequency metering
- Modular design
- Integrated data logging plus three custom data logs
- TOU (time of use), 4 tariffs, 12 seasons, 14 schedules

Powering Business Worldwide

Metering

- Voltage V1, V2, V3, VLNavg, V12, V23, V31, VLLavg
- Current I1, I2, I3, In, Iavg
- Power P1, P2, P3, Psum
- Reactive power Q1, Q2, Q3, Qsum
- Apparent power S1, S2, S3, Ssum
- Frequency F
- Power factor PF1, PF2, PF3, PF
- Energy EP_imp, EP_exp, EP_total, EP_net, EPa_imp, EPa_exp, EPb_imp_EPb_exp, EPc_imp, EPc_exp
- Reactive energy EQ_imp, EQ_exp, EQ_total, EQ_net, EQa_imp, EQa_exp, EQb_imp, EQb_exp, EQc_imp, EQc_exp
- Apparent energy ES, ESa, ESb, ESc
- Demand Dmd_P, Dmd_Q, Dmd_S, Dmd_I1, Dmd_I2, Dmd_I3
- Load type, inductive or capacitive
- Four quadrant power

Monitoring

- Power quality
- Voltage harmonics 2nd to 63rd and THD
- Current harmonics 2nd to 63rd and THD
- Voltage crest factor
- Telephone interference factor (TIF)
- Current K factor
- Voltage unbalance factor U_unbl
- Current unbalance factor I_unbl
- Max./min. statistics with time stamps

Alarms

Limits can be set for up to 16 parameters and can be set with a specified pickup delay time interval. If any input of the indicated parameters is over or under its setting limit and persists over the specified time interval, the event will be recorded with time stamps and trigger the alarm DO output. The 16 parameters can be selected from any of the 80 parameters available.

I/O option module

A maximum of two modules can be used for one meter.

Time of use

Users can assign up to four different tariffs (sharp, peak, valley, and normal) to different time periods within a day according to the Utility TOU rate structure. The meter will calculate and accumulate energy for the programmed rate periods based on the TOU settings.

Power quality event logging

When a power quality event happens, such as voltage sag and swell, PXM 3000 will record the timestamp and the triggering condition of the event. It can save up to 50,000 power quality events.

Automatic frequency adaptation

Rated frequency is adjusted automatically to local frequency such as 50 Hz or 60 Hz. The same meter can be applied in countries with different electrical frequencies.

Display

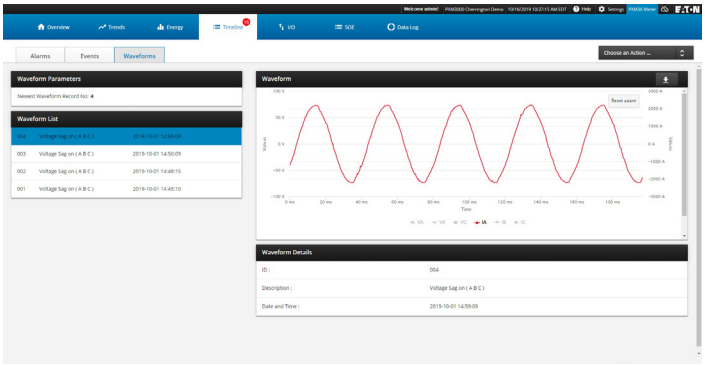
- Clear and large character LCD screen display with white backlight
- Wide environmental temperature endurance
- Display load percentage, four quadrant power, and load type, inductive or capacitive
- Small size 96 × 96 DIN or 4-inch ANSI round panel cutouts

Power Xpert Meter 3000 embedded web server

The Power Xpert Meter 3000 embedded Web server offers Eaton® customers 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. Webserver also provides ability to view Sag/Swell waveforms.

Waveform recording

The Power Xpert Meter 3000 can record waveforms for 20 cycles up to 128 samples per cycle.



Waveform capture

PXM 3000 can record 100 groups of voltage and current waveforms. It logs at 64 points per cycle. (200 groups of voltage and current waveforms in case of 64 points per cycle and 100 groups of voltage and current waveform in case of 128 points per cycle). It provides the waveform record of 10 cycles before and after the triggering point.

It also supports a settable triggering condition.

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

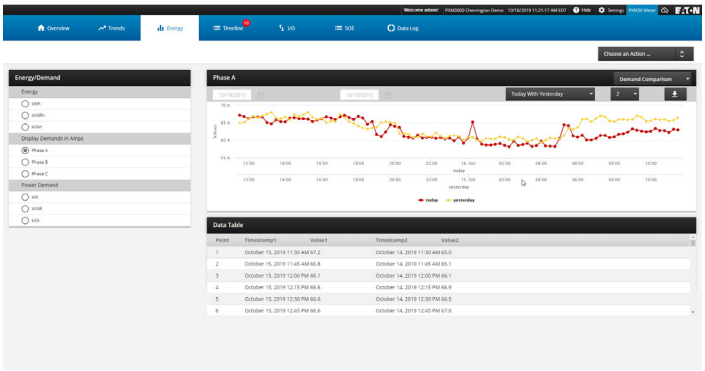
The Power Xpert Meter 3000 records historical data for graphical viewing from the embedded Web server. Graphical views of historical data support pan and zoom. Over 100 standard metering parameters are logged as part of the standard meter functionality including min/max and average for each parameter. The averages are calculated over the interval period. In addition to the standard logs, the PXM3000 also includes three custom data logs that can be configured and viewed via the web interface.

Load profile data

The Power Xpert Meter 3000 records average real, reactive and apparent power. These readings are stored on a fixed five minute interval. Up to four 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, day-to-day comparison chart built into the meter. Raw data can be exported as a .csv file with the "download" option to other applications for further analysis and graphing.



Alarm triggers

The Power Xpert Meter 3000 has configurable alarm triggers.

The meter limits can be set for any measured parameter, for up to 16 limits. If any of the 16 limits are exceeded, an alarm condition will be present and can cause the backlight to flash on the meter faceplate if desired. The meter out of limits can also be used to energize a relay output, when meter is equipped with optional I/O module.

Event logging

The Power Xpert Meter 3000 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. Monitoring and time stamping of digital inputs enables the user to compare the sequence of digital input transitions.

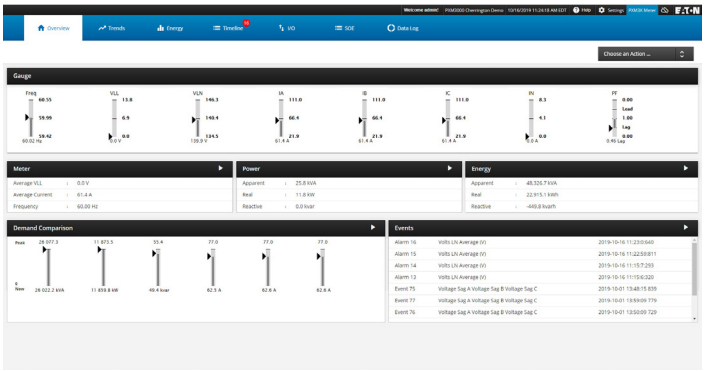
Email

The Power Xpert Meter 3000 contains the ability to send emails based on an event and / or alarm that has been triggered or cleared.

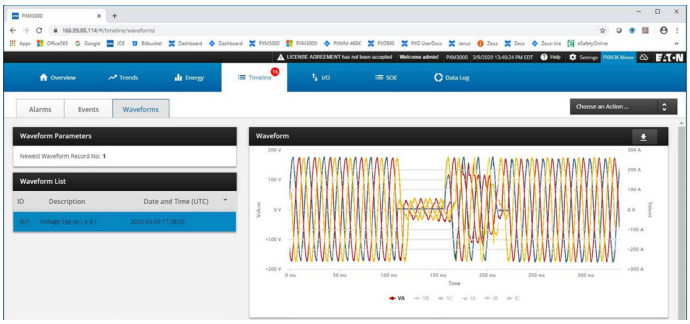
Displayed information

- Monitored information is available locally through the display, the web browser or system power management software.
- True rms values through 63rd harmonic.
- ANSI C12.20 Class 0.2% revenue metering specification.

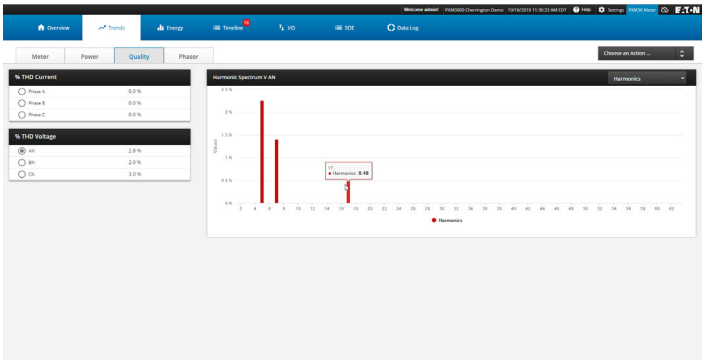
Power Xpert Meter 3000 web browser views



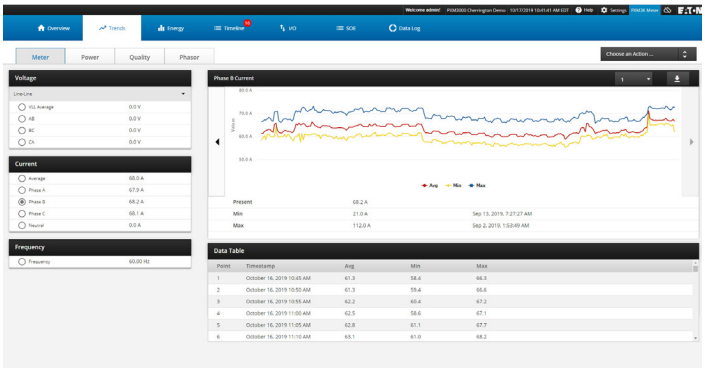
Power Xpert Meter 3000's embedded web server Overview screen allows a quick view of critical electrical parameters. These parameters are placed on a chart that allows customers to easily identify real time, as well as the mean with +/- 3 standard deviation values. They also can see the events log and demand.



The web server offers a waveform view to visualize disturbances such as voltage sags that can cause costly business interruptions.

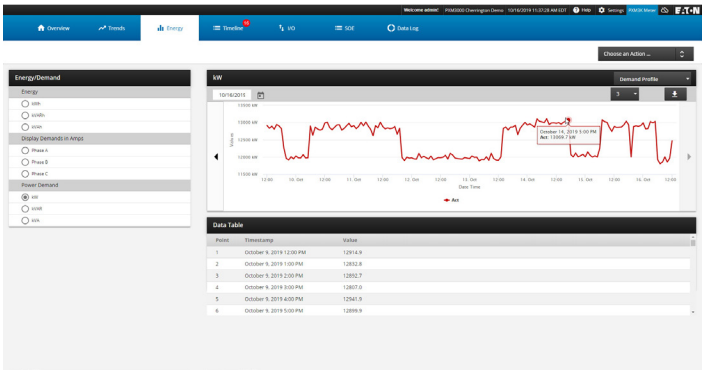


The harmonic spectral plot displays harmonics up to the 63rd order. Individual harmonics and THD are displayed for diagnostic purposes.



Graphical trending of data

The Power Xpert Meter 3000 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 Managers can view load profile data compared against the peak demand.

Data logging

The PXM 3000 meters contain 1.5GB of memory for data logging and historical trending. Since each meter contains a real-time clock, all events and logged data will be time stamped.

The PXM 3000 meters have three sets of historical data logs. Each log can be independently programmed with individual settings, meaning that each can be used to monitor different parameters. The user can program up to 117 parameters per log.

Web server device configuration

Special software is not required to configure a Power Xpert Meter 3000. The embedded web server includes a comprehensive device configuration engine.

Communications

The communications card provides one ethernet connection via a 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 email, SMTP.
- Providing Modbus TCP/IP, and BACnet/IP communications to BMS systems.
- Providing SNMP communications to NMS systems.
- Synchronizing with an NTP server.
- Updating firmware on the meter.

The card also contains a micro USB port for programming and monitoring. The USB port allows access to the meter's web interface.

Figure 1. PXM 3000 rear view.

1	Power supply inputs
2	RS-485
3	Current inputs
4	Micro USB
5	Ethernet

Parameters

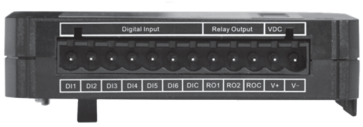
Category		Item	Parameters	PXM 3000
Metering	Real-time metering	Phase voltage	V1, V2, V3, VLnavg	■
		Line voltage	V12, V23, V31, VIlavg	■
		Current	I1, I2, I3, In, Iavg	■
		Power	P1, P2, P3, Psum	■
		Reactive power	Q1, Q2, Q3, Qsum	■
		Apparent power	S1, S2, S3, Ssum	■
		Power factor	PF1, PF2, PF3, PF	■
		Frequency	F	■
	Energy and demand	Energy	Ep_imp, Ep_exp, Ep_total, Ep_net, Epa_imp, Epa_exp, Epb_imp, Epb_exp, Epc_imp, Epc_exp	■
		Reactive energy	Eq_imp, Eq_exp, Eq_total, Eq_net, Eqa_imp, Eqa_exp, Eqb_imp, Eqb_exp, Eqc_imp, Eqc_exp	■
		Apparent energy	Es, Esa, Esb, Esc	■
		Demand	Dmd_P, Dmd_Q, Dmd_S, Dmd_I1, Dmd_I2, Dmd_I3	■
TOU	Time of use	Energy/max. demand	TOU, 4 tariffs, 12 seasons, 14 schedules	■
	Daylight saving time	Two adjustable formats	Month/day/hour/minute Month/week/first few weeks/hour/minute	■
Monitoring	Waveform capture	Voltage and current waveform*	Trigger, manual, DI change, sag/dips, swell, overcurrent	■
	Power quality	Voltage unbalance factor	U_unbl	■
		Current unbalance factor	I_unbl	■
		Voltage THD	THD_V1,THD_V2,THD_V3, THD_Vavg	■
		Current THD	THD_I1, THD_I2, THD_I, THD_Iavg	■
		Individual harmonics	Harmonics 2nd to 63rd (50 Hz or 60 Hz)	■
		Voltage crest factor	Crest factor	■
		TIF	Telephone interference factor	■
		Current K factor	K factor	■
	Statistics	MAX with time stamp MIN with time stamp	Each phase of V & I; Total of P, Q, S, PF & F; demand of I1, I2, I3, P, Q&S; each phase THD of V & I; unbalance factor of V & I	■
Others	Alarm	Over/under limit alarm	V, I, P, Q, S, PF, V_THD and I_THD each phase and total or average; unbalance factor of V and I; load type; analog input of each channel; demand of I1, I2, I3, P, Q&S; reverse phase sequence; DI1~DI28	■
	Power quality event logging	Sag/dips, swell	Voltage	■
	Data logging	Data logging 1 Data logging 2 Data logging 3	F, V1/2/3/avg, V12/23/13/avg, I1/2/3/n/avg, P1/2/3/sum, Q1/2/3/sum, S1/2/3/sum, PF1/2/3, PF, U_unbl, I_unbl, Load Type, Ep_imp, Ep_exp, Ep_total, Ep_net, Eq_imp, Eq_exp, Eq_total, Eq_net, Es, Epa_imp, Epa_exp, Epb_imp,Epb_exp, Epc_imp, Epc_exp, Eqa_imp, Eqa_exp, Eqb_imp, Eqb_exp, Eqc_imp, Eqc_exp, Esa, Esb, Esc, THD_V1/2/3/avg, THD_I1/2/3/avg, harmonics 2nd to 63rd, crest factor, THFF, K factor, sequence and phase angles, DI counter, AI, AO, Dmd P/Q/S, Dmd I1/2/3	■
	Onboard memory size	Memory	Bytes	1.5 GB
	Communication	RS-485 port, half duplex, optical isolated, RJ-45 Ethernet, Micro USB	Modbus®-RTU protocol/DNP3.0, Modbus TCP, BACNet IP	■
	Time	Real-time clock	Year, month, date, hour, minute, second	■

Accessories

Digital/analog I/O

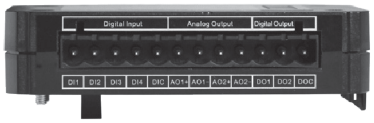
Integrate data to/from other devices with field expandable plug-in I/O modules. A maximum of two I/O cards may be added to the PXM3000 meter.

PXM1K-1XX



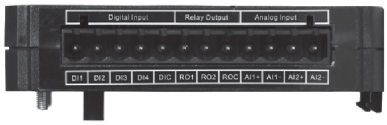
- 6x digital inputs
- 24 Vdc power for digital inputs
- 2x relay outputs

PXM1K-2XX



- 4x digital inputs
- 2x digital outputs
- 2x analog outputs

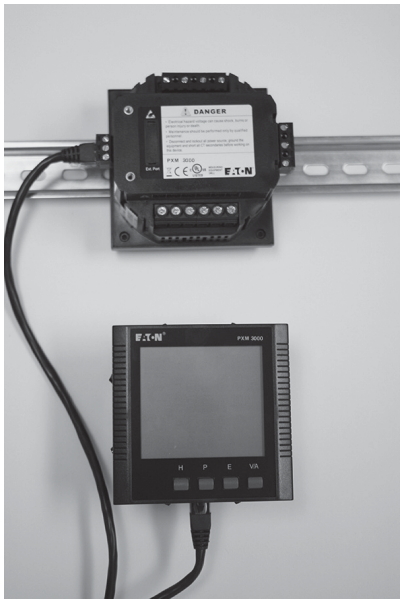
PXM1K-3XX



- 4x digital inputs
- 2x relay outputs
- 2x analog inputs

Panel mount remote display

PXM 3000 panel mount remote display (PXM3K-DISP) for DIN rail mount transducer version (eg. PXM3000TA15). The remote display includes 6ft cable for the connection.



Meter input wiring

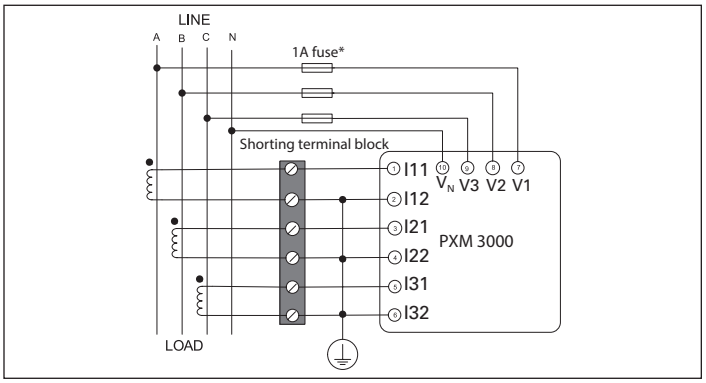


Figure 2. Three-phase, four-wire (3LN, 3CT).

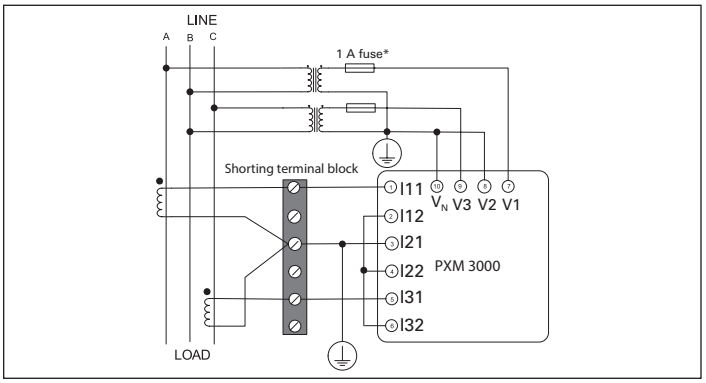


Figure 5. Three-phase, three-wire with PT and 2CT (2LL, 3CT).

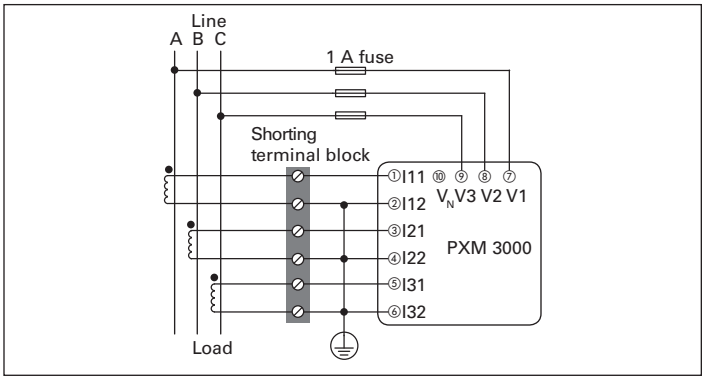


Figure 3. Three-phase, three-wire (3LL, 3CT).

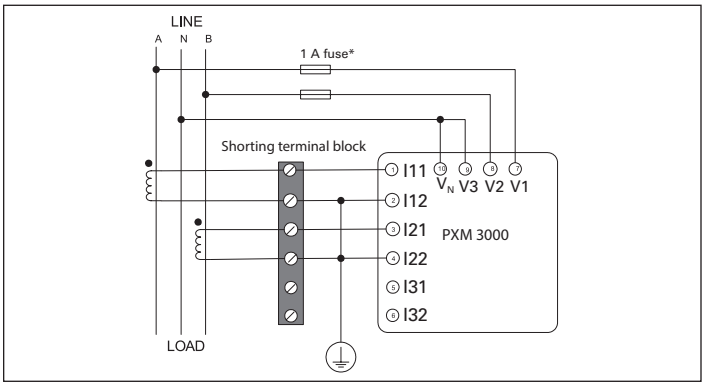


Figure 6. Single-phase, three-wire (1LL, 2CT).

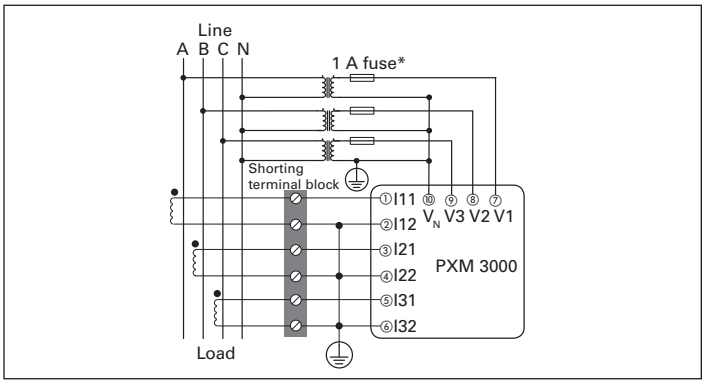


Figure 4. Three-phase, four-wire with PT (3LN, 3CT).

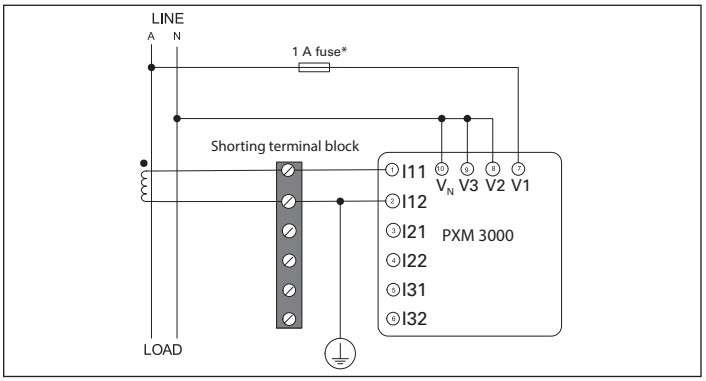


Figure 7. Single-phase, two-wire (1LN, 1CT).

* 1A fuse typical

I/O cards wiring

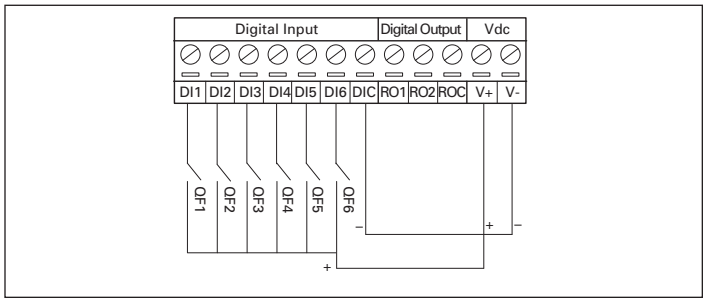


Figure 8. PXM1K-X1X

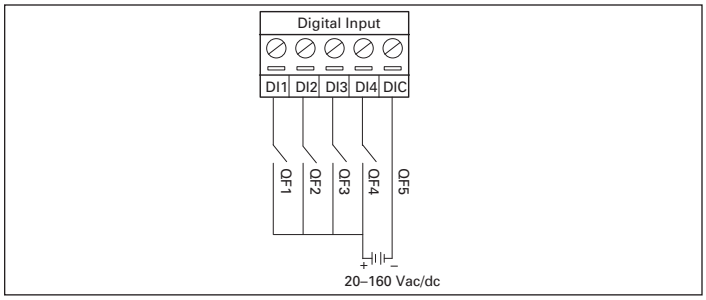


Figure 9. PXM1K-X2X/X3X

Dimensions in inches (mm)

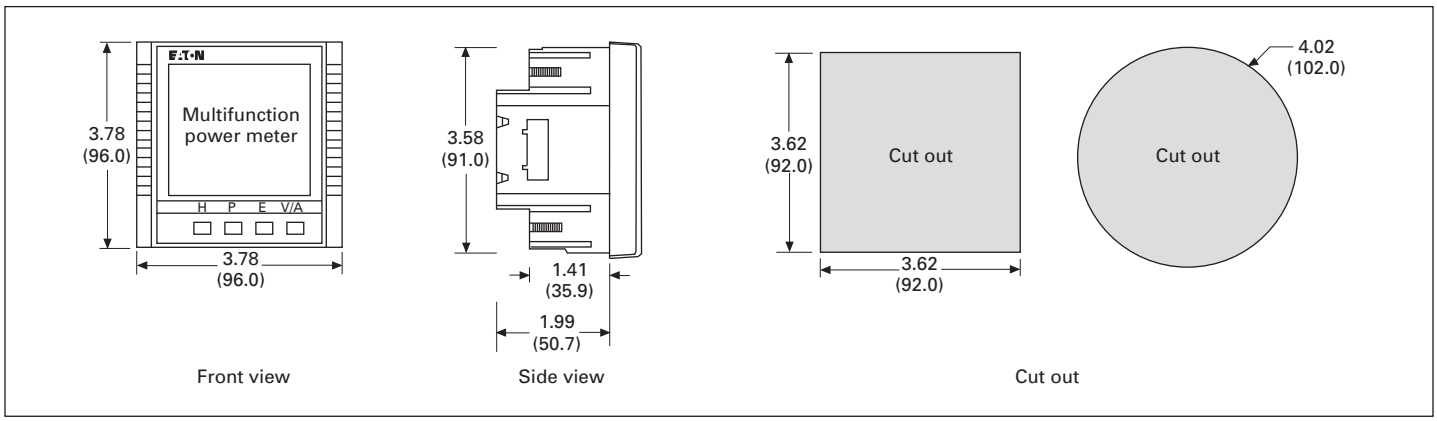


Figure 10. PXM 3000

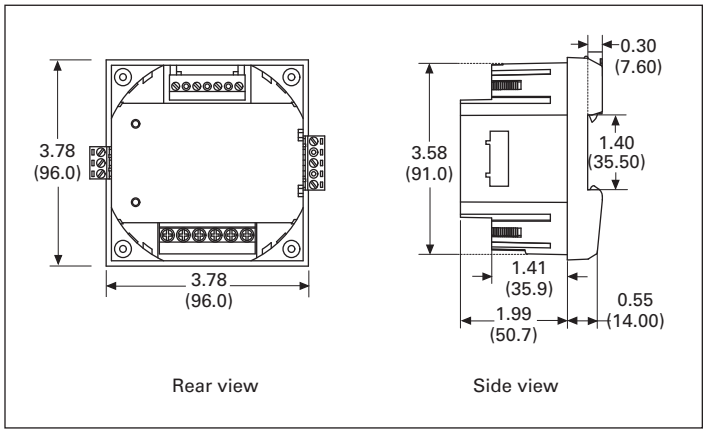
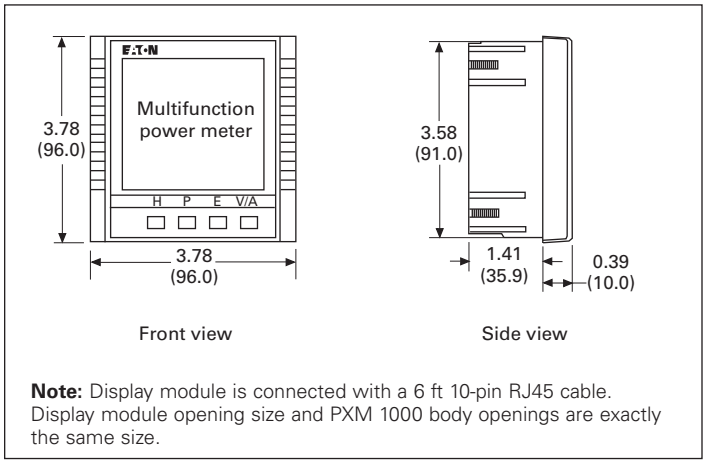


Figure 11. DIN mount meter



Note: Display module is connected with a 6 ft 10-pin RJ45 cable. Display module opening size and PXM 1000 body openings are exactly the same size.

Figure 12. External display module

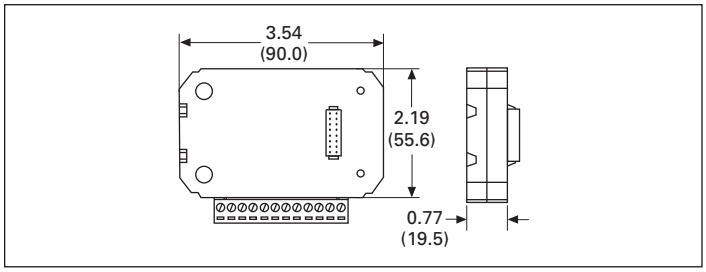


Figure 13. I/O module

Ordering information

To order a Power Xpert Meter 3000, the catalog number should be determined using **Table 1**. The table illustrates how to include the desired factory options as part of a catalog number. I/O option modules are separate and field installable. Each type of I/O module also has two addresses, logic address 1 and logic address 2. Up to 2 I/O modules per meter can be installed. Power Xpert Meter modules include panel mounting brackets.

Example: PXM3000MA15 (PXM 3000 meter/display, 5 A, 100–277 Vac or 100–250 Vdc)

Table 1. Power Xpert Meter 3000 catalog numbering system.

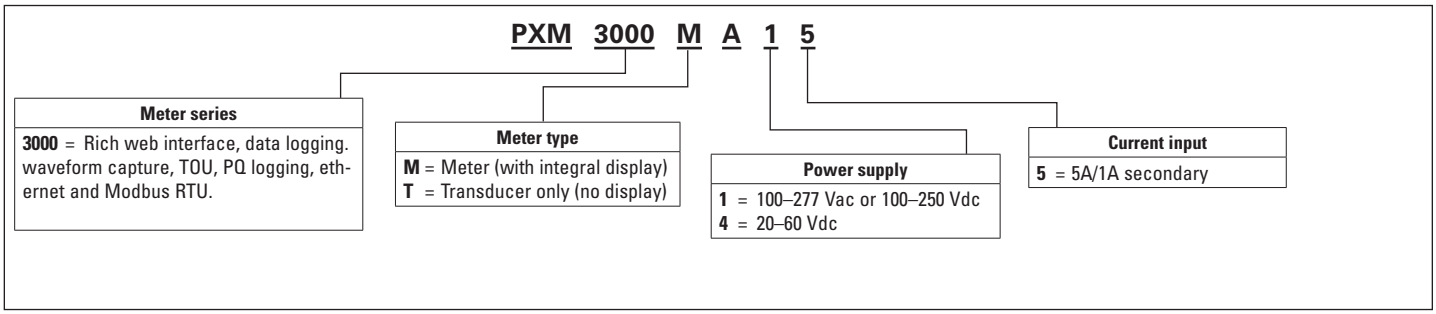


Table 2. Power Xpert Meter 1000/3000 I/O module.

Description	Catalog number
PXM 1000 I/O module logic address 1; 2 RO, 6DI with DI power supply 24 Vdc	**PXM1K-110**
PXM 1000 I/O module logic address 2; 2 RO, 6DI with DI power supply 24 Vdc	**PXM1K-120**
PXM 1000 I/O module logic address 1; 4 DI, 2 DO, 2 AO (4–20 mA)	**PXM1K-210**
PXM 1000 I/O module logic address 1; 4 DI, 2 DO, 2 AO (0–20 mA)	**PXM1K-211**
PXM 1000 I/O module logic address 1; 4 DI, 2 DO, 2 AO (1–5 V)	**PXM1K-212**
PXM 1000 I/O module logic address 1; 4 DI, 2 DO, 2 AO (0–5 V)	**PXM1K-213**
PXM 1000 I/O module logic address 2; 4 DI, 2 DO, 2 AO (4–20 mA)	**PXM1K-220**
PXM 1000 I/O module logic address 2; 4 DI, 2 DO, 2 AO (0–20 mA)	**PXM1K-221**
PXM 1000 I/O module logic address 2; 4 DI, 2 DO, 2 AO (1–5 V)	**PXM1K-222**
PXM 1000 I/O module logic address 2; 4 DI, 2 DO, 2 AO (0–5 V)	**PXM1K-223**
PXM 1000 I/O module logic address 1; 4 DI, 2 RO, 2 AI (4–20 mA)	**PXM1K-310**
PXM 1000 I/O module logic address 1; 4 DI, 2 RO, 2 AI (0–20 mA)	**PXM1K-311**
PXM 1000 I/O module logic address 1; 4 DI, 2 RO, 2 AI (1–5 V)	**PXM1K-312**
PXM 1000 I/O module logic address 1; 4 DI, 2 RO, 2 AI (0–5 V)	**PXM1K-313**
PXM 1000 I/O module logic address 2; 4 DI, 2 RO, 2 AI (4–20 mA)	**PXM1K-320**
PXM 1000 I/O module logic address 2; 4 DI, 2 RO, 2 AI (0–20 mA)	**PXM1K-321**
PXM 1000 I/O module logic address 2; 4 DI, 2 RO, 2 AI (1–5 V)	**PXM1K-322**
PXM 1000 I/O module logic address 2; 4 DI, 2 RO, 2 AI (0–5 V)	**PXM1K-323**

Table 3. Power Xpert Meter 3000 accessories.

Description	Catalog number
PXM 3000 panel mount remote display for DIN rail mount transducer version; include one 6 ft cable	**PXM3K-DISP-3**
Din rail mounting adapter	**PXM1K-DINADPT**
Terminal plug kit	**PXM1K-TPK**
Display cable (6ft)	**PXM1K-DISPCBL-6**
Display cable (15ft)	**PXM1K-DISPCBL-15**

Technical information

Input

Current inputs (each channel)

5A/1A nominal input range settings:

Current sensor input options	5 A	1 A
Nominal configuration selection	5 A	1 A
Metering range (%of nominal)	200%	200%
Pickup current (%of nominal)	0.1%	0.1%

Withstand: 20 A rms continuous, 100 A rms for 1 second, non-recurring
Burden: 0.05 VA (typical) at 5 A rms
Accuracy: 0.2% IEC 61557-12 class 0.2

Voltage inputs (each channel)

Nominal full scale: 400 Vac L-N, 690 Vac L-L (+20%)
Withstand: 1500 Vac continuous, 2500 Vac, 50/60 Hz for 1 minute
Input impedance: 2 mohm per phase
Metering frequency: 45–65 Hz
Pickup voltage: 10 Vac
Accuracy: 0.2% IEC 61557-12 class 0.2

Energy accuracy

Active: Class 0.2 s (according to IEC 62053-22), Class 0.2 s (according to ANSI C12.20)
Reactive: Class 2 (according to IEC 62053-23)

Harmonic resolution

Metered value: 63rd harmonic (50 Hz or 60 Hz type)

Communication

RS-485 (standard)

Modbus RTU and DNP 3.0
Two-wire shielded twisted pair cable connection
Baud rate: 1200–38,400 bps

Standard compliance

Measurement standard: IEC 62053-22; ANSI C12.20
Environmental standard: IEC 60068-2
Safety standard: IEC 61010-1, UL 61010-1, IEC 61557-12
EMC standard: IEC 61000-4/-2-3-4-5-6-8-11, CISPR 22, IEC 61000-3-2, IEC 61000-6-2/4
Outlines standard: DIN 43700, ANSI C39.1

Operating environment

Operation temperature: –25 °C to +70 °C
Storage temperature: –40 °C to +85 °C
Relative humidity: 5% to 95% noncondensing
Protection level: IP54 (front), IP30 (cover)

Approvals

UL File E185559
RoHS

I/O option

Digital input

Input voltage range: 20–160 Vac/Vdc
Input current (max.): 2 mA
Start voltage: 15 V
Stop voltage: 5 V
Pulse frequency (max.): 100 Hz, 50% duty ratio (5 ms ON and 5 ms OFF)
SOE resolution: 2 ms

Digital output (DO) (photo-MOS)

Voltage range: 0–250 Vac/Vdc
Load current: 100 mA (max.)
Output frequency: 25 Hz, 50% duty ratio (20 ms ON, 20 ms OFF)
Isolation voltage: 2500 Vac

Relay output (RO)

Switching voltage (max.): 250 Vac, 30 Vdc
Load current: 5 A (resistive), 2 A (inductive)
Set time: 10 ms (max.)
Contact resistance 30 mohm (max.)
Isolation voltage: 2500 Vac
Mechanical life: 1.5×10^7

Analog output (AO)

Output range: 0–5 V / 1–5 V, 0–20 mA / 4–20 mA (optional)
Accuracy: 0.5% Full scale accuracy
Temperature drift: 50 ppm / °C typical
Isolation voltage: 500 Vdc
Open circuit voltage: 15 V

Analog input (AI)

Input range: 0–5 V / 1–5 V, 0–20 mA / 4–20 mA (optional)
Accuracy: 0.2%
Temperature drift: 50 ppm / °C typical
Isolation voltage: 500 Vdc

Power supply for DI (24 Vdc)

Output voltage: 24 Vdc
Output current: 42 mA
Load (max.): 21 DIs

Control power

Universal: AC or DC

AC/DC control power

Operating range: 100–277 Vac, 50/60 Hz; 100–250 Vdc
Burden: 5 W
Frequency: 50/60 Hz
Withstand: 3250 Vac, 50/60 Hz for 1 minute
Installation category III (distribution)

Low voltage DC control power (optional)

Operating range: 20–60 Vdc
Burden: 5W

Notes:

Eaton
1000 Eaton Boulevard
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United States
Eaton.com

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