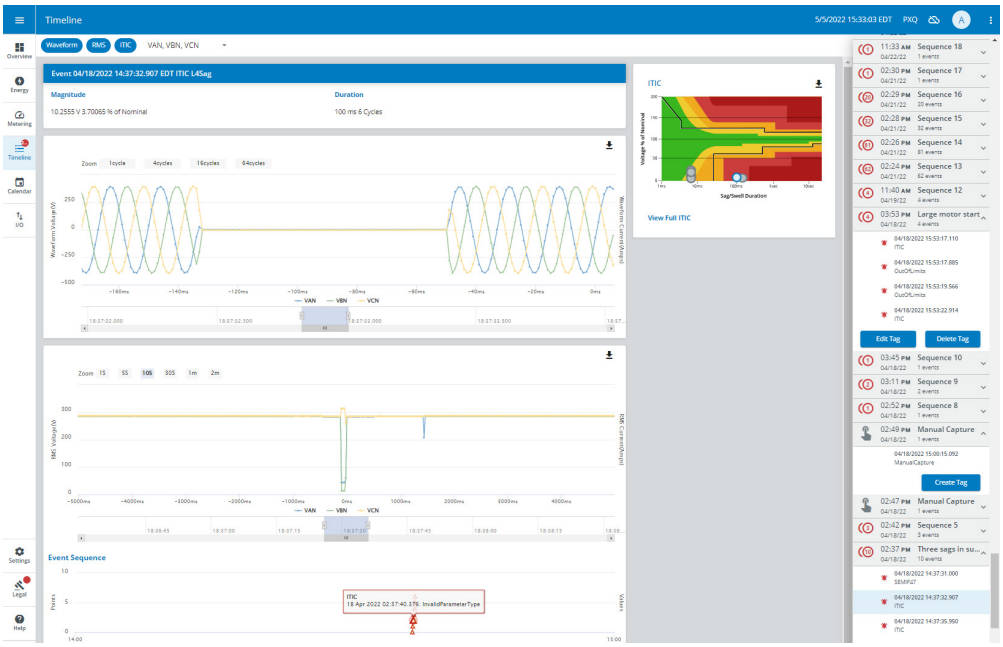
PXQ Event Analysis System Technical Datasheet



Overview

Eaton's Power Xpert Quality (PXQ) event analysis system is a state-of-the-art power quality monitoring instrument designed for power distribution assemblies like low and medium voltage switchgear and switchboards. Compatible with industry power quality standards (such as IEC 61000-4-30 Class A and IEEE 1453), this ANSI C12.20 Class 0.1 metering device offers advanced analytics at the edge that simplify troubleshooting of power-quality events. A highly modular approach provides maximum flexibility to configure a metering system that can grow with the application it is monitoring.

Applications

- Protect the integrity of your most important systems with Eaton's patented Power Quality Health Index, which provides an intelligent read-out of circuit health based on statistical analysis of power quality events and disturbances.
- Diagnose PQ problems with +/-0.1 ms sequence of events recording that uses PTP for high precision time stamping. This is 10x better than the industry benchmark.
- Multichannel dual plotting allows comparisons of current and voltage channels at high resolutions to easily explore the effect of large loads on your system with a clarity never seen before.
- Investigate power quality disturbances by severity, time or occurrence with Event Analysis Calendar, graphical ITIC/SEMI-F47 analysis, and sequenced events - part of the unique web-based analysis suite available on board PXQ.

Features & Benefits

- Automatic PQ Analysis captures harmonics, sags, swells, and subcycle disturbance transients to protect mission-critical IT equipment and infrastructure like motors, capacitor fuse banks, transformers and conductors from damage.
- Minimize business interruptions by automatically diagnosing disruptions to sensitive, mission-critical processes with Setpoint Learning and pre-configured ITIC and SEMI-F47 triggers to get started again as quickly as possible.
- Industry's highest ANSI class accuracy, along with high-fidelity 512 or 1024 samples/cycle measurements on current, voltage, power factor, and other comprehensive power metering parameters such as harmonic distortion, flicker, crest factor, K-Factor, and more.
- Circuit monitoring to improve the life of your infrastructure and equipment investments: watching for harmonics, voltage transients, and other potentially harmful power events.
- Circuit loading can be monitored with voltage and power levels, power factor, energy usage, I/O status, and power quality measurements, as well as harmonic plots, disturbance and transient waveforms, and an ITIC disturbance summary screen.
- Power quality capture and analysis of multi-channel waveforms and other information to support in-depth statistical analysis.

Power quality recording and event detection

Description	
Standard samping rate	True RMS PXQ Tier 1:512 samples/cycle PXQ Tier 2: 1024 samples/cycle
Transient detection and capture	17 µs subcycle transient (or 20 µs at 50 Hz) 100 ns impulsive or oscillatory transients with PXQ-ENH module
Voltage tolerance curves	ITIC, SEMI-F47
Modes to trigger	User-defined value as upper/lower threshold Manual trigger in web interface Via a Modbus command Learned setpoint (for out of limits triggers) Pre-defined PQ event pattern (sags, transients, etc)
Event types	Out of limits: voltages, currents, frequency; power, power factor, THD, flicker Demand overload (predictive demand) ITIC Sags/Swells: L2, L4, L8 Sags; L2, L4, L8 Swells Subcycle disturbance transient: absolute voltage or dv/dt change threshold SEMI-F47 Sags High speed voltage transient (with PXQ-ENH)
Waveform recording	PXQ Tier 1: 60 cycles COMTRADE @ 512 sampling PXQ Tier 2: 120 cycles COMTRADE @ 1024 sampling
Event Sequence RMS (extended RMS capture)	PXQ Tier 1: 1 minute COMTRADE @ half-cycle sampling PXQ Tier 2: 2 minute COMTRADE @ half-cycle sampling
Reporting	Event sequence alert Daily or monthly summary email
Data storage	4GB or 32GB non volatile memory for logged data, alarms, events and waveforms

Metered parameters

Description	
Voltage (Per phase and system for L-L or L-N)	True RMS PXQ Tier 1:512 samples/cycle PXQ Tier 2: 1024 samples/cycle Includes symmetric components
Current (Per phase and system)	True RMS PXQ Tier 1:512 samples/cycle PXQ Tier 2: 1024 samples/cycle Includes symmetric components
Power (Per phase and system)	Real, Reactive, Apparent Apparent and Displacement Power Factor
Frequency	42.5-69 Hz (50/60 Hz nominal)
Energy	kWh (forward, reverse, net, sum), kvarh (delivered, received, net, sum), kVAh (forward apparent, reverse apparent, sum apparent)
Demand	kW or KVA (forward, reverse, sum), kVAR (received, delivered, sum), or absolute (Amps)
Harmonics (spectrum)	To 85th Interharmonics (5Hz increments) Supra-harmonics (modbus registers only) per IEC 61000-4-7
Harmonic Distortion (THD)	Expressed as % or absolute (volts or amps) For total, odd, even, or interharmonics
Misc	K-factor Crest factor Flicker Phasor diagram representations

Built in graphical views

Description	
Zero-config trend analysis	Hundreds of parameters logged, no configuration required 200 ms min/max 5-minute interval average Dual plots show current and voltage together Display multiple channels simultaneously Export graphics via PDF or PNG CSV data available via sFTP
Spectral harmonic analysis	Instantaneous RMS harmonics spectrum (to 85th) Captured waveform harmonics analysis (to 85th) Includes all phases for voltage and currents Magnitude and phase angle for each harmonic Includes interharmonics (5Hz resolution)
Calendar analysis	12-month view (by calendar year) of triggered events Detect recurring problems and gain instant insight with color-coded event indicators
Energy and demand comparisions	Compare any two days, weeks, or months to identify periods of heavy energy usage Monitor daily usage (energy and peak demand) at a glance with summary card on the overview screen.
Sag Source Analysis	Easily determine disturbance direction (upstream or downstream) with unique visuals

Built-in oscilloscope /power analyzer functionality

Description	
Interactive trend plots	Pan and zoom to navigate multi-channel trends Dual trace view shows current and voltage simultaneously
Real-time views	Real time harmonics and waveforms Phasor diagrams
COMTRADE viewer	Supports 12 channels of selectable data
Data export	Graphical views exportable as PDF or PNG CSV trend data available via sFTP Waveform COMTRADE available via sFTP

Automatic PQ analysis

Description	
PQ Health Index	Simplify monitoring with a PXQ's exclusive analysis that tracks multiple power quality parameters and reports as a single, color-coded health value
Event sequencing	Provide context to root cause on back-to-back events Reduce nuisance notifications Tag events for future troubleshooting
Setpoint learning	Supports configuration to create setpoints based on a learned" system normal

I/O applications

Description	
Status and alarms	Monitor status and provide emailed alarms Control oututs with alarms and boolean logic (2 operations) Integration in to PQ event sequence
Sequence of events historian	Supports NTP or PTP protocols. Highly precise time synchronization up to +/- 0.1ms resolution (10x better than industry benchmark) Downloadable event history
Pulse counting (WAGES)	Built-in WAGES dashboard Modbus registers for raw and scaled data (convert pulse totals to units like gallons)

Modbus (TCP and RTU) register specifications

Description	
Register numbering/ addressing	1-based
Bit order	Big-endian (most significant bit first)
Data interval	200 ms refresh Unless otherwise specified in register map

Cybersecurity

Description	
Passwords and user management	Role-based access control on individual user accounts Configurable password rules complexity rules (8-64 characters, special characters, expiration and lock out period) Password recovery with physical access to device
Logs	History of access attempts, configuration changes and other security actions
Communications	Enable/disable communication protcols Whitelist IP addresses Specify ports Supports secure protocols like sFTP and HTTPs
Firmware	Digitally signed firmware
Secure by Design	Adheres to Eaton's IEC 62443-4-1 and UL 2900 certified Secure Development Life Cycle (SDLC) process Tested in UL and IEC certified lab environment capable of certifying products to UL 2900 and IEC-62351 standards. https://www.eaton.com/us/en-us/company/news-insights/cybersecurity/secure-by-design-solutions-and-iec-62443.html

Dimensions

Eaton PXQ's unique modular design enables a customized solution to fit your application and grow along with you.

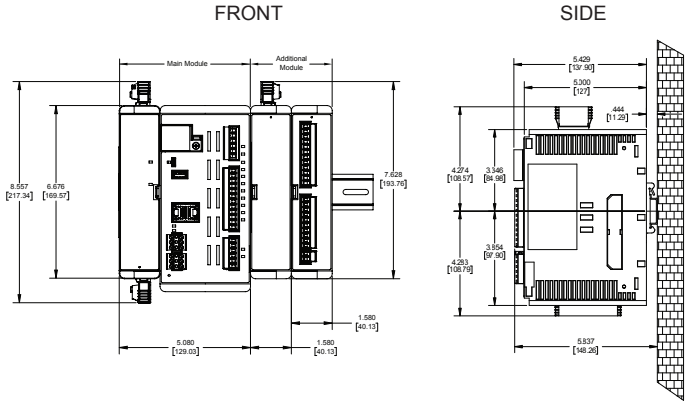


Figure 1. Dimensional Drawings

- Module height (typical): 6.7" (170.18mm)
- Height (including connectors): 8.557" (217.34mm)
- Module width (each): 1.58" (40.13mm)
- Module depth: 4.5" (114.3mm)

Metering specifications

Metering standards compliance	
Power Quality	61000-4-30, Class A IEC 62586 IEC 62586-2
Harmonics and spectral components	IEC 61000-4-7
Flicker	IEC 61000-4-15 IEEE 1453
Power Monitoring Devices (PMD)	IEC 61557-12/SD/K70.0.2 IEC 61557-12/SS/K70.0.2

Metering accuracy	
Current (A)	IEC 61557-12 Class 0.1
Voltage (V)	IEC 61557-12 Class 0.1
Active energy (Wh)	IEC 62053-22 Class 0.1 S ANSI C12.20:2015 Class 0.1 ANSI C12.1:2022 Class 0.1
Reactive energy (VARh)	IEC 62053-24 Class 0.5 S
Apparent energy (kVAh)	IEC 61557-12 Class 0.2
Active power (W)	IEC 61557-12 Class 0.1
Reactive power (Vars)	IEC 61557-12 Class 1
Apparent power (VA)	IEC 61557-12 Class 0.2

Compatible power systems

Description	
Supported wiring configurations	Single Phase 2 Wire (1 CT) Single Phase 3 Wire (2 CT) 3 Phase, 3 Wire Delta (3 CT) 3 Phase, 3 Wire Delta (2 CT) 3 Phase, 4 Wire Y (3 CT) 3 Phase, 4 Wire, Center Tap Delta (3 CT) 3 Phase, 4 Wire 2 1/2 Element Y (3 CT, 2V)
Nominal V L-L (PT Primary)	100-150,000 V L-L
Nominal Application Current (CT Primary) Phases or Neutral/Ground CT	5-12,500 A

Current and voltage input specifications

Meter current input (Meter Module IA, IB, IC, IX)	
Installation category	CAT-III
CT rating	5A nominal
Sampling rate	Up to 1024 samples per cycle, true RMS
Accuracy	IEC 61557-12 Class 0.1
Metering range at specified accuracy	0.05 A to 20 A (Continuous)
Maximum current rating	20A (continuous)
Frequency range at specfied accuracy	42.5-69 Hz (50/60 Hz nominal)
Overload current withstand rating	500A rms for 1.0 second (non repeating)
Maximum voltage (dielectric withstand) rating	400V continuous 3500 Vac for 1 minute
Impedance	<0.010 Ohm (per phase)
Burden	<0.05 VA at 5A (per phase)
Wiring	10-18 AWG to removable 8-position terminal plug

Meter standard voltage input (Meter Module VA, VB, VC, VN)	
Installation category	CAT-III
Sampling rate	Up to 1024 samples per cycle, true RMS
Accuracy	IEC 61557-12 Class 0.1
Metering range at specified accuracy	30 to 700 Vac rms L-G
Frequency range at specfied accuracy	42.5-69 Hz (50/60 Hz nominal)
Maximum allowable voltage rating	347 Vac rms L-N 600 Vac rms L-L
Overload voltage withstand rating	1700 Vac rms (sustained)
Maximum voltage (dielectric withstand) rating	3500 Vac for 1 minute
Impedance	5 MOhm
Wiring	10-18 AWG to removable 4-position terminal plug

Meter high speed transient voltage input (Enhanced Capture Module VA, VB, VC, VN)	
Installation category	CAT-III
Sampling rate	Configurable, 1,000,000 samples per second or 10,000,000 samples per second
Accuracy	+/- 1V
Metering range at specified accuracy	1V-10kV
Overload voltage withstand rating	1700 Vac rms (sustained)
Maximum voltage rating	UL: 347 VAC RMS L:N /600 VAC RMS L:L IEC: 400VAC RMS L:N/690VAC RMS L:L
Frequency range at specfied accuracy	42.5-69 Hz (50/60 Hz nominal)
Impedance	5 MOhm
Wiring	10-18 AWG to removable 4-position terminal plug

Power supply input specifications

Control power supply input (System Core PS)	
Voltage	24-48 Vdc +/-10%
Maximum current draw under load	50 VA (assumes 2 accessory modules)
Typical minimum ride-through time	With no optional accessories: 200 ms (12 cycles at 60 Hz)
Maximum ride-through time	With capacitive ridethrough: Up to 15 seconds Tested with CliQ II Buffer Module DRB-24040ABN

I/O specifications

Digital inputs (System Core IN, D1-D8; SER Module IN, D1-D16)

Number of inputs	Included on System Core: 8 (built-in) PXQ-SER: 16 additional per module, maximum of 32 additional with 2 modules
Application	WAGES (pulse counting), sequence of events analysis, status change notifications
Event timestamp accuracy	+/- 0.1 ms when connected to PTP source, +/- 1 ms otherwise
Pickup (voltage on state)	>17.5 Vdc
Dropout (voltage off state)	<16.0 Vdc
Maximum voltage rating	60 Vdc
Minimum pulse width	10 ms
Maximum pulse rate	50 pulses per second (10 ms on, 10 ms off)
Nominal current draw (per input)	On: 2.5 mA Off: 0.5 mA
Voltage output (for external device activation)	Nominal 24 Vdc Suitable for driving external devices' dry contact for digital input pickup
Max number of simultanous status changes	16
Wiring	12-18 AWG to removable 12-position terminal plug 0.25 mm^2 to 2.5 mm^2 wire ferrule recommended

Solid state outputs (System Core OUT, DO1/DO2)

Number of outputs	2
Type	Form C (NO and NC bidirectional)
Maximum pulse rate	20 pulses per second (25 ms on, 25 ms off)
Pickup/Dropout time	< 25 ms
Maximum voltage rating	60 Vdc
Isolation (Circuit to Ground or DO1 to DO2)	Up to 2kV for 1 minute
Rated Current/Load Current	170 mA
Wiring	12-18 AWG to removable 6-position terminal plug 0.25 mm^2 to 2.5 mm^2 wire ferrule recommended

Safety and environmental specifications

Safety

Safety	IEC/EN61010-1 UL 61010-1 File E530482

Environmental conditions

Operating temperature	-20 to +70° C (-4 to +158° F) -20 to +60° C (-4 to +140° F) for PXQ-ENH
Storage temperature	-40 to 85° C
Humidity rating	5-95% relative humidity, noncondensing
Installation category / Overvoltage category	III
Operating altitude	0 to 9843 ft (0 to 3000m)
IP degree of protection rating	IEC 60529 IP 20 minimum, IP30 preferred, NEMA 1

Electromagnetic compatibility

EMC standards	IEC62052-11, IEC61326-1, IEC61000-6-5
Conducted and radiated emissions*	EN55011 and EN55032 Class B, FCC Part 15 Class B, ICES-003 Class B
Emission limits for harmonics and flicker	Harmonics fluctuations: EN 61000-3-2 Voltage fluctuations: EN 61000-3-3
Immunity	Electrostatic discharge: IEC61000-4-2 Radiated fields: IEC61000-4-3 Fast transients: IEC 61000-4-4 Surges: IEC 61000-4-5 Conducted disturbances: IEC 61000-4-6, IEC61000-4-16 Power frequency magnetic fields: IEC61000-4-8 Conducted disturbances, 2-150 KHz: CLC/TR 50579 Voltage dips and interruptions: IEC 61000-4-11 Ring waves: IEC 61000-4-12
Surge withstand capability	IEEE/ANSI C37.90.1

Note: *Applies to date codes starting 2025. PXQ with date codes 2024 and prior comply with Class B without PXQ-ENH. Compliance is Class A with PXQ-ENH installed.

Communications specifications

Serial port specifications (System Core COM1)

Type	RS-485 2-wire, half duplex (D+, D-, Shield/Common)
Number of ports	1
Industrial Protocols	Modbus RTU
Max distance	Up to 4000 ft
Baud Rate	9600 to 115,200 baud Default: 9600
Data Bits	8
Parity	None, Even or Odd. Default: None
Stop Bits	1 or 2 Default: 1
Address range	1-247 Default: 2
Wiring	12-18 AWG to removable 6-position terminal plug 0.25 mm^2 to 2.5 mm^2 wire ferrule recommended

Ethernet port specifications (System Core E1, E2)

Connections	10/100/1000 BASE-TX (full duplex)
Number of ports	2
Connector type	RJ45
Cable type	Cat5/5E/6 Shielded cable recommended for network connections

Communications protocols

Industrial communication	Modbus TCP/RTU, BACnet/IP
Network communications	SNMP v1, SNMP v3, HTTP, HTTPS, SMTP
Network addressing	IPv4, IPv6, DHCP
Time synchronization	NTP/SNTP, PTP
File transfer	sFTP (secure FTP)
Authentication	LDAP for OpenLDAP systems
Cryptography	TSL 1.2, SSL

Optional Display

Features	
Capabilities	Acknowledge events and alarms View waveforms and event sequences Display all of the Advanced Analytics Suite View trended data
Security	Secure Authentication Acknowledge events and alarms Advanced password management for 6 to 64 characters, including customizable special character requirement, password expiration, and configurable lock-out period Active Directory authentication
Configuration	Edit system configuration View security logs Manage users Enable/disable communications protocols Configure Active Directory connection settings Set and edit triggers Configure email reporting
Minimum Specifications for BYOD	Display resolution: 1024 x 600 RAM: 2GB Flash: 8GB 1x Ethernet 10/100Mb port Supports browser (Google Chrome recommended)

Eaton 7" HMI (PXDB-HMI-07)	
Physical characteristics	(W x H x D): 7.56" x 5.20" x 1.42" Cutout (W x H): 7.3" x 4.9" Weight: 1.1lb Aluminum front, Side PTFE coating
Screen	Display size: 7" Display Resolution: 1024 x 600 pixels TFT Capacitive Touch Screen LED backlight w/ 50,000 Hrs expected life Brightness: 500 cd/m^2 Multitouch functionality (pinch, zoom, scroll and swipe)
Power	Power supply (external): 12 – 32 Vdc Maximum Power Consumption: 7W
Connectivity	2 USB v2.0 ports 1 Ethernet 1 Gb Port + 1 Ethernet 10/100 MB
Standards	UL CE EN60068-2-6 EN60068-2-27 Humidity EN60068-2-30
Environmental	Ingress Protection: IP66 (front) Temperature Range: -10 to 50 C Storage Temperature range: -20 to 65°C Humidity: <90% Relative Humidity, Noncondensing Environment

Alternative: Bring Your Own Display (BYOD)

Need something bigger? Have dimensional constraints? PXQ supports your favorite web-capable HMI, screen or kiosk.

Minimum Specifications for BYOD:	
Display resolution	1024 x 600
RAM	2GB
Flash	8GB
Connectivity	1x Ethernet 10/100Mb port
Browser	Google Chrome recommended
OS	Android OS recommended

Catalog Information

	PXQ-ST1-1A1	PXQ-ST2-1A1
	Tier 1	**Tier 2**
Samples per Cycle	512	1024
Extended Waveform Capture	60 Cycles (1s)	120 Cycles (2s)
Event Sequence RMS	1 minute	2 minute
Event Time Stamp Resolution	+/- 1 ms	+/- 0.1 ms
Memory	4GB	32GB

PXQ Main Unit

Description	Catalog Number
PXQ event analysis system kit (Tier 1) Includes system core and meter module 512 samples/cycle, 60 cycles COMTRADE, 1-minute RMS, 4 GB memory.	PXQ-ST1-1A1
PXQ event analysis system kit (Tier 2) Includes system core and meter module 1024 samples/cycle, 120 cycles COMTRADE, 2-minute RMS, 32 GB memory.	PXQ-ST2-1A1

Accessories and expansion modules

Description	Catalog Number
7" touchscreen display (web-based)	PXDB-HMI-07
Enhanced Capture Module Detect and record high speed voltage transients up to 10kV in magnitude	PXQ-ENH
Input expansion module Configurable for device status monitoring, sequence of events historian and pulse-counting (WAGES) applications	PXQ-SER

Retrofit kits

Description	Catalog Number
PXQ retrofit kit for PXM4000/6000 replacement Comes preinstalled in adapter and ready to swap. Includes PXQ System Core & Meter Module, built-in 24V power supply, and prewiring for quick installation Includes space for 1 expansion module.	PXQ-ST1-1A1-A46K
PXQ retrofit kit for PXM8000 replacement Comes preinstalled in adapter and ready to swap. Includes PXQ System Core & Meter Module, Enhanced Capture Module, built-in 24V power supply, and prewiring for quick installation	PXQ-ST1-1A1-A8K
PXQ retrofit kit for PXM4000/6000 replacement UPGRADE (doubles your sampling rate and accuracy over PXM4000/6000) Comes preinstalled in adapter and ready to swap. Includes PXQ System Core & Meter Module, built-in 24V power supply, and prewiring for quick installation Includes space for 1 expansion module.	PXQ-ST2-1A1-A46K
PXQ retrofit kit for PXM8000 replacement UPGRADE (doubles your sampling rate and accuracy over PXM8000) Comes preinstalled in adapter and ready to swap. Includes PXQ System Core & Meter Module, Enhanced Capture Module, built-in 24V power supply, and prewiring for quick installation	PXQ-ST2-1A1-A8K

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

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Powering Business Worldwide