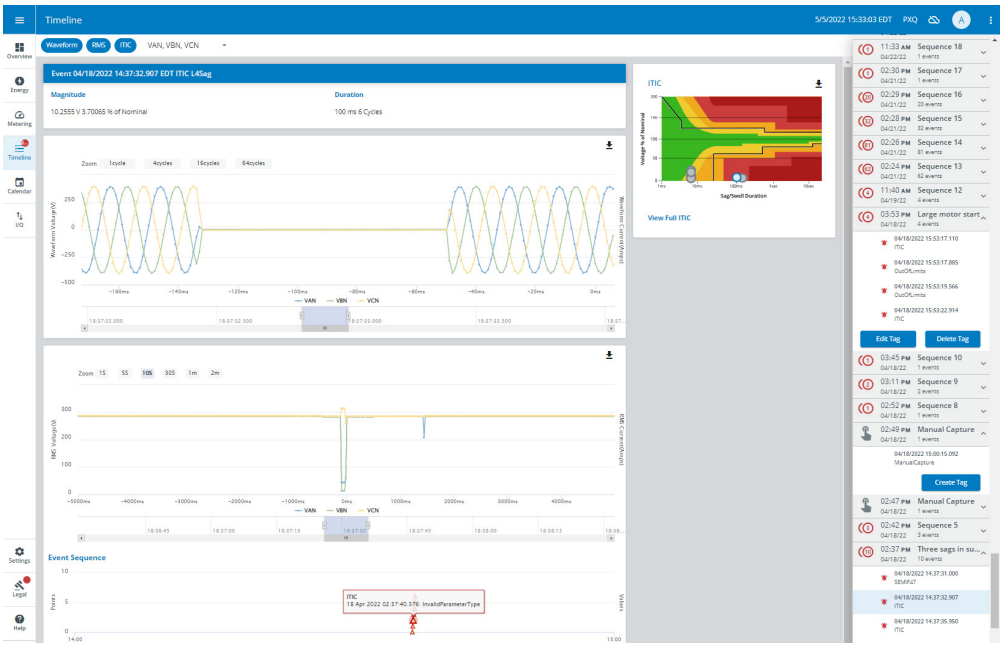
PXQ Event Analysis System Technical Datasheet



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 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.
- Securely access onboard webserver for advanced analytics and graphical views of realtime and historical data without requiring additional software.
- 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.

Metered Parameters

- Zero-Config Trending: Hundreds of metering parameters logged, including 200ms min/max and 5 minute interval average for each parameter, no configuration required.
  - Voltage: per phase and system average
  - Current: per phase, neutral/ground, system average; with demand
  - Power: real, reactive, and apparent
  - Frequency
  - Power factor: apparent and displacement
  - Energy: real, reactive, and apparent
  - Demand: real, reactive, and apparent
  - Individual harmonics and interharmonics
  - Distortion: THD, TDD
  - K-factor, crest-factor, flicker and more

Graphical Trended Data

- Interactive multichannel trends with dual plotting of current and voltage provide insights available when comparing both trends simultaneously.
- Pan, zoom and export to save the views you need for reporting and analysis
  - Graphical views exportable as PDF or PNG for easy sharing.
  - CSV data can also be retrieved from the built-in Secure FTP server for import into third-party benchmarking and analysis tools
- Trend-Event Linkage provides 1-click event navigation between historical trended data and corresponding triggered event details

Automatic PQ Analysis

- Easily view your system's health with at-a-glance gauges of present values with respect to a statistically normal range.
- Power Quality Health Index is a proprietary Eaton analysis that evaluates multiple power quality parameters and reports as a single health value.
- The averages for measured parameters are automatically calculated over the interval period. The minimum and maximum readings are based on 200ms calculations.
- Events are automatically categorized by ITIC and SEMI-F47 severity.
- Sequenced events provide context to root cause and reduce nuisance notifications.

Disturbance Navigator Timeline

- Disturbance Navigator Timeline view provides multi-channel waveforms and event sequence RMS shown simultaneously alongside event parameters and Graphical ITIC and SEMI-F47 as applicable.
- Sixty cycles of waveform are captured at up to 1024 samples per cycle and with up to 60 cycles pre-trigger and 60 cycles post-trigger (30 cycles pre-trigger and 30 cycles post-trigger are standard).
- For each event, RMS data is captured as a COMTRADE file, accessible via the built-in viewer. PXQ's event sequence RMS records up to 60 seconds pre-trigger and 60 seconds post-trigger (30 seconds pre-trigger and 30 seconds post-trigger are standard).
- Waveforms are stored in non-volatile flash memory using an industry standard COMTRADE format. Waveforms can be retrieved from a secure FTP (file transfer protocol) directory structure or downloaded as PDF or PNG from the onboard web interface.
- Events are grouped into sequences and are taggable with name and notes for future identification.
- Graphical ITIC and SEMI-F47 analysis automatically categorizes sags and swells by severity. All events in a given sequence are plotted together in a single view. Plot graphics are exportable as PNG and PDF.
- Recloser Sequence Capture records multiple sag sequences in rapid succession. A COMTRADE waveform is captured for each recloser operation.
- Alarm system triggers notification of selected people and power management software when conditions exceed established tolerance ranges. Configurable email notifications provide crucial data required for maintenance of a facility.
- The following types of event triggers are supported:
  - Out of limits
  - Demand overload
  - Subcycle disturbance transient (20us)
  - SEMI-F47 (sags & swells)
  - Rapid voltage change
  - Harmonic out of limits
  - ITIC (sags & swells)
- Actions upon trigger include:
  - Capturing Waveform
  - Capture Parameters
  - Email Notification
  - Operating a Digital Output

Advanced Harmonics Analysis

- Calculation of individual harmonic magnitudes and phase angle for each phase voltage and current through the 85th harmonic.
- Harmonic trending for up to 50 selected harmonics.
- Configurable out of limits alarming for individual harmonic trends to prevent damage to sensitive equipment and save cost.
- Total Harmonic Distortion (THD) and Total Demand Distortion (TDD) trended and available for triggered events and alarming.

Event Analysis Calendar

- 12-month view (by calendar year) of triggered events.
- Gain instant insight to the frequency of power events and detect reccurring problems.
- Color-coded events provide visual indicator of event types.
- Dive deeper and view triggered events by event type and date with a single-click to detect specific issues.

Sag Source Analysis

- Capture voltage disturbances upstream and downstream of PXQ
- Easily determine the source of each voltage sag with respect to location of PXQ

Energy Management

- Manage energy usage patterns and associated costs with energy and demand readings.
- Graphical comparisons identify periods of heavy energy use. Plot any two periods (days, weeks or months) or simply compare the current period with the previous for vivid energy or demand comparisons, exportable as PDF or PNG for easy reporting. CSV also available for additional analysis.
- Monitor daily usage (energy and peak demand) at a glance with summary card on the overview screen.
- Up to eight status inputs can be configured as energy accumulators for pulse counting or WAGES monitoring. Customizable labels provide application-specific context.
- Standard LED for calibration and energy pulse testing.

Sequence of Events Time Stamping

- Supports NTP or PTP protocols.
- Highly precise time synchronization up to +/- 0.1ms resolution, 10x better than industry benchmark.
- Battery back-up for real time clock when control power is lost. The battery is an off-the-shelf coin cell and can be replaced in the field if required.

I/O Applications

- Time stamping breaker trips to +/- 0.1 ms for Sequence of Events Recording (SER)
- Supports WAGES applications with scalable pulse counting
- Control outputs with Boolean logic or triggered event

Cybersecurity

- Integrated Trusted Platform Module (TPM) provides hardware-based cryptographic security for an extra layer of protection.
- Update securely with digitally signed firmware, preventing unauthorized applications from being deployed to the meter.
- Individual accounts with role-based access control (RBAC) allows authorized personnel to access your critical equipment.
- LDAP support make it easy to manage employee access across the metering fleet.
- Advanced password management supporting 6-64 characters, including customizable special character requirement, password expiration and lock-out period.
- Security and access logs providing history of access attempts, configuration changes and other security actions.
- Secure protocols including SFTP and HTTPS.
- Ability to enable/disable communication protocols or specific ports.
- Secure field password recovery procedure shall be possible with physical access to the device. Removal of installed PXQ shall not be required to recover access.
- Tested in UL-accredited lab environment capable of certifying products to UL 2900 and IEC-62351 standards.
- Adheres to Eaton's IEC 62443-4-1 and UL 2900 certified Secure Development Life Cycle (SDLC) process.

Components

- System Core
- Meter Module
- Display (optional)
  - Supports "bring your own display" (BYOD).
  - Compatible with most web-based HMI or display screens.
  - e.g. PXDB-HMI-07
  - Minimum specifications for display available in this document.

Dimensions

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

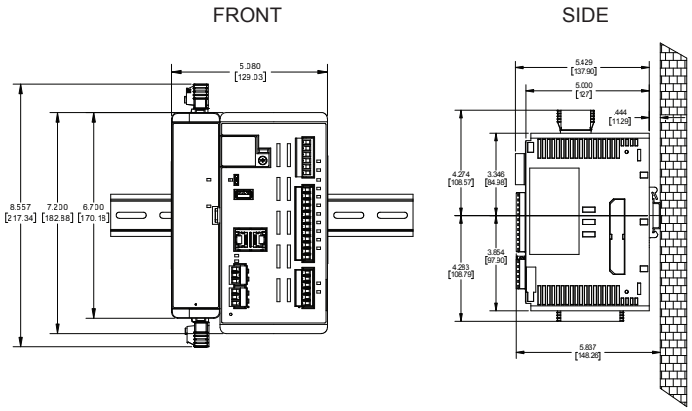


Figure 1. Dimensional Drawings

- Height (chassis only): 7.200" (182.88mm)
- Height (including connectors): 8.557" (217.34mm)
- Width (includes Meter Module): 5.429" (137.90mm)
- Depth: 5.12" (130.0mm)

Accuracy

Active energy (Wh)

IEC 62053-22 Class 0.1 S, ANSI C12.20 2015 Class 0.1

Reactive energy (VARh)

IEC 62053–24 Class 0.5 S

Power monitoring device (PMD)

IEC 61557–12 PMD/SD/K70/0.2 and PMD/SS/K70/0.2

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

Apparent energy (kVAh)

IEC 61557–12 Class 0.2

Current (Amps)

IEC 61557-12 Class 0.1

Voltage (Volts)

IEC 61557-12 Class 0.1

Power Quality/Metering

- IEC 61000-4-30 Class A
- IEC 61000-4-15
- IEC 61000-4-7
- IEC 61557-12
- IEC 62586
- IEC 62586-2
- IEEE 1453 - Flicker

Safety/Compliance

- IEC/EN61010-1
- UL 61010-1 File E530482
- CE Mark

Environmental

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

- Ingress Protection IEC 60529 IP 20 minimum, IP30 preferred, NEMA 1
- Temperature Range: –20 to +70°C (–4 to +158°F)
- Storage Temperature Range: –40 to 85°C
- Humidity: 5–95% relative humidity, noncondensing environment
- Pollution Degree: II
- Elevation: 0 to 9843 ft (0 to 3000m)
- Housing: IP20

Emissions Conducted and Radiated

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

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 - IEEE/ANSI C37.90.1

System Core and Metering Module

Specification

- Up to 32 GB Onboard Memory (4 GB standard)
- Up to 3 years of energy data shall be retained at 15 minute intervals

Ports and Connections

System Core

Device Power Supply Input (PS)

- Voltage: 24-48VDC
- Maximum Draw: 50 VA
- Minimum ride-through: 200ms (with meter base and standard speed metering)
- Optional ride-through: up to 15 seconds with capacitive ride-through accessory (e.g. CliQ II Buffer Module DRB-24V040ABN or similar)
- Maximum power: 50W (assumes 2 accessory modules)

Digital Inputs x8 (IN, D1-D8)

- Digital Inputs: 8
- Event Timestamp Accuracy: +/- 0.1ms (when connected to PTP source, +/- 1ms otherwise)
- Maximum Voltage: 60 VDC
  - Voltage on state: > 16.5 Vdc
  - Voltage off State: < 12.0 Vdc
- Input Current Draw: 2.5mA
- Minimum Pulse Width: 10ms
- Maximum Pulse Rate: 50Hz (10ms on, 10ms off)
- Wiring to 12-position Removable Terminal Plug
- 12–18 AWG, Wire Ferrule Recommended: 0.25mm^2 to 2.5mm^2
- External Voltage: 24VDC to drive external dry contact

Solid State Outputs (OUT)

- Outputs: 2
- Type: Form C NO and NC Bidirectional FET
- Maximum External Source Voltage: 48 Vdc (+/- 20%)
- Maximum Load Current 170 mA
- Minimum Pulse Width 25 ms
  - Fixed 25 milliseconds for pulse initiator function
- OFF state leakage: 1uA
- ON state resistance: 20 Ohms
- Wiring to Six-position Removable Terminal Plug
- 12–18 AWG, Wire Ferrules Recommended

Communications Ports (System Core)

Ethernet Ports (E1, E2)

- Dual RJ45 10/100/1000 Base-T Ethernet ports
- DHCP or Fixed IP Address modes
- Supported Protocols
  - IPv4, IPv6 capable
  - HTTPS for embedded webserver
  - Modbus TCP
  - BACnet I/P
  - PTP or NTP
  - SFTP
  - SNMP
  - SMTP with support for authentication

Meter Module

Current Inputs CT1-4 (each channel)

- Rating: 5 A Secondary Nominal, 20 A Continuous Max.
- Metering Range: 0.25 to 20 A
- Frequency Range: 50-60Hz +/-15% (42.5 – 69Hz)
- Burden: <10 m ohm
- Overload Withstand: 500 A AC / 1 Second, Non-repeating
- Accuracy: IEC 61557-12 Class 0.1
- Wiring to Removable Terminal Plug: Range 10–18 AWG
- Safety Insulation Rating: 400 V All CT Circuits to Ground
- Installation Category: CAT-III
- Dielectric Withstand: All Inputs to Ground 3500 Vac / 1 minute

Standard Metering Voltage Inputs VTV1-VR

- Maximum rating
  - 700 Vac rms L:G
  - 1200 Vac rms L:L
- Installation category: CAT-III
- Metering range (temporary transitions): 30–700 Vac rms L:G
- Abuse overload rating: 1700 Vrms sustained input impedance 5 megohm
- Accuracy: IEC 61557-12 Class 0.1
- Wiring to removable terminal plug: Range 10–18 AWG
- True RMS processing at 1024 sample/cycle with Third-Order Butterworth

Display

Bring Your Own Display (BYOD)

PXQ is display agnostic and supports BYOD.	
Capabilities	Acknowledge events and alarms View waveforms and event sequences Display all of the Advanced Analytics Suite View trended data
Security	Secure Athentification 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

If you do not have your own display, Eaton offers a 7" PXDB HMI.	
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, zoon, 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

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

Catalog Number	Description
PXQ-ST1-1A1	PXQ event analysis system kit (system core and meter module, Tier 1)
PXQ-ST2-1A1	PXQ event analysis system kit (system core and meter module, Tier 2)
PXDB-HMI-07	Optional 7" HMI

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