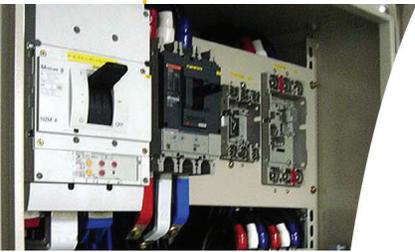


PSL



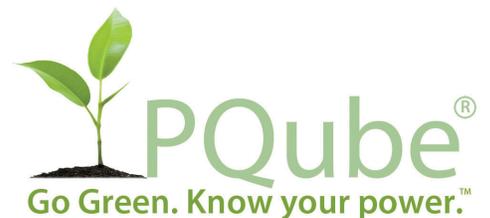
LOW-COST, HIGH-PRECISION POWER QUALITY & ENERGY MONITORING



PQube[®] POWER QUALITY & ENERGY ANALYZER

- AC AND DC MONITORING
- LAB-GRADE ACCURACY
- MODULAR & EMBEDDABLE
- PLUG-AND-PLAY FUNCTIONALITY
- DIRECT REMOTE COMMUNICATION
- NO SOFTWARE REQUIRED**

FC CE            





General

- Three-phase, single-phase and split-phase monitoring 100~690V, 50/60/400Hz.
- Self-configuration—auto-detects single-phase, 3-phase, phase-to-phase, wye, nominal voltage, nominal frequency, and more.
- Two analog inputs, one digital input, up to 4 relay outputs, two temperature-humidity channels.
- Direct connect to 100~690V—no PTs required.
- Powers from 24 VAC, 24~48VDC, or 100~240 VAC with optional PS1 plug-in module.
- Built-in, self-rechargeable Li-Ion UPS with up to 9 minutes of backup power.
- Automatic data storage on included 4GB SD card (up to 2 years of data)
- Full color organic LED display, 35 built-in languages.
- DIN-rail or optional panel mount bracket.

Power Quality Monitoring

- High-speed 256-samples-per-cycle recording.
- Power quality disturbances recorded with waveforms and RMS graphs.
- Voltage sags, swells and interruptions; over-frequency and under-frequency events; 1 micro-second high-frequency impulse detection; time-triggered snapshots.
- Voltage THD, current TDD and current THD; voltage and current unbalance; VARs (fundamental and Budeanu); VAR-hr accumulator; flicker (Pinst, PST, PLT).
- Voltage and current harmonics and interharmonics—up to the 63rd, with statistics.
- Daily, weekly, monthly trends. Cumulative probability, histograms, and more.

Energy (with Current module)

- Watts, VA, VARs, True Power Factor, Watt-hours, VA-hours, VAR-hours.
- Carbon footprint meter (in kg), CO₂ generated and avoided.
- Peak averages—single-cycle, 1-minute and 15-minute, and at user-selected intervals.
- CT ratios support up to 50,000 amps; PT ratios support up to 6,900,000 volts.
- Daily, weekly, monthly trends; load duration curves and more.
- Energy accumulators—daily, weekly, monthly.

Communication (with Ethernet module)

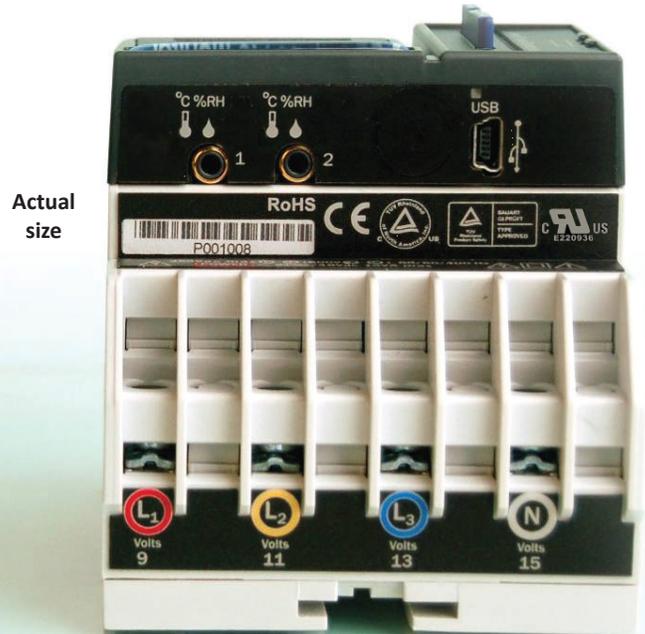
- Direct remote access to built-in web server—NO SOFTWARE REQUIRED.
- Instant email notification after a power quality disturbance or end of trend interval.
- Free email account.
- Modbus-TCP—read meters with any client, anytime.

Compliance

- Safety: UL, TUV, ISA-82.02.01 (IEC 61010-1 MOD), CAN/CSA-C22.2 NO.61010-1, Japan S-mark, GS, CE.
- Immunity: IEC 61000-4-5 (6kV peak 100kHz surge), IEC 61000-4-4 (4kV peak EFT bursts), IEC 61000-4-2 Level 1 and MIL-STD-883 (electrostatic discharges), IEC 61000-4-3 (radio frequency fields), IEC 61000-4-8 (magnetic fields).
- Emissions: EN 55022 and CISPR 22, radiated and conducted RF emissions.
- Accuracy: Full NIST-trace certificate for each PQube.



PQube front terminals



Actual size

PQube back terminals

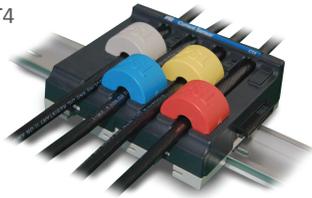


	Semiconductor	Medical	Government	Wind & Solar	Data Centers	Utilities	Transportation	Manufacturing	Energy Research	Telecom
Detects All Power Quality Disturbances	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No Software	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AC and DC			✓		✓	✓			✓	✓
Temperature & Humidity					✓	✓			✓	✓
Remote Access (FTP, SMTP, Modbus, Email)		✓	✓	✓	✓	✓	✓	✓	✓	✓
Secure Data Access	✓			✓						
Extensive VAR Capabilities	✓			✓		✓	✓	✓	✓	✓
Peak & Accumulated Energy	✓		✓	✓		✓	✓	✓	✓	✓
Report Writer	✓				✓	✓				✓
Incandescent Flicker				✓						✓
PQDIFs										✓
690 VAC				✓						✓
400 Hz Monitoring			✓	✓						
Self-Configuring	✓	✓	✓	✓						
Modular & Embeddable	✓	✓	✓	✓	✓				✓	
Open Source Files	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Multilingual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

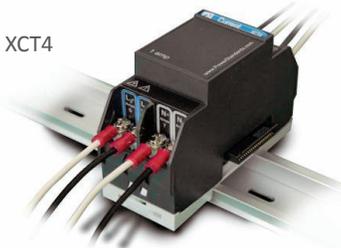
PQube Applications

Current Sensing Modules

CT4



XCT4



XCT5



- Simple-to-set CT ratios in your PQube (up to 50 kiloAmps).
- Crest factor of 350%.
- Current waveforms, inrush current.
- Power/energy (kW, kWh, kVA, kVAh, kVAR, kVARh, tPF).
- Measure unbalance, harmonics, and interharmonics for current.
- Peak meters—peak amps, peak kVA, and peak watts. Single-cycle, 1-minute, and 15-minute peaks. Useful for sizing circuit breakers, UPSs, and transformers.
- Carbon footprint meter—input your local electric power source information, and your PQube automatically measures your CO₂ footprint directly in kilograms.

CT4 Current Sense module

- Just pass wires through openings in module (0.34in [8.6mm] maximum diameter).
- Part Number CT4-20A-00 for 20A nominal rating
- Part Number CT4-50A-00 for 50A nominal rating

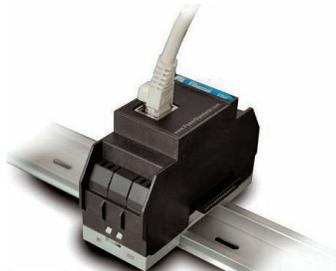
XCT4 Current Transformer Interface module

- Connects directly to current transformer secondary wires—1A or 5A.
- Part Number XCT4-01A-00 for CTs with 1A output
- Part Number XCT4-05A-00 for CTs with 5A output

XCT5 Current Transformer Interface module

- Up to five channels of current monitoring, includes neutral and earth.
- Connects directly to voltage secondary wires of your CTs—0.333V, 1V, 5V, or 10V.
- Part Number XCT5-0.333V-00 for CTs with 0.333V output
- Part Number XCT5-01V-00 for CTs with 1V output
- Part Number XCT5-05V-00 for CTs with 5V output
- Part Number XCT5-10V-00 for CTs with 10V output
- Current transformers with 0.333V output available from www.powerstandards.com.

Network Connectivity Modules



ETH1 Ethernet module

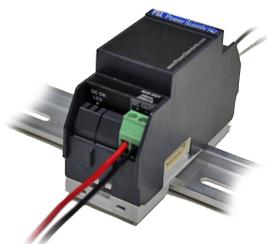
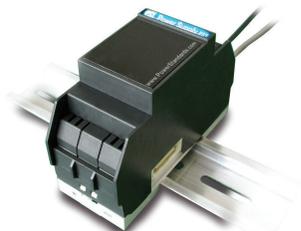
- Automatically sends you an email whenever a disturbance occurs, complete with picture and Excel®-compatible attachments.
- Built-in web server.
 - See status of your PQube and look at event and trend recordings.
 - Update your firmware and reset your PQube remotely.
- Free email account with each PQube.
- Use SNTP for synchronizing to UTC time standard.
- DHCP/Fixed IP, POP, SMTP, FTP, Modbus-over-TCP.
- Part Number ETH1-10T-00

CTE1 Combined Current and Ethernet module

- ETH1 ethernet module and XCT5 current module in a single package.
- Smaller footprint—ideal for panel mounting where space is limited.
- Part Number CTE1-10T-0.333V-00 for 0.333V nominal rating
- Part Number CTE1-10T-1V-00 for 1V nominal rating
- Part Number CTE1-10T-5V-00 for 5V nominal rating
- Part Number CTE1-10T-10V-00 for 10V nominal rating



Power Supply Modules



PS1 Power Supply module

- Power your PQube from 100V~240V, 50/60 Hz. (Your PQube takes power from 24VAC, 24VDC~48VDC without any optional modules.)
- Snap multiple PS1 modules together for redundant power from different feeders.
- Part Number PS1-100~240-00

PS2 Power Supply module

- Power your PQube from 100V~240V, 50/60 Hz.
- 24VDC output for powering external accessories.
- Part Number PS2-100~240-00

Temperature and Humidity Probe



TH1 Temperature/Humidity probe

- Monitors ambient temperature and humidity.
- Temperature/Humidity event triggers
- Every PQube accepts two electrically isolated probes.
- Use one probe for local ambient temperature/humidity, and put the other on an optional 10-meter extension cable for monitoring remote conditions.
- Temperature accuracy: Typical: $\pm 0.5^{\circ}\text{C}$
- Humidity accuracy: Typical: $\pm 4.5\% \text{RH}$ (20~80% R.H.)
- Part Number TH1-80C-00

DC Monitoring Modules



ATT1—DC Voltage Monitoring

- For high voltage DC monitoring.
- Measure 1 differential voltage or 2 voltages relative to earth available.
- Part Number ATT1-0600V-00 for 600V nominal rating
- Part Number ATT1-1200V-00 for 1200V nominal rating

ATT2—DC Power and Energy

- For DC power and energy monitoring.
- Measures DC voltage (up to 600V).
- Measures DC current (with Hall effect sensors).
- Part Number ATT2-0600V-00
- DC current sensors available.

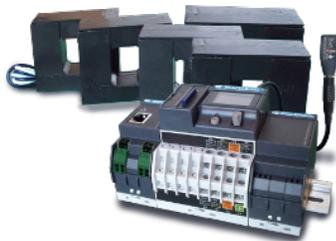
PQP-ETH1 - Power Quality with Remote Communication Kit



This kit is perfect for evaluating PQube power quality options.

- Automatically send an e-mail whenever a disturbance occurs, complete with GIF graph pictures and Excel© compatible CSV attachments
- Temperature and humidity monitoring
- Update your setup and firmware via e-mail. Check meter readings via e-mail, too!

PQP-CTE1 - Power Quality & Energy with Remote Communication Kit



If you've got an application with up to 6000 amps, this is the perfect kit for evaluating PQube energy and power quality options.

- CTE1 plug-in module accepts 0.333V output CTs. Five CT's are included in the kit (4 for Lines & Neutral, 1 for Earth).
- Five channels of current (3-phase channels, 1 neutral channel and 1 Earth channel) at $\pm 0.1\%$ rdg $\pm 0.1\%$ FS, plus CT accuracy

PQP-CT4 - Embedded Energy & Power Quality Kit



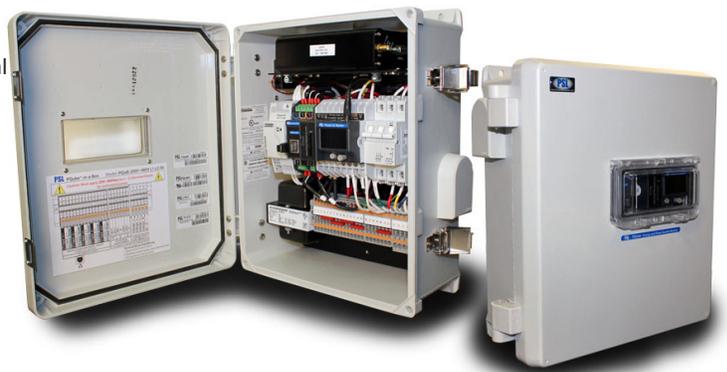
If you've got an embedded application, this is the perfect kit for evaluating PQube energy and power quality options.

- Plug-in module has integrated CTs up to 20-Amp. Just pass wires through openings.
- Maximum conductor diameter - 0.34in (8.6mm)
- Crest Factor (peak measurement) 3.5 times nominal CT rating.
- Four channels of current at $\pm 0.1\%$ rdg $\pm 0.1\%$ FS

PQiaB - PQube in a Box

Power Quality and Energy monitoring pre-packaged in a pre-wired enclosure:

- Ready to install immediately - All connections to your PQube are pre-wired. Spring loaded terminal blocks allow for quick and safe field wiring.
- Powered by mains AC voltage - No separate instrument power required!
- Weather resistant enclosure - Ready to install anywhere. Just drill conduit/wiring holes where needed.
- Front window - Convenient access to the PQube display and SD card without exposure to hazardous voltage.
- Optional:
 - Pole-mount bracket
 - Cooling fans
 - Cellular modem mounting kit





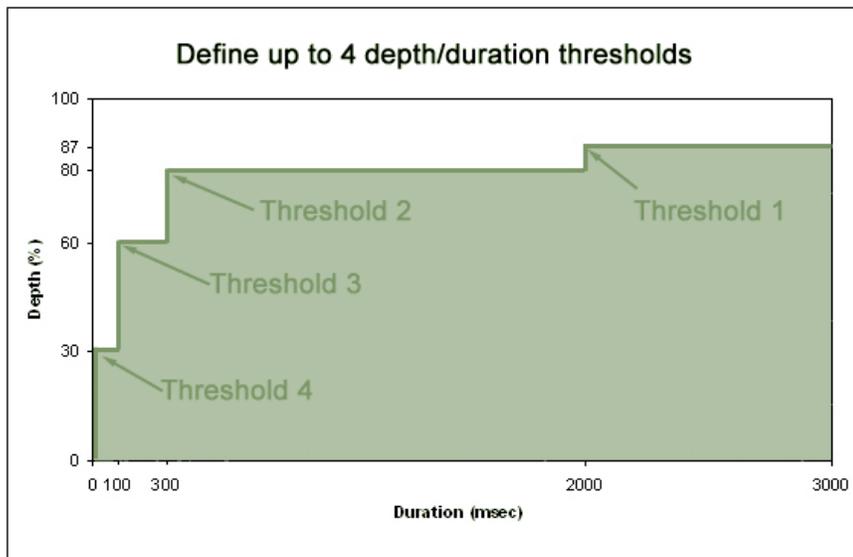
Custom Major Dip Ride Through Curve

Need to trigger an event based on voltage *and* time?

Customize your own Major Dip ride through curve! You can specify up to 4 depth/duration points.

Define a ride-through curve which defines a specific set of voltage sags based on depth and duration. Your PQube will trigger a Major Dip event if the voltage sag exceeds this curve.

For example, the SEMI F47 ride-through curve is commonly used in the semiconductor industry. Equipment that complies with SEMI F47 requirements can withstand approximately 90% of all the voltage sags in the world.



Temperature/Humidity Event Triggers

Your PQube now records temperature and humidity events with a TH1 probe, complete with magnitude, duration, and timestamp. Specify over-thresholds and under-thresholds.



Your PQube will send two email notifications:

1. When the temperature/humidity first exceeds the threshold
2. When the temperature/humidity comes back within the threshold, plus hysteresis

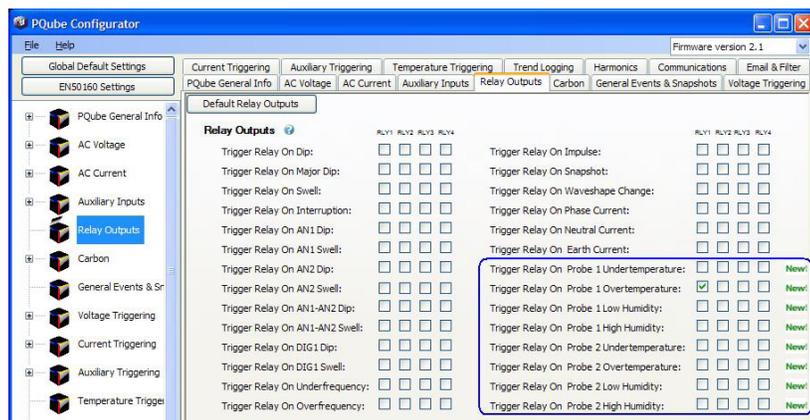
Probe 1 Overtemperature - (location not set)

PQube Information	
Location:	(location not set)
PQube ID:	(PQube ID not set)
Note 1:	(note not set)
Note 2:	(note not set)
PQube Serial Number:	P004954
Model Number:	PQube 02-0000
Firmware Version:	2.1.0 #2821
IP Address:	172.17.4.15

Configuration	
Power Configuration:	Single Phase L1-N
Nominal Line-to-Neutral Voltage:	120V
Nominal Frequency:	60Hz

Event	
Event Type:	Probe 1 Overtemperature
Event Magnitude:	64.50deg C
Event Duration in Seconds:	43.255
Trigger Date:	2012/07/30
Trigger Day of Week:	Monday
Trigger Time:	T 16:26:15.050
Trigger Threshold:	60.0deg C

Data from the PSL PQube[®] by www.PowerStandards.com



You can also trigger the PQube's output relay when it detects a temperature or humidity event. Select you desired events from the Relay Outputs section.



PQube File Formats

Your PQube provides data in several useful formats.

- Events, trends, and statistics as universal .GIF formats and .CSV data files
- Text, XML and HTML summaries
- PQDIF files (IEEE standard for power quality data files)

Each graph and chart is labeled in your choice of two languages (35 languages total).

All PQube graphs are generated by your PQube directly, without software, and can be viewed in a browser or opened in any picture viewer. They are included in event notification emails as simple .GIF file attachments, and can be forwarded to a third party, such as a facility engineer or utility company.

You can see more graphs like these at map.PQube.com—free PQube data streamed live from around the globe.

PQube B-5 - Bldg 90 - Bldg Main Serv
 LBNL Bldg 90 Energy Monitoring Project
 Environmental Energy Technologies Division - BTD

Status

Meters

Events

Trends/Statistics

Commands

Network

PQube Information

Location:	Bldg 90 - Bldg Main Service
PQube ID:	PQube B-5
Note 1:	LBNL Bldg 90 Energy Monitoring Project
Note 2:	Environmental Energy Technologies Division - BTD
PQube Serial Number:	P002944
Model Number:	PQube 01-0000
Firmware Version:	1.4.14 #2552
IP Address:	128.3.13.217

Configuration

Power Configuration:	Wye/Star
Nominal Line-to-Neutral Voltage:	277V
Nominal Line-to-Line Voltage:	480V
Nominal Frequency:	60Hz
Current Transformer Ratio:	18000:5

PQube Time

Date:	2011/10/27
Day of Week:	Thursday
Time:	T 10:33:48 PST

Data from the PSL PQube® by www.PowerStandards.com

▲ **The PQube web interface access screen.** From here, you can check your PQube status, access the meters, view events, and give commands to your PQube. Each PQube can be labeled with a unique name and location, making it easy to monitor multiple PQubes.

An overview of a PQube meters screen. All data refreshes on click. Clicking the Events and Trends/Statistics links allows you to see the most important parts of this data in graph form (see following pages). ▶

PQube B-5 - Bldg 90 - Bldg Main Serv
 LBNL Bldg 90 Energy Monitoring Project
 Environmental Energy Technologies Division - BTD

Status

Meters

Events

Trends/Statistics

Commands

Network

Meters

Meter	Value
L1-N	283.77V
L2-N	283.21V
L3-N	284.08V
N-E	0.95V
L1-L2	490.71V
L2-L3	491.42V
L3-L1	491.90V
L1 Amp	282.8A
L2 Amp	270.4A
L3 Amp	282.3A
N Amp	0.01A
Frequency	60.009Hz
Voltage THD	4.6%
RMS Flicker	P_{inst} 0.1
	P_{ST} 0.2
	P_{LT} 0.2
IEC Zero Sequence V	0.0%
IEC Negative Sequence I	2.1%
TH1 Probe 2	24.8deg C
	30.3% RH
L1-N Voltage Fundamental	283.45V 0deg
L2-N Voltage Fundamental	282.90V -120deg
L3-N Voltage Fundamental	283.77V 120deg
L1 Current Fundamental	263.5A 1deg
L2 Current Fundamental	259.6A -119deg
L3 Current Fundamental	272.9A 120deg
User Counter (since 2010/04/02)	0

Energy

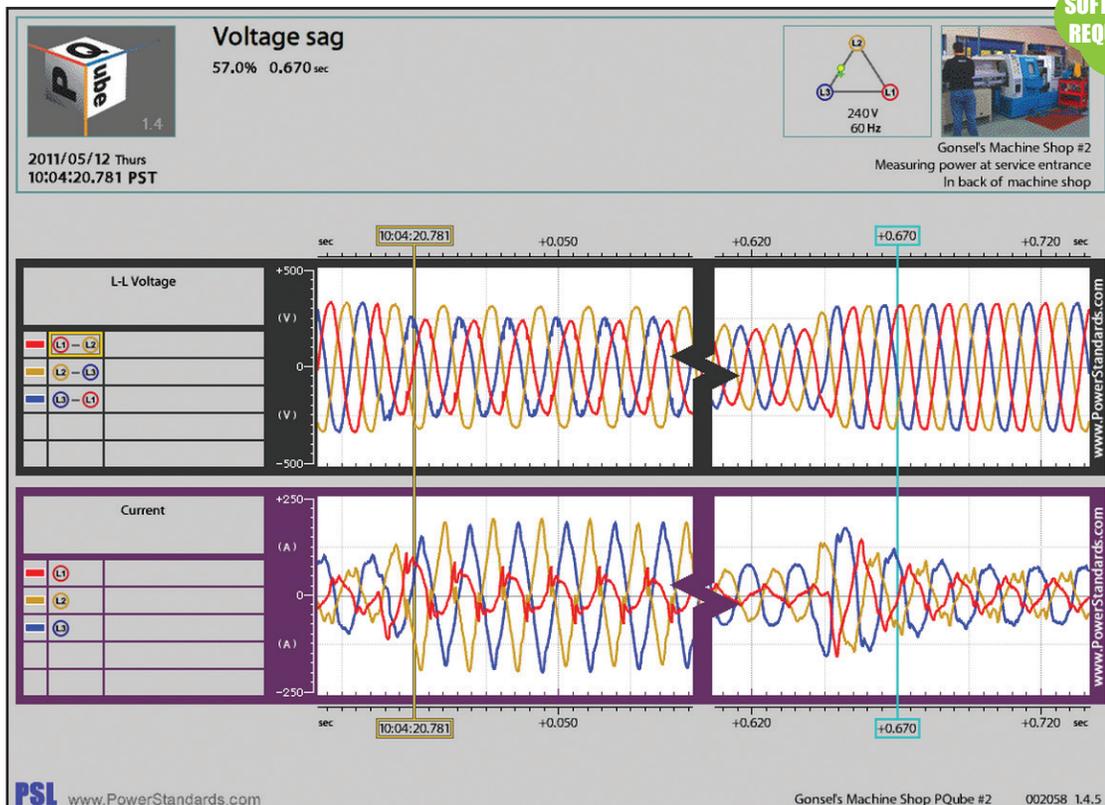
Meter	Value
Power	226.27kW
Apparent Power	237.29kVA
Reactive Power	71.47kVAR
True Power Factor	0.95
Energy (since 2010/04/02)	2.370GWh
Apparent Energy (since 2010/04/02)	2.472GVAh
Carbon (since 2010/04/02)	768.145Mg
Carbon Rate	73.33kg/h
Peak RMS Current (since 2010/04/02)	1 cycle 2098.3Arms
	1 minute 695.6Arms
	15 minute 670.9Arms
Peak Power (since 2010/04/02)	1 cycle 797.38kW
	1 minute 559.68kW
	15 minute 537.35kW
Peak Apparent Power (since 2010/04/02)	1 cycle 869.82kVA
	1 minute 564.90kVA
	15 minute 544.49kVA

Harmonic H7

Meter	Value
L1 Harmonic H7	7.76V 154deg
	35.1A 239deg
L2 Harmonic H7	7.13V 36deg
	34.1A 121deg

NO SOFTWARE REQUIRED

NO SOFTWARE REQUIRED



NO SOFTWARE REQUIRED

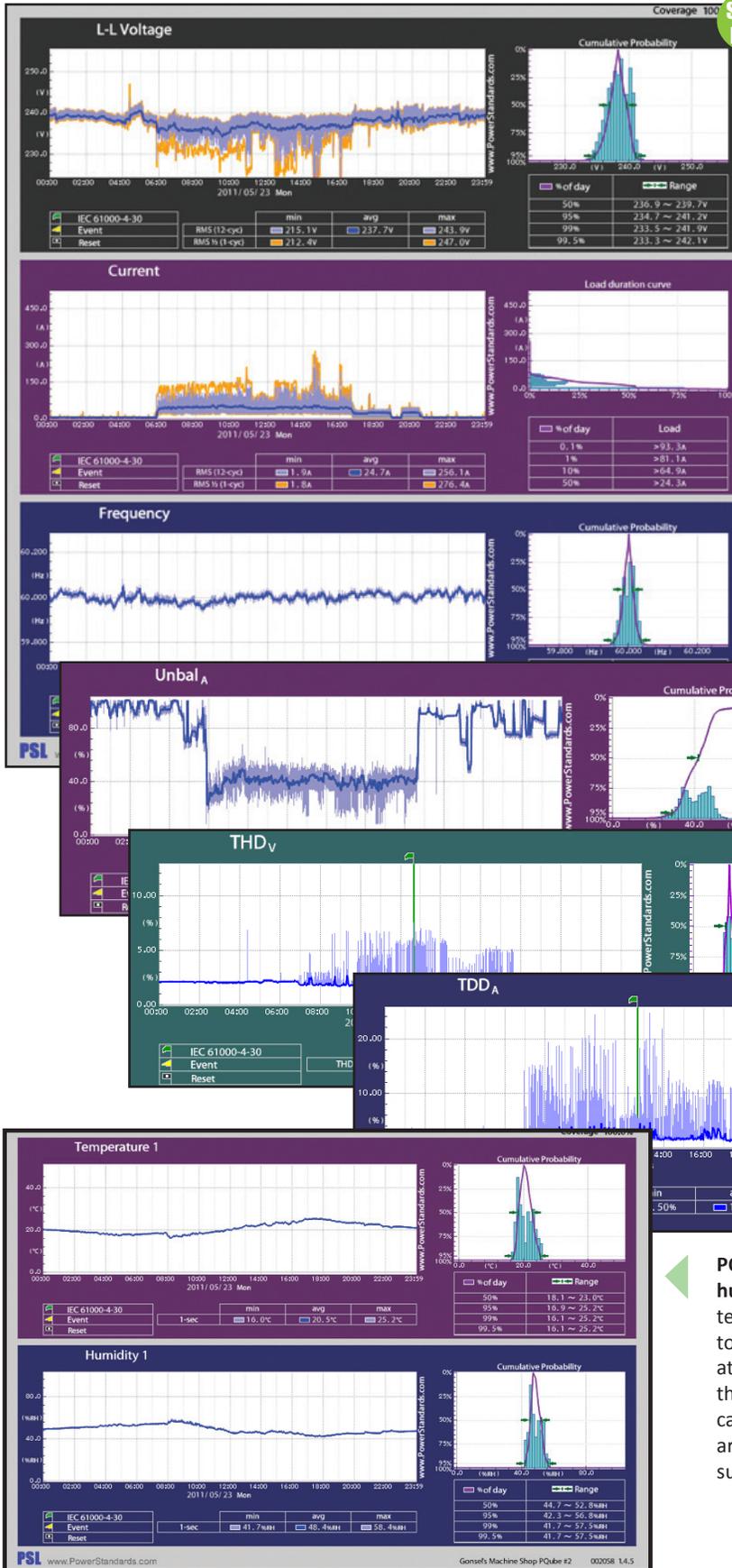
PQube-generated waveform and RMS graphs of a voltage sag recorded at a machine shop. The graphs give you the time, depth, and duration of the event, and a snapshot of your power at the beginning and end of the event. You don't need any special software to create or read the graphs.

With PQube-generated graphs like this you can:

- Prove to your utility that a sag happened
- Rule out power problems during troubleshooting—by showing that no events occurred
- Identify the source of your power problems
- Understand how your equipment affects the power in your facility.



NO SOFTWARE REQUIRED

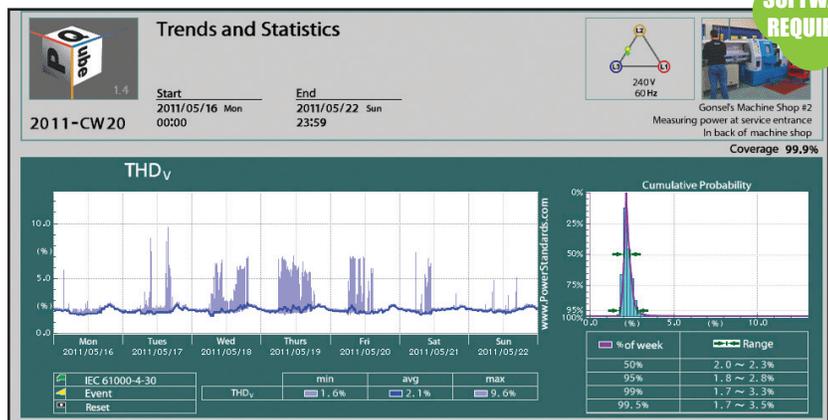


NO SOFTWARE REQUIRED

A PQube-generated daily trend summary with min/avg/max values and statistics.

A daily unbalance graph. Unbalance can be a persistent and difficult-to-detect cause of equipment failure and energy loss.

PQube-generated temperature and humidity graph. Your PQube has two temperature-humidity ports, allowing you to monitor the temperature and humidity at two locations, up to 10 meters away from the meter (with optional PSL extension cables). This is important in applications that are sensitive to environmental conditions, such as photovoltaic plants and data centers.



NO SOFTWARE REQUIRED

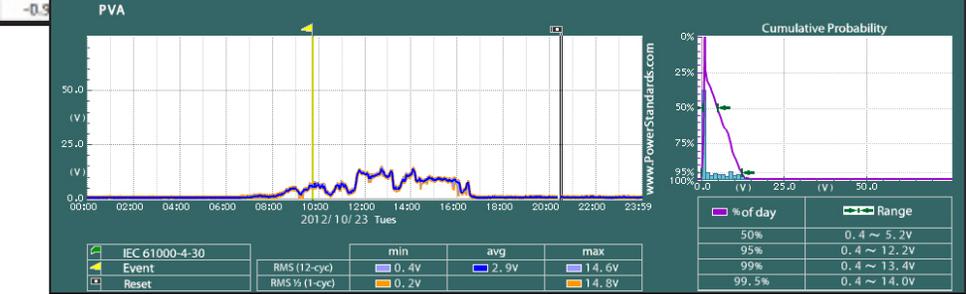
Weekly harmonics distortion graph for voltage and current. Voltage harmonics can pollute the grid and affect other loads. Current harmonics increase losses in transformers and wiring. High current harmonics will distort the voltage, which can affect your loads.



A "harmonic profile" snapshot. Identify exactly which harmonic is causing problems. Harmonic snapshots can be generated from the PQube on demand, or every 10 or 15 minutes (user-selected).

Seconds	L1-L2 (V)	L2-L3 (V)	L3-L1 (V)	L1 Amp (A)	L2 Amp (A)	L3 Amp (A)	Frequency (Hz)	Power (kW)
-1.067	237.3	236.2	234.5	31.6	46	71.6	59.994	17.54
-1.058	237.4	236.3	234.5	31.8	46.6	71.6	59.994	17.54
-1.05	237.4	236.2	234.6	31.8	46.6	71.5	59.994	17.58
-1.042	237.4	236.2	234.6	31.9	46	71.5	59.994	17.58
-1.033	237.4	236.3	234.6	31.9	46	71.7	59.994	17.56
-1.025	237.4	236.2	234.6	31.9	46.4	71.7	59.994	17.56
-1.017	237.4	236.2	234.6	31.9	46.4	71.6	59.994	17.55
-1.008	237.4	236.1	234.6	31.9	46.4	71.6	59.994	17.55
-1	237.3	236.2	234.6	31.9	46.4	71.5	59.994	17.53
-0.992	237.4	236.3	234.7	31.8	46.6	71.5	59.994	17.53
-0.983	237.4	236.2	234.6	31.8	46.6	71.4	59.994	17.49
-0.975	237.4	236.2	234.6	31.4	46.5	71.4	59.994	17.49
-0.967	237.4	236.3	234.6	31.4	46.5	71.5	59.994	17.5

Customize your PQube data. All PQube data is available in .CSV format. You can open these files in any spreadsheet program such as Microsoft Excel® and create your own custom graphs and reports.



DC

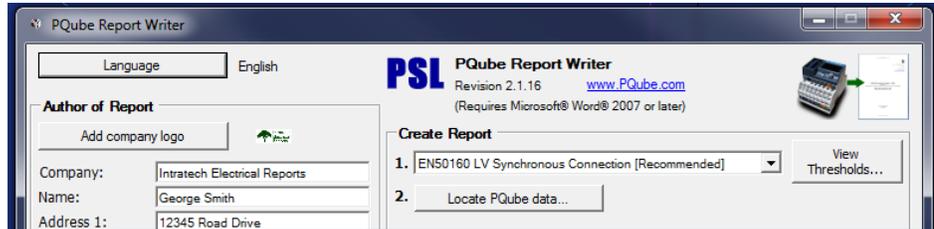
....and many more!

PQube Sample Files

PSL



Complete with AUTOMATIC REPORT GENERATOR



EN50160 4.2.2: Supply Voltage Variations

Nominal Voltage: 277.00V L-N / 480.00V L-L
Parameter definition: 10 minute mean RMS value of the supply voltage
Limitation: For systems with a synchronous connection to an interconnected system

EN50160 Requirement	Measured L1 Voltage	Measured L2 Voltage	Measured L3 Voltage	Result
95% of day: 249.30V - 304.70V	281.77V~285.77V	281.84V~285.27V	279.71V~283.56V	PASS
100% of day: 235.45V - 304.70V	280.70V~286.66V	280.63V~286.28V	278.56V~284.58V	PASS

Voltage Trend L-N



pqube.com



map.pqube.com



Schedule
Contract GS24F0066M

Our company: www.powerstandards.com
The PQube page: www.PQube.com
Our authorized distributors: www.PQube.com/distributors
Our customers: www.PQube.com/customers

Test-drive a PQube at map.PQube.com

