PQE
POWER SYSTEM
SDN BHD

PQE POWER QUALITY ANALYZER (G4000)

Digital Fault Recorder
Power Quality Analyzer
Class-A Power Meter
Revenue Grade Energy Meter

Power Quality & Energy Audit made easy:

- Two (2) parallel computation engines i.e. IEC 61000-4-30 and cycle by cycle aggregation
- A non threshold trigger power logger; record all the electrical parameter all the time
- The highest sampling rate i.e. 1,024 sampling per cycle
- The finest graph resolutions fro the trending i.e. 0.001mS
- The longest continues recorded period up to 2-year plus
- Four quadrant energy (active & reactive)
- Details inter-harmonic and sub harmonics

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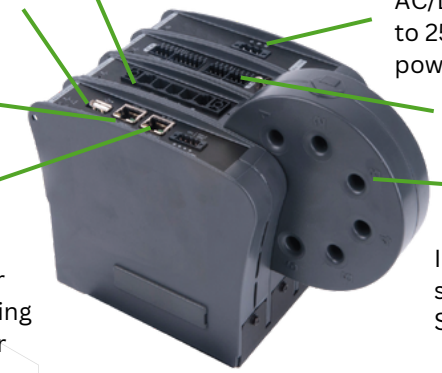


How Does it Work?

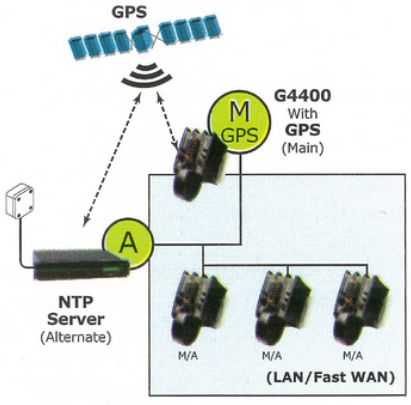
Patent-pending PQZip compression technology with a typical 1000:1 compression ratio allows virtually unlimited onboard data storage. The data is stored in its raw format (waveforms), allowing all possible parameters include all usual parameter such as RMS voltage, currents, powers and harmonics, and also grid or electrical network impedances. By analyzing the impedance, it is possible to investigate the root of the phenomenon and not only its consequences.

A unique time synchronization algorithm assures that measurements from different locations are synchronized with maximum deviation of +/- a single sample. By analyzing multiple locations with complete time accuracy, the exact propagation of an anomaly can be monitored and analysed.

The Solutions

G4400's are installed at key measurement points along the grid or electrical network, and data is logged continuously during every cycle of the network at up to 1,024 samples per cycle and stored for more than a year in the internal memory of each G4400. The data can be gathered periodically via computer using PQSCADA software for detailed analysis.

The G4000 Series feature a unique time synchronization algorithm that allows synchronization between devices connected on the same LAN with typical accuracy of 50 sec (maximum deviation of one sample). By using GPS, it is possible to attain accuracies of single micro seconds (1/1000th of a second), which is 1000x better than many other GPS-based synchronization solutions.



Typical Configuration for Energy Consumption

Typical Configuration for Energy Consumers Energy consumers bear the majority of the costs derived from poor power quality, so they have the highest incentive to install G4000 Series device throughout their facilities to detect anomalies and prevent their re-occurrence through analysis.

Both industrial and commercial facilities utilize the G4000 technology by installing it at the main service entrance on both sides of their transformer(s). By installing the devices in this manner, it is highly likely to identify if the source of power anomalies are being caused from inside the facility, G4000 series devices are installed near every potential problematic load, the source of the anomaly can be easily isolated and corrected.

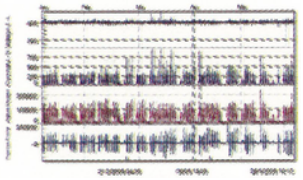


Figure 1: Half-year Trends

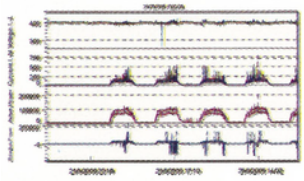


Figure 2: Day Zoom (5 Days)

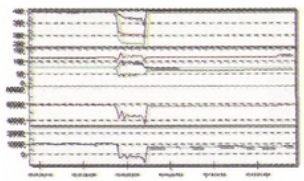


Figure 3: Second Zoom (5 seconds)

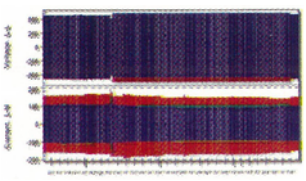


Figure 4: 25 Second waveforms

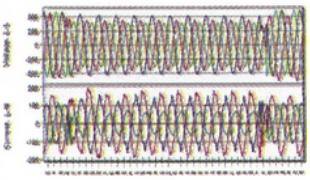


Figure 5: 17 Cycle waveforms

Unique Features*

Accurate Measurement
Cycle-by-cycle Measurements
IEC 61000-3-40 requires averaging every 200ms (10/12 cycles at 50/60Hz). Though this improves accuracy and allows measurement of inter-and sub-harmonics, it poses a critical problem when analyzing rapid events, such as motor start up, spot welding and breakers re-closing. The G4000 is the only measurement device capable of FFT (Fast Fourier Transform) every cycle for both IEC 61000-4-30 (Class A) and cycle-by-cycle measurements at the same time.

Fault Recording
Full scale reading of up to 54xVn and 50xIn (depends on PT and CT use) with 0.1% accuracy for both normal and extended scale provides precise, accurate fault analysis.

Simultaneous 12 A/D
The use of 12 Analog to Digital converters working in parallel, each one with maximum sample rate of 250,000 samples per second, provides incomparable with no cross-channel lags or accuracy interconnections.

Onboard Temperature Sensors
2 onboard temperature sensors assure accurate readings regardless of the ambient temperature.

Fast Flickering
IEC 61000-4-15 standard indicates two periods for flicker monitoring: 10 minutes (PST) and 2 hours (PLT). Many processes vary during 10 minute period making flicker level monitoring difficult. G4000 extended flicker standard algorithm allows analysis of flicker levels at 2 second, 10 second and 1 minute resolution, facilitating ease in decision making.

Time Synchronization
The G4000 system utilizes a special synchronization protocol over LAN. This allows 0.1 synchronization. Multiple combinations of LAN, GPS and internet time servers can be utilized to assure precise time synchronization.

Detailed Inter- and Sub-harmonics
The G4000 displays the sub-harmonics (below fundamental) and inter-harmonic (between integer multiplication of fundamental) values for every 5 Hz from DC to 1275 Hz (a total of 256 values). It can also be used to perform predictive maintenance, particularly to motors (motor generates inter and/or sub-harmonics when it starts to wear, depending on the problem type).

Connectivity
Onboard OPC Gateway and SCADA Support
The embedded integral OPC Server in each G4000 provides seamless and immediate connection to any SCADA system or other OPC supported application.

External Communication Concept
GPRS, EDGE, UMTS, ISDN modem, dialup modem, WiFi, ADSL and other communication devices are supported using external modules connected over LAN.

Power
Ride Through
The G4000 internal super capacitors provide reliable power for up to 25 seconds without the need of any power source or batteries. This feature provides logging capabilities during re-closing situations or a shutdown sequence

POE Support
PoE (Power over Ethernet - IEEE 802.3af) enables the delivery of 48VDC over standard network Ethernet cable without interrupting data communication.
With 1 powered port in and 1 port out, the G4000 can be powered by a PoE Source and provide power to PoE drain.

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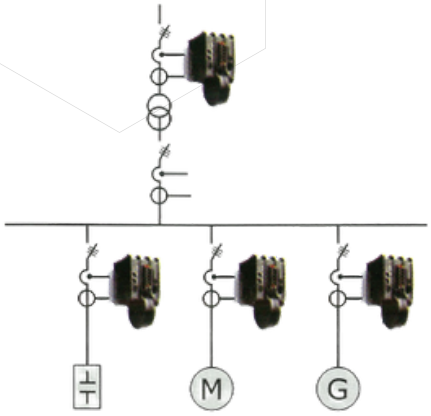
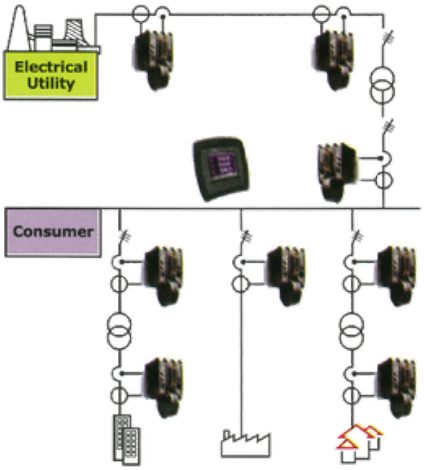
Typical Configuration for Energy Provider

Energy providers, which include generation, transmission, and distribution companies, can use G4000 technology to identify the sources of power quality anomalies.

Typically, generation companies install G4000 devices at generation outputs and at various connection points to the grid and at transformers throughout the distribution system. By installing devices on each side of the transformers, it is possible to determine sources of failure and losses, allowing preventive maintenance by monitoring performance trends. When significant amount of power quality anomalies at the utility result from specific consumer networks, it is advantageous to install G4000 Series devices near each consumer site, or at specific key problematic points throughout the grid.





Local & Remote Displays

G41000 Remote Displays represent the next generation in power network information exchange.

Various unprecedented setup configurations, enabled over great distances using Ethernet infrastructure, can connect remote displays and G4400 Power Quality Data Centers. To illustrate, one remote display can monitor multiple Power Quality Data Centers and one Data Center can be monitored by multiple remote displays.

Comprehensive Web Server for Remote Monitoring

The integral web server allows comprehensive monitoring and control of the unit, with 3-level user privileges and 128-bit SSL cryptographic protocol. It include tabular display screens, graphical display and remote control and configuration screens. By using an existing web browser, the inconvenience of installing dedicated software is avoided. Most operations can be performed via the web server interface

PQSCADA Investigator

By effectively processing enormous amounts of logger network data, the PQSCADA Investigator provides an immediate understandable picture of everything that happened within the network. All selected parameters from single or multiple measuring points are presented on one synchronized time line, offering operators a clear and instant graphical view of everything that occurred within the network in a specific timeframe.

Zoom In/Out
View the data in any resolution, zooming in from a year's information to millisecond then out again.

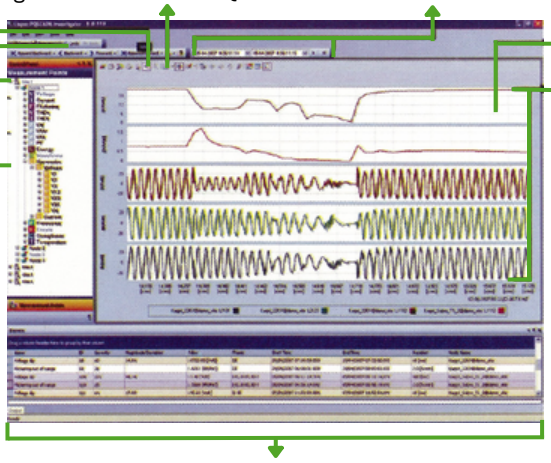
Export
Graphs and data can be exported to a variety of formats including Microsoft Excel, Metafile and PQDIF formats.

Time Selection
Allows users to shift through time and instantly spot any anomalies within the network.

Undo & Redo

Hierarchal View of Unlimited device

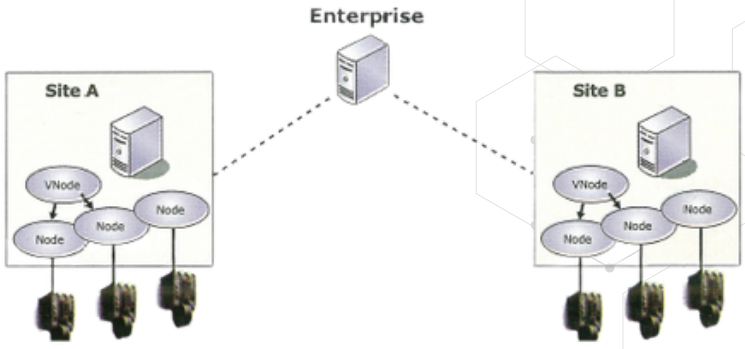
Selection of Any Parameter
Calculate in post-processing, select and add any desired power parameter during the analysis process. Colorful parameters and measurements from different devices can be highlighted and moved from one axis to another, making events and propagation detection a very easy task.



Controlable Axis

High-Low Graph
It allow even sub-cycle monitoring at yearly scale at a glance. The application draws a line from the lowest to the highest value during this period. In this way, single cycle sag can be easily monitored on a one tear scale.

Filtered Events and Events Severity
Instead of limiting metering capabilities by pre-determining triggers & thresholds, customized event conditions are available and allow users to select, sort & define events based on conditions, triggers and thresholds after the completed data logging. All logged information is kept intact for modified sorting according to future compliances and standards.



PQE POWER QUALITY ANALYZER (G4000)

Features

Measurement

- Accuracy 0.1%
- Up to 1024 samples per cycle
- 12 channels: 4 voltages, up to 6 current, 2 temperature indicators
- Simultaneous 12 channel sampling at 250 kHz (4 micro sec)
- Cycle-by-cycle trends for all RMS values and harmonics
- Harmonics up to 511th, inter- and sub- harmonics
- Accurate measurement even with presence of harmonics and at all measurement scale
- Onboard auto temperature calibration provides high accuracy in all temperature range
- Full scale readings 10x from nominal voltage and currents at high accuracy

Onboard Data Logging

- 1+ year, every cycle onboard logging of all measurements at high accuracy
- Patent-pending PQZip compression technology with typical 1000:1 compress ratio
- Solid state standard off-the-shelf compact flash storage, up to 8 GB

Standard Compliance

- Standard compliance testing to EN50160, IEEE 519, and others
- 2 simultaneous and parallel harmonic computations: IEC 61000-4-30 and cycle-by-cycle
- Voltage flickering according ti IEC 61000-4-15 and unique fast flicker compatible algorithm for real time analysis.

Connectivity

- 2 fast Ethernet ports (10/100 MBit) with Power over Ethernet (PoE) device and source.
- USB and RS-485/422 ports (2- and 4- wires, up to 115,200 bps)
- Ethernet bridge to RS-485/422 products.
- Conventional TCP/IP based data packaging protocol, provides communication for traditional TCP/IP supported software.
- Comprehensive build-in web server for remote monitoring using standard web browser.
- 2 integral OPC servers (DA and AE) for seamless connection with SCADA system

Mechanical Design and Expansion Options

- Unlimited number of remote display can be connected to one G4400
- Unlimited number of G4400 can be monitored single remote display
- No limit to the distance between the device and remote display
- Rear mounting: optional DIN rail mount
- Standard Compact Flash (CF) expansion slot
- Hardware expansion by stack-able optional modules

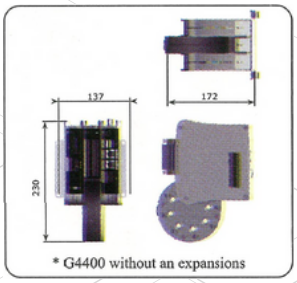
Power Supply

- 4 power supply sources with automatic seamless changeover
- Versatile AC power and DC voltages
- Power over Ethernet (PoE) allows both reception and dispatch of power over the Ethernet port
- Up to 25 second ride through at power loss

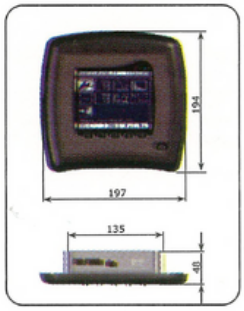
Real-time Measurement	**G4410**	**G4420**	**G4430**
Voltage/current: per phase, average, unbalance	/	/	/
Power: real, reactive, apparent, power factor,	/	/	/
frequency	/	/	/
Energy: bi-directional, in, out, net, total	/	/	/
Demand: window, sliding window	256	512	1024
Sampling rate, maximum samples/cycle	127th	255th	511th
Harmonics (individual, even, odd, total) up to	/	/	/
Measurement according to IEC 61000-4-30		/	/
Cycle-by-cycle RMS, Frequency and Harmonics	x2	x10	x10
Measurement during overloading (from nominal)	12 bit	16/20*	16/20*
Type of Analog to Digital converter		bit	bit
Data and Waveforms logs			
Cycle-by-cycle PQZIP logging	/	/	/
Event logs	/	/	/
Waveform logs	/	/	/
Min/Max logs for any parameter	/	/	/
Timestamps, resolution in micro seconds			
- with Ethernet synchronization	50	50	50
- with GPS synchronization	/	/	/
Internal Memory			
Firmware limit for contiguous data and waveform	1 day	1 month	1+year
capture	64 MB	2 GB	8 GB
Power Quality Analysis			
Sag/swell monitoring	/	/	/
Symmetrical components: zero, negative, positive	/	/	/
Transient detection, microseconds (50/60Hz)	78/65	39/32.5	19.5/16
Flicker (IEC 61000-4-15)		/	/
Fast Flickering			/
Compliance testing to EN50160	/	/	/
EN50160 Timestamps		/	/
Configurable for IEEE 519-1992, IEEE 1159, SEMI	/	/	/
Timestamps of above		/	/
Interharmonics			/
Communication Ports and I/O			
Ethernet Port/s	1	2	2
Power Over Ethernet (PoE) - in, out		/	/
RS-485/422 port	/	/	/
USB Port		/	/
Compact Flash (CF) Expansion		/	/
Voltage Ride though on Power Loss	10 sec	25 sec	25 sec
Onboard comprehensive WEB server	/	/	/
Onboard OPC (Open Connectivity) server		/	/
OPC Gateway: other RS-485/422 accessible via OPC		/	/

G4400 Specifications

Input Channels:	up to 12
Rated voltage:	800V (8kV for 10x range(
Power Supply:	Max 10 VA
Voltage inputs impedance:	>3MOhm
Current input burden:	0.08VA
Dimensions (HxWxD):	230x137x172 mm
Power supply:	110-230 VAC ~ 50-60 Hz
	48 VDC
	PoE in, PoE out



* G4400 without an expansions



G4410 Specifications

Dimension:	197x200x46 mm
Power Supply	
Operating range:	110-230 VAC ~ 50-60Hz
Auxiliary DC Supply:	48 VDC
Auxiliary Supply-PoE in:	PoE In according to 802.3af
LED backlight	
160x128 pixels Graphic screen	
6 function buttons	
Maximum distance to G4400:	unlimited