ELSPEC G4000

Power Quality Data Center

Power Quality Analysis made easy:

- Continuous every cycle logging of all power quality parameters

- Up to 1,024 samples per cycle resolution

- No thresholds or other limitations

Power Quality Solutions

elspec-ltd.com

New Concept in Power Quality Survey

The ELSPEC G4000 Series brings revolution to your power. It stores all information all the time. The waveform of every cycle is continuously stored in onboard memory for more than a year at high accuracy, allowing no gaps in data recording. In addition, a unique time synchronization algorithm assures that data from multiple locations is synchronized and displayed on the same time scale. The result is that every anomaly can be accurately analyzed and its source can be pinpointed definitively. Since all data is stored continuously and accurately over a long period of time, the ELSPEC G4000 Series is much more than an analysis device, but rather a full-fledged power quality data center.

The main objective of power quality troubleshooting engineers is to identify the source of an event or potential failure, and determine the required corrective action. When performing troubleshooting procedures, there is always a lack of information: data between events, events that occurred below pre-set thresholds, data from other locations, and other un-recorded parameters. The lacking information is due to the traditional logging concept of long periods and short events. As a result, in most cases it is only possible to monitor the event without identifying its source. More importantly, it is virtually impossible to determine what needs to be done to prevent reoccurrence of the problem.

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 to be calculated from this information. The available parameters include all usual parameters such as RMS voltages, currents, powers and harmonics, and also grid or electrical network impedances. By analyzing the impedances, 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 the anomaly can be monitored and analyzed.

What Makes it so Unique?

The ELSPEC G4000 Series is much more than a Power Quality Analyzer; it is a 4th generation Power Quality Data Center.

1st Generation:	Simple power meters without memory, whether analog or digital
2nd Generation:	Data loggers that provide periodic data logging
3rd Generation:	Power Quality Analyzers that allow logging of partial information according to pre-defined thresholds
4th Generation:	Power Quality Data Centers that stores all required data every cycle for more than a year and more

While 3rd Generation equipment can tell what happened and when (e.g., a voltage sag of X% at location Y at time Z), Power Quality Data Centers tell why it happened and what the source of the problem is. Using these 4th Generation devices will allow the power quality engineer to perform corrective action to prevent the problem from reoccurring.

If thresholds are still desired, no longer is there guess-work involved in advance… rather, simply use post-processing thresholds. When data logging is completed, simply select the suitable thresholds to obtain the necessary data from an event.

To accurately analyze an event when using 3rd Generation event-based meters, each of the following would need to occur:

- ALL meters in the network detect the event and record it

And
- ALL meters have the required amount of memory

And
- ALL possible parameters are recorded and event thresholds set correctly

And
- ALL meters are time-synchronized in +/- one-sample resolution (micro seconds)

And
- The analysis software used can analyze ALL of the above simultaneously

Unfortunately, usually at least one of the above items does NOT happen, making it impossible to correctly analyze events. Even in cases where an educated guess may provide the answer, it is usually NOT definite enough to drive expensive correction actions.
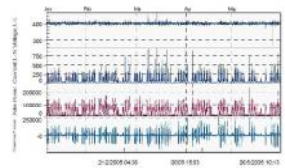

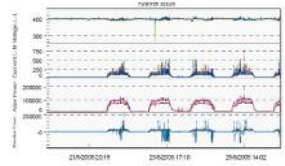**Figure 1 :**
Half-year Trends

Figure 2 :
Day Zoom (5 Days)

Figure 3 :
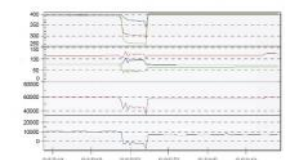**Second Zoom (5 seconds)**
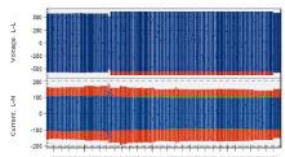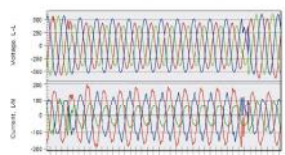

Figure 4 :
25 Second Waveforms

Figure 5 :
17 Cycle Waveforms

The Solution

The ELSPEC G4000 Series includes:

- ELSPEC G4400 – Power Quality Data Centers
- ELSPEC G4100 – Remote monitors/displays (optional)
- PQSCADA – Central analysis software

ELSPEC 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 ELSPEC G4400. The data can be gathered periodically via computer using PQSCADA software for detailed analysis.

The ELSPEC G4000 Series features a unique time synchronization algorithm that allows synchronization between devices connected on the same LAN with typical accuracy of 40-50ìsec (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.
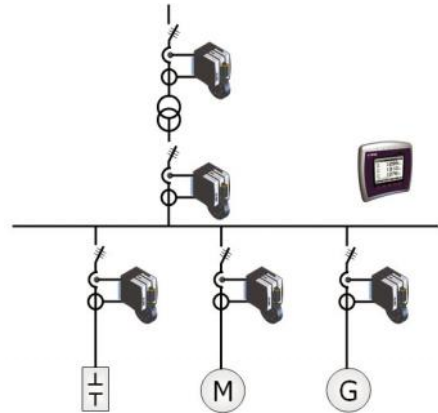
Typical Configurations

To serve the variety of electrical networks serving industrial, commercial and utility applications, implementation of the ELSPEC G4000 Series Power Quality Data Center system is customized to meet all designated site and system requirements.

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 ELSPEC G4000 Series devices throughout their facilities to detect anomalies and prevent their reoccurrence through analysis.

Both industrial and commercial facilities utilize the ELSPEC 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 from inside (the facility) or outside (the utility). If the 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.

Typical Configuration for Energy Providers

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

Typically, generation companies install ELSPEC 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 transformers, it is possible to determine sources of failure and losses, allowing preventative maintenance by monitoring performance trends. When significant amount of power quality anomalies at the utility result form specific consumer networks, it is advantageous to install ELSPEC G4000 Series devices near each consumer site, or at specific key problematic points throughout the grid.
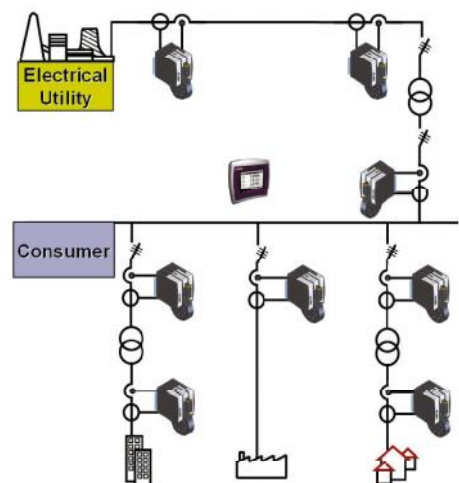
Local and Remote Displays

ELSPEC G4100 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 ELSPEC 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.

Display Capabilities

Various display capabilities of comprehensive network measurement data.

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 includes 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; the screens are intuitive and easy to use. This means that monitoring, managing and analyzing network data can be performed using the web interface.

PQSCADA Analysis Software

Innovative PQSCADA enterprise analysis software enables operators to view, control, analyze, and monitor multiple measurement devices simultaneously. Data is accurately time-synchronized within sites and across sites.

The practically unlimited amount of data, collected from the Elspec G4400 devices, is processed and analyzed by using the PQSCADA software. The operator receives a comprehensive picture of graphical system trends and time synchronized power quality values from multiple devices on same screen for status and anomaly source-propagation analysis.

The software's distributed architecture is scalable and allows easy management of countless local and remote measurement devices. The scalability scheme supports physical expansions and reflects the hierarchy of the components in the electrical grid.
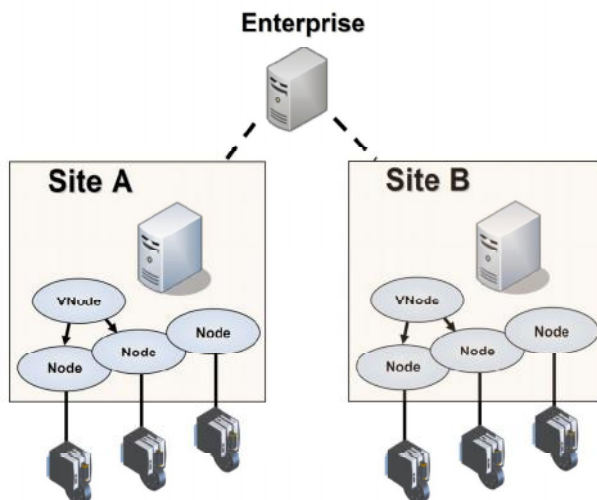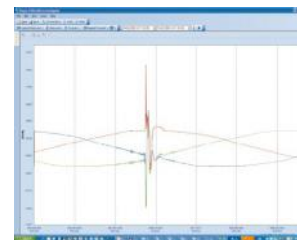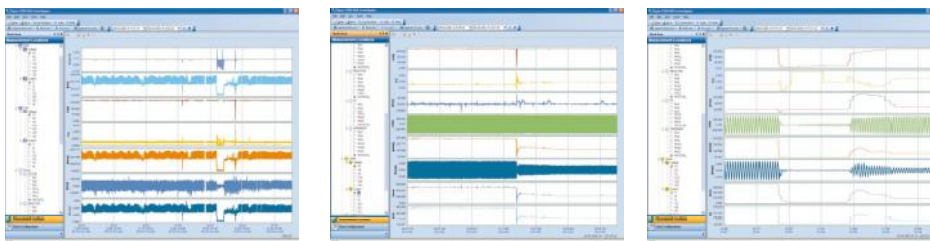
The architecture is built on nodes, sites and enterprise:

Nodes are software components that directly control measurement devices for collection, storage, management, and ultimate analysis of measurement data.

Nodes are grouped logically under sites which serve as entry points for various applications (internal and 3rd party) and provide a real-time picture of all connected points for management and configuration functions. Enterprise is the umbrella site that comprises all sites and provides all-inclusive snapshots of the network (trends and data).

F e a t u r e s

Measurement

- Accuracy < 0.1%

- Up to 1,024 samples per cycle

- 12 channels: 4 voltages, up to 6 currents, 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 voltages and currents at high accuracies

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 EN 50160, IEEE 519, and others

- 2 simultaneous and parallel harmonic computations: IEC 61000-4-30 and cycle-by-cycle

- Voltage flickering according to 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 built-in web server for remote monitoring using standard web browser

- 2 Integral OPC servers (DA and AE) for seamless connection with SCADA systems

Mechanical Design and Expansion Options

- Unlimited number of remote displays can be connected to one Elspec G4400

- Unlimited number of Elspec G4400 can be monitored by 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 expansions by stackable optional modules

Power Supply

- 4 power supply sources with automatic seamless change-over

- 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 Measurements

	ELSPEC G4410	ELSPEC G4420	ELSPEC 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	+	+	+
Sampling rate, maximum samples/cycle	256	512	1024
Harmonics (individual, even, odd, total) up to	127th	255th	511st
Measurement according to IEC 61000-4-30	+	+	+
Cycle-by-cycle RMS, Frequency and Harmonics	-	+	+
Measurement during overloading (from nominal)	x2	x10	x10
Type of Analog to Digital converter	12 bit	16/20* bit	16/20* 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	1	1	1
Internal Memory	64MB	2GB	8GB
Firmware limit for contiguous data and waveform capture	1 day	1 Month	Unlimited

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-through 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	-	+	+

Elspec G4400 Specifications

Input channels:	up to 12
Rated voltage:	800V (8 kV for 10x range)
Power supply:	Max 10 VA
Voltage inputs impedance:	>3 MOhm
Current input burden:	0.08 VA
Dimensions (HxWxD):	230x137x172mm
Power supply:	110-230 VAC ~ 50-60 Hz
	48 VDC
	PoE in, PoE out

Up to 25 second ride-through

1,024 samples per cycle revolution

PQZip typical 1000:1 compress rate
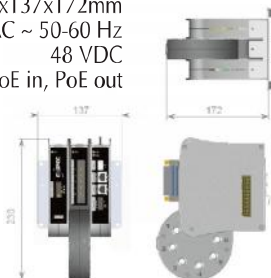
*ELSPEC G4400 without an expansions

Elspec G4100 Specifications

Dimensions (HxWxD):	197x200x46 mm
Panel cutout:	135x135 mm
Power supply:	48 VDC
	PoE in

LED backlight

160x128 pixels Graphic screen

6 function buttons

Maximum distance to Elspec G4400: unlimited

About Elspec

Elspec develops, produces and markets comprehensive electrical power quality solutions and sophisticated electrical network analysis technologies. Implemented applications spanning the industrial, commercial and utility sectors enhance electrical network quality and increase energy savings using advanced network analysis tools.

The Elspec product family features:

Equalizer real-time power quality enhancement system for optimal power quality; *Activar* power factor correction unit of unlimited transient-free operations; *Elspec G4000* Power Quality Data Center for optimal power quality using patent-pending PQZip compression technology for selection and endless storage of logged measurement data; *PPQ-306* portable power quality analyzer for in-depth site analysis; *PQSCADA* measurement and analysis software for evaluating complex data in graphical format; I*ron Core Reactors* for harmonics filtration; *MKP Capacitors* with low-losses for reactive energy compensation.

ELSPEC

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