

The BlackBox

G4400

3 Phase Power
Quality Analyser



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BlackBox G4400

Designed for Your Needs

A comprehensive energy management and power monitoring program is the key to success for any energy provider/consumer, regardless their size. The BlackBox G4400 series, the most advanced power meter in the market today, is equipped with the revolutionary PQZIP patent algorithm for continuous waveform recording. It enables you to predict, prevent and troubleshoot an incidence easily, without the need to set any trigger or threshold in order to capture specific event.



Utilities

(Transmission, distribution, generation)

- Optimizes protective equipment configuration and substation automation solutions
- Ensures a reliable & consistent supply of energy
- Evaluates the performance of breakers and relays
- Identifies and manage peak demand
- Real time power quality monitoring to meet any international standard
- Produces detailed & comprehensive statistical records

Energy Consumer

(Critical power, industrial, commercial, government etc.)

- Measures & analyzes system efficiency, provides solutions and increases profits
- Negotiating capabilities with power providers
- Detect electric bill inconsistencies
- Avoid PQ compliance issues
- Real time PQ monitoring and analysis

Elspec's Unique Technology

PQZIP Compression Technology

The PQZIP Patent compression algorithm enables the meter to continuously store waveform signals over a long period of time, whether an event of interest was identified. This technology is unique to Elspec and ensures precise and accurate characterization of electrical system dynamics.

PQZIP Compression features:

- ✓ Continuous waveform recording
- ✓ Supreme Trend Resolution
- ✓ Extended Harmonic Recording
- ✓ Threshold free setup
- ✓ Easy deployment

Parameter	Resolution
Waveform	20µsec
RMS	½ Cycle
THD	½ Cycle
TDD	½ Cycle
Unbalance	½ Cycle
K Factor	½ Cycle
Crest Factor	½ Cycle
Powers	1 Cycle
Harmonics	1 Cycle
Frequency	1 Cycle

Discover

Outstanding Features

Dual Range Gain

Elspec's pioneering measurement method uses a dual-range gain of 2 X 16 bit ADC yield, a superior accuracy and resolution. Therefore, the use of a 16 simultaneous ADC (each one with 1,024 sample/sec), provides incomparable accuracy with no cross-channel lags or interconnections.

Accuracy standards

The G4k superior accuracy surpasses by far, the highest standards set by the industry. The BLACKBOX device series compiles with standard for:

Power Quality

- ✓ IEC 61000-4-30 Class A
- ✓ IEC 61000-4-15 Flicker meter
- ✓ IEC 61000-4-7 Harmonics and inter-harmonics

Energy

- ✓ ANSI C12.20 0.2%
- ✓ IEC 62053-22/23 class 0.2

Temperature Adjustment

The G4k adjusts automatically its calibration parameters based on real time temperature reading.

SCADA Compatible

The G4400 series is equipped with standard industrial protocol for seamless integration into any existing SCADA system:

- ✓ Modbus TCP/IP and RTU
- ✓ DNP 3
- ✓ OPC

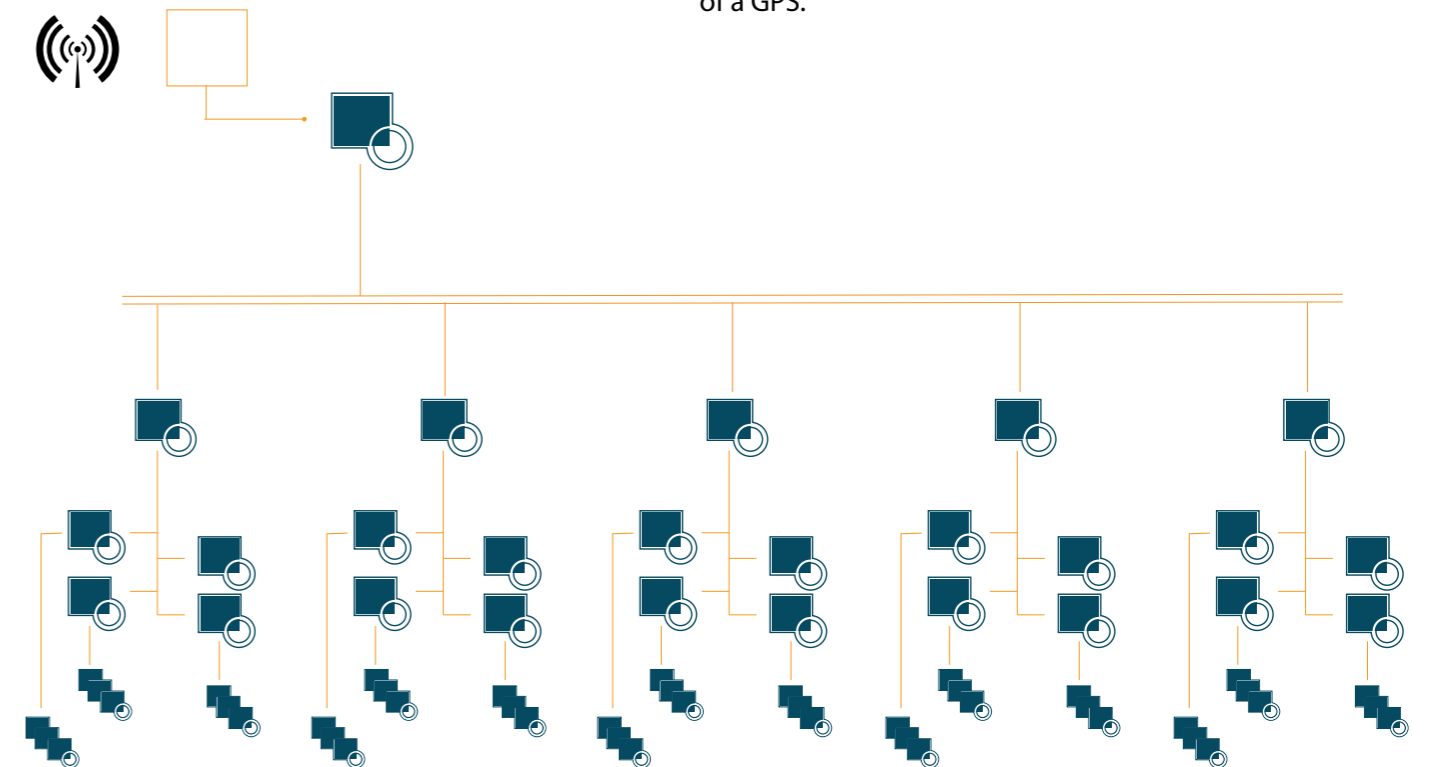
High End Power Quality and billing measurement

Thousands of power quality and energy usage parameters are available in real time in the G4400 series. The G4400 series provides advanced power disturbance recordings meeting the highest standards on the market. The meter is designed with the most accurate level in order to be used as a primary meter, a sub-meter, as a detector of inconsistencies in electricity bills.

Time Synchronisation

The G4400 series uses a special continuous synchronization algorithm to ensure accurate time stamping of up to 1µsec using SNTP, GPS, IRIG-B and DCF-77.

Each G4400 meter acts as a SNTP server therefore each meter on the network is synchronized to each other over LAN. This allows accurate time stamping, without the need of a GPS.

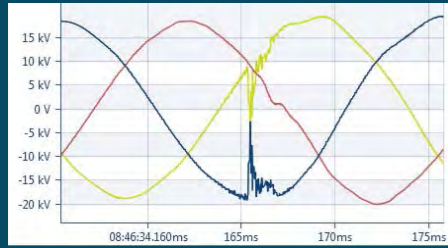


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Accurate Results



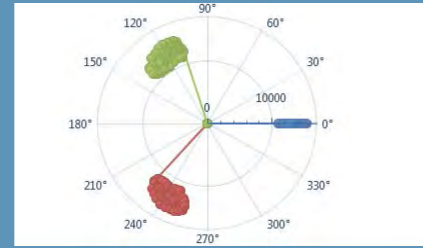
Supreme Trends Resolution

The BLACKBOX measures and records 5,000 power parameters continuously at a resolution of 1/2 cycles, 10/12 cycles, 150/180 cycles, 10 min and 2 hours of which, any given resolution is calculated for display and reporting purposes. Hence, there is no need to select which parameters to log, and more importantly, which parameters to ignore.



Waveform & Fault Recorder

- Continuously samples and records waveform signals at 1,024 sample/cycle
- Threshold free setup
- 2 X 16 bit converter yield superior waveform resolution
- Waveform capture of up-to 8kVPk



Phasor Analysis

Phase angle between voltage and current channels are logged continuously at 1 cycle resolution. Phasor charts display the phase angled over time in a unique phasor chart.

PQSCADA Sapphire

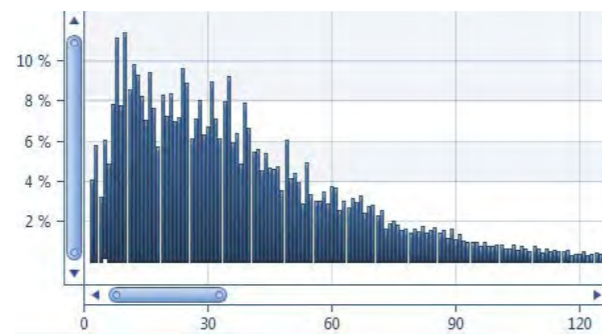
Accurate Data Anywhere, Anytime

PQSCADA Sapphire is a comprehensive, yet easy to use, analysis and engineering software designed to manage and monitor power quality analyzers, digital fault recorders, revenues meters and other IED. The PQSCADA Sapphire express edition is complimentary with all Elspec devices.

Parameter	Min	Max	Avg
V1	13.36V	12917.17V	12954.08V
V2	13.36V	12917.17V	12954.08V
V3	13.36V	12917.17V	12954.08V

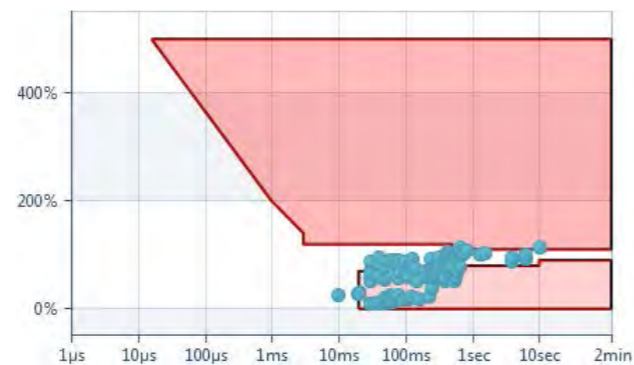
Harmonics & Inter-harmonics Analysis

- The BlackBox has two FFT engines for harmonics analysis:
- Cycle by Cycle: performs FFT at 1 cycle resolution for extended bandwidth. This engine provides 512 harmonics order at 50Hz resolution.
 - 10/12 Cycles: performs FFT 10/12 cycles resolution for extended resolution and sub-grouping calculation. This engine provides the magnitude and angle of 512 spectrum components at 5Hz resolution.



Comprehensive Event Mechanism

The G4400 series is designed to detect any event occurring on your system. The event mechanism allows you to configure events on any measured parameter (more than 1,000) and/or I/O ports. The event mechanism supports out-of-limit events as well as rate of changed limits. As the G4400 records the waveform signals continuously. The event configuration doesn't trigger the recording but stores summary logs including start and end time, duration, severity and magnitude of the event. All the events can be displayed in a tabular or scatter charts as CBEME/ITIC.



Extensive Charts Capabilities

- **Trend chart:** View electrical parameters for a selected time range as one or more graphs
- **Grid chart:** View selected parameters for selected time range in a table.
- **Spectrum chart:** View selected parameters for selected time range in a column graph. This allows viewing and investigating frequency domain phenomenon.
- **Event chart:** View system, power quality, I/O and custom events in a table for a selected time range. This table provides valuable information regarding occurrence, duration and severity of those events.
- **Statistics chart:** View selected parameters for a selected time range. It shows two sub charts: a "relative chart" and a "cumulative chart".
- **Scatter Parameter chart:** View selected parameters for a selected time range. It allows reviewing scattered dots of a specific parameter in relation to another parameter.
- **Scatter Event chart:** View events for a selected time range according to standards or custom definition (such as CBEMA)
- **Phasor chart:** View the phasor's amplitude and angle for a selected time range.
- **Cyclic Histogram chart:** View overlaid voltage waveform cycles for a selected time range. It is made possible thanks to the unique continuous recording mechanism of Elspec BlackBox analyzers. The histogram shows the deviation from the expected ideal waveform by overlaying the waveforms.
- **Summary chart:** View parameters for a selected time range. This chart displays the minimum, maximum and average value of each parameter.

Features

- ▶ Easily read COMTRADE, PQDIF & PQZIP files
- ▶ Comprehensive power quality module
- ▶ Geographical map view*
- ▶ Automatic power quality report for EN50160, IEEE1159, FOL, GOST.
- ▶ Configurable report module to design your own report template
- ▶ Power quality grid line code configuration
- ▶ Export to Excel, word, JPG & PDF
- ▶ API to Matlab for advance post processing analysis*
- ▶ Export data to COMTRADE, PQDIF, Excel & CSV
- ▶ Multiple Site investigation

* Available on the Enterprise & Professional plan only

Optional Accessories

Multi I/O extension to comply with every application

The G4400 series offers the option to expand the meter capability by adding the multi I/O module in conjunction with all metering functionalities. The I/O module includes analog and digital I/O as well as a relay output to specifically work with your application.

The multi I/O module extends the meter capability in order to replace RTUs and PLCs for energy management and substation automation. With the G4400 series you can monitor the reliability of system apparatus such as transformers, circuit breakers and other critical equipments. The G4400 series supports up to 2 I/O modules using internal power along with:

- ✓ 8 fast digital input at 16sample/sec
- ✓ 4 fast digital output at 16 sample/sec
- ✓ 4 analog 4-20mA input sampled at 1Hz with programmable scaling
- ✓ 4 analog 4-20mA output
- ✓ 3 Relays



Real Time Local & Remote Monitoring

The G4400 series is accessible locally or remotely, using either an integral web server interface or the Elspec G4100 remote display. The Elspec G4100 represents the next generation in power network information exchange.

By using IP based communication, various unprecedented setup configurations are enabled over a great distance. Using ethernet infrastructure, the G4100 can monitor multiple G4400 meters connected to the network remotely or connected to each analyzer directly.

The G4100's display provides full control over all meters allowing technicians and field operators to fully configure and operate each single meter in the network. The G4100 can be powered by external power supply or through the G4400 embedded PoE port.



Multi-Frequency 3.5G Wireless Modem

The Wireless GPRS modem provides a fast mobile communication access and offers the perfect solution in industrial data communication. It is fitted with a sim card drawer structure, and it may be connected with a standard RS-422 interface. Data is transmitted at 3.5G, and is fully compatible with GSM/GPRS/EDGE



GPS

The GPS provides an optimal mobile time synchronization solution for accurate time data via satellite signal. In absence of many other technologies, it synchronizes the time at any remote location.



Specifications

Product Series	G4410	G4420	G4430
Voltage Sampling Rate, Maximum Samples/Cycle	256	512	1024
Voltage Harmonics (Individual, Even, Odd, Total) Up to -	127 TH	255 TH	511 TH
Type of Analog to Digital Converter	16/20 ¹ bit	16/20 ¹ bit	16/20 ¹ bit
Storage Capacity w			
Internal Memory	128 MB	4 GB	16 GB
Power Quality Analysis			
Transient Detection, Microseconds (50Hz/60Hz)	78.1/65.1µs	39/32.5µs	19.5/16.3µs
Communication Ports			
Ethernet Ports	1	2	2
Power Over Ethernet (PoE- Out)	-	1	1
Voltage Ride Through on Power Loss (up to)	10 sec.	25 sec.	25 sec.
Specifications			
Applicable Measurement Standards		Control	
EN50160, IEEE1159, IEEE519, IEC61000-4-15, IEC61000-4-7, IEC61000-4-30 Class A, IEC62053-22/23 Class 0.2		Comprehensive web server for local and remote real-time monitoring and control	
Applicable EMC Standards		Applicable Environmental Standards	
EN55011 Group 1 Class A, EN60439-1 (clauses 7.9.1, 7.9.3, 7.9.4, 7.10.3, 7.10.4), FCC Part 15 Subpart B Class A, IEC61000-3-3, EN61000-6-2, IEC60255		IEC60068-2-1, 2, 6, 11, 27, 30, 75	
Voltage		Applicable Safety Standards	
Channels	3 Phase + Neutral	EN61010-1:2001 2 nd Edition	
Nominal Full Scale	1000V	Power Supply	
Maximum Peak Measurement	8kV	Auxiliary Supply – PoE In	According to 802.3af
Input Impedance	3MΩ	Auxiliary DC Supply	48 Vdc
Uncertainty	0.1% of Nominal	Operating Range	100-260 VAC: 50/60 Hz 100-300 VDC
Current		Time	
Channels	3 Phase + Neutral	Real Time Clock	20ppm
Nominal Full Scale	5A	Synchronization Device	
Maximum Peak Measurement	50A	GPS	100-200µs
Burden	0.0001VA@5A	IRIG B	100-200µs
Phase	±0.42°@3A ±0.17°@5A	SNTP Server	50-100µs
Uncertainty	0.1% of Nominal	DCF-77	±15ms
Frequency		Communication Protocols	
Fundamental Frequency	42.5 Hz to 69 Hz	Modbus TCP, Modbus RTU, OPC, DNP3 SMTP Client	
Frequency Resolution	10 mHz	RS-485/422	
Frequency Accuracy	±10 mHz		
Physical		Environmental Conditions	
Dimensions	175mm x 232mm x138mm	Operation Temperature	-20°C to 70°C(-4°F to 158°F)
Weight	1.7Kg	Storage Temperature	-40°C to 85°C(-40°F to 185°F)

¹ Effective bits

Disclaimer: Specifications subject to changes without prior notice

Worldwide Innovator in Power Quality

Since 1988 Elspec has developed, manufactured and marketed proven power quality solutions far exceeding our clients' needs and expectations. Our innovations not only simplify the understanding of the quality of power itself, but are also highly compatible, making it suitable for any business and/or application. Elspec's international team of professionals with extensive experience in electrical engineering, are ready to provide a tailor-made strategy that will enable a sustainable and efficient use of your electrical energy.



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