

CARLO GAVAZZI
Automation Components



PQA 700

Power Quality Analyser

Measurements
of all the
electrical
variables,
harmonic
analysis
and other
parameters
according
to EN 50160



Control

PQA700

Portable Power Quality Analyzer



- Base accuracy 0.5% RDG (current, voltage)
- Measurement of single phase and system variables: V, A, W, VA, var, TPF, DPF, Hz, Wh, varh-L, varh-C, VAh
- Complete Harmonic analysis up to the 50th harmonic
- 20ms continuous signal sampling
- Automatic storage of MIN, MAX and AVG values
- Time-based curve distribution of variable and load
- Statistic management of stored variables
- Oscilloscope functions
- Built-in printer
- RS232 port
- Rechargeable battery
- Complete accessory set
- Carrying case
- Analysis software

Description advantages

PQA700 is a complete power quality analyser suitable to check the electrical phenomena according to what is required by the EN50160 Standard (Harmonics, Supply voltage dips, Supply voltage variations and Supply interruptions). The basic features are particularly interesting because they include: a display which, thanks to its shape, shows the information clearly and neatly; a built-in impact dot matrix printer for printing the measurement results manually and automatically; a rechargeable battery to allow the user to take measurements even under tough disturbances and special power supply conditions; an RS232 communication port to download and process the measurements adequately and last but not least an easy and intuitive operating mode.



All this is supplied together with a rich equipment of accessories including a set of three accurate clamp-on probes which allows to take measurements up to 1200A (with two selectable full scales: 100A or 1000A) a complete set of cables, an analysis software ...

On request a 3000A flex clamp probe is available. (model: Flex 3000Q)



... and finally a modern and rugged carrying case. The compact dimensions, the rugged construction, the shape and the reduced weight of the instrument simplify its use and its location under any condition of installation.

The Main Menu

Some examples of display pages

The selection menu of the measuring functions is immediately available by means of a keypad command and allows the operator to:

- Display the instantaneous measurements
- Display the energies
- Enable the oscilloscope function
- Enable the harmonic analysis
- Enable the recording of supply voltage dips
- Enable the MIN / AVG/ MAX recording
- Set the clock
- Program the basic parameters of the instrument



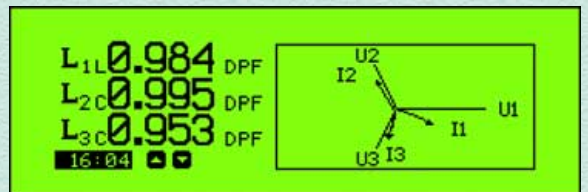
The Instantaneous Variables

The instantaneous variables are displayed clearly and neatly; moreover they're displayed with characters at various heights, according to their importance, and they're grouped per page, by system variables and phase variables so that they can be easily compared among them.



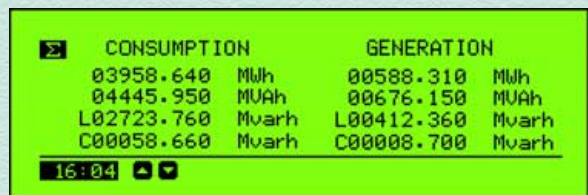
The Power factors

Particular attention has been given to the way of displaying the variables: in case of TPF and DPF the values of each phase are displayed together with the FRESNEL diagram.



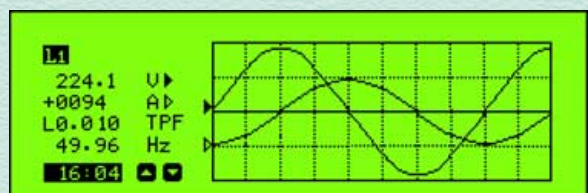
The energies

The energies are displayed: by consumed and exported active, reactive and apparent energy and by time period.



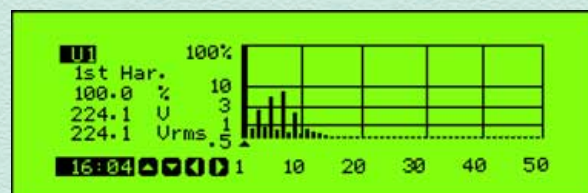
The oscilloscope function

The behaviour of the current and voltage variables is displayed comparing the relevant waveforms for each phase. Moreover, also the main instantaneous variables are displayed in a numeric form: V-A-TPF-Hz.

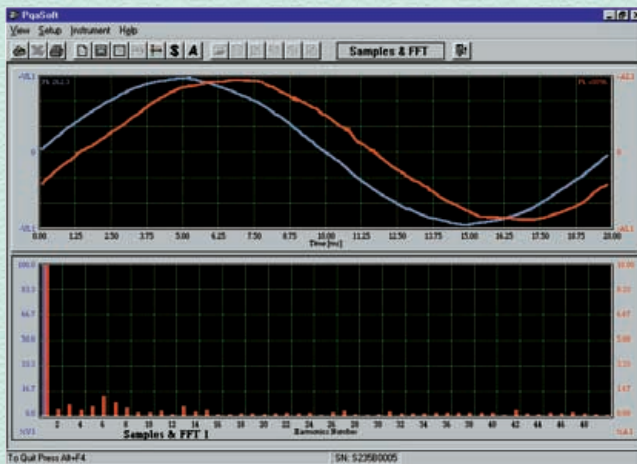


The harmonic analysis

The FFT analysis displays the harmonic content in various pages: by phase, current and voltage. A pointer allows the operator to display for each harmonic the percentage value, the absolute value as a current or voltage and the corresponding harmonic order.



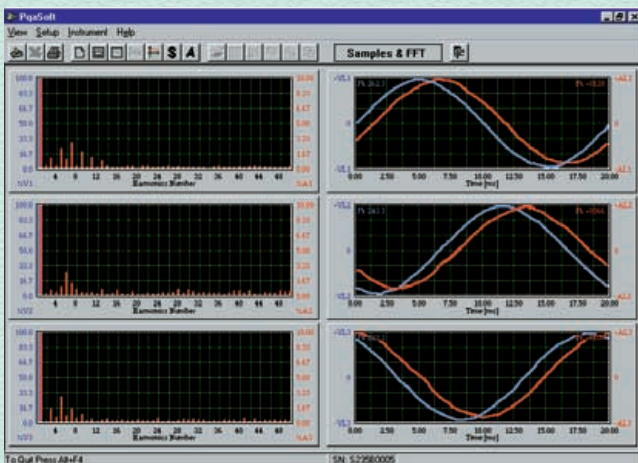
The analysis software PqaSoft



This Windows 95/ 98/ 2000/ XP based software allows the user to download all the data acquired by PQA700 during the measuring phase. PqaSoft allows the user, by means of icon buttons, to display simply and intuitively the data stored in the memory of the instrument; it also allows a graph processing of current and

voltage (oscilloscope function) and the displaying of histograms relating to the FFT (harmonic analysis). Other available functions are: management of energy meters by time periods, export of the data acquired as TXT format files readable by different Windows programs, possibility of instrument's configuration

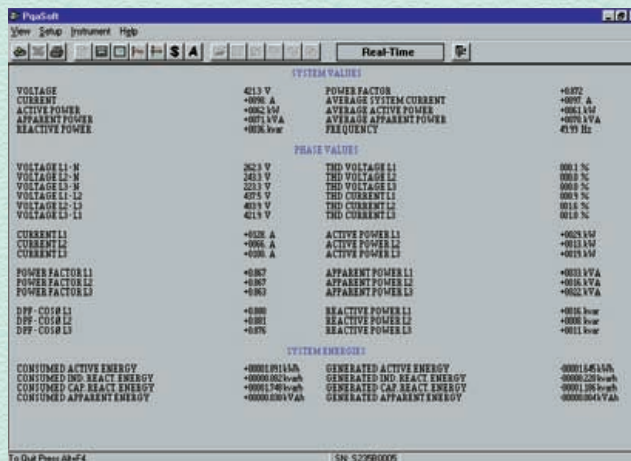
from the PqaSoft, data logging of up to 20 variables in TXT format files directly on the hard disk of the PC. All the PqaSoft functions are available connecting PQA700 and the PC directly. Furthermore PQA700 allows the user to download the stored data and to program it by analogue modem.



Display of current and voltage for each phase with indication of the harmonic contents.

	Date Min.	Min. Value	Date Max.	Max. Value
3-Phase Voltage	Apr 10 15:40:41	316.0 V	Apr 10 15:40:48	455.6 V
Voltage L1	Apr 10 15:37:56	262.3 V	Apr 10 15:38:32	262.4 V
Voltage L2	Apr 10 15:40:41	142.6 V	Apr 10 15:40:48	262.6 V
Voltage L3	Apr 10 15:40:41	141.8 V	Apr 10 15:40:48	263.4 V
3-Phase Current	Apr 10 15:42:21	+0066. A	Apr 10 15:41:18	+0098. A
Line Current L1	Apr 10 15:42:11	+0194. A	Apr 10 15:38:31	+0128. A
Current L2	Apr 10 15:42:16	+0050. A	Apr 10 15:37:56	+0066. A
Current L3	Apr 10 15:42:22	+0005. A	Apr 10 15:41:18	+0100. A
3-Phase Active Power	Apr 10 15:37:56	+0033. kW	Apr 10 15:42:46	+0067. kW
3-Phase Apparent Power	Apr 10 15:40:41	+0046. kVA	Apr 10 15:41:18	+0071. kVA
3-Phase Power Factor	Apr 10 15:38:32	0.998	Apr 10 15:38:32	0.998
Average Active Power	Apr 10 15:37:56	+0012. kW	Apr 10 15:43:09	+0056. kW

Display of MIN and MAX values with time reference to the phase voltage and current, to the active and apparent power, to the system power factor together with the average power.



Real time display of the main variables.

	Tariff 1	Tariff 2	Tariff 3
Consumed Active Energy	+0000.023 kWh	+00004.000 kWh	+0001.063 kWh
Gen. Inductive Reactive Energy	+00000.010 kvarh	+00000.000 kvarh	+00000.075 kvarh
Gen. Capacitive Reactive Energy	+00000.011 kvarh	+00004.000 kvarh	+0001.737 kvarh
Consumed Apparent Energy	+00000.021 kVAh	+00000.000 kVAh	+00000.017 kVAh
Generated Active Energy	-00000.007 kWh	-00000.000 kWh	-00001.037 kWh
Gen. Inductive Reactive Energy	-00000.000 kvarh	-00000.000 kvarh	-00000.228 kvarh
Gen. Capacitive Reactive Energy	-00000.005 kvarh	-00000.000 kvarh	-00001.100 kvarh
Generated Apparent Energy	-00000.003 kVAh	-00000.000 kVAh	-00000.000 kVAh

Display of all the energies with reference to the consumed and to the exported energies.

Starting from 1994 with the publication of the EN50160 Standard by CENELEC, the idea of quality of the electric service has been introduced and made executive for the public electrical network at low and medium voltage. This event underlines, for the first time, the necessity to introduce some measuring parameters of the electric product, with the indication of its basic features and the limits within which it is considered as a quality product. The items featuring the service/product in the origin of the installation are the following: its waveform, its frequency, its magnitude and symmetry (in a three-phase system); the relevant conditions are: normal use and emergency use. It is clear that the characteristics of the electric product not only depend on the skill of the supplier in the electrical

network management, but also on how the electric product is used. The improvement in the quality of the electric service obviously implies a cost both for the supplier and for the user. The supplier's costs can be summed up in the updating, extension and development of the electrical network; the user's costs: any necessary disturbance compensation, any necessary subordinate electric connection, any possible payment of penalties due to a low power factor or to the overcoming of the limits of power demand. Some additional costs can be even higher and unforeseeable, such as those due to failures of the loads and to the subsequent unplanned maintenance of the machines and of the installations merely due to electric problems.

Electrical phenomena

If we briefly go back to the characteristics of electric voltage in the origin of the installation and in order to closely examine this matter, the Regulation divides these features into two groups;

The first one for which some quantitative information are supplied:

- Frequency
- Harmonic distortion
- Phase Asymmetry

The second one for which a few approximate data are supplied:

- Quick voltage variations
- Voltage dips
- Supply interruptions
- Overvoltages

All these variables have a direct consequence on the service quality, but also on lines and loads.



The problems

The direct consequences of these phenomena on lines and loads can be underlined as follows:

- Failures on compensation capacitors
- Blowing of capacitor fuses
- Overheating of power supply transformers with load current below the rated value
- Overheating of motors and frequent failures
- High neutral conductor currents
- Problems on electronic motor controls
- Frequent activation of UPS.

The solution

In this case the solution to the monitoring of these electric variables can have two different proposals depending on the application needs:

- The first one refers to the occasional analysis and monitoring of the lines and of some critical charges by means of the right instrument, such as PQA700. This

analyzer represents therefore the solution according to what is required by EN50160.

- The second and more complete proposal refers to the continuous monitoring and to the automatic recording of various conditions; these are due either to basic phenomena such as the harmonic contents of currents and voltages or to the measurements connected to consumption (current, power, energy, etc.). The latter can be taken with a flush-mounting instrument, like WM3-96, and can be followed by the subsequent research and location of the anomalies by means of a proper measuring and analysis instrument such as PQA700.

How to order PQA700

PQA70[Clamp type: **2**= CA1002, **3X**= Flex 3000Q]
 [Language: **I, E, F, D, UK**][Power Supply: **115V, 230V**]
 See next page: "Accessories".

- e.g.:
- PQA702 UK 230V
 - PQA702 D 230V
 - PQA703X UK 115V

PQA700 main features

Display type	Graph, 240 x 64 dots (back lighted)
Display refresh time	500ms
Display language	Selectable: English, Italian, Spanish, German, French
Other indications	Battery recharging by means of a red LED
Accuracy	0.5% RDG + 0.15% F.S. (5 to 120% of the voltage range, resolution: 0.1V), 45 to 65Hz 0.5% RDG + 0.15% F.S. (5 to 120% of the current range), minimum measurable current: 1A (1mV) , 45 to 65Hz 0.05% RDG (frequency) 1% RDG all the other measurements
Sampling frequency	6400Hz @ 50Hz
Sampling time	For instantaneous variables: 20ms / continuous For dips: 10ms
Measuring inputs	Voltage measurements: 4 (not insulated), max. 700V _{LL} RMS Max peak value: 1600Vp for 1s Current measurements: 3 (non insulated, the insulation is achieved by the clamp-on probes) max. 1.4VAC equivalent to 1400A
Type of connections	1-phase, 3-phase balanced load, 3-phase unbalanced load, ARON type
Measuring method	TRMS type, crest factor ≤ 3
Available measurements	Instantaneous single and system variables: W, VA, var, V, A, TPF, DPF, Hz, THD (voltage, current), odd THD, even THD Maximum demand calculation: W, VA, A (system variables), calculation period: programmable from 1 to 60 minutes Automatic calculation of kvar necessary to compensate low PF FRESNEL diagram indication Maximum and minimum calculations (single phase and system variables): W, VA, var, V, A, DPF, TPF, Hz, THD (THD is considered for both current and voltage), odd THD, even THD Energies: + Wh, - Wh, + varh, - varh, +VAh, -VAh (also by time period) FFT analysis (harmonic distortion): histogram indication up to the 50th harmonic, numerical and percentage indication of harmonic contents, of both voltage and current. THD (total, odd, even) and single harmonic measurement. FFT voltage range: 2 to 100% F.S.; FFT current range: 5 to 100% F.S. THD calculation according to EN61000-4-7
Data recording	Type: FIFO or stack Start measuring delay: programmable from 00:00h to 23:59h Data integration time interval (10ms sampling) : programmable from 1 to 999s (15 min.) Type of recording: minimum, maximum and average value or voltage DIPS Data references: date and time (hh:mm:ss) Total available memory: 1Mbyte
Archives function (by means of PqaSoft)	Type: stack measuring period: fully programmable. Data sampling time: programmable from 10 to 999 s. Type of recording: data sampling of up to 20 selectable variables. Data references: date and time (hh:mm:ss)
Other functions (by means of PqaSoft)	Statistic management of the stored variables Time-based curve distribution of variables and loads
Oscilloscope function with automatic trigger	Current and voltage (current and voltage of single phase available in the same display page)
Measurements according to EN50160	Supply voltage dips, slow and fast supply voltage variations, supply interruptions
Outputs (insulated)	RS232: 9 pole connector, programmable baud rate up to 38400
Printer	Impact dot matrix type, paper width: 54mm (numerical and graph data printing)
Power supply	230VAC ±15% (115VAC ±15% on request) and internal rechargeable battery power supply (battery life: 1h)
Installation Category	III / 600V (according to EN61010-1), double insulation
EMC	EN61000-4-2 discharge: 8kV "air" level 3, 4kV "contact" level 2; EN61000-4-3 radiated field: 10V/m level 3; EN61000-4-4 transients: 2kV level 3; EN61000-4-5 surge: 2kV; EN50011 conducted emission, class A
Operating temperature	0 to 55°C (R.H. < 90% non-condensing)
Storage temperature	-10 to 60°C (R.H. < 90% non-condensing)
Carrying case / weight	160 x 340 x 510mm / Instrument: 3.7Kg, the whole set: 10Kg
Standard accessories	4 voltage measuring cables, length 3m 1 RS232 cable + 9-25 pole adapter 1 power supply cable 1 analysis software (PqaSoft) 1 instruction manual (English, Italian, Spanish, German or French) CA 1002: current clamp probe 100-1000AAC, jaw opening 52mm, cable length 2m accuracy: 0.7% @ 100A, 0.5% @ 1000A
Accessories on request	Flex3000Q: current clamp probe 3000AAC, flexible type, sensor length 400mm, measuring range: 0,5A to 3000A, cable length 2m; accuracy: 1.5% @ 150A, 0.75% @ 1600A, 0.5% @ 3000A