



Power Quality Analyzer PQM-702



From the very beginnings of the power industry, generally up until 1980s, the problem of the quality of the power supply, and phenomena related to it, practically did not exist in Eastern Europe. Along with development in technology and the elimination of economic barriers, equipment processing electric energy started to appear on a large scale in the system. Today, each piece of equipment of the household appliances and audio/video devices, computers, and even lighting, to some extent uses distorted current. Electric motors are operated via inverters, which make their control easier, but generate current distortions. In offices, hundreds of thousands of fluorescent lamps generate higher harmonics. Round-the-clock, arc furnaces, inverter welding machines, UPS units, powerful server rooms and many other devices generate disadvantageous effects in power system.



Fig. 1. PQM-702 analyzer.

In order to eliminate hazards for the safe operation of power networks and the equipment which is supplied by them, it is required to identify phenomena occurring in these networks and to interpret them correctly. A suitable tool is required for such diagnostics.

Power quality analyzer is such a tool. The most recent product from Sonel, **PQM-702**, is a development and continuation of the renowned family of PQM-701 line analyzers.

Addressed to a very broad group of users, who need to control electric energy quality using a portable device, **it satisfies the requirements of a multi-sheet standard IEC 61000 for class A analyzers**. This applies to measurement uncertainties, measurement methods, and synchronization of time with a standard signal. The last condition is satisfied owing to a built-in GPS module with an internal antenna. If the analyzer is installed inside, it is possible to use an additional antenna with a 10m-long wire. If the antenna is situated outside, GPS signal will be attainable without any problem and used for the synchronization of an internal clock.

In practice, the analyzer may be used in all network types with rated voltage ranging from 110V to 690V, directly or indirectly via transformers. It may be operated in the following networks:

- one-phase,
- two-phase with shared N wire,
- three-phase star type (z) and without N wire,

- three-phase delta type,
- with constant voltage.

As a result of this, the **PQM-702** is suitable in sectors of professional power industry and facilities maintenance in industrial plants, as well as for people offering network analysis services.

The ergonomic, aesthetic, and at the same time robust, two-component housing has IP65 protection class, which makes it possible to install the analyzer in virtually any conditions, both indoor and outdoor. The compact size means that the analyzer can even fit into the small ZK boxes. A built-in heater switches on automatically when the temperature falls below 0°C inside the meter, ensuring the optimal operating conditions for electronic systems. Special bands make it possible to fix the instrument onto a pole, for example. The analyzer may also be installed on a DIN rail using the special fasteners provided with it.

A new element is the high-resolution colour backlit LCD screen, which clearly and visibly shows the basic parameters of the examined network, e.g. voltage, current or power values. Moreover, it is easily possible to check if the network connection is correct on a colour phasor diagram which appears on the screen. The user additionally receives information on unit configuration and, messages and warnings about equipment operation status and/or emergency states.

The **PQM-702** is provided with five voltage input sockets: L1, L2, L3, N and PE. Wires are fixed permanently via a hermetic connector. The maximum range of voltages measured by four measuring channels reaches $\pm 1150\text{V}$. Currents are measured with pincers (7 types available), which are connected to any of 4 current inputs (sockets at the ends of the wires).. The following pincers work with the analyzer: flexible F-1, F-2, F-3, nominal current range: 3000 A (varying only in coil circumference) and hard C-4 (range: 1000 A AC), C-5 (range: 1000 A AC/DC), C-6 (range: 10 A AC) and C-7 (range: 100 A AC). Since the users' needs differ considerably, the pincers specified above are available as optional equipment, to allow the selection of the optimal solution.

The unit is equipped with an internal memory of 8 GB. Data is transferred to a computer via an USB interface. Two transfer modes are possible:

fast - when the analyzer is on standby (no recording),
slower - while the analyzer simultaneously records data. This mode is

very useful when it is needed to analyse already saved data without interrupting current recording.

Moreover, the data may be read via two wireless communication links: radio transmission with an OR-1 receiver, or a built-in latest generation GSM modem. While radio transmission works at a distance of up to 50 m in an undeveloped land, after inserting any SIM card with a permanent IP number in the unit it is possible to control it from any place in the world via original Sonel Analysis software.

The power quality analyzer PQM-702 is a technologically advanced product allowing the thorough measurement, analysis and recording of parameters for 50/60 Hz power systems and ensuring electric energy quality according to the European Standard EN 50160 and the Regulation of May 4, 2007 by the Minister of Economy, concerning detailed conditions for electric power system functioning.

The **PQM-702** records peak factors for current and voltage, frequencies ranging within 40Hz...70Hz, active power, apparent power, distorted power, reactive power - determining its nature (capacitive or inductive). Two methods may be used for power measurements: Budeanu or IEEE 1459. Of course, parameters including active power, reactive power, apparent power, power factor, $\cos \varphi$ and $\tan \varphi$ are recorded as well. Other values, which can be analysed, are: the degree of transformer overload, due to harmonic disturbances (factor K), harmonics in current and voltage up to 50-th harmonic, THD coefficient for current and voltage, short-term and long-term flicker factor, asymmetry of voltage and current values. Moreover, all events including voltage dips, overvoltages and power failures with oscillograms are recorded as well (also for currents). After each averaging period, the meter may record oscillograms for current and voltage. All the mentioned options allow the thorough analysis of phenomena in the examined power network to be carried out.

The **PQM-702** analyzer is delivered in a set with all the required connectors and feeder cables. The set contains crocodile clips, a USB cable for data transmission, carrying case, a set for mounting the device onto a pole or DIN rail, and software.

Sonel Analysis Software

The key element deciding about the unit usability in performed

analyses is Sonel Analysis software, which is required for its functioning. The new version (2.0) of Sonel Analysis application makes its debut along with the analyzer. Apart from the completely renewed graphic interface better fitted to current trends in informatics, the application contains very important modifications, which at first glance are invisible for the user, yet they extremely facilitate work with it. Optimisation regarding even faster work with huge data volumes, new types of diagrams, improved operation of GSM modems, less usage of computer system resources, and even more configuration options are only a few improvements from among dozens, which have been introduced in the new version of the application.

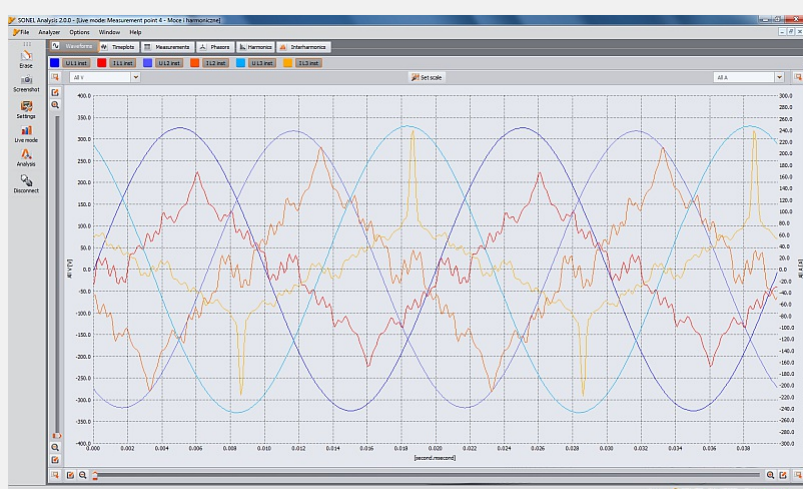


Fig. 3. Current and voltage oscillograms.

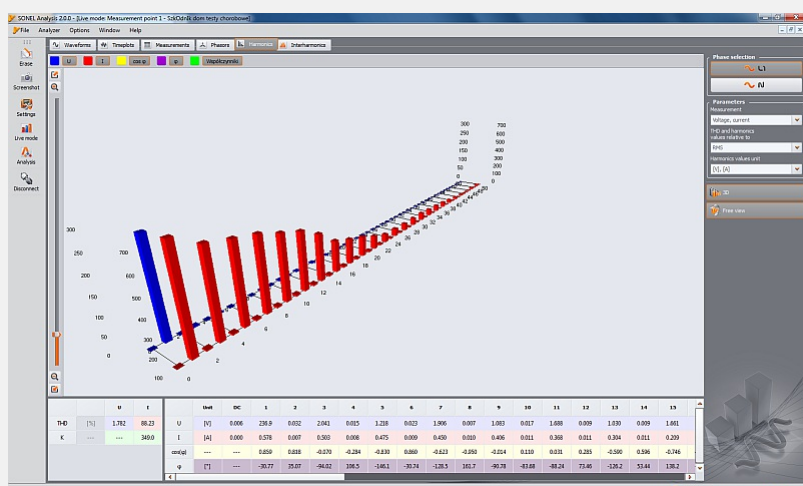


Fig. 4. Harmonics diagram in 3D.

The application allows the configuration of individual measuring functions, and the analysis of data acquired during the recording process or observation of current network parameters. It guarantees full analyzer configuration as regards recorded parameters, safeguards or preferences of measurement points, since the unit allows any four settings in four different measurement points to be recorded. This saves the time required for data reading each time the

settings have been modified. It is possible to carry out four separate recordings, and then return to the office and read out data.

From the application level, it is possible to: set recording release mode (immediate after pressing the START button, or if the preset threshold for any measured value is exceeded), set the recording time schedule, or configure memory allocation for individual measurement points.

Wireless communication also allows remote analyzer control via an OR-1 module or GSM modem. This means it is possible to monitor current data from any place in the world (via GSM modem), to start or stop recording remotely, and to check the analyzer status. It is also possible to send data saved in the memory, bearing in mind the much lower throughput of radio interfaces compared to that of USB.

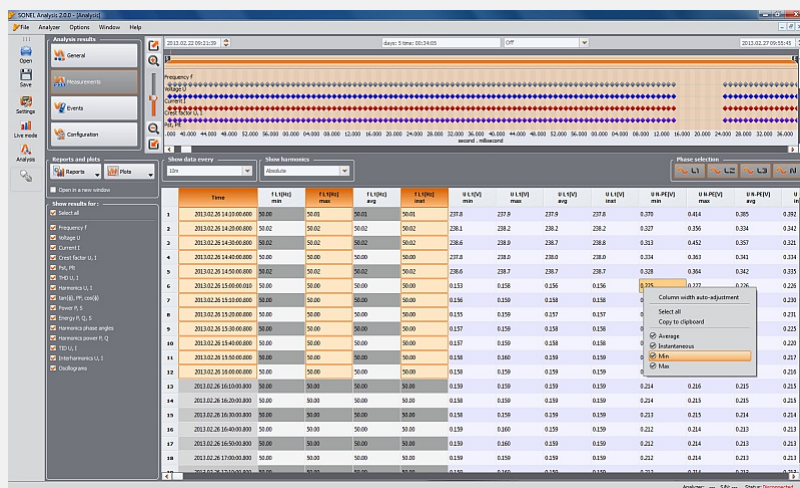


Fig. 5. Measurement data.

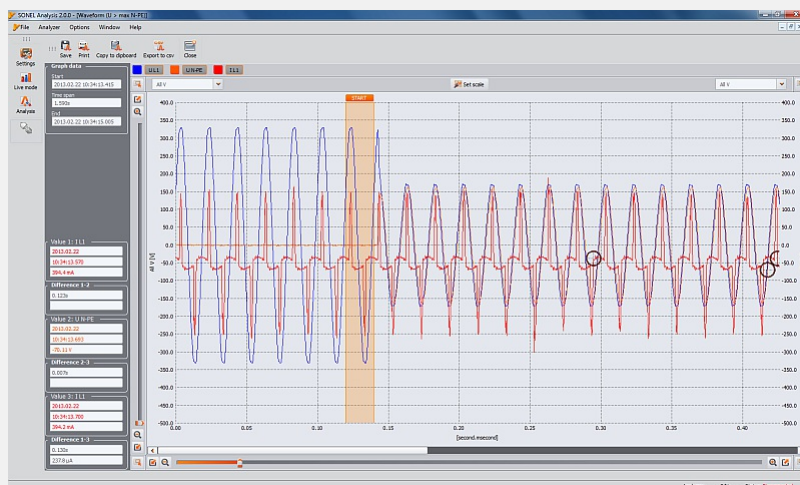


Fig. 6. Event oscillograms.

The antitheft function is an innovative option. As a result of its activation, a short text message is sent with the current location by PQM-702 analyzer to a specified mobile phone number if unit has been stolen.

Completely independent of the carried out recording and parameters chosen in the configuration mode, is the possibility to view many parameters measured by the analyzer in real time. The following may be checked:

- diagrams of current and voltage trajectories for individual phases,
- diagrams of current and voltage values in the function of time for individual phases,
- measurement results in the form of tables,
- voltage and current displacements shown on a phasor diagram,
- current and voltage harmonics up to 50-th harmonic, and active and reactive power of harmonics,
- interharmonics.

The main purpose of the application is data reading from the meter, and the subsequent data analysis. The user has the following options: viewing the measurement data in the form of tables, viewing the events with their oscillograms, creating reports for compliance with applicable regulations, and making various types of diagrams: values in time, harmonic distributions, current and voltage oscillograms, CBEMA and ANSI curves, or diagrams of event types compared to their duration.

The screen of events offers many options as regards the analysis of all selected events. It provides information on the number of events during recording, their duration, type and other key parameters. An important innovation is the introduction of the ANSI/CBEMA diagram, making it possible to see, in a simple way, which of the voltage-related events could have generated any damage in the equipment.

The application has an option of reporting and diagram printing. If hundreds of events have been saved during recording, there is the possibility of marking out only those, which because of any reasons, are more important than others.

Summary

The PQM-702 unit, with its software, is an extremely useful power quality analyzer designed for all sectors of electrical power engineering, both in professional power industry and industrial plants. Resistant to environmental conditions, easy to operate and with user-friendly software, the unit makes an excellent offer in the market.

Additionally, the highest quality and reliability of the unit is proven by a 36-month warranty extendable to 60 months.