

Sonel PQM-700

Power Quality Analyzer • Quick Guide



v1.00 | 27.10.2020



Status signalization

	LED is on. The analyzer is on.		LED flashes. Problem in at least one mains phase:		ERROR is off, MEM is on. Problem with the memory or memory full.
	LED flashes. The meter is ready for software update (press START to confirm).		<ul style="list-style-type: none"> reverse phase sequence, incorrect values of voltages and/or currents, energy generation. See tolerances in step 4 in page 6.		LEDs are on. No memory card or unformatted memory card. If LEDs are still on after pressing START - the memory is damaged.
	LEDs flash. Software update in progress.		ON is on, LOG flashes. Recording in progress.		ERROR is on, MEM is off. Internal error of the analyzer.
	LED flashes. Battery charge level $\leq 20\%$.		ON is off, LOG flashes in every 10 s. Recording in progress. Analyzer in sleep mode.		
	LED is on. Battery completely depleted. After 5 s the analyzer shuts down.				

Maximum input voltage



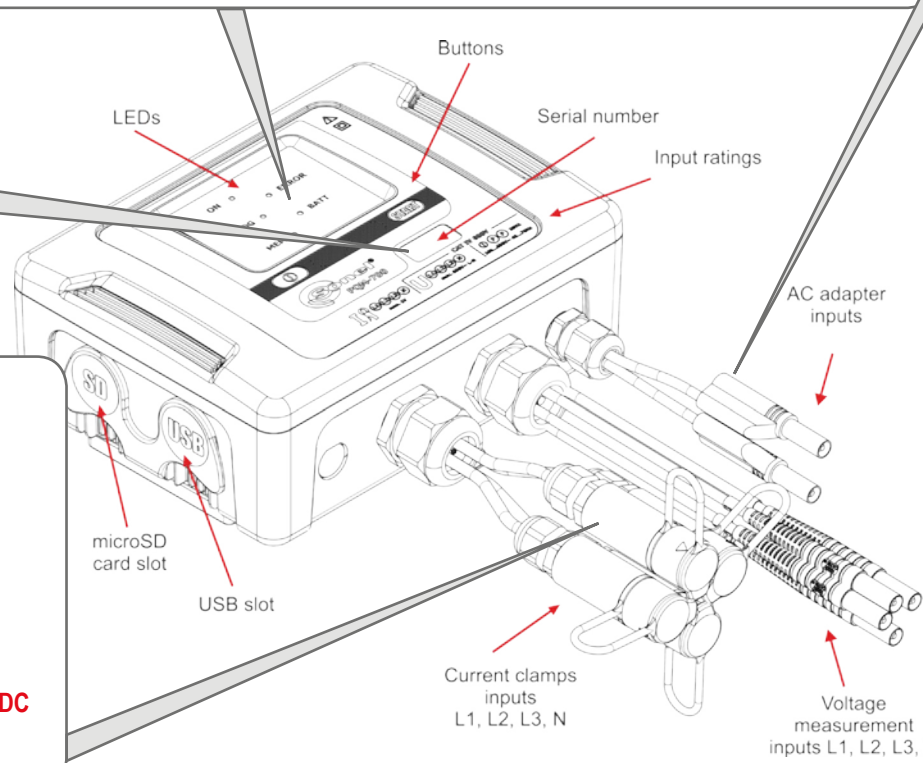
Measurement inputs

Voltage - 4 inputs

L1, L2, L3, N
 AC: **MAX. 760 V_{RMS}**
 DC: **±760 V**
 referred to ground

Current - 4 inputs

Flexible probes: **F-xA1: 1...1500 A AC**
F-xA: 3...3000 A AC
F-xA6: 6...6000 A AC
 Hard clamps: **C-4A: 0.1...1000 A AC**
C-5A: 0.5...1000 A AC/DC
C-6A: 0.01...10 A AC
C-7A: 0.1...100 A AC



Li-Ion BATTERY

3.7 V
4.4 Ah

External DC power
MAX. 140...415 V

External AC power
MAX. 100...415 V AC
MAX. 40...70 Hz

Power supply

Mounting



Three steps to get results

1 Prepare measurement configuration and send it to the meter ▶ page 2



2 Install the analyzer and start the measurement ▶ page 6

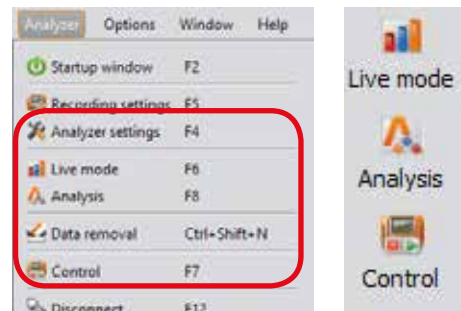


3 Analyze the recorded data ▶ page 8



Getting started | Connecting the analyzer

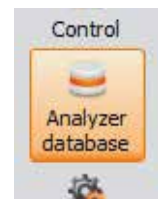
Method 1. Choose a function requiring analyzer connection



Analyzer connection window will appear.

- Choose the desired analyzer.
- Press **Select**.
- Enter PIN code (default: 000).

Method 2. Choose desired analyzer from the database



No.	Analyzer type	Serial number
1	PQM-700	AZ0025



Getting started | Creating a measurement configuration



Enter main settings.

Measured network parameters

- 1 Nominal voltage
- 2 Nominal frequency
- 3 Mains system

Choice of probes and transducers

- 4 Choice of current probes
- 5 Voltage transducers settings
- 6 Current transducers settings

Measurement parameters

- 7 Additional recording of U_{N-PE} and I_N
- 8 Averaging period
- 9 Measurement triggering
- 10 Events detection hysteresis (typical 2%)

Period	Start	Stop	Span
	2020-01-10 11:55:48	2020-01-10 11:55:48	
	2020-01-10 11:55:56	2020-01-10 11:55:56	
	2020-01-10 11:55:56	2020-01-10 11:55:56	
	2020-01-10 11:55:56	2020-01-10 11:55:56	

Estimated memory usage: 0.0% (0.0 / 874MB) Total time span: 0s

P1 Estimated recording time: 12y 8M 3w 0d 12h 20m 21s Analyser: S/N Status: Disconnected

Enter recording parameters.

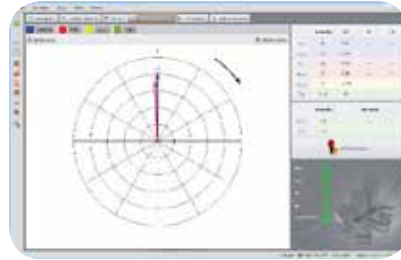
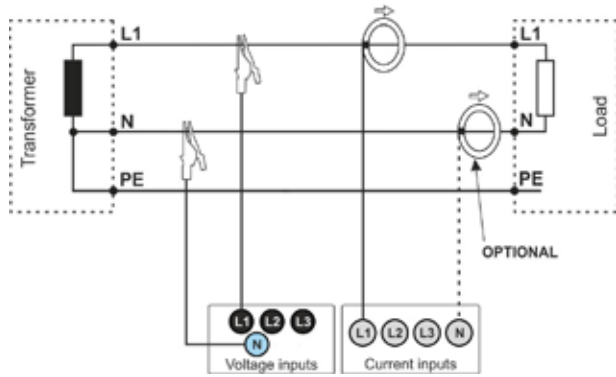
Send configuration to the analyzer.

Receive configuration from the analyzer's memory.

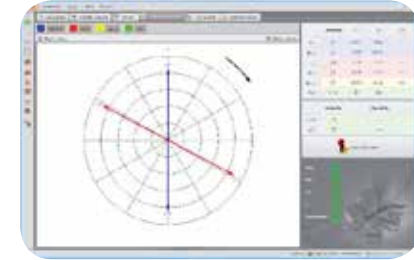
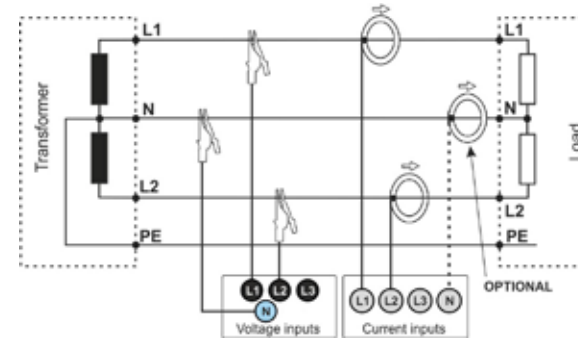
View actual configurations of the connected analyzer (**Analyzer** section).

Getting started | Choosing the mains system

Single-phase



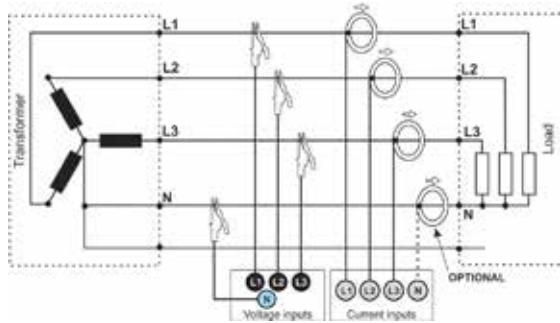
Split-phase



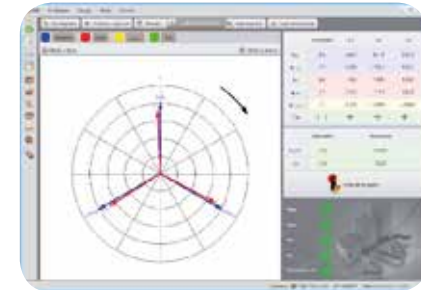
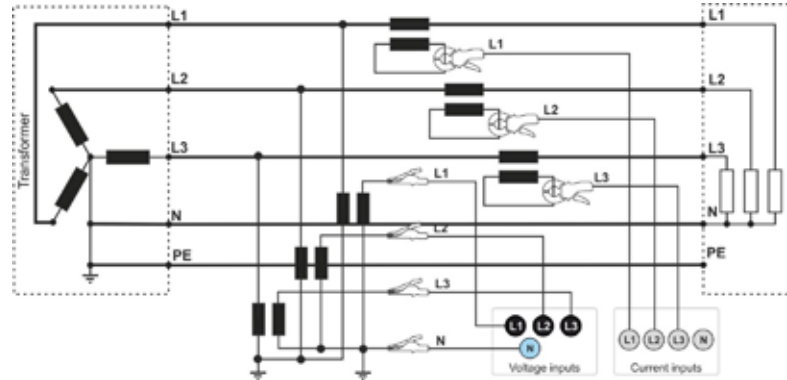
U1 ► U2

3-phase 4-wire (WYE with a neutral conductor)

Direct connection



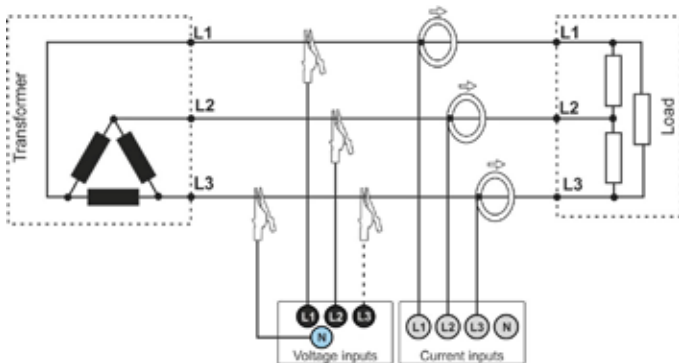
Connection with transducers



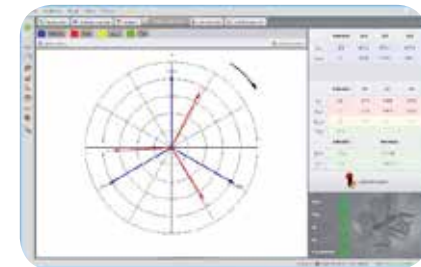
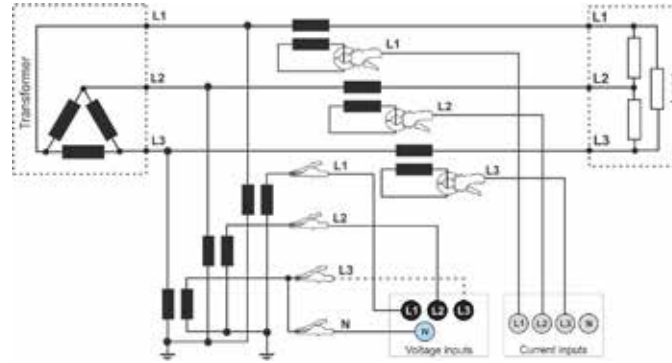
U1 ► U2 ► U3

3-phase 3-wire (Delta)

Direct connection



Connection with transducers



U12 ► U23 ► U31

Getting started | Adjusting transducer settings



Probes type: C-6(A)
max = 1,20 [kA]

Current limit
0,10 % [1,2A]

Voltage transducers

Primary: 21 750,00 V
Secondary: 103,57 V
Ratio: 210,00

Current transducers

Primary: 600,00 A
Secondary: 5,00 A
Ratio: 120,00

Activate **Voltage transducers**, if the measurement will not be carried out in a direct way.

Activate **Current transducers** for connection:

- with current transducers,
- direct (multiloop) measurement of small current for accuracy enhancement.

Direct current measurement - enhanced accuracy

The use of a current transmission in direct connection enhances probe sensitivity for small signal measurement. It decreases the upper measuring range according to the formula:

$$\text{New range} = \frac{\text{Nominal probe range}}{\text{no. of turns}}$$

and deepens the lower measuring range. It increases the accuracy and operating range of the probe.

C-7A probe • nominal range 100 A • no. of turns = 5



$$\text{New range} = \frac{100 \text{ A}}{5 \text{ turns}} = 20 \text{ A}$$

Current transducers

Primary: 20,00 A
Secondary: 100,00 A
Ratio: 0,20

F-1A probe • nominal range 3000 A • no. of turns = 2



$$\text{New range} = \frac{3000 \text{ A}}{2 \text{ turns}} = 1500 \text{ A}$$

Current transducers

Primary: 1 500,00 A
Secondary: 3 000,00 A
Ratio: 0,50

Measurement with transducers

Depending on the type of measured network (WYE with neutral / Delta), enter transducers' parameters and the nominal level of exceedings control.

Mains type: WYE with neutral conductor

Probes type: C-6(A)
max = 200 [A]

Current limit
0,02 % [0,04A]

Voltage transducers

Primary: 66 395,00 V
Secondary: 60,36 V
Ratio: 1 100,00

Current transducers

Primary: 100,00 A
Secondary: 5,00 A
Ratio: 20,00

For WYE+N type mains, tolerances, harmonics and exceedings are controlled according to **phase-to-neutral** value. Enter:

- 100-percent value of the nominal **phase-to-neutral** voltage,
- voltage transducer ratio k_U .

Enter parameters of current transducers:

- primary current,
- secondary current.

Mains type: Delta

Probes type: C-6(A)
max = 1,20 [kA]

Current limit
0,10 % [1,2A]

Voltage transducers

Primary: 21 750,00 V
Secondary: 103,57 V
Ratio: 210,00

Current transducers

Primary: 600,00 A
Secondary: 5,00 A
Ratio: 120,00

For Delta type mains, tolerances, harmonics and exceedings are controlled according to **phase-to-phase** value. Enter:

- 100-percent value of the nominal **phase-to-phase** voltage,
- voltage transducer ratio k_U .

Enter parameters of current transducers:

- primary current,
- secondary current.

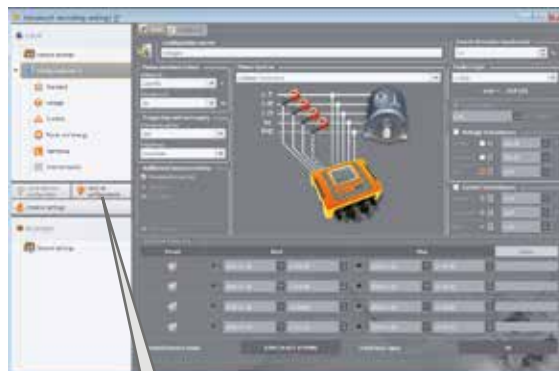
Measurements

1 Mount the analyzer



2 Upload the configuration to the analyzer

Create a measurement configuration and upload it to the analyzer using **Sonel Analysis** software.



Send all configurations

3 Connect the analyzer to the network acc. to the configuration



- Arrows on all clamps have to be pointed towards the electrical load.
- Pay close attention to connecting the analyzer in systems with transducers. In these systems, C-6A clamps will be useful - they are dedicated to measure current at transducers.

4 Check the network status and the analyzer connection status

RMS voltages

- ✓ U_{RMS} within $\pm 15\% U_N$ range
- ✗ U_{RMS} outside of $\pm 15\% U_N$ range

RMS currents

- ✓ I_{RMS} within $0.3\% \dots 115\% I_N$ range
- ✗ I_{RMS} exceed $115\% I_N$
- ? I_{RMS} below $0.3\% I_N$
- current probes not selected

Frequency

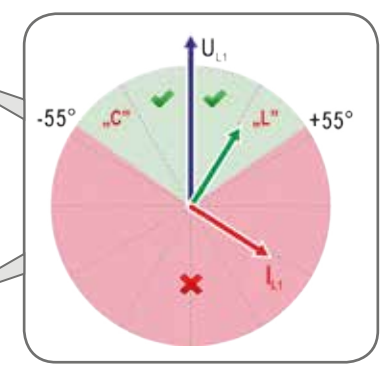
- ✓ is within $\pm 10\% f_N$ range
- ✗ is outside the $\pm 10\% f_N$ range
- ? too low voltage: $< 10 V$

Voltage angles - phase succession (clockwise)

- ✓ angles of the range of $\pm 30\%$ of the theoretical values $0^\circ, 120^\circ, 240^\circ$
- ? too low voltages: $< 1\% U_N$
- ✗ incorrect angles

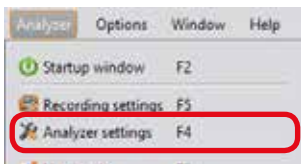
Current angles - relative to voltage

- ✓ current vectors are within $\pm 55^\circ$ range in relation to corresponding voltage vector
- ✗ at least one current vector is outside the acceptable range $\pm 55^\circ$
- ? too low currents: $< 0.3\% I_N$

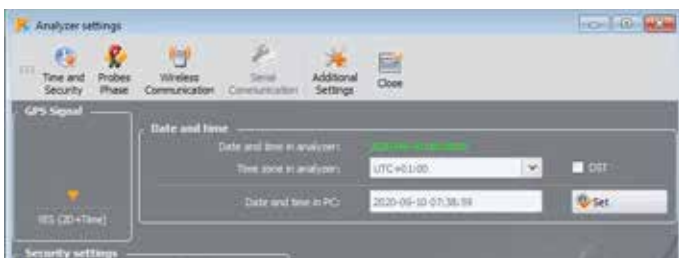


Measurements

5 Zweryfikuj czas analizatora



In Sonek Analysis software, in **Analyzer** menu, you can verify and change the time and date in the device.

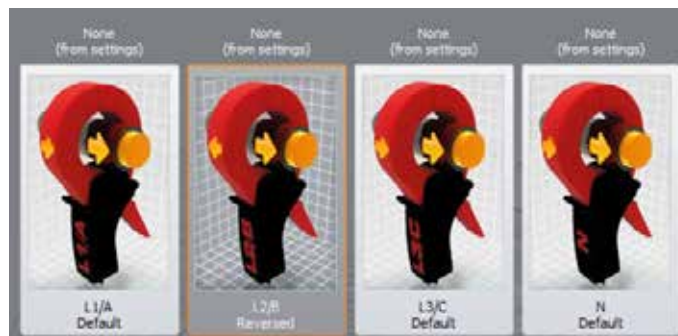


The button **Set** uploads the computer's current time to the analyzer.

6 Adjust analyzer settings

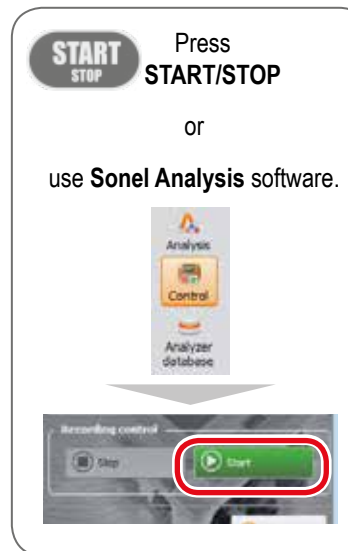
Using Sonek Analysis, under menu **Analyzer**, adjust:

- security,
- reverse current direction on the probe.



After each change, confirmation window will appear.

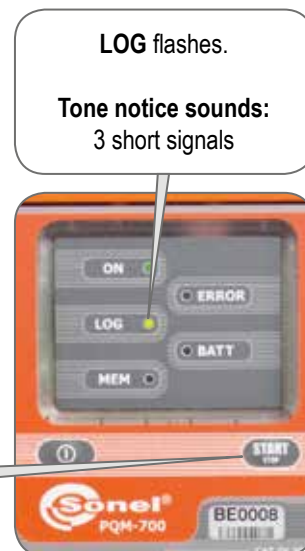
7 Start recording



Press **START/STOP**

or

use **Sonek Analysis** software.

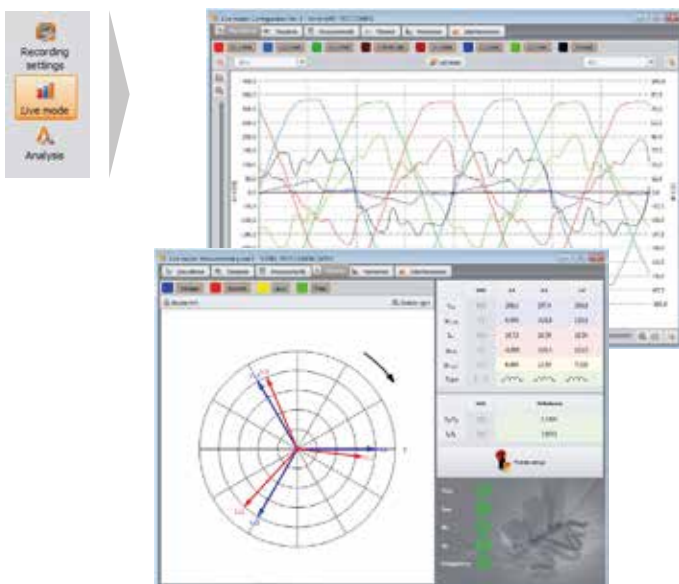


LOG flashes.

Tone notice sounds:
3 short signals

8 Monitor the meter and measurements

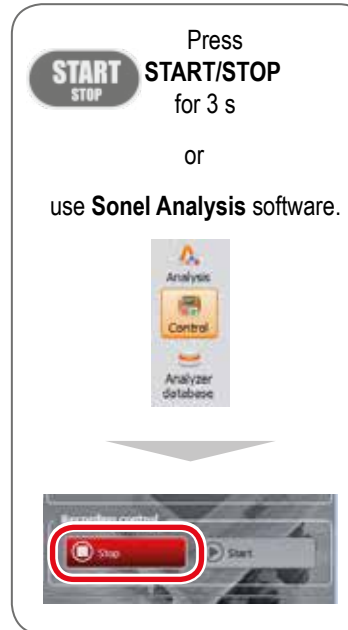
View live readings



Change settings if necessary



9 Finish recording



Press **START/STOP** for 3 s

or

use **Sonek Analysis** software.

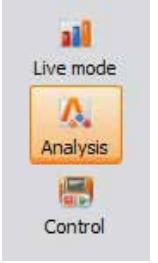


LOG stops flashing.

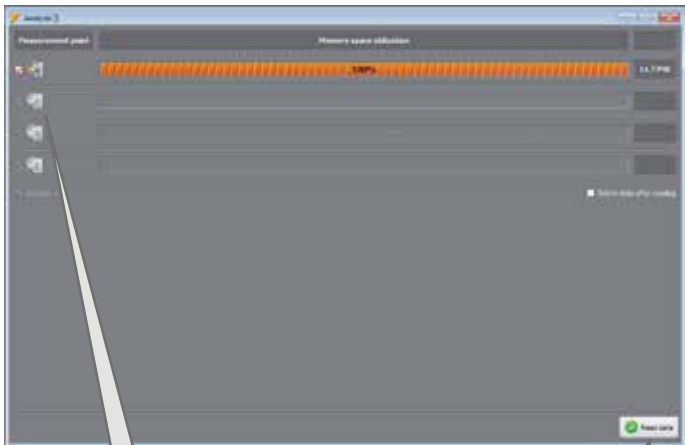
Tone notice sounds:
1 long and 3 short signals.

Data analysis

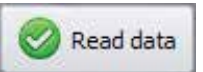
1 Download data from the analyzer



- Connect the analyzer.
- Select menu **Analysis**.




Choose the recording for analysis.


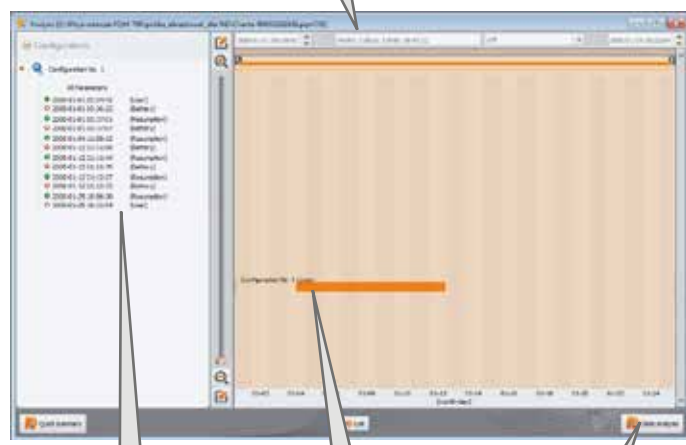


Press **Read data** button.

The recording will be saved to your computer as a file *.pqm700.

2 Choose the recording for analysis

On the top bar choose the time range if necessary.

See the details of each downloaded recording.

Select the recorded data.

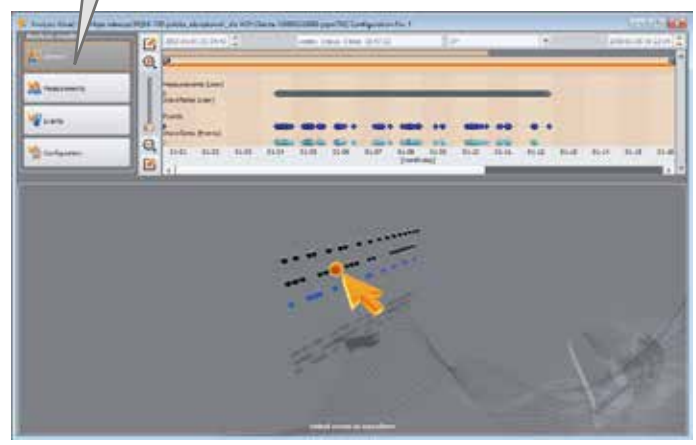


Press **Data analysis** button to see the measurements.

3 Analyze the data

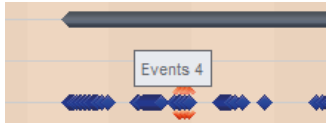
There are four menu options to help you analyze the data:

- **General** - general information on the measurements,
- **Measurements** - analyze the measurements, generate reports and plots,
- **Events** - analyze the events,
- **Configuration** - view, how the meter was set for the analyzed recording.



"General" menu

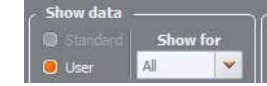
Ekran "Pomiary"



The top screen is the view of the whole recording.



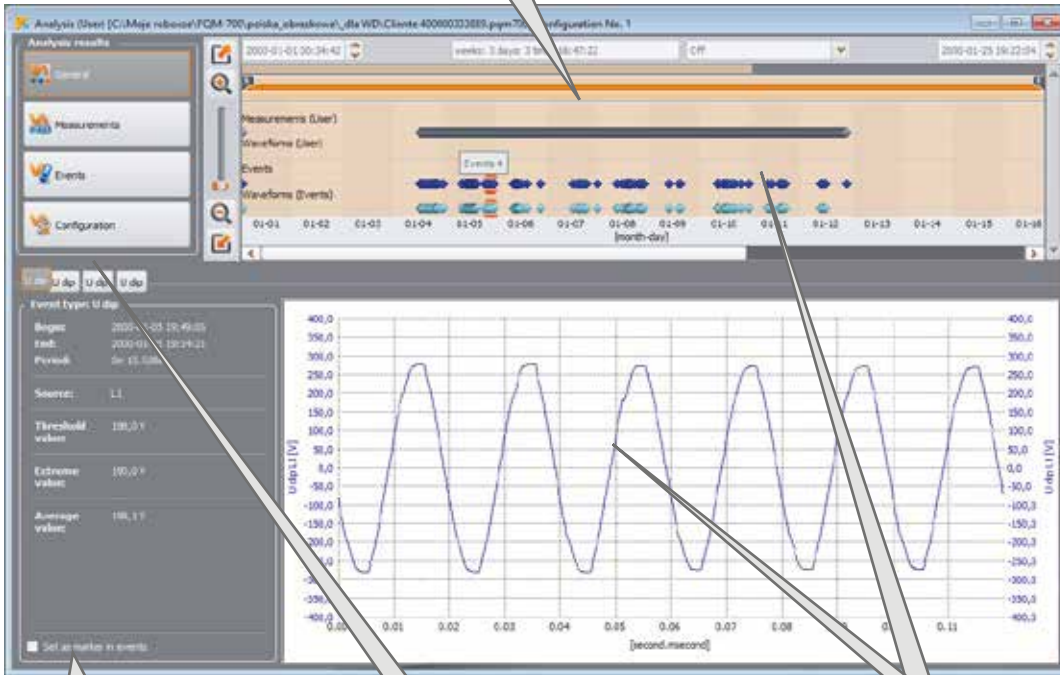
Recording time and values.



Choose data for analysis.



Filter phases from which you want to analyze data.



Set as marker in events

Mark the desired event to make it appear on the individual list in "Events" menu".

View event's details by choosing the correct tab.

Choosing a point in **Events** line will cause the oscillogram to appear.



Show results for:

- Select all
- Frequency f
- Voltage U
- Current I
- Flicker Pst
- Flicker PIt
- Crest factor U
- Crest factor I
- THD U

Here are groups of chosen parameters.



Choose the form of graph under menu **Plots**:

- timeplot,
- harmonics,
- interharmonics.

Create reports under menu **Reports**.

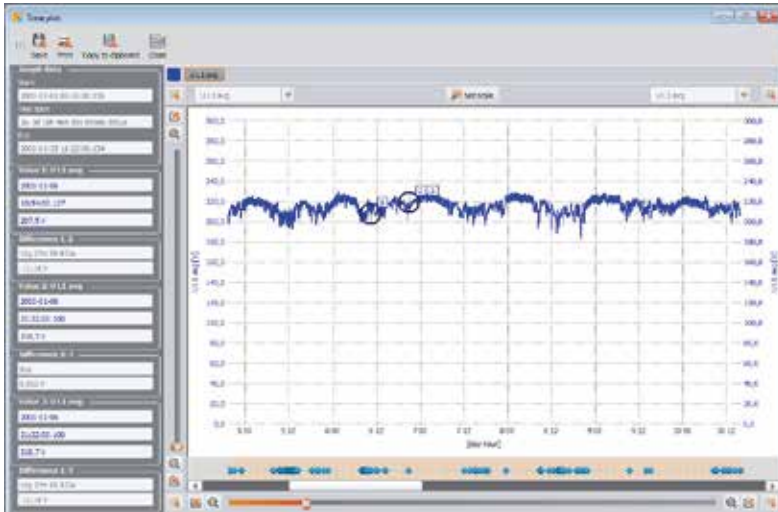
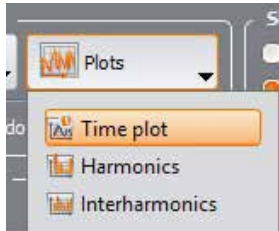
Choose the parameters for analysis.

U1S min [V]	U1S max [V]	U1S avg [V]	U1S min [A]
9 103	9 136	9 136	9 039

Mark columns for data analysis in order to create a plot or report.

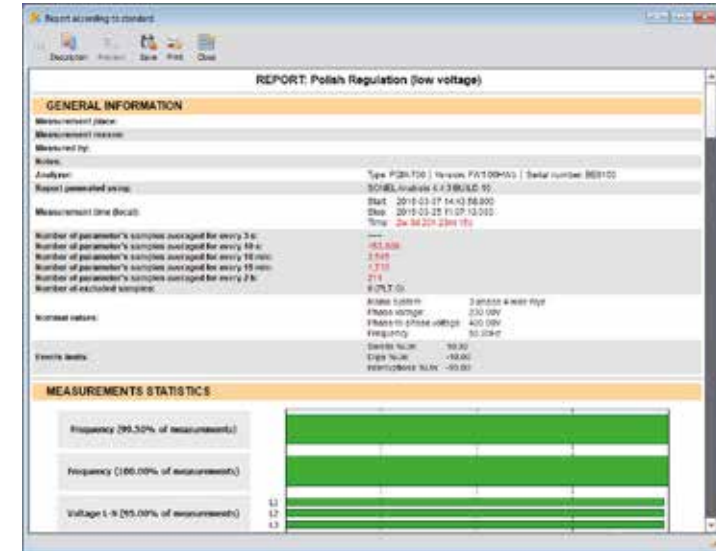
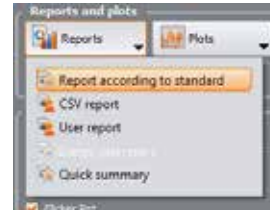
Data analysis

Time plot



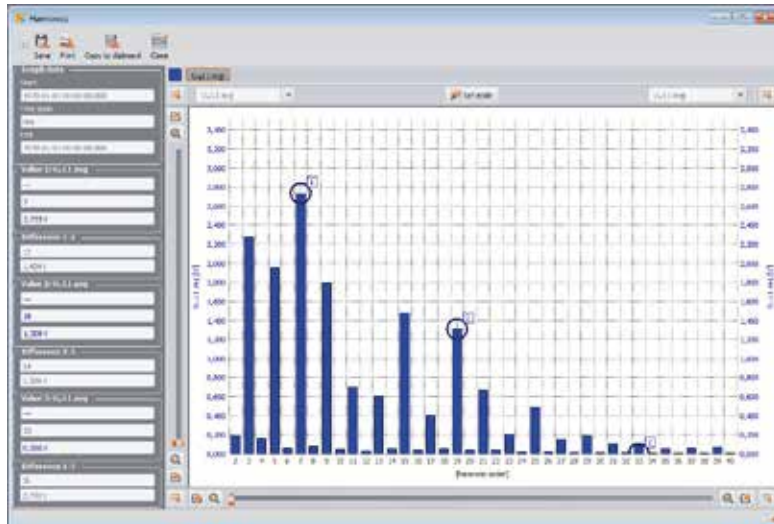
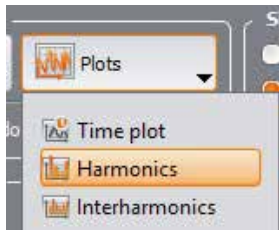
Choose the plot form. The graph will open in a new window.

Creating reports



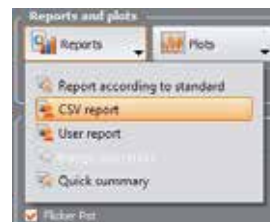
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.

Harmonics and interharmonics



Choose appropriate plot to analyze harmonics or interharmonics.

Data export to CSV file



Nazwa	Typ	Data modyfikacji
Measurement 1	Microsoft Excel Comma Separated Values File	2019-05-
Measurement 2	Microsoft Excel Comma Separated Values File	2019-05-
Measurement 3	Microsoft Excel Comma Separated Values File	2019-05-

You can also export data directly to CSV file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Analyzer:	P2M-T00 (P2100)													
2	Recording start:	01.01.2000 04:24													
3	Recording stop:	28.01.2000 11:27													
4	Time:	2h 34m 29s													
5	File:														
6	Event:														
7	P - PLL no synchronization														
8	G - GPS no synchronization														
9	T - time synchronization														
10	A - A/D overflow														
11															
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Find more information in the user manual and on our website www.soneel.pl/en