



CLASS S
IEC 61000-4-30

CAT IV
300 V

EVENTS

55°C
HEAVY DUTY
20°C

IP65

v1.01 | 29.03.2023

Status signalization

	LED is on. The analyzer is on.
	LED flashes. The meter is ready for software update (press START to confirm).
	LEDs flash. Software update in progress.
	LED flashes. Battery charge level <20%.
	LED is on. Battery completely depleted. After 5 s the analyzer shuts down.



LED flashes. Problem in at least one mains phase:

- reverse phase sequence,
- incorrect values of voltages and/or currents,
- energy generation.

See tolerances in step ④ in page 6.



ON is on, LOG flashes. Recording in progress.



ON is off, LOG flashes in every 10 s. Recording in progress. Analyzer in sleep mode.



ERROR is off, MEM is on. Problem with the memory or memory full.



LEDs are on. No memory card or unformatted memory card. If LEDs are still on after pressing START - the memory is damaged.



ERROR is on, MEM is off. Internal error of the analyzer.

Maximum input voltage

L1 L2 L3 N
max. 760 V~

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

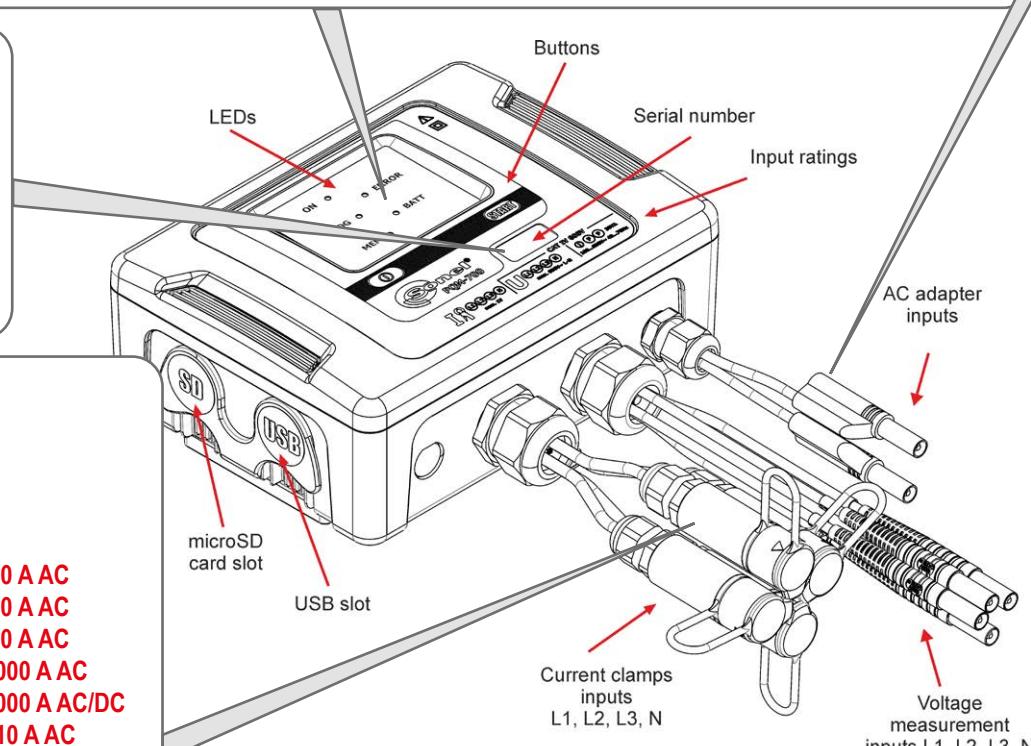
F-xA6: 6...6000 A AC

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



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

3.7 V
4.4 Ah

Li-Ion BATTERY



External DC power
MAX. 140...415 V

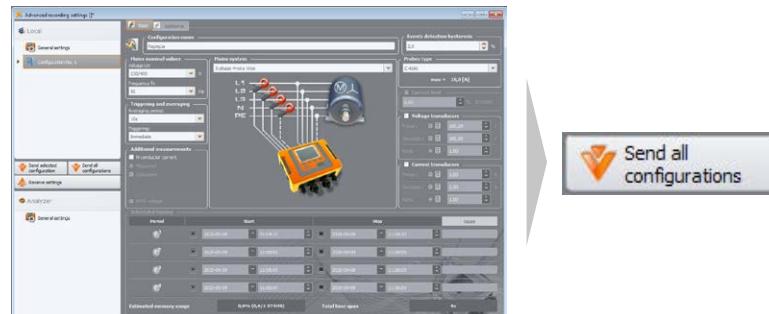
External AC power
MAX. 100...415 V AC
MAX. 40...70 Hz

Power supply

Mounting

Three steps to get results

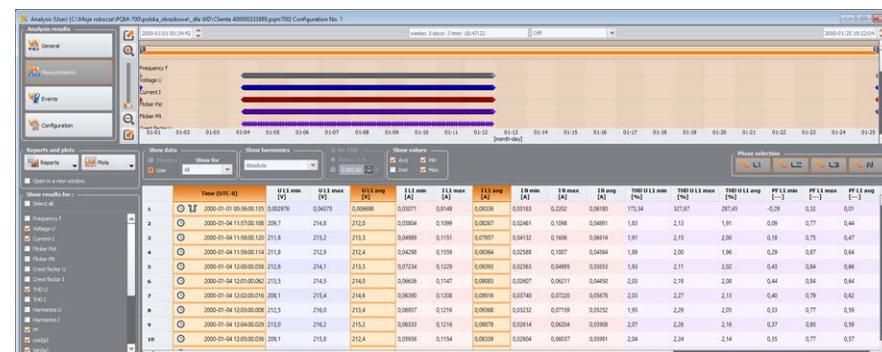
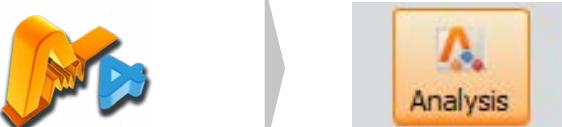
① Prepare measurement configuration and send it to the meter ▶ page 2



② Install the analyzer and start the measurement ▶ page 6



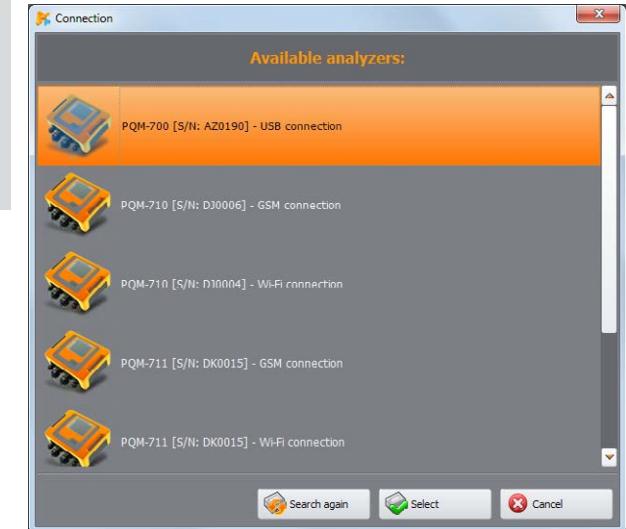
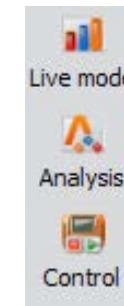
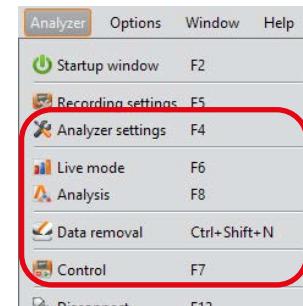
③ Analyze the recorded data ▶ page 8



Getting started | Connecting the analyzer



Method 1. Choose a function requiring analyzer connection

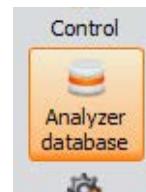


Analyzer connection window will appear.

- 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%)

The screenshot shows the 'Advanced recording settings' window with the 'Basic' tab active. The configuration name is set to 'Voltages'. Under 'Mains nominal values', 'Voltage Un' is set to '230/400 V' and 'Frequency fn' is set to '50 Hz'. The 'Mains system' is configured as '3-phase 4-wire Wye'. In the 'Triggering and averaging' section, 'Averaging period' is set to '10s' and 'Triggering' is set to 'Immediate'. Under 'Additional measurements', the 'N-conductor current' checkbox is checked. The 'Scheduled logging' section displays four scheduled log entries for January 10, 2020, with start times at 11:55:48 and stop times at 11:55:56. The right panel contains sections for 'Events detection hysteresis' (set to 2.0), 'Probes type' (set to C-6(A)), 'Current limit' (set to 0.00), 'Voltage transducers' (primary: 100.00 V, secondary: 100.00 V, ratio: 1.00), and 'Current transducers' (primary: 1.00 A, secondary: 1.00 A, ratio: 1.00). A diagram on the right shows a three-phase system with a motor and a current probe connected to the N-PE line.

Enter recording parameters.

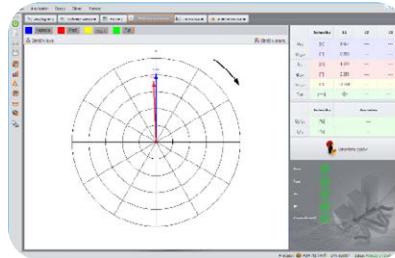
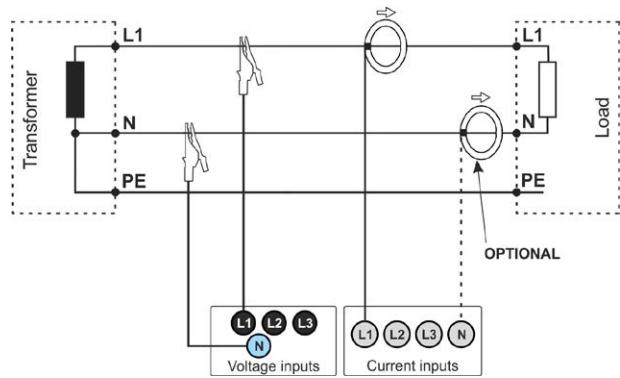
Send configuration to the analyzer.

Receive configuration
from the analyzer's memory.

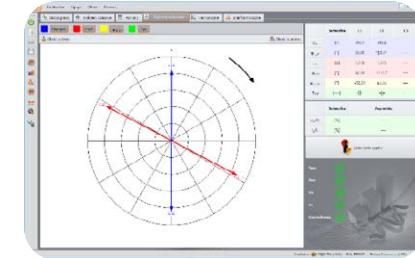
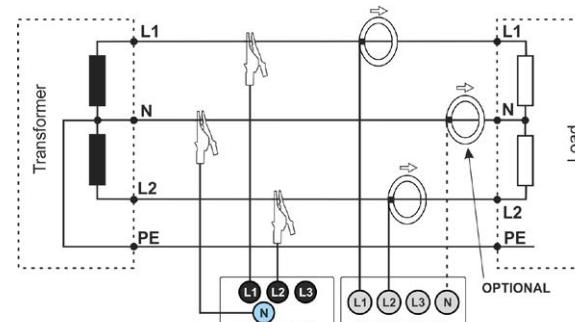
View actual configurations of the connected
analyzer (Analyzer section).

Getting started | Choosing the mains system

Single-phase

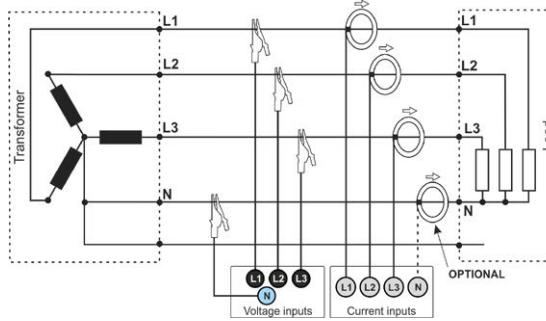


Split-phase

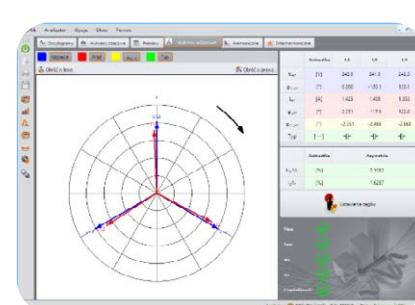
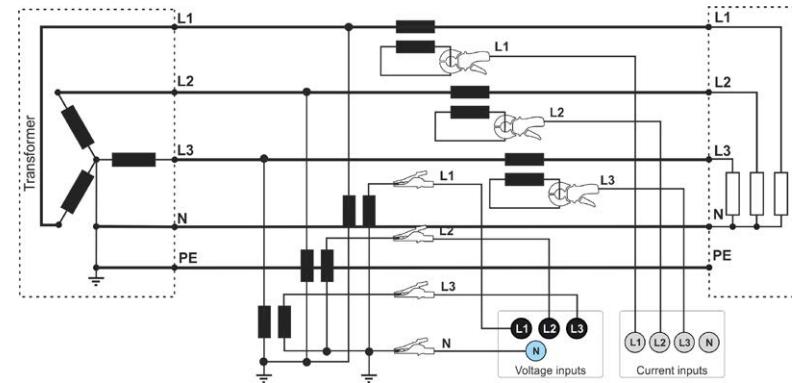


U1 > U2

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

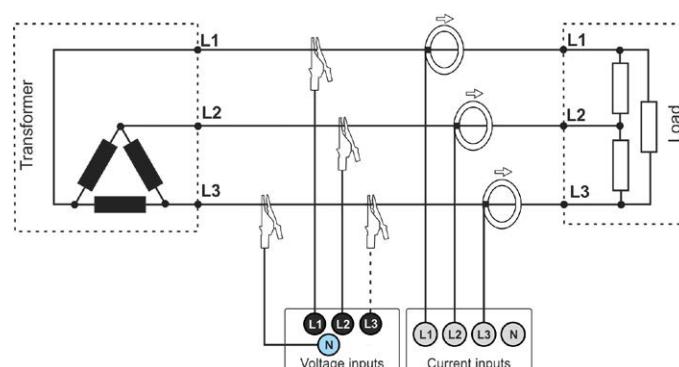


Connection with transducers

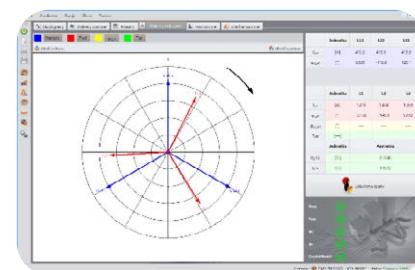
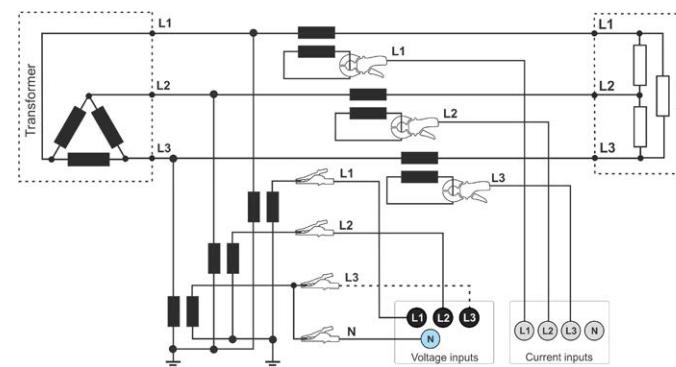


U1 > U2 > U3

3-phase 3-wire (Delta)

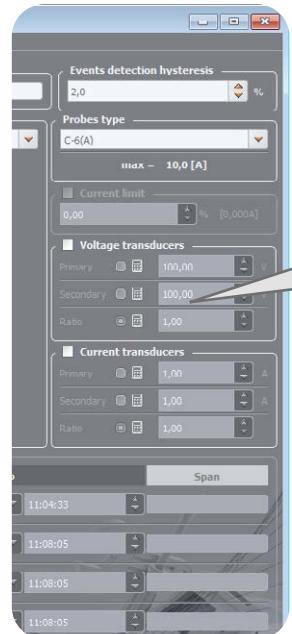


Connection with transducers



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

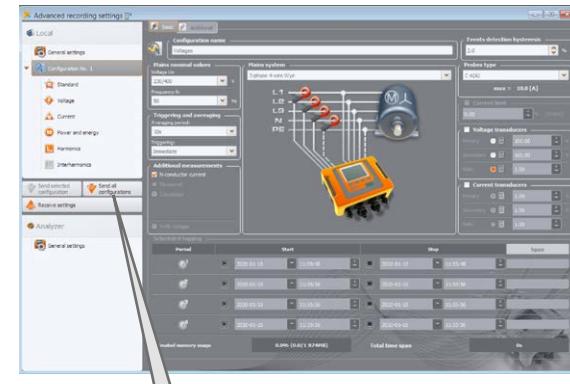
Upload the configuration to the analyzer

③

Connect the analyzer to the network acc. to the configuration



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



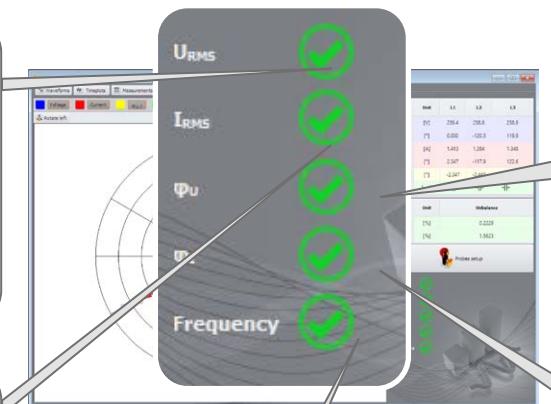
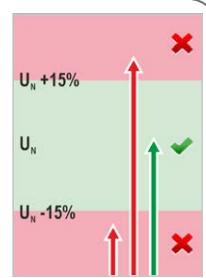
- Arrows on all clamps have to be pointed towards the electrical load.
- Pay close attention to connecting the analyzer in systems with transducers. In these systems, C-6A clamps will be useful - they are dedicated to measure current at transducers.

④

Check the network status and the analyzer connection status

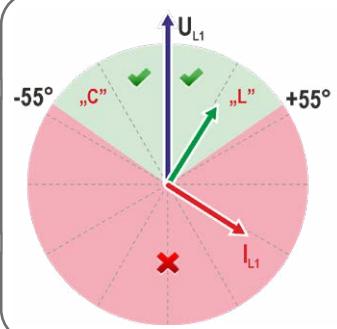
RMS voltages

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



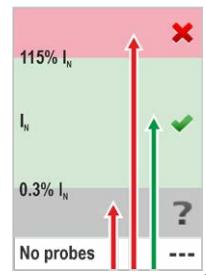
Voltage angles - phase succession (clockwise)

- ✓ 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



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

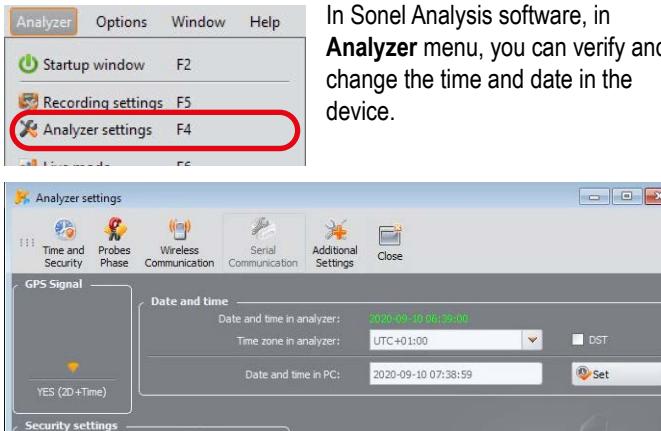
Current angles - relative to voltage

- ✓ 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



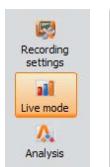
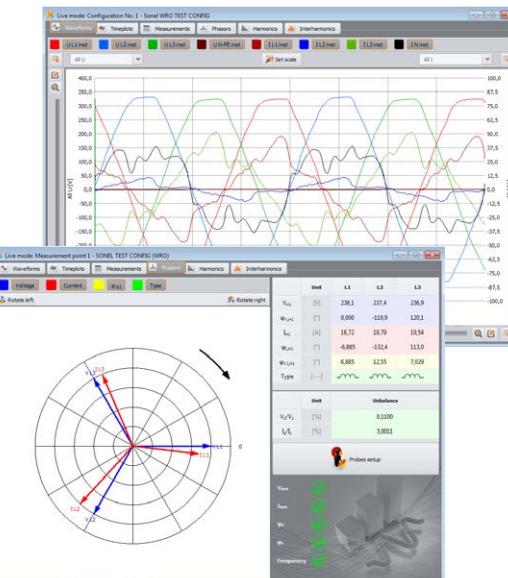
The button **Set** uploads the computer's current time to the analyzer.

8

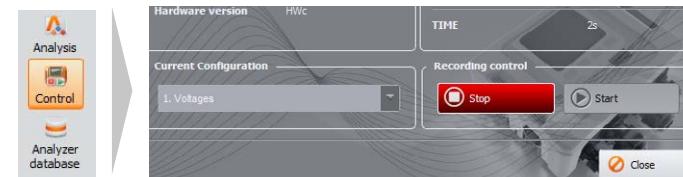
Monitor the meter and measurements



View live readings



Change settings if necessary



6

Adjust analyzer settings

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

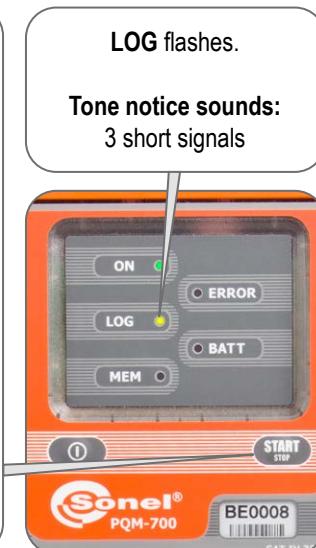
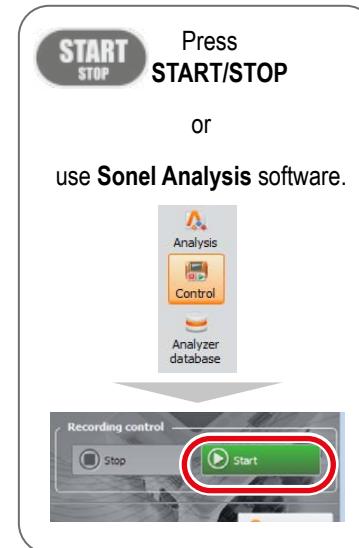
- security,
- reverse current direction on the probe.



After each change, confirmation window will appear.

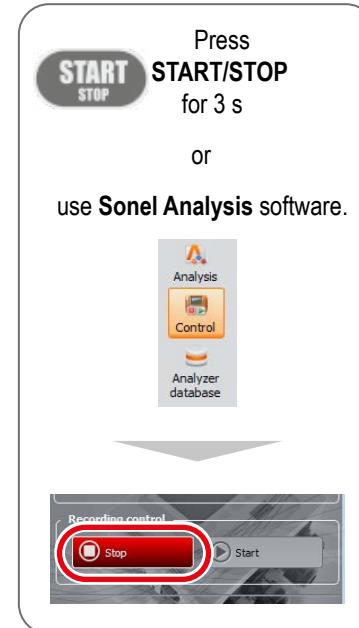
7

Start recording



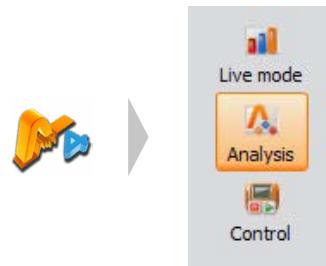
9

Finish recording



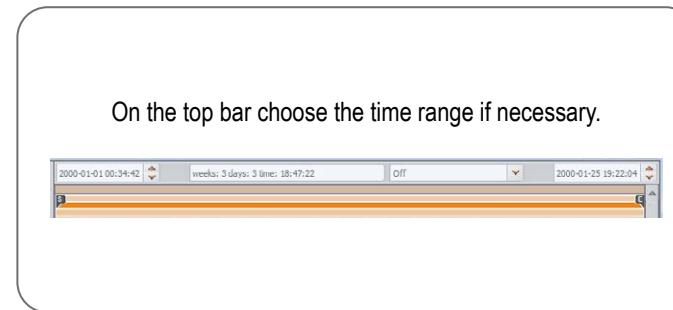
Data analysis

① Download data from the analyzer



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

② Choose the recording for analysis

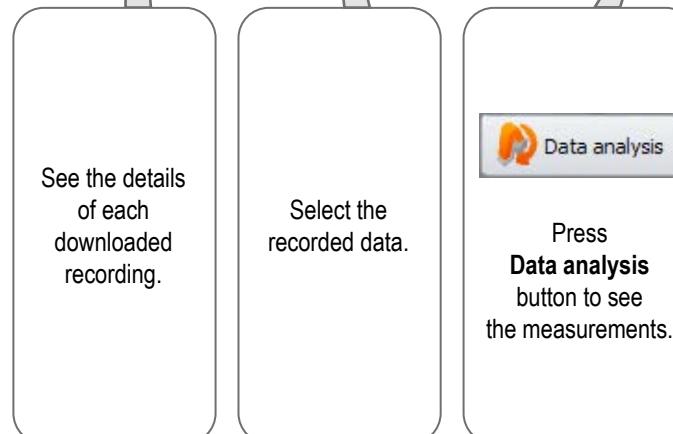
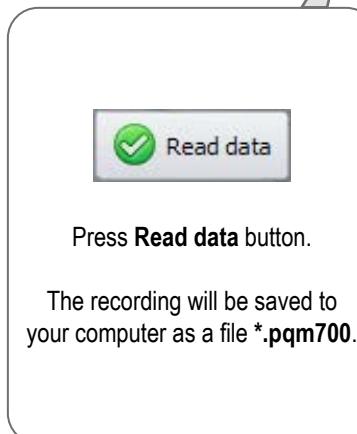
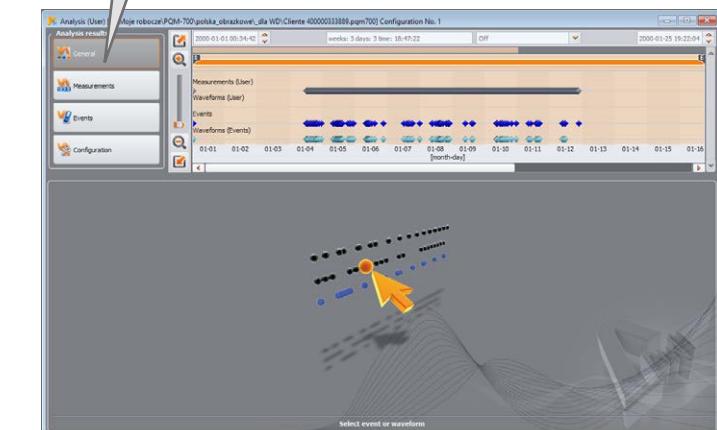
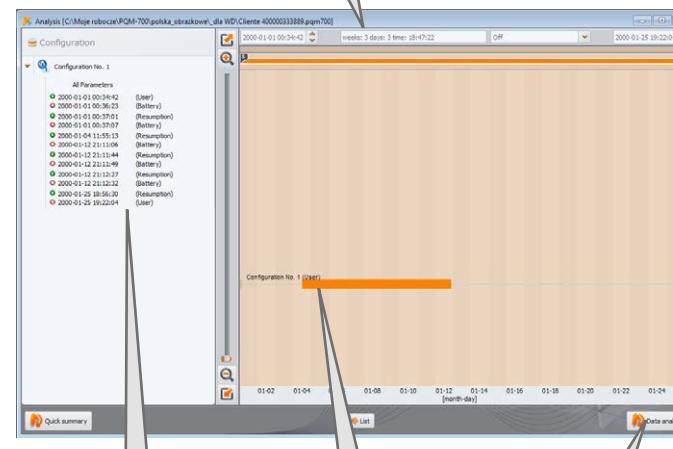
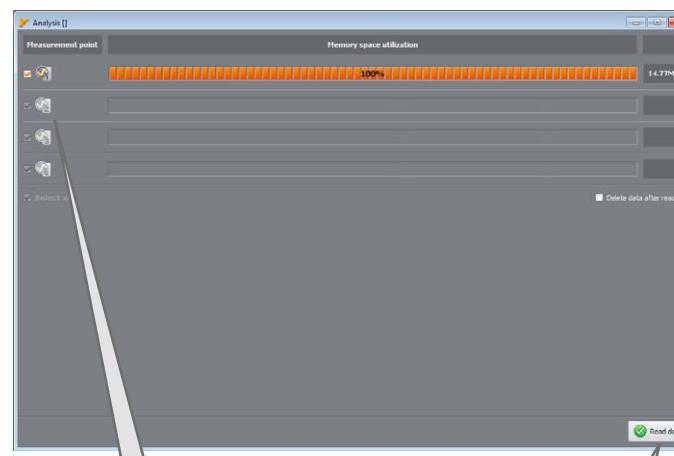


③ Analyze the data



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.

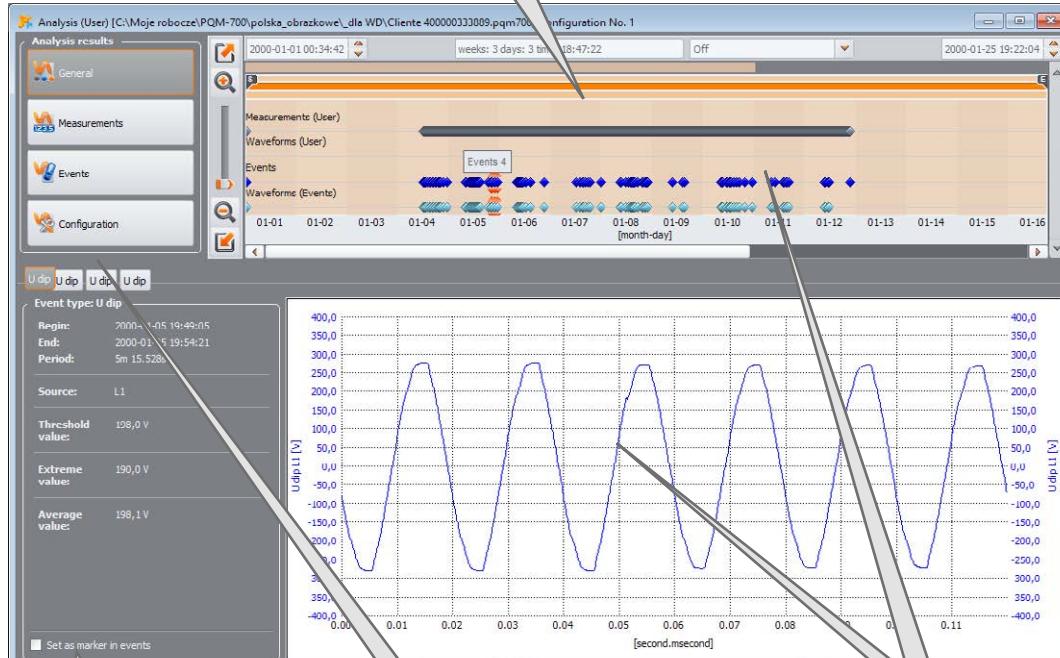


Data analysis

"General" menu



The top screen is the view of the whole recording.



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.



Ekran "Pomiary"

Time (UTC-0)
2000-01-01 00:36:00.135 50,0

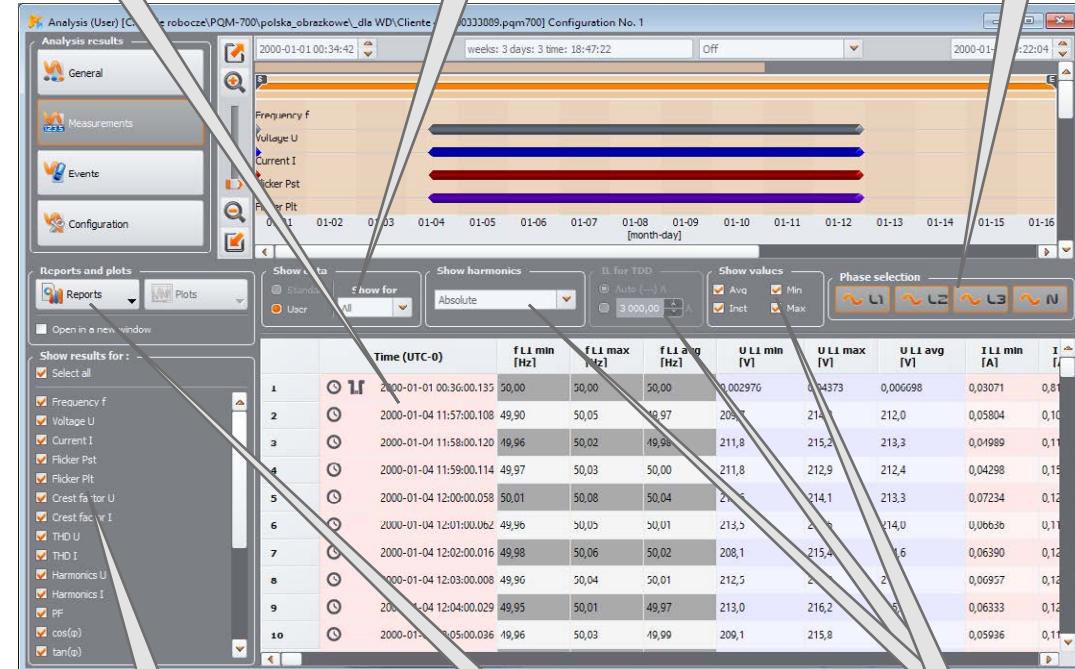
Recording time and values.

Show data
Standard Show for All

Choose data for analysis.

Phase selection L1 L2 L3 N

Filter phases from which you want to analyze data.



Show results for:
 Select all
 Frequency f
 Voltage U
 Current I
 Flicker Pst
 Flicker Plt
 Crest factor U
 Crest factor I
 THD U

Here are groups of chosen parameters.

Reports and plots
Reports Plots

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

- timeplot,
- harmonics,
- interharmonics.

Create reports under menu **Reports**.

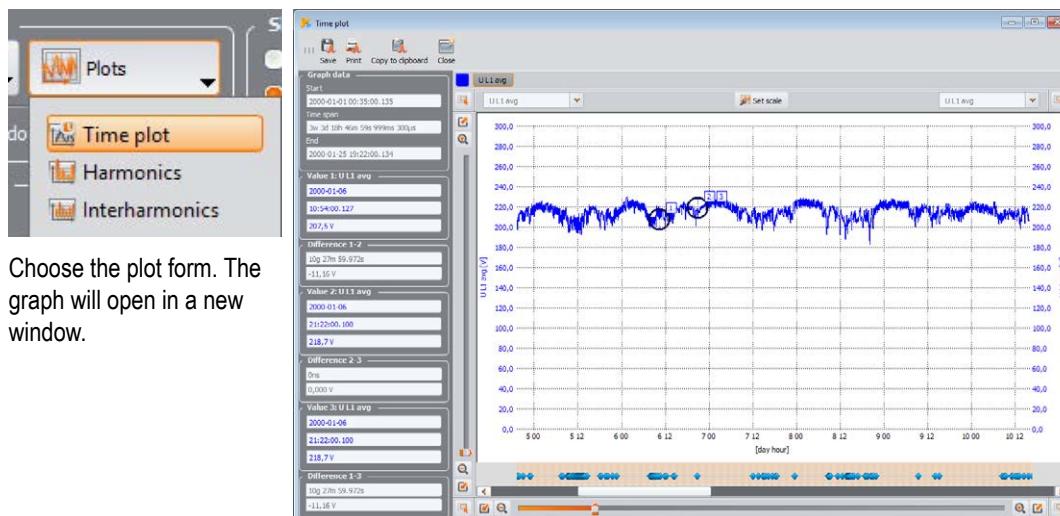
U L1 min [V]	U L1 max [V]	U L1 avg [V]	U L2 min [V]
9 103	9 156	9 136	9 039
0,140	0,155	0,150	0,084

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

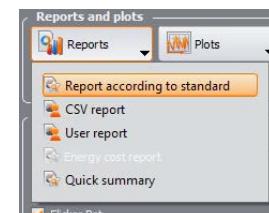
Data analysis



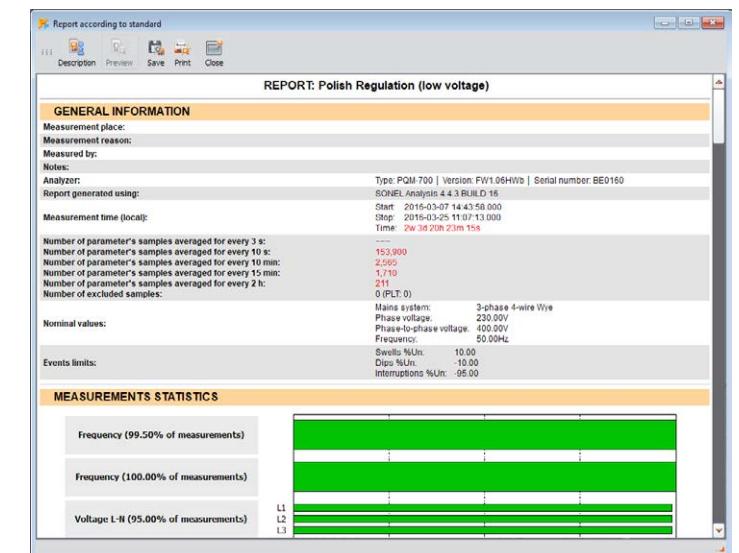
Time plot



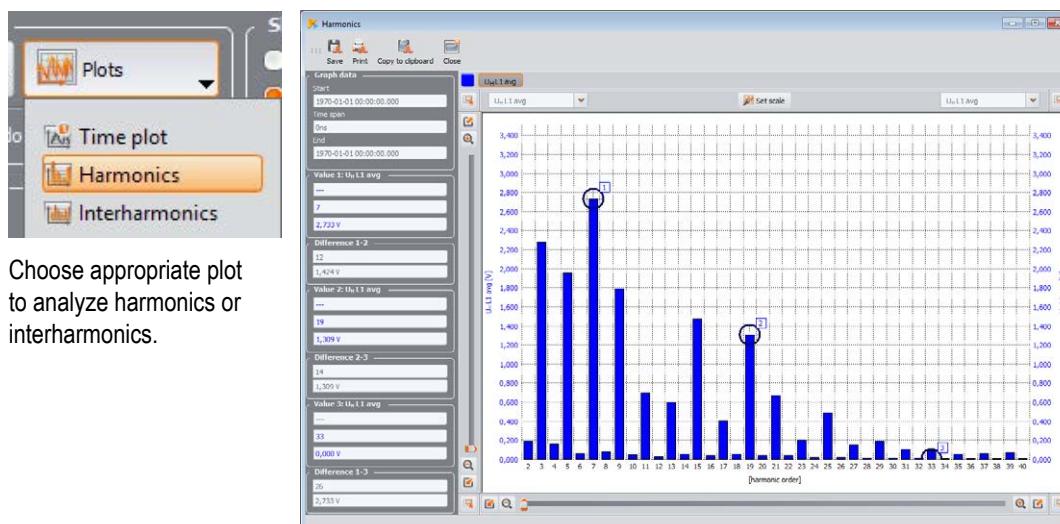
Creating reports



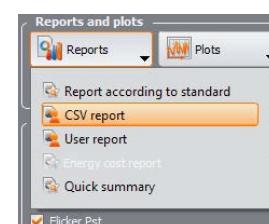
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.



Harmonics and interharmonics



Data export to CSV file



You can also export data directly to CSV file.

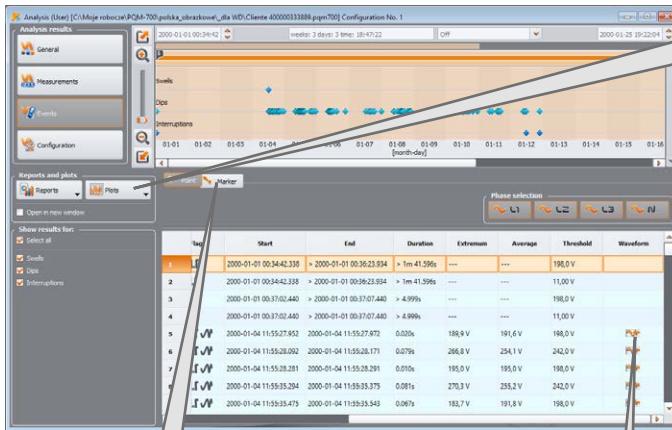
BASE (F) > PQM > Text database													
Nazwa Typ Data model													
Measurement 1 Microsoft Excel Comma Separated Values File 2019-05-10													
Measurement 2 Microsoft Excel Comma Separated Values File 2019-05-10													
Measurement 3 Microsoft Excel Comma Separated Values File 2019-05-10													
1 Analyzer: PQM-700 (BE0702)	A	B	C	D	E	F	G	H	I	J	K	L	N
2 Recording start: 01.01.2000 00:36	01.01.2000 11:50:00:120	49.99	214.35	0.032600	0.0								
3 Recording stop: 25.01.2000 19:22	(UTC+0)	01.01.2000 11:59:00:114	50	212.35	0.039639	0.0							
4 Time: 01.01.2000 11:59:00:114	04.01.2000 12:00:00:058	50.04	213.31	0.039327	0.0								
5 Flag:	0 L absent	04.01.2000 12:01:00:062	50.01	214.04	0.090833	0.0							
6 P - PLL no synchronization	04.01.2000 12:02:00:011	50.02	214.65	0.089157	0.0								
7 G - GPS no synchronization	04.01.2000 12:03:00:004	50.01	213.4	0.093678	0.0								
8 T - time resynchronization	04.01.2000 12:05:00:035	49.99	212.42	0.083911	0.0								
9 R - recording resume	04.01.2000 12:06:00:195	50.03	210.06	0.084156	0.0								
10 D - data loss	04.01.2000 12:07:00:141	50.04	218.64	0.083978	0.0								
11 A - A/D overflow	04.01.2000 12:08:00:157	49.99	215.43	0.052426	0.0								
12 E - event	04.01.2000 12:09:00:112	50.03	215.67	0.011449	0.0								
13 F - event	04.01.2000 12:10:00:051	50.04	216.35	0.082912	0.0								
14 G - event	04.01.2000 12:10:00:055	50.03	214.35	0.085393	0.0								
15 H - event	04.01.2000 12:11:00:056	50.04	214.92	0.084122	0.0								
16 I - event	04.01.2000 12:12:00:050	50.03	211.91	0.089422	0.0								
17 J - event	04.01.2000 12:14:00:112	50.04	212.92	0.086216	0.0								
18 K - event	04.01.2000 12:15:00:165	49.95	210.78	0.089444	0.0								
19 L - event	04.01.2000 12:16:00:007	49.95	210.99	0.083211	0.0								
20 N - event	04.01.2000 12:17:00:024	49.96	207.39	0.082084	0.0								

Data analysis

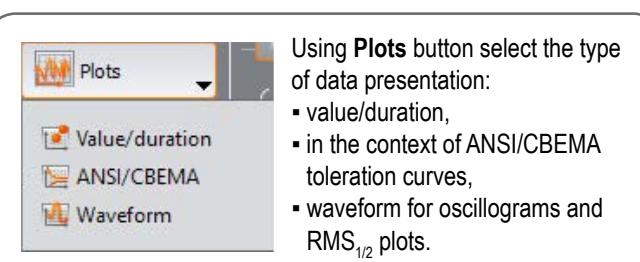


"Events" menu

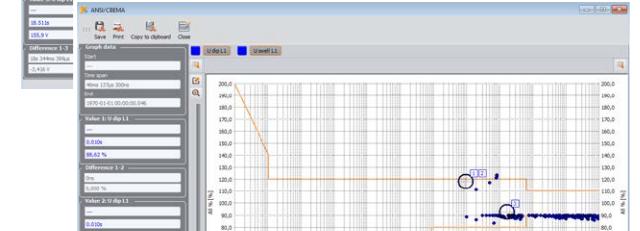
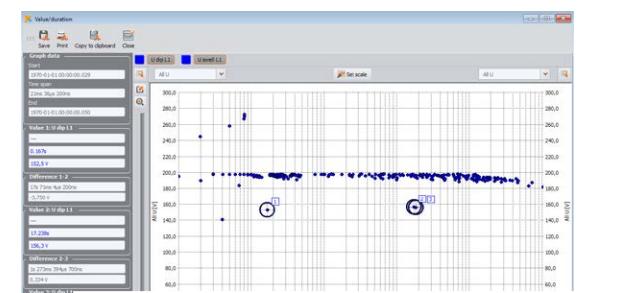
This menu contains the list of events that occurred during the recording.



Find the list of events marked in "General" menu under tab **Marker**.

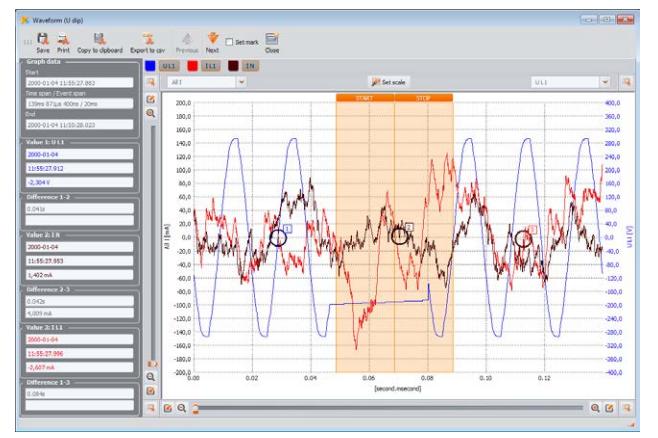


Using **Plots** button select the type of data presentation:
▪ value/duration,
▪ in the context of ANSI/CBEMA toleration curves,
▪ waveform for oscilloscopes and RMS_{1/2} plots.



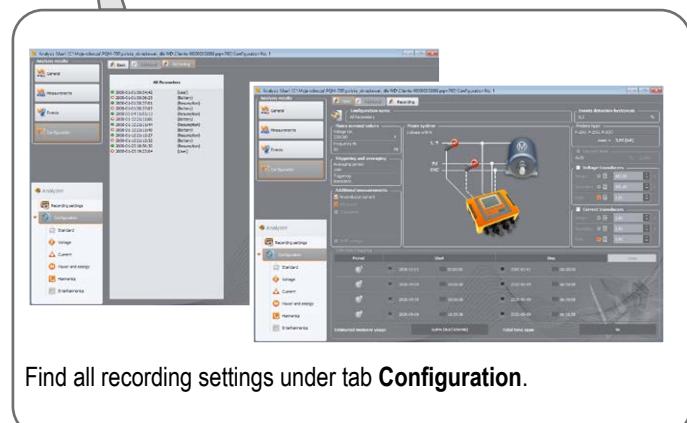
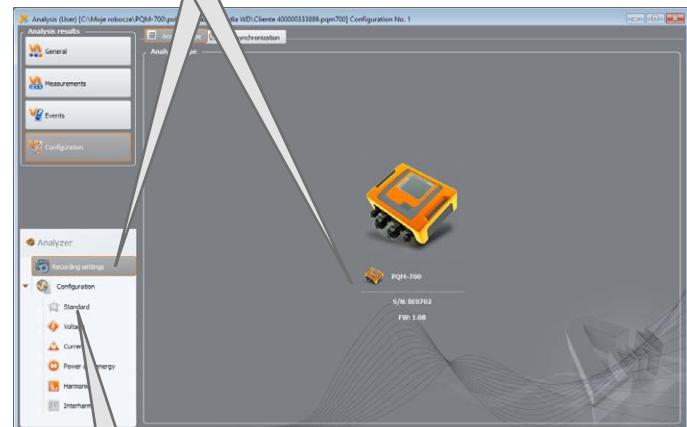
Choosing the **Oscillogram** icon will open two windows:

- timeplot for that event,
- waveform for that event.



"Configuration" menu

View, how the analyzer was set for the analysed recording.



Find all recording settings under tab **Configuration**.



Find more information in the
user manual and on our website
www.sonel.pl/en