



CLASS A
IEC 61000-4-30

CAT IV
600 V



TRANSIENT RECORDER
PQM-703 • PQM-711

OR-1
PQM-702 • PQM-702T
PQM-703

WiFi
PQM-710 • PQM-711

GSM
GPS

HEAVY DUTY
55°C
-20°C
PQM-702T

TEMPERATURE PROBE

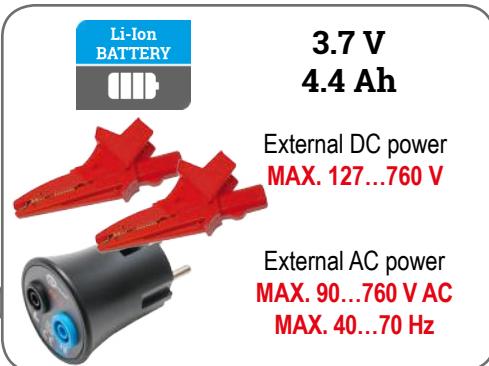
IP65

v1.01 | 11.09.2019

Top bar

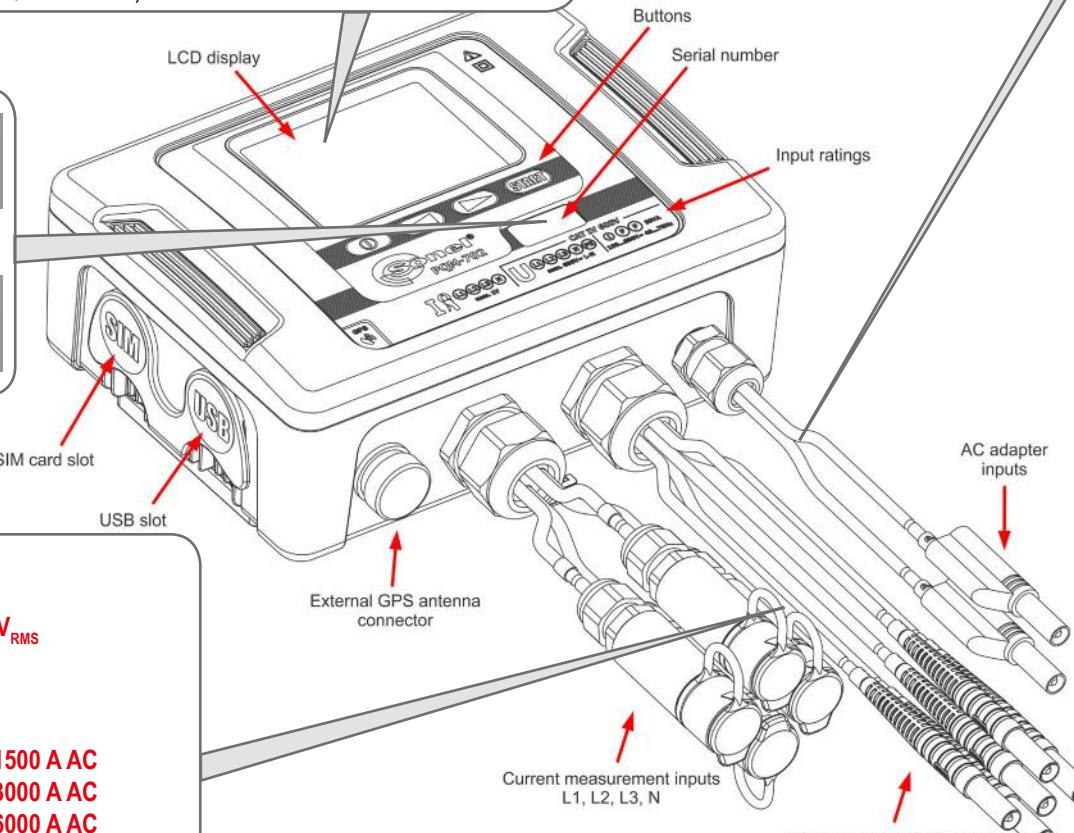
1 2 3 4 5
P3 | 1.80 GB | 20.12.12 11:30:12 ➡️ 🔋 ⚡

- 1 Number of active measurement configuration
- 2 Available space on the memory card
- 3 Date and time (DD:MM:YY, HH:MM:SS)
- 4 Power supply indicator
- 5 GSM signal indicator



Maximum input voltage

U **L1 L2 L3 N PE**
max. 760 V~
or
U **L1 L2 L3 N PE**
max. 1000 V~



Measurement inputs

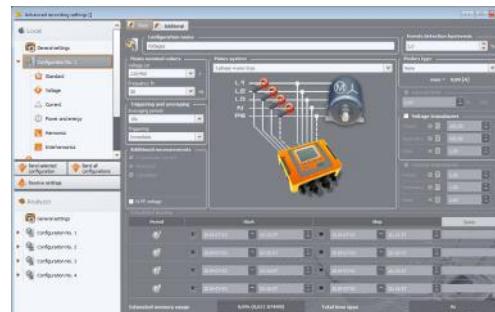


Power supply

Mounting

Three steps to get results

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

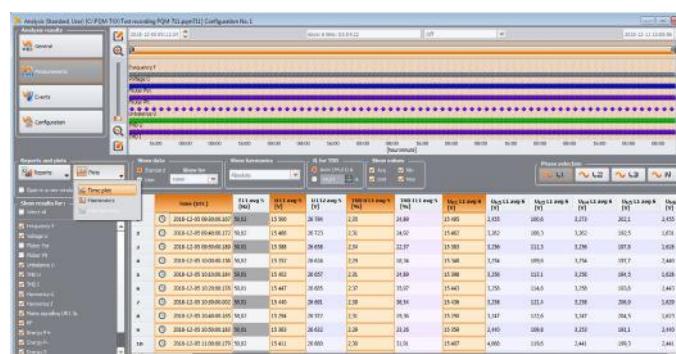


Send all configurations

② Install the analyzer and start the measurement ▶ page 6



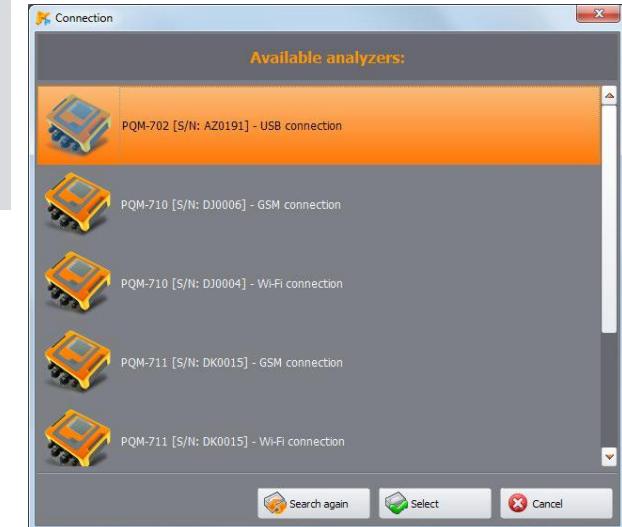
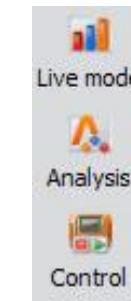
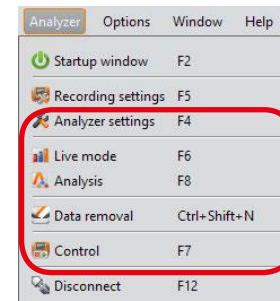
③ Analyze the recorded data ▶ page 8



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-702	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%)
- 11 Current limit

The screenshot shows the 'Advanced recording settings' window with the following details:

- Configuration name:** Voltages
- Mains nominal values:** Voltage Un: 230/400 V, Frequency fn: 50 Hz
- Mains system:** 3-phase 4-wire Wye
- Triggering and averaging:** Averaging period: 10s, Triggering: Immediate
- Additional measurements:** N-conductor current, Measured
- Events detection hysteresis:** 2,0 %
- Probes type:** None
- Current limit:** max = 0,00 [A]
- Voltage transducers:** Primary: 100,00, Secondary: 100,00, Ratio: 1,00
- Current transducers:** Primary: 1,00, Secondary: 1,00, Ratio: 1,00
- Scheduled logging:** Four entries for July 3, 2019, from 10:53:28 to 10:53:28.
- Analyzer section:** Shows Configuration No. 1 selected.

Annotations with numbers 1 through 11 point to specific configuration fields and sections in the software interface.

Enter recording parameters.

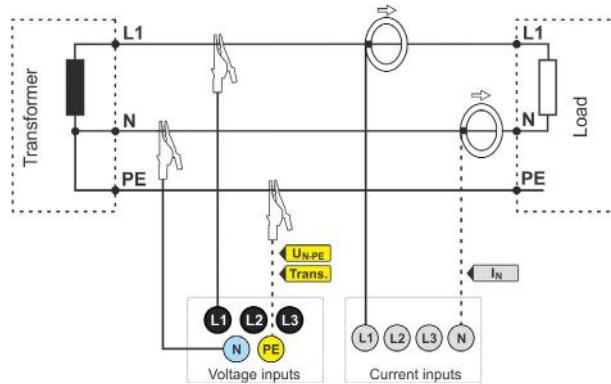
Send configuration to the analyzer.

Receive configuration from the analyzer's memory.

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

Getting started | Choosing the mains system

Single-phase

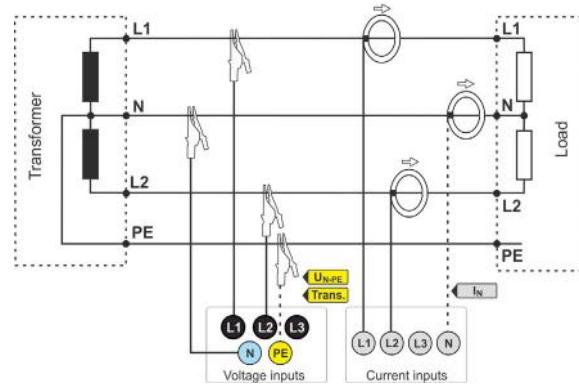


P3 | 1.80 GB | 20.12.12 11:30:12

U_{RMS} ✓
 I_{RMS} ✓
 φ_U ✓
 φ_I ✓
 f ✓

<1/9>

Split-phase



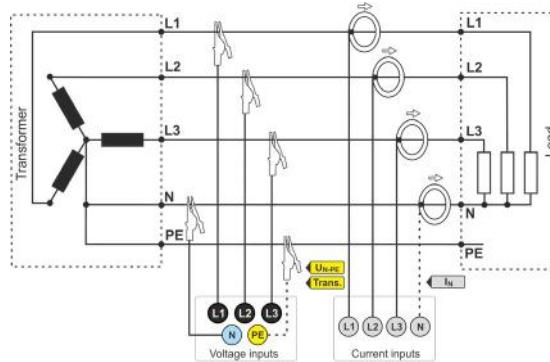
P3 | 1.80 GB | 20.12.12 11:30:12

U_{RMS} ✓
 I_{RMS} ✓
 φ_U ✓
 φ_I ✓
 f ✓

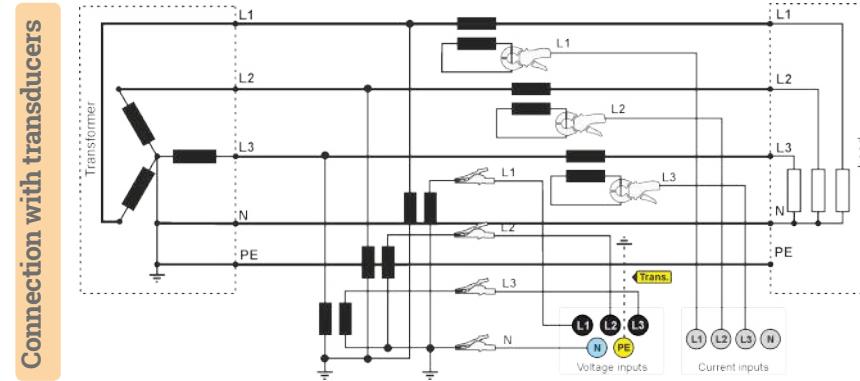
<1/9>

$U_1 \blacktriangleright U_2$

Direct connection



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



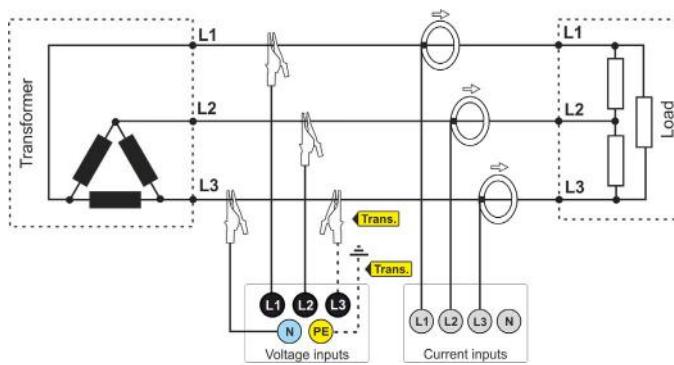
P3 | 1.80 GB | 20.12.12 11:30:12

U_{RMS} ✓
 I_{RMS} ✓
 φ_U ✓
 φ_I ✓
 f ✓

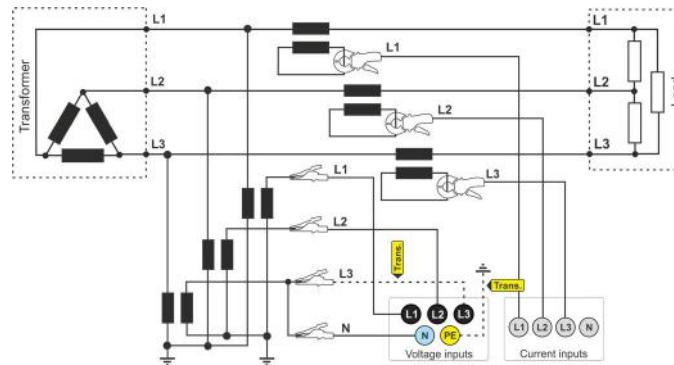
<1/9>

$U_1 \blacktriangleright U_2 \blacktriangleright U_3$

Direct connection



Connection with transducers



3-phase 3-wire (Delta)

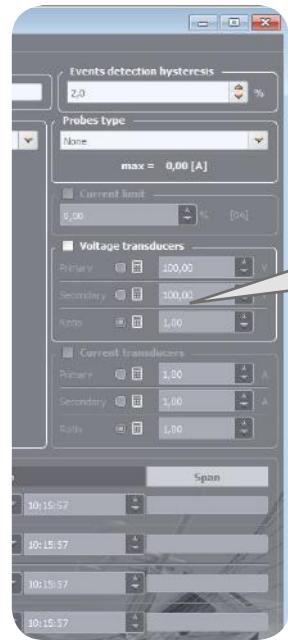
P3 | 1.80 GB | 20.12.12 11:30:12

U_{RMS} ✓
 I_{RMS} ✓
 φ_U ✓
 φ_I ✓
 f ✓

<1/9>

$U_{12} \blacktriangleright U_{23} \blacktriangleright U_{31}$

Getting started | Adjusting transducer settings



Probes type

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

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

Voltage transducers

Primary	100,00	V
Secondary	100,00	V
Ratio	1,00	

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	1500,00	A
Secondary	3000,00	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 Choose the active configuration

To change the active configuration, press simultaneously buttons and hold them for ≥ 1 s.

Choose the desired configuration by pressing the assigned button

or

use Sonel Analysis software
(Control menu).



Using buttons switch between the screens. You will find the information on preset network parameters and analyzer status.

P1 1.78 GB 25.02.14 10:45:57		
Choose measurement point:		
P1	P2	P3

P3 1.80 GB 20.12.12 11:31:02		
System type: 3-phase wye		
Clamps : F-x		
Frequency : 50 Hz		
U _{nom} : 230 V		
I _{nom} : 3000 A		

3 Verify the configuration

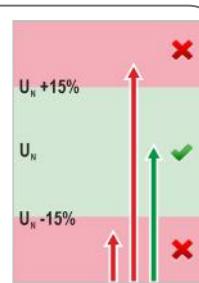


4 Connect the analyzer to the measured mains

5 Verify mains status and analyzer connection

RMS voltages

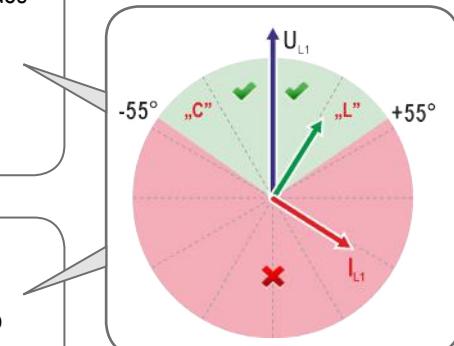
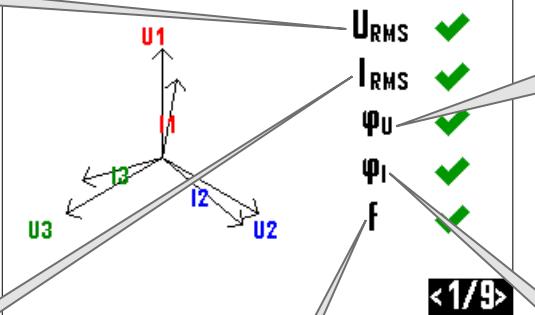
- ✓ U_{RMS} within $\pm 15\%$ U_N range
- ✗ U_{RMS} outside of $\pm 15\%$ U_N range



P1 | 1.80 GB | 20.12.12 11:30:12

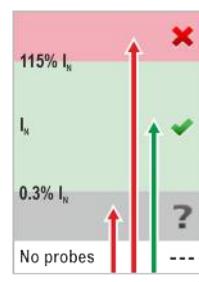
Voltage angles - phase succession (clockwise)

- ✓ 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

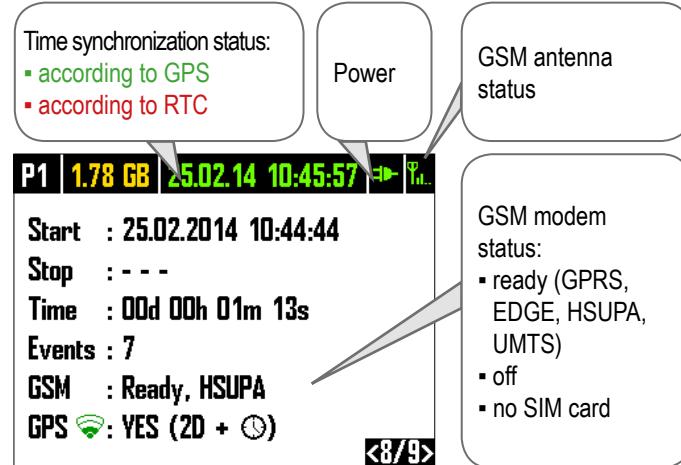
Current angles - relative to voltage

- ✓ 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: $< 0.3\% I_N$

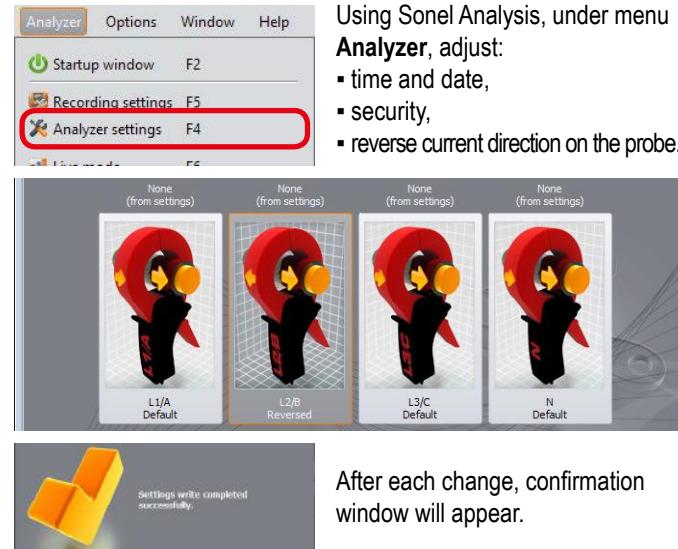
Measurements

6 Verify additional parameters

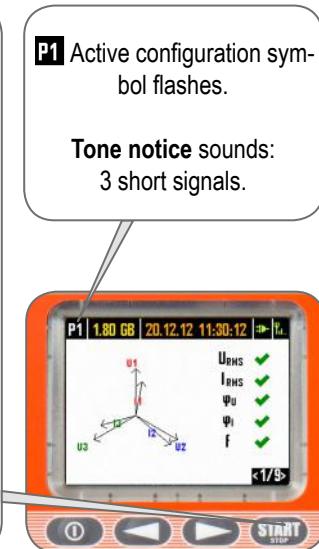
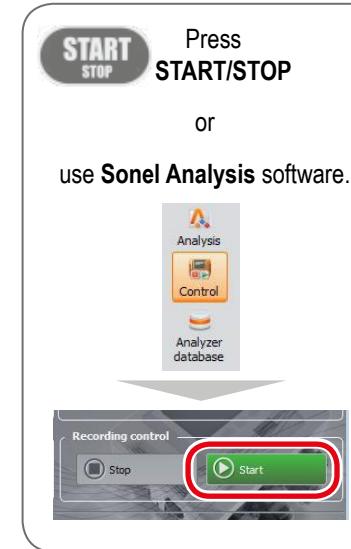
Using buttons go to screen 8 in order to verify additional recording parameters.



7 Adjust analyzer settings

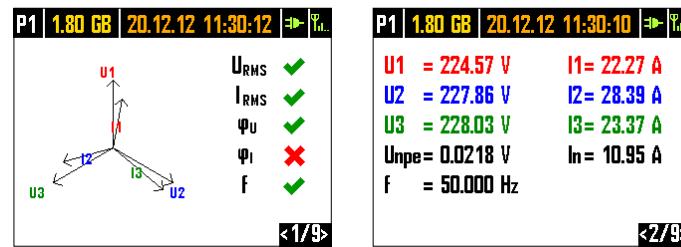


8 Start recording



9 View the readings

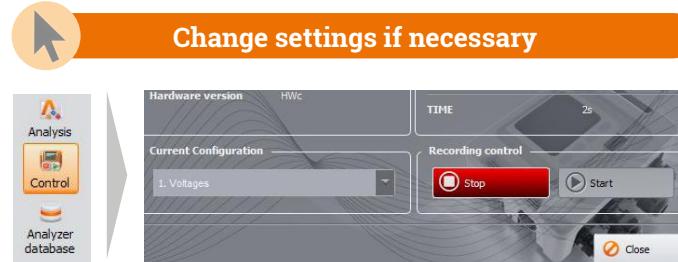
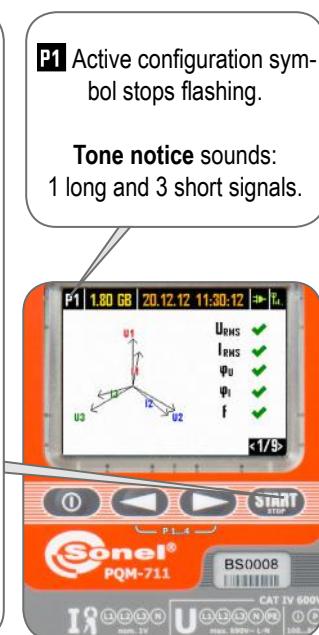
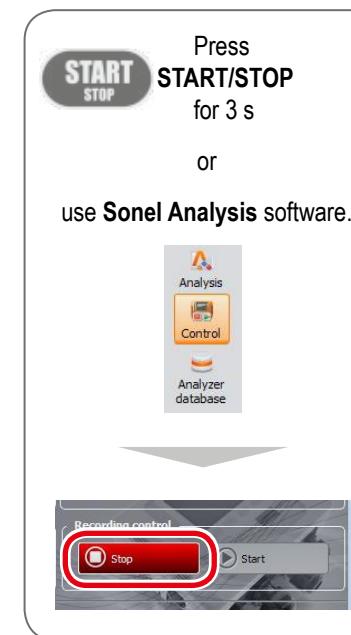
Using buttons switch between the screens in order to view recorded parameters.



10 Monitor the meter and measurements

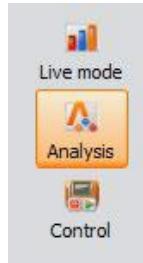


11 Finish recording



Data analysis

① Download data from the analyzer



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

② Choose the recording for analysis

On the top bar choose the time range if necessary.

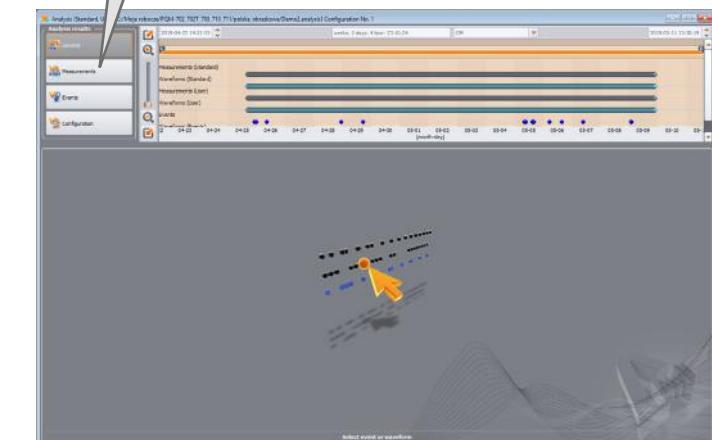
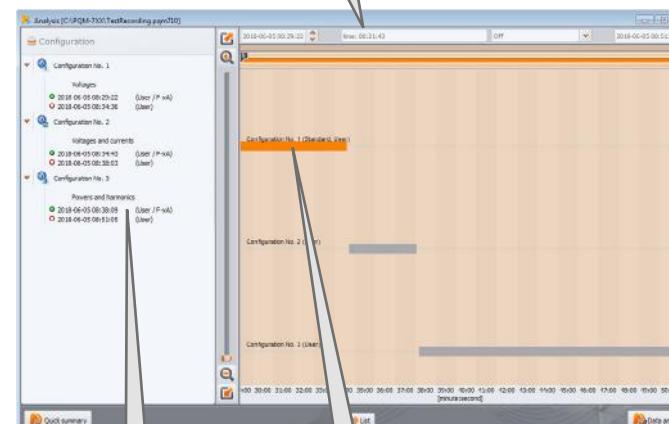
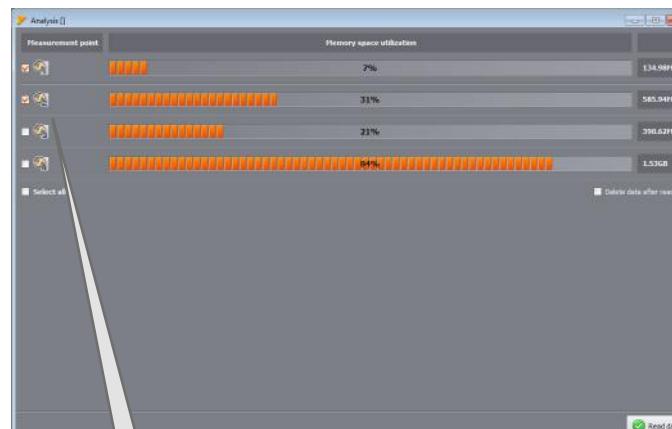


③ Analyze the data



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

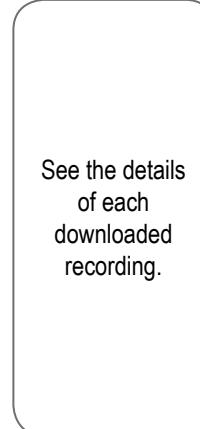
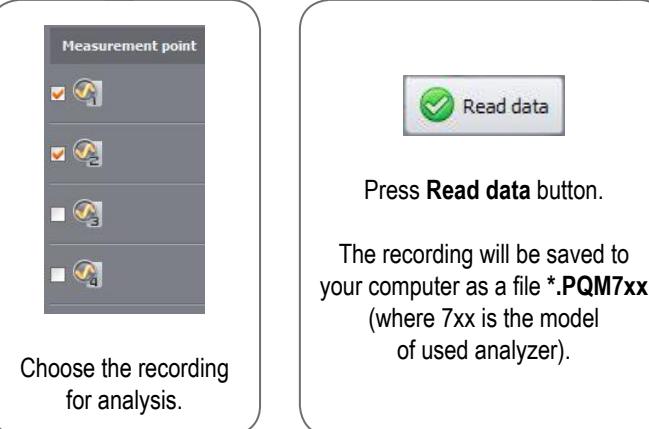
- **General** - general information on the measurements,
- **Measurements** - analyze the measurements, generate reports and plots,
- **Events** - analyze the events,
- **Configuration** - view, how the meter was set for the analyzed recording.



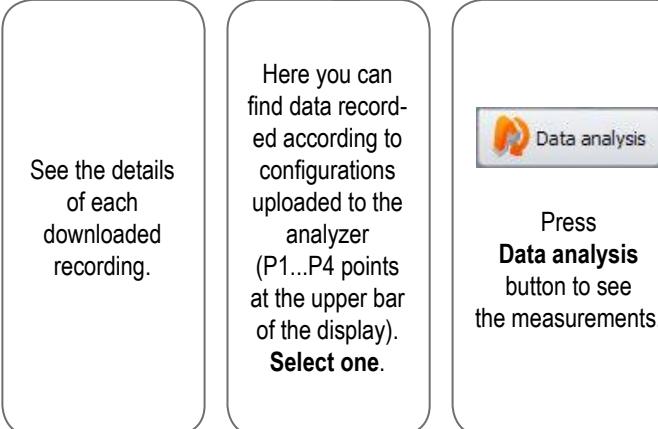
Press **Read data** button.

The recording will be saved to your computer as a file *.PQM7xx (where 7xx is the model of used analyzer).

Choose the recording for analysis.



See the details of each downloaded recording.

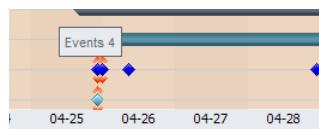


Press **Data analysis** button to see the measurements.

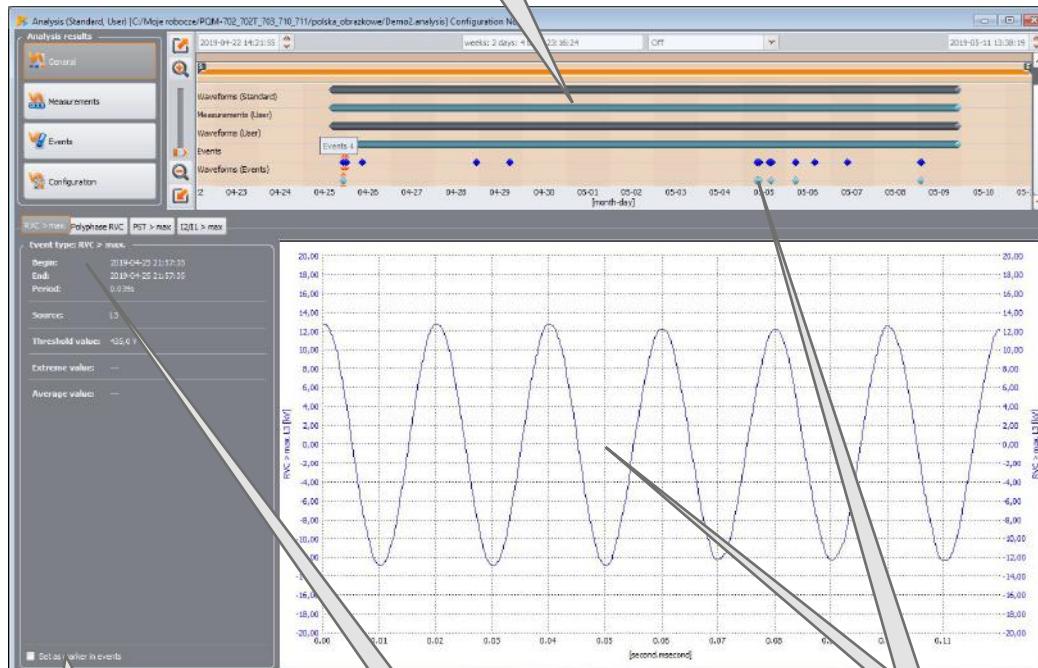


Data analysis

"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.

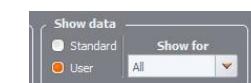
"Measurements" menu



Time (UTC+2) fL [Hz]

2019-04-25 15:42:30.003 49,98

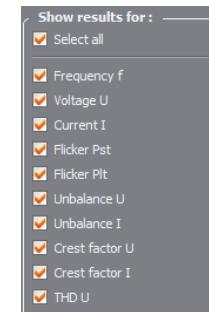
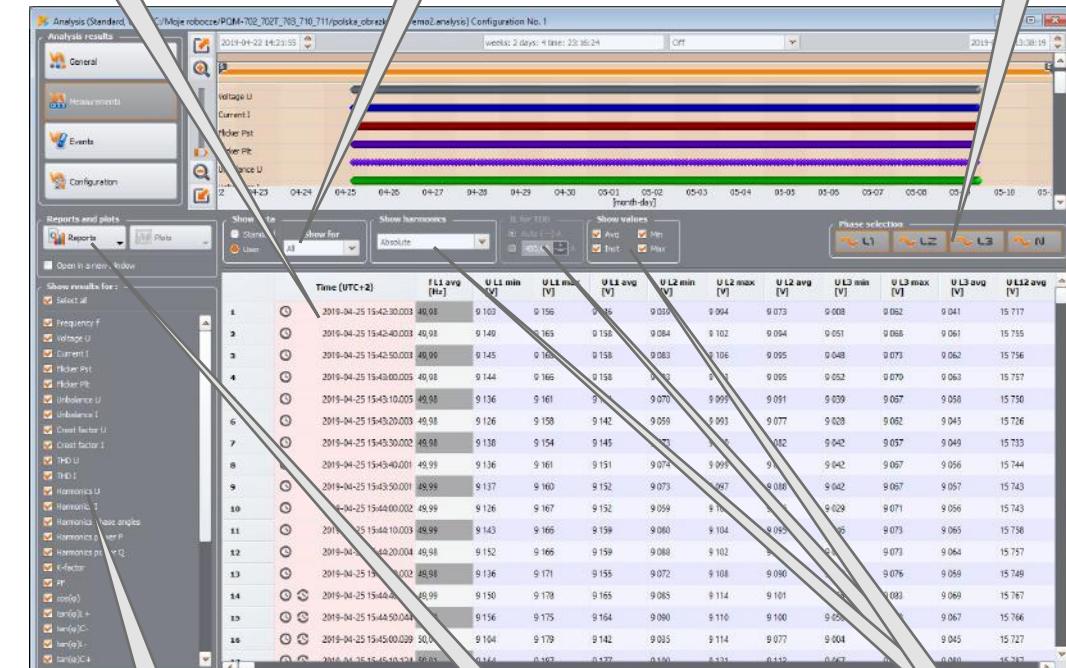
Recording time and values.



Choose data for analysis.



Filter phases from which you want to analyze data.



Here are groups of chosen parameters.



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

- timeplot,
- harmonics,
- interharmonics.

Create reports under menu **Reports**.

UL1 min [V]	UL1 max [V]	UL1 avg [V]	UL2 min [V]
9 103	9 156	9 136	9 039
9 140	9 155	9 150	9 034

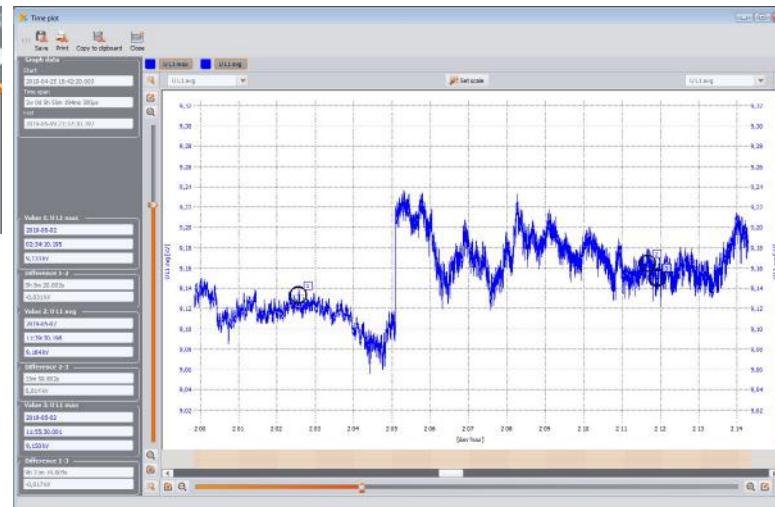
Mark columns for data analysis in order to create a plot or report.

Data analysis



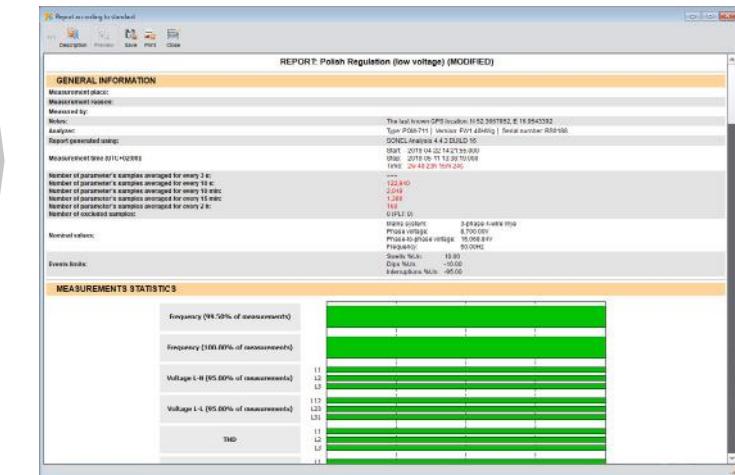
Time plot

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



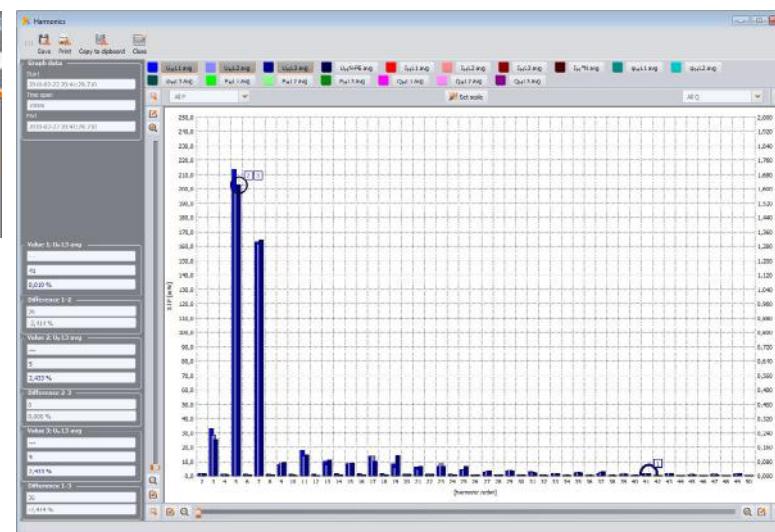
Creating reports

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

You can also export data directly to CSV file.

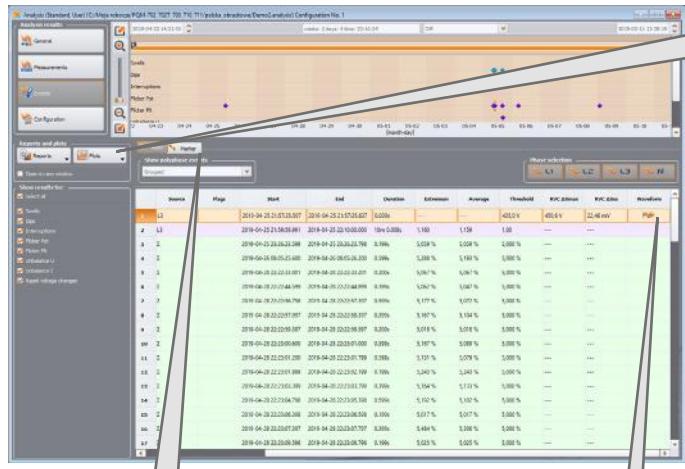
BASE (F) > PQM > Text database	
Nazwa	Typ
Measurement 1	Microsoft Excel Comma Separated Values File
Measurement 2	Microsoft Excel Comma Separated Values File
Measurement 3	Microsoft Excel Comma Separated Values File
X11	
A	B
1 Analyzer	PQM-711 (BS0188)
2 Recording start:	25.04.2019 15:42
3 Recording stop:	09.05.2019 21:37
4 Time:	(UTC+2)
5 Flag:	
6 E - event	
7 P - PLL no synchronization	
8 G - GPS no synchronization	
9 T - time resynchronization	
10 A - A/D overflow	
11	E' P' G' T' A' Date Time (UTC+2) U L1 avg [V] U L2 min [V]
12	G' 25.04.2019 15:42:40.003 9157.8 9084
13	G' 25.04.2019 15:42:50.003 9158.3 9082.6
14	G' 25.04.2019 15:43:00.000 9157.9 9083.2
15	G' 25.04.2019 15:43:10.005 9154.3 9070
16	G' 25.04.2019 15:43:20.003 9141.6 9058.8
17	G' 25.04.2019 15:43:30.002 9145.1 9072.9
18	G' 25.04.2019 15:43:40.001 9150.8 9074.2
19	G' 25.04.2019 15:43:50.001 9151.7 9072.6
20	G' 25.04.2019 15:44:00.002 9151.8 9059.3
21	G' 25.04.2019 15:44:10.003 9159.3 9079.8
22	G' 25.04.2019 15:44:20.004 9159 9087.6
23	G' 25.04.2019 15:44:30.002 9154.6 9072.2
24	

Data analysis



"Events" menu

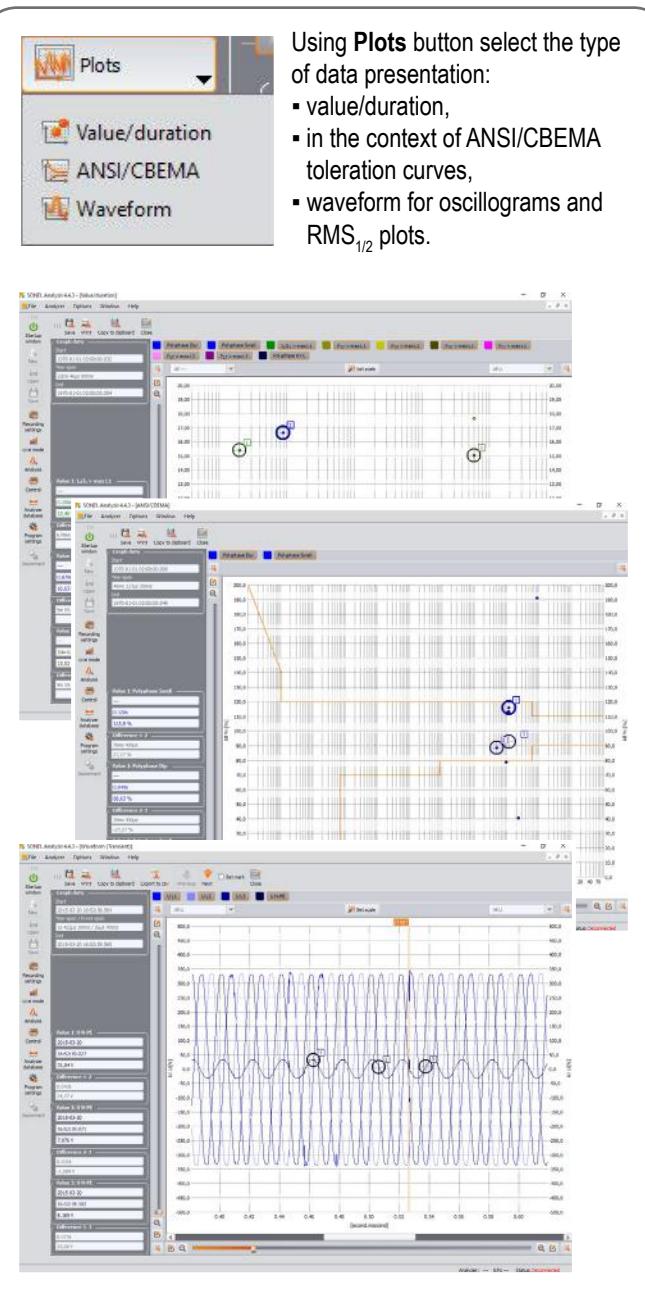
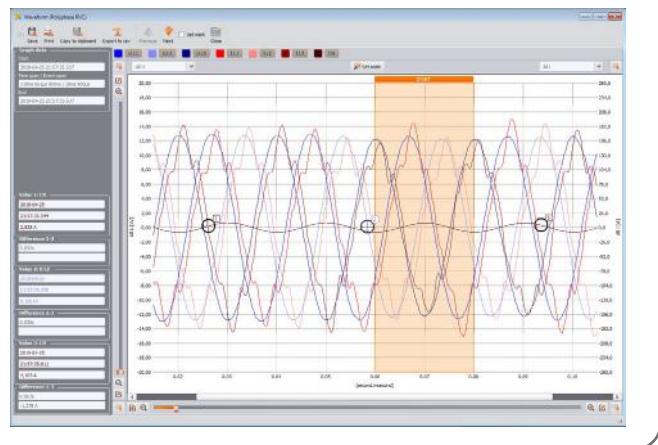
This menu contains the list of events that occurred during the recording.



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

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

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

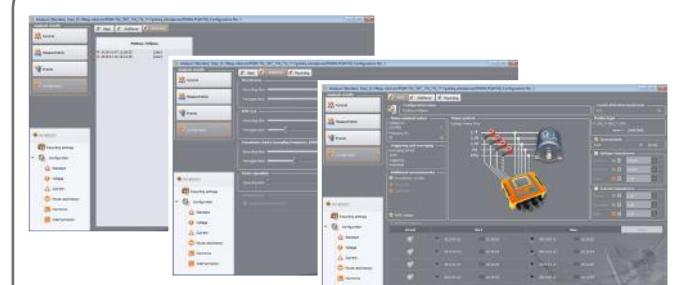
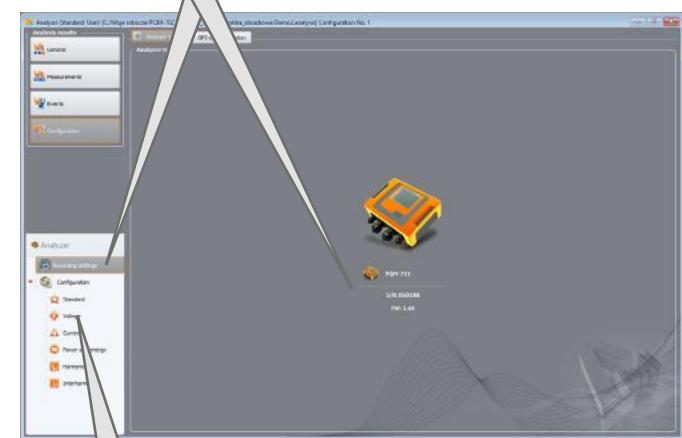


Using **Plots** button select the type of data presentation:
▪ value/duration,
▪ in the context of ANSI/CBEMA toleration curves,
▪ waveform for oscillograms and RMS_{1/2} plots.



"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