

Sonel PQM-702 / 702T / 703 / 710 / 711

Power Quality Analyzers • Quick Guide



v1.01 | 11.09.2019

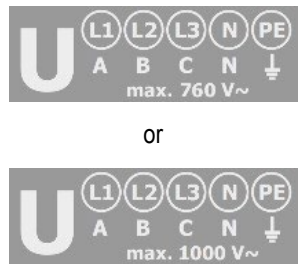


Top bar



- 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



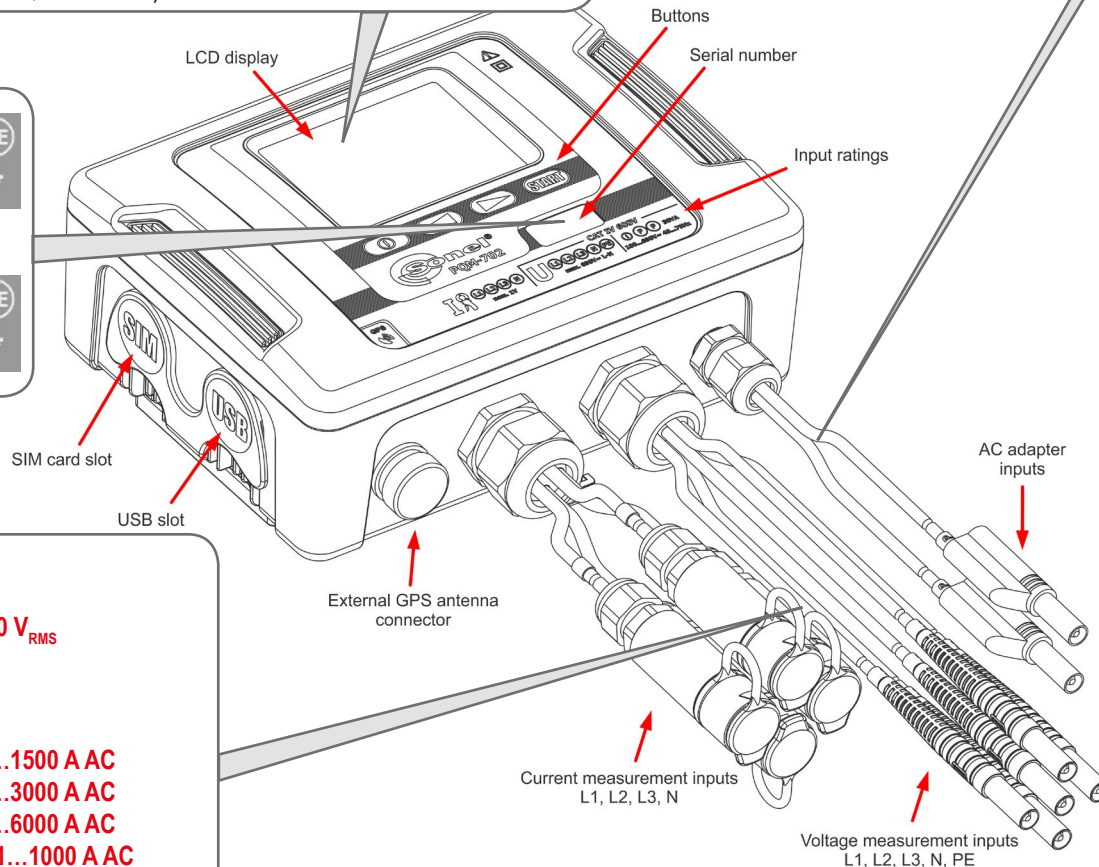
Measurement inputs

Voltage - 5 inputs

L1, L2, L3, N, PE
AC: **MAX. 760 V_{RMS}** or **1000 V_{RMS}**
DC: **±760 V** or **±1000 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. 127...760 V

External AC power
MAX. 90...760 V AC
MAX. 40...70 Hz

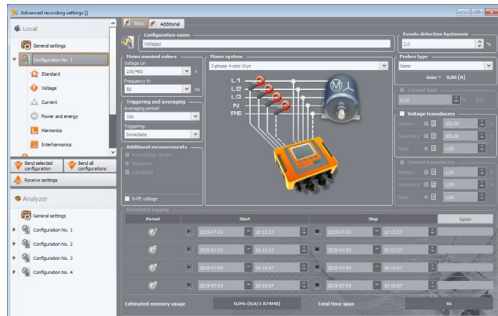
Power supply

Mounting



Three steps to get results

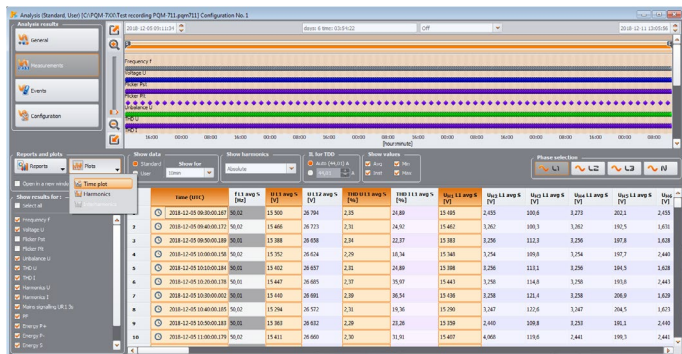
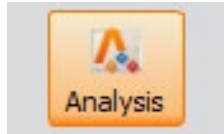
1 Prepare measurement configuration and send it to the meter ► page 2



2 Install the analyzer and start the measurement ► page 6

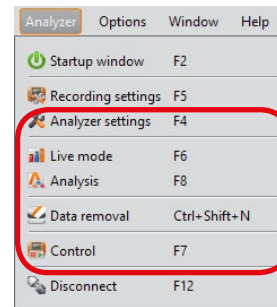


3 Analyze the recorded data ► page 8



Getting started | Connecting the analyzer

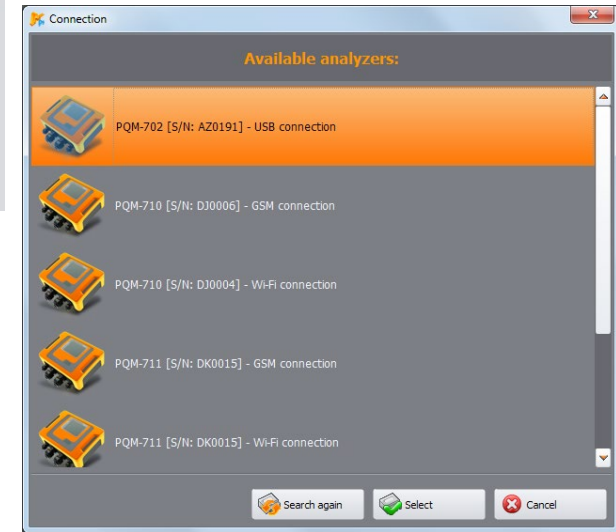
Method 1. Choose a function requiring analyzer connection



Live mode

Analysis

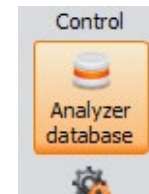
Control



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

Enter recording parameters.

Send configuration to the analyzer.

Receive configuration from the analyzer's memory.

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

Advanced recording settings []*

Local

- General settings
- Configuration No. 1
- Configuration No. 2
- Configuration No. 3
- Configuration No. 4

Send selected configuration

Send all configurations

Receive settings

Analyzer

- General settings
- Configuration No. 1
- Configuration No. 2
- Configuration No. 3
- Configuration No. 4

Basic

Additional

Configuration name

Voltages

Mains nominal values

Voltage Un

230/400 V

Frequency fn

Hz

Mains system

3-phase 4-wire Wye

Triggering and averaging

Averaging period:

10s

Triggering:

Immediate

Additional measurements

☐ N-conductor current

☐ Measured

☐ Calculated

☐ N-PE voltage

Events detection hysteresis

2,0 %

Probes type

None

Current limit

0,00 % [A]

Voltage transducers

Primary

100,00 V

Secondary

100,00 V

Ratio

1,00

Current transducers

Primary

1,00 A

Secondary

1,00 A

Ratio

1,00

Scheduled logging

Period	Start	Stop	Span
1	2019-07-03 10:53:28	2019-07-03 10:53:28	
2	2019-07-03 10:53:28	2019-07-03 10:53:28	
3	2019-07-03 10:53:28	2019-07-03 10:53:28	
4	2019-07-03 10:53:28	2019-07-03 10:53:28	

Estimated memory usage

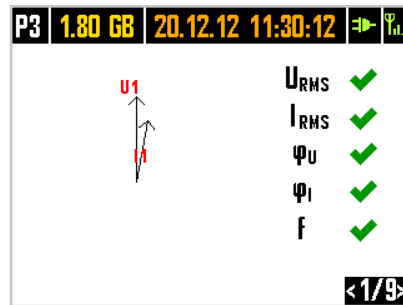
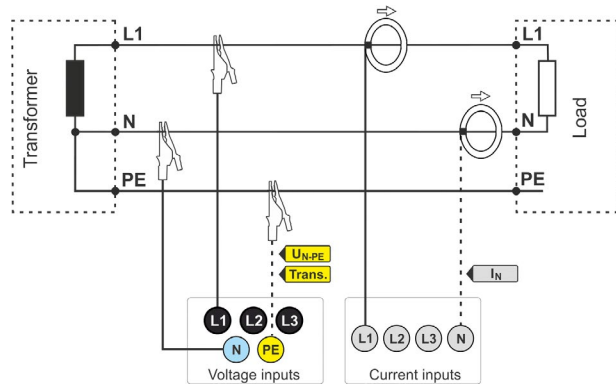
0,0% (0,0/1 874MB)

Total time span

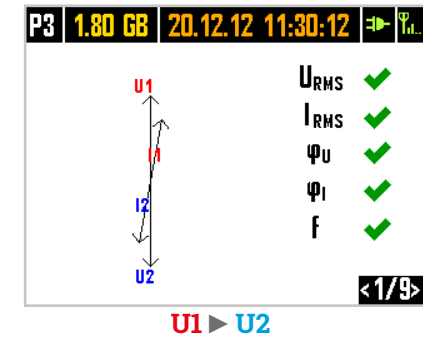
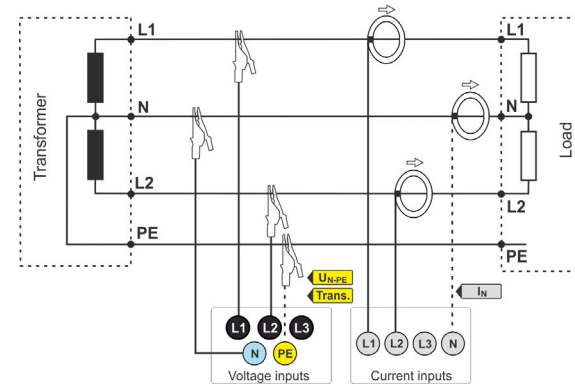
0s

Getting started | Choosing the mains system

Single-phase

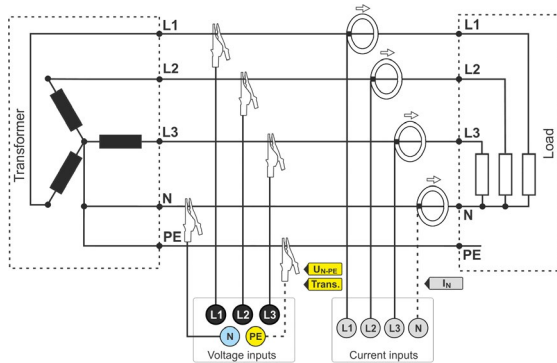


Split-phase

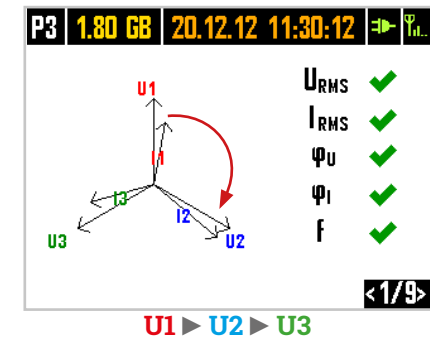
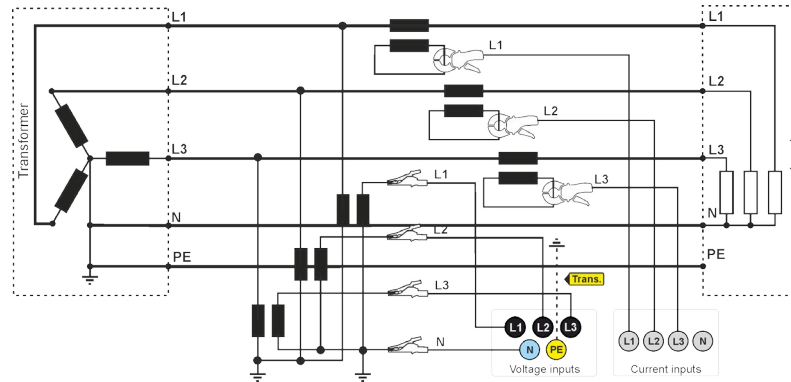


3-phase 4-wire (WYE with a neutral conductor)

Direct connection

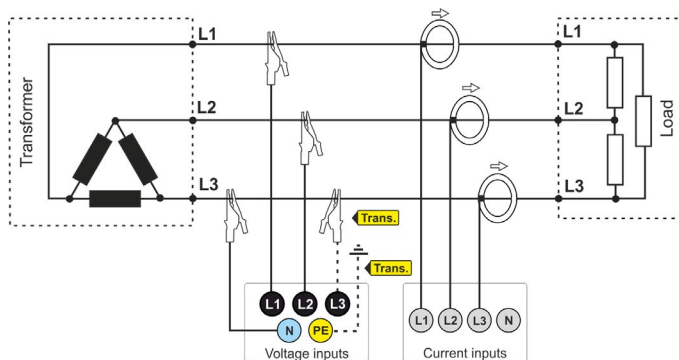


Connection with transducers

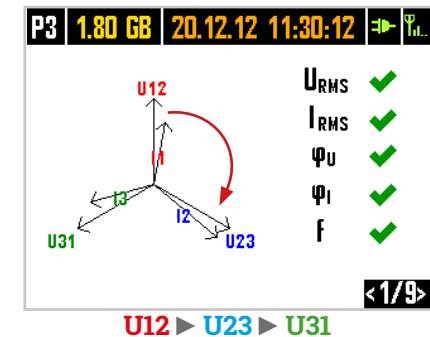
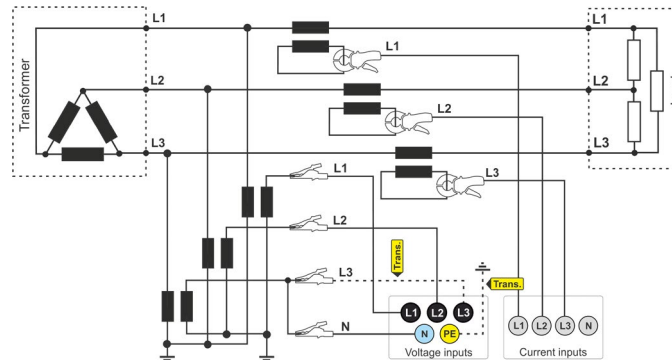


3-phase 3-wire (Delta)

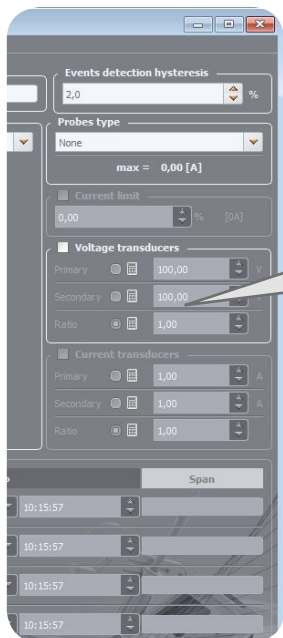
Direct connection



Connection with transducers



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

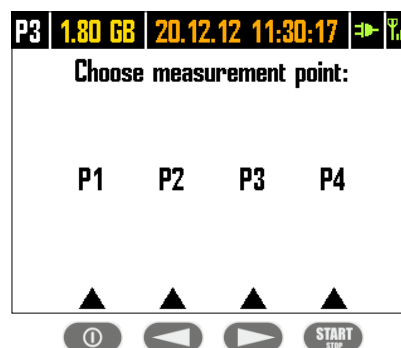
Choose the active configuration

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

Choose the desired configuration by pressing the assigned button

or

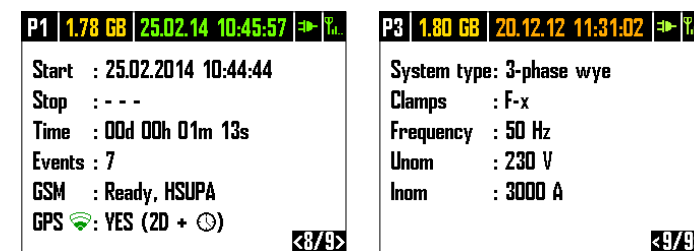
use **Sonel Analysis** software
(Control menu).



3

Verify the configuration

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



4

Connect the analyzer to the measured mains

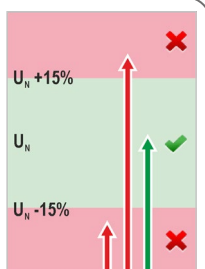


5

Verify mains status and analyzer connection

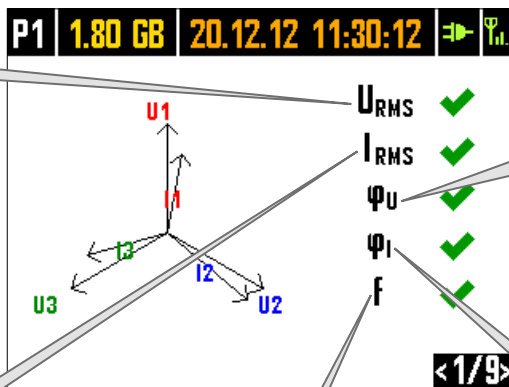
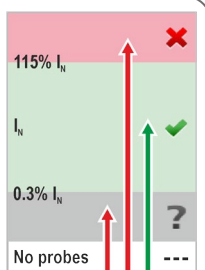
RMS voltages

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



RMS currents

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



Voltage angles - phase succession (clockwise)

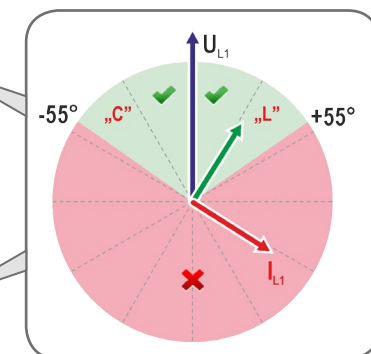
- ✓ angles of the range of $\pm 30^\circ$ of the theoretical values $0^\circ, 120^\circ, 240^\circ$
- ? too low voltages: $< 1\% U_N$
- ✗ incorrect angles

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.

Time synchronization status:
 ▪ according to GPS
 ▪ according to RTC

Power

GSM antenna status

P1 1.78 GB 25.02.14 10:45:57 ▶ P...

Start : 25.02.2014 10:44:44

Stop : - - -

Time : 00d 00h 01m 13s

Events : 7

GSM : Ready, HSUPA

GPS : YES (2D + ⌚)

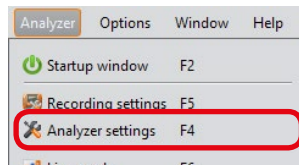
<8/9>

GSM modem status:

- ready (GPRS, EDGE, HSUPA, UMTS)
- off
- no SIM card

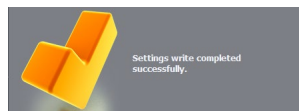
7

Adjust analyzer settings



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

- time and date,
- security,
- reverse current direction on the probe.



After each change, confirmation window will appear.

8

Start recording

START STOP

Press **START/STOP**

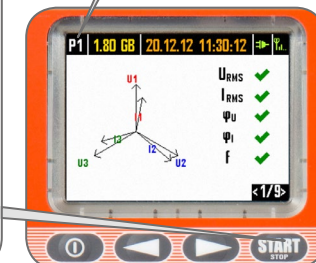
or

use **Sonel Analysis** software.



P1 Active configuration symbol flashes.

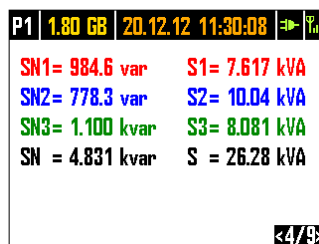
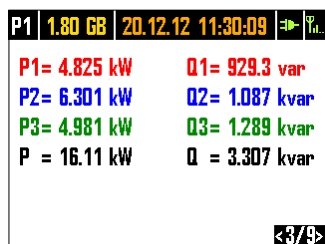
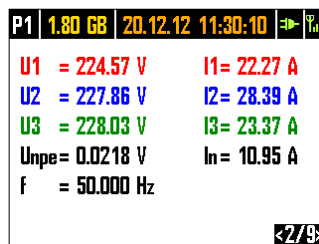
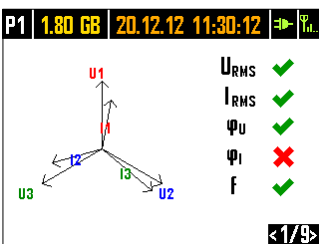
Tone notice sounds:
3 short signals.



9

View the readings

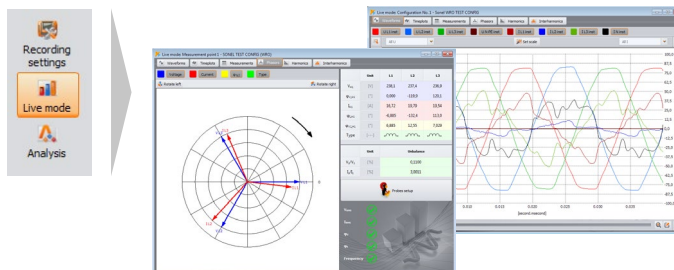
Using buttons ◀ ▶ switch between the screens in order to view recorded parameters.



10

Monitor the meter and measurements

View live readings



Change settings if necessary



11

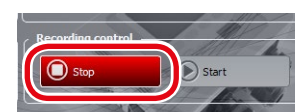
Finish recording

START STOP

Press **START/STOP** for 3 s

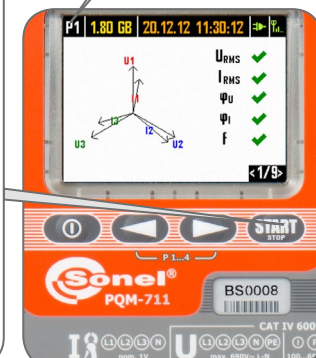
or

use **Sonel Analysis** software.



P1 Active configuration symbol stops flashing.

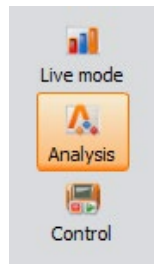
Tone notice sounds:
1 long and 3 short signals.



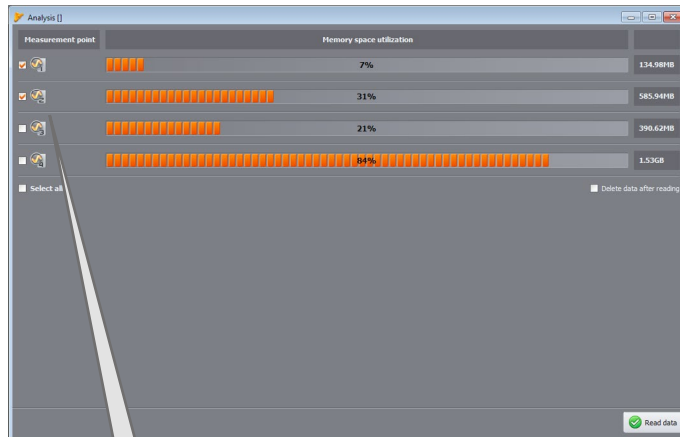
Data analysis

1

Download data from the analyzer



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



Choose the recording for analysis.



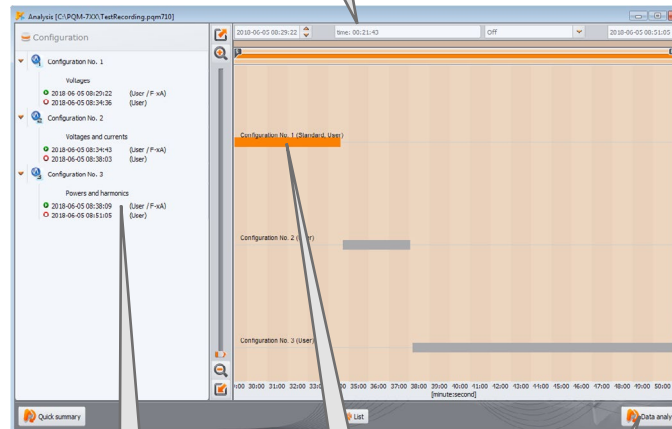
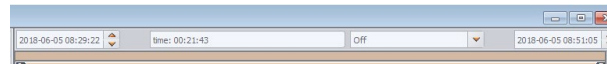
Press **Read data** button.

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

2

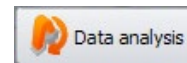
Choose the recording for analysis

On the top bar choose the time range if necessary.



See the details of each downloaded recording.

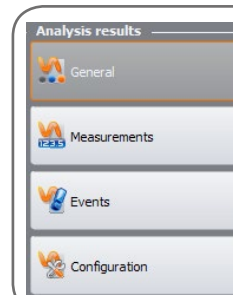
Here you can find data recorded according to configurations uploaded to the analyzer (P1...P4 points at the upper bar of the display). **Select one.**



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

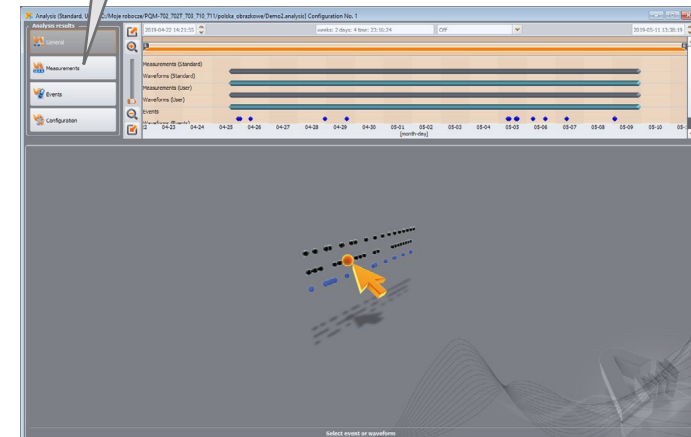
3

Analyze the data



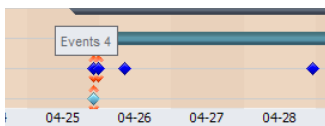
There are four menu options to help you analyze the data:

- **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.

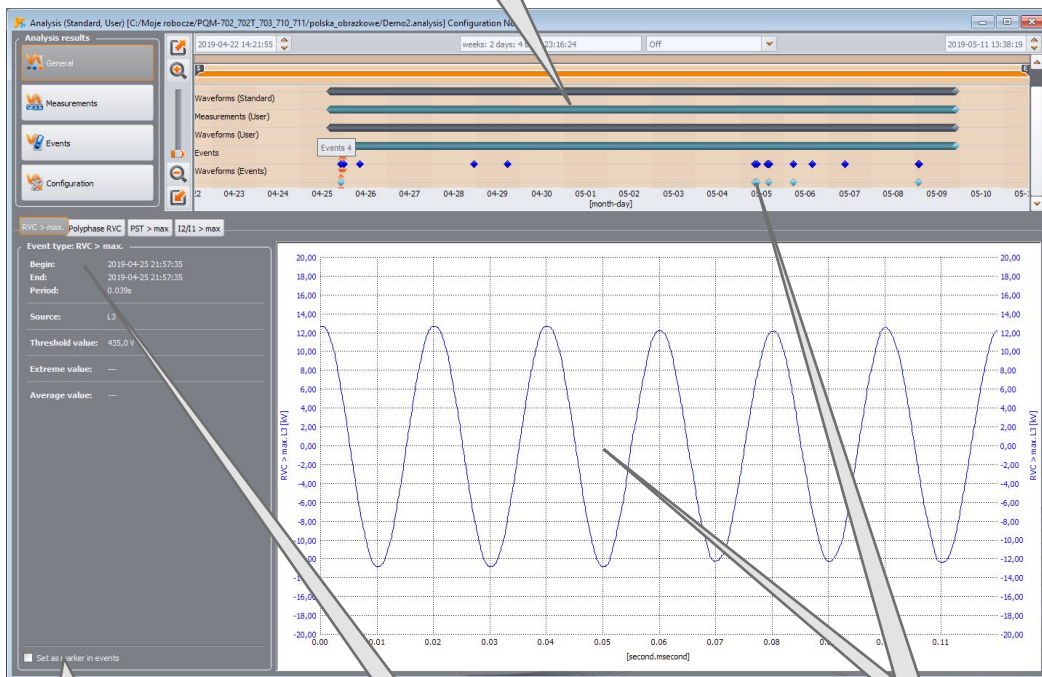


Data analysis

"General" menu



The top screen is the view of the whole recording.



Set as marker in events

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)
2019-04-25 15:42:30.003
f L [Hz]

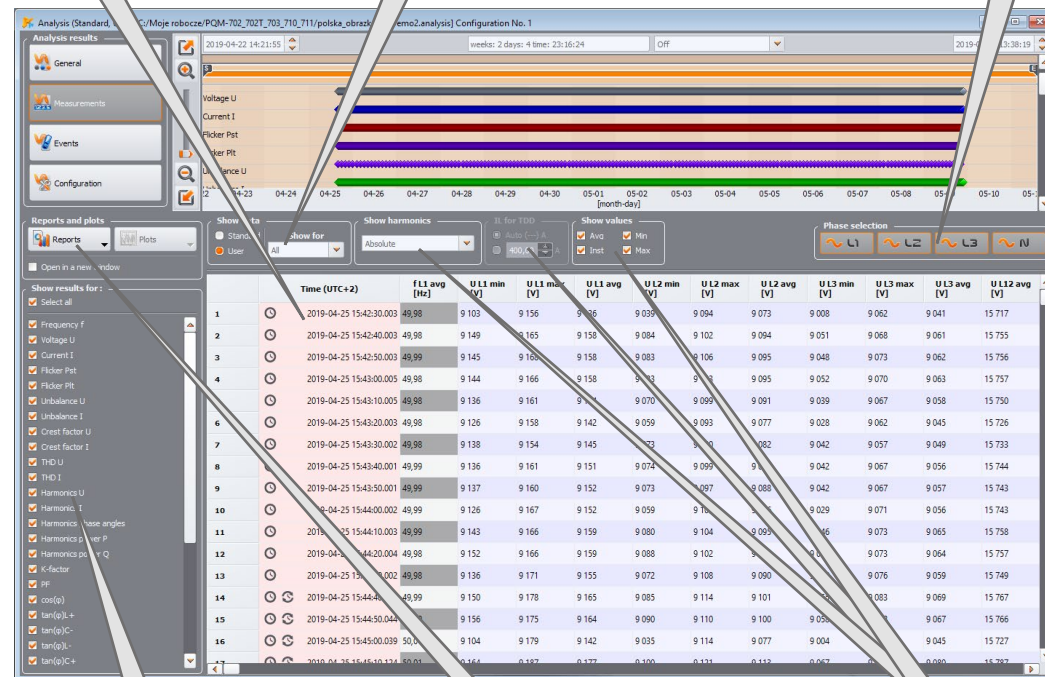
Recording time and values.

Show data
Standard
User
Show for

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 PIt
- ☒ Unbalance U
- ☒ Unbalance I
- ☒ 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**.

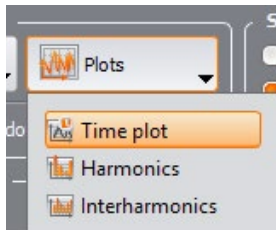
Choose the parameters for analysis.

U L1 min [V]	U L1 max [V]	U L1 avg [V]	U L2 min [V]
9 103	9 156	9 136	9 039
9 149	9 165	9 158	9 084

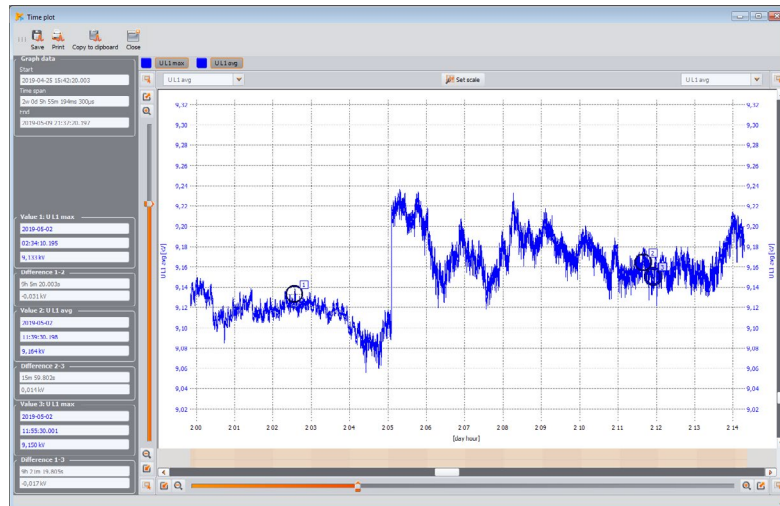
Mark columns for data analysis in order to create a plot or report.

Data analysis

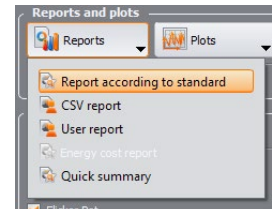
Time plot



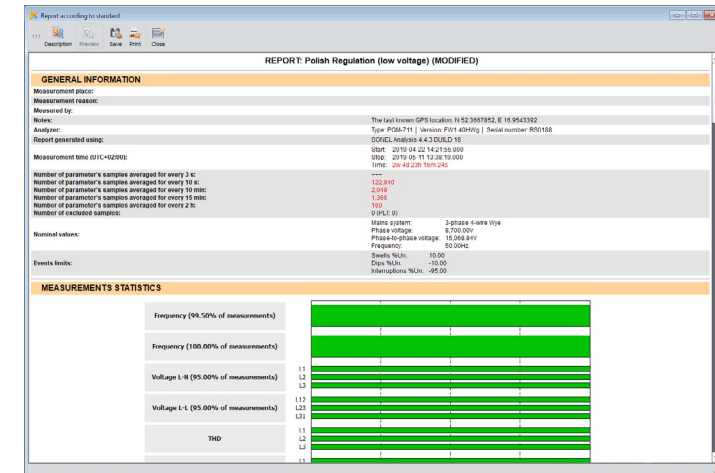
Choose the plot form. The graph will open in a new window.



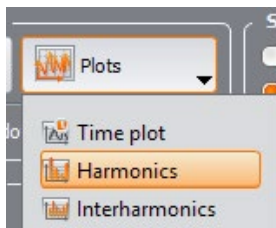
Creating reports



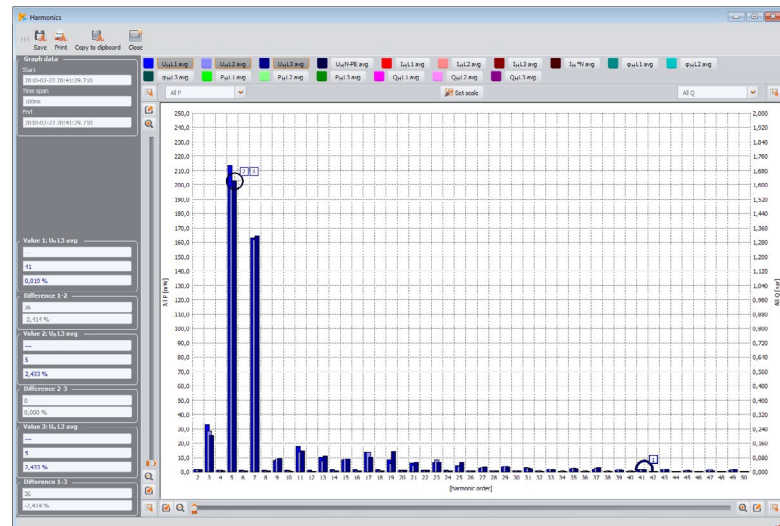
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.



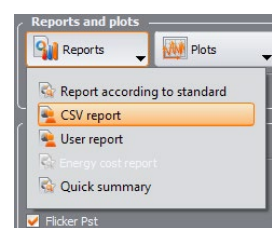
Harmonics and interharmonics



Choose appropriate plot to analyze harmonics or interharmonics.



Data export to CSV file



You can also export data directly to CSV file.

Nazwa	Typ	Data mo
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-

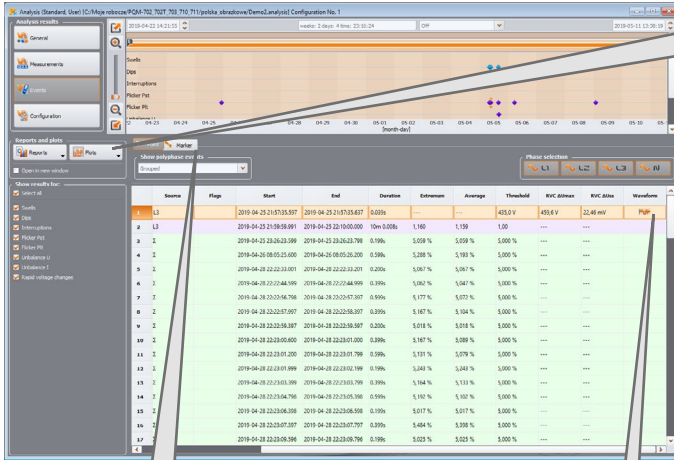
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Analyzer:	PQM-711 (BSU100)											
2	Recording start:	25.04.2019 15:42											
3	Recording stop:	09.05.2019 21:37											
4	Time:	(UTC+2)											
5	Flag:												
6	E - event												
7	P - PLL no synchronization												
8	G - GPS no synchronization												
9	T - time resynchronization												
10	A - A/D overflow												
11													
12			E	P	G	T	A	Date	Time (UTC+2)	U L1 avg [V]	U L2 min [V]		
13									25.04.2019 15:42:40.003	9157.8	9084		
14									25.04.2019 15:42:50.003	9158.3	9082.6		
15									25.04.2019 15:43:00.005	9157.9	9083.2		
16									25.04.2019 15:43:10.005	9154.3	9070		
17									25.04.2019 15:43:20.003	9141.6	9058.8		
18									25.04.2019 15:43:30.002	9145.1	9072.9		
19									25.04.2019 15:43:40.001	9150.8	9074.2		
20									25.04.2019 15:43:50.001	9151.7	9072.6		
21									25.04.2019 15:44:00.002	9151.8	9059.3		
22									25.04.2019 15:44:10.003	9159.3	9079.8		
23									25.04.2019 15:44:20.004	9159	9087.6		
24									25.04.2019 15:44:30.002	9154.6	9072.2		

Data analysis



"Events" menu

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

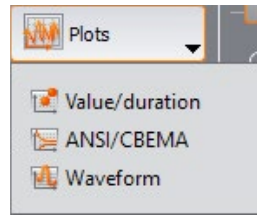
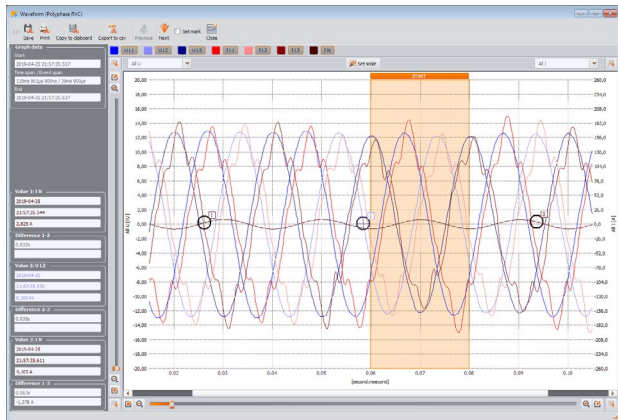


polyphase events

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

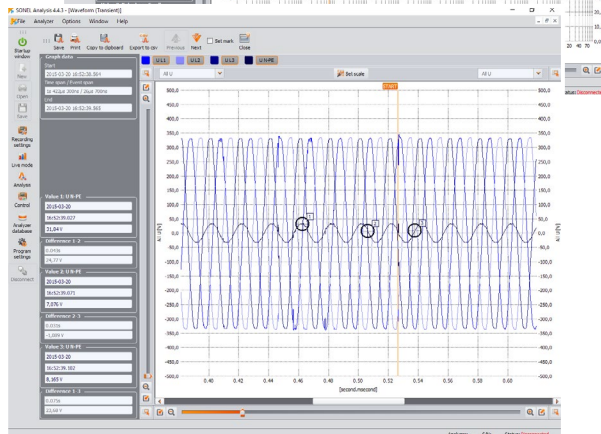
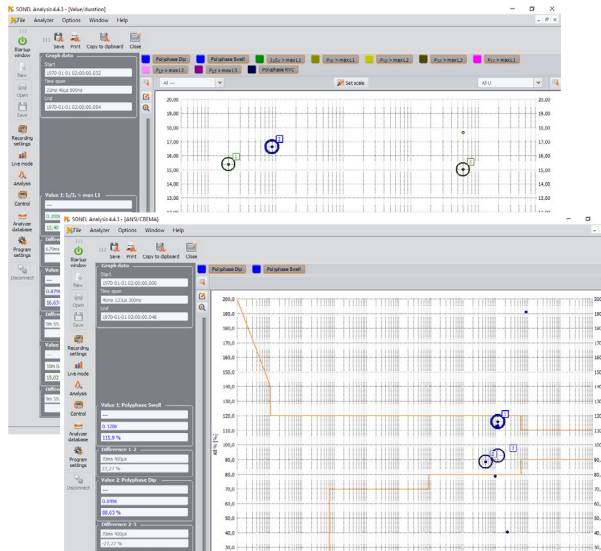
Choosing the **Oscillogram** icon will open two windows:

- 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.

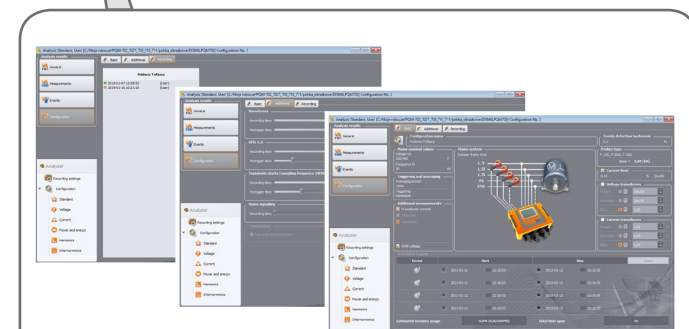
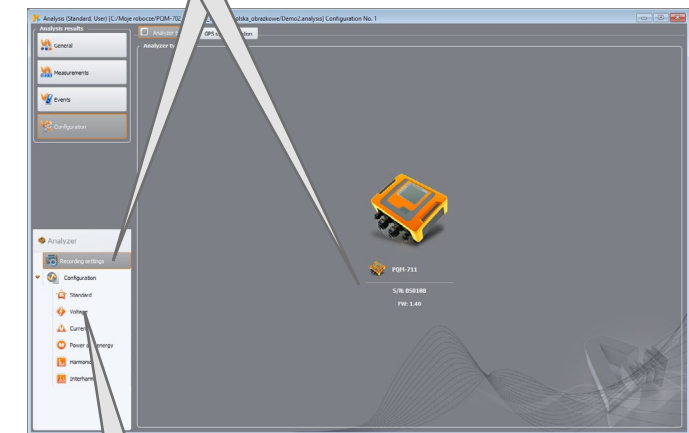
PQM-711

S/N: BS0188

FW: 1.40

Under tab **Recorder settings** find analyzer details such as:

- model,
- serial number,
- firmware version.



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



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