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

Power Quality Analyzers • Quick Guide

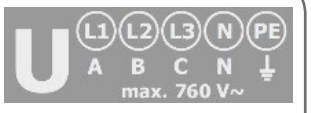
v1.01 | 11.09.2019

CLASS A IEC 61000-4-30 | CAT IV 600 V | EVENTS | TRANSIENT RECORDER (PQM-703 • PQM-711) | OR-1 (PQM-702 • PQM-702T PQM-703) | WiFi (PQM-710 • PQM-711) | GSM | GPS | 55°C HEAVY DUTY 20°C | TEMPE-RATURE PROBE (PQM-702T) | IP65

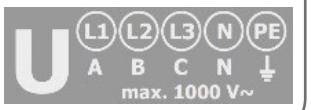
Top bar

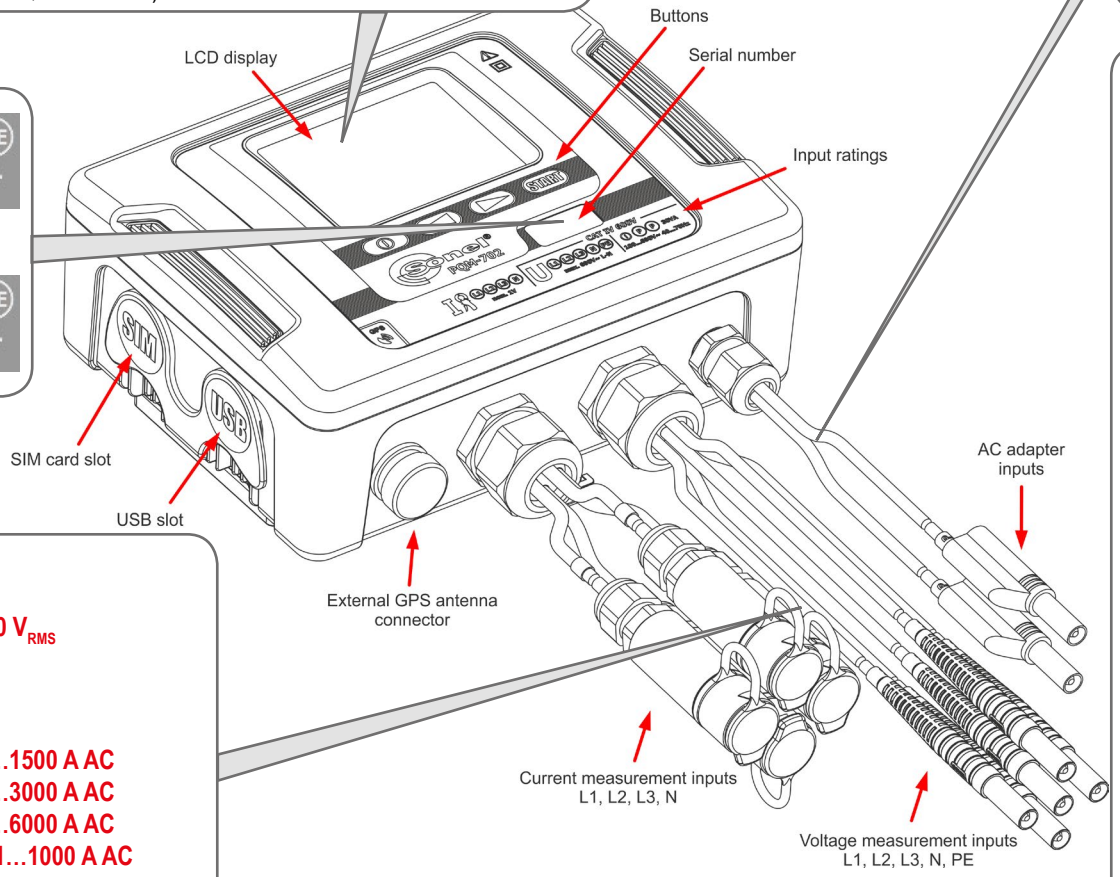
1 Number of active measurement configuration
2 Available space on the memory card
3 Date and time (DD:MM:YY, HH:MM:SS)
4 Power supply indicator
5 GSM signal indicator

Maximum input voltage



or





Measurement inputs

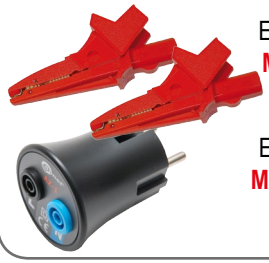
Voltage - 5 inputs
L1, L2, L3, N, PE
AC: **MAX. 760 V_{RMS}** or **1000 V_{RMS}**
DC: **±760 V** or **±1000 V**
referred to ground

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

Power supply

Li-Ion BATTERY

3.7 V
4.4 Ah



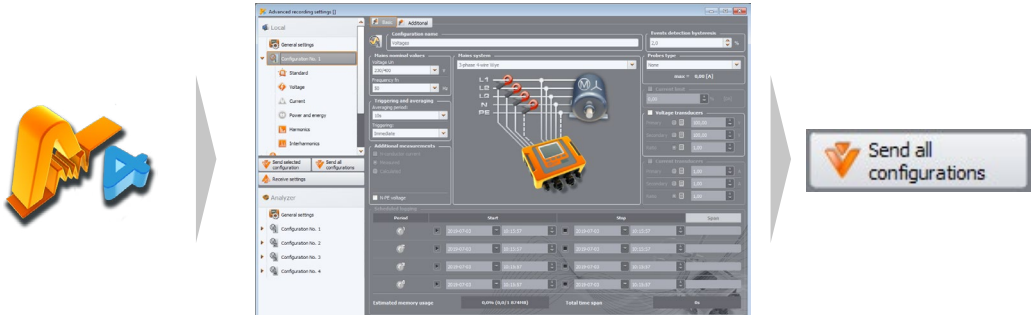
External DC power
MAX. 127…760 V

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

Mounting

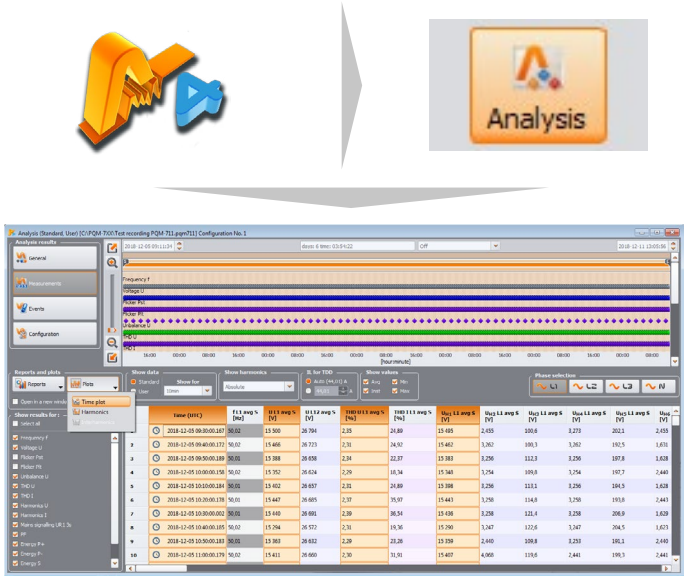
Three steps to get results

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



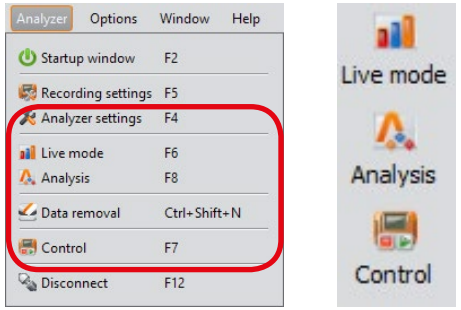
② Install the analyzer and start the measurement ► page 6

③ Analyze the recorded data ► page 8

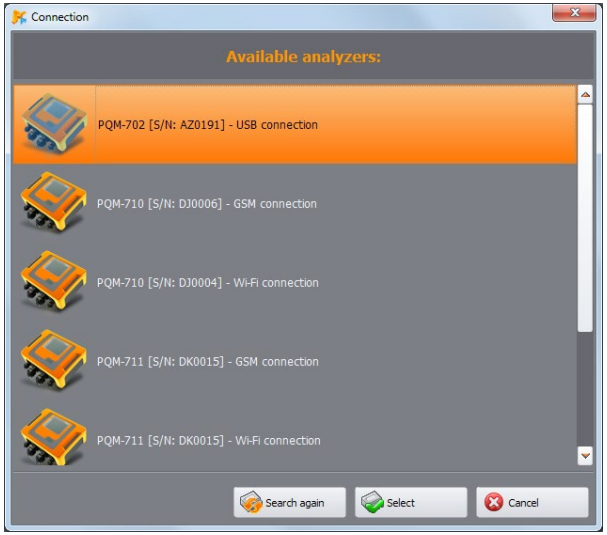


Getting started | Connecting the analyzer

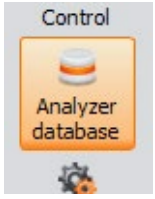
Method 1. Choose a function requiring analyzer connection

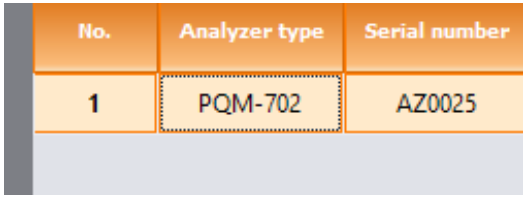


Analyzer connection window will appear.
- Choose the desired analyzer.
- Press **Select**.
- Enter PIN code (default: **000**).



Method 2. Choose desired analyzer from the database





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

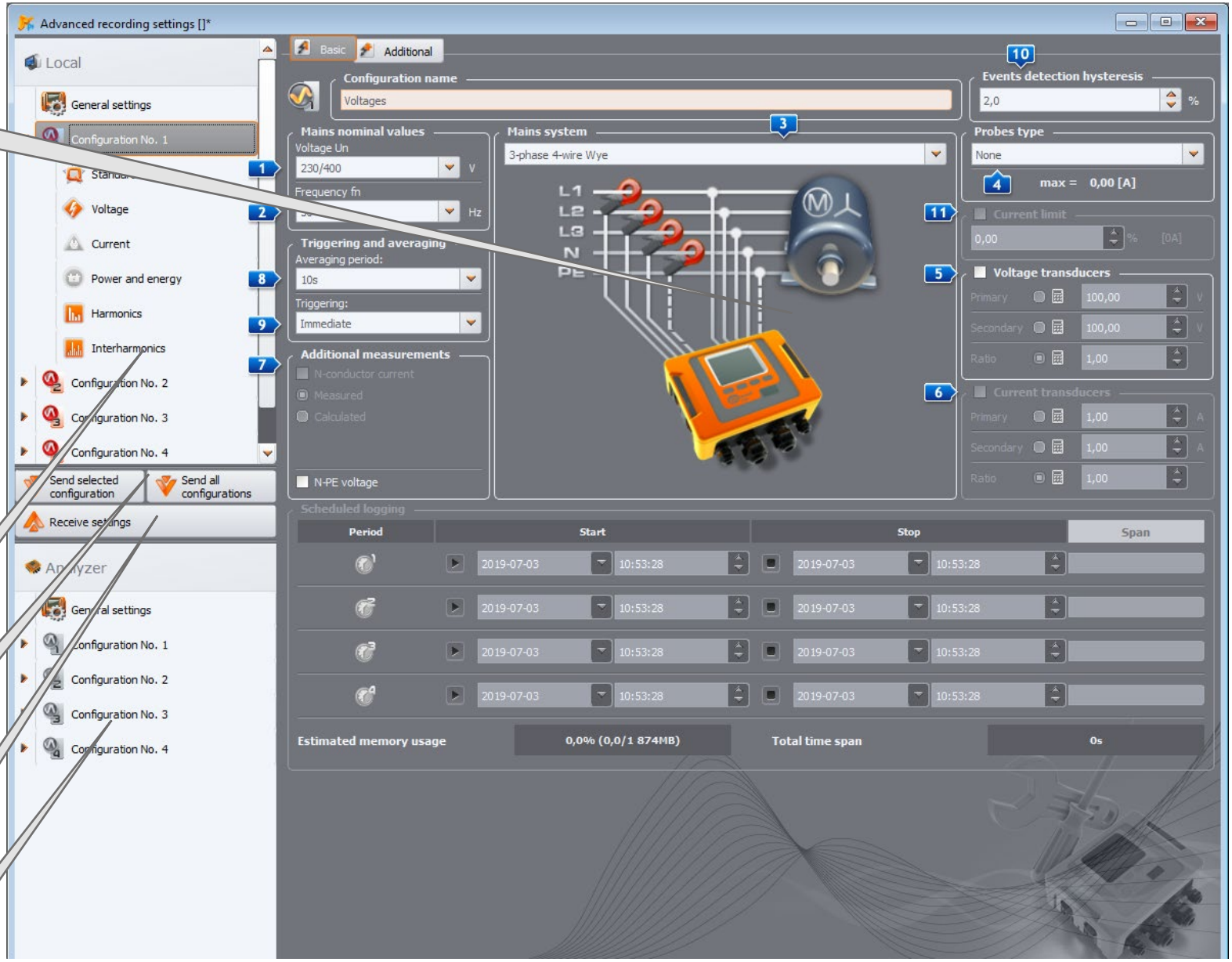
Measurement parameters
- 7 Additional recording of U_{N-PE} and I_N
- 8 Averaging period
- 9 Measurement triggering
- 10 Events detection hysteresis (typical 2%)
- 11 Current limit

Enter recording parameters.

Send configuration to the analyzer.

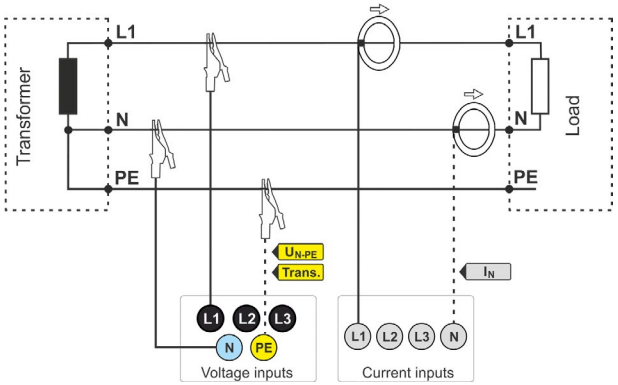
Receive configuration from the analyzer's memory.

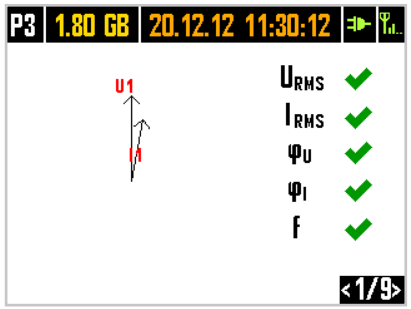
View actual configurations of the connected analyzer (**Analyzer** section).



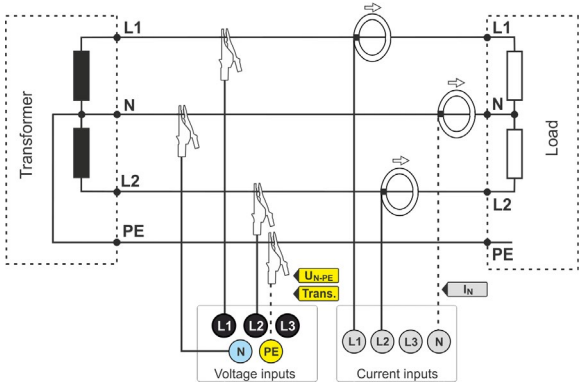
Getting started | Choosing the mains system

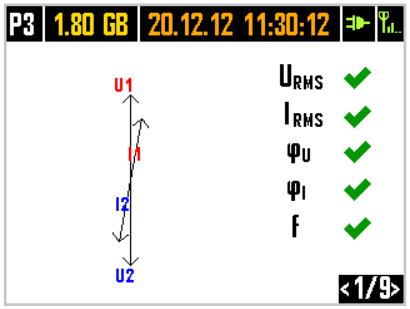
Single-phase





Split-phase

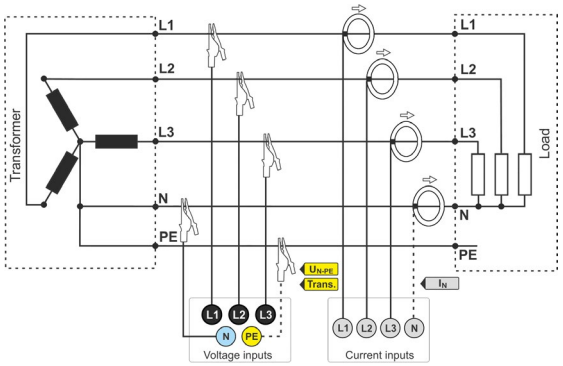




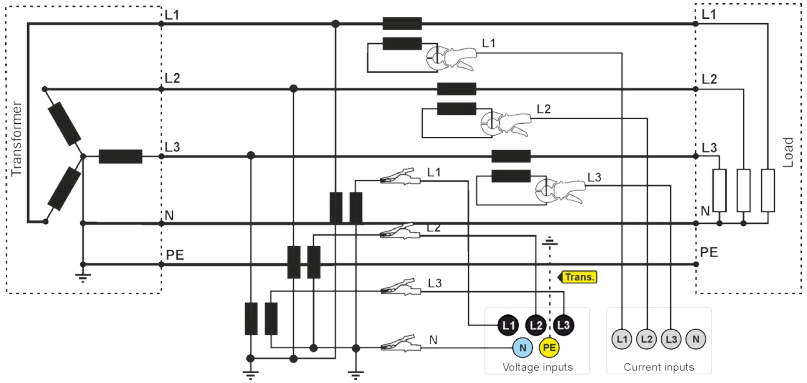
U1 ▶ U2

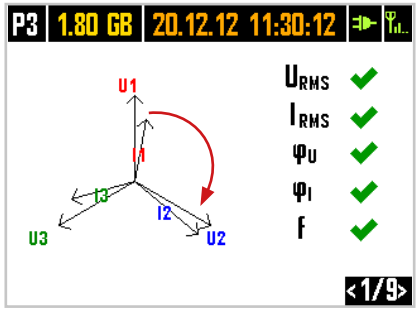
3-phase 4-wire (WYE with a neutral conductor)

Direct connection



Connection with transducers

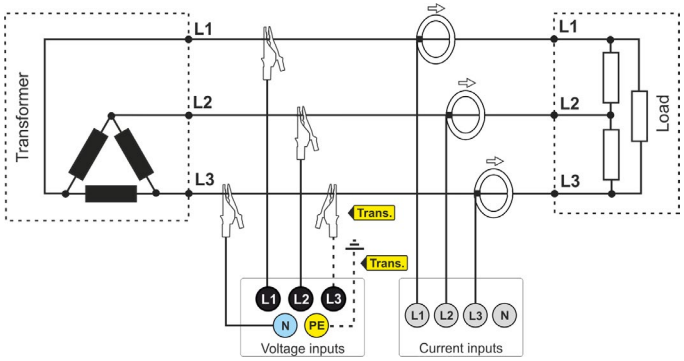




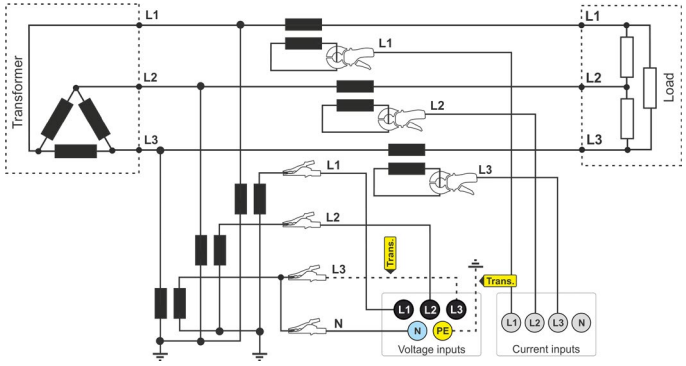
U1 ▶ U2 ▶ U3

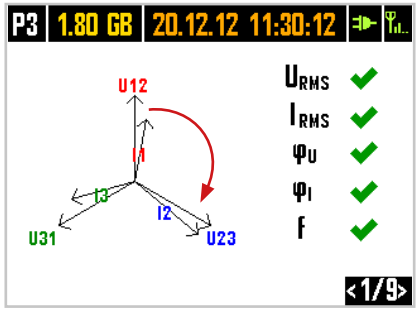
3-phase 3-wire (Delta)

Direct connection

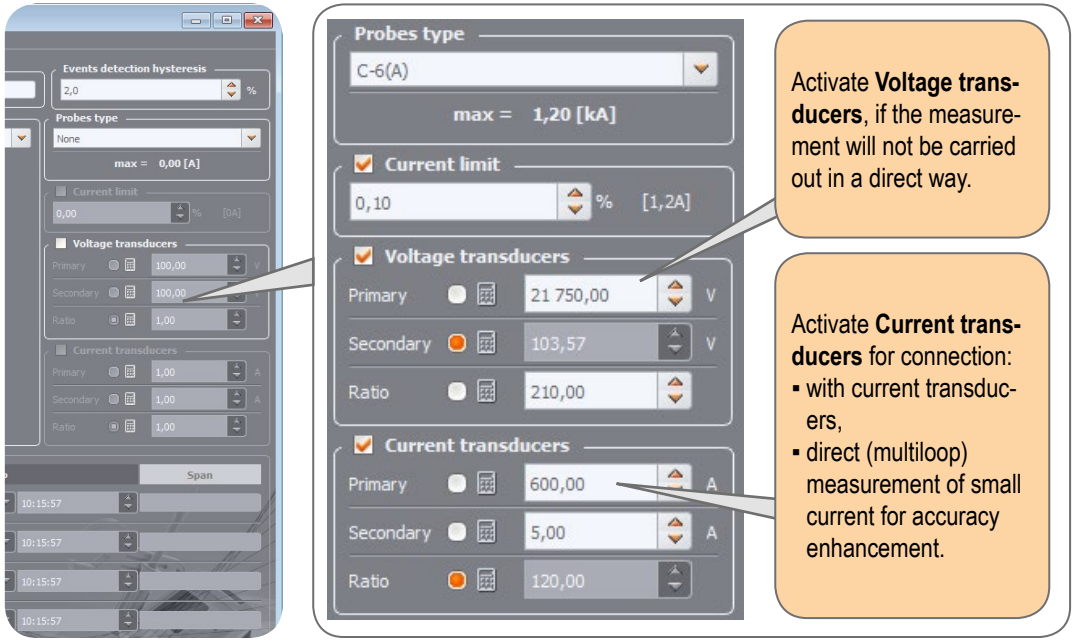


Connection with transducers





U12 ▶ U23 ▶ U31



Direct current measurement - enhanced accuracy

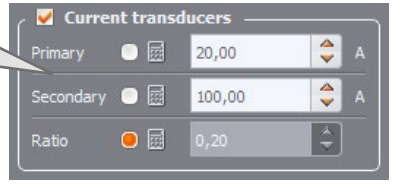
The use of a current transmission in direct connection enhances probe sensitivity for small signal measurement. It decreases the upper measuring range according to the formula:

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

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

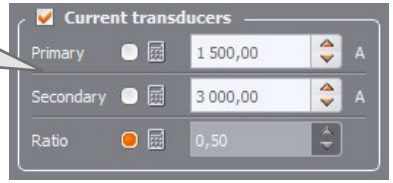
C-7A probe • nominal range 100 A • no. of turns = 5

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



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

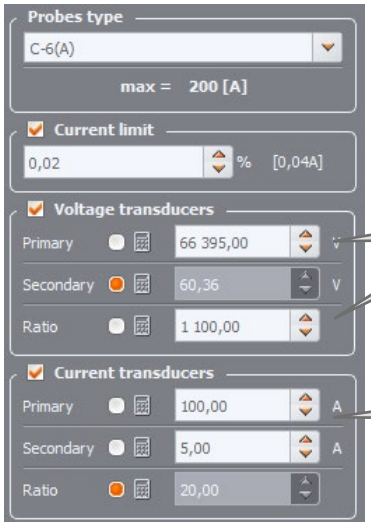
$$\text{New range} = \frac{3000\ \text{A}}{2\ \text{turns}} = 1500\ \text{A}$$



Measurement with transducers

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

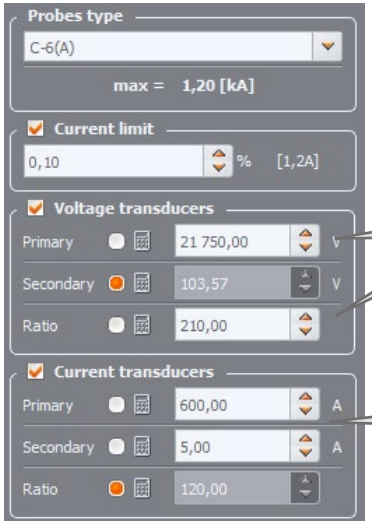
Mains type: WYE with neutral conductor



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



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

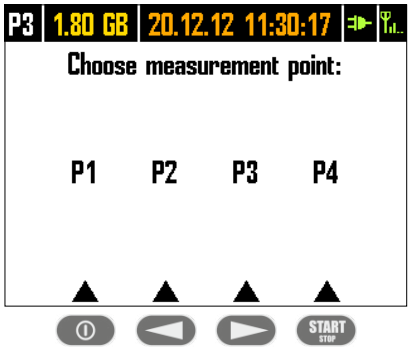
2 Choose the active configuration

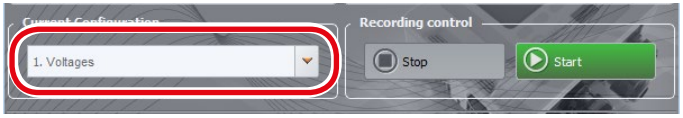
To change the active configuration, press simultaneously buttons ◄ ► and hold them for ≥1 s.

Choose the desired configuration by pressing the assigned button

or

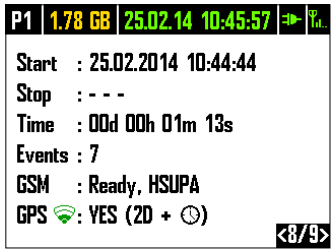
use **Sonel Analysis** software (**Control** menu).

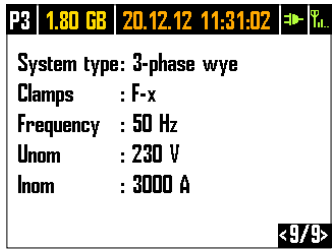




3 Verify the configuration

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

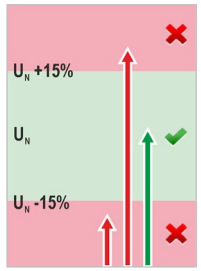




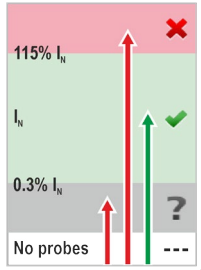
4 Connect the analyzer to the measured mains

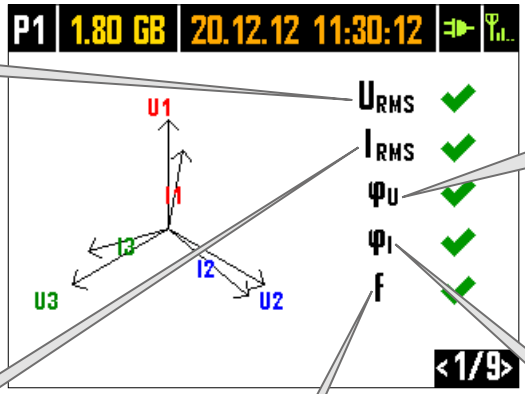
5 Verify mains status and analyzer connection

RMS voltages
- ✔ U_{RMS} within ±15% U_N range
- ✖ U_{RMS} outside of ±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

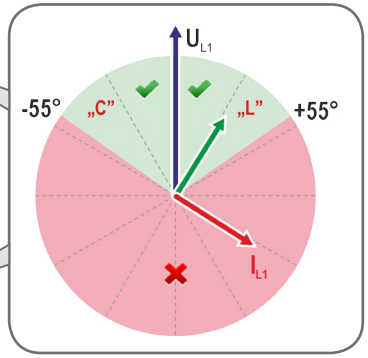




Frequency
- ✔ is within ±10% f_N range
- ✖ is outside the ±10% f_N range
- ? too low voltage: <10 V

Voltage angles - phase succession (clockwise)
- ✔ angles of the range of ±30% of the theoretical values 0°, 120°, 240°
- ? too low voltages: <1% U_N
- ✖ incorrect angles

Current angles - relative to voltage
- ✔ current vectors are within ±55° range in relation to corresponding voltage vector
- ✖ at least one current vector is outside the acceptable range ±55°
- ? too low currents: <0.3% I_N



Measurements

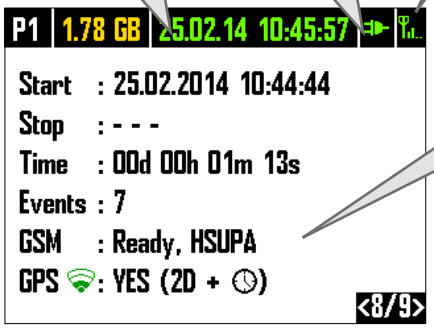
6 Verify additional parameters

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

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

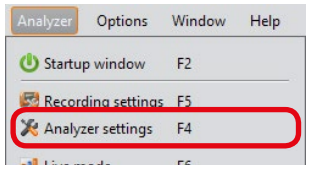
Power

GSM antenna status

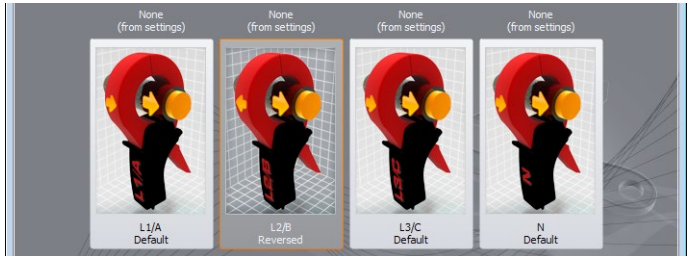


GSM modem status:
- ready (GPRS, EDGE, HSUPA, UMTS)
- off
- no SIM card

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

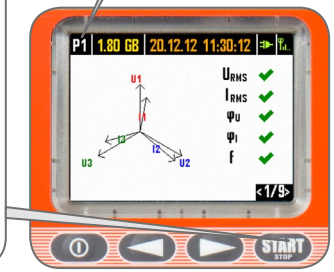
START STOP Press **START/STOP**

or

use **Sonel Analysis** software.

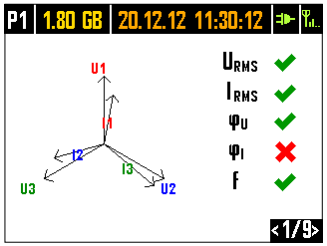
P1 Active configuration symbol flashes.

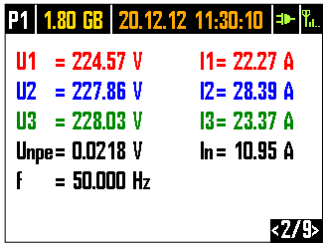
Tone notice sounds: 3 short signals.

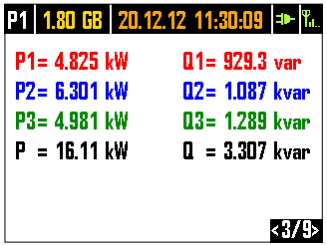


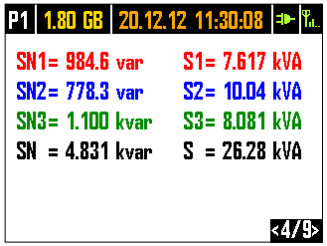
9 View the readings

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



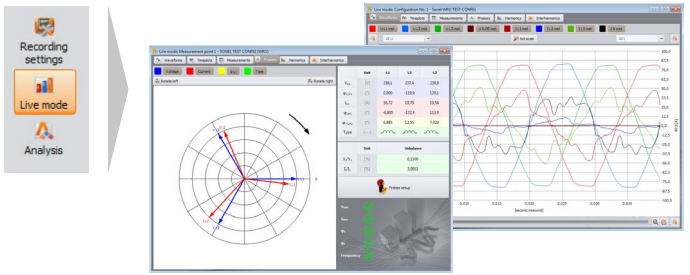




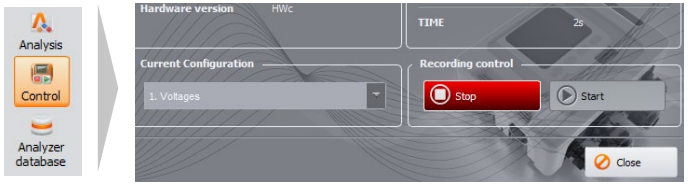


10 Monitor the meter and measurements

View live readings



Change settings if necessary

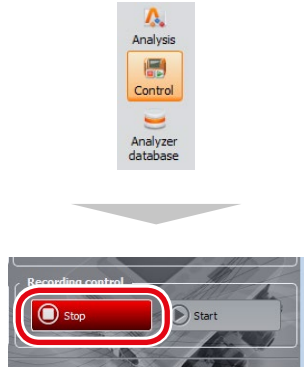


11 Finish recording

START STOP Press **START/STOP** for 3 s

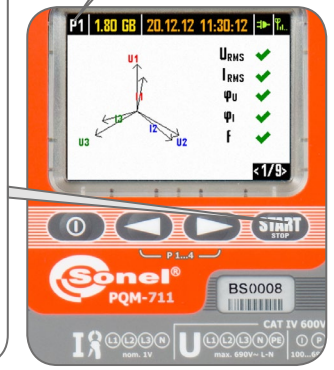
or

use **Sonel Analysis** software.



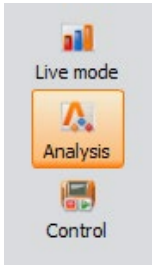
P1 Active configuration symbol stops flashing.

Tone notice sounds: 1 long and 3 short signals.

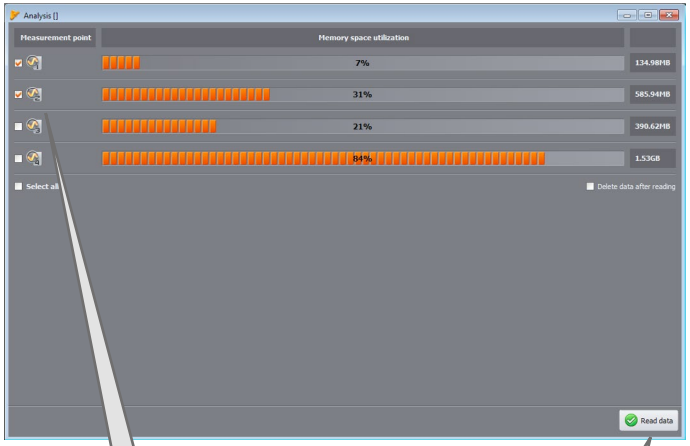


Data analysis

1 Download data from the analyzer



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



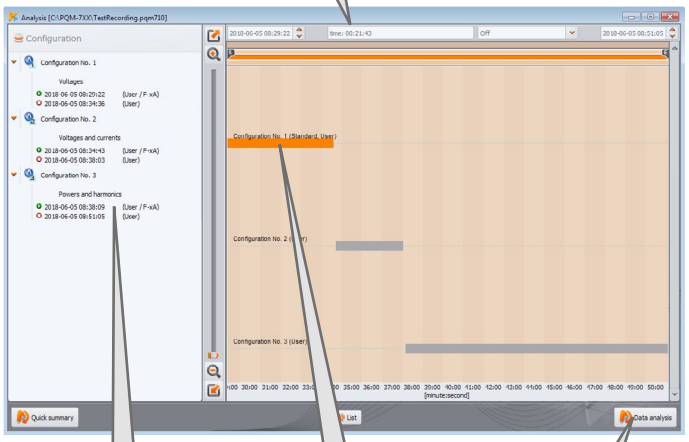
Choose the recording for analysis.

Press **Read data** button.

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

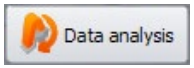
2 Choose the recording for analysis

On the top bar choose the time range if necessary.



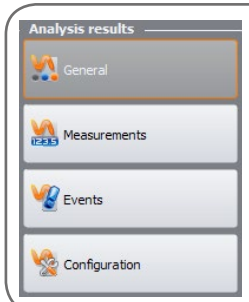
See the details of each downloaded recording.

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**.



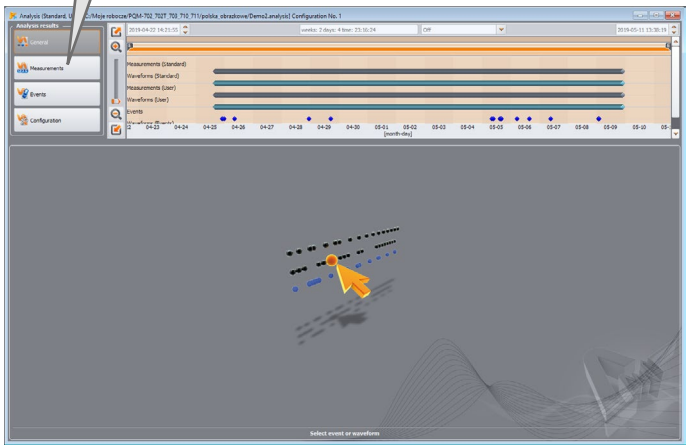
Press **Data analysis** button to see the measurements.

3 Analyze the data



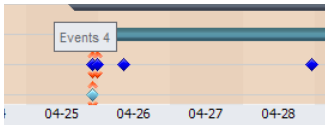
There are four menu options to help you analyze the data:

- **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.

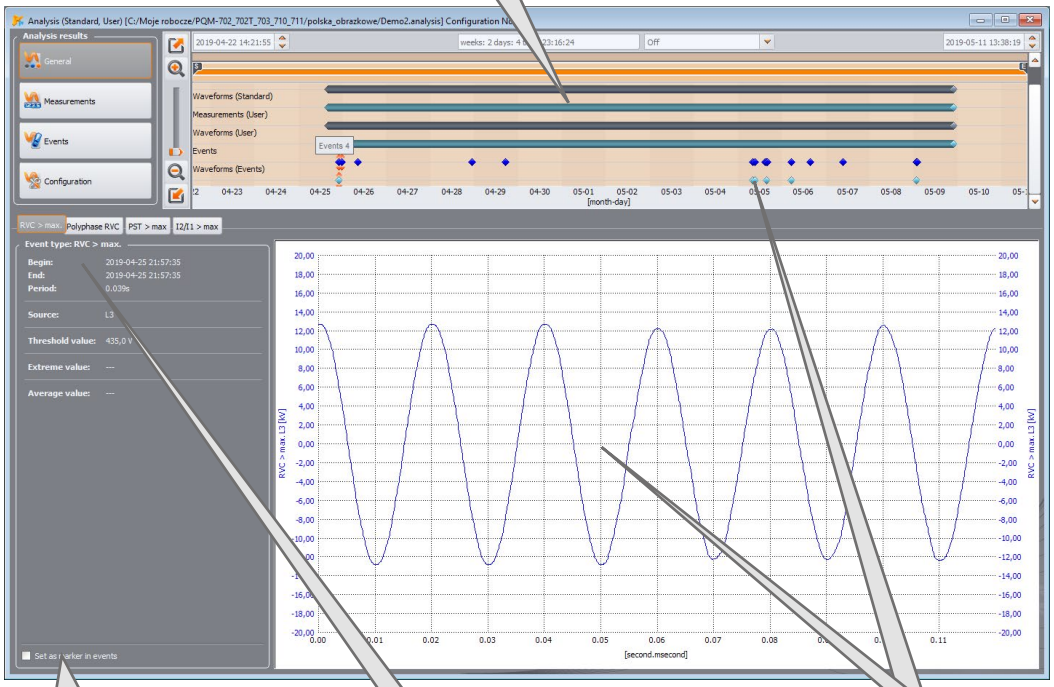


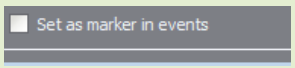
Data analysis

"General" menu



The top screen is the view of the whole recording.



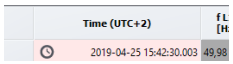


Mark the desired event to make it appear on the individual list in **"Events"** menu.

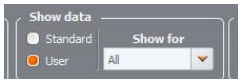
View event's details by choosing the correct tab.

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

"Measurements" menu

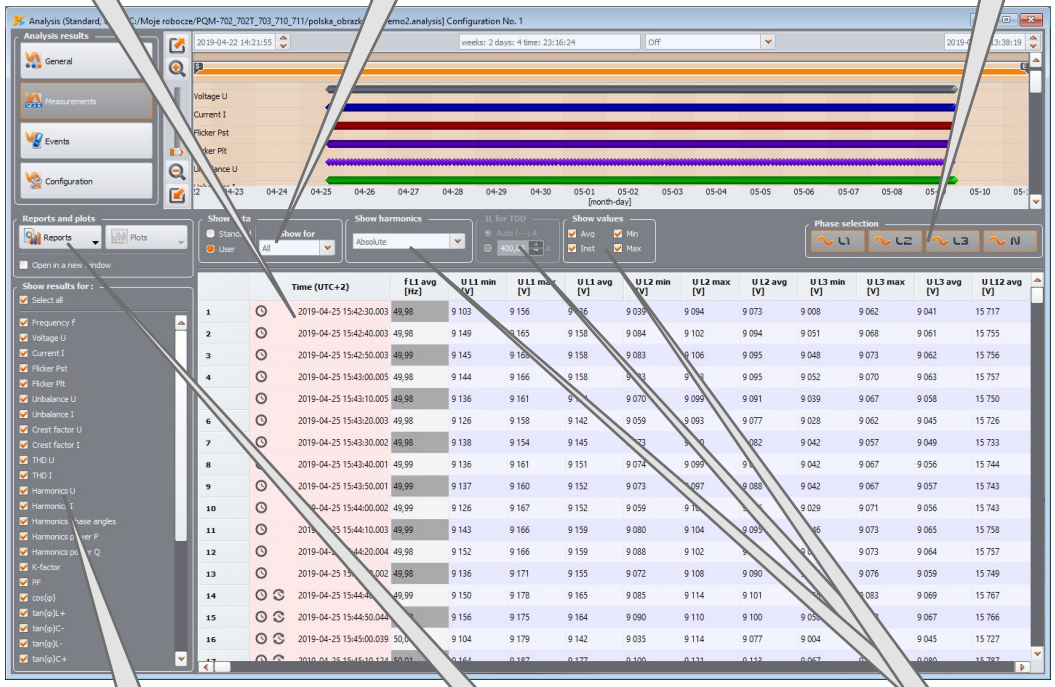


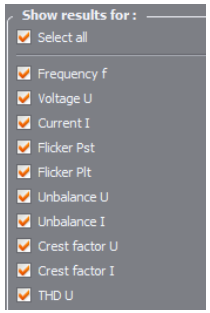
Recording time and values.



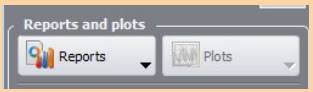
Choose data for analysis.

Filter phases from which you want to analyze data.





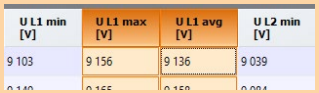
Here are groups of chosen parameters.



Choose the form of graph under menu **Plots**:
- timeplot,
- harmonics,
- interharmonics.

Create reports under menu **Reports**.

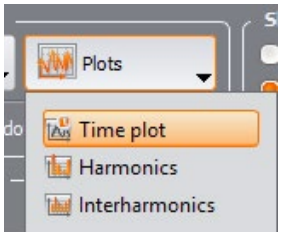
Choose the parameters for analysis.



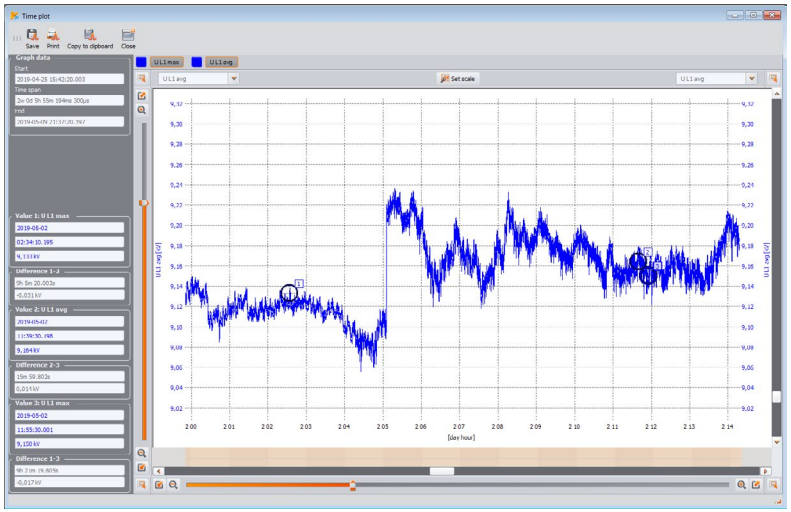
Mark columns for data analysis in order to create a plot or report.

Data analysis

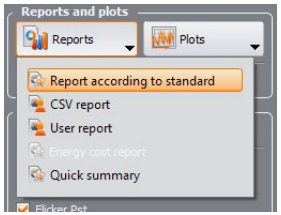
Time plot



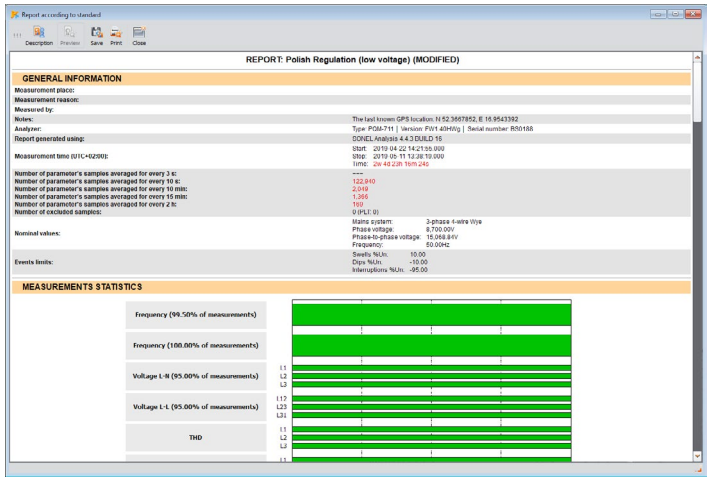
Choose the plot form. The graph will open in a new window.



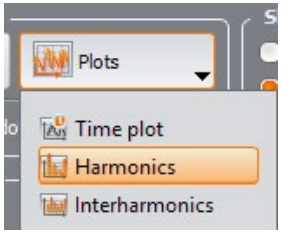
Creating reports



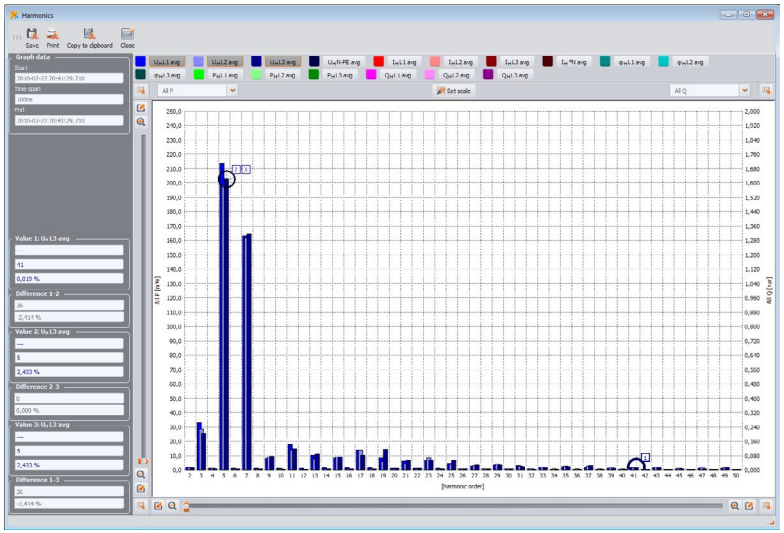
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.



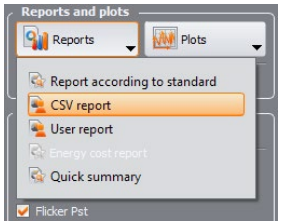
Harmonics and interharmonics



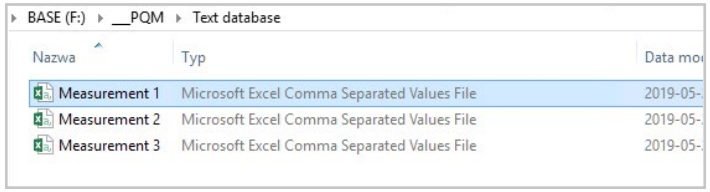
Choose appropriate plot to analyze harmonics or interharmonics.

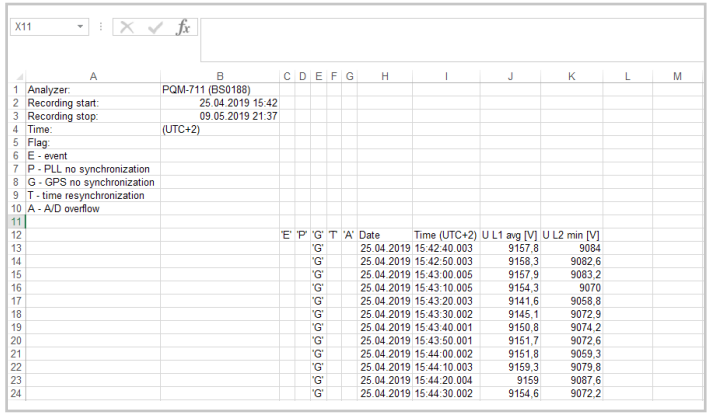


Data export to CSV file



You can also export data directly to CSV file.



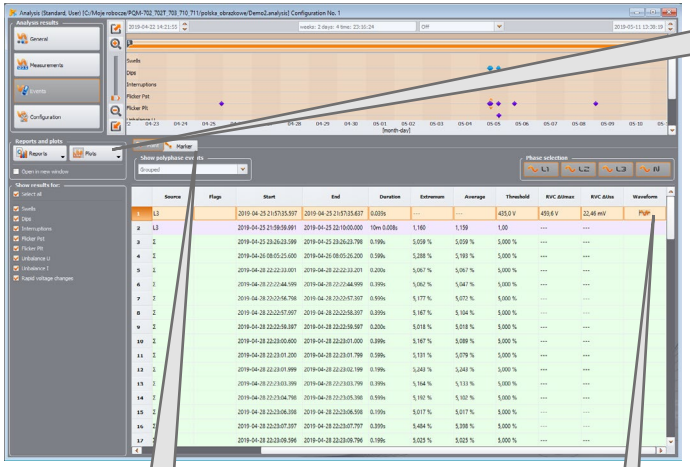


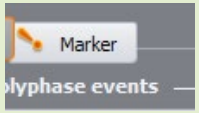
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Analyzer:	PQM-711 (BS0188)											
2	Recording start:	25.04.2019 15:42											
3	Recording stop:	09.05.2019 21:37											
4	Time:	(UTC+2)											
5	Flag:												
6	E - event												
7	P - PLL no synchronization												
8	G - GPS no synchronization												
9	T - time resynchronization												
10	A - A/D overflow												
11													
12			'E'	'P'	'G'	'T'	'A'	Date	Time (UTC+2)	U L1 avg [V]	U L2 min [V]		
13					'G'			25.04.2019	15:42:40.003	9157,8	9084		
14					'G'			25.04.2019	15:42:50.003	9158,3	9082,6		
15					'G'			25.04.2019	15:43:00.005	9157,9	9083,2		
16					'G'			25.04.2019	15:43:10.005	9154,3	9070		
17					'G'			25.04.2019	15:43:20.003	9141,6	9058,8		
18					'G'			25.04.2019	15:43:30.002	9145,1	9072,9		
19					'G'			25.04.2019	15:43:40.001	9150,8	9074,2		
20					'G'			25.04.2019	15:43:50.001	9151,7	9072,6		
21					'G'			25.04.2019	15:44:00.002	9151,8	9059,3		
22					'G'			25.04.2019	15:44:10.003	9159,3	9079,8		
23					'G'			25.04.2019	15:44:20.004	9159	9087,6		
24					'G'			25.04.2019	15:44:30.002	9154,6	9072,2		

Data analysis

"Events" menu

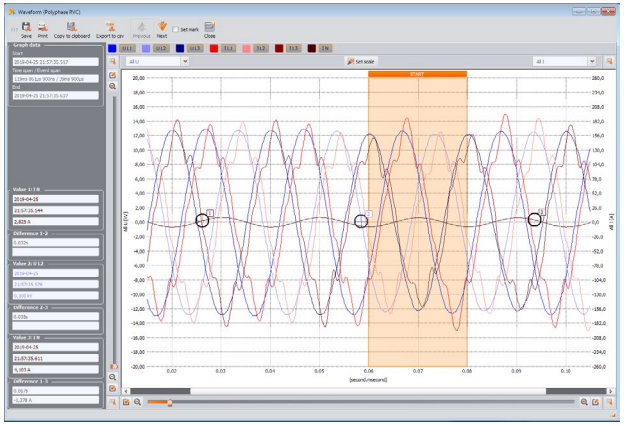
This menu contains the list of events that occurred during the recording.

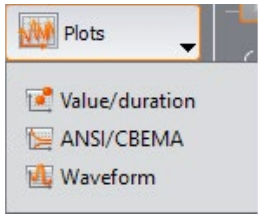




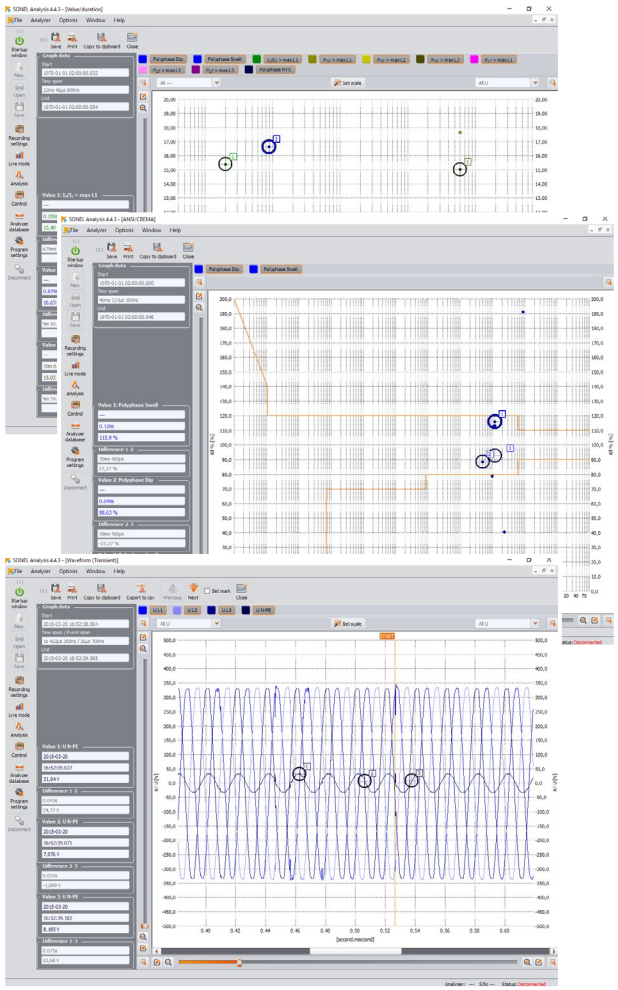
Find the list of events marked in **"General"** menu under tab **Marker**.

Choosing the **Oscillogram** icon will open two windows:
- timeplot for that event,
- waveform for that event.





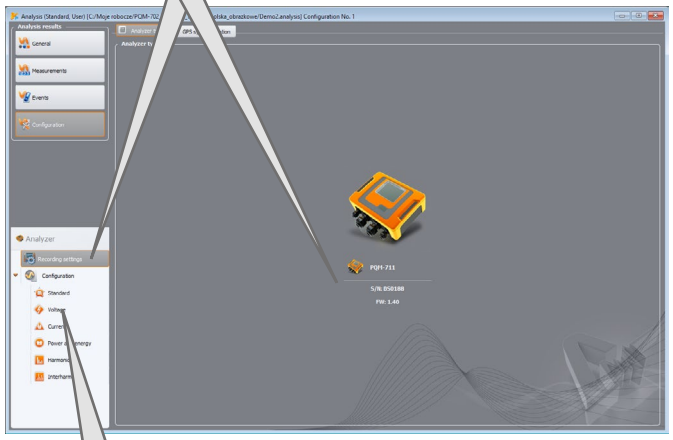
Using **Plots** button select the type of data presentation:
- value/duration,
- in the context of ANSI/CBEMA toleration curves,
- waveform for oscillograms and $RMS_{1/2}$ plots.

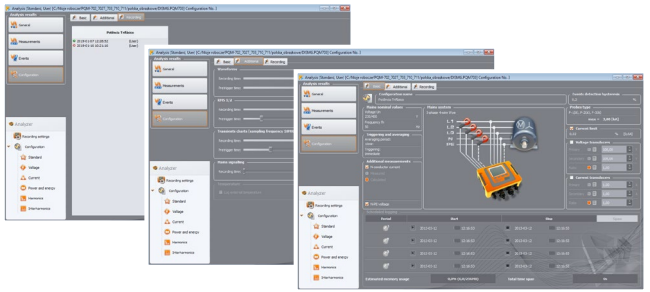


"Configuration" menu

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

Under tab **Recorder settings** find analyzer details such as:
- model,
- serial number,
- firmware version.





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

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