Sonel PQM-700

Power Quality Analyzer • Quick Guide

v1.00 | 27.10.2020

CLASS S IEC 61000-4-30 | CAT IV 300 V | EVENTS | 55°C HEAVY DUTY -20°C | IP65

Status signalization

ON	LED is on. The analyzer is on.
ON	LED flashes. The meter is ready for software update (press **START** to confirm).
ON + MEM	LEDs flash. Software update in progress.
BATT	LED flashes. Battery charge level ≤20%.
BATT	LED is on. Battery completely depleted. After 5 s the analyzer shuts down.
ERROR	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 + LOG	ON is on, LOG flashes. Recording in progress.
ON + LOG	ON is off, LOG flashes in every 10 s. Recording in progress. Analyzer in sleep mode.
ERROR + MEM	ERROR is off, MEM is on. Problem with the memory or memory full.
ERROR + MEM	LEDs are on. No memory card or unformatted memory card. If LEDs are still on after pressing **START** - the memory is damaged.
ERROR + MEM	ERROR is on, MEM is off. Internal error of the analyzer.

Maximum input voltage

U L1 L2 L3 N

max. 760 V~

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

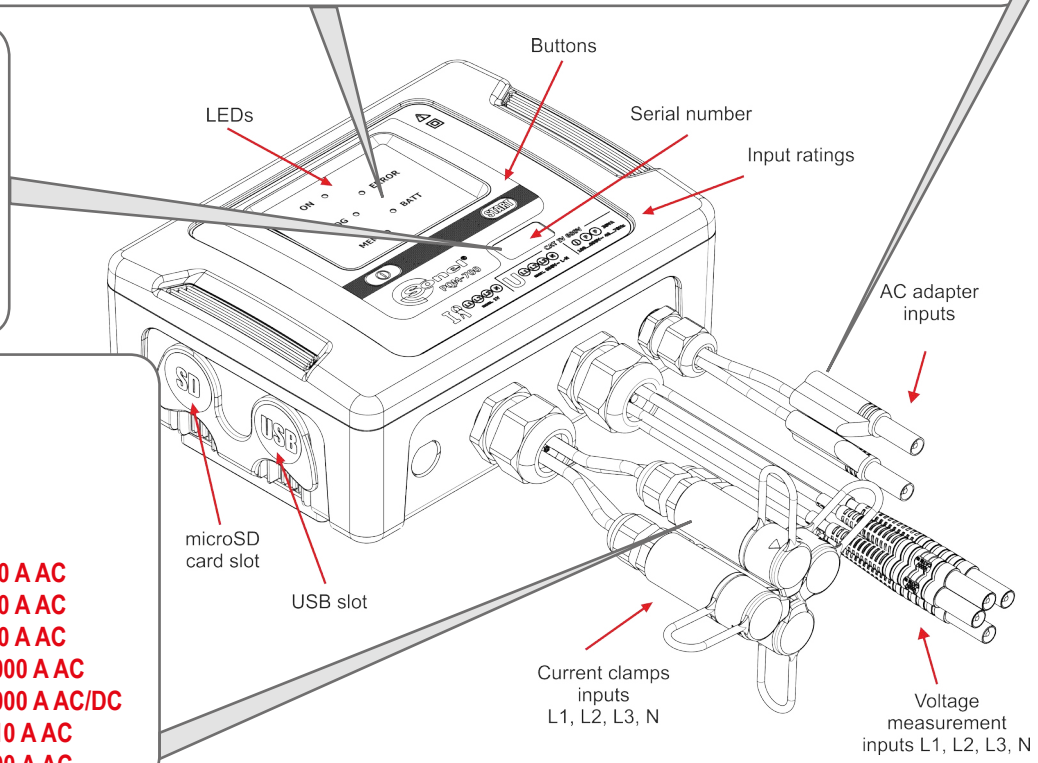
F-xA6: 6…6000 A AC

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



Power supply

Li-Ion BATTERY

3.7 V
4.4 Ah

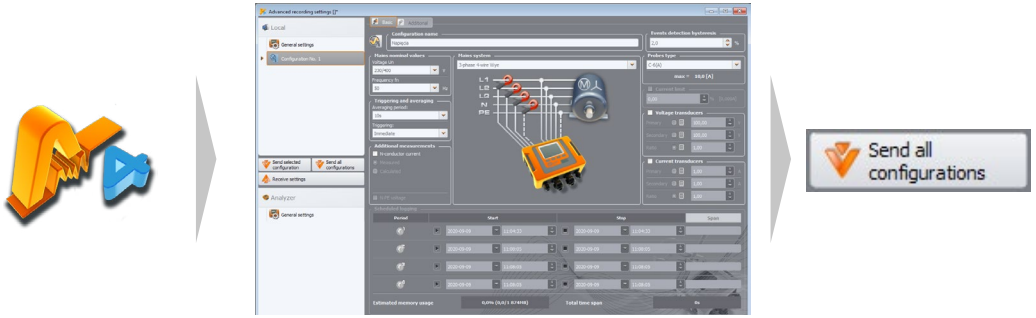
External DC power
MAX. 140…415 V

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

Mounting

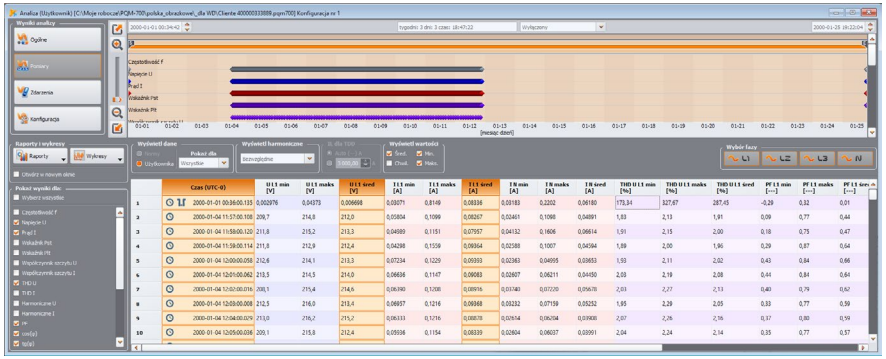
Three steps to get results

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



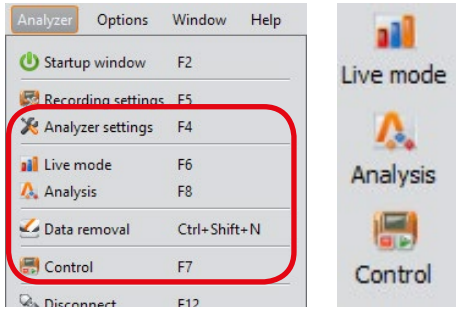
② Install the analyzer and start the measurement ► page 6

③ Analyze the recorded data ► page 8

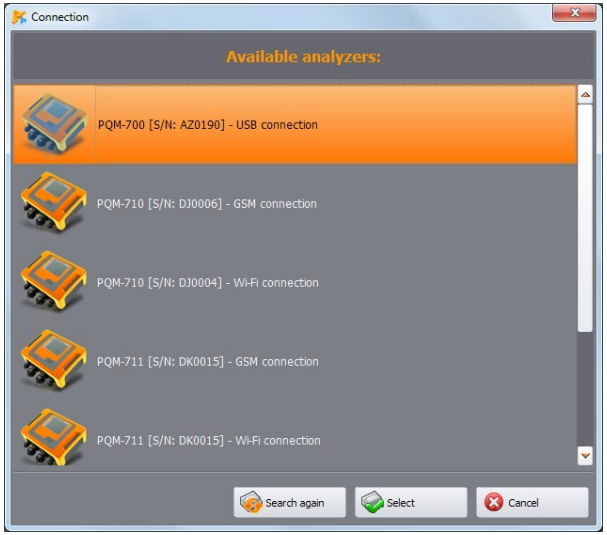


Getting started | Connecting the analyzer

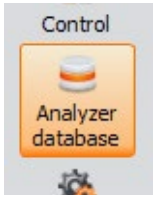
Method 1. Choose a function requiring analyzer connection

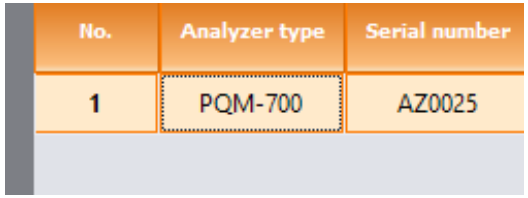


Analyzer connection window will appear.
- Choose the desired analyzer.
- Press **Select**.
- Enter PIN code (default: **000**).



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

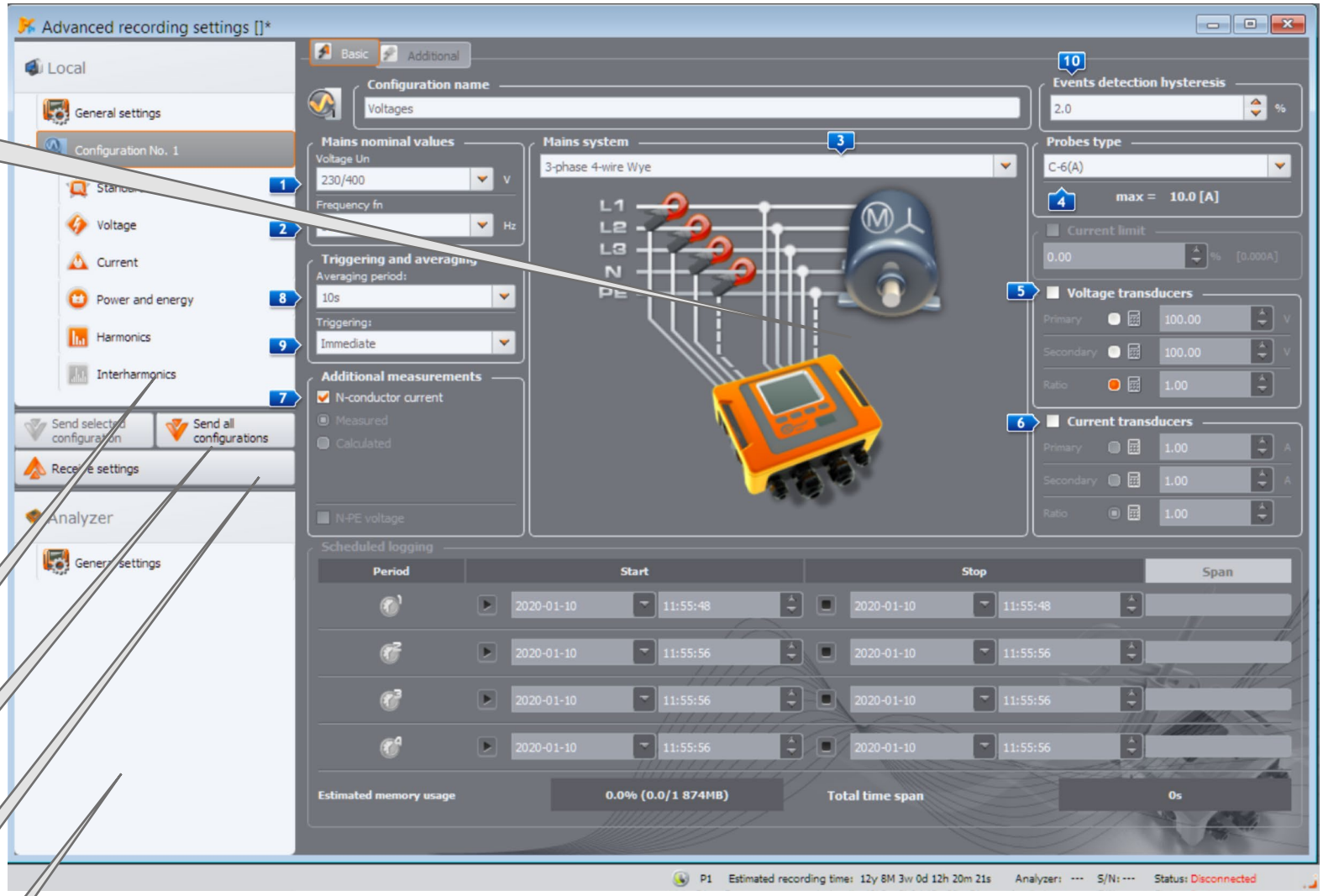
7 Additional recording of U_{N-PE} and I_N
8 Averaging period
9 Measurement triggering
10 Events detection hysteresis (typical 2%)

Enter recording parameters.

Send configuration to the analyzer.

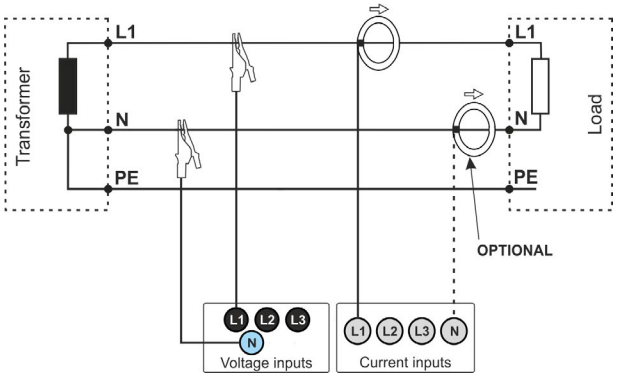
Receive configuration
from the analyzer's memory.

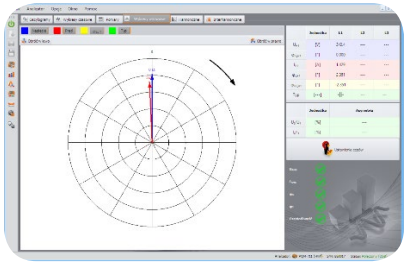
View actual configurations of the connected analyzer (**Analyzer** section).



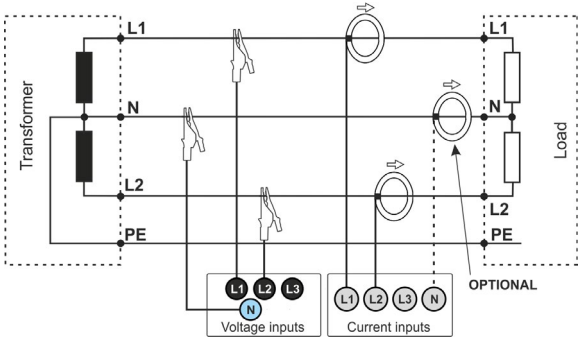
Getting started | Choosing the mains system

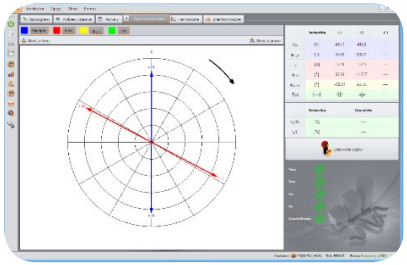
Single-phase





Split-phase

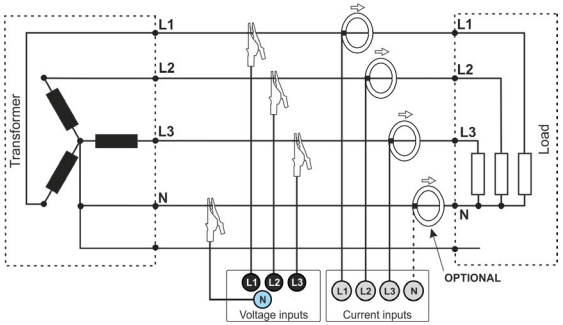




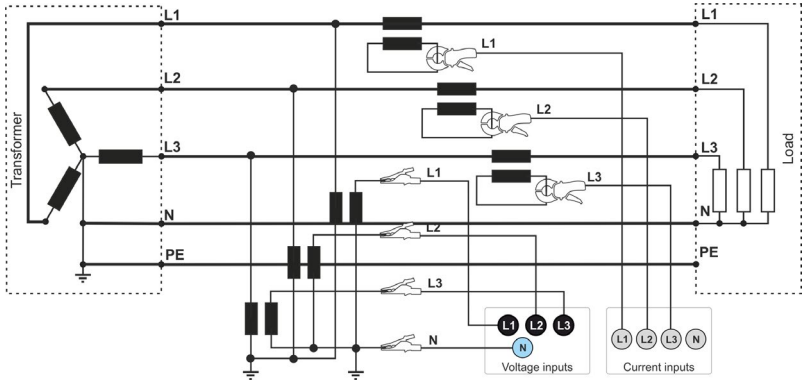
U1 ▶ U2

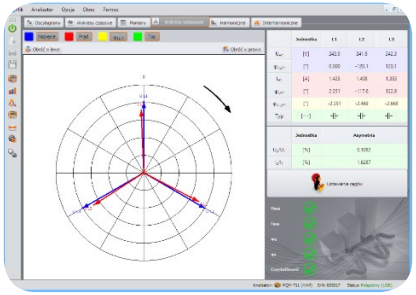
3-phase 4-wire (WYE with a neutral conductor)

Direct connection



Connection with transducers

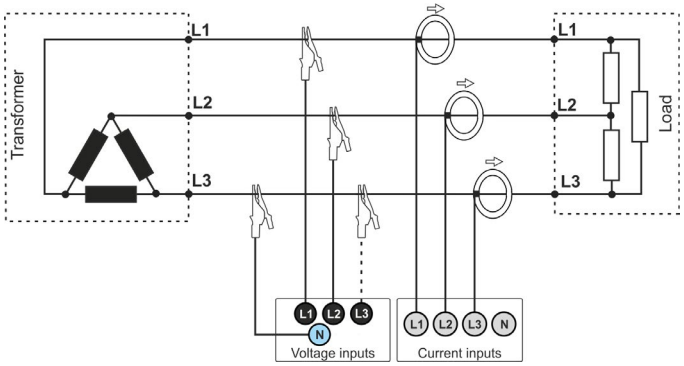




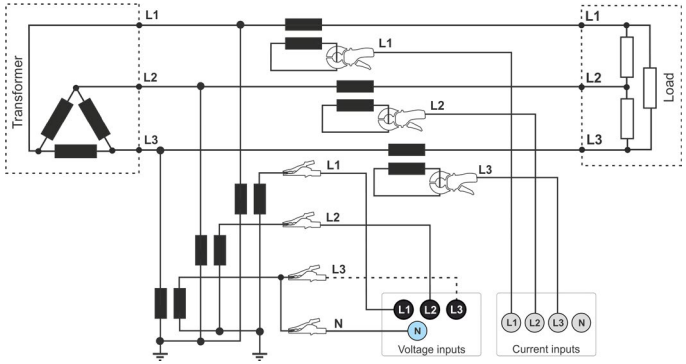
U1 ▶ U2 ▶ U3

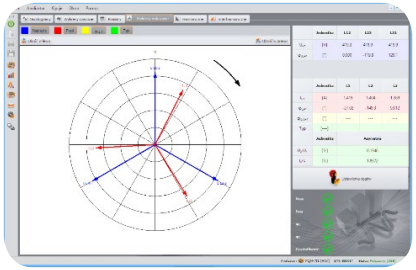
3-phase 3-wire (Delta)

Direct connection

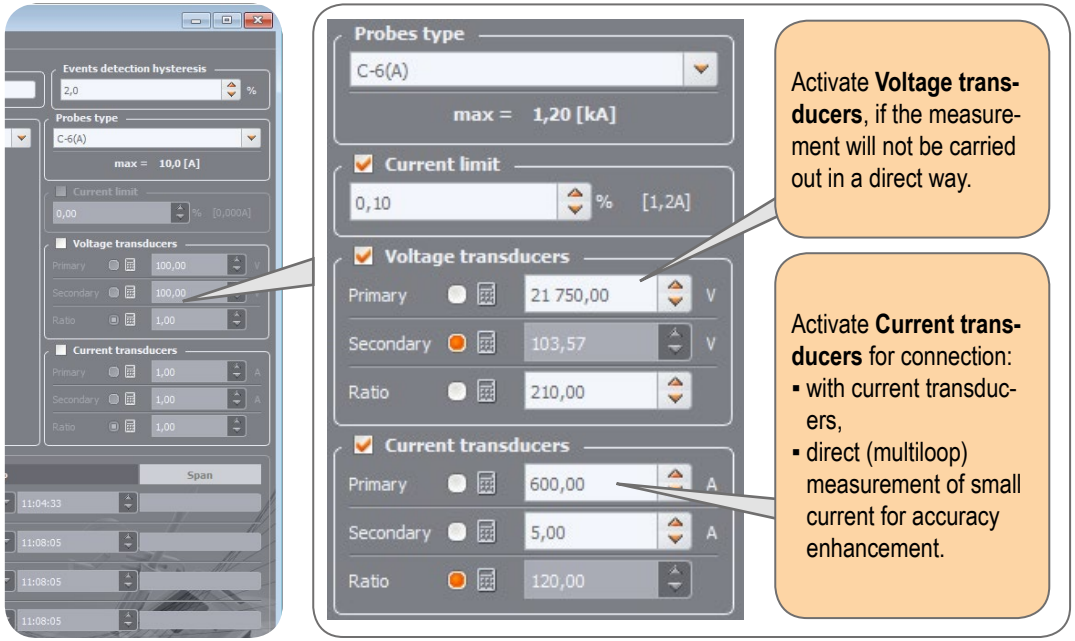


Connection with transducers





U12 ▶ U23 ▶ U31



Direct current measurement - enhanced accuracy

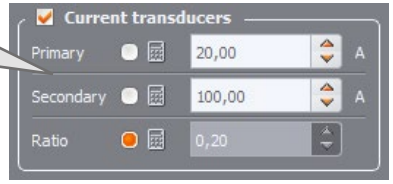
The use of a current transmission in direct connection enhances probe sensitivity for small signal measurement. It decreases the upper measuring range according to the formula:

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

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

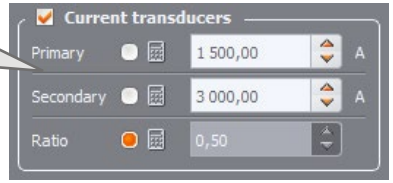
C-7A probe • nominal range 100 A • no. of turns = 5

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



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

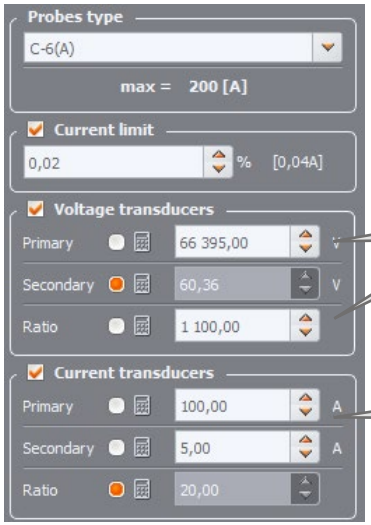
$$\text{New range} = \frac{3000\ \text{A}}{2\ \text{turns}} = 1500\ \text{A}$$



Measurement with transducers

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

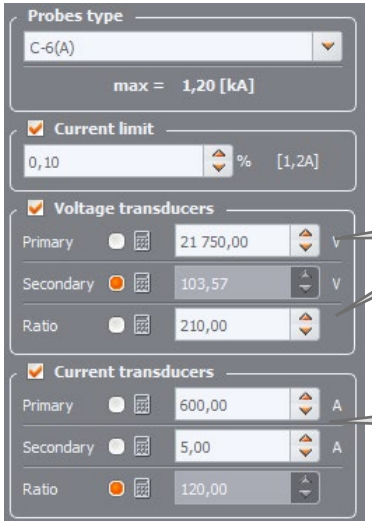
Mains type: WYE with neutral conductor



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.

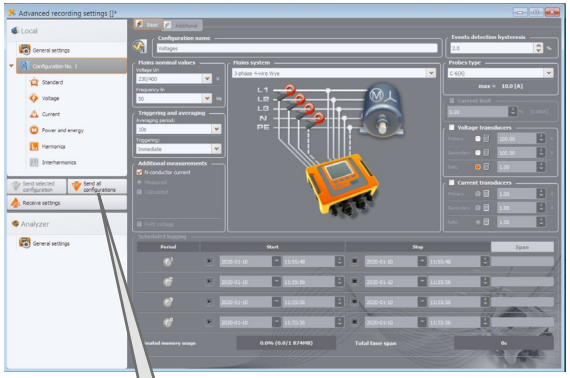
Enter parameters of current transducers:
- primary current,
- secondary current.

Measurements

1 Mount the analyzer

2 Upload the configuration to the analyzer

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

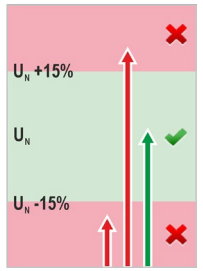


3 Connect the analyzer to the network acc. to the configuration

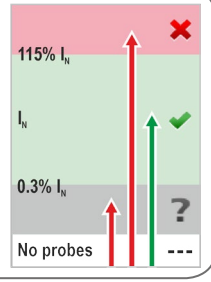
- Arrows on all clamps have to be pointed towards the electrical load.
- Pay close attention to connecting the analyzer in systems with transducers. In these systems, C-6A clamps will be useful - they are dedicated to measure current at transducers.

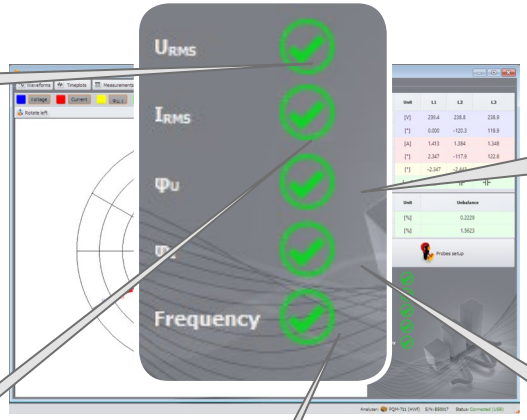
4 Check the network status and the analyzer connection status

RMS voltages
- ✔ U_{RMS} within ±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

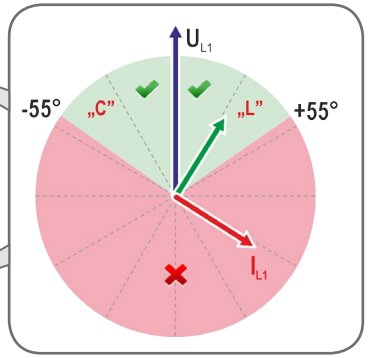




Frequency
- ✔ is within ±10% f_N range
- ✖ is outside the ±10% f_N range
- ? too low voltage: <10 V

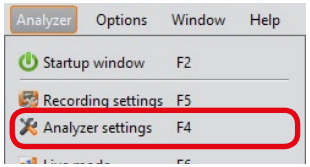
Voltage angles - phase succession (clockwise)
- ✔ angles of the range of ±30% of the theoretical values 0°, 120°, 240°
- ? too low voltages: <1% U_N
- ✖ incorrect angles

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

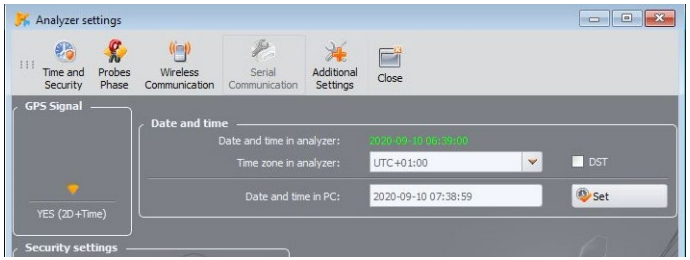


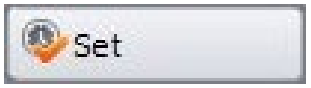
Measurements

5 Zweryfikuj czas analizatora



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

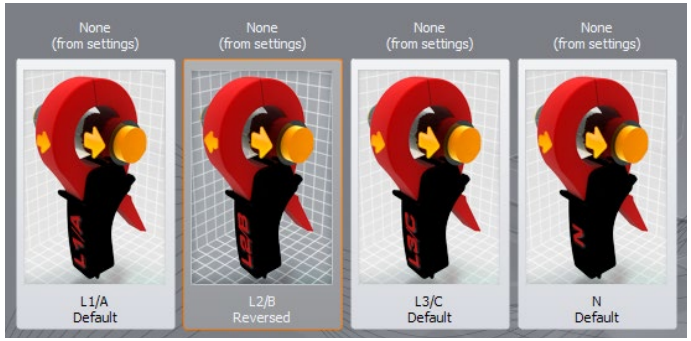




The button **Set** uploads the computer's current time to the analyzer.

6 Adjust analyzer settings

Using Sonel Analysis, under menu **Analyzer**, adjust:
- security,
- reverse current direction on the probe.



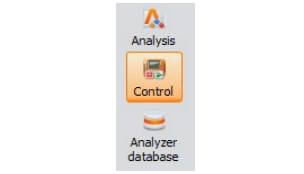
After each change, confirmation window will appear.

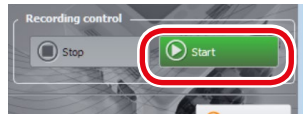
7 Start recording

Press **START/STOP**

or

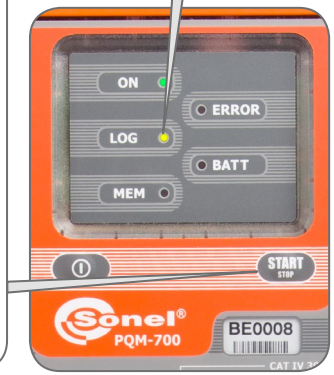
use **Sonel Analysis** software.





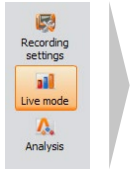
LOG flashes.

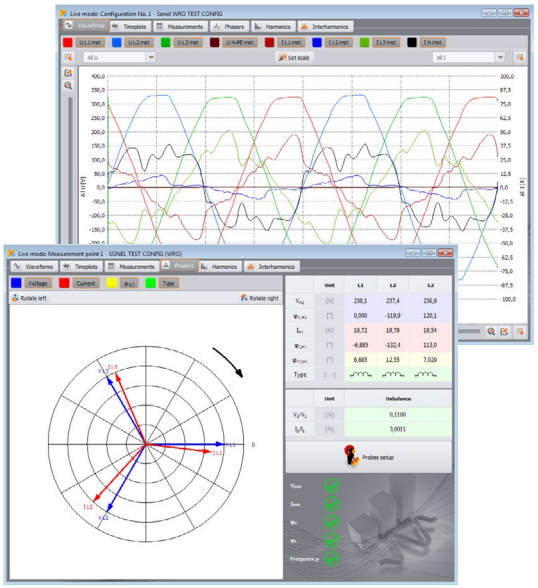
Tone notice sounds:
3 short signals



8 Monitor the meter and measurements

View live readings





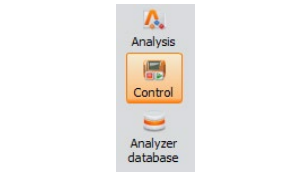
Change settings if necessary

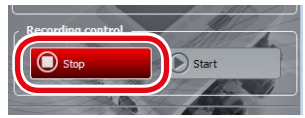
9 Finish recording

Press **START/STOP** for 3 s

or

use **Sonel Analysis** software.



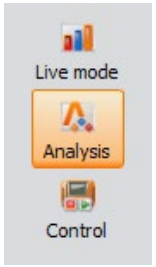


LOG stops flashing.

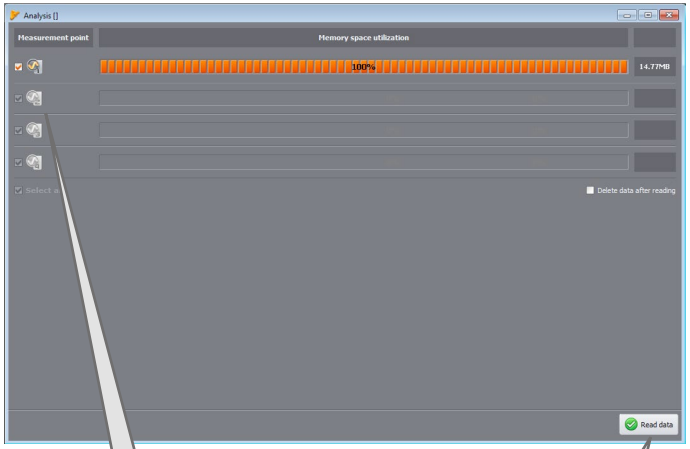
Tone notice sounds:
1 long and 3 short signals.

Data analysis

1 Download data from the analyzer



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



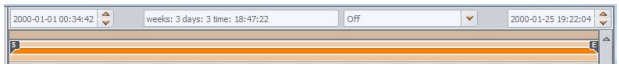
Choose the recording for analysis.

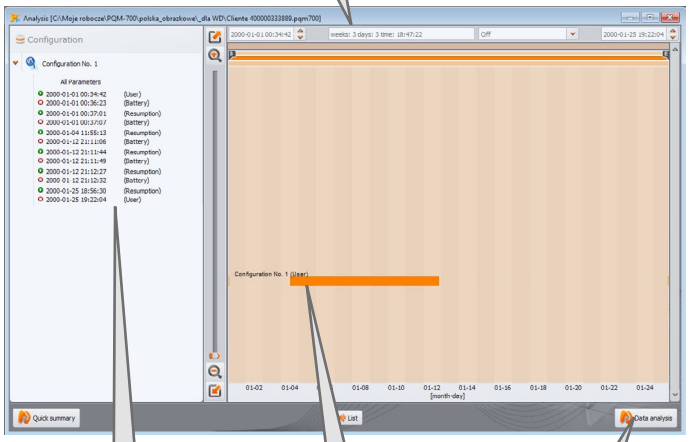
Press **Read data** button.

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

2 Choose the recording for analysis

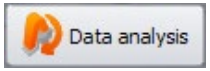
On the top bar choose the time range if necessary.





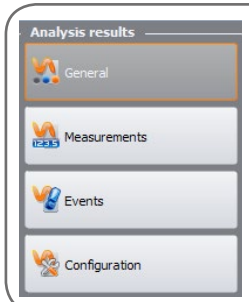
See the details of each downloaded recording.

Select the recorded data.



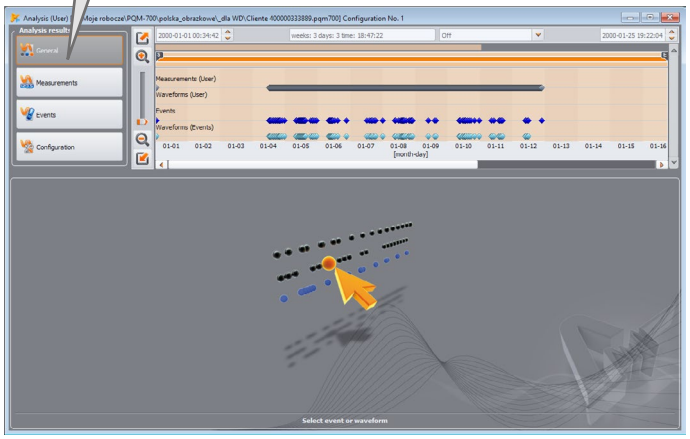
Press **Data analysis** button to see the measurements.

3 Analyze the data



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

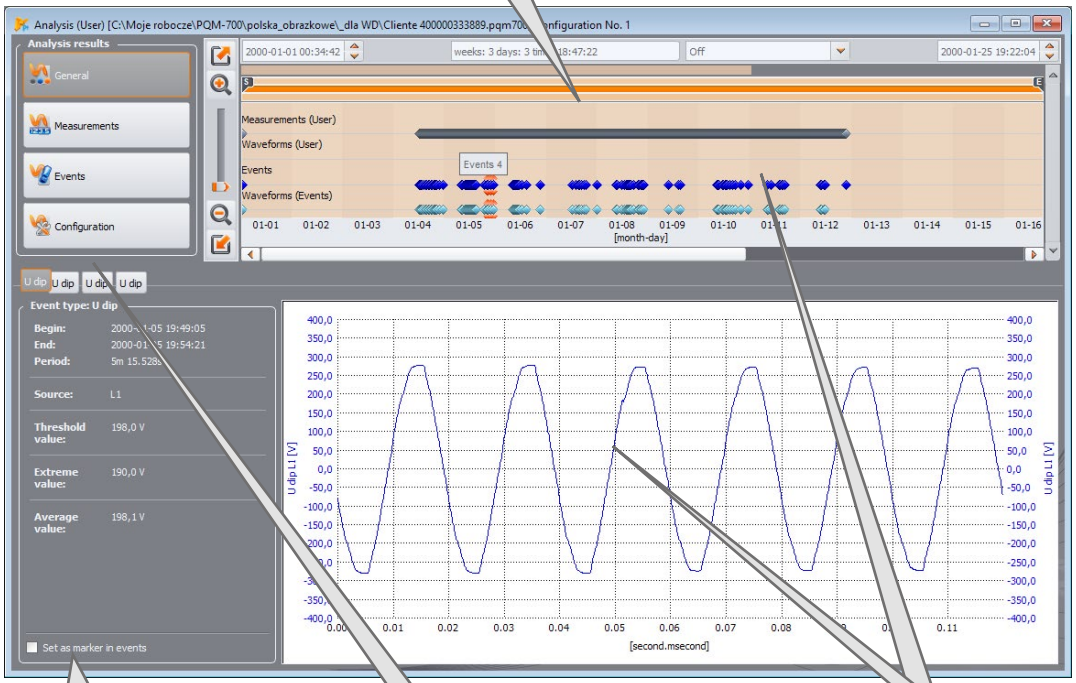
- **General** - general information on the measurements,
- **Measurements** - analyze the measurements, generate reports and plots,
- **Events** - analyze the events,
- **Configuration** - view, how the meter was set for the analyzed recording.



Data analysis

"General" menu

The top screen is the view of the whole recording.



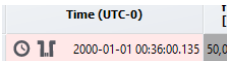
Set as marker in events

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

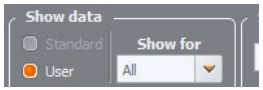
View event's details by choosing the correct tab.

Choosing a point in **Events** line will cause the oscillo-gram to appear.

Ekran "Pomiary"

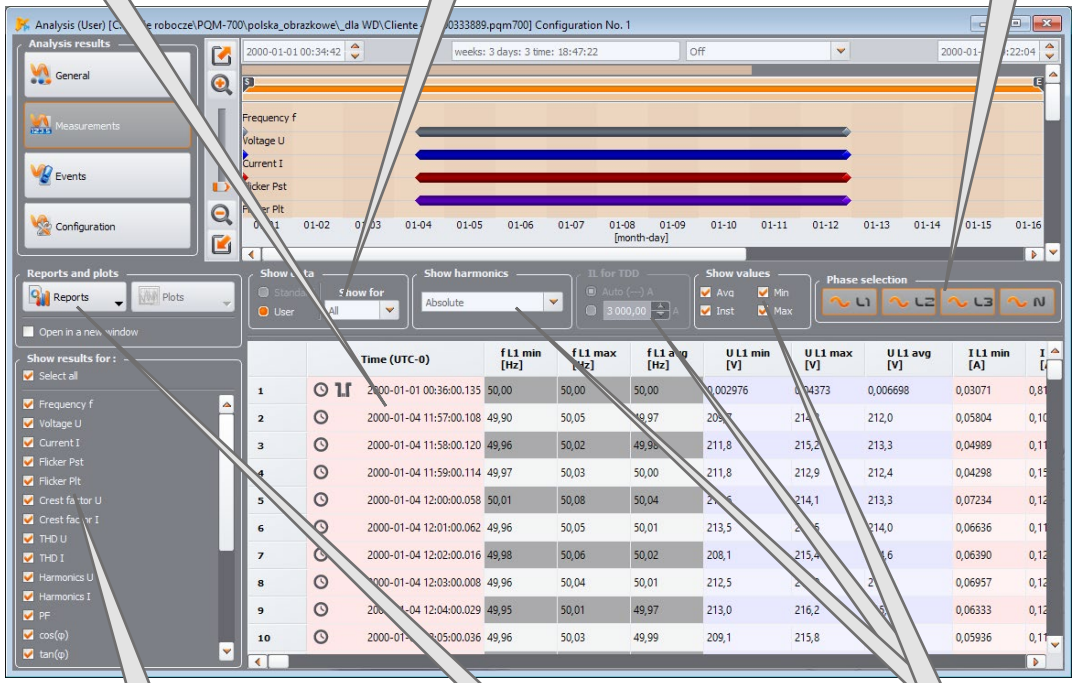


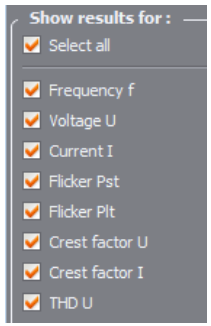
Recording time and values.



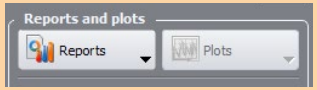
Choose data for analysis.

Filter phases from which you want to analyze data.





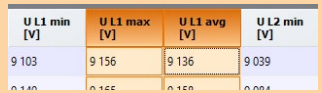
Here are groups of chosen parameters.



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

Create reports under menu **Reports**.

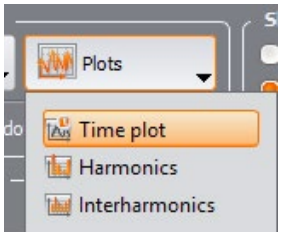
Choose the parameters for analysis.



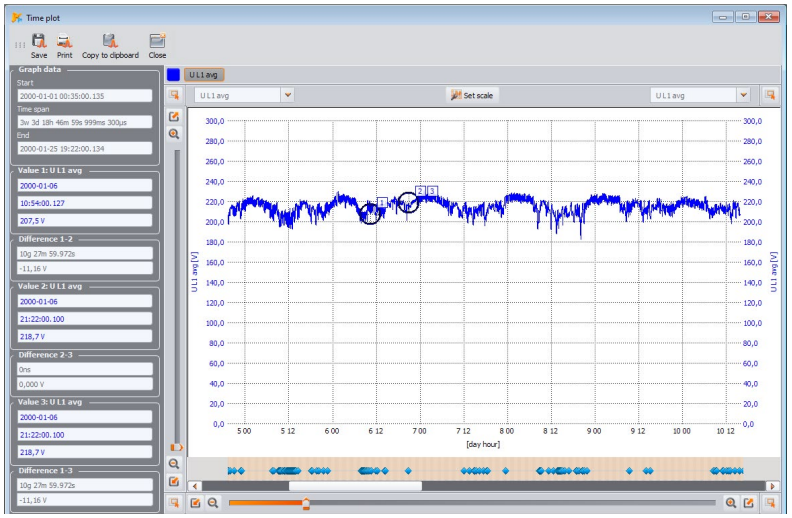
Mark columns for data analysis in order to create a plot or report.

Data analysis

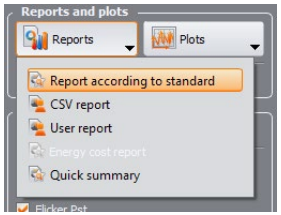
Time plot



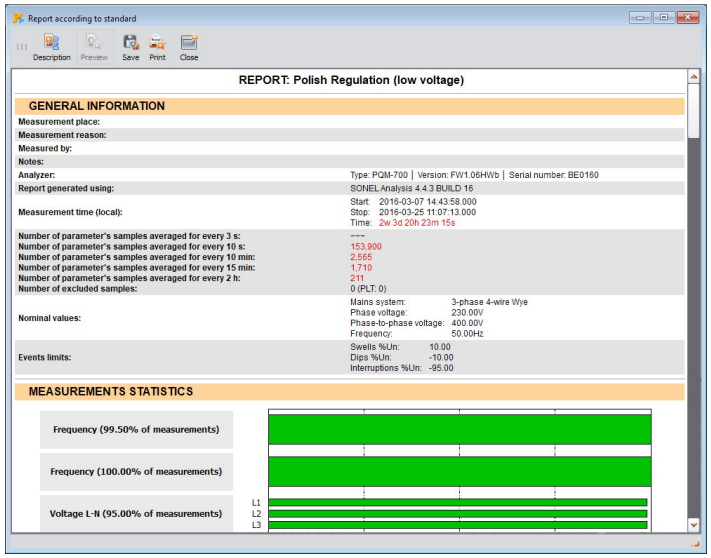
Choose the plot form. The graph will open in a new window.



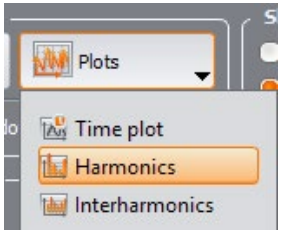
Creating reports



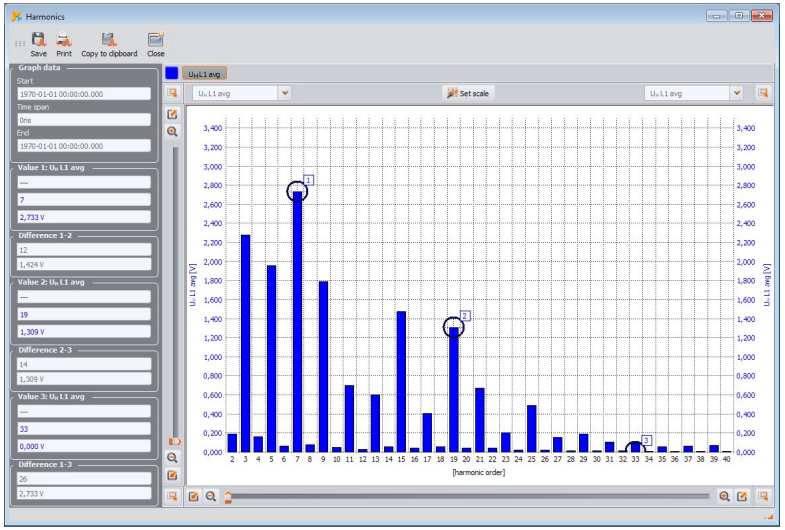
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.



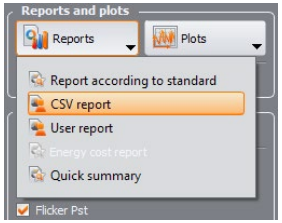
Harmonics and interharmonics



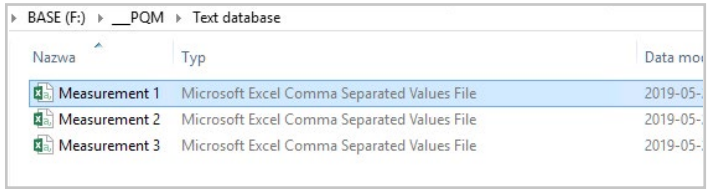
Choose appropriate plot to analyze harmonics or interharmonics.

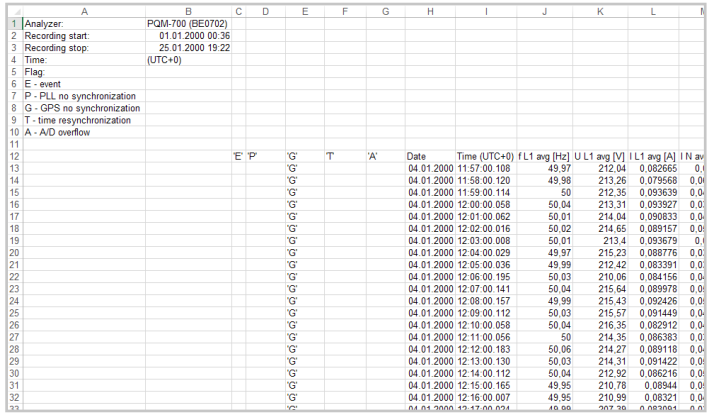


Data export to CSV file



You can also export data directly to CSV file.



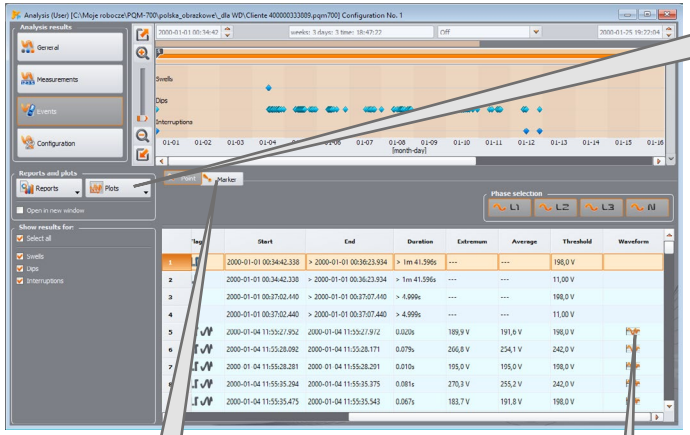


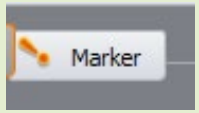
	A	B	C	D	E	F	G	H	I	J	K	L
1	Analyzer:	PQM-700 (BE0702)										
2	Recording start:	01.01.2000 00:36										
3	Recording stop:	25.01.2000 19:22										
4	Time:	(UTC+0)										
5	Flag:											
6	E - event											
7	P - PLL no synchronization											
8	G - GPS no synchronization											
9	T - time resynchronization											
10	A - A/D overflow											
11												
12				'E'	'P'	'G'	'T'	'A'	Date	Time (UTC+0)	f L1 avg [Hz]	U L1 avg [V]	I L1 avg [A]
13						'G'			04.01.2000	11:57:00.108	49,97	212,04	0,082665
14						'G'			04.01.2000	11:58:00.120	49,98	213,26	0,079568
15						'G'			04.01.2000	11:59:00.114	50	212,35	0,093639
16						'G'			04.01.2000	12:00:00.058	50,04	213,31	0,093927
17						'G'			04.01.2000	12:01:00.062	50,01	214,04	0,090833
18						'G'			04.01.2000	12:02:00.016	50,02	214,65	0,089157
19						'G'			04.01.2000	12:03:00.008	50,01	213,4	0,093679
20						'G'			04.01.2000	12:04:00.029	49,97	215,23	0,088776
21						'G'			04.01.2000	12:05:00.036	49,99	212,42	0,083391
22						'G'			04.01.2000	12:06:00.195	50,03	210,06	0,084156
23						'G'			04.01.2000	12:07:00.141	50,04	215,64	0,089978
24						'G'			04.01.2000	12:08:00.157	49,99	215,43	0,092426
25						'G'			04.01.2000	12:09:00.112	50,03	215,57	0,091449
26						'G'			04.01.2000	12:10:00.058	50,04	216,35	0,092912
27						'G'			04.01.2000	12:11:00.056	50	214,35	0,086383
28						'G'			04.01.2000	12:12:00.183	50,06	214,27	0,089118
29						'G'			04.01.2000	12:13:00.130	50,03	214,31	0,091422
30						'G'			04.01.2000	12:14:00.112	50,04	212,92	0,086216
31						'G'			04.01.2000	12:15:00.165	49,95	210,78	0,08944
32						'G'			04.01.2000	12:16:00.007	49,95	210,99	0,08321

Data analysis

"Events" menu

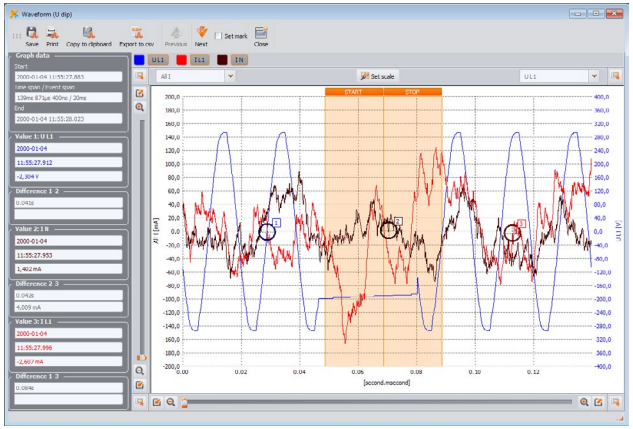
This menu contains the list of events that occurred during the recording.

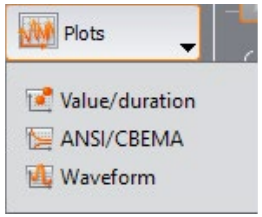




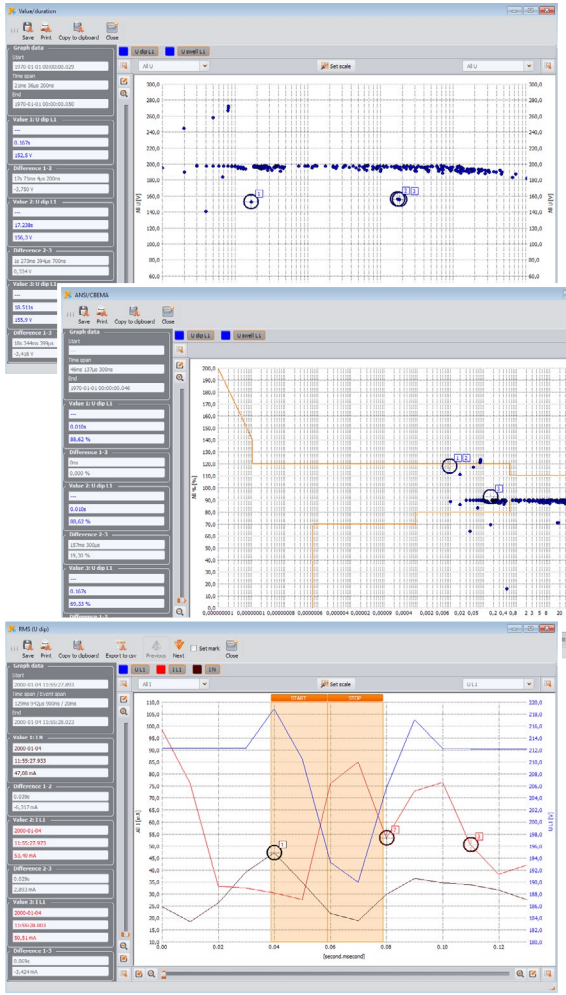
Find the list of events marked in **"General"** menu under tab **Marker**.

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





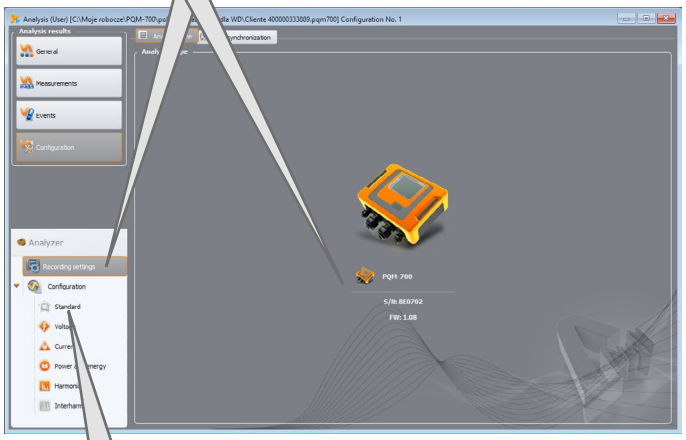
Using **Plots** button select the type of data presentation:
- value/duration,
- in the context of ANSI/CBEMA toleration curves,
- waveform for oscillograms and $RMS_{1/2}$ plots.

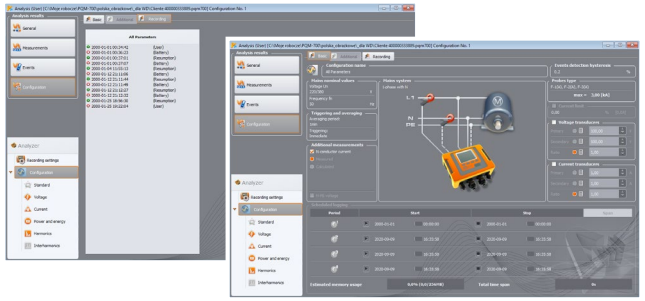


"Configuration" menu

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