

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

Power Quality Analyzers • Quick Guide



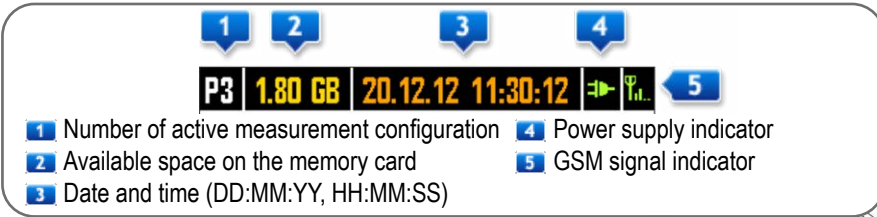
v1.02 | 29.03.2023



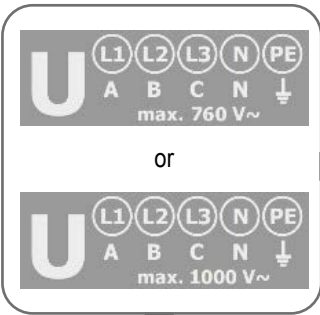
PQM-703 • PQM-711



## Top bar



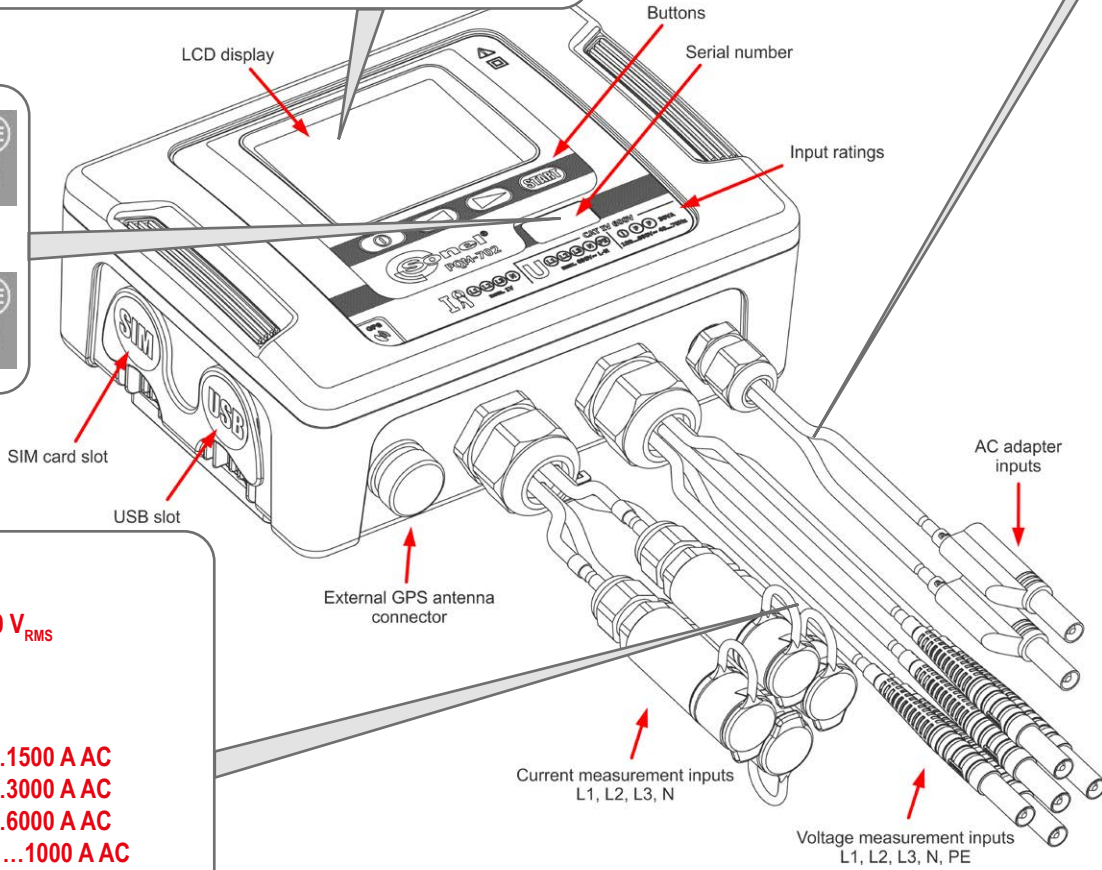
## Maximum input voltage



## Measurement inputs

**Voltage - 5 inputs**  
 L1, L2, L3, N, PE  
 AC: **MAX. 760 V<sub>RMS</sub>** or **1000 V<sub>RMS</sub>**  
 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**

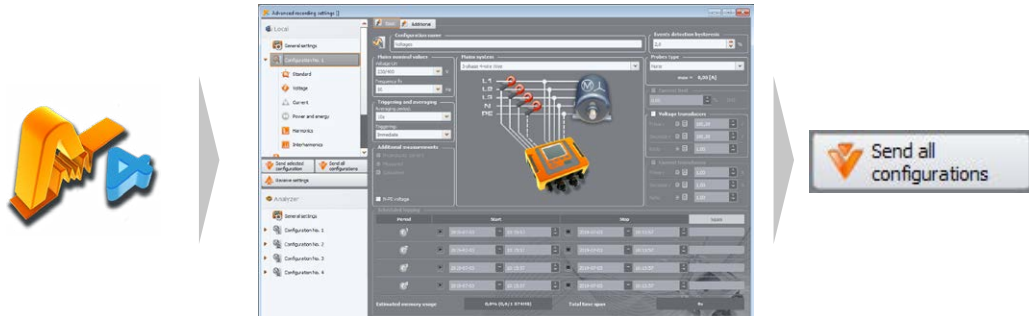
## Power supply

Mounting hardware and installation examples.

## Mounting

# Three steps to get results

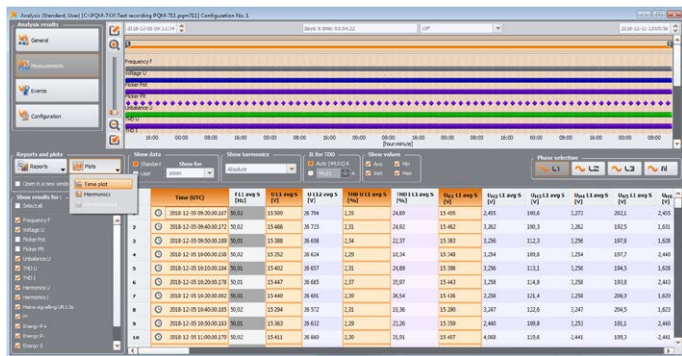
1 Prepare measurement configuration and send it to the meter ▶ page 2



2 Install the analyzer and start the measurement ▶ page 6

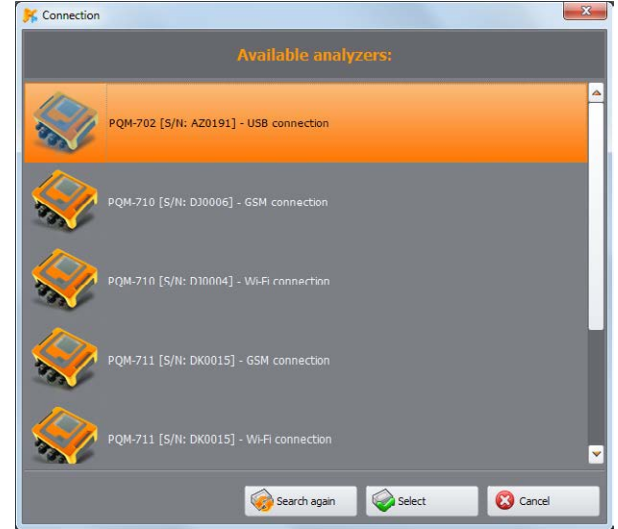
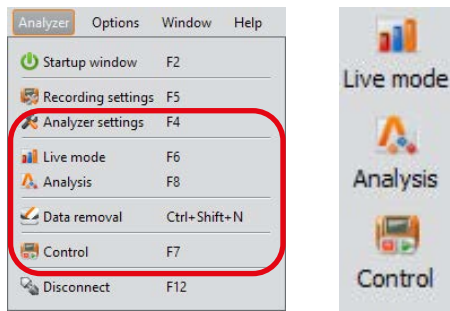


3 Analyze the recorded data ▶ page 8



# Getting started | Connecting the analyzer

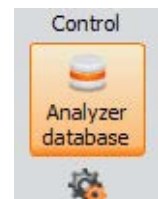
Method 1. Choose a function requiring analyzer connection



Analyzer connection window will appear.

- Choose the desired analyzer.
- Press **Select**.
- Enter PIN code (default: 000).

Method 2. Choose desired analyzer from the database



No.	Analyzer type	Serial number
1	PQM-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.

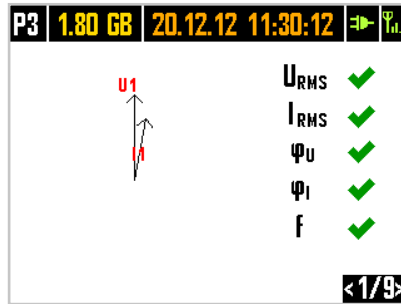
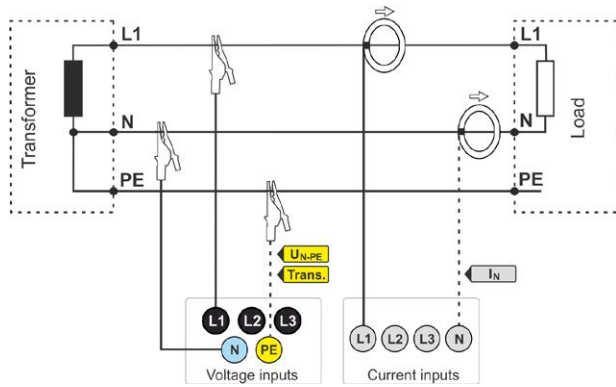
View actual configurations of the connected analyzer (**Analyzer** section).

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	

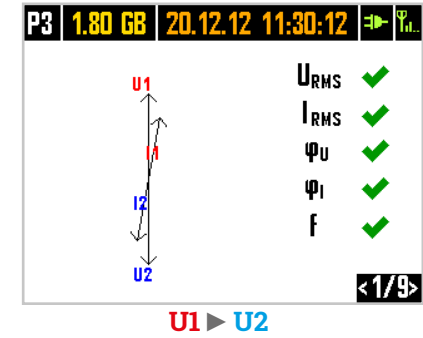
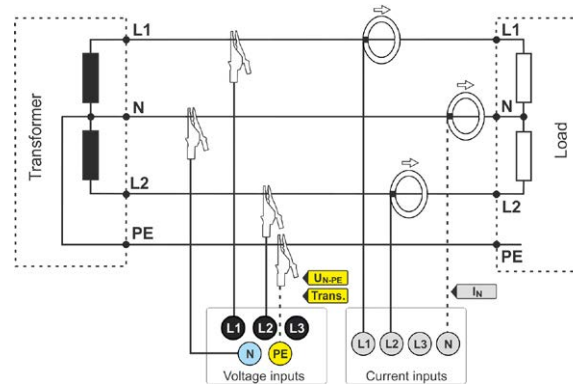
Estimated memory usage: 0,0% (0,0/1 874MB)      Total time span: 0s

# Getting started | Choosing the mains system

## Single-phase

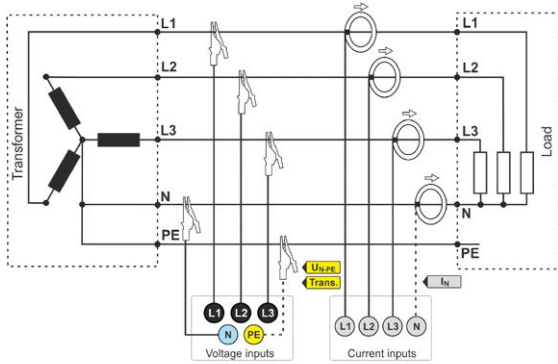


## Split-phase

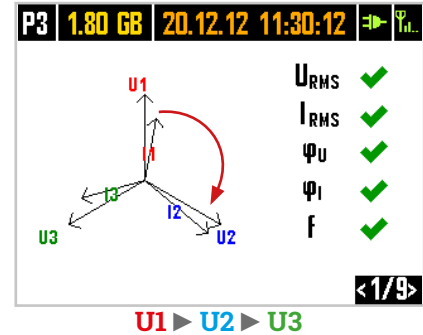
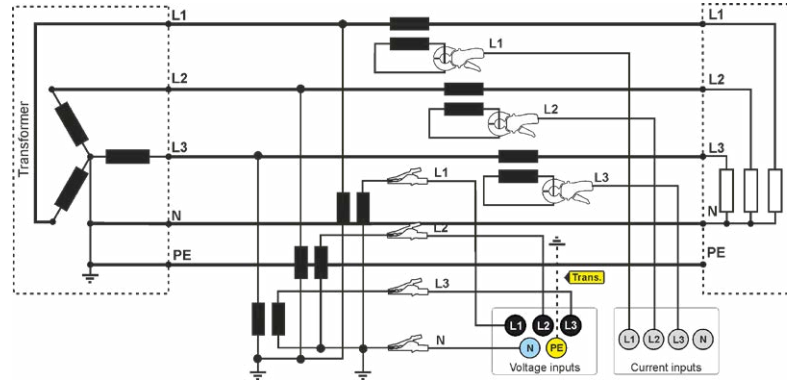


## 3-phase 4-wire (WYE with a neutral conductor)

Direct connection

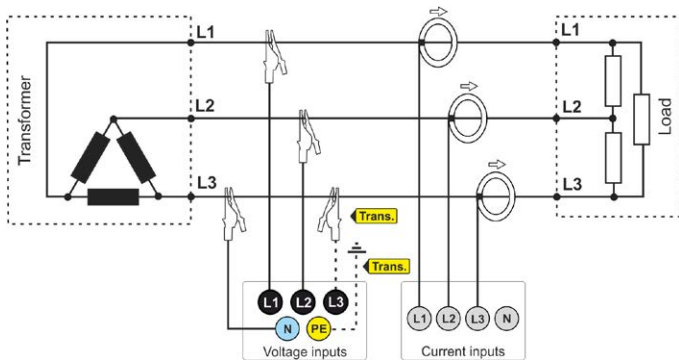


Connection with transducers

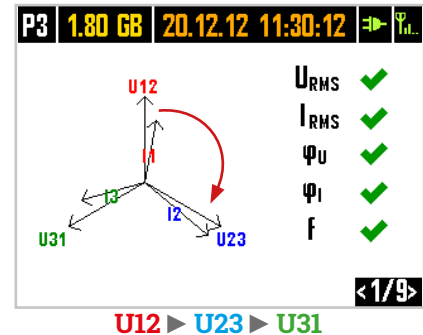
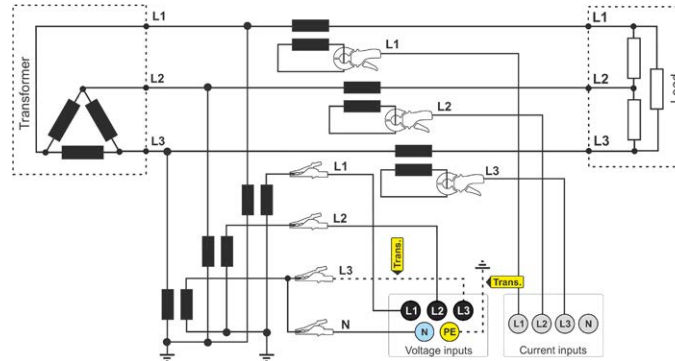


## 3-phase 3-wire (Delta)

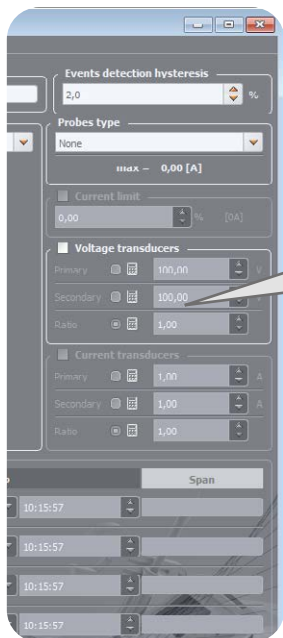
Direct connection



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



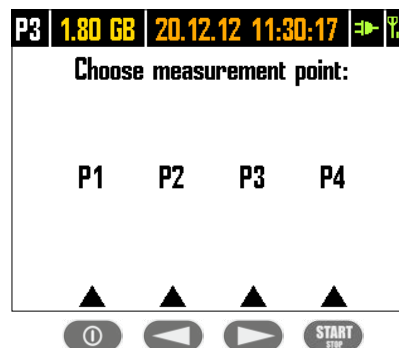
## 2 Choose the active configuration

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

Choose the desired configuration by pressing the assigned button

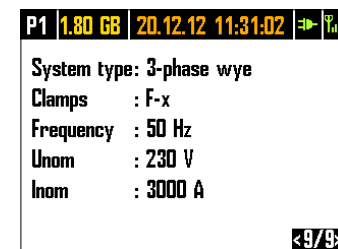
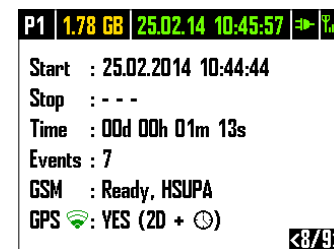
or

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

**Frequency**

- ✓ is within  $\pm 10\%$   $f_N$  range
- ✗ is outside the  $\pm 10\%$   $f_N$  range
- ? too low voltage:  $< 10$  V

**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

**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:  $< 0.3\%$   $I_N$

P1 1.80 GB 20.12.12 11:30:12

<1/9>

# 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

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

Analyzer Options Window Help

- Startup window F2
- Recording settings F5
- Analyzer settings F4**
- ... F6

Using SoneI 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

Press **START/STOP**

OR

use **SoneI 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.

**P1** 1.80 GB 20.12.12 11:30:12

U<sub>RMS</sub> ✓  
I<sub>RMS</sub> ✓  
φ<sub>U</sub> ✓  
φ<sub>I</sub> ✗  
f ✓

**<1/9>**

**P1** 1.80 GB 20.12.12 11:30:10

U1 = 224.57 V I1 = 22.27 A  
U2 = 227.86 V I2 = 28.39 A  
U3 = 228.03 V I3 = 23.37 A  
Unpe = 0.0218 V In = 10.95 A  
f = 50.000 Hz

**<2/9>**

**P1** 1.80 GB 20.12.12 11:30:09

P1= 4.825 kW Q1= 929.3 var  
P2= 6.301 kW Q2= 1.087 kvar  
P3= 4.981 kW Q3= 1.289 kvar  
P = 16.11 kW Q = 3.307 kvar

**<3/9>**

**P1** 1.80 GB 20.12.12 11:30:08

SN1= 984.6 var S1= 7.617 kVA  
SN2= 778.3 var S2= 10.04 kVA  
SN3= 1.100 kvar S3= 8.081 kVA  
SN = 4.831 kvar S = 26.28 kVA

**<4/9>**

## 10 Monitor the meter and measurements

View live readings

Change settings if necessary

## 11 Finish recording

Press **START/STOP** for 3 s

OR

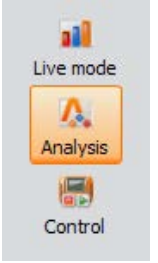
use **SoneI Analysis** software.

**P1** Active configuration symbol stops flashing.

**Tone notice sounds:**  
1 long and 3 short signals.

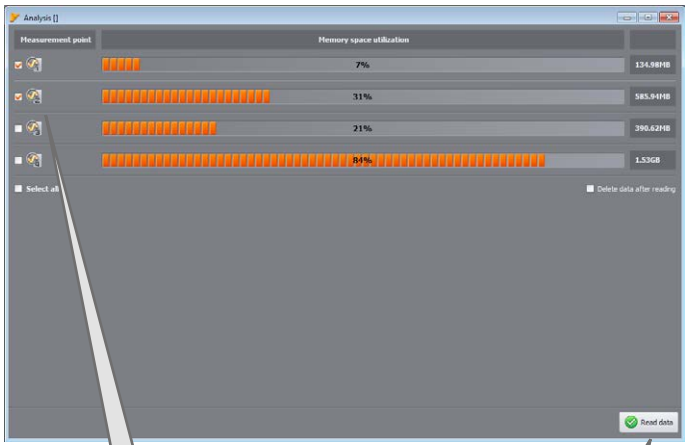
# Data analysis

## 1 Download data from the analyzer



- Live mode
- Analysis**
- Control

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




Measurement point

Measurement point	Memory space utilization	Value
1	7%	134.98MB
2	31%	585.91MB
3	21%	396.62MB
4	89%	1.53GB

Read data



Choose the recording for analysis.


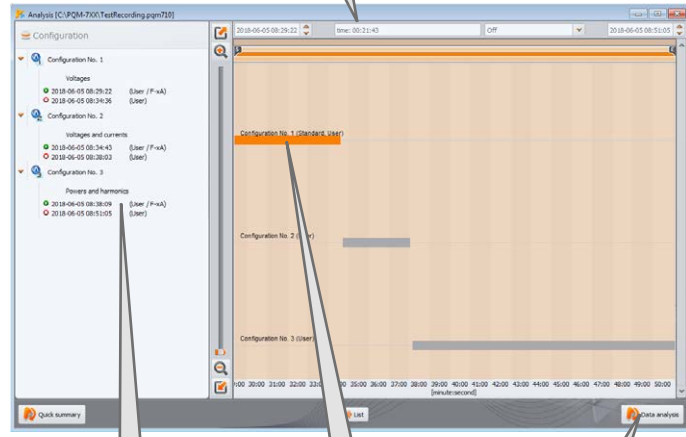


Press **Read data** button.

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.

Configuration

- Configuration No. 1
  - 2018-06-05 08:29:22 (User: P=AA)
  - 2018-06-05 08:39:26 (User: )
- Configuration No. 2
  - 2018-06-05 08:34:43 (User: P=AA)
  - 2018-06-05 08:38:03 (User: )
- Configuration No. 3
  - 2018-06-05 08:38:09 (User: P=AA)
  - 2018-06-05 08:51:05 (User: )

Data analysis

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.

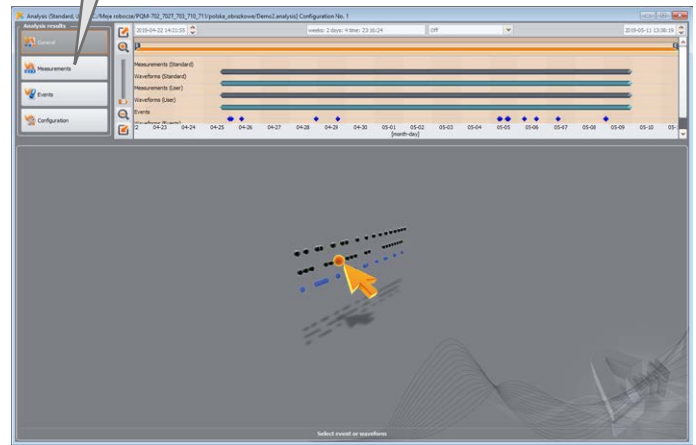
## 3 Analyze the data

Analysis results

- General
- Measurements
- Events
- Configuration

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.



Analysis results

Measurements (Standard)

Measurements (User)

Waveforms (User)

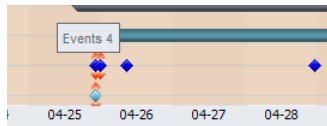
Events

Configuration

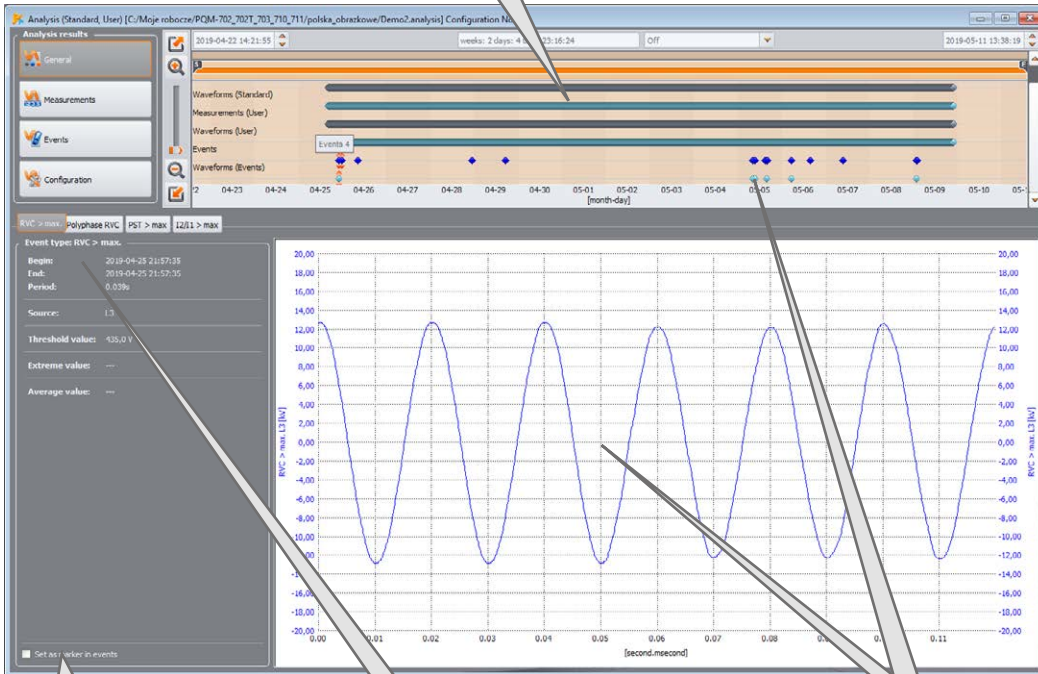


## "General" menu

## "Measurements" menu



The top screen is the view of the whole recording.

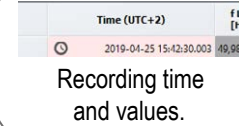


Set as marker in events

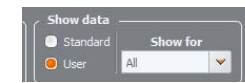
Mark the desired event to make it appear on the individual list in "Events" menu.

View event's details by choosing the correct tab.

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



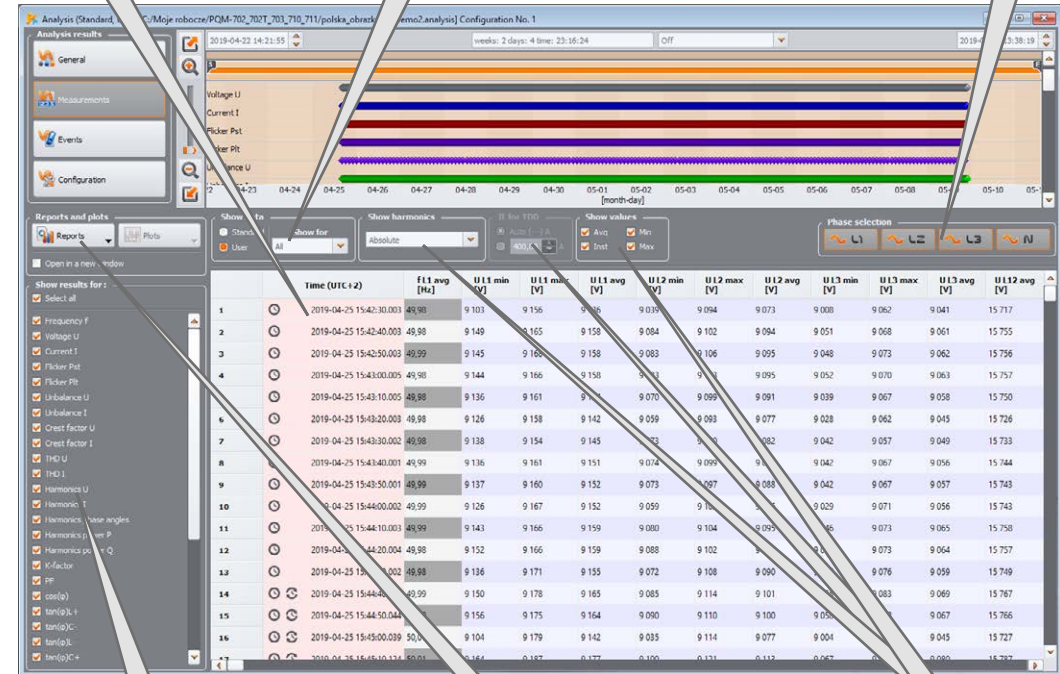
Recording time and values.



Choose data for analysis.

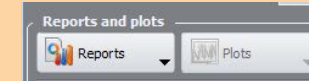


Filter phases from which you want to analyze data.



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

Here are groups of chosen parameters.



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

- timeplot,
- harmonics,
- interharmonics.

Create reports under menu **Reports**.

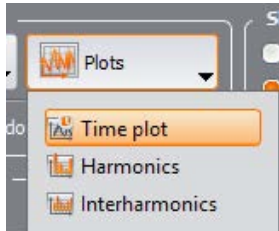
Choose the parameters for analysis.

U L1 min [V]	U L1 max [V]	U L1 avg [V]	U L2 min [V]
9 103	9 156	9 136	9 039
9 140	9 155	9 150	9 004

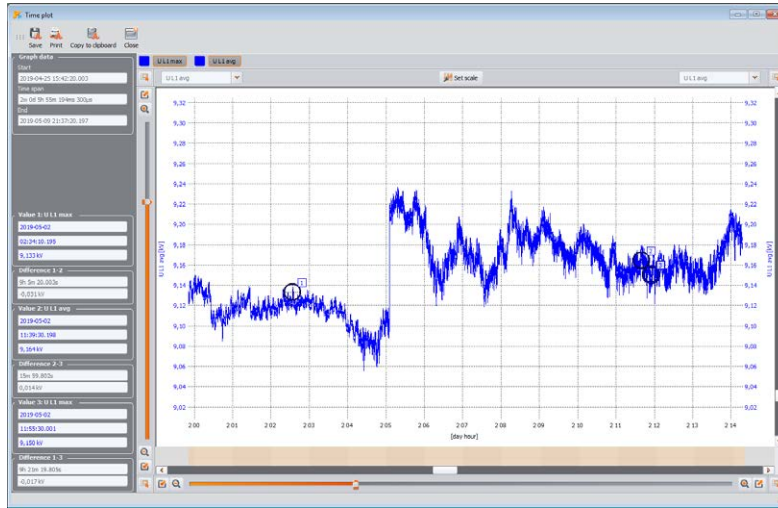
Mark columns for data analysis in order to create a plot or report.

# Data analysis

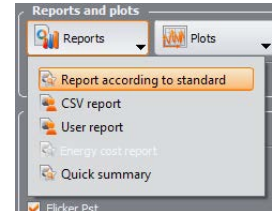
## Time plot



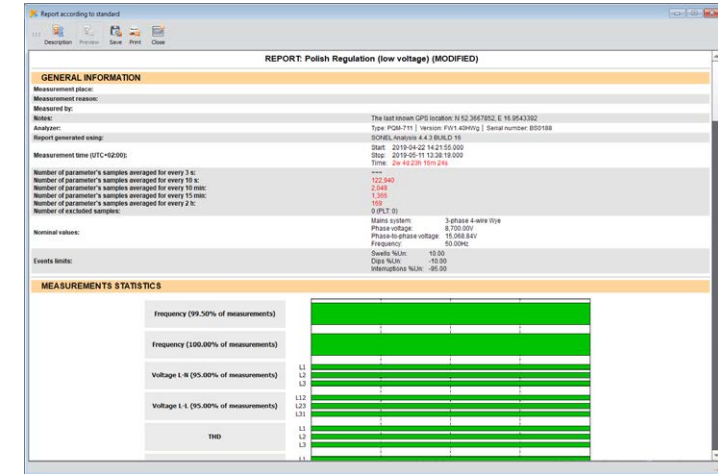
Choose the plot form. The graph will open in a new window.



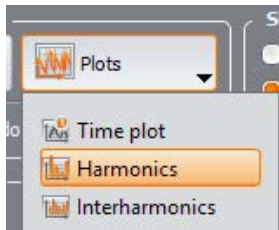
## Creating reports



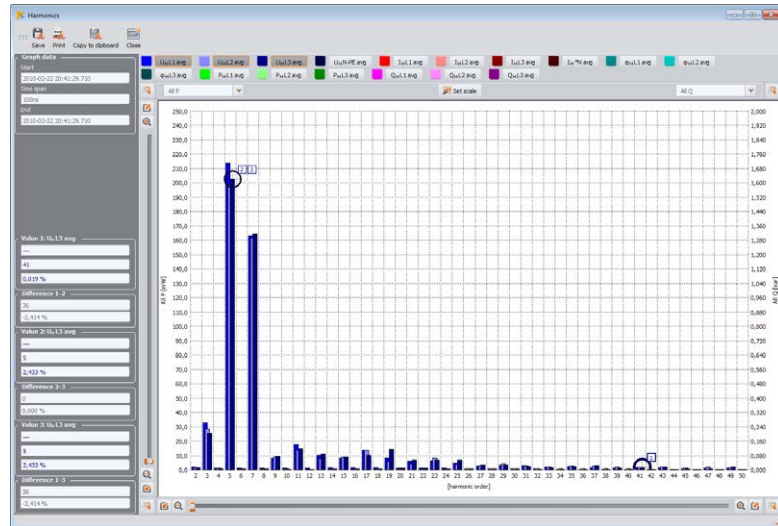
If the recording was made to verify compliance with a particular standard, choose **Report according to standard**, to create appropriate report.



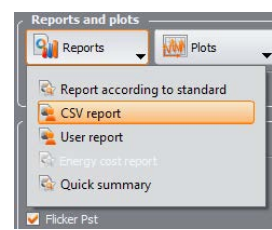
## Harmonics and interharmonics



Choose appropriate plot to analyze harmonics or interharmonics.



## Data export to CSV file



You can also export data directly to CSV file.

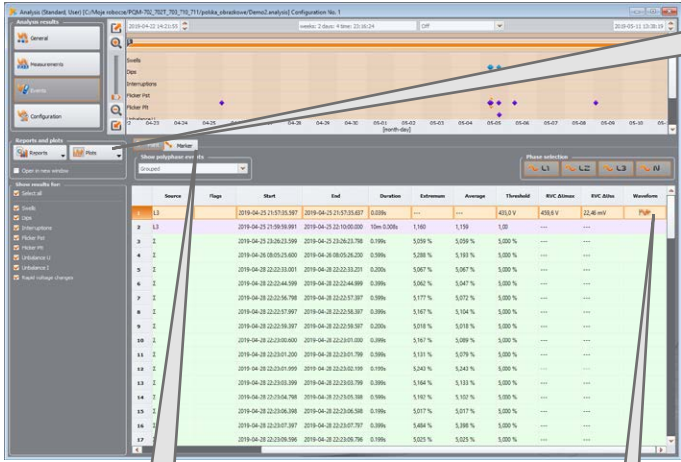
Nazwa	Typ	Data mo
Measurement 1	Microsoft Excel Comma Separated Values File	2019-05-
Measurement 2	Microsoft Excel Comma Separated Values File	2019-05-
Measurement 3	Microsoft Excel Comma Separated Values File	2019-05-

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Analyzer:	PQM-711 (BSU188)											
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 ang [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	9077.6		
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.

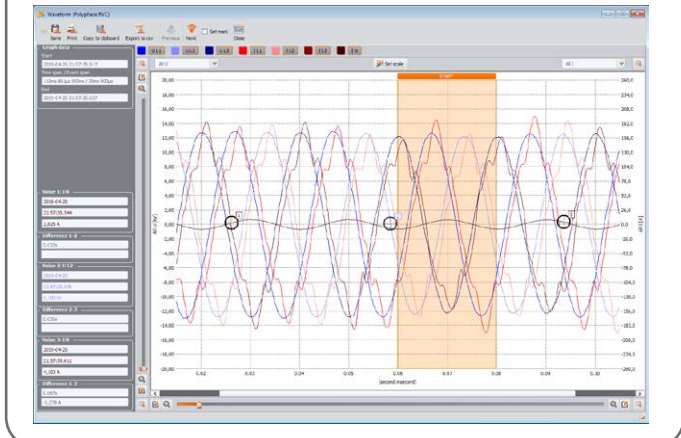


**Marker**  
polyphase events

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.



**Plots**

- Value/duration
- ANSI/CBEMA
- Waveform

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.soneel.pl/en](http://www.soneel.pl/en)