

User & Installation Guide

Pure BlackBox

Power Quality Analyzer



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Introduction - Pure BlackBox

The PureBB is an advanced Class A power quality analyzer embedded with PQZIP Technology. It is an easy to use plug and play device that continuously records all power quality parameters without the need to set up thresholds setting or recording configuration.

The device comes in 2 versions:

- Single Phase
- 3-Phases

When using the PureBB any installation error, such as wrong phase order, can be fixed during post-processing. The Pure BlackBox has a ride through super capacitors technology to enable continuous recording during short supply interruptions.

Power quality post recording processing and analysis are available using the free PQSCADA Sapphire Express Edition software via drag and drop of recorded data PQZ files for immediate analysis, PQ trending, events occurrences and reports.

Recorded information is saved in a non-volatile memory SD card which is accessed either as a standard external memory or via the device USB slot, connected to a PC, or by inserting the SD card in a reader connected to a PC.

Main Features

- Light weight, hand-held portable PQ recorder
- 256 Sample/Cycle
- Class A devices IEC61000-4-30
- Configuration FREE Device
- Easy USB connectivity to PC
- SD card slot hot swap
- IP40 for rugged environments



3 - Phase Preparation - Safety Single Phase Precautions

Kindly review & take all the necessary safety precautions prior to proceeding.

 WARNINGS 
REVIEW THE ENTIRE MANUAL BEFORE USING THE INSTRUMENT AND ITS ACCESSORIES
OBSERVE ALL WARNINGS AND CAUTIONS
DO NOT OPERATE THE INSTRUMENT AROUND EXPLOSIVE GAS OR VAPOR
AVOID WORKING ALONE
BEFORE USE, INSPECT THE INSTRUMENT, LEADS AND ACCESSORIES FOR MECHANICAL DAMAGE, AND REPLACE WHEN NEEDED
PAY SPECIAL ATTENTION TO THE INSULATION SURROUNDING THE CONNECTORS AND PLUGS
REMOVE ALL ACCESSORIES THAT ARE NOT IN USE
MAKE SURE THE INSTRUMENT IS PROPERLY GROUNDED TO A PROTECTIVE EARTH GROUND
DO NOT INSERT POWER OR ANY OTHER CONNECTORS ABOVE THE RATING OF THE INSTRUMENT AS SHOWN ON THE NAME PLATE
DURING INSTALLATION, ENSURE THAT THE DEVICE IS COMPLETELY DISCONNECTED FROM ANY LIVE POINTS AND/OR PLUGS
DO NOT INSERT METAL OBJECTS INTO CONNECTORS AND OPENINGS
NEVER OPEN THE INSTRUMENT'S ENCLOSURE DURING OPERATION; DANGEROUS VOLTAGES ARE PRESENT
USE THE INSTRUMENT ONLY AS SPECIFIED IN THIS MANUAL, OR THE PROTECTION PROVIDED BY THE INSTRUMENT MAY BE IMPAIRED
DO NOT EXPOSE THE INSTRUMENT TO EXTREME MOISTURE AND OR RAIN
TO AVOID SHOCK OR FIRE
VERIFY THAT THE UNIT IS DISCONNECTED FROM THE MAIN POWER SUPPLY
INSPECT ALL ELECTRICAL AND MECHANICAL CONNECTIONS VISUALLY FOR MECHANICAL DAMAGE AND INTEGRITY OF COMPONENTS AND ACCESSORIES
PULL-TEST ALL CONTROL WIRING TO ENSURE SECURE SEATING IN TERMINALS

BEFORE USE, INSPECT THE INSTRUMENT, LEADS AND ACCESSORIES FOR MECHANICAL DAMAGE, AND REPLACE WHEN DAMAGED

DO NOT OPERATE THE INSTRUMENT OR ITS ACCESSORIES WHEN FOUND WET FOR ANY REASON

Unpacking Components & Accessories

The Pure BlackBox is delivered from Elspec's factory in a sealed case in order to protect from damage during transportation.

Pure BlackBox Unit

Single Phase

The single phase unit can be used for:

- Voltage recording - the unit main power socket voltage is recorded
- Voltage and current recording - the unit main power socket voltage and the current flowing through the unit to the load are recorded



3 Phase

The 3-phase unit has a separated power supply and voltage measuring mechanisms



Installation

This section contains the plug and play installation procedure for the Pure BlackBox

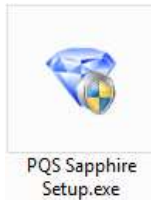


Install PQSCADA Sapphire Express Edition Software

Download the PQSCADA Sapphire installation from Elspec website.

The application's setup wizard will guide you through the installation process:

At the download location on your hard drive select the PQSCADA Setup icon:



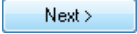
The Welcome Screen of the installation guide will now open:



Select the  button to start the installation process

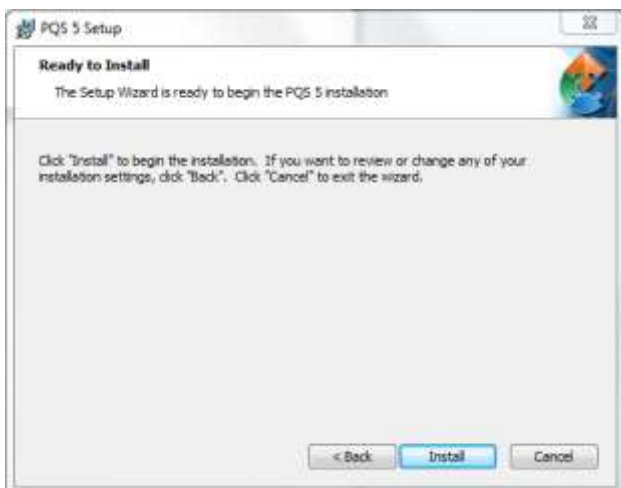
Read & accept the license agreement at "I Agree" & select the  button:



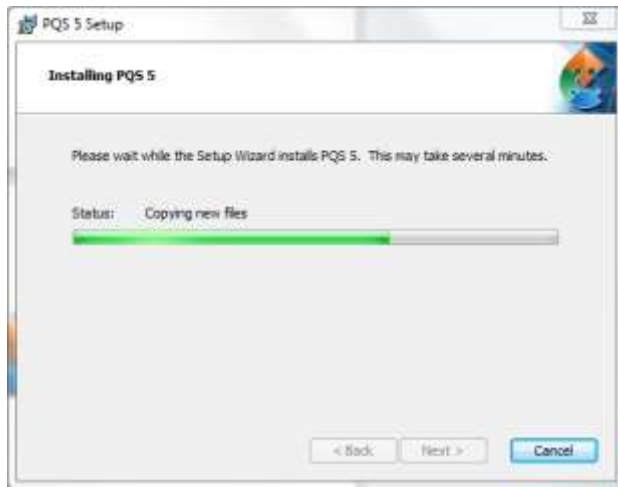
The wizard will request the location where you would like to install the application. It is recommended to include it on your hard drive in an Elspec folder. Either Browse / Type the Location, select the Availability Option & select the  button:



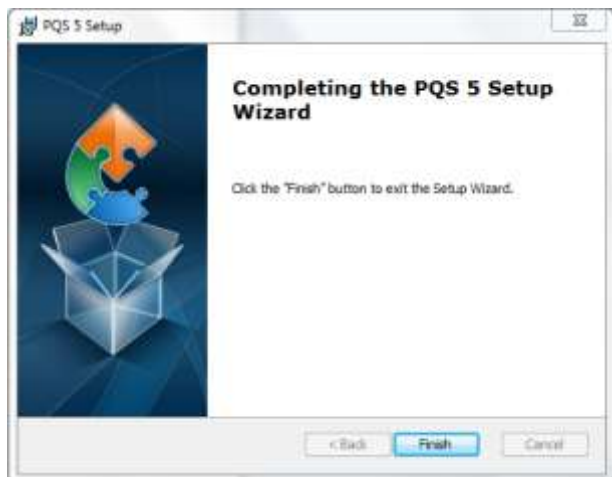
After verifying that no changes are required in the installation configuration select the  button



Wait until the installation process is completed



Select the **Finish** button after the installation process is complete



Download Recorded Data from the Pure BlackBox

There're two alternatives for downloading recorded data from the Pure BlackBox removable SD card:

- i. Direct PC connection via the USB port
- ii. Remove the SD card from the unit and use an SD card reader connected to a PC

Recorded data can be dragged and dropped directly from the unit to an Investigation window of the PQSCADA or saved on your computer.

Investigate with the PQSCADA Sapphire Express Edition Software

Run the PQSCADA Sapphire software



Select 'Continue with Express mode' and if you don't want to see this message again select 'Do not display this window again'



Select **Finish** button

The PQSCADA is now open on the Investigation section and you can either drag and drop the files you wish to investigate or **Start New Investigation**

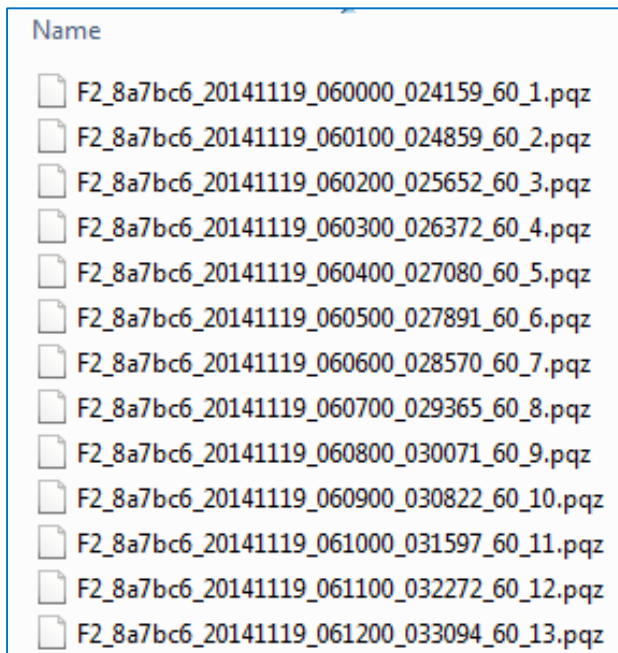


The easiest way to begin an investigation is to drag and drop files directly to create new investigation folder icon.

Select the PQZ files you wish to investigate

Note: the PQZIP file name contains the date in which it was created. For example

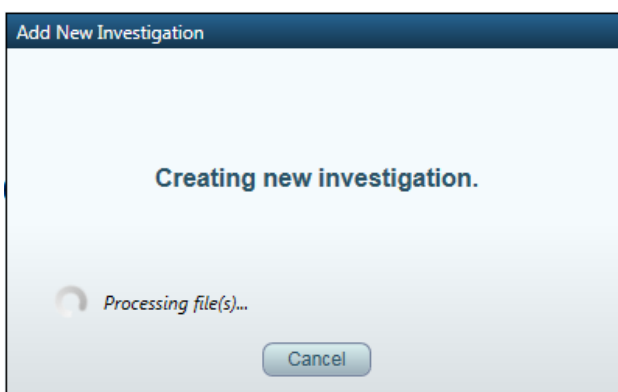
 F2_8a7bc6_20141119_060000_024159_60_1.pqz indicates that the file was created on 19/11/2014 at 06:00:00AM GMT Time.



Drag the files into the Investigation tab folder 'Drag files to create new investigation'.

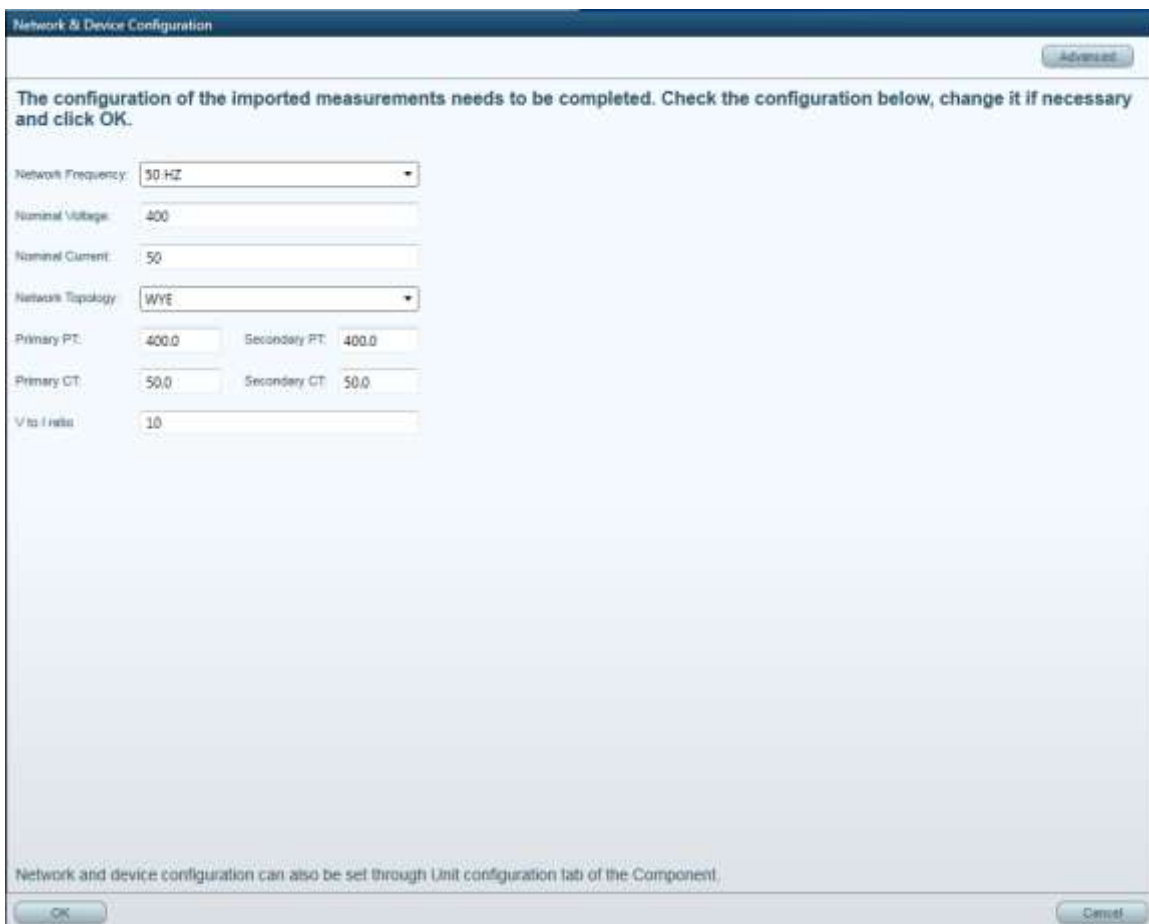
The Pure BlackBox is designed as a plug & play device where voltage & current channels can be used to measure any of the phases without pre-configuration. Therefore when files are investigated you need first to configure the measured channels so the PQSCADA would know which voltage/current channel is related to which phase.

The system will create a new investigation



A configuration window will appear, edit the network & device configuration with the following:

- Network frequency
- Nominal Voltage (keep on mind that the nominal Voltage is also the 100% reference for the compliance events)
- Nominal current
- Topology
- PT ratio
- CT ratio
- Clamps I/V ratio (type the value in mV, for example 1A to 0.01V will be represented as 10mV)



The configuration of the imported measurements needs to be completed. Check the configuration below, change it if necessary and click OK.

Network Frequency: 50 HZ

Nominal Voltage: 400

Nominal Current: 50

Network Topology: WYE

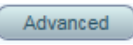
Primary PT: 400.0 Secondary PT: 400.0

Primary CT: 50.0 Secondary CT: 50.0

V to I ratio: 10

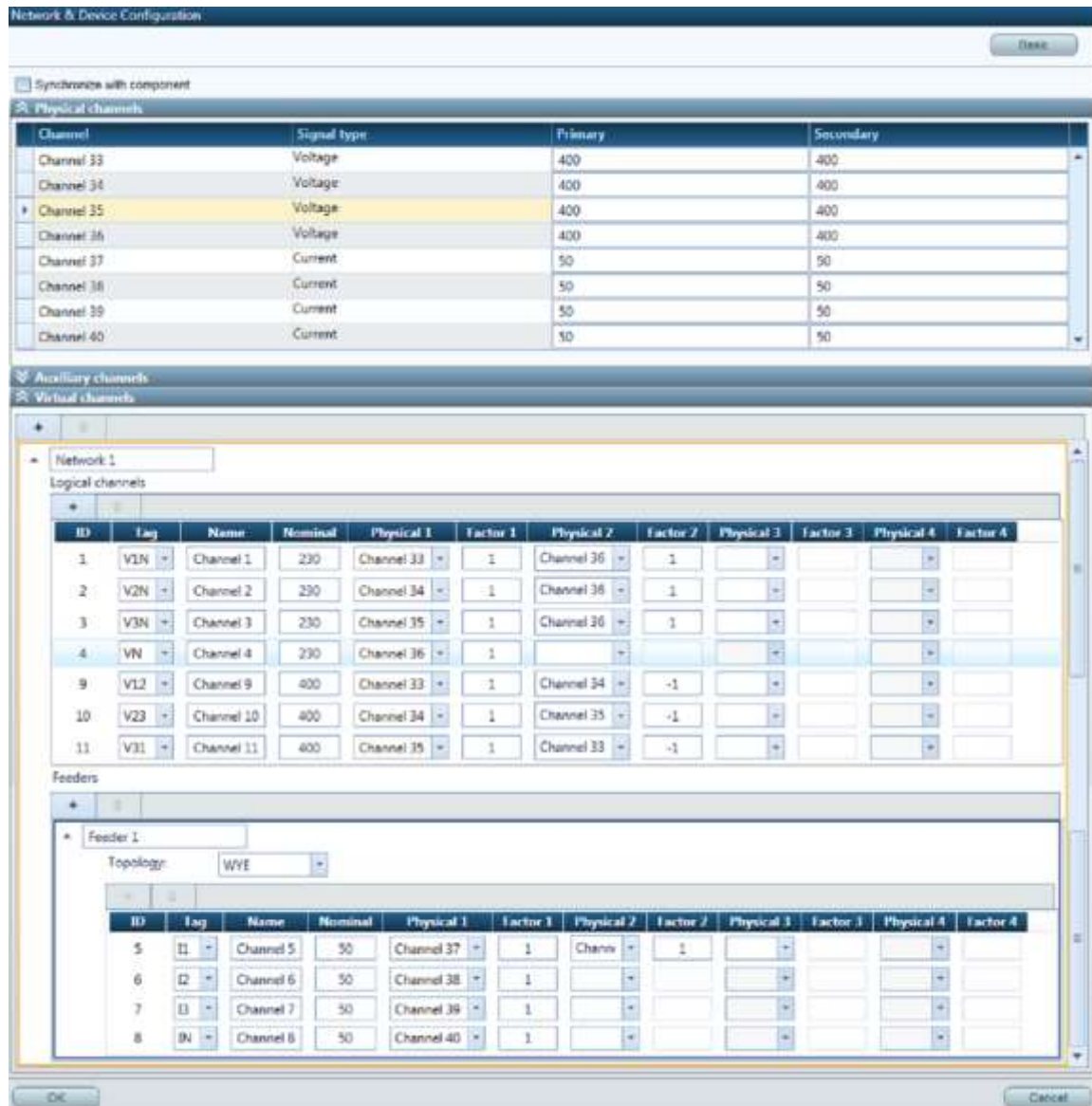
Network and device configuration can also be set through Unit configuration tab of the Component.

OK Cancel

For advance settings, select the  button and the following window will appear

The Advance window can be used in the following scenarios:

- If not all phases share the same PT/CT ratio (for example different clamps per channels)
- Virtual channels (calculated channels) can be configured. For example phase to phase channel will be implemented as differential channel, leakage channel as the sum of all channels...etc.



The screenshot shows the "Network & Device Configuration" window. It has a "Close" button in the top right. Below the title bar, there is a checkbox for "Synchronize with component". The main area is divided into two sections: "Physical channels" and "Auxiliary channels".

Physical channels

Channel	Signal type	Primary	Secondary
Channel 33	Voltage	400	400
Channel 34	Voltage	400	400
Channel 35	Voltage	400	400
Channel 36	Voltage	400	400
Channel 37	Current	50	50
Channel 38	Current	50	50
Channel 39	Current	50	50
Channel 40	Current	50	50

Auxiliary channels

Virtual channels

Network 1

Logical channels

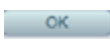
ID	Tag	Name	Nominal	Physical 1	Factor 1	Physical 2	Factor 2	Physical 3	Factor 3	Physical 4	Factor 4
1	V1N	Channel 1	230	Channel 33	1	Channel 36	1				
2	V2N	Channel 2	230	Channel 34	1	Channel 38	1				
3	V3N	Channel 3	230	Channel 35	1	Channel 39	1				
4	VN	Channel 4	230	Channel 36	1						
9	V12	Channel 9	400	Channel 33	1	Channel 34	-1				
10	V23	Channel 10	400	Channel 34	1	Channel 35	-1				
11	V31	Channel 11	400	Channel 35	1	Channel 33	-1				

Feeder 1

Topology: WYE

ID	Tag	Name	Nominal	Physical 1	Factor 1	Physical 2	Factor 2	Physical 3	Factor 3	Physical 4	Factor 4
5	I1	Channel 5	50	Channel 37	1	Channel 38	1				
6	I2	Channel 6	50	Channel 38	1	Channel 39	1				
7	I3	Channel 7	50	Channel 39	1	Channel 40	1				
8	IN	Channel 8	50	Channel 40	1						

OK Cancel

After finish configuring the "Network & device configuration" window, click 

The files are processed and the progress is indicated in percentile

9 files left

Local Machine

Investigation 24/11/2014 13:21:15

19.23%

Processing

F2_8a7bc6_20141119_060800_030071_60_9.pqz

0%

Processing

F2_8a7bc6_20141119_060900_030822_60_10.pqz

0%

Processing

F2_8a7bc6_20141119_061000_031597_60_11.pqz

0%

Processing

F2_8a7bc6_20141119_061100_032272_60_12.pqz

0%

Processing

F2_8a7bc6_20141119_061200_033094_60_13.pqz

0%

Processing

F2_8a7bc6_20141119_060000_024159_60_1.pqz

Completed

F2_8a7bc6_20141119_060100_024859_60_2.pqz

Completed

F2_8a7bc6_20141119_060200_025652_60_3.pqz

Completed

F2_8a7bc6_20141119_060300_026372_60_4.pqz

30%

Processing

F2_8a7bc6_20141119_060400_027080_60_5.pqz

0%

Processing

F2_8a7bc6_20141119_060500_027891_60_6.pqz

0%

Processing

F2_8a7bc6_20141119_060600_028570_60_7.pqz

0%

Processing

F2_8a7bc6_20141119_060700_029365_60_8.pqz

0%

Processing

Process of files complete

Local Machine

Investigation 23/11/2014 19:29:52

76.92%

Calculate historical data

F2_8a7bc6_20141119_060500_027891_60_6.pqz

Completed

F2_8a7bc6_20141119_060600_028570_60_7.pqz

Completed

F2_8a7bc6_20141119_060700_029365_60_8.pqz

Completed

F2_8a7bc6_20141119_060800_030071_60_9.pqz

Completed

F2_8a7bc6_20141119_060900_030822_60_10.pqz

Completed

F2_8a7bc6_20141119_061000_031597_60_11.pqz

Completed

F2_8a7bc6_20141119_061100_032272_60_12.pqz

Completed

F2_8a7bc6_20141119_061200_033094_60_13.pqz

Completed

F2_8a7bc6_20141119_060000_024159_60_1.pqz

Completed

F2_8a7bc6_20141119_060100_024859_60_2.pqz

Completed

F2_8a7bc6_20141119_060200_025652_60_3.pqz

Completed

F2_8a7bc6_20141119_060300_026372_60_4.pqz

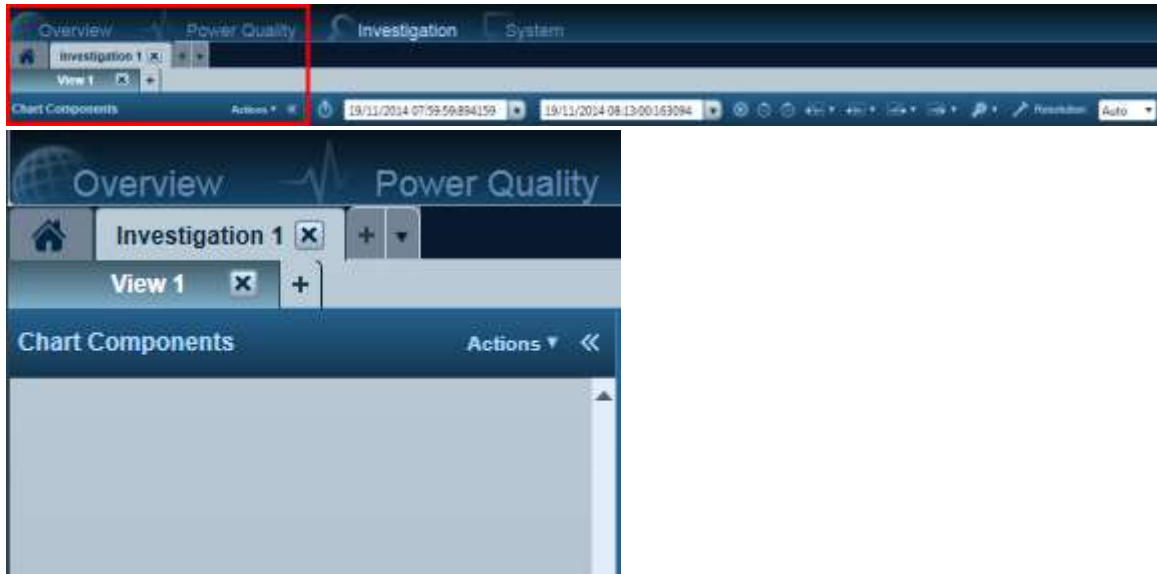
Completed

F2_8a7bc6_20141119_060400_027080_60_5.pqz

Completed

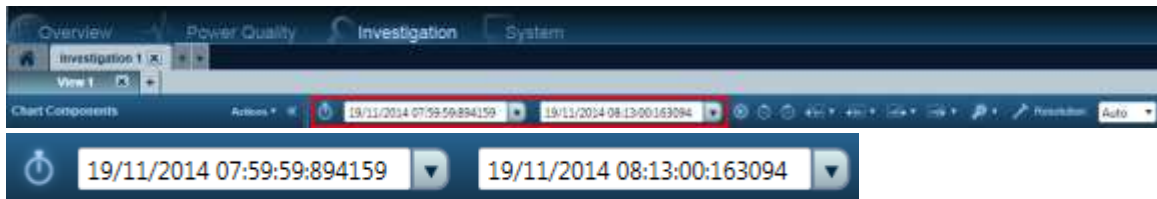
You can clear all files from this window, minimize it or close it by clicking respectively on the upper right part of this window.

- An investigation tab is created under the named 'Investigation 1' with a view tab named 'View 1'



Since no charts are defined the "Chart Components" section is empty.

- The time interval contains the start time and the end time set according to the processed PQZ files



- Add a new chart

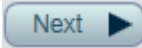


- Select the type of chart you wish to create

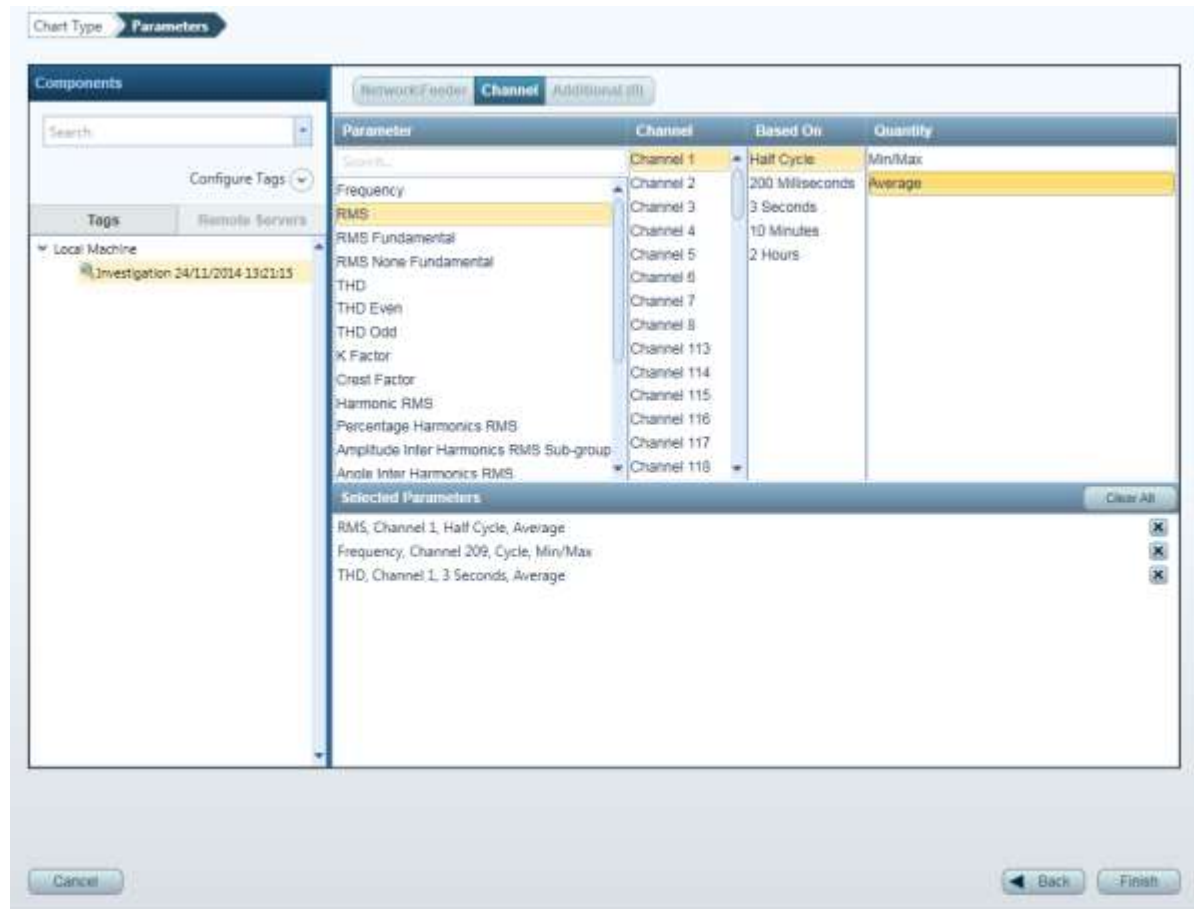


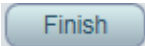
The chart types are:

- Trend
- Grid
- Spectrum
- Event
- Statistics
- Scatter Parameter
- Scatter Event
- Phasor

- After the chart type is selected click 

- Select the parameters, channels, and interval that the calculation is based on and the quantity e.g., Min/Max & Average.



- Selected parameters summary list appears at the bottom part of the window. After required parameters are selected click 

For further information please refer to the PQSCADA user guide.

Datasheet

3-Phase

SPECIFICATIONS	
Voltage Inputs	4 channels, 110-690VAC Nominal Measuring up to 1.5kV RMS
Current Channels	4 channels Voltage output CTs (0-10V peak)
Line Frequency	40-70Hz
Waveform Sampling	256 Sample/Cycle at 50/60Hz
Measurements	Continuous PQZ file
Accuracy	IEC 61000-4-30 Class A
LED Indicators	11 Bi-color LED: Voltage clips status - 4 Current clamps status - 4 SD card status - 1 PQZ Recording status - 1 General status - 1
COMMUNICATION	
USB	PQZ file download, FW upgrade & clock setting
LAN	Available in extension module
POWER	
Power Supply	100-240VAC 50/60Hz 10W 140-300VDC 5VDC over USB
Battery	Available in extension module
Ride through	15sec
MECHANICAL	
Operating Temperature	-20 to + 70 °C (*)
Humidity	5% to 95% non-condensing
IP protection	IP 40
Weight	0.4kg
Dimensions	180 x 115 x 60
STORAGE	
Nonvolatile memory	SD card supporting hot swap (**)
SYNCHRONIZATION	
Internal clock	10 ppm
External synchronization	NTP available in extension module

(*) T>60°C requires an external power supply

(**) See SD card specifications in user manual

Single Phase

SPECIFICATIONS	
Voltage Inputs	2 channels, phase and neutral through power socket 110/240VAC Nominal Measuring up to 0.5kV RMS
Current Channel (optional)	1 channel, between source and load up to 10A Peak
Line Frequency	40-70Hz
Waveform Sampling	256 Sample/Cycle at 50/60Hz
Measurements	Continuous PQZ file
Accuracy	IEC 61000-4-30 Class A
LED Indicators	3 Bi-colors LED SD card status - 1 PQZ Recording status - 1 General status - 1
COMMUNICATION	
USB	PQZ file download, FW upgrade & clock setting
POWER	
Power Supply	100-240VAC 50/60Hz 10W 140-300VDC 5VDC over USB
Ride through	30sec
MECHANICAL	
Operating Temperature	-20 to + 70 °C (*)
Humidity	5% to 95% non-condensing
IP protection	IP 40
Weight	0.25kg
Dimensions	146 x 82 x 48
STORAGE	
Nonvolatile memory	SD card supporting hot swap (**)
SYNCHRONIZATION	
Internal clock	10 ppm

(*) T>60°C requires an external power supply

(**) see SD card specifications in user manual