



PQ Secure



Light user and software installation manual

English version 26.0

Introduction

An increasing number of non-linear loads, such as computers, office equipment and frequency converters are currently being connected to the public electricity distribution network. Electrical equipment of this type affects the power quality in the network in a negative way and is frequently more sensitive to disturbances than older equipment. It has never been more important to measure and monitor power quality in the electricity distribution network in order to detect disturbances before serious and costly faults occur.

PQ Secure is the result of targeted efforts by Unipower and our customers to create an advanced, user-friendly and reliable power quality monitoring system.

In order to simplify the use of your PQ Secure system we have divided the documentation into separate manuals:

<i>PQ Secure SQL user and software installation manual</i>	Describes the installation procedures for the PQ Secure system software. Instructions for configuration and use of the system.
<i>PQ Secure Light user and software installation manual</i>	Describes the installation and use of the PQ Secure Light software mainly used together with portable meters.
<i>Hardware installation and configuration manual</i>	Describes hardware installation of the meters, communications equipment etc. Instructions for configuration and use of the hardware.
<i>Technical manuals</i>	Technical data for the meters



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INTRODUCTION	2
1 SAFETY INFORMATION	5
1.1 INSTALLATION CONDITIONS	5
1.2 INSTALLING THE INSTRUMENT	5
1.3 POWER SUPPLY	5
1.4 USED PRODUCTS	6
2 UNDERTAKING AND WARRANTY	6
2.1 LIABILITY	6
2.2 WARRANTIES	6
2.3 PATENT	6
3 PQ SECURE	7
3.1 INSTALLING PQ SECURE LIGHT	7
3.2 STARTING PQ SECURE FOR THE FIRST TIME	7
3.2.1 Adding Licenses	7
3.3 COMMON TASKS	9
3.3.1 Adding a measurement file	9
3.3.2 Viewing events	10
3.3.3 Viewing local events	10
3.3.4 Creating a report	10
3.3.5 Creating a voltage graph	11
3.3.6 Creating an event duration graph with CBEMA limits	13
3.3.7 Evaluating the direction of a Sag/Swell	14
3.3.8 Creating a custom graph	15
3.4 DETAILED PROGRAM DESCRIPTION	17
3.4.1 Main menu	17
3.4.2 File	17
3.4.3 Tools	18
3.4.4 Explorer	18
3.4.5 Graph evaluation	18
3.4.6 Description of the various parts of the graph evaluation	20
3.4.6.1 Graph properties	21
3.4.6.2 Flagging	22
3.4.7 Accessing meter configuration in PQ Secure	23
3.4.8 Graph evaluation Tabs	23
3.4.8.1 Tab – Current/Voltage	24
3.4.8.1 Tab – Power	25
3.4.8.2 Tab - Flicker	26
3.4.8.3 Tab - Harmonics	27
3.4.8.4 Tab - Supraharmonics	28
3.4.8.5 Tab – Signalling (interharmonics)	29
3.4.8.6 Tab – Sags/Swells	30
3.4.8.7 Tab – Transients	36
3.4.8.8 Tab – Recorder	39
3.4.8.9 Tab – Slowsan	41
3.4.8.10 Tab – RVC	42
3.4.8.11 Tab – Custom	42
3.4.8.13 Symmetrical components/Unbalance	46
3.4.8.14 Analysis view – statistics	47
3.4.8.15 Harmonics phase aggregation	48
3.4.9 Multiple Meters	49
3.4.9.1 The Timeline	49
3.4.10 The toolbar	51
3.4.11 Exporting measurement data	51
3.4.11.1 Export graph data	52
3.4.11.2 Export to Comtrade	52
3.4.11.3 Harmonic export	52
3.4.12 Creating custom sag/swell limit levels	53
3.4.13 Importing PQDIF Files	53
3.4.14 Exporting Harmonics	53

3.4.13	<i>The settings window</i>	56
3.4.14	<i>Reports</i>	57
3.4.14.1	Explanation of reports.....	58
3.4.15	<i>The Event list</i>	62
3.4.15.1	Event settings.....	63
3.4.15.2	The Event menu.....	63
3.4.15.3	Graph Limits.....	64
3.4.15.4	Graph menu – Settings.....	64
3.4.16	<i>The Event list – List</i>	64
3.4.16.1	The Event list – Event Filters	65
3.4.16.2	The Event list – Time and location	65
3.4.16.3	The Event list – Toolbar	66
3.4.16.4	The Event list - Context menu	67
3.4.16.5	The Event list – Settings	68
3.4.17	<i>Different types of events</i>	69
3.4.17.1	Signalling events.....	69
3.4.18	<i>Event evaluation</i>	70
3.5	INDEX.....	74

1 SAFETY INFORMATION

This section contains basic safety instructions relating to this product, which are always applicable unless expressly stated otherwise. Read through all the information before starting work on the product. The product can be referred to as *Instrument*, *Measuring Device* or *Measuring Instrument* or *Meter*.



Only authorized and well-informed personnel must use the instrument, because normal use of the instrument involves dangerous high voltages, which can cause death or serious injury. Only trained Unipower personnel may carry out any intervention in the instrument.

1.1 Installation conditions

Make sure the area in which you plan to install the meter is clean, dry and dust-free. Follow these recommendations to maintain a safe working environment and to avoid accidents:

- Avoid installing and handling the instrument if there is a risk of *thunderstorms*, as these can cause injury or damage.
- Ensure that the installation site has *no uninsulated* wires and *standing water* near the measuring device.
- The instrument case must *never be dismantled* under any circumstances.
- Make sure that *no loose or hanging items*, e.g. chains, bracelets, etc., can cause problems during installation.
- Use gloves and a helmet if there is a risk you might come into *contact* with live components.
- Follow the applicable electrical rules at the installation site.
- Never work on electrical installations on your own.

1.2 Installing the instrument

The following conditions must be met in order to achieve the best measurement results, to avoid installation errors and to minimize the risk of accidents:

- Always connect the transducers to the inputs of the measuring device before turning on the power.
- Never connect/disconnect the transducers while the measuring device is live.
- Make sure that the measuring device is always connected to protective earth before measuring transducers are installed and during the measuring process.
- Use the measuring device within the electrical ratings indicated on the transducers or on the case of the measuring device.

1.3 Power supply

Use a "clean" and regulated power source, free of surges and line noise. If a suitable DC voltage source is available this is preferred choice. If there is no station/internal battery backup, Unipower recommends that you connect the instrument to an external UPS type battery source in order to prevent power failure disturbances.

Note: The meter may only be powered off if the instrument is not connected to power.

Always protect the power supply with a two amp 2A fuse in each conductor (phase and neutral).

1.4 Used products

After use, the product must be disposed of in accordance with the relevant national laws relating to waste handling. The product contains components, such as lithium batteries, which must be handled correctly in order to prevent environmental pollution/damage. Contact your local authority for advice.

2 UNDERTAKING AND WARRANTY

Unipower undertakes to comply with the requisite legislation and recommendations relating to marketing and product liability.

2.1 Liability

Unipower AB reserves the right to make changes to the instrument or in the instrument specification as described in this manual without notice. Unipower AB encourages customers to obtain the latest version of all documentation before making a purchase.

In the absence of a written agreement with the other party, Unipower AB does not accept liability in respect of customers' failure to observe clauses and copyrights of Unipower and its suppliers, and third-party products of systems or applications. Unipower AB cannot be held liable for circumstances in which license agreements expire for systems or applications installed in the customer's property. In addition, Unipower AB or its suppliers cannot be held liable for direct or indirect faults that occur when our products are installed or used. Unipower AB cannot be held liable for material damage or personal injury arising during the use of our products if such damage/injury has been caused by a failure to observe guidelines and health and safety rules.

2.2 Warranties

Unipower AB warrants the absence of material or manufacturing faults during the warranty period. The warranty is limited to one year from the date of delivery inclusive. The warranty does not apply if:

- the product fault is caused by the customer's incorrect handling
- the product has been used beyond the intended area of application
- the product has been opened by the customer or by a third party
- the purchaser or a third party has attempted to repair, or made modifications to, the item

In the event of a claim for repair under the warranty, Unipower AB is entitled to choose whether to repair or to replace the product. The purchaser's claim under the warranty must be made in writing to Unipower AB before the warranty expires. Items must not be returned without Unipower's prior written authorization. If the purchaser claims that the product is not in accordance with Unipower's product specification, full details of the claimed infringement must be submitted. Compensation will not be provided until the fault has been documented and approved by the manufacturer. Apart from the warranty obligations above, Unipower AB is not bound by other warranties or obligations unless these have been agreed between the parties or are imposed by law.

2.3 Patent

Unipower AB's products are covered by one or more of the following patents/patent applications:

Swedish Pat. No. SE525331

Chinese Pat. No ZL200380109063.0

European Pat. No. EP1581816

German Pat. No EP11341

U.K. Pat. No 1581816

French Pat. No EP11341

US Pat. No US 7,640,118 B2

3 PQ Secure

PQ Secure is the software used to evaluate the measure data in the monitoring system.

3.1 Installing PQ Secure Light

PQ Secure should be installed in the *Client Computers*.

Start by closing all running programs. Insert the PQ Secure Light CD, and then wait for the Installation program to open.

Make sure .NET Framework 4.7.2 is installed first. Then click on the **PQ Secure Application** button and complete the installation. Check that the installation path is correct. Unipower recommends **C:\Program Files\Unipower\PQ Secure**

If the installation doesn't start automatically, click on the Windows **Start** button and select **Run**. Use the Browse button to open the file "Setup.exe" in the **PQSecure folder** and click on **OK**.

3.2 Starting PQ Secure for the first time

Before the system can be used some basic configuration must be done. The following sections describe the step needed.

3.2.1 Adding Licenses

To be able to use your meters in the PQ Secure system you need to add some licenses in to the program. The licenses consist of a sting of letters and numbers generated from *Unipower AB*. To add licenses do as follows:

1. Go to "Tools"
2. Click "Manage Licenses"

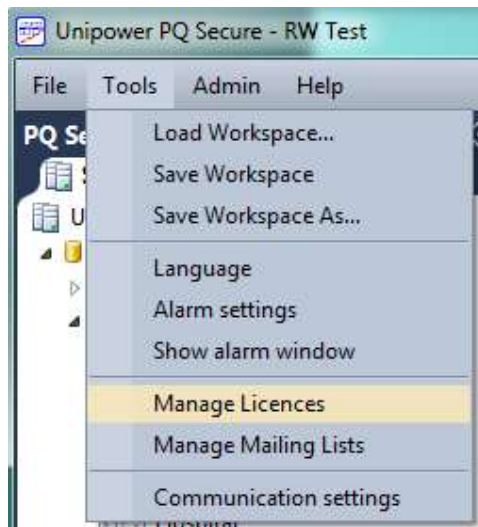


Figure 1

3. Click "Add" and paste the licenses into the dialogue. Then click "Add". Then press "Ok".

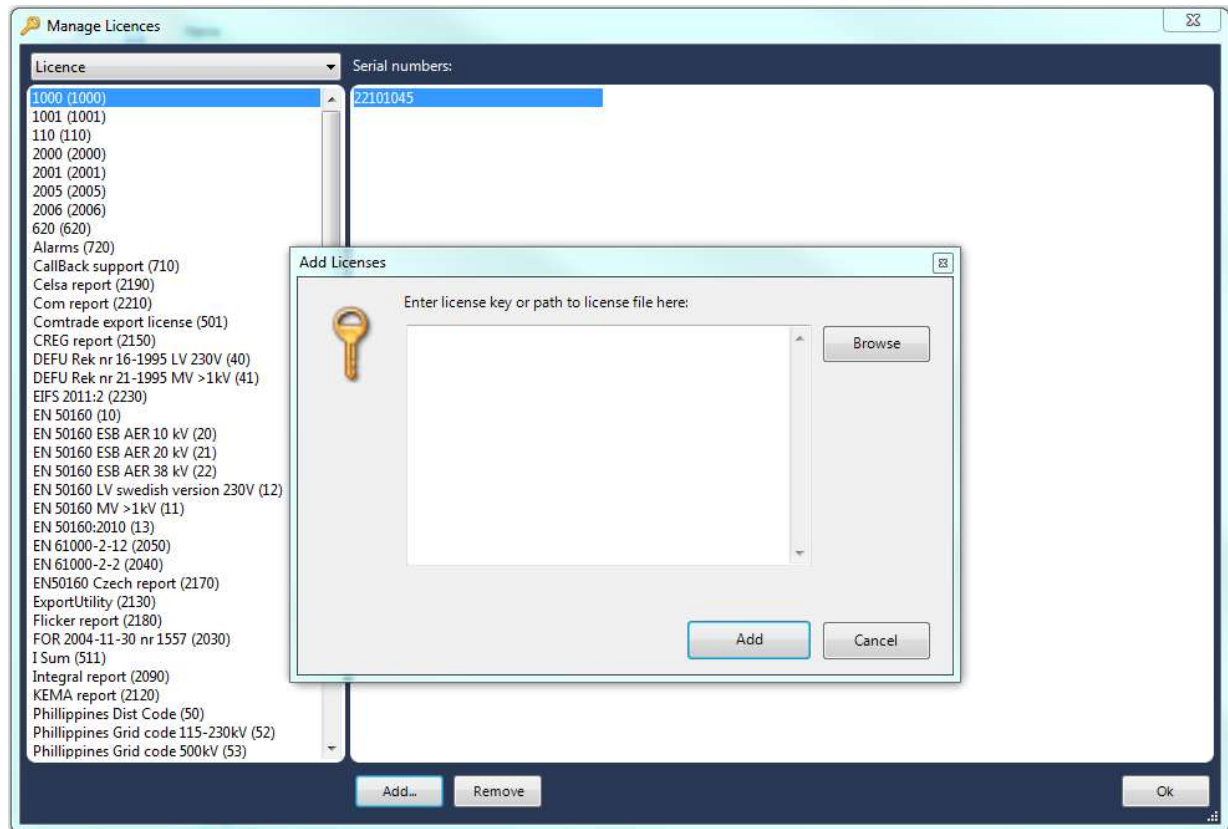


Figure 2

3.3 Common tasks

This section describes some common tasks and how to perform them. For a more detailed description, see 0.

3.3.1 Adding a measurement file

When working with separate measurement files (as with portable instruments) PQ Secure will by default place this in a dedicated part of the PQ Secure explorer called “Files”. Here you may either create folders or shortcuts to folders where your measurement files are stored. If you have a PQ Secure system which is also supporting permanent installations (UP 2210) their measurement data will be evaluated in the same manner as portable meters.

If you choose to download to the measurement files to the catalog that is pre-defined by PQ Online these measurement files will automatically be in the “Downloaded Data” folder.

Note! It might be hard to orientate in this folder when the amount of measurement files grows!

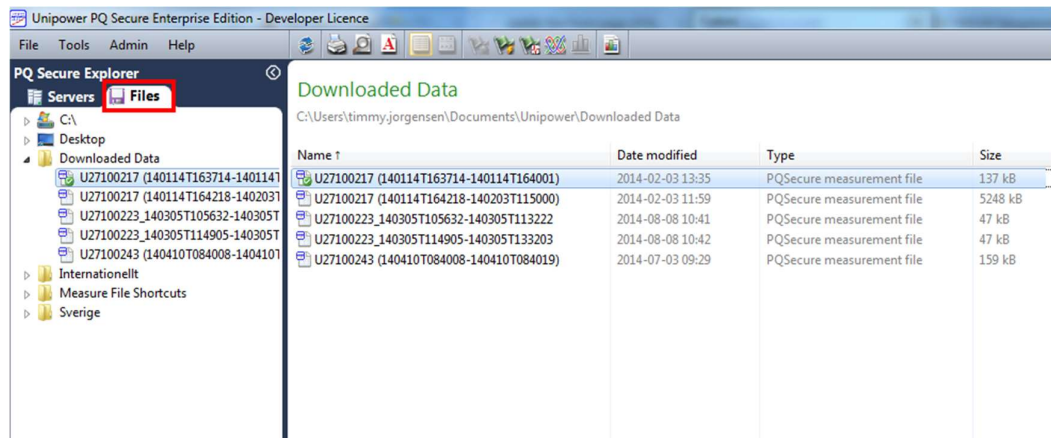


Figure 3

1. Go to the “Files” tab in the PQ Secure explorer
2. Right click the empty space below the tab and choose New-> Folder. Name this folder.
3. Drag and drop a measure file from your hard drive directly in this folder.

1. Go to the “Files” tab in the PQ Secure explorer.
2. Right click the empty space below the tab and choose New-> Measure File shortcut
3. Navigate to the folder where you usually put downloaded measurement files and press OK

3.3.2 Viewing events

3.3.3 Viewing local events

When opening the list, the default setting will be used and events from the last seven days are displayed.

For a more detailed description of the event list go to Section 3.4.15.

Time 1	Location	Type of event	Value	Priority	Comment	Signature	Inform...	Event x	Time span and notes
2013-08-01 09:28:43.000	UP Incoming 3	Master Start	3.137338/0.0	9				4046205	Events from 2013-02-01 18:09:58
2013-08-01 09:00:04.000	UP Incoming 3	Master Start	3.137338/0.0	9				4046260	
2013-08-01 20:34:57.000	UP Incoming 3	Master Start	3.137338/0.0	9				4722328	
2013-08-01 12:01:05.000	UP Incoming 3	Master Start	3.137338/0.0	9				4744232	
2013-08-09 08:54:58.000	UP Incoming 3	Master Start	3.137338/0.0	9				4785325	2013-12-19 18:09:58
2013-08-02 16:25:24.000	UP Incoming 3	Master Start	3.057616/0.113	9				4311216	
2013-08-01 12:44:43.000	UP Incoming 3	Master Start	3.057614/0.048	9				4311306	
2013-08-01 23:38:21.000	UP Incoming 3	Master Start	3.057614/0.0	9				4318957	
2013-08-02 20:52:05.000	UP Incoming 3	Master Start	3.057614/0.0	9				4320074	Time span control ☐ Custom ☒ Day ☐ Week ☐ Month
2013-08-02 20:30:28.000	UP Incoming 3	Master Start	3.057614/0.0	9				4320387	
2013-08-02 23:28:03.000	UP Incoming 3	Master Start	3.057614/0.0	9				4320396	
2013-08-02 00:39:04.000	UP Incoming 3	Master Start	3.057614/0.0	9				4320507	
2013-08-02 00:39:04.000	UP Incoming 3	Master Start	3.057614/0.0	9	test test	TJO	test	4321778	Today Date Select Date
2013-08-02 15:05:01.000	UP Incoming 3	Master Start	3.057614/0.0	9				4322628	
2013-08-02 16:30:47.000	UP Incoming 3	Master Start	3.057616/0.0	9				4322631	
2013-08-02 20:38:20.000	UP Incoming 3	Master Start	3.057616/0.0	9				4321489	
2013-08-02 20:35:07.000	UP Incoming 3	Master Start	3.057616/0.0	9				4323604	☒ Enable QuickView ☐ Measure sites ☐ UP Incoming 3
2013-08-02 27:01:42.000	UP Incoming 3	Master Start	3.057616/0.0	9				4323608	
2013-08-02 27:04:38.000	UP Incoming 3	Master Start	3.057616/0.0	9				4324239	
2013-08-02 27:05:01.000	UP Incoming 3	Master Start	3.057616/0.0	9				4324342	
2013-08-02 27:14:29.000	UP Incoming 3	Master Start	3.067147/0.13	9				4325443	Add Remove
2013-08-01 23:32:01.000	UP Incoming 3	Master Start	3.067147/0.0	9				4325963	
2013-08-02 05:56:39.000	UP Incoming 3	Master Start	3.067147/0.0	9				4327082	
2013-08-02 07:04:54.000	UP Incoming 3	Master Start	3.067147/0.0	9				4327746	
2013-08-02 11:23:20.000	UP Incoming 3	Master Start	3.067409/0.128	9				4328953	
2013-08-02 11:21:25.000	UP Incoming 3	Master Start	3.067400/0.0	9				4329063	
2013-08-02 16:42:20.000	UP Incoming 3	Master Start	3.067420/0.045330	9				4329547	
2013-08-02 18:40:20.000	UP Incoming 3	Master Start	3.067420/0.0	9				4329662	
2013-08-02 18:07:05.000	UP Incoming 3	Master Start	3.067420/0.0	9				4329668	
2013-08-02 04:08:36.000	UP Incoming 3	Master Start	3.067420/0.02	9				4329846	
2013-08-02 10:25:53.000	UP Incoming 3	Master Start	3.067460/0.0402222	9				4329930	
2013-08-04 11:37:01.000	UP Incoming 3	Master Start	3.067462/0.0	9				4329939	
2013-08-02 10:15:25.000	UP Incoming 3	Master Start	3.067463/0.0	9				4329923	
2013-08-02 10:16:26.000	UP Incoming 3	Master Start	3.147379/0.0	9				4329826	
2013-08-02 11:25:24.000	UP Incoming 3	Master Start	3.147379/0.0	9				4329891	
2013-08-02 11:54:43.000	UP Incoming 3	Master Start	3.147379/0.0	9				4329892	
2013-08-02 12:04:45.000	UP Incoming 3	Master Start	3.067482/0.13	9				5000914	
2013-08-02 16:44:51.000	UP Incoming 3	Master Start	3.067482/0.0	9				5000917	
2013-08-02 14:53:03.000	UP Incoming 3	Master Start	3.147379/0.0	9				5011245	
2013-08-02 12:42:05.000	UP Incoming 3	Master Start	3.067462/0.09	9				5011260	
2013-08-02 13:11:08.000	UP Incoming 3	Master Start	3.067463/0.0	9				5011389	
2013-08-02 13:13:39.000	UP Incoming 3	Master Start	3.147379/0.0	9				5013169	
2013-08-02 10:16:42.000	UP Incoming 3	Master Start	3.147379/0.0	9				5047539	
2013-08-02 10:16:42.000	UP Incoming 3	Master Start	3.157347/0.0	9				5047673	

Figure 4

3.3.4 Creating a report

To create a report (or any other report), follow the steps below:

- Select one or more measurement file(s).

- Right-click on the selected file(s) and select **Report** and the report dialogue window will open (see Figure 5).
- Make sure the selected meter is included in the **Selected meters** list.
- Select report type in the list of **Available reports**
- If you would like to change any report setting such as document type (pdf/docx), comments, logotype etc., click on the **Report settings** button.
- Select the time interval for the report. Usually a report specifies a time interval of a week but the analysis works for other intervals as well.
- Click on **Create report**.
- Select a destination for the file created by the report tool.
- When the report has been created a dialogue window with shortcuts to the created documents will appear. Double click on the report shortcut to open it in the associated program (this requires MS Word or similar for RTF reports or Acrobat Reader for PDF reports)

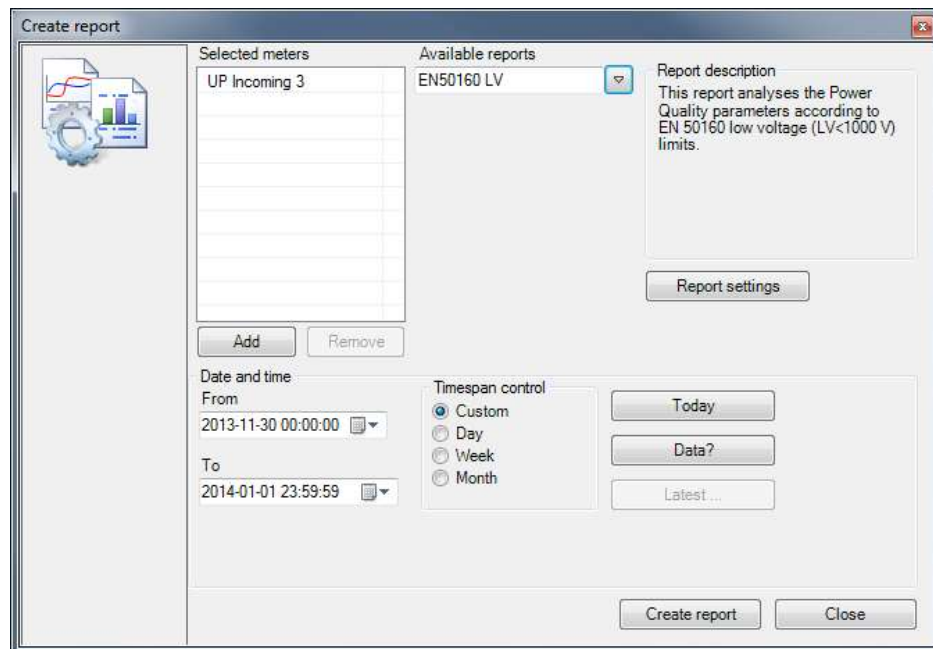


Figure 5

3.3.5 Creating a voltage graph

Follow the steps below to create a voltage graph:

1. Select one or measurement file(s).
2. Right-click on the selected file(s) and select **Graph evaluation**. The graphical evaluation tool will now open.
3. Make sure that the **Voltage** tab is selected.
4. Select the measurement parameters that you would like to include in the graph, e.g. U1Avg, U2Avg and U3Avg (voltage averages for phases 1-3).
5. Select the time span for the graph. Select a period where you know that data exists in the folder. Click the **Data?** button if you are unsure. Checking **Day**, **Week** or **Month** under **Time span control** will show data from that interval.
6. Click the **Refresh** button, the graph is created and will resemble the graph in Figure 6

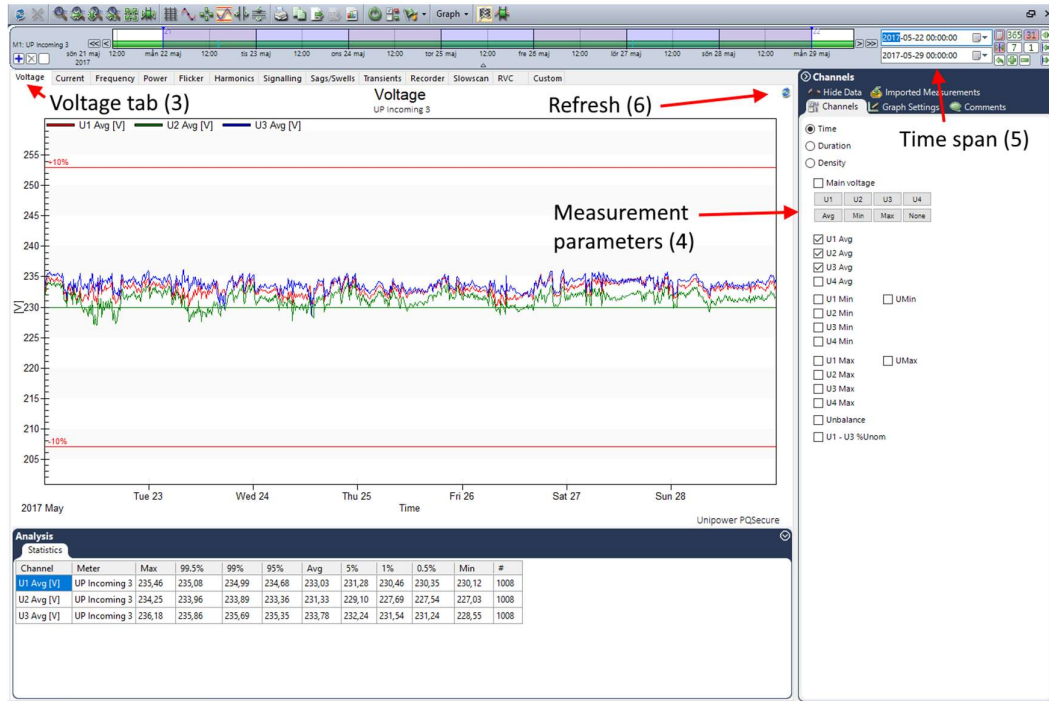


Figure 6

3.3.6 Creating an event duration graph with CBEMA limits

CBEMA is an abbreviation for *Computer Business Equipment Manufacturers Association*, an organization in the United States that in the late 1970's developed limits for depth and/or duration of voltage dips (Sags) and over voltages (Swells) in order to not affect or damage computer equipment. The association changed their name to ITIC (*Information Technology Industry*) in the mid-1990 and they later developed a new set of limits, the ITIC limits. The CBEMA limits are a very common way of classifying voltage events in the power network.

To create an event duration graph with CBEMA limits follow the steps below:

1. Select one or more measurement file(s)
2. Right click on the selected meter(s) and select **Graph evaluation**. The graphical evaluation tool will open.
3. Select the **Sags/Swells** tab (see Figure 7)
4. Select a period during which at least one Sag/Swell event occurred. Click on the **Data?** button to find the first and last date when a Sag/Swell event occurred.
5. Click on the **Refresh** button.
6. Check the **Duration graph** option. You will now get a depth/duration plot.
7. Check the **CBEMA limits** and a plot with the CBEMA limits included will be displayed (see Figure 7)
8. Choose which sags/swells you wish to evaluate, Line-Line, Line-Neutral, or Undefined (undefined sags are voltage dips from instruments that does not support PQ Main voltage)

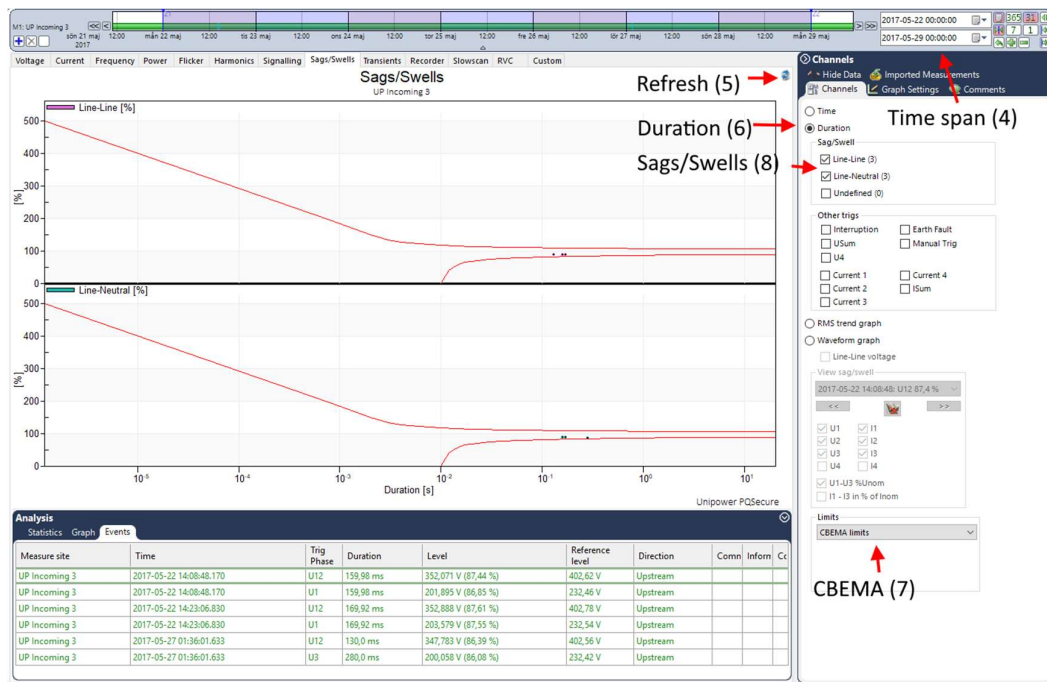


Figure 7

Each Sag/Swell is marked as a point in the plot. In the *duration graph*, the x-axis shows the duration of the event and the y-axis shows the magnitude in percent of the nominal voltage level. The CBEMA limits can be interpreted as: **Within** the limits computer equipment will function without problems. If one or more events are placed **outside** the limits the risk of computer malfunction is substantial.

3.3.7 Evaluating the direction of a Sag/Swell

To evaluate the direction of a Sag/Swell, follow the steps below:

1. Select one or more measurement file(s).
2. Right-click on the selected file(s) and select **Graph evaluation**. The graphical evaluation tool will open.
3. Select the **Sags/Swells** tab.
4. Select a period during which at least one Sag/Swell event occurred. Click on the **Data?** button to find the first and last date when a Sag/Swell event occurred.
5. Click on the **Refresh** button. A plot with each Sag/Swell event marked as a dot will be displayed (see Figure 8). To get information about a specific event, hover the mouse over a specific event and read the direction of the sag/swell.

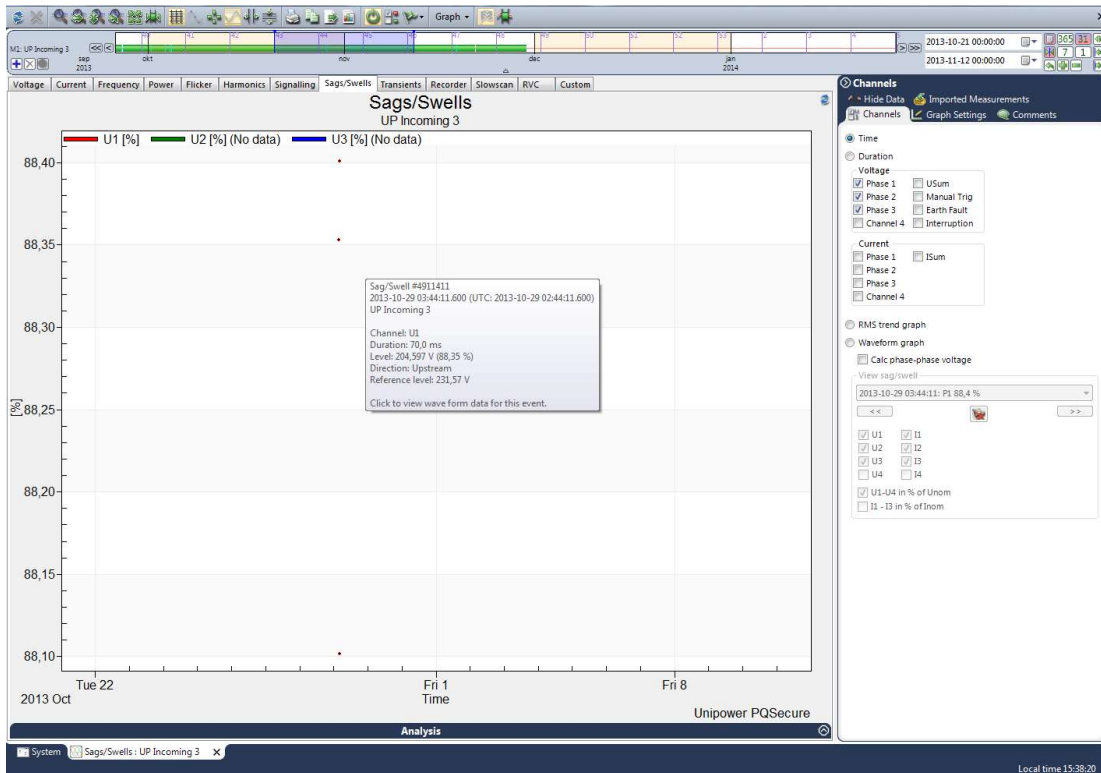


Figure 8

3.3.8 Creating a custom graph

To create a custom graph with for instance current and voltage stacked on separate axes, follow the steps below:

- Select one or more measurement file(s).
- Right-click on the selected file(s) and select **Graph evaluation**, the window presented in Figure 9 will now appear. Select the **Custom** tab.
- Select the time span for the graph. Select a period for which there is data. Click the **Data?** button if you are unsure. Checking **Day**, **Week** or **Month** under **Time span control** and then clicking **refresh** will set the dates to the latest day/week/month where data exists.
- Select graph data by clicking the **Select graph data** button, a dialogue window will appear where you can select all available measurement parameters. Select for example **U1-3Min** (under the *Voltage* tab), **I1-3 Max** and **THDF1-3** (under the *Harmonics* tab) and click **Ok**.

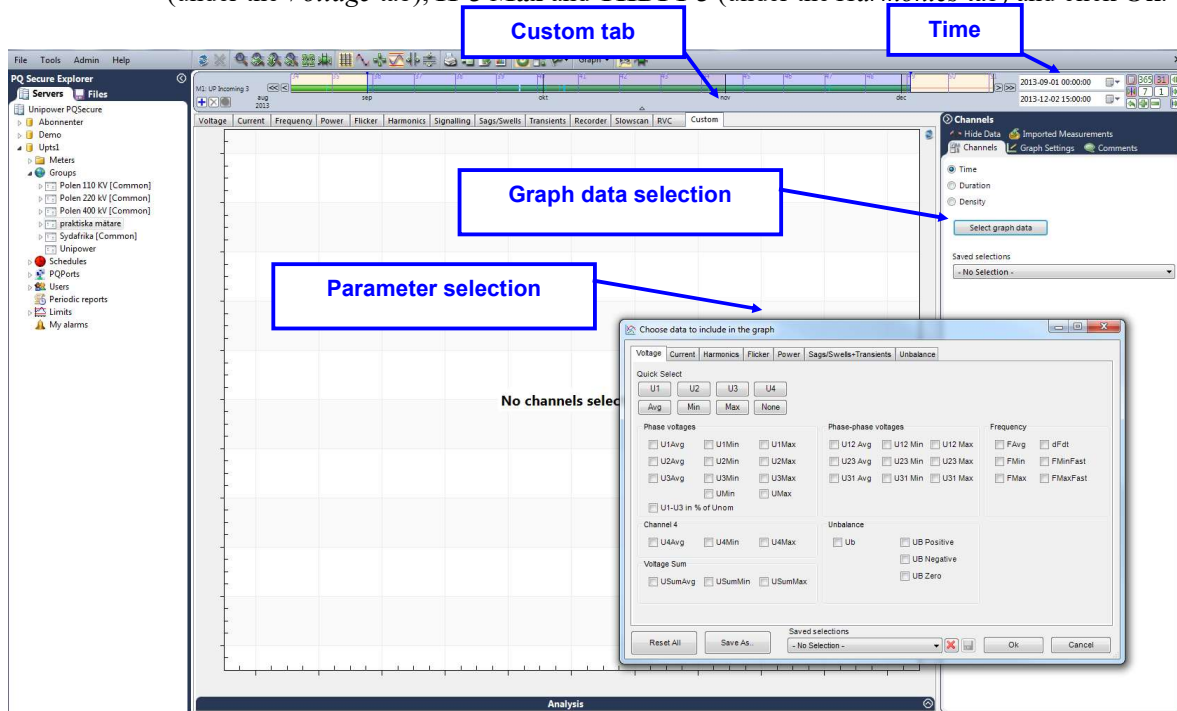


Figure 9

- You will now get a graph with the chosen parameters. However, they will be presented on the same y-axis and can therefore be difficult to evaluate especially when the amplitudes vary. Right click the evaluation window and choose **Split** and then choose "by **Quantity**".

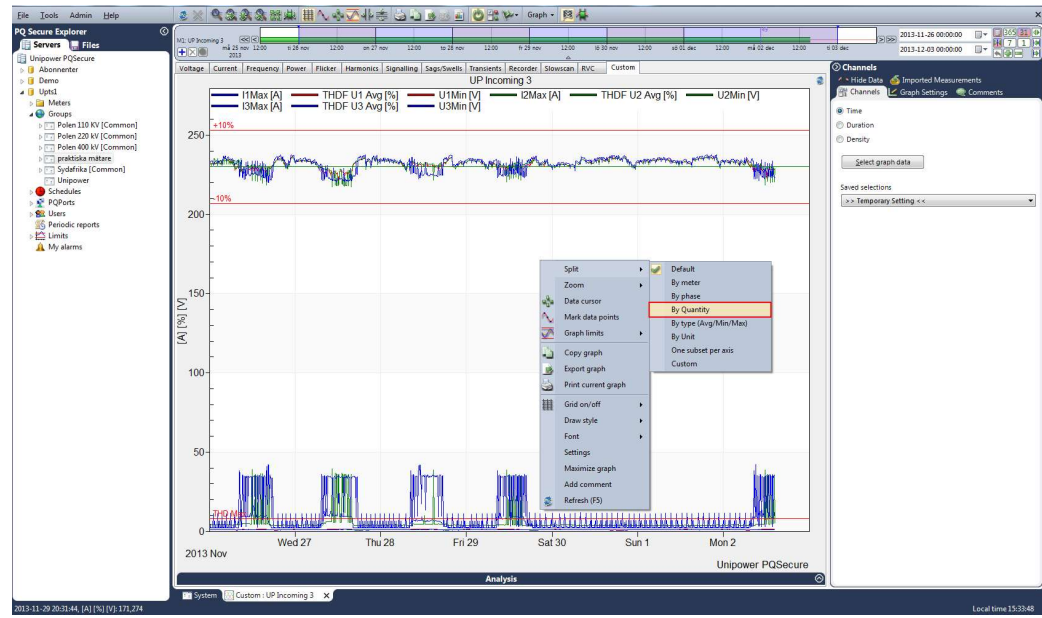


Figure 10

3.4 Detailed program description

This section describes the various parts of the PQ Secure program in detail. When you are logged in, the screen will resemble as like. The two main parts of the program are highlighted in the figure, the *Main menu* and the *PQ Secure Explorer*. In the main menu some basic functionality such as **Exit** and **Language** can be accessed. In the Explorer you can configure and control the system. See Section 3.4.2 for a more detailed description of the System manager.

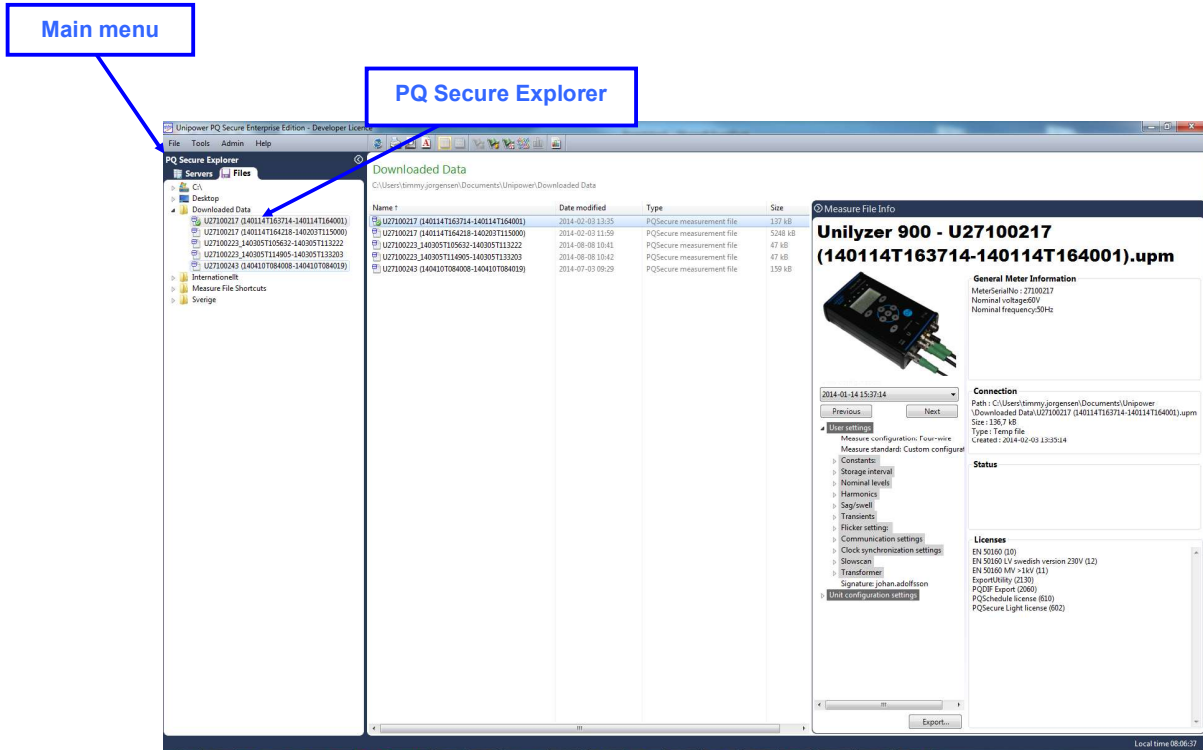


Figure 11

3.4.1 Main menu

In the main menu you can access some basic functions, such as Exit and Language. The most important sub-menus are described below.

.2.2 File

In the File menu you will find the following options.

- **Load measurement file** – Loads a measurement file and adds a shortcut to the: **My measurement files** folder.
- **Exit** – Saves the current workspace and exits the program.

.2.3 Tools

In the Tools menu you will find the following options.

- **Load workspace** – Loads a workspace file. The workspace file contains general settings for the program as well as measure file shortcuts, folders and database connections. The workspace can be described as a user profile. The workspace will also contain all measurement files you have added under, **My measurement files**.
- **Save workspace** – Saves the current workspace.
- **Save workspace as** – Saves the current workspace with a different name.

3.4.2 Explorer

The system manager is the central part of the program. Here you can configure the system and evaluate measurement data. The system manager is divided into a left-hand view, with a tree structure, and a right-hand view displaying information about the selected node in the tree view (much like the Explorer view in Windows). To perform an operation on a node in the tree, or an item in the right-hand view, right-click on the item and an appropriate menu with all the available options will appear (see marker **C** in Figure 12) shows the system manager; some important parts are marked and described.

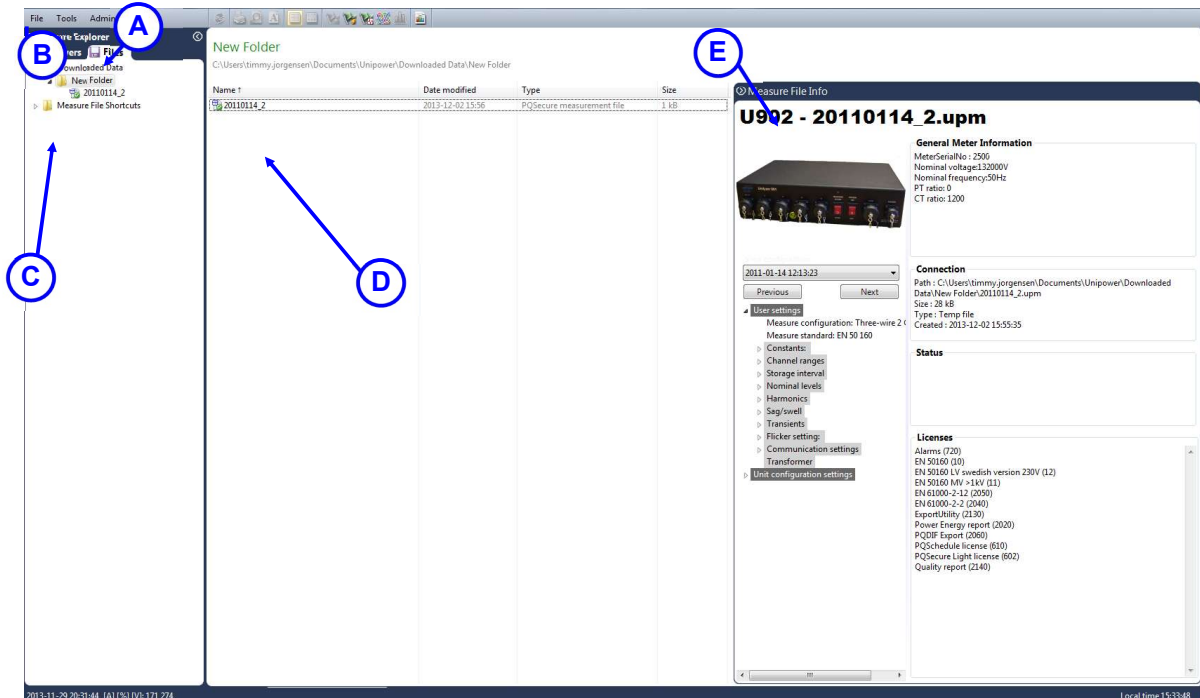


Figure 12

- (A) **Files** – The root folder for all your measurements.
- (B) **Servers** – The tab containing your possible server connections
- (C) **File tree** – The file tree is your mean of navigation between your measurement files.
- (D) **Available files** – The files available for evaluation
- (E) **Information window** – Contains basic information about the measurement file

3.4.3 Graph evaluation

In the PQ Secure program there is a graph evaluation tool, especially designed to evaluate, analyze and document measurement data from Unipower's recorders. The graph evaluation gives the user an easy way of performing load analysis, controlling voltage quality, analyzing harmonics and much more.

Graphs created in the graph evaluation can easily be copied to other Windows applications (MS Word, MS Excel etc.) to be used in reports or other documentation. The tool is designed to be easy to use when

evaluating standard power quality parameters, as well as flexible and powerful, when analyzing more complicated custom graphs with multiple parameters involved.

The graph evaluation can be used with measurement data coming from meters in the folders, as well as with the measurement files registered with shortcuts under the tab: **My measurement files**. You can start the graph evaluation in a number of ways:

- Right-click on a meter under the **Meters** node in the left hand view of the system manager and select **Graph evaluation** in the pop up menu.
- Right-click on a meter in a **Group** and select **Graph evaluation** in the pop up menu.
- Double-click on a meter under the **Meters** node in the left hand view of the system manager.
- Double-click on a meter in a **Group**.
- Right-click on a measurement file shortcut added to the: **My measurement files** node and select **Graph evaluation** in the pop up menu.
- Double-click on a measurement file shortcut added to the: **My measurement files**.

3.4.4 Description of the various parts of the graph evaluation

In Figure 13 you can see the graph evaluation window with some important sections highlighted. These are described below:

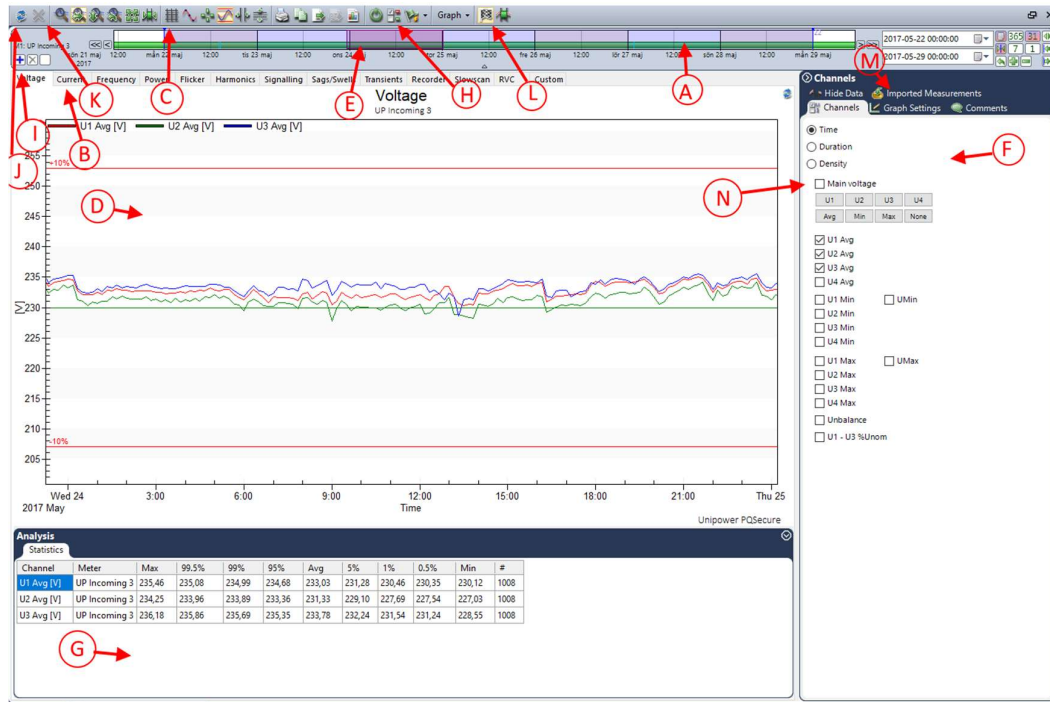


Figure 13

- A. Time line** – The time line indicates when data exists in the database and if the data is flagged. Time span may also be selected in the time line, see section 9.2.15
- B. Quantity tabs** – To simplify evaluation, all the common power quality parameters has a separate tab. See section 0 - 3.4.6.10.
- C. Tool bar** – Contains various practical tools such as: zoom, export, refresh etc. See 3.4.8
- D. Evaluation window** – Displays the selected parameters as a graph.
- E. Zoom window** – This shaded rectangle represents the zoomed/enlarged time span shown in the graph. You can move this rectangle in order to scroll in a zoomed mode.
- F. Parameter settings** – In this panel you select the parameters you wish to study. The window will have a different layout depending on the quantity tab selected.
- G. Analysis window** – The percentages shown sorts out the cumulative values within the measure period. As an example – for a week with 10-min storage interval the 95% value corresponds to value 958 (sorted from low to high) out of the total 1008 values. Accordingly the 99.5% value corresponds to value 1003 out of the 1008 values, etc.
- H. Show events** – By activating this option, events will be indicated by a clickable line in the graph. By hovering with the cursor over the line you will see information about the event and by clicking the line you will go directly to the waveform graph of the event. With the Add and Remove buttons you can add/remove new types of events.
- I. Add/Remove meters** – Here you can easily add and remove different meters from the graph. This is useful if you are comparing data from different locations in the grid. Or wish to complement with a measurement carried out with a portable device.

- J. Refresh button** – Click this button to retrieve data from the database (or measure file) and redraw the graph. Any time you add/remove parameters to plot or change the time settings etc. you need to click this button.
- K. Cancel button** – Sometimes, when working with many meters or very long periods of time, it could take a while to retrieve data from the database. If you change your mind or just don't want to wait anymore, click this button and wait. Be patient, database operations over large networks can require time.
- L. Show/hide flagged data** – See section 3.4.4.2.
- M. Graph property tabs** - Various settings concerning the graph and selected recorders are displayed here.
- N. Main voltage** – check/uncheck to switch between Line-Line and Line-Neutral voltage

3.4.4.1 Graph properties

To the right of the graph are the **graph properties tabs** that consist of five tabs, these are:

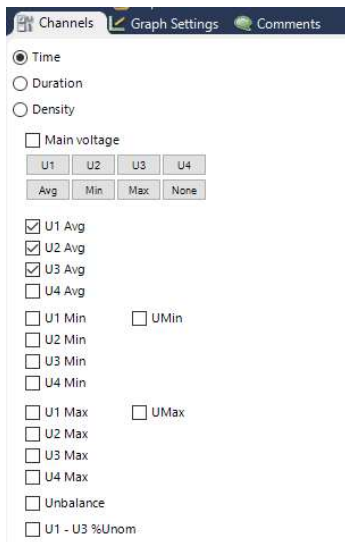


Figure 14

Channels

In this panel you select the parameters you wish to study. The tab will have a different layout that depends on which of the quantity tab that is selected.

- **Graph settings**

The graph related settings are controlled in this tab. Here you may change the:

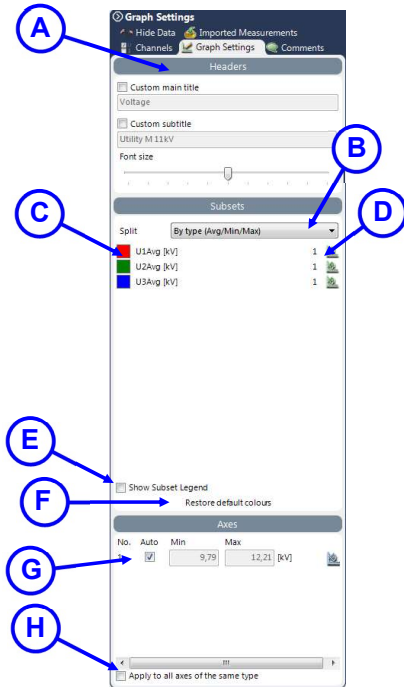


Figure 15

A. Headers

Edit the main and sub title by checking the check box for the respective title, edit the text to the desired one and press tab.

B. Subset splitting

Split the subsets in different ways depending on quantity, average/min/max, phase etc.

C. Colors

Change color of the selected parameters. Click the colored box and select a color of your choice.

D. Axis Selection

Manually select axis number and right/left axis placement.

E. Legend visibility

When a lot of parameters are selected the area allocated for the legend takes up a lot of space. If you wish to hide the legend, uncheck this check box.

F. Restore default colors

This button restores all changed colors to the default color settings.

G. Axis scaling

Auto scaling on/off and custom scale is edited here.

H. Apply to all Axes of the same type

By checking this check box all axes that contains the quantity (and magnitude) will be scaled to match the one you edit.

3.4.4.2 Flagging

Flagging

When a sag/swell event occurs, the disturbance will influence the value of other power quality parameters such as flicker, harmonics etc.

Flagging is used to exclude these values so they do not influence the power quality analysis. The concept of flagging is defined in the norm IEC 61000-4-30.

In all the quantity tabs you can select to show or hide flagged data. Just click the checkbox (X in 3.4.8) and then refresh. The flagging is defined in IEC 61000-4-30.

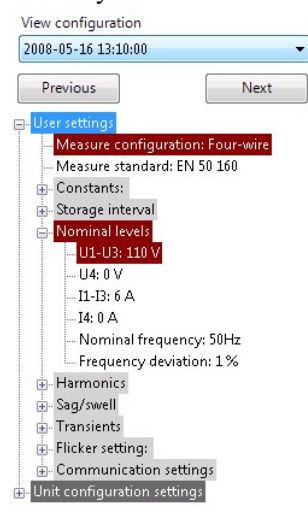
3.4.5 Accessing meter configuration in PQ Secure

Each meter configuration that has been stored in the meter may be accessed using PQ Secure. In the “system tab” (see bottom of Figure 16), these are named by the date they are loaded in the meter.



Figure 16

You may then choose each configurable parameter and read the configuration.



When browsing through the configurations with the Previous/Next buttons for a meter, the difference from the previous configuration is shown with red markings. This helps when trying to find out what has been changed between two configurations.

In the example below the wiring and nominal level has been changed.

Figure 17

3.4.6 Graph evaluation Tabs

After activating the graph evaluation, you can follow the four simple steps below in order to create a graph over the most common measurement parameters:

- Select the appropriate tab; if for example, you wish to evaluate voltage select the **Voltage** tab.

- Select the measure parameters, e.g. U1Avg, U2Avg and U3Avg.
- Select the **time span**, e.g. to select the latest week where data exist, check the **Week** box under **Time and location**.
- Click the **Refresh** button.

These steps apply for most tabs, the **Signaling**, **Sag/Swell**, **Transient**, **RVC** and **Custom** tabs are slightly different and are described in more detail in the following sections.

3.4.6.1 Tab – Current/Voltage

Under the tab Current/Voltage you can study current and voltage. You can show the average value, the minimum value or the maximum value. All these values come from the 10-minute value stored from the meter. The current and the voltage graph are both shown simultaneously to see how the two quantities affect each other.

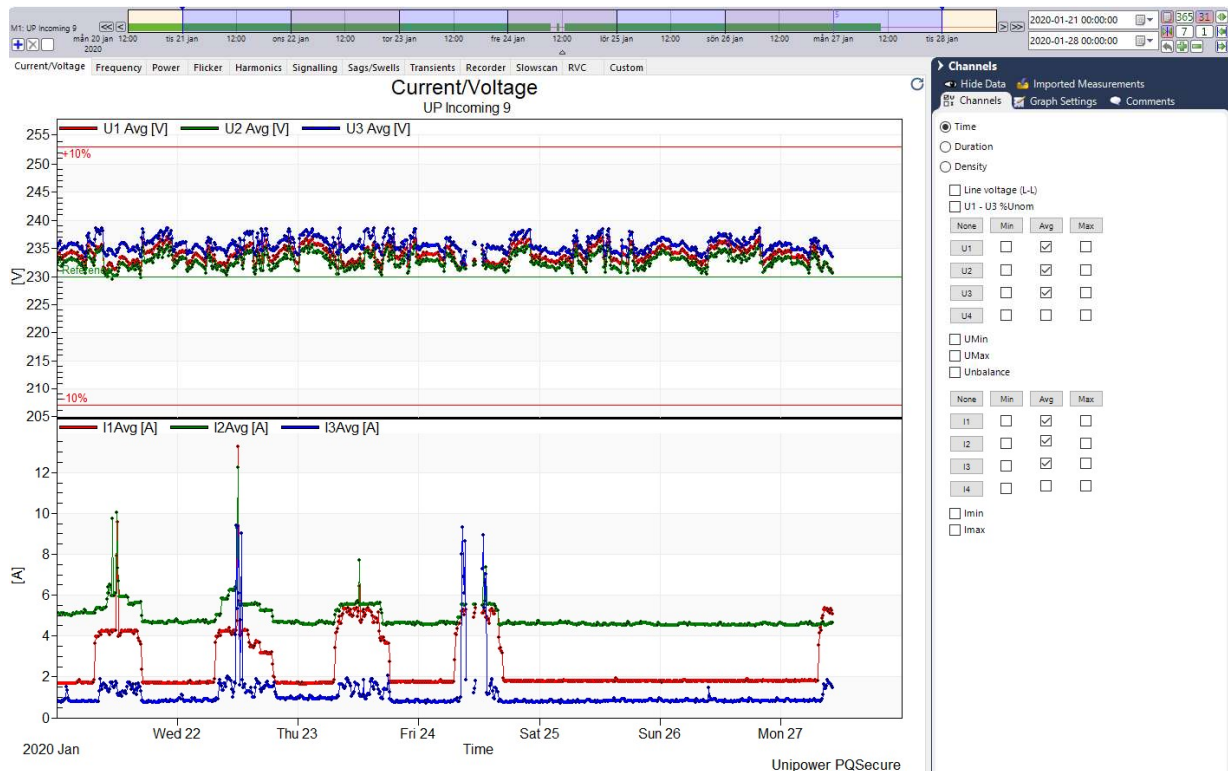


Figure 18

Voltage

In the voltage graph you can choose to see the values by phase-to-neutral or phase-to-phase. You can also choose to see each phase individually or all phases together in the same graph. There is also an option to see how much unbalance there is between the phases.

Current

In the current graph you can choose to see each phase individually or all together. The maximum values are most commonly used when you try to figure out the source of an event.

3.4.6.1 Tab – Power

Under the tab **Power** you may study Active, Reactive and Apparent Power as well as the corresponding Energy. The Power Factor and the Displacement Power Factor may also be plotted.

The energy for the plotted interval is found in the **Analysis** tab. The Analysis tab shows the average, min and max values per phase for Active, Reactive and Apparent Power. It also shows the average, min and max values for all phases for each of these quantities.



Figure 19

3.4.6.2 Tab - Flicker

Under the tab Flicker you can study PST and PLT (Short term flicker and long term flicker). There is a third parameter named IFL (Instantaneous flicker) which isn't presented in PQ Secure, its solely purpose is to calculate the PST and the PLT. The PST is calculated from the IFL and is presented as a 10-minute RMS value. The PLT value is then calculated from 12 PST values and making it a 2-hour RMS value. In the graph below the graphs has been split by quantity.

There is also an option to calculate sliding PLT by using the Sliding PLT checkbox. This will calculate 2 hour sliding values every 10 minutes.

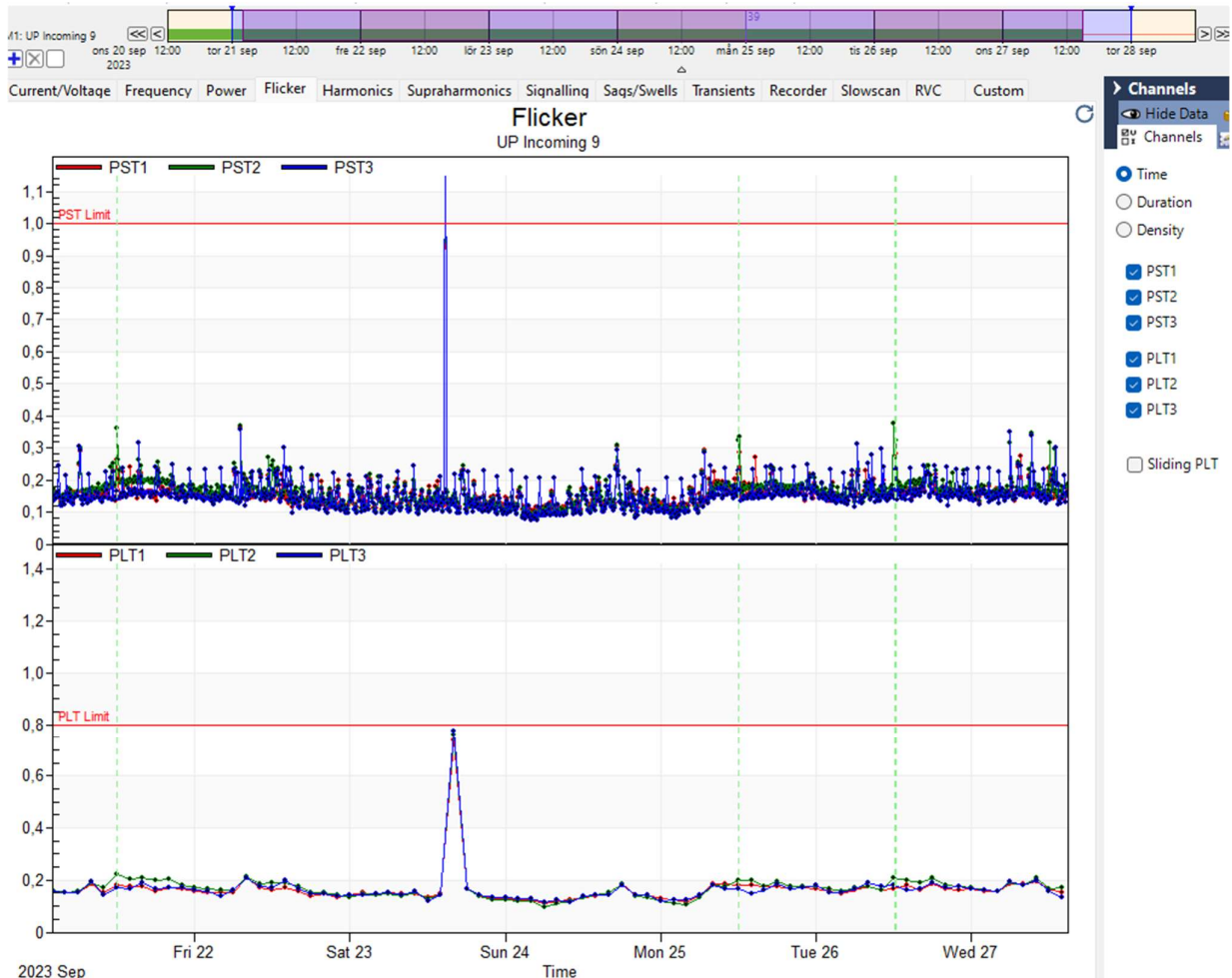


Figure 20

3.4.6.3 Tab - Harmonics

Under the tab **Harmonics**, you can study *harmonic* frequency components i.e. frequency components that are an integer multiple of the fundamental frequency. Example $2 \cdot 50$ (100 Hz), $3 \cdot 50$ (150 Hz) and so on.

Presentation can be a time graph (see Figure 21- Harmonics A) or bar graph (see Figure 21- Harmonics B).

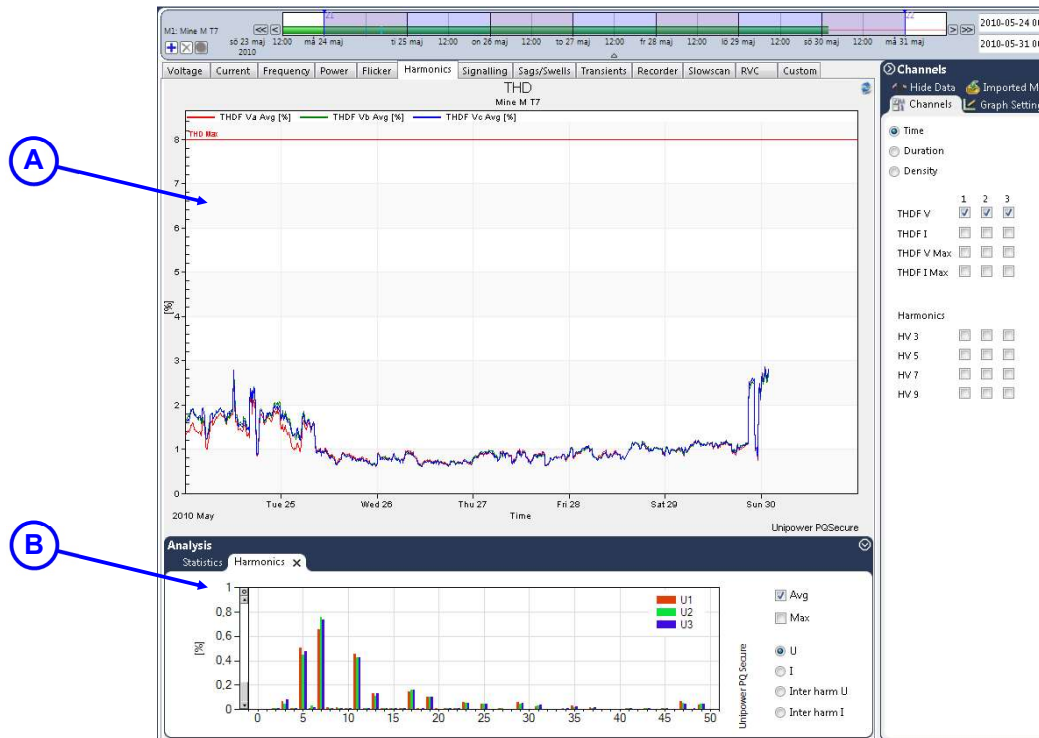


Figure 21- Harmonics

The 3rd bar in the bar graph contains the average (and or maximum) of all 3rd harmonics for **the entire** selected time interval. By selecting, for example a week of time, you can get the weekly average and maximum for all

3.4.6.4 Tab - Supraharmonics

Under the tab **Supraharmonics**, you can study higher frequency components in the range of 2-9kHz. The frequencies are grouped in 200Hz bins according to IEC 61000-4-30. The values are 3 second peak values during the storage interval.

Presentation can be a time graph (Figure 1 A) or bar graph (Figure 1 B).



Figure 1 Supraharmonics

The bar graph contains the maximum and a percentage value for the selected time interval. By selecting, for example a week of time, you can get the weekly maximum for all Supraharmonics harmonics.

3.4.6.5 Tab – Signalling (interharmonics)

Under the tab **Signalling**, you can study frequency components in the electricity network not related to the fundamental frequency, so-called interharmonics. Signalling is entirely separated from harmonics, which are always integer multiples of the fundamental frequency ($2 \times 50=100$ Hz, $3 \times 50=150$ Hz, etc.)

An example of signalling is *ripple control*. The ripple control signal is set at a particular frequency, e.g. 187.5 Hz. The frequency is always selected so it will fall between the harmonic frequencies. In PQ Secure, all interharmonic frequencies are registered in frequency bands of 100 Hz up to 3 kHz.

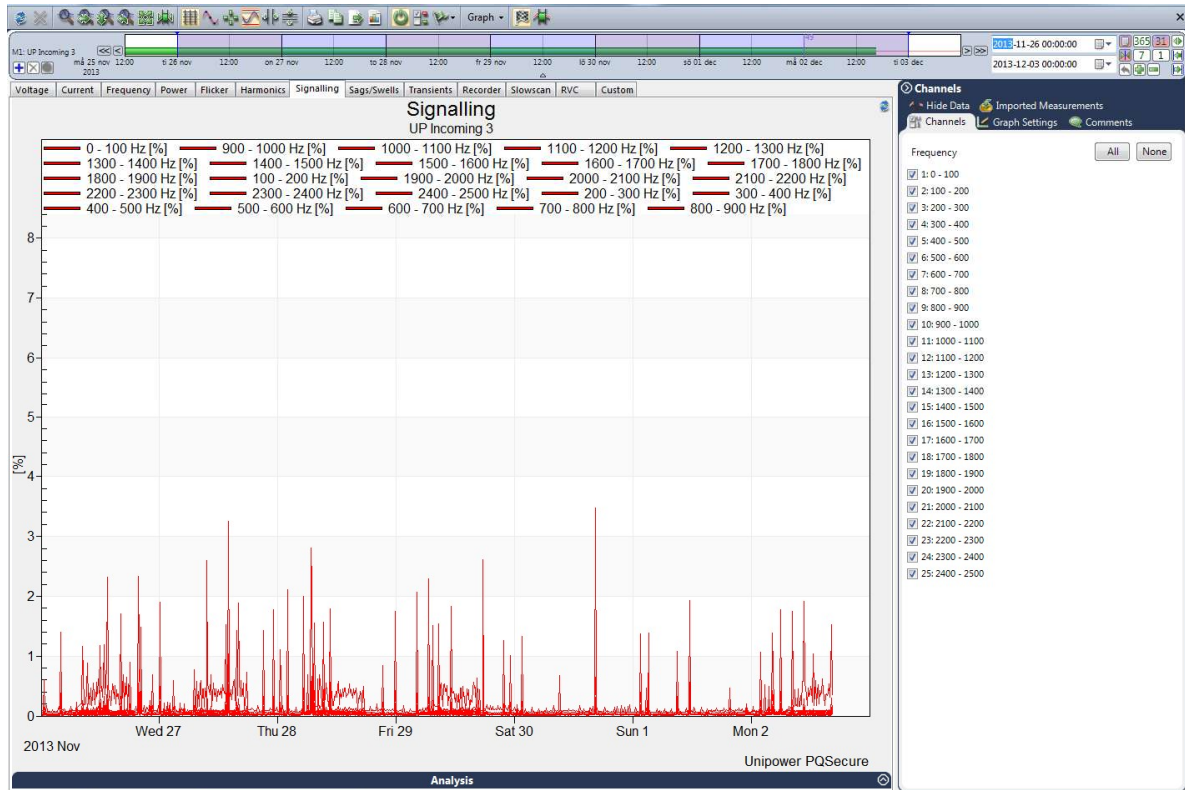


Figure 22

To create a signalling graph, click the **Select** button. Select the signalling bands to be included in the graph. Press **Ok** to create the graph. Signalling is always specified as percentage of nominal voltage level.

3.4.6.6 Tab – Sags/Swells

Under the tab Sags/Swells, events of this category that have been registered and transferred to the database are shown. The tab has a design similar to the other tabs with one exception; the disturbances can be presented in the evaluation window using alternative methods.

Sag/Swell – Time graph

The **Time graph** displays the sags/swells that have occurred, sorted by the time and by the magnitude of the disturbance, expressed as a percentage of the nominal voltage level. The magnitude is also called *residual voltage* and is equal to *depth*, defined in IEC 61000-4-30.

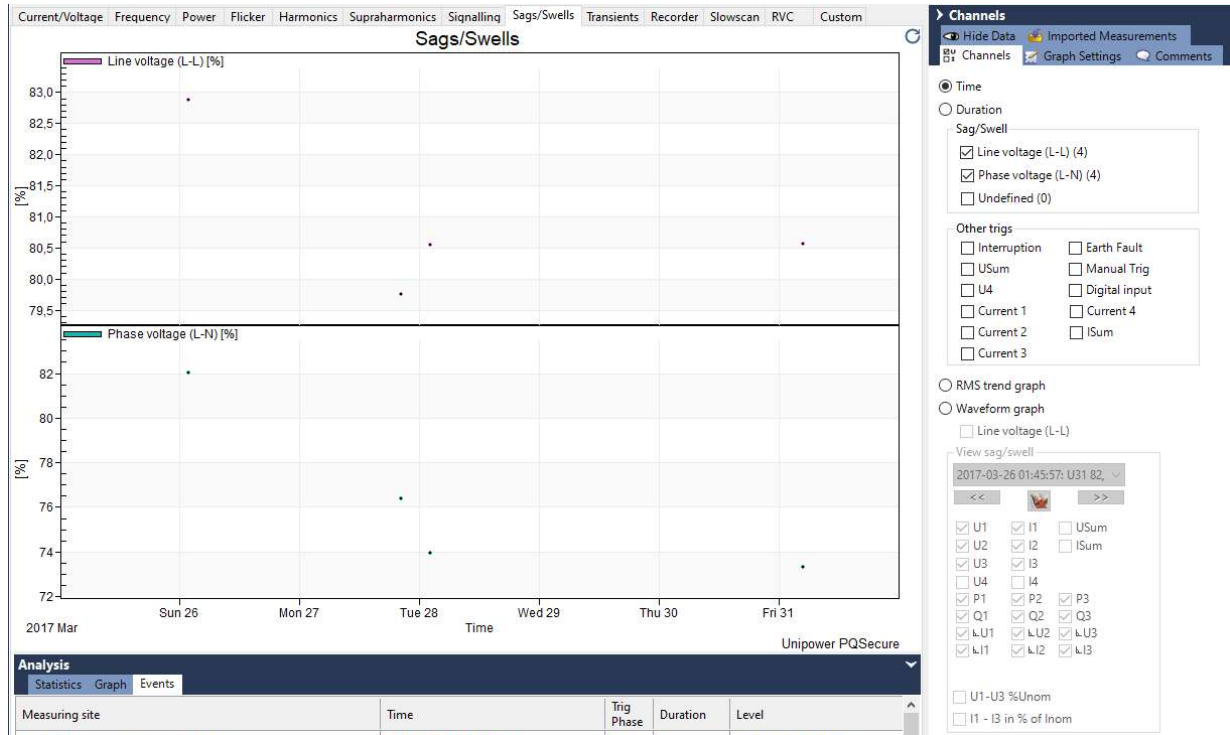


Figure 23

You can hover the mouse over a symbol for an event, to display more information about the disturbance. The symbols will have different colors corresponding to the phase that triggered the event.



Figure 24

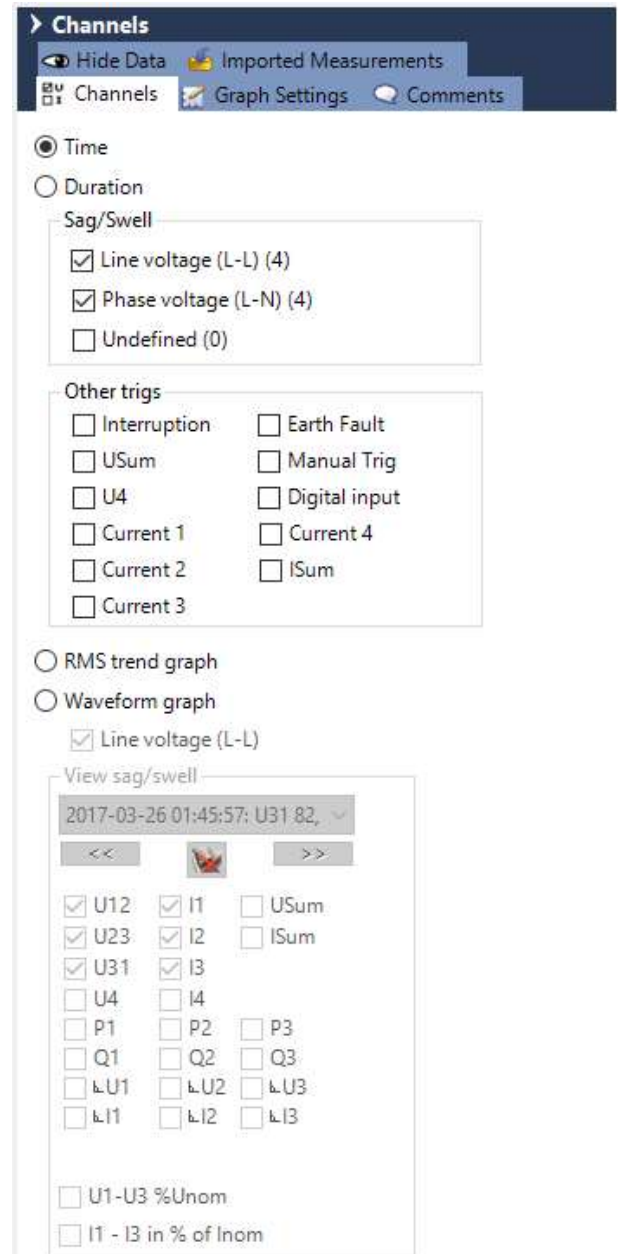
Sag/Swell No	A unique event ID automatically generated by the system.
Time	Date and time the event occurred.
Trig Phase	The phase that triggered the event.
Duration	The duration of the event.
Level	The magnitude of the event in relation to the nominal value.
Direction	If the disturbance is up stream or downstream.
Uref	The pre-defined nominal voltage.
Confirmed	Signature of the person confirming the event.
Comment	User comments related to the event.

Sag/Swell Event Type

To the right of the graph is a selection area where to choose which sag/swell event types you want to view.

You can also select different quantities to study during the sag like active and reactive power. Also, the phase angels for voltage and current can be viewed.

With some disturbances it can also be interesting to look at the USum indicating unbalance or ISum that can reveal earth fault.



Channels

Hide Data Imported Measurements

Channels Graph Settings Comments

☒ Time

☐ Duration

Sag/Swell

☒ Line voltage (L-L) (4)

☒ Phase voltage (L-N) (4)

☐ Undefined (0)

Other trigs

☐ Interruption ☐ Earth Fault

☐ USum ☐ Manual Trig

☐ U4 ☐ Digital input

☐ Current 1 ☐ Current 4

☐ Current 2 ☐ ISum

☐ Current 3

☐ RMS trend graph

☐ Waveform graph

☒ Line voltage (L-L)

View sag/swell

2017-03-26 01:45:57: U31.82

<< >>

☒ U12 ☒ I1 ☐ USum

☒ U23 ☒ I2 ☐ ISum

☒ U31 ☒ I3

☐ U4 ☐ I4

☐ P1 ☐ P2 ☐ P3

☐ Q1 ☐ Q2 ☐ Q3

☐ LU1 ☐ LU2 ☐ LU3

☐ LI1 ☐ LI2 ☐ LI3

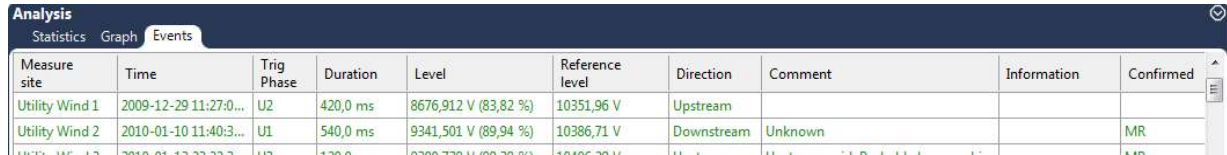
☐ U1-U3 %Unom

☐ I1 - I3 in % of Inom

Figure 25

Sag/swell analysis window

In addition to the normal statistical values in the panel at the bottom of the graph area, Events are displayed in an event list. If the mouse cursor is pointing at an event in the graph the corresponding list entry will be highlighted with a light green out line. You can double click row in the event list to go directly to the waveform for the event. Greyed out text in an entry means that no waveform is available for that event.



Measure site	Time	Trig Phase	Duration	Level	Reference level	Direction	Comment	Information	Confirmed
Utility Wind 1	2009-12-29 11:27:0...	U2	420,0 ms	8676,912 V (83,82 %)	10351,96 V	Upstream			
Utility Wind 2	2010-01-10 11:40:3...	U1	540,0 ms	9341,501 V (89,94 %)	10386,71 V	Downstream	Unknown		MR

Figure 26

Measure site	Tells witch meter the Sag/Swell occurred on.
Sag/swell No	A unique event ID automatically generated by the system.
Time	Date and time the event occurred.
Trig Phase	The phase that triggered the event.
Duration	The duration of the event.
Level	The magnitude of the event in relation to the nominal value.
Reference Level	The pre-defined nominal voltage or the actual sliding reference voltage at the time.
Direction	The direction of the sag/swell.
Comment	User comments related to the event.
Information	Additional information related to the event.
Confirmed	Signature of the person confirming the event.

Sag/Swell – Duration graph

The **Duration graph** displays the sags/swells that have occurred, sorted by the duration and by the peak value for respective event. The peak value is the difference between the lowest/highest value of the event and the nominal level expressed in percentage.

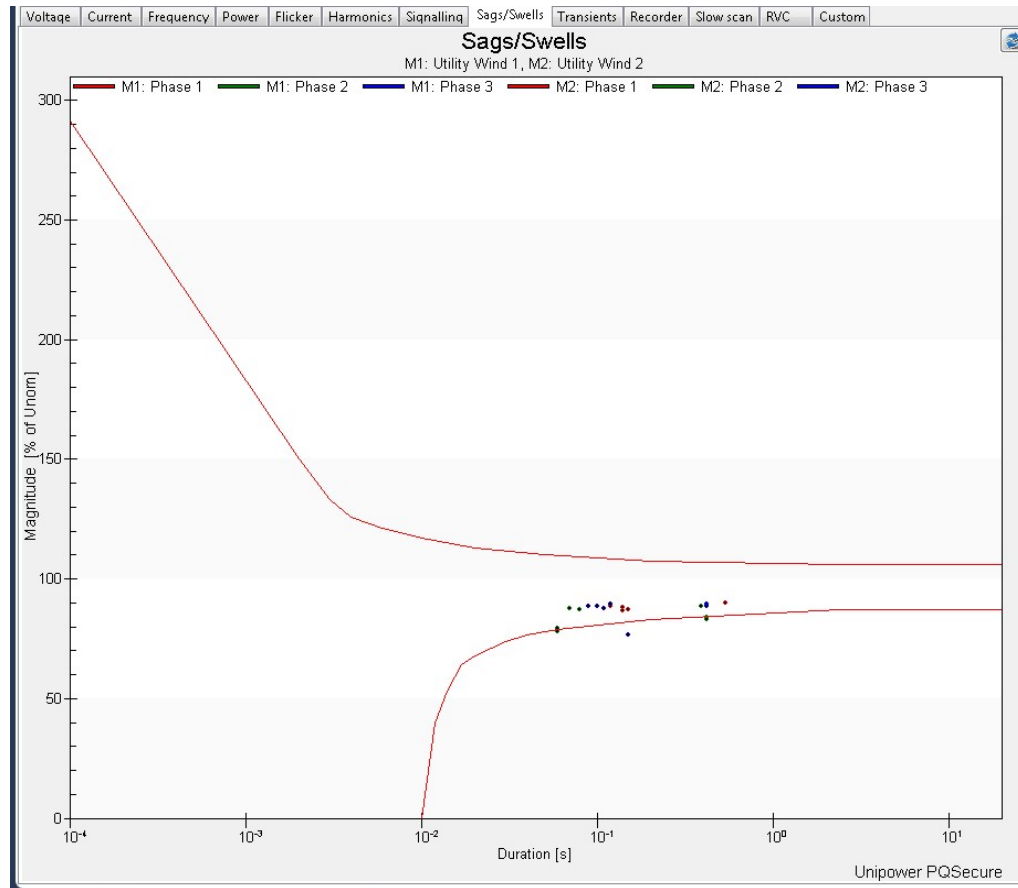


Figure 27

You may use this method of presenting events as a way of comparing the events against limits defined by ITIC, CBEMA, SSG 4908, EIFS or SEMI F47. For more information about these limits, please refer to the standards and literature relating to power quality. In brief, the values should fall within the lines formed by the limits, or else there is a risk that equipment (such as computers) will not work properly or may be damaged.

You can hover the mouse over an event icon to display more information about the disturbance.

Sag/Swell – RMS trend graph

The RMS trend graph displays detailed information about every sag/swell that occurs. The graph is based on each stored half period value (RMS). The length of the loaded trend graph depends on how the particular recorder has been configured (1.3/2.5 seconds). The y-axis shows the voltage, and the x-axis shows the duration/time.

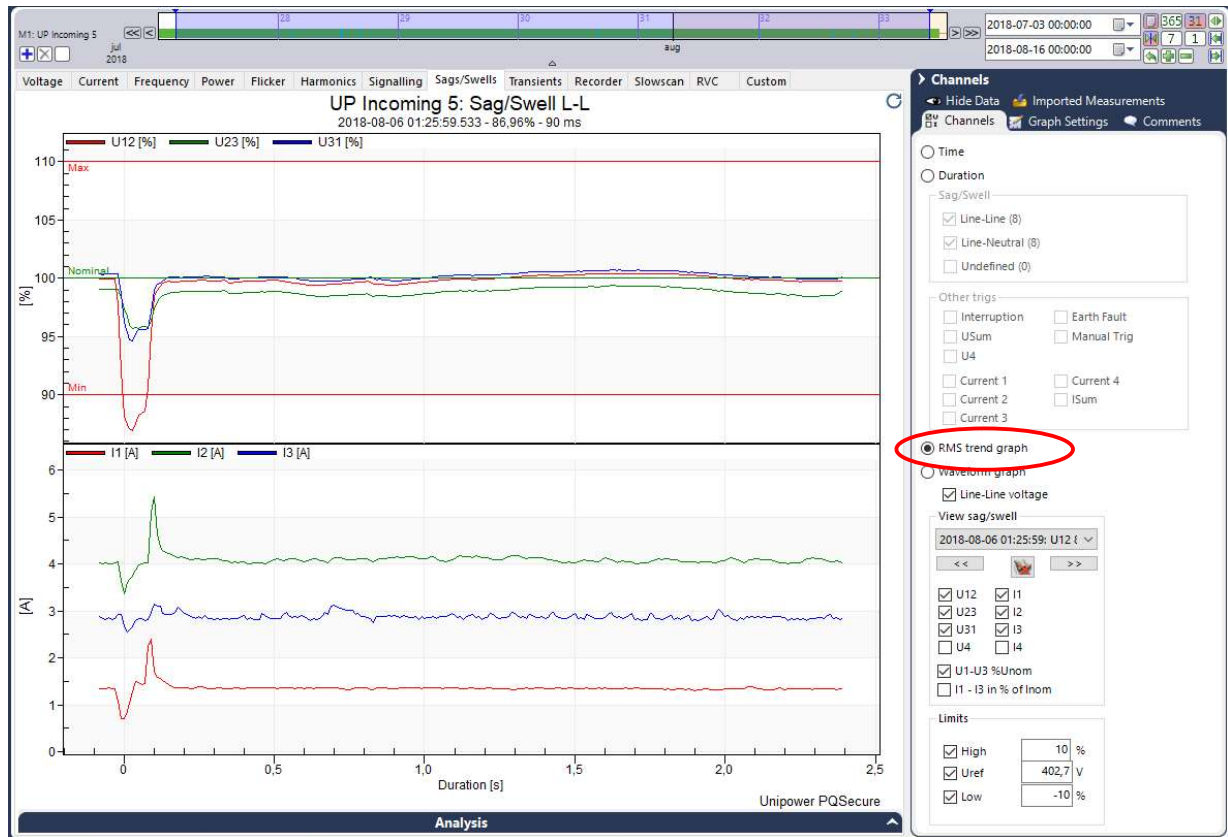


Figure 28

By presenting the events this way, it is also possible to select in the frame View sag/swell, which event (use the scroll list and the right/left arrows) as well as which parameters you want to study. Both voltage and current can be studied.

Sag/Swell – Waveform graph

The **Waveform graph** displays the waveform of the event.

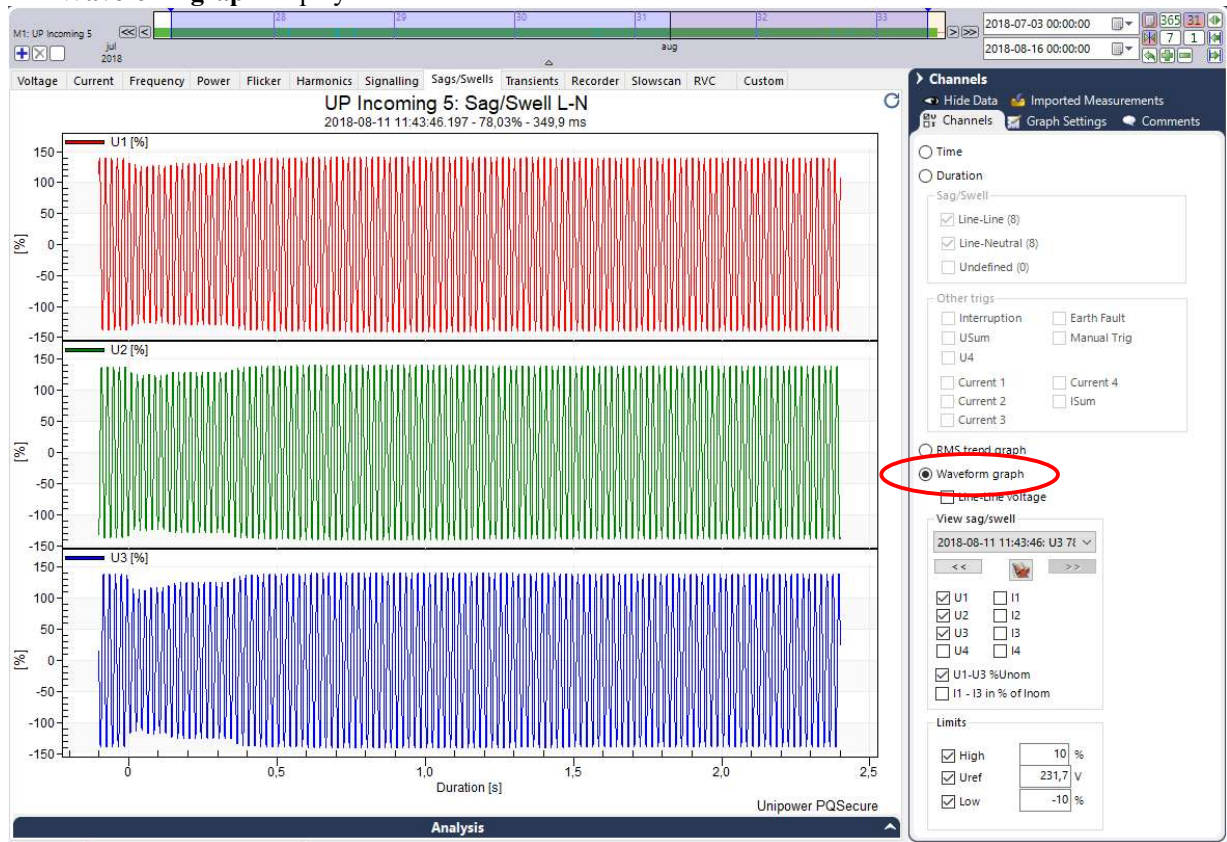


Figure 29

3.4.6.7 Tab – Transients

Under the tab Sags/Swells, events of this category that have been registered and transferred to the database are shown. The tab has a design similar to the other tabs with one exception; the disturbances can be presented in the evaluation window using alternative methods.

Transients – Time graph

The Time graph displays the transients registered, sorted by the level and the point in time when the events occurred. The level is the highest recorded span between Max and Min peak values during the events. You may calculate the Line-Line voltage of the transient by clicking the “Calculate main voltage” checkbox

Level: Highest recorded span between Max and Min peak values during the event.

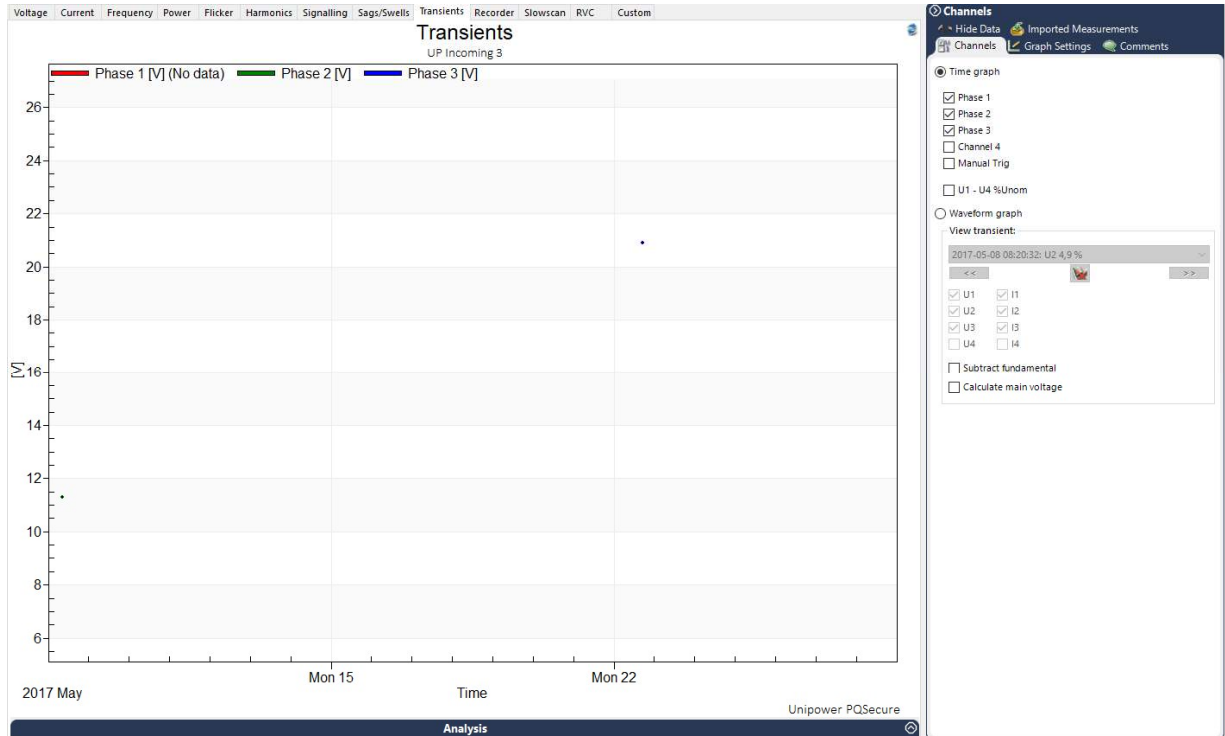


Figure 30

You can click on the event to display the waveform. For more information about the disturbance, check the event list in the Events tab below the graph. The event list works in the same manner as the event list on the Sag/Swell graph tab.

You may hover your mouse over the event to display more information about the disturbance. The icons will have different colours corresponding to the phase that triggered the event.

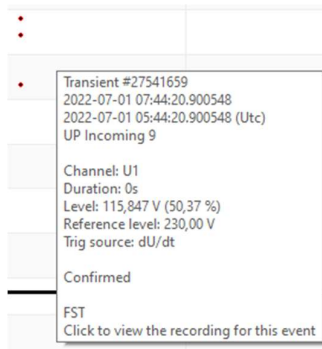


Figure 31

Transient No	A unique event ID automatically generated by the system.
Time	Date and time the event occurred.
Channel	The phase that triggered the event.
Duration	The duration of the event.
Level	Highest deviation from the average curve.
Uref	The predefined nominal value.
Trig source	The type of trig that initiated this recording.
Comment	Confirming user signature and optional comments to the event.
View	Press the button to view Waveform

Transients – Waveform graph

Every time a transient is detected, five periods of voltage and current are stored in the recorder - one period before the event and four periods after it. If the event occurs in one of the four voltage channels, values are stored for all eight channels, i.e. even the current channels are stored.

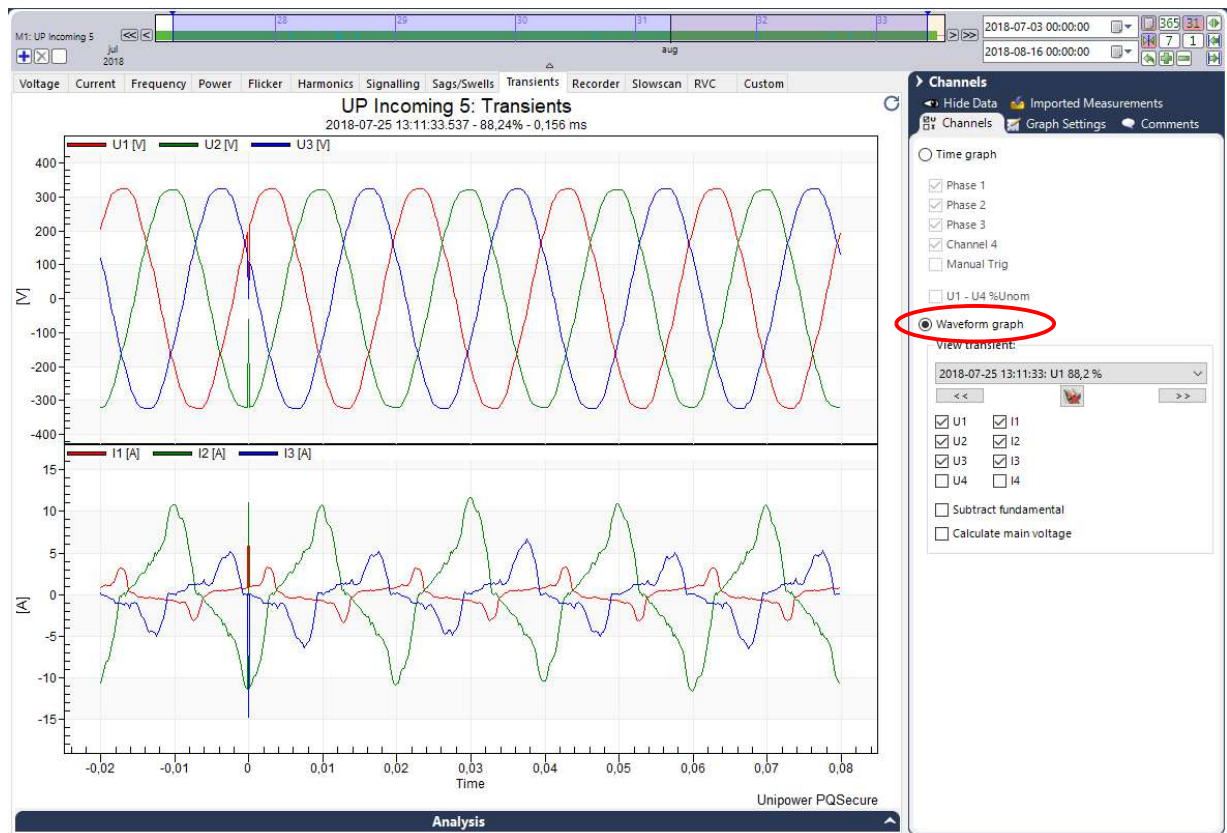


Figure 32

If you choose to display the events in this way, you can use the **View transient** group to select the events you want to study (use the list box or the right/left arrows), and also the parameters you want to study. You can study voltage as well as current parameters.

For each transient waveform you can choose to subtract the fundamental in order to facilitate the analysis of the disturbance. You do this by clicking **Subtract fundamental** in the **View transient** frame. See Figure 33.

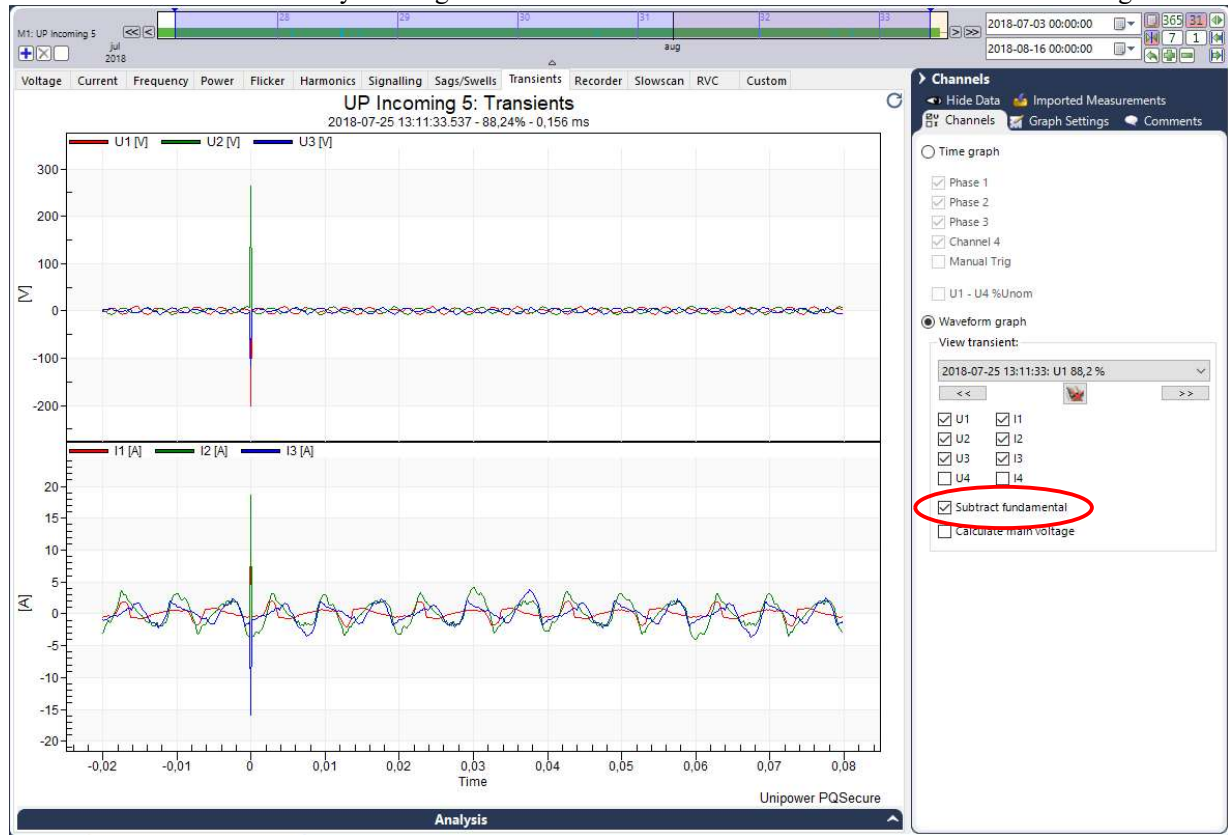


Figure 33

There might exist multiple recording of different sampling rate that coincide around the same time. Then you can use the functionality of merging transients to draw them together in the same waveform graph.

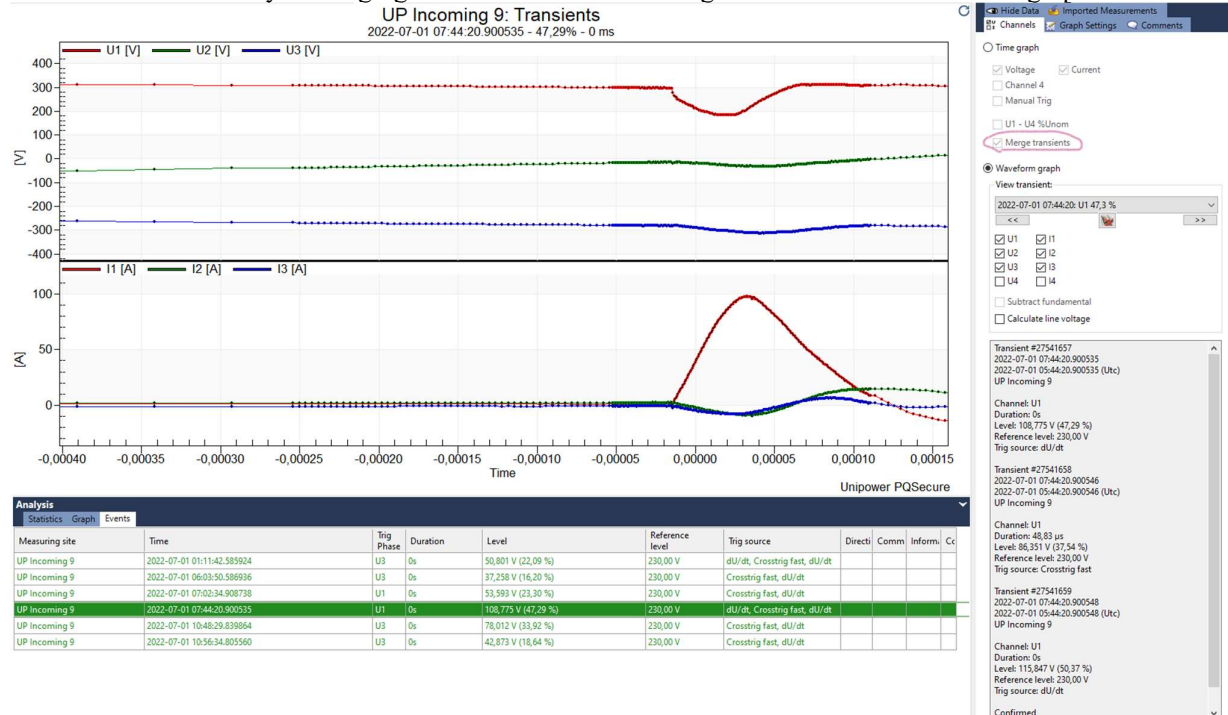


Figure 34

3.4.6.8 Tab – Recorder

The Fault Recorder option must be activated on the recorder to use this function. The **Recordings** category includes two methods of studying the recordings - **Time graph** or **Recorder graph**.

Recordings – Time graph

The **Time graph** displays the recordings sorted by the time and duration of the events.

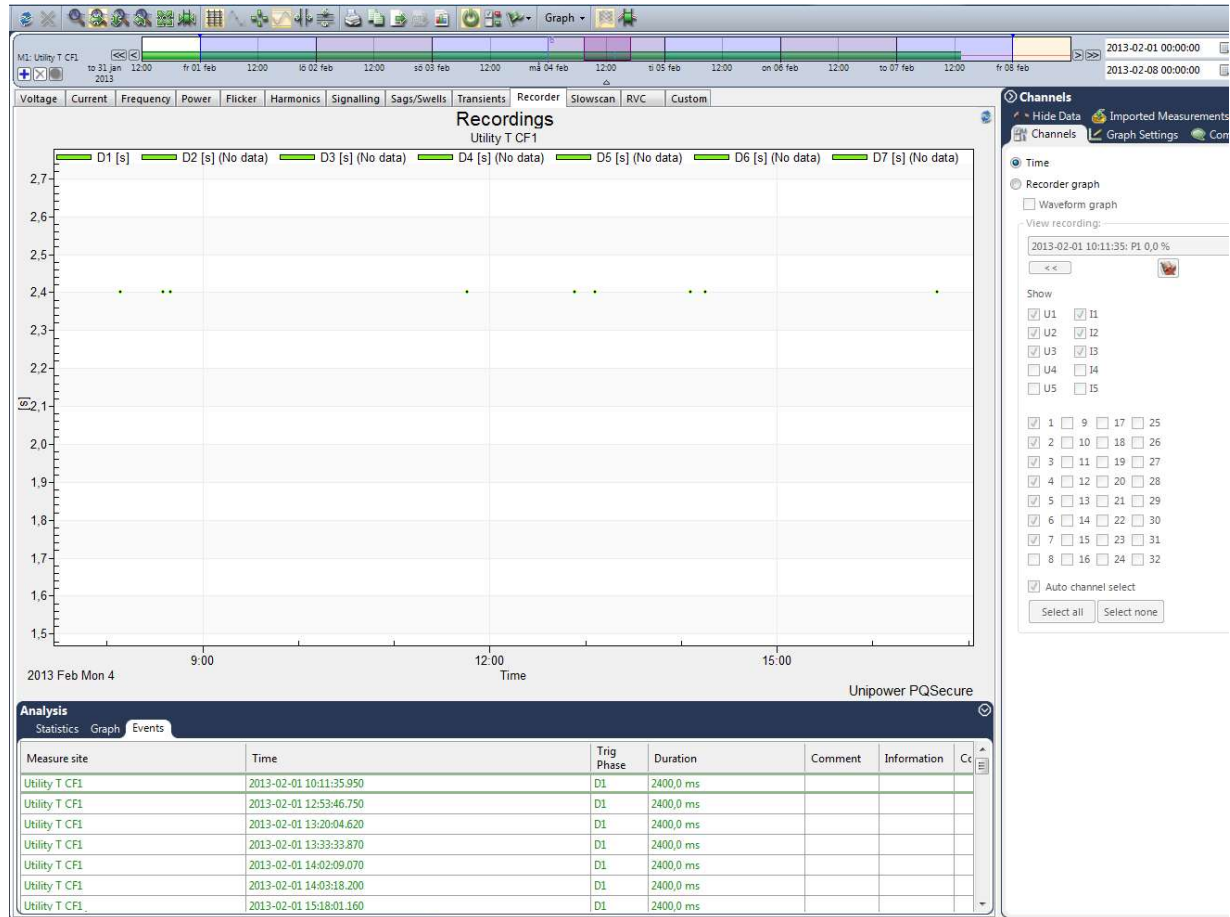


Figure 35

You can click on the event to display more information about the disturbance. The icons have different colours depending on which phase the disturbance occurred in.

The event list below the graph has similar content to the sag/swell and transient event lists.

Measure site Tells which meter the Sag/Swell accrued on.

Time Date and time the event occurred.

Trig Phase. Shows which of the connected digital inputs that triggered the recording.

Duration The duration of the event.

Comment User comments related to the event.

Information Additional information related to the event.

Confirmed Signature of the person confirming the event.

Recordings – Recorder graph

In the **Recorder graph** you can see graphs for the connected channels. The values of the parameters are based on half period values (RMS), where the length of the recording depends on how the corresponding recorder has been configured.

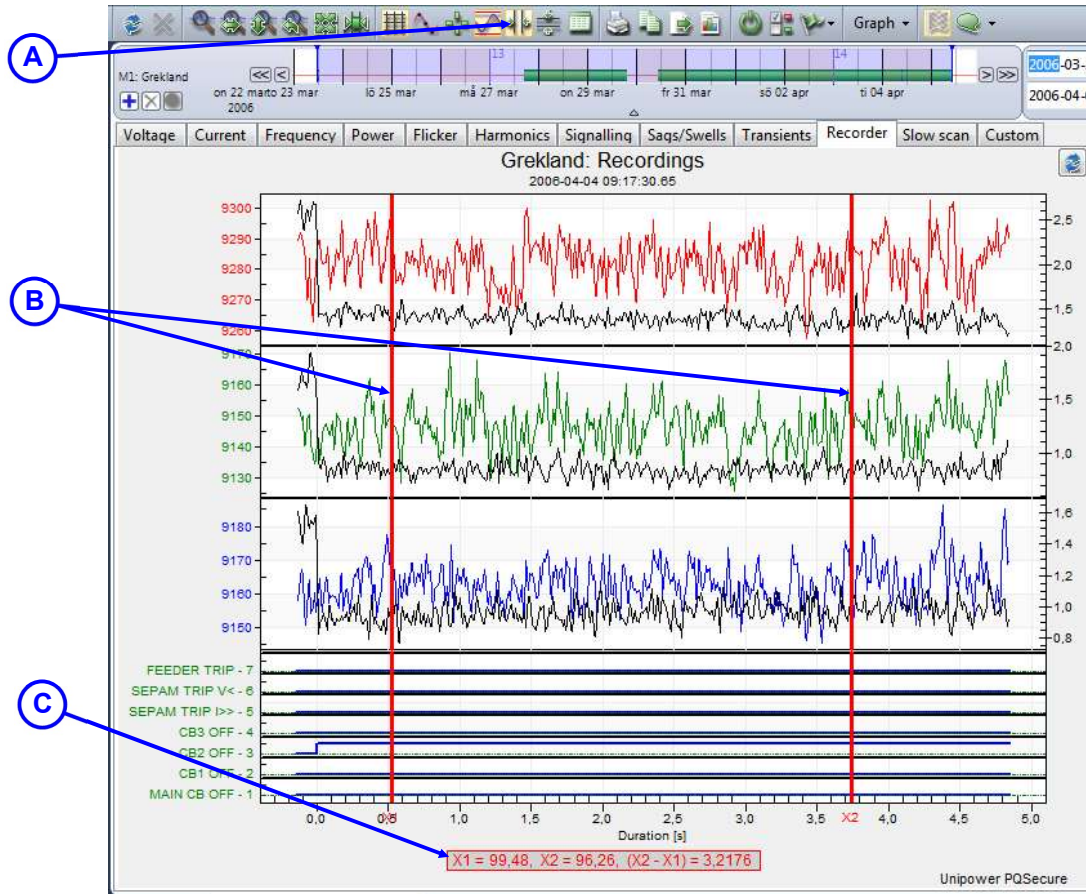


Figure 36

In the evaluation window you study the graphs from the digital channels, and at the same time you can see the RMS values of the voltage and current channels, which gives a complete picture of the event. With the horizontal measure tool (A) you can select part of the graph (B). This can be helpful when analyzing the duration of the event. The duration is presented under (C).

3.4.6.9 Tab – Slowscan

In the tab slowscan you can study longer disturbances in the electrical grid. During a slowscan recording, the RMS value of the parameters are stored with a resolution of 10-100 samples per second. Since the resolution is lower a longer recording can be made. Maximum pre-trig is 30 seconds and the maximum recording length is 300 seconds (including pre trig). Different parameters can trig the recording, such as frequency, power, current or voltage.

When you update the slowscan page you will see all the events as dots just as in the Sags/Swells tab. When you click on one of the dots that event will be plotted for you to analyze just as in the figure below.

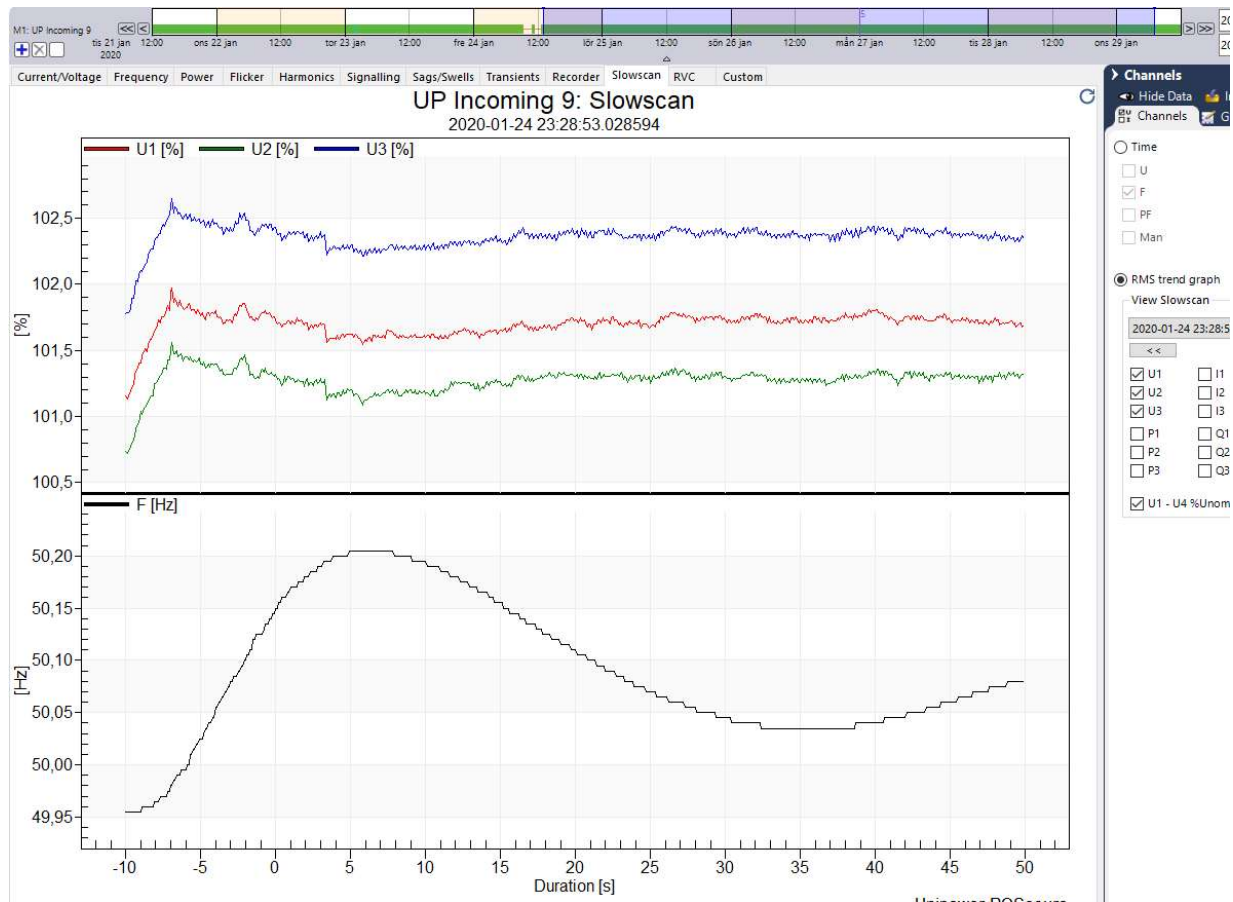


Figure 37

3.4.6.10 Tab – RVC

An RVC is defined as a single jump in the voltage RMS value between two steady-state levels. The change is less than 10% of the nominal voltage otherwise the change is defined as a voltage dip (sag) or swell.

Under this tab you can study a table and graph of the number of RVCs during a specified time period. The RVCs are divided into groups based on the magnitude of the voltage change.

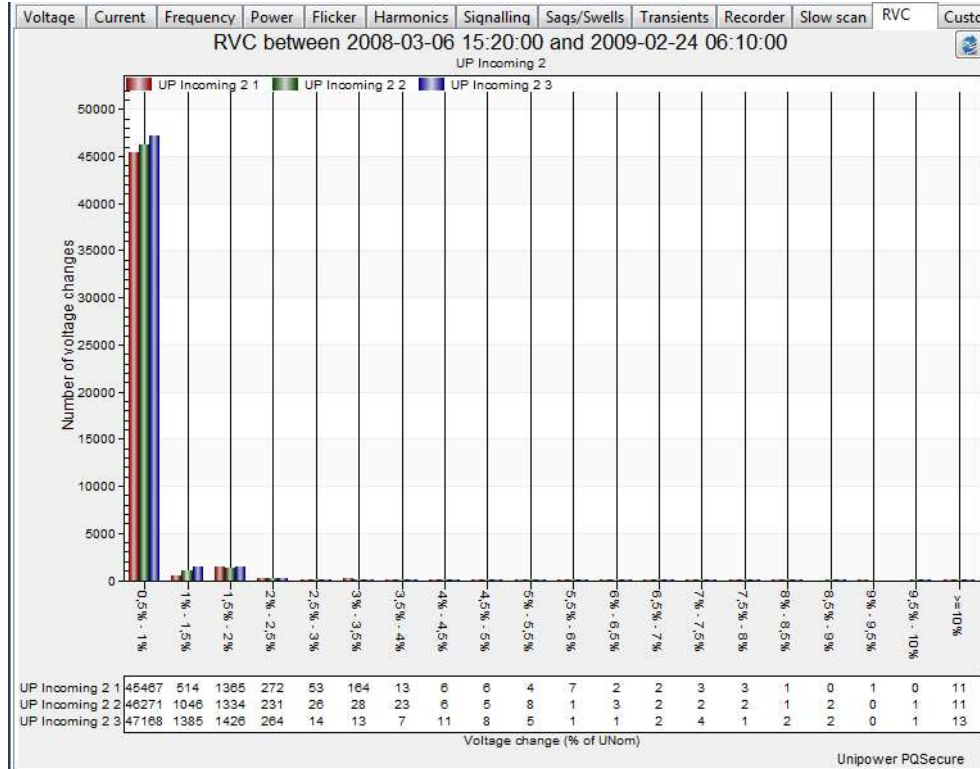


Figure 38

3.4.6.11 Tab – Custom

Under the tab **Custom** you have the possibility of comparing various measurement parameters for the same time span in the same graph. This function will facilitate the analysis of how a disturbance in one parameter will influence other parameters.

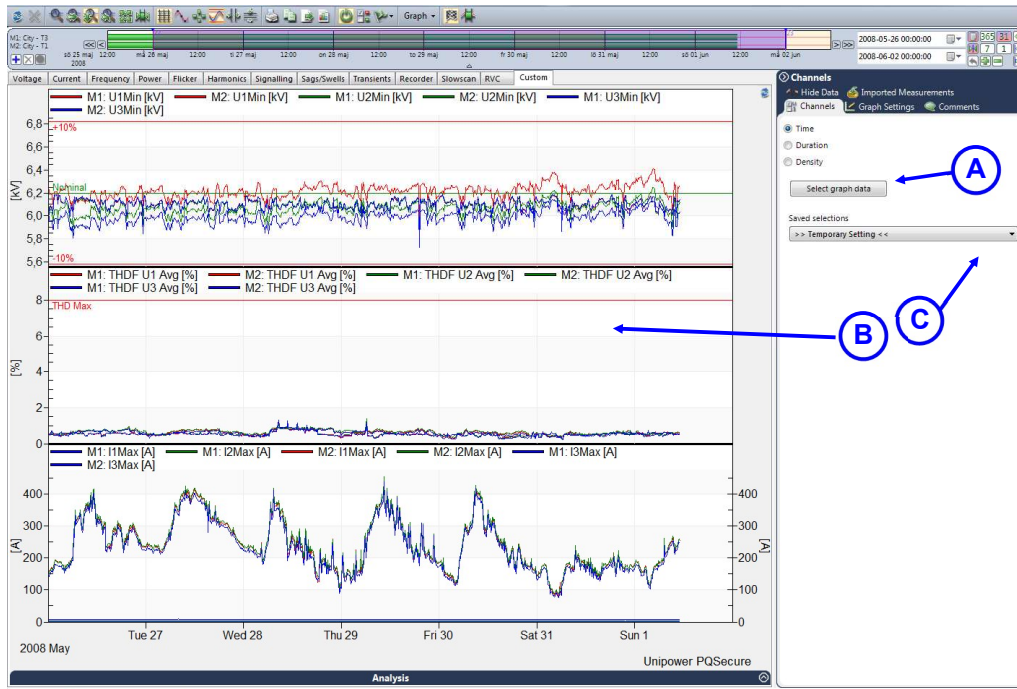


Figure 39

- A. Under **Select graph data** you select the parameters you wish to study in the evaluation window.
- B. In the graph you can select **Split graph**. This is done in order to give each parameter an individual scale on the y-axis or to divide the evaluation window. Do so by right clicking in the evaluation window.
- C. Allows for loading of previously saved custom tabs. This might prove useful since some settings are very efficient for specific task such as tracing the source of harmonics.

Note: If you select too many parameters simultaneously, a large number of graphs are presented, which will complicate the analysis. In these cases, a large amount of data should be transferred from folders to the graph and this may also take a long time.

Custom – Select graph data

By using the function **Select graph data** you can select the measurement parameters to be presented in the evaluation window.

All parameters measured by the recorder and the system are available in this dialogue window.

In the **Harmonics** tab you can select among voltage harmonics and current harmonics, the phase angle of the harmonics and power harmonics.

You can also choose to analyze individual harmonics, by checking the box **Individual**. This opens up a new window where all stored individual harmonics are available for evaluation (see **Error! Reference source not found.**).

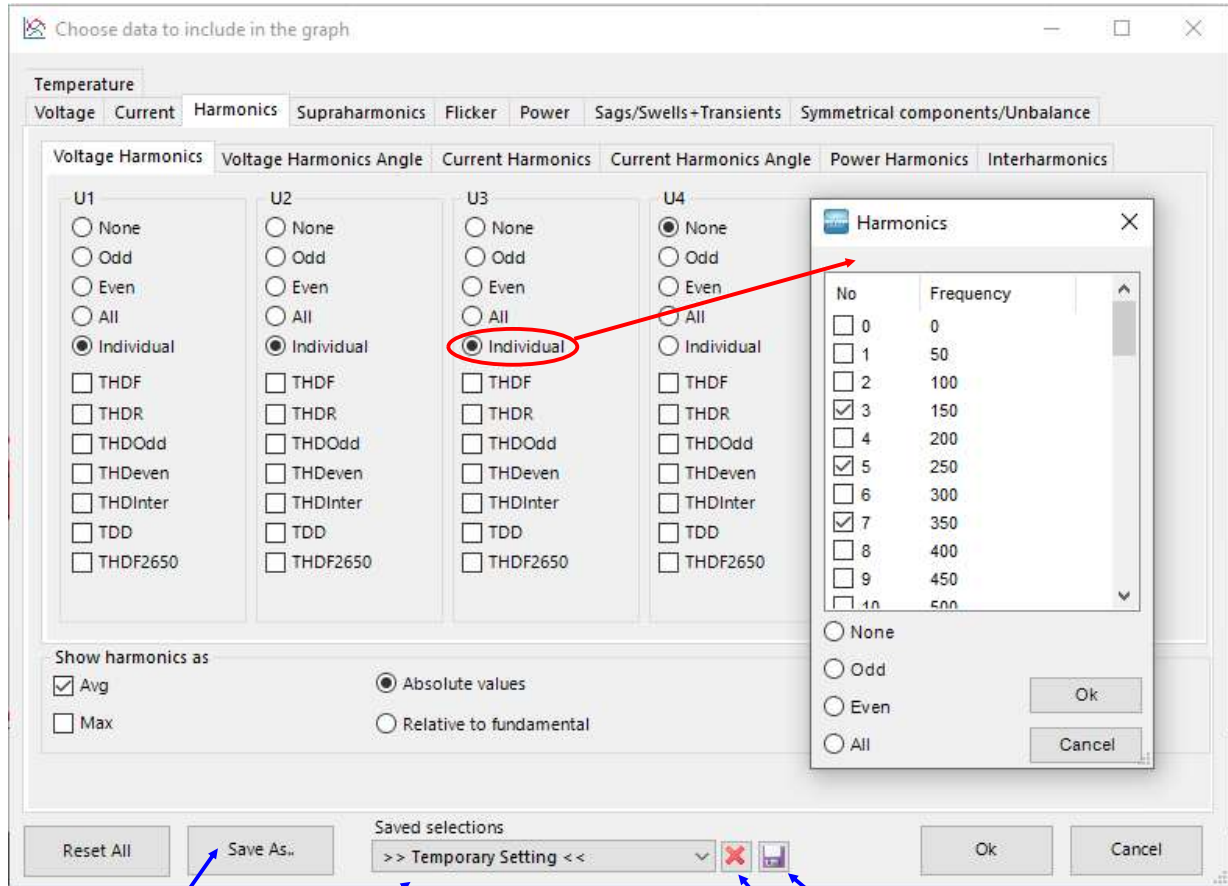


Figure 40

O. You can save the selected channels and give it a name by using this button.

A. Here all previously saved selections are shown. By selecting in this list, you can quickly do complex selections. This list is also shown in the custom graph main window (Figure 39).

B. When pressing this button, the selected selection is deleted.

C. When pressing this button, the selected selection is saved.

3.4.6.13 Symmetrical components/Unbalance

In the Custom tab in PQ Secure you may evaluate the symmetrical components, the total unbalance and the relation between symmetrical components and the positive component.

The positive component UBPos/IBPos is the set of components with **the same phase sequence** as the studied system, the reverse component UBNeg/IBNeg is the set of components with the **opposite phase sequence** as the studied system. The zero phase component is the set of components where the components are **in phase with each other**.

In order to plot these select them in the tab “Symmetrical components/Unbalance”.

$U2/I2$ is the relation between the negative phase component and the positive component. And will be presented in percentage.

The $U0/I0$ is the relation between the zero phase component and the positive component. And will be presented in percentage.

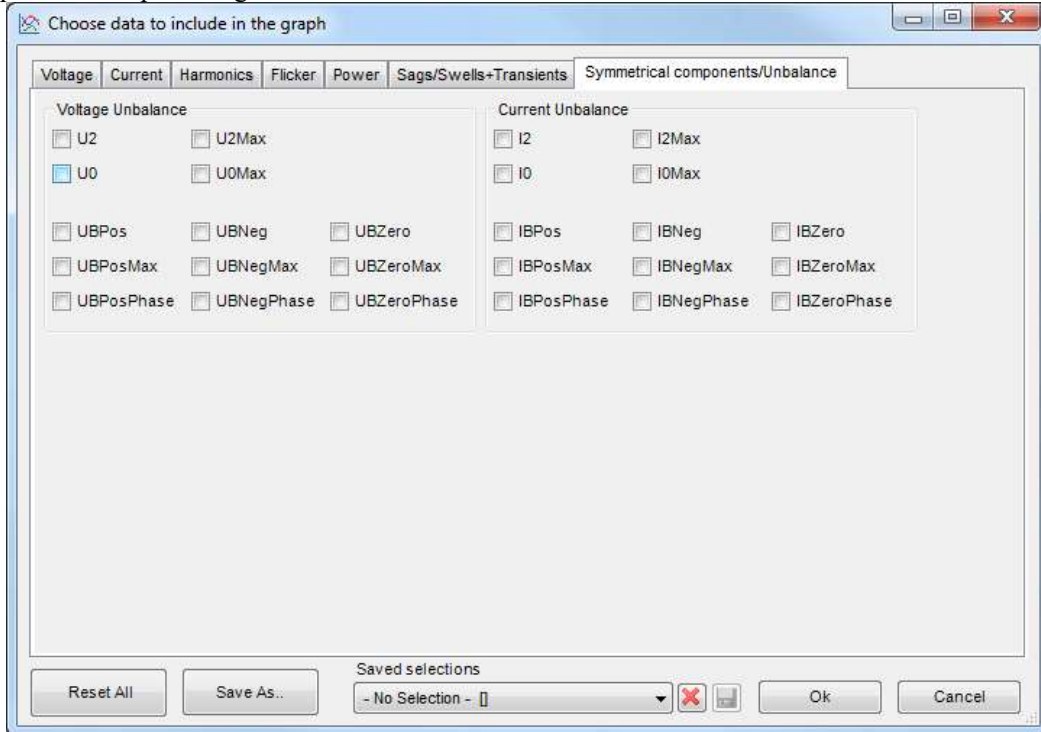


Figure 41

3.4.6.14 Analysis view – statistics

The analysis view's statistical window has more functions. Statistics for voltage is shown below. Min/max values as well as statistical 99%, 95%, 5% and 1% are shown.

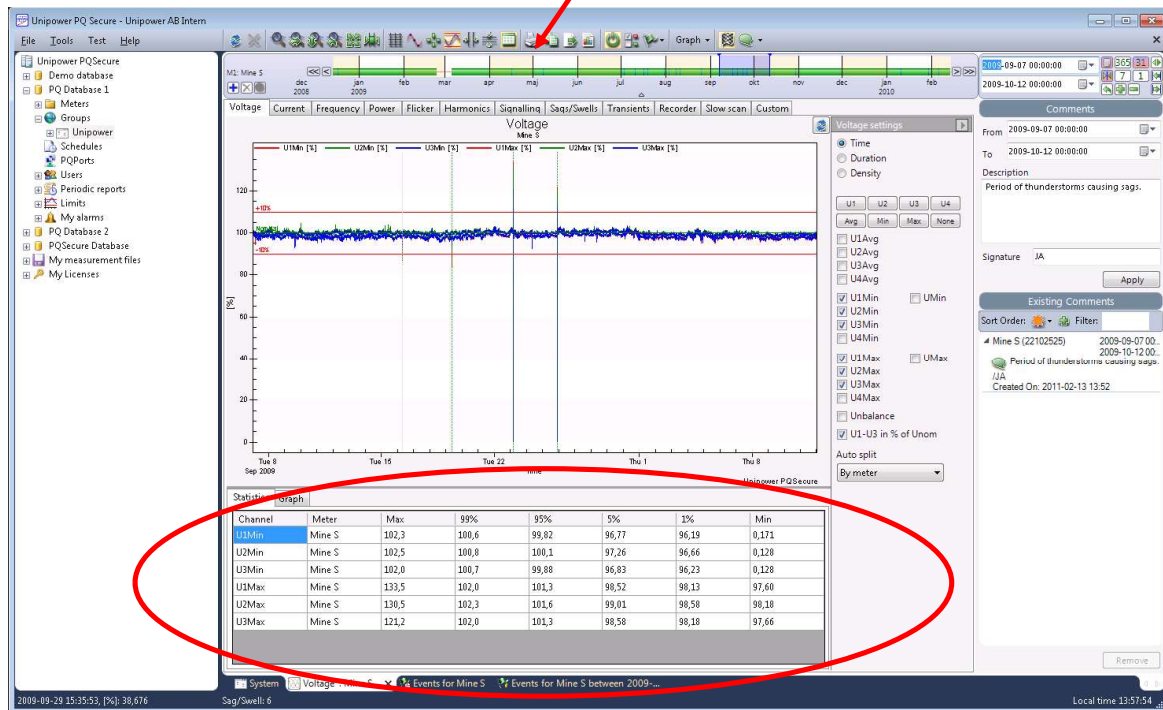


Figure 42

Similar window for sags, transients or other events. The number of events is easily counted:

Statistics				
Graph				
Channel	Meter	Max	Min	#
Phase 1	Mine S	85,23	0,135	2
Phase 2	Mine S	87,82	87,82	1
Phase 3	Mine S	0,172	0,142	3

Figure 43

Hour/Day distribution of disturbances are presented in the “Graph” view of the analysis window:

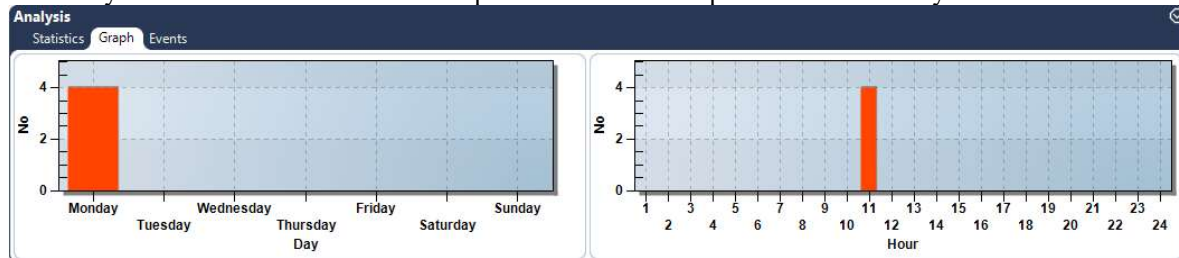
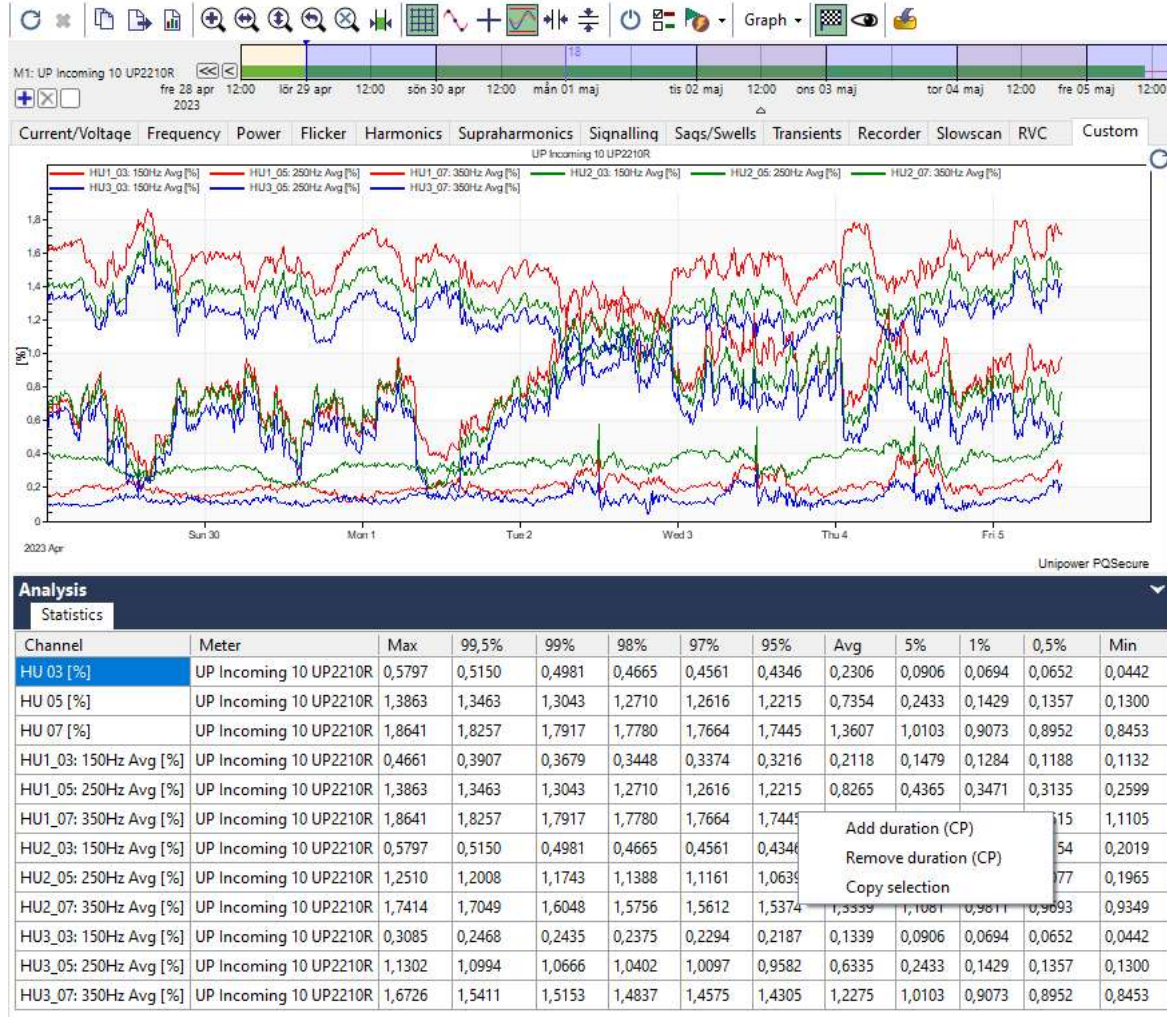


Figure 44

3.4.6.15 Harmonics phase aggregation

When plotting harmonics, the statistical analysis under the graph will contain an aggregated value for each selected harmonic. This value will be the largest of the three phases for each harmonic. The aggregated values only have a harmonic index (see selection below). By right-clicking with the mouse you can add your own percentile for the statistical calculation. To export the information in the statistic table, mark the data and select Copy.



3.4.7 Multiple Meters

An important function in PQ Secure is the ability to simultaneously view multiple meters. You can select one or more meters before selecting the graph, report or event list tools. You may also simply drag and drop a new meter/measurement file from the PQ Secure explorer window onto the evaluation window to add it.

Remember that using the **split** function might prove very useful while viewing multiple meters.

Below is an example of a graph with multiple meters selected (*Figure 63*).

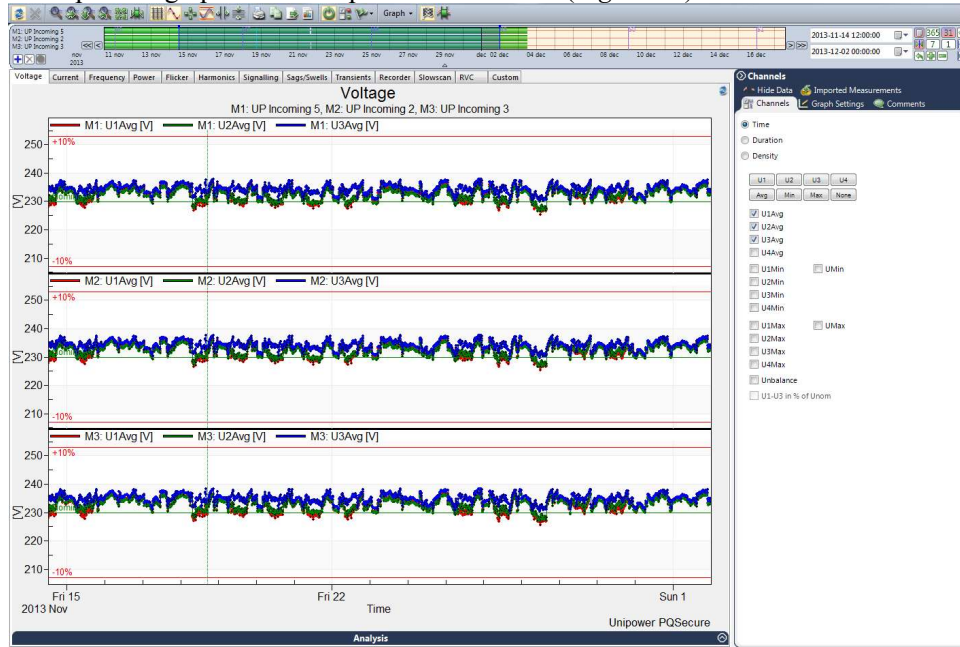


Figure 45

Below a couple of meters shown with a common y-axis. Because the measure sites are on different voltage levels the relative scale in percent has been chosen.

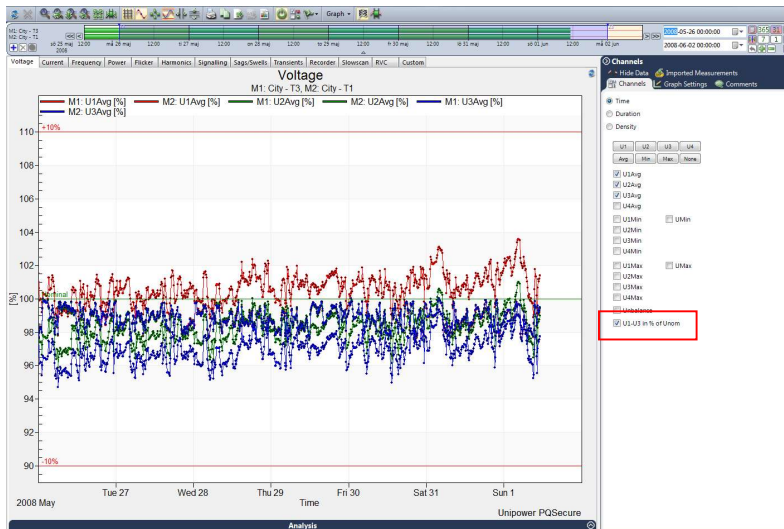


Figure 46

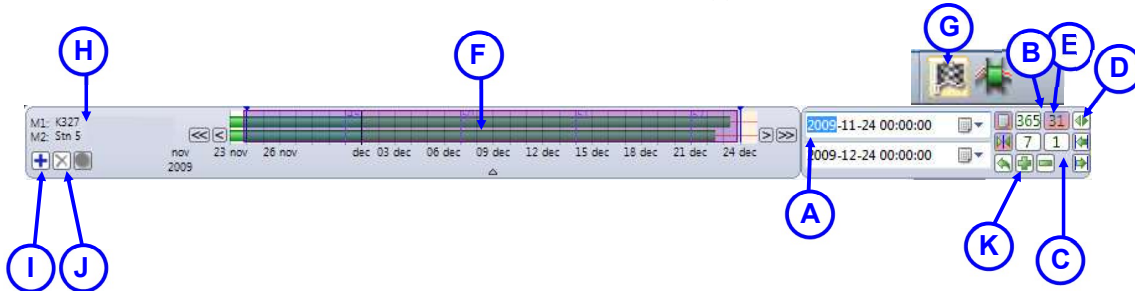
9.2.15 The Timeline

The time line is a tool used to show when measurement data is available.

It shows a timeline for the three last added meters in the **Selected meters** list (*see 3.4.6.12*). The color of the timeline indicates the status of the measurement data as follows:

- **Blue** – Data is available, but it is flagged (*see 9.2.6*)

- **Green** – Normal data is available and it is *not* flagged.



- D. Date** - Here you can specify start and end dates for the evaluation.
- E. Time span** - Here you select the time span for the evaluation, select which intervals of data you want to display. Latest day, latest week, latest month, latest year.
- F. Today** - Click this button to see the last 24 hours of measurement data in the file.
- G. Select all available data** – Selects all available data in the measurement file.
- H. Latest Month** - Selects the latest day/week/month (depending on the time span selection) where measurement data is available.
- I. Show timeline** – This is a simple timeline to indicate during which period there is measurement data/ if measure data is flagged.
- J. Hide flagged data** – If this box is checked, flagged data will be hidden (for an explanation of the concept flagging, please refer to 3.4.4.2).
- K. Selected meters** - A list of meters included in the graph.
- L. Add** - Click here to add a database meter or a measurement file to the list.
- M. Remove** - Click here to remove a meter or a measurement file from the list.
- N. Zoom and undo** – Zoom in the timeline with the +/- and undo latest zoom.

3.4.8 The toolbar



Figure 47

The toolbar functions in the graph evaluation are described below:

- A. **Refresh** – Loads the measurement values from the measurement file to the evaluation window
- B. **Stop** – Stops the retrieval of data from the measurement file
- C. **Custom zoom** – Allows you to zoom freely in the graph. Choose this function and draw a rectangle in the graph using your mouse pointer. Check the function and select an area in the graph using the mouse. The function will be active until you click on the button again or another function is selected.
- D. **Horizontal zoom** – Enables horizontal zoom cursors for the graph.
- E. **Vertical zoom** – Enables vertical zoom cursors for the graph.
- F. **Undo latest zoom** – Undo the latest zoom action.
- G. **Undo all zoom** – The graph will return to original size.
- H. **Graph zoom to timeline** – Sets the zoomed part of the timeline as the time interval.
- I. **Grid on/off** – Will activate or hide the grid lines in the evaluation window.
- J. **Mark data points** – Marks each stored value as a clickable point.
- K. **Data cursor** – Activates a horizontal and a vertical line tracking the mouse pointer.
- L. **Graph limits** – Toggles the graph limits.
- M. **Measure time (x-values)** – Measure time between to fixed points. Also useful to temporarily show an interval in the evaluation window.
- N. **Measure amplitude (y-values)** – Measure the difference between two y-points in the evaluation window. Also useful to temporarily show an interval in the evaluation window.
- O. **Print** – Prints the evaluation window.
- P. **Copy graph** – Copies the graph. The graph may then be pasted in to another document.
- Q. **Export graph** – Exports the data, either as file or directly to clipboard.
- R. **Export to COMTRADE format** – Only available as an option. Export the data as a Comtrade file.
- S. **Create report** – Creates a report for the selected **time interval**.
- T. **Hide/show events** – Allows for hiding/showing of events directly in the evaluation window. Appears as a clickable vertical line in the graph.
- U. **Select events** – Choose which events should be presented in the evaluation window.
- V. **Events** – Shows local/global events
- W. **Graph** – Presents the same options as right clicking the evaluation window.
- X. **Hide flagged data** – Hide/show flagged data.
- Y. **Show/Hide Meters for Hidden Measure Data in the Timeline** – Show/Hide hidden measurement data.

3.4.9 Exporting measurement data

PQ Secure offers the function of exporting and importing measurement data. This allows measurement data from Unipower instrument to be imported into other PQ Software and measurement data from other PQ Analyzers to be used in PQ Secure.

3.4.9.1 Export graph data

The measurement data displayed in the evaluation window can be exported to other applications, e.g. Microsoft Excel. Use the button **Export graph** in the toolbar.

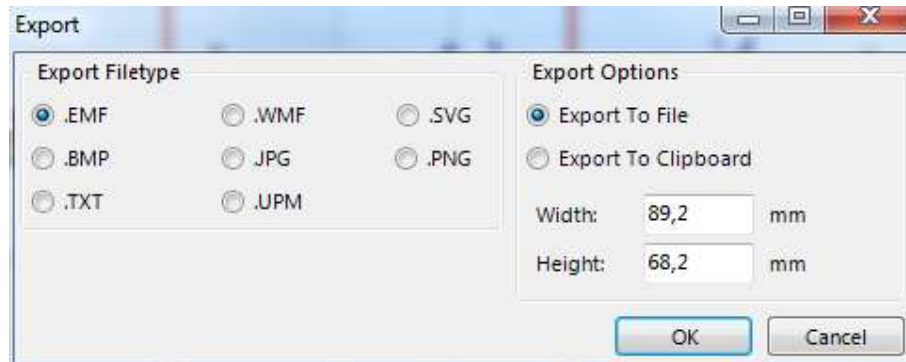


Figure 48

Select which file format the measurement data should be exported to. This can be a Metafile, a Bitmap image (BMP) or a Text/Data format normally used in for example Excel. **Export Option** refers to where the file will be saved; select **Clipboard** if you want to paste the file straight away. To save the file, click on **File** and browse to the location you want to store it. (You may also set the size before exporting the measure data). When you have completed all the settings, click on **Ok**.

3.4.9.2 Export to Comtrade

Disturbances presented in the evaluation window can be exported to a file using the Comtrade-format. Use the button **Comtrade** in the toolbar (see Figure 49).

When the function has been activated you only need to select where the file should be stored.



Figure 49

3.4.9.3 Harmonic export

The harmonic export is a separate troubleshooting module (optional) where you can get harmonic values up to the 100th harmonic. To do this you right click on your measurement file and chose harmonic export (see **Error! Reference source not found.**). In the following dialogue chose where you desire to save the export file. The file that will be created will be in .txt format. The file is preferably opened with Microsoft excel and it will show the harmonic values. Since this is an export of numerous values there is no graph created. If you want to look at the values in a graph you need to use Excels graph making tools.

3.4.10 Creating custom sag/swell limit levels

In PQ Secure you have the option to configure your own custom sag/swell limits.

The sag/swell limit lines are created by editing an .xml file, this .xml file can found under the folder *Manual* found on the cd.

Name the .xml file to a fitting name and open it with notepad.

The immunity lines are then configured by editing the values for the x1, x2, y1, y2, color, linetype and limitttype. Where:

- x1 and x2 indicates the start and end time of the line (expressed in seconds)
- y1 and y2 indicates the percentage value of the start and end time (expressed in percent)
- Color indicates the color in RGB
- Limitttype indicates the type of limit the line is. -1 will only provide a line in the sag/swell duration graph. 1 will create a “upper limit” which will provide a line in the sag/swell duration graph as well as a high limit in the event evaluation. 2 will provide a lower limit which will create a line in the sag/swell duration graph as well as a low limit in the event evaluation tab.

The finished .xml file must then be placed under

C:\Users\[windows user name]\AppData\Roaming\Unipower\PQSecure\CustomLines

Then select your custom sag/swell limits as you would with other limits

3.4.11 Importing PQDIF Files

If you wish to import a PQDif measurement files into the PQ Secure system. Simply drag the file from the file location and drop it in the “Files” section of the PQ Secure Explorer.

3.4.12 Exporting Harmonics

You can export the individual harmonics of a measurement file to a CSV text file easily imported to for example Excel.

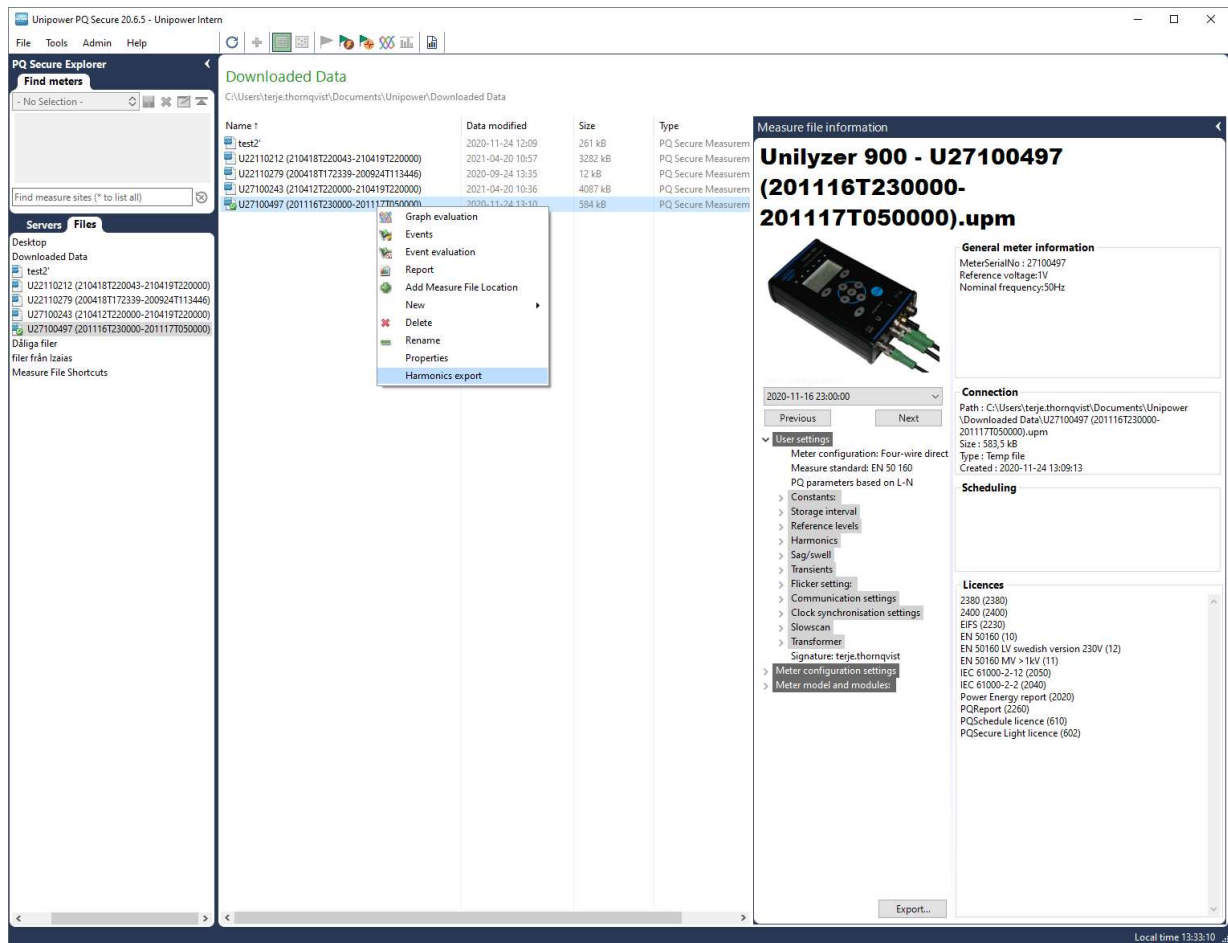


Figure 50

After selecting Harmonics Export the following dialog will be show.

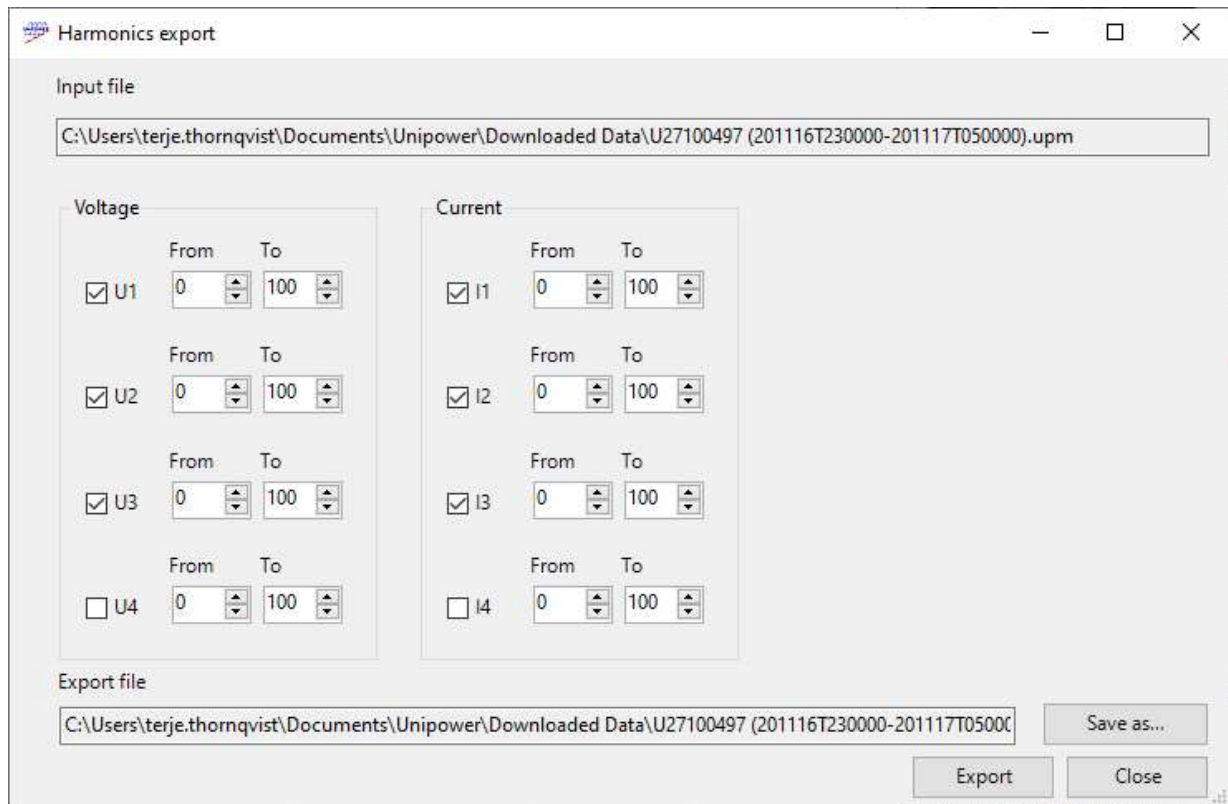


Figure 51

This dialog allows you to change the exported channels as well as the range of harmonics to be exported from each channel as well as the filename of the exported file.

3.4.13 The settings window

The evaluation window in the graph evaluation is designed to represent the various graphs parameters as effectively as possible. You can easily change the settings by clicking the “Graph Settings” at the right hand side of PQ Secure. Here you may edit the graph properties such as plot style, titles, axes settings, color etc. can be modified.

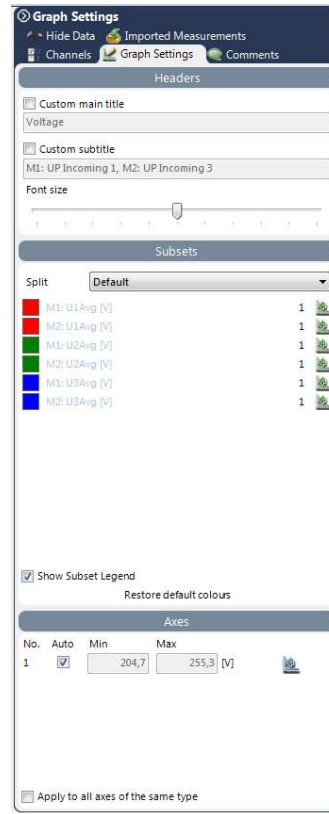


Figure 52

3.4.14 Reports

The PQ Secure program has a built-in report generator. You can use this function to generate a power quality report in which the measured values from a meter are compared against applicable standards.

You can access the report generator much in the same way as the graph evaluation tool, e.g. by right-clicking on the meter and selecting **Report** in the pop-up menu. The **Create report** dialogue window will then be displayed (see Figure 53).

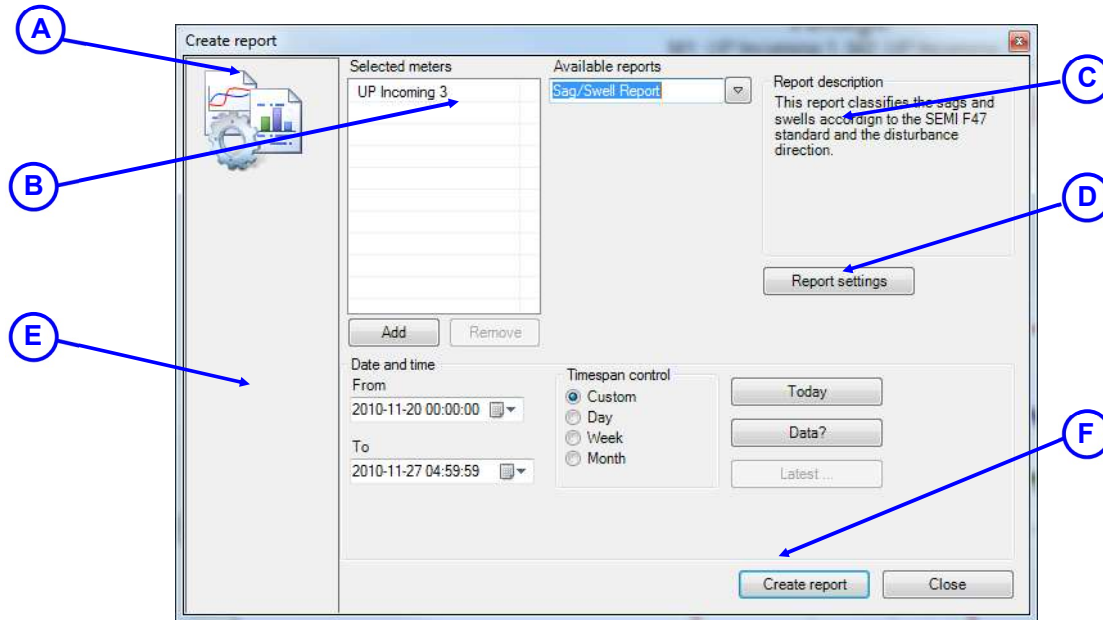


Figure 53

- A. This list contains the meters selected for the report.
- B. List with available reports.
- C. A brief description of the selected report type.
- D. Click this button to change the report settings such as report document type, comments, limits etc. (these settings vary depending on the report chosen).
- E. Time span settings for the report.
- F. Click here to create the report.

Follow these five simple steps to create a report:

1. Select a meter in the system manager, right click on it and select **Report**.
2. Select the report type **(B)**.
3. Optionally, change the report settings **(D)**.
4. Select the time span for the report **(E)**.
5. Click the **Create report** button **(F)**. You will now be prompted for a destination directory. Browse to the desired destination path and click **Ok**. The report will now be generated. If you have selected several meters, you will receive one report per meter. When the report has been generated it will be presented in a dialogue window and you can double click on it to open the document in the associated reader.

3.4.14.1 Explanation of reports

Unipower offers a variety of reports in order to fit your preferences. If the reports available to you in PQ Secure does not fit your needs for functionality or parameters remember that Unipower offers custom made reports.

Below is an explanation of the most common reports.

1. Standard Report

The Standard Report is included with each PQ Secure installation.

This report presents both voltage and current with min, max and average-values. Both parameters are presented with a time graph and a duration graph.

The time graph gives a quick overview of the voltage and current variation over time and the duration graph gives statistical values such as 95% and 99%.

2. Sag/Swell Report

The Sag/Swell Report is included with each PQ Secure installation.

The Sag/Swell report presents all voltage sags and swells. These are sorted according to a chosen standard. Either: Semi F47, CBEMA or ITIC.

CBEMA	- Immunity levels for older IT-equipment.
ITIC	- Immunity levels for newer IT-equipment.
Semi F47	- Immunity levels for the semi-conductor industry.

Semi F47 presents all events in a table where the amount of disturbances can be seen.

The events are also grouped based on the direction: up streams, down streams or if the event was triggered on channel U4.

3. EN 50160 Report

Optional module.

This report is split into 3 parts depending on the voltage level: low, medium or high. This is a European norm which is of interest for every stakeholder on the grid: producers, distributors and consumers. EN 50160 covers the following parameters:

- Frequency
- Unbalance
- Voltage variations
- Flicker
- THD
- Individual harmonics
- Interharmonics

Each parameter is evaluated according to norm limits and is presented as passed or failed.

The parameters are then presented with an information window where max, min and average- values, 95 % values and time within limits can be read together with a duration graph.

4. EN 61000-2-2/ EN 61000-2-12

Optional module.

These reports treat the compatibility between grid and consumer and are of interest for grid owners. EN 61000-2-2 is meant for **low voltage** while EN 61000-2-12 is meant for **medium voltage**.

The norm compares the consumers' intended immunity and the grids disturbances as two overlapping normal distributions.

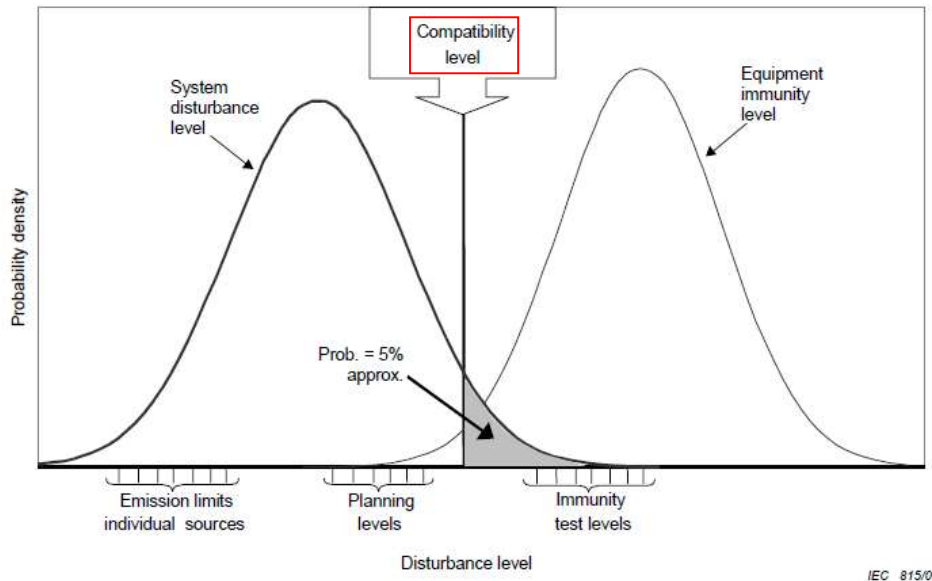


Figure 54 - The grids disturbance levels and the equipment's immunity level plotted as normal distributions – EN 61000-2-2:2002

The compatibility level is then defined as the area between these distributions and is the base for this norms limit.

The norm treats:

- Frequency
- Unbalance
- Flicker
- THD

- Individual harmonics

5. PQ Report

Optional module.

The PQ Report is a non-norm based report but is instead based on preference levels. With the PQ Report you can yourself set 2 individual levels (preferably an upper level according to norms and a lower limit according to planning levels).

The report then works after your preferred settings. The adjustable parameters are:

- Limits for voltage in 2 levels
- Limits for frequency in 2 levels
- Limits for flicker, unbalance and THD
- Availability for another statistical limit as pure information
- Limits for individual harmonics
- Your choice of immunity curve
- RVC (Rapid Voltage Change)
- Current and Power

6. Flicker Report

Optional module.

The Flicker Report presents the statistical properties for flicker and evaluates these according to chosen (adjustable) planning levels.

This report covers both the long term (PLT) and short term (PST) flicker measured by the meter.

The report is of interest for both distributors as well as industries containing lots intermittent loads that produce a lot of flicker.

With this report you will be able to set limits for 100%-, 99%- and 95% values.

7. Quality Report

Optional module.

The Quality Report is designed to analyze power quality for multiple meters simultaneously.

Analyzed parameters are:

- Voltage
- Unbalance
- Flicker
- Harmonics
- Sag/Swell
- Transients

The report compares all parameters 95% values per day with respective planning levels.

For example: The graph below shows an analysis of the voltage with the Quality Report for a couple of meters over a 5-week period. For each meter each day a 95% value for the voltage is calculated the average, minimum and maximum for these 95% values are presented in a graph together with given planning levels

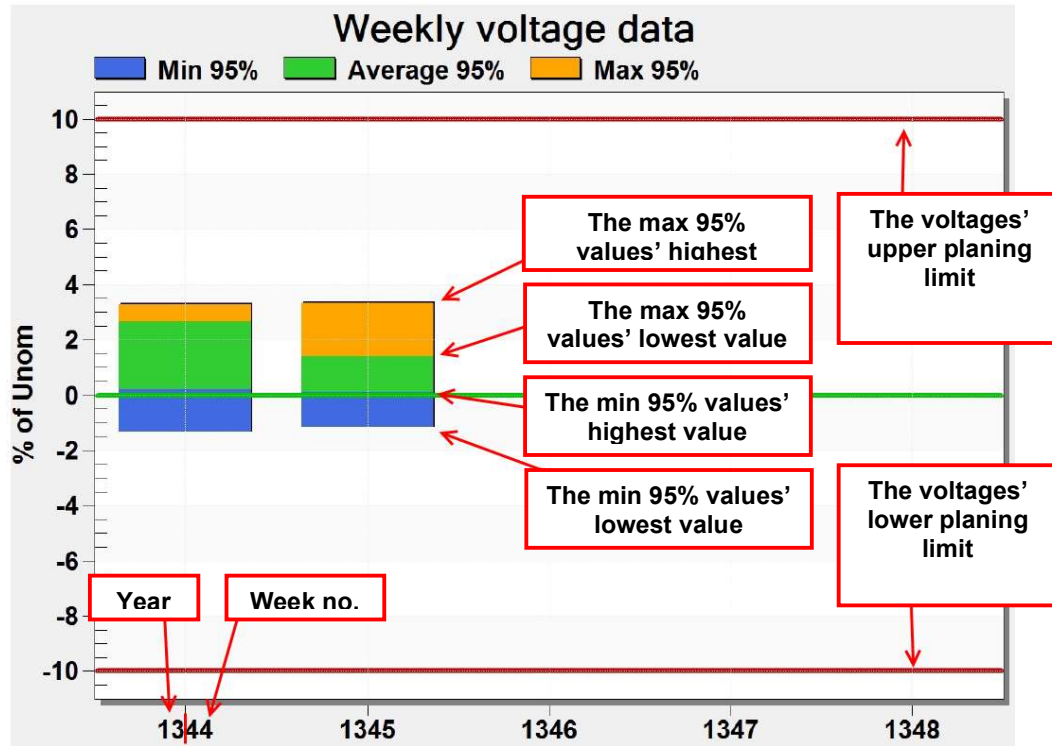


Figure 55

In the report the sags/swells and transients are also presented with graphs for:

- Amount per week
- Amount per hour (statistical)
- Depth over time

8. Current analysis report (IEEE519)

Optional module

This module can be used to analyze current according to norm IEEE519 Recommended Practice and Requirements for Harmonic Control in Electric Power Systems.

Analyzed parameters are:

- Voltage THD
- Current
- Current TDD
- Current THD
- Frequency
- Power
- Individual voltage harmonics
- Individual current harmonics
- Power factor
- Voltage unbalance
- Current unbalance
- Flicker

3.4.15 The Event list

The PQ Secure Light has an event list, **Local event list**. This list provides information about registered events in the PQ Secure Light system such as disturbances, communications details and more. All information is saved with a time stamp making it easier to study information from a number of meters simultaneously. For example, is it possible to study the propagation of a disturbance through an electricity network.

For events stored together with a graph (e.g. disturbances events) which may be studied directly from the event list. You also have the possibility to confirm and add a comment to the event.

Events from the measure site (e.g. disturbances events) are updated with every new download to folders, whereas system events are updated continuously.

The **local event list** displays events for a selected meter and is activated by right clicking on a meter in the system manager and selecting **Events** in the pop up menu.

Figure 56 shows a local event list with one meter selected.

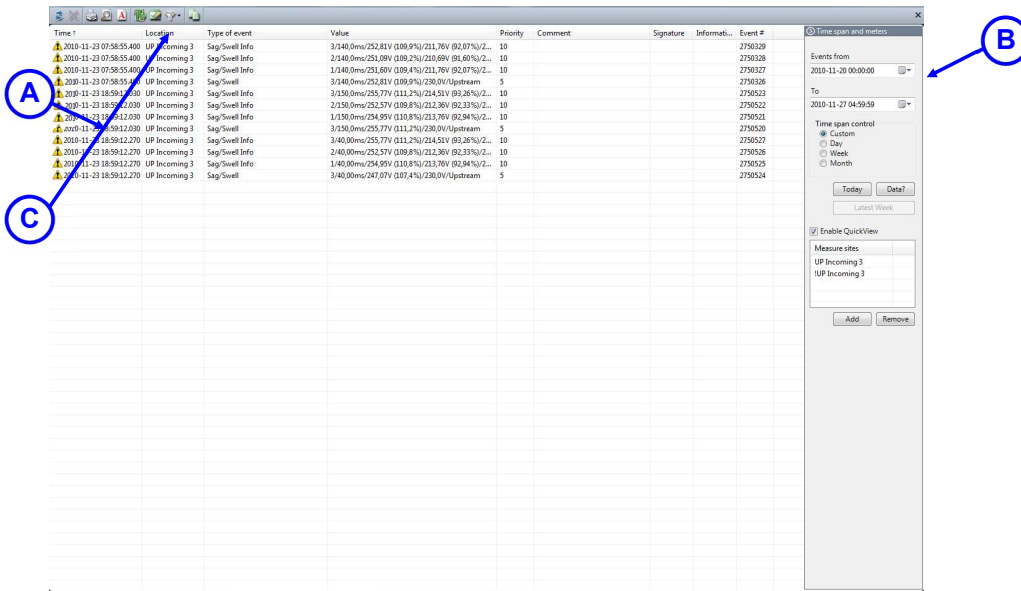


Figure 56

- A. **Event list** – This is where all the events registered during the specified time span are listed (*see* Figure 56)
- B. **Time and location** - Here you can manually select the time span and from which meters you wish to have the information displayed (*see* Figure 56 (B)).
- C. **The toolbar** - Here you can access several useful functions such as configuration, print out etc. (*see* 0).

3.4.15.1 Event settings

In this menu you select which type of events that should be shown as vertical event lines in the graph. The color and line type may also be selected.

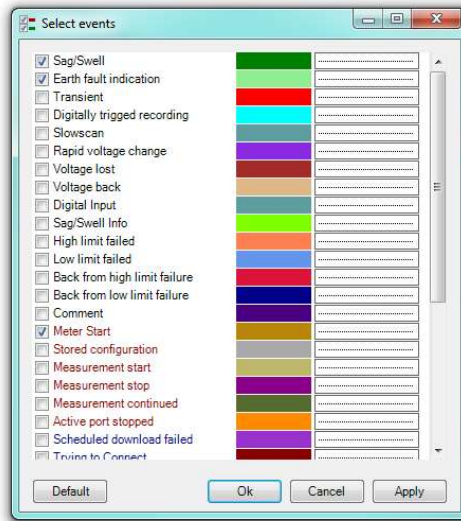


Figure 57

3.4.15.2 The Event menu

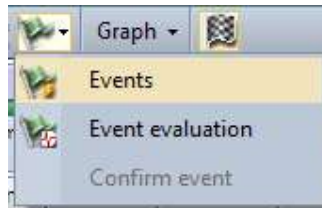


Figure 58

This menu presents shortcuts to the event list (3.4.15 and the event evaluation 3.4.18) When in an event tab (Sag/swell, Transient) you can confirm the event directly from this menu.

3.4.15.3 Graph Limits

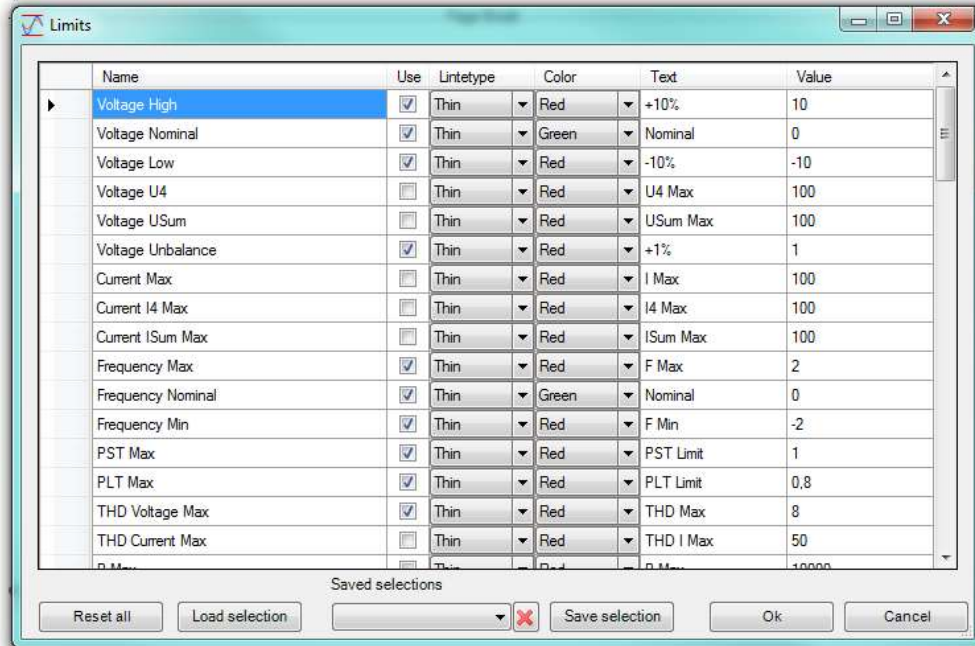


Figure 59

This menu controls the limit lines you can show in the graphs. For each limit (like the Voltage High limit) you can select the color, line type and label as well as the actual value for the line. If you want voltage limits to be +/- 7% instead of the default +/- 10%, just change the appropriate fields to 7.

The column **Use** controls whether a line is visible or not.

You can save all settings using the **Save selection** button. You can also load a previous setting using the **Load selection** button.

3.4.15.4 Graph menu – Settings

This option will open up the Graph Settings tab on the right.

The font type of the different texts in the graph can be changed in the Font sub menu, see Figure 60 - Font selection

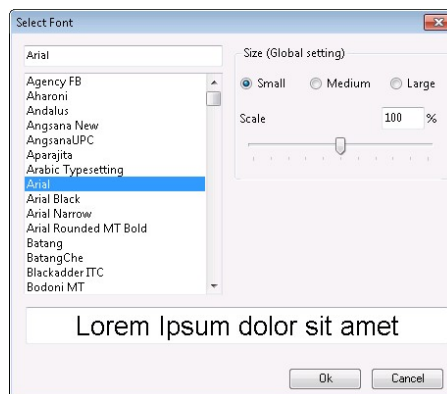


Figure 60 - Font selection

3.4.16 The Event list – List

In the event list you get access to an extensive amount of information about registered events, such as date and time, location, event type etc. The list can be sorted in ascending or descending order by clicking on the column headers. You can get additional information and an event graph (if available) by holding the mouse pointer over the Value column on the event of interest. The **Quick View** dialogue window will then be displayed.

You may also **Delete** events by right clicking the event and select Delete in the pop up menu. Select multiple events by holding down the left **Ctrl** or **Shift** key.

You can also double click on an event to display more detailed information about the event (see Figure 61).

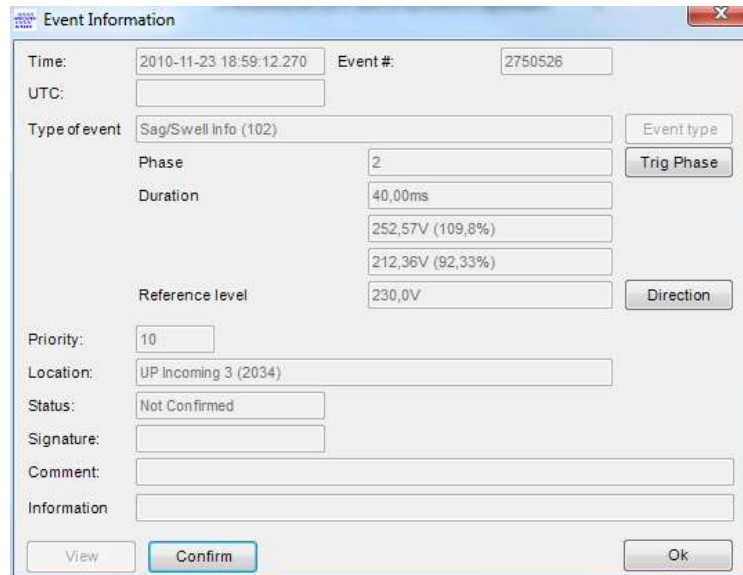


Figure 61

In the Event information dialogue window you can confirm the event by clicking the **Confirm** button. You can also view the event in the graph evaluation (if waveform data is available) by clicking the **View** button. A confirmed event has a comment that describes the cause of the event and the event is removed from the list. In this way the amount of information is kept manageable.

3.4.16.1 The Event list – Event Filters

By clicking the funnel icon you can choose the different kinds of filters that are available.

PQ Event filters removes all system event such as clock set, port stop events etc.

Sag/Swell L-L are sags registered as Line-Line events while Sag/Swell L-N are sags registered as Line-Neutral events. Note that a sag may be registered and visible in both L-L and L-N perspective.

“Sags/Swells” are events registered by older meters that does not support L-L/L-N sags.

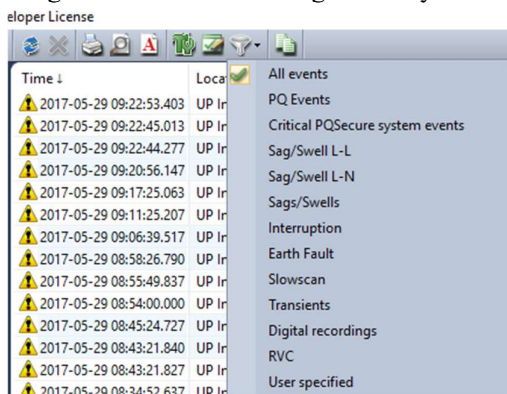


Figure 62

3.4.16.2 The Event list – Time and location

This panel enables you to manually select the time span for displayed events. However, to enable this function you must configure the event list accordingly. Apart from this, the panel works in the same way as the **Time and location** panel in the graph evaluation. Here you also have the possibility to Enable/Disable the **Quick View** window.

3.4.16.3 The Event list – Toolbar

With the toolbar buttons you can access the basic functions in the event list.

A B C D E F G H I



Figure 63

- A. **Refresh** – Retrieve measurement data from the measurement file.
- B. **Stop** – Stop retrieving data from the measurement file.
- C. **Print** – Prints the window.
- D. **Preview** – Previews the printed document.
- E. **Page Settings** – Adjust the settings for the printed document.
- F. **Event Maintenance** – Allows for removing of events.
- G. **Settings** – Settings for the events list.
- H. **Quick Filter** – Quick filtration of the events such as transients, sag/swell etc.
- I. **Copy** – Copies an event.

3.4.16.4 The Event list - Context menu

Right clicking on an event brings up the context menu.

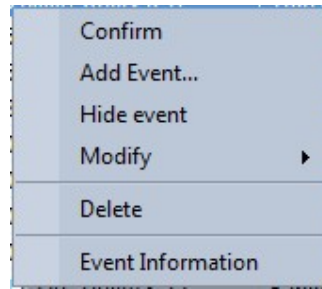


Figure 64

- **Confirm** - Lets the user attach a descriptive text and a signature to the event.
- **Add Event...** - Adds a Voltage lost and Voltage back event pair.
- **Hide Event** – Hides the data from the Event list. The data is NOT removed, only hidden. You can retrieve it from the “*Hide Data*” tab in the graph window.
- **Modify** – Opens a tab for changing direction and changing trig channel. This should be used with caution and only if you know that you are doing it right
- **Delete** - Deletes the selected event completely.
- **Event Information** – Opens the more detailed information window. Here you can view, confirm and edit the event.

3.4.16.5 The Event list – Settings

Here you can change the settings for the event list and define how the information is presented. When selecting **User Specified** in the **Quick Filter** list (see Figure 65) the settings in this section are made active on the event list.

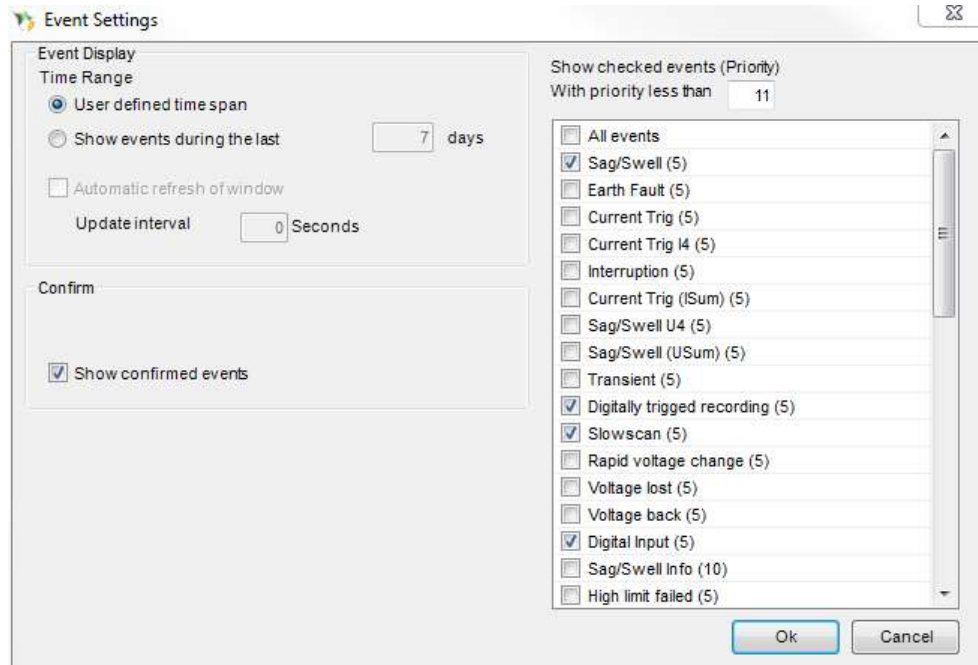


Figure 65

If you select **Show events during the last** and the number of days the window displays the events that have occurred during the last few days.

You can use **Event Priority** to select the types of event you want the list to include. The lower the priority number for an event is, the more important it is. Critical events, for example system events, will have a low priority figure, while events of informative nature will have a high figure. Events with **priority 1** are always PQ Secure system faults, and they are displayed with a **Stop sign** at the start of the event row.

Priority	Type of event
1:	Serious system events
5:	Power quality events
9:	Communication problem
10:	Information events

The user can filter events to be displayed in the event list by checking them in the **Show checked events** list, e.g. if only transients are checked, then the list will only show transient events.

The user can also filter events by priority. Do so by specifying a number from 1 to 11 in the field, “**With priority less than....**”

Unipower recommends the use of one of the following alternatives:

- Select to show: **All events** with priority less than 11 in orders to view all events.
- Select to show: **All events** with priority less than 6 in order to view power quality and serious system events.

- c) If you instead wish to select specific events from the list it is **most important** that you select to show events with priority less than 11.

The event list can be set to automatically update all events that occur in the system, i.e. the event list is constantly updated to show the most recent events. Select the **Automatic refresh of window** checkbox to activate this function.

If you want events to appear in the event list even after they have been confirmed, activate the checkbox **Show confirmed events**.

3.4.17 Different types of events

3.4.17.1 Signalling events

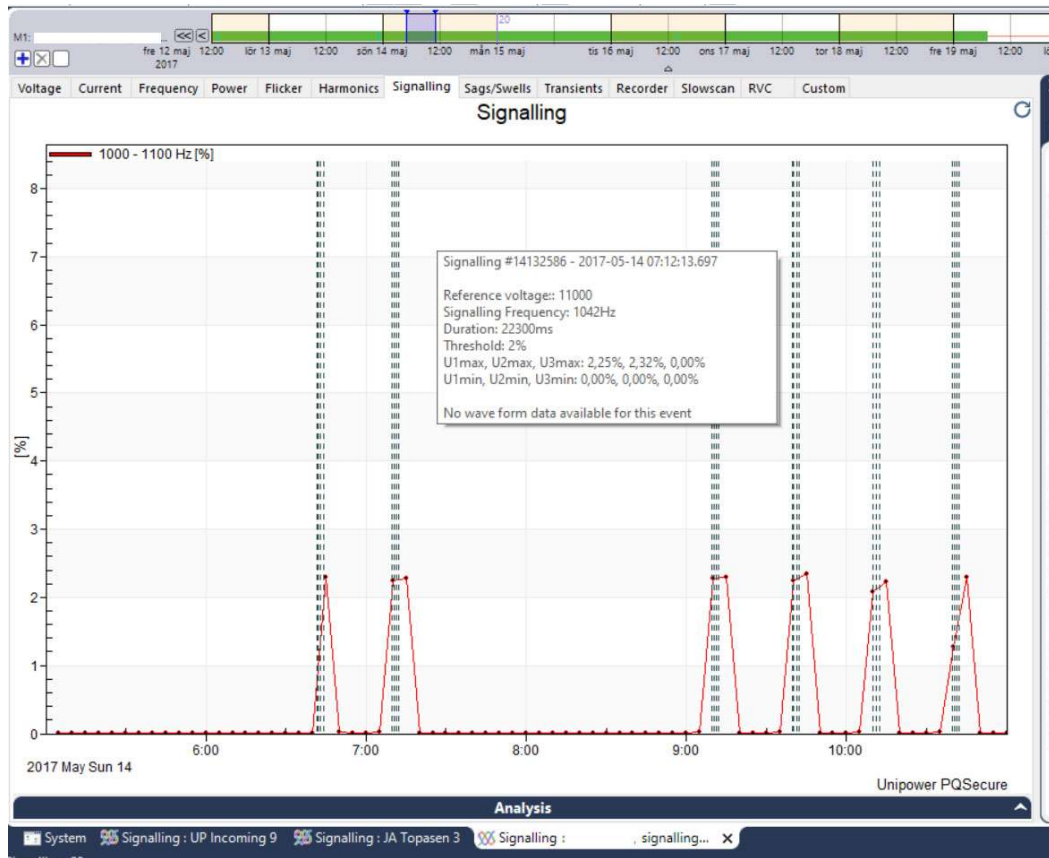
Signalling is communications signals that are transmitted over the power distribution network. They behave like inter-harmonic frequencies and can cause malfunctions in other equipment.

You can set up an event trigger to capture these events. The events are shown in the event list:

tion 19.0.10 - Unipower Intern

Time ↑	Location	Type of event	Value	Comment
2017-05-14 06:41:27.703	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/19840ms/2%/2,29%, 2,38%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 06:42:03.203	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22120ms/2%/2,34%, 2,42%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 06:43:03.283	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/37400ms/2%/2,33%, 2,41%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 06:43:56.060	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22410ms/2%/2,33%, 2,41%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 07:09:45.427	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/19580ms/2%/2,32%, 2,40%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 07:10:20.540	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22460ms/2%/2,25%, 2,35%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 07:12:13.697	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/37510ms/2%/2,34%, 2,42%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 08:37:12.860	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22300ms/2%/2,25%, 2,32%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 08:37:12.860	signalling event	11kV Station Fibre	Three phase RVC	11,00kV/365,4V (3,32%)/6,479V (0,06%)/1,20s
2017-05-14 09:09:43.810	signalling event	11kV Station Fibre	Rapid voltage change	3/11,00kV/365,4V (3,32%)/-6,479V (-0,06%)
2017-05-14 09:10:18.940	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/18790ms/2%/2,36%, 2,43%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:11:19.133	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22240ms/2%/2,30%, 2,38%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:12:11.913	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/37450ms/2%/2,32%, 2,39%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:39:45.853	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22450ms/2%/2,34%, 2,41%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:40:21.017	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/17990ms/2%/2,35%, 2,43%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:41:21.340	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22440ms/2%/2,36%, 2,44%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 09:42:14.273	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/37610ms/2%/2,36%, 2,44%, 0,00%/0,00%, 0,00%, 0,00%
2017-05-14 10:00:44.007	signalling event	11kV Station Fibre	Signalling	11000/1042Hz/22360ms/2%/2,34%, 2,42%, 0,00%/0,00%, 0,00%, 0,00%

These events can also be shown as event lines in any graph:



Refer to the instrument manuals for information how to set up these triggers.

3.4.18 Event evaluation

In this specialized tool you can study sag/swells and transients in a more comprehensive way. Figure 66 shows how you activate event evaluation from the main system view. You will also find the same icon in the graph view.



Figure 66

The example in Figure 67 shows the event evaluation with the event list to the left (only sag/swells are shown) and the graph tab to the right. Click on an event and it will be shown to the right. Commenting events is an important task. With relevant and descriptive comments the work with finding the cause and effects of a sag will be much quicker.

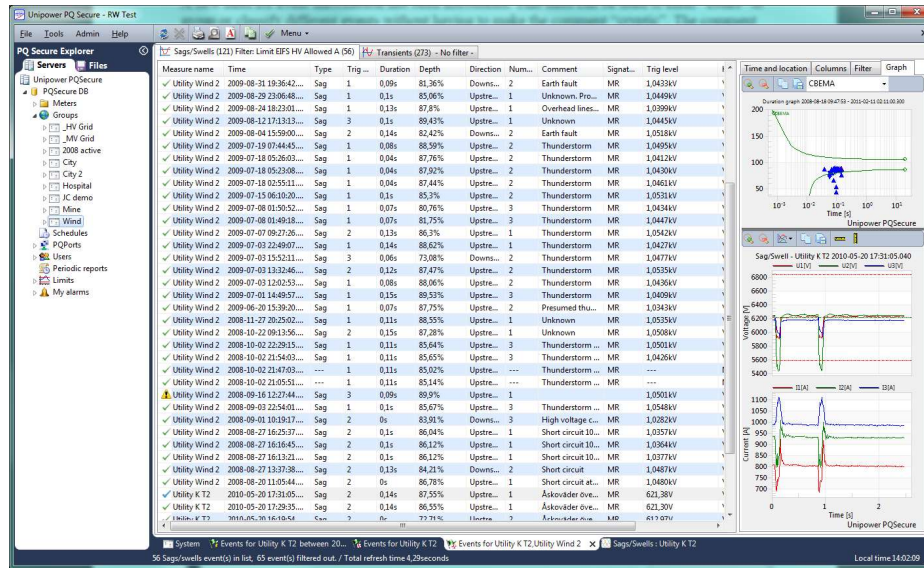


Figure 67

The event evaluation has refined and calculated columns that make the evaluation more efficient. The *Number of triggered phases*, for instance, determines how many of the phases that are under sag condition. This helps you to differ between single phase and poly phase disturbances. The *Type* column classifies the event into interruption, sag, swell, earth fault etc. In the columns tab you can add, change location or remove different columns, see Figure 68.

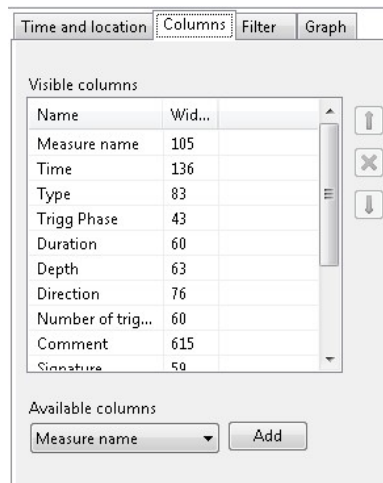


Figure 68

By double clicking on an event you can confirm it, view it in more detail or change the direction parameters.

Event Details

Event type

Sag/Swell

Time

2009-07-08 01:49:18.730

Location

Utility Wind 2

Event no

1240128

Priority

5

Status

Confirmed

Signature

MR

Comment

Thunderstorm

Information

Description

Direction	Upstream
Type	Sag
U Ref	10447.41V
Number of triggered pha...	3
Min Voltage Phase 4	177,18V
Min Voltage Phase 3	8,4714kV
Min Voltage Phase 2	8,4578kV
Min Voltage Phase 1	8,4296kV
Max Voltage Phase 4	198,15V

View

Confirm

Direction

Event type

Trig Phase

Ok

Figure 69

When selecting an immunity limit in the graph tab all events that are outside of the limit will be marked as red. In the example below the ITIC limits have been selected.

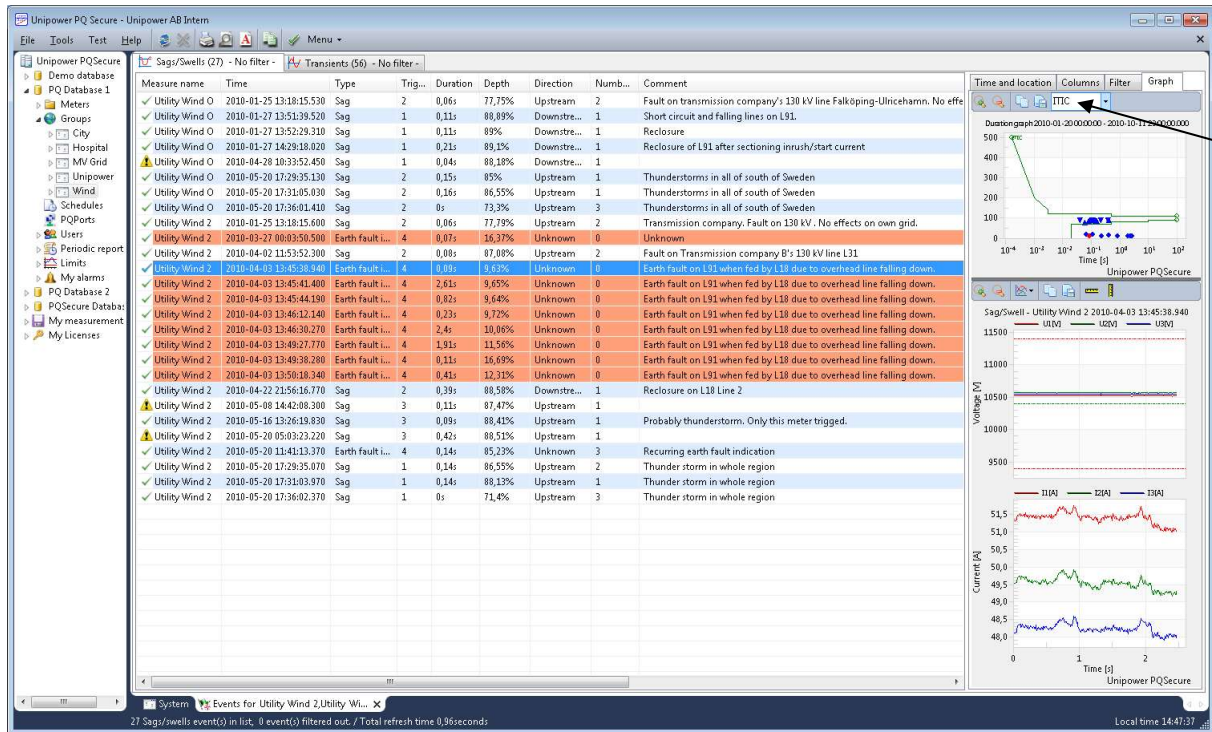


Figure 70

3.5 Index

A		
Active energy	25	
Active power	25	
Add file	9	
Add/Remove meters	20	
Analysis	20	
Analysis view	46	
Apparent energy	25	
Apparent power	25	
Axis options	22	
C		
Cancel button	21	
CBEMA	13, 33, 57	
Change event direction	70	
color	63	
Comment	56, 61, 64, 69	
COMTRADE	50, 51	
Configuration	7	
Confirm events	70	
Custom graph	15, 42	
D		
Direction	14	
Displacement power factor	25	
Duration graph	33	
E		
EIFS	33	
EN 50160	10, 56, 58	
EN 61000-2-12	58	
EN 61000-2-2	58	
Evaluation window	20	
Event evaluation	69	
Event list	10, 61, 69	
Event settings	62	
Event settings	67	
Export graph	51	
F		
Flagged data	21	
Flagging	22	
Flicker report	59	
font type	63	
Fuse	5	
G		
Graph	11, 18, 51, 61	
Graph evaluation	13, 18, 20	
Graph limits	63	
Graph property tabs	21	
Graph settings	55	
H		
Harmonics	44	
Headers	22	
Hide data	66	
high limit	63	
Horizontal zoom	50	
I		
IEC 61000-4-30	22, 24	
IEEE	52	
Immunity limits	72	
Individual harmonics	44	
Installation	5	
ITIC	13, 33, 57	
L		
Language	17	
Legend visibility	22	
Liability	6	
Licenses	7	
line type	63	
low limit	63	
M		
Measurement file	9	
Microsoft .NET Framework	7	
MS Excel	18	
MS Word	11, 18	
Multiple meters	48	
N		
Negative phase component	45	
P		
Parameter settings	20	
Patent	6	
Positive phase component	45	
Power factor	25	
Power supply	5	
Power supply protection	5	
PQ Online	7	
PQ Report	59	
PQDif	52	
PQDIF export	52	
Priority	67	
Priority number	67	
Q		
Quantity tabs	20	
QuickView	63	
R		
Reactive energy	25	
Reactive power	25	
Recorder	39	
Recorder Graph	40	
Refresh button	21	
Report	10, 56, 57	

S

Safety	5
Sag/Swell	14
Select graph data	44
SEMI F47	33, 57
Show events	20
Show/hide flagged data	21
Signalling	24, 29
Signature	66
Split graph	15, 43, 48
SSG 4908	33
Symmetrical components	45
System manager	17, 18

T

Time line	20
Time span control	11
Tool bar	20
Toolbar	61, 65

Transients	36
------------------	----

U

Unbalance	45
Undertaking	6

V,W

Vertical cursor	50
Warranty	6
Waveform Graph	37
Workspace	18

Z

Zero phase component	45
Zoom window	20