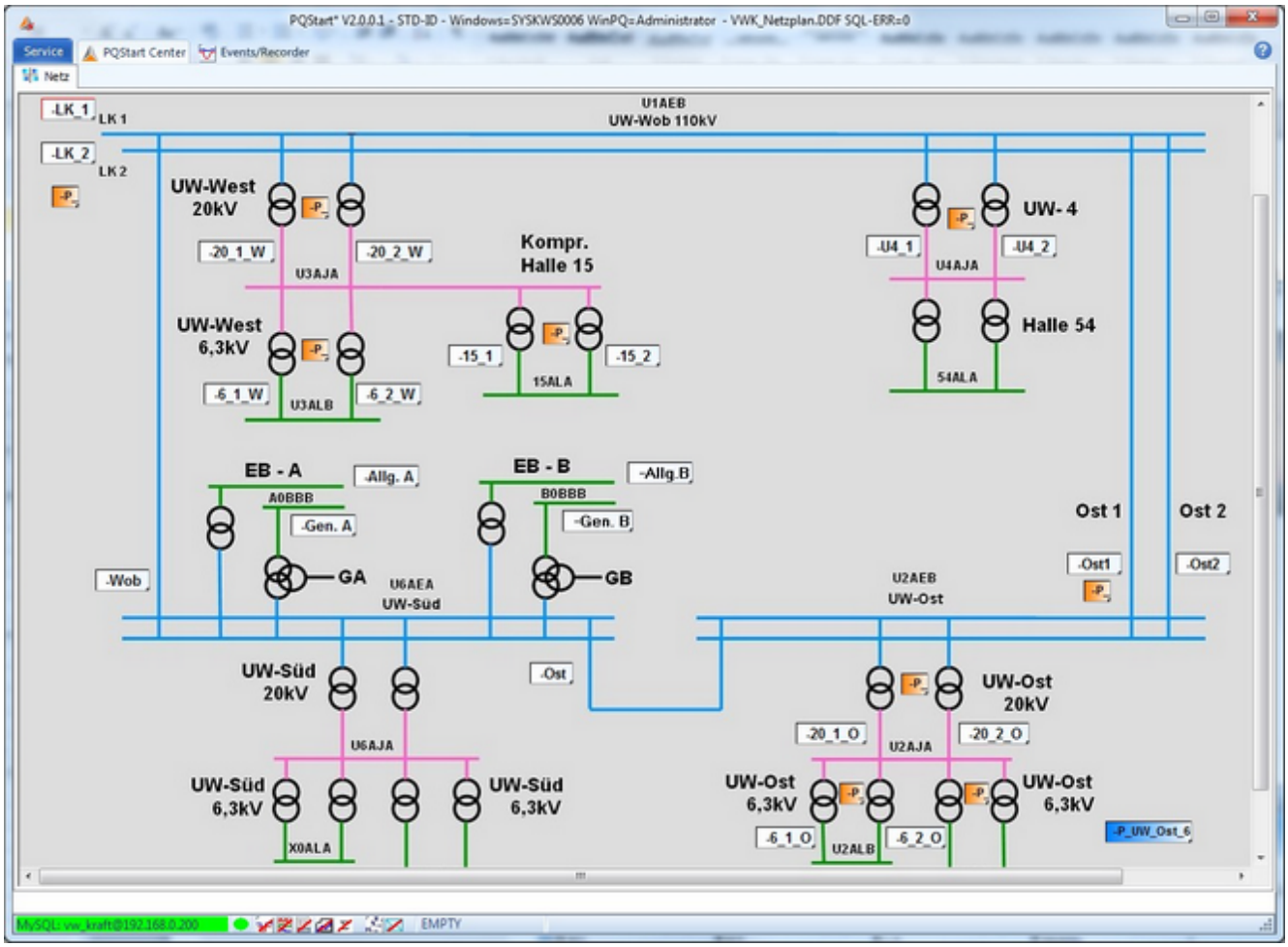
Instruction manual

WinPQ Evaluation-Software



Software WinPQ

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PQ Para Express

For parametrisation purposes of **PQI-D** and **PQI-DA** there is an additional software "**PQParaExpress**". This software can be downloaded free of charge from our website www.a-eberle.de.
This software is able to change all device parameters localy. Is it also possible to check the online values to review if the modifiers are setup correctly.

The PQParaExpress does not have to be installed and can be run from an USB stick.

The instructions from the PQPara part of this help file also apply to the PQParaExpress.

WinPQ smart / PQI-DA smart

For parametrisation purposes of **PQI-DA smart** there is an additional software "**WinPQSmart**". This software has its own instruction manual and is not part of this manual.
The software WinPQSmart can be downloaded free of charge from out webiste ww.a-eberle.de.

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General information

Based on the order code, the WinPQ evaluation software stores measurement data either in an MySQL® database or a MariaDB database. The software supports the installed measuring systems PQI-D/DA and PQI-DA Smart as well as the mobile grid analyzers PQ-Box100/150/200.

WinPQ was developed in collaboration with power companies and industrial enterprises with the goal of creating a user-friendly and adaptable solution to evaluate power quality parameters in power distribution grids.

The system can be used with low, medium and high voltage grids.

The purpose of this program is to prepare the power quality measurement data and error logs stored in the SQL database so users can display them on their computer screen. To this end, the program provides tools to select stored data as well as a range of graphical and tabular views and pages for predefined reports with power quality characteristics in accordance with the European norm EN 50160, and IEC standards IEC 61000-2-2 and IEC 61000-2-4.

The following manuals are available:

- Commissioning instructions
- Commissioning and configuring the PQI-D(DA) and PQI-DA Smart devices and WinPQ evaluation software
- Operating instructions for the PQI-D devices
- Operating instructions for the PQI-DA devices
- Operating instructions for the PQI-DA Smart devices
- Operating instructions for the WinPQ evaluation software (this document)

WinPQ program features:

- Automatic reporting according to the compatibility levels of EN 50160, IEC 61000-2-2 or IEC 61000-2-12.
- Information about faults in the grid in the form of error logs
- Management of many of the installed grid monitoring devices (PQI-D/PQI-DA Smart and PQ-Box 100/150/200)
- Automatic collection of long-term data and events
- Statistical analyses of long-term data
- Correlation of events and different measurement data
- All of the components can communicate with each other on a network
- User-friendly, user-oriented evaluation
- Data export functions (e.g., CSV, COMTRADE and PQDIF).

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System requirements

PC (server) system requirements for WinPQ

- Operating system:
  - Windows 7 (32 Bit/64 Bit)
  - Windows 8/8.1
  - Windows 10
  - Windows Server 2008
  - Windows Server 2012
  - Windows Server 2012 R2
  - Windows Server 2016
- Hardware:
  - Processor: at least dual core
  - Memory: 20 GB + 1 GB for each connected device per year (if the standard profiles are used)
  - RAM: at least 4 GB
  - Monitor with minimum resolution 1280 x 1024

Ports:

Program	Purpose	Server/Client	TCP Port
MySQL (mysqld.exe)	Database server	Server	3306
PQRS232Server (PQRS232Server.exe)	RS232 conversion software	Server	1701, 1702, ...
PQReport, PQVisu, PQStart (PQReport.exe, PQVisu.exe, PQStart. exe)	Read and display MySQL data	Client	3306
PQPara (PQPara.exe)	Communication with the devices through PQRS232Server	Client	1701, 1702, ...
PQManager (PQManager.exe)	Transfer data from the devices to the database	Client	1701, 1702, ...
WuT-Com	Configure COM server	Client	1111, 8000
PQSmartManager, WinPQSmart (PQSmartManager.exe, WinPQSmart.exe)	Access to PQI-D Smart devices	Client	5040

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WinPQ desktop/start screen

All of the devices are displayed on the**WinPQ desktop/start screen**, giving the user quick access to the devices and/or the data they contain. You can also split different grid regions, voltage levels and device groups across several pages.

Different types of views can be created depending on how the software is used:

- default tile view
- geographical view (GPS coordinates)
- tile view with graphical background

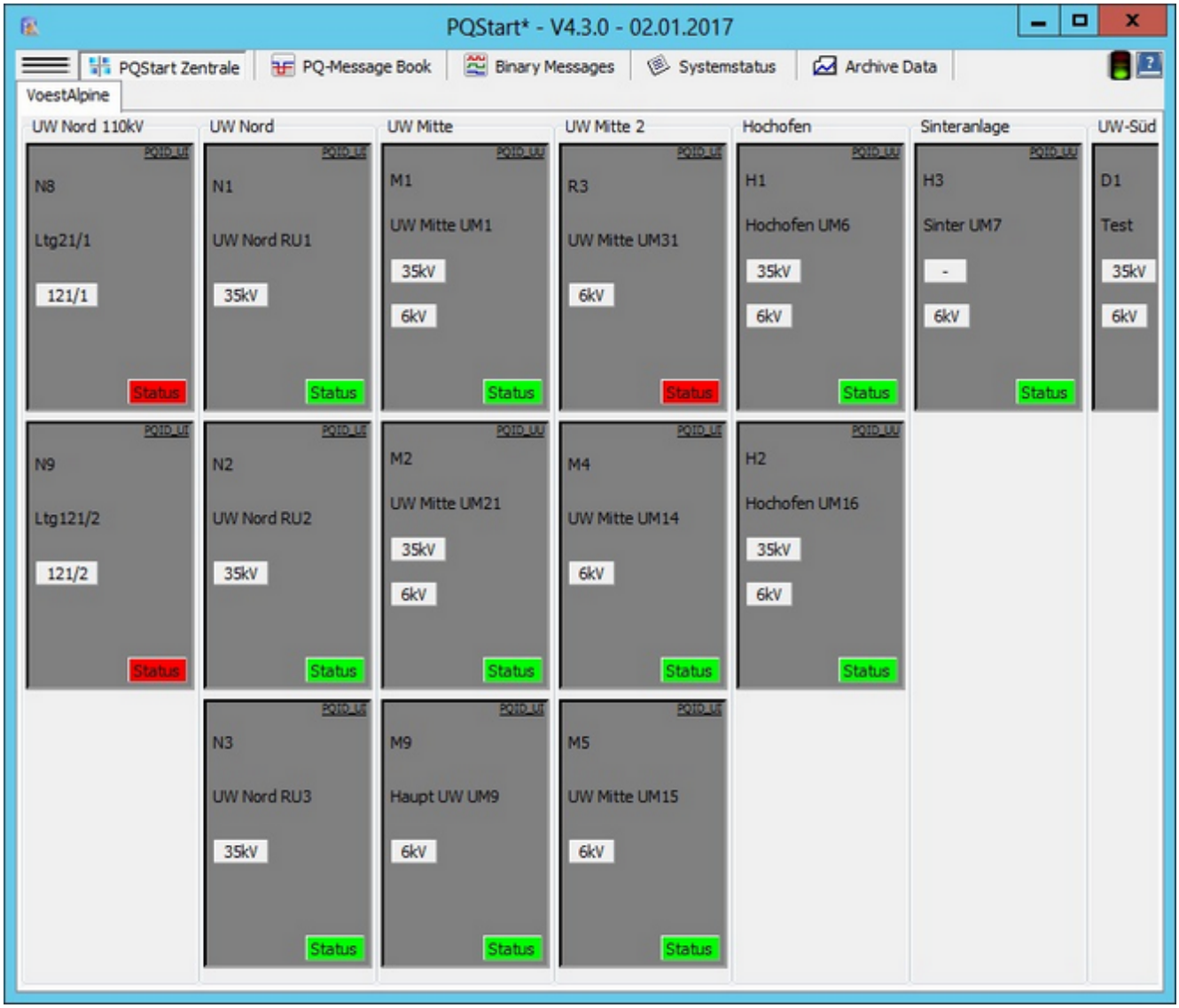

Figure: The figure shows tiles that include substations

The desktops are stored in XML format. These XML files are stored in the database so that every client can access all the desktops. Which also means that every user with the right to alter desktops can do that. Other users, which use the same Desktop will see the changes after the next restart of PQStart.

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Designing the WinPQ desktop

The WinPQ desktop can be displayed in two ways.

- The program starts by default with the classic desktop
- You can use the menu options to switch to a graphical desktop.

Note that you cannot switch back to the classic desktop once you have switched to a graphical desktop. If you create a graphical desktop, we recommend saving it under a different name so you can switch back to the classic desktop at a later stage. In both views, the device tiles can be moved around by dragging and dropping them (press and hold the left mouse button to move them). You can also group the devices and spread them across several pages if this works better for you. You can configure the tab to display messages pertaining to the devices on the page. This function is configurable.

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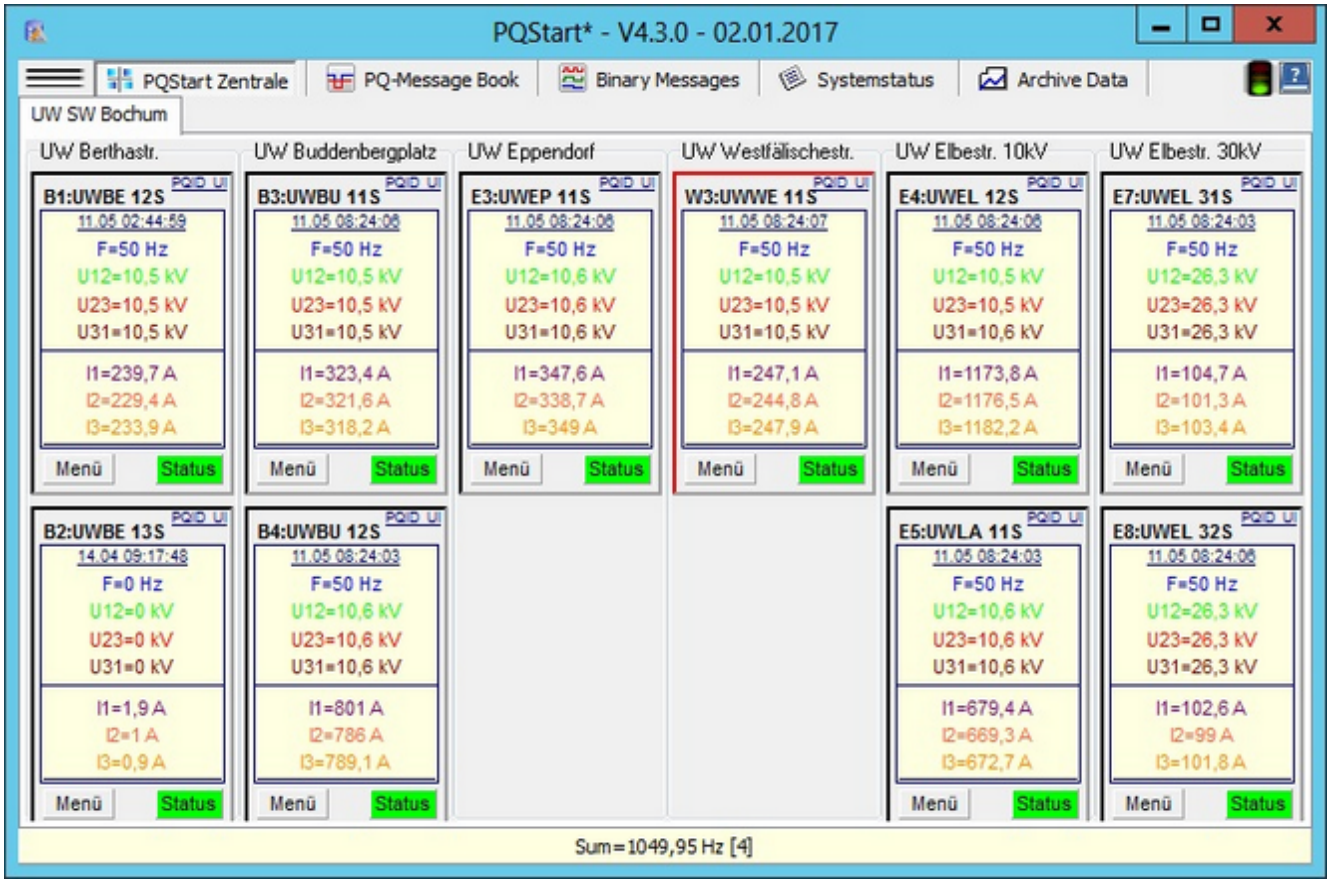
Classic desktop

By default, the program displays as 'tiles'.

Groups can be arranged vertically or horizontally by right-clicking in an empty space in a group and selecting 'Group: change direction'.

A **vertical display** is best when there are a lot of groups (e.g., subgroups with up to three devices) that do not contain many devices.



A horizontal display is better if you would like to combine a lot of devices into groups (e.g., switchgear with a lot of outgoing feeders).

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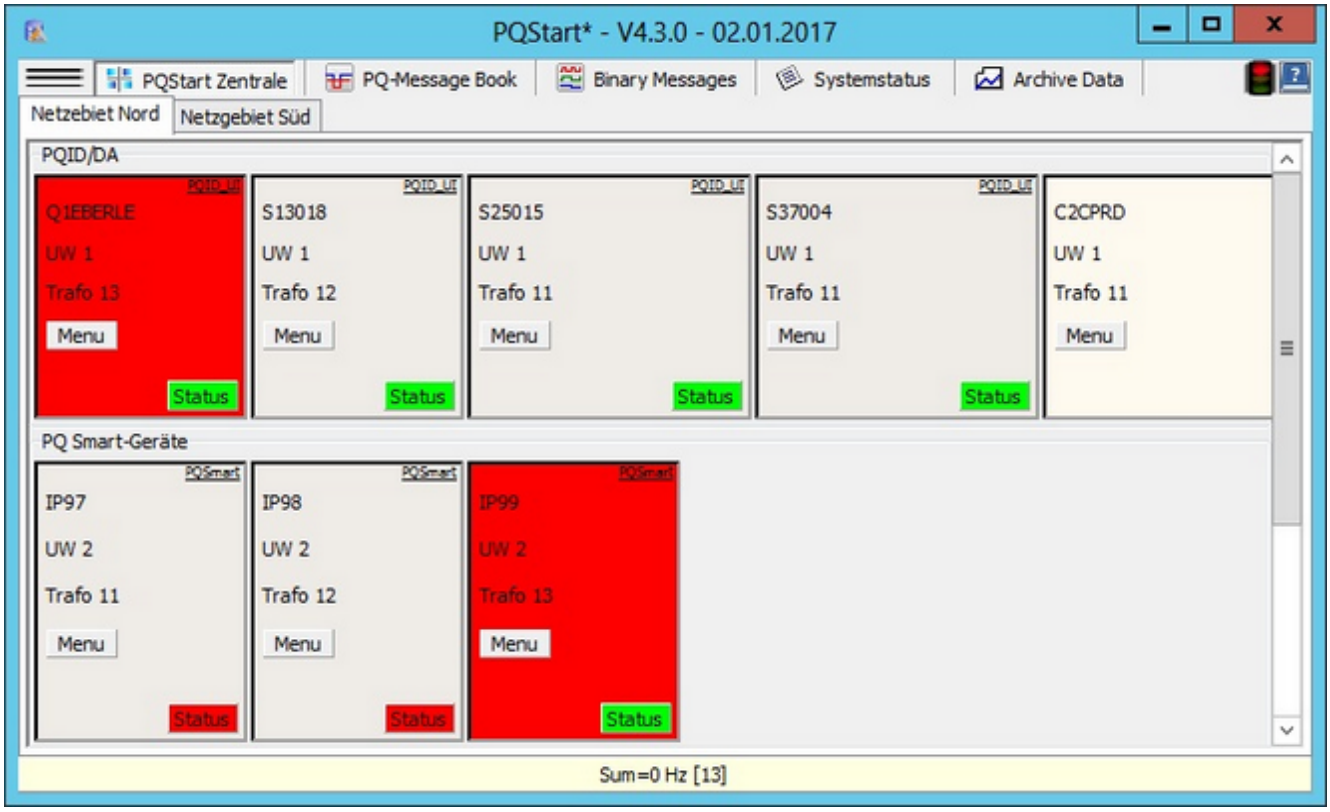
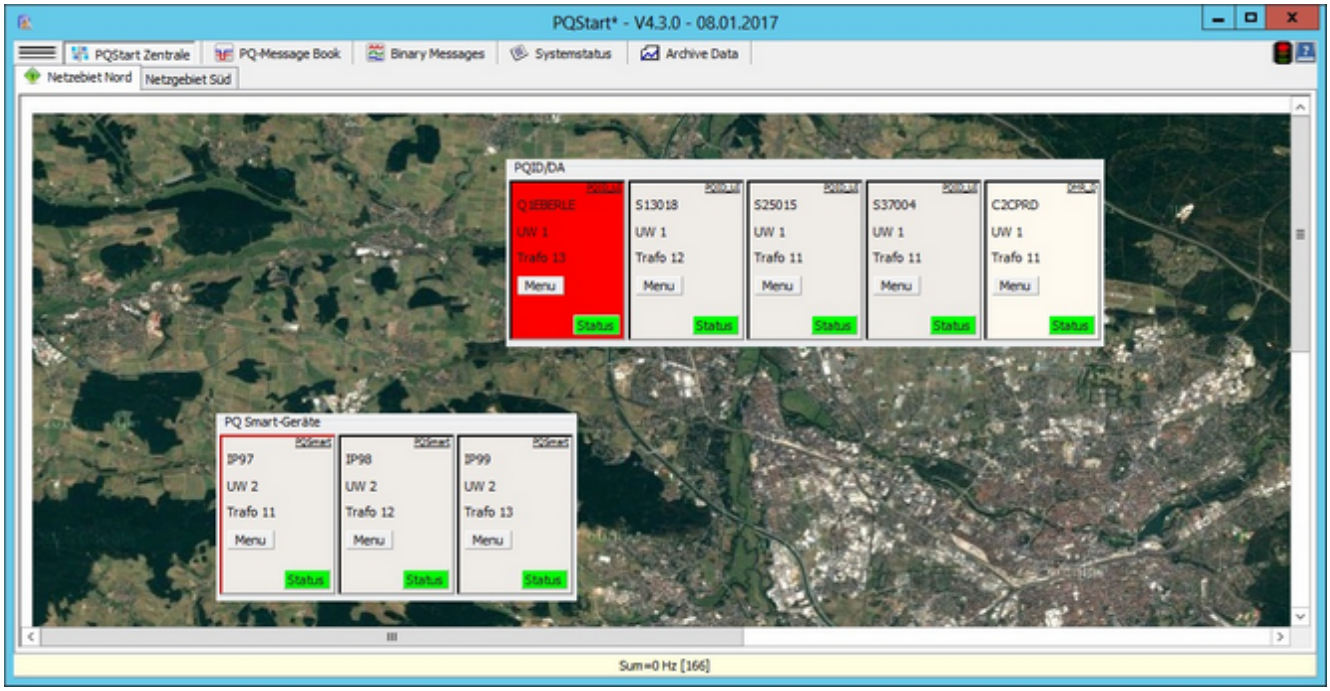


Use the context menu (right-click on a device tile) to change the size of the tiles and groups.

Graphical desktop

As an alternative to the classic desktop, the graphical desktop enables you to configure your screen the way you want it. In the graphical desktop it is possible to group devices by dragging them onto each other.



Alternative layout options

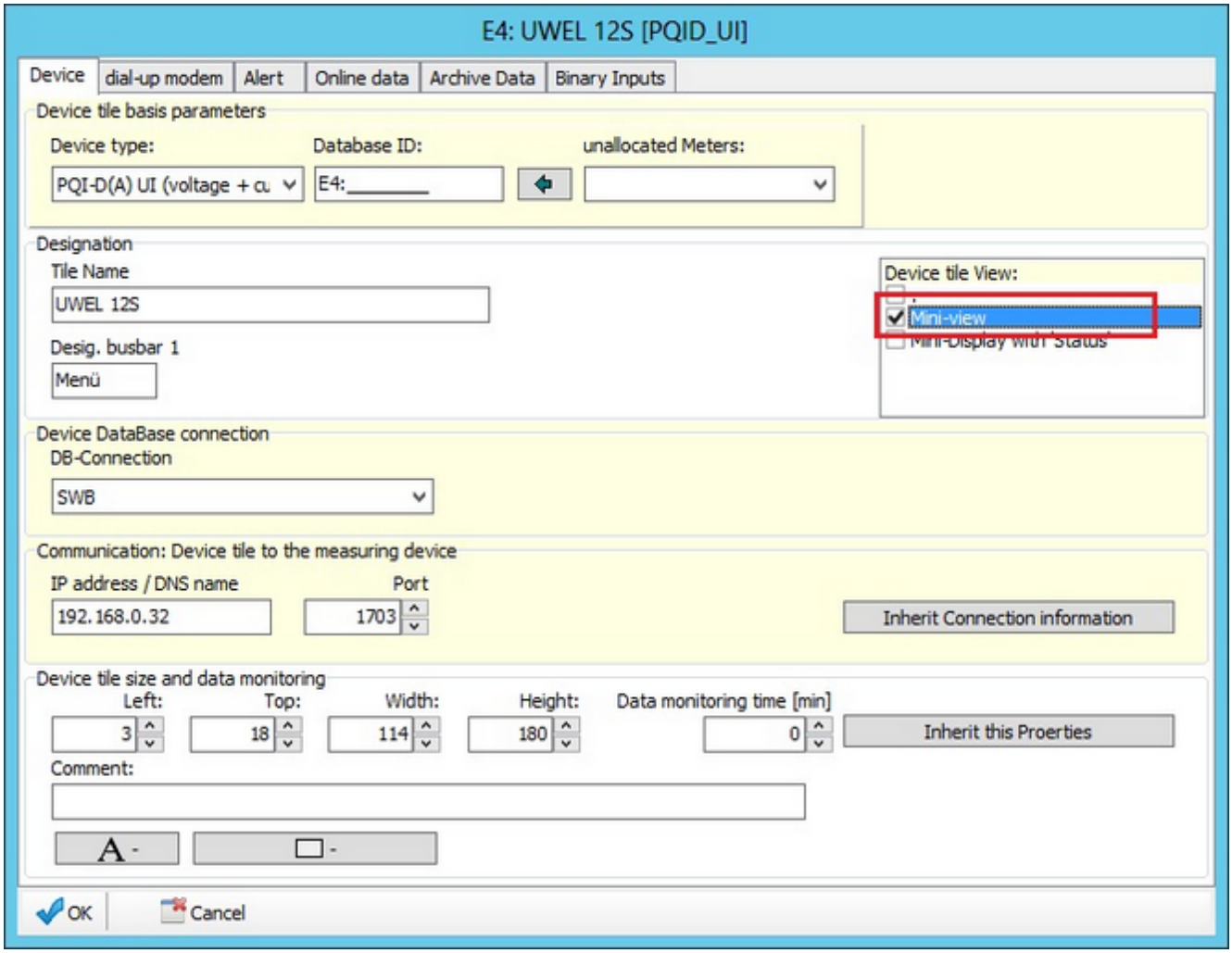


Figure: Displaying data in the 'Mini-view'

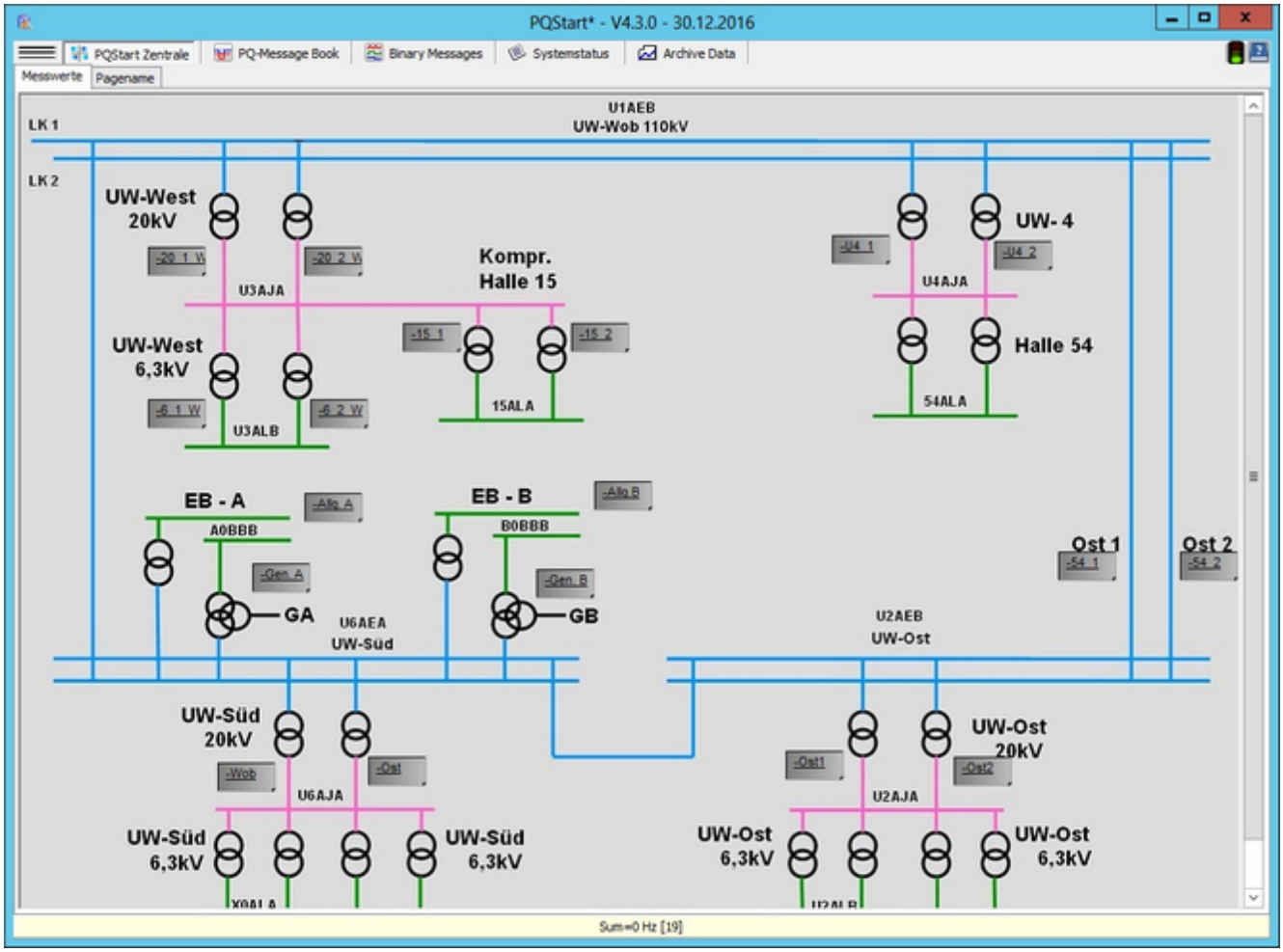


Figure: Look and feel of the devices' 'Mini-view'

The following assumptions apply:

- The target group consists of people who evaluate the recorded operating data (no error logs, no EN events, no reports).
- It is a device layout with graphical background (the background is defined by the user).
- The mini-view was selected to display as many devices in as little space as possible.
- The description (e.g., F6_ost) on the device panel is a link (cursor displays as hand) to the archive data. Clicking on the device link opens the Archive data page where the devices are pre-selected.

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Background images

Right-click to display the context menu and select **'Background image from file'**. File formats .bmp, .png and jpg are supported.

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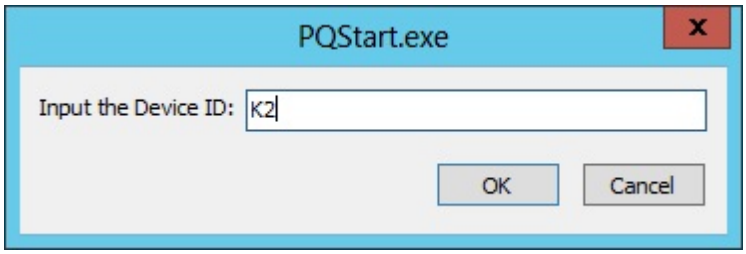
Desktop context menu for a graphical desktop

The context menu that is displayed by right-clicking on the desktopoutside of groups is structured as follows:

The following functions are available:

- **Page: New** - creates a new page with a device
- **Page: Designation** - enables you to specify a page text
- **Group: Paste** - to paste a group from another Tab to this one
- **View: Refresh** - forces the whole group to be refreshed (e.g., in the event of accidental overlapping)
- **Background image from file** - select a background file
- **Find device** - uses the device ID to bring the device to the foreground (the matching device has a green frame).



A 'New group' **function** is not necessary. Groups are created in the graphical display by dragging and dropping the device panes on top of each other.

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Groups

The purpose of groups is to group devices, for example, by subdevices.

- **Group: properties** - The description of the group, the position of the group, the font and the size of the font are defined in the group properties.
- **Group: New** - Use this function to add a new group.
- **Group: Cut** - Use this function to remove a group from the current page. You can paste the group you just cut somewhere else.
- **Group: Paste** - Paste in: Group to paste previously cut groupsin this position. This is a goodway of moving groups between pages.
- **Group: Align** - Changes the alignment of the group either from left to right or from top to bottom.

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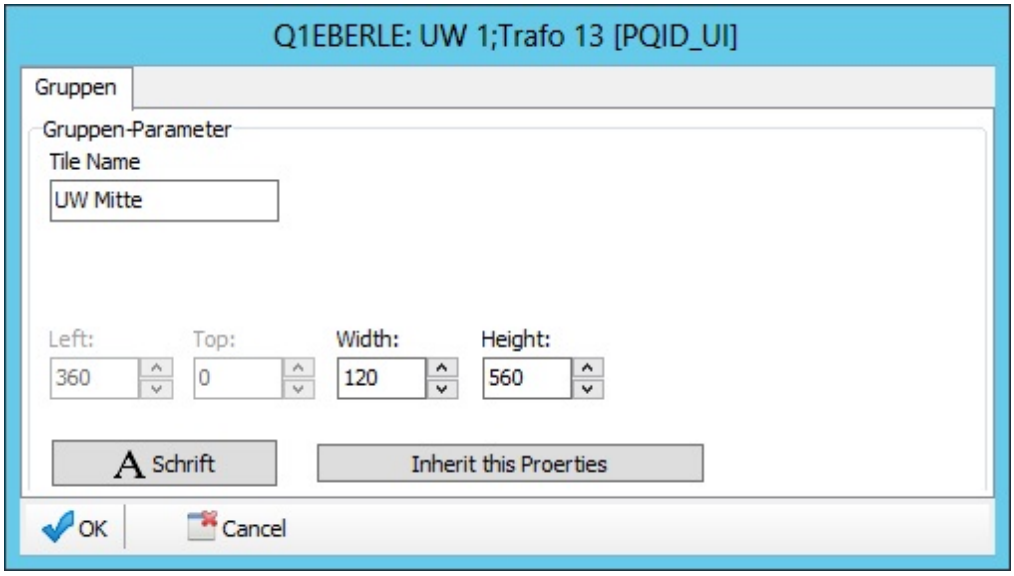
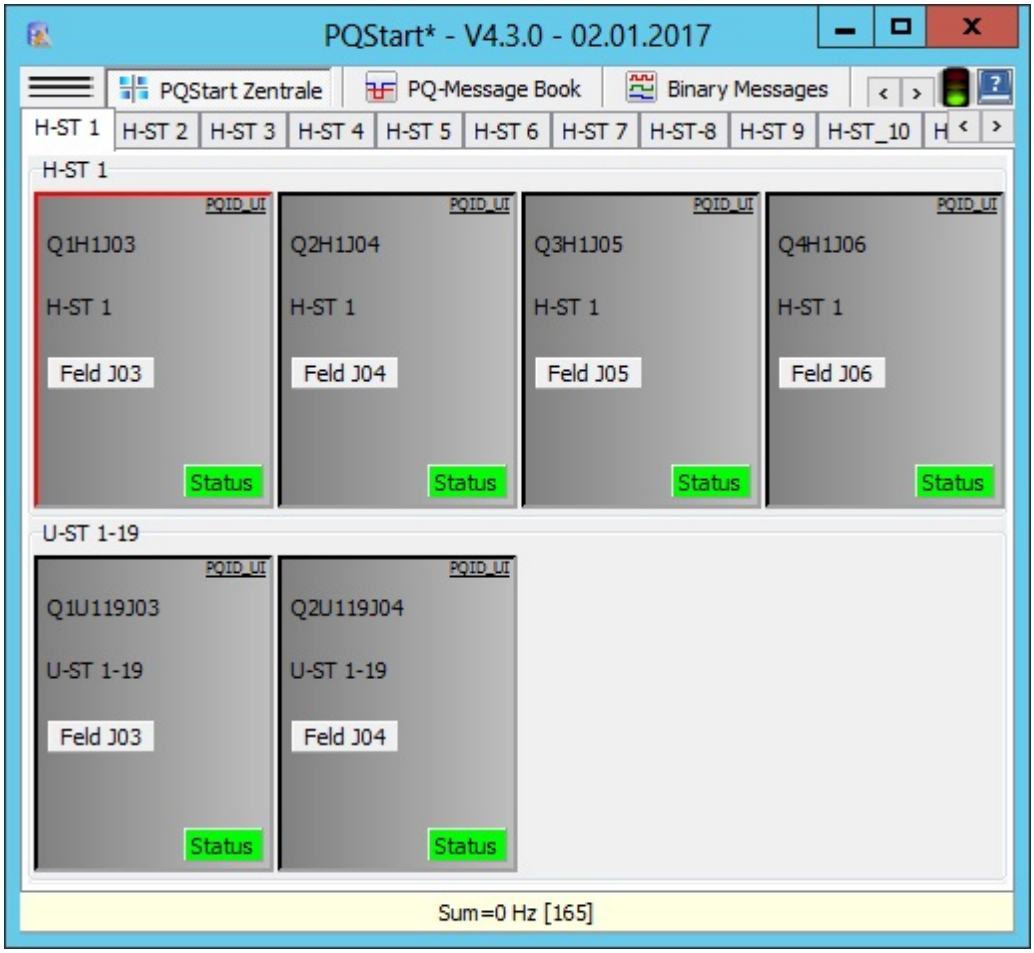


Figure: Group properties

Pages

Like groups, pages are used to organize devices.

Devices in a grid area can be grouped on pages so you can easily switch between the different grid areas by clicking on the tabs.



Functions:

- Page: New - To create a new page, right-click on the desktop to display the context menu and select Page: New. Enter a name for the new page. An empty tile is added to the page.
- Page: Description - The description of the page is user-definable and specifies the name of the page in the desktop. You can quickly draw attention to an event that occurs on one of the page's devices even if the page is inactive by giving the tab an appropriate description.

The 'Delete page' function does not have to be run separately. A page is automatically deleted when the last device is deleted from it.

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General information about the device tiles

The following applies to the device tiles:

- Each device in the system is represented by exactly one device tile.
- All of the device's properties (descriptions, connection information, GPS coordinates etc) are stored with the tile.
- You can group the tiles and spread them across several pages (if needed) to create a better overview.

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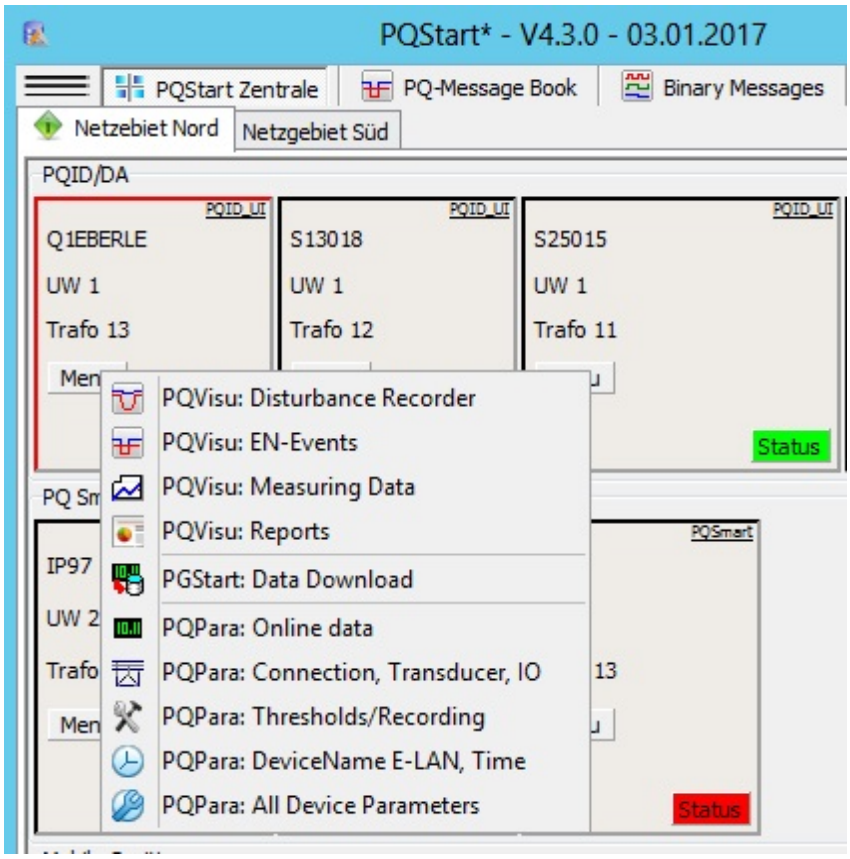
Local tile menu

The **'Menu'** button on the device tile displays options based on the PQ device tile you are clicking on.



The context menu that displays by clicking on the '**Menu**' button displays the following options for the **PQI-D/DA device**:

PQVisu: Disturbance Recorder	Retrieve error logs from the database and view and evaluate them
PQVisu: EN-Events	View power quality events
PQVisu: Measuring Data	View level-time diagrams (long-term data)
PQVisu: Reports	Create daily, weekly or yearly reports

Direct link to measurement data:

PQPara: Online data	View online data as level-time diagram or measured value table
PQStart: Data Download	Read measurement data and events manually from devices (most installations do this through the 'Taskscheduler')

Direct link to change the device configuration:

PQPara: Connection, Transducer, IO	measuring transformer, voltage, LEDs, Binary Inputs, etc.
PQPara: Tresholds/Recording	selection of the recorded values within their data classes, trigger

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	conditions, etc.
PQPara: DeviceName, E-LAN, Time	basic setup for communication, time and device name
PQPara: All Device Parameters	displays all of the above settings in one surface

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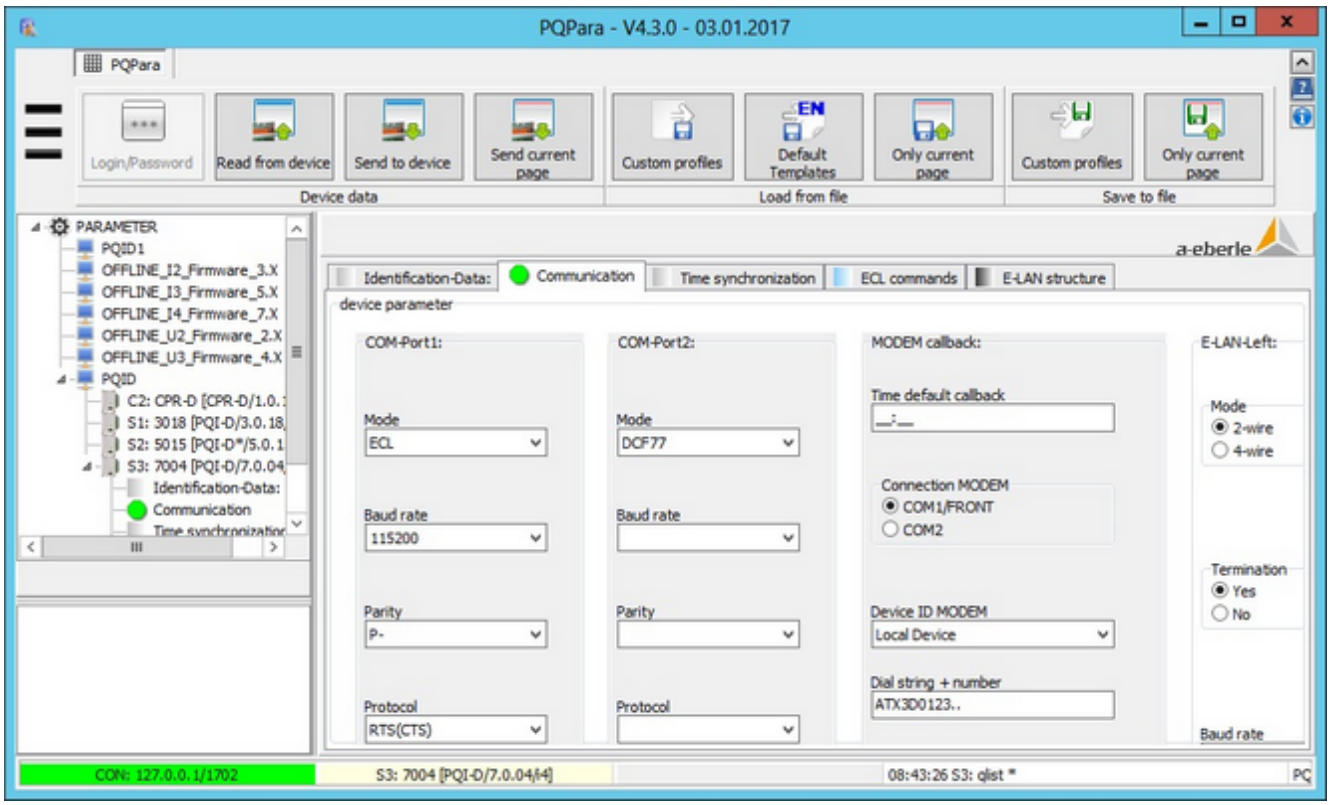
Example of changing the device configuration with: PQPara

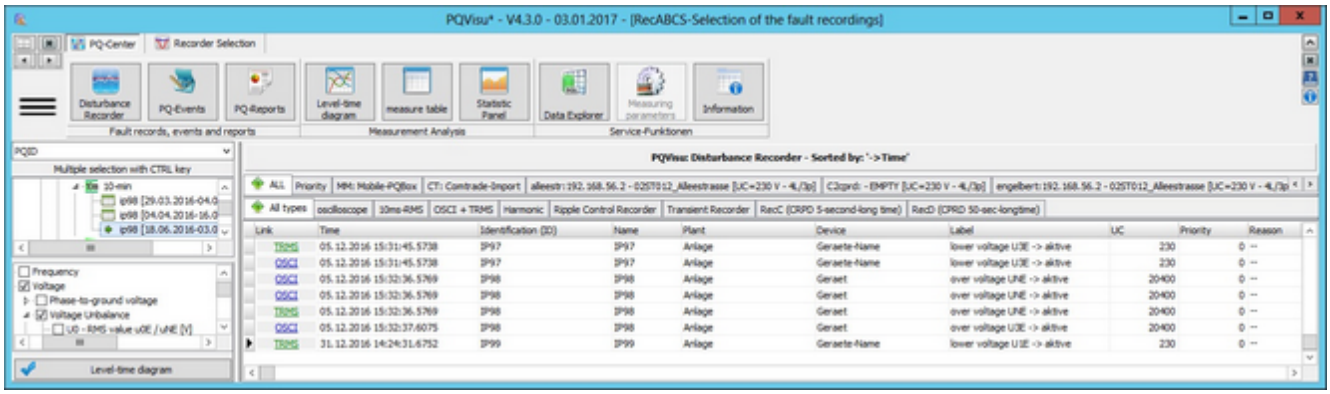
This screen enables you to establish a connection using the default settings so you can select a device and upload data:



Example of displaying stored data with: PQVisu

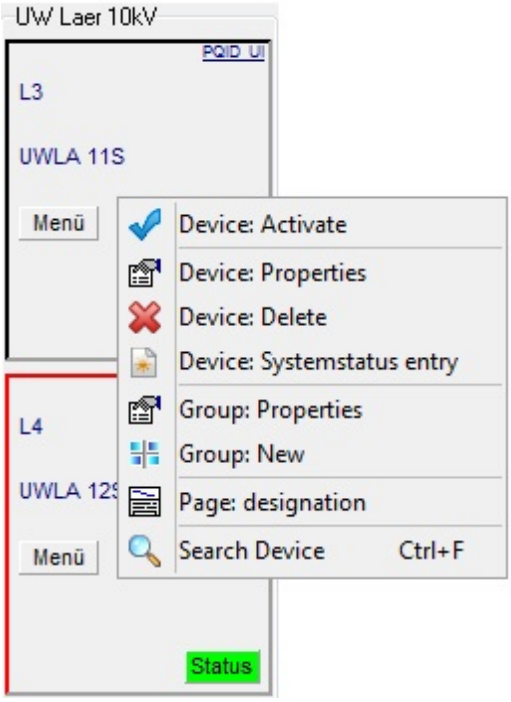
The purpose is to prepare the next program option based on the selected device. For example, activate a filter in the next view in the visualization software:

Example: Error log from a device:



Context menu

Right-clicking on a device displays the following menu:



The following functions are available:

- **Device: Activate** - if the data on this device are to be stored in a database other than the one that is currently active, the database connection is switched accordingly.
- **Device: Properties** - displays the properties for the selected device.
- **Copy device settings** - copies the device
- **Paste device settings** - pastes the copied settings of a device into the currently selected device
- **Device: New** - adds a new device tile to the group with the same settings as the device that is selected
- **Device: Delete** - deletes the selected tile (NOTE: if this device is the last one in a connection, the whole connection is deleted -> data are no longer transferred from the device to the database)
- **Device: Entry in operation log** - adds an entry to the operation log for this device
- **Group: Properties** - opens the properties for the group to which this device belongs
- **Group: New** - creates a new group with a new empty device
- **Page: Description** - add a description to the current page
- **Find device** - enables you to use device names to locate devices in the desktop

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Device tile colours

The device **'Q1:H7J03'** is running and is monitored.	There are no measurement data in the database for '**Q2:U119J05**'.	The device '**Q2:H6J04**' has a communication problem and cannot be accessed.

- The default colour grey indicates that measurement data are available for the device ID that is stored in the database. The user can change this colour at any time, for example, to distinguish different device groups.
- The colour yellow indicates that a new device was added before measurement data could be read from the database.
- The colour red indicates a communication problem between the measurement device and the database. The maximum delay before this message is triggered is specified in 'Device properties'. The data are based on the 10-minute values.

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The Status button

The STATUS displayed on the device tile provides information about new error logs or PQ events(device status).
Here can quickly create the most important standard reports (e.g., EN 50160 - Basic report)

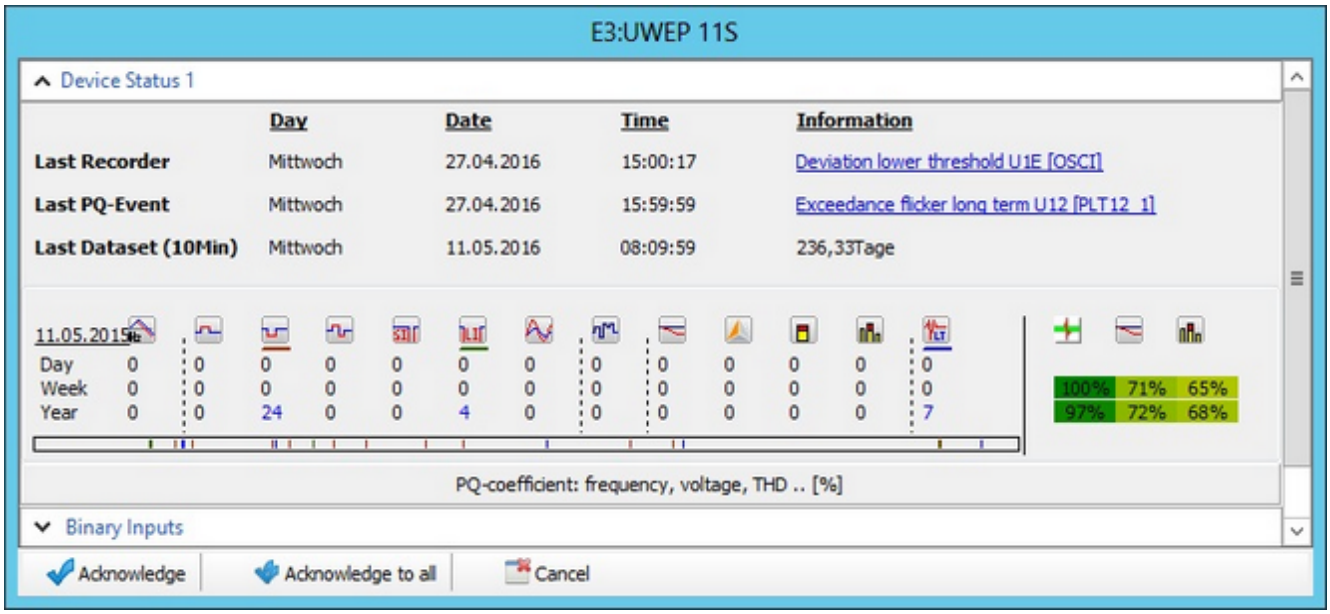
In the event of a **new** failure on a connected device, the colour of the status changes to red.
Status button colours:

- The default colour is STATUS
- The status changes appearance when a new error (log or PQ event) occurs STATUS
- The pane can also be displayed as STATUS. In this case, the recording was deactivated on the device.

Clicking on STATUS opens the device status.

Displaying a device's status information

Clicking on the STATUS button displays a dialogue field with the main status information for the selected device:



Contents of the status display: Last access, last log entry, last PQ event, statistics overview, status of the binary inputs (providing that the recording of binary inputs is enabled). There is also an area to select and display power quality reports for the selected device, device group or all devices. This function is discussed separately.

- '**Last error log**': Time and reason of the last device triggering.
- '**Last PQ event**': This information is the same as that contained in the error log but for PQ events.
- '**Last dataset**': The difference between the last dataset of the 10-minute data class in the SQL database and the current PC time is calculated. If the difference is positive (the sign of the difference is displayed) the device time is ahead of the PC time. This is usually due to improper device configuration.
- '**Statistics overview (left section)**': (Day, Week, Year): These are calculated from the event data on the device (events that are classed in retrospect as 'planned measure' are not taken into account). If a criterion exceeds its allowed frequency per time unit, the number is displayed in red.
- '**Statistics overview (right section)**': This is where the frequency of the EN violations and the 10-minute averages of key grid quantities (frequency, voltage, unbalance, THD), the 2h PLT values and the harmonics up to the 25th are statistically grouped. The coloured display is understood as power quality reserve on a scale of 0 to 100%. The display is supported by colours (from red to green). Details on the calculation of the values can be found in the document on power quality reports.

Description of the icons (displayed as text in the bottom panel together with the underlying threshold):

- First, the frequency violations,
- then the half-period events: '**Voltage swell**', '**Voltage dip**', '**Voltage changes**', '**Short interruptions**', '**Long interruptions**', '**Temporary mains frequency voltage swells** ',
- then the influence from '**Signal voltages**' (200 ms),
- followed by the 10-minute average value events: Violation of the '**10-min voltage average**', the '**Voltage symmetry**', the '**THD value**' or at least one '**harmonic.** '.

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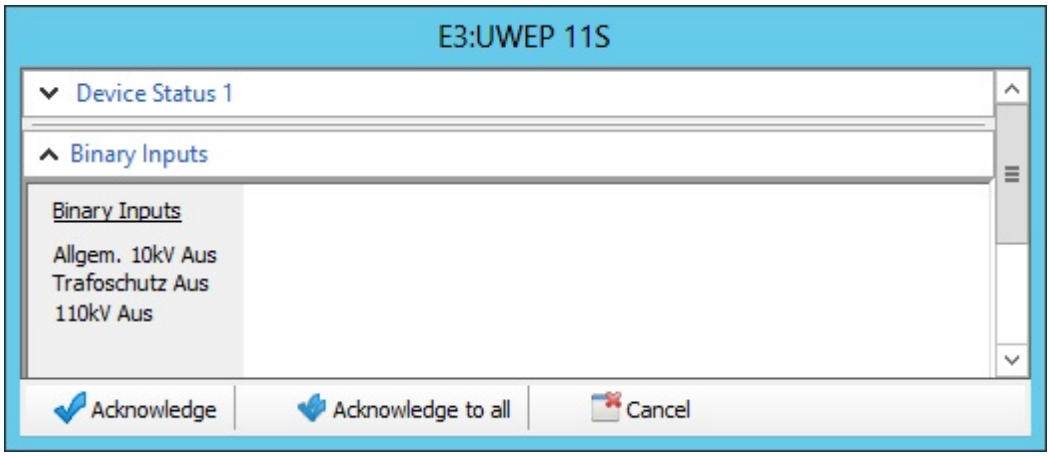
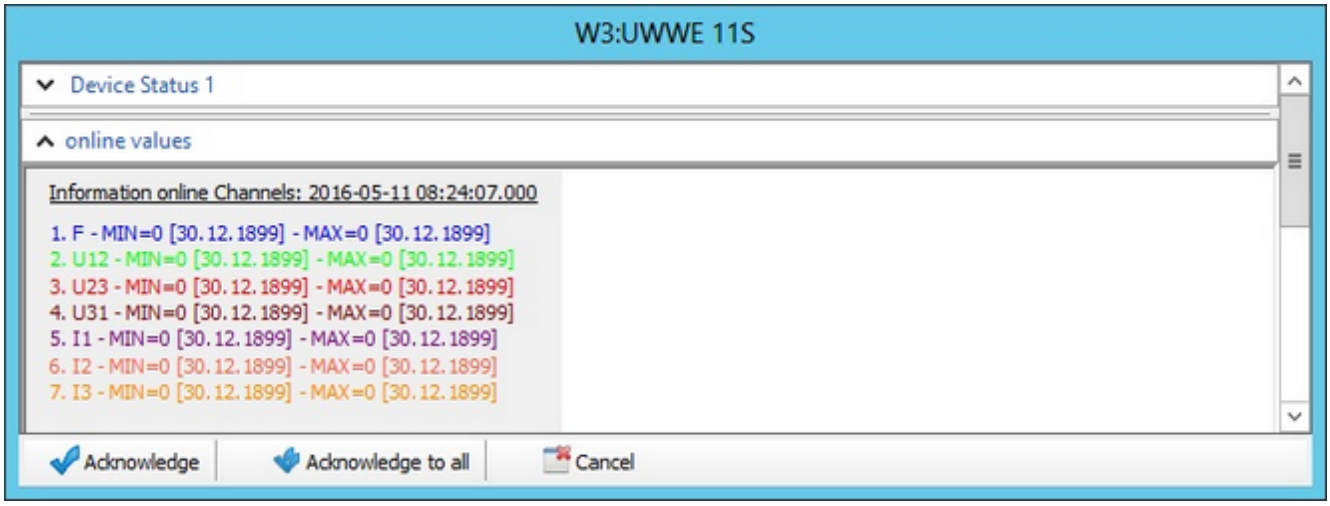
- And finally the violation of the **long-term flicker**' (2 hours).

In the section '**Power Quality Reserve**', the events are displayed followed by the 10-minute grid quantities and the harmonics.



Status of the '**Binary inputs**': Displays the current status at the input of the selected device (only the selected channels).



The device status can be reset with **'Acknowledge'** or **'Acknowledge all'** (for all devices, e.g., after a major event with a lot of error logs)!

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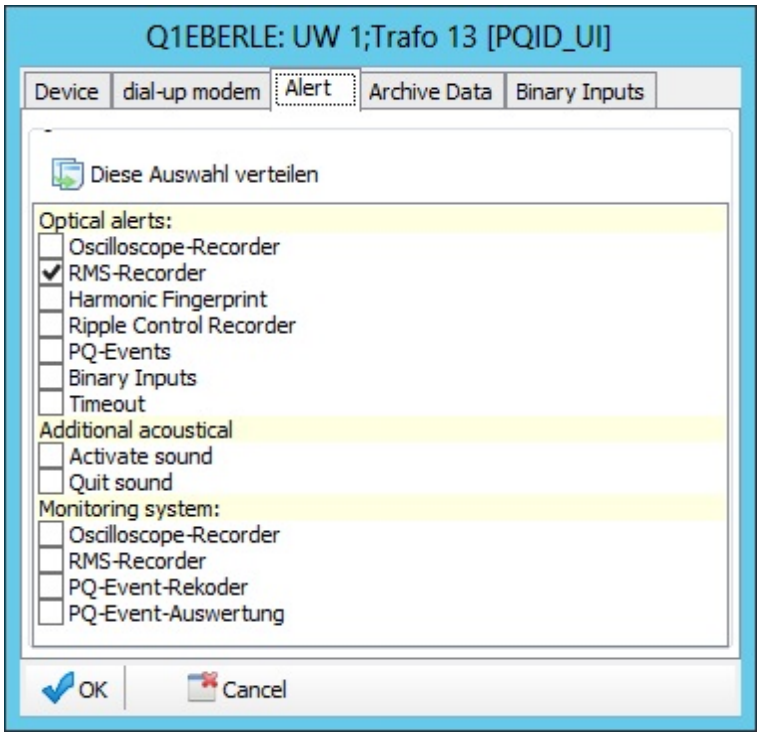
The Status button

The behaviour of the Status view is determined in Device properties (right-click to display the context menu):



In addition to configuring the parameters, which change the colour of the display depending on the status, you can also set up an audible alert (one-time or continuous until 'Acknowledge sound' is clicked).

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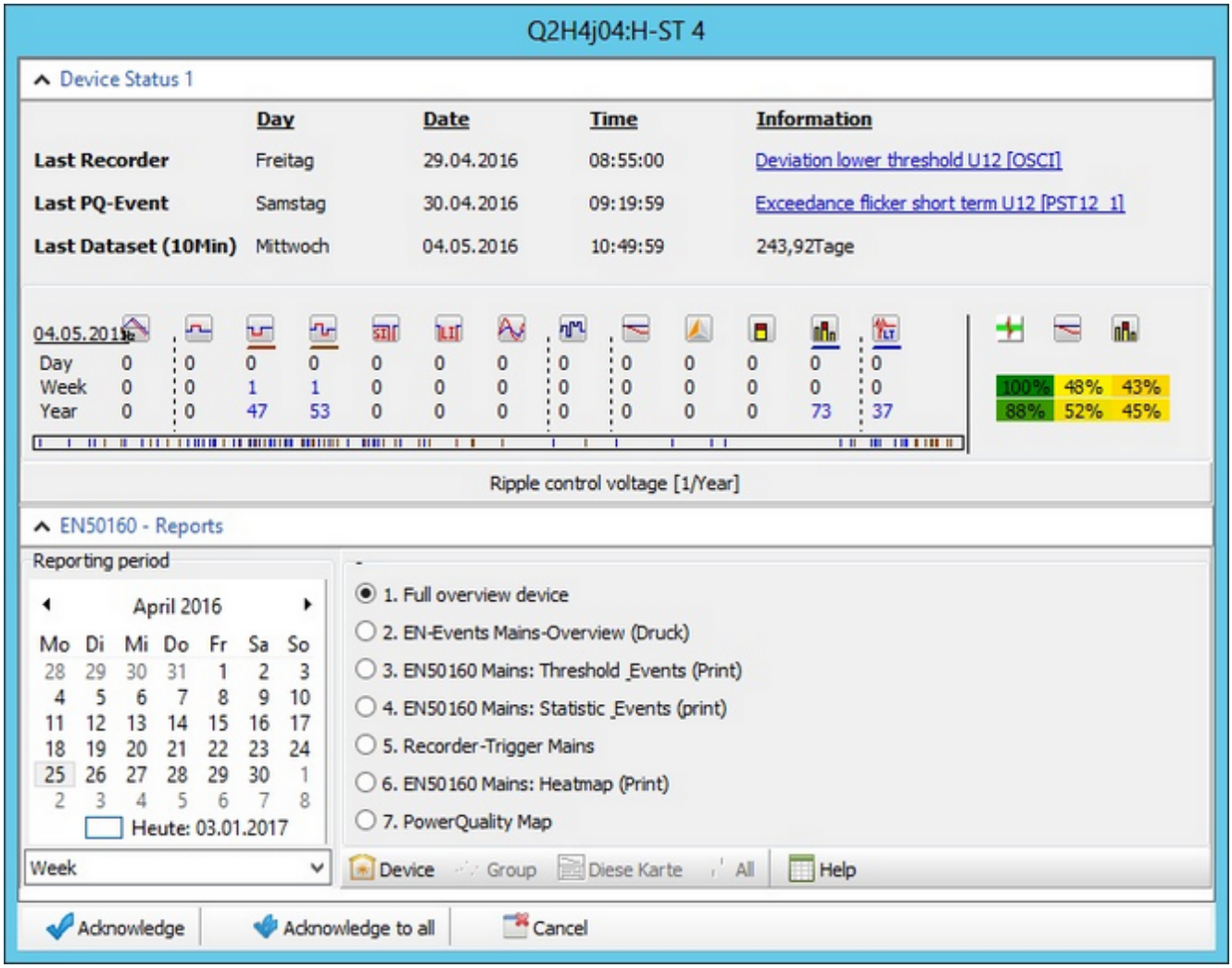
EN 50160 reports (Status button)

In addition to the **'Device status'**, clicking on the **'Status'** button enables you to generate select reports. One of the advantages is that you can use the groups (This device, This group) in the **PQStart** desktop for the evaluation. The reports are displayed with the native **'FastReport'** reader and can be converted to PDF files by clicking on the button. All of the reports except **'EN50160 - Full overview'** show the data from several devices in one report. The **'EN 50160 - Full overview'** report is a 4-page report of tables and graphics that is generated for each of the devices. The reports are discussed in a separate document. They are the same as the reports that are automatically generated. The options are displayed in the below figure:



- Quick access to the main reports.
  - 'EN 50160 - Full overview'
  - 'EN - Grid event overview (print)'
  - 'EN 50160 - Grid: Event thresholds (print)'
  - 'EN 50160 - Grid: Event statistics (print)
  - 'Grid error log triggers'
  - 'EN 50160 - Grid: Heatmap (print)'
  - 'PQ map'.

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- The reporting period comprises the start and duration of the report. The start is determined by setting an arbitrary date for the entire period.
- The time window (start and end of the respective period are predefined by the program):
  - Day
  - Week
  - Month
  - Quarter
  - Half-year and
  - Year

To create a report, you must first select the report type. Then, select the date and the period in the 'Reporting period' box. Click on 'Device',**'Group'**, **'All'** to generate and display the power quality report.

PQ map

The PQ map displays the PQ coefficients of the selected stations on the map based on their GPS coordinates. The colours represent the value of the PQ coefficient. The colour changes from green (100%) to yellow (50%) to red (0%).

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Configuring the station properties:

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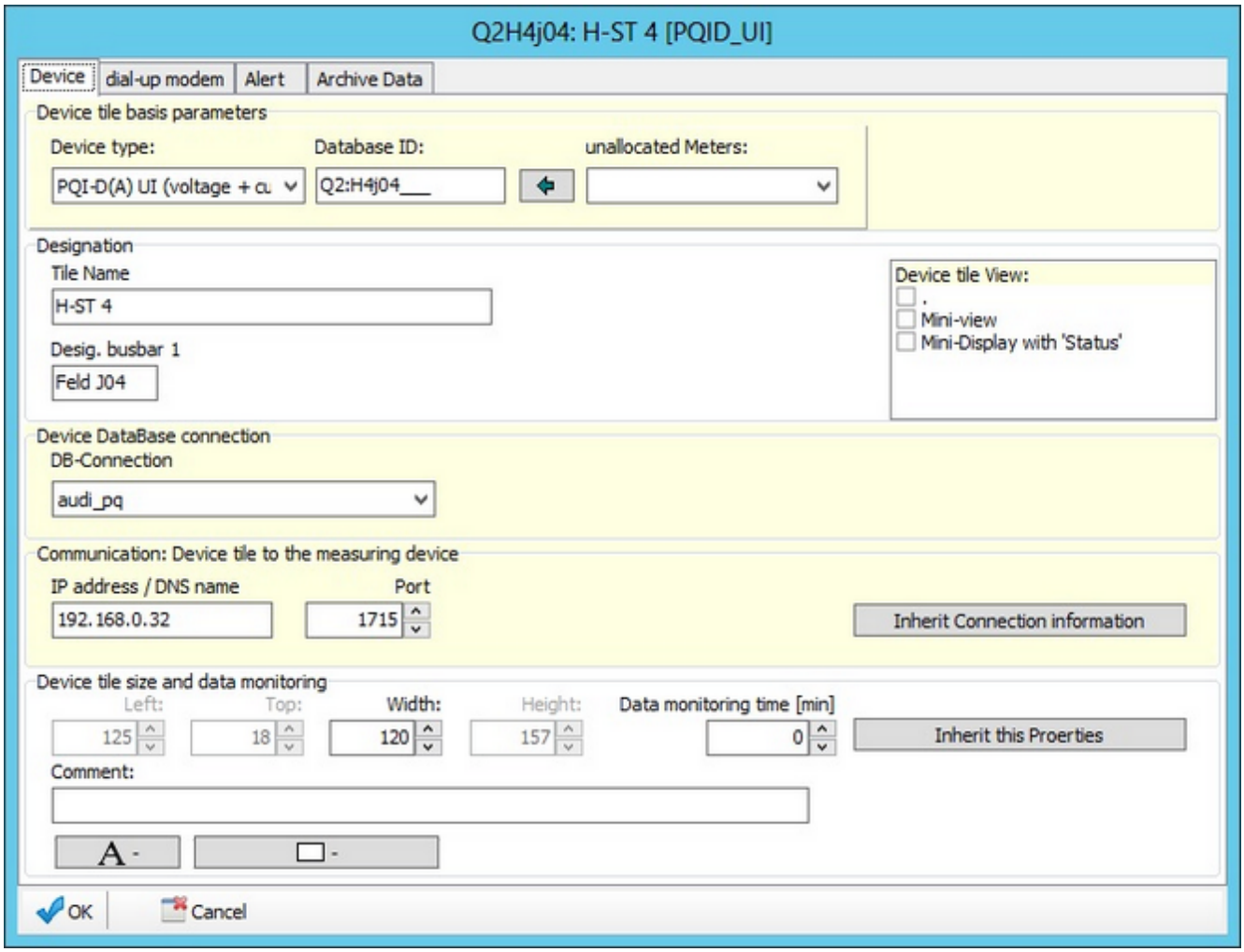
Identification and connection data:



The 'Device properties' function is displayed by right-clicking on a device tile:

- '**Device**' page:
  - Device type, device ID (must match the device's actual ID), name and position.
  - Connection parameters
  - Background colour as additional information or special font/font size (e.g., to save space in the online display).
- 'Modem' page (no figure): Telephone number and additional dialling codes when using a modem.
- 'Alert/Mail' page: Page with alert and email settings, as well as start/stop recording data on the device (e.g., when switching off the recorder during a protection test).
- 'Online data' page (no figure): Configuration of the online display (selection, display and scaling of the online display).
- 'Archive data' page (no figure): Configuration of the archive data display (every line in a UU device has its own page. Similar options are available if the user-defined data class option is enabled).
- 'Binary inputs' page: Name and selection of the binary inputs for display.

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- 'Information' page (no figure): Summarizes information that can be useful for troubleshooting.
- The Online, Archive and Binary data pages have Load template and Save template buttons. These buttons enable you to share setup data between the devices, which reduces the time it takes to configure them.

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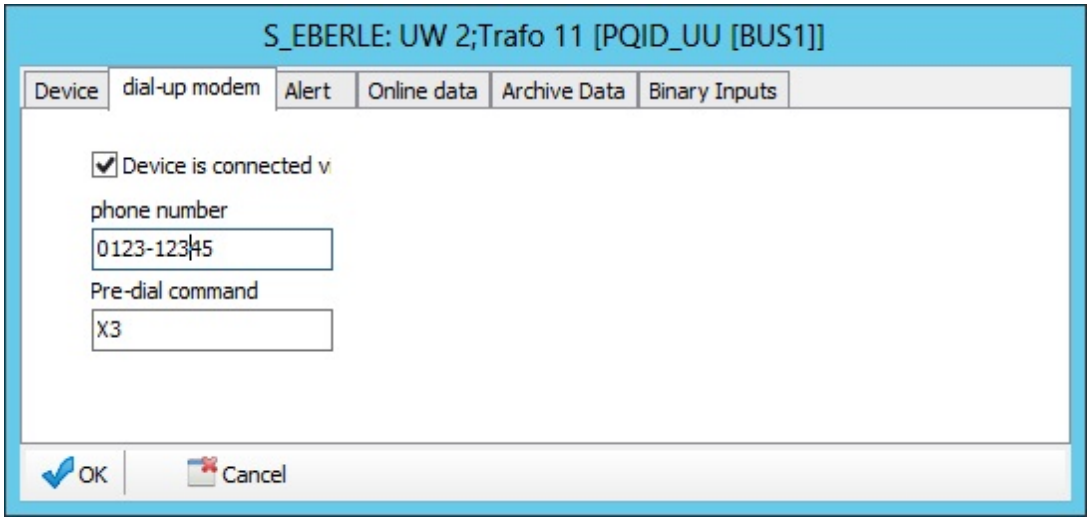
Communication by modem



This function is rarely used, e.g., if you want to display a device's online data that can only be reached through a hard-wired dial-up mode.

To read out the data in the database, the measuring system is configured in such a way that the devices 'report in' at least once a day (or immediately after a failure) to dump their data.

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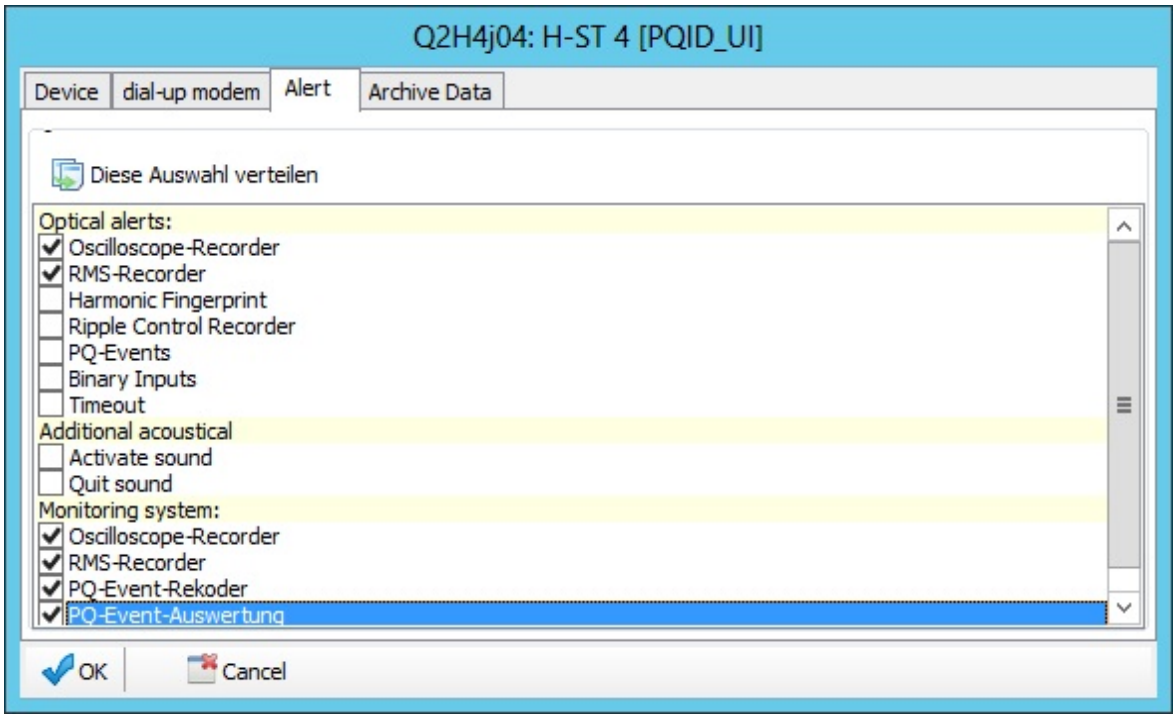
Specifying the alert function:



The "Monitoring system" part can be used to signal that certain events where disabled by a user/binary input. It signals this by coloring the status yellow.

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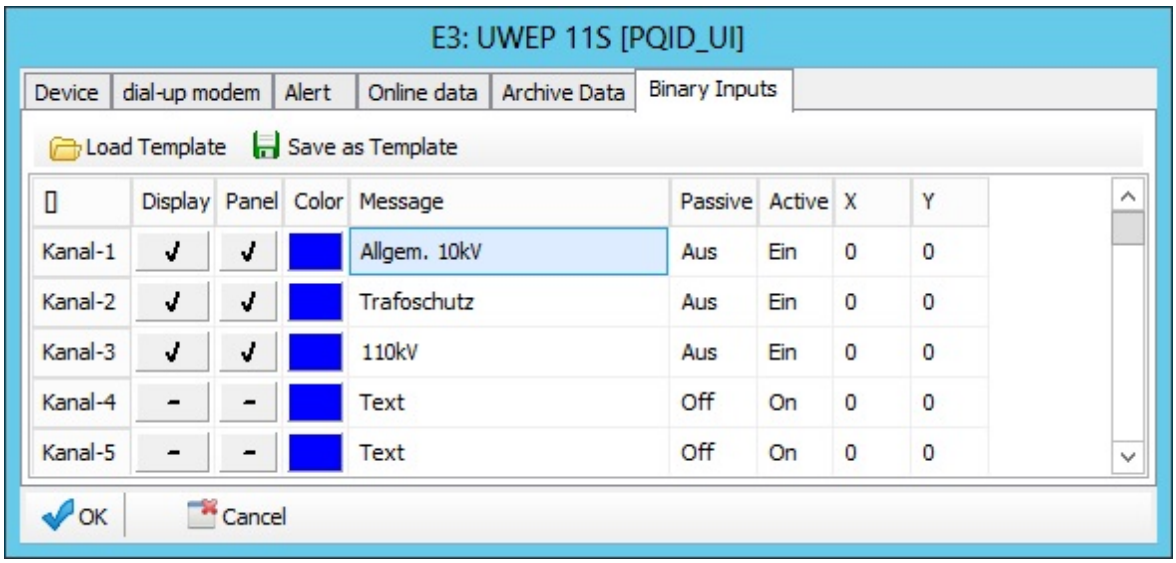
Selecting measured values to display online

Onlinedata is described here.

Selecting measurands for the Archive data view

Archiv data is described here.

Managing/displaying binary inputs:



- The number of channels is determined by the device hardware (order characteristic) and is therefore not configurable.
- The abbreviations (used in the display when there is little space, i.e. in graphic printouts) are part of the device parameters that must be configured in the parameterization software under 'Thresholds, connection, IO'.
- The 'Display' column specifies which binary inputs are displayed in the graphics (colour as well as actual values).
- In the 'Online' column, the inputs that are displayed in the online panel are selected in PQStart (continuous monitoring).
- The message is generated from the last three columns, for example: 'Grid protection active' or 'Grid protection passive'.
- Using templates (Load template and Save template buttons) can save data entry time.
- This parameter does not have to be saved separately. The configuration is saved automatically after this parameter is changed.

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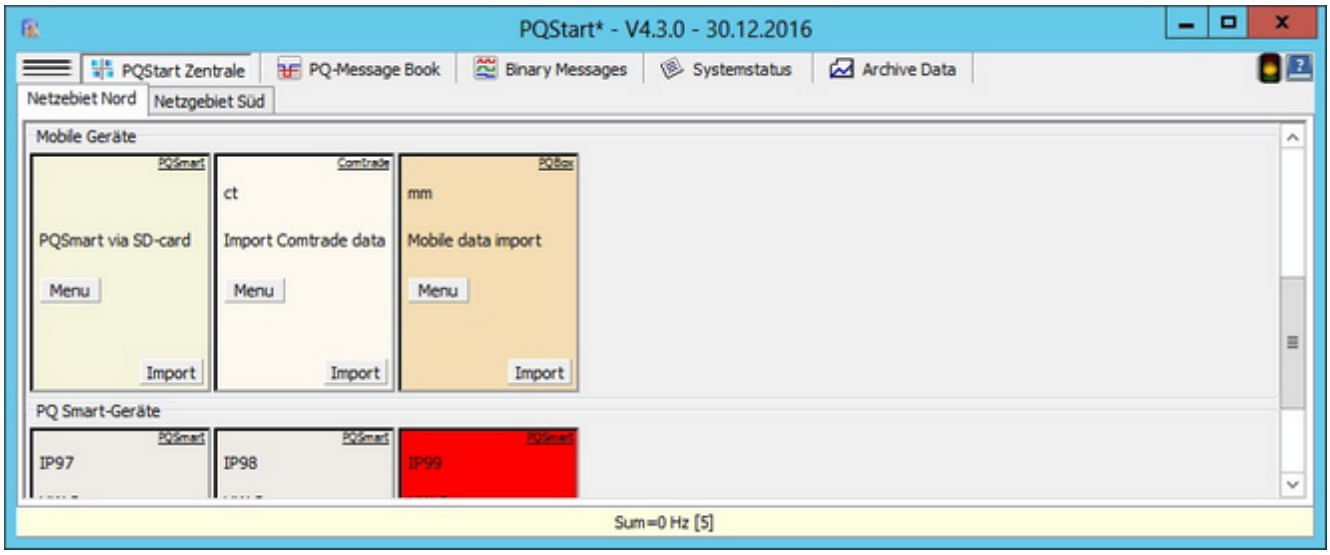
Importing external data

There are different ways to import data into the WinPQ database:

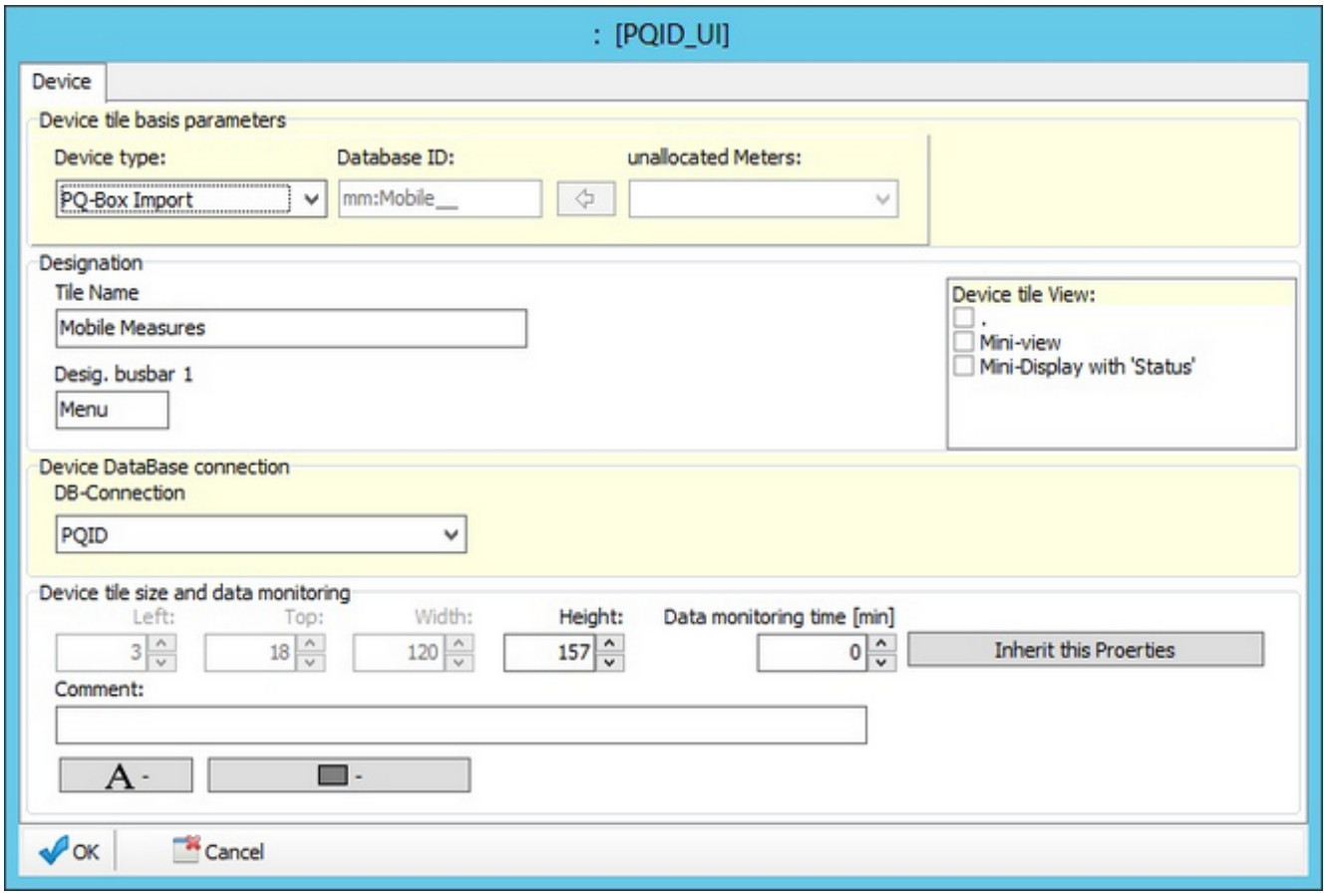
- Measurements from the mobile a.eberle measurement devices **'PQBox 100/150/200'**,
- Measurement data that are recorded in **'Comtrade'** format,
- Measurement data that are generated by the SD card on **PQI-DASmart** devices.



Access to these imports is prepared by configuring the**PQStart** desktop. You can also import data from remote counter readings (ZFA) using specially developed programs. For further informations please contact the a.eberle service.

Importing mobile measurement data from the PQBox 100/150/200

In order to use this function, a **PQStart** tile must be configured. In order to do this, the device type must be '**PQBox Import**'.



The other parameters relate to the designations, database, assignment, etc.

The import starts with an **'Open file'** dialogue. Select the drive and the folder in which the files are stored. All of the files with the extension **'.pqf'** are displayed in the right pane.

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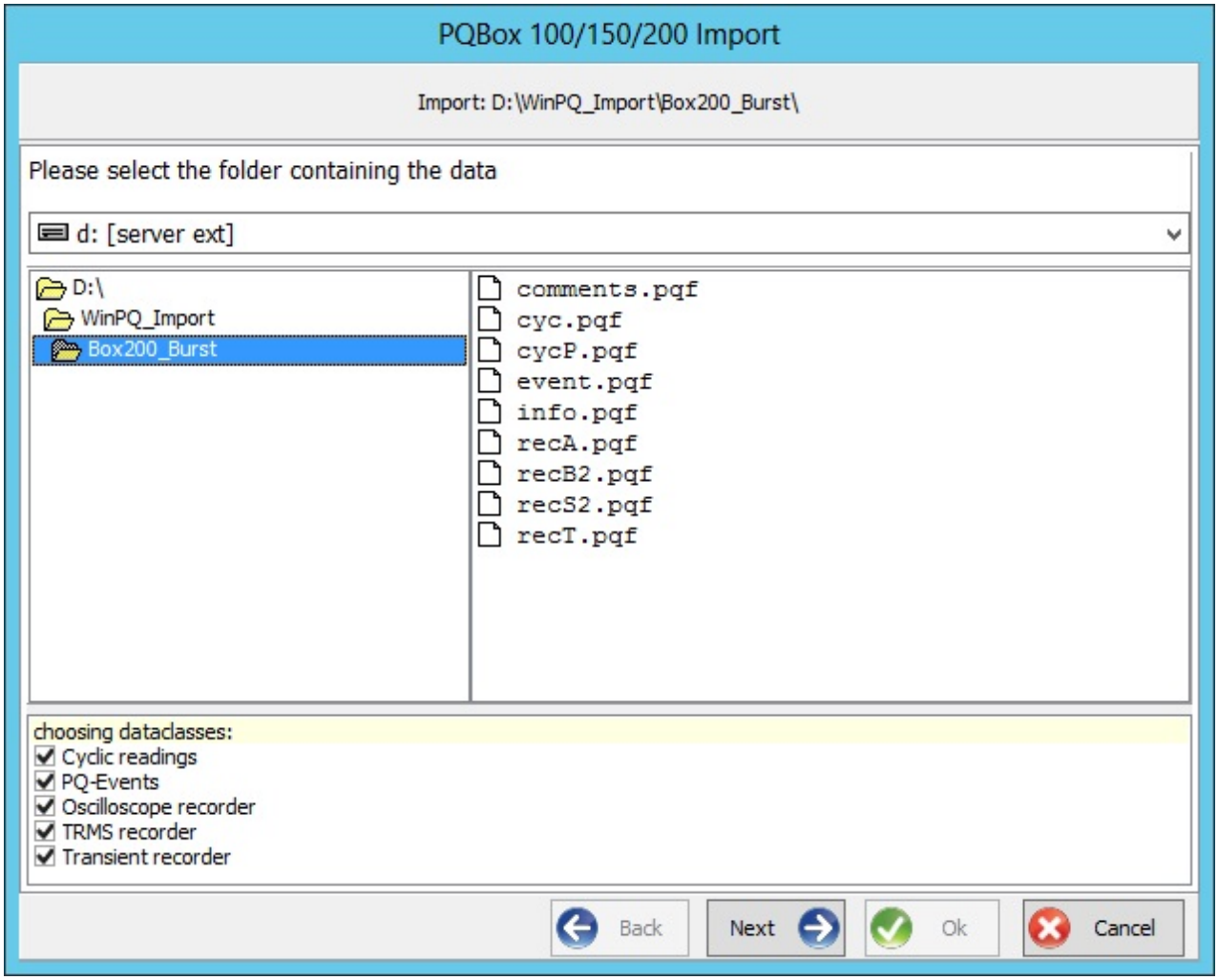

Files with information about the measurement (**'comments.pqf'** and **'info.pqf'**) are always needed. If one of the files is missing, the **'Next'** button will be disabled.

You can limit the size of the measurement data to import in the selection field with the importable measurement data.

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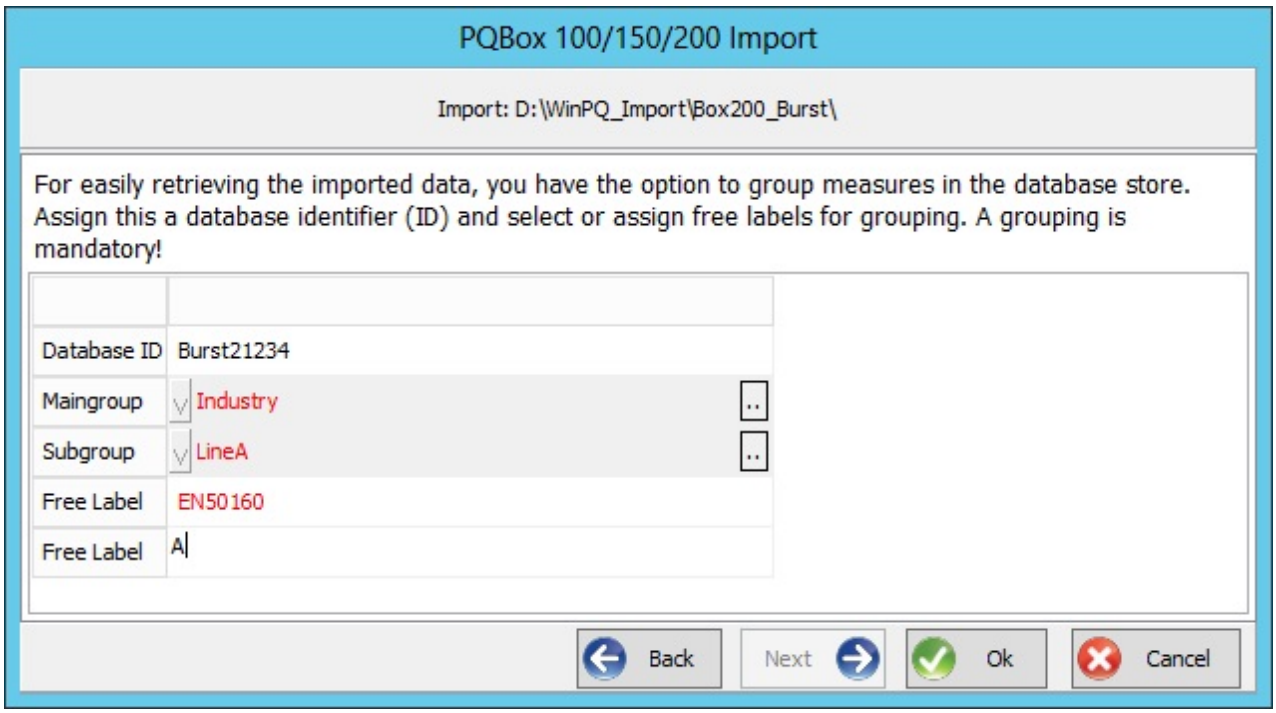
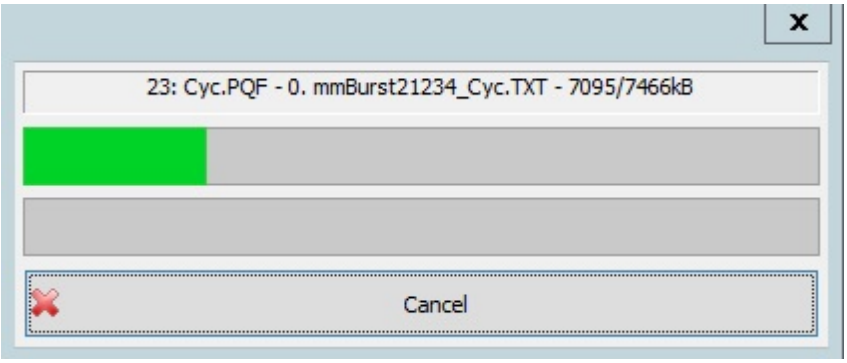


Before you start the import, enter the information under which the measurement is to be stored in the database. The ID you enter in the first field must be unique across all PQBox measurements. The other fields are used to structure the data for display in PQVisu. The fields ' and ' may have to be extended by clicking on '..'. The last two fields are text fields that can contain text that is printed in reports.

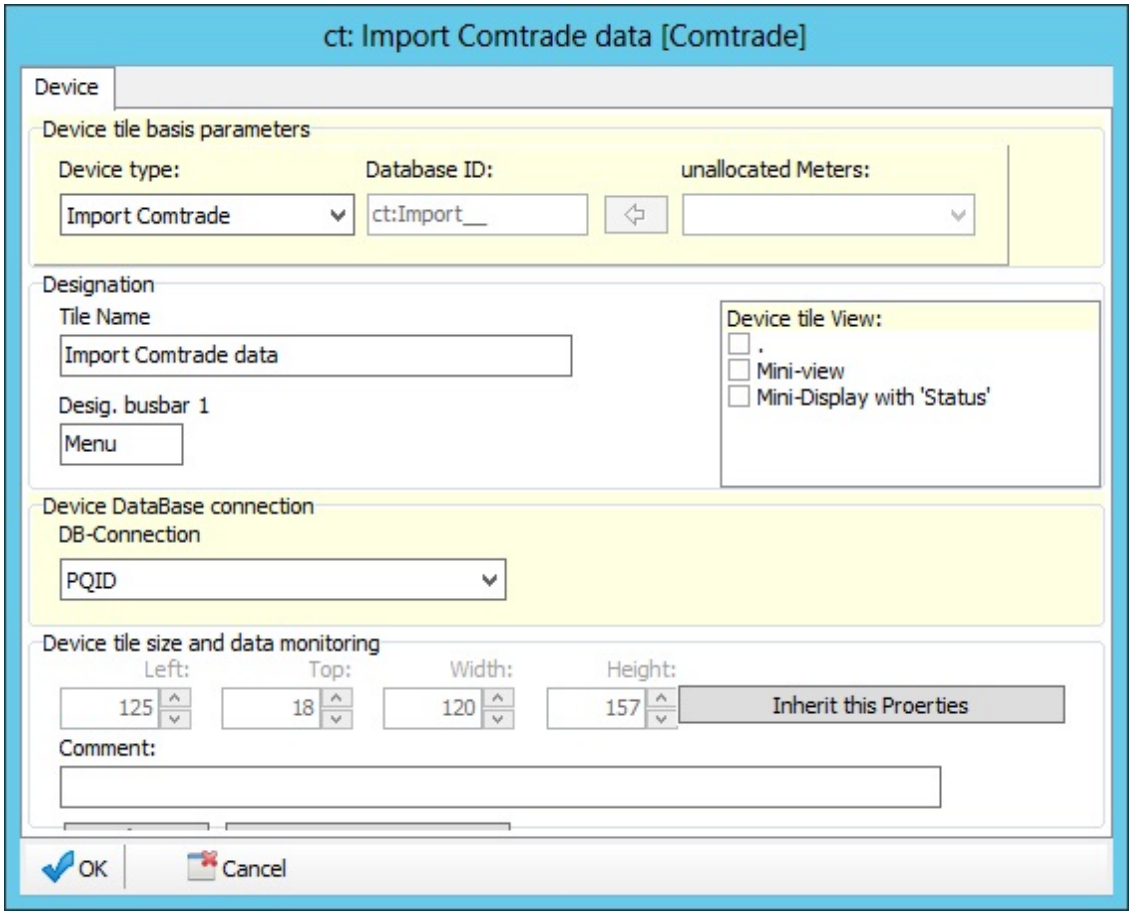


The files are imported in succession. The progress of the import is displayed.

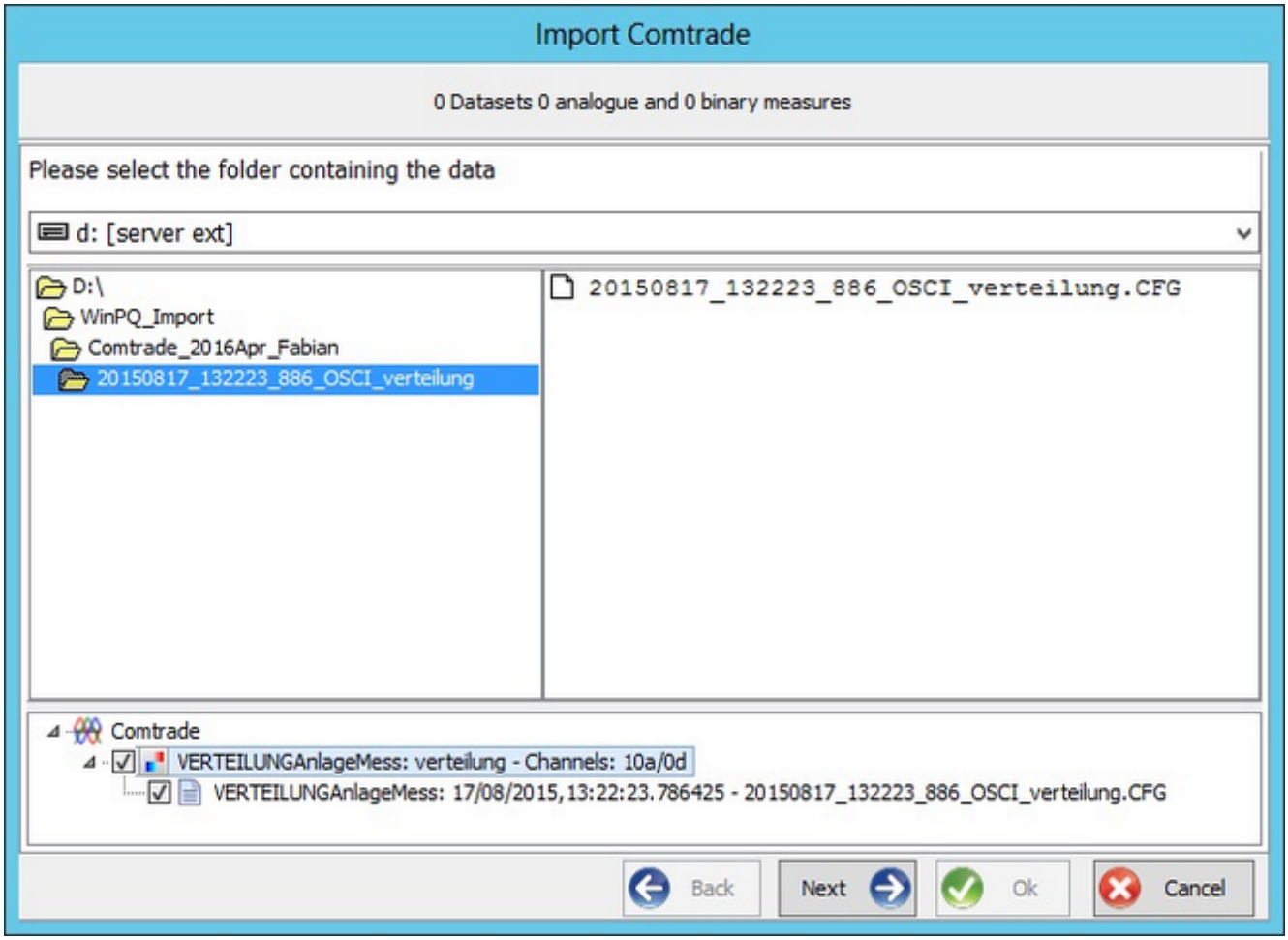
Importing Comtrade data

NOTE: This function requires an add-on licence!

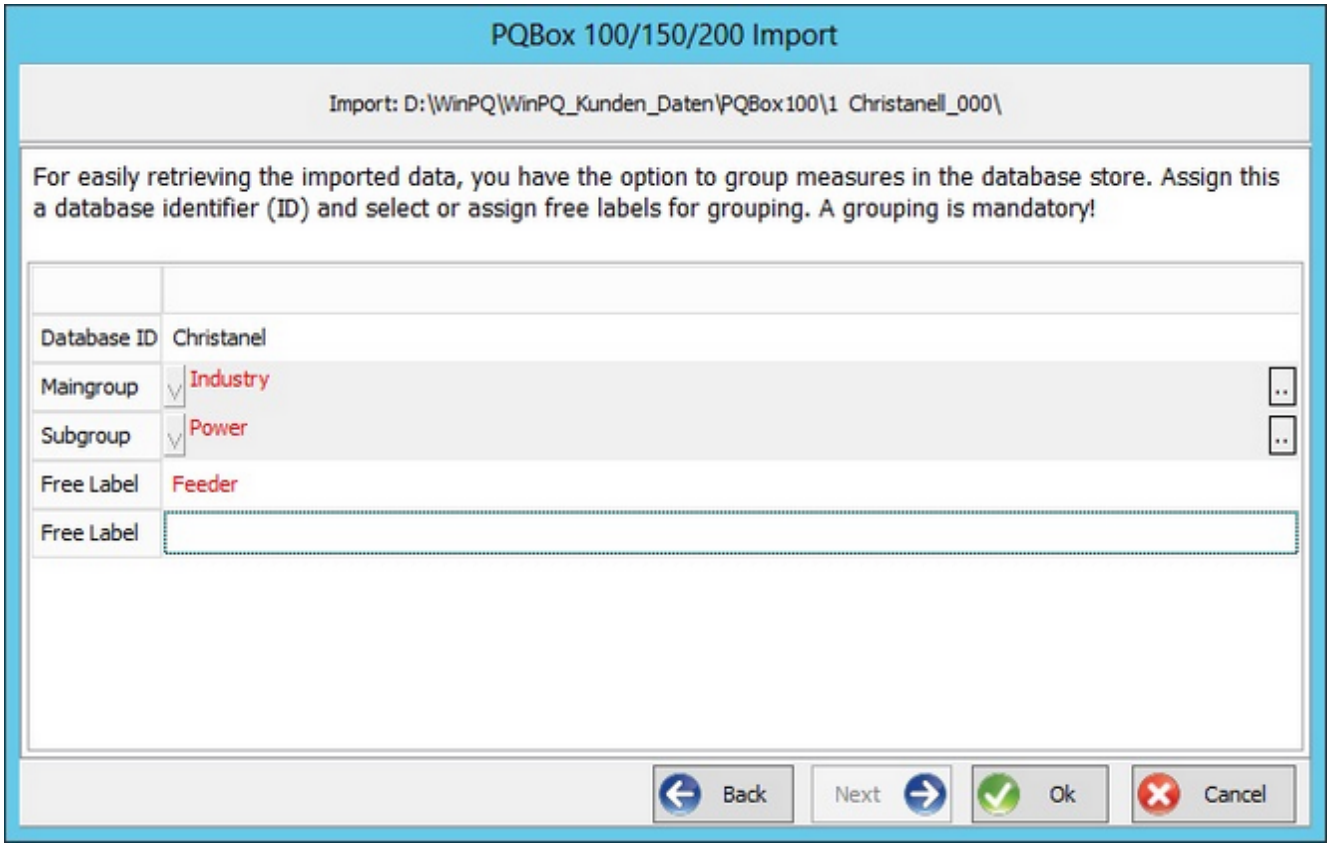
The import is similar to that of the**PQBox**. The device type must be set to ' **Import Comtrade**'.



Browse to find the directory that contains the **'Comtrade'** measurements. Opening the folder immediately starts analyzing the data and classifies them in the CFG file based on the ID data.

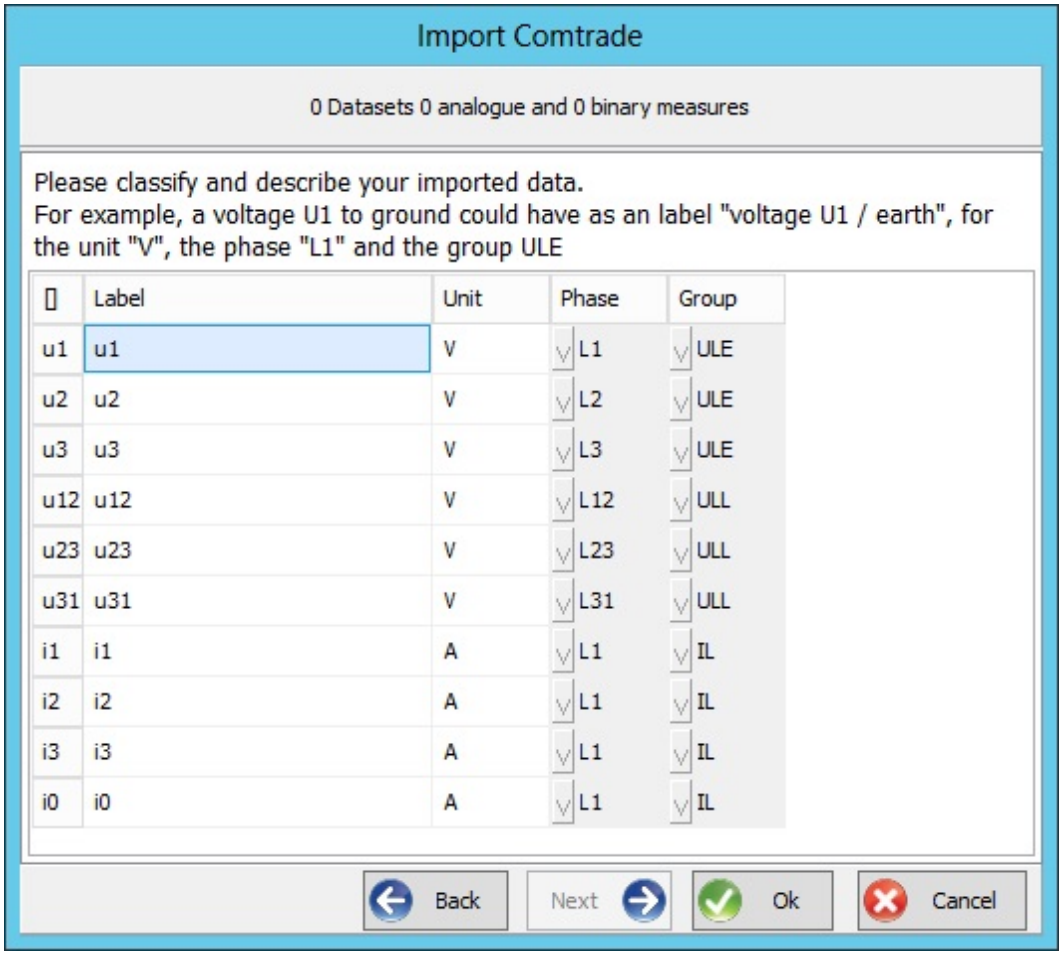


You can now select the measurements you want to import.



Once you've done that, you can specify the information that is later used to sort the display.

Now it's time to define and classify the measurement channels.



The symbols in the first column are prescribedby the **CFG** file. The information in the other columns must be added for use in **WinPQ**. This is a one-time procedure as this allocation is saved to the database.

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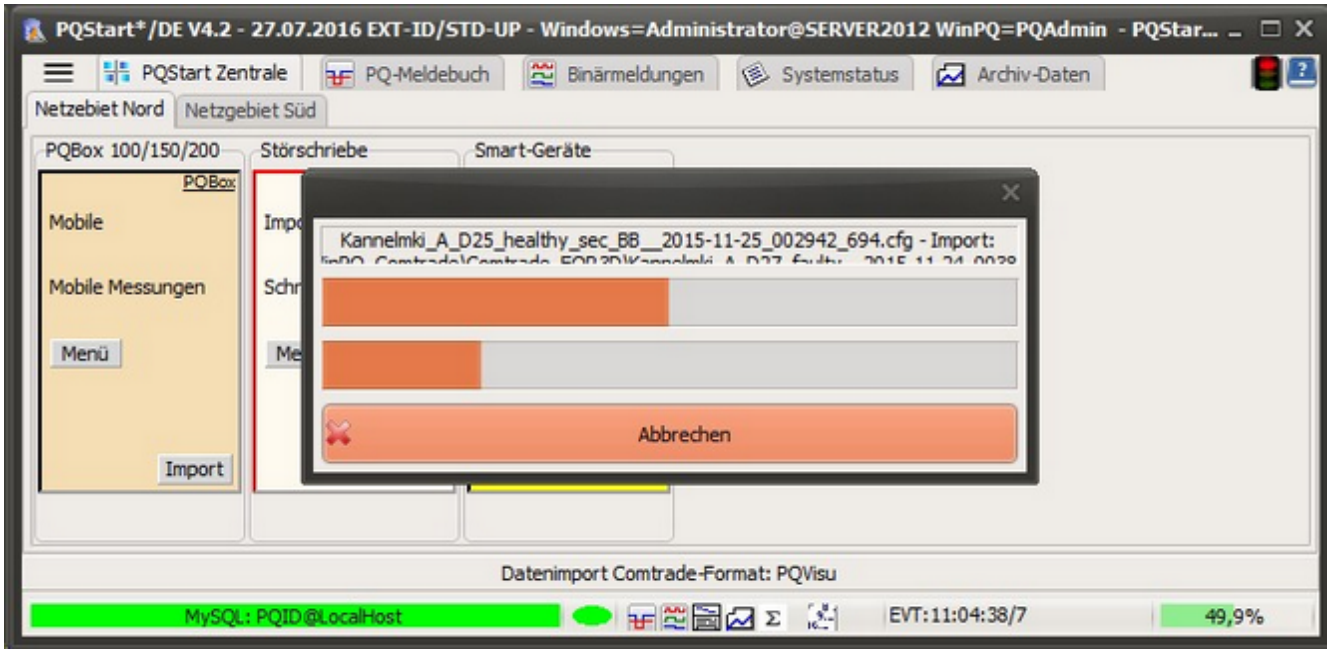
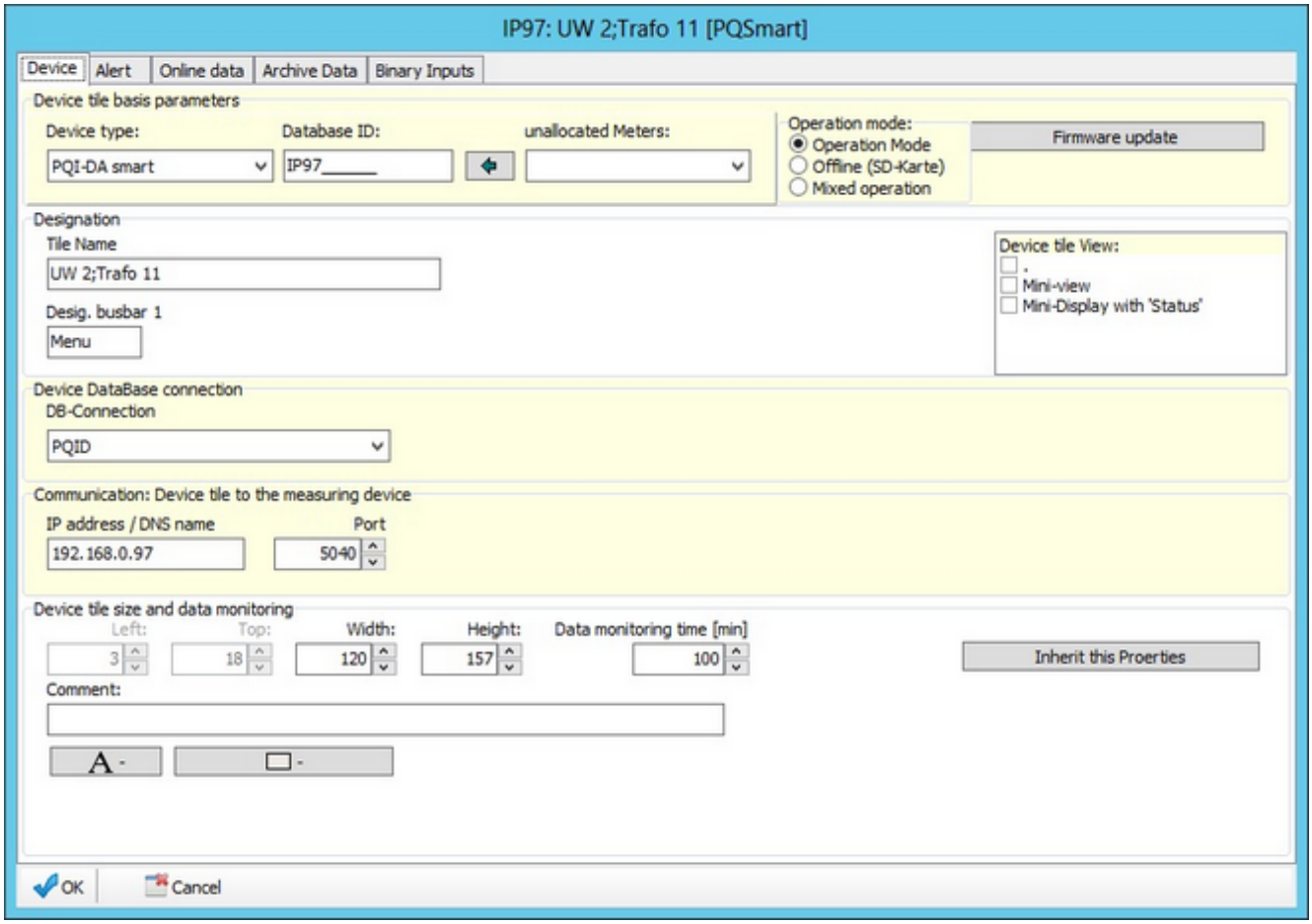
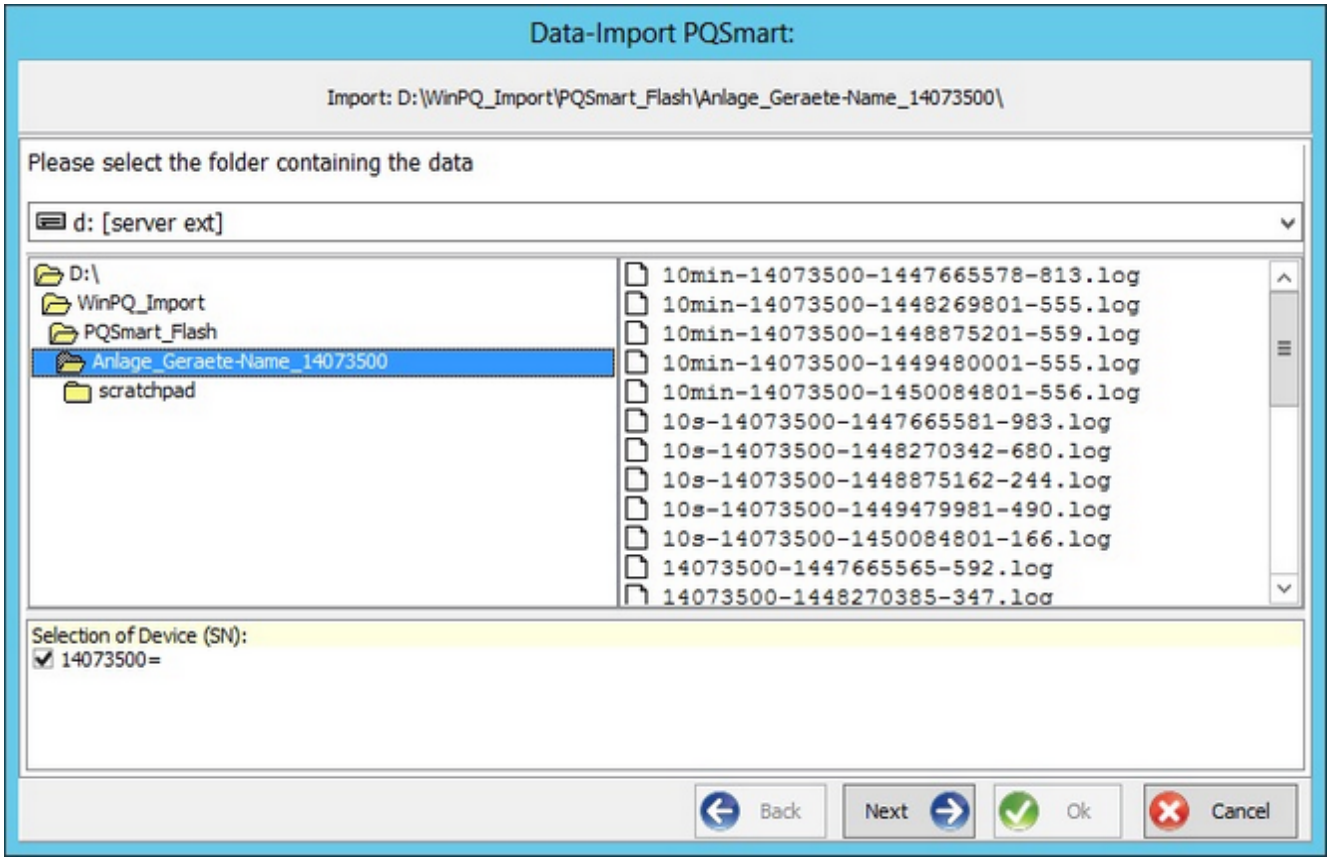

PQStart*/DE V4.2 - 27.07.2016 EXT-ID/STD-UP - Windows=Administrator@SERVER2012 WinPQ=PQAdmin - PQStar...
PQStart Zentrale
PQ-Meldebuch
Binärmeldungen
Systemstatus
Archiv-Daten
Netzebiet Nord
Netzgebiet Süd
PQBox 100/150/200
Störschriebe
Smart-Geräte
PQBox
Mobile
Mobile Messungen
Menü
Import
Kannelmki_A_D25_healthy_sec_B8__2015-11-25_002942_694.cfg - Import:
Abbrechen
Datenimport Comtrade-Format: PQVisu
MySQL: PQID@LocalHost
EVT:11:04:38/7
49,9%

Importing flash disk data from the PQI-DA Smart

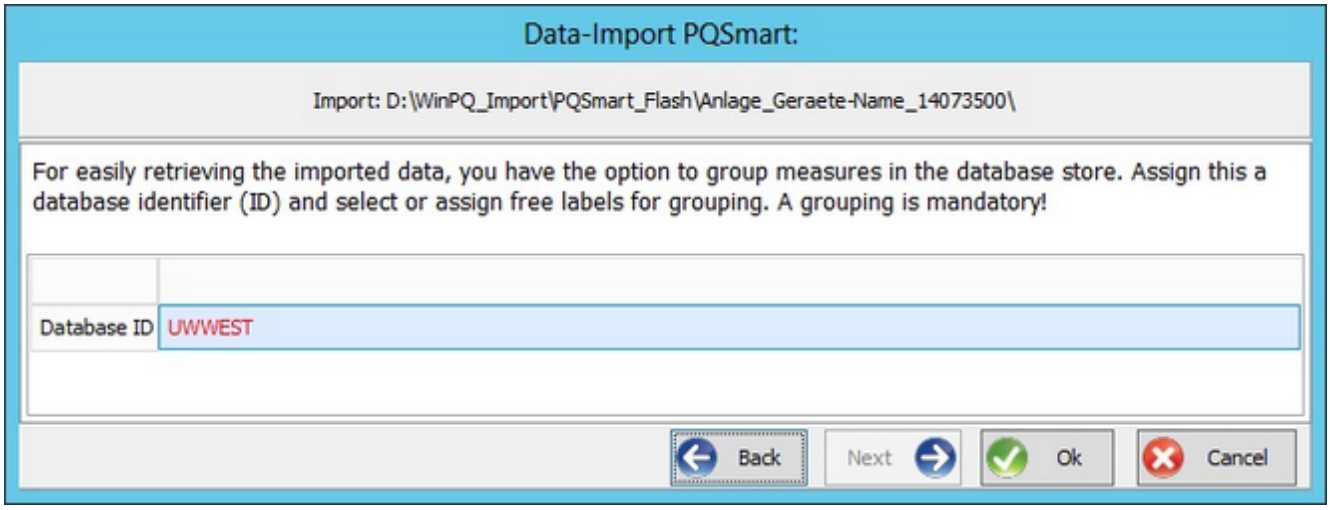


Data can be transferred in two ways:

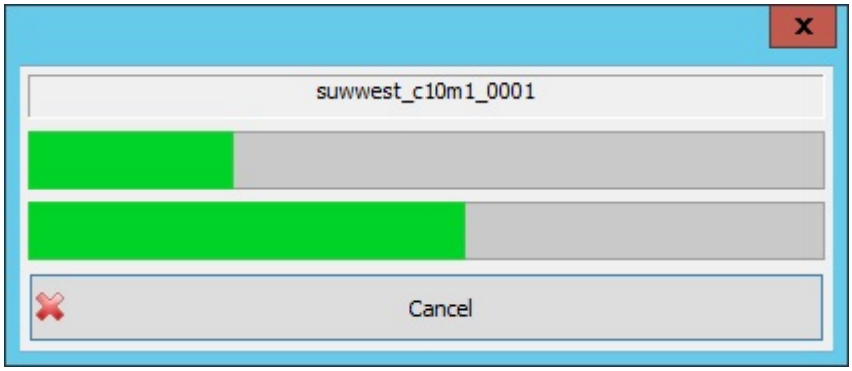
- 'Offline (SD card)' - only from the card
- 'Mixed operation' - in part online, in part from the card



The selection starts with an Explorer window with a list of directories.



Defining the database ID links the device's serial number to it.



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Binary inputs: List of all binary messages on its own page

This view provides information about the chronological sequence of the changes made to the binary inputs on the PQI-D or PQ-DA Smart. The view displays the time at which changes were made to which inputs in binary and text form.

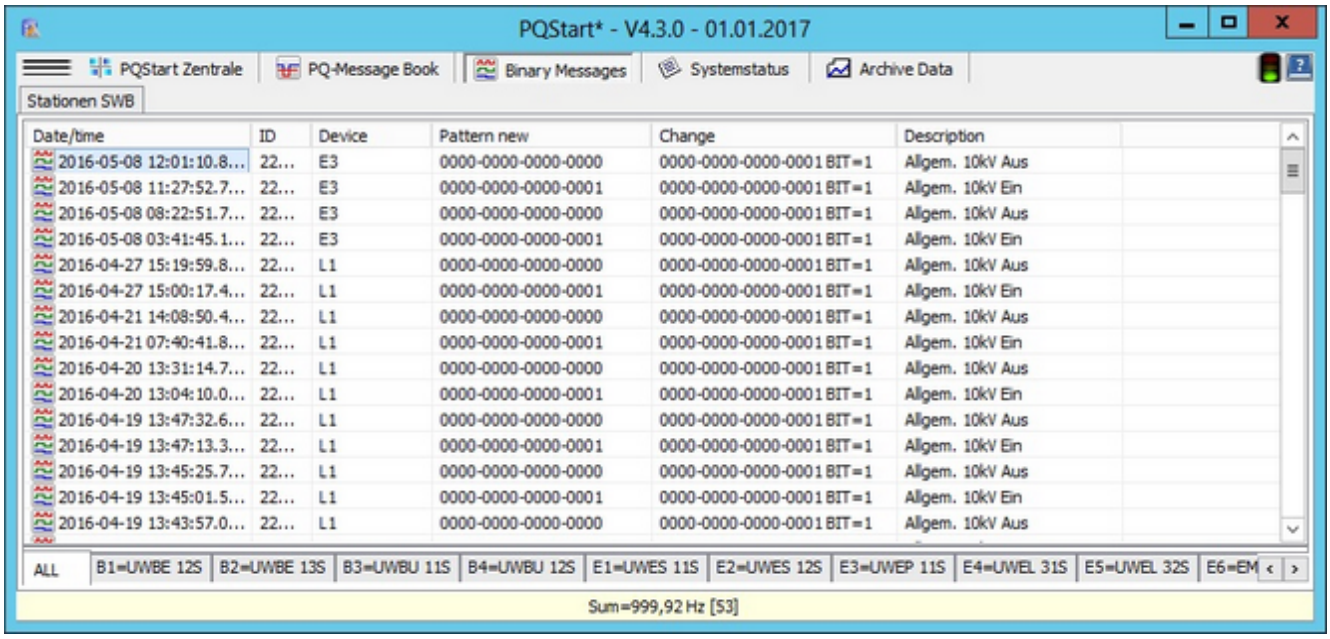

Figure: View of the changes as selective list

Two conditions must be met in order to display binary information:

- The binary inputs must be configured on the device (the abbreviation of 8 characters max is used in the graphic),
- The view must be enabled in **WinPQ**.

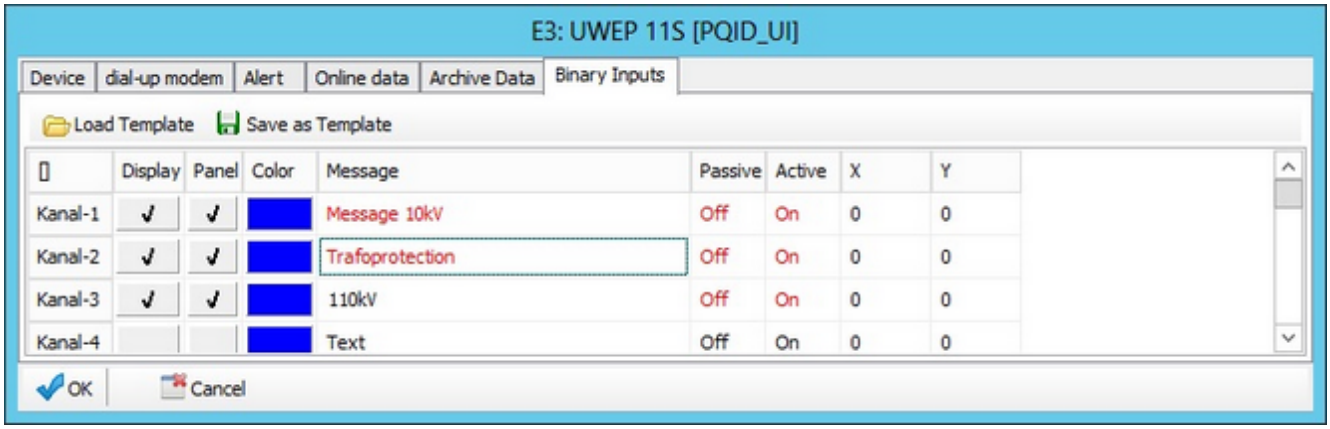

Figure: Enabling the binary view for online display

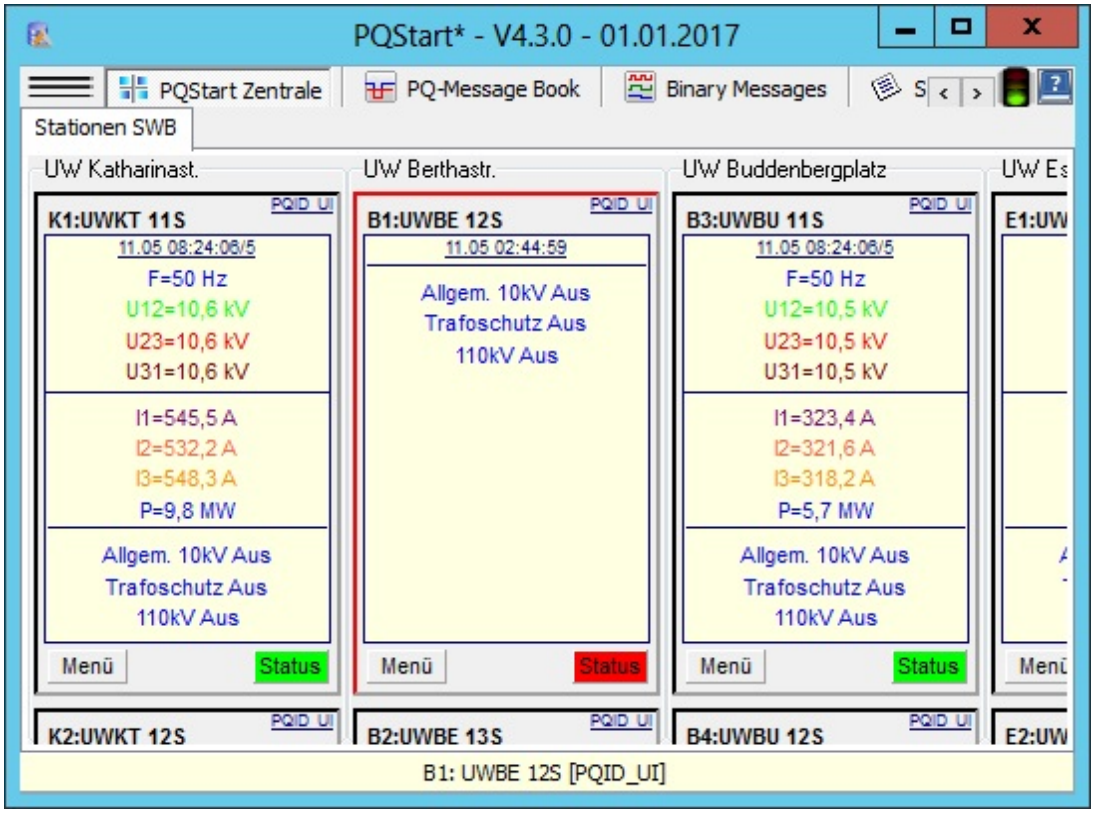

Figure: Status of the binary inputs in a device tile

System status: List of all system messages on its own page

The purpose of this function is to make system monitoring easier by collecting and centrally displaying messages that are generated by programs in the **WinPQ** environment. Based on the severity of the event, a distinction is made between a 'Warning' and an 'Alert'. Based on the severity of the message, the traffic light, which is visible from every angle of the desktop, is either green (no fault) yellow (warning) or red (perpetual problem - alert). Click on Acknowledge to reset the traffic signal to green.

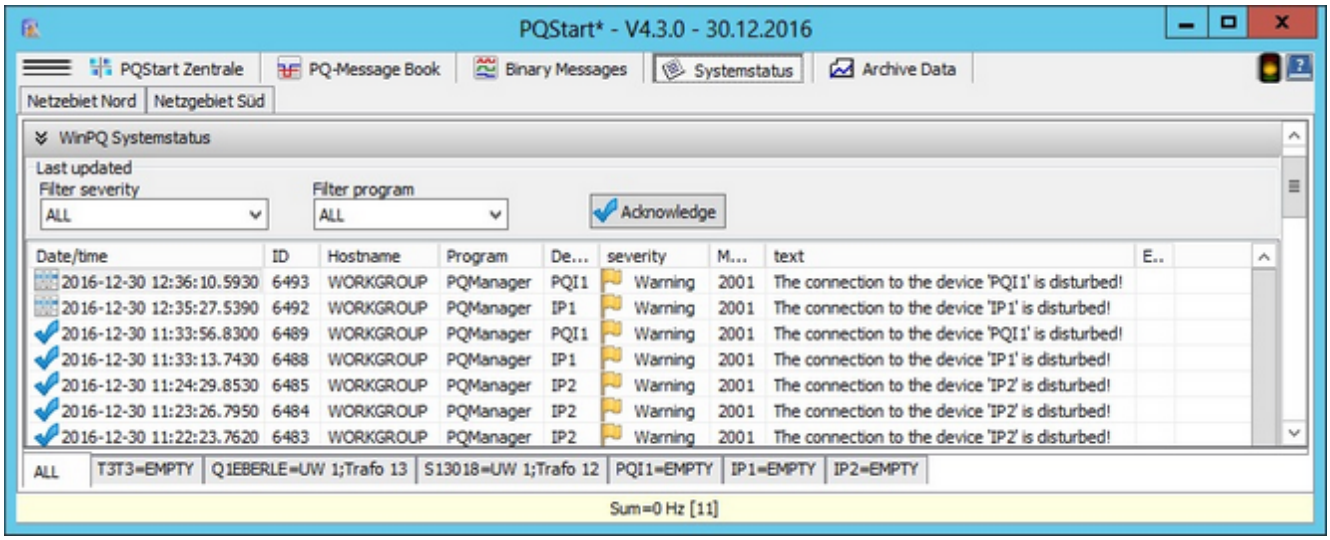

Figure: System messages

There are several ways to filter and confirm messages. Each message is assigned a severity by the program that generated it. This severity, the name of the program and the device ID can be used as filters.

Message texts should be self-explanatory. A number of examples are listed below.

Device messages:

- RAM error
- Internal batt error
- LAN/L error
- Battery low
- Date/time on PQI-DA is wrong
- The evaluation of the PQ statistics on the device did not start

Communication error messages:

- The connection to device 'xyz' is faulty
- The connection to device 'xyz' has been lost

Internal program error:

- The SQL syntax is faulty
- Unknown program exception
- Delay loading SQL data

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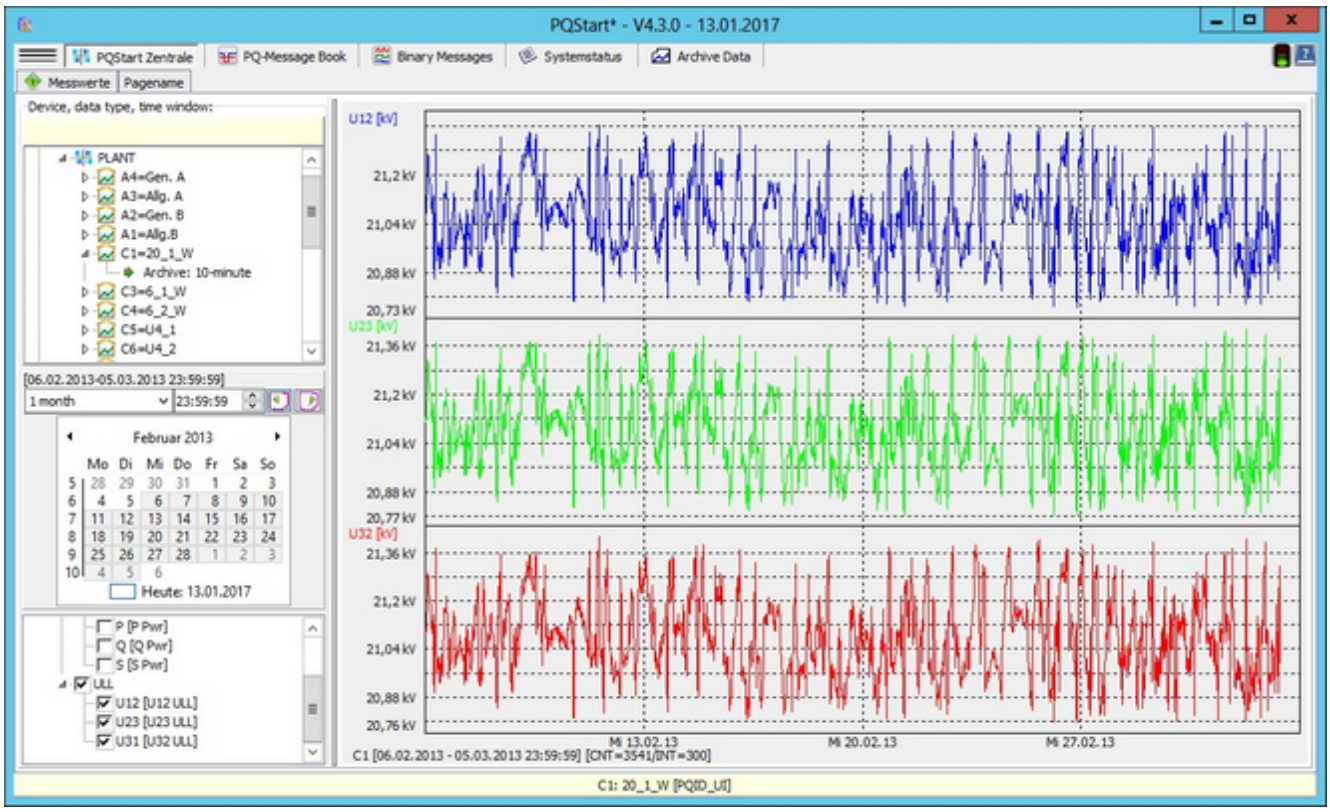
Archive data: Display time behaviour of measured data

The goal is to provide a user-friendly way of displaying long-term data recordings as curves.



Basic information on viewing long-term data in PQStart:

These graphic functions are not needed to display data in**PQVisu**. A customer submitted an enhancement request for a desktop that had fewer but more intuitive functions that made the software easier to use.

This approach is based on a division of tasks:

- The administrator/system manager prepares the views accordingly.
- The user can only use the values that are predefined, scaled and have been given a colour. For example, a user who is tasked with evaluating the load relationships in the grid only has access to the active power, reactive power and the apparent power, or a few of the power factors.
- This is why the PQ administrator has to prepare the system in advance: He or she selects the measurands, sets the parameters to group the measurands and also selects the colours and defines the scaling for the graphics.
- All the user then has to do is check the measurands and move around the time window.

If the**'Archive data'** option is enabled and no measurands have been preselected, all of the quantities are available.

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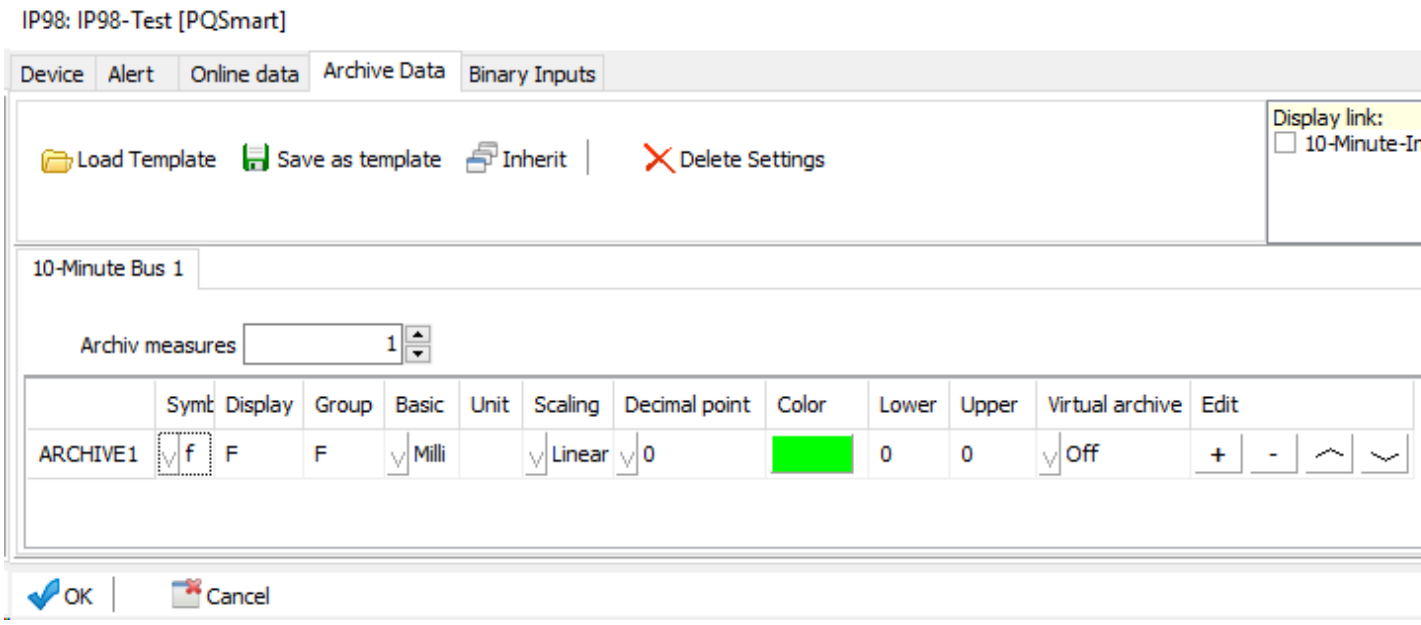
The administrator prepares the view:



This function is accessed by clicking on 'Device: Properties' on a specific device.

- First, determine the number of measurands. Every time the number changes, rows are either added to or deleted from the table (at the end).
- The 'Symbol' column contains the name of a column/measurand in the 10-minute SQL table. Right-click to select it from a list. The up and down buttons enable you to scroll through the list.
- Make sure symbols are not used twice (this results in SQL command errors).
- The 'Display' column enables you to assign the display text that displays later independently from the symbol name.
- The 'Group' name enables you to combine measurands in the later graphical view.
- The unit that is later displayed (e.g., kV) is generated by combining the 'Basic' and 'Unit' columns. The program uses the stored basic unit to do the conversion.
- Click on the 'Scaling' arrow to toggle between a 'linear' and 'logarithmic' view.
- You can specify the number of 'Decimal points' to display. However, only the number of decimal places needed are ever displayed.
- Right-click to select the 'Colour' of the view from the list that displays. If you need more colours, right-click to display the Windows colour picker.
- The scaling thresholds are stored in the 'Lower' and 'Upper' columns.
- The next column is 'Virtual archive'. Virtual measurands can be displayed device-wide in a graphic.

About the buttons:

- A profile can be saved as a template. If you are designing a number of the same or very similar desktops, clicking on 'Load from template' can save you a lot of time.
- Inherit sends this setup to all equal devices.

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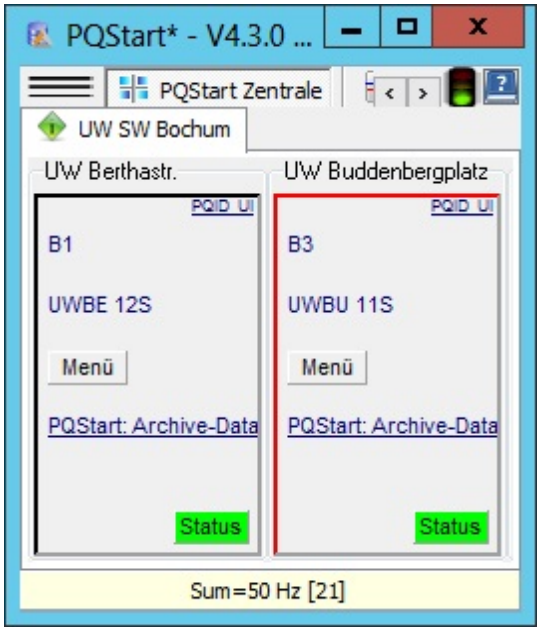
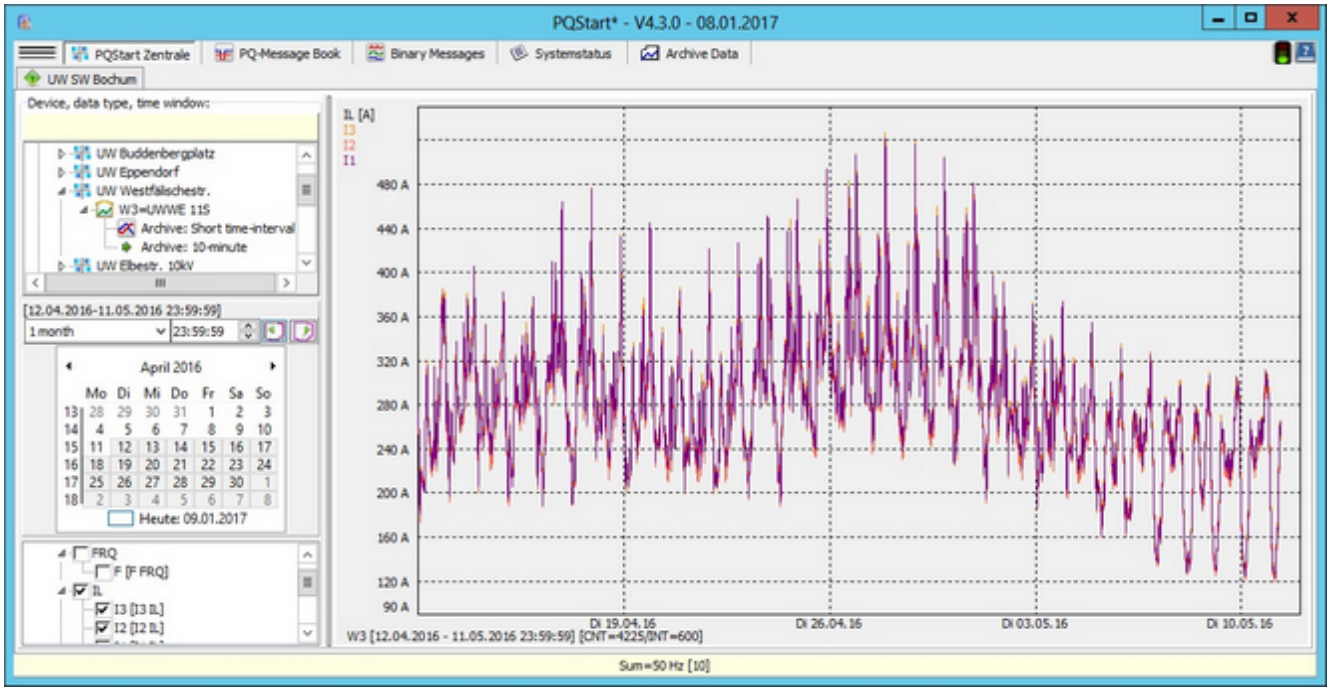
Displaying archive data in PQStart:



Link to the Archive data



Selecting and displaying measurands

- This view is displayed by clicking on the Archive data link on one of the device tiles. Key selection fields, such as Data class and Device, are already populated. You can also click on the 'Archive data' tab and start selecting data.
- The data are entered (left selection panel in the figure) intuitively from top to bottom. This means that the value that is selected in the upper fields determines the value that is populated in the lower fields.
- The values that can be selected are (fewer options may be displayed, e.g., when the virtual table function is not

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used): 3-second archive, 10-minute archive and a user archive (customization: certain interval data are recombined, e.g., a 15-minute interval can be created from three consecutive 5-minute values).

- The 'virtual table' item describes the access to the measurands that the program retrieves from different SQL tables (several devices) (e.g., the apparent power of the devices B1, B2 and B3).
- The selection of the calendar date and the time window as well as the following selection lists for measurand groups (when a parent node is selected, the child elements are selected) and measurand symbols should be self-explanatory.

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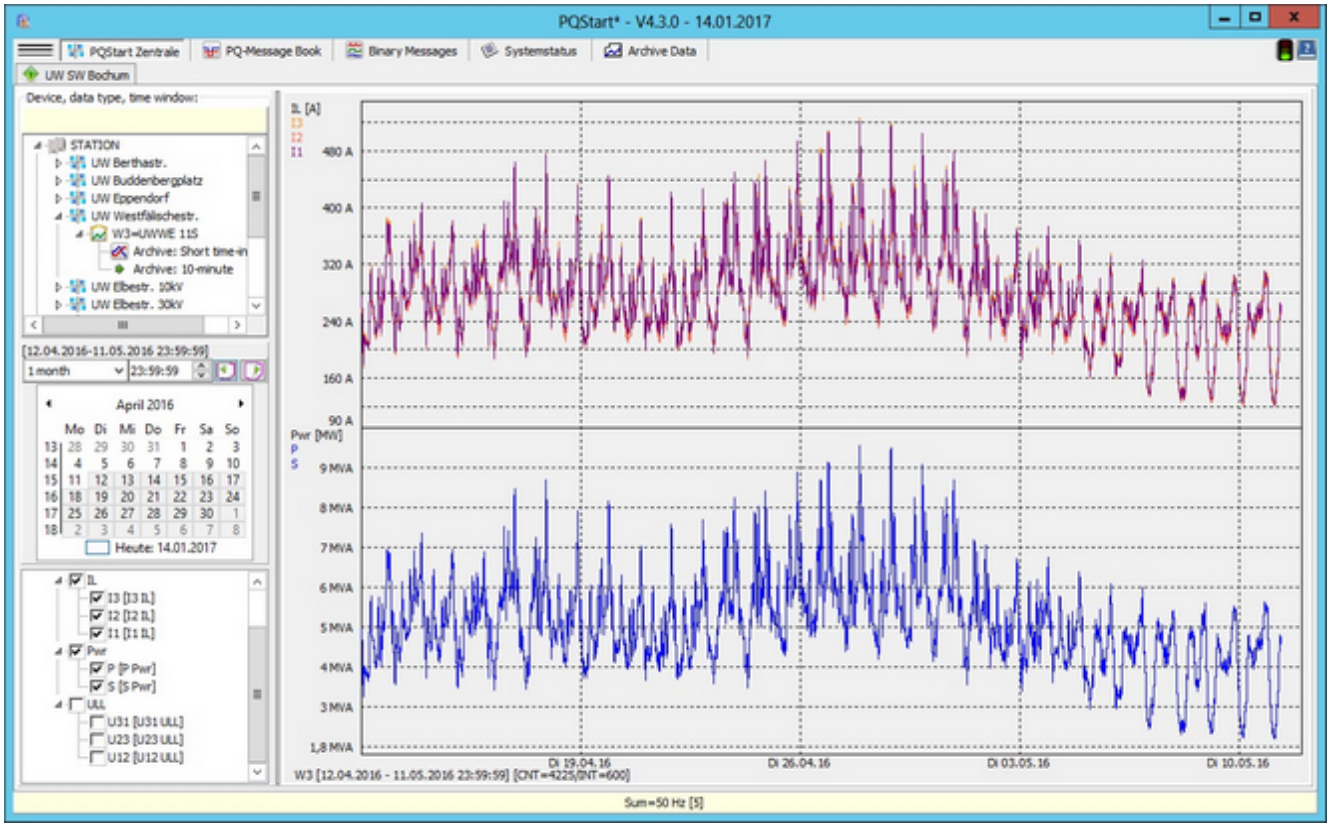
Using the selection panel:



- The following selection is available (in descending order):
  - Data class (3-second, 10-minutes, user, virtual 3-second, virtual 10-minutes and virtual user)
  - Devices (all of the devices that are on the desktop)
  - Time window (display timeframe, context dependent 1 day, 1 week, 1 month, etc.)
  - Right/left buttons (direction-dependent time window shifting)
  - Start date (by clicking any day on the calendar; quick shifts are also possible by selecting the month or year)
  - Measured value group (alphabetical comparison according to the entry under device properties)
  - Measured value symbol (all entries can be switched on or off separately)
- The groups are selected through the measurands' group accounts (e.g., IL, UL).
- The graphical display is automatically refreshed every time a value changes.

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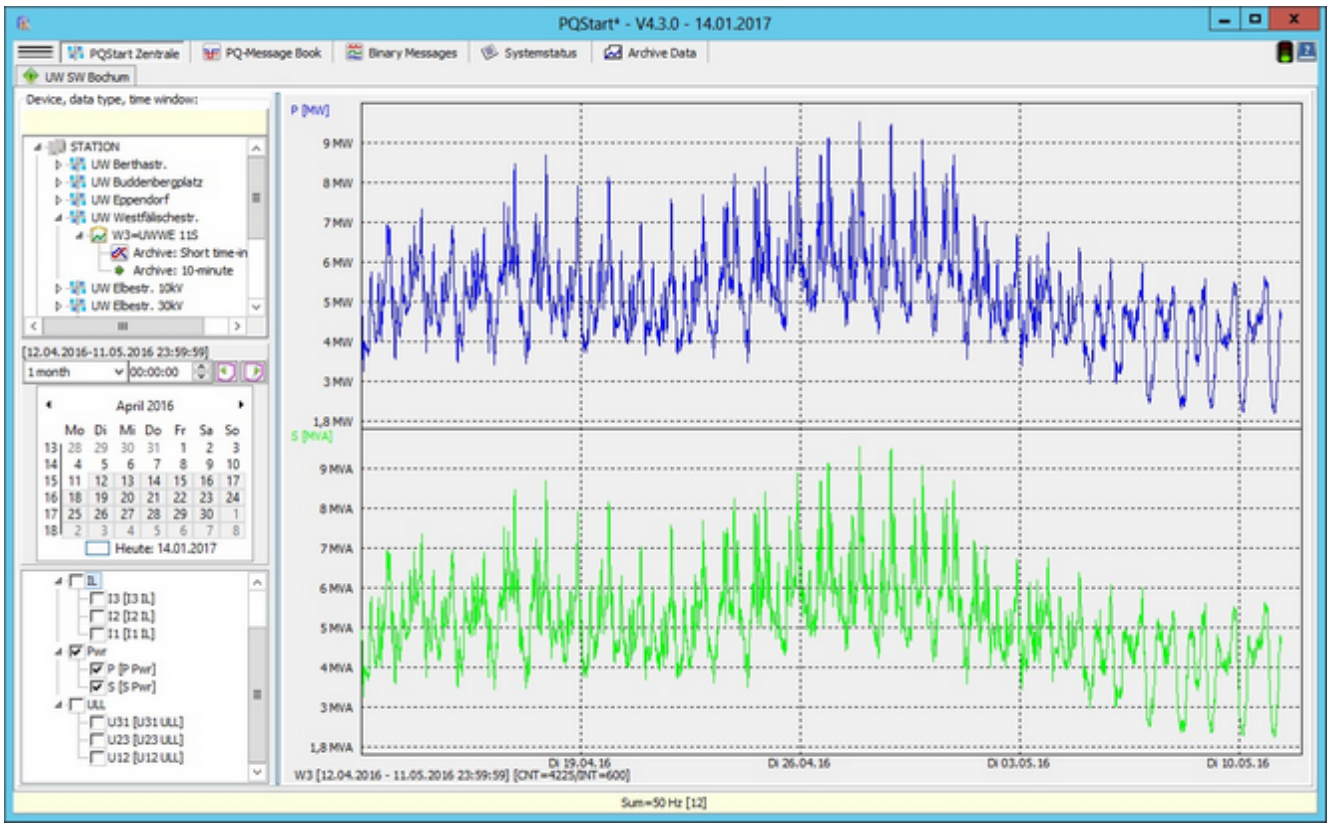
Additional graphical display functions:



These functions are available by right-clicking in the graphics area of the screen.

- **Display options** :
  - Auto scaling: The scaling set by the administrator is used by default because there are no other input fields, making auto scaling the only option if the current values are outside of the predefined value range.
  - Automatic colours: The colours that are assigned are used. If there are overlaps, e.g., virtual tables (from different SQL tables), you can switch to automatic.
- **Display options** :
  - Normal: This is the basic display. All of the items in a group are displayed in one area.
  - Stacked: Each curve is displayed in its own (stacked) area.
  - Sum: The individual curves are summed up across the same sample points and displayed.
  - Average value: Same as above, except that the sum is divided by the number of curves.
- **Graphical output** :
  - Print graphic: The graphical area is printed to the printer.
  - Copy graphic: The graphic is coped to the Windows clipboard.
  - Graphic as PDF: The graphic is opened with the standard PDF viewer. The file is stored in the Windows clipboard and can be used in other places.
  - Copy data: The measured values are displayed as numbers (below figure: minimum and maximum with time

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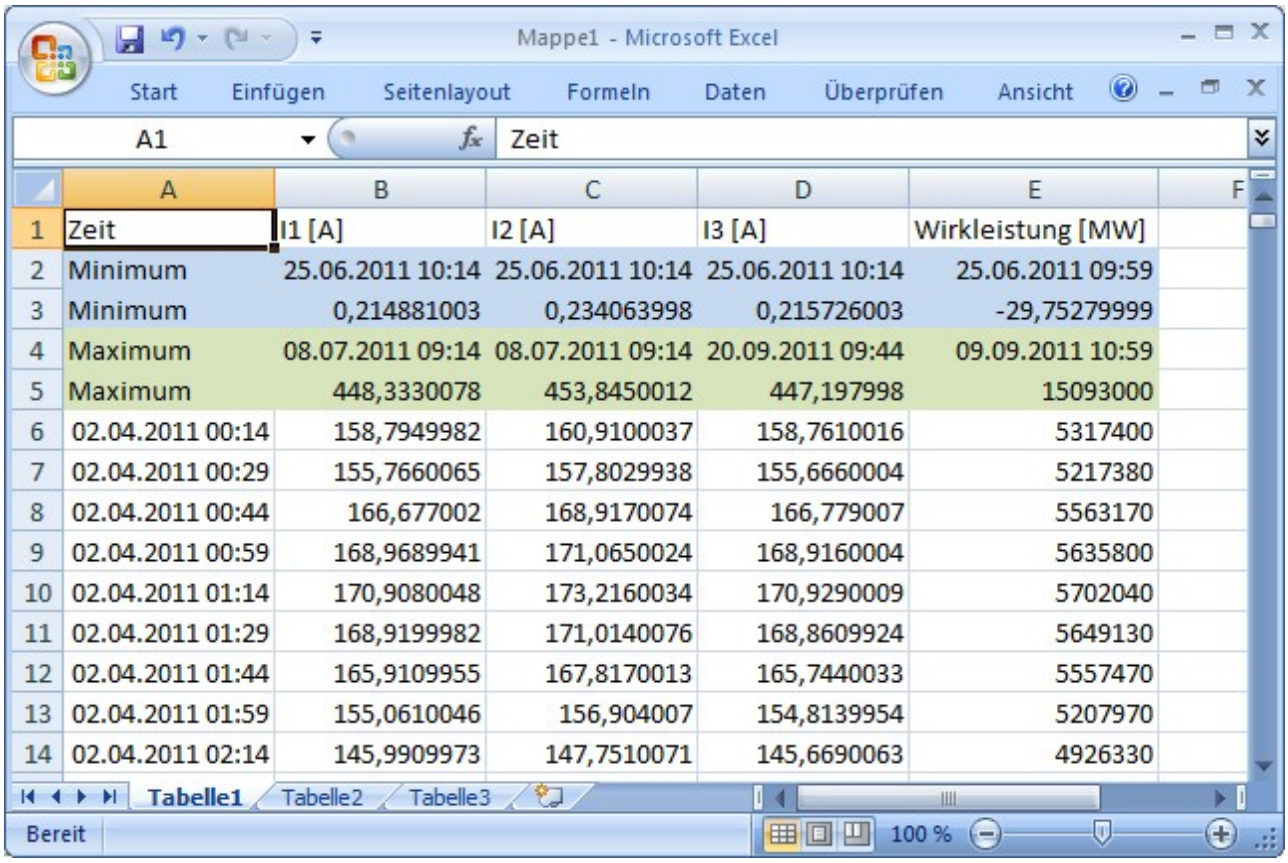
stamp are displayed before the measured values).



	A	B	C	D	E
1	Zeit	I1 [A]	I2 [A]	I3 [A]	Wirkleistung [MW]
2	Minimum	25.06.2011 10:14	25.06.2011 10:14	25.06.2011 10:14	25.06.2011 09:59
3	Minimum	0,214881003	0,234063998	0,215726003	-29,75279999
4	Maximum	08.07.2011 09:14	08.07.2011 09:14	20.09.2011 09:44	09.09.2011 10:59
5	Maximum	448,3330078	453,8450012	447,197998	15093000
6	02.04.2011 00:14	158,7949982	160,9100037	158,7610016	5317400
7	02.04.2011 00:29	155,7660065	157,8029938	155,6660004	5217380
8	02.04.2011 00:44	166,677002	168,9170074	166,779007	5563170
9	02.04.2011 00:59	168,9689941	171,0650024	168,9160004	5635800
10	02.04.2011 01:14	170,9080048	173,2160034	170,9290009	5702040
11	02.04.2011 01:29	168,9199982	171,0140076	168,8609924	5649130
12	02.04.2011 01:44	165,9109955	167,8170013	165,7440033	5557470
13	02.04.2011 01:59	155,0610046	156,904007	154,8139954	5207970
14	02.04.2011 02:14	145,9909973	147,7510071	145,6690063	4926330

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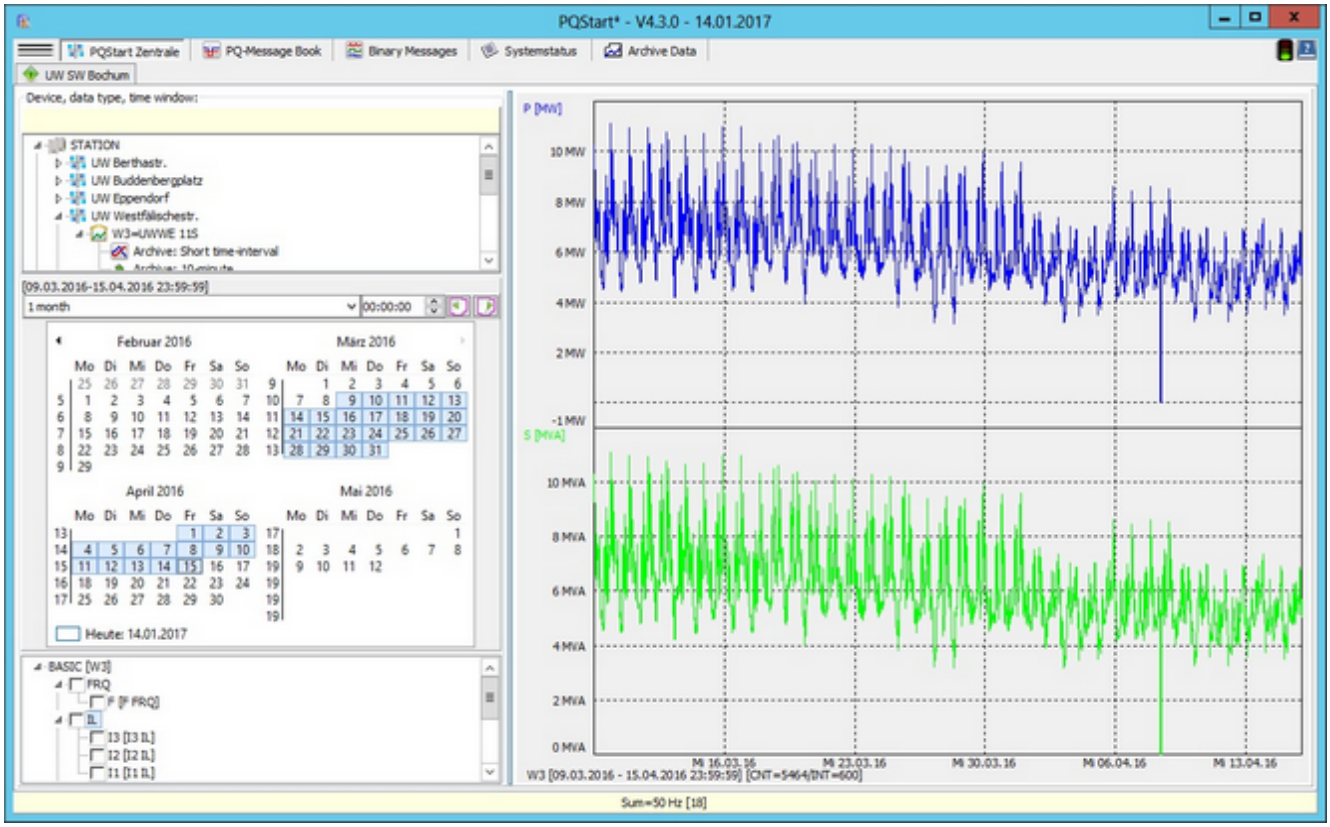
Selecting an arbitrary time domain:



- A time window can be selected using one of the following elements: Calendar, time domain, time-field and right/ left buttons.
- The calendar field automatically scales to the available space. As shown in the figure, several calendars can be displayed beside or above each other.
- The calendar is designed for the selection of time domains (multiple selection). The start date (in the figure, 20 August) is selected by clicking on it and then the second date (in the figure 30 November) is selected by clicking on it with the Shift key pressed.
- The selection of the time window adapts automatically to the selected data class. For short intervals (e.g., 3 seconds), options up to two days (53600 interval points) are available. For intervals of 10 minutes, views up to one year (52560 interval points) are possible.
- For short intervals, the input field for the time is also enabled so that the display can start at a specific time during the day.
- The right/left buttons above the calendar enable the datasets to be selected sequentially. You can also do this by dragging (pressing and holding the left mouse button) the mouse in the graphic area.

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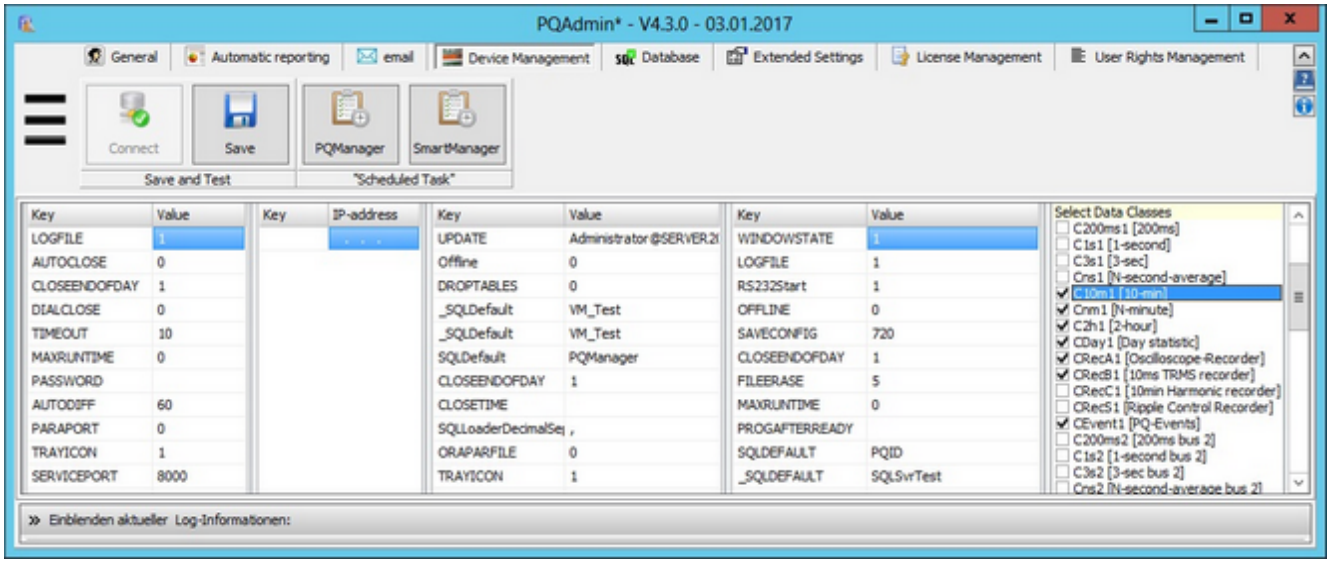
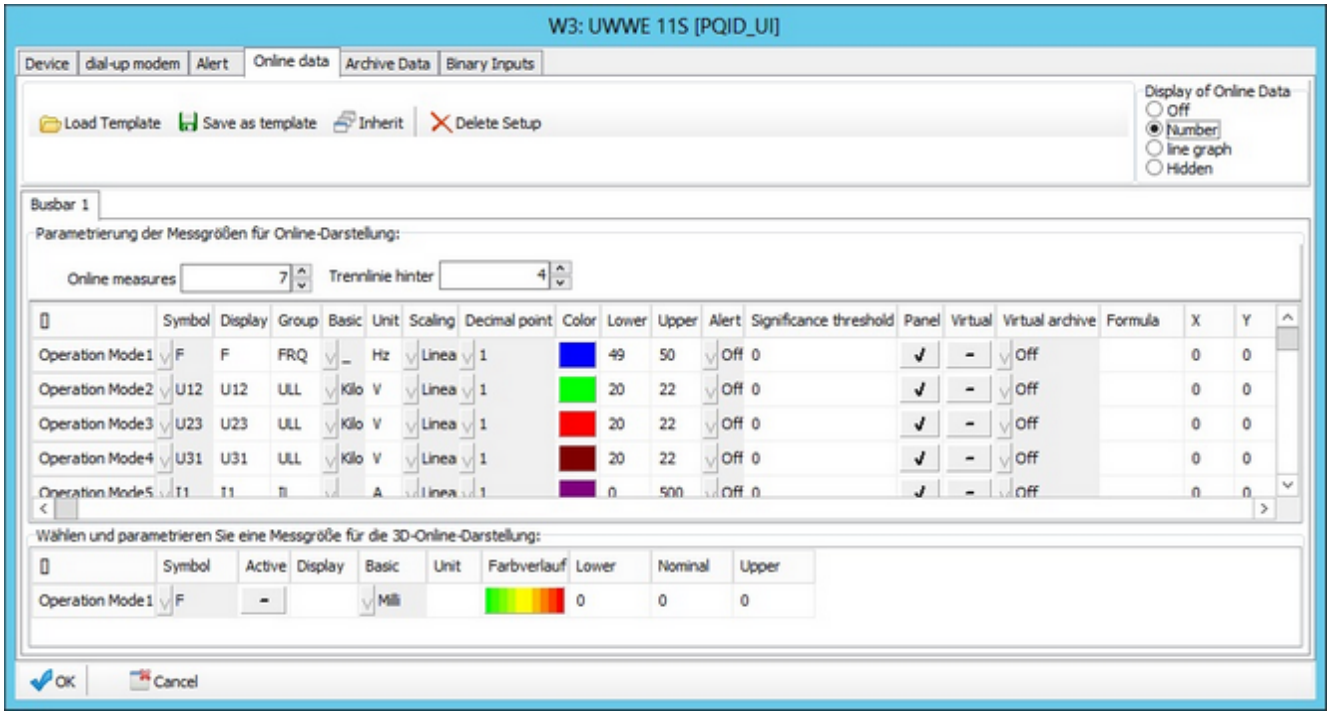
Prerequisites of displaying online data PQI-D(A)



- The 3-second data is not transfered into the SQL database by default. That is why this data class has to be enabled in 'Device management' (see Figure).
- Another parameter defines the recording depth of these data (default is 30 days). Older data are automatically deleted from the database so memory doesn't get too full. If you do not want to delete these data, set the parameter PQI3SECLIMIT to 0 (zero).
- PQManager must be restarted every time a parameter is changed. You should give **PQManager** about 10 minutes to reinitialize before generating the new **PQStart** desktop. You can also wait for the next daily program restart for the change(s) to take effect.

Configuring the desktop:



- First, determine the number of online measurands. Every time the quantity changes, rows are either added to or deleted from the table.
- The 'Symbol' column contains the column name of the 3-second SQL table. It is selected from a list. Right-click in one of the column's cells to select a quantity.
- Make sure no symbols are selected twice (this results in SQL command errors).
- The 'Display' column enables you to assign the display text that displays later independently from the symbol name.
- The 'Group' name enables you to combine measurands (later curve view).
- The unit that is later displayed (e.g., kV or MW) is generated by combining the 'Basic' and 'Unit' columns. The program uses the stored basic unit to do the conversion.
- Click on the 'Scaling' arrow to toggle between a 'linear' and 'logarithmic' view.
- You can specify the maximum number of displayed 'Decimal points'. However, only the number of decimal places needed are ever displayed.
- Select the 'Colour' of the view from a list. If you need more colours, right-click to access the Windows colour picker.
- Thresholds that are supposed to trigger an alarm when they are exceeded are specified in the 'Upper' and 'Lower' columns.
- The threshold that is monitored is specified in the 'Alert' column. Possible options are: 'Off', 'Lower', 'Upper' and 'Both'.
- The 'Significance threshold' enables you to determine the quantity from which measured values are displayed (below that a dash displays).
- The next column is 'Online panel'. If this column is enabled, the quantity it contains is displayed as online value in the device tile.
- The next column is 'Virtual online'. Virtual measurands can be combined device-wide and displayed in a graphic. You will have to create tiles with the device type 'Virtual'.

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- The last column is 'Virtual archive'. This option enables you to display the time behaviour of measurement data on different devices retrospectively in a graphic.

'Display online data' radio buttons:

- 'Number' corresponds to the above figure
- 'Line graph' displays the measured as a curve
- 'Hidden' means no display but the values are still continuously retrieved so that they can be used for virtual displays

Popup functions:

- Note that the 'Copy', 'Paste', 'Populate column' functions etc can considerably reduce data entry time.

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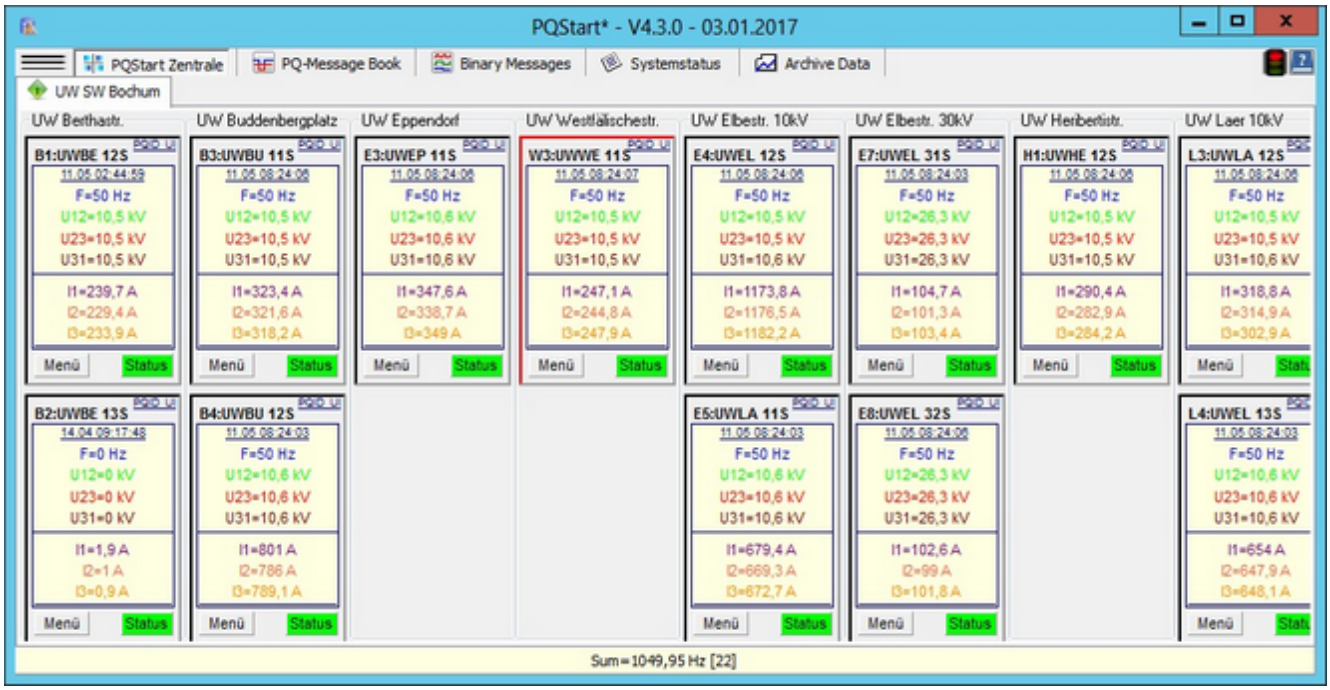
Tile screen with online data



- This is the simplest form of the 3-second online display.
- A few measurands (usually the same ones), whose current value is read cyclically from the database and displayed on the device panels below each other, were assigned to each tile.
- The font and its size can be adjusted for each device.
- The text colour can be selected for each quantity.
- A significance threshold can be defined that must at least be exceeded before the measured value is displayed as a number (otherwise '-'; see second tile from top left).
- When thresholds (set for each device during its configuration) are exceeded, the colour can change or an acoustic alarm can be triggered.

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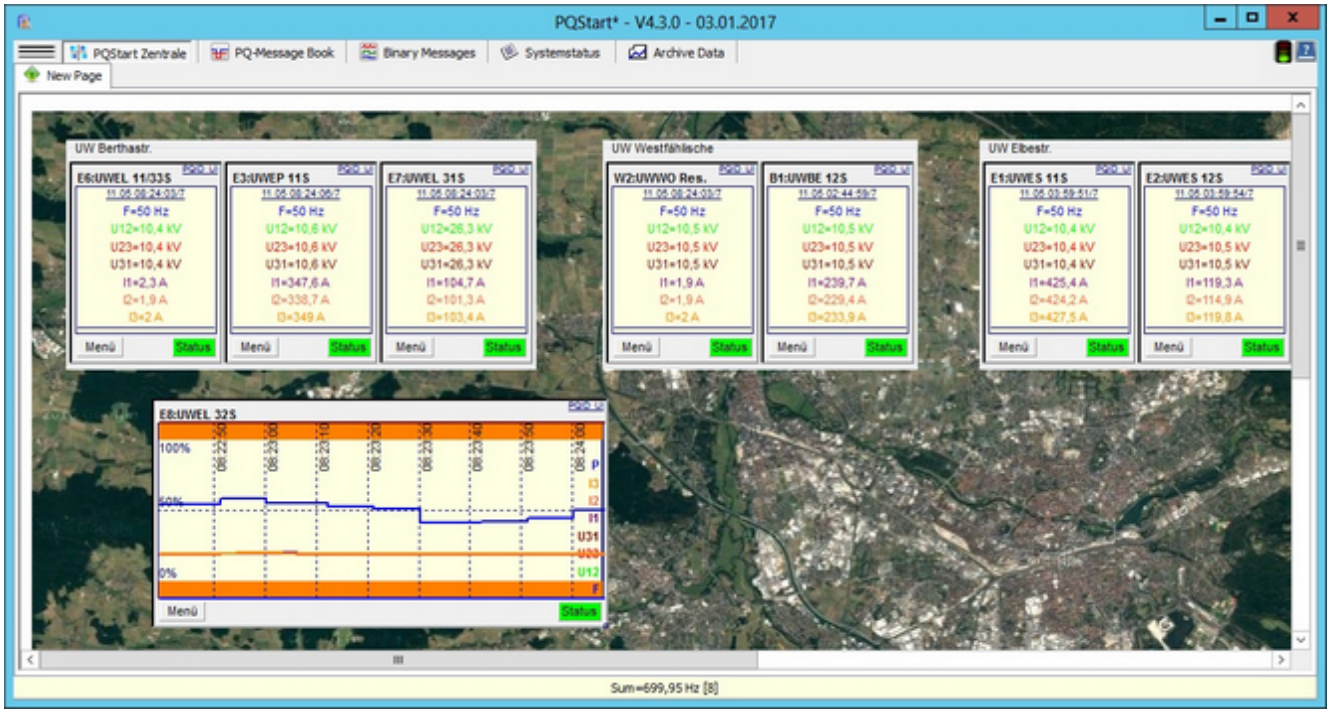
Online data with graphical background:



- This view is particularly useful if you want to display measurement data as a progression curve.
- The right bottom corner of each tile has a small box. Dragging this box expands the tile temporarily.
- The scale and the colours must be configured separately for each device. If necessary, you can use the **'Save as template'** function to make designing a desktop more efficient.

Generating virtual tables

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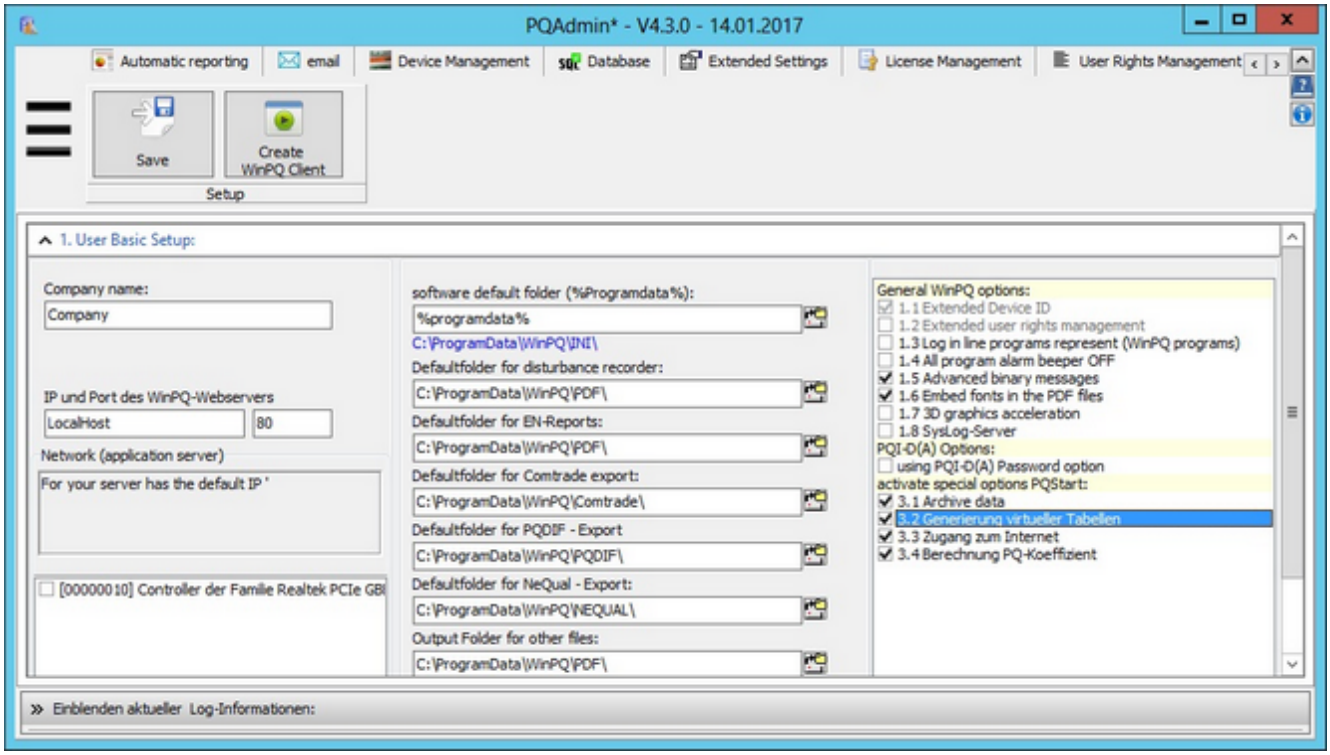
Virtual tables

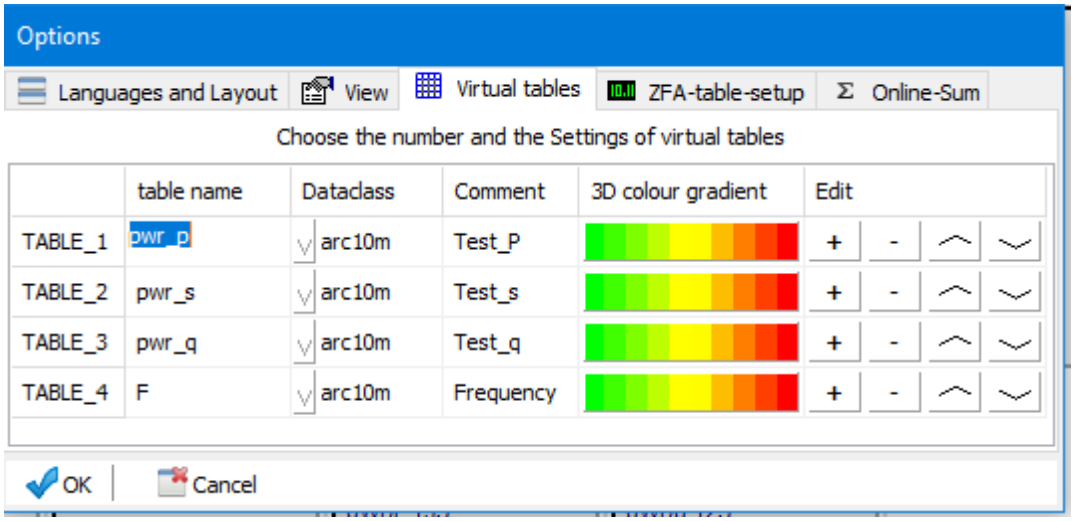
From time to time, recordings from different sources (several PQI-Ds) need to be compared with each other or derived quantities (e.g., power sums) calculated. In general, this means selecting the different devices and columns (measurands) one at a time and bringing them together in one display. This is a demanding and time-consuming task. The use of virtual tables in PQStart is based on the assumption that tasks are divided between the PQ administrator and the users. The administrator creates the profiles that the users will use at a later stage.



In order to use this function, the selection must be enabled in**PQAdmin**.

The administrator prepares the view

To administer the virtual tables open the 'startscreen options' in the main menu.



- The PQ administrator must first define the 'virtual table', meaning that he or she must first enter a table name such as 'P_106' and give it a recording interval (currently '3/5 seconds', '10 minutes' or 'user interval').
- The 'Comment' column is a display-only field that has no further function.
- Moving the selection in the table (here 'P_H18') automatically copies the items to the input fields.
- Click on 'New/Change' to adjust the table row. Either an existing item name is overwritten or a new one created (new row in the table).
- Click on 'Delete' to remove an item. Click on 'Save setup' to write all of the changes to the database.

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Assigning measurands to virtual tables

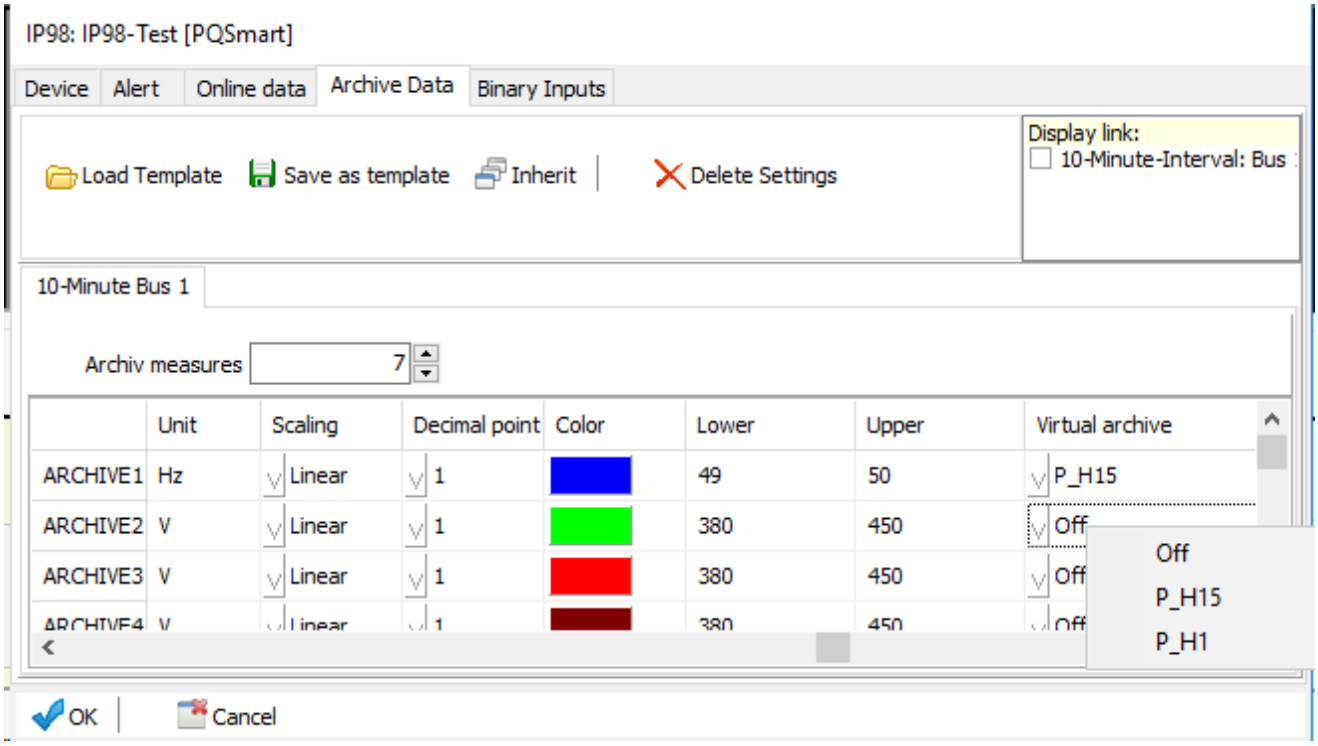

Figure: Local menu in the 'Virtual archive' column.

- In a second step, the PQ administrator must assign columns (measurand symbols from different devices) to the virtual tables.
- This is done by selecting a device, right-clicking to display the context menu and selecting 'Device: Properties' to display the page to configure the archive data. The 'Virtual archive' column contains measurands. Each measurand, e.g., 'P', 'Q' or 'S' can be added to a virtual table with the up/down control (right-click - in the example, the table to the right - to display all of the virtual tables).
- There are cases in which a physical measurand is needed in several virtual tables. In this case, check all of the virtual tables in the which the measurand is needed under 'Send multiple selection to'.
- This process must be repeated for each measuring device.

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Accessing virtual tables

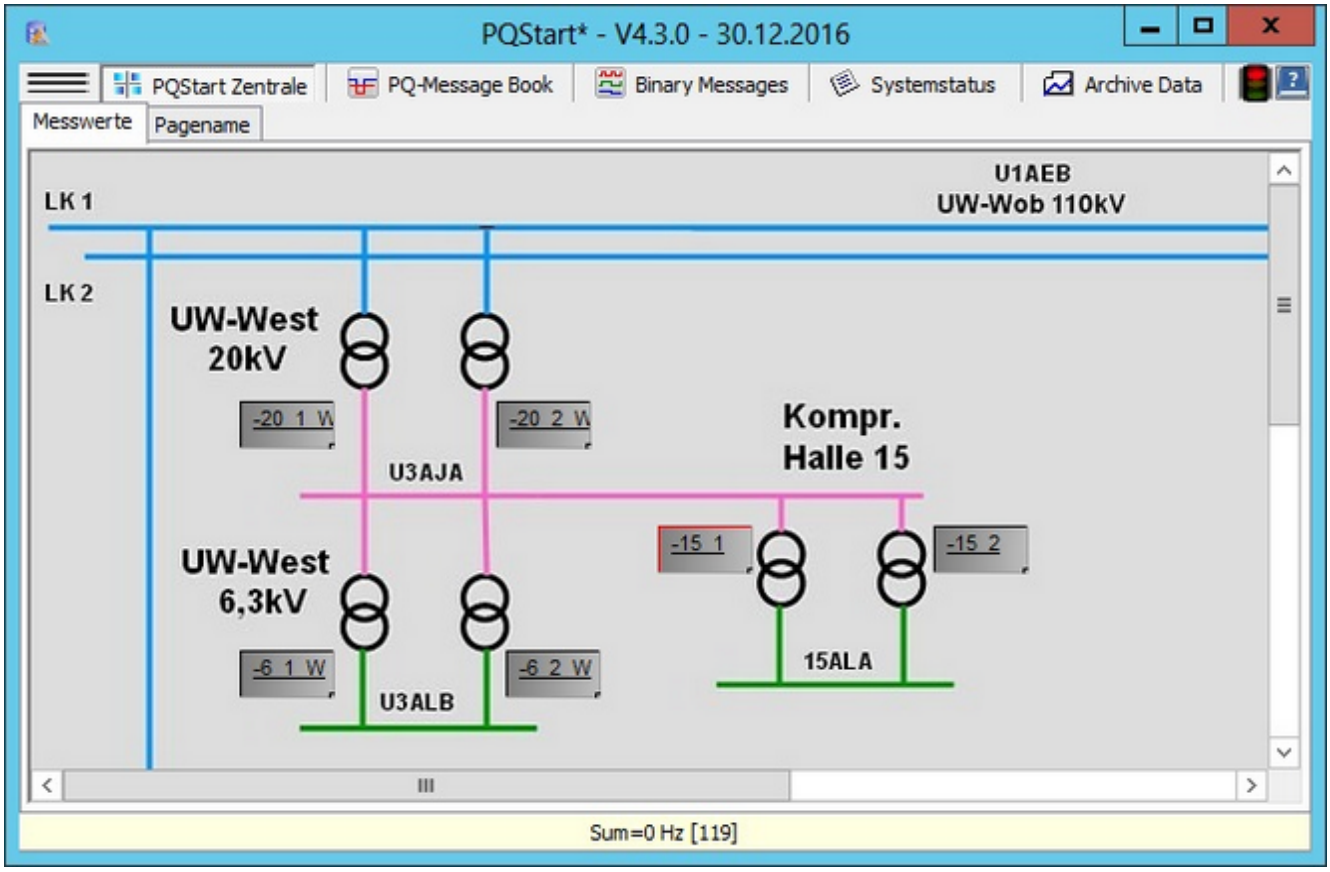

Figure: Virtual devices in the PQStart overview

In the overview, 'Virtual devices' can be highlighted, for example, by selecting a specific background colour and/or position. Clicking on the virtual station (here orange) takes you directly to the virtual tables that contain the calculated values.

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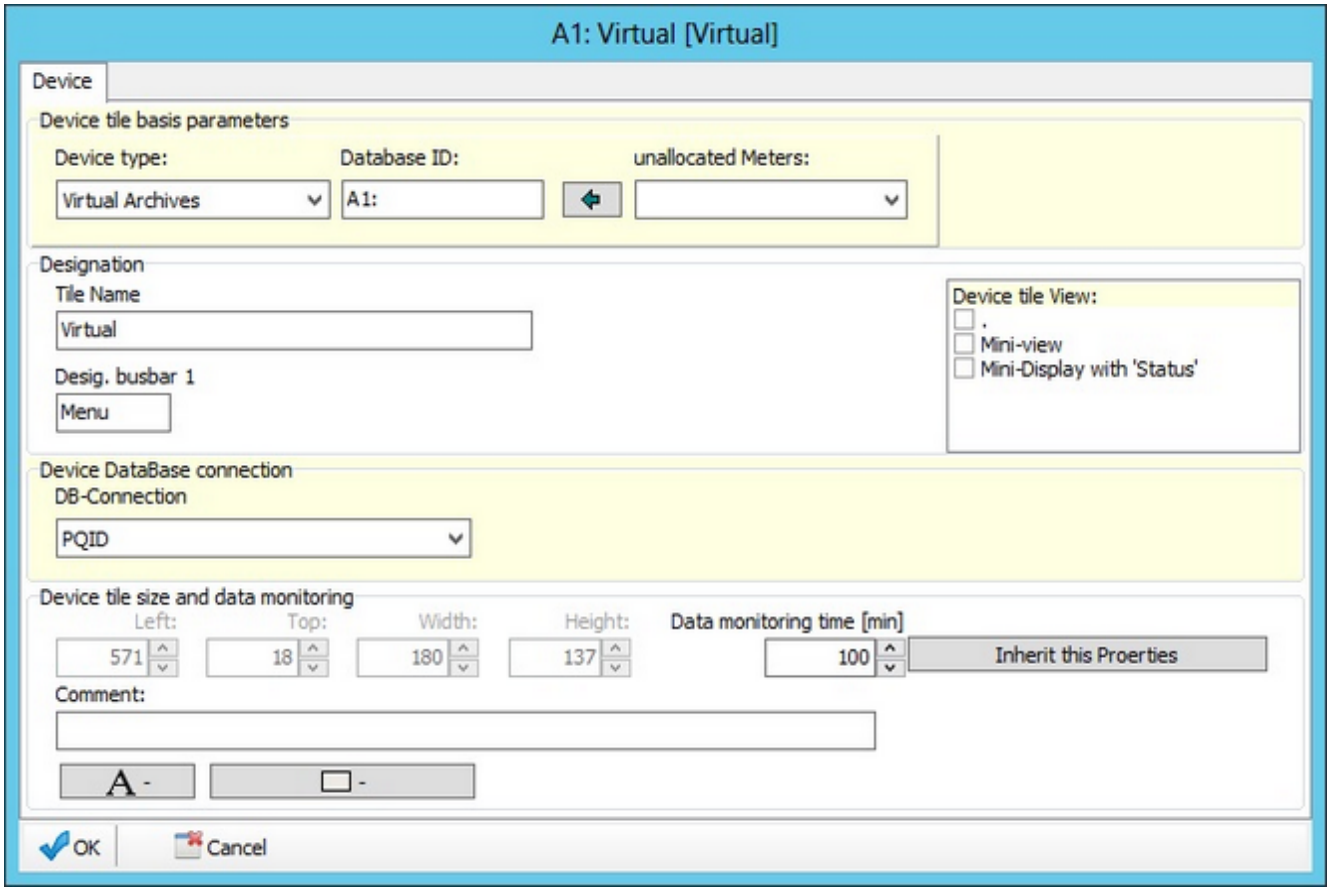
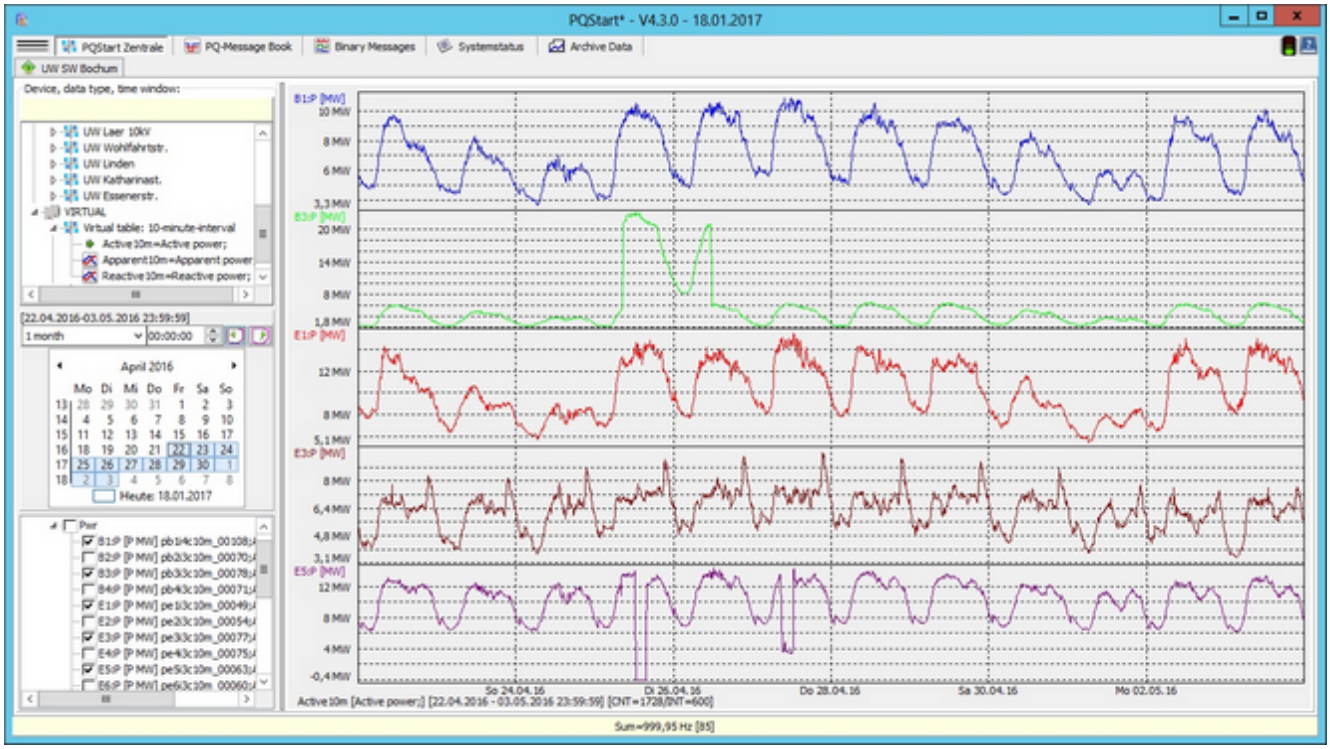


Figure: Making a device virtual

In the Properties pane at the top of the screen, select device type 'VirtualArch' and select the desired tables from the drop-down list.

Graphical view of virtually grouped channels



- This area can help users in their daily job.
- Click on the Archive data link in a device tile on the page (could also be a standalone pane) to display archived data.
- The Data Class field contains 'Virtual table: 10-minute interval'.
- The 'Select a virtual table' field contains a list of all of the available elements
- (time window, calendar, groups and symbol selection) that are used to display device-related data. The local graphic menu (print, copy, etc) is the same as with other graphics.

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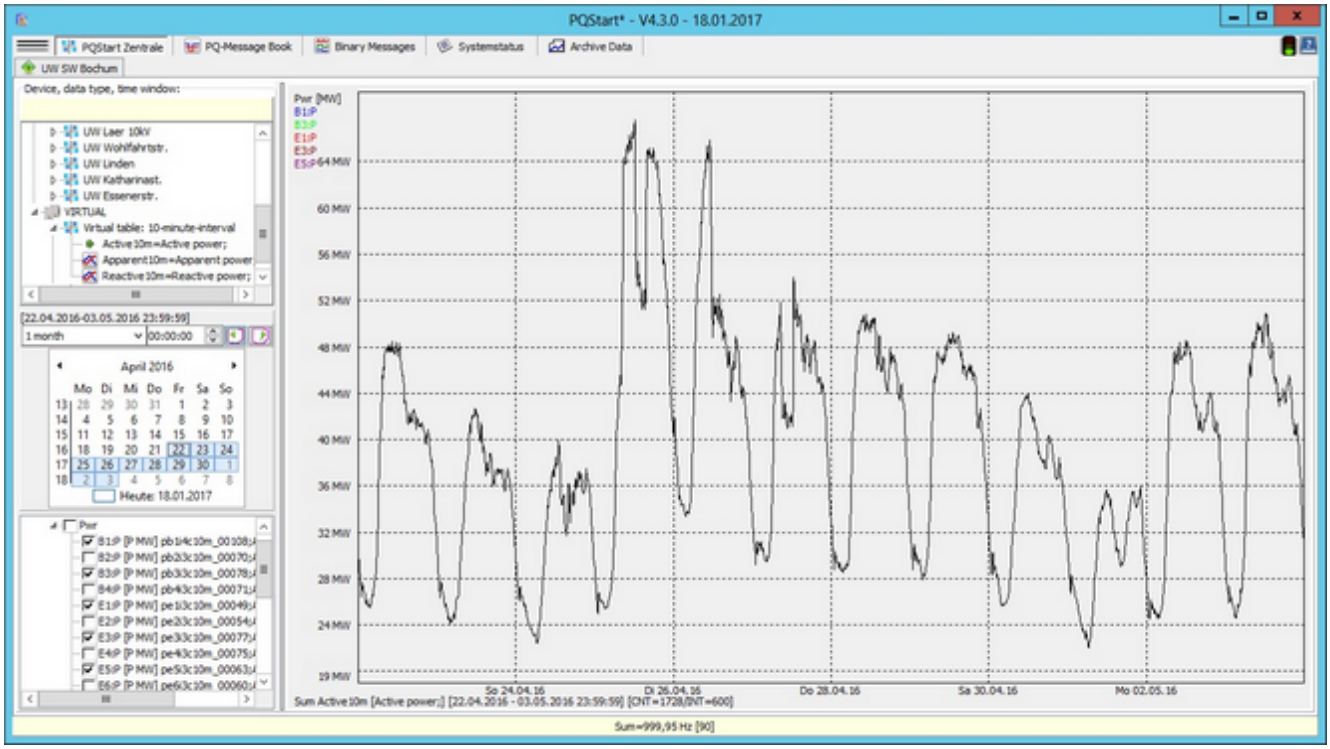
Summation of signals from virtual tables



This type of display is often used to calculate a sum from individual quantities. In line with the figure on the previous page, you can now right-click to display the 'Display: Sum' option. This option calculates and displays the sum of all of the recorded points. These values can also be copied and further processed.

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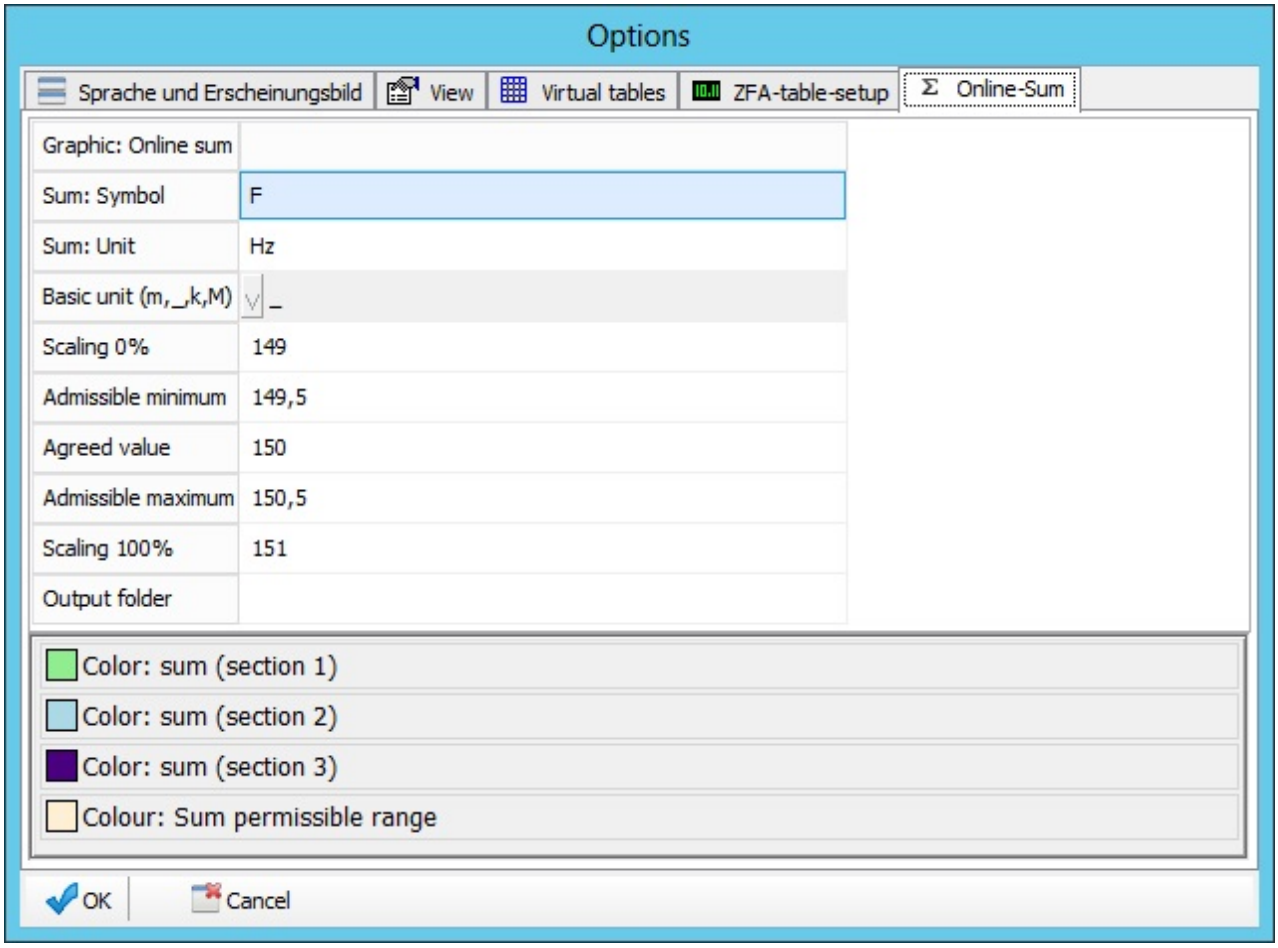
Calculating the total power

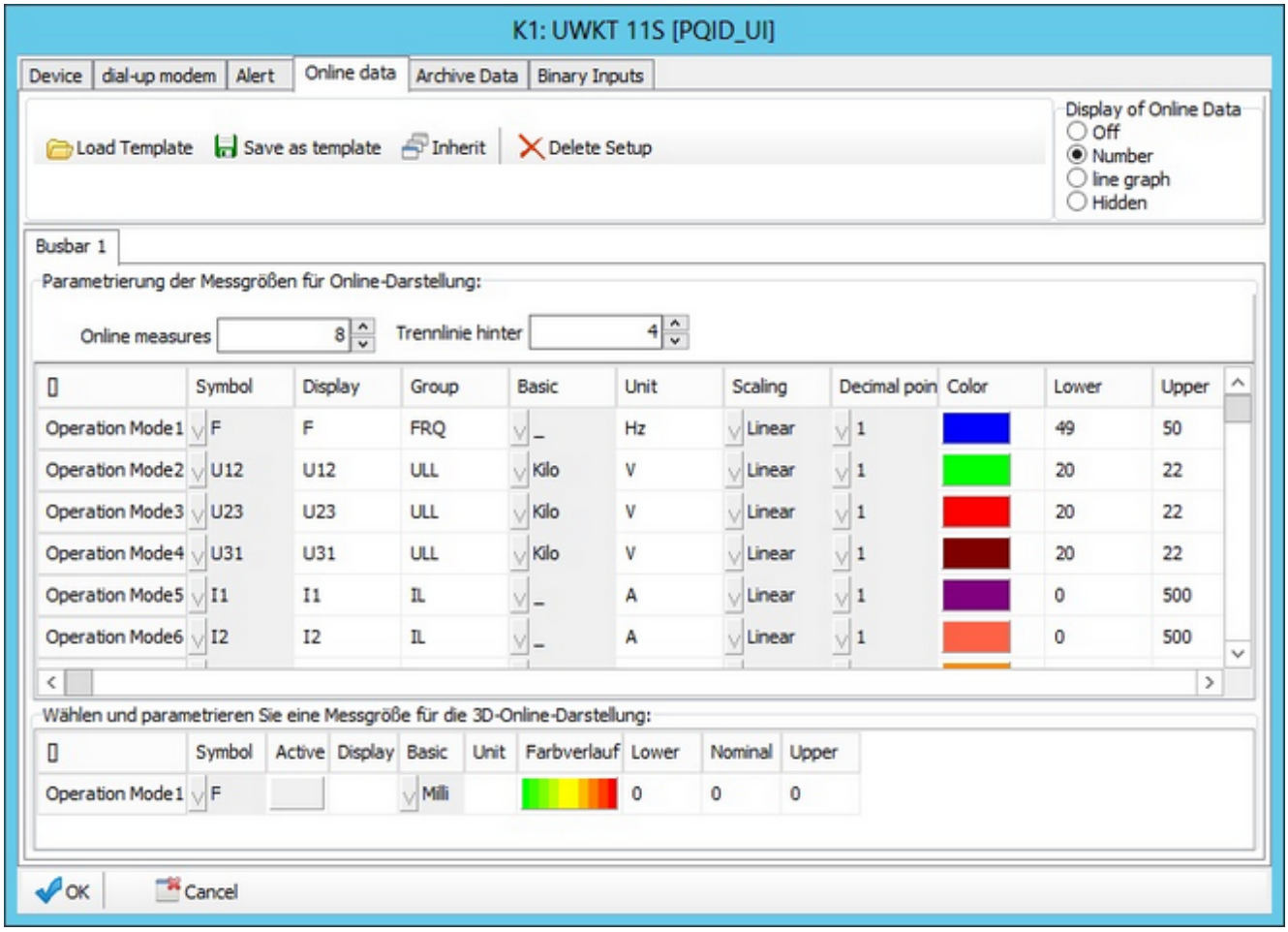
This view enables the sum of an online measurand to be calculated across all PQ devices (usually 3-seccond interval) and displayed. For example, the calculation of the active power sum of all substations.

In order to use this function, 'Online sum display'must be enabled in **PQAdmin**.

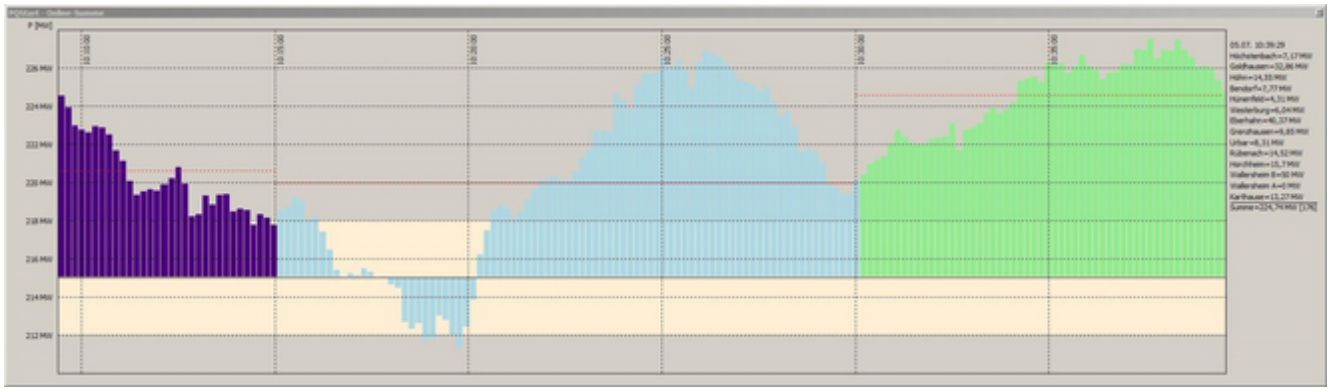
First, the parameters such as threshold and colour have to be defined for the graphical display:

- The symbol ('P' in the figure) determines the measurand that is used in the calculation. This symbol must also be defined as the first measurand (next but one figure) in the online data setup.
- Unit and basic unit are used accordingly in the display.
- The following values are used to scale the graphic, whereby the tolerance range is indicated by a colour. The sums are displayed at the average value line as bars.
- Different colours can be used to better distinguish the 15-minute thresholds.





The 15-minute interval is used as basic time interval. The data are wrapped in the graphical display at the 1/4 hour transition. The groups' power sums and the total are displayed in figures on the right side of the view. The red line in the graphic designates the 15-minute average.



Functions in the program's main menu

Every WinPQ program has a function menu (three horizontal lines) that provides access to additional key functions.

Clicking on the three horizontal lines opens the menu. Clicking on the three horizontal lines when the menu is open, closes the menu.

The menu is split into three main areas:

Basic information :

- **Password**: If you are working with several user levels, this is where users enter their password. The text in the program pane line changes upon successful authentication. The user level is determined by the password. If no password or the wrong password is entered in the password field, the user is automatically sent to the user level with all restrictions. The authentication applies to other programs that are started (e.g., error logs or reports).
- **Add PQ device**: Clicking on this option opens a dialogue box that enables new devices to be added to the database (Commissioning wizard)
- **System management (PQ-Admin):** Starts the WinPQ system management program (SQL basic structures, user setup, INI file editing, install/start service programs etc).
- About WinPQ: Clicking on this option opens a modal dialogue box that enables you to determine the program's behaviour.
- **Close PQStart**: Closes WinPQ.

Load/save desktop :

- **Load: Plant structure**: You can choose from the files that are listed (e.g., you would like to work with a graphical desktop or use your own structure for different grid or user levels).
- **Save: Plant structure**: This function saves the current device setup in a file with an arbitrary name (this function is useful id you want to give your application a name).
- **Create new desktop**: Creates a new desktop.

Edit / Show Open Street Maps:

- **Parametrisation Maps Desktop:** Place devices according to their GPS postion.
- **Online Data in GPS context:** Visualize online data in context of GPS data.

Additional information :

- **Device properties:** Groups the most important settings for your desktop in a table (see below example), such as 'Description', 'Type', 'Host', 'Port', 'SQL connection, '3-second table', '10-minute table', 'Position' and 'Arrangement'.
- **Display time-out information** : Lists the current time-out status of all devices in a table.
- **List of virtual online symbols** : Displays all of the configured virtual symbols in a table.
- **List of virtual archive tables** : Displays all of the configured archive tables and the associated symbols in a table.
- **List of GPS data** : Displays the geographical coordinates associated with the devices in a table.

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Start screen options

This screen is accessed by clicking on 'Service' in the main menu and selecting 'Startscreen Options':

- **Design**: This is where you select the design for the WinPQ display.
- **Language**: Because this information is stored in the registry in the user area and retrieved when the user logs in, users can select the language they want to work in.
- **Display pane**: Select the options you want to use. Pages/panes that are not selected are hidden. User cannot change these settings without the password:
  - **Off**: This type of view is disabled
  - **On**: This option has a page
  - **Free**: If, for example, several screens are available the panes can be split (e.g., the first screen for status information and the second for archive measurement data views).
- **Special functions** : Most of the device options can be enabled and disabled centrally as well as individually.
  - **Enable database query** : You can supress the continuous database query
  - **Enable 3/5 seconds online** : The transmission of online data can be enabled or disabled centrally (if the option is disabled, the icon on the status bar is struck through)
  - **Enable email dispatch** : The dispatch of alert emails can be stopped temporarily
  - **Alert messages as page text**: When systems are split across several pages, it is useful that new status information display on the tab
  - **Multi-line tab**: If the number of pages doesn't fit on the screen you can decide whether the tabs should be displayed in several rows or if right/left navigation buttons should be used.
- **Status display** : Here you can determine the amount of information that is displayed when the 'Status' button is clicked (the options are self-explanatory).
- The right pane contains a number of additional options:
  - **Alert colour**: This applies to information such as 'Transmission failure', 'No valid SQL data', 'Warning displaying online data view' (The background colour is the background colour of the graphical display. The other two parameters determine how text is displayed).
  - You can select an audio file for each of the three events that trigger an acoustic alert. The sound plays briefly every time an option is changed.
  - **Reset alert counters**: Information about acknowledged alerts is stored in the database by user (usually the Windows user name). This option can be reset here.
  - The colour selection is for the**display functions for long-term recordings (background colour progression with start/stop as well as line colour)** that are embedded in PQStart.

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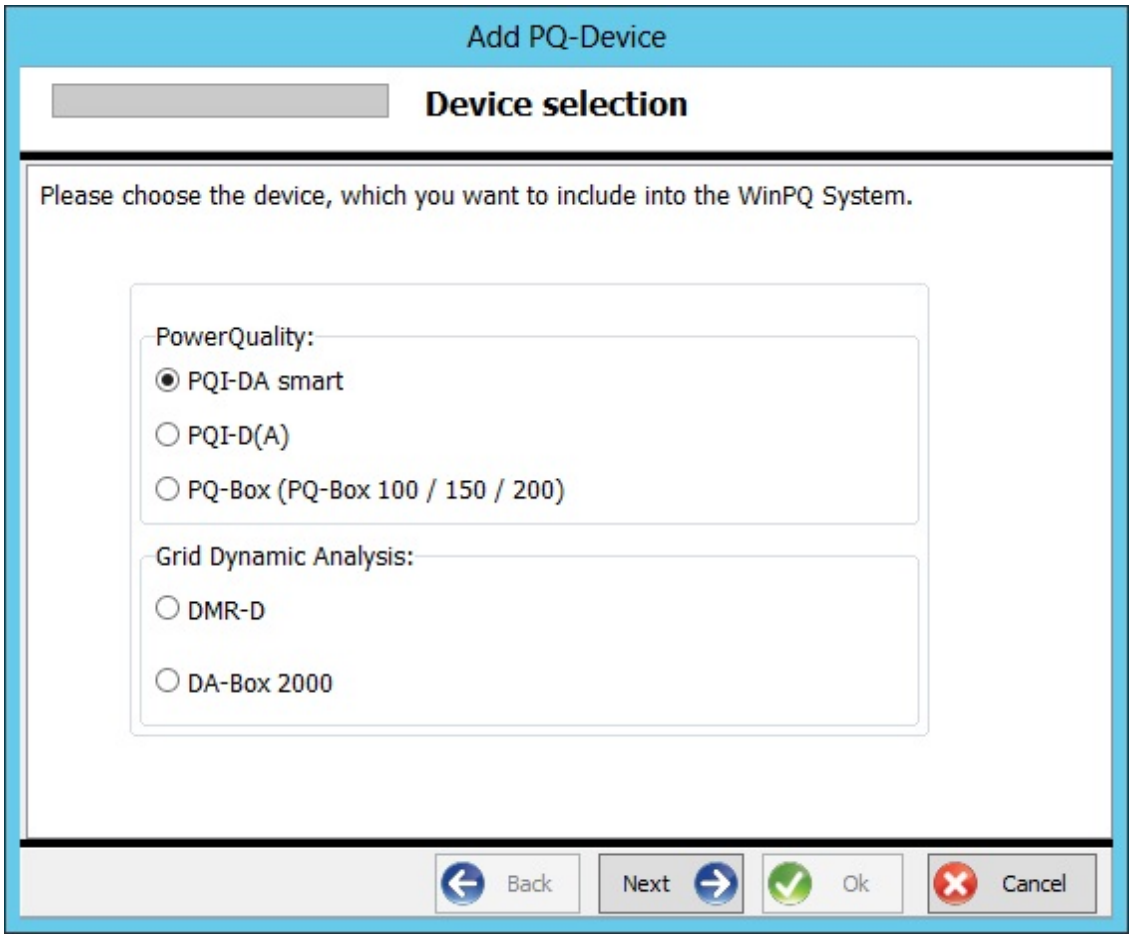
Adding a PQ device

To facilitate the commissioning of new devices, WinPQ has a few wizards that make it easy to connect devices to the database. Users are guided through a number of selection fields. Information about the field is displayed at the top of the page.

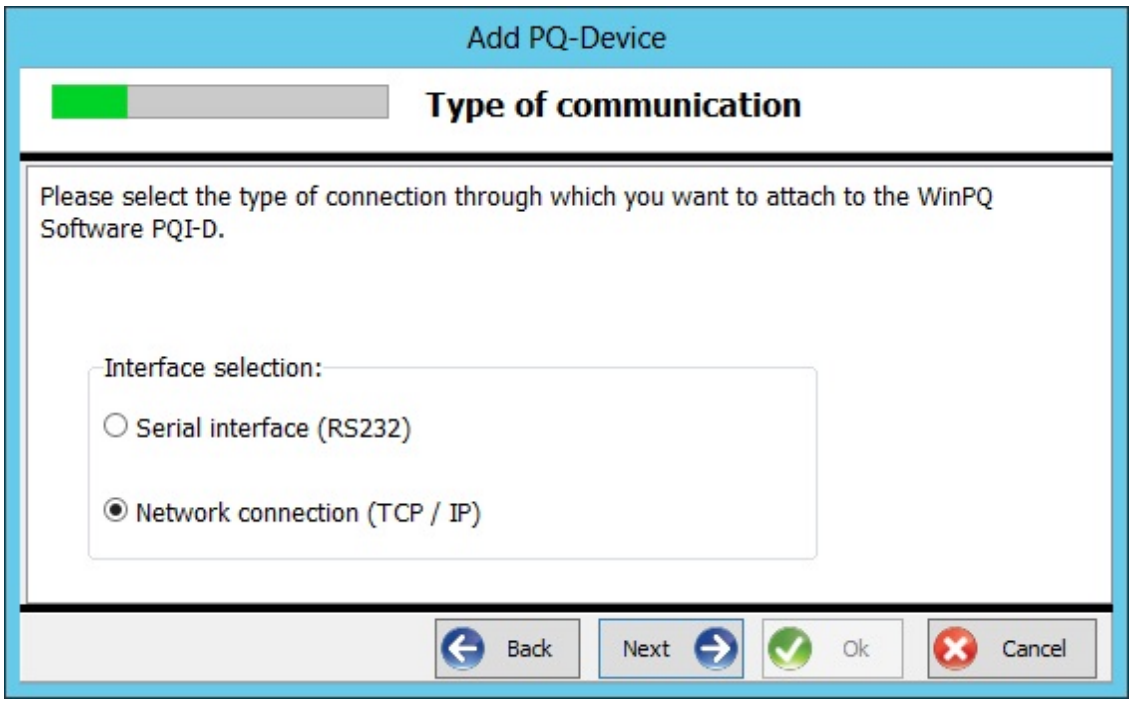
First, the device is selected.

- PQI-D Smart
- PQI-D(A)

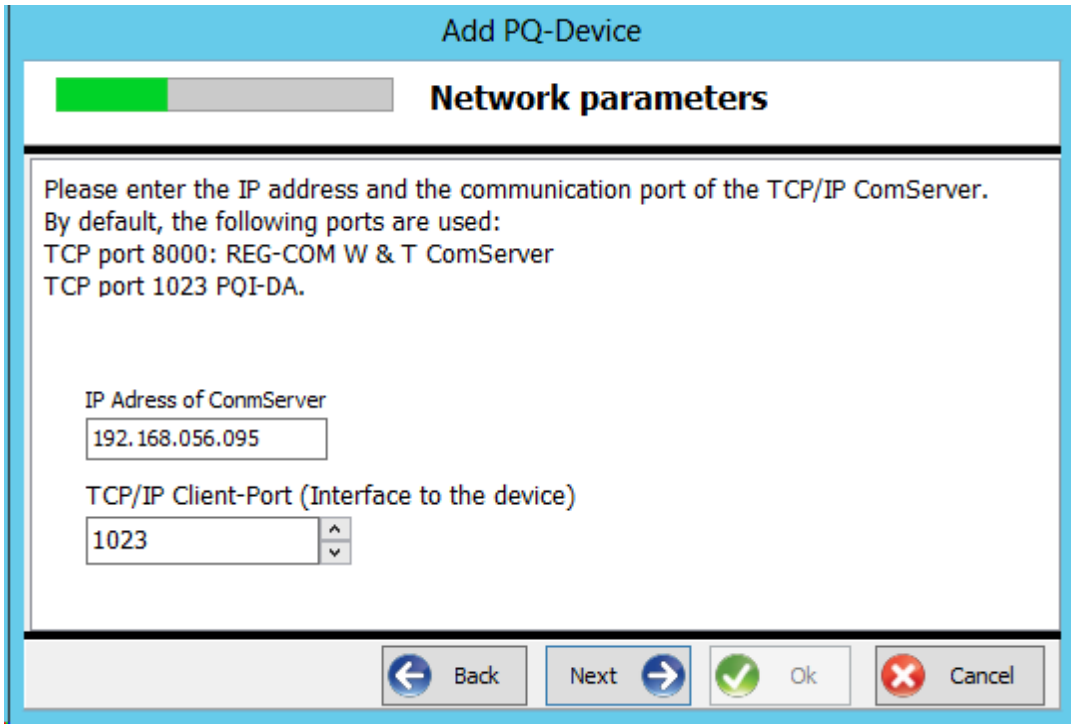


Adding a PQI-D/DA

Second, the type of server connection is selected:



If a TCP/IP connection is selected, the following parameters must be set:



The parameters are used to search for a suitable device on the connected network:

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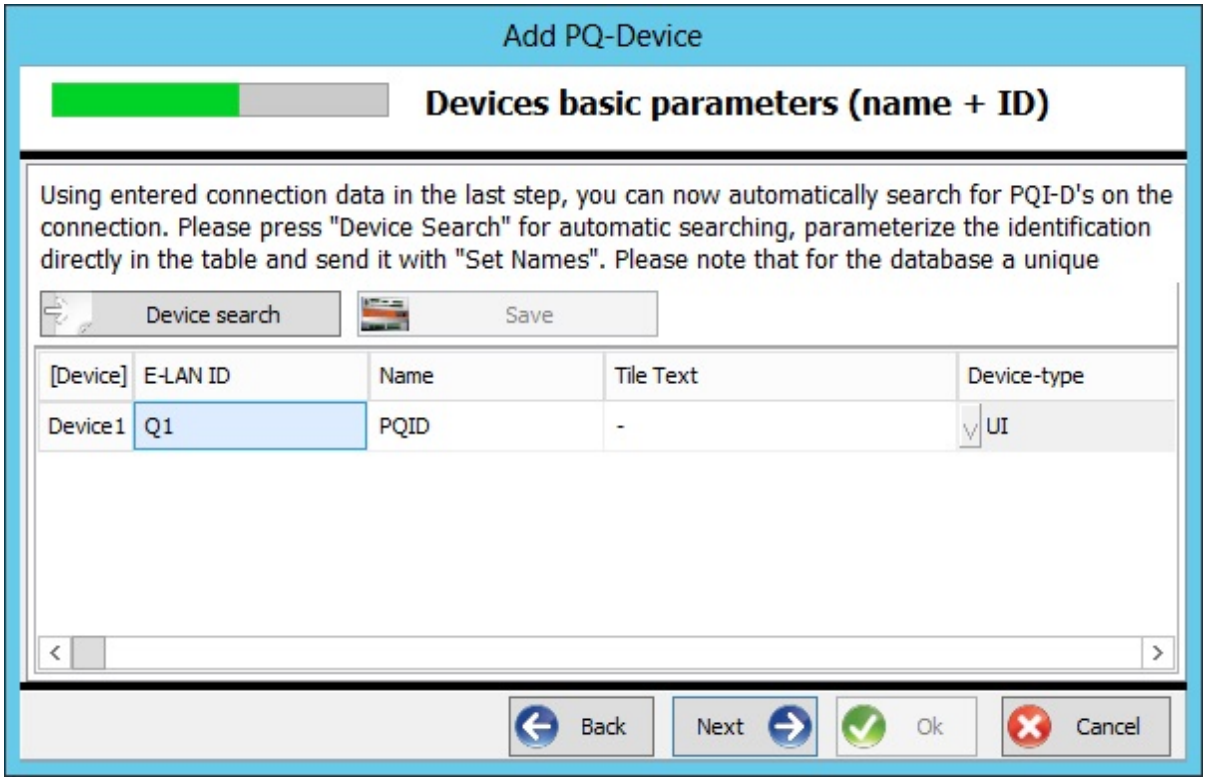
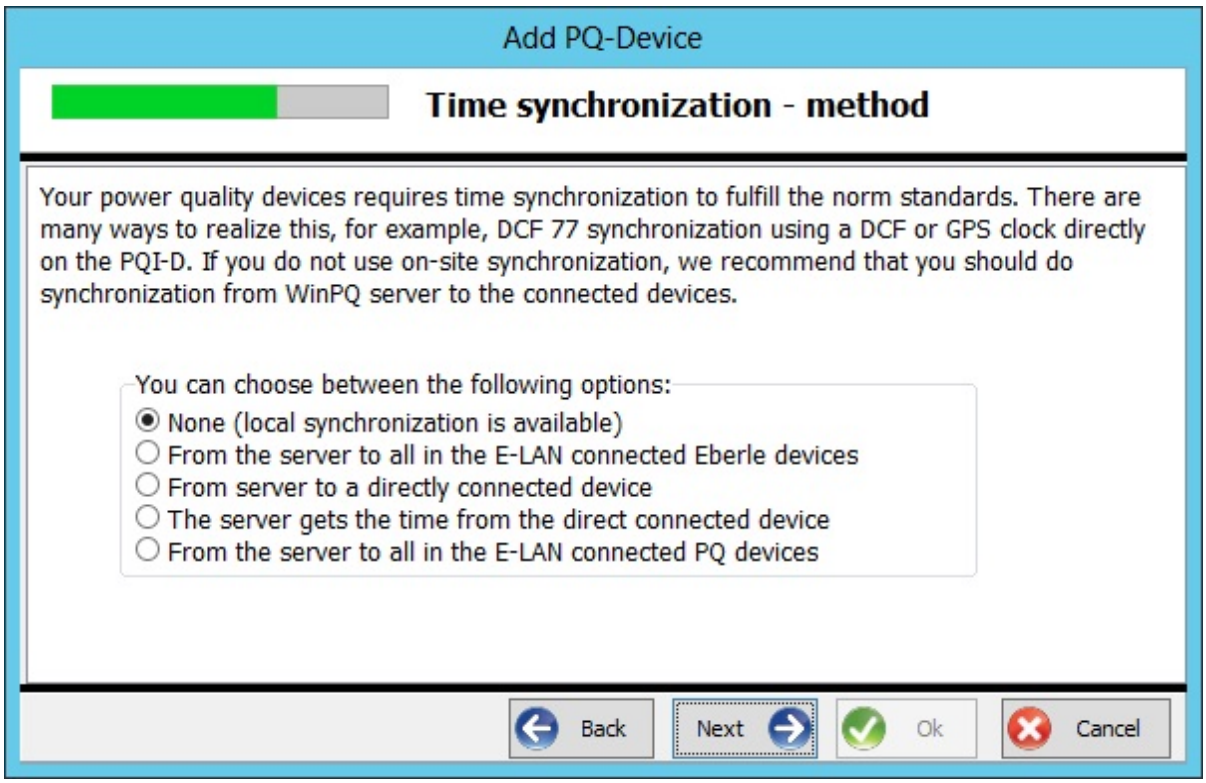
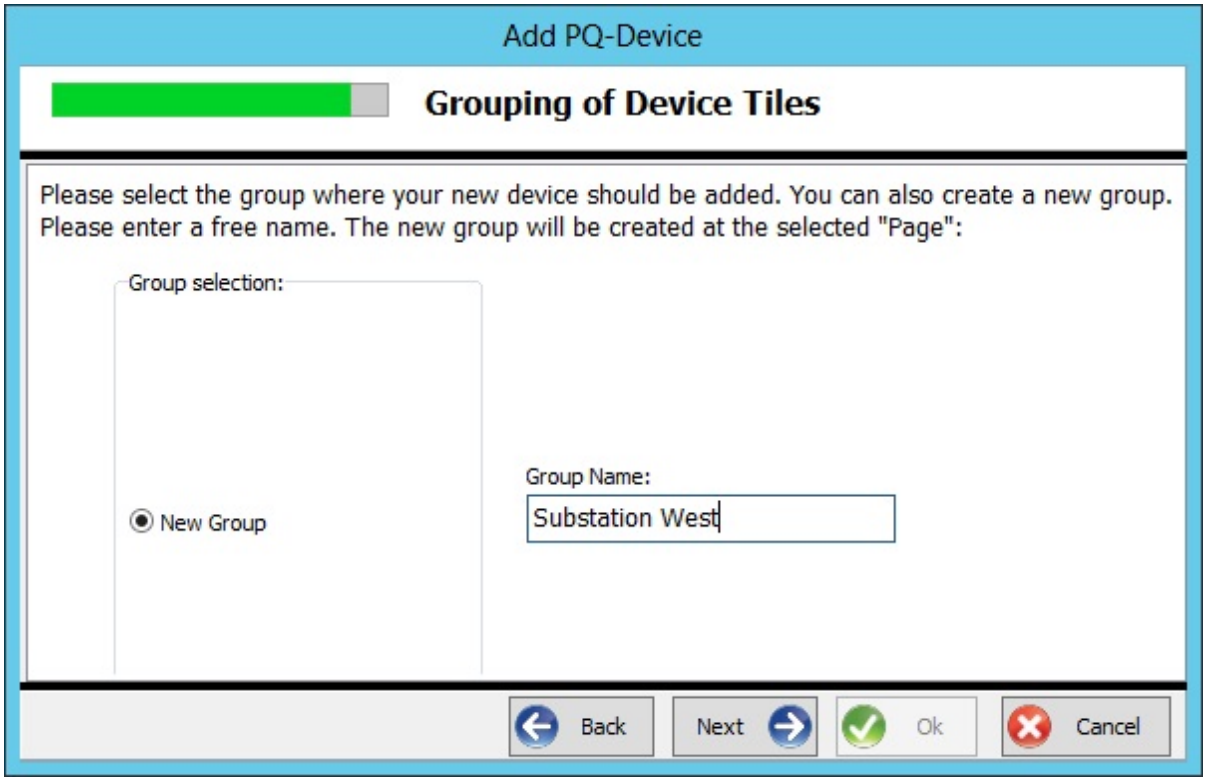


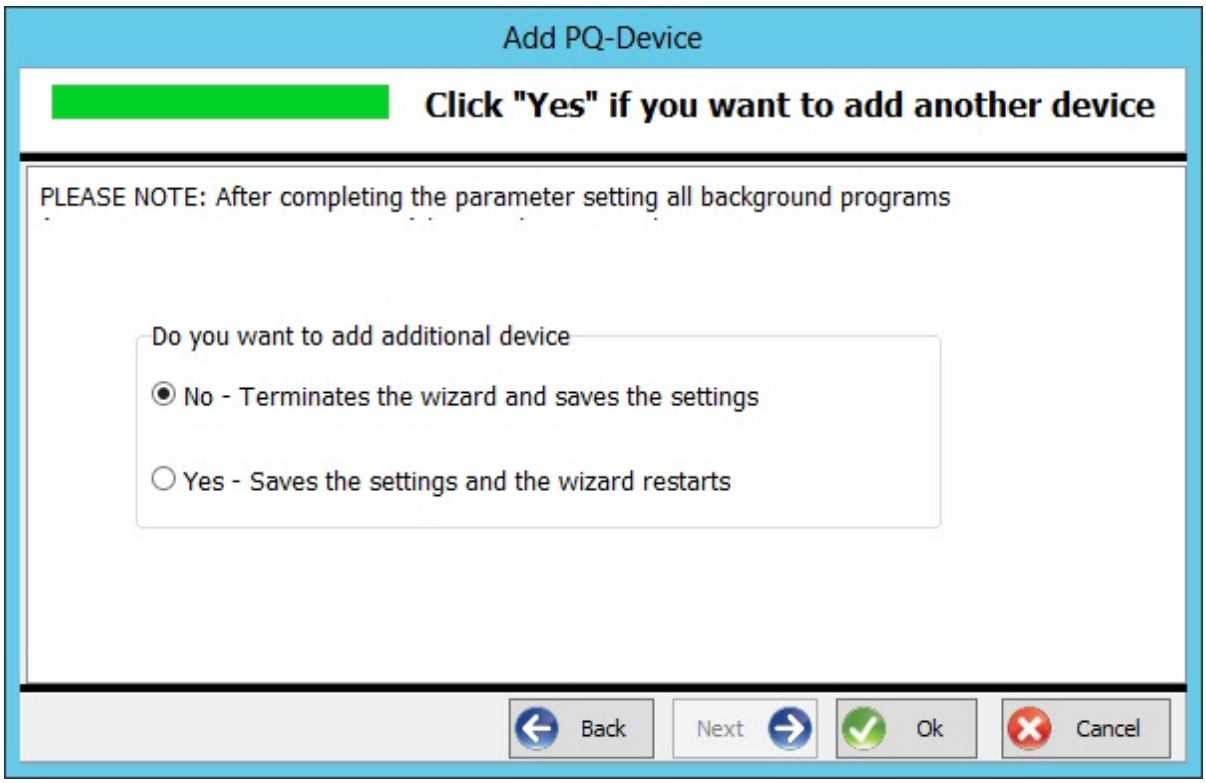
Next, the type of time synchronization is selected:



The device can be added to an existing group of devices.



Last, you are asked whether you would like to configure another connection.



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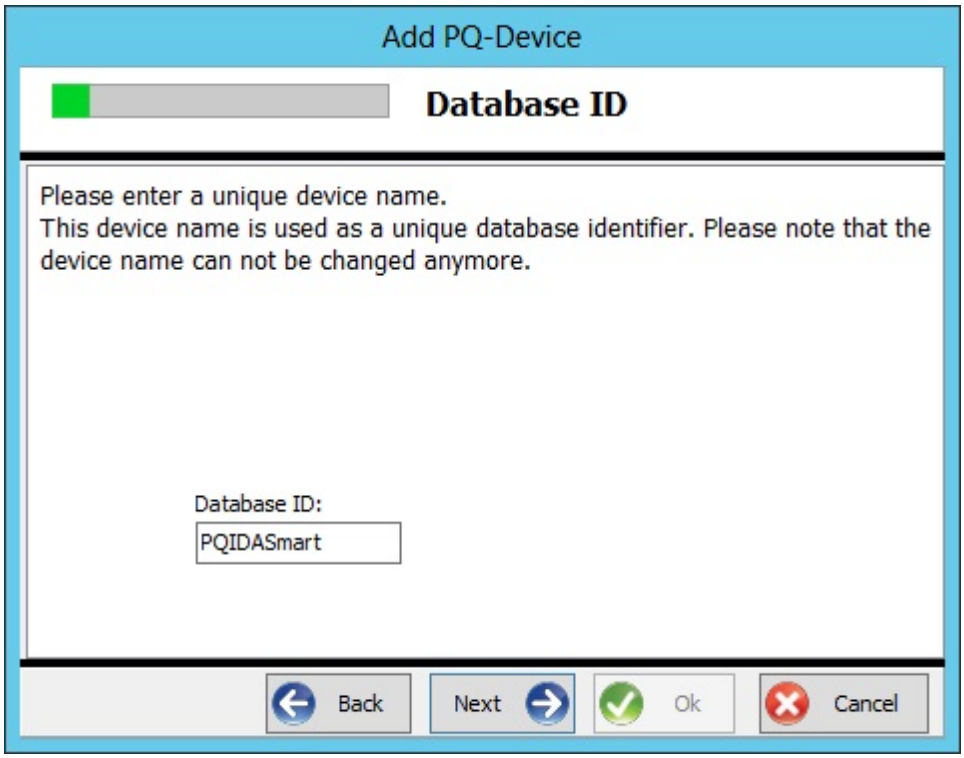
Adding a PQI-DA Smart

The following basic information is important:

- A device is always identified by its serial number.
- Entering a database ID, i.e. the name of the device (text field), enables you to access the device by its ID rather than its serial number.



The information (text) entered below enables the user to recognize a device and is used only on the user's device tile.

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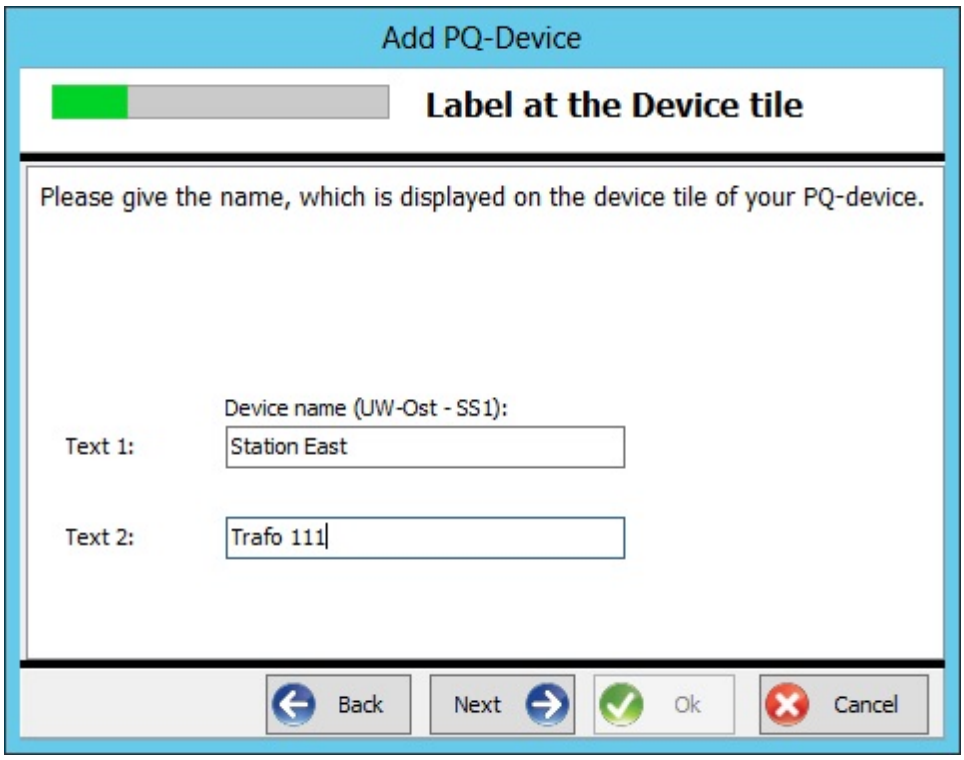
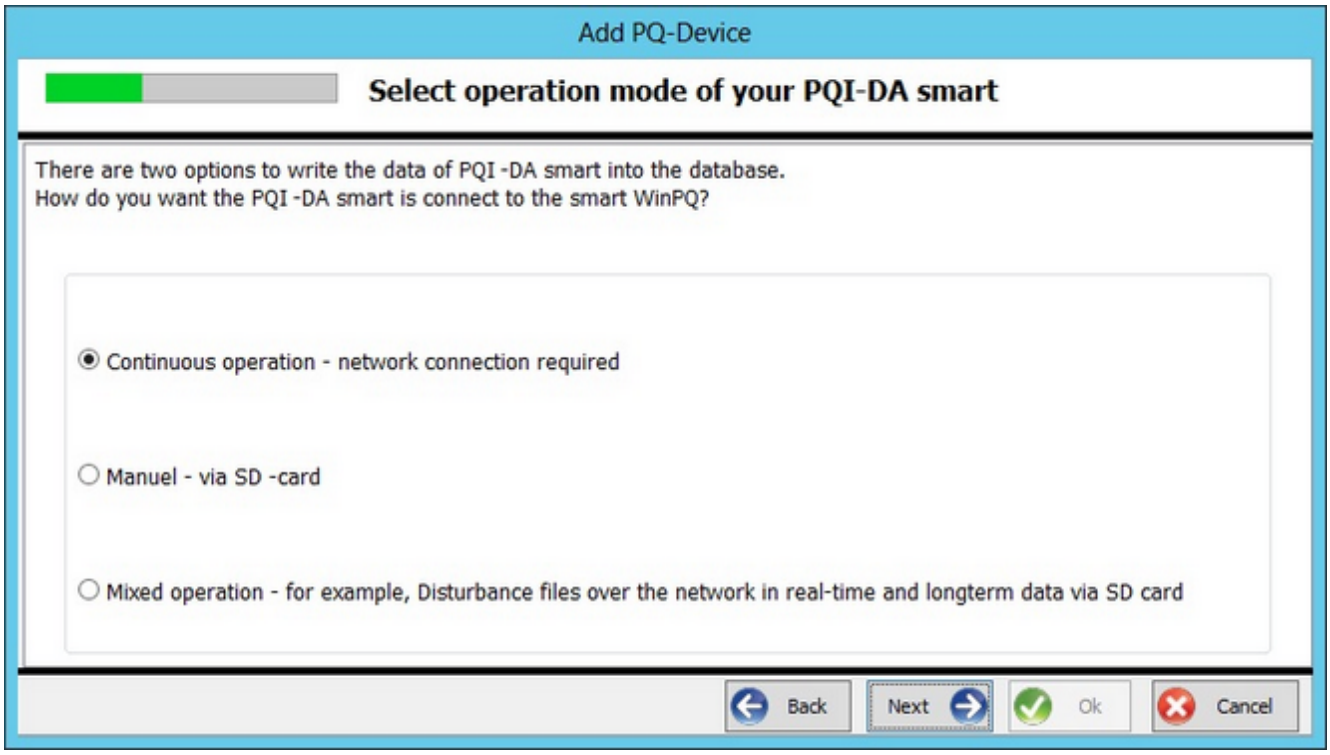
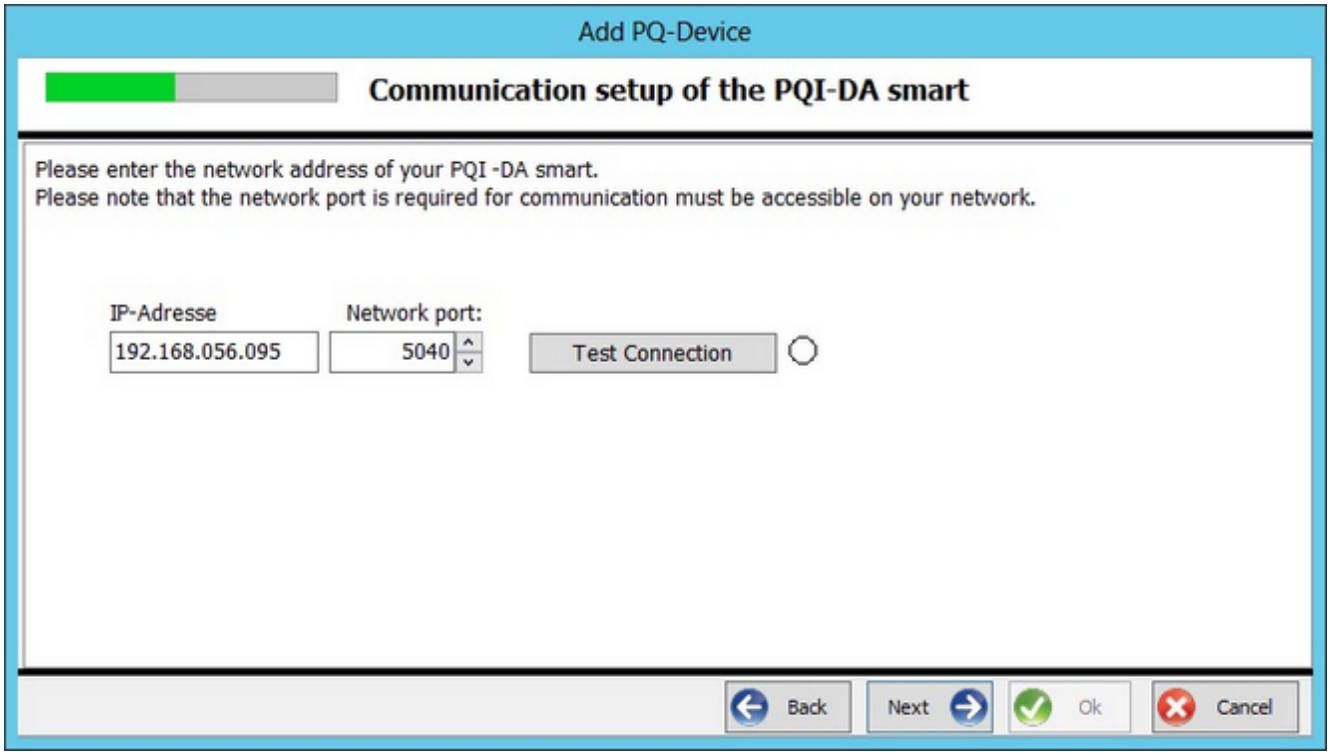


The default operating mode is **'Continuous operation'**. This operating mode continuously retrieves data from the devices. If you do not change this operating mode, you will have to specify the connection data when you're finished.





The option to connect a device which has already been 'fully configured' describes the behaviour with and without security functions. The commissioning 'with security functions' requires in the following steps the selection of the files or the input of parameters, which are necessary for a data transfer secured by SSH.

First, the compatibility mode without active security functions should be considered. In this case, enter the device IP and the port (standard 5040) via which the device can be addressed. A 'Test connection' button can be used to check whether the device (e.g. firewall filter) can be reached.

If the 'Security Mode' option has been selected for an already fully configured device, the parameters 'IP Address' and Port (default 22) must first be entered. Then start the user administration on the device.

ATTENTION: SSH devices can only be added on the server itself. The files required for communication are stored directly in the corresponding folder and encrypted in such a way that they can only be used on this computer.

If you want to complete the commissioning of a device with security function, you have the possibility to make the entries step by step on the computer or to read in an ident file created by the device. When using the ID file, the available file with the extension *.AEI must be selected via a file open dialog. The contents of the file are then displayed in a table. Then continue with the user administration on the device.

For manual setup, in addition to standard input of IP and port, the 8-digit serial number of the device is also required. Up to now, only IPv4 has been supported by the device as the Internet protocol.

User administration on the device:

The device requires one user for each of the three defined roles (Administrator, Operator, User), which must be entered together with a password.
If data is to be read automatically, the so-called M2MUser must also be created (Machine to Machine). This automatically receives the user name "WinPQ".
Depending on the password guideline, a password is required that corresponds to the IT guideline in the company.
When the M2MUser is created, keys for secure communication with the device are automatically created for it. These are saved in the WinPQ program data directory, so that the PQSmartManager can access these files without further ado.
If all users have been successfully created and transferred to the encoder completely and correctly, the message "User successfully created" appears.

The data classes to be transferred must then be selected.

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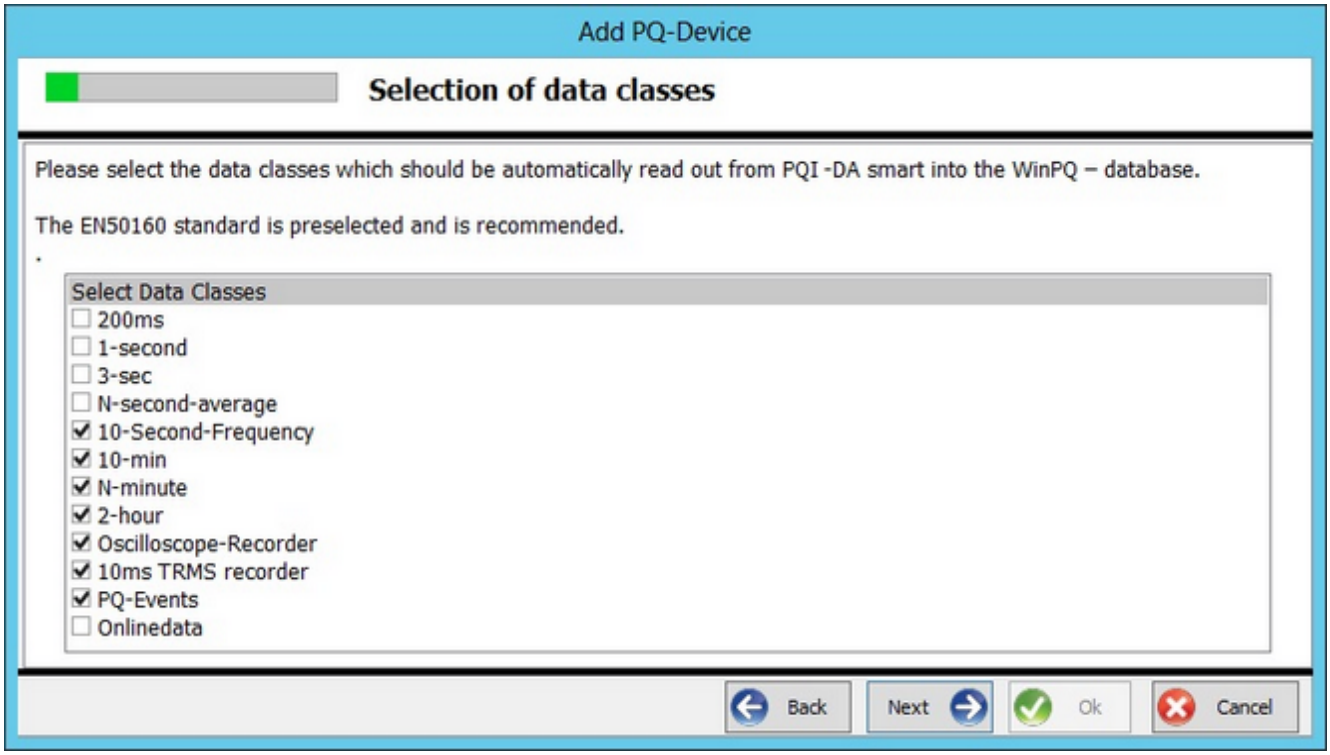
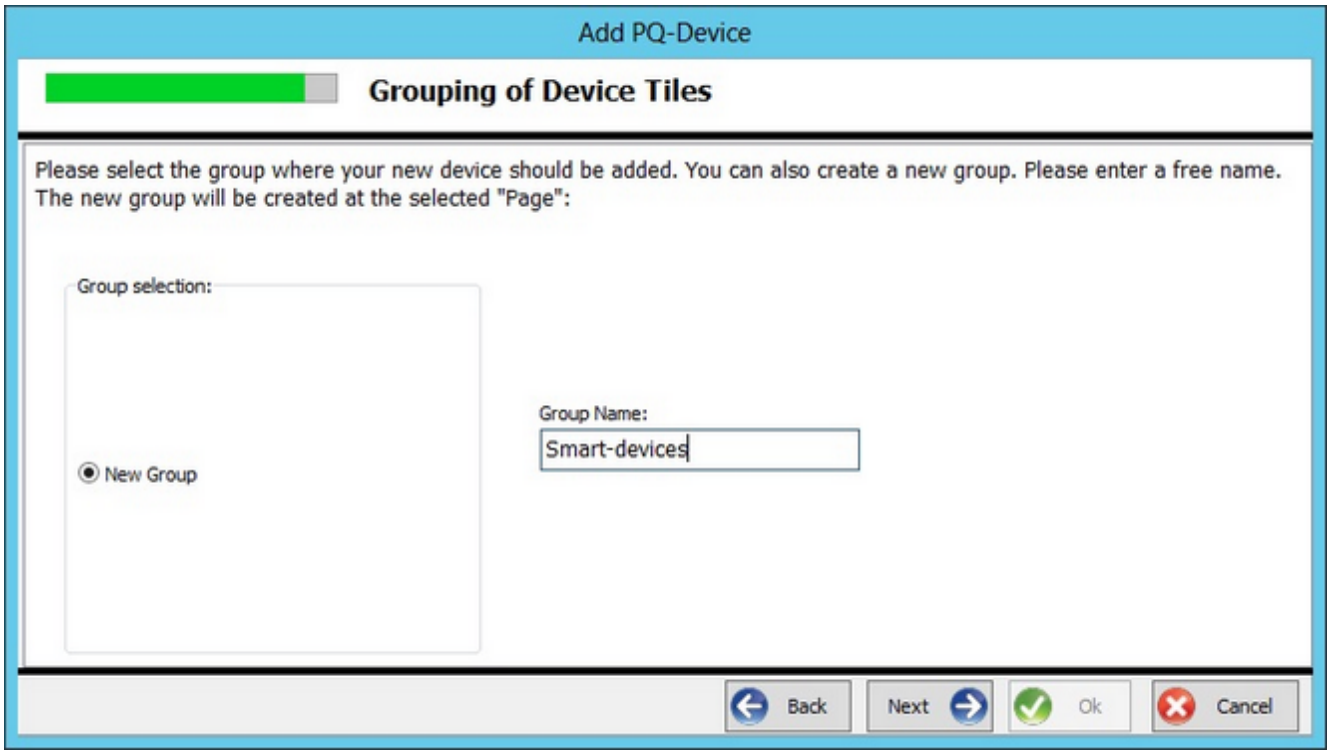


The following dialog supports the arrangement of the device tile on the PQStart.desktop:

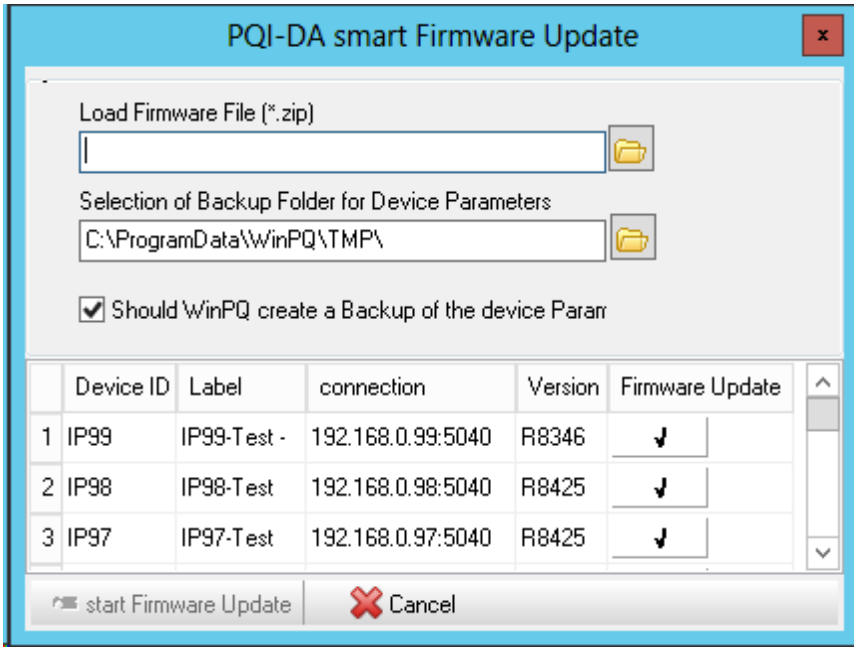


PQI-DA smart Firmware-Update

With this function the firmware of PQI-DA smart devices can be updated on all devices automatically:

- **Load Firmware File**: The desired firmware file must be selected in ZIP format.
- **Selectin of Backup Folder for device parameters**: An alternative folder can be selected, in which the backups of the current parameterization of the devices is stored. In addition, a text file is generated in this folder, which logs the overview of the update process.
- **Should WinPQ create a Backup of the Device Parameters**: If this function is activated, the parameterization is read out before the update and stored in XML format with a unique name in the selected folder above.
- **Device list**: In the list, all known PQI-DA smart devices appear together with Device ID, Label, Connection and current firmware version. You can selectively deselect devices which shouldn't be updated.

ATTENTION: Devices that are connected via SSH cannot be automatically updated here. For these devices the update must be done manually.



Edit/Show: Open Street Maps

The GPS Data of the devices can be edited, and Online data can be shown on maps based on OpenStreetMaps.

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Edit GPS-Data

Here the PQ devices can be dragged from the list on the left into the map. Devices that have already been placed can either be moved directly on the map or dragged again from the list onto the map.

Above the device list there is a switch and a search field, to get a better overview.

By help of the search field one can search for devices. All irrelevant devices will be automatically removed from the list.

With the "Show devices without position" button, all devices with assigned position will be remove from current display.

A Right-Click on a device in the list with GPS coordinates, moves that device to the centre of the map.

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Additional information

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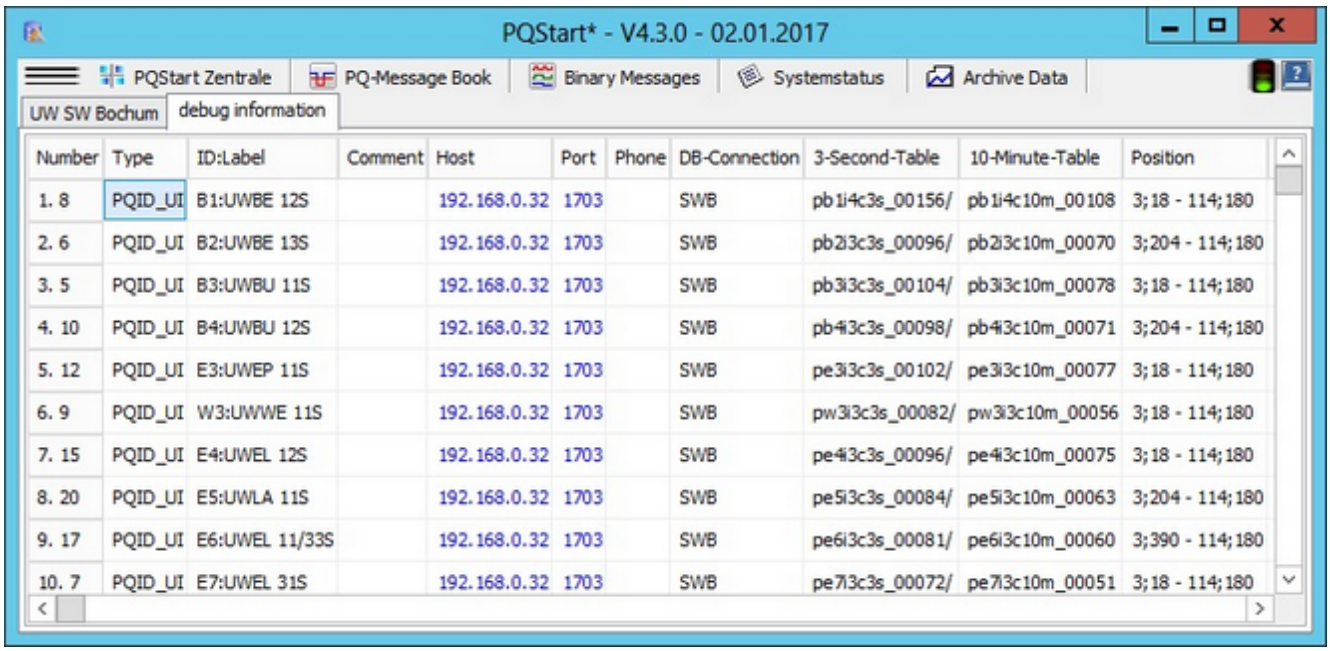
Device properties



Number	Type	ID:Label	Comment	Host	Port	Phone	DB-Connection	3-Second-Table	10-Minute-Table	Position
1. 8	PQID_UI	B1:UWBE 12S		192.168.0.32	1703		SWB	pb1i4c3s_00156/	pb1i4c10m_00108	3;18 - 114;180
2. 6	PQID_UI	B2:UWBE 13S		192.168.0.32	1703		SWB	pb2i3c3s_00096/	pb2i3c10m_00070	3;204 - 114;180
3. 5	PQID_UI	B3:UWBU 11S		192.168.0.32	1703		SWB	pb3i3c3s_00104/	pb3i3c10m_00078	3;18 - 114;180
4. 10	PQID_UI	B4:UWBU 12S		192.168.0.32	1703		SWB	pb4i3c3s_00098/	pb4i3c10m_00071	3;204 - 114;180
5. 12	PQID_UI	E3:UWEP 11S		192.168.0.32	1703		SWB	pe3i3c3s_00102/	pe3i3c10m_00077	3;18 - 114;180
6. 9	PQID_UI	W3:UWWE 11S		192.168.0.32	1703		SWB	pw3i3c3s_00082/	pw3i3c10m_00056	3;18 - 114;180
7. 15	PQID_UI	E4:UWEL 12S		192.168.0.32	1703		SWB	pe4i3c3s_00096/	pe4i3c10m_00075	3;18 - 114;180
8. 20	PQID_UI	E5:UWLA 11S		192.168.0.32	1703		SWB	pe5i3c3s_00084/	pe5i3c10m_00063	3;204 - 114;180
9. 17	PQID_UI	E6:UWEL 11/33S		192.168.0.32	1703		SWB	pe6i3c3s_00081/	pe6i3c10m_00060	3;390 - 114;180
10. 7	PQID_UI	E7:UWEL 31S		192.168.0.32	1703		SWB	pe7i3c3s_00072/	pe7i3c10m_00051	3;18 - 114;180

This table displays all of the important settings in a clear overview. The 'Information' page is hidden every time you switch to another page.

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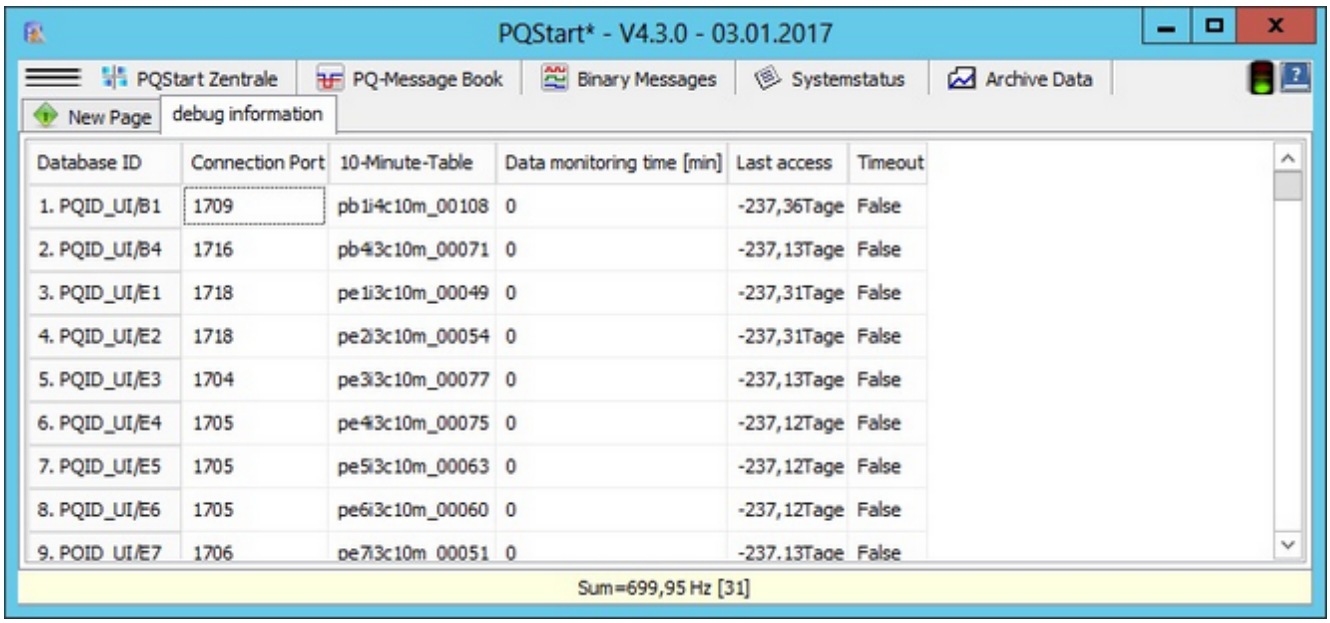
Table with access status

This table lists all of the devices and displays the latest records that were uploaded to the database.



Database ID	Connection Port	10-Minute-Table	Data monitoring time [min]	Last access	Timeout
1. PQID_UI/B1	1709	pb1i4c10m_00108	0	-237,36Tage	False
2. PQID_UI/B4	1716	pb4i3c10m_00071	0	-237,13Tage	False
3. PQID_UI/E1	1718	pe1i3c10m_00049	0	-237,31Tage	False
4. PQID_UI/E2	1718	pe2i3c10m_00054	0	-237,31Tage	False
5. PQID_UI/E3	1704	pe3i3c10m_00077	0	-237,13Tage	False
6. PQID_UI/E4	1705	pe4i3c10m_00075	0	-237,12Tage	False
7. PQID_UI/E5	1705	pe5i3c10m_00063	0	-237,12Tage	False
8. PQID_UI/E6	1705	pe6i3c10m_00060	0	-237,12Tage	False
9. PQID_UI/E7	1706	pe7i3c10m_00051	0	-237,13Tage	False

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Weiter Zusatzinformationen

More tables with additional information are available:

- Display: List of virtual online symbols: All quantities that can be used for online display are shown.
- Status of all SQL-Tables: To generate this information, meta data of all SQL-tables of the active database are displayed.
- System-Documentation: General information about the operating system and the measurement setup to read data from the devices is shown.

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PQ message book: List of all PQ events on its own page

'**PQ message book**': Current PQ events and error logs are displayed as sorted list (in the '**Event time**' column). The reason for the trigger is added to the error log as text (e.g. 'Voltage dip U31'). PQ events are usually linked to a value that describes the event in more detail (e.g. depth of the voltage dip). The following options are also available:

- Right-clicking displays a context menu in which you can select '**Change font**' to change the look and feel of the table.
- You can change the column width by dragging the separator in the header pane (if the column width has become too small, you can reset it to its initial state by clicking on 'Reset layout').
- The current view can be saved by clicking on '**Save**'.
- Only current events (about max 100) are displayed. It is not possible to scroll beyond the displayed data (please use the **PQVisu** visualization software).
- The tabs at the bottom of the screen enable you to limit the view to the data of a few devices (here too, only current events are displayed). After selecting a tab, you must wait a little time for the information to be retrieved from the database.
- Error logs (marked with an icon in the 'Symbol' column) can be saved as a PDF file (menu or double-click) and displayed in the FastReport reader (conversion in PDF by clicking on the FR Reader icon).

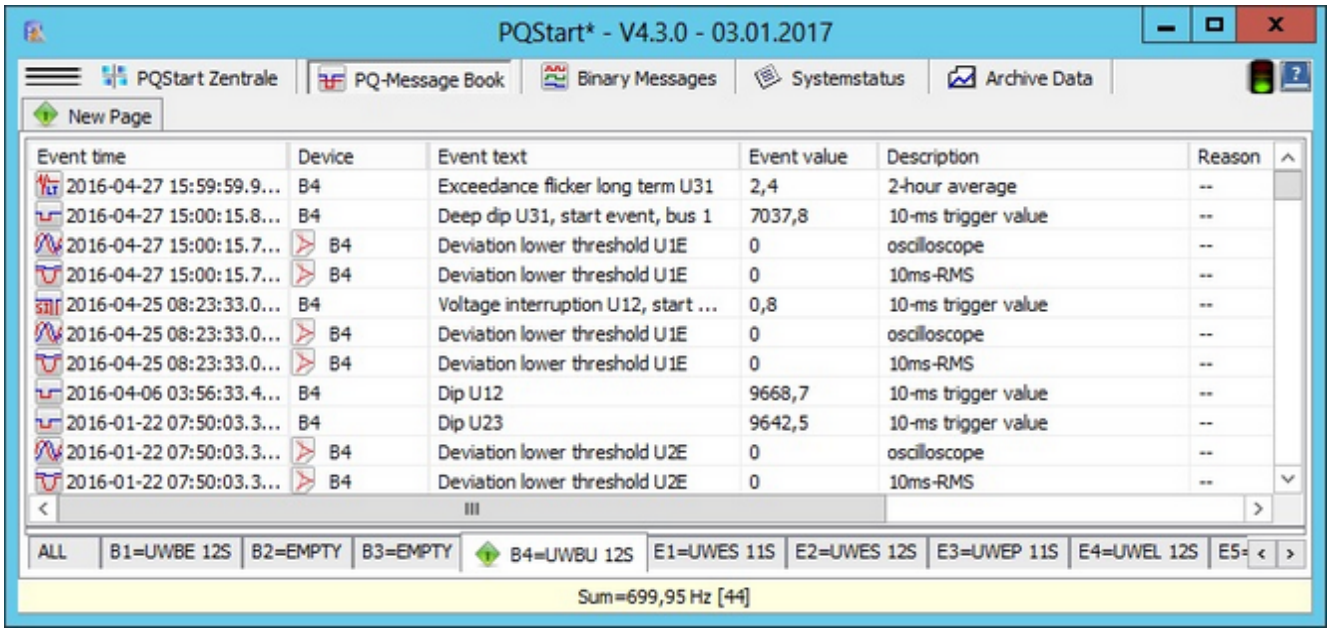


Figure: List of current PQ events and logs

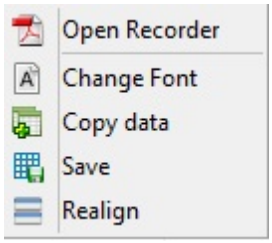
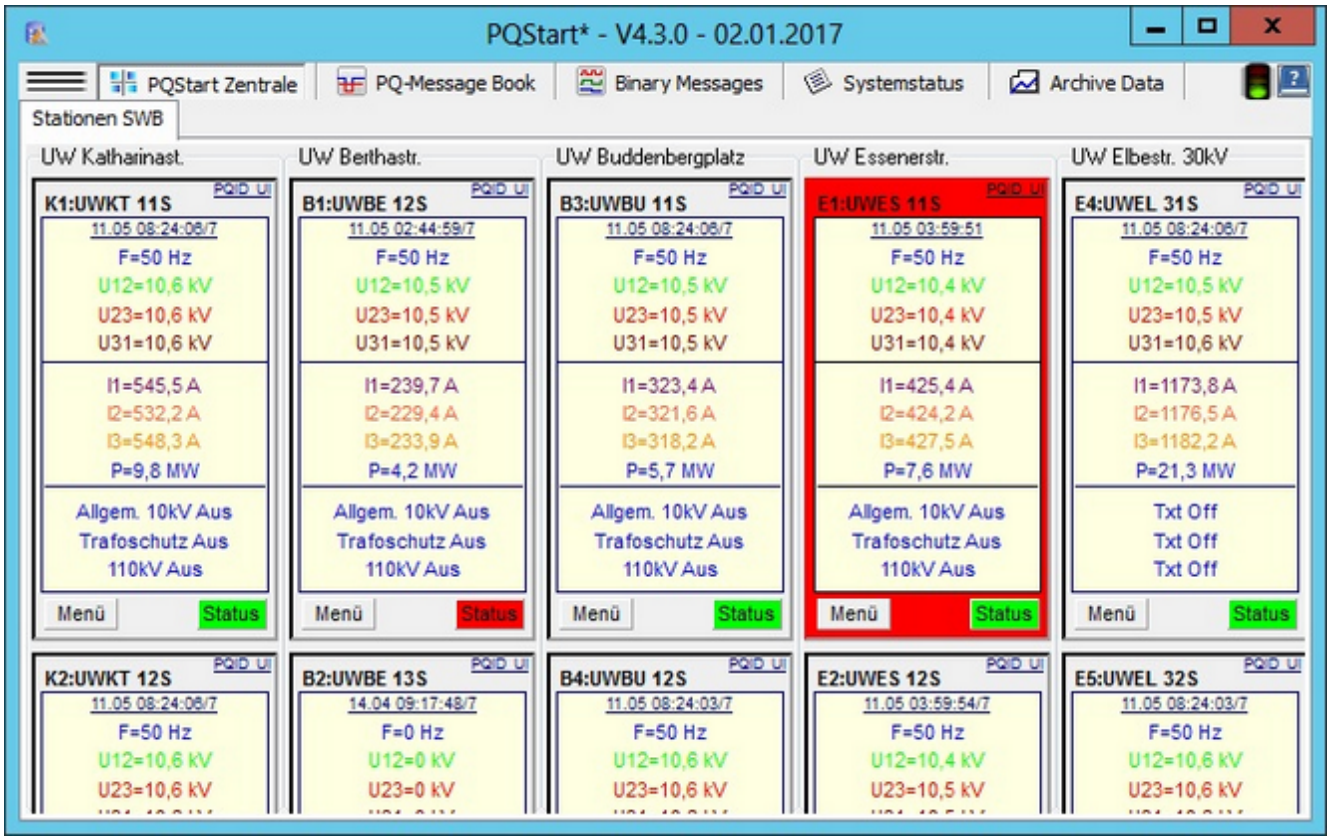


Figure: Local context menu to change the look and feel

Description of the extended information view

Extended information means additional information about the database connection, the current user, the recording of log files and more.



1. The extended information view can be hidden and displayed by pressing 'Ctrl+Alt+S'.
2. Content of the program pane line (text in the above program pane):
   - '*' - LOGFILE is active
   - STD/EXT-ID (standard or extended ID)
   - STD/EXT-UP (standard or extended user policy)
   - Windows=Joerg (the user logged in to Windows or the swapping of the user name with a WinPQ name to meet special configuration requirements)
   - WinPQ=Administrator (the administrator, the operator and the user can be assigned different use options)
   - PQStart_STWB.DDF (name of the DDF file with the data for the PQStart desktops)
   - Number of SQL ERR (the program continuously queries the SQL database for status information or to display online data. Error messages cannot be ruled out).
3. Description of the sections in the bottom status bar:
   - SQL connection: Green: Connection is active or Red: No connection to the database

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- LED: System load caused by status queries, switches to yellow for the duration of the SQL database query (a kind of load indicator)
- ICONS: Activation of program functions (the icons are described below).

4. Description of the icons in the status list (if the icon is struck through, the option is disabled):
   - - Tab with EN events
   - - Tab with binary messages
   - - Tab for the operation log
   - - Archive data in PQStart
   - - Calculation of power sums from several PQI-Ds in a substation
   - - Online measured values (3 seconds)

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Advanced user management

When PQStart is first run on the server with advanced user management, a message displays asking you to set up the database.

In most cases the default settings can be accepted. Clicking on **'Next'** initializes the database and starts the PQStart desktop with the desktop configuration wizard. After the desktop has been configured, the clients can be distributed and the users managed in PQAdmin.

The exported clients should be configured to automatically connect to the right database when they start up. If there are problems,a message will be shown. In this case, the access settings for the database can be changed on the server. Remember to click on **Save** so the client connects to the correct database the next time it starts up.

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OpenStreetMaps

It is possible to display certain data from its PQ devices on a map in the context of its geographic location.

Requirements:

In order to use this function, the corresponding license is required. In addition, the OSM map package must be installed on a server. The installer of this feature automatically creates a Scheduled Task for the PQOSMServer during the installation. By default, the PQOSMServer opens port 8040 for communication. If a different port is necessary, a parameter "ServicePort" can be changed to the desired value in the file %programdata%\WinPQ\ ini\ PQOSMServer.ini. The map material must only be installed on the server. All clients will automatically access this server (the corresponding port must be accessible from the client).

Navigation:

The map can be zoomed as usual (mouse wheel or buttons) and dragged (move the mouse while left mouse button hold is pushed).

In the tree view on the left, devices are grouped according to their position in the PQStart. in the 2D display, the map centres on this device by clicking on a device node of the tree.

With '2D/3D' the current map is taken, and the data is displayed in 3D on the map.

In this case, the card can be tilted with the left mouse button down. Press the right mouse button to move the section. If both buttons are pressed, zooming can be performed.

In the 2D and 3D display the devices can be clicked on the card. This will open the status dialog of the selected device.

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GPS Koordinaten bearbeiten

In order to assign GPS coordinates to the PQ devices, they must be dragged from the tree view on the left to their corresponding position on the map.

Devices that are already on the map can also be moved within the map. To remove a device use the right-click menu on the specific device.

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Desktop-Geräte im geografischen Kontext

This feature provides an alternate desktop. Here, the devices are not displayed as tiles as usual, but are displayed as circles with their previously assigned position on the map.

The color of the circle represents the status of this device.

A left click on the circle opens the status informationen of the selected device.

By right-clicking you can reach the local tile menü.

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Zeitstrahl (Status und EN Bericht)

Via the timeline function, the EN weekly reports can be retrieved for the devices which are distributed on the map.

The week can be selected via the calendar on the top left. Only the devices with GPS coordinates and data for the selected time range are displayed on the map.

The color of the displayed devices (from green over yellow to red) reflect the PowerQuality rating.

Left-clicking on a device will generate the EN50160 report for this device in the selected week.

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Online Messwerte

Bei den Online Messwerten kann sich eine Messgröße pro Gerät aus den Onlinemesswerten als live Größe auf die Karte gelegt werden. Die Auswahl der Größe sowie die Farbauswahl kann über dieOnlineeinstellungvorgenommen werden.

With the online measured values, one measured quantity per device can be put on the map from the online measured values. The selection of the value and the color can be made via theonline setting.

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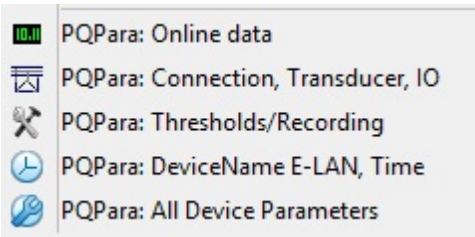
PQPara - Configuring the PQ measuring devices PQI-D and PQI-DA

The below view is for the configuration of the PQI-D/DA device types only.
The menu items represent a configuration activity on the device:

- **PQPara: Online data**: Display current device data in a graphic or table
- **PQPara: Connection, transducer, IO:** Configure transducer factors and binary and analogue inputs and outputs
- **PQPara: Thresholds/Recording**: Specify thresholds and select measurands to be recorded
- **PQPara: Description, E-LAN, Time** : Enter device description, time control and network



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PQPara: Description, E-LAN, Time

Specify the device name, time control and how the PQI-Ds and PQI-DAs are networked through the E-LAN bus.

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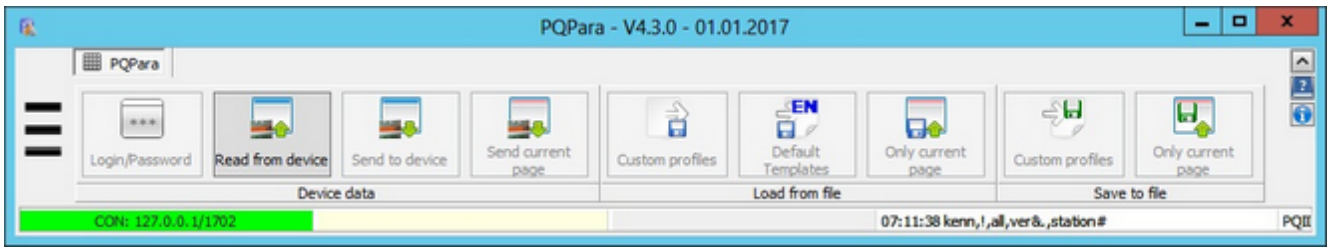
Button bar



- The button bar is divided into three main sections:
  - **Device data** - Manages the upload and download of device data
  - **Load from file** - Management of own and system-related device profiles in files
  - **Save in file** - Used to save device data e.g., to restore a profile after a device swap.
- The **'Login/Password'** button is used to manage a device's password functionality (own document).
- Device data are generally read automatically. You can restart the data transfer under special circumstances by clicking on **'Read from device'**.
- The two Send buttons only transfer the changes (red items) to the device. After each change, an affected parameter is retransferred and displayed in the desktop. Sometimes it makes sense only to transfer data on the **current page**.
- The 'Template 'button is particularlyinteresting in the '**Load from file**' section. This button takes you to the central read-only directory where the standard a.eberle templates for the different voltage levels and the hardware and firmware statuses for the **PQI-D** are stored. The profile names are self-explanatory.
- You can restrict yourself to the current page also when loading and saving profiles. Profile data are text files that are structured like Windows INI files. Each item on the desktop is either a section or is assigned to an item in a section. An item is saved as 'Key=Value'. A section/key combination is always unique.

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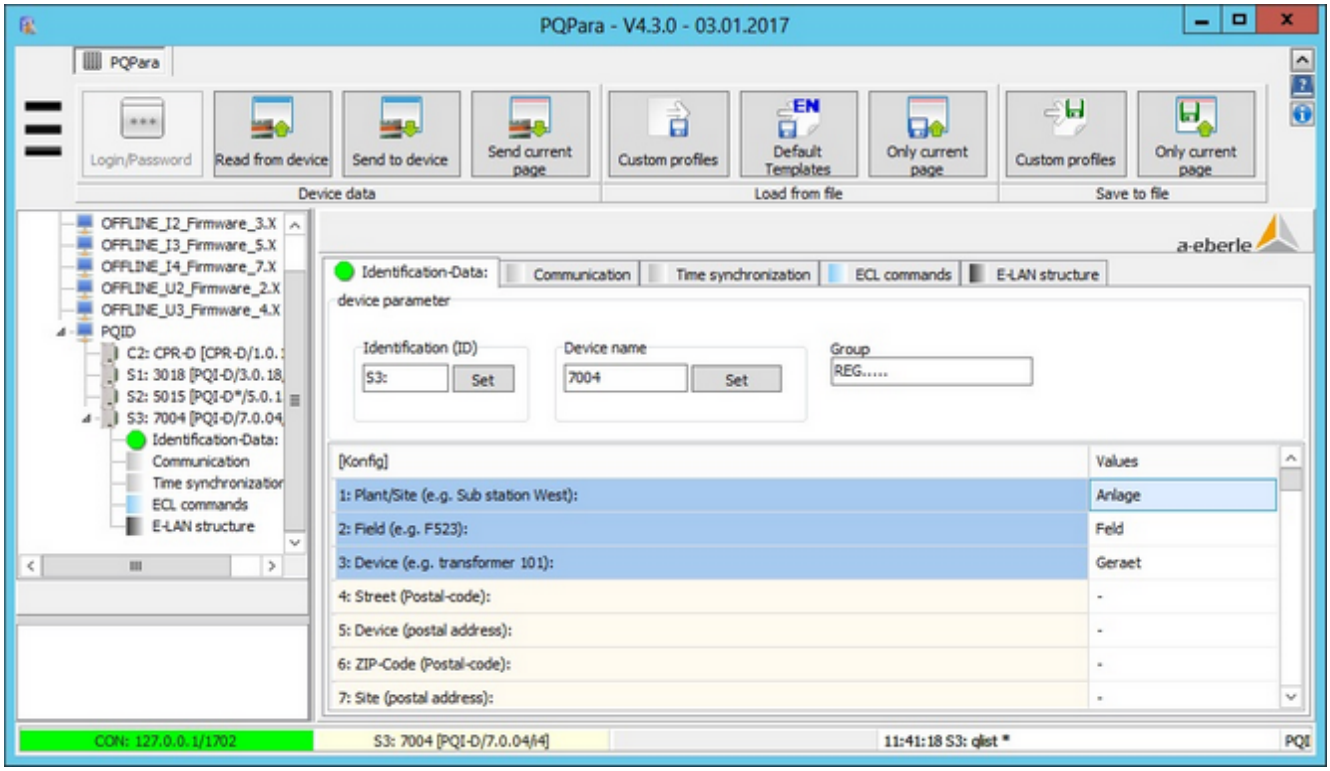
Identification data for E-LAN and SQL database

These informations will later be used to uniquely identify in the database and on reports. So these settings need to be chosen very carefully.



- The 'Device ID' (ID pane) must not only be unique for the E-LAN but also for all of the devices whose data are stored in a common database.
- The 'Device name' should also be unique (the 'Extended ID' option is used). The name appears in different printouts/tables, as well as in field content: Plant, Field and Device. We recommend keeping all of the entries as short as possible to save space in the printouts. Spaces may not be used.
- The group name can be used as an additional classification level in the device overview in PQVisu.
- The 'Send to device' button on the main button bar does not work for panes/groups that have their own 'Save' button. This is done to ensure the uniqueness of the parameters when copying profile data.

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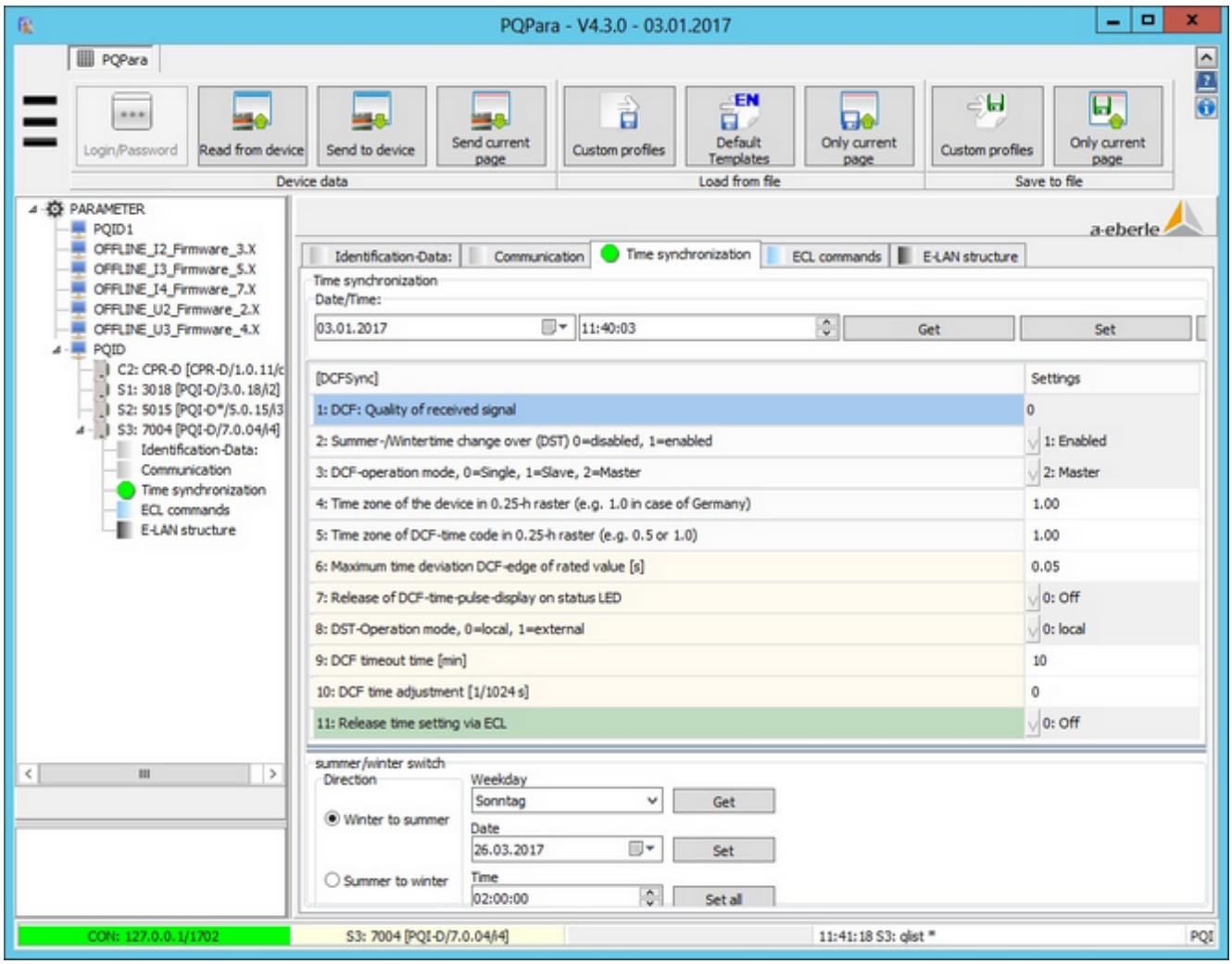
Time synchronization versions and parameters



- The first row displays a value between 0 and 100 when a radio clock is connected. The value designates the quality of the time signal.
- The summer/winter time switch should be enabled (H-Program SOWI should not be played anymore). The switchover is performed accurately to the split second by the device.
- If 'DCF operating mode' is selected, select MASTER for standalone devices. If not, select MASTER for all devices that are connected to a radio clock and SLAVE for those that get their time from the master. The terminating resistors must be taken into account (the DIP switches are on a circuit board, slide-in must be pulled out. For the PQI-DA, termination resistors can be activated on the terminals).
- The time zone for Germany is 1.0 (deviation from Greenwich Mean Time).
- Line 7 (pulse display) can be useful during commissioning. The PQI-D status LED flashes in the rhythm of the time impulses.
- Line 11 (Enable ECL): If a radio clock is available or is synchronized through the time synchronization bus, ECL should not be enabled. Otherwise (for example, synchronization to PC time), we recommend 'protected' (the time can only be corrected within a small time window). If large time differences have to be corrected, we recommend temporarily switching to 'ON' and then clicking on '>PC'.

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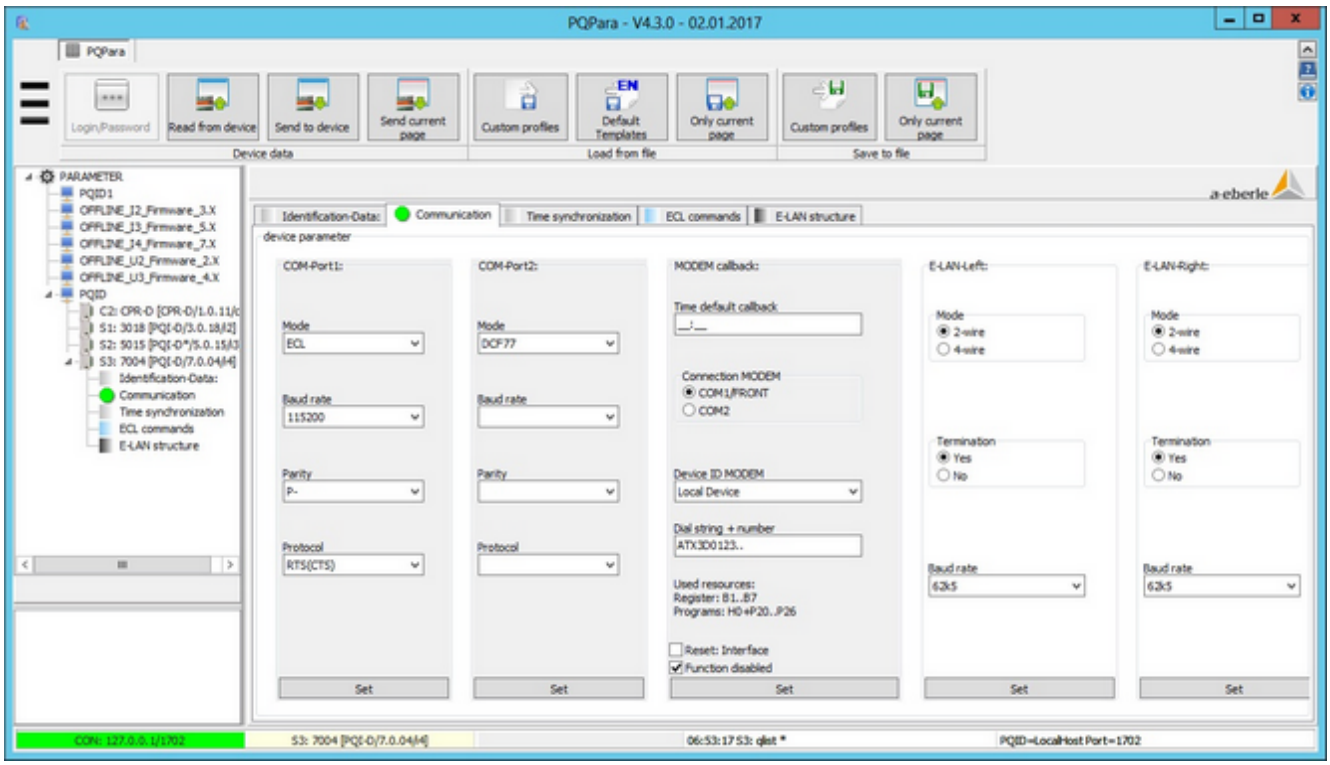
Configuring the communication interface



- The coloured pane (COM Port1 in the example) indicates the interface that is currently used for communication.
- If a radio clock is connected to a serial interface (e.g., COM2), select DCF77 from the 'Mode' drop-down list in the respective COM Port pane.
- The fields in the MODEM-Callback pane are used to run a background program that immediately dials the server when a new event (e.g., new error log) is created.
- The rest of the buttons are used to configure the E-LAN connections: 2-wire (short distance, bus system, termination at the end of the bus), 4-wire (longer distances, point-to-point connection)
- On this page, every pane has its own 'Save button'. This means that the parameters in each pane must be saved separately. They are ignored by the 'Send to device' button because this part of the configuration is device specific.

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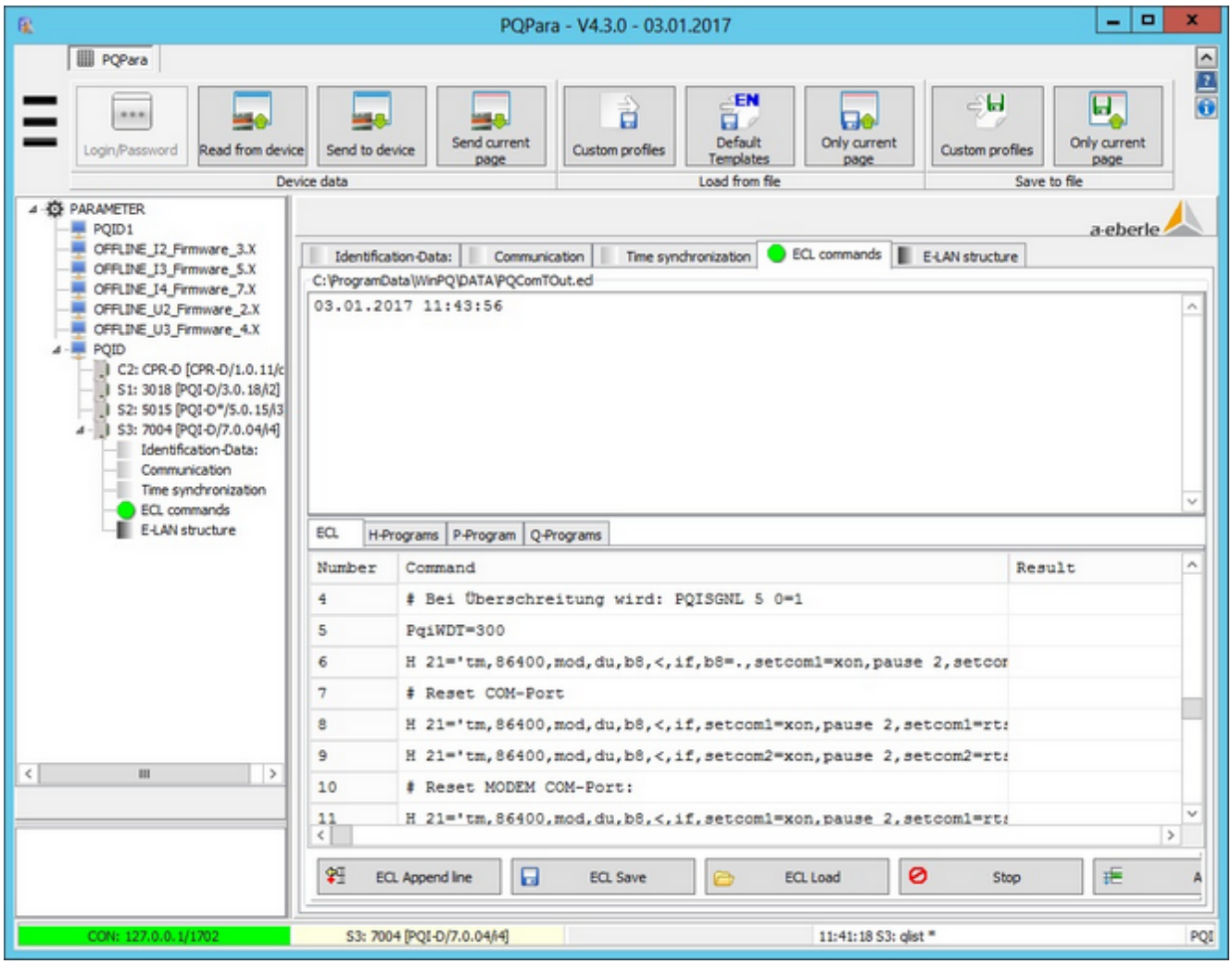
User-programmable ECL device



- All ECL commands (Energy Control Language) can be entered and run from here.
- A range of predefined command sequences are copied during the installation ('Load ECL' button).
- Conversely, you can save your own command sequences by clicking on 'Save ECL'.
- 'Step' transfers the current (marked) row. 'All' starts running the program in the current row and automatically continues until the end. 'Stop' stops the transfer.
- H, P and Q programs are maintained on separate pages. H programs are always run in the background (e.g. monitoring current measured values and switching relays when thresholds are exceeded). P and Q programs extend the storage, for example, for the H programs and must always be run from the command line.
- These programs (H, P and Q) are automatically read by PQI-D, displayed in the tables and adopted when loading/ saving profiles. But they have to be explicitly ('Step', 'All') transferred.

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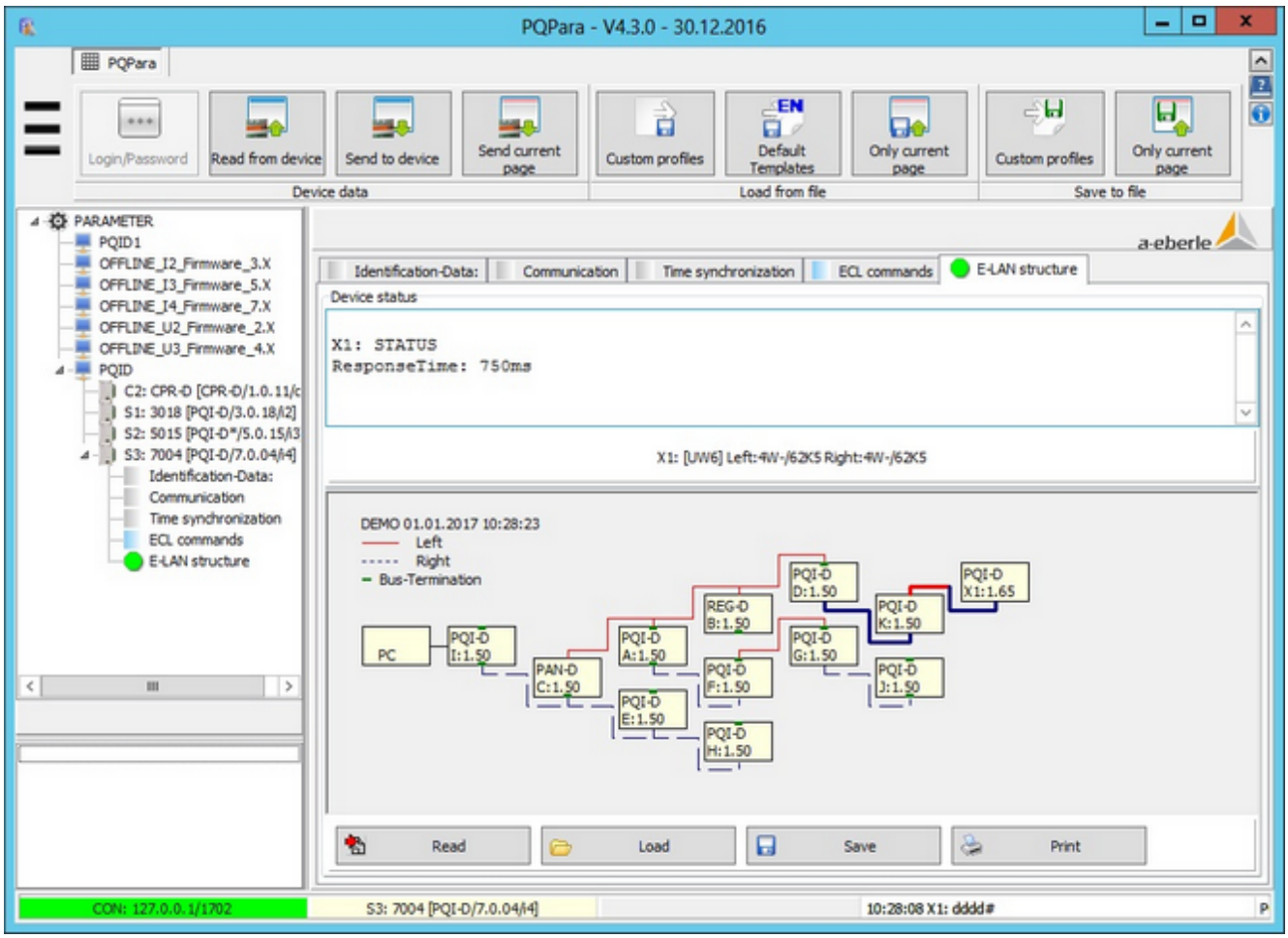
Analysis of the E-LAN structure



- The connection (E-LAN) between the devices is evaluated.
- The small green rectangle on the connection describes an active terminating resistor (for 2-wire technology, only the physically first and last device are terminated). The real position cannot be determined by the program.
- Unoccupied connections must be terminated!
- Clicking on a device sends the STATUS command to it and displays the status in the status pane.
- 4-wire connections must always be set up as point-to-point connections (see bold line in the above figure).

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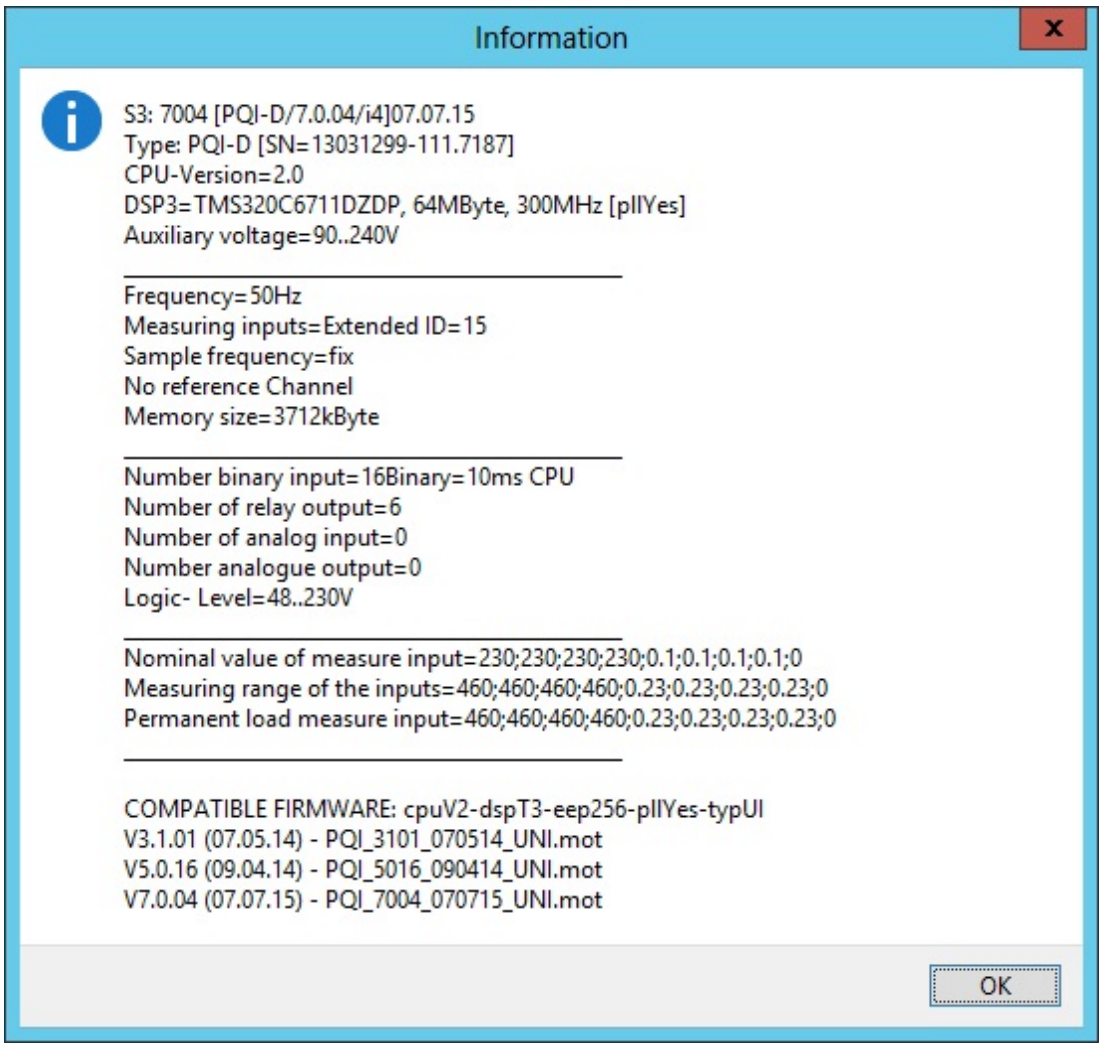
Read out and analyze device information



- The parameters to generate this figure are read automatically by the device every time the parameter software is started. They are displayed in the Service menu.
- The view displays the CPU and DSP type, the size of the repository, information about the measurement inputs, the binary inputs and outputs and more.
- The compatible firmware version is displayed. In the example, Version 7.0.04 from 07.07.2013 is used. The same firmware version can exist with a later date (bug fixes, small function changes). The latest firmware (PQPara program version) 7.0.04 is already installed.

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PQPara: Connection, transducer, IO

Configure transducer factors and binary and analogue inputs and outputs

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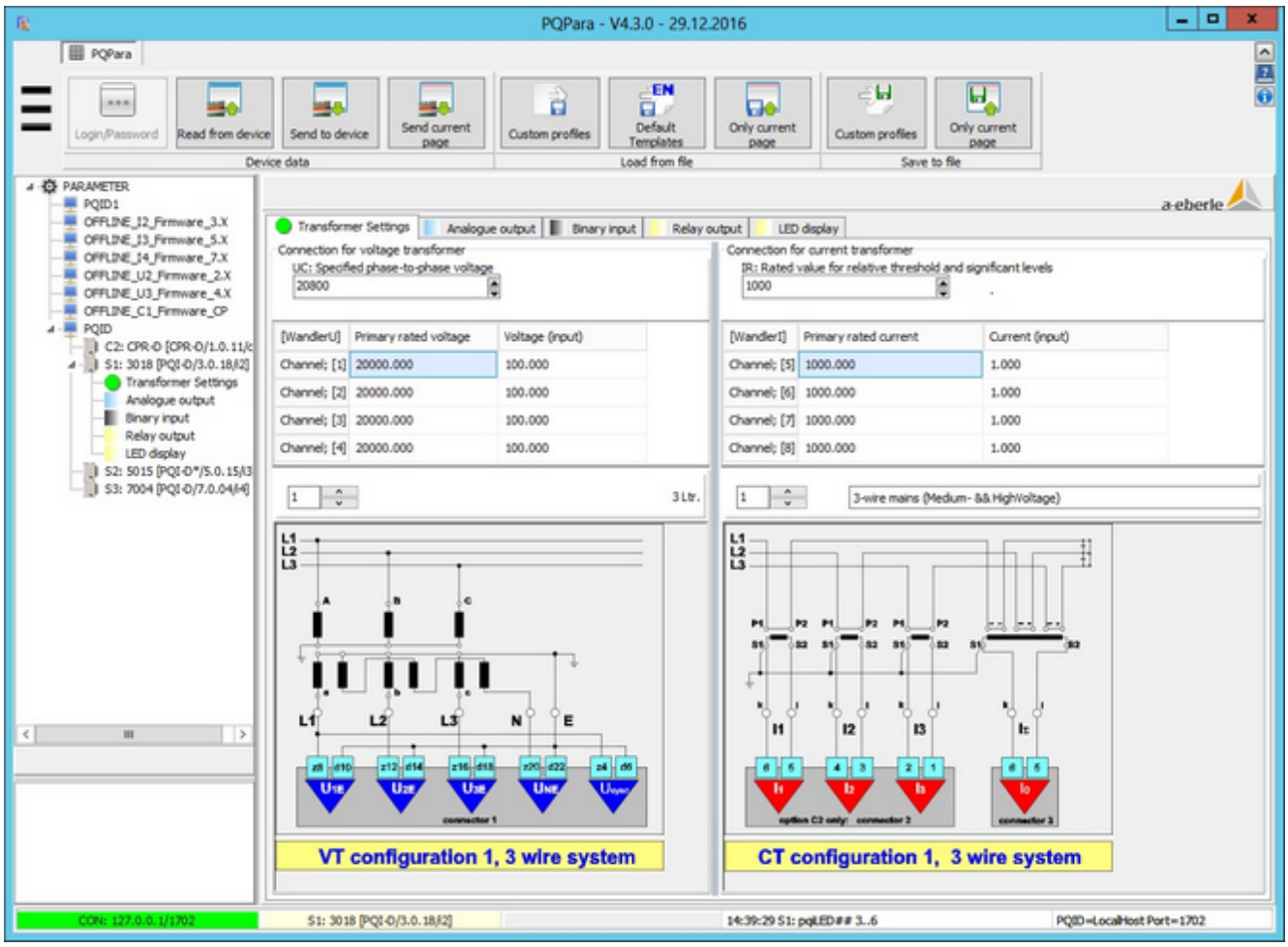
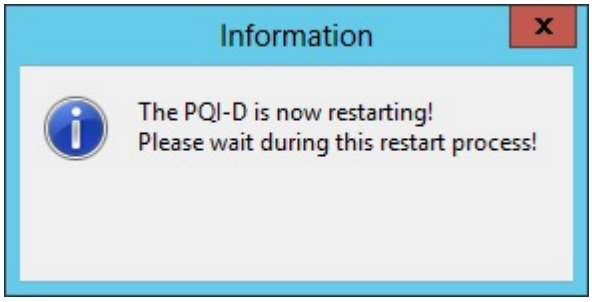
Connection diagram, transducer factors and the agreed voltage

The device delivers all values as primary values. These settings will be the base for their correct calculation.



- Commissioning should start with the selection of the circuit diagram. The distinction 3/4 wire mains affects the displayed images.
- Either switch 1 (fourth voltage/current is measured) or switch 2 (fourth voltage/current is measured internally) are suitable in most situations.
- If the circuit diagram changes, a system reset must be performed on the device. The device is offline for about 20 seconds. An according message will be displayed.
- The agreed voltage (top left) is key to the triggering of error logs and EN events. The nominal value of the current should be recorded (even if the recorder is not supposed to be triggered by current) because this value is also used for the transnostic function, which is explained later in this document.



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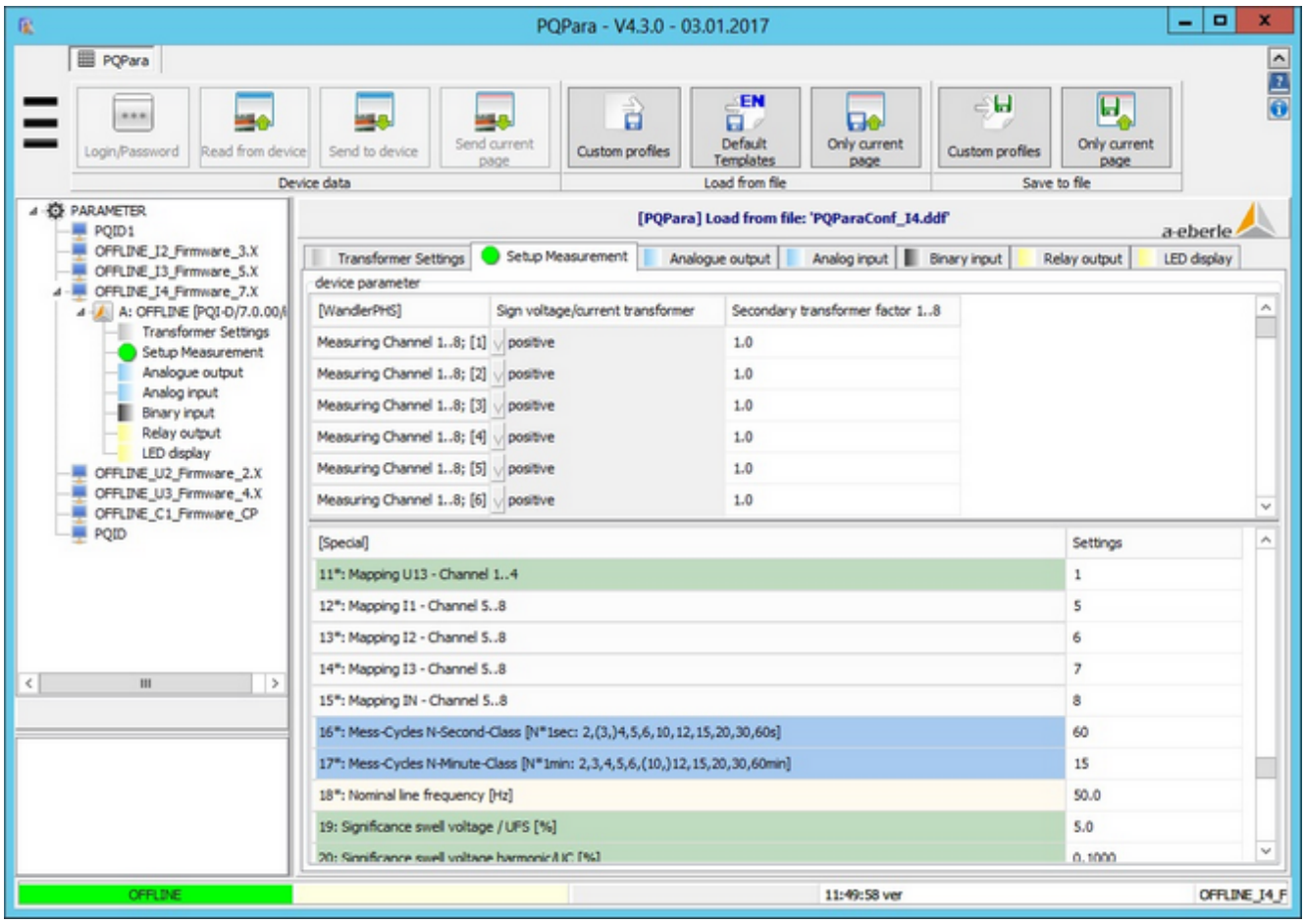
Message: 'SYSTEMRESET'

Special connection parameter and the user-definable 10-minute interval



- The transformer's signs can be inverted (above table).
- The measurement inputs can be reallocated (although it's better to change the wires).
- The duration of the interval for the 10-minute data class (alternative not additional) can be reassigned. However, certain EN evaluations no longer comply with EN 50160.
- Additional data classes with user-definable intervals are available from firmware Version 6.X and 7.X.

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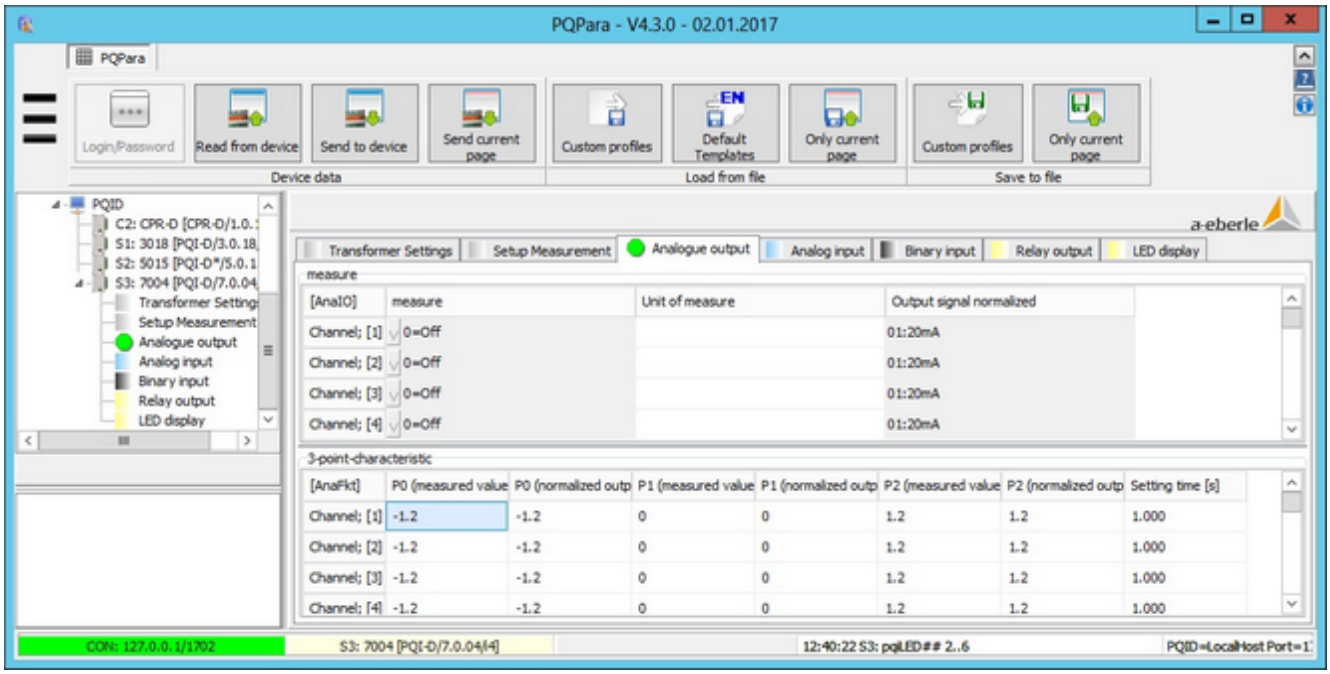
Device with analogue output (measured value for converter)

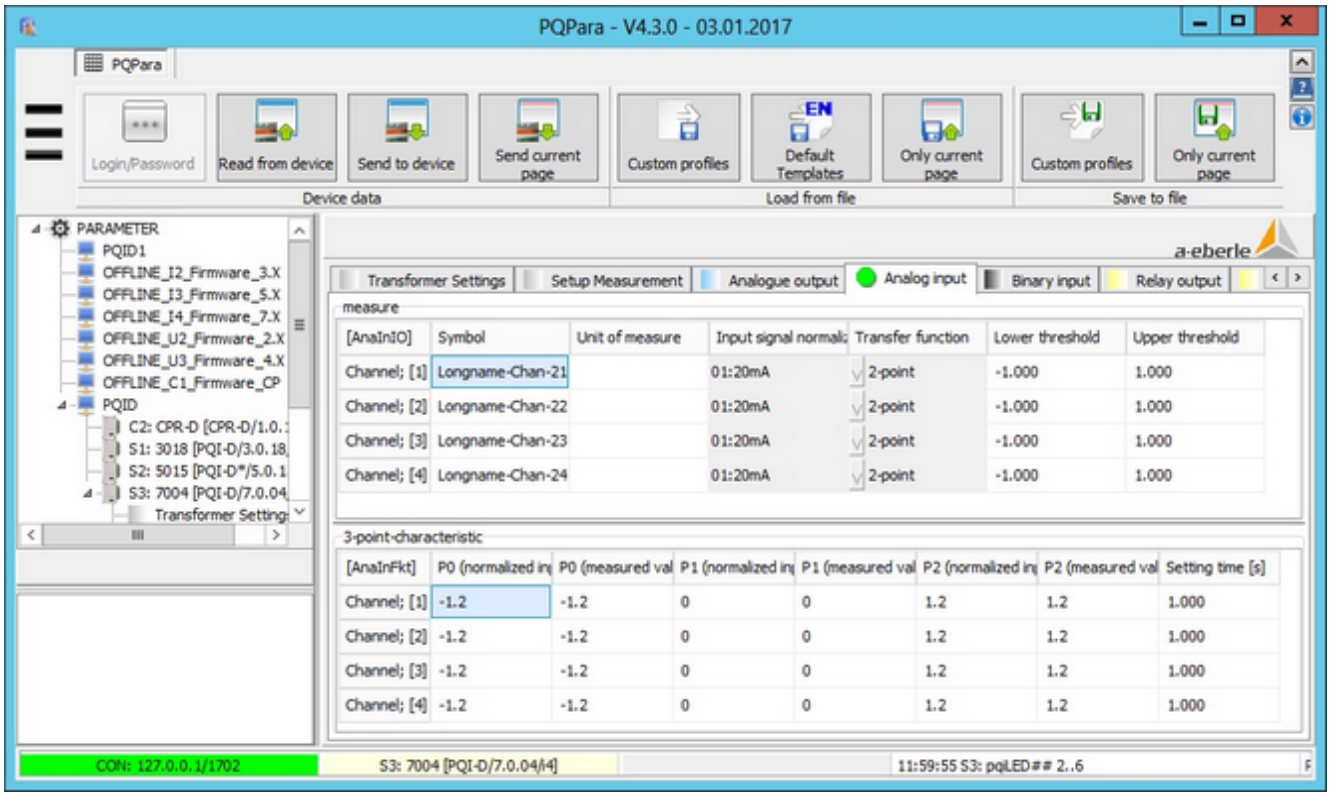
This options need hardware features.



- First, the internal quantities are assigned (e.g. active power).
- To select a measurand from a list right click in the top table.
- The transfer function is entered in the bottom pane (allocation of a measured value to an analogue output value).

The new feature to record up to 4 analogue quantities

This options need hardware features.



- This device extension records additional physical quantities (e.g., wind speed, radiation etc).
- Symbol and unit of the measurand are added to the database and used in the visualization software.
- The thresholds (top table, right) can be used at the device level to generate events.
- The parameters for the transfer function are similar to those for the transfer function on the 'Analogue output' page.

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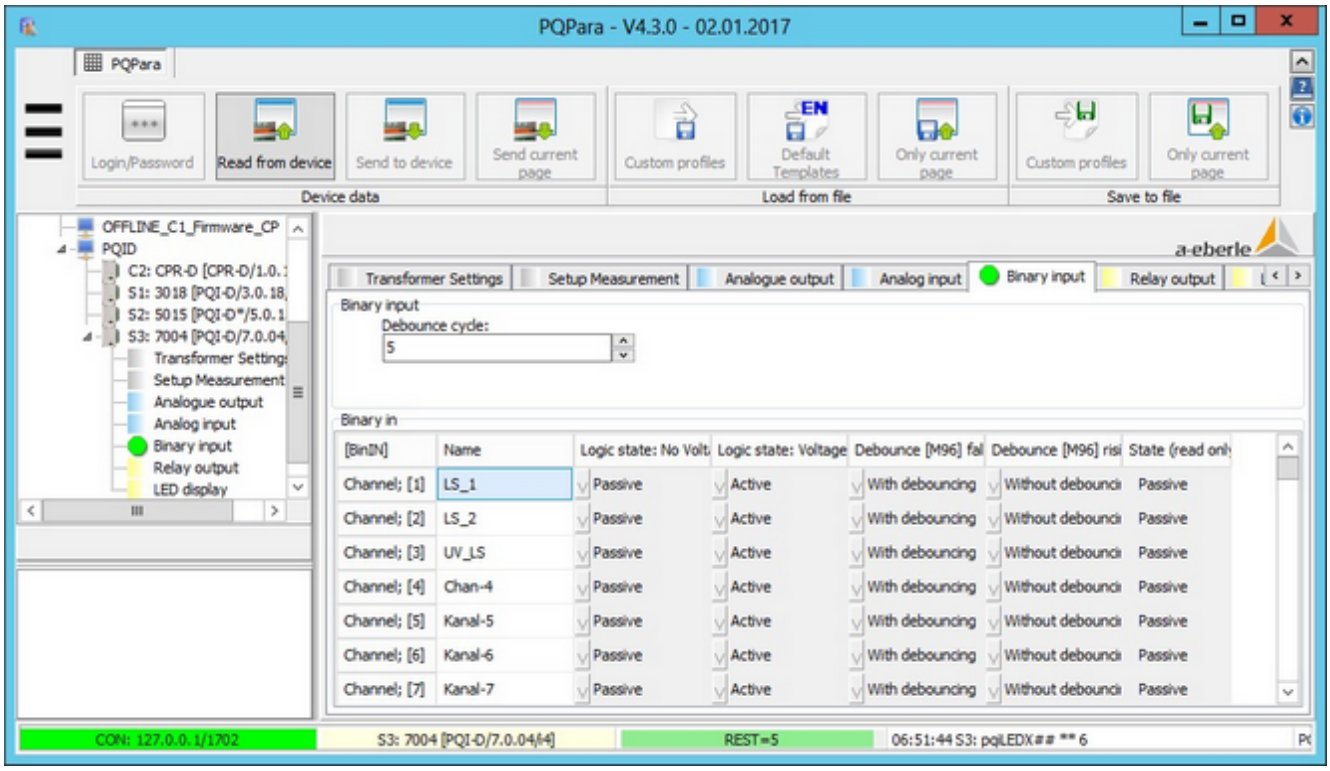
Configuring binary inputs

The number of binary inputs is hardware dependent.



- You can set the logic state. If the logic state is 'Voltage at input', you can process it internally as active or inactive.
- You can also freeze the logic state (regardless of the input signal). In this case, the logic state on the page changes to 'Memory allocation' and is displayed with a red frame.
- Under characteristic M96 (binary signal is sampled by DSP), the number of debounce cycles still plays a role (signal must have at least a certain number of table sample points).

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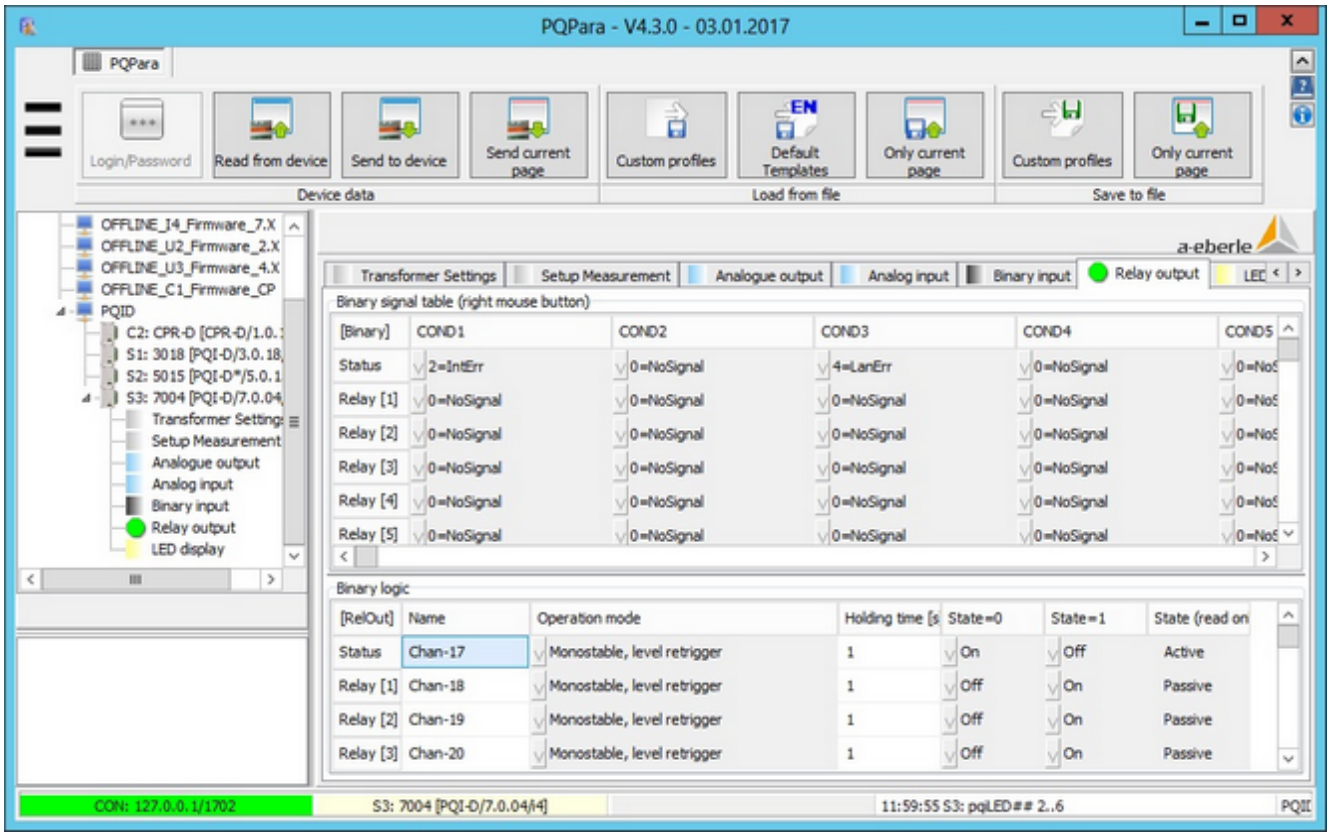
Configuring the relay output and LED display



- The configuration of the relay and the LED is basically the same.
- The LED can be configured to be 'Off', and have the colour red, green or yellow.
- The messages (e.g., new error log, signal change on the binary input etc) that are used to activate the relay/LED are selected in the top pane. Up to 32 messages can be linked with 'OR' statements.
- The operating mode (monostable level/edge-retrigger, bistable, save through ECL), the dwell time and other parameters are set in the bottom pane.

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PQPara: Thresholds/Recording

Specify thresholds and select the measurands to be recorded

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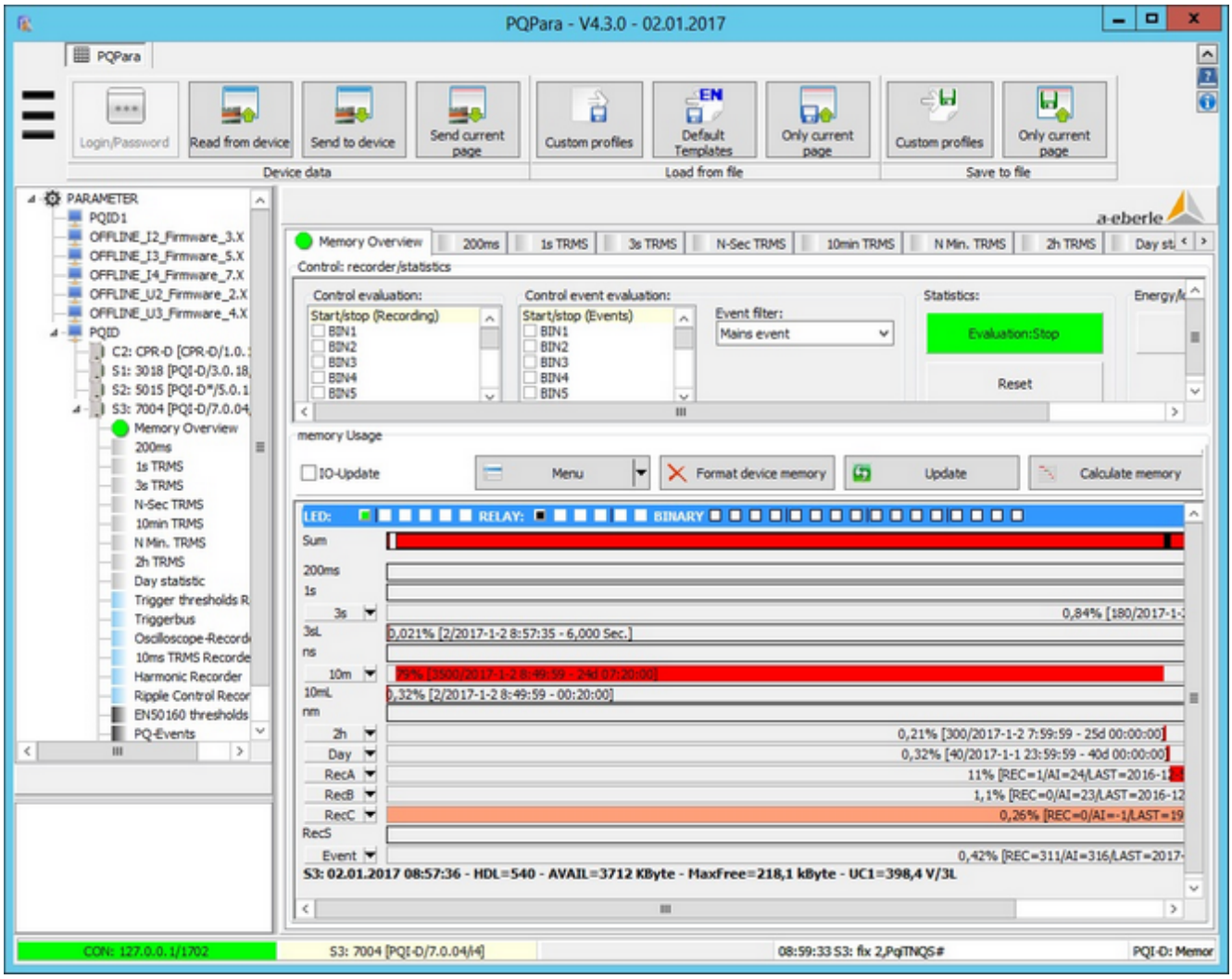
Controlling the recording and other functions



- In PQI-D, data are recorded through the binary input (up to 16 inputs through 'OR' statements). No more measured values are saved to the device's memory once it has been switched off. The same applies to the event evaluation.
- The event filter enables you to toggle between grid and phase events. Grid event (default) means one coming and one going event for each error event regardless of the number and sequence of the affected phases.
- Selecting the 'Flagging' parameter enables you to specify from which 10-ms event (e.g., voltage dip or interruption) 10-min events (Flicker, THD etc.) are no longer generated. The datasets created by the continuous recording (e.g., 10-minute values) are 'flagged' (from Firmware 6.X and 7.X, flagging is more finely broken down and can be configured using thresholds, connection and IO).
- The statistical evaluation can start (green background) once all of the parameters have been set during commissioning and the measured values have been checked. So long as the evaluation has not started, the horizontal bars in the statistical data class and the event data classes are displayed in the memory with light red background (see above under Day + Event).
- In some cases, the statistical data may have to be reset to zero ('Reset' button).
- The fields in the right pane are used to enter load profile data (e.g., 1/4-hrs values). You can select the 1/4-hrs impulse through a binary input or the internal clock. User-defined data classes with user-definable interval are available from Firmware version 7.X.

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- In this case, (Firmware 3.X + 5.X) the load profile data are forwarded through the event list. A central parameter in PQAdmin must be set in order to use this function.

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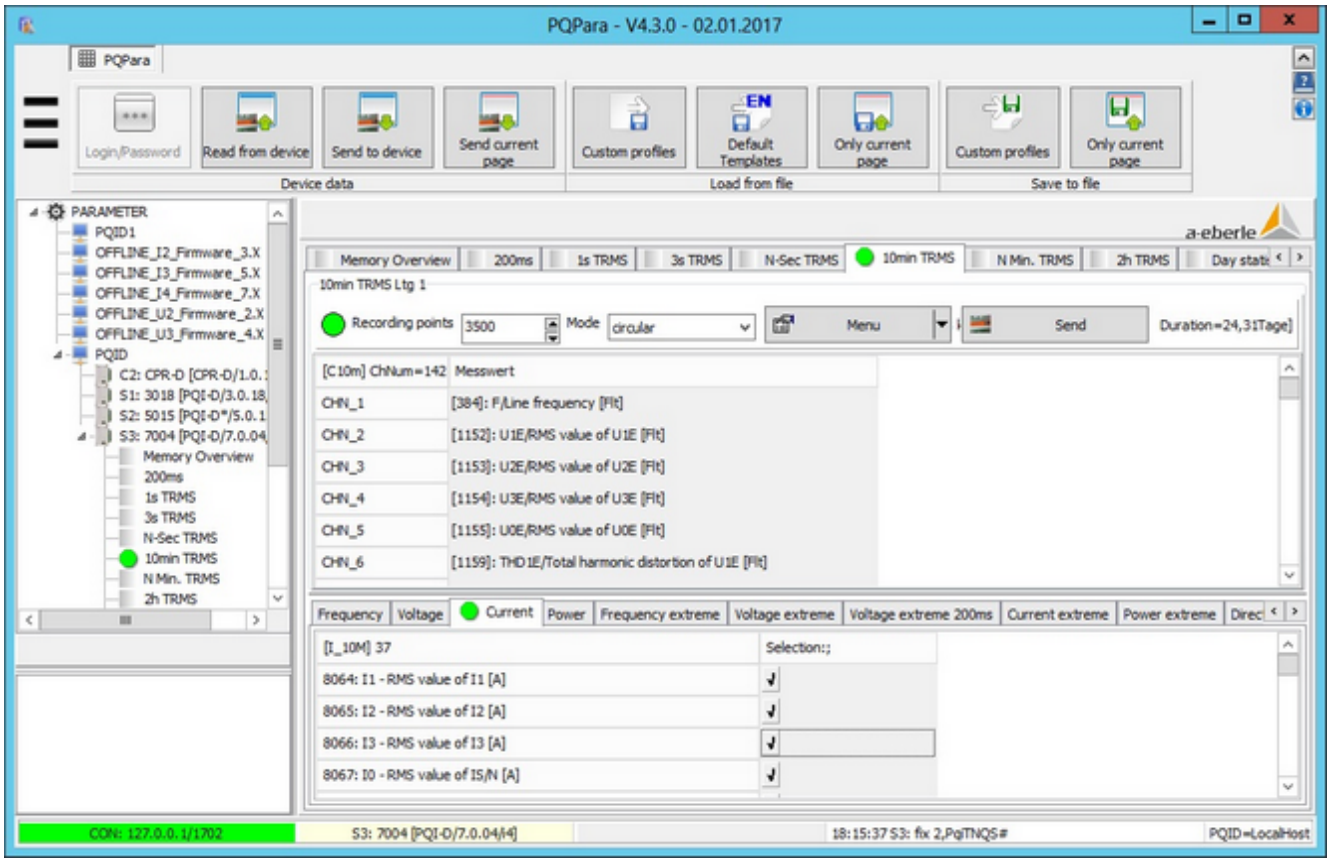
Configuring a data class using 10-minute values as example



- All of the measurands that the respective data classes can make available are displayed on the pages in the bottom half of the pane.
- For the 10-minute data class, these are the average and extreme values of conventional measurands in power engineering (currents, voltages, powers, angles etc.) and the harmonics and interharmonics up to the 50th for current and voltage. The pages are arranged according to their physical context.
- Checking and unchecking checkboxes in this area immediately affects the list of active measurands (above table). The whole list is coloured red (meaning 'not yet active on the device').
- The top row contains the number of recording points, the recording mode (linear/circular) and menu functions (Load/save profile, Start/Stop recording etc) that only affect this one page.
- The memory requirement is calculated by multiplying the space requirements across all measurands (4 Bytes for an average value and 12 Bytes for an extreme value with time stamp) by the number of recording points. If a parameter changes, the PC program calculates the new space requirement and checks whether the requirement can be met. If it cannot be met, the text is displayed in red in the top left.

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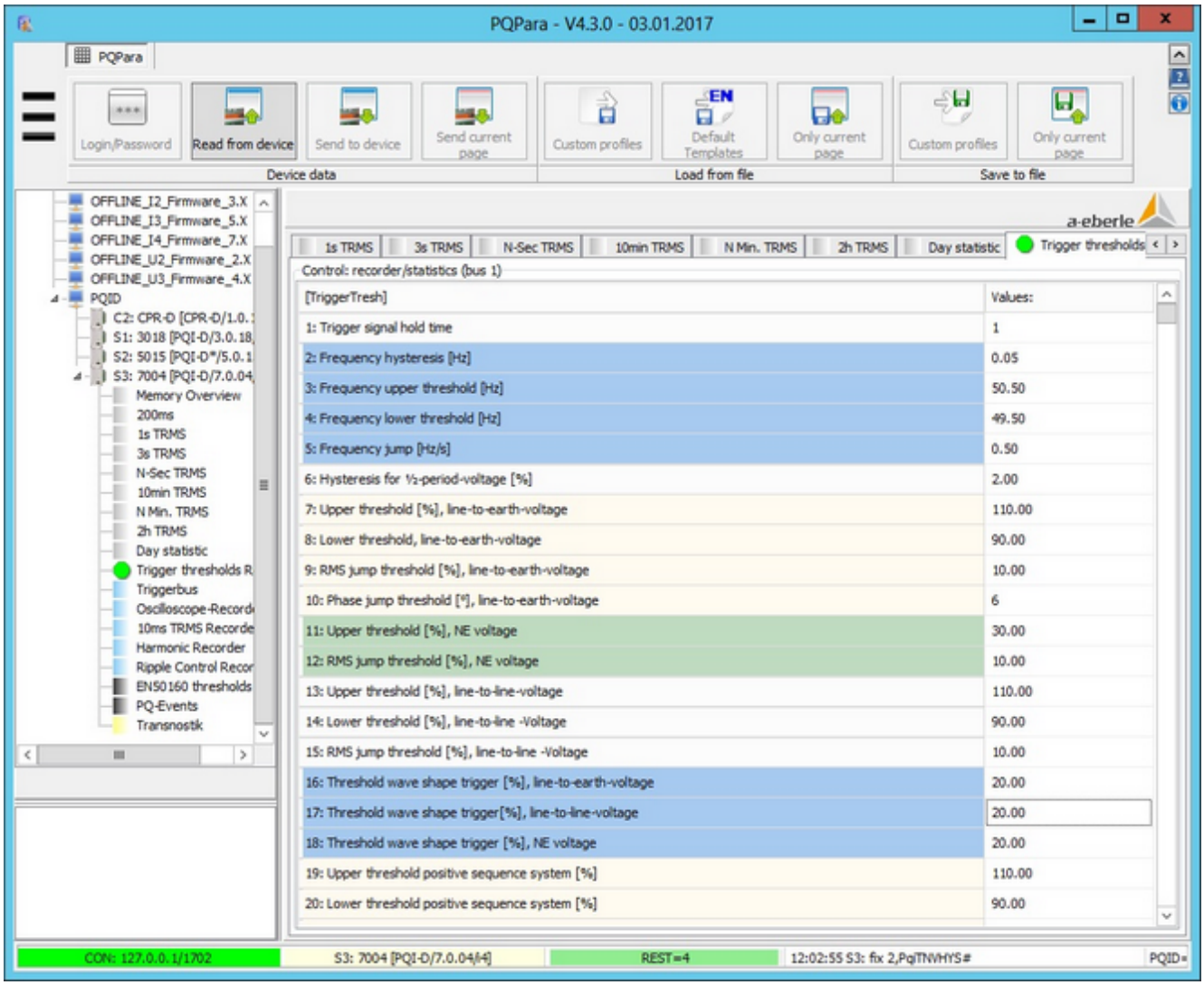
Setting trigger thresholds



- Parameters that are technically similar are grouped in colour-coded table rows.
- Thresholds can be set for the following criteria:
  - Frequency monitoring
  - Upper and lower trigger threshold for phase-to-phase voltage and phase-to-earth voltage
  - RMS voltage peaks
  - Upper threshold for the residual voltage
  - Envelope trigger
  - Threshold for positive sequence voltage, negative sequence voltage, zero sequence voltage
  - Current thresholds

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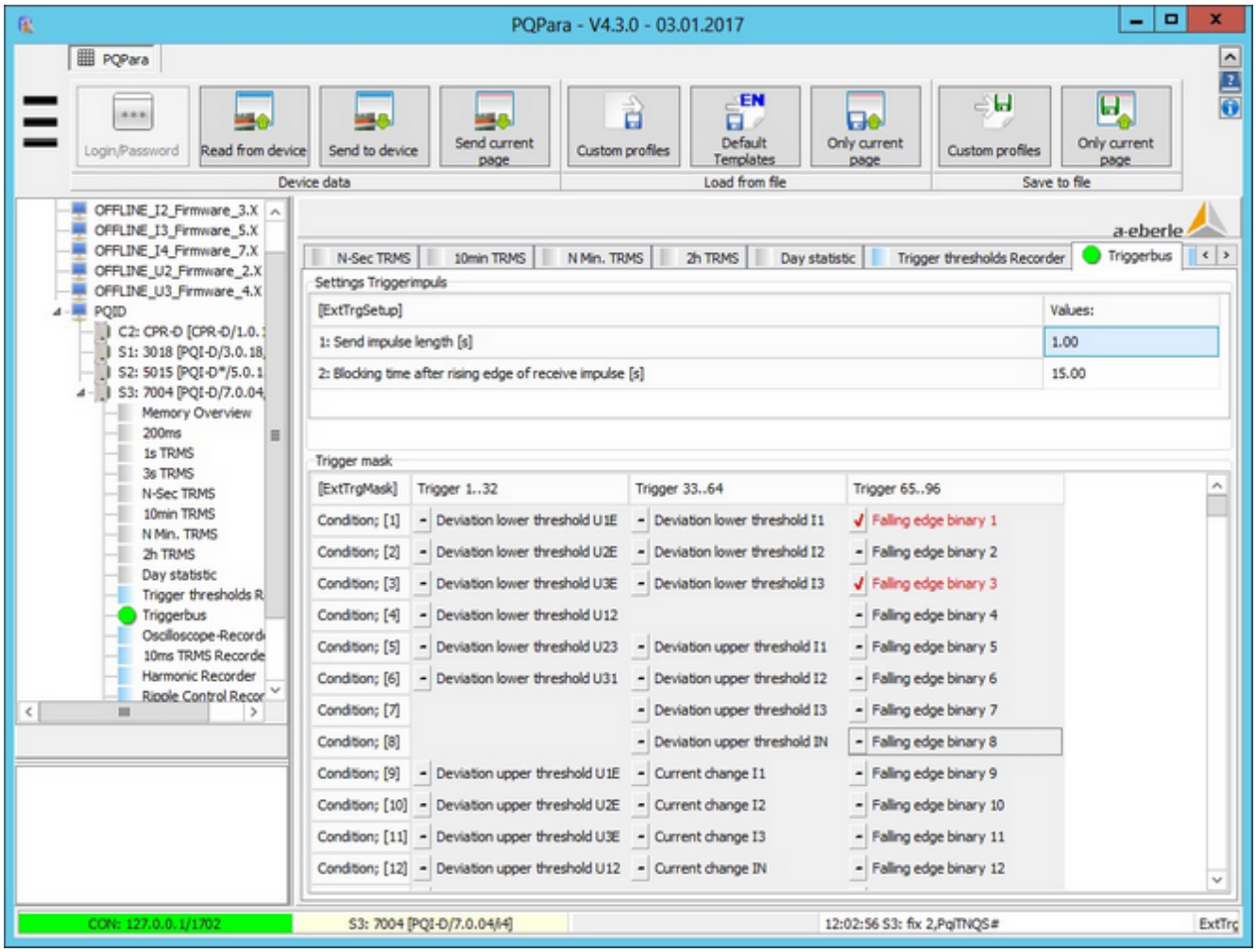
The trigger bus



- In addition to the E-LAN and time synchronization bus, the trigger bus is the third bus system that transmits information between devices.
- In the mask, you can define which trigger criteria are transmitted to other devices. The target device has a checkbox. If it's checked, the device will accept the incoming signal. If it's not checked, the device will reject the incoming signal.
- There are two parameters in the top pane that are used to set the Impulse length [sec] and Blocking time [sec] between two consecutive pulses.

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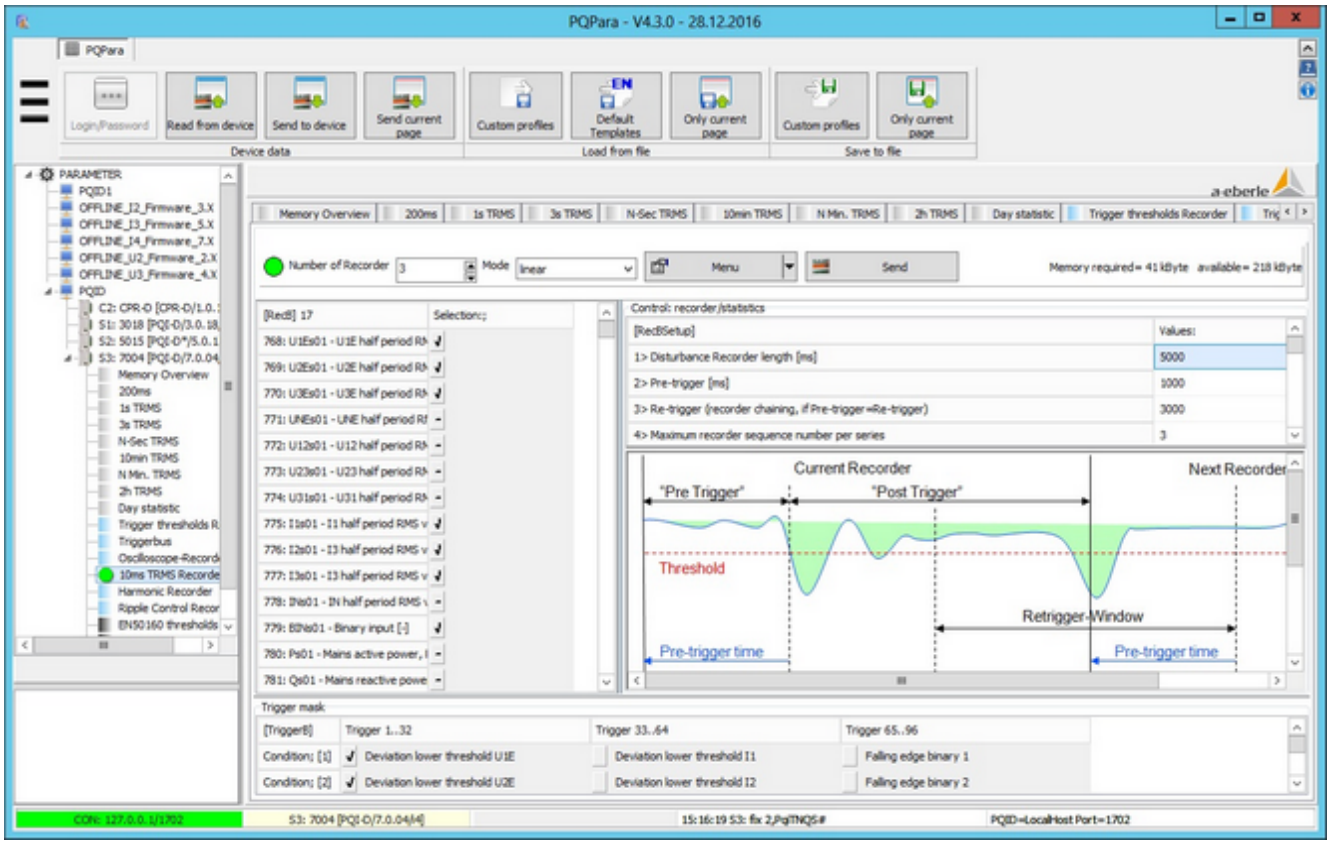
Configuring error logs using the example of the RMS recorder



- Measurands are selected in the top left of the table.
- In the right table, you can enter:
  - the total length of the error log
  - the recording length before the trigger point
  - the retrigger
  - the maximum number of triggers per sequence (the below figure explains the parameters)
- The criterion in row 3 of the 'Retrigger' table is used to extend the recording length (especially for oscilloscope logs). Partial logs are not combined until they are saved to the database.
- The table with the trigger mask contains criteria whose thresholds are entered on the 'Trigger thresholds' page. This is where you determine which criteria are used for the different recording types.
- Error logs should be configured with a 'linear' recording mode. This adds another ca. 48 MB of memory on the DSP processor (digital signal processor) to the current 4 MB of device memory.

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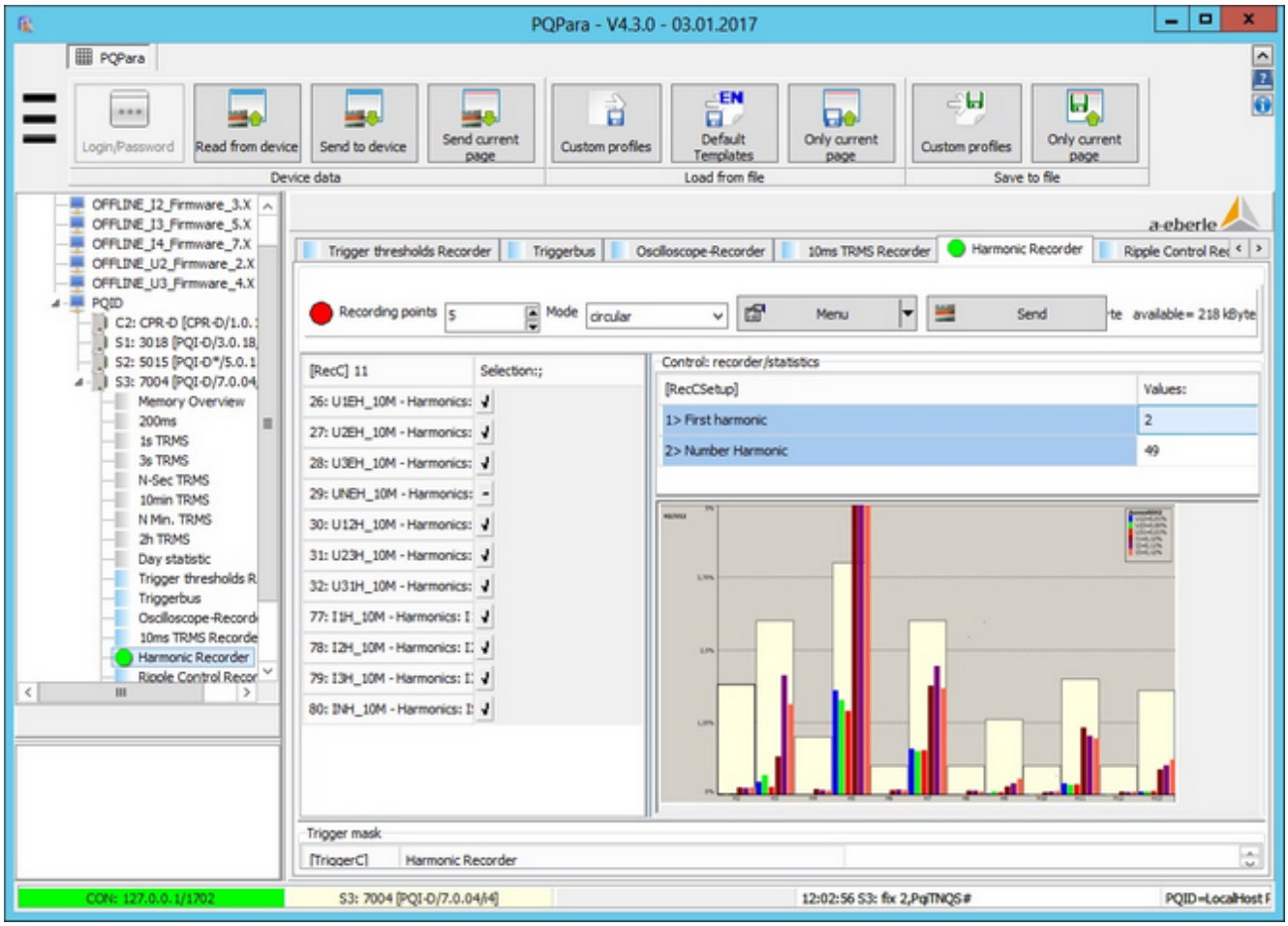
Harmonic fingerprints



- Here you can select which quantities (e.g., phase-to-phase in the MV and HV grid or phase-to-earth in the LV grid) are recorded. You can also determine the range of the harmonics.
- A Recorder C is only recorded if one of the conditions in the trigger mask is met. In general, at least one of the harmonics up to the 25th or the THD value must have exceeded a threshold.
- There is a condition in the trigger mask for continuous recording (irrespective of the compatibility levels). The condition enables the maximum threshold of 1024 measurands in the 10-minute data class (only needed in rare exceptions) to be extended.

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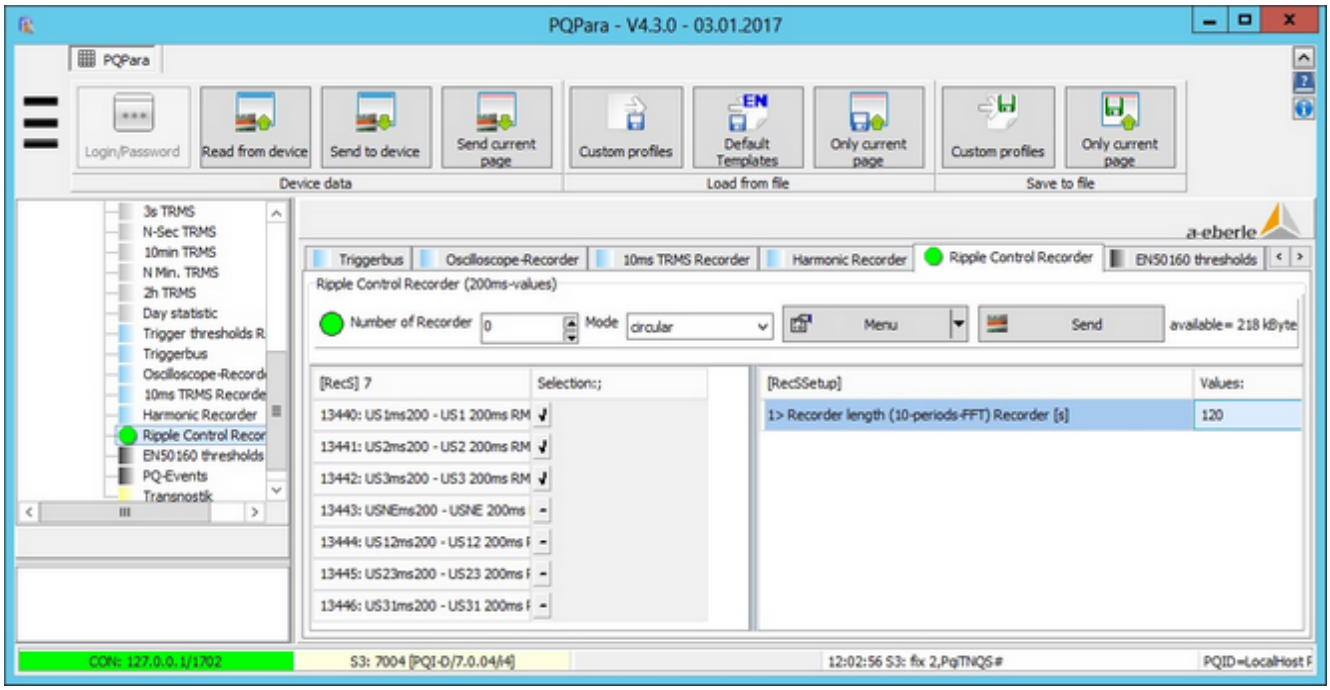
Ripple control recorder



- The recorder is generated from the values of an FFT analysis over 10 periods (meaning five recording points per second). The recording length of 120 s (in the above table) equates to 600 recording points. This means that the memory requirement pretty much corresponds to the RMS value of the error log.
- The data from this recorder type should only be stored in the database in exceptional cases (too many recordings).
- It is generally sufficient for a circular recording to have a memory depth of some 20 to 30 recordings so that the logs can be directly accessed through the configuration software if need be.

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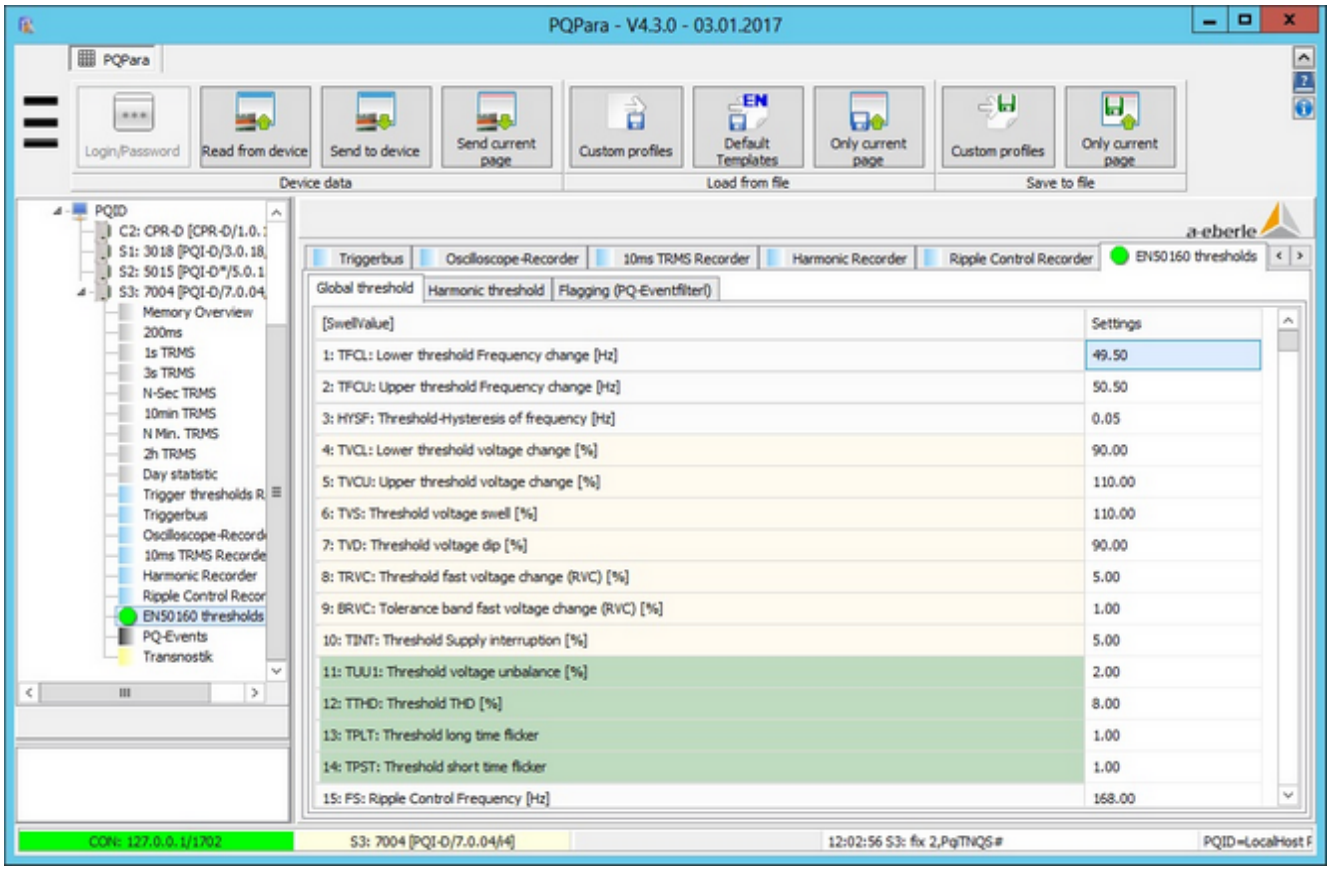
EN thresholds and compatibility level of harmonics



- Frequency thresholds
- Voltage thresholds
- Admissible frequencies (used, e.g., for notifications that can be output to a relay).
- Compatibility level to the 25th harmonic (page: harmonics thresholds) Thresholds up to the 50th harmonic can be managed from Firmware versions 6.X and later.

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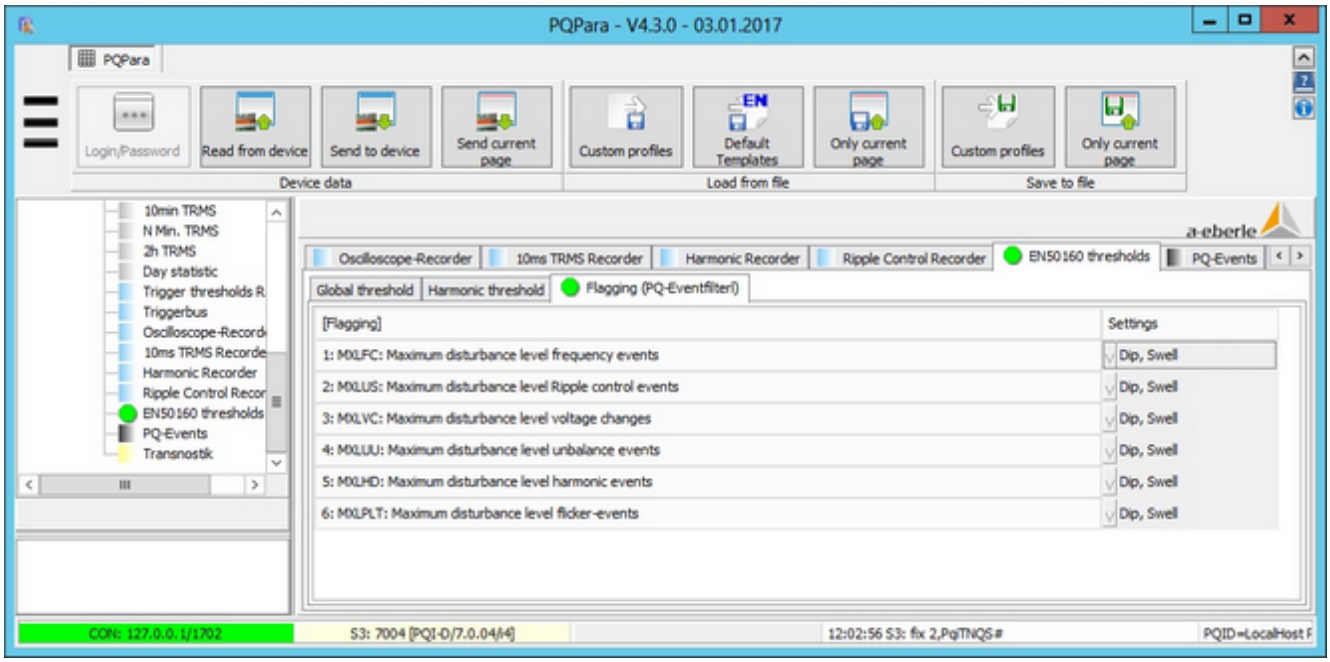
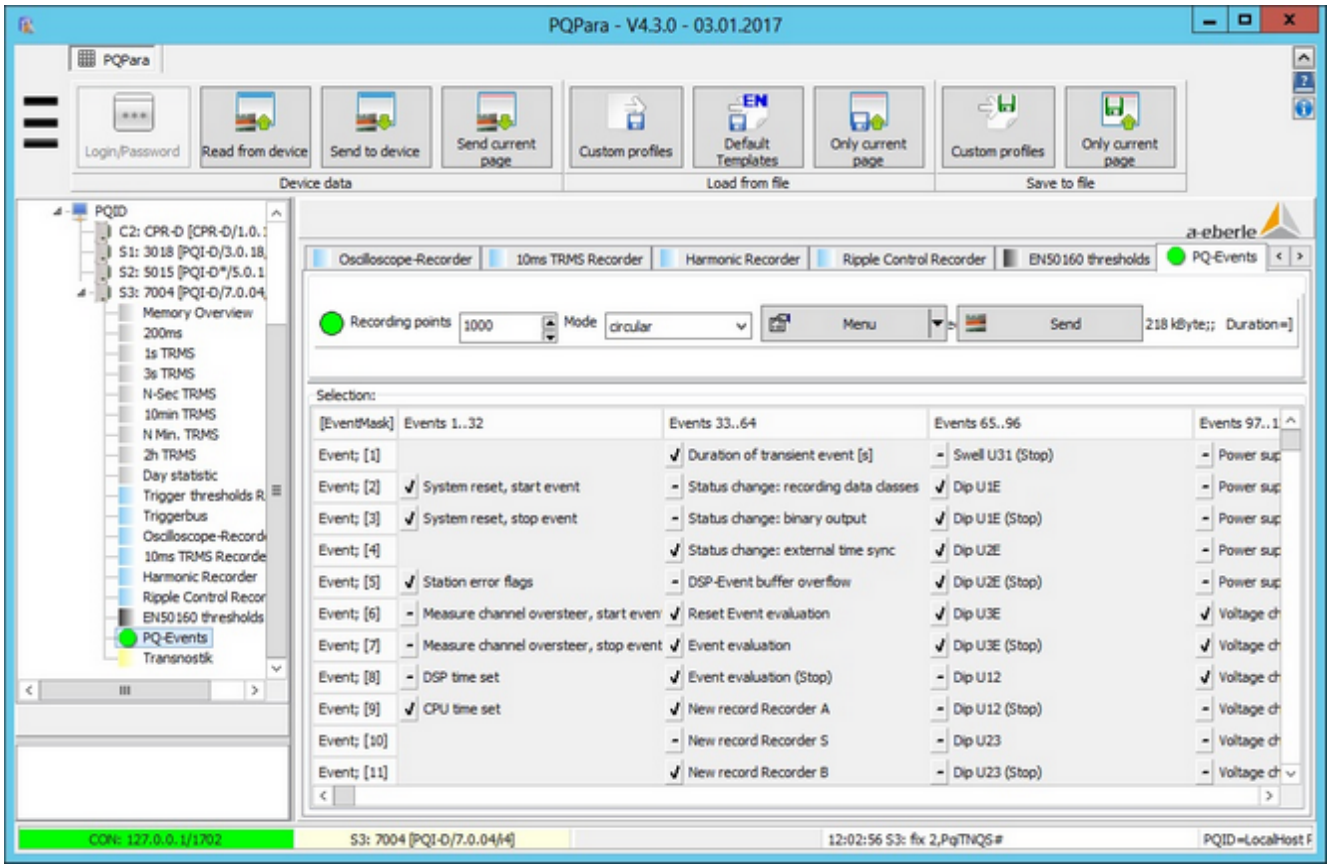
Expansion of the flagging concept



In version 6.X and 7.X, all event types have their own flagging level.

Event class on the PQI-D



- This is where relevant events are selected (e.g., phase-to-phase for MV and HV grids and phase-to-earth for LV grids).
- In addition to the PQ events, there are a range of device-specific events (set time, change day, etc.).
- Every event consists of an ID, a time stamp and a parameter that provide more details about the event (e.g., lowest value of a voltage dip).

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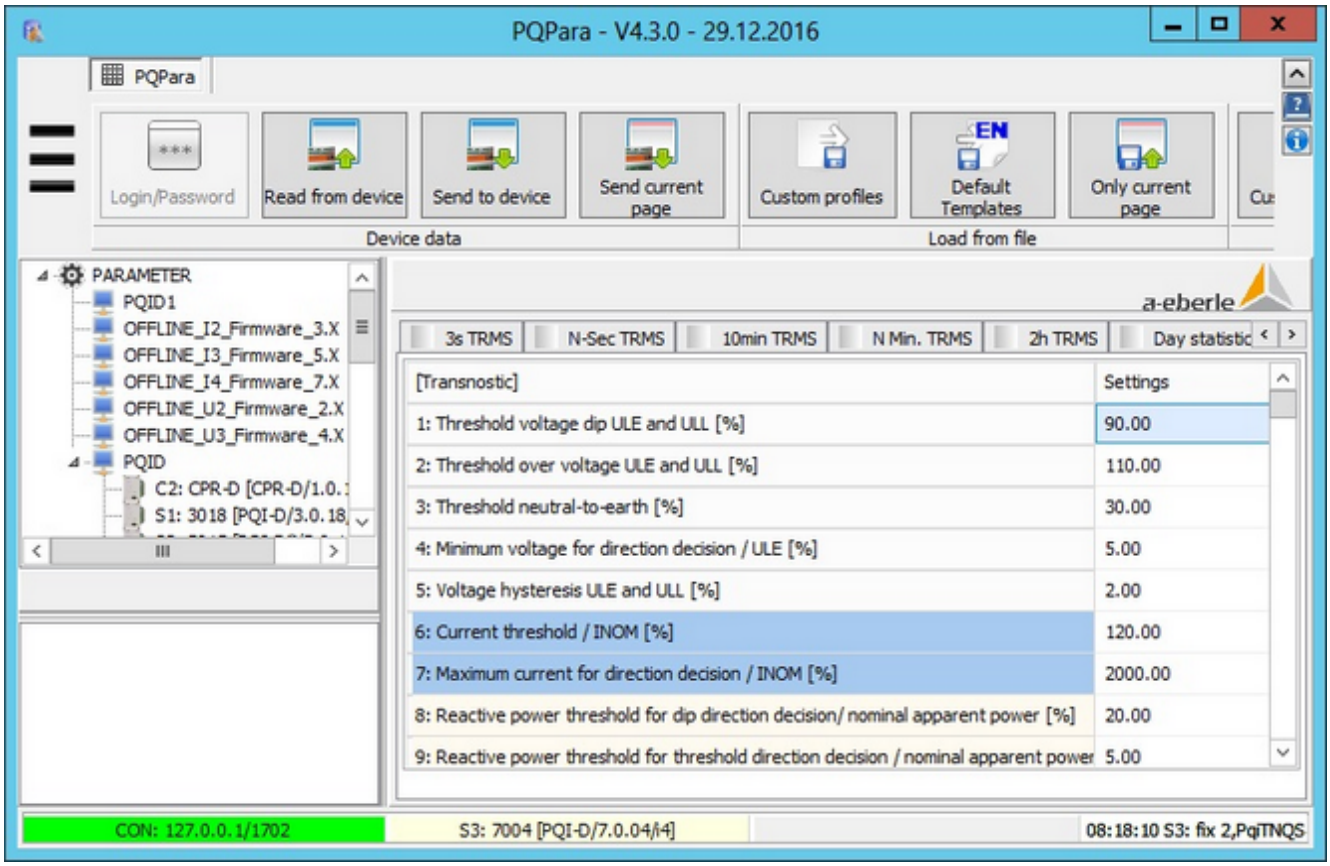
Transnostic parameters



- Trigger threshold from which a voltage dip is evaluated.
- Trigger threshold for the evaluation of the voltage swell.
- Threshold for the detection of an earth fault.
- Minimum voltage from which the calculation is done (if the residual voltage is too small, the reactive power cannot be measured properly and the error will be too big).
- The hysteresis specifies how much percent the trigger end value must deviate from the trigger threshold in order to be triggered again (this function prevents too many events from occurring in a very short time when the voltage fluctuates around the threshold).
- The current threshold determines when overcurrent is detected.
- The upper threshold for the maximum current limits the evaluation range of the measuring device. The value must match the PQI-D's current measuring channel as well as the connected measuring transducer. (Example: If the device is connected to a measuring transducer with a maximum current of 10A and the PQI-D is the 2xIn version, the maximum threshold must be set to 200%).
- The reactive power threshold specifies the minimum value from which the power is calculated and used to decide the direction of a voltage dip.
- The reactive power trigger threshold for the evaluation of the voltage swell is specified here in percent.

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PQPara: Online data

Graphical and tabular view of current device data.

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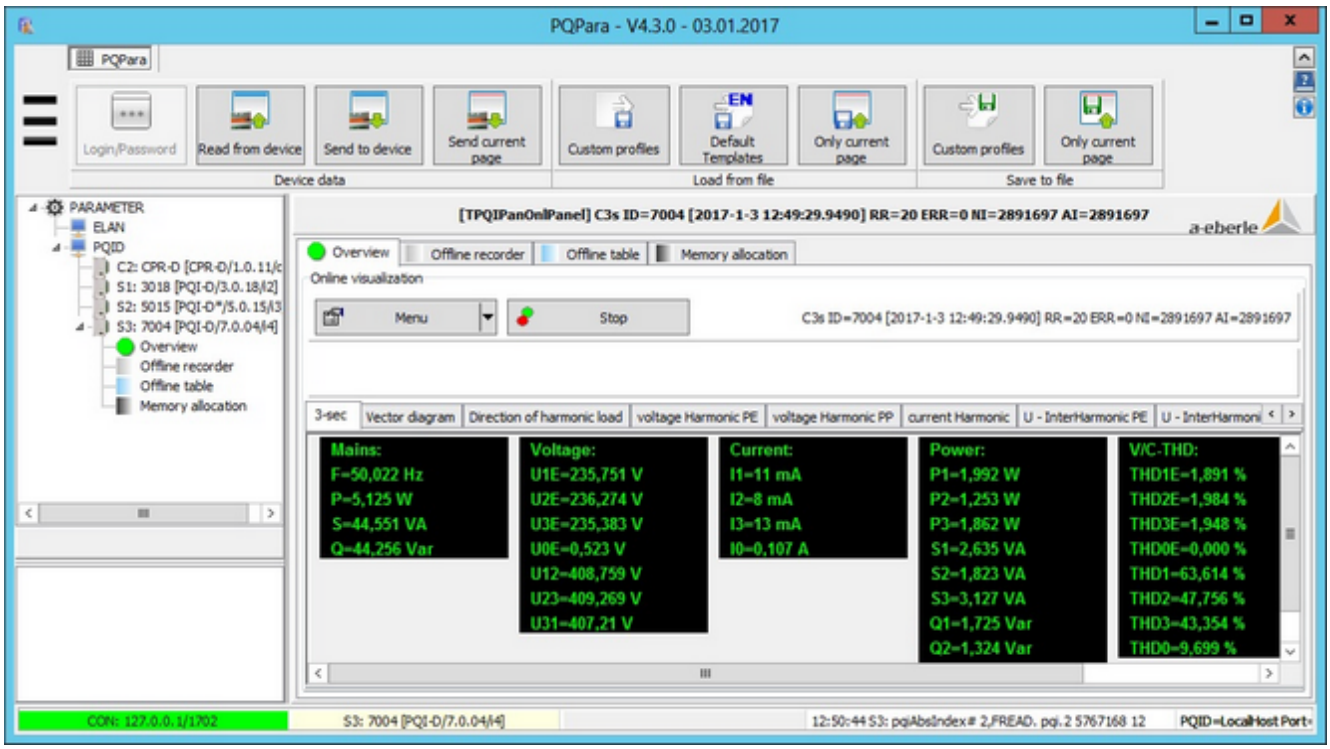
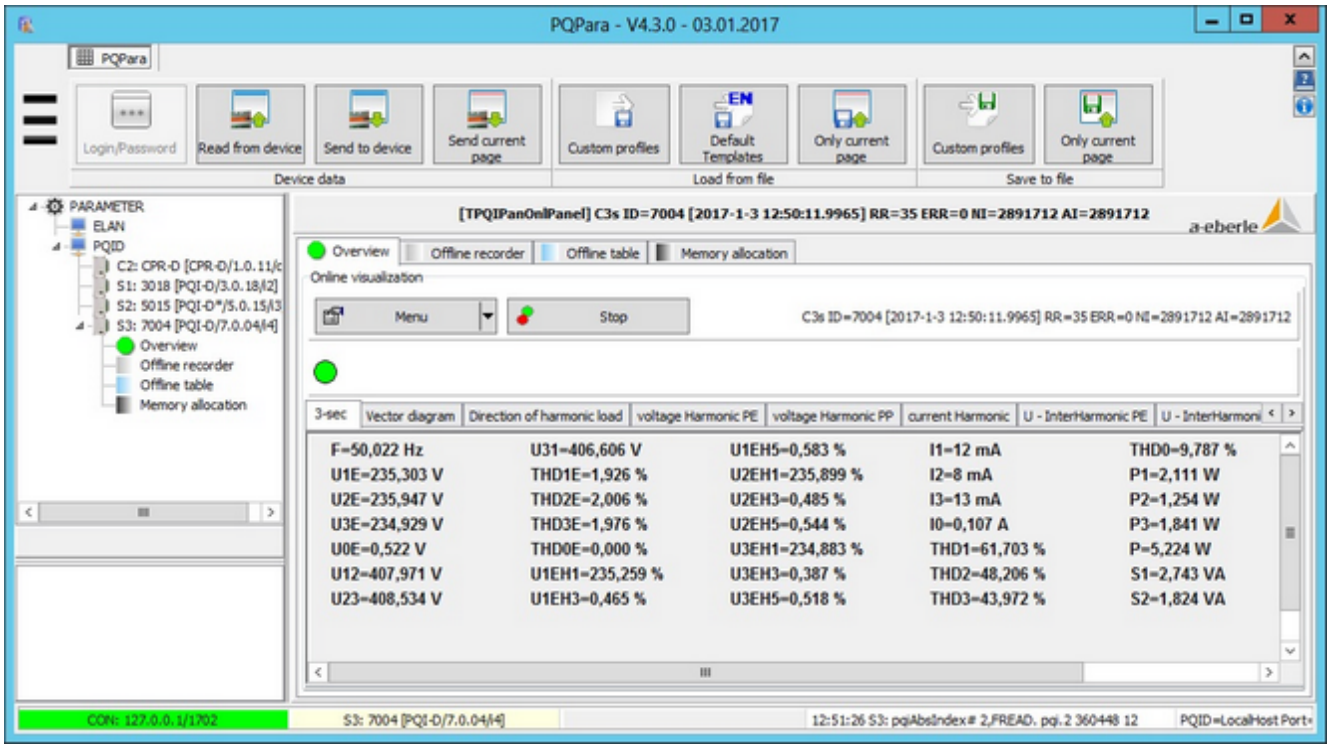
Displaying online data (3-second data class)

By physical aspects:



By measurand ID:



- The online view is especially meaningful during the commissioning of the devices because the correct activation of the measurement channels (e.g., current flow) and the entry of the transducer factors can be read through the measured values.

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- The top pane lists the selected measured values (they must be part of the data class configuration) by physical classification criteria.
- The bottom pane (right-click) shows all of the quantities in the 3-second data class (sorted by measurand ID). In this mode (bottom pane), all of the measurands can be selected (right-click) or, if necessary, the measured values logged in a text file.

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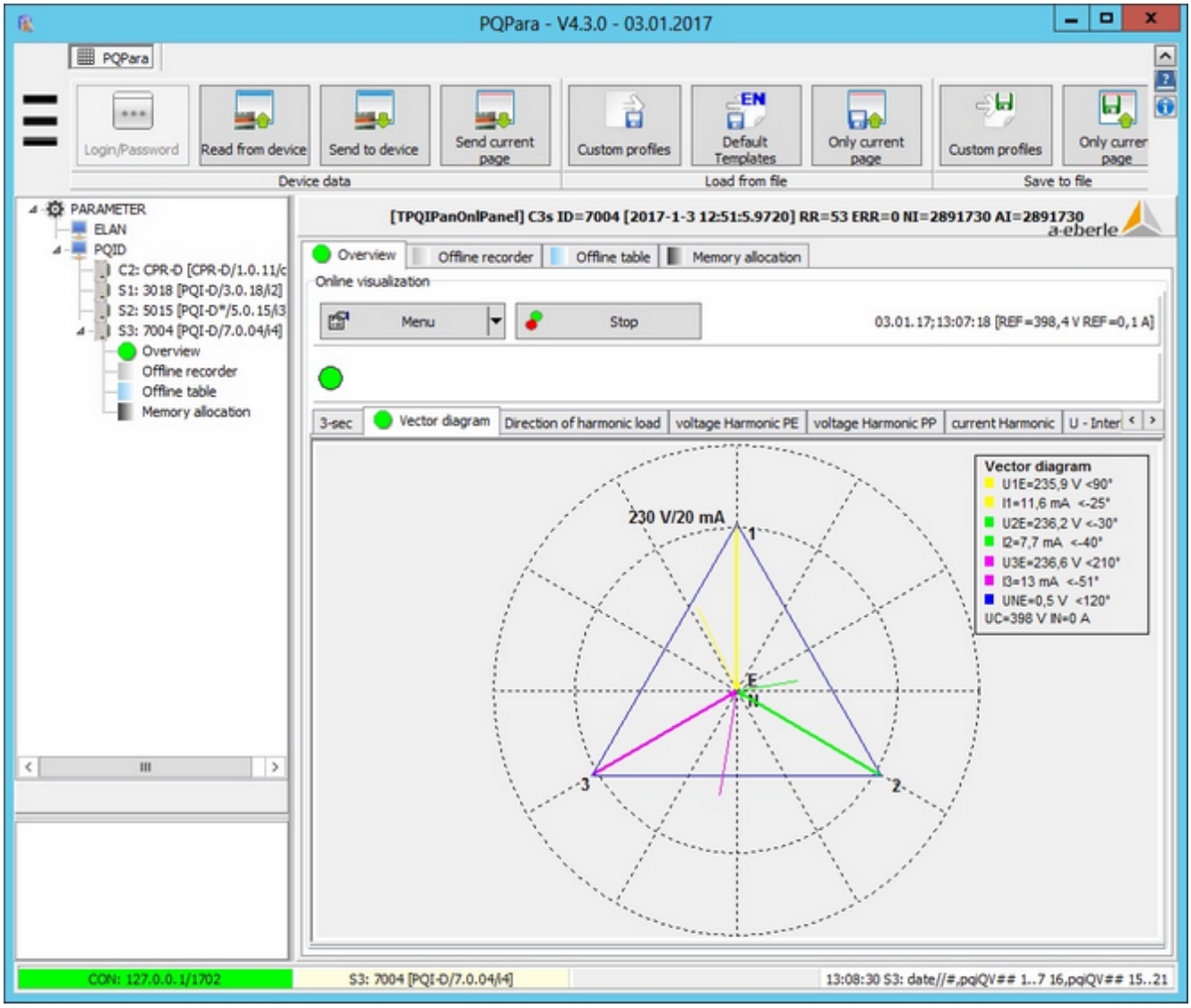
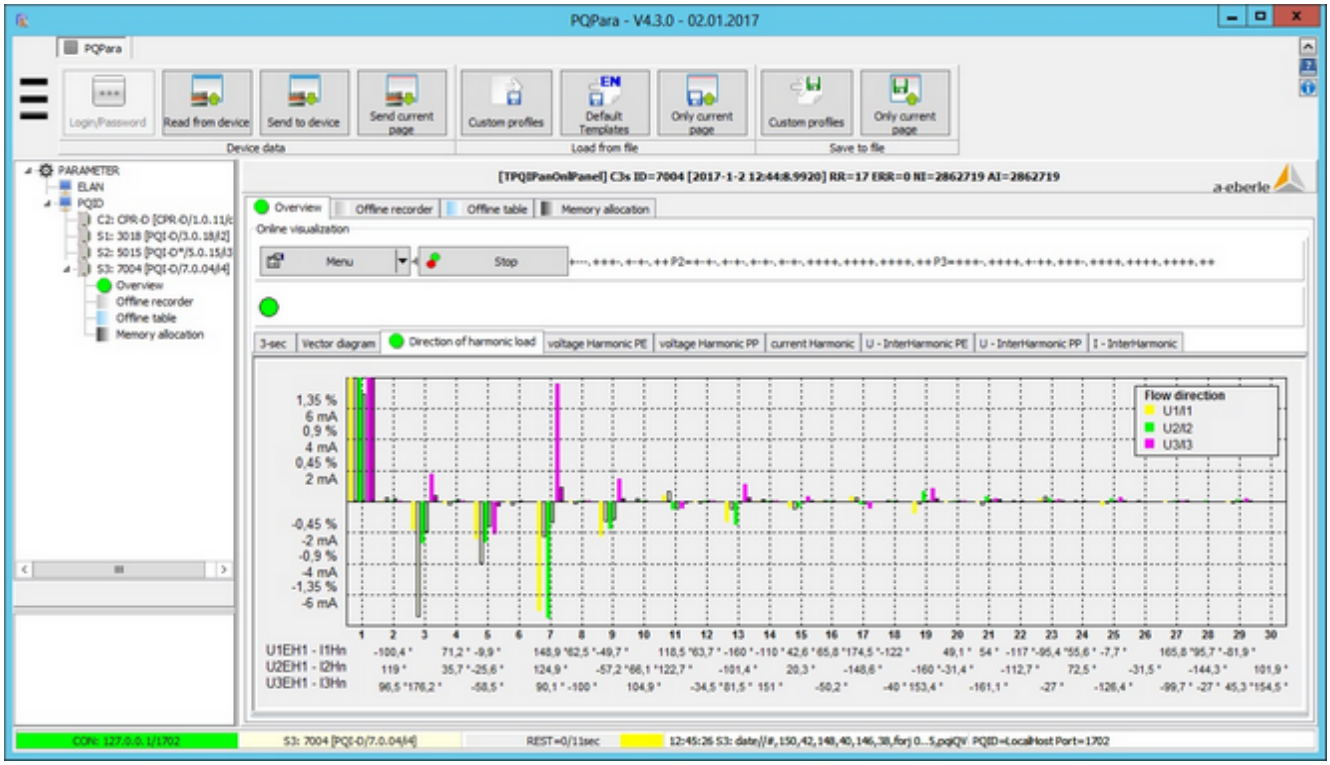
Displaying currents and voltages as vector diagram



- A second way is to display the voltages and currents as vector diagram.
- The values and angles for the voltages and currents displayed in this view are read from the device even if they're not part of the current 3-second data class allocation.
- The inner circle (dash-dash-line) displays the values of the 'agreed voltage' (converted ove. $\sqrt{3}$ the agreed phase-to-phase voltage) or the nominal current.
- There's a menu option to hide the legend (values and angles as numbers).

Direction of harmonics energy flux (3-second data class)



- The third figure displays the direction of the harmonics' energy flux. The display shows whether the harmonics are produced in their own grid or are imported by the supplier.
- Calculation: The angle of the current and voltage up to the 30th harmonic of each conductor are compared with each other.
- The figure shows that the energy flux of most of the harmonics (e.g., 5th, 7th, 11th, and 13th) is against the direction of the main energy (fundamental wave), meaning that they are generated in the subgrid.
- The value of the 50 Hz components is cut off for display reasons. The values of the higher harmonics correspond to their measured value.

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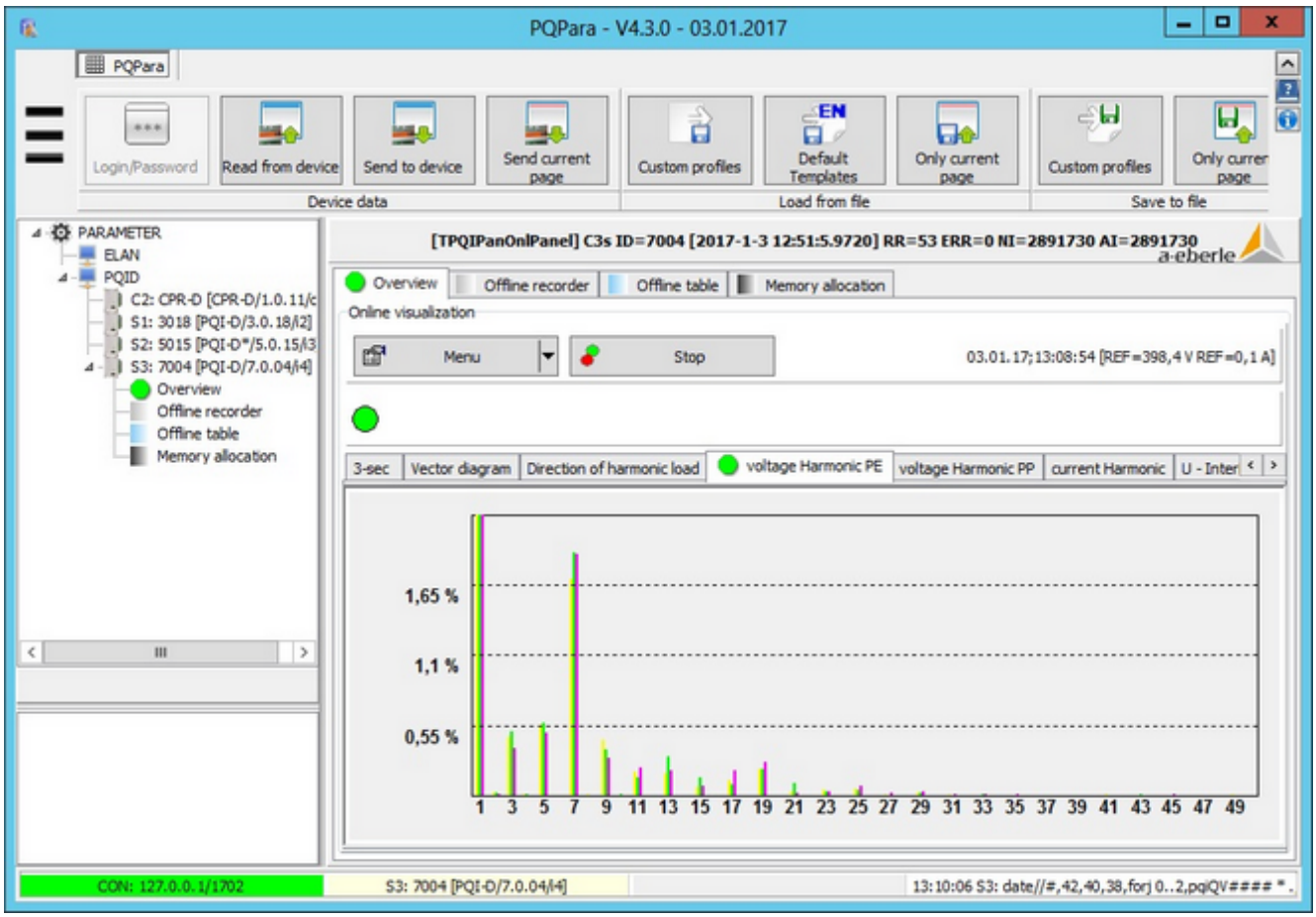
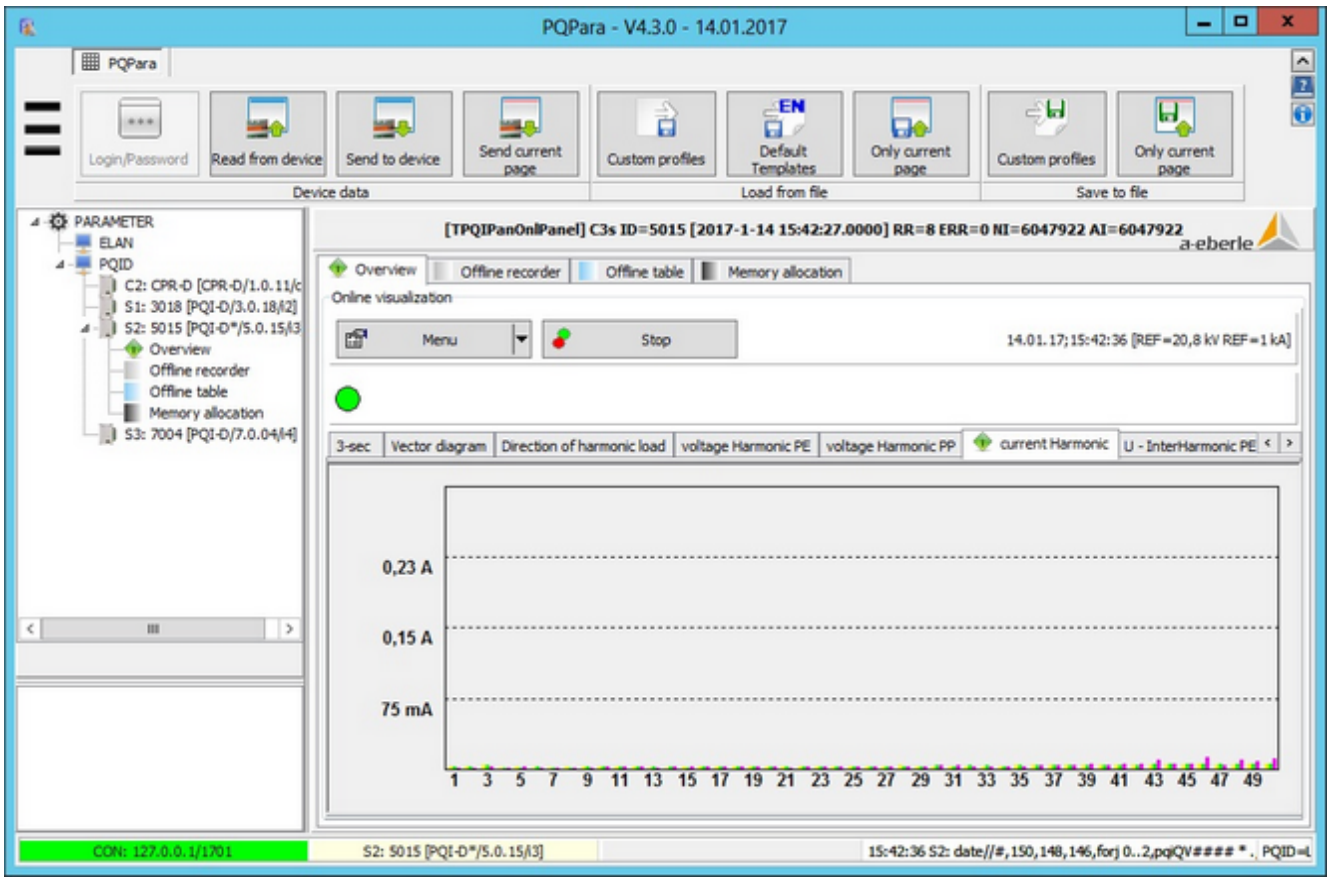
Displaying harmonics up to the 50th (3-second data class)

Voltage harmonics up to the 50th:



Current harmonics up to the 50th:



- The view provides an overview of the current status of all harmonics and interharmonics for all currents and voltages.
- The view depends on how the data classes are configured, but is generated from the 3-second values.
- The selection is performed by clicking on the top tabs (phase-to-earth + phase-to-phase etc).

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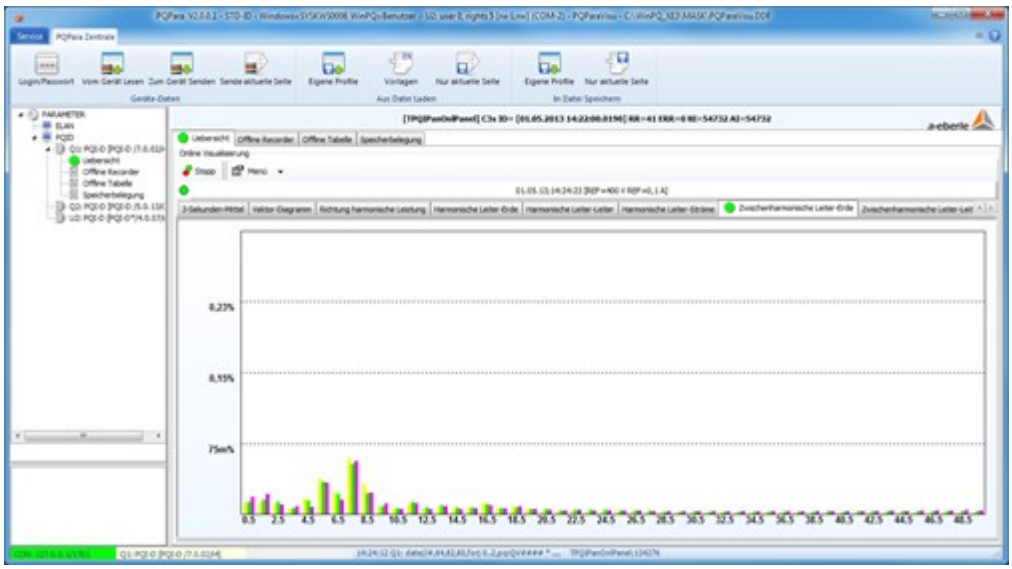
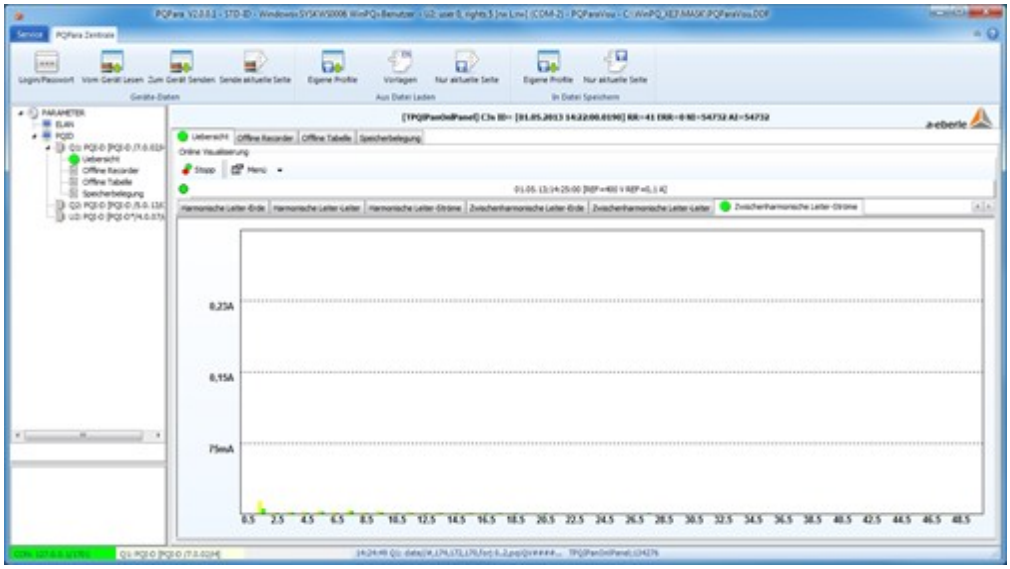
Displaying interharmonics up to the 49.5th (3-second data class)

Voltage interharmonics:



Current interharmonics:



- The view shows the values of the interharmonics for current and voltage.
- See the description on the previous page.

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Using the parameterization software to retrieve error logs

- So long as the data are still in the device, the log files can be read and displayed with the parameterization software.
- This is the fastest way of accessing the logs (e.g., with the free Express software) during commissioning (e.g., on site at the substation).
- This option is not as user friendly as displaying the values from the database. First you have to take the download time into account, which depends on the amount of data to be downloaded. Second you might have to access the desired log file sequentially because not all of the time stamps can be displayed in the beginning.
- An online graphic for the 3-second values (as recorder) is also an option.

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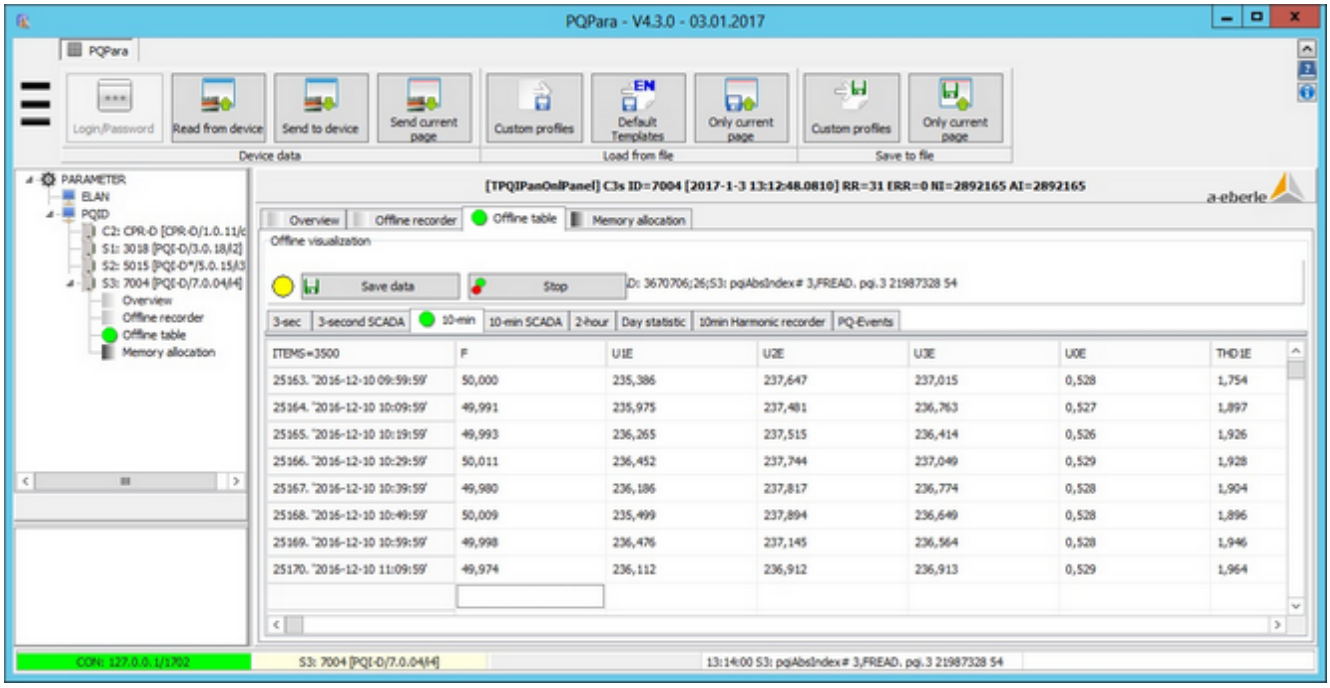
Transferring measurement data from the device's repository



- All of the data that are still in the memory (usually allocated as circular) can be transferred into a table.
- These data can be stored in a file or the clipboard and then copied to Excel, for example.
- The first column contains the ID and time stamp (both are managed by PQI-D, the ID ensures the uniqueness of each dataset).
- The dataset is flagged if the ID is preceded by an * (flagging: a 10-ms event was registered in the interval). For the later evaluation this means that this dataset is not allowed to be used in statistical evaluations.

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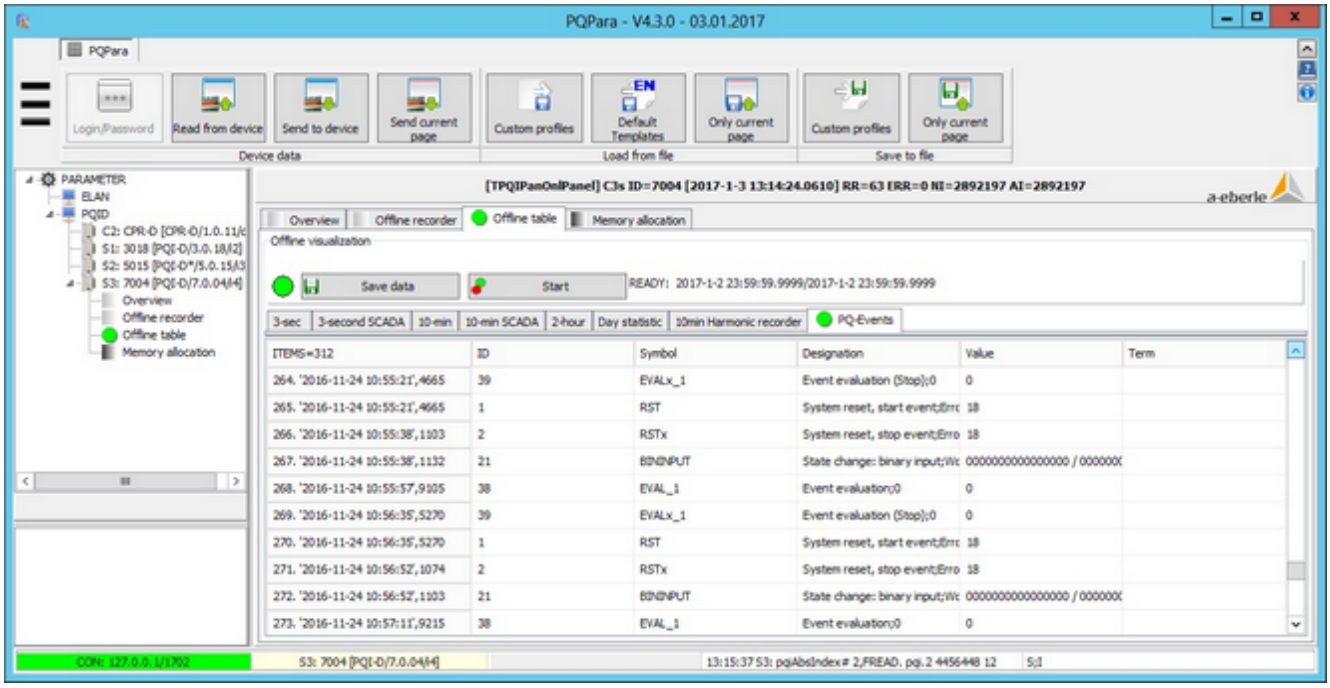
Displaying event data from the device's repository



- This is where all sporadic events are displayed,
- Such as PQ events, error log records, periods, day change (in the sense of a vital sign), fault condition of the device etc.
- Special tasks have (since version V6/V7) user-defined events that can be generated, for example, by H-Program.

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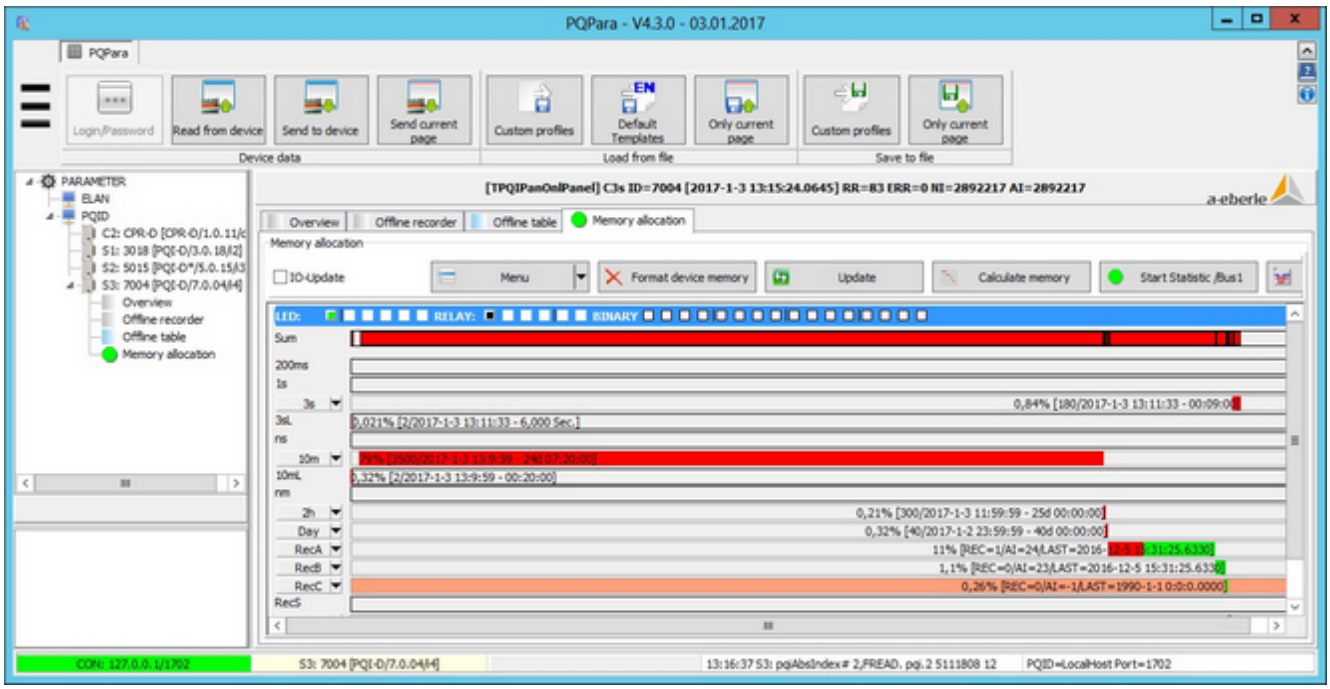
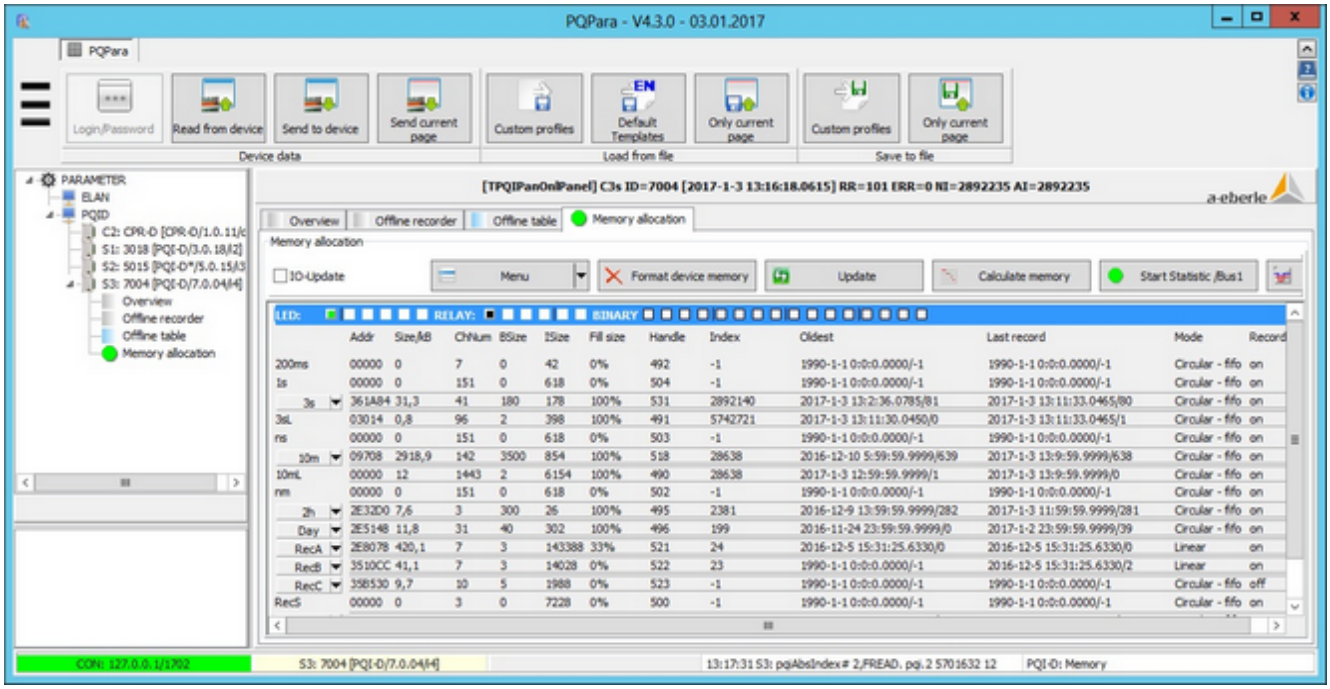
Graphical and alphanumeric display of memory allocation

Graphical memory allocation:



Alphanumeric memory allocation:



- The figure above shows the memory allocated to a device in a bar chart (the total length of which represents the available memory) (Green: allocated memory, Red: used memory).
- For data classes with a circular buffer, the bars turn red and stay red. Linear buffers (crosshatched bars, e.g. error logs) are completely deleted by PQManager at regular intervals. The bars turn green again.
- Alphanumeric buffers (right figure) have a time stamp that enables you to determine when the last recording took

place. Here you can read whether a grid failure triggered a recording on the device (e.g. last log, last event).

- If a background bar is coloured light red, the recording of the data class was stopped or the evaluation of the statistics (day and event data class) not started yet. The starting and stopping can be triggered through the software of binary inputs.
- Click on the Update button to update the view (e.g., after a software trigger). Because the information about memory allocation is very complex, it is retrieved automatically only when the program starts.
- The status of LEDs, relays and binary inputs is displayed at the top of the panel. During device commissioning, checking the 'Update' field enables you to continuously read the status of LEDs, relays and binary inputs.

Memory management issues:

This is the typical memory allocation of a PQI-D with the latest firmware (hardcopy from the parameterization software):

- 3-second data ca. 40 measurands for only 5 minutes of online display need 0.5% of total memory.
- 10-minute average/extreme values ca. 120 measurands for 25 days need 66% of total memory.
- PQ events with a memory depth of 1000 events on the device need about 1% of total memory.
- RecA logs (sinus for 1 second, 3 logs in the circular buffer, more logs in the auxiliary memory) need 11% of total memory.
- RecB logs (RMS for 5 seconds, 3 logs in the circular buffer, more logs in the auxiliary memory) need 2% of total memory.

The crosshatching on recorder types RecA/B means that another 48 Mbyte (50,331,648 Byte) of DSP memory (Digital Signal Processor) can be used. 100 error logs RecA (150,000 bytes per log is typical) and 100 logs RecB (20,000 bytes per log) need only 17 million bytes of memory. In linear mode (only logs), data are deleted by PQManager after they have been stored in the database so that the data from the auxiliary memory can be added. The recording focus (less 10-minute data more logs or more 3-second values etc) is user-definable.

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PQPara password

E-LAN password protection

This protection secures access for each RS-232 to the devices on the ECS-LAN. A master user (User 1) and four other users (User 2..5) can be assigned different passwords (numbers between 1 and 999999999; on the program side, the lower limit was changed to 999).

The master user can set up the access permissions for each of the users, and the users can change their password - providing they know the old one. The access permissions entered for the master user apply when no user is logged in (User 0) or the timeout has expired. The master user always has full permission (=5). In the beginning, all passwords = 0. Only the master user can change 0 passwords. To delete all passwords, the master password must be reset to 0. The device that is connected to the PC server through its RS-242 interface must be configured.

If passwords are used, the following procedure is recommended (stricter policies are possible):

- The master user is assigned read permissions on all devices, which means that PQManager can read data at any time without authentication.
- The other users (E-LAN User 2..5) can be assigned write permissions as needed. This ensures that device parameters are only changed by users who can authenticate themselves.

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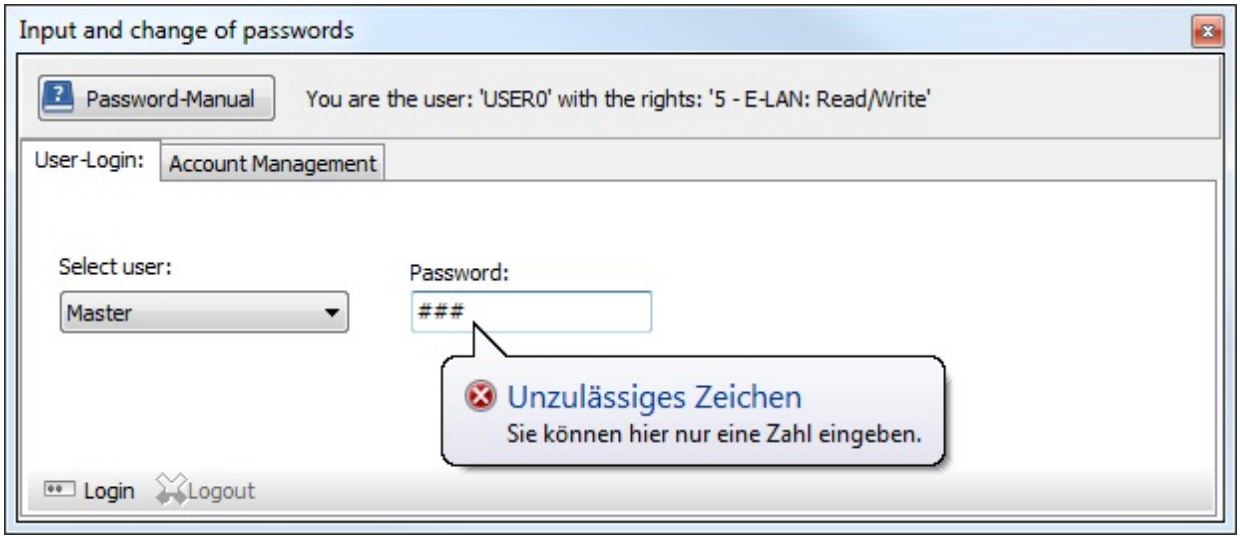
Integration with WinPQ parameterization software:

The window to log in, generate and change user accounts is part of the parameterization software. This window displays automatically if PQPara detects that no read permissions are available. This is also the case when a user that doesn't have write permissions tries to write data to a device.



- If user accounts have already been set up, every user can log in from here.
- Passwords may consist only of digits (in the range 999 … 999999999).
- You can select the user from the drop-down box.
- Click on Password Manual to display this document.

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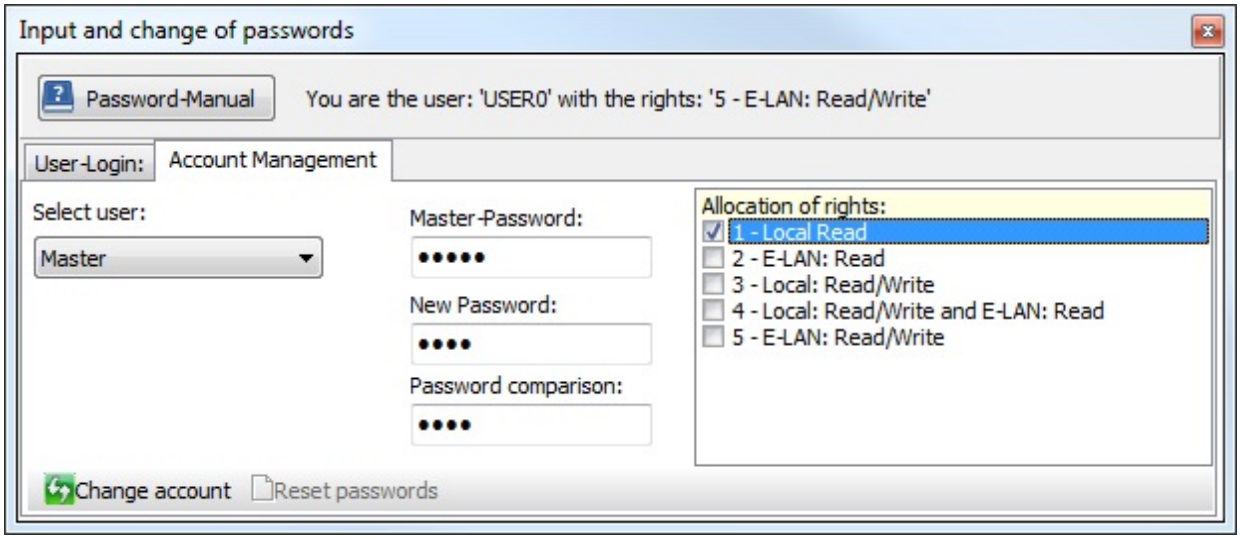
Adding and changing user accounts:



- The master can set up accounts for 'User 2 to 5'.
- Users can change their passwords themselves.
- To change an account, you must enter the master password once and the user password twice for verification.
- The permissions can be assigned according to the list on the right side of the view. Only one option can be selected at a time.

If the master is logged in, he or she can deactivate user management by clicking on Reset password.

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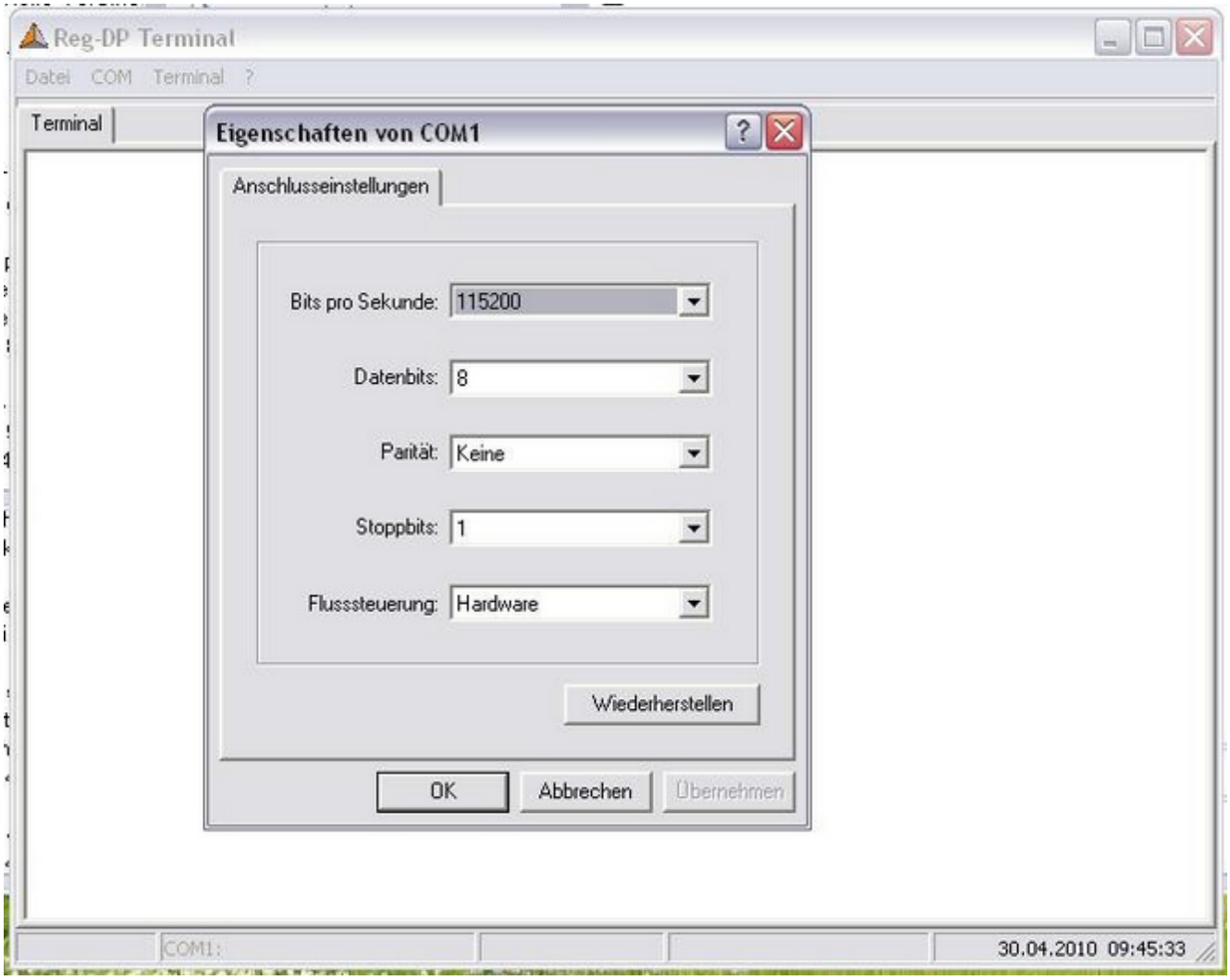
Update PQI-D/PQI-DA firmware

Each device must be connected directly to the PQI-D/DA with the standard cable through the front interface:

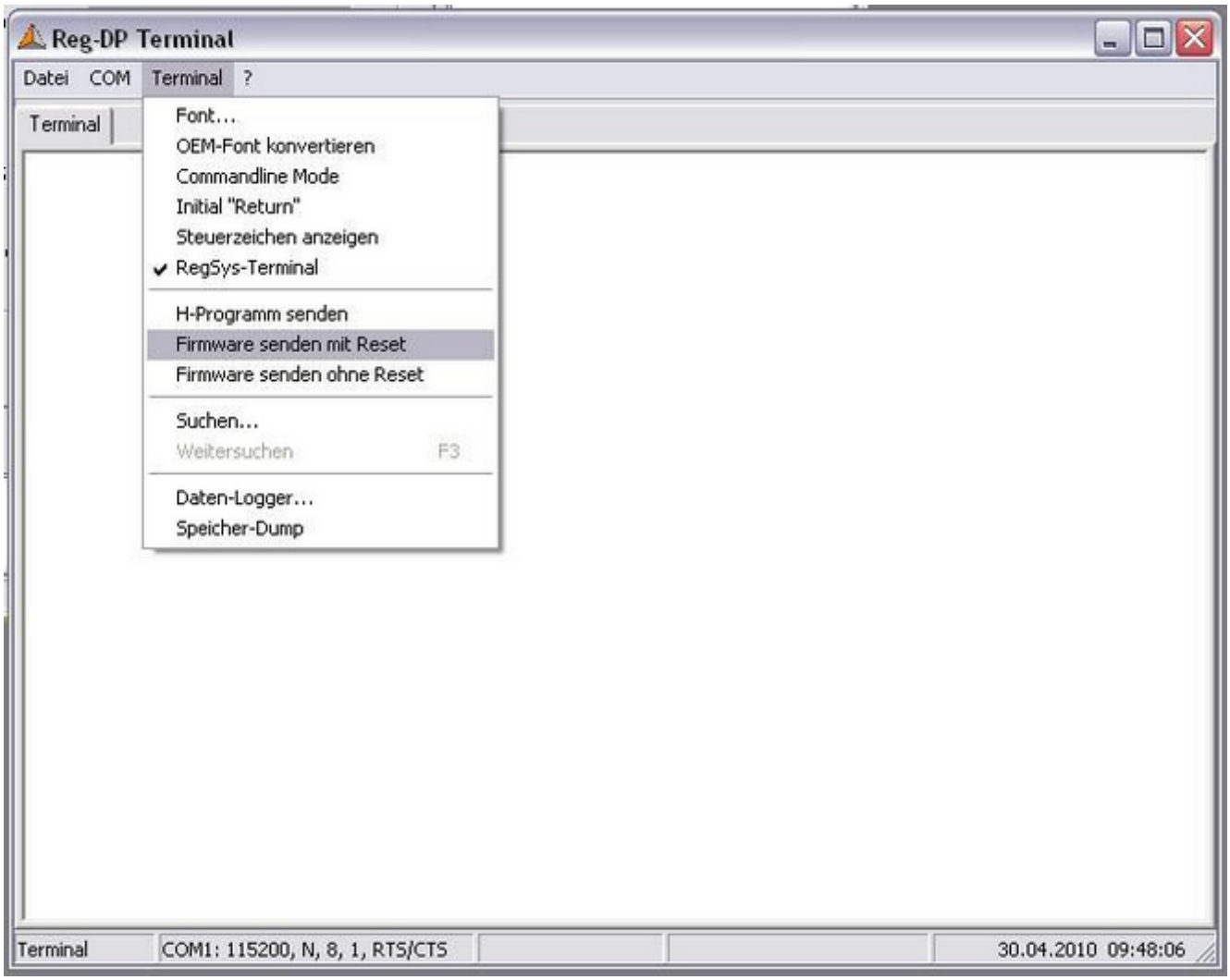
- Restore serial connection to a PQI-D module (use the original a.eberle cable).
- The Com.exe program is stored in the '..Program Files/WinPQ/Firmware' subdirectory. Start the program (it may be enough to copy only this program and the firmware files to a laptop). The fastest way to run the software is through a link in the ParaExpress software or from the 'Program Files/Properties' menu in PQStart.
- The interface is configured in the COM menu.
  - Select **'Com 1'** or one of the other available interfaces.
  - Set Bits per second: to **'115200'**,
  - set Protocol: to **'Hardware'** (leave all other options as they are).

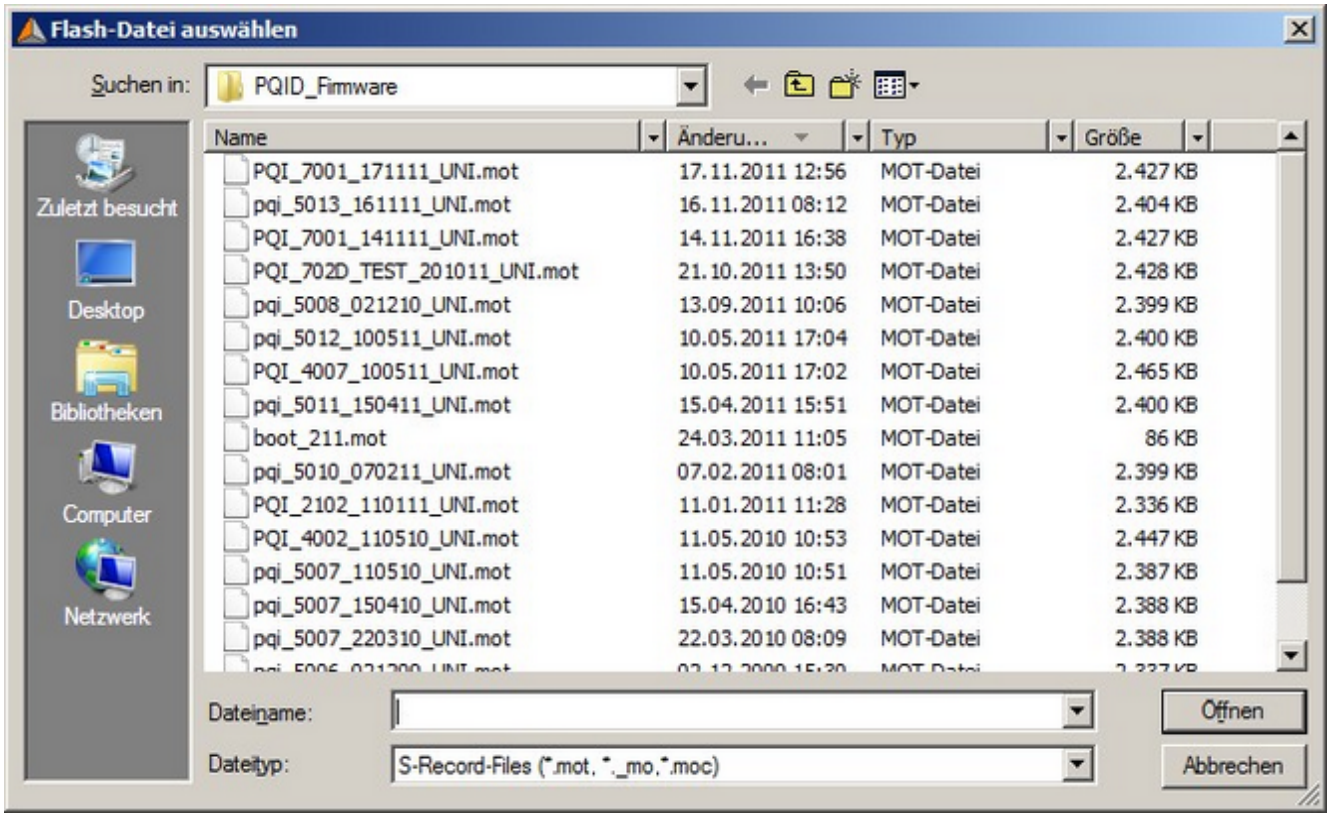


- Perform a hardware reset on the corresponding PQI-D. You will need a thin instrument (small screw driver, bent paper clip, etc.). The Reset button must be held through the opening in the front of the device for at least 5 seconds

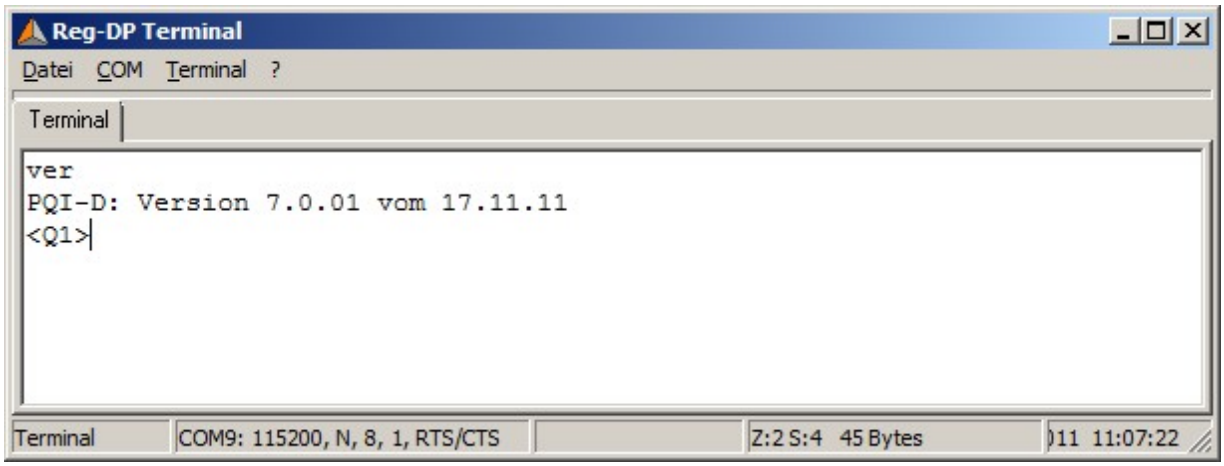
until the colours of the LEDs change or you can hear the relay click. It doesn't matter which LEDs light up.

- Sometimes the bootloader needs replacing: In the Terminal menu 'Send firmware with Reset', select and open the file 'boot_211.mot' (or later). If the message 'Continue anyway' displays, press OK to continue.
- After 'boot_211.mot' has been successfully uploaded, the procedure must be repeated with the actual firmware file. This is done by resetting the PQI-D again (see Point 4) and repeating Point 5, but then with the file 'pqi_5006_021209_UNI.mot' or later.





Once the file has been uploaded, the status LED on the device should be green. The update for the first module has been successfully completed. After each transmission, enter the ECL command 'VER' to check the firmware version number:



You can also use the **REGUpdate** function **in PQParaExpress**.

REGUpdate
Update
Konfigurieren
Hilfe
a-eberle
PQI-D Firmware Update
COM9 Baudrate: 115200 Urlader ???

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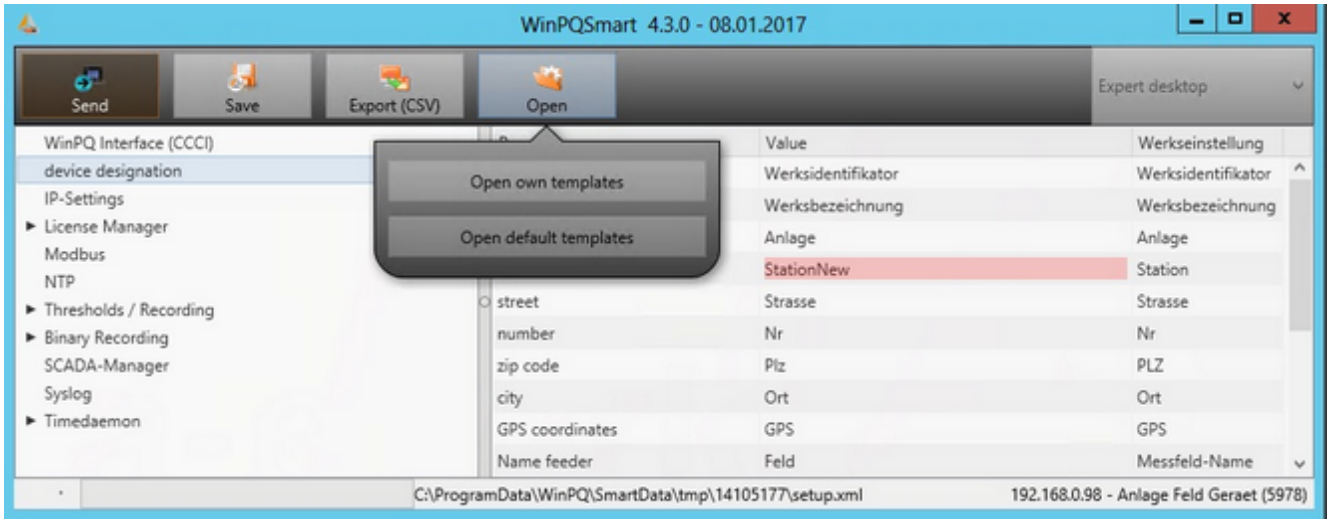
Selecting the next steps



1. The tree structure on the left enables you to select a focus area whose parameters you wish to change.
2. Buttons to send data, store profiles and open templates are at the top of the view.
3. The 'Expert view' field enables you to toggle between several view levels (only as many as are necessary).
4. The table in the right part of the view shows the description of the parameter, the actual value, a default value and the allowable threshold.
5. If a cell in a table has been changed, the new value is marked with a red background.

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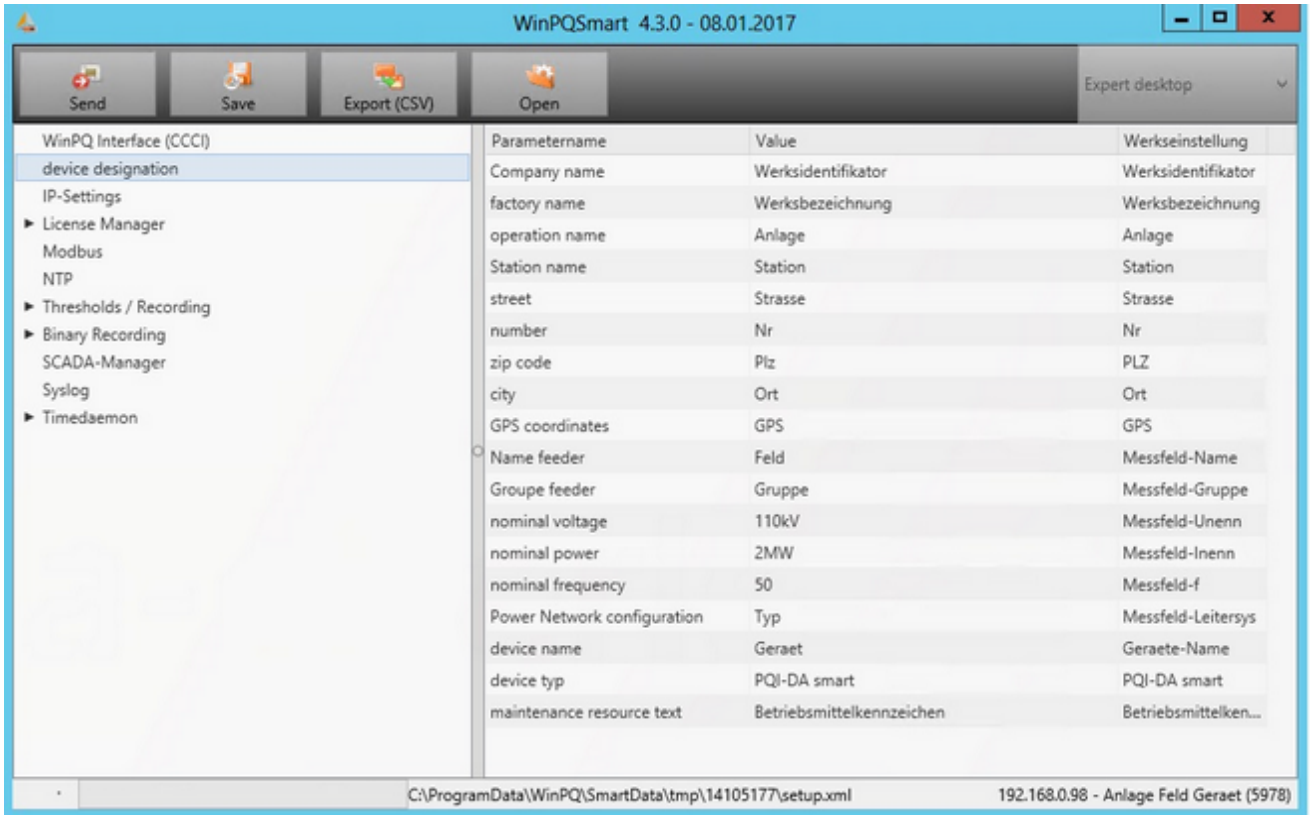
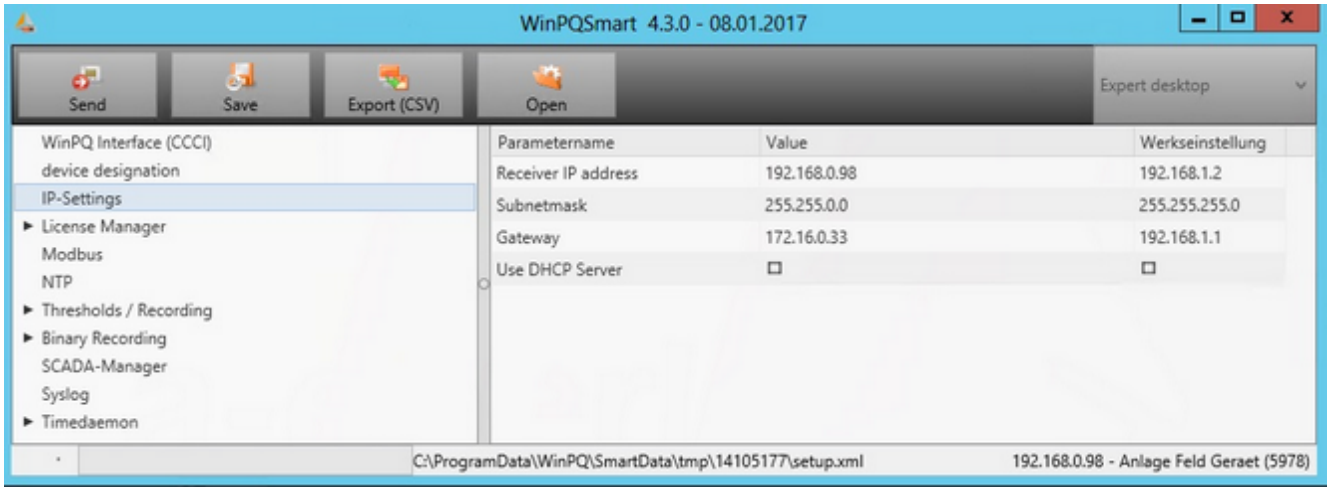
Configuring the devices



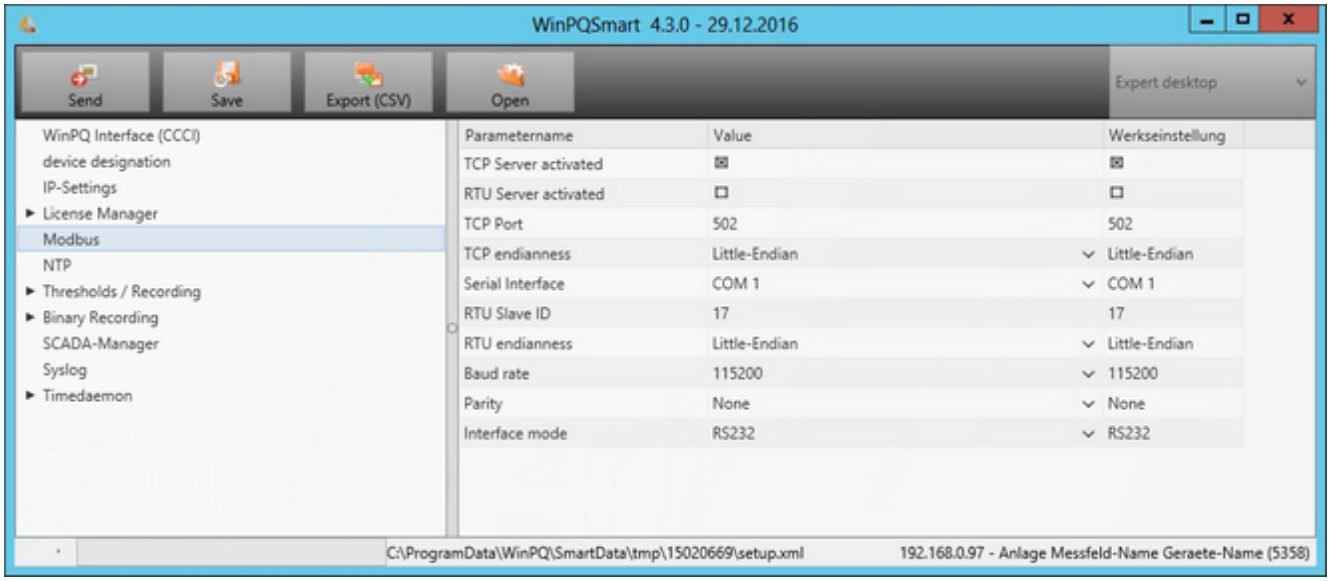
1. This focus area includes general information on the measurement point:
   - Address data
   - GPS data
   - Power data

IP settings



1. The usual parameters needed to establish an IP connection are entered here:
   - IP address
   - Subnet mask
   - Gateway
2. You can also enable the 'Dynamic Host Configuration Protocol' (DHCP) if you wish.

Configuring the Modbus



1. This is where the parameters for the Modbus protocol are changed.
2. For more information, see http://de.wikipedia.org/wiki/Modbus or the corresponding a.eberle documentation.

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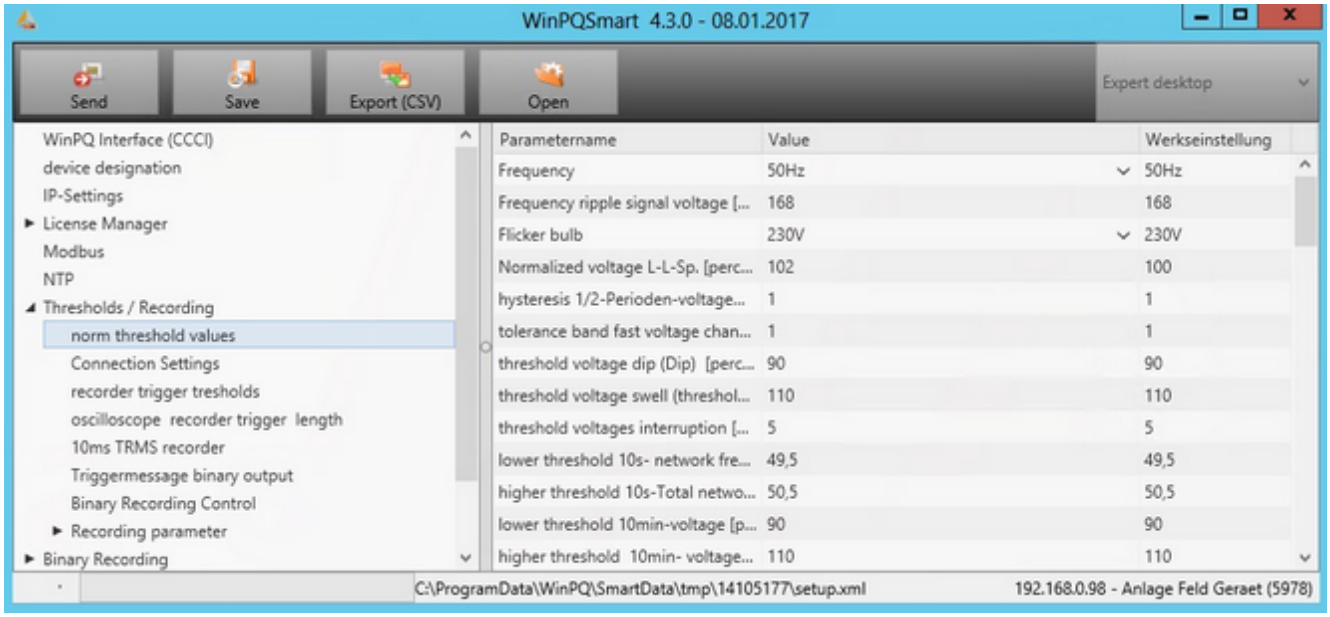
PQ parameters



1. Here you can change parameters that affect the devices' measurement behaviour. Examples:
   - Grid frequency
   - Signal voltage frequency
   - Calculation models (e.g., for flicker)
   - Thresholds for voltage changes, harmonics (second to fifth) etc.

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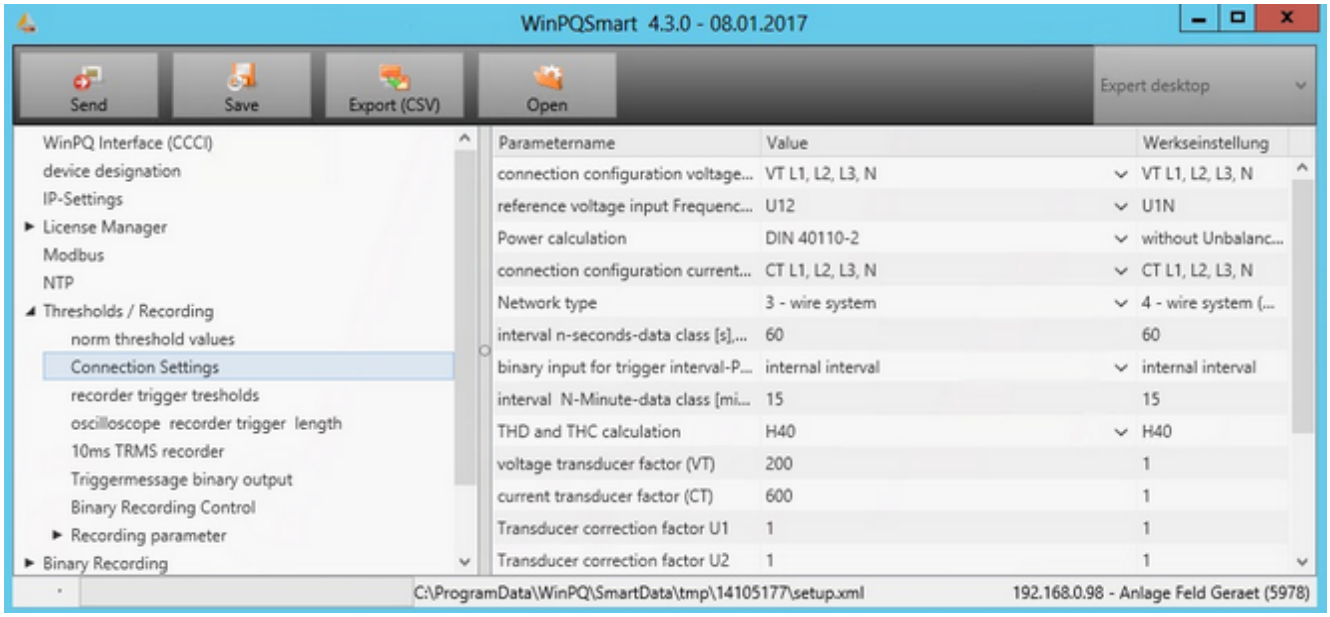
General user settings



1. Here you can change parameters that describe the conditions for the measurement point. Examples:
   - Connection configuration for voltage and power inputs (3 or 4 quantities)
   - Transducer factors for current and voltage
   - Reference input for the frequency measurement

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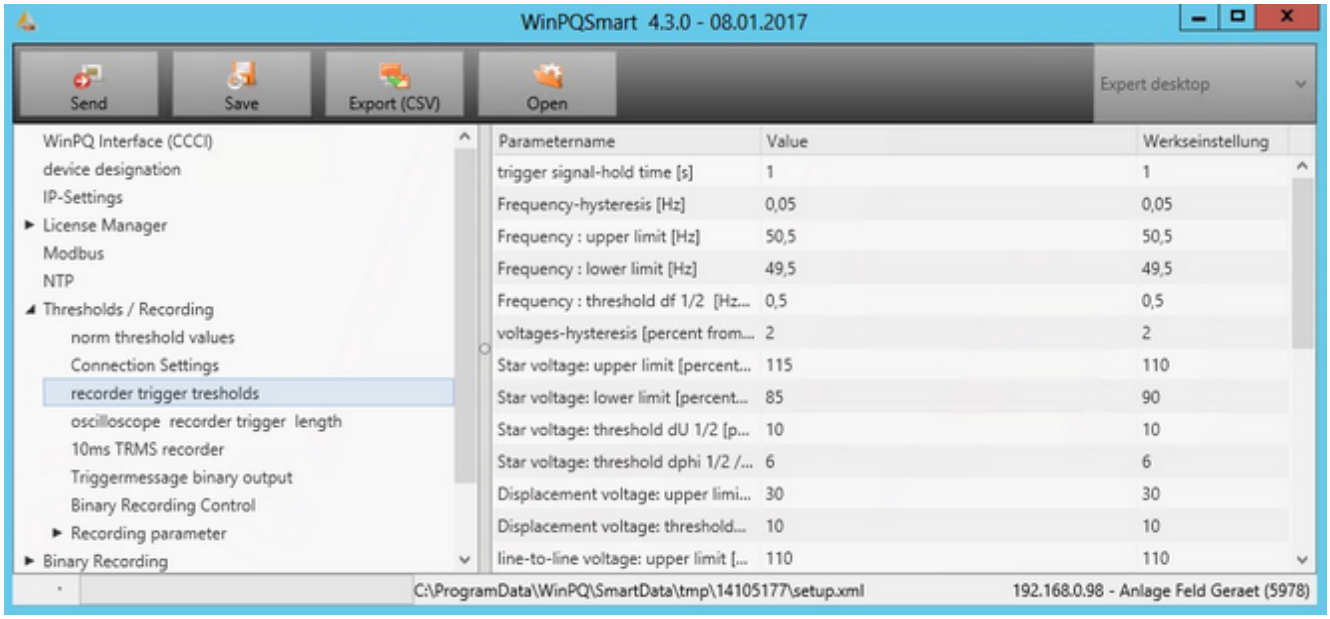
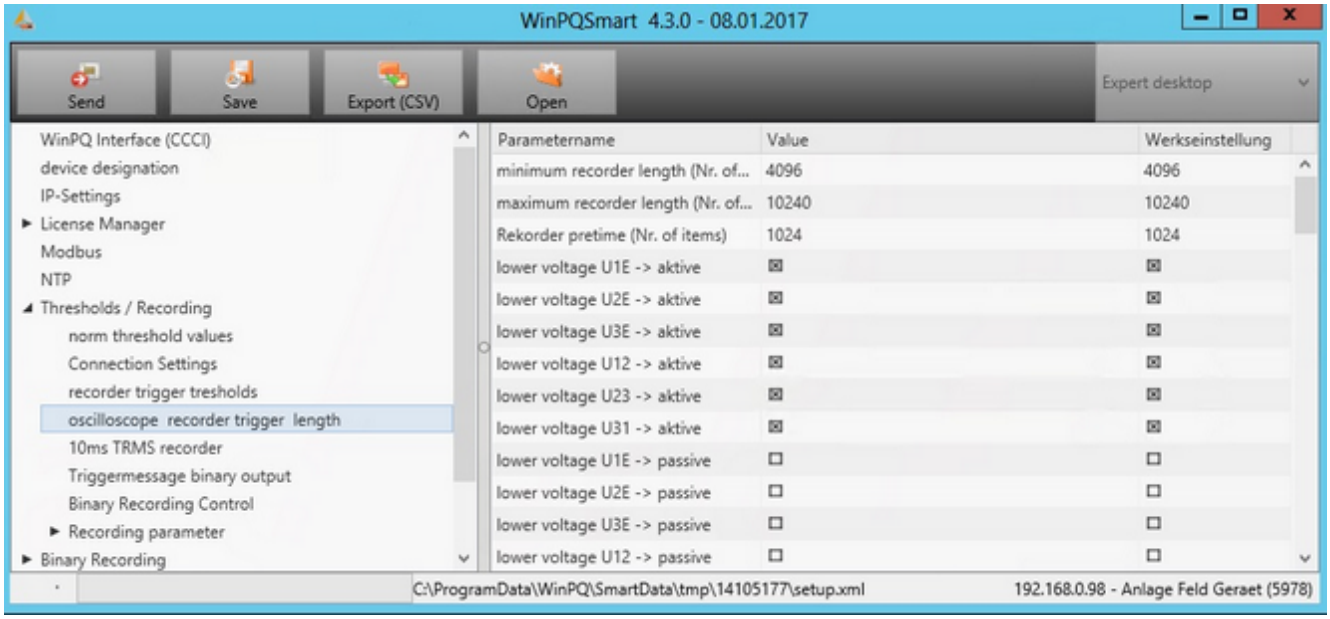
Trigger parameters



1. This section describes the main parameters that trigger error logs:
   - Lower and upper voltage thresholds (phase-to-phase or phase-to-ground)
   - Current thresholds
   - Envelope triggers
   - Symmetrical components

Configuring the oscilloscope recorder/half-period recorder



1. This is where you set the recording time for the oscilloscope.
2. The length of the history before the trigger point can be set.
3. You can change the active trigger screen.

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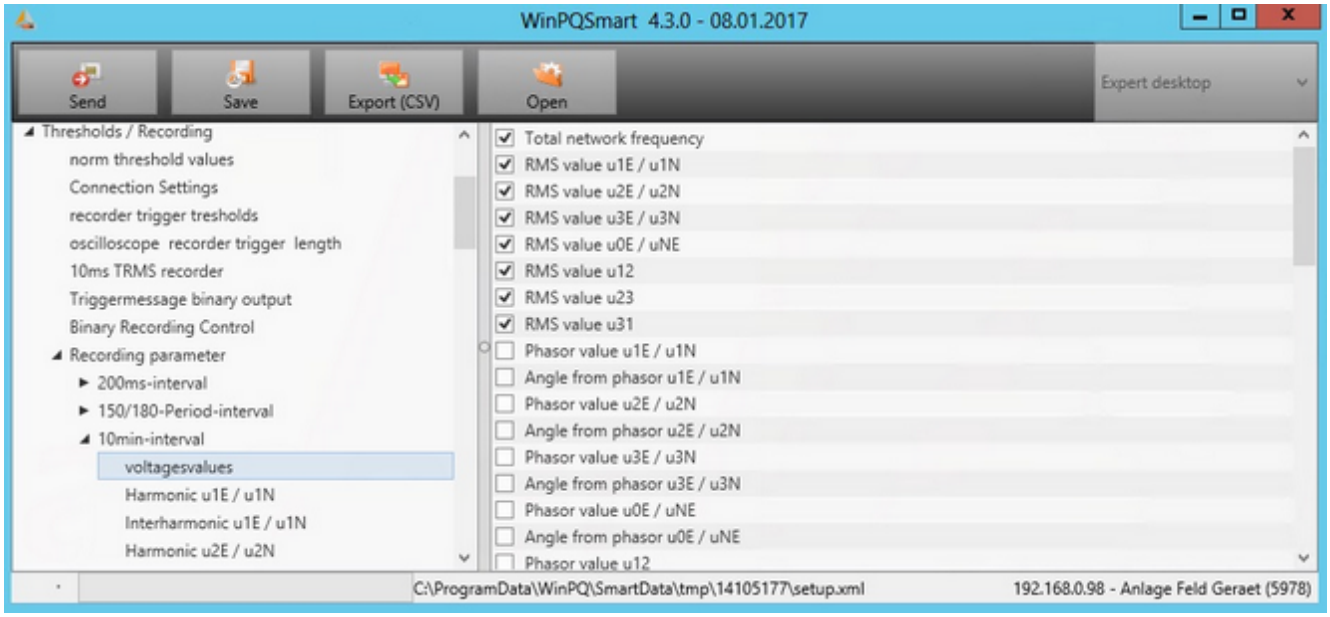
Recording parameters



1. You can add detailed measurands for a total of 10 recording classes that are temporarily available in the device's log files.
2. You should only select quantities that are needed to generate EN reports and that users will be evaluating within the framework of their measurement tasks. Selecting only the necessary quantities has an immediate effect on the size of the database (keeps it small).
3. Please note that the standard a.eberle profile was prepared for different grid levels.
4. When completing the table, you can right-click to use a populate function. The population is always performed top-down starting from the selected cell.

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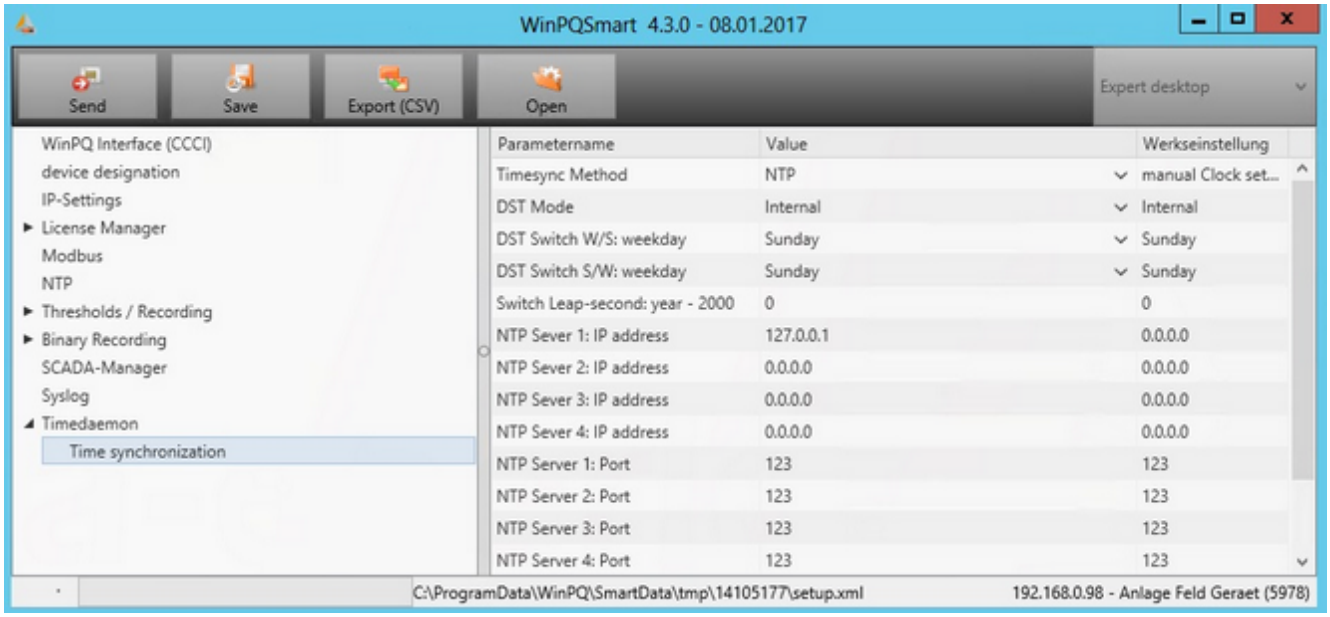
Time synchronization



1. This is where you specify how time is adjusted on the devices.

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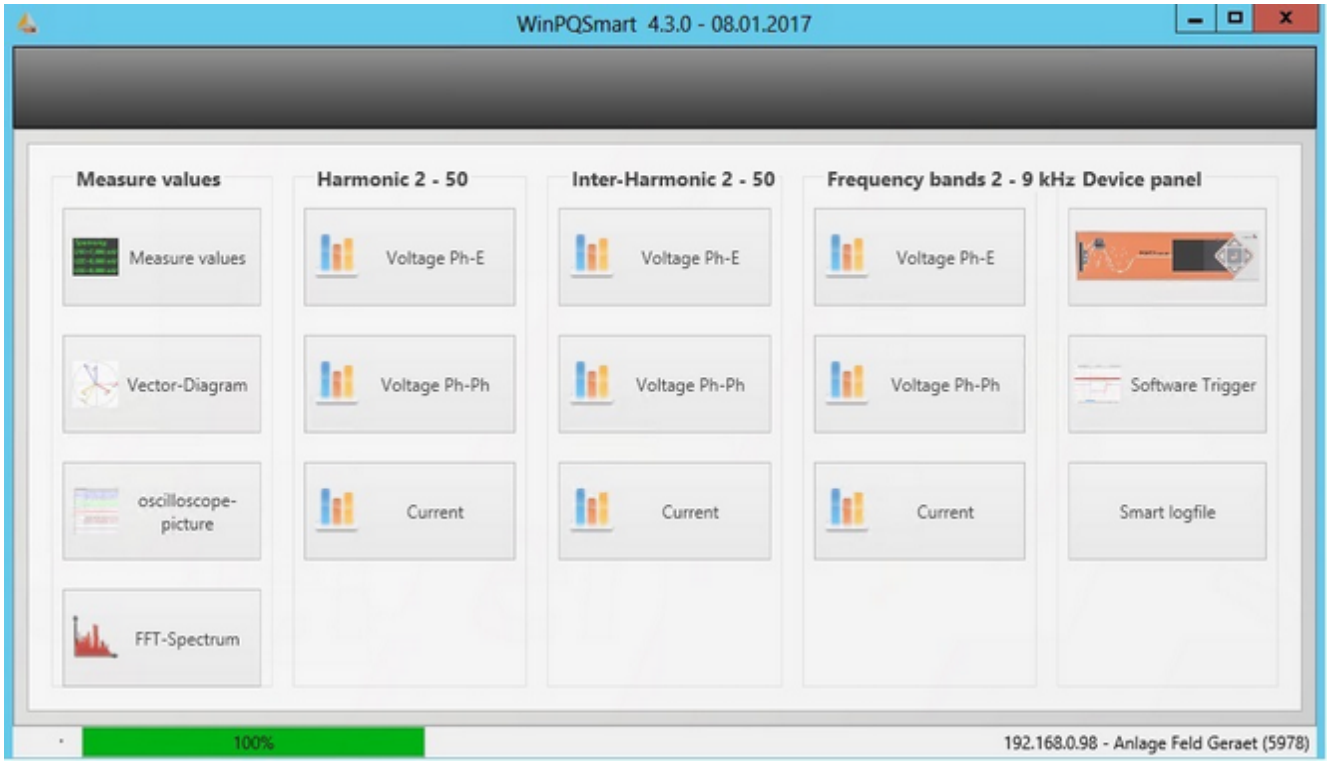
Displaying PQSmart online data



The following views are possible:

1. A selection of current measured values
2. Voltage and currents as vector diagram
3. Online oscilloscope image over 10 periods
4. The voltage harmonics up to the 50th (ULE and ULL) and current IL
5. The voltage interharmonics up to the 49.5th (same measurands)
6. Selected frequency bands in higher frequency ranges (same measurands)
7. Online panel to view the device's display including use of the buttons
8. The ability to trigger an error log through the software
9. Access to the device's LOG information

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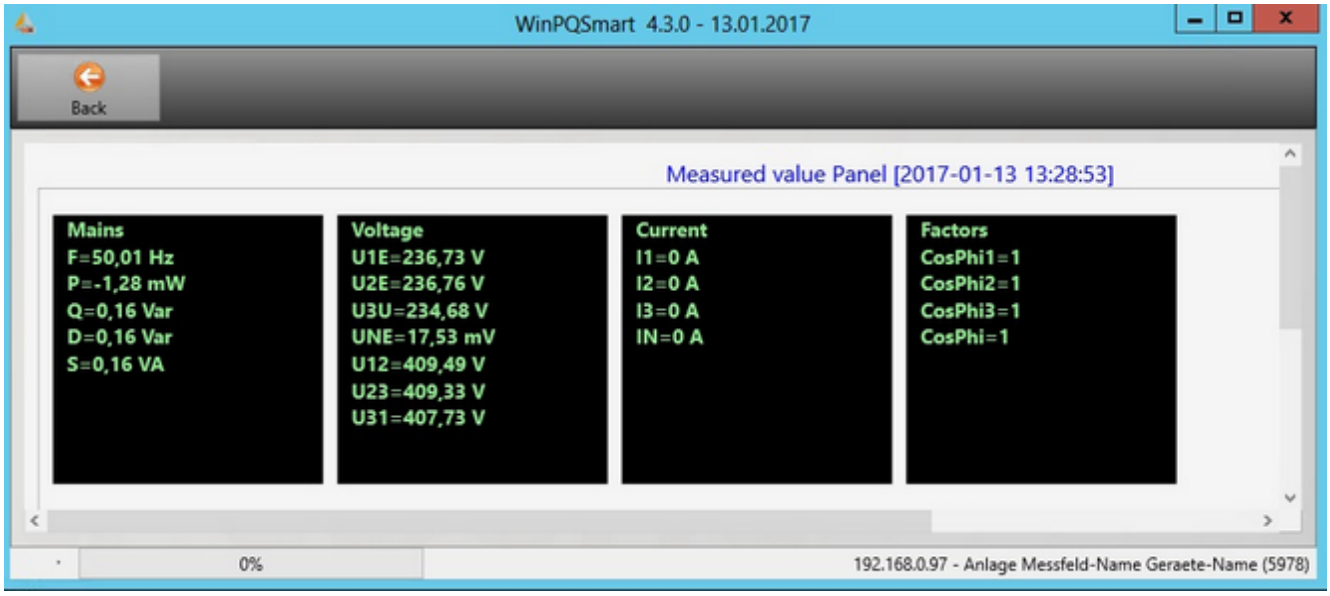
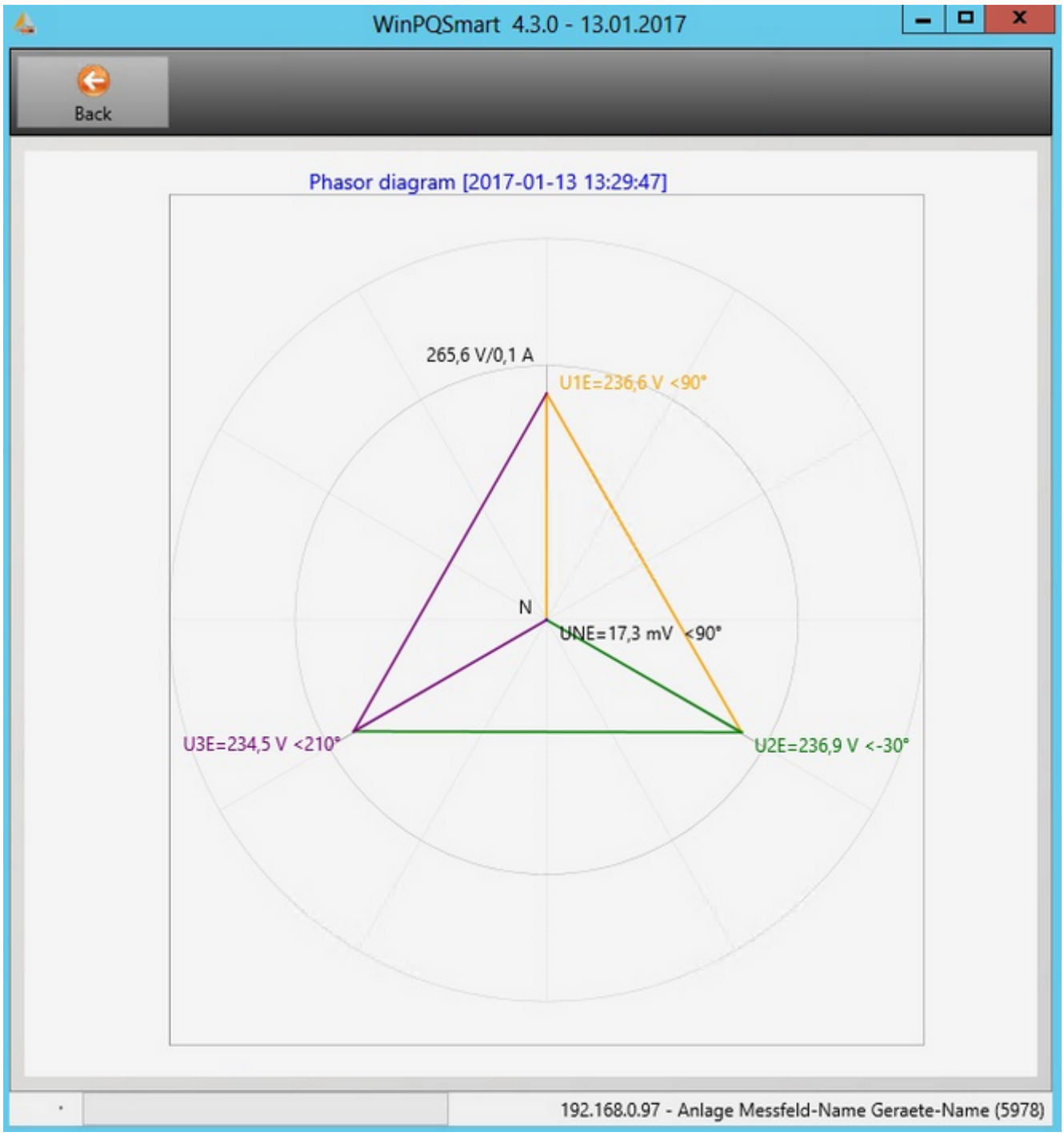
Online measured values and vector diagram



Online measured values



Vector diagram

1. The following quantities are displayed alphanumerically in the measured value panel:
   - Frequency
   - Active power, reactive power and apparent power
   - Phase-to-earth voltages, phase-to-phase-voltages, and residual voltage
   - Conductor currents
   - Power factors

2. The vector diagram displays the values and angles for voltages and currents in a graphic.

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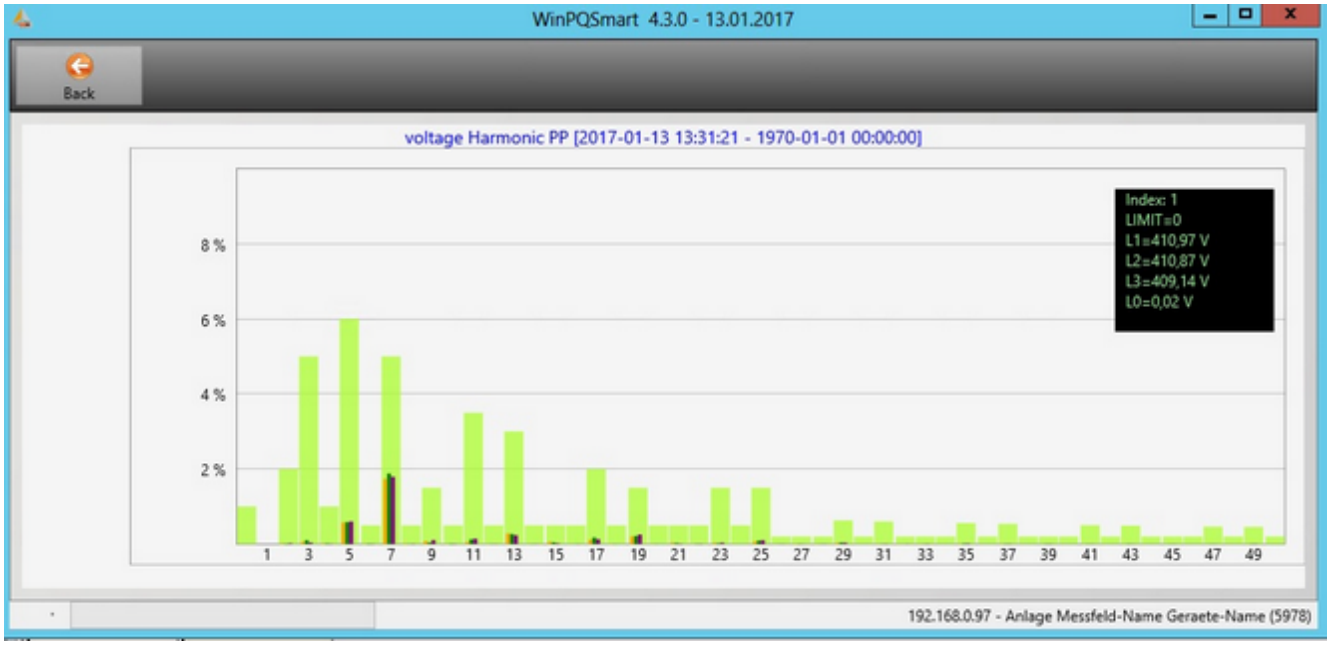
Displaying current harmonics and interharmonics



1. This selection is limited to phase-to-earth-voltages, three phase voltages and conductor currents.
2. The compatibility levels in accordance with EN 50160 are displayed in the background.
3. Clicking on a specific harmonic displays its values in the legend.

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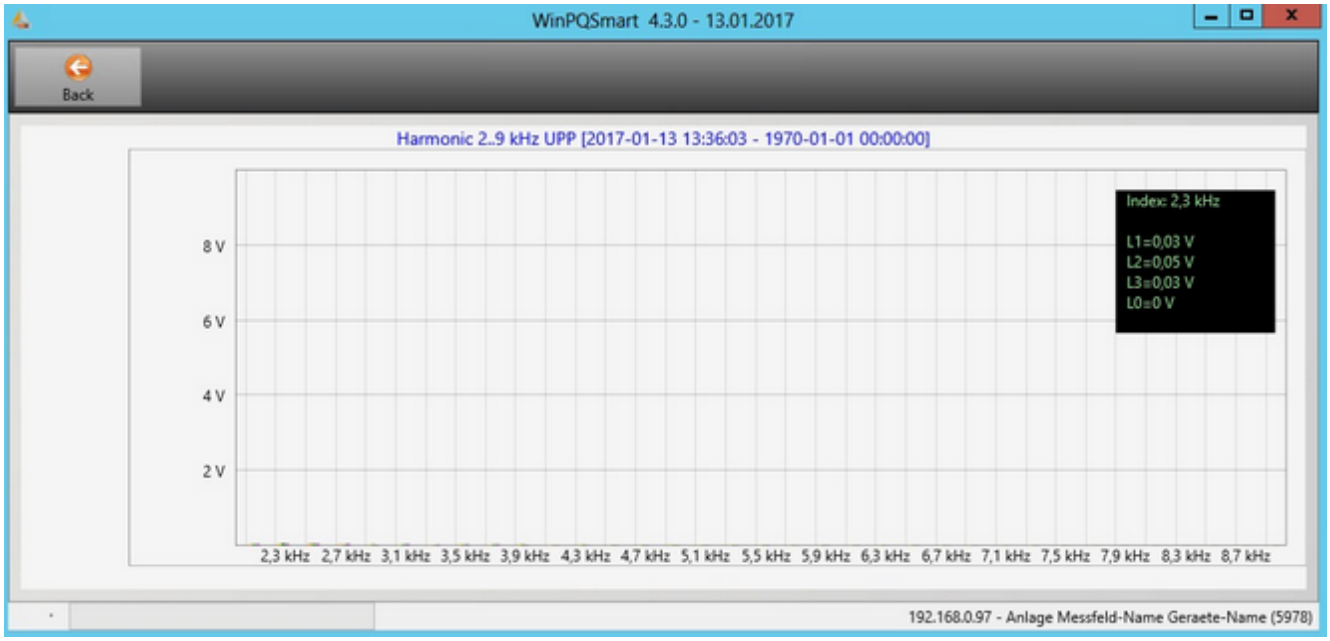
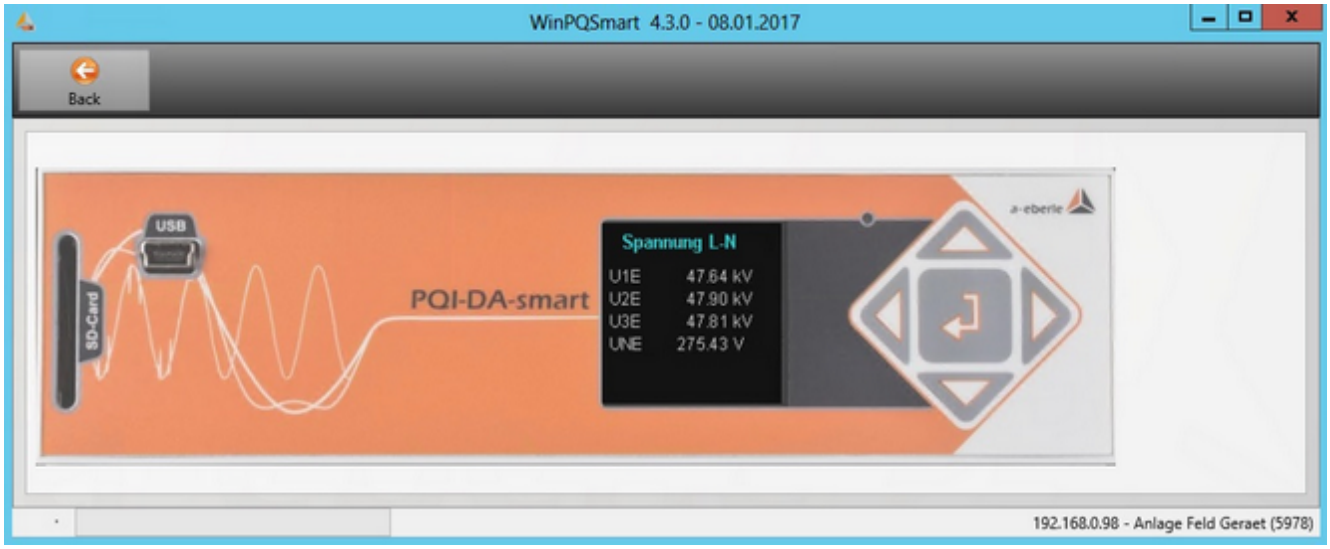
Viewing frequency bands with a higher frequency



1. The same principles that apply to the harmonics view apply to this view.
2. The values are combined into specific frequency ranges between 2 and 9 kHz.

Displaying the PQSmart panel



1. This function displays the device's panel on the screen.
2. The display and all of the functions that can be executed by pressing a key correspond to the keys on the device.
3. You can perform a full initial commissioning and change key parameters.
4. You can also view the most important current measured values and statistical information in the EN 50160 events and the error log.

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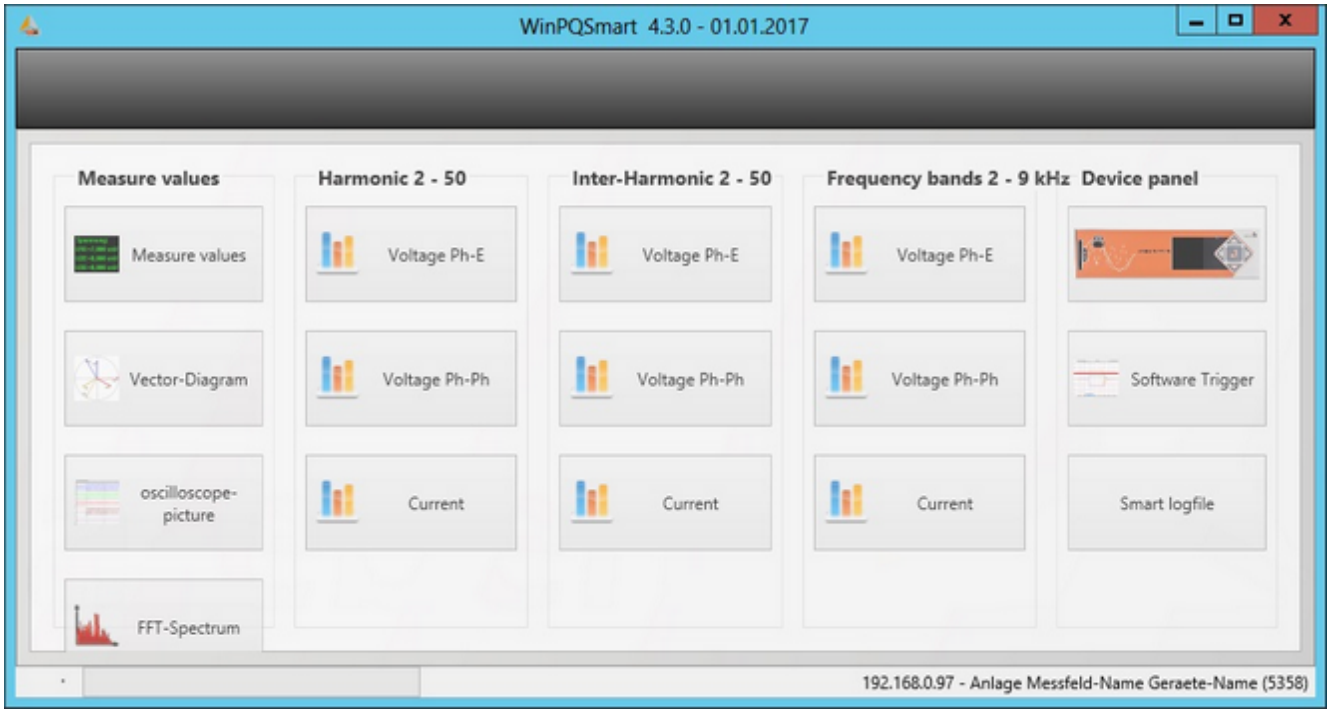
Additional functions



1. This is where the software triggers for the error log are triggered. You can test the whole system for the capture, transmission and logging of data without anyone having to be on site.
2. The second point is used to download a device's log file, which can be opened with the default program used to display log files (e.g., Notepad).

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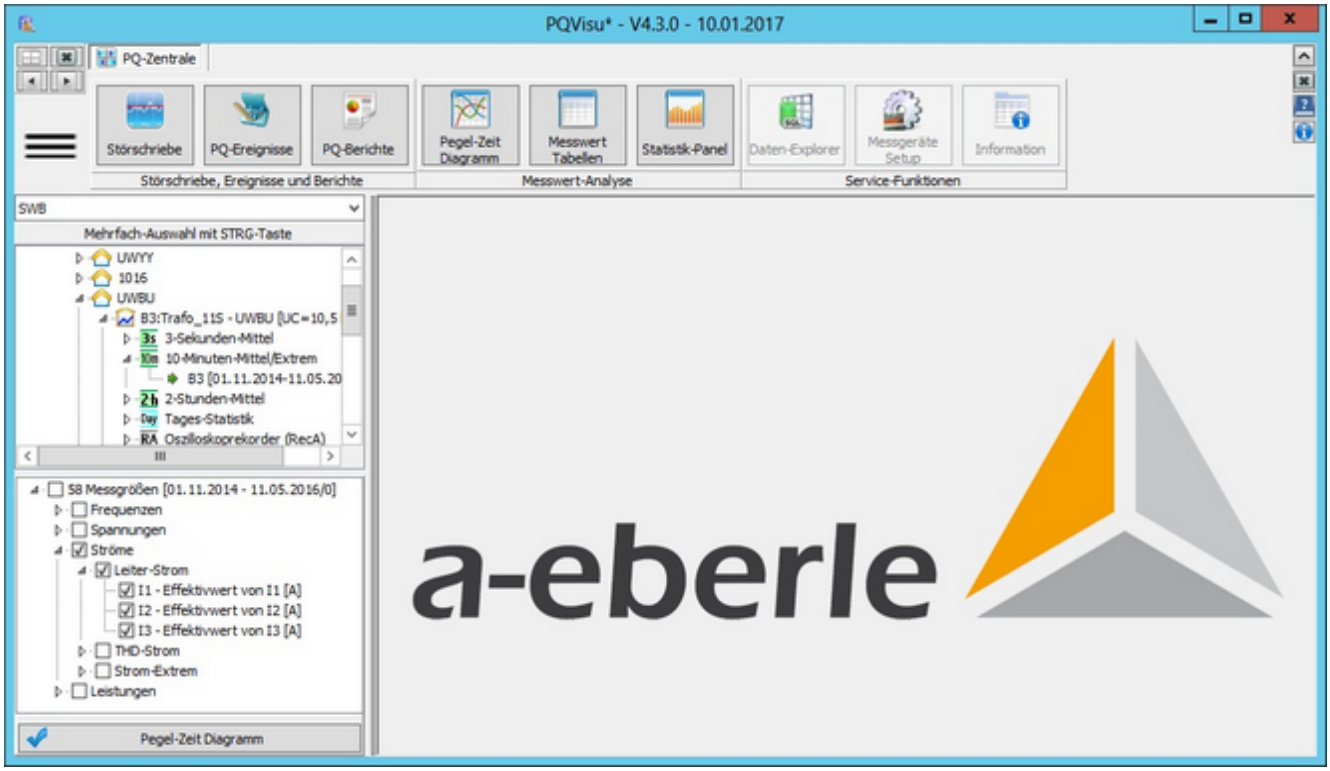
3.

PQVisu - Visualization of PQ data

Operation



- The panes for error logs, PQ events, PQ reports are only generated once. Other panes (level-time diagrams, measured value tables, and the statistics panel) are generated more than once.
- In the standard view, the functions in the button bar are used to run basic program functions.
- The database selection pane (here 'Server_PQID') enables you to switch to other databases (e.g., Archive data).
- The table selection pane displays all of the SQL tables in a hierarchical structure.
- Selecting a table displays the measurands are displayed in a structured selection list.
- The four navigation buttons in the top right of the view enable you to switch between panes, display them beside each other or on top of each other.

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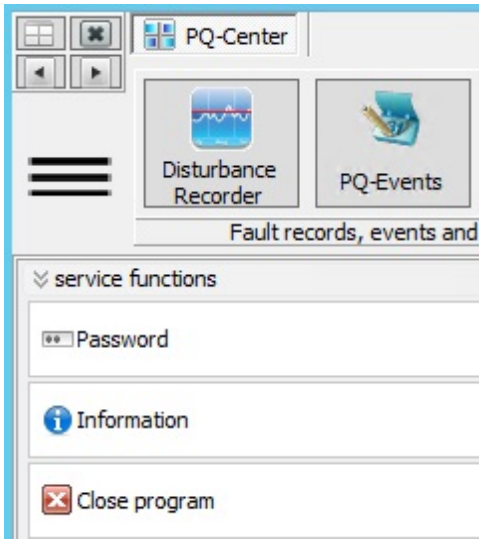
Service menu



- Password entry: Is only active if WinPQ Account Management has been activated. The current permissions in the PQStart program are adopted,
- Information: Shows a dialogue field with important program properties, version number etc.
- Close program

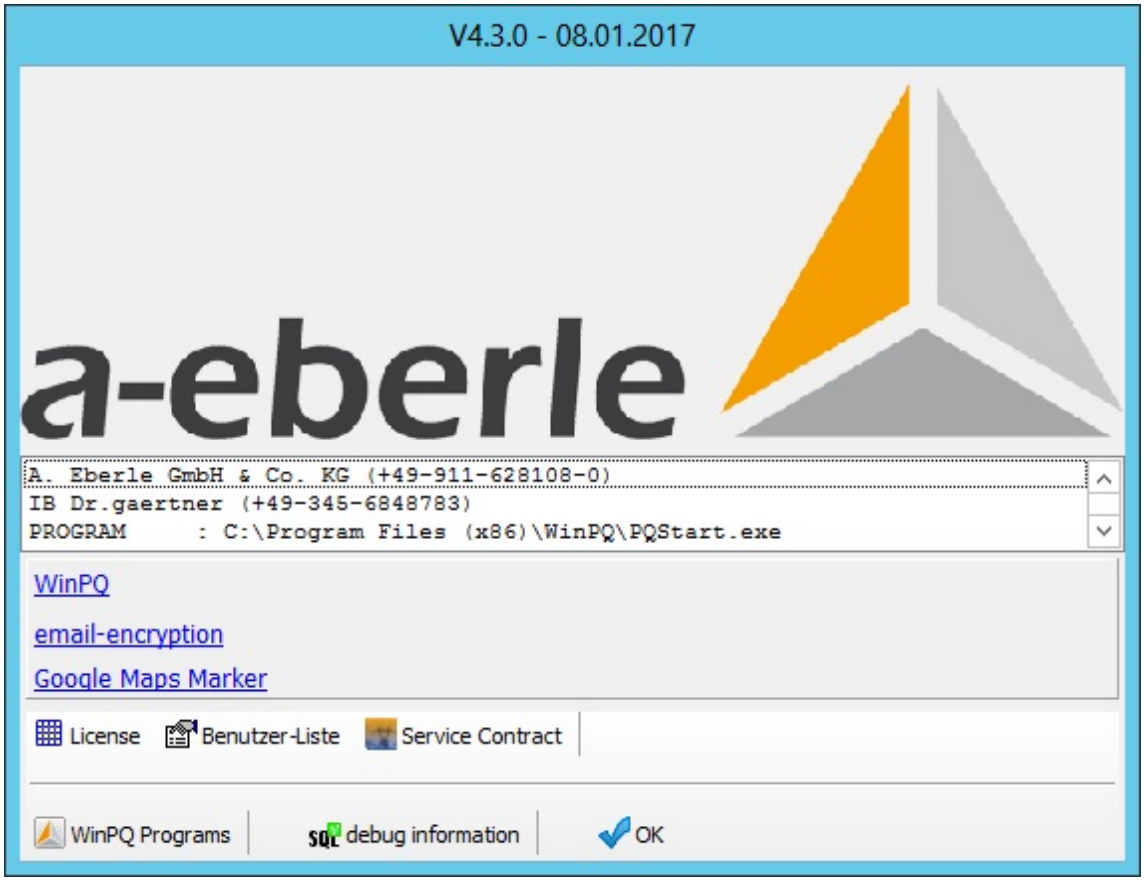


Figure: The information box shows information about the licence, the context of the logged in user and the connected

database.

The theme for the WinPQ software is selected in the PQStart program. The options you select display as follows in PQVisu:

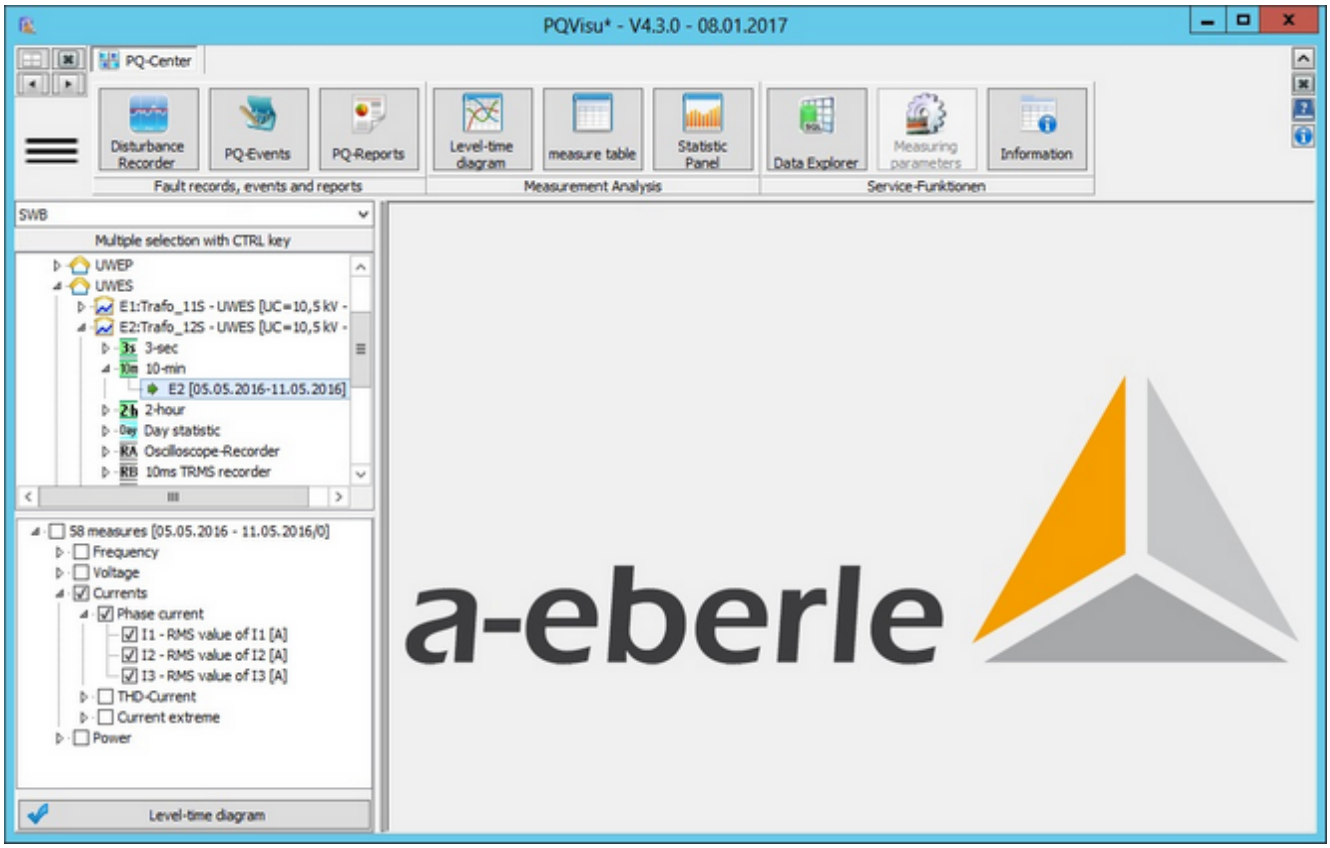


Figure: 'Windows' theme

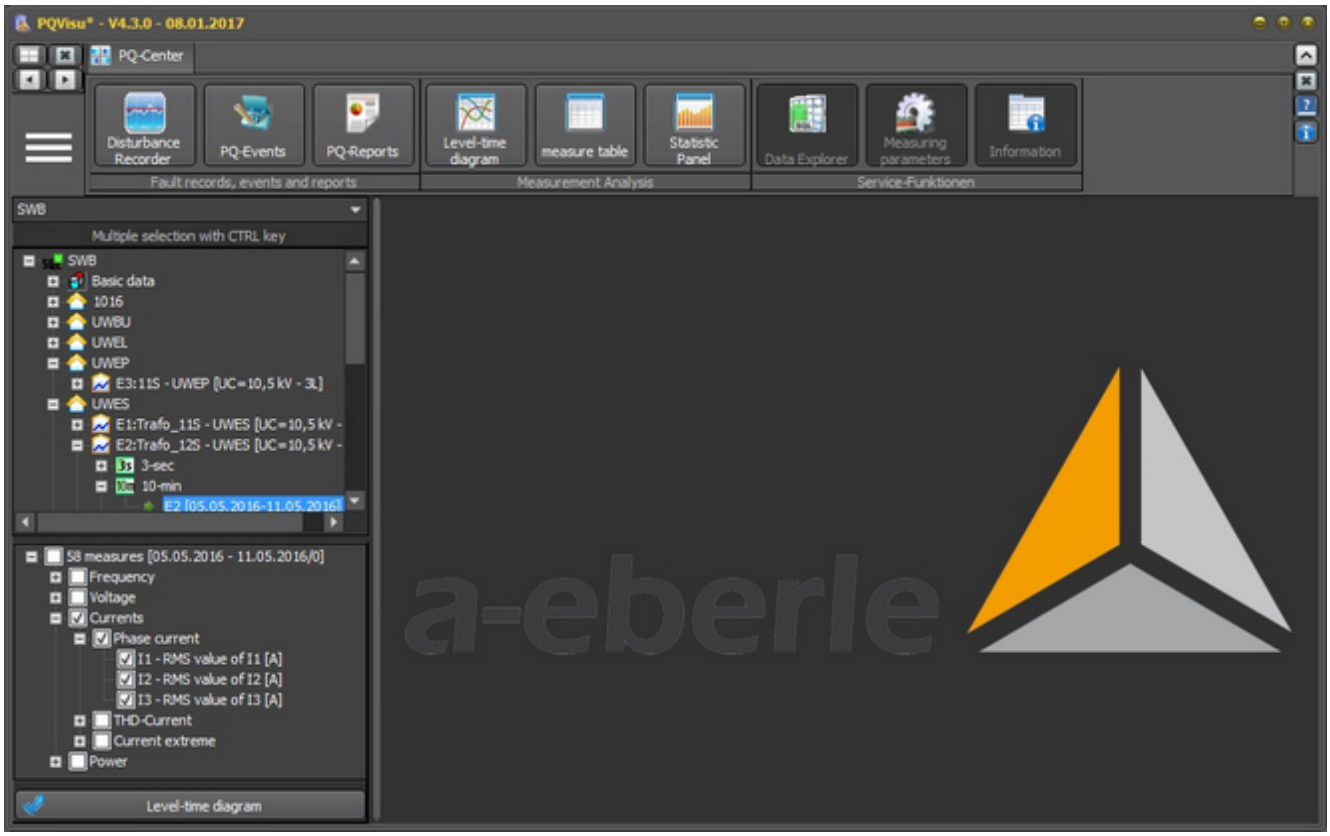


Figure: 'Auric' theme

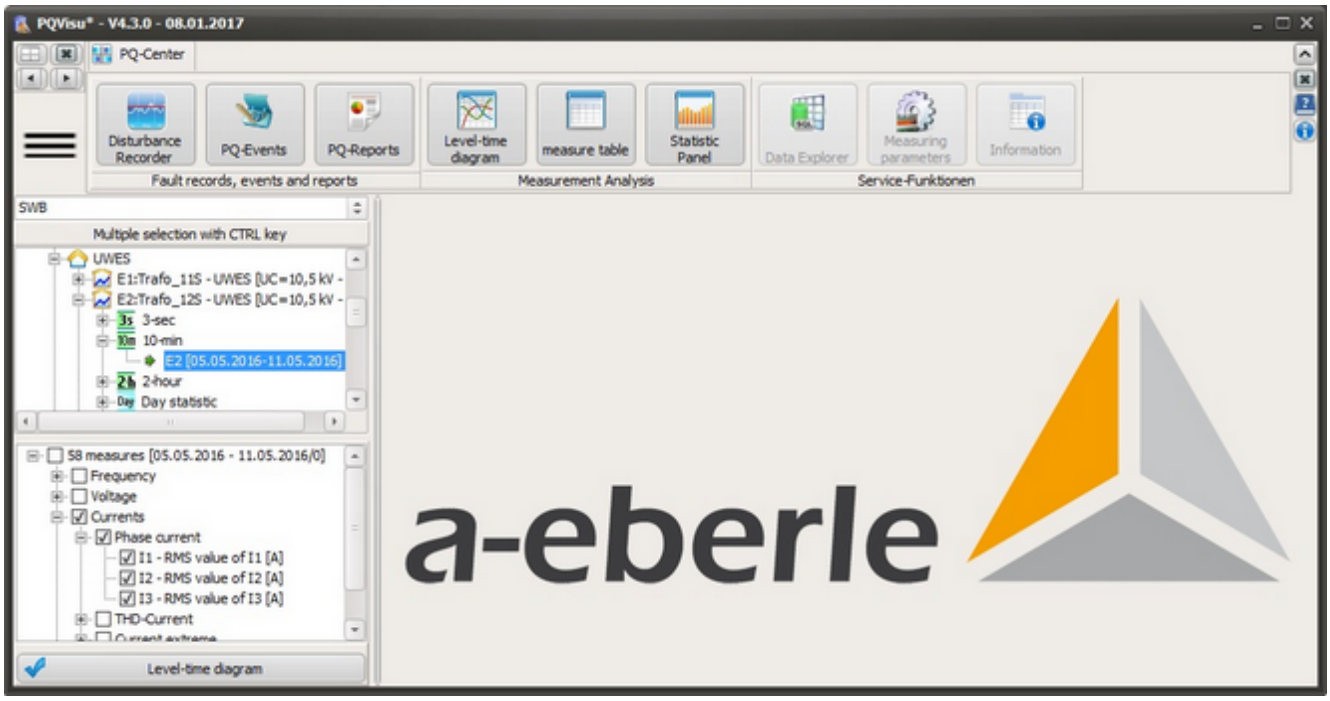
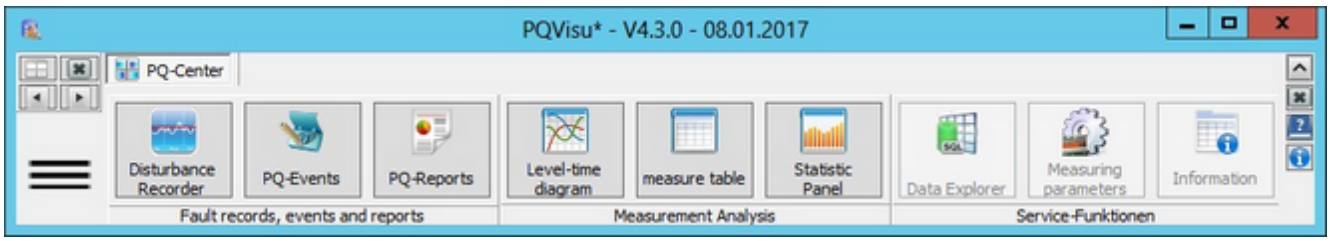


Figure: 'Smokey Quarz' theme

Navigation buttons



Navigation (group of four buttons on the top left of the screen):

- Close: Closes the active pane.
- Left: Back to the previous pane.
- Right: Forward to the next pane.
- Split: The panes are split equally across the available space.

Displaying windows (vertical buttons on the top right of the screen):

- '^' hides the button bar (e.g., when the extra space is needed to display a graphic).
- 'x': Closes the active window.
- '?': Opens a PDF file (manual) with a description of the program.
- 'i': Minimizes the active form.

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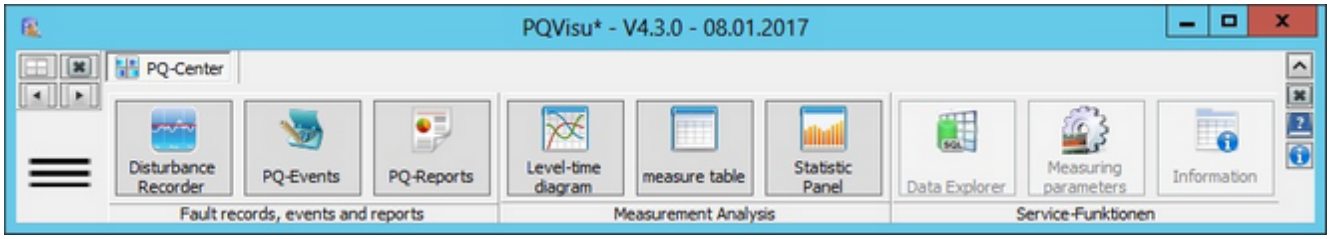
Navigating the PQVisu software

The visualization software is divided into three main components.

- Error logs, events, reports,
- measured value analysis,
- service functions.



The three default tasks are displayed on the left:

- Error logs: Leads to a table with a list of all of the error logs (which are displayed in the next step)
- PQ events: Shows a list of the recorded PQ events (e.g., time, duration, classification)
- PQ reports: Shows a selection of possible PQ reports and statistical evaluations.

The next three buttons are needed to display measurement data. The buttons display based on the data you selected:

- Level-Time diagram: Measured values displayed as a line diagram
- Measured value tables: Measured values displayed in a table
- Statistics panel: Measured values that are statistically analyzed before display

Service functions:

- Data Explorer: Use SQL commands to query data in the database
- Measuring device setup: Compare the setup of several measuring devices
- Information: Overviews of measuring devices, measurands, event classes etc.

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Window overview

The SQL tables are displayed to the left in an Explorer-like tree structure:

- The top entry is the SQL database. A new database can be selected at any time from the list of available databases.
- The first entry is the basic data folder. This is where tables that contain device-wide data are grouped (e.g., error log references or the setup for all devices).
- The measuring devices are listed below that. Here, for example: 'E5:Trafo_12S'.

The data class level is below the devices. For example,

- 3-sec average
- 10-minute average/extreme
- 2-hour average
- Daily statistics
- Oscilloscope recorder (RecA)
- 10-ms TRMS recorder RecB
- 10-minute Harmonics RecC
- Signal voltage RecS
- EN 50160 events

The tables with the data are below the data class. Each entry also has a reference to the time domain of the available data.

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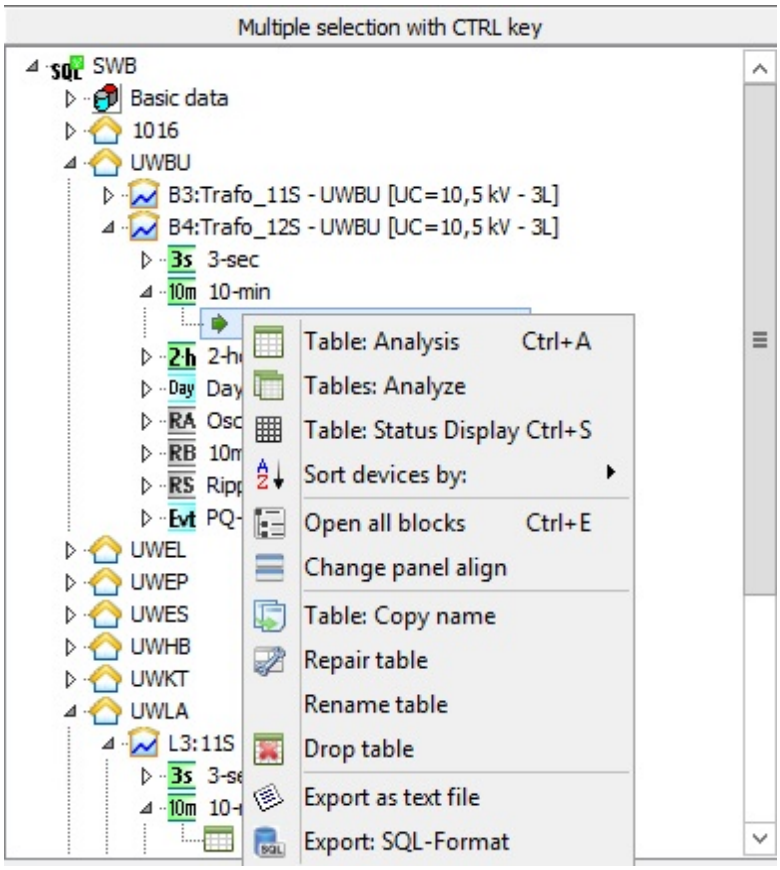
Context menu for tables

Right-clicking displays the context menu that contains a lot of the functions that are described here:



Following is a brief description of the available functions:

- **Analyze table**: Displays the number of datasets, the 'From-To' time domain and the measurands it contains (is the same as double-clicking on the table entry).
- **Table: Analyze all:** Same as above except that the program automatically captures all of the tables.
- **Table: Display status** : Displays information about the data the table contains.
- **Sort devices/tables by:** There are three sort options (see next section)
- **Open all blocks:** Collapses all of the entries. Only the level below the database is expanded.
- **Change panel alignment:** Tables and measurand panes can be arranged vertically or horizontally.
- **Copy table name:** The original table name is coped to the Windows clipboard.
- **Repair table:** The MySQL 'repair table ...' command is used to rebuild the table index.
- **Rename table**: A special function reserved for PQ Admin.
- **Delete table**: Use the 'drop table ...' command to delete tables without meaningful content.
- **Export: Text file:** Uses the SQL function to create a text file with current data. This function also works over the network (e.g. if the SQL server is on another machine)
- **Export: SQL send**: This function uses the SQL command 'backup table ...' Data cannot be transferred over the

network.

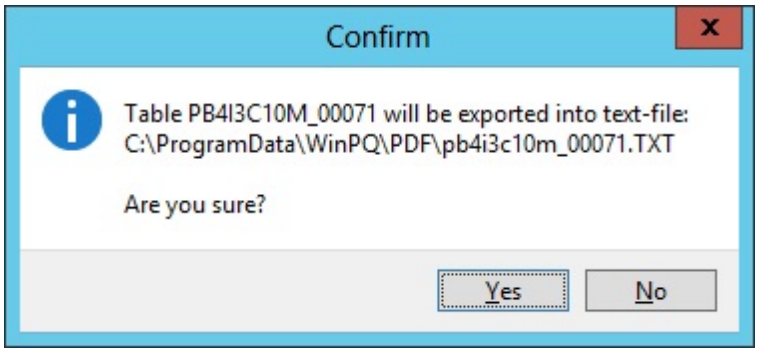


Figure: Export: Text file

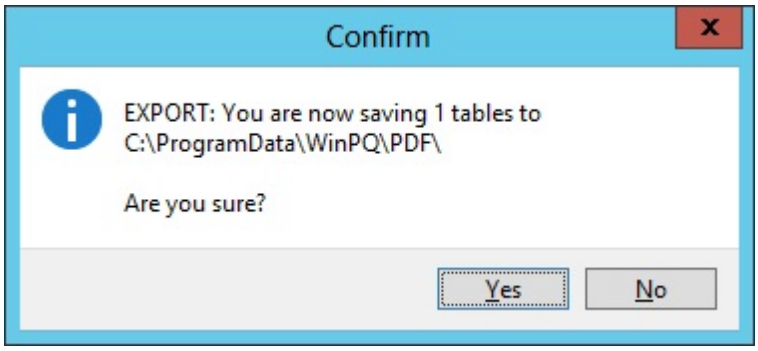


Figure: Export: Send

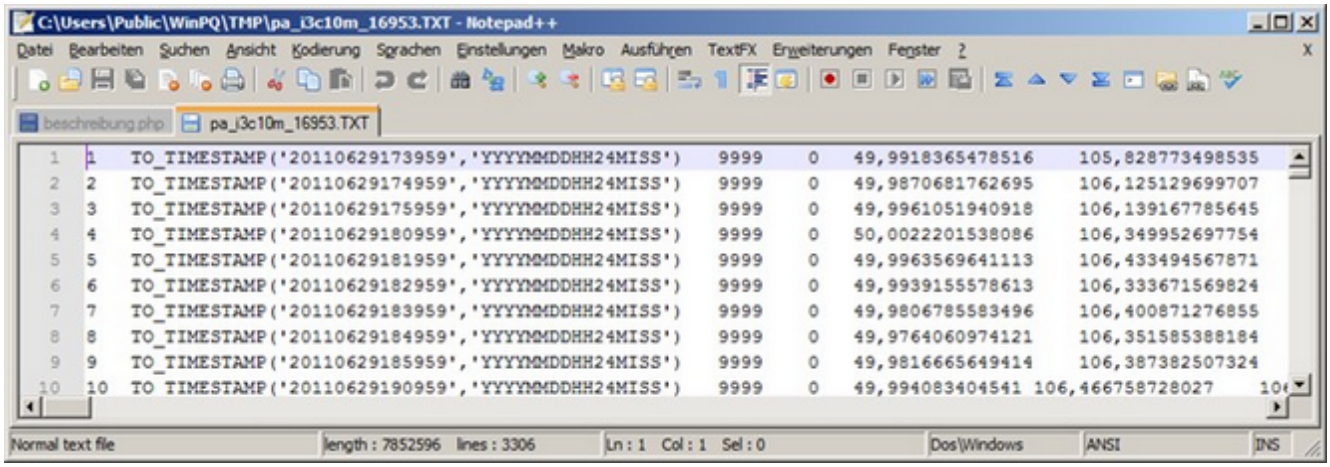


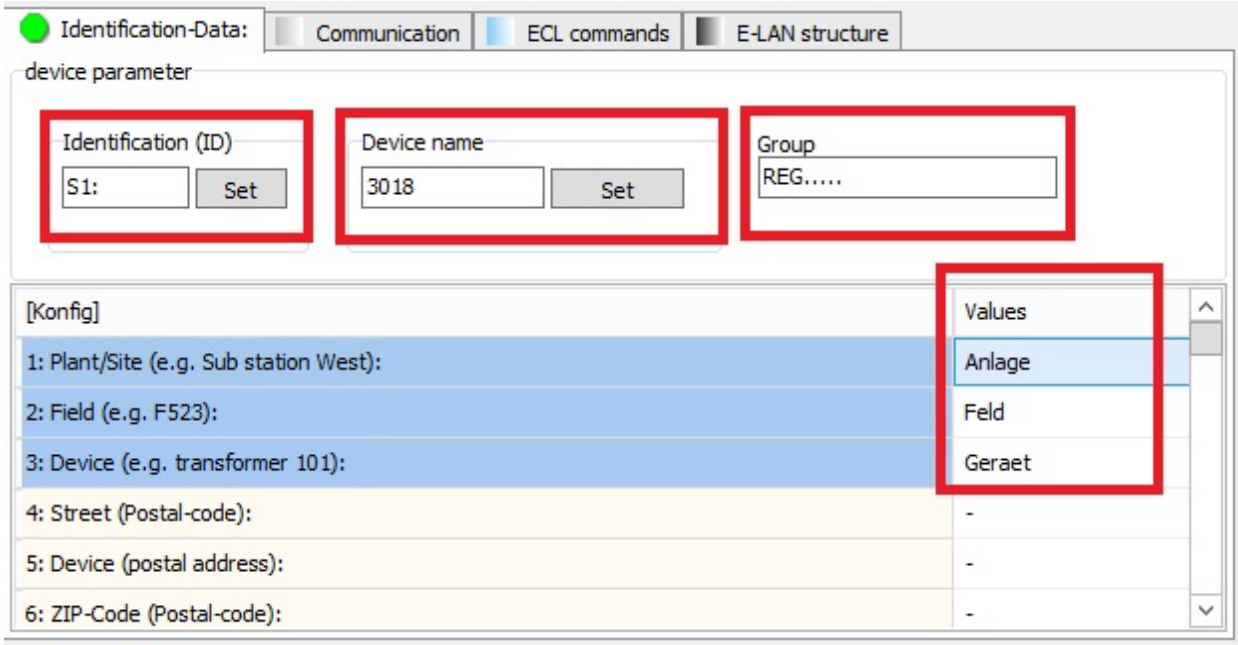
Figure: View of the output in Notepad++

Sorting devices in the Explorer view

A lot of options are available to create clearly laid out plant structures that guarantee fault finding even in highly complex systems.

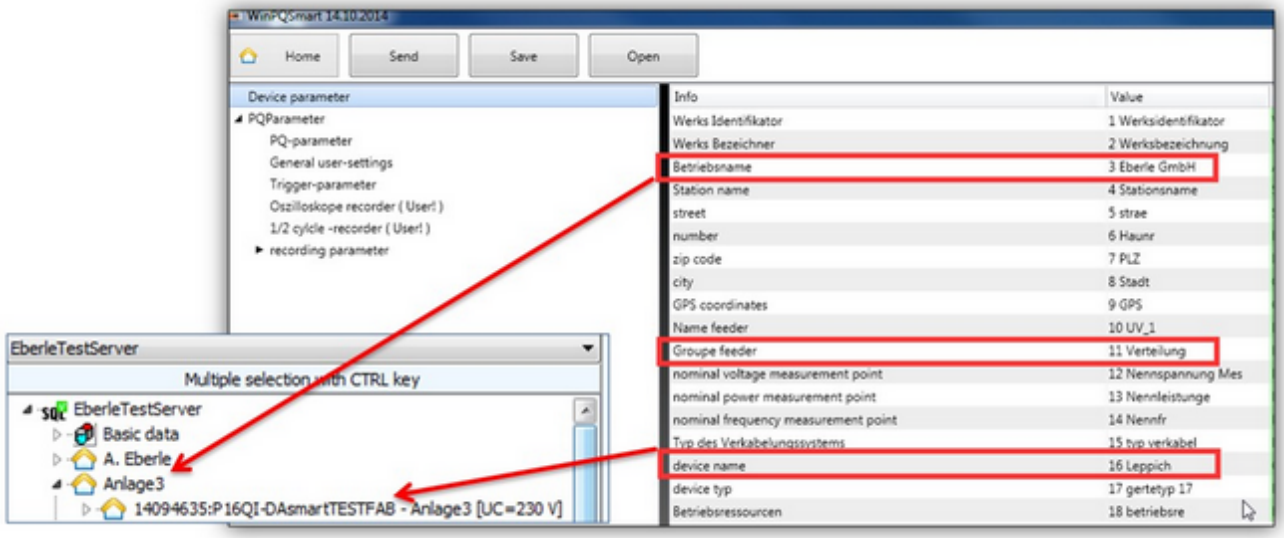
Device sorting is configured as follows for the different devices:

- PQI-D: The following parameters are available in the Description/E-LAN Time tile:

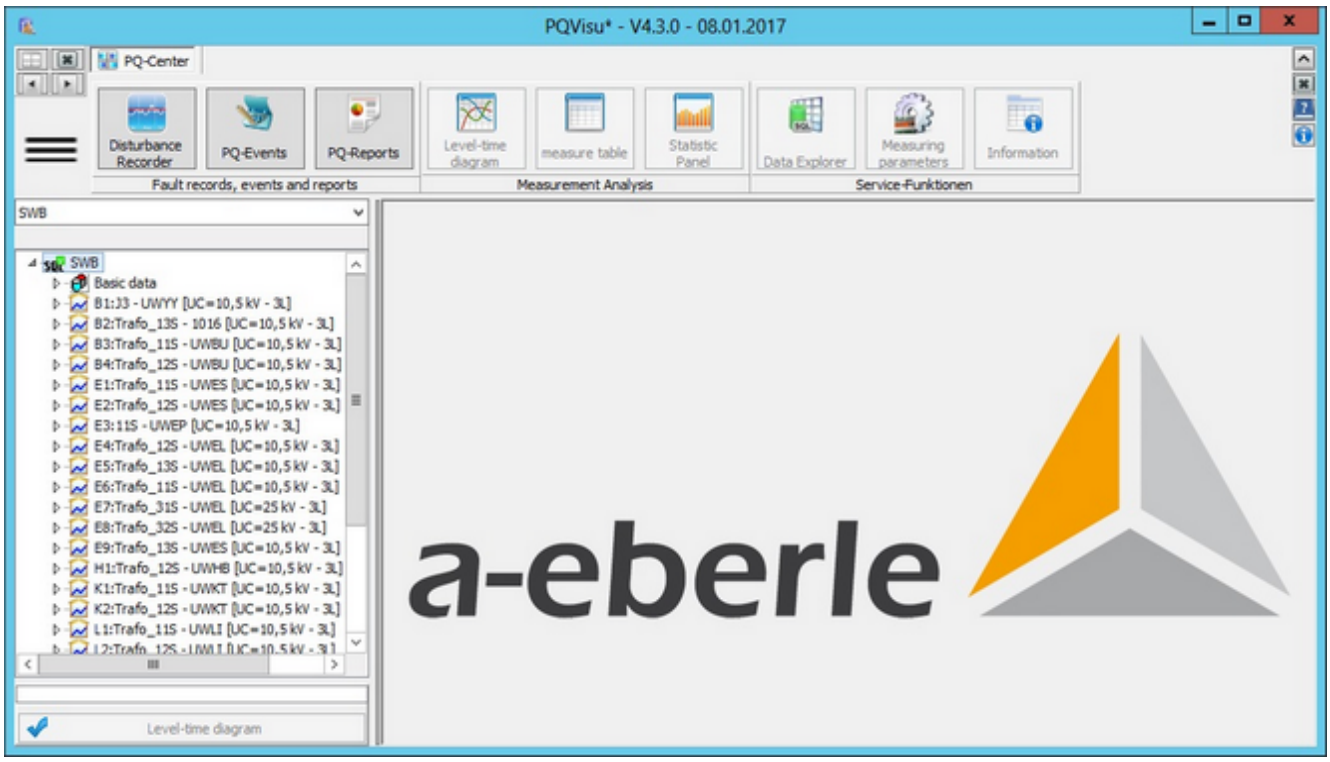


- PQI-D Smart

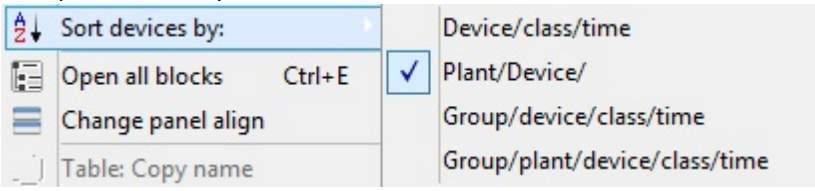
In PQI-DA Smart, the following parameters are important for the correct display.

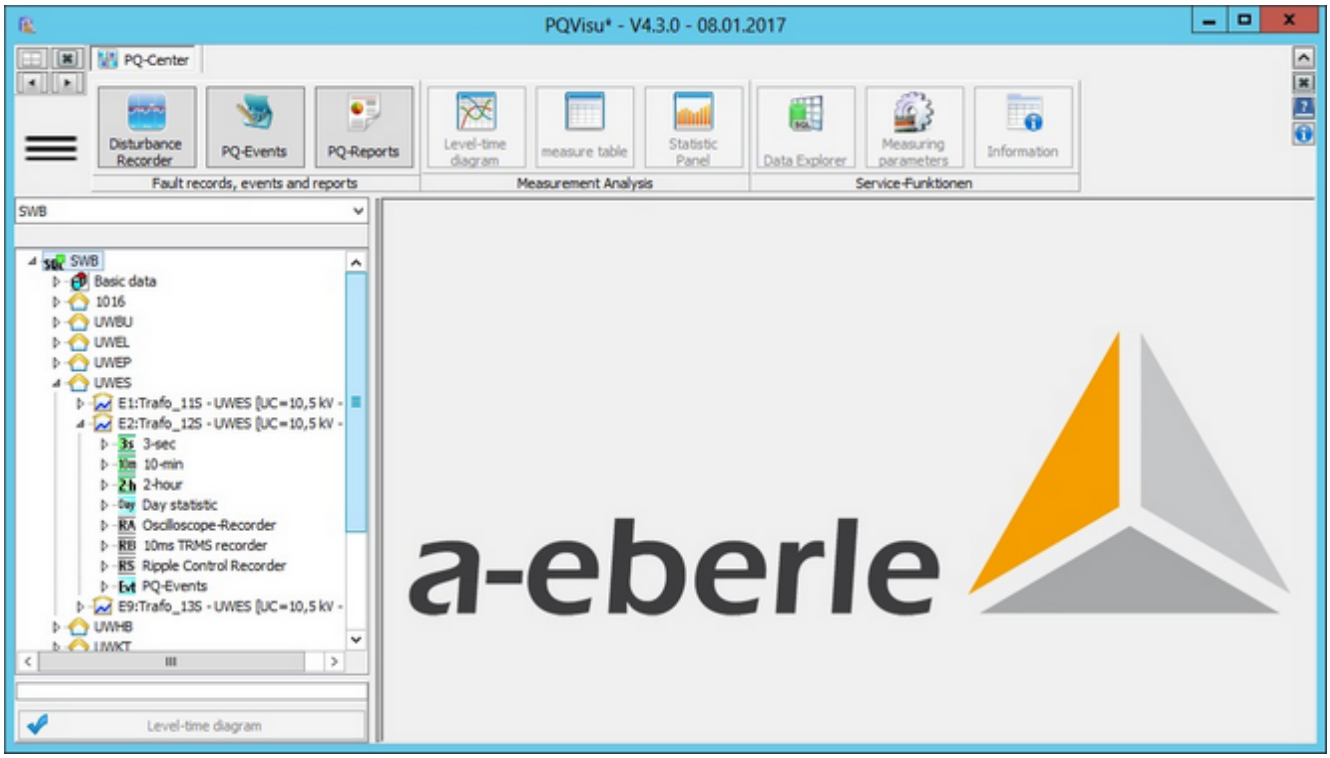


Up to four levels are available for device classification (below Figure):

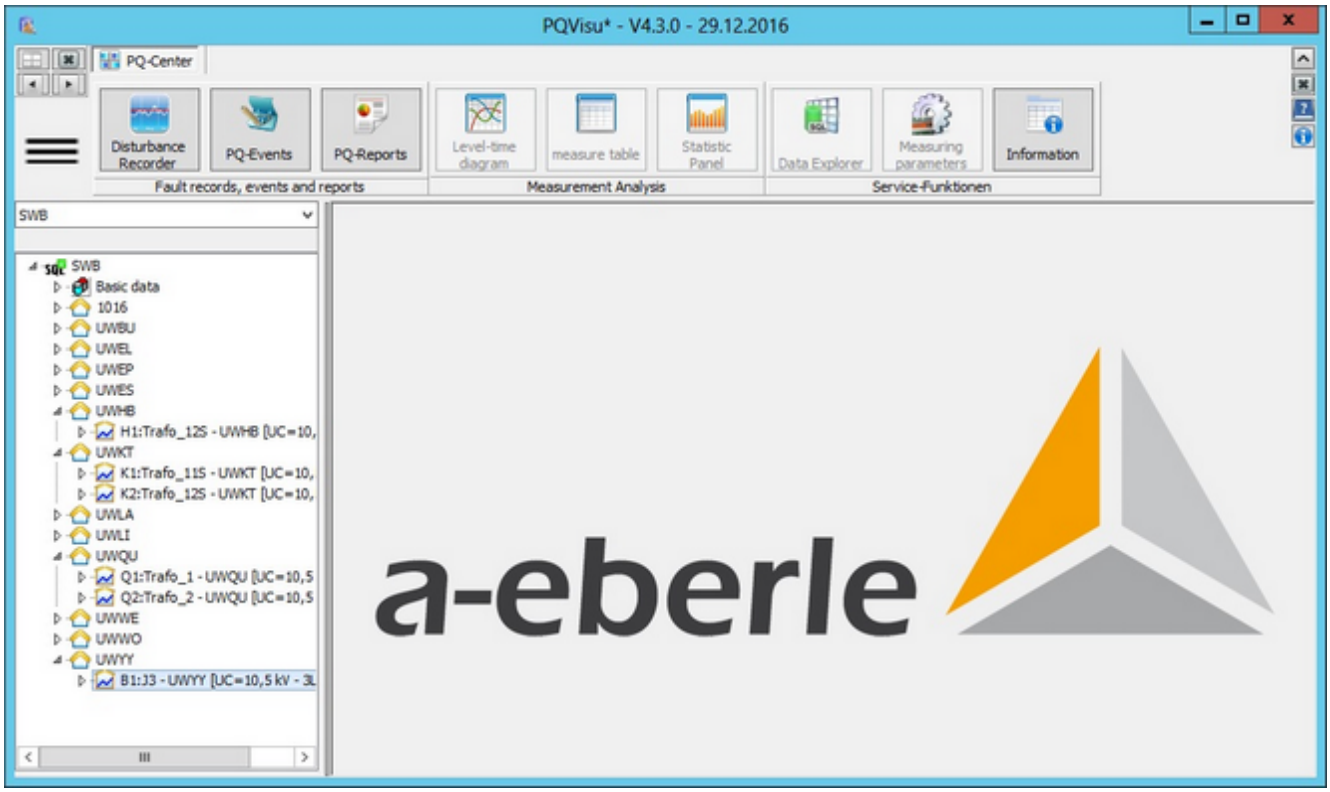


Example 1: Sorted by 'Device name'



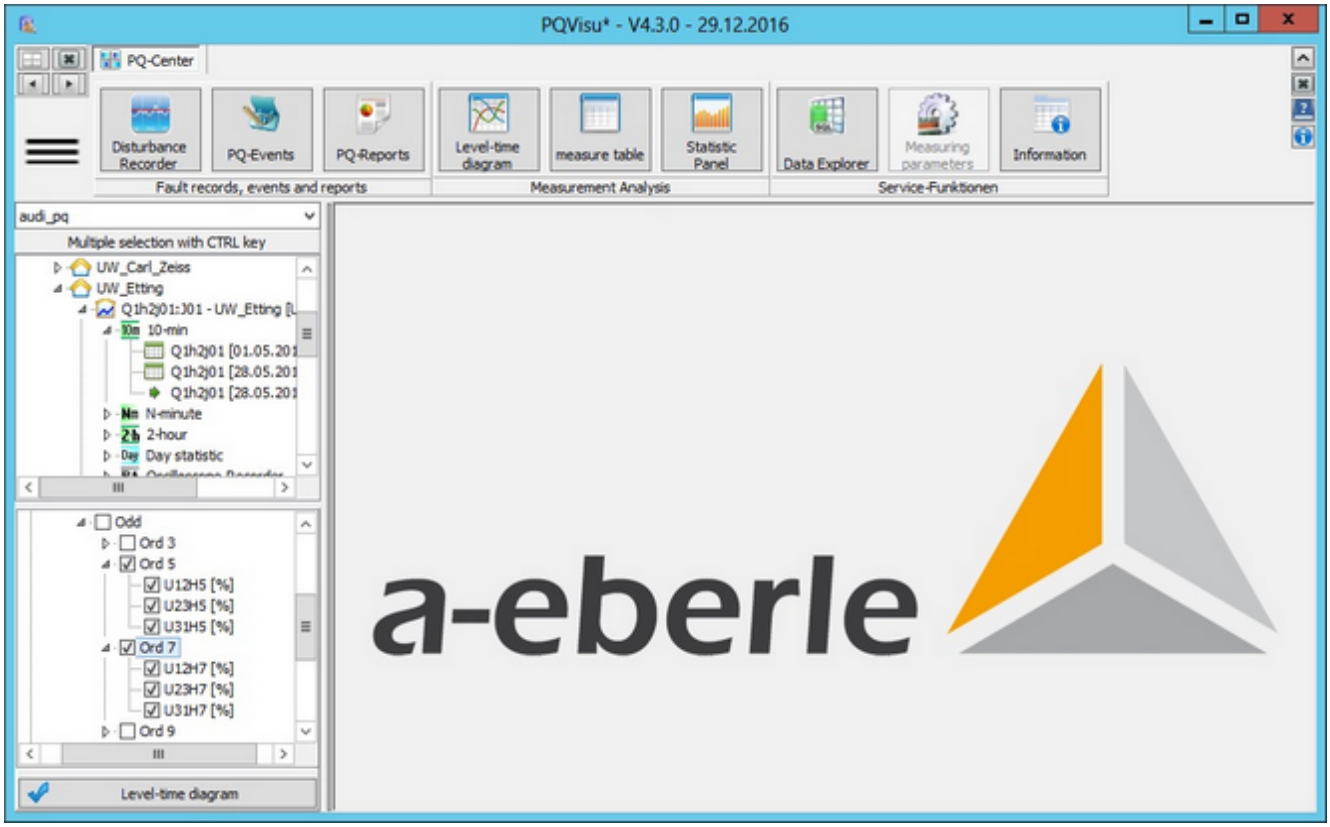


Example 2: Sorted by 'Plant, Device name'



Example 3: Sorted by 'Group, Device name'

Selecting measurands



- Whether measurands are displayed as a graphic or in a table or statically evaluated, the sequence is always the same: First the table columns (measurands) are filtered. At a later stage, the time window of the displayed data is shifted.
- There are two ways to select (measurand) columns: As group or as individual quantities.
- This status is automatically transferred when a parent node is activated/deactivated.

In order to display the 5th and 7th harmonics as a one-line diagram or measured value table, select the quantities and click on 'Level-time diagram' or 'Measured value table'.

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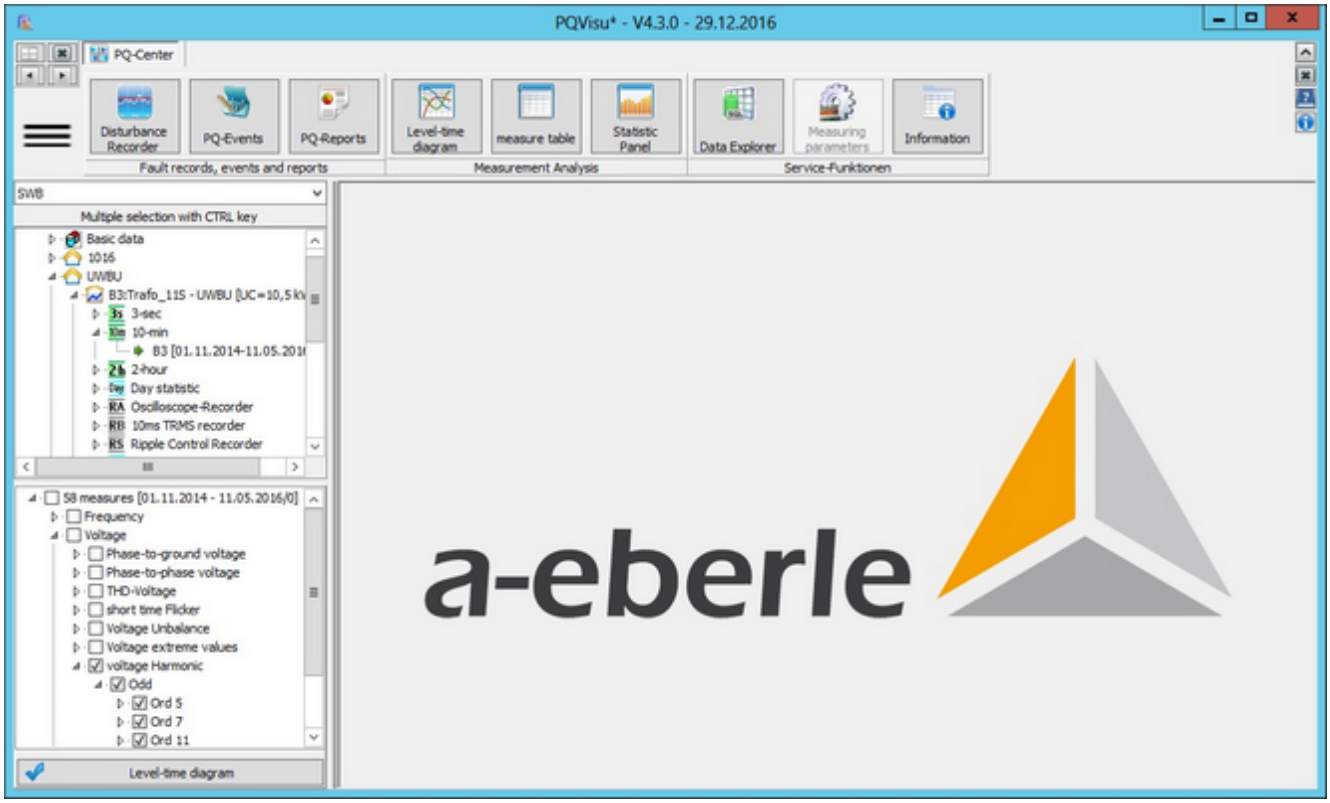
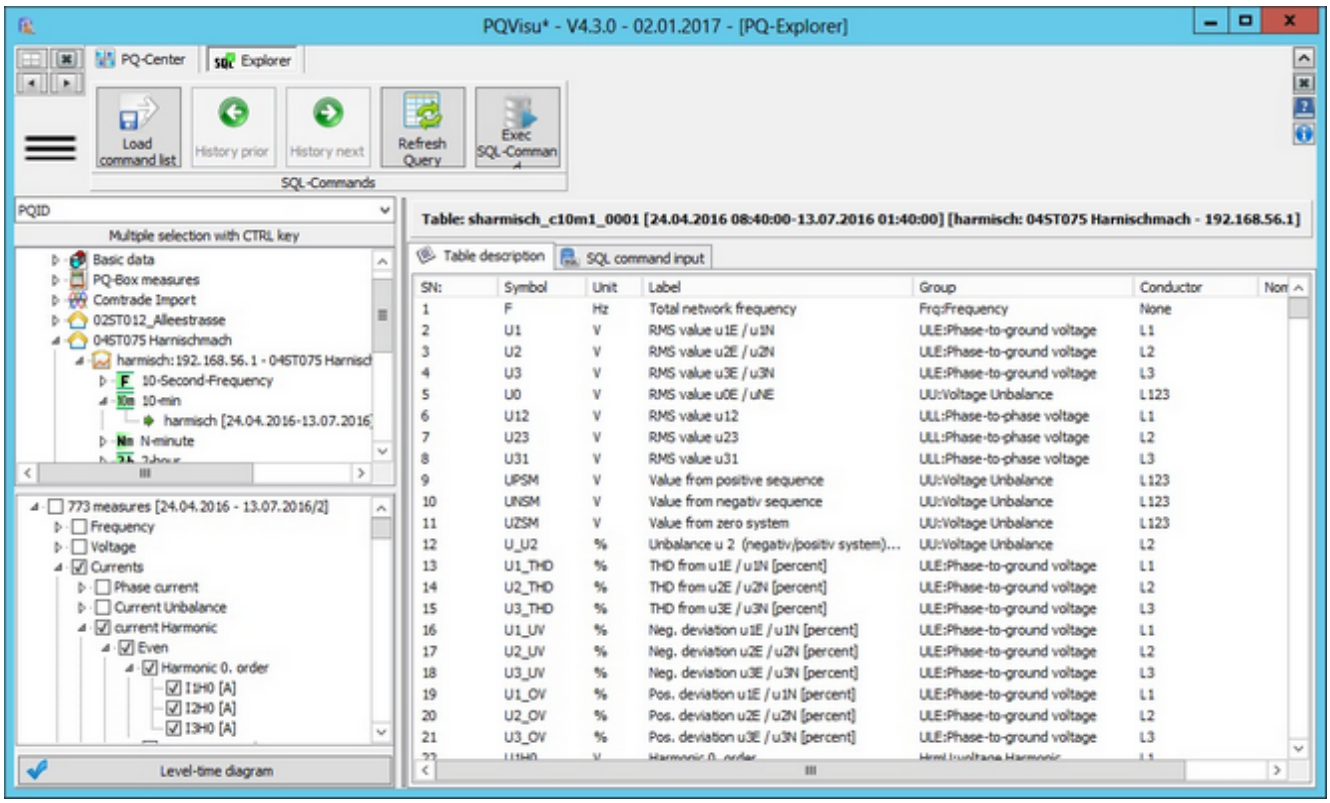
Data Explorer

The purpose of this function is to provide users with a simple SQL Query browser. It gives the user unlimited access to the SQL query language. Another service function to display data is also available. Clicking on the Data Explorer button loads the data in the current table into a table grid.

You can also use the standard MySQL tools MySQL Query Browser, MySQL Workbench etc.



Clicking on the Data Explorer button displays a general description of the contents of the selected SQL table. This view is context dependent. For measured value tables, the measurand's unit, description, group and line allocation are displayed in addition to its symbol.



It is now possible to switch to the 'SQL commands' tab.

First, the whole table (all columns) is displayed. The SQL commands that are used are copied to the text field above the red pane. Pre-defined commands can be selected from a list by using the arrow keys. Each command is copied and pasted in the text field where it can be edited. The current table name is automatically populated. The LIMIT clause (here 'LIMIT 1000') restricts the number of rows in a query in order to prevent the query from transferring millions of datasets (users may be able to run the clause) from the database and bringing the system to a standstill. Any external data that are used can be copied. You can copy specific data by marking the rows. Editing the field list enables additional quantities to be calculated (e.g., average, maximum values, etc.). Additional options for the 'WHERE' or 'LIMIT' clause can be found in the MySQL user manual.

Other useful commands are: UPDATE, REPAIR, OPTIMIZE, DESCRIBE. Commands that can change the table's contents can only be run by the PQ administrator (if there is one).

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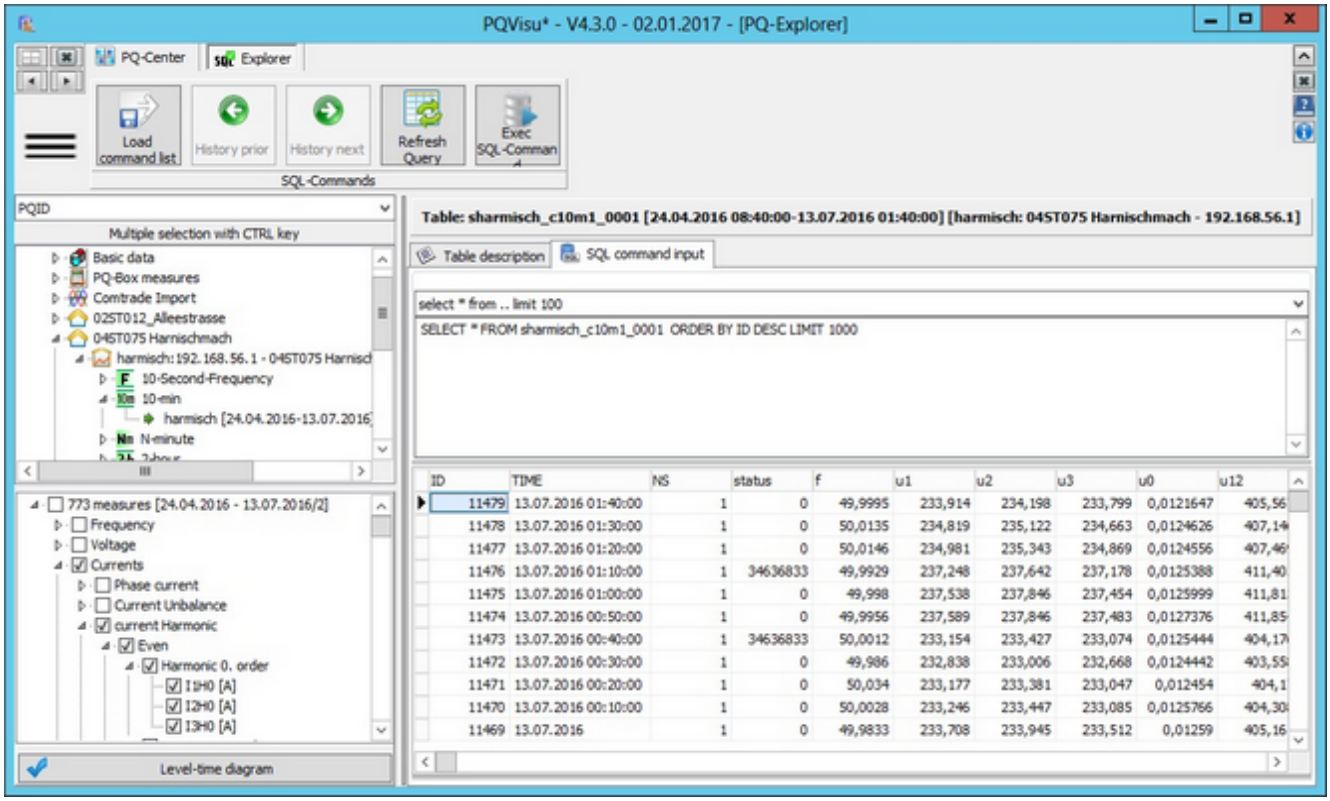

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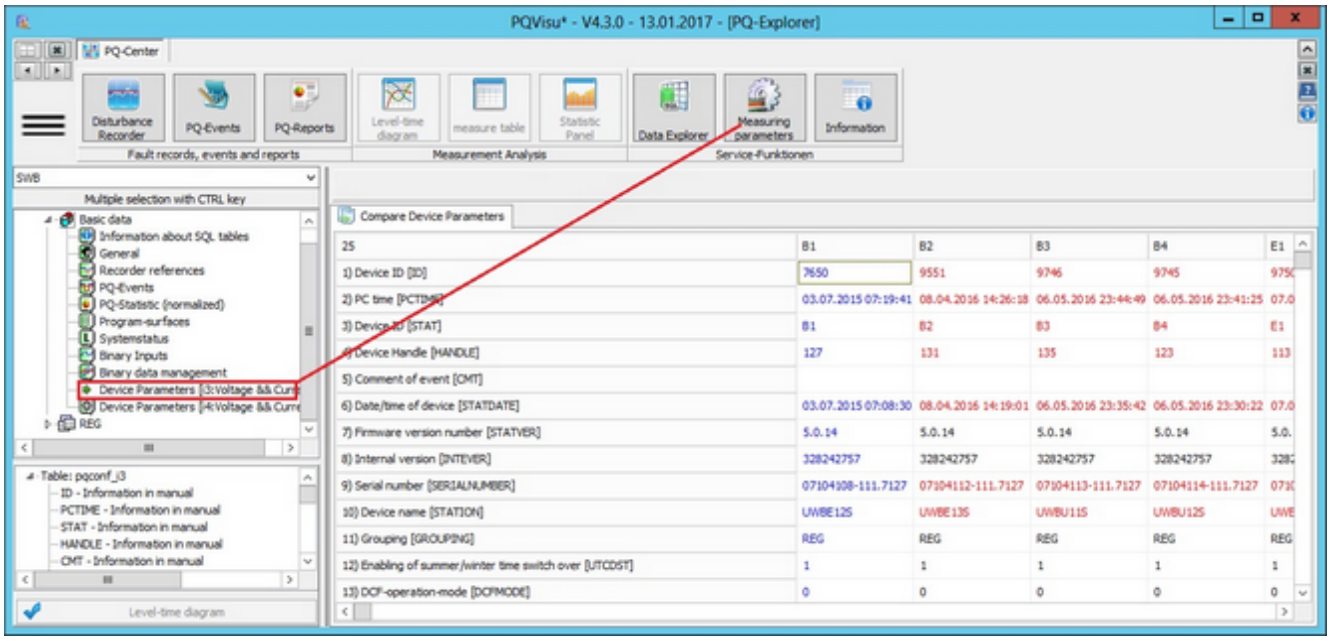
Measuring device parameters

This table contains all of the settings for all of the measuring devices that are linked to the database. This enables you to compare all of the device parameters with each other. The number of tables with device parameters depends on the hardware (UU and UI devices) and the firmware (different states). This view is generated by activating one of the 'Setup: device' nodes under 'Basic data'.



The following assumptions apply:

- This table displays this current parameters in the different devices next to each other and gives them a colour based on their value.
- A table column is a template. The selection can be changed at any time by right-clicking (place the cursor in the desired column and select 'Compare with current column').
- The content of the table can be copied to the Windows clipboard at any time by right-clicking.
- There is also the service function 'Delete this device parameter'. Only use this function if the table doesn't contain columns that are no longer maintained.
- The table is also easy to delete if necessary. The table is refreshed the next time PQManager is started.

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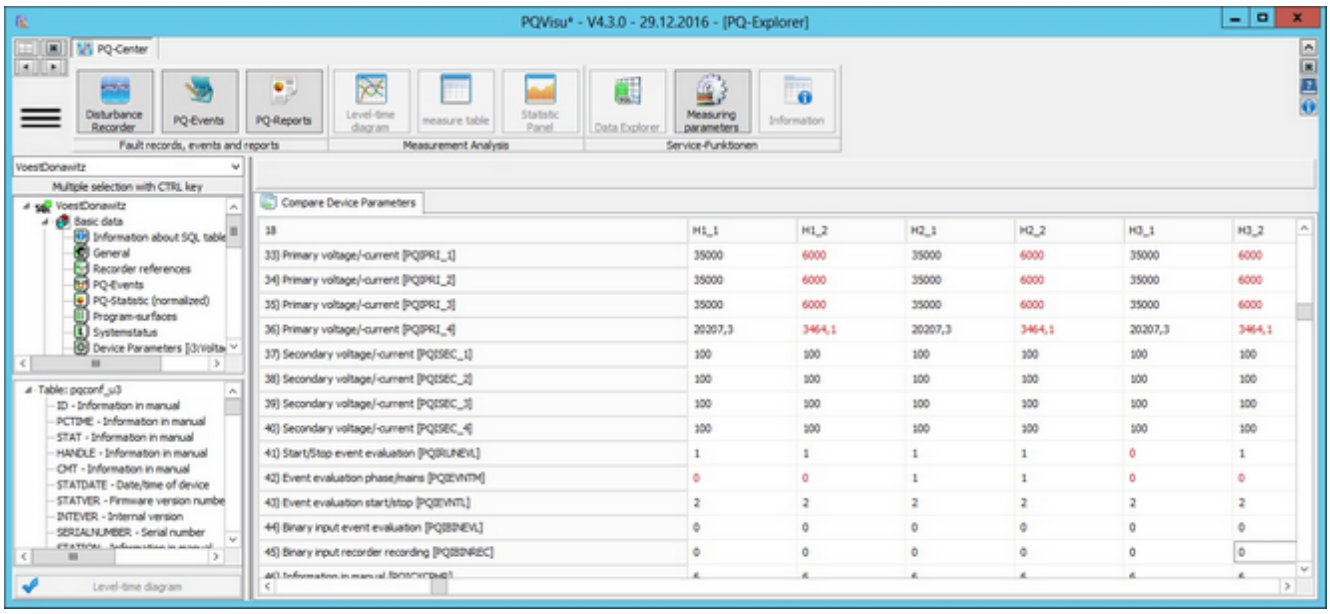
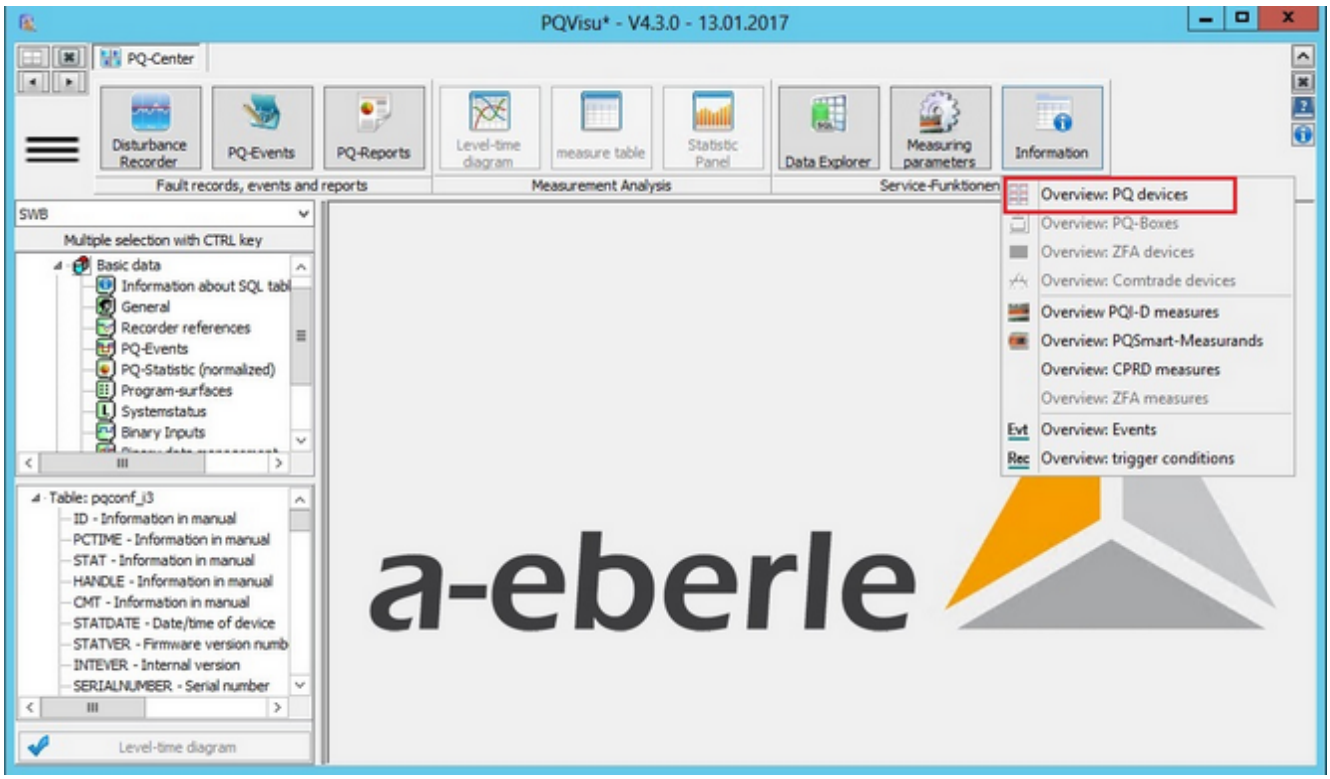


Right-click to switch between the comparative view and a device's parameter history. The same principles apply to the colour scheme.

Information

Clicking on Information displays a number of additional functions.



Particularly interesting is the information about the measuring devices, which are grouped by device type. Some functions are available by right-clicking, such as:

- Changing text fields (may be overwritten at a later stage if the original data on the device are not changed as well)
- Deleting devices (applies to all SQL tables that contain this device and all of the references in the parent tables)
- Renaming devices

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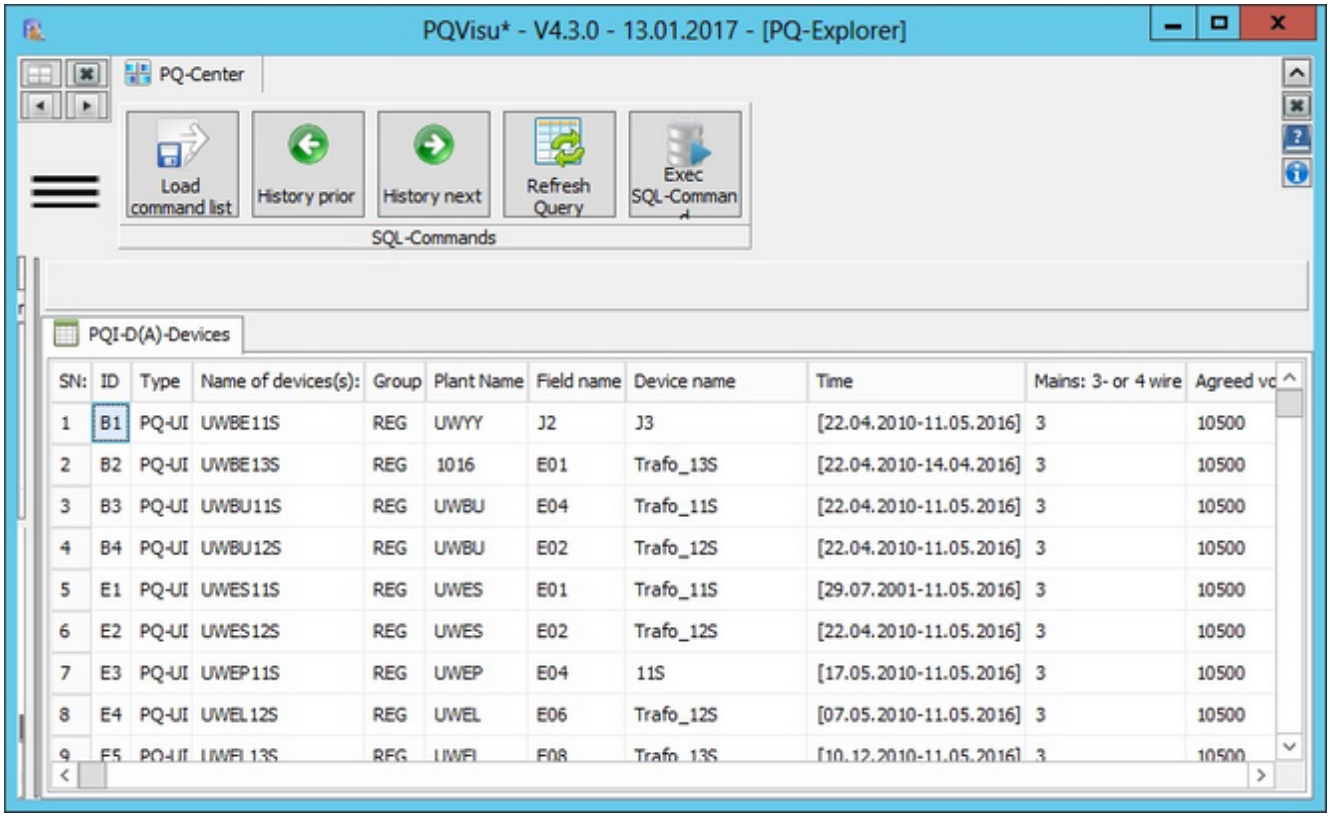

SN:	ID	Type	Name of devices(s):	Group	Plant Name	Field name	Device name	Time	Mains: 3- or 4 wire	Agreed vo
1	B1	PQ-UI	UWBE11S	REG	UWYY	J2	J3	[22.04.2010-11.05.2016]	3	10500
2	B2	PQ-UI	UWBE13S	REG	1016	E01	Trafo_13S	[22.04.2010-14.04.2016]	3	10500
3	B3	PQ-UI	UWBU11S	REG	UWBU	E04	Trafo_11S	[22.04.2010-11.05.2016]	3	10500
4	B4	PQ-UI	UWBU12S	REG	UWBU	E02	Trafo_12S	[22.04.2010-11.05.2016]	3	10500
5	E1	PQ-UI	UWES11S	REG	UWES	E01	Trafo_11S	[29.07.2001-11.05.2016]	3	10500
6	E2	PQ-UI	UWES12S	REG	UWES	E02	Trafo_12S	[22.04.2010-11.05.2016]	3	10500
7	E3	PQ-UI	UWEP11S	REG	UWEP	E04	11S	[17.05.2010-11.05.2016]	3	10500
8	E4	PQ-UI	UWEL12S	REG	UWEL	E06	Trafo_12S	[07.05.2010-11.05.2016]	3	10500
9	E5	PQ-UI	UWEL13S	REG	UWEL	E08	Trafo_13S	[10.12.2010-11.05.2016]	3	10500

Note: These functions should be used with care because some of them cannot be undone. Consider backing up the data first.

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Displaying error logs

Clicking on **'Error logs'** opens a list of trigger events (oscilloscope image and 10-ms RMS recordings). The last event is always at the bottom of the list:

- **OSCI** = oscilloscope image (10.24 kHz or 40.96 kHz sampling values)
- **TRMS** = RMS value recorder (1/2 period RMS recorder)
- **HARM** = harmonics recorder
- **SIGNAL** = ripple control signal recorder

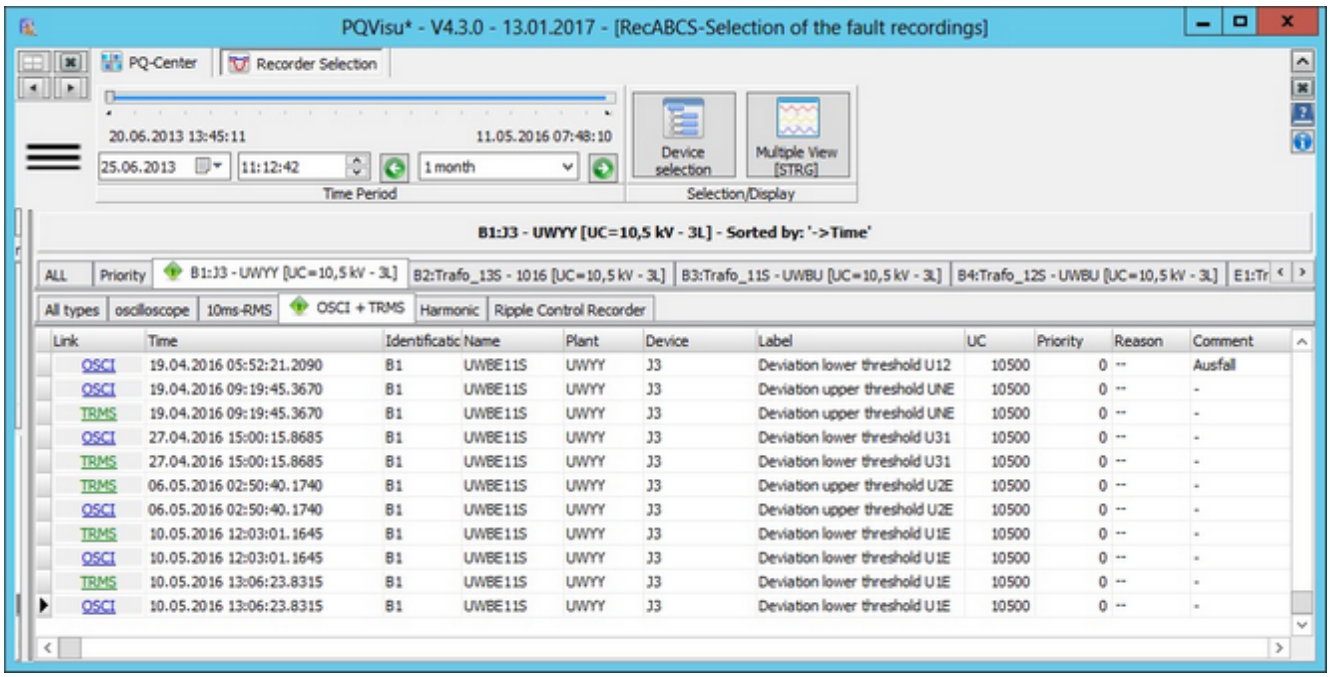

Figure: Selecting the logs to display

The tabs at the top of the window enable you to switch between devices as well as between the different types of recordings.

The time period for the list can be changed in the calendar. The arrow buttons enable you to move the view through time.

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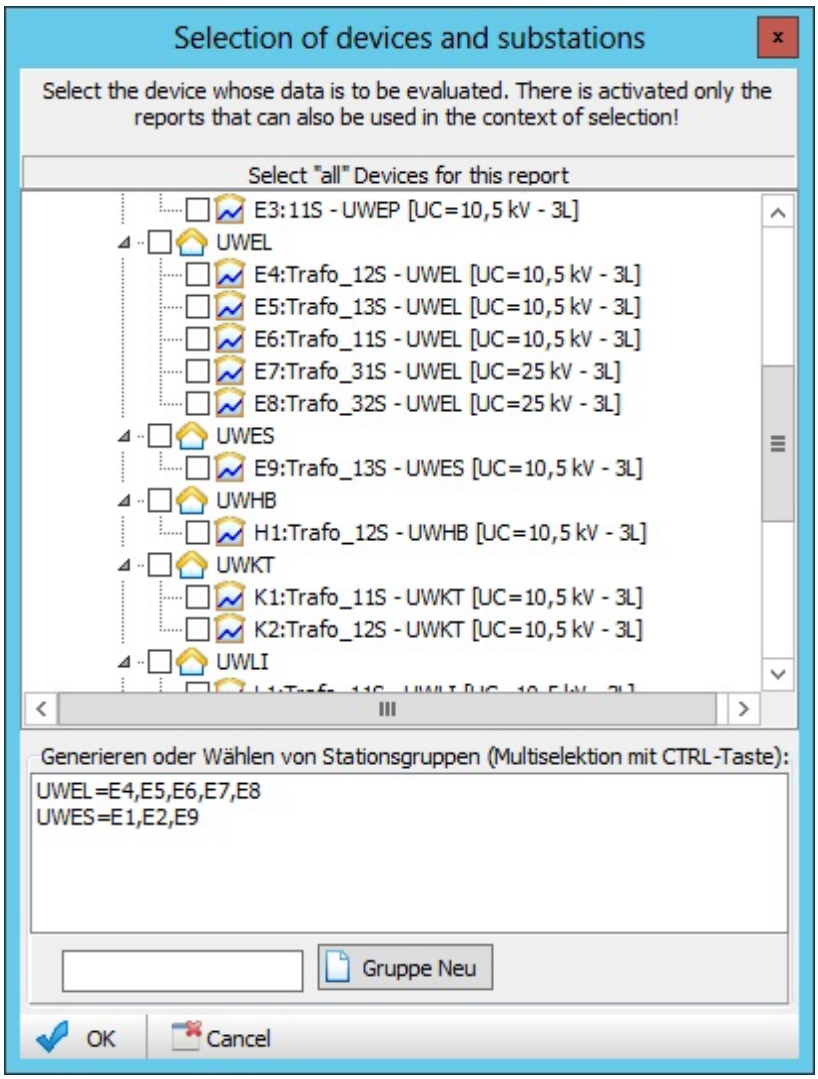
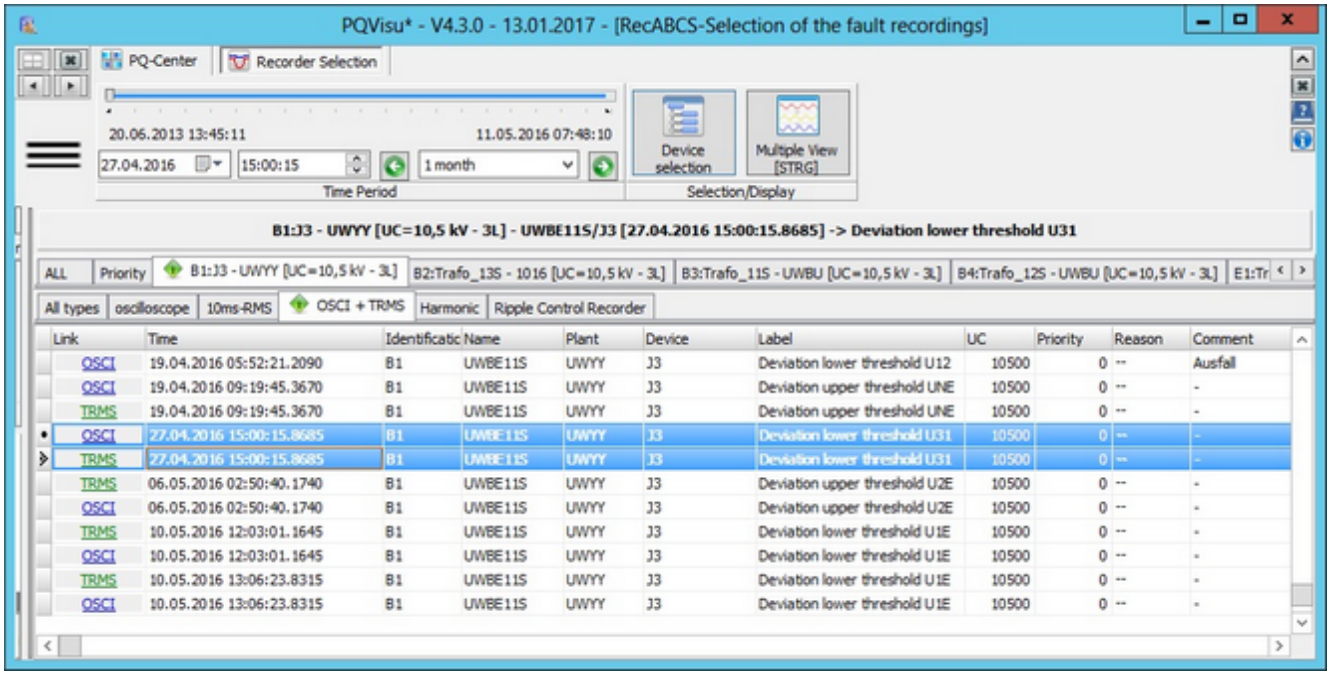


Click on **'Select devices'** to limit the number of displayed devices. 'All' then refers only to the devices that are checked.

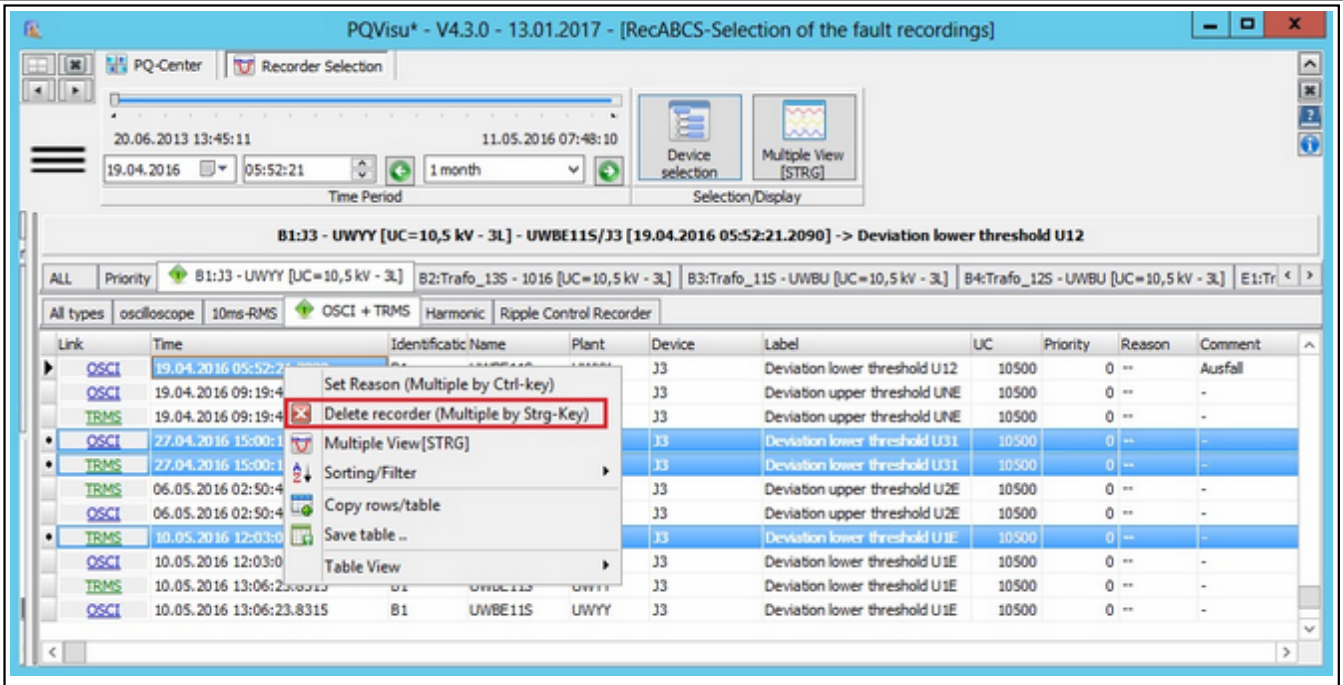


If you would like to display several recordings in the same graphic, select the desired recorders (press and hold the Ctrl and

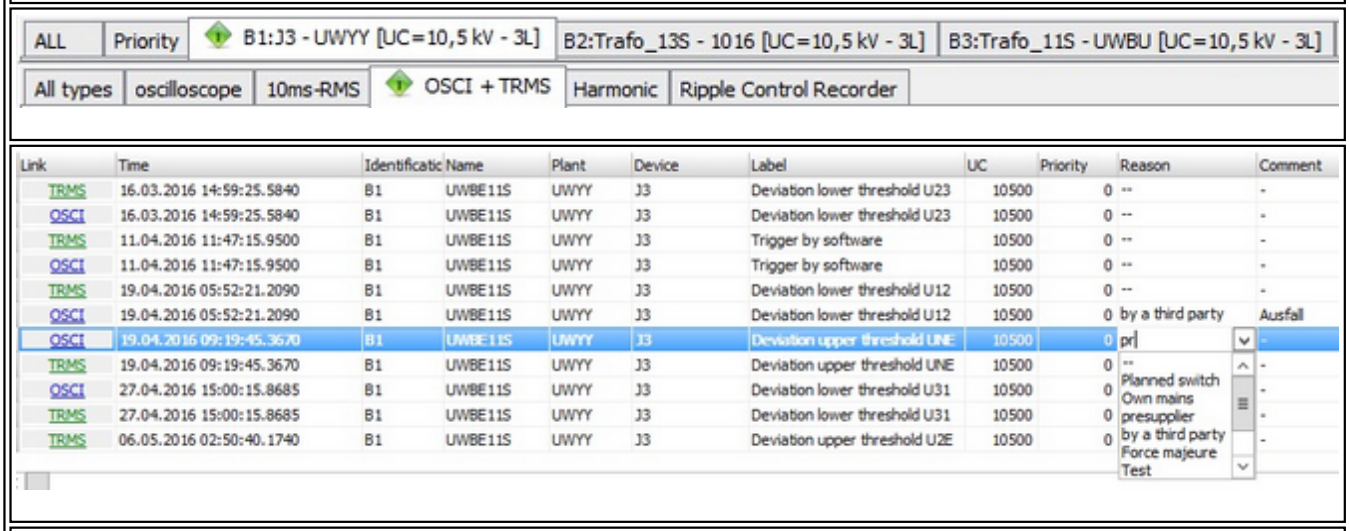
Shift keys) and click on **'Displayerror log(s)'**.

Deleting and commenting on saved error logs:

Press and hold the Ctrl key to select several logs. Right-clicking displays the context menu and the option to delete the logs.



Delete logs



- In the '**Reason**' column, the cause of the failure can be documented according to fixed criteria. Reports and annual statistics are sorted by these criteria.
- In the '**Comment**' column, you can add text that describes the error.
- The '**Priority**' (Numbers 0 .. 9) provides an additional filter criterion.

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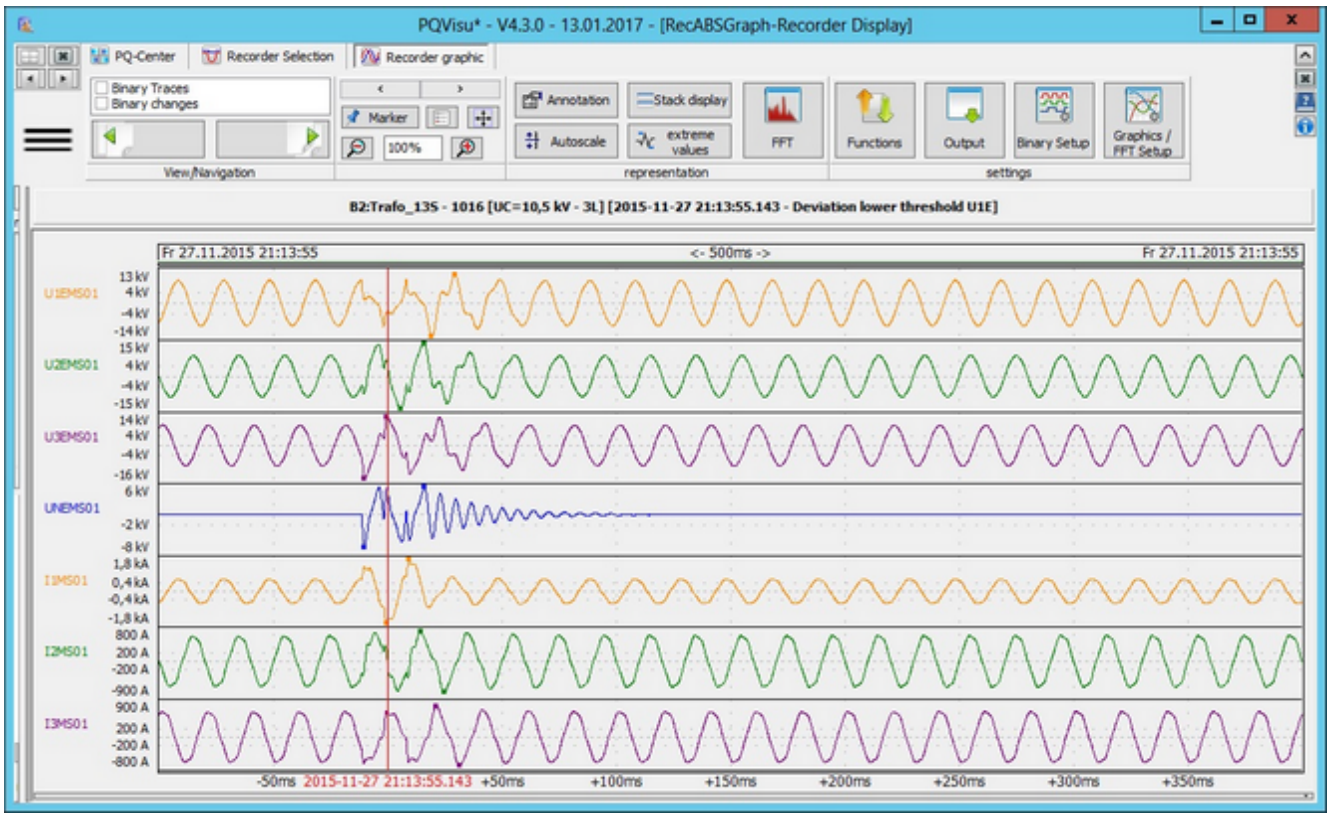
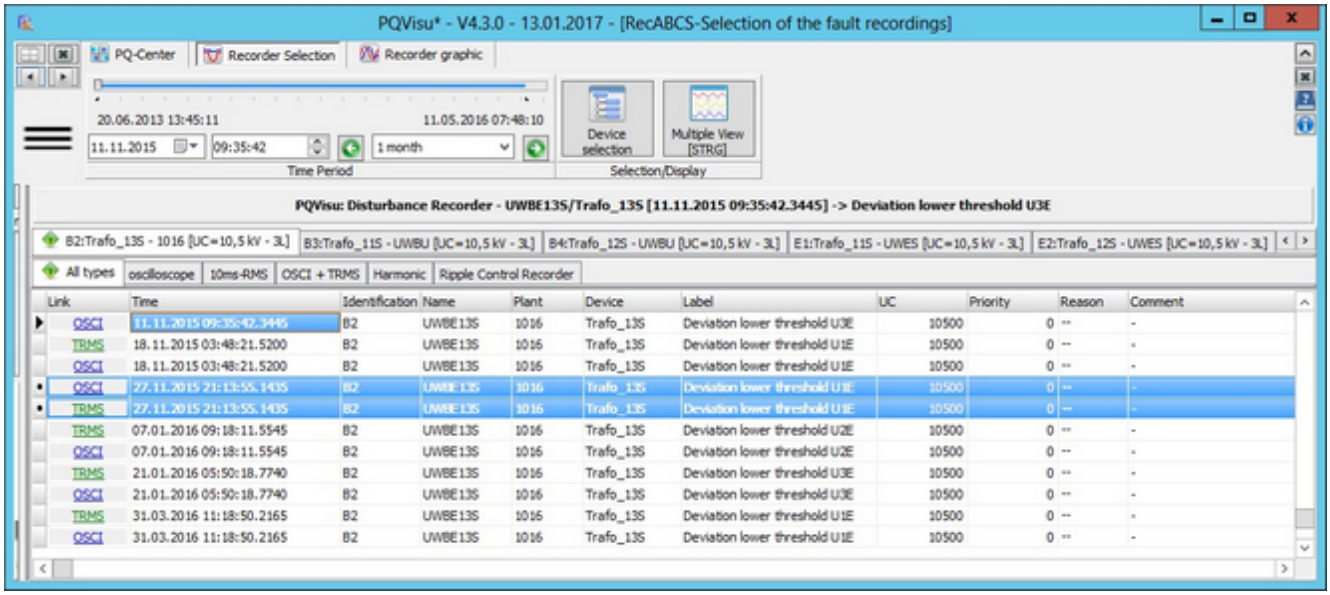
Oscilloscope recorder

Example: Oscilloscopeimage of voltages L1E, L2E, L3E, NE and currents L1, L2, L3



To evaluate several events in one chart, you must select several rows in a table. Click the Displayerror log(s) button to display all of the logs in one view. You can also combine oscilloscopeand RMS value logs.



The active window is marked with a colour. In the above example, the active window is the 10-ms RMS recorder.

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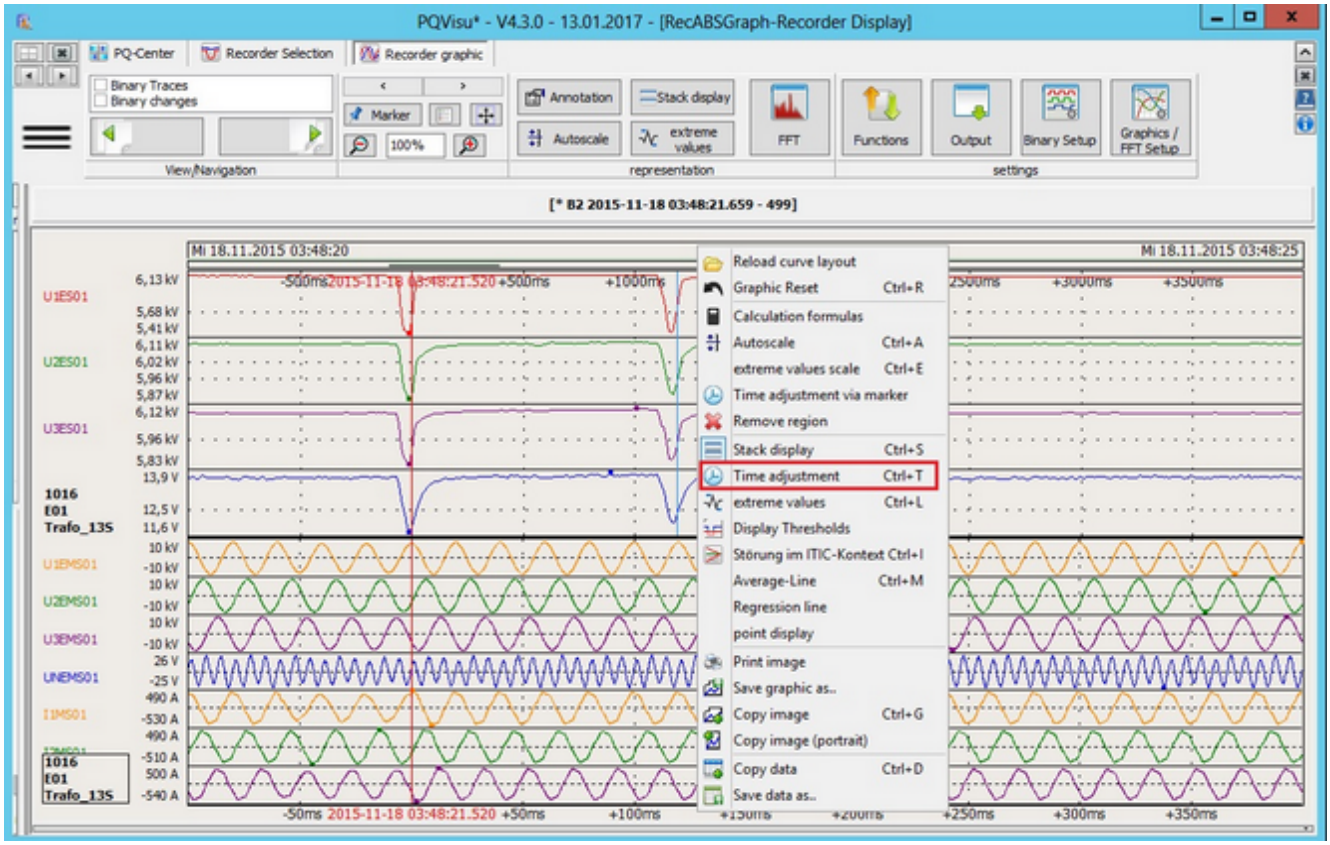
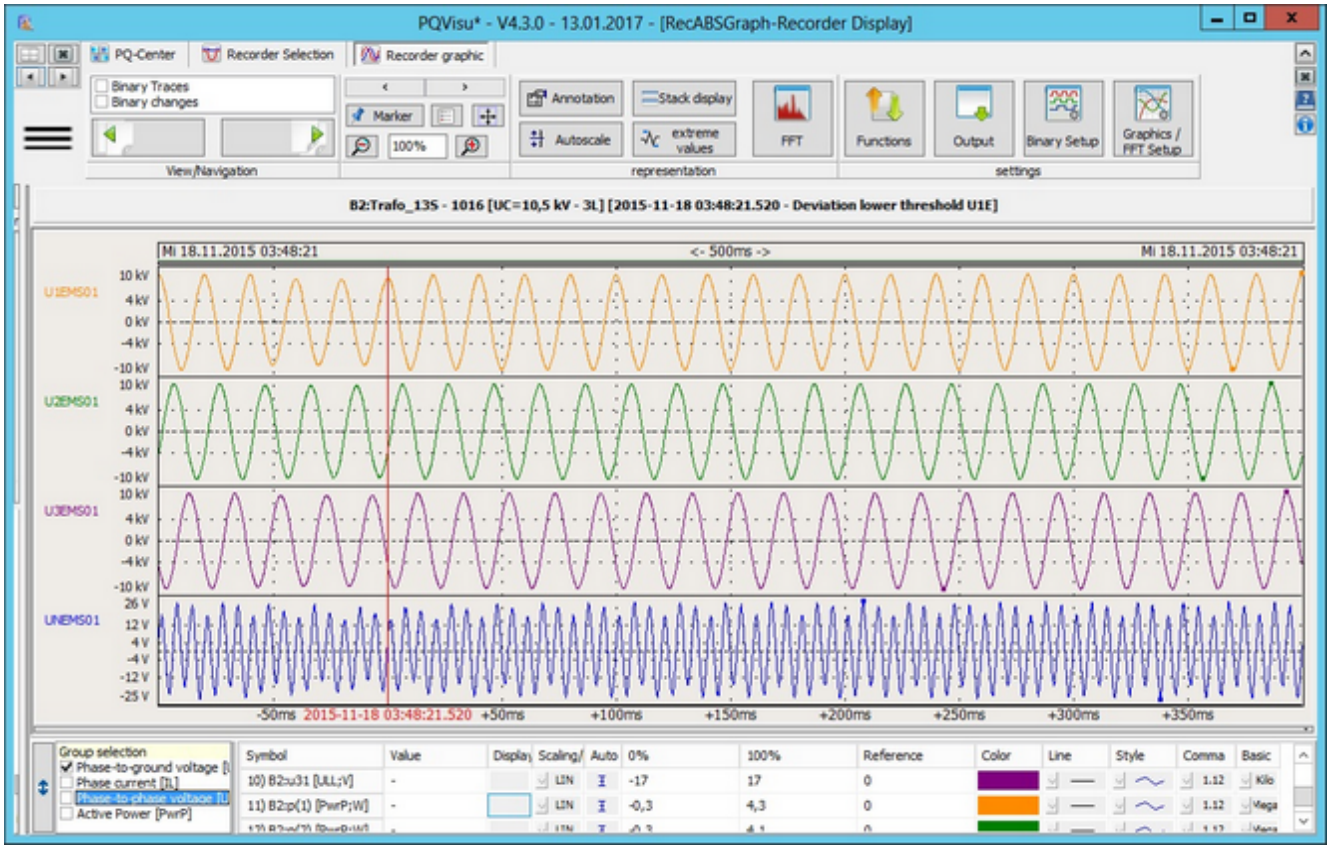
If the oscilloscopeimage and the 10-ms RMS logs are displayedtogether, you can use the 'Time adjustment' function (right-clickto displaycontext menu) to synchronize the different file lengths. The oscilloscopeimage is time-compressed and displaysat the correct time when displayed with the 10-ms RMS recorder.



The configuration of the graphic is displayed in a table below the curve view. Between the table and the graphic is a

combined splitter button. Right-clicking in the red area hides and shows the table for configuration. You can change things such as the colours, line thickness, basic units (kilo, mega etc) and scaling in the table.



The 'Select as group' field can be used to make a quick selection. Note that there are selection fields for the phase-to-phase voltage and for the active power although they are not activate on the device. In this case, the quantities are calculated from the available sampling values.

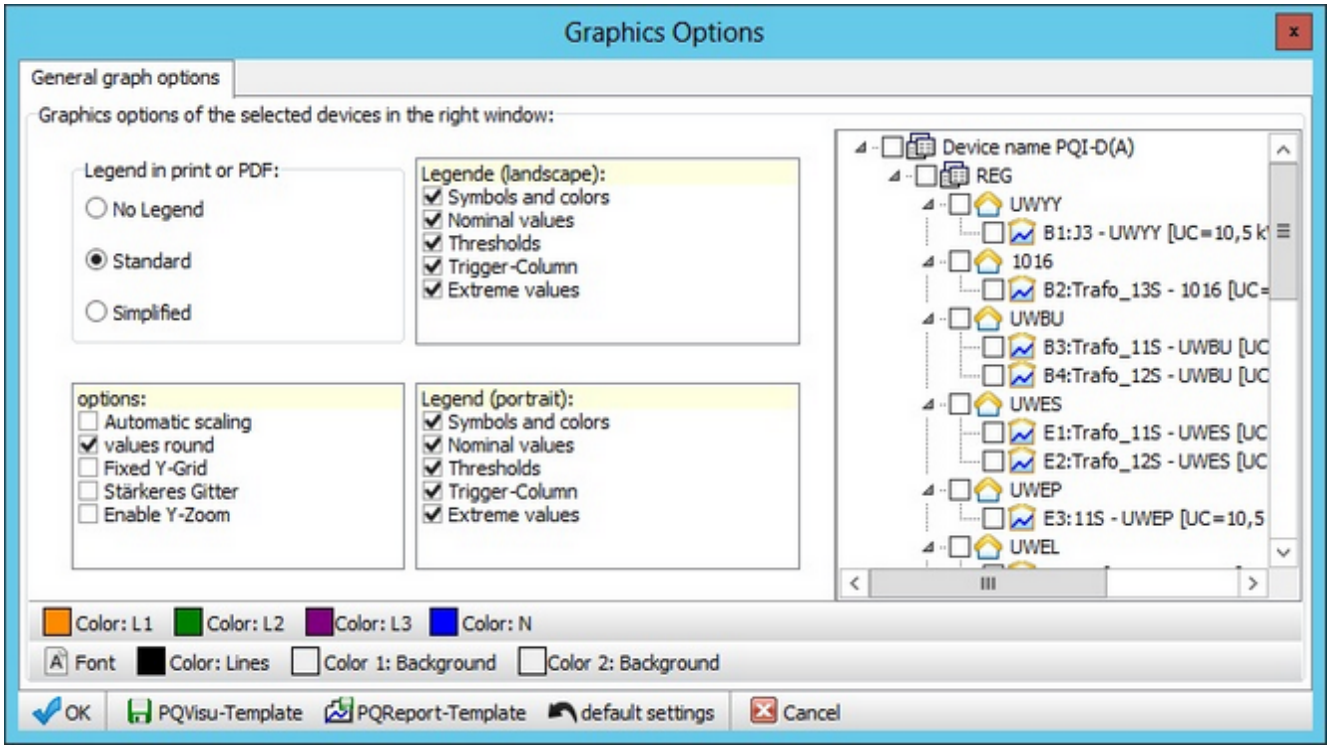
Configuring graphics/FFT

In Graphics/FFT

you can save the settings for the oscilloscope recorder permanently for the view:

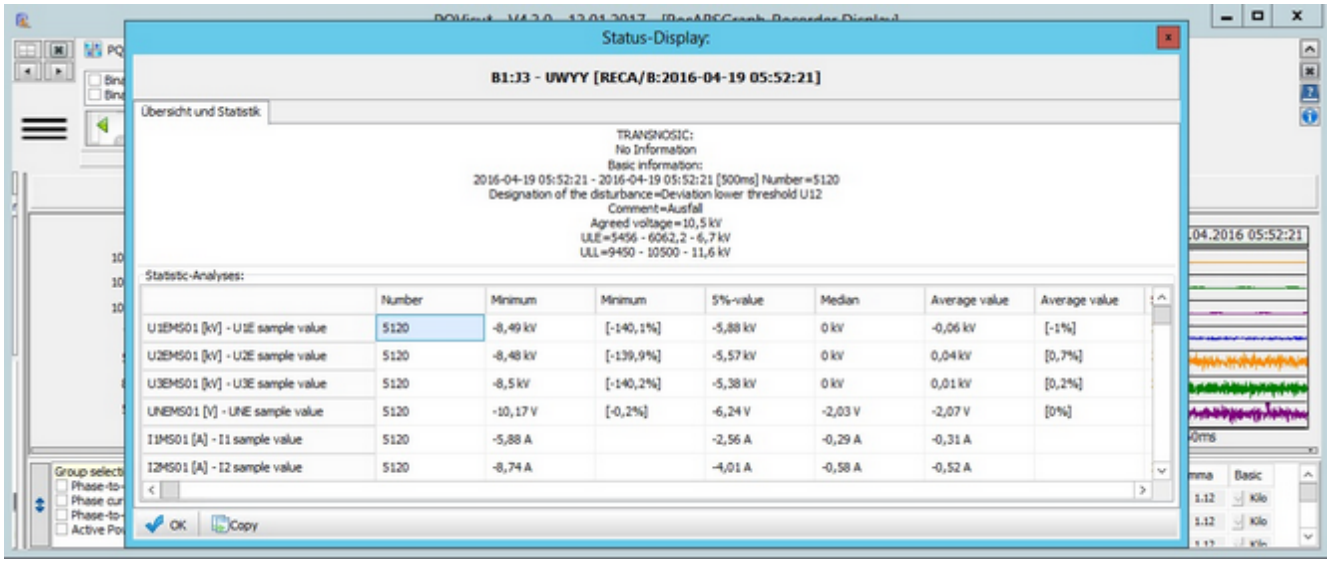
- For the visualization software as 'Display setup'
- For automatic printing as 'Report setup'

The current display parameters and curve settings (scaling, colours etc) are saved for the selected device. The next time you check the same data on this device, they will be displayed with these settings. You can configure the view differently for each device.



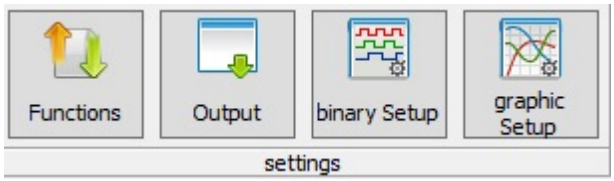
Explanation

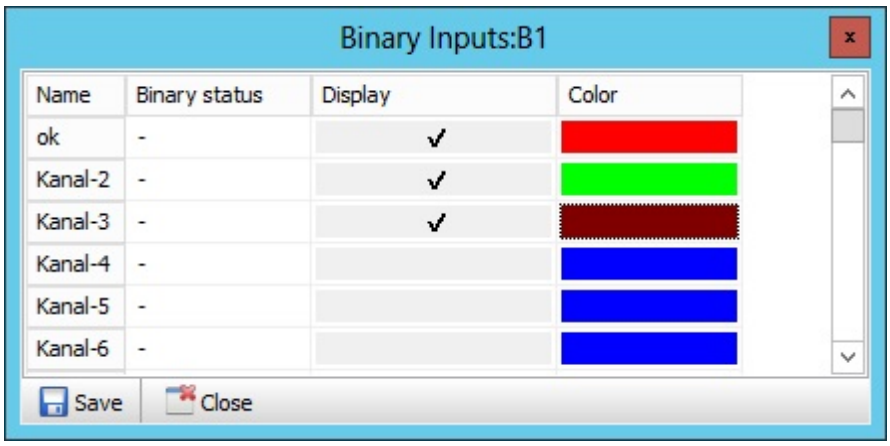
Clicking 'Explanation' displays the duration of the fault and the extreme values for all measurement channels. In the example, the duration of the fault is (90% threshold line). The minimum and maximum values for voltage and currents are displayed. If the Transnostic function is enabled in the measuring device, the direction of the fault is displayed (in front of or behind the measuring point).



Binary channels

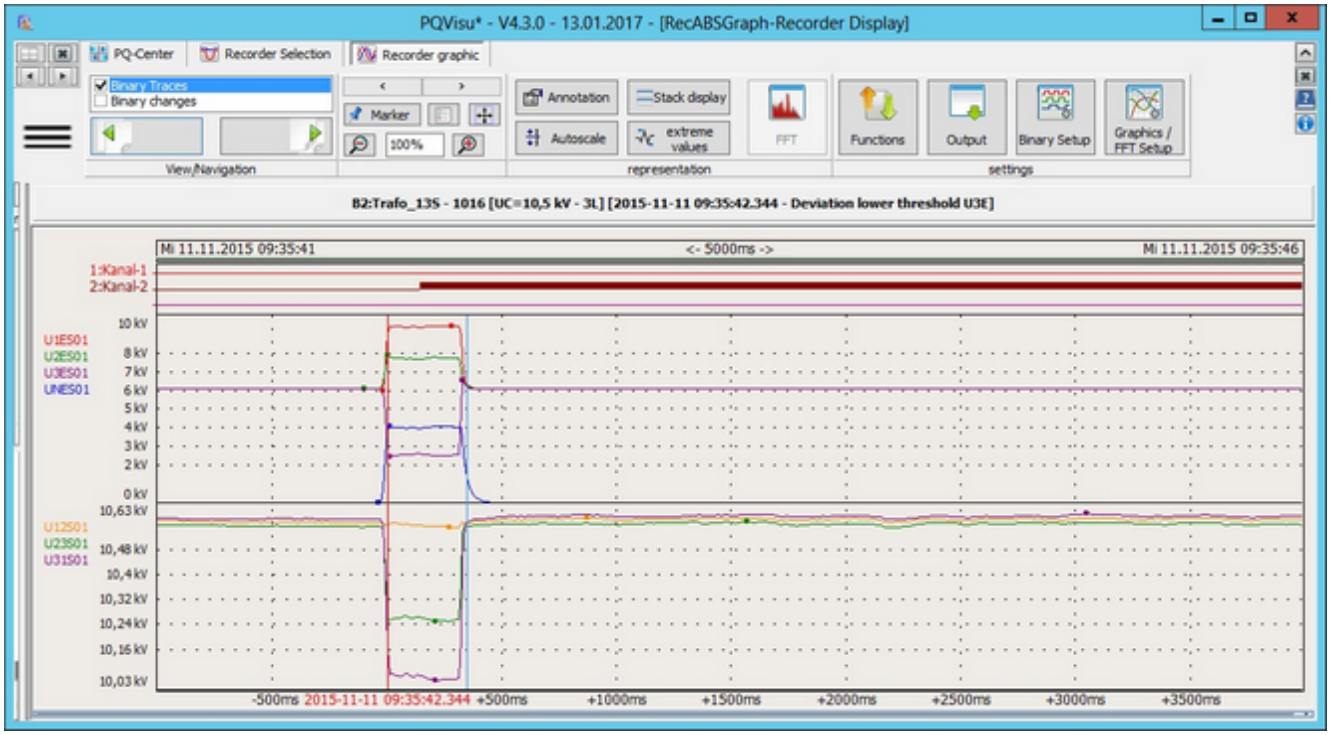
Binary channels can be enabled and configured by clicking on the 'Binary setup' button. You can label the channels and change their colour.





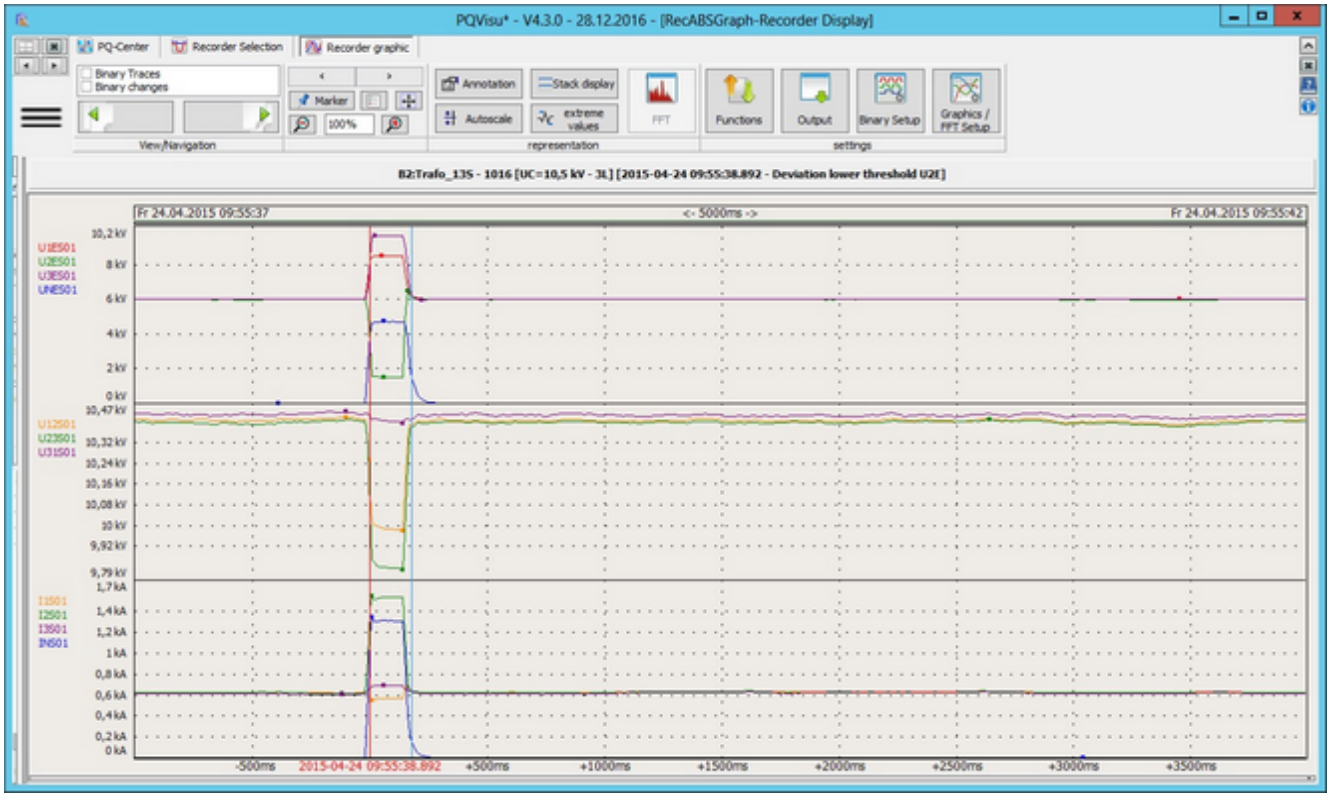
Checking 'Show binary inputs' shows all of the active binary inputs in the device's error log graphic. Binary channels can be displayed in all recording types (oscilloscope,10ms RMS, 3 sec and 10 min long-term data).

The example shows an error log with three active binary channels– binary input no. 2 (green) was triggered during a failure. Checking 'Display binary changes' only displaysChannel 1 and Channel 2.



10-ms RMS recorder

Example: 10-ms RMS recorder: Voltages L1E; L2E; L3E; NE; L12; L23; L31 and Currents L1, L2, L3



You can zoom in by expanding a rectangle, a time section (X-axis) with the mouse (press and hold the left mouse button - magnifying glass with '+'). When the mouse button is released, the frame of the rectangle is used as the edge of the magnified view. All of the curves are redrawn and the changed parameters in the table adopted. Moving the edge of the rectangle in the other direction, i.e. shrinking it, (magnifying glass with '-') restores the view to its original size. Moving the edge of the rectangle displays the cursor as a magnifying glass with '+' (zoom in - move to the right) or '-' (zoom out - move to the left).

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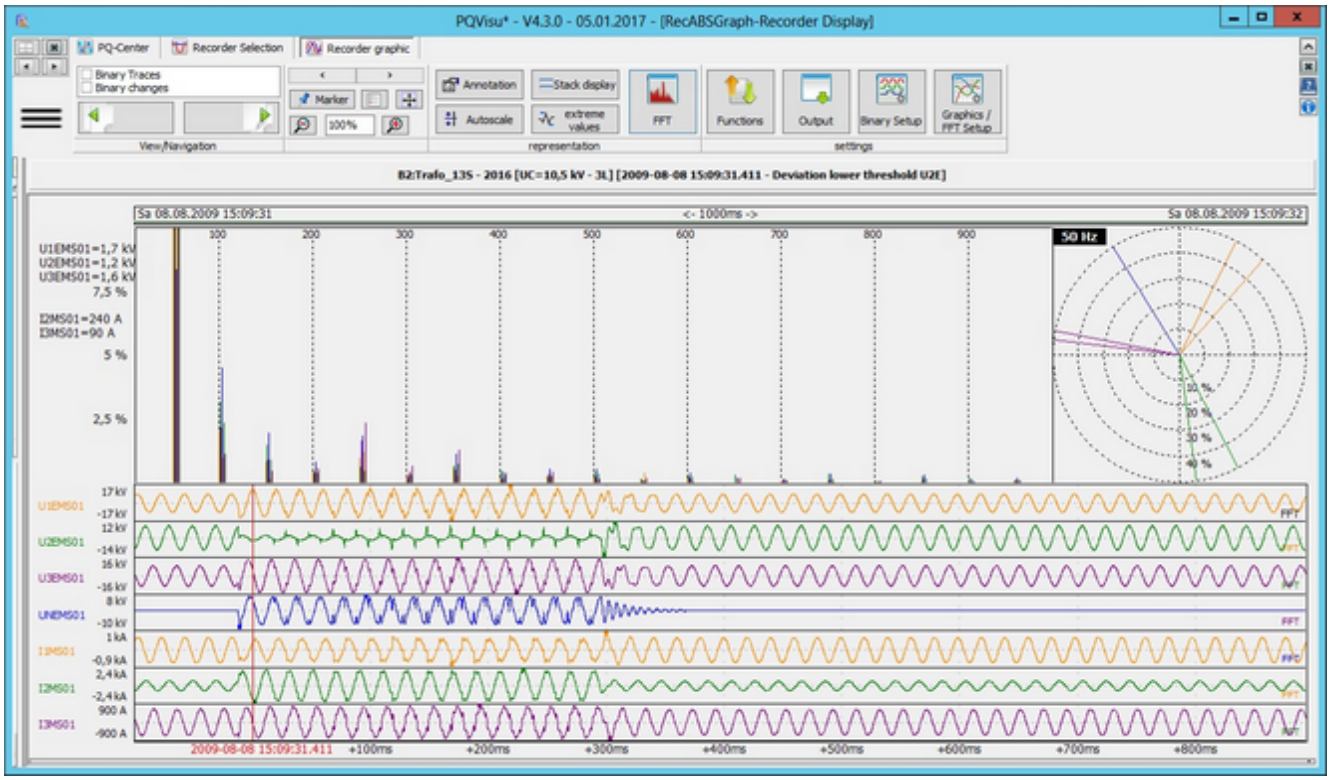
FFT analysis from oscilloscope image

Click on FFT to perform an FFT calculation from any oscilloscope image. The time window (default length 10 periods) that the calculation is performed over, is specified by clicking on Chart/FFT setup.

The view is split: The bottom pane displays the time behaviour of the measurands. The top pane displays the harmonics on the left and the vector diagram for the active frequency on the right (starts with the fundamental frequency).

The cursor works in the time domain as well as in the frequency view. Each shift in the time domain starts a new calculation and displays it immediately. Moving the cursor in the frequency pane displays the vector diagram for another harmonic. The zoom function works in both panes. Right-click anywhere on the spectrum to display the context menu and copy the data to the Windows clipboard.



Legend: Moving the cursor displays the view's complex parameters as numbers. These numbers represent current and voltage quantities and angles, the symmetrical components of the voltage, the active and reactive power of the phase and the angle between the voltage and the current. The impedance of the phase is also displayed.

This is where the calculation window (in the example, 2048 measurement points = 200 ms) for the FFT calculation is configured. The spectrum is displayed from DC to 5 kHz. Use the 'Last spectral line' up/down control to limit the displayed frequency range (511 corresponds to 5000 Hz).

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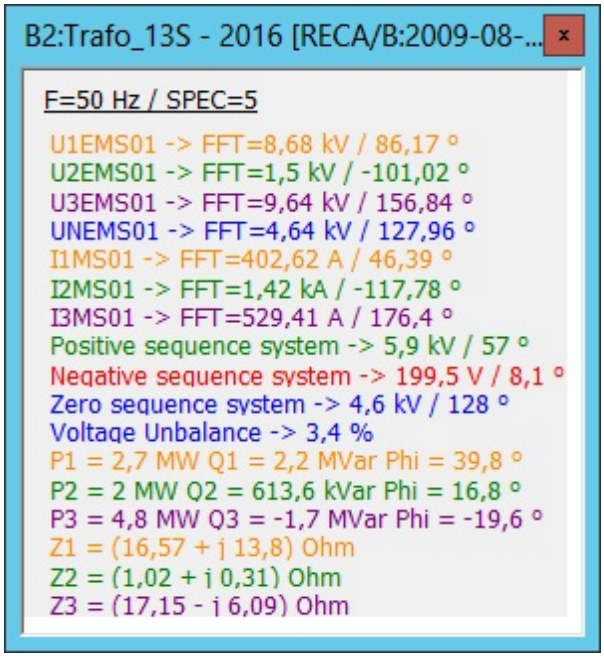
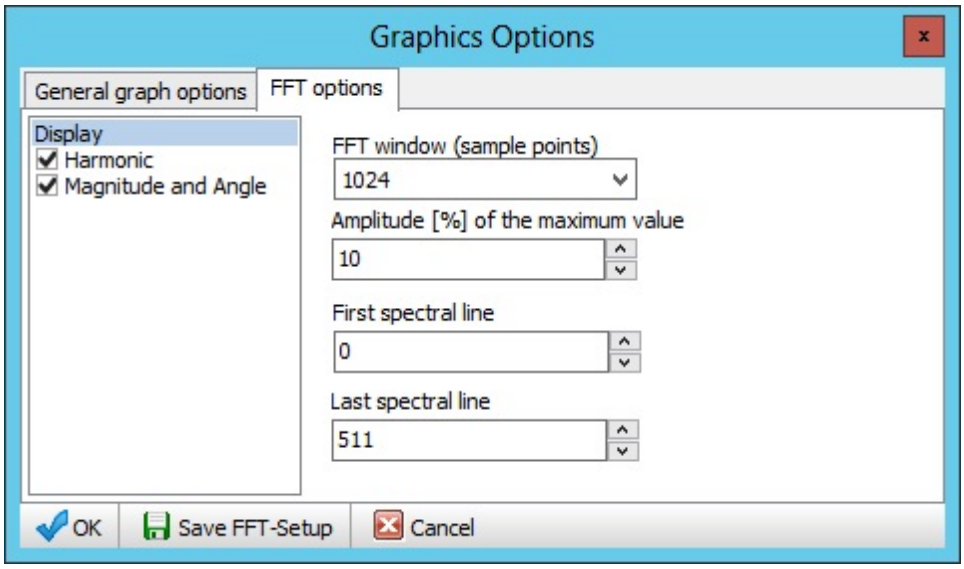
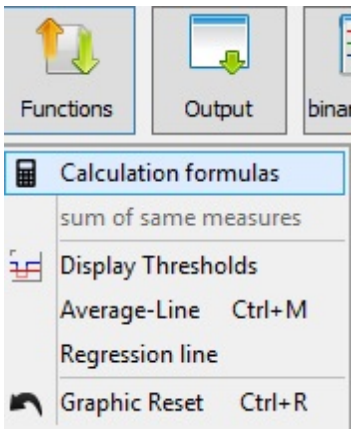


Legend

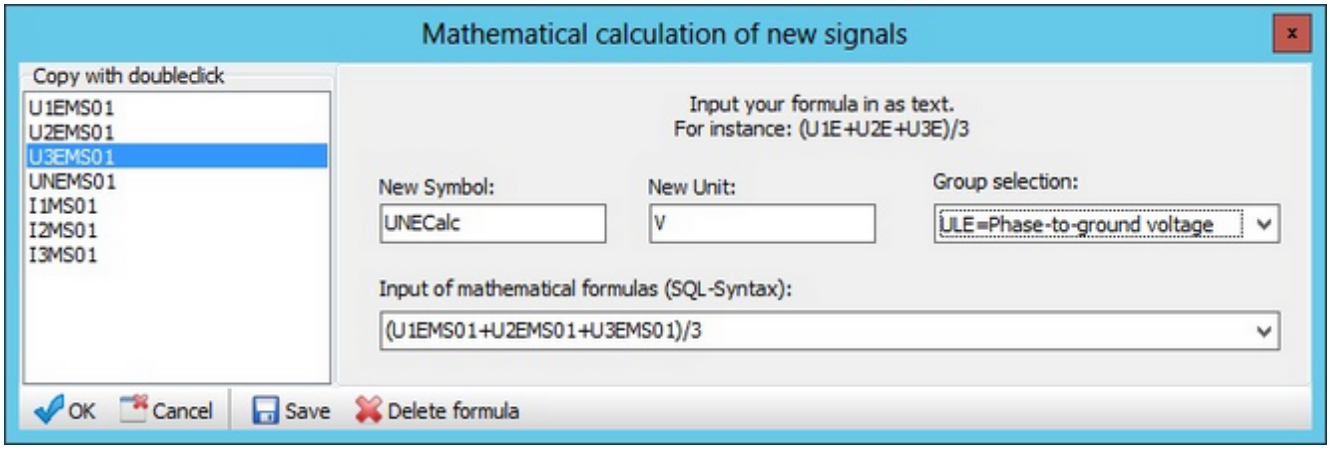


FFT setup

Calculation - Adding a formula

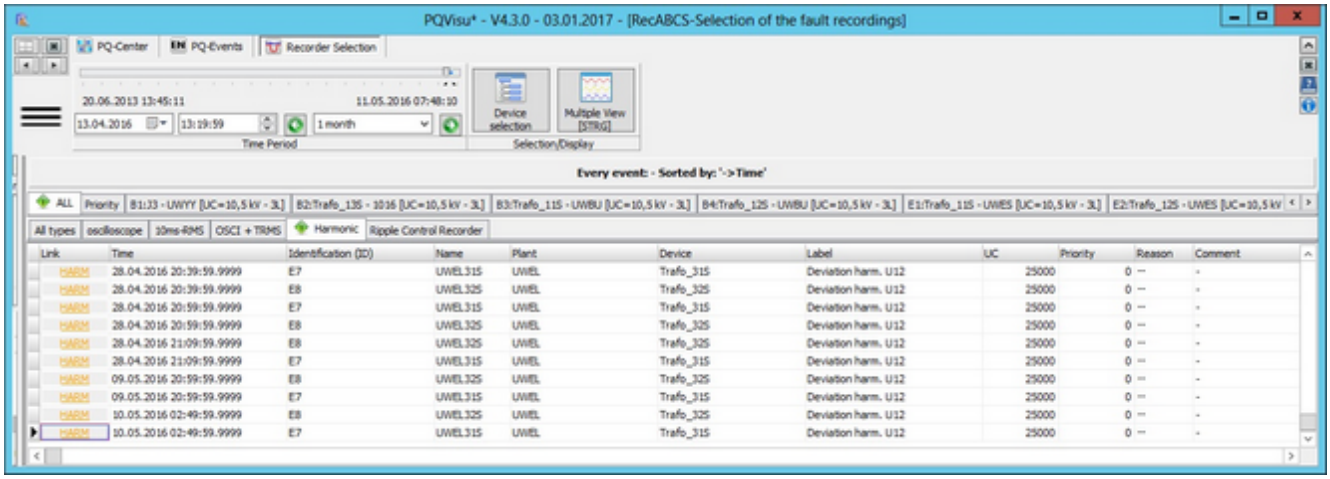


Adding a formula enables you to use measured channels to calculate and display a virtual channel. The formula is based on normal program language syntax (in the example, the phase-to-earth-voltage sampling values are used to calculate the residual voltage). In order to display the calculated signal correctly, other information is required such as symbol, unit and group. All other actions are the same as the measured signals.



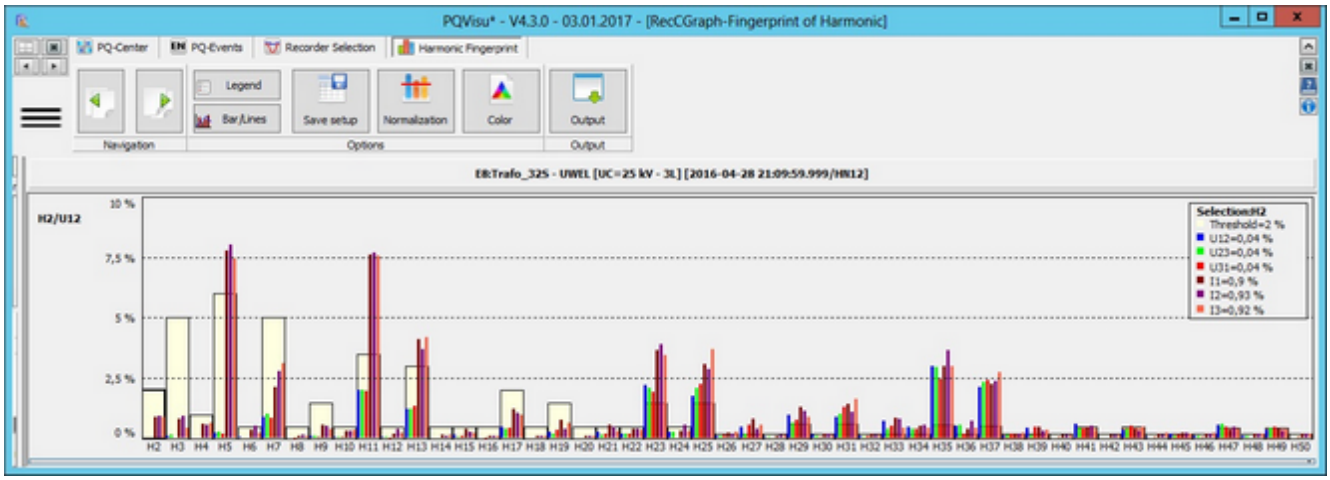
Harmonics recorder

Enabling the 'HARM-Harmonics' page displaysa list of the frequency spectrums for voltage and current harmonics (in the event that the THD threshold or an individualvoltage harmonic is exceeded). All of the control elements such as calendar, comments etc, are the same as those for the previously described recorders.



Clicking on the 'HARM' buttons at the beginning of the event rows displaysthe respective harmonics recording.

Example: Spectrums of voltages U12; U23; U31; UNE and currents L1; L2; L3



The diagram shows the respective EN 50160 and IEC 61000-2-2 (12) compatibilitylevels for each voltage harmonic, as well as the voltage and current levels at the time the threshold was exceeded (10-min average). Clicking on the harmonic changes the legend for the current harmonic (in the figure, H11 with compatibilitylevel = 3.5% and the current 10-minute averages). Here too, you can copy data or graphicsby right-clicking.

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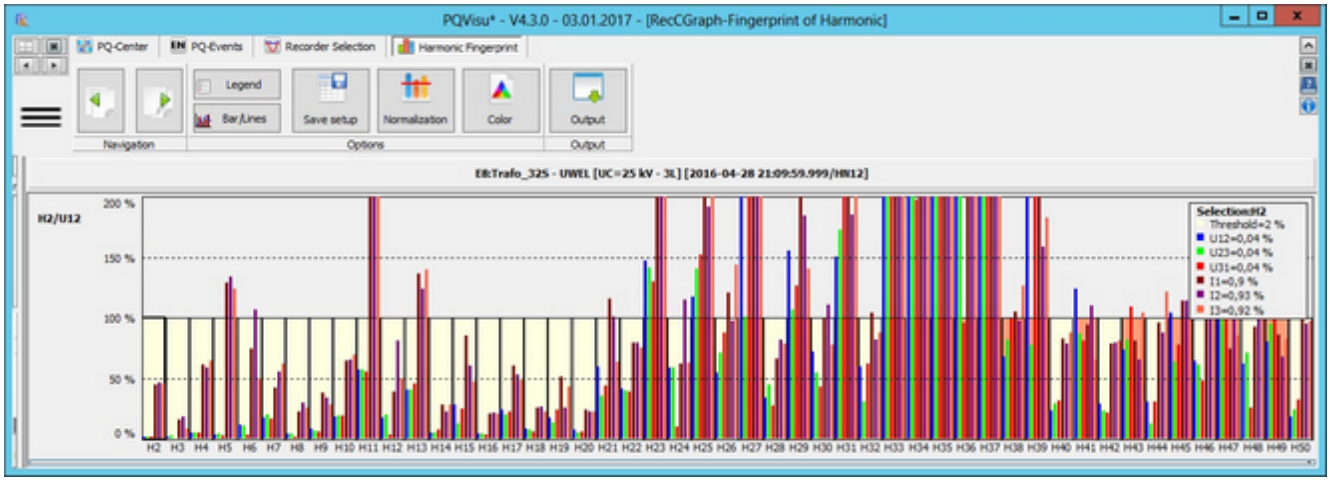
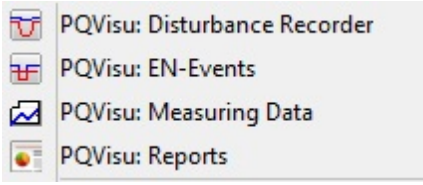


If the 'Standardize' option is used, the compatibility level (according to EN standard or the device setup) is used as 100% value in the display. Harmonics with a small absolute value stand out better against the threshold.

PQ events

In PQStart, you can access a table with the recorded PQ events for a specific device.



The following PQ event classes are displayed:

- 10-ms events (e.g., voltage dips and swells)
- 200-ms events (influenced by ripple control signals)
- 10-second events (frequency deviation)
- 10-min events (THD, unbalance etc.)
- 2-hour events (long-term flicker)

Events as tables:

This pane lists all of the power quality events and links the entries in the table to error logs (to the extent that the recorder recorded them). The measuring system enables you to define trigger thresholds for error logs irrespective of the EN 50160 settings. You can use the same filters that are described under 'Recorder'.

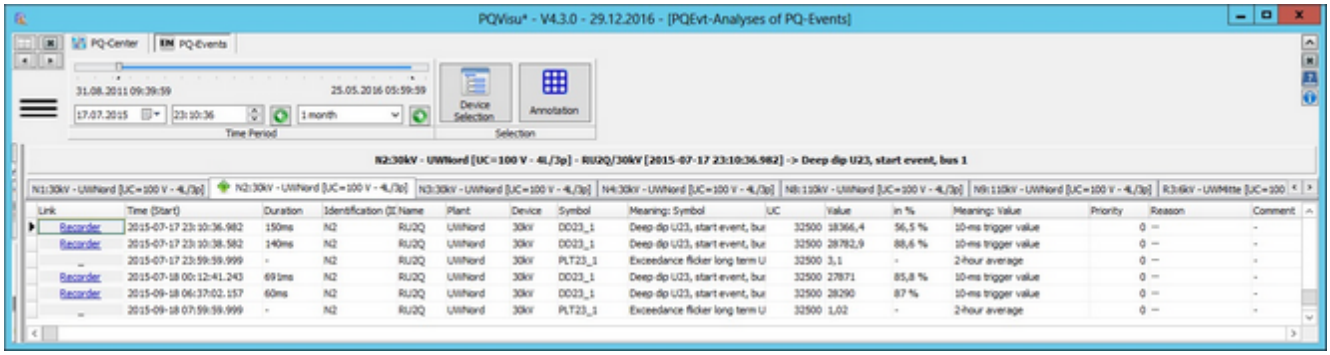


Figure: Event table of a device that is displayed by clicking on 'PQ events' in the context menu

The following important information is displayed:

- Start of the event
- Fault duration
- Type of PQ violation
- Agreed voltage
- Extreme value in 'V' and '%'

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If an error log was created at the same time that the PQ event occurred (the PQI-D devices trigger thresholds for logs and events independently of each other), a blue button will be displayed. Clicking on it will display the associated oscilloscope image or the 10-ms RMS recorder.

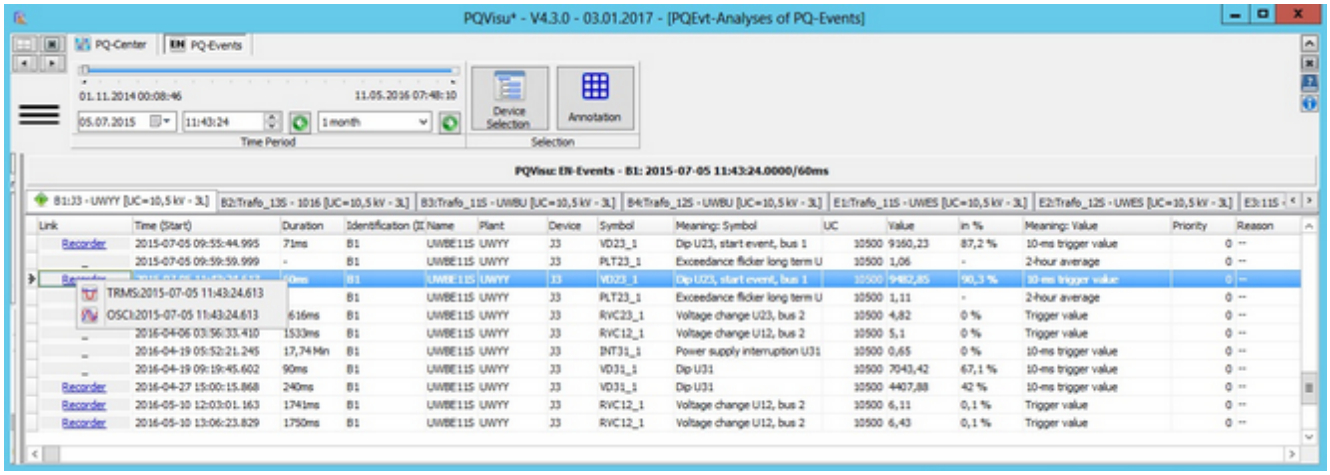
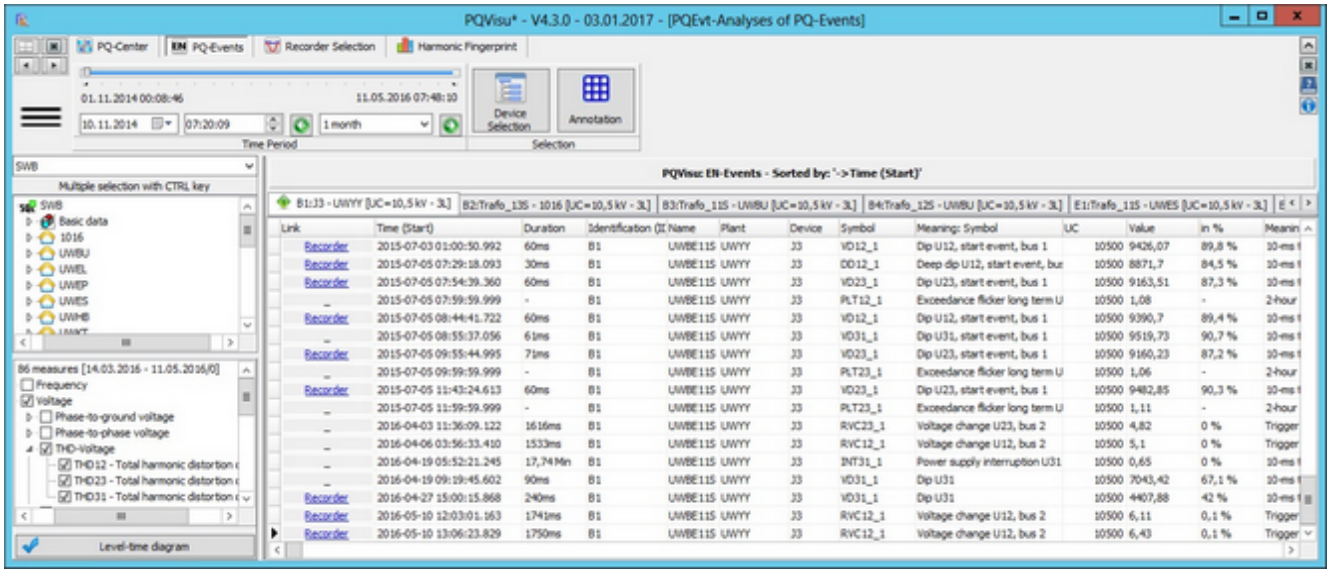


Figure: Selection menu for error logs generated by a PQ event

Displaying the event table



You can display PQ events by clicking on 'PQ events' or directly from the device menu in PQStart. The data that are displayed are stored in the PQEvent table. This table is under Basic data.

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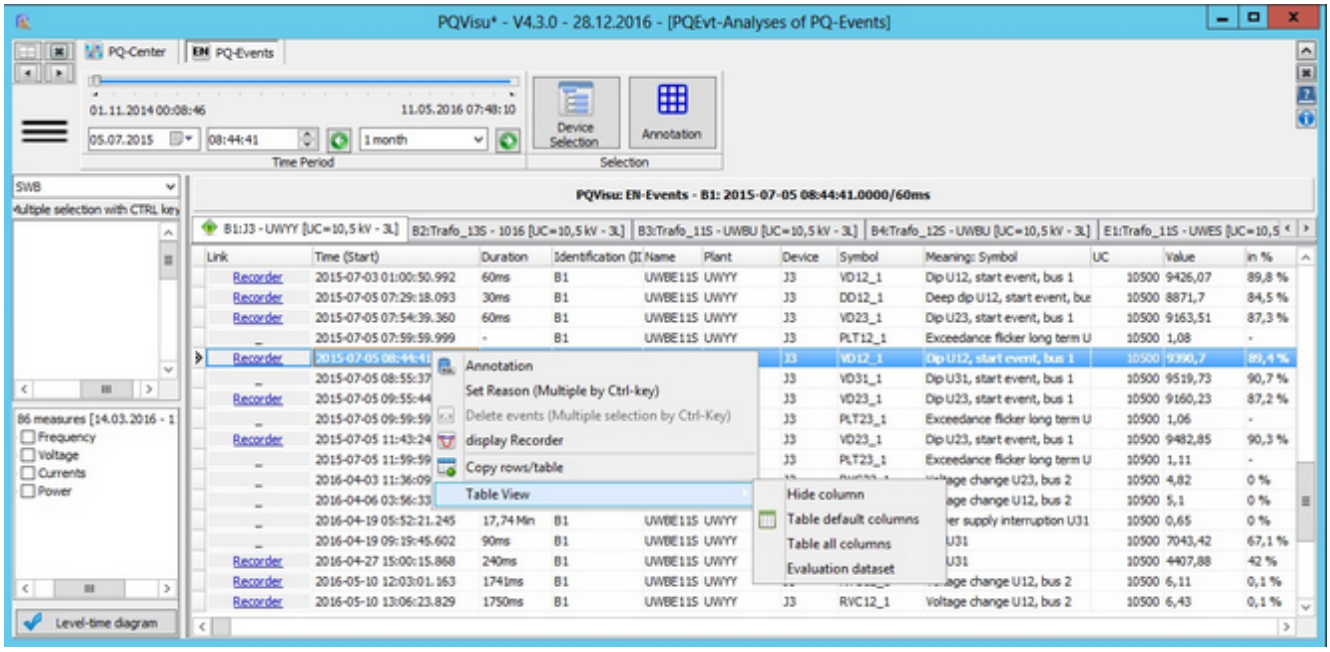
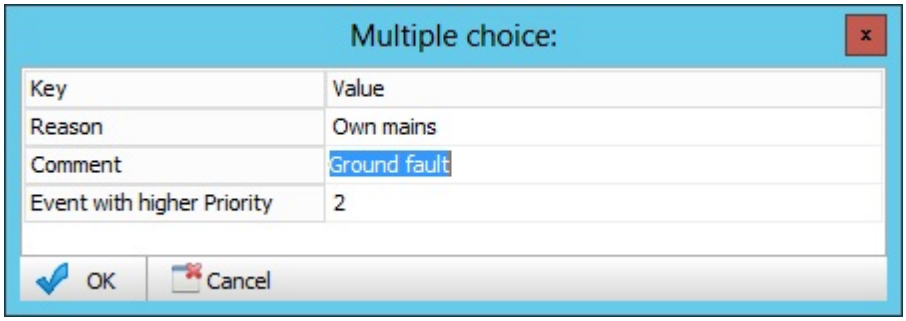
Context menu



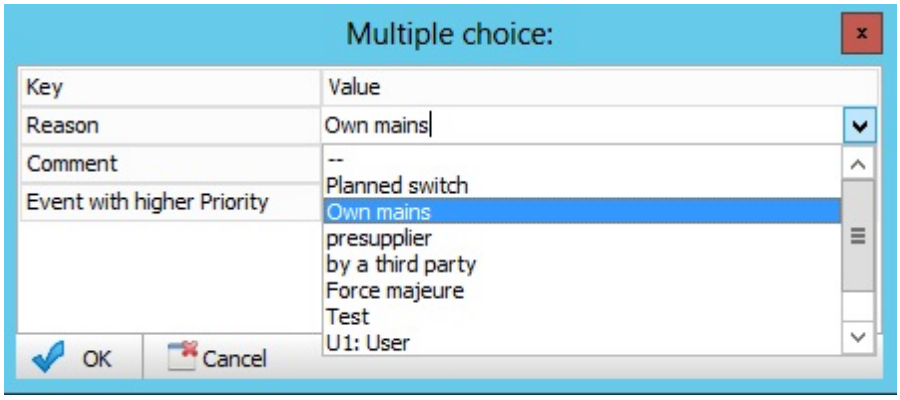
In the Context menu, you can add reasons to events ('Add reason') or delete events.

Press and hold the Ctrl key on the PC keyboard to select several events.

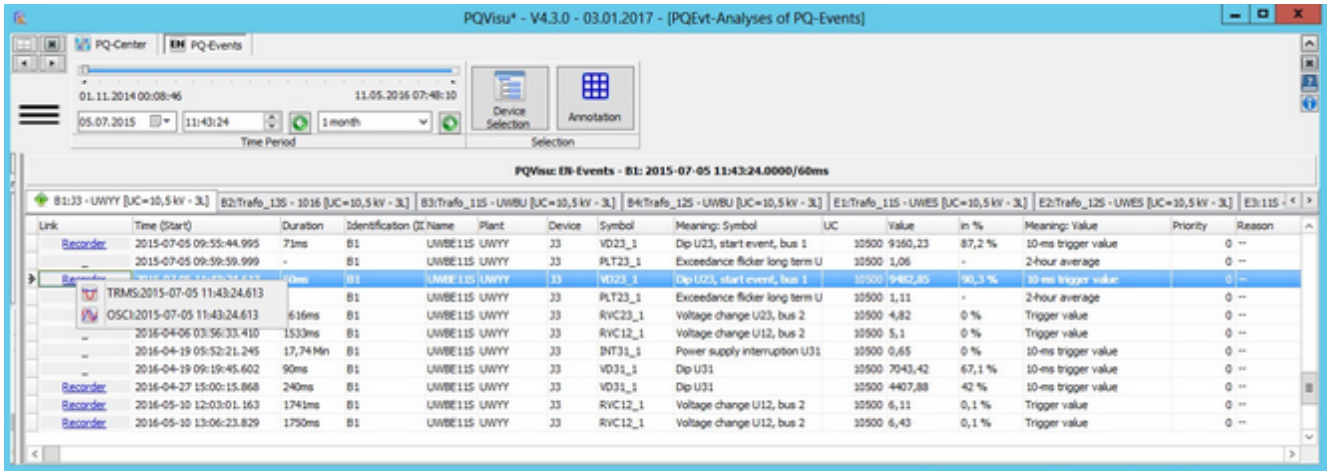
The reason is added in a separate pop-up window.The entry/selection is done in a small pane that displays at the end:



The reason's type is decided by the classification in the PQ reports. An event that is added, for example, with a 'Test' or 'Planned switch' reason is not displayed in the PQ reports.



Viewing and analyzing PQ events



- Time and duration of an event: The duration in older firmware versions is calculated from the time at which the device started and stopped. In the current versions, the devices send a duration event.
- The columns: 'ID', 'Name', etc are used to identify the location at which the measuring devices is installed, the voltage level, etc.
- The link to PQ events with possible error logs is laid by entries in the 'Link' column.
- Because there is no direct link in PQI-D between a PQ event and an error log, the Rec A/B entry must be interpreted as follows:
  - When it is clicked, the program uses the time criterion to search for matching error logs.
  - All of the recordings that the system finds are added to a local menu where the user can select a log to display.
  - Regardless of the log that is selected, all of the suggested elements are sent to the display form and can be displayed next to each other by browsing.
- Followed by the columns UC, Value, in %. If it is useful (e.g. voltage dip, over voltage) the extreme values of the event are displayed absolute and in percent.
- The last three columns are editable. It is possible to classify and comment the events with the help of this columns.

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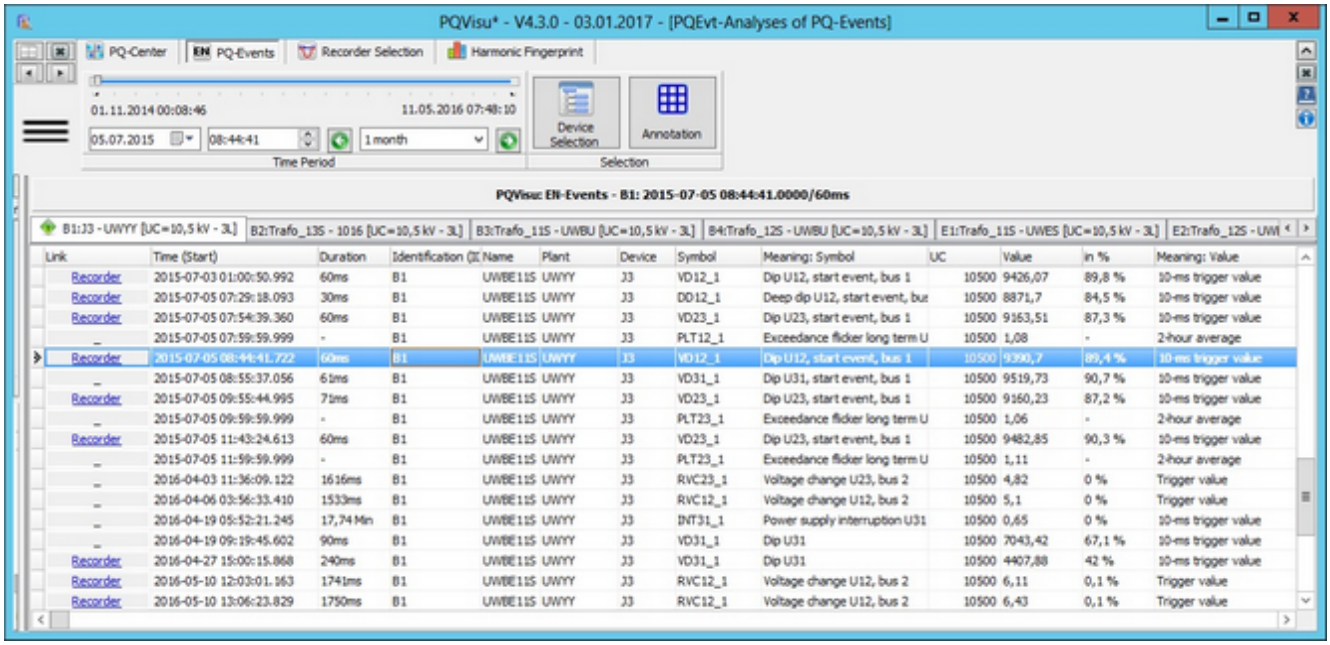
Event depth - Agreed voltage



The agreed voltage UC, the depth of the dip in volt and percent to the UC value can be read directly from the table.

The columns 'Reason', 'Comments' and 'Severity' are processed as described in the document on the error logs.

In addition:

- Table cells can be marked (e.g. to indicate that additional action is needed) by pressing the Ctrl key and right-clicking or by pressing and holding the Shift key and selecting the table cells with the up or down arrow keys.
- Use the sort function above the column header (in the figure, →event symbol) to search for specific event types. There are table fields that belong (e.g. event symbol or value) to the underlying SQL table. You can sort these fields without restriction. Other fields are 'calculated' fields (e.g. the columns 'Plant' and 'Description'). 'Calculated fields' are gathered and added to the table when the dataset is output. You cannot sort on these fields. The program decides which alternatives are meaningful, for example, sorting by device ID.
- You can use the 'Priority' field at your discretion (in terms of relevance). Numbers 0 to 9 are allowed. On the 'Priority' tab, you can determine that only events with a value>0 are displayed.

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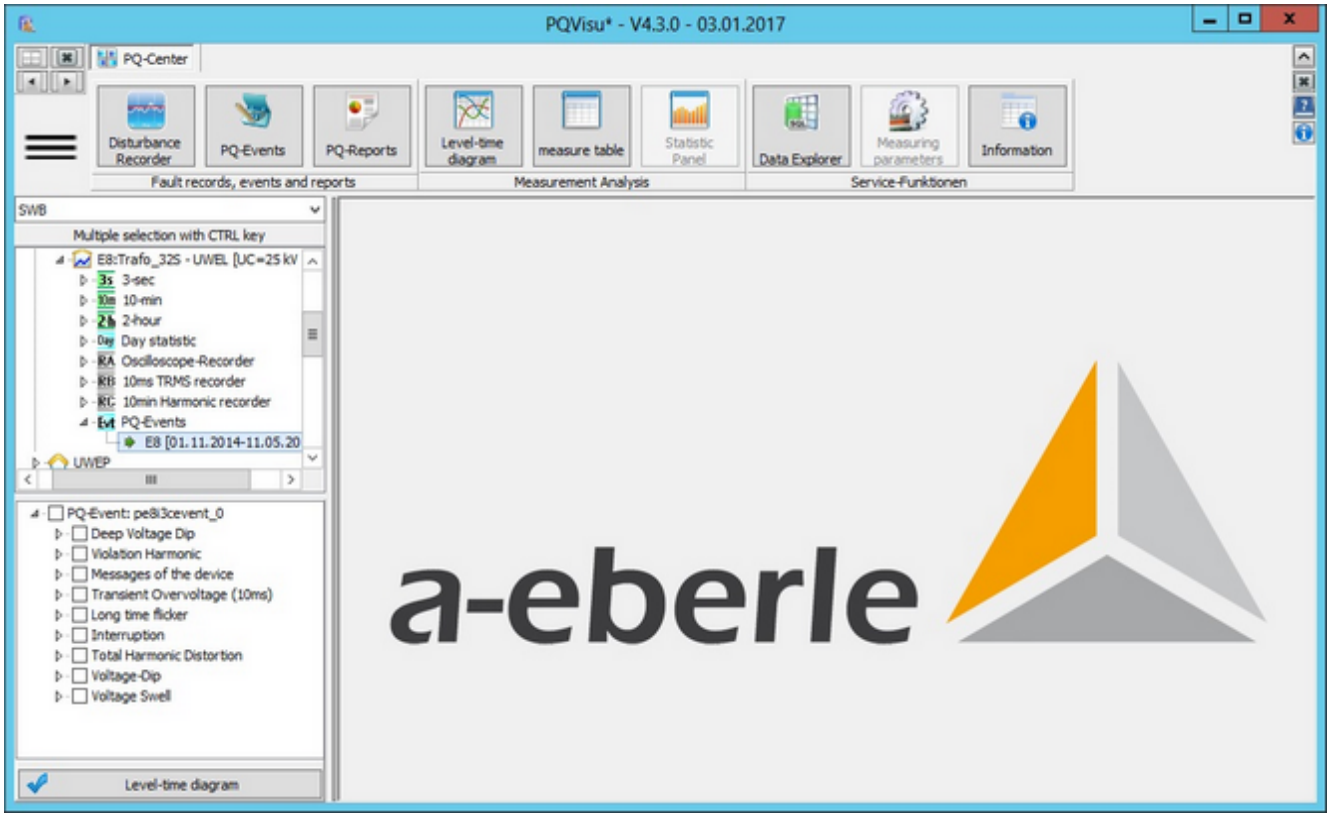
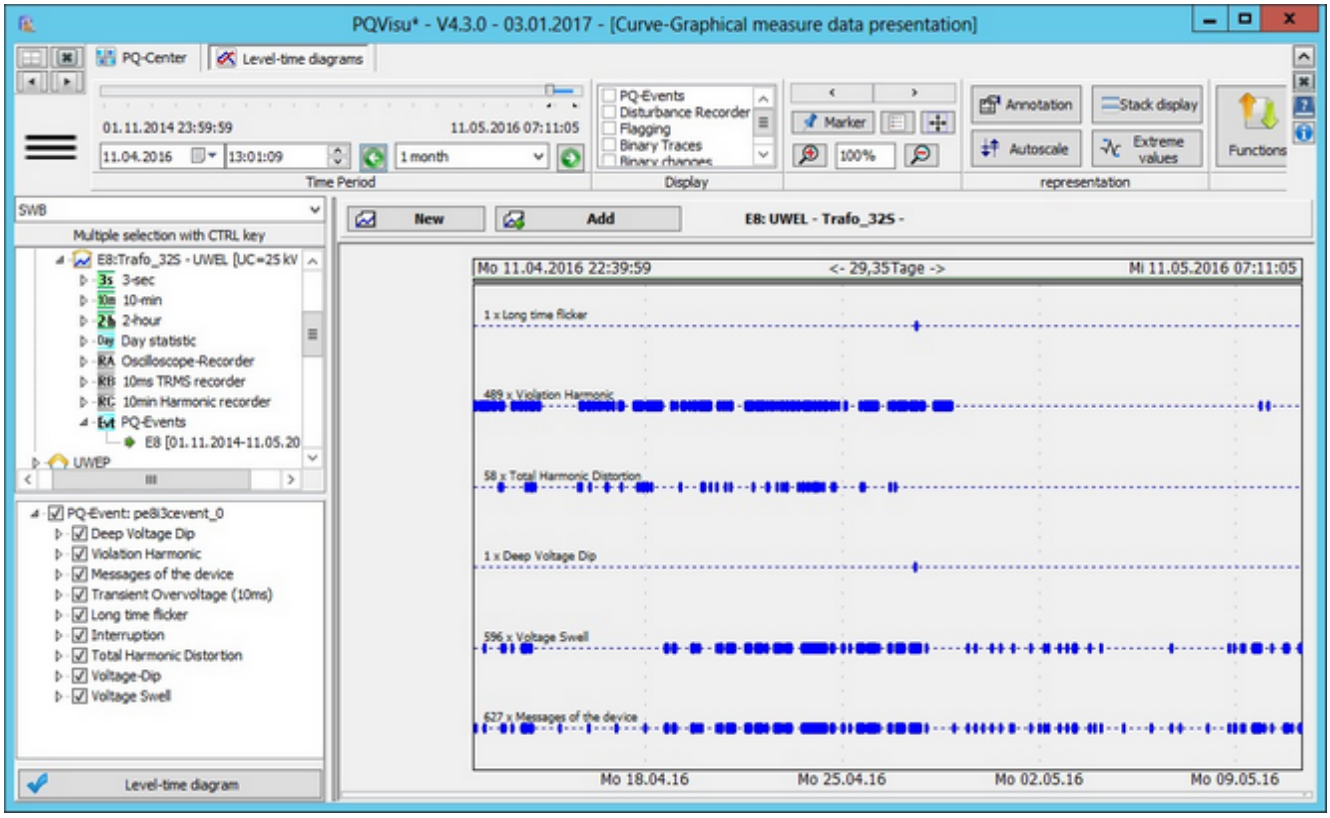
Displaying data from the device's event tables



- This table displays the event list that is generated by the device. Filters can only be set directly on the device above the event filter mask.
- A device-specific event table contains both 'Power quality events' and 'Other notifications'.
- There are two ways to display these data:
  - level-time diagram (the name is misleading but corresponds to the view components used)
  - event table
- Right-click for more filter and sort options.

Graphical event view



A diagram displays after the graphical view has been activated:

- The events are grouped and displayed by time.
- The description and the number of events (e.g., '18 x voltage dip') are displayed in the selected period.
- The 'Right', 'Left' and 'Calendar' time scroll functions correspond to those for the curve progressions.

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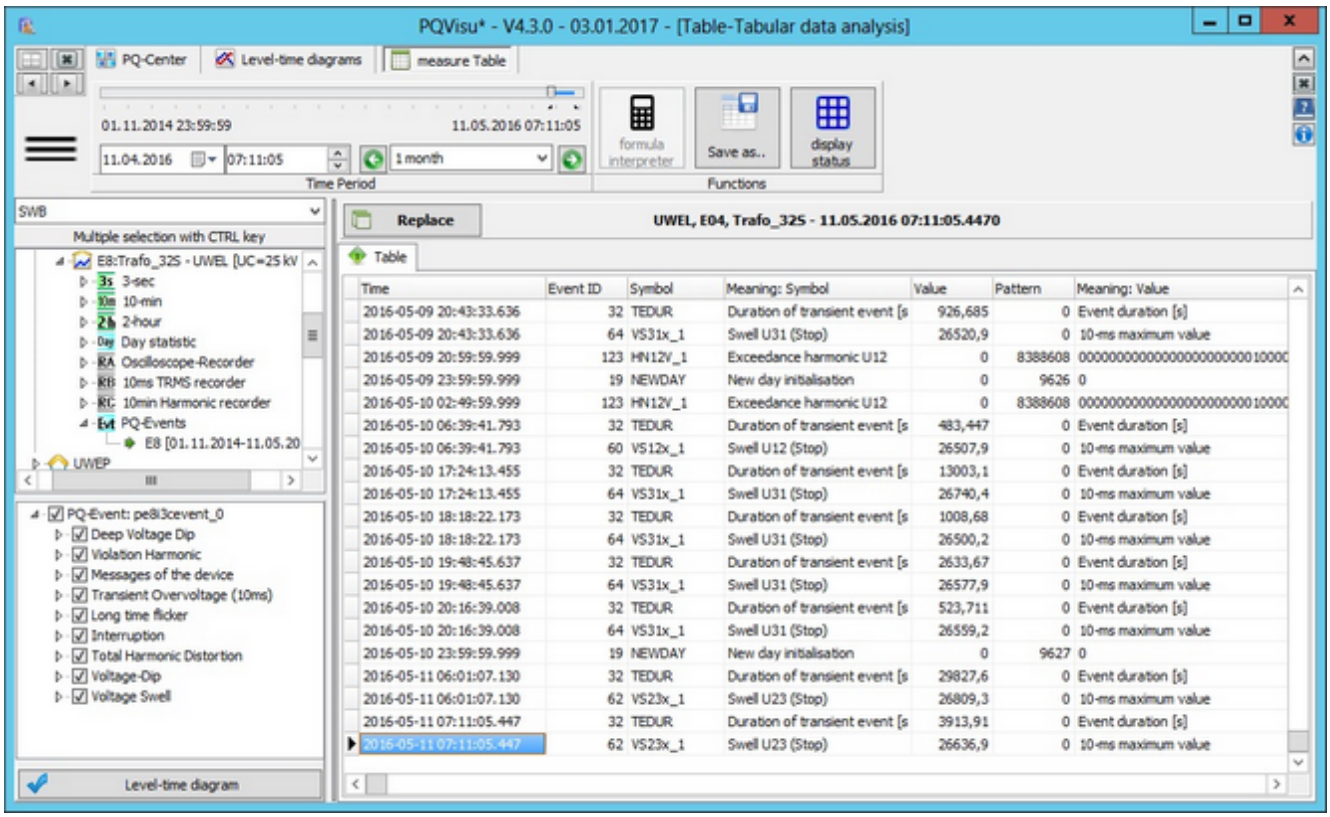
Tabular event view:



- Another option is to display the events in a table.
- Text columns such as 'Description' and 'Value' are not part of the table. They are generated and added to the table when it's displayed.
- Clicking on a column description sorts its contents.

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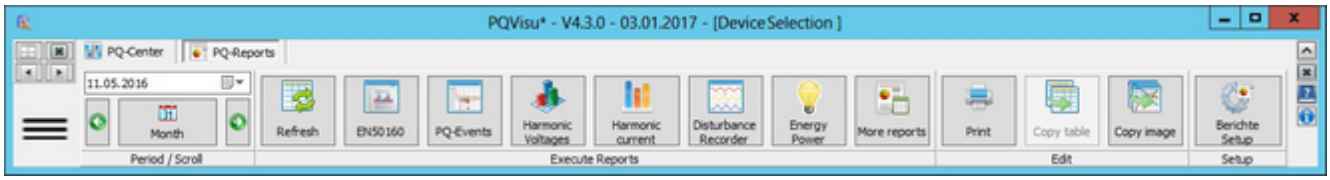
Power quality reports

First, the basic approach of designing and executing reports is described.

In the PQVisu you can access the 'Reports'



Select reporting period	Select report	Output and setup

The sections of the button bar on this card are:

- Period/Scroll: This selects the start date and the period of a report.
- Run reports: Each button displays a menu from which the desired report can be selected.
- Edit: Service for printing, copying data and similar functions.
- Setup: An extensive dialog box appears in which the parameters of the reports can be set.

Reports are partly interactive (e.g., UNIPEDE with the option to display matching error logs or 3D reports with a rotation option). Reports are always generated for a specific time window. The data selected in the calendar are always in the reporting period. Weekly reports always start on Monday, monthly reports on the first day of the month etc. Use the arrow keys to move to the next time window. Use Device selection to determine the device data that should be in the report. The program also makes its own decisions, e.g. power reports cannot be generated for devices that do not have power inputs.

The following figure shows the dialog to select devices that must be filled in before a report can be created. The hierarchy corresponds to the initial device sorting. There are reports in which the data of device groups or the data of all devices are summarized in a report (picture below, with the possibility of multiselection) and those which show only the data of a single device (by selecting a new item the previous one is automatically removed). In multiselection dialogs, a group section is displayed to improve the speed of the group assignment for repetitive tasks.

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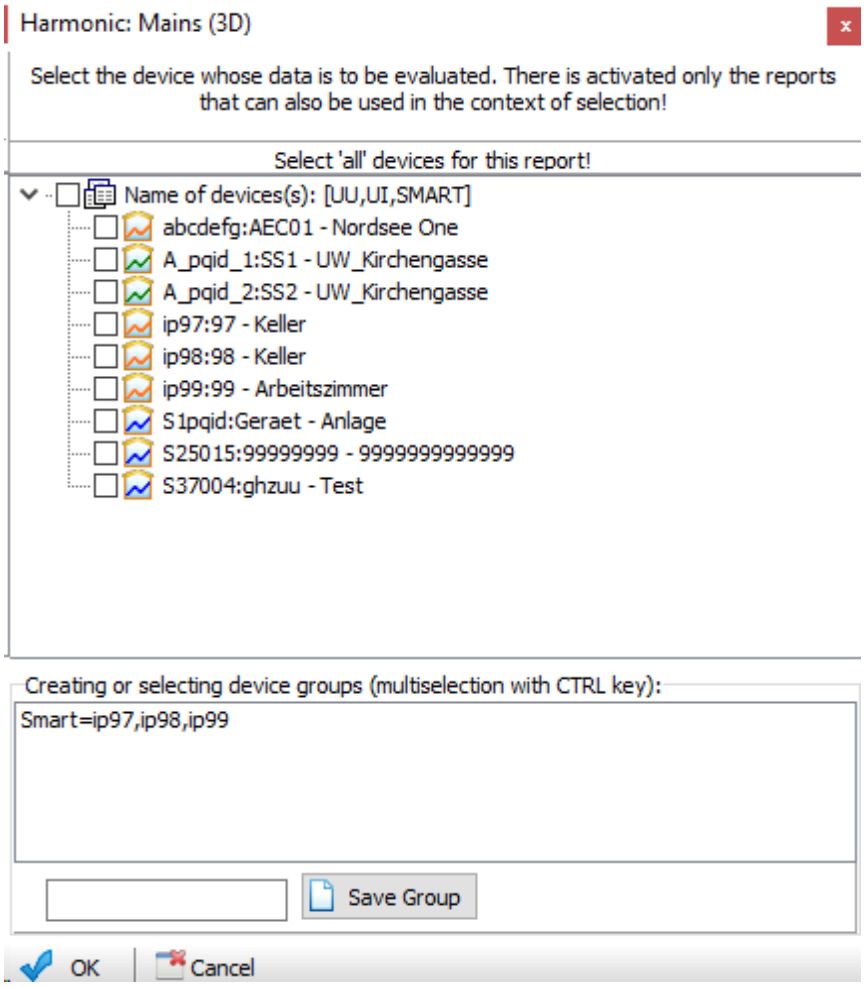

The following reports can be created (the outline corresponds to the layout on the Report toolbar). The following guidelines apply:

- 'Device' indicates that the evaluation can be executed for only one device at a time.
- 'Network' indicates that an evaluation is possible on all devices.
- The entries marked with 'Print' are report forms which cannot be further influenced (for instance a PDF file can be generated directly from this).

At this point, basic information on navigation in the 3D representations is given.

The left navigation field with the slider opens the possibility of changing the size (Alternatively, this behaviour can also be achieved by turning the mouse wheel):

1. '+' Magnification
2. '-' Reduction.

The circular navigation field allows the rotation of the graphic in the indicated four directions:

1. '<', '^', '>' Stepwise rotation,
2. 'R' Reset to the initial state.

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EN 50160 device: Full overview (print)

The EN 50160 report is a comprehensive 4-page single-device report that can be generated and printed for several devices at a time. The displayed data are calculated from the 10-minute averages and PQ events:

- Page - Overview of all of the parameters in accordance with EN 50160 and compatibility level
- Page – View of all of the voltage harmonics, scaled to the threshold
- Page – Table of all of the voltage harmonics and their thresholds
- Page – Overview of all PQ events and ITIC view of all of the voltage swells and dips

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Preview

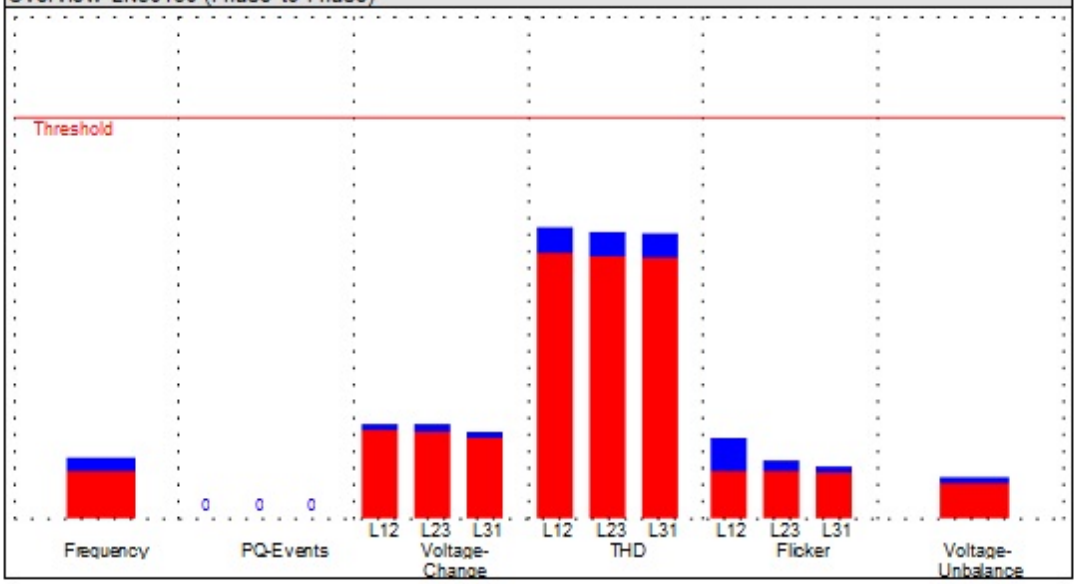
75% 1 of 5 Close

Comment: PQVisu Start: Sonntag 01.05.2016 Duration: 31Tage	Company Full overview device	a-eberle

Plant Name	Field name	Device name
UW Carl Zeiss	UST 81314	J24

Agreed voltage	21 kV	Voltage system	3-wire-network
Nominal frequency	50 Hz	Reason of recording	Permanent recording
Ripple control frequency	5 Hz		

Overview EN50160 (Phase-to-Phase)

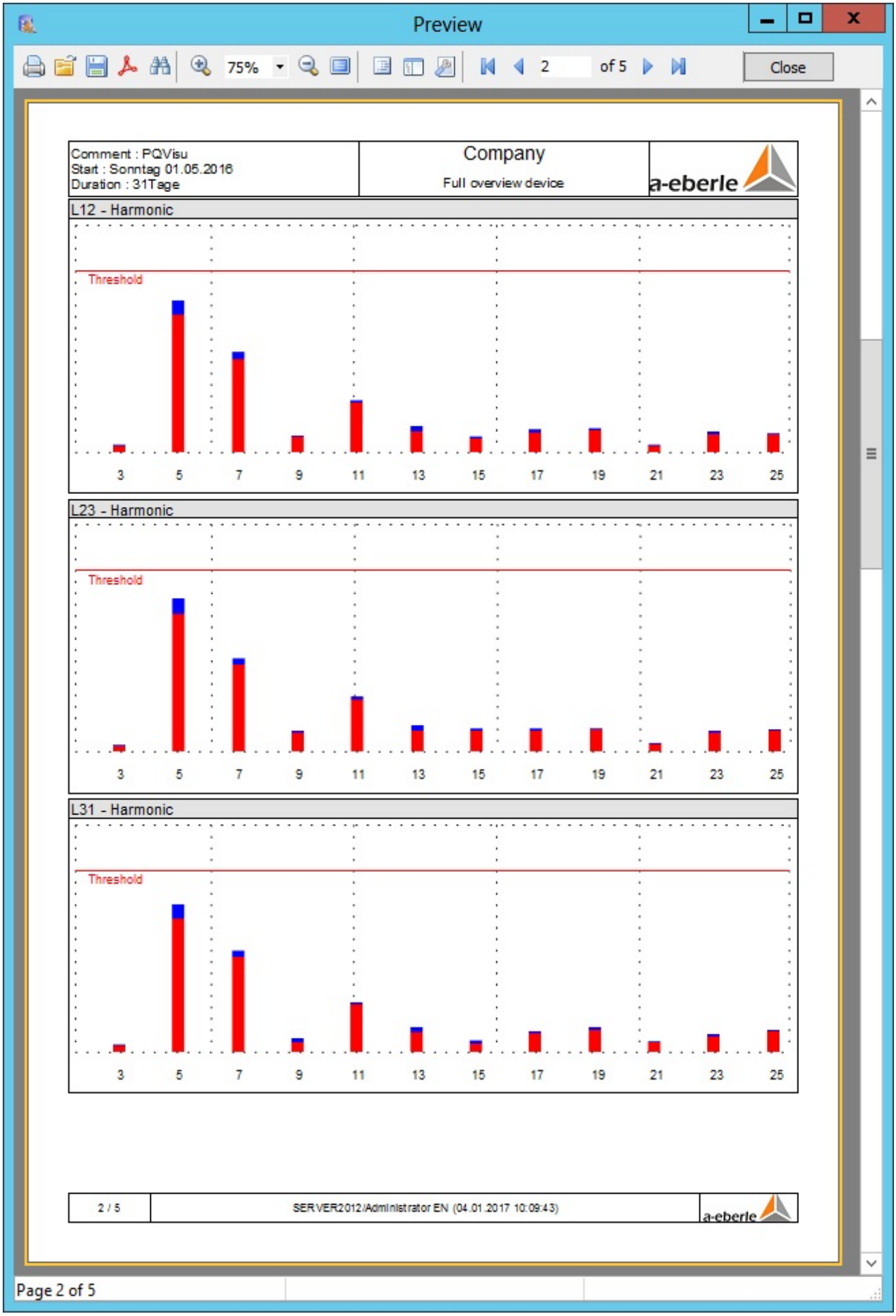


Norm details (Phase-to-Phase)

	Minimum	Lower X%-value	Upper X%-value	Maximum	Lower threshold	Upper threshold	Valid intervals (Total*)
Frequency (X=99,5 %)	49,93 Hz	49,95 Hz	50,06 Hz	50,08 Hz	49,5 Hz	50,5 Hz	496 (496)
Voltage U12 (X=99 %)	20,51 kV	20,54 kV	20,83 kV	20,85 kV	18,9 kV	23,1 kV	496 (496)
Voltage U23 (X=99 %)	20,51 kV	20,55 kV	20,84 kV	20,85 kV	18,9 kV	23,1 kV	496 (496)
Voltage U31 (X=99 %)	20,55 kV	20,58 kV	20,88 kV	20,89 kV	18,9 kV	23,1 kV	496 (496)
Unbalance (X=95			0,17 %	0,21 %		2 %	496 (496)
Flicker PLT12 (X=95			0,12	0,2		1	41 (41)
Flicker PLT23 (X=95			0,12	0,14		1	41 (41)
Flicker PLT31 (X=95			0,11	0,13		1	41 (41)

1 / 5	SERVER2012/Administrator EN (04.01.2017 10:09:43)	a-eberle

Page 1 of 5


Preview
75%
2
of 5
Close
Comment : PQVisu
Start : Sonntag 01.05.2016
Duration : 31Tage
Company
Full overview device
a-eberle
L12 - Harmonic
Threshold
3 5 7 9 11 13 15 17 19 21 23 25
L23 - Harmonic
Threshold
3 5 7 9 11 13 15 17 19 21 23 25
L31 - Harmonic
Threshold
3 5 7 9 11 13 15 17 19 21 23 25
2 / 5
SERVER2012/Administrator EN (04.01.2017 10:09:43)
a-eberle
Page 2 of 5

Preview

100% 3 of 5 Close

Comment : PQVisu Start : Sonntag 01.05.2016 Duration : 31Tage	Company Full overview device

Harmonic

	Threshold	L12 - 95%	L12 - Max	L23 - 95%	L23 - Max	L31
THD	8 %	5,289 %	5,783 %	5,226 %	5,717 %	5
2	2 %	-	-	-	-	
3	5 %	0,183 %	0,196 %	0,14 %	0,159 %	0
4	1 %	-	-	-	-	
5	6 %	4,534 %	5,02 %	4,543 %	5,031 %	4
6	0,5 %	-	-	-	-	
7	5 %	2,554 %	2,751 %	2,372 %	2,564 %	2
8	0,5 %	-	-	-	-	
9	1,5 %	0,125 %	0,14 %	0,155 %	0,173 %	
10	0,5 %	-	-	-	-	
11	3,5 %	0,947 %	0,998 %	0,991 %	1,051 %	0
12	0,5 %	-	-	-	-	
13	3 %	0,348 %	0,429 %	0,344 %	0,433 %	0
14	0,5 %	-	-	-	-	
15	0,5 %	0,037 %	0,043 %	0,056 %	0,062 %	0
16	0,5 %	-	-	-	-	
17	2 %	0,22 %	0,246 %	0,226 %	0,248 %	0
18	0,5 %	-	-	-	-	
19	1,5 %	0,178 %	0,198 %	0,18 %	0,189 %	0
20	0,5 %	-	-	-	-	
21	0,5 %	0,018 %	0,02 %	0,02 %	0,021 %	0
22	0,5 %	-	-	-	-	
23	1,5 %	0,148 %	0,166 %	0,156 %	0,175 %	0
24	0,5 %	-	-	-	-	
25	1,5 %	0,146 %	0,156 %	0,167 %	0,175 %	0

Page 3 of 5

Preview

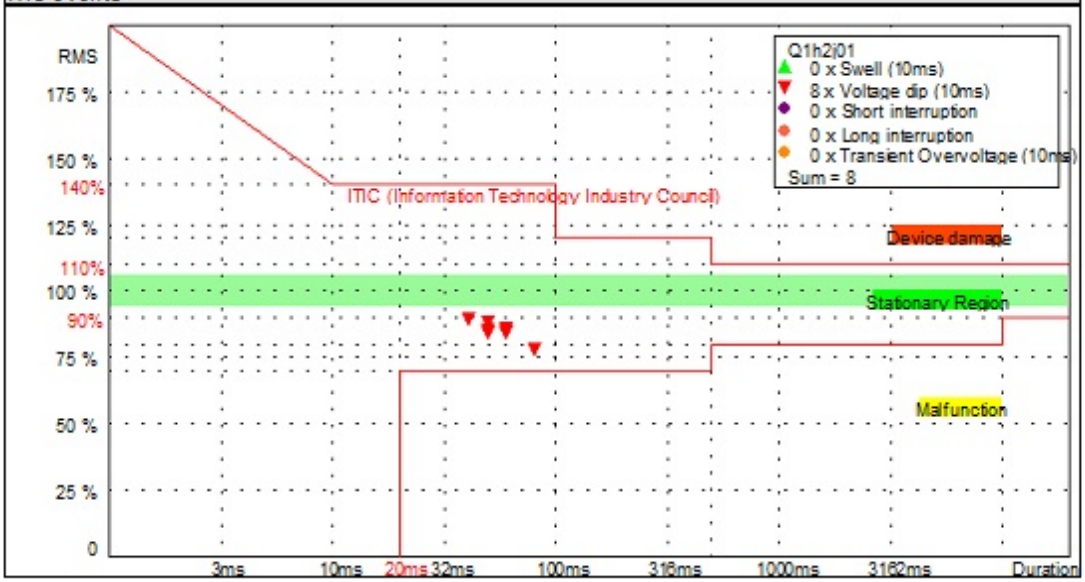
75% 4 of 5 Close

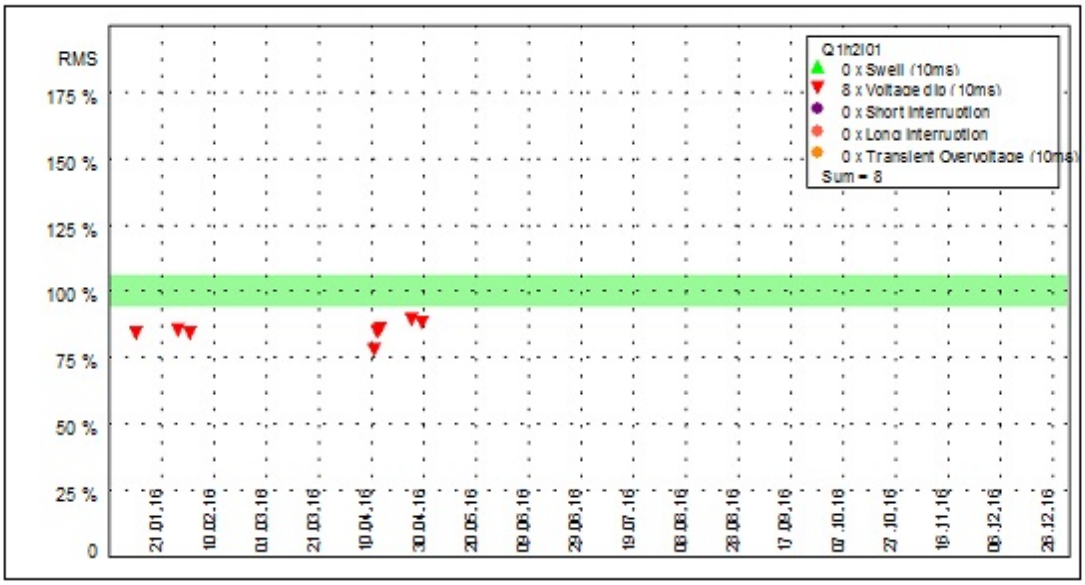
Comment : PQVisu Start : Freitag 01.01.2016 Duration : 366Tage	Company Full overview device	a-eberle

PQ-Events

Frequency deviation	0	Ripple control signal (3s)	0
Transient Overvoltage (10ms)	0	Slow voltage change	0
Swell (10ms)	0	Exceeding long time Flicker	6
Voltage dip (10ms)	8	Exceeding imbalance	0
Rapid voltage change (10ms)	9	THD	0
Supply interruption	0	Exceeding Harmonic	80

ITIC events





4 / 5	SERVER2012/Administrator EN (04.01.2017 10:18:44)	a-eberle

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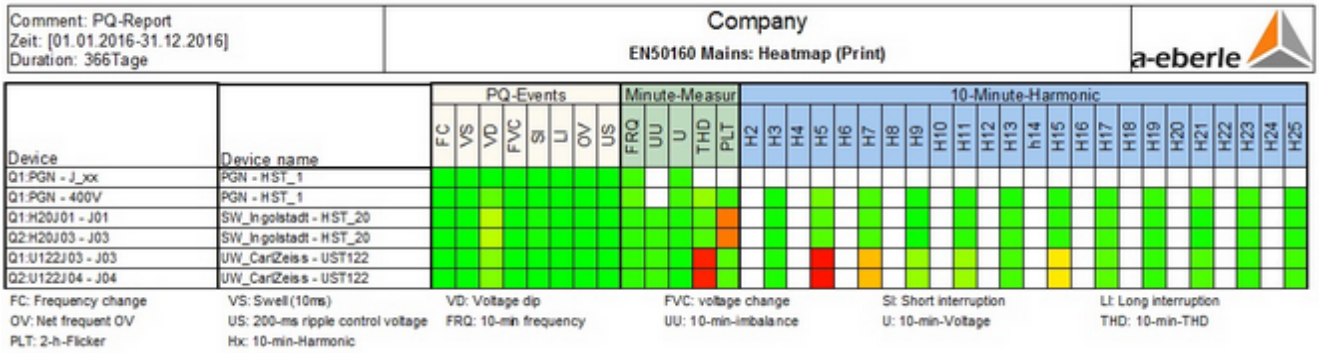
EN 50160 grid: Heatmap (print)

This report can be used to get a quick summary for the power quality situation over many devices.



This view uses a colour scheme to show which PQ parameters are heavily utilized on the grid. Three PQ focus points are observed separately:

- The events (e.g., by counting the 10-ms voltage dips or supply interruption).
- The 10-minute average value is derived from the voltage (frequency, unbalance, RMS voltage and flicker) by observing the nominal value and the allowable deviation in context (95% value).
- The average value of the harmonics in accordance with their EN 50160-based compatibility level.

In the example, these are the 5th and 15th harmonics in particular as well as the load that is generated by the frequency of the voltage swell.

Red = Compatibility level of the specified norm has been exceeded.

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EN 50160 Net: Heatmap (Interactiv)

This is an extend representation of the prior shown Heatmap report. The columns are representing the EN attributes while the rows are representing the devices. The particular EN parameter displays its corresponding value with a color. The color range is from green (close to nominal value) across yellow to red (close to threshold),

The expansion regards:
- all harmonics up to the 50th
- frequency bands from 2 to 9 kHz in a 200 Hz interval

By clicking on a colored panel will show detailed data. This data contains:
- the time lapse of the measure values of all phases
- the quantiles in 1% steps
- a frequency distribution of the measure values
- an intraday heatmap

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EN 50160 grid: Thresholds and events (print)

This view shows the EN criteria in a table. 12 lines are specified for each device. Both nominal values (if available) and threshold values (lower only if appropriate) are displayed. Furthermore, the integration interval, the actual runtime within the evaluation period, and the number of violations are shown. In the last column, the output of the event number is done in blue if the number is greater than 0 and in red if the number is greater than the permissible occurrence of violations in the period.

Comment: PQ-Report
Start: Dienstag 01.12.2015
Duration: 31Tage

Company

EN50160 Mains: Threshold & Events (Print)

a-eberle

		Nominal	UnGrenz	ObGrenze	tegration interv	nissible occurre	Runtime	Violations
Q1:U122-J03 - J03	Frequency	50 Hz	49,5 Hz	50,5 Hz	10sec	0,1 %	31 days	0
	Swell (10ms)	20,5 kV		22,6 kV	10ms	100/Year	31 days	0
	Voltage Dip	20,5 kV	18,5 kV		10ms	100/Year	31 days	1
	Rapid voltage change				10ms	3650/Year	31 days	0
	Short interruption	20,5 kV	2,1 kV		10ms	10/Year	31 days	0
	Long interruption	20,5 kV	2,1 kV		10ms	30/Year	31 days	0
	Transient Overvoltage (10ms)	20,5 kV		41 kV	10ms	10/Year	31 days	0
	Signal voltage [%]			410 V	200ms	1days	31 days	0
	Slow voltage change	20,5 kV	18,5 kV	22,6 kV	10min	5 %	4464 Int.	0
	Unbalance [%]			2 %	10min	5 %	4464 Int.	0
	THD [%]			8 %	10min	5 %	4464 Int.	14
	Harmonic				10min	5 %	4464 Int.	873
	PLT [-]			1 -	2h	5 %	372 Int.	1
Q2:U122-J04 - J04	Frequency	50 Hz	49,5 Hz	50,5 Hz	10sec	0,1 %	31 days	0
	Swell (10ms)	20,5 kV		22,6 kV	10ms	100/Year	31 days	0
	Voltage Dip	20,5 kV	18,5 kV		10ms	100/Year	31 days	1
	Rapid voltage change				10ms	3650/Year	31 days	0
	Short interruption	20,5 kV	2,1 kV		10ms	10/Year	31 days	0
	Long interruption	20,5 kV	2,1 kV		10ms	30/Year	31 days	0
	Transient Overvoltage (10ms)	20,5 kV		41 kV	10ms	10/Year	31 days	0
	Signal voltage [%]			410 V	200ms	1days	31 days	0
	Slow voltage change	20,5 kV	18,5 kV	22,6 kV	10min	5 %	4464 Int.	0
	Unbalance [%]			2 %	10min	5 %	4464 Int.	0
	THD [%]			8 %	10min	5 %	4464 Int.	13
	Harmonic				10min	5 %	4464 Int.	871
	PLT [-]			1 -	2h	5 %	372 Int.	1

This report is only possible for PQI-D/DA due to the available data source (daily statistics data).

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EN 50160 grid: Statistics and events (print)

EN 50160 grid: Statistics and events (print)

In addition to the event frequencies, the quality-relevant measured values of the 10-minute and 2-hour recording are also considered. The X% and the maximum values or the respective measurand are evaluated. The X-value for the observed quantile is user definable (based on the standard, the X-value for the frequency is 99.5% and 95% for the voltage in the 4-wire mains. In the 3-wire mains, the X-value is 99%).

When all of the parameters have been configured, the 'Standard met' column displays 'Yes'. Each of the used X-values is displayed in the legend.

Comment: PQ-Report
Start: Sonntag 01.05.2016
Duration: 31Tage

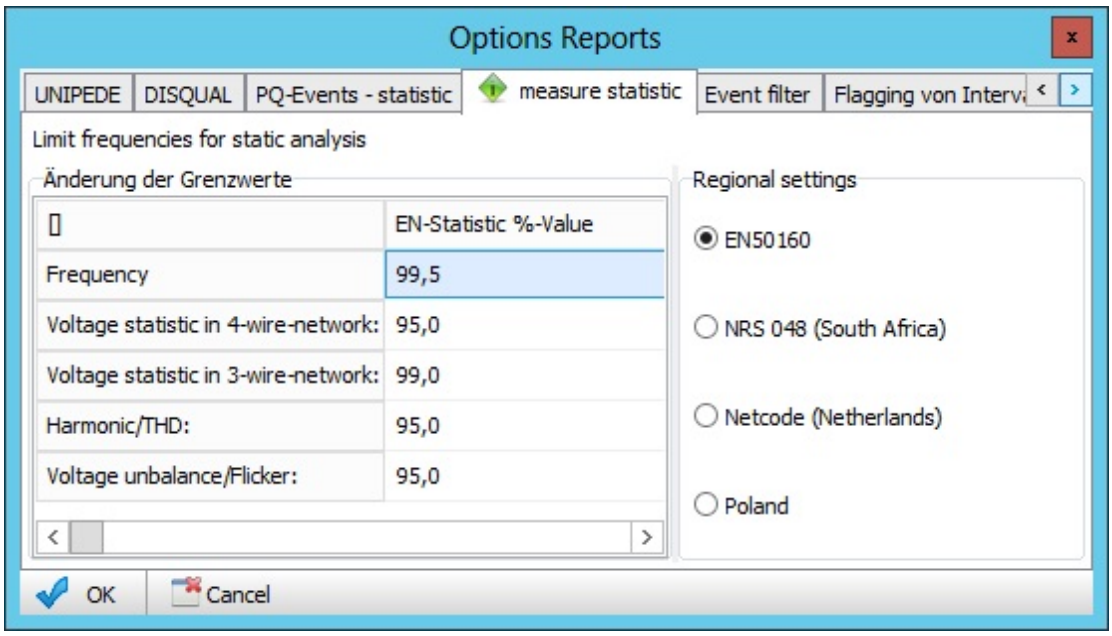
Company
EN50160 Mains: Statistic & Events (print)

a-eberle

Overview Quality Parameter Device name:	Norm satisfied	Number of intervals within X% limits									Number of PQ-Events			
		UC	I10m	F	U	UU	HN	THD	I2h	PLT	NVS	NVD	NI	NFVC
N1:RU1Q - 30kV UWNord - RU1	Yes	32,5 kV	3494	100 %	100 %	100 %	100 %	100 %	283	100 %	0	0	0	1
N2:RU2Q - 30kV UWNord - RU2	Yes	32,5 kV	3500	100 %	100 %	100 %	100 %	100 %	290	100 %	0	0	0	0
N3:RU3Q - 30kV UWNord - RU3	Yes	32,5 kV	3500	100 %	100 %	100 %	100 %	100 %	291	100 %	0	0	0	0
N4:RU4Q - 30kV UWNord - RU4	No	32,5 kV	1945	100 %	100 %	100 %	100 %	100 %	36	100 %	0	15	0	111
N8:Ltg1211 - 110kV UWNord - Ltg121/1	No	112 kV	1957	100 %	100 %	100 %	100 %	100 %	158	100 %	0	0	2	1
N9:Ltg1212 - 110kV UWNord - Ltg121/2	Yes	110 kV	2874	100 %	100 %	100 %	100 %	100 %	184	100 %	0	0	0	1

UC - Agreed voltage | I10m: 10-Minute-Interval | F: Frequency | U: Voltage
UU: Unbalance | HN: Harmonic | THD: THD
I2h: 2-Hour-Interval | PLT: Flicker PLT
NOV: Swell (10ms) | NDD: Network collapse | NI: Interruption | NFVC: Rapid voltage change
Frequency X=99,5 % THD/Harmonic X=95 % Flicker/Unbalance X=95 %
Voltage 3-Wire-Network X=99 % 4-Wire-Network X=95 %

The results



Configuring the X% values

Note: PQReport is used to calculate the EN50160 grid: Heatmap (print) report. Please make sure that PQReport starts automatically as described in the Commissioning Instructions.

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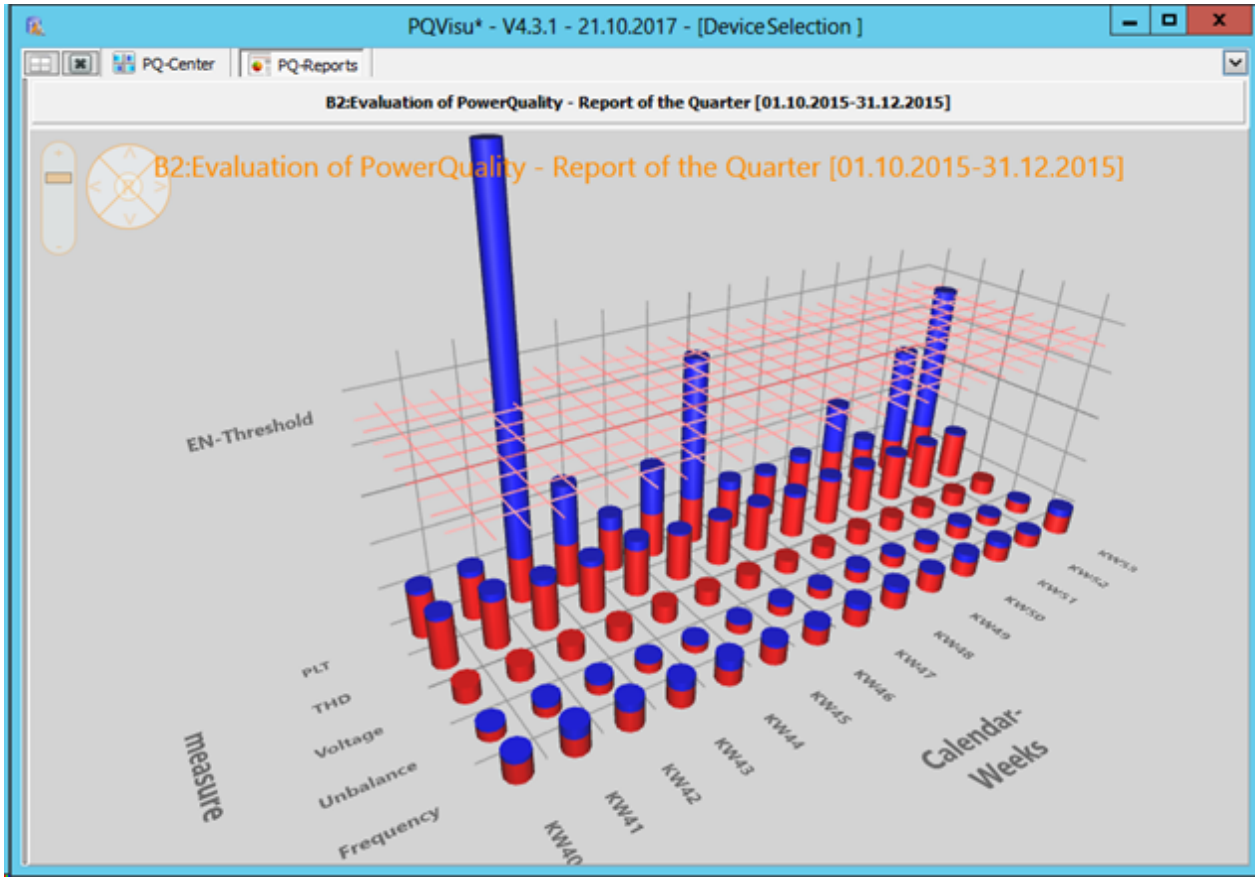
EN 50160 device: In the selected period (3D)

In these 3D representations, the following quantities are considered:

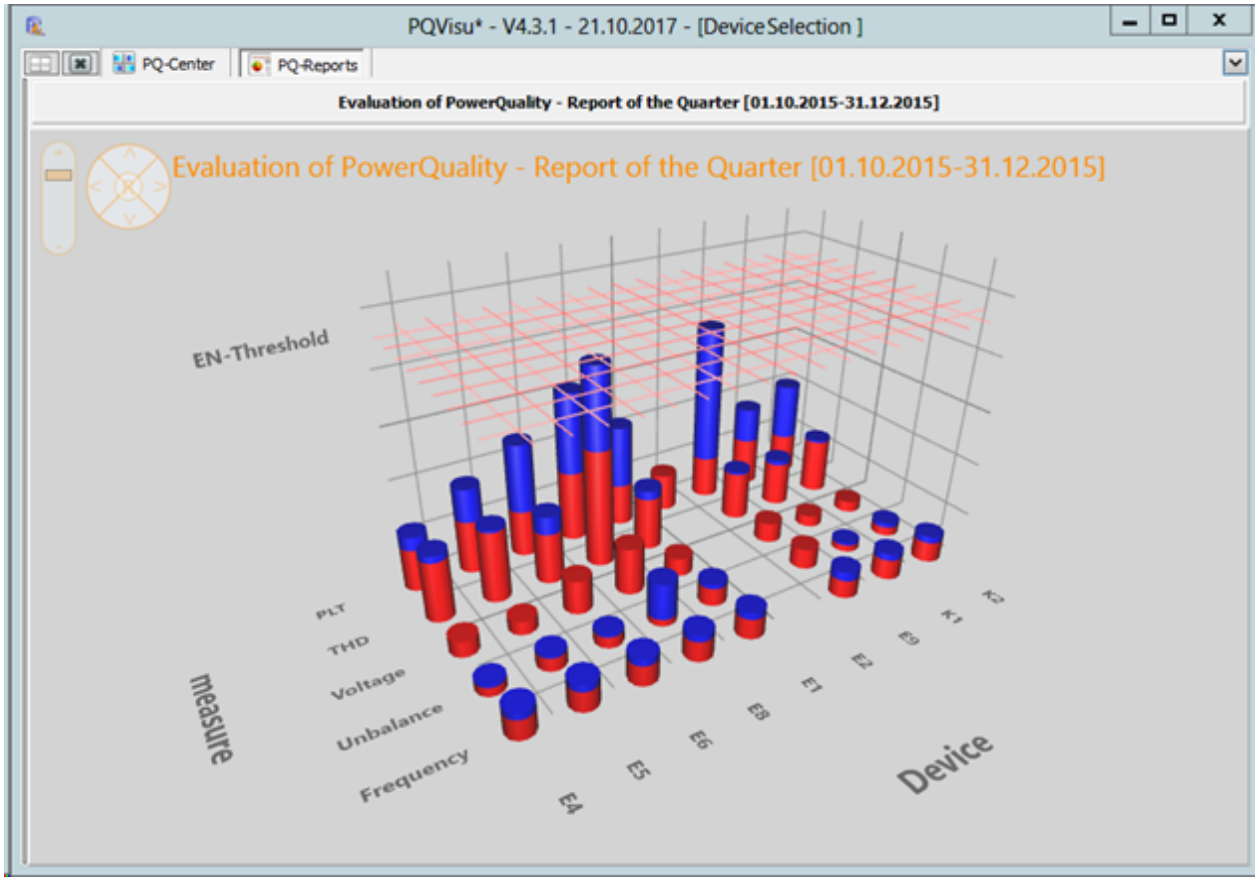
- PLT - Longterm-Flicker,
- THD - Total-Harmonic-Distortion,
- Voltage,
- Voltage-Unbalance,
- Frequency.

The red area shows the 95% value, the blue area describes the region between 95% and maximum value. The red threshold surface indicates the threshold values of the EN standard (more precisely the current setup of the device).

The following figure shows the statistical values calculated from the measured values as a function of the location of the measuring device:



In another selection, the variation over time of the device parameters (from week to week) are displayed:



From the general representation one can get to the detailed display by clicking on a bar.

The details page has 3 tabs on the left for the following presentations:

- Time course,
- X%-quantile,
- Heatmap (day).

'Time course' shows the measurement values which where used to generate the 3D statistic bars.

X% quantile displays thje measurement values as cumulativ frequency in 1% steps. The 5% / 50% / 95% values are marked as well as the compatibility border values.

The Heatmap show the values as color with the day on the x-axis and the time of the day at the y-axis. This is useful to easily see intraday or weekly peculiaritys.

Note: The data of this report is calculated using the program 'PQReport'. Please ensure that the 'PQReport' program is started automatically as described in the commissioning manual.

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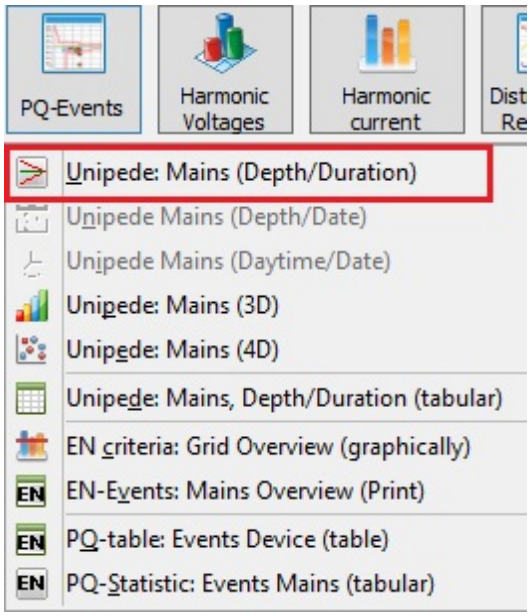
PQ-Events

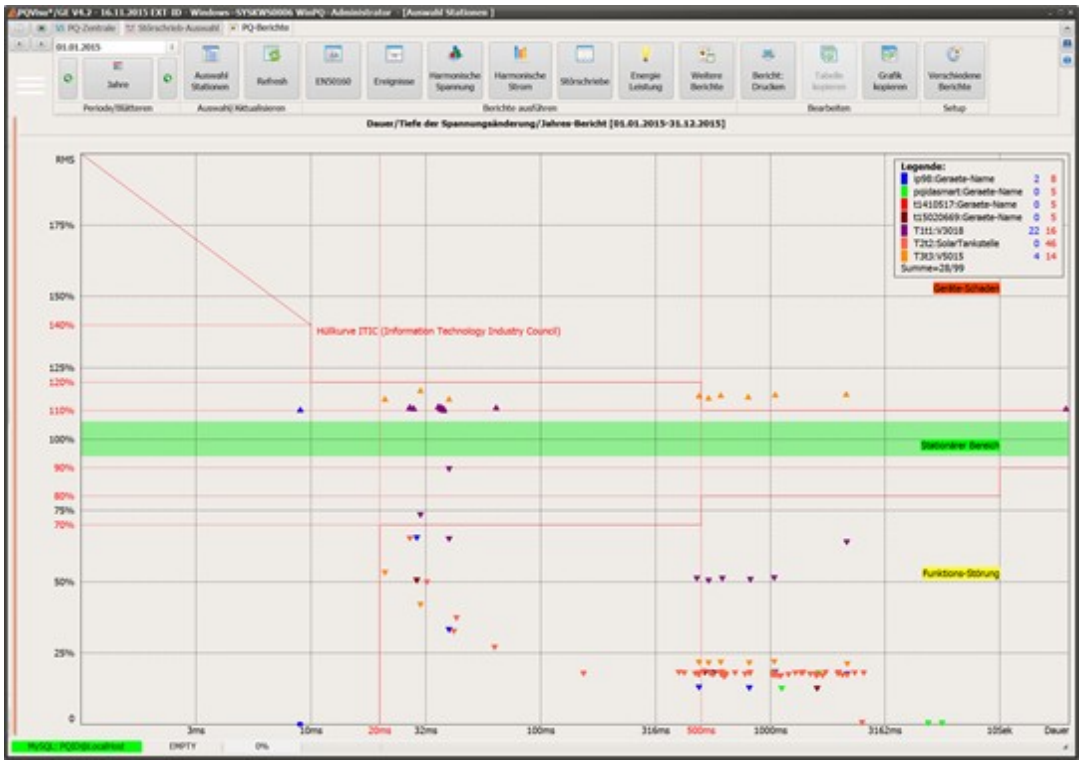
The following reports are available:



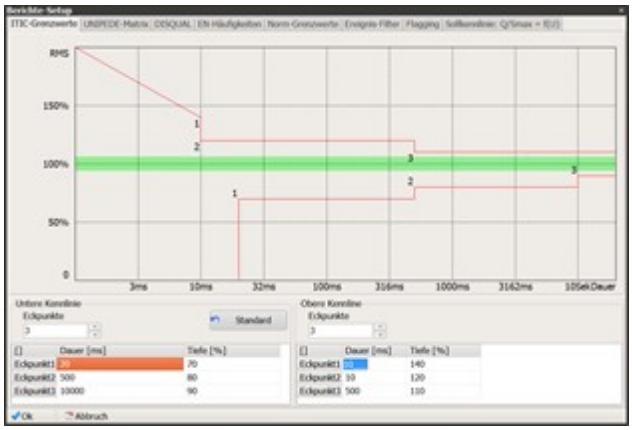
UNIPEDE: Grid (depth/duration)

Note: This report is only available in PQVisu!

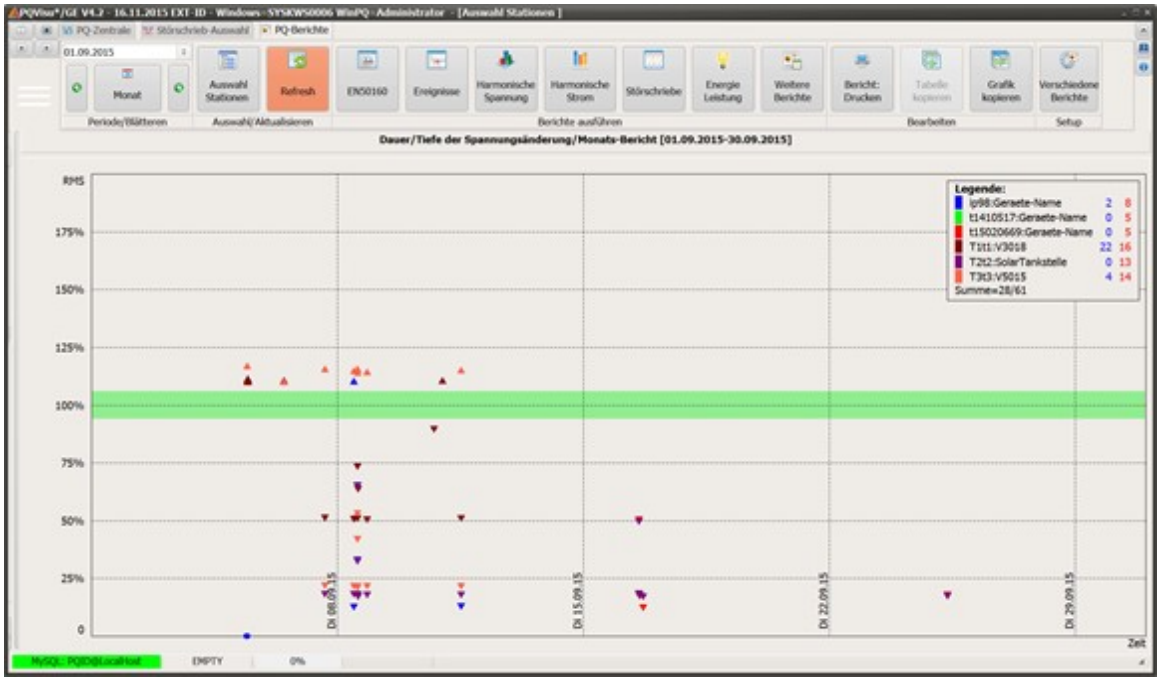
The figure shows the UNIPEDE (ITIC) display in several views. The default view displays the dips/swells as a function of the fault duration. The fault duration is displayed logarithmically in the range from 10 ms to ca 10 s.
The faults detected by the devices are displayed as colour pixels (colours assigned to the devices). The default ITIC curve is shown (varies based on the fault duration and the percentage deviation of the nominal value). The figures shown in the legend relate to events inside and outside of the ITIC curve.



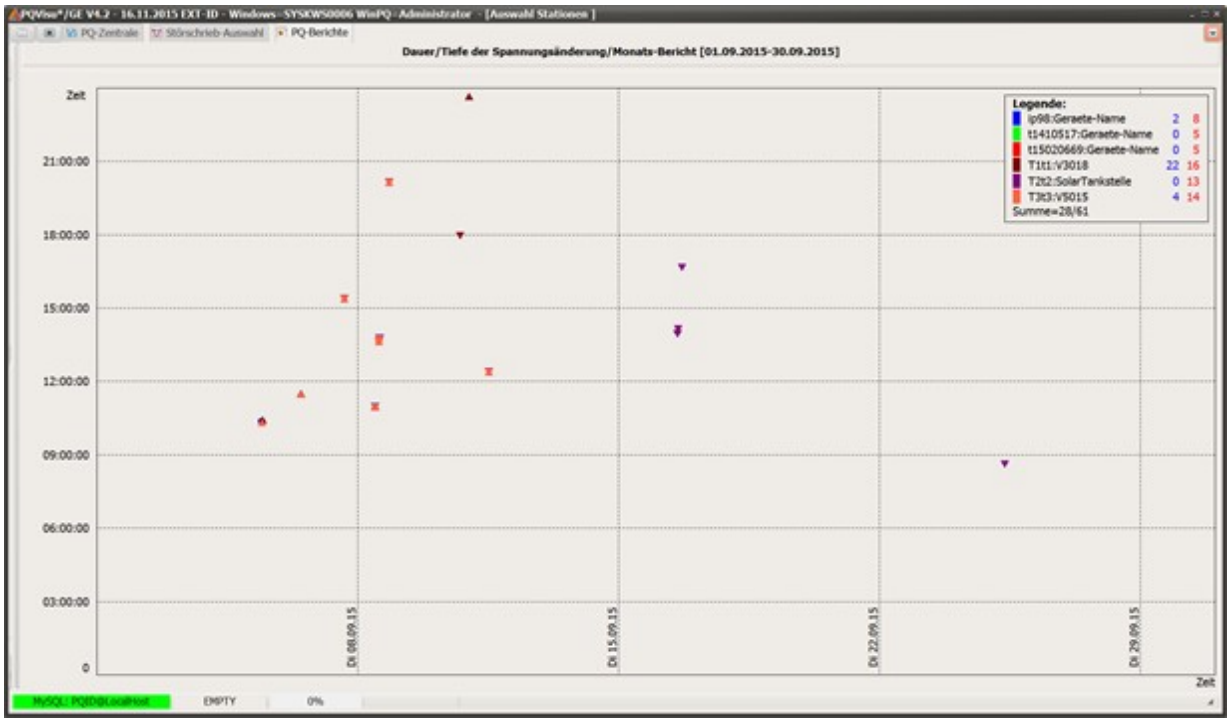
The number and value of the reference points on the ITIC curve are user definable:



The data can also be displayed by date:



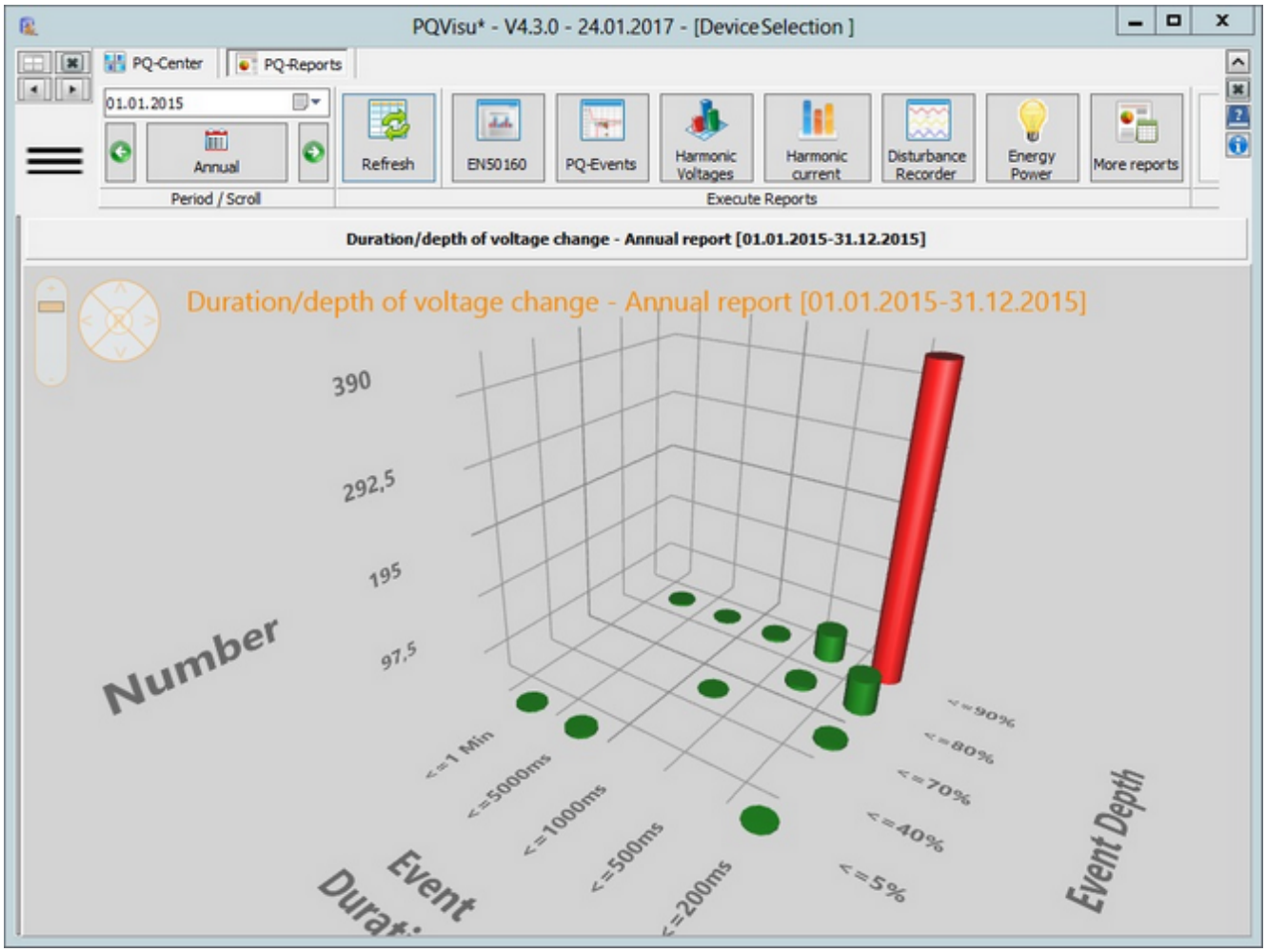
The data can also be displayed by time as a function of day/date:



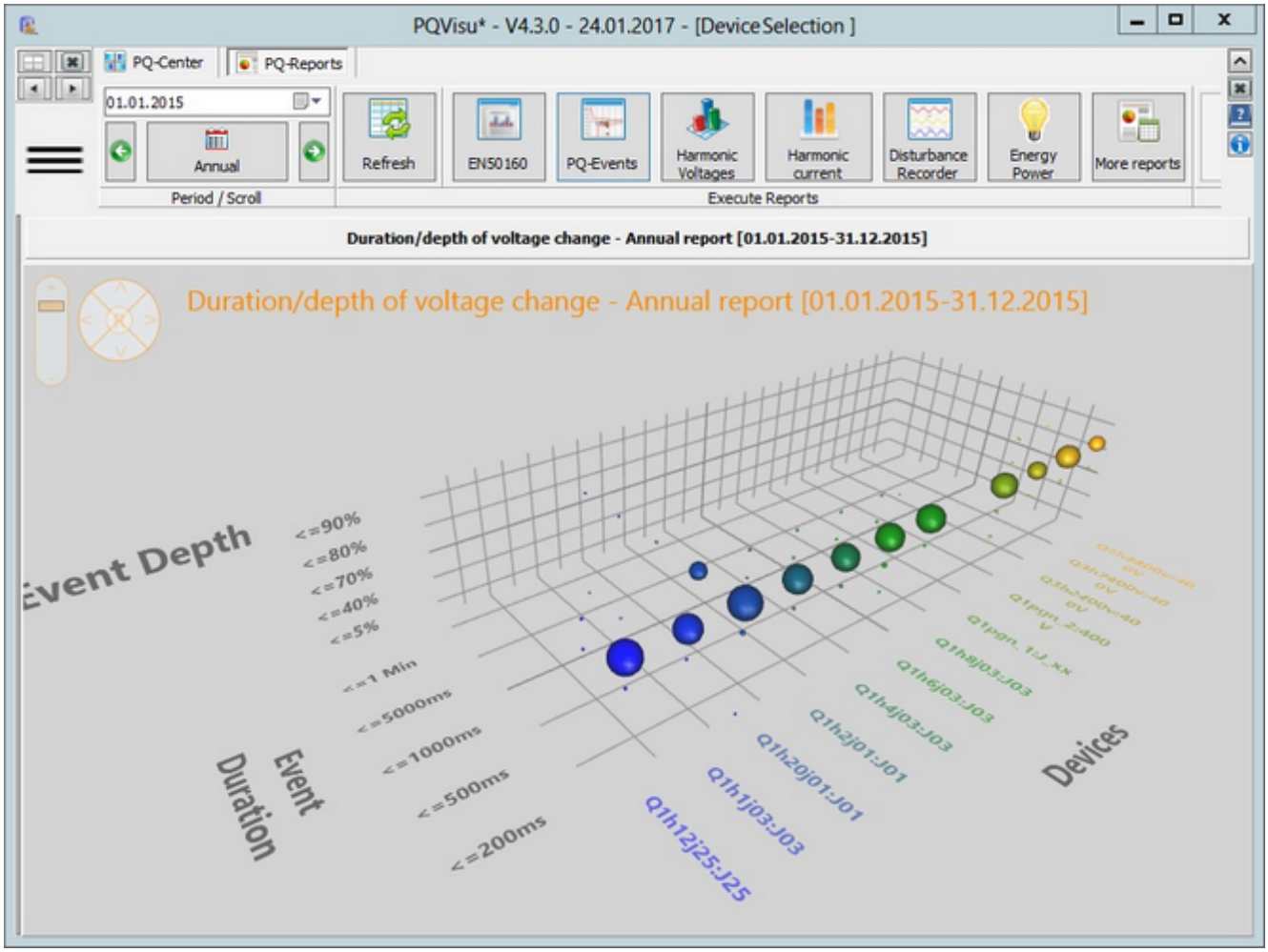
UNIPEDE: Grid (3D)

Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

All events are grouped into classes based on their duration and depth. The height of the bar corresponds to the number of events in a class.



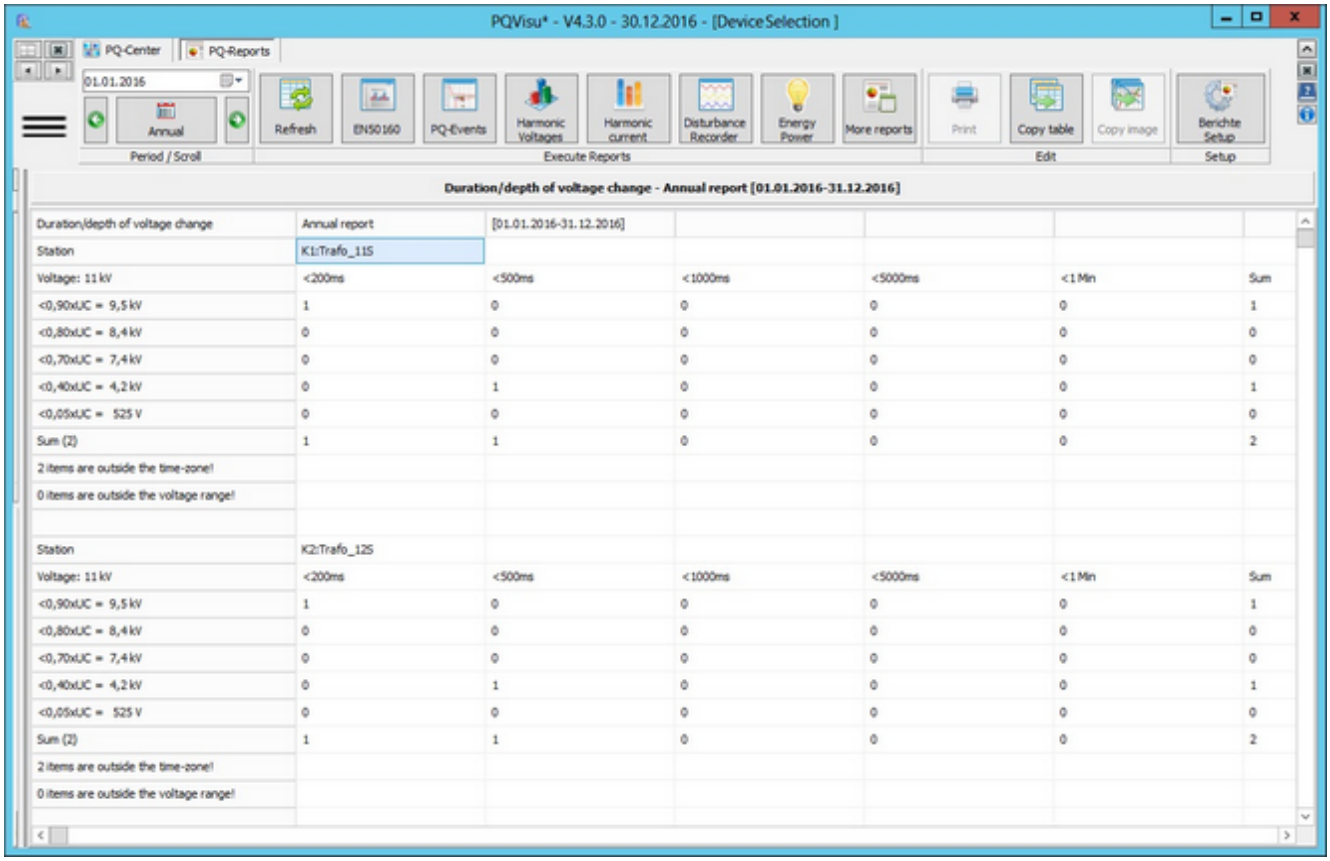
The below figure contains an additional dimension (the measurement device). In this case, the class frequency is reflected by the size of the sphere.
(Note: Rotating the graphic helps clarify)


PQVisu* - V4.3.0 - 24.01.2017 - [Device Selection]
PQ-Center
PQ-Reports
01.01.2015
Annual
Period / Scroll
Refresh
EN50160
PQ-Events
Harmonic Voltages
Harmonic current
Disturbance Recorder
Energy Power
More reports
Execute Reports
Duration/depth of voltage change - Annual report [01.01.2015-31.12.2015]
Duration/depth of voltage change - Annual report [01.01.2015-31.12.2015]
Event Depth
<=90%
<=80%
<=70%
<=40%
<=5%
Event Duration
<=1 Min
<=5000ms
<=1000ms
<=500ms
<=200ms
Devices
Q1h12j25:J25
Q1h1j03:J03
Q1h20j01:J01
Q1h2j01:J01
Q1h4j03:J03
Q1h6j03:J03
Q1h8j03:J03
Q1psrt_1:J_xx
Q1psrt_2:400
Q3h2400v=40
0V
Q3h2400v=40
0V
Q3h2400v=40
0V

UNIPEDE: EN 50160 – Matrix

Note: This report is only available in PQVisu!

This report shows a matrix table in which all voltage dips and interruptions are classified by event duration and depth:



Duration/depth of voltage change	Annual report	[01.01.2016-31.12.2016]				
Station	K1:Trafo_11S					
Voltage: 11 kV	<200ms	<500ms	<1000ms	<5000ms	<1 Min	Sum
<0,90xUC = 9,5 kV	1	0	0	0	0	1
<0,80xUC = 8,4 kV	0	0	0	0	0	0
<0,70xUC = 7,4 kV	0	0	0	0	0	0
<0,40xUC = 4,2 kV	0	1	0	0	0	1
<0,05xUC = 525 V	0	0	0	0	0	0
Sum (2)	1	1	0	0	0	2
2 items are outside the time-zone!						
0 items are outside the voltage range!						
Station	K2:Trafo_12S					
Voltage: 11 kV	<200ms	<500ms	<1000ms	<5000ms	<1 Min	Sum
<0,90xUC = 9,5 kV	1	0	0	0	0	1
<0,80xUC = 8,4 kV	0	0	0	0	0	0
<0,70xUC = 7,4 kV	0	0	0	0	0	0
<0,40xUC = 4,2 kV	0	1	0	0	0	1
<0,05xUC = 525 V	0	0	0	0	0	0
Sum (2)	1	1	0	0	0	2
2 items are outside the time-zone!						
0 items are outside the voltage range!						

The values from the event data in the devices are used. A table is created for each measuring device. A summary of all of the devices is displayed at the bottom of the screen.

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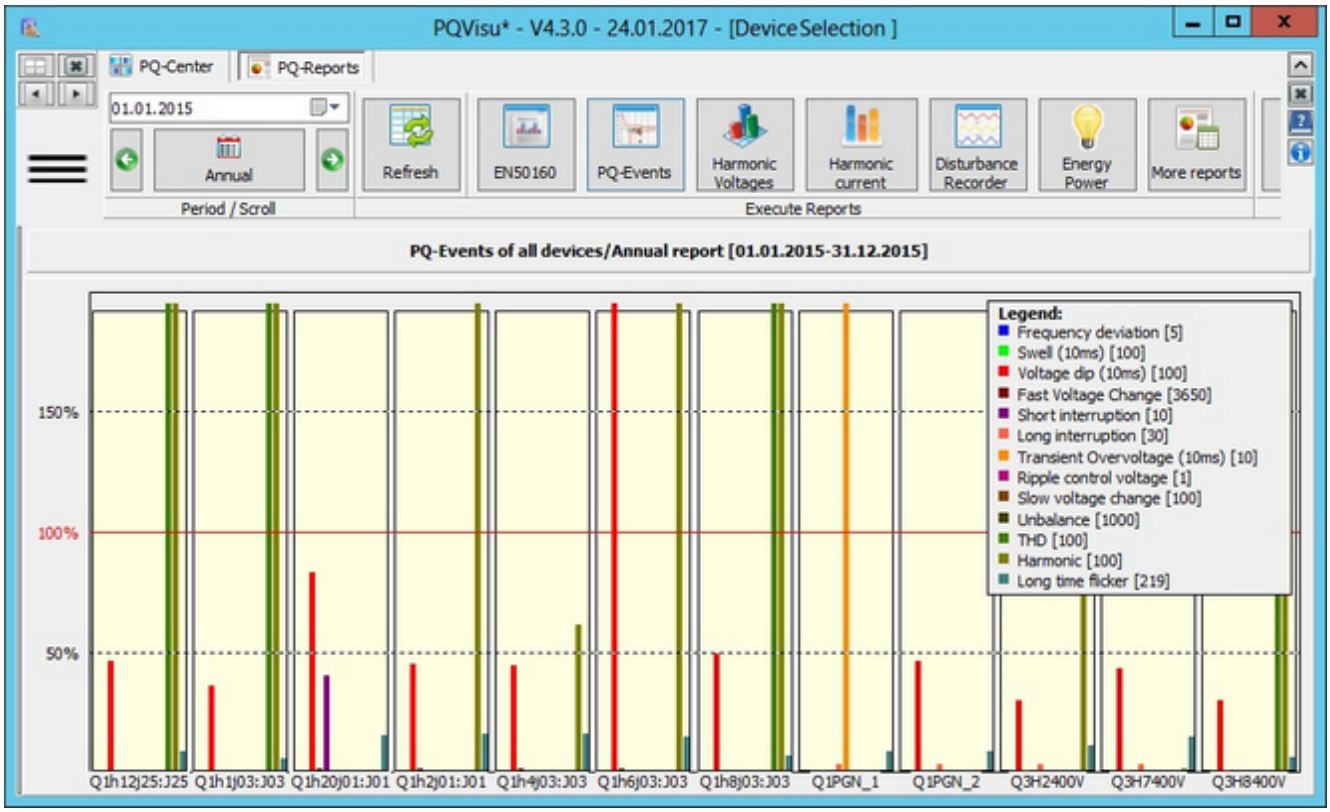
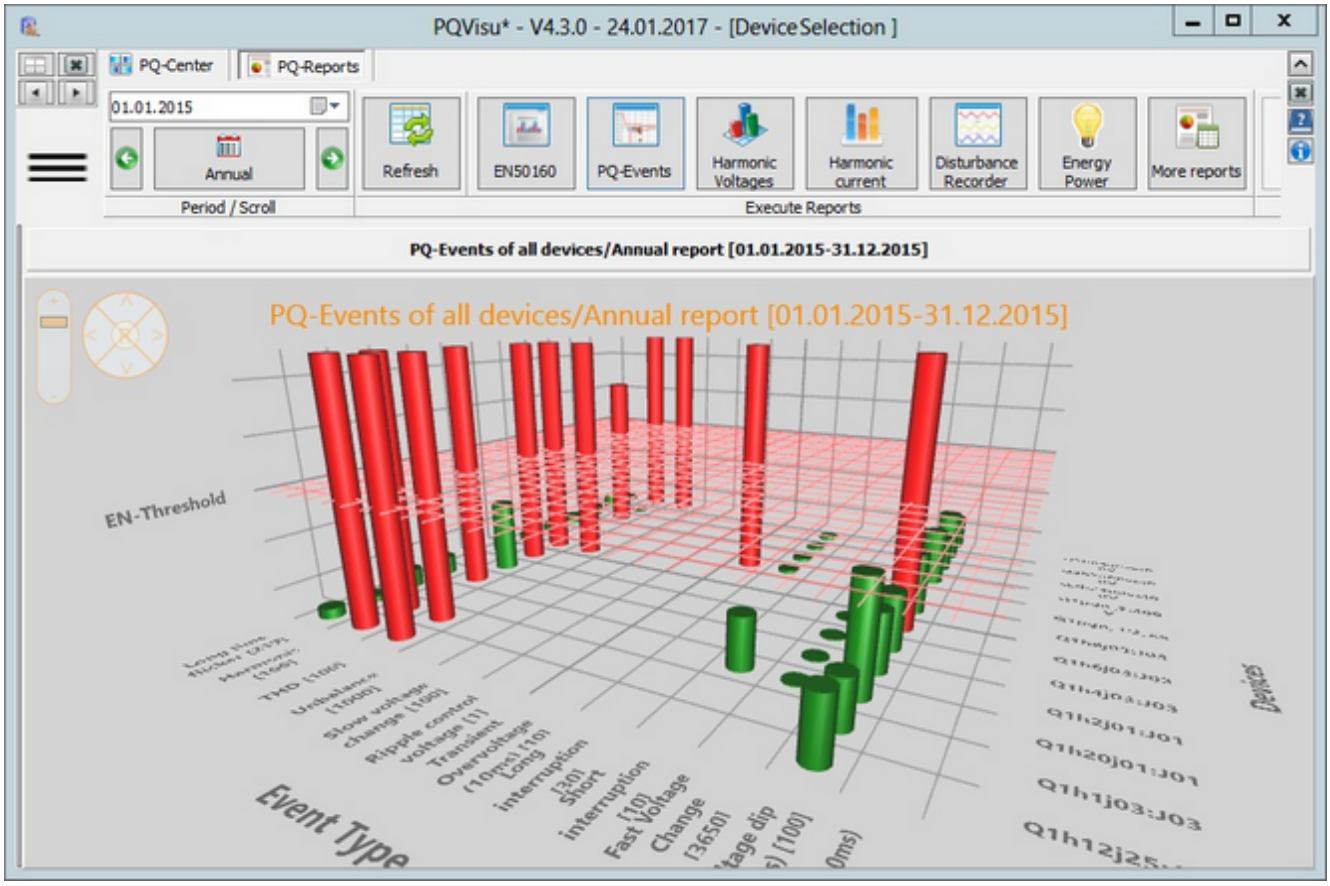
EN criteria: Graphical overview

Note: This report is only available in PQVisu!

The number of events is viewed for the allowed violation frequency in the time interval. The colour of the bar (legend) indicates the classification of the faults. The number of allowed violations is configurable (as annual frequency). The red 100% line describes this threshold, which is always applied proportionally to the selected period.



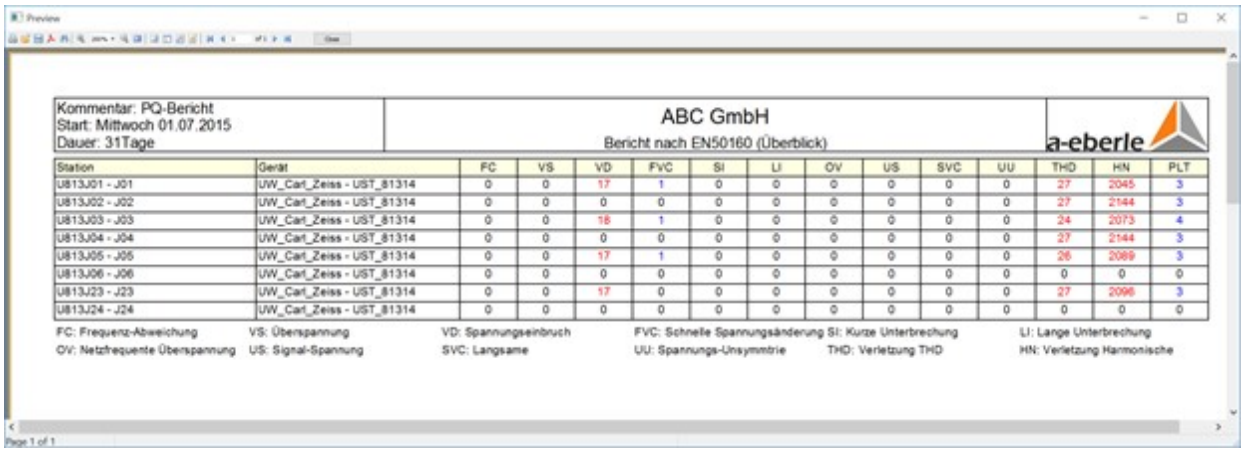
This figure displays the same data in 3D:


PQVisu* - V4.3.0 - 24.01.2017 - [Device Selection]
PQ-Center
PQ-Reports
01.01.2015
Annual
Period / Scroll
Refresh
EN50160
PQ-Events
Harmonic Voltages
Harmonic current
Disturbance Recorder
Energy Power
More reports
Execute Reports
PQ-Events of all devices/Annual report [01.01.2015-31.12.2015]
PQ-Events of all devices/Annual report [01.01.2015-31.12.2015]
EN-Threshold
Event Type
Device

EN events Grid overview (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

The number of violations by station classified by type of violation is displayed in a table. Numbers greater than zero are displayed in blue or red if they also exceed the number of time windows that are allowed to be selected.



Kommentar: PQ-Bericht
Start: Mittwoch 01.07.2015
Dauer: 31Tage

ABC GmbH
Bericht nach EN50160 (Überblick)

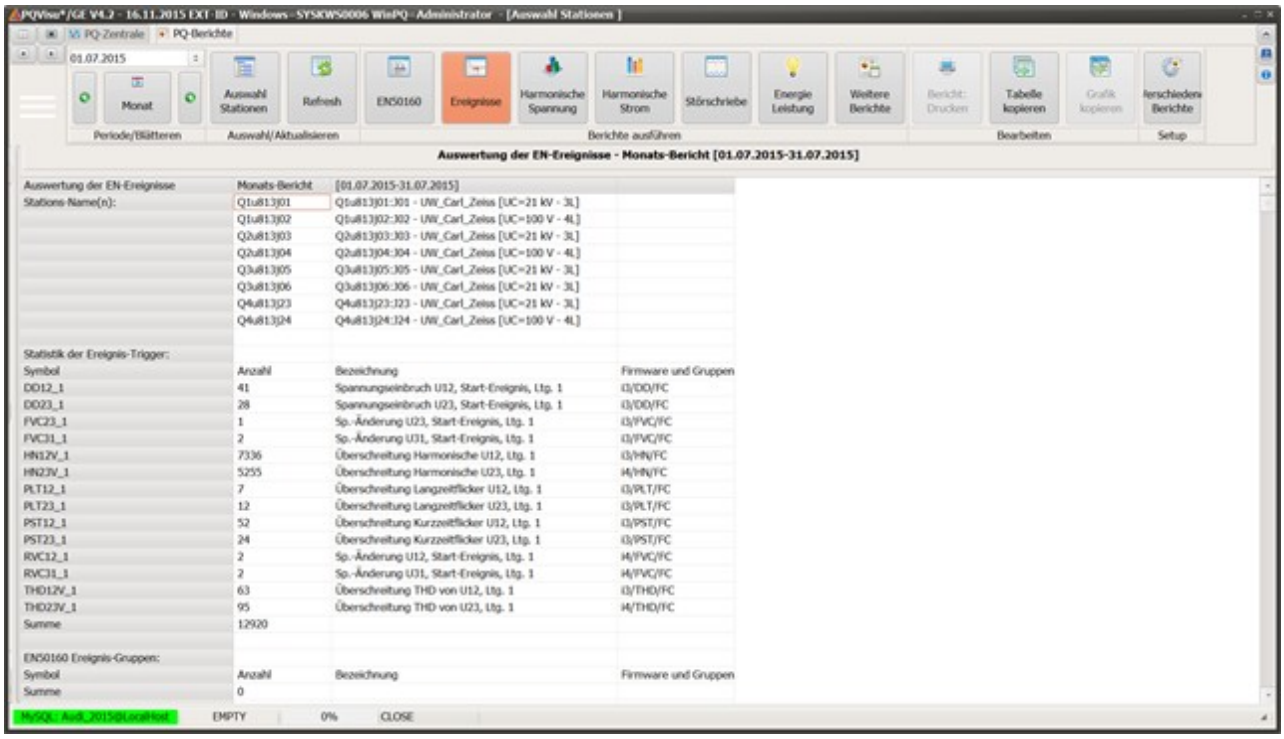
a-eberle

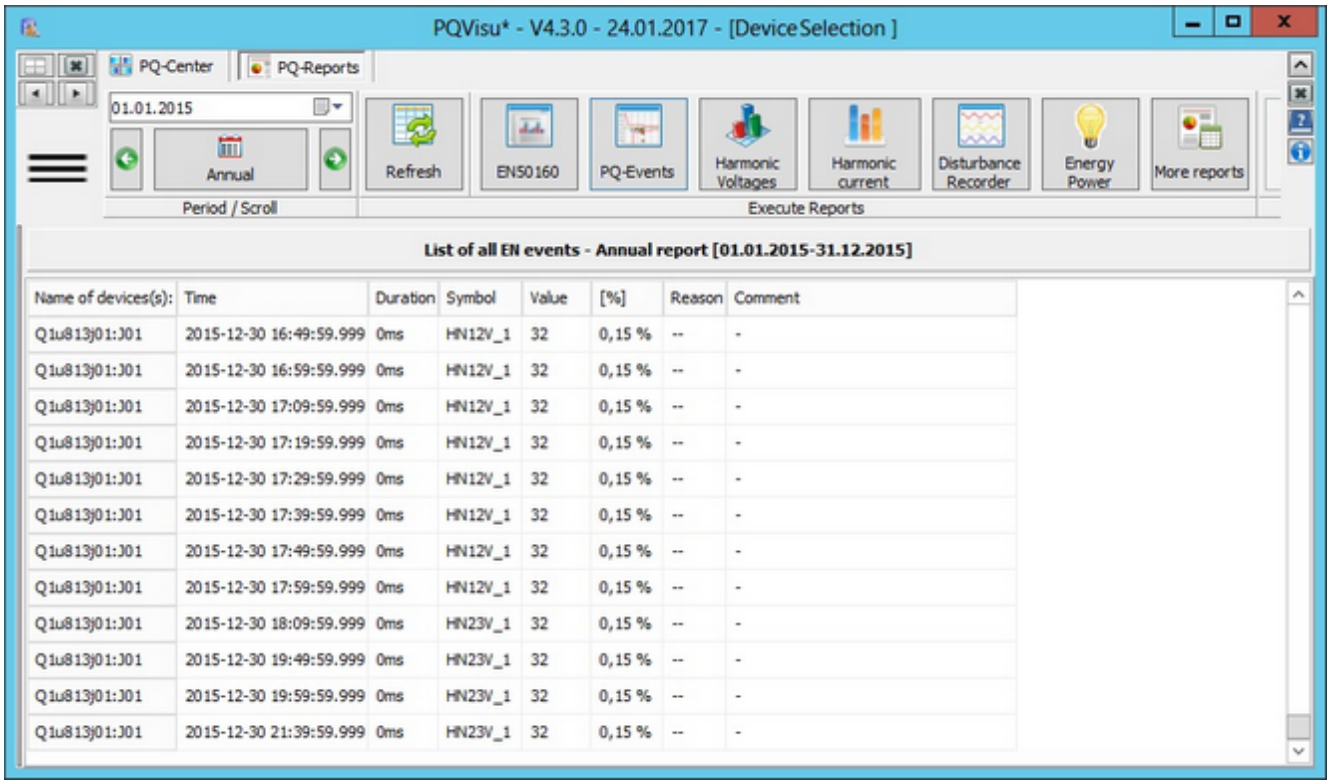
Station	Gerät	FC	VS	VD	FVC	SI	LI	OV	US	SVC	UU	THD	HN	PLT
U813J01 - J01	UW_Carl_Zeiss - UST_81314	0	0	17	1	0	0	0	0	0	0	27	2045	3
U813J02 - J02	UW_Carl_Zeiss - UST_81314	0	0	0	0	0	0	0	0	0	0	27	2144	3
U813J03 - J03	UW_Carl_Zeiss - UST_81314	0	0	18	1	0	0	0	0	0	0	24	2073	4
U813J04 - J04	UW_Carl_Zeiss - UST_81314	0	0	0	0	0	0	0	0	0	0	27	2144	3
U813J05 - J05	UW_Carl_Zeiss - UST_81314	0	0	17	1	0	0	0	0	0	0	26	2089	3
U813J06 - J06	UW_Carl_Zeiss - UST_81314	0	0	0	0	0	0	0	0	0	0	0	0	0
U813J23 - J23	UW_Carl_Zeiss - UST_81314	0	0	17	0	0	0	0	0	0	0	27	2096	3
U813J24 - J24	UW_Carl_Zeiss - UST_81314	0	0	0	0	0	0	0	0	0	0	0	0	0

FC: Frequenz-Abweichung VS: Überspannung VD: Spannungseinbruch FVC: Schnelle Spannungsänderung SI: Kurze Unterbrechung LI: Lange Unterbrechung
OV: Netzfrequente Überspannung US: Signal-Spannung SVC: Langsame UU: Spannungs-Unsymmtrie THD: Verletzung THD HN: Verletzung Harmonische

PQ list: Grid events (table)

Note: This report is only available in PQVisu!





ITIC/UNIPEDE graphic

This report is part of the 'Events' drop-down list.

The list contains several types of views for voltage dips and swells. Right-click to display the context menu and toggle between the views:

- View of the dips and swells as a function of the event duration. In this report, all of the voltage swells, dips and interruptions are displayed in the evaluation period. The event duration is displayed on the X axis (logarithmically divided: 10 ms, 100 ms, 1 s etc), the Y axis scales the voltage change in % to the 'Agreed voltage' (in a 20 kV grid, 100% is e.g., 20,700 V). The device allocation is designated by the colour scale. This view displays the number of events for all devices.

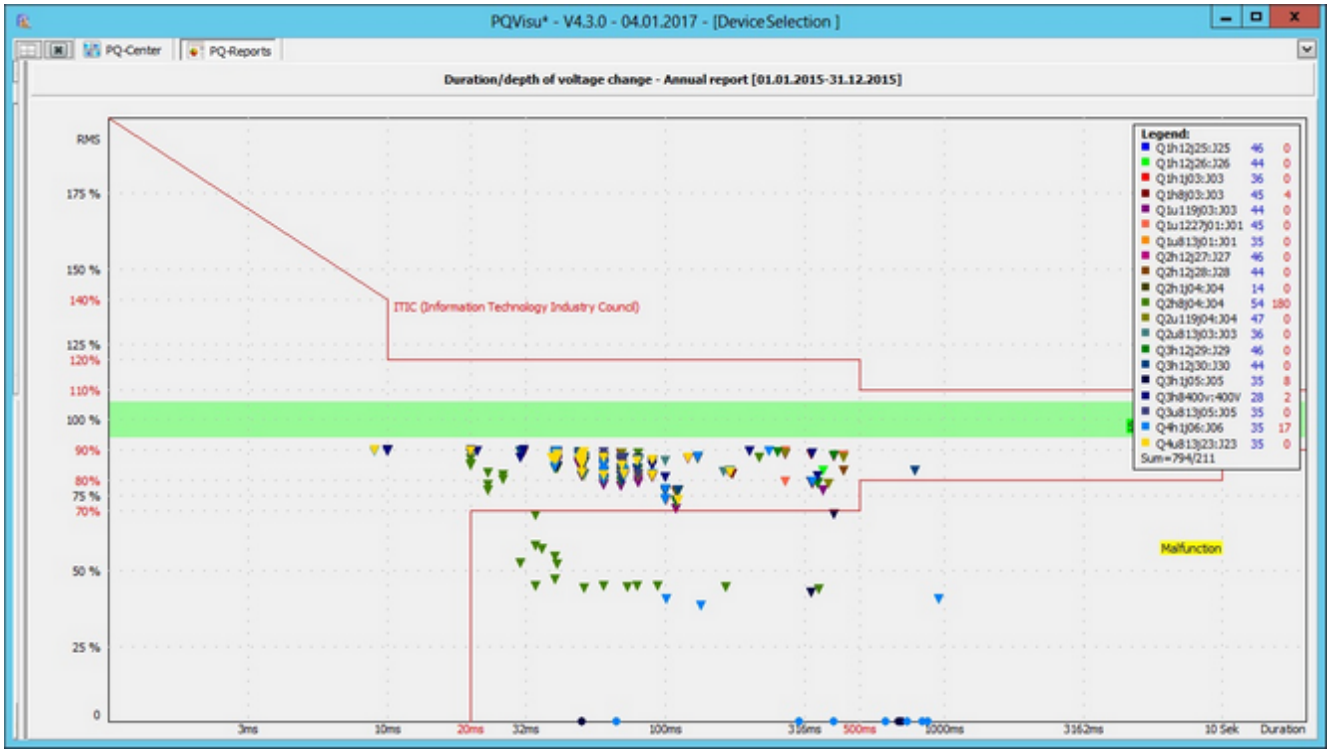
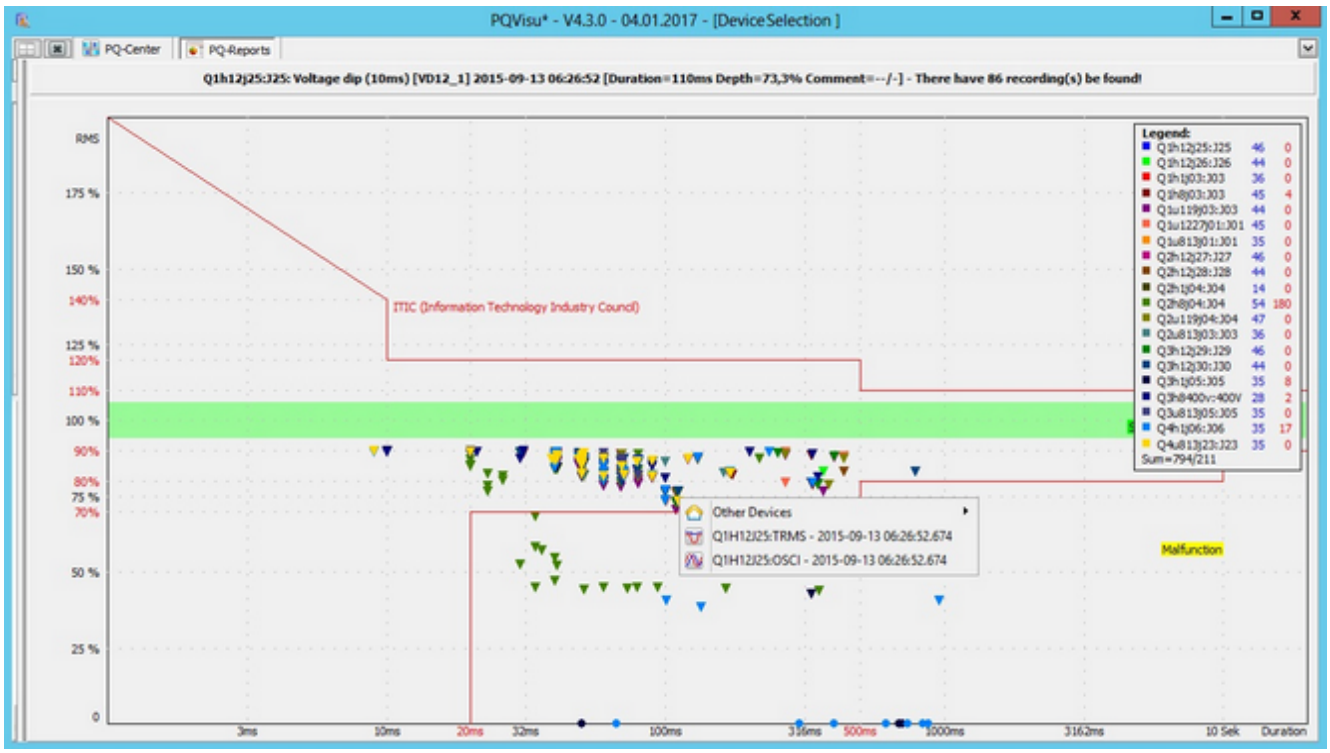


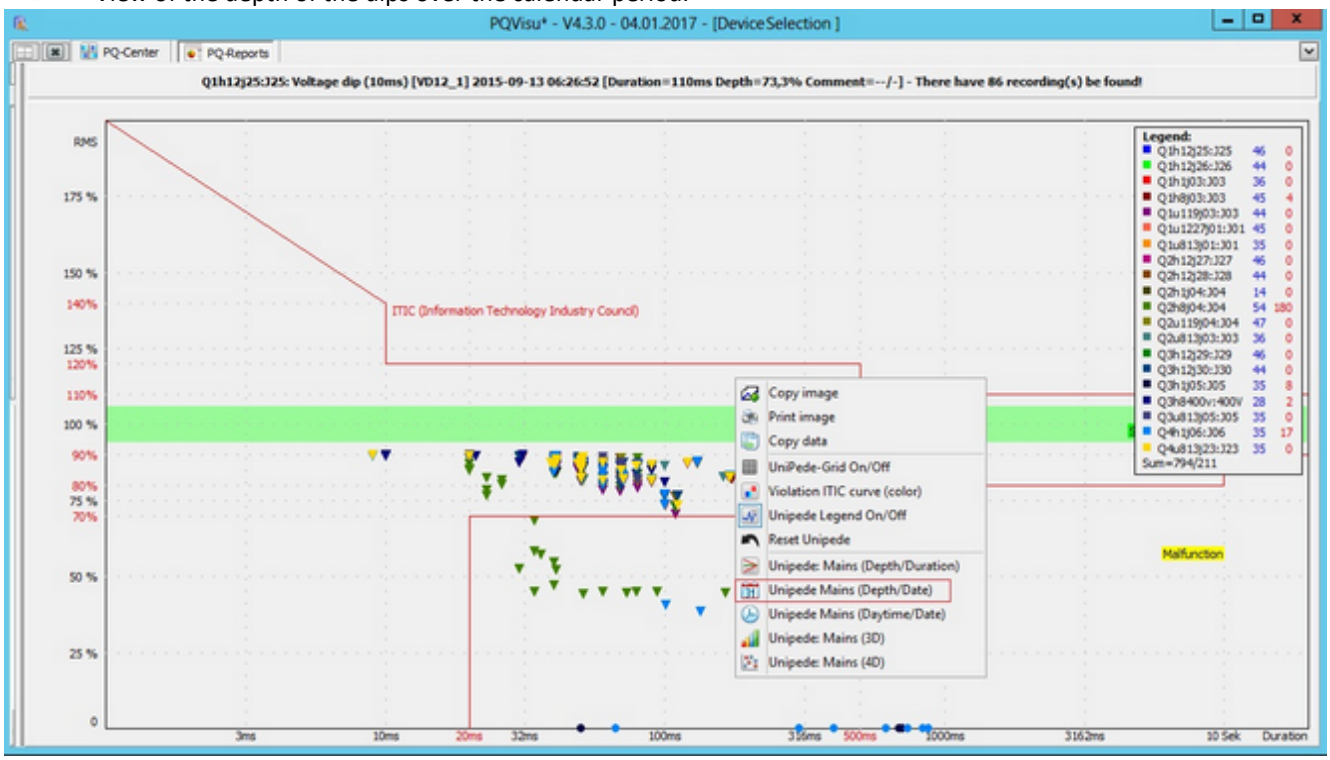
Figure: 'Statistics: Depth/Duration' – graphical evaluation - ITIC (CEBMA) Evaluation of the voltage events for all devices in one month (here June 2012).



Clicking on a specific event lists all of the error logs that were recorded during this period. Each error log can be opened from here. In the example, an RMS value log and an oscilloscope image were found in this period. Error logs that were recorded at the same time at other measurement points can be viewed under 'Other devices'.

Note: Because the threshold settings for PQ events and error logs can be configured differently on the device, not every PQ event has a matching error log.

- View of the depth of the dips over the calendar period.



EN - Grid event overview (print)

This representation is kept simple. Nevertheless, it shows a complete overview of all captured PQ violations of all measurement devices in one table.

Comment: PQ-Report
Start: Sonntag 01.05.2016
Duration: 31Tage

Company

EN-Events Mains-Overview (Druck)

a-eberle

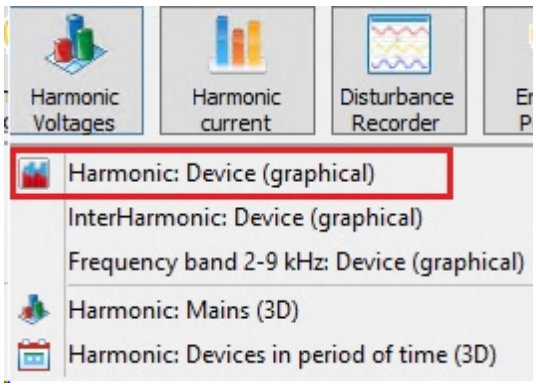
Device	Device	FC	VS	VD	FVC	SI	LI	OV	US	SVC	UU	THD	HN	PLT
M1_1:UM11Q - 30kV	UWMitte - UM11	0	0	0	0	7	0	0	0	0	0	0	0	0
M1_2:UM11Q - 6kV	UWMitte - UM11	0	0	0	0	7	0	0	0	0	0	0	0	0
M2_1:UM12Q - 30kV	UWMitte - UM12	0	0	0	0	0	0	0	0	0	0	0	0	0
M2_2:UM12Q - 6	UWMitte - UM12	0	0	0	0	0	0	0	0	0	0	0	0	0
M3_1:UM13Q - 30kV	UWMitte - UM13	0	0	0	0	0	0	0	0	0	0	0	0	0
M3_2:UM13Q - 6kV	UWMitte - UM13	0	0	0	0	0	0	0	0	0	0	0	0	0
M4:UM14Q - 6kV	UWMitte - UM14	0	0	0	6	0	0	0	0	0	0	0	0	0
M5:UM15Q - 6kV	UWMitte - UM15	0	0	0	0	0	0	0	0	0	0	0	0	0
R3:UM13Q - 6kV	UWMitte - UM13Res	0	0	0	2	2	0	0	0	0	0	0	0	0
N1:RU1Q - 30kV	UWNord - RU1	0	0	0	1	0	0	0	0	0	0	0	64	0
N2:RU2Q - 30kV	UWNord - RU2	0	0	0	0	0	0	0	0	0	0	0	0	0
N3:RU3Q - 30kV	UWNord - RU3	0	0	0	0	0	0	0	0	0	0	0	0	0
N4:RU4Q - 30kV	UWNord - RU4	0	0	15	111	0	0	0	0	0	0	0	0	291
N8:Ltg1211 - 110kV	UWNord - Ltg121/1	0	0	0	1	2	0	0	0	1	0	0	0	0
N9:Ltg1212 - 110kV	UWNord - Ltg121/2	0	0	0	1	0	0	0	0	0	0	0	0	0

FC: Frequency deviation VS: Swell (10ms) VD: Voltage Dip FVC: Rapid voltage change SI: Short interruption LI: Long interruption
OV: Transient Overvoltage (10ms) US: Ripple control voltage SVC: Slow voltage change UU: Voltage unbalance THD: Violation THD HN: Violation Harmonic

Violations greater than zero are colored blue while violations which exceed the valid quantity in the selected period are shown in red. This report is especially suitable as cyclical automatic report (e.g. weekly).

Harmonics voltage

The following applies in principle: In the 3-wire network, the phase-to-earth voltages are always evaluated and the 4-wire network is evaluated.



The following applies in principle: In the 3-wire network, the phase-to-earth voltages are always evaluated and the 4-wire network is evaluated.

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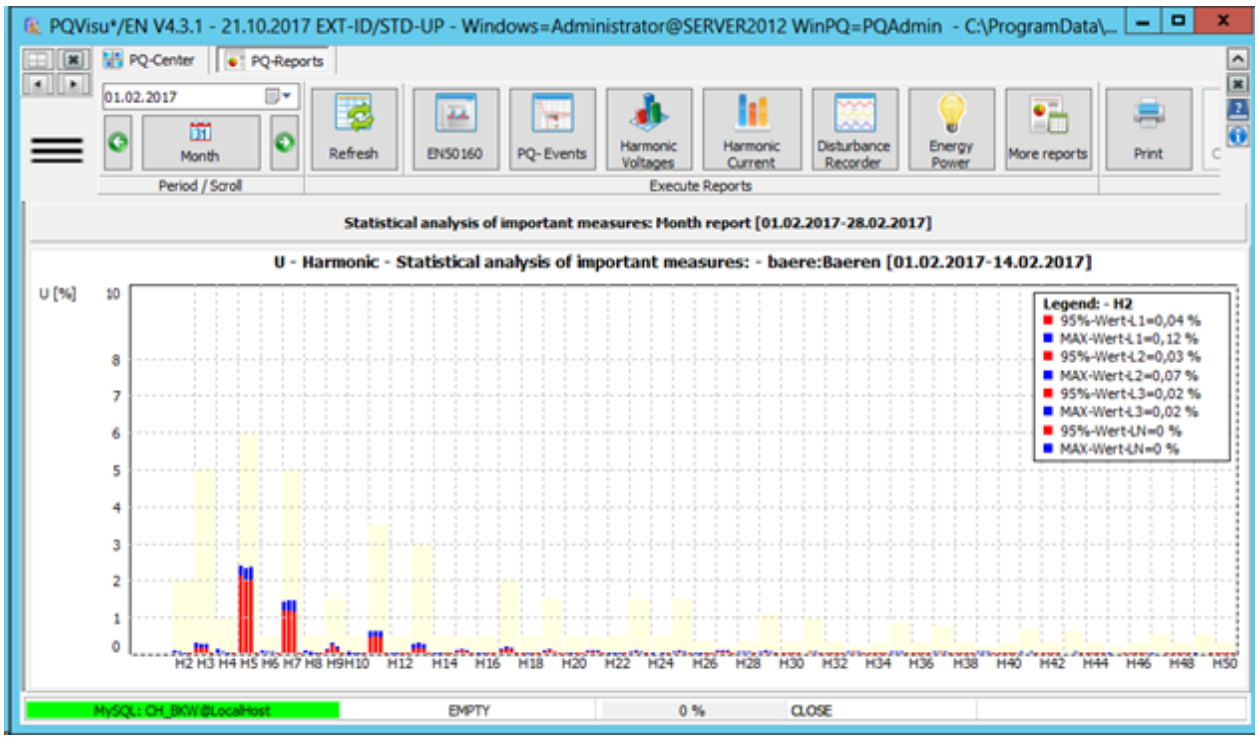
Voltage harmonics device (graphic)

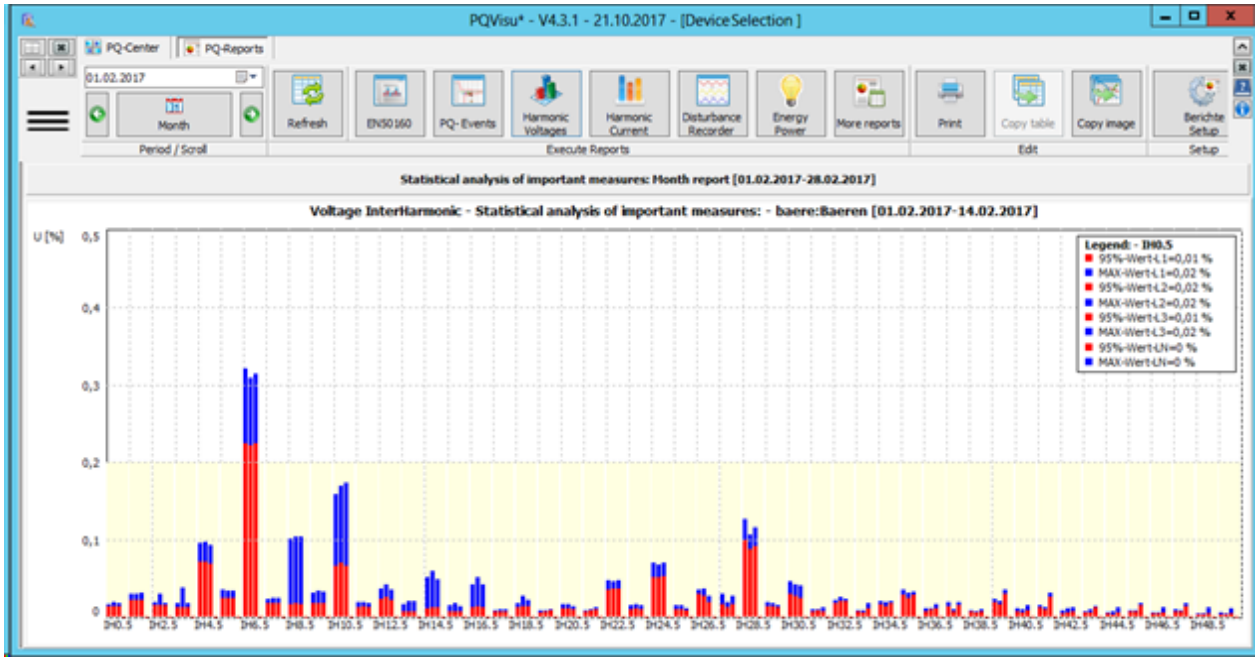
Note: This report is only available in PQVisu!

From the available harmonic voltages, the 95% and the maximum value are calculated. Above the 95% value the bar is blue. The representation is interactive so one can click to show the values of the selected harmonic in the legend. The currently valid (part of the device parameterization) compatibility thresholds are shown as a background bar.



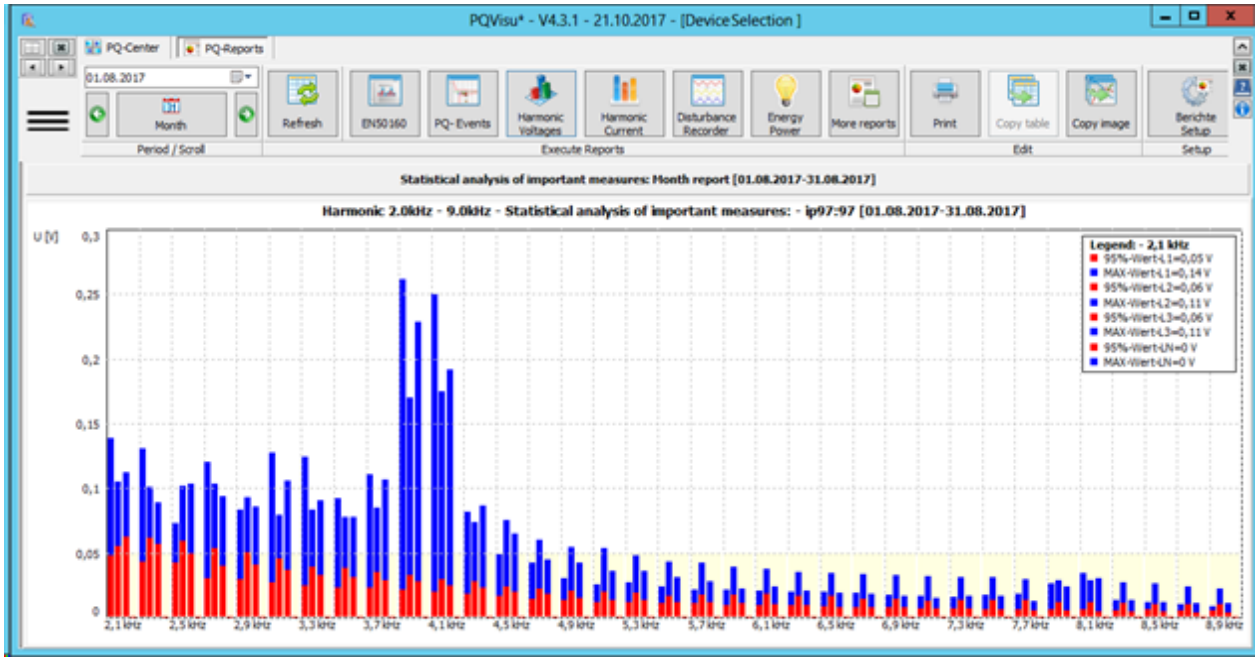
Voltage: Interharmonis, Device (graphical)

The representation corresponds to the previous section, this time the interharmonics are displayed. Compatibility levels are not available.



Voltage: Frequency bands 2-9 kHz, Device (graphical)

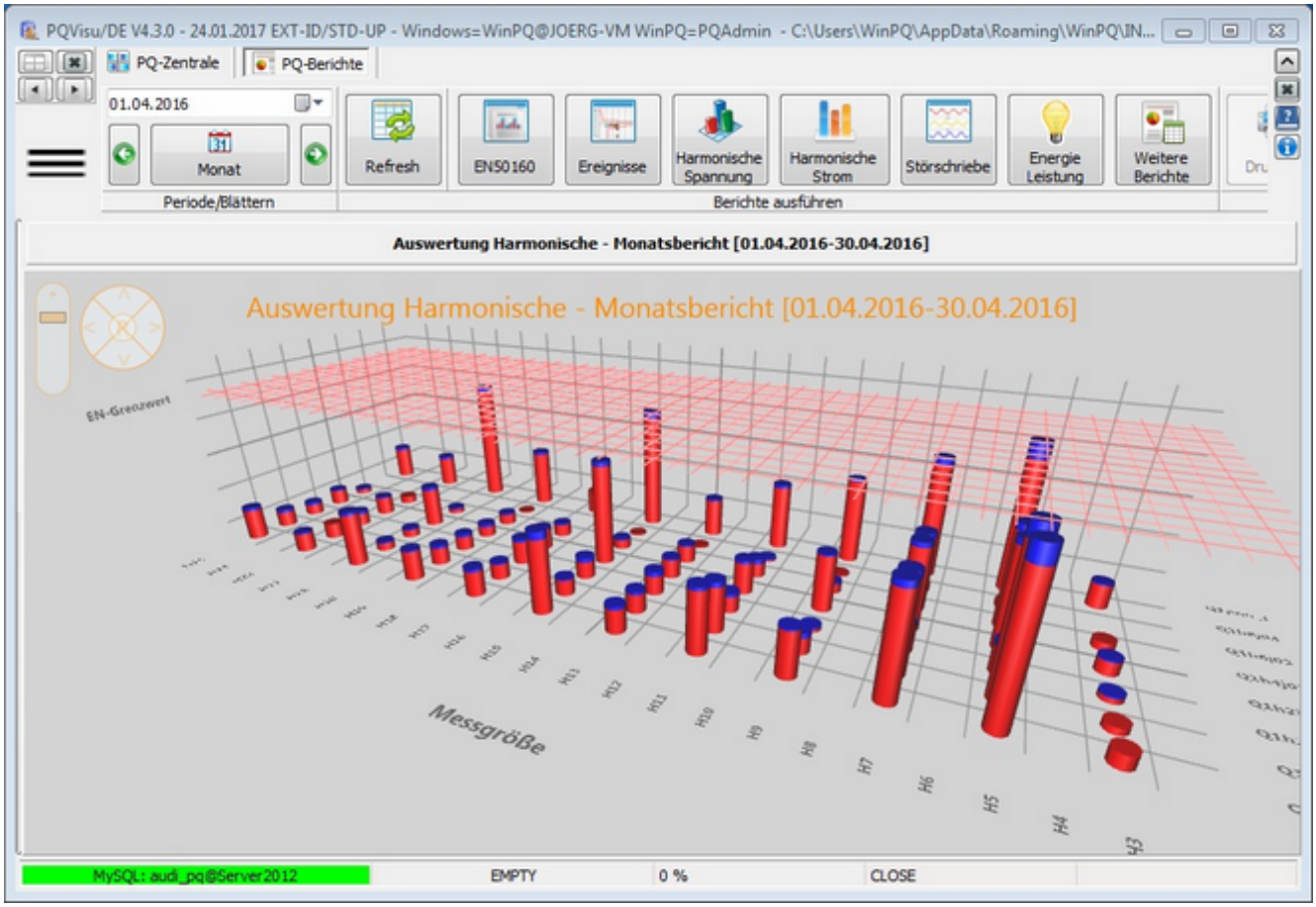
This evaluation includes the frequency bands of the voltages between 2 kHz and 9 kHz. Compatibility levels are not defined. These data are available up from the device generation 'PQI-DA smart'. Clicking on a band displays the values of the frequency band in the legend.



Voltage harmonics: Grid (3D)

Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

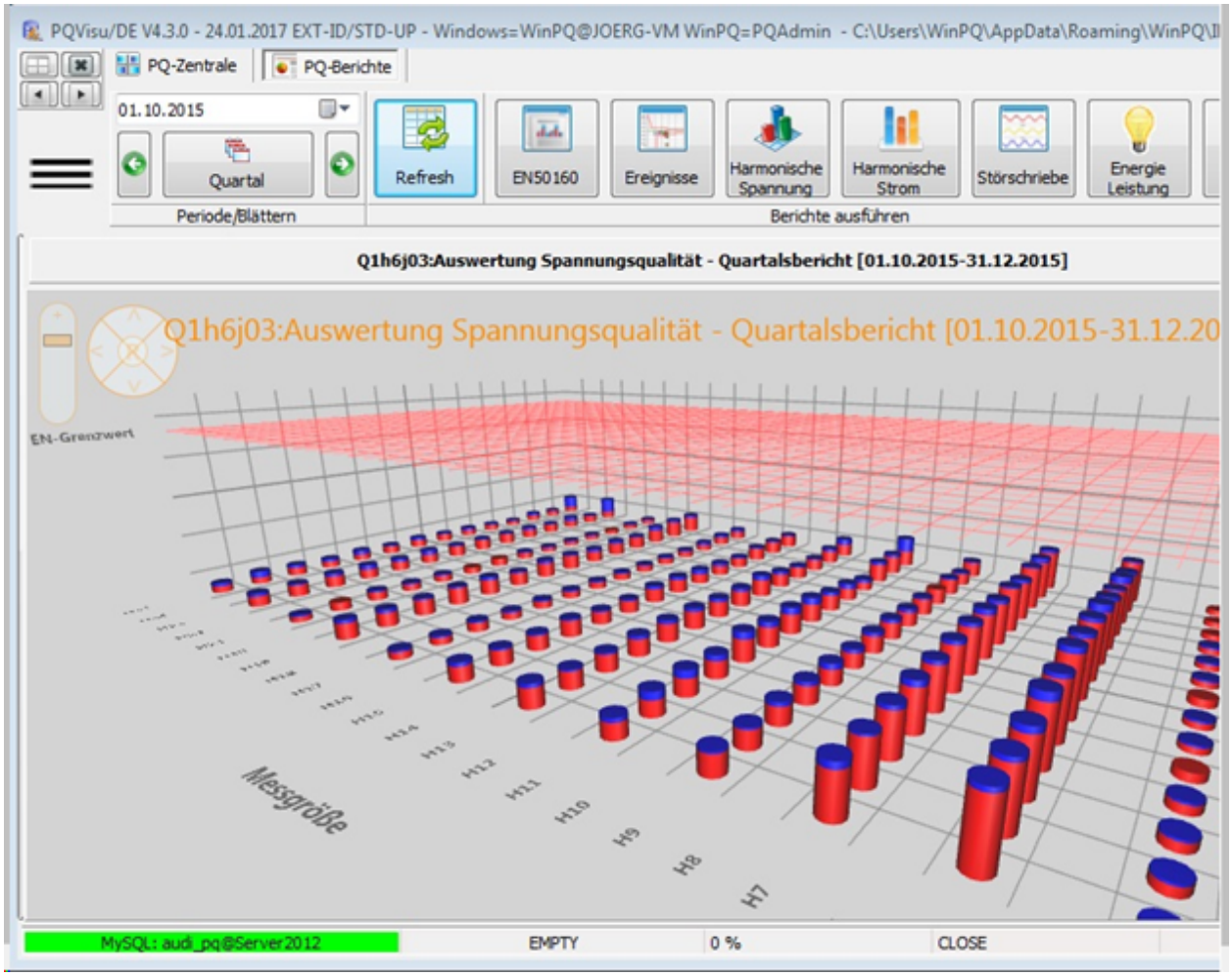
In this report you select the devices of interest. From the available harmonics, the 95% value (red) and the maximum value (blue) are displayed as a function of the calendar week. The compatibility thresholds (per standard EN 50160) are indicated by the threshold area in red.



Voltage harmonics: Device in period (3D)

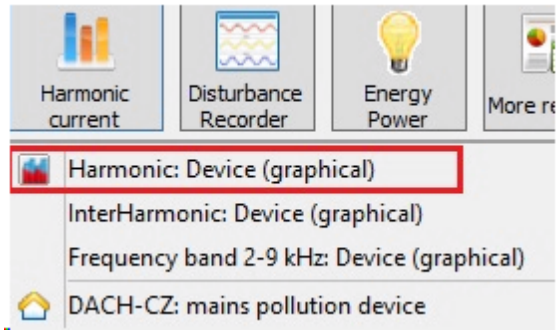
Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

For this report you choose a device. From the available harmonics, the 95% value (red) and the maximum value (blue) are displayed as a function of the calendar week.



Harmonics current

The following reports are provided under this menu:



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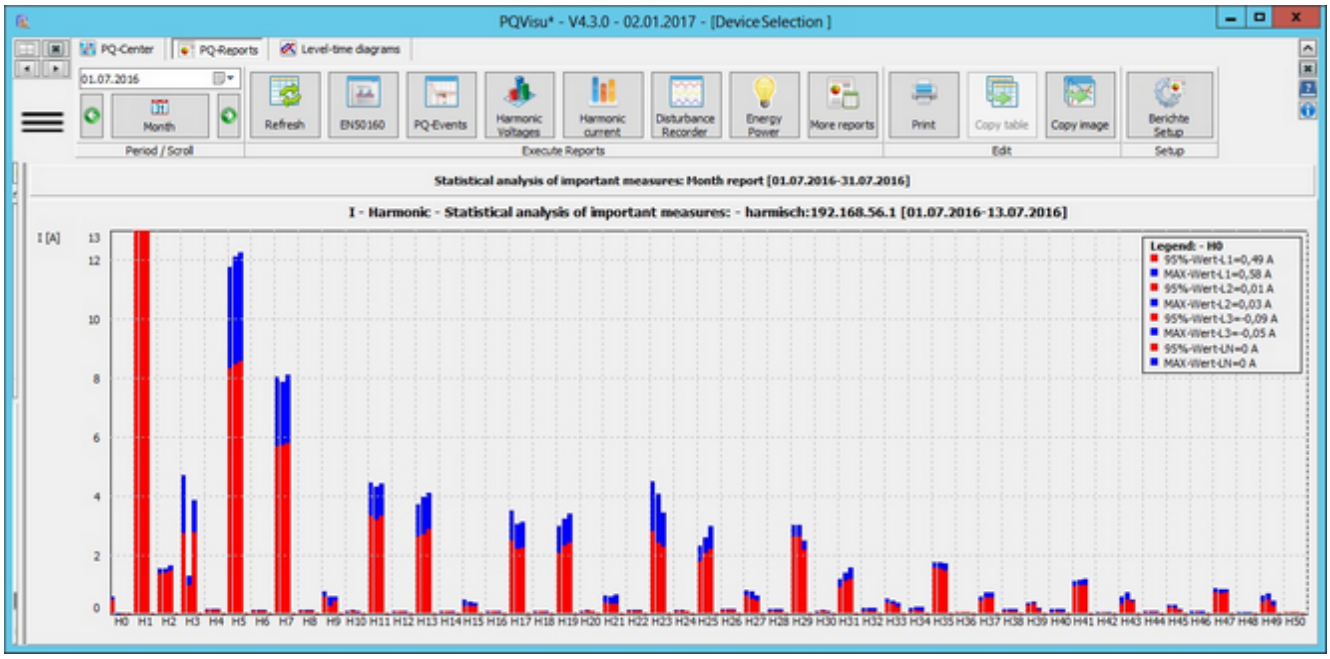
Current harmonics: Device (graphic)

Note: This report is only available in PQVisu!



- Current harmonics are displayed in [A].
- The fundamental wave is cut off for display reasons.

Current: Interharmonis, Device (graphical)

The representation corresponds to the previous one, this time the interharmonics of the current are displayed. Compatibility levels are not available.

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Current: Frequency bands 2-9 kHz, Device (graphical)

This evaluation includes the frequency bands of the currents above 2 kHz to 9 kHz. Compatibility levels are not provided. These data are available from the device generation 'PQI-DA smart'. Clicking on a band will display the values of the selected frequency band in the legend.

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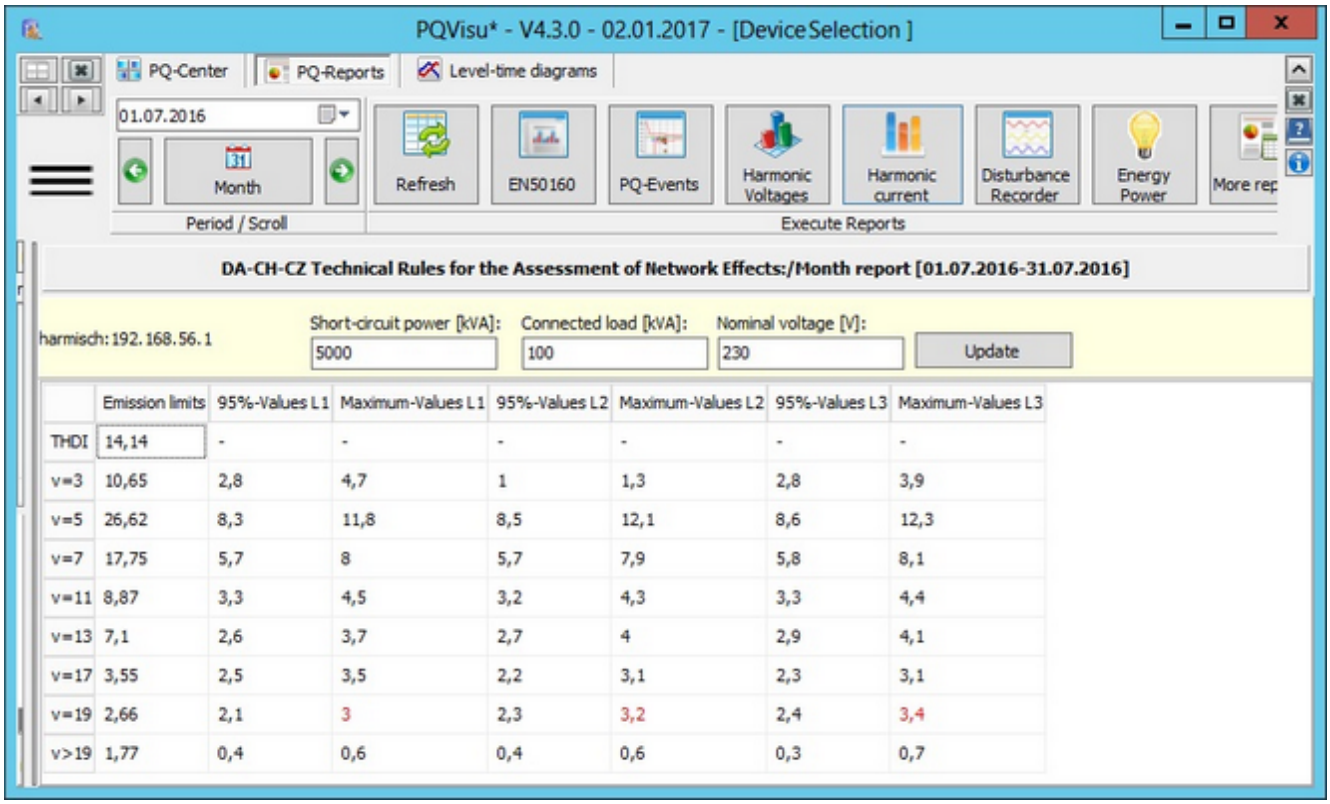
DACH-CZ: Grid perturbations

Note: This report is only available in PQVisu!



	Emission limits	95%-Values L1	Maximum-Values L1	95%-Values L2	Maximum-Values L2	95%-Values L3	Maximum-Values L3
THDI	14,14	-	-	-	-	-	-
v=3	10,65	2,8	4,7	1	1,3	2,8	3,9
v=5	26,62	8,3	11,8	8,5	12,1	8,6	12,3
v=7	17,75	5,7	8	5,7	7,9	5,8	8,1
v=11	8,87	3,3	4,5	3,2	4,3	3,3	4,4
v=13	7,1	2,6	3,7	2,7	4	2,9	4,1
v=17	3,55	2,5	3,5	2,2	3,1	2,3	3,1
v=19	2,66	2,1	3	2,3	3,2	2,4	3,4
v>19	1,77	0,4	0,6	0,4	0,6	0,3	0,7

Calculation of the emission threshold for the v-harmonics from:

- Emissions limits are calculated with the connection data
- Necessary inputs can be inserted in the appropriate input box
- These inputs are:
  - Short-circuit power
  - Connected wattage
  - Nominal voltage
- These values are stored in context of the device
- After enetring new values a recalculation can be done with the update button
- The emission limits then are compared to the present harmonics of current
- The max values und 95% values over all phases are displayed
- If this lies above the determined emission limits the number is displayed in red.

$$\frac{I_v}{I_A} \leq \frac{p_v}{1000} \cdot \sqrt{\frac{S_{kV}}{S_A}}$$

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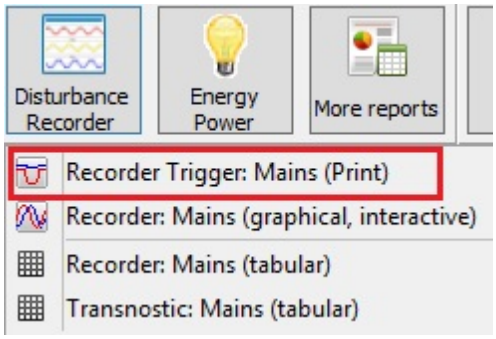
Disturbance records

The following reports are provided under this menu:



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Error log triggers: Grid (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

Comment: PQ-Report
Start: Freitag 01.01.2016
Duration: 182Tage

Company
Recorder-Trigger Mains

a-eberle

Device	Device	Number	LTU	UTU	UNE	RX	STUP	STU	CURR	ET	BALANCE	FRQ	BIN	OTHER
B1:UWBE11S - J3	UWYY - J2	10/10	7/7	2/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/1
B2:UWBE13S - Trafo_13S	1016 - E01	4/4	4/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
B3:UWBU11S - Trafo_11S	UWBU - E04	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
B4:UWBU12S - Trafo_12S	UWBU - E02	4/4	4/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E1:UWES11S - Trafo_11S	UWES - E01	5/5/13300	4/4/13300	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E2:UWES12S - Trafo_12S	UWES - E02	10/11	6/7	4/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E3:UWEP11S - 11S	UWEP - E04	5/4	5/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E4:UWEL12S - Trafo_12S	UWEL - E06	2/2	2/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E5:UWEL13S - Trafo_13S	UWEL - E08	4/4	4/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E6:UWEL11S - Trafo_11S	UWEL - E05	4/4	4/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E7:UWEL31S - Trafo_31S	UWEL - E01	5/6	3/4	2/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E8:UWEL32S - Trafo_32S	UWEL - E04	5/5	4/4	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
E9:UWES13S - Trafo_13S	UWES - E107	7/7	6/6	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
H1:UWHB12S - Trafo_12S	UWHB - E02	5/4	5/4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
K1:UWKT11S - Trafo_11S	UWKT - E00	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
K2:UWKT12S - Trafo_12S	UWKT - E01	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
L1:UWLI11S - Trafo_11S	UWLI - E01	171/106	168/95	3/8	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/3
L2:UWLI12S - Trafo_12S	UWLI - E03	18/19	18/19	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
L3:UWLA11S - 11S	UWLA - E00	6/6	4/4	2/2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
L4:UWLA12S - 12S	UWLA - E00	5/5	5/5	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Q1:PQID - Trafo_1	UWQU - H1	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Q2:UWQU2 - Trafo_2	UWQU - H2	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
W1:UWWO13S - Trafo_13S	UWWO - E00	8/7	7/6	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
W2:UWWORes -	UWWO - E00	7/6	6/5	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
W3:UWWE11S - Trafo__11S	UWWE - E03	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0

LTU: Lower Voltage Threshold UTU: Upper voltage threshold RX: External Trigger STUP: Phase Jump STU: RMS-Jump CURR: Current Trigger
ET: Envelop Trigger BALANCE: Unbalance FRQ: Frequency Trigger BIN: Binary Trigger OTHER: Other Reason UNE: Residual voltage

This report was created to get an overview of the reasons of the fault recorder triggering of each device. If a device generates disproportionately many records, the device parameterization can be changed in time before hundreds of records are transferred to the database. A table row is assigned to each device. The table columns include the number of records by type of trigger (e.g., voltage RMS violations, phase jumps, envelope triggers, etc.). There are two numbers separated by '/' in each cell. These numbers are assigned to the type of recorder Oscilloscope/TRMS.

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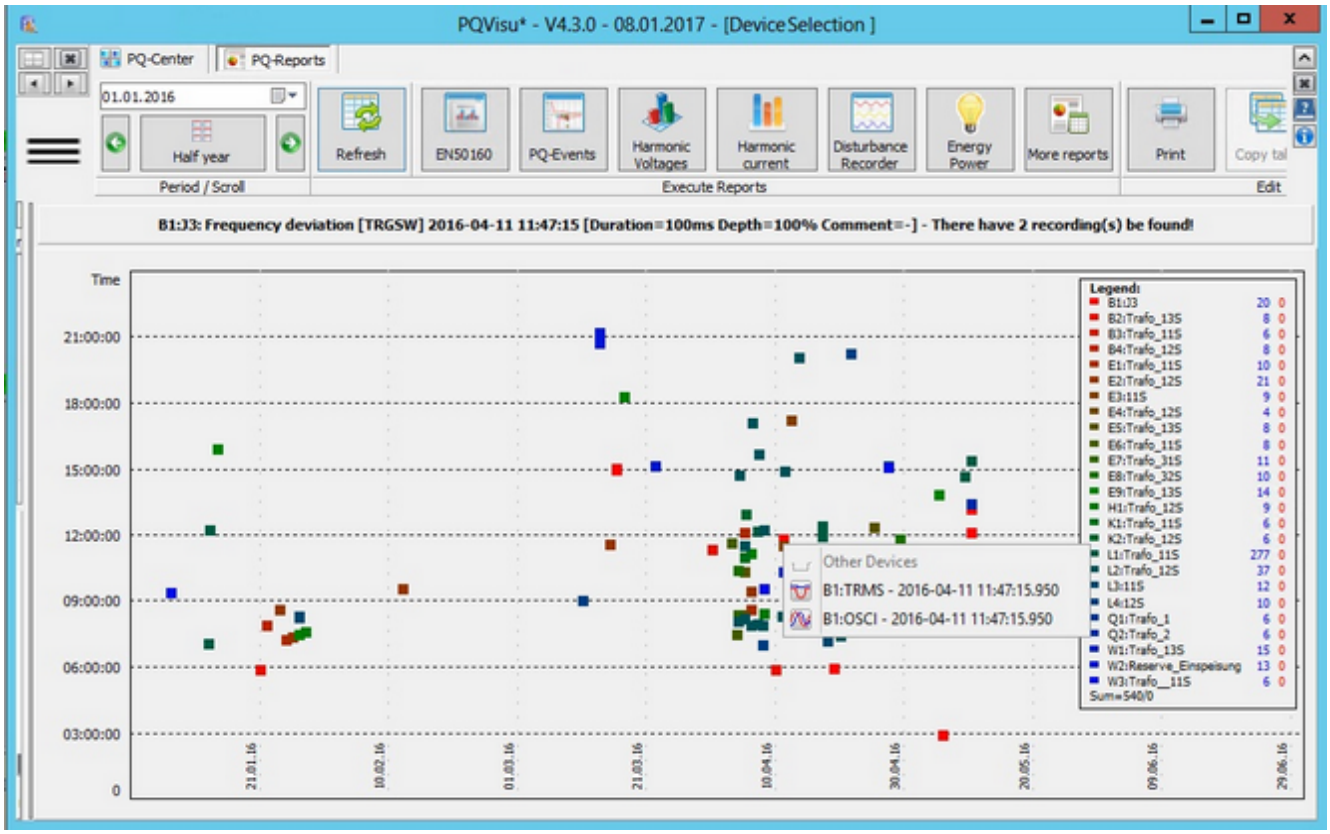
Error logs: Grid (graphical, interactive)

Note: This report is only available in PQVisu!

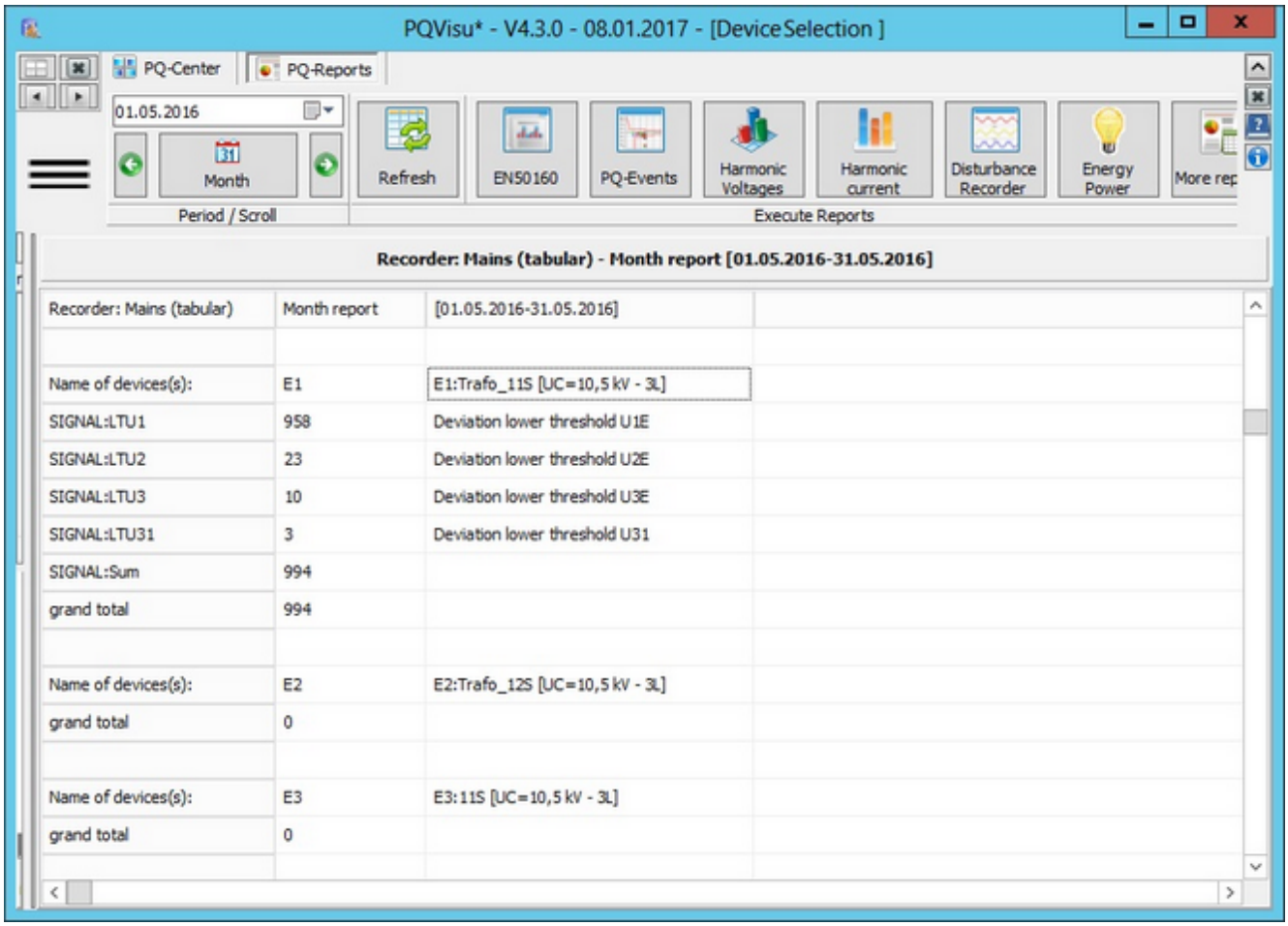


This type of representation is based on the previously described 'ITIC graphic', which was generated from the PQ events. For this image the fault recordings made the basis. The time is plotted on the Y axis, the X axis shows the date, and the meters can be assigned by the colors.

Event durations and depths are not available a priori, they can only be shown by the help of disturbance recording itself. The graphic can be zoomed. When clicking on a symbol, a local menu with the appropriate fault recorder references is displayed. Also records of other devices recorded at the same time will be found.

Error logs: Grid (table)

Note: This report is only available in PQVisu!

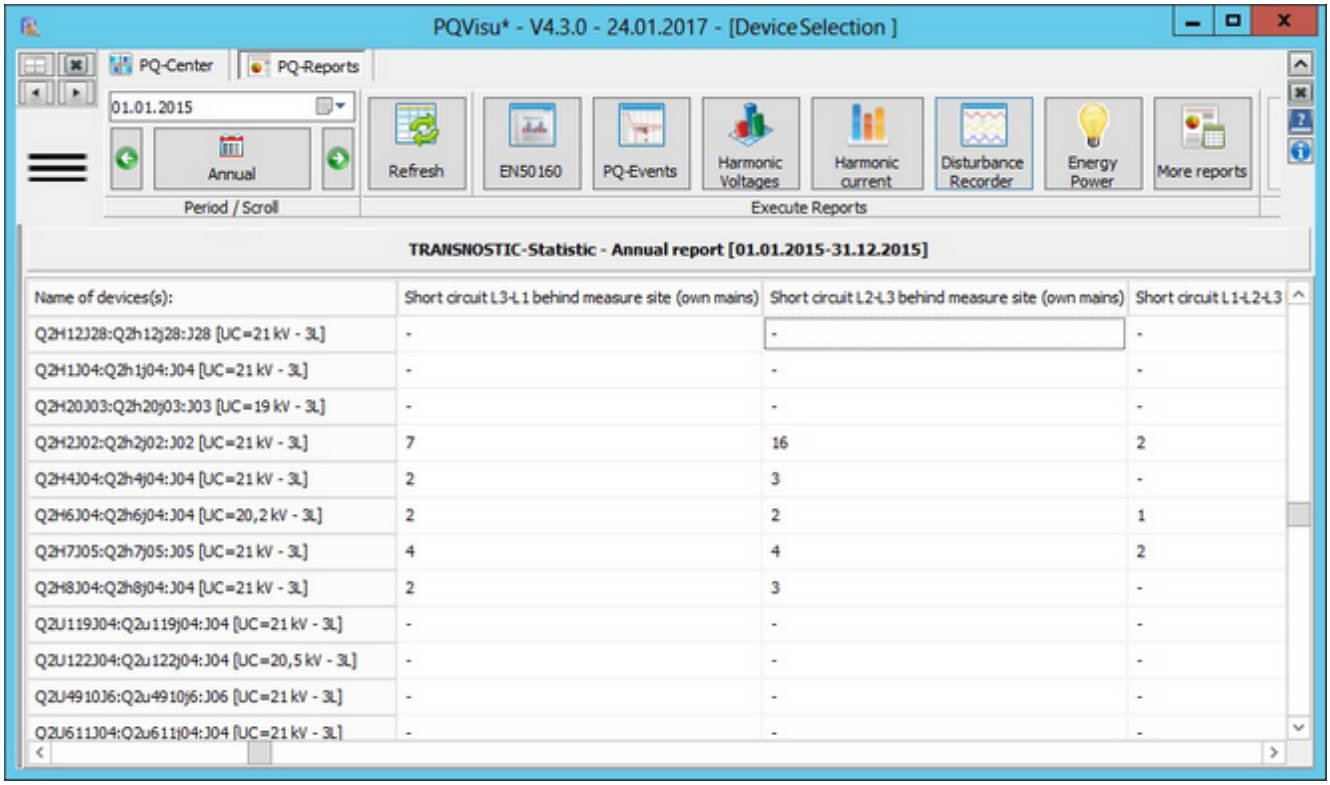


A table with the count and of all trigger criteria per device.

Transnostic: Grid (table)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

PQI-D and PQI-DA devices (not PQI-DA smart) are able to determine the cause of the disturbance. This includes the point of the disturbance (before or after the measuring point) and the kind of disturbance (earth fault, short circuit) as well as the affected conductor. With this report it is possible to display the cause of the disturbance per device with its frequency in a period.



Name of devices(s):	Short circuit L3-L1 behind measure site (own mains)	Short circuit L2-L3 behind measure site (own mains)	Short circuit L1-L2-L3
Q2H12J28:Q2h12j28:J28 [UC=21 kV - 3L]	-	-	-
Q2H1J04:Q2h1j04:J04 [UC=21 kV - 3L]	-	-	-
Q2H20J03:Q2h20j03:J03 [UC=19 kV - 3L]	-	-	-
Q2H2J02:Q2h2j02:J02 [UC=21 kV - 3L]	7	16	2
Q2H4J04:Q2h4j04:J04 [UC=21 kV - 3L]	2	3	-
Q2H6J04:Q2h6j04:J04 [UC=20,2 kV - 3L]	2	2	1
Q2H7J05:Q2h7j05:J05 [UC=21 kV - 3L]	4	4	2
Q2H8J04:Q2h8j04:J04 [UC=21 kV - 3L]	2	3	-
Q2U119J04:Q2u119j04:J04 [UC=21 kV - 3L]	-	-	-
Q2U122J04:Q2u122j04:J04 [UC=20,5 kV - 3L]	-	-	-
Q2U4910J6:Q2u4910j6:J06 [UC=21 kV - 3L]	-	-	-
Q2U611J04:Q2u611j04:J04 [UC=21 kV - 3L]	-	-	-

Grid error log triggers

This report can be used to check all of the devices' trigger settings.

Comment: PQ-Report
Start: Sonntag 01.05.2016
Duration: 31Tage

Company

Recorder-Trigger Mains

a-eberle

Device	Device	Number	LTU	UTU	UNE	RX	STUP	STU	CURR	ET	BALANCE	FRQ	BIN	OTHER
M1_1:UM11Q - 30kV	UWMitte - UM11	7/7	7/7	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M1_2:UM11Q - 6kV	UWMitte - UM11	6/0	6/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M2_1:UM12Q - 30kV	UWMitte - UM12	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M2_2:UM12Q - 6	UWMitte - UM12	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M3_1:UM13Q - 30kV	UWMitte - UM13	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M3_2:UM13Q - 6kV	UWMitte - UM13	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M4:UM14Q - 6kV	UWMitte - UM14	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
M5:UM15Q - 6kV	UWMitte - UM15	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
R3:UM13Q - 6kV	UWMitte - UM13Res	3/3	3/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N1:RU1Q - 30kV	UWNord - RU1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N2:RU2Q - 30kV	UWNord - RU2	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N3:RU3Q - 30kV	UWNord - RU3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N4:RU4Q - 30kV	UWNord - RU4	10/8	10/8	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N8:Ltg1211 - 110kV	UWNord - Ltg121/1	16/15	7/6	9/9	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
N9:Ltg1212 - 110kV	UWNord - Ltg121/2	23/23	3/3	20/20	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0

LTU: Lower Voltage Threshold UTU: Upper voltage threshold RX: External Trigger STUP: Phase Jump STU: RMS-Jump CURR: Current Trigger
ET: Envelop Trigger BALANCE: Unbalance FRQ: Frequency Trigger BIN: Binary Trigger OTHER: Other Reason UNE: Residual voltage

In every cell in the table are at least 2 numbers: the first one is the number of oscilloscope writs while the second one is for the number of TRMS writs. If there are signal voltage recorder write a third number is displayed.

This report is very suitable for an automatic generation (e.g. weekly).

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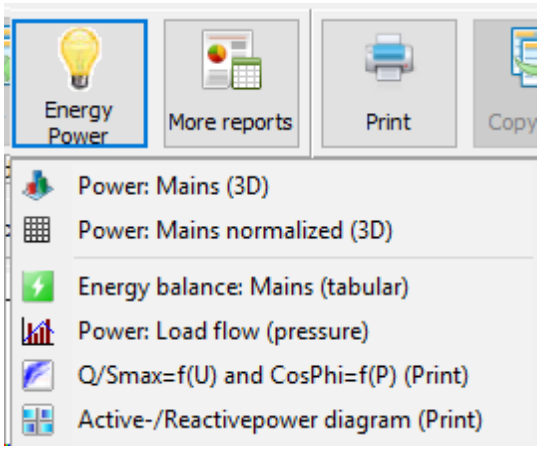
Energy/Power

In this section, functions are grouped which refer to power or energy values calculated by the devices.



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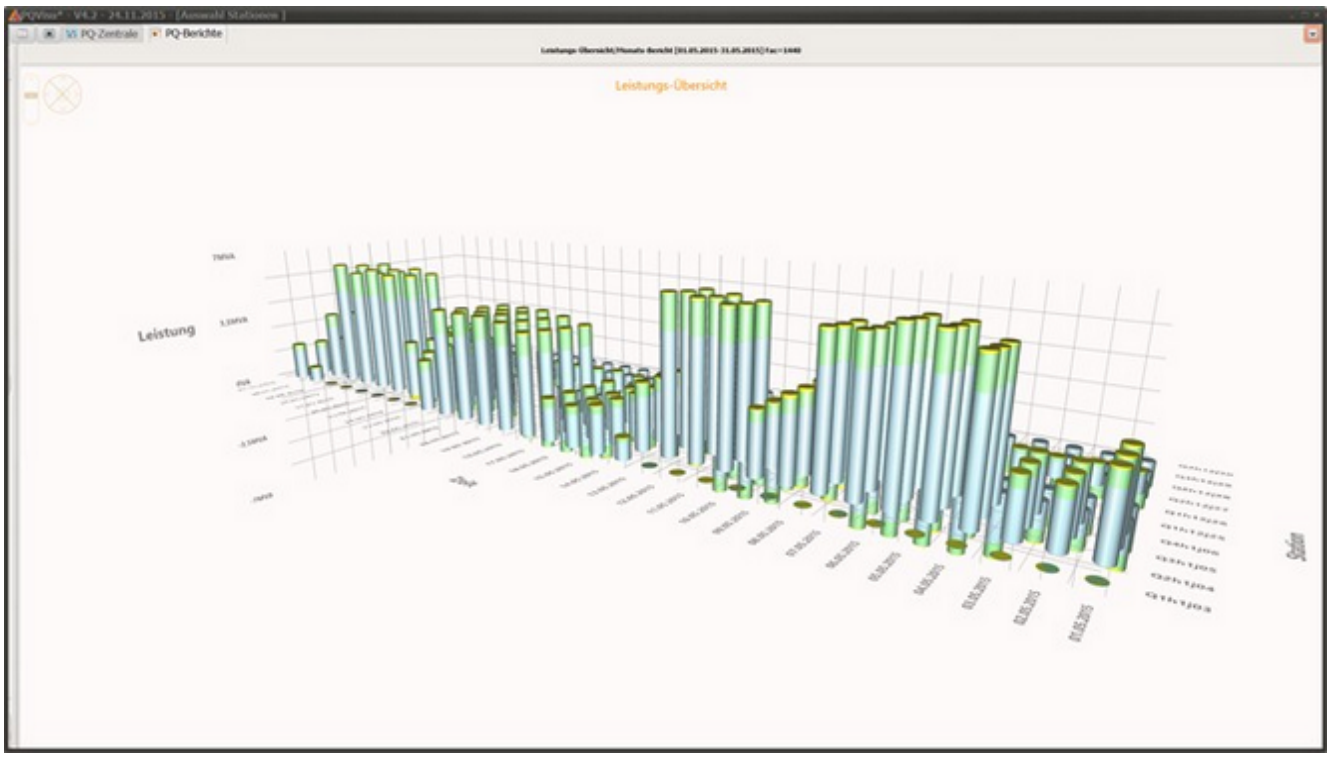
Power: Grid (3D)

Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

This representation is intended to represent the ratio of active and reactive power as a function of time and location (PQ device). The following applies:

- The data are generated from the 10-minute average value recordings (for example for the graphic of a day, 6 intervals are combined to an hourly average value, for the week display the average value calculation is carried out over 6 hours each, etc.).
- The sign of the active power determines the direction of the bar.
- The reactive power (first the displacement reactive power in green, then distortion reactive power in yellow) is set above the active power section.

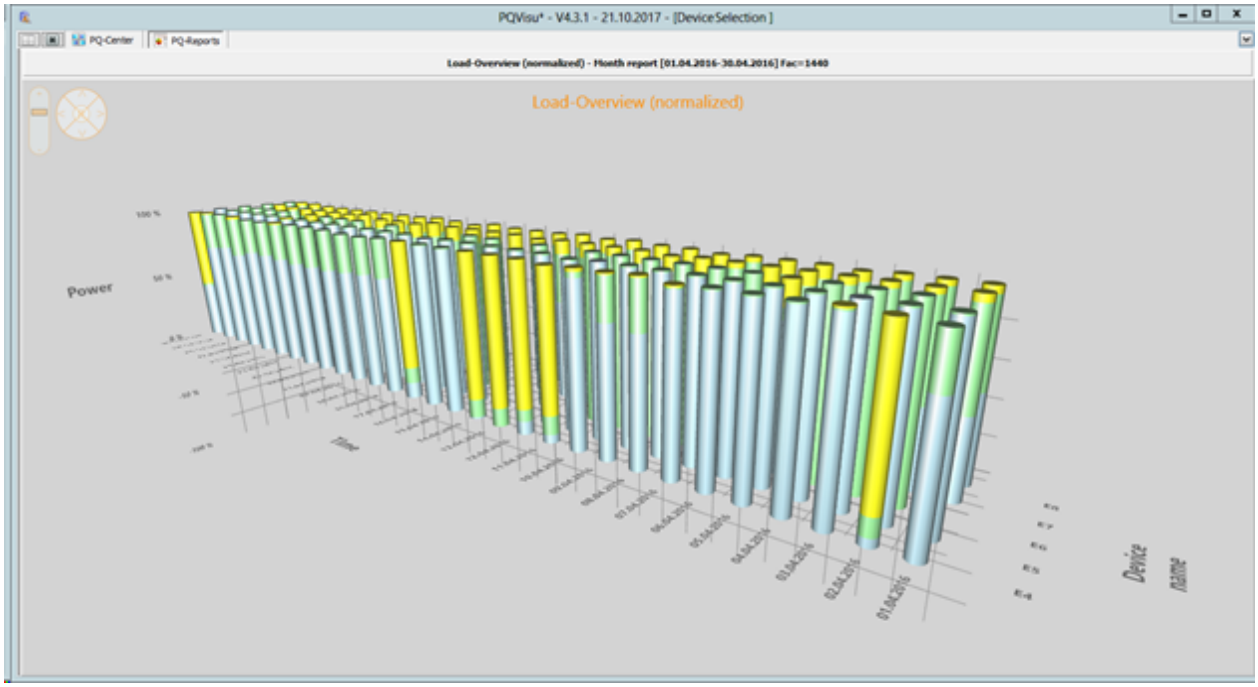


Normalized:

PQ-Zentrale
PQ-Berichte
Leistungs-Übersicht (normalisiert)
Zeit

Power: Mains normalized (3D)

In the normalized form, the total height of the beam is set to 100%. Thus, the ratio of the power components to one another is more clearly recognizable.



Energy Balance: Mains (tabular)

This report is based on the requirement that the listed energy measurement values are activated in the 10min data class on the device:

- Total active energy Mains
- Delivery active energy Mains
- Consumption active energy Mains
- Total reactive energy Mains
- Delivery reactive energy Mains
- Consumption reactive energy Mains.

The shown energy values are calculated from the difference between the last and first value in the interval period.

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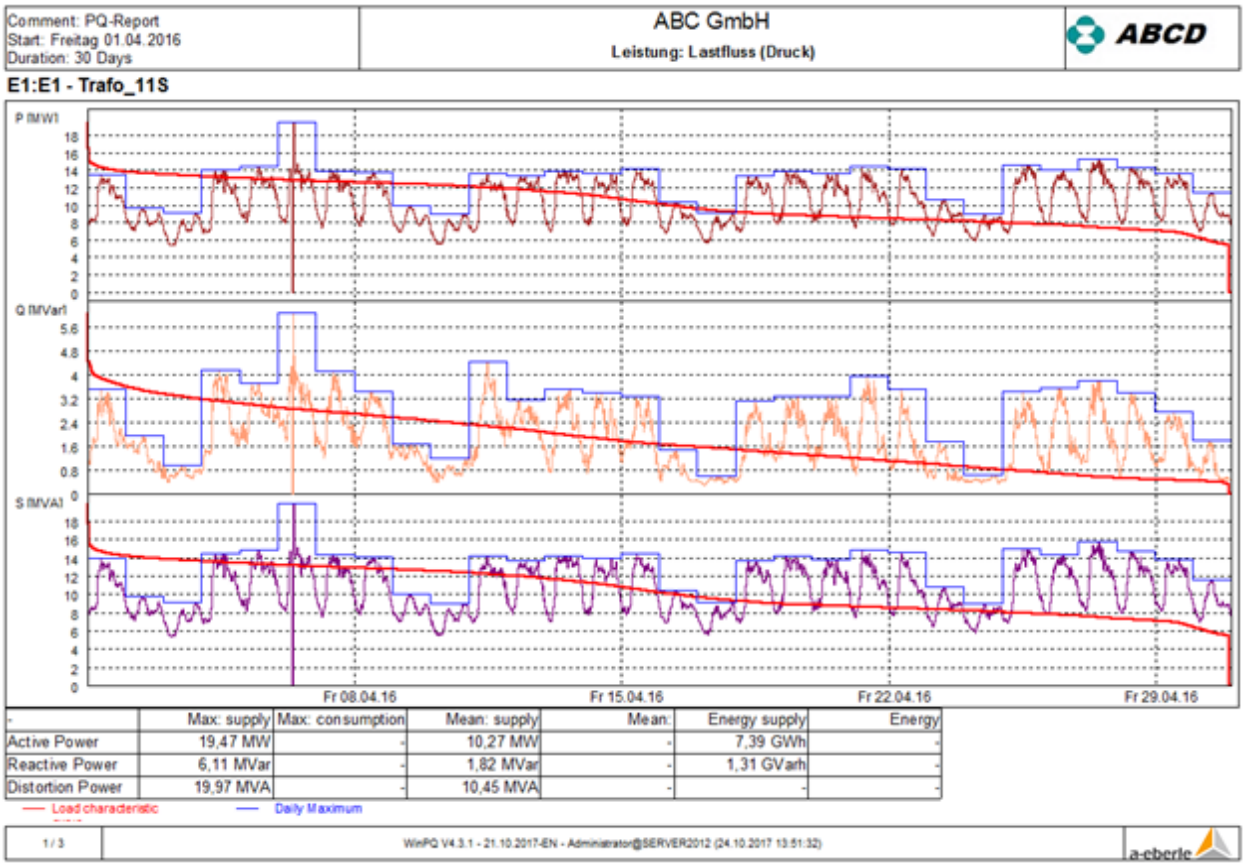
Power: Loadflow (Print)

For all 3D-Reports the corresponding license is required.

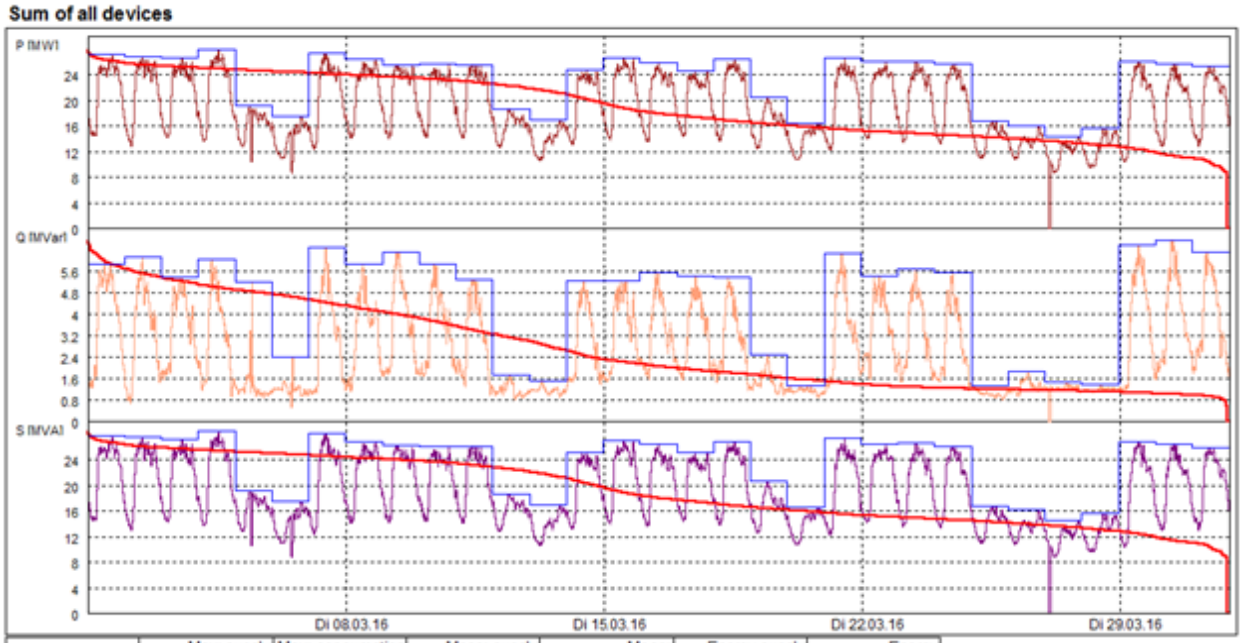
The aim is to evaluate the curves of active, reactive and apparent power. If available, the 15min interval values (24h - 96 values) are used. Otherwise 10min recordings are used. Up to a display duration of 1 month, these 15min values are displayed as a curve (max. 96 values multiplied with 31 days=2976 points). In the case of longer time windows, only the daily maximum values are displayed.

The sorted representation of the 15min values over the accounting period is referred to as the‘Ganglinie’ (red in the diagram). For a power maximum limitation, this type of representation is well suited. It is possible to see how many times the load must be reduced to remain below a certain load threshold.



-	Max: supply	Max: consumption	Mean: supply	Mean:	Energy supply	Energy
Active Power	19,47 MW	-	10,27 MW	-	7,39 GWh	-
Reactive Power	6,11 MVar	-	1,82 MVar	-	1,31 GVarh	-
Distortion Power	19,97 MVA	-	10,45 MVA	-	-	-

The respective daily maximum is shown as a blue line. Ultimately, the goal is that the sum of several measuring devices (exits / lines) can be combined into one diagram. For the Parametrization of the diagram a section in the Report-Setup-Dialog is available.



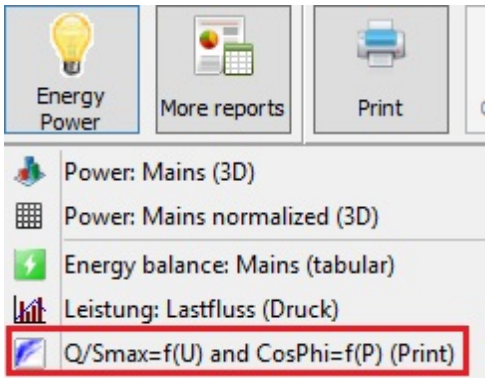
-	Max: supply	Max: consumption	Mean: supply	Mean:	Energy supply	Energy
Active Power	27,96 MW	-	18,83 MW	-	13,99 GWh	-
Reactive Power	6,77 MVar	-	2,69 MVar	-	2 GVarh	-
Distortion Power	28,45 MVA	-	19,06 MVA	-	-	-

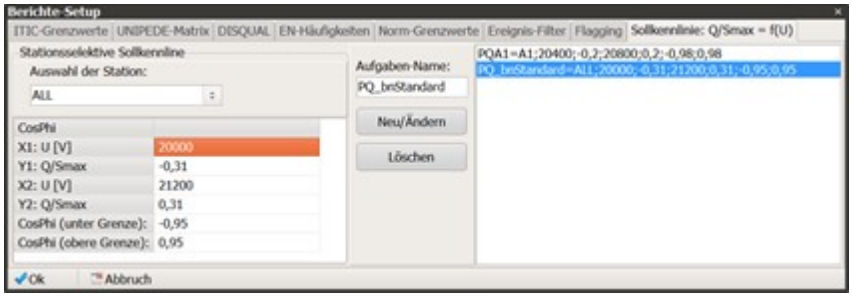
Load characteristic Daily Maximum

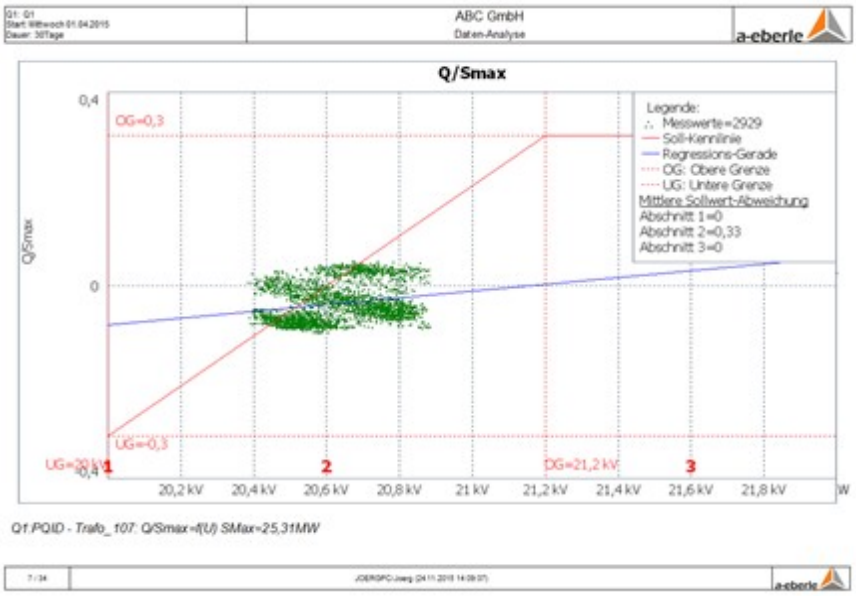
In addition, the selected limit line (zero means that this function is disabled) and the number of intervals that violate these limits are displayed in the buzzer over all selected devices.

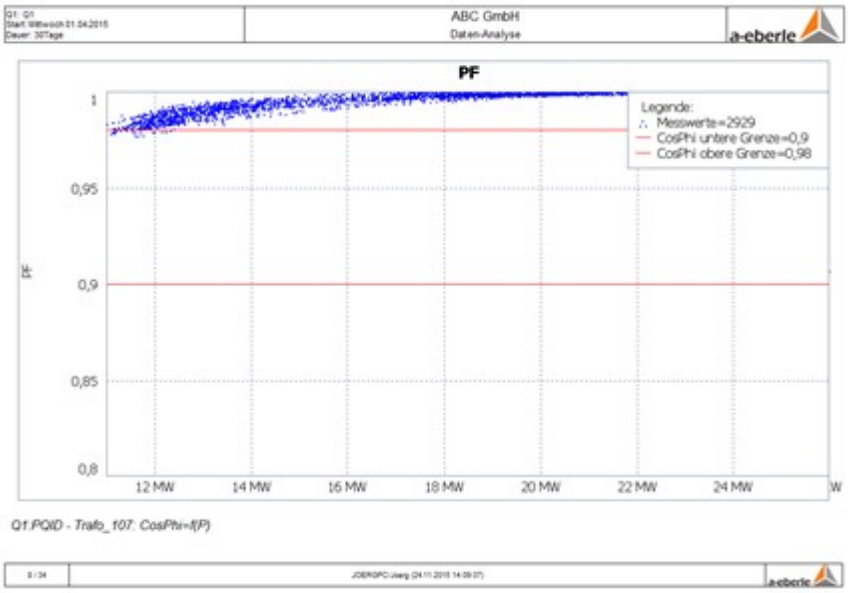
Q/Smax=f(U) and CosPhi=f(P) (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!
A licence for the CosPhi report is required.



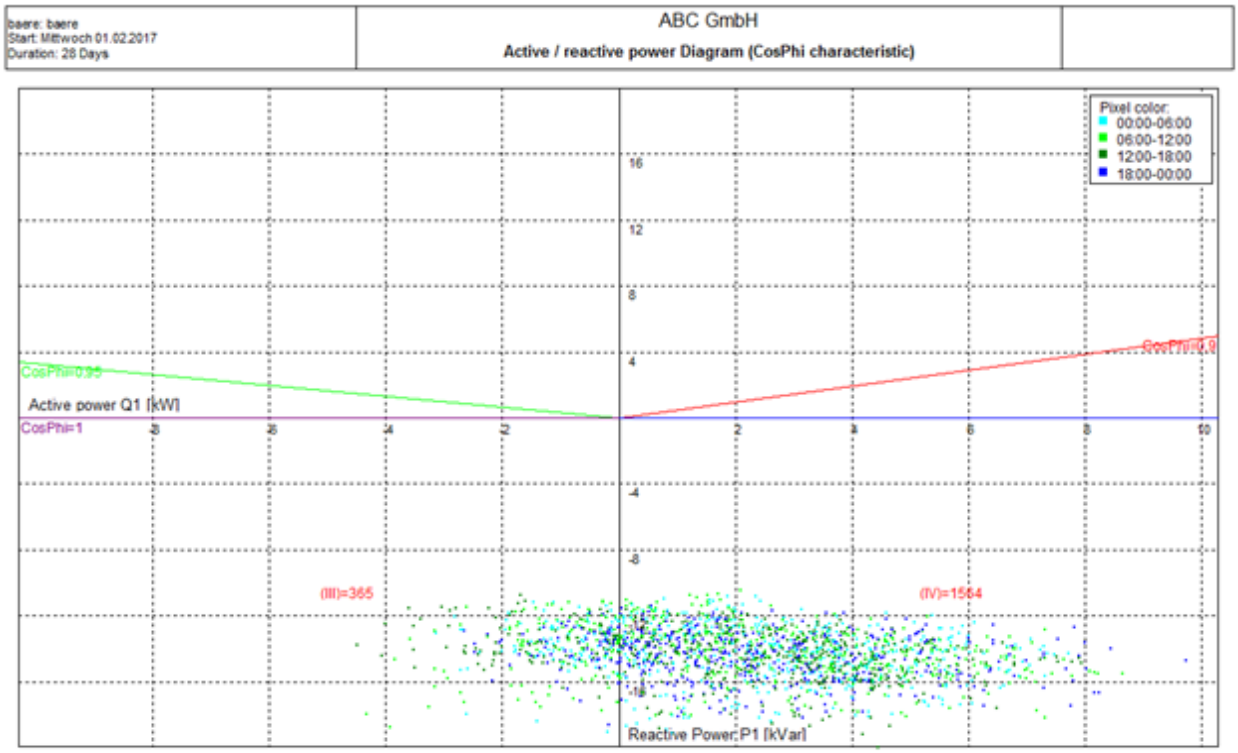





Q1: Q1
Start: Mittwoch 01.04.2015
Dauer: 30Tage
ABC GmbH
Daten-Analyse
a-eberle
PF
Legende:
Messwerte=2929
CosPhi untere Grenze=0,9
CosPhi obere Grenze=0,98
1
0,95
0,9
0,85
0,8
12 MW
14 MW
16 MW
18 MW
20 MW
22 MW
24 MW
W
Q1:PQID - Trafo_107: CosPhi=f(P)
a-eberle

Active-/reactive Power-Diagram (Print)

This diagram shows the dependency of active and reactive power in a diagram. The sign-based reactive power (inductive / capacitive) of the fundamental wave is primarily used for the representation. In addition, up to four CosPhi values can be assigned to each device. If there are no measuring points in a quadrant, the CosPhi line is not displayed.



ga:gaert - - Dorf - Ortschwaben UC=230 V

By the color of a pixel (see legend) the time at which the measured values were generated can be determined.

Additional reports

All other reports are accessible with this button.

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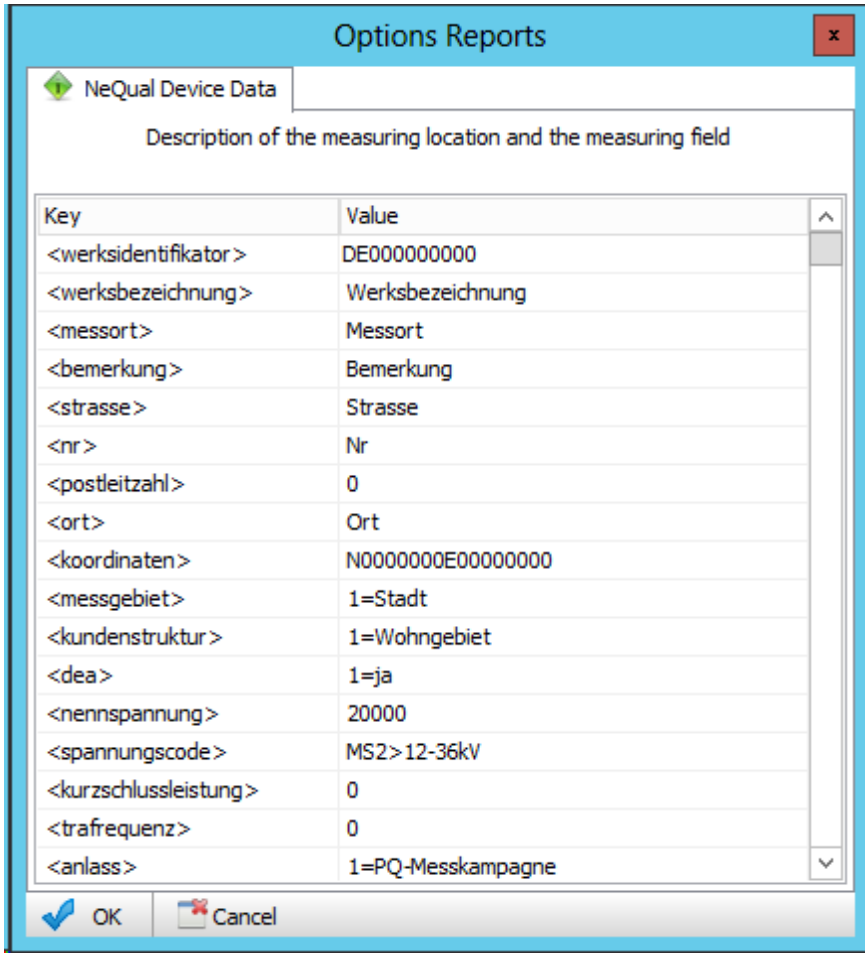
NeQual Export (Switzerland)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!
A separate licence is required for XML export.

It is a precisely specified data format (based on the XML specification) in order to carry out comparable evaluations independent of the used measuring devices.

Detailed information can be found at:
https://www.strom.ch/de/verband/angebot/produkte/meistverkaufte/nequalc.html

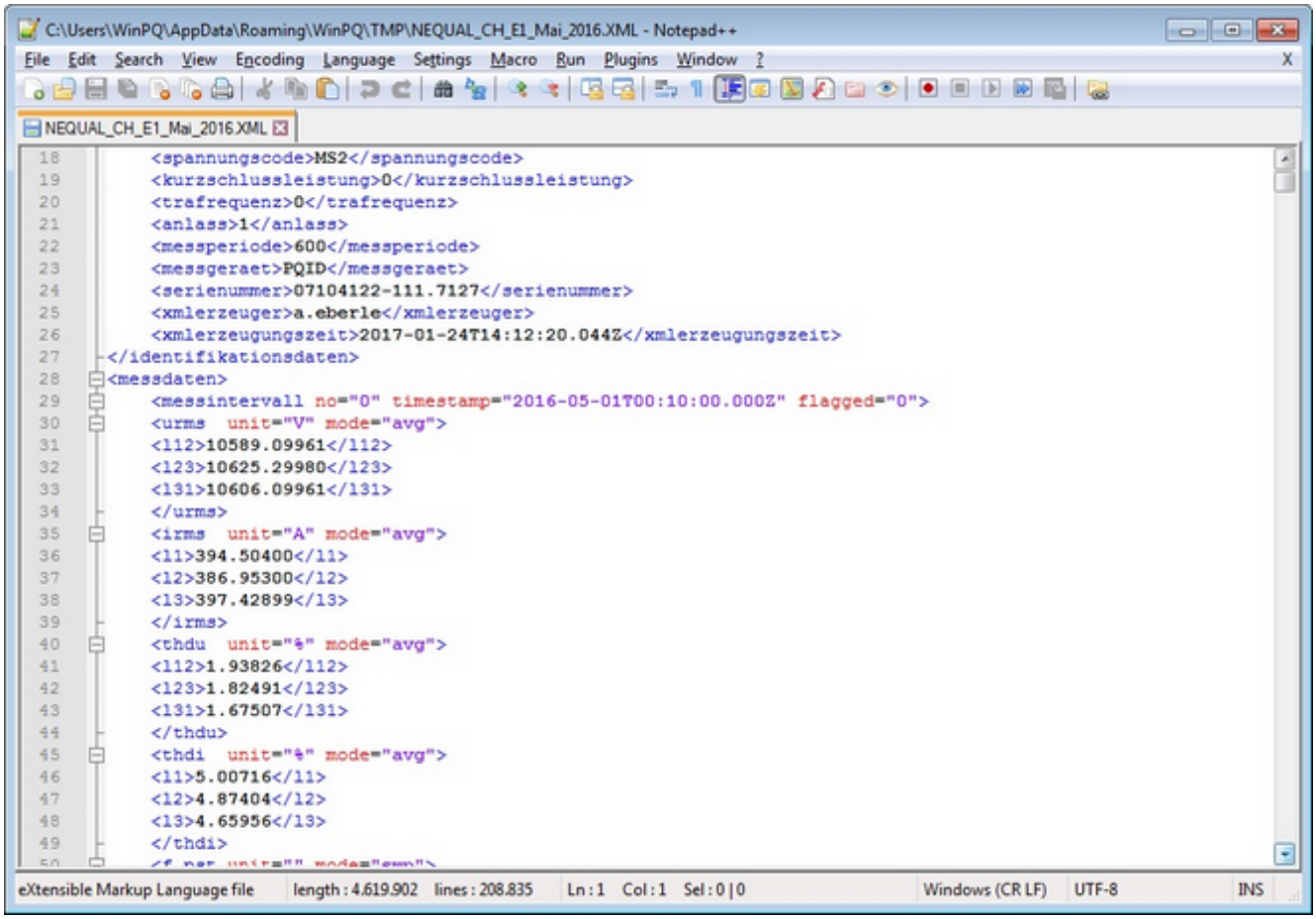
The generation of the export data begins with the filling in the form for the metadata of the measuring location, the measuring reason, and so on:



Key	Value
<werksidentifikator>	DE000000000
<werksbezeichnung>	Werksbezeichnung
<messort>	Messort
<bemerkung>	Bemerkung
<strasse>	Strasse
<nr>	Nr
<postleitzahl>	0
<ort>	Ort
<koordinaten>	N0000000E00000000
<messgebiet>	1=Stadt
<kundenstruktur>	1=Wohngebiet
<dea>	1=ja
<nennspannung>	20000
<spannungscode>	MS2>12-36kV
<kurzschlussleistung>	0
<trafrequenz>	0
<anlass>	1=PQ-Messkampagne

These data are stored directly so that they can also be used to create the automatically generated XML files. As a result, a manual export is required for each device before the automatic creation is provided.

The following figure shows the basic file structure:



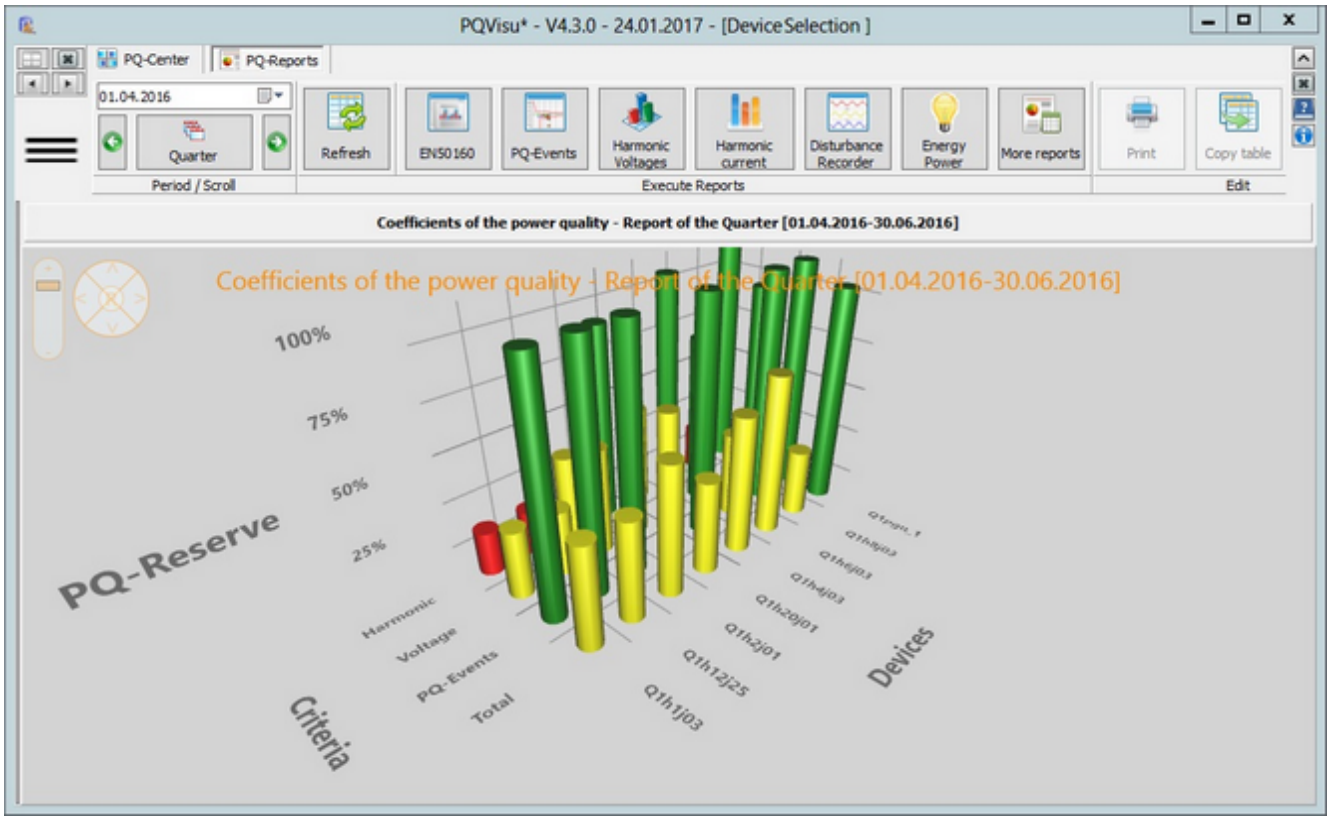
There is a modified version of this report for Austria: only events are evaluated (voltage swells, voltage dips and interruptions).

PQ coefficient grid (3D)

Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

Goal is to display the core area of the voltage quality in a ruled area over several recording devices on different measurement points. To achieve this the following things are considered:

1. General parameters (voltage, frequency, flicker, unbalance, THD)
2. Single harmonics up the 25th
3. Voltage events (dips, swells, changes, interruptions)



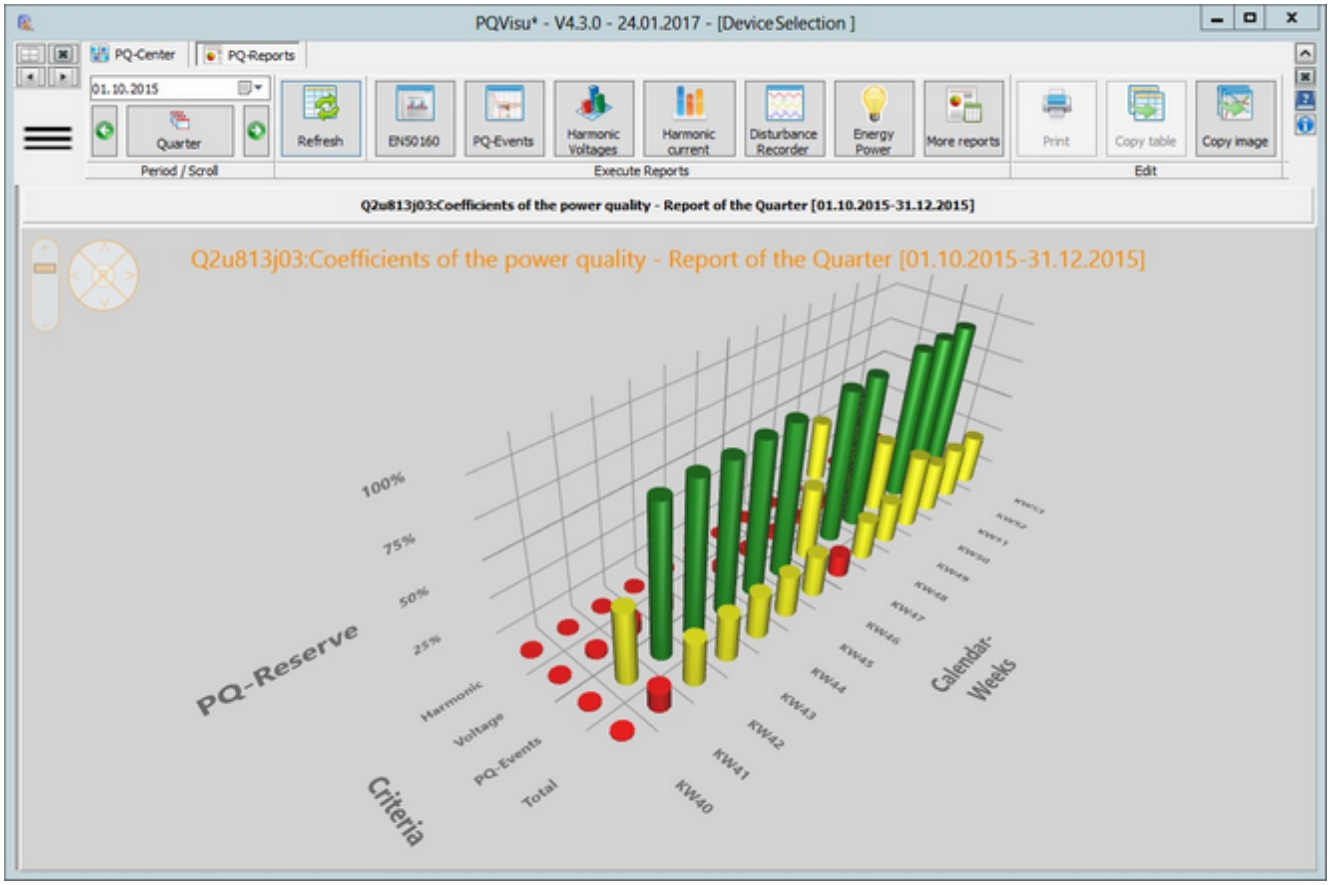
The height of a bar can be seen as PQ reserve. Is the bar green and near 100% the measurement value is close to the nominal value (e.g. frequency or voltage) or close to zero (flicker, THD).

These criteria are combined into a single bar.

PQ coefficient device (3D)

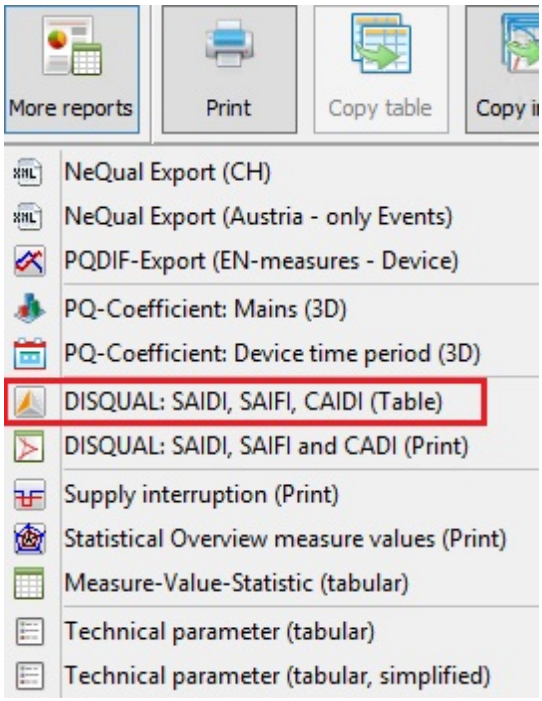
Note: This report is only available in PQVisu!
A separate licence is required for each 3D report.

Alternatively, to the previous display it is possible to select one device. This device will then be displayed in dependency of the calculated coefficient from week to week.



DISQUAL: SAIDI, SAIFI, CAIDI (table)

Note: This report is only available in PQVisu!



SAIDI: The **System Average Interruption Duration Index,** SAIDI is the average outage duration for each customer served, and is calculated as:

$$\mathrm{SAIDI} = \frac{\sum U_i N_i}{\sum N_i}$$

SAIFI: The **System Average Interruption Frequency Index** is the average number of interruptions that a customer would experience, and is calculated as:

$$\mathrm{SAIFI} = \frac{\sum \lambda_i N_i}{\sum N_i}$$

CAIFI: The **Customer Average Interruption Frequency Index,** it gives the average outage duration that any given customer would experience. CAIDI can also be viewed as the average restoration time. CAIDI is measured in units of time, often minutes or hours. It is usually measured over the course of a year, and according to IEEE Standard 1366-1998 the median value for North American utilities is approximately 1.36 hours.

$$\mathrm{CAIDI} = \frac{\text{sum of all customer interruption durations}}{\text{total number of customer interruptions}} = \frac{\mathrm{SAIDI}}{\mathrm{SAIFI}}$$

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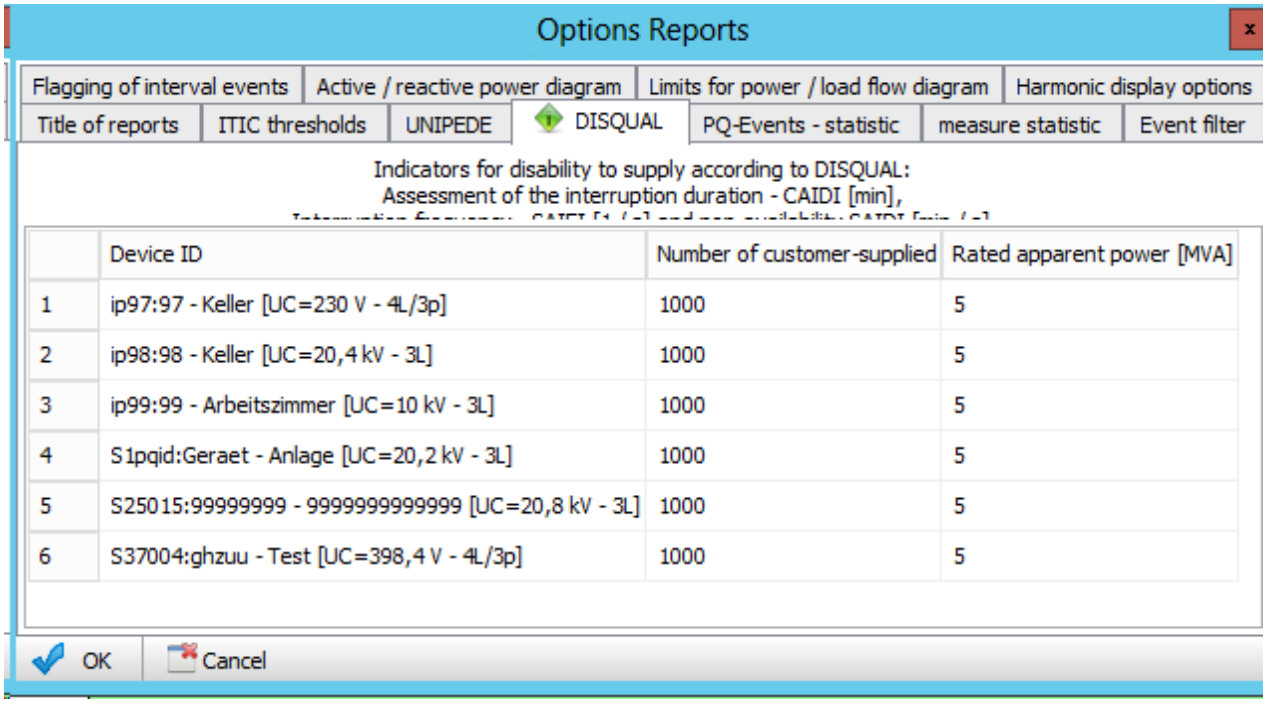

	Device ID	Number of customer-supplied	Rated apparent power [MVA]
1	ip97:97 - Keller [UC=230 V - 4L/3p]	1000	5
2	ip98:98 - Keller [UC=20,4 kV - 3L]	1000	5
3	ip99:99 - Arbeitszimmer [UC=10 kV - 3L]	1000	5
4	S1pqid:Geraet - Anlage [UC=20,2 kV - 3L]	1000	5
5	S25015:99999999 - 9999999999999 [UC=20,8 kV - 3L]	1000	5
6	S37004:ghzuu - Test [UC=398,4 V - 4L/3p]	1000	5

Two methods can be used to calculate the key:

- Method A over the number of customers supplied
- Method B based on the rated apparent power

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DISQUAL: SAIDI, SAIFI, CAIDI (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

Explanation for the coefficient are in the previous chapter. This representation is useful for automatically generated reports.

Kommentar: Manueller Bericht Start: Donnerstag 01.01.2009 Dauer: 365 Tage	ABC AG DISQUAL - Qualitäts-Parameter	a-eberle GLOBAL NET QUALITY

	UC Grenze	Kunde Power	Nummer Dauer	CAIDI	SAIFI	SAIDI
E4:UWEL12S - Trafo_12S UWEL - E06	10,5 kV 10	Leistung: B 10	100 764,66 h	7,6	10	76,5
E5:UWEL13S - Trafo_13S UWEL - E08	10,5 kV 10	Leistung: B 10	80 678,88 h	8,5	8	67,9
E6:UWEL11S - Trafo_11S UWEL - E05	10,5 kV 10	Leistung: B 10	100 462,92 h	4,6	10	46,3

For the calculation of this coefficient either the Rated apparent power (method b) or the number of provided clients (method a) is needed. These can be entered in the Report setup.

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Power supply interruption: (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

Kommentar: Manueller Bericht Start: Donnerstag 01.01.2009 Dauer: 365 days	ABC AG Liste der Versorgungs-Unterbrechungen	a-eberle GLOBAL NET QUALITY

Station	Zeit	Dauer	Ereignisse	Grund	Kommentar
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:04:12 22.04.2009 10:09:12	4,99Min	SI23_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:04:12 22.04.2009 10:09:12	4,99Min	SI12_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:10:16 22.04.2009 10:10:21	5514ms	SI12_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:10:16 22.04.2009 10:10:21	5514ms	SI23_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:26:14 22.04.2009 10:27:14	59,37Sek	SI12_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:26:14 22.04.2009 10:53:19	27,08Min	SI23_1 Interruption	--	-
E6:UWEL11S - Trafo_11S UWEL - E05	22.04.2009 10:36:54 22.04.2009 10:53:19	16,42Min	SI23_1 Interruption	--	-

- All of the power supply interruptions that occurred in the evaluation period are listed.
- The time at which the interruption occurred and its duration are displayed.
- The class that the fault was added to as well as any notes that were entered are also displayed.
- Events that are classified as 'Planned measure' or 'Test' are not displayed.

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Statistical overview of measured values: (print)

Note: This report is available in PQStart, PQVisu and as an automatic report in PQReport!

The goal of this report is to set statistically characteristics of the PQ relevant values of its threshold value into context of different measurement points. This is achieved by displaying average, 95% value and max value on a radial graph.

Comment: PQ-Report
Start: Sonntag 01.05.2016
Duration: 31Tage

Company

Statistical Overview measured values

a-eberle

Device	measure	Nominal	Lower threshold	Upper threshold	Number	Minimum	5%-value	Average	95%-value	Maximum
E4:UWEL12S - Trafo_12S	F	50 Hz	49,5 Hz	50,5 Hz	1490	49,93	49,95	50	50,05	50,08
E4:UWEL12S - Trafo_12S	UUNS	-	-	3	1490	0,04	0,07	0,11	0,15	0,18
E4:UWEL12S - Trafo_12S	THD12	-	-	8	1490	0,76	1,09	1,67	2,18	2,39
E4:UWEL12S - Trafo_12S	THD23	-	-	8	1490	0,79	1,02	1,55	2,04	2,26
E4:UWEL12S - Trafo_12S	THD31	-	-	8	1490	0,69	1,05	1,55	1,98	2,18
E4:UWEL12S - Trafo_12S	U12	10,5 kV	9,45 kV	11,55 kV	1490	10411,6	10420,6	10522,78	10614,2	10625,9
E4:UWEL12S - Trafo_12S	U23	10,5 kV	9,45 kV	11,55 kV	1490	10401,9	10420,3	10526,04	10620,1	10631,5
E4:UWEL12S - Trafo_12S	U31	10,5 kV	9,45 kV	11,55 kV	1490	10418,1	10436,3	10540,45	10634,3	10644,4
E4:UWEL12S - Trafo_12S	PLT12	-	-	1	124	0,05	0,1	0,16	0,21	0,27
E4:UWEL12S - Trafo_12S	PLT23	-	-	1	124	0,06	0,1	0,17	0,22	0,26
E4:UWEL12S - Trafo_12S	PLT31	-	-	1	124	0,05	0,1	0,16	0,22	0,24
E4:UWEL12S - Trafo_12S	U12H2	-	-	2	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H2	-	-	2	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H2	-	-	2	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H3	-	-	5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H3	-	-	5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H3	-	-	5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H4	-	-	1	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H4	-	-	1	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H4	-	-	1	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H5	-	-	6	1490	0,09	0,21	0,95	1,9	2,12
E4:UWEL12S - Trafo_12S	U23H5	-	-	6	1490	0,08	0,2	0,87	1,79	2,02
E4:UWEL12S - Trafo_12S	U31H5	-	-	6	1490	0,07	0,16	0,82	1,7	1,92
E4:UWEL12S - Trafo_12S	U12H6	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H6	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H6	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H7	-	-	5	1490	0,59	0,94	1,27	1,56	1,67
E4:UWEL12S - Trafo_12S	U23H7	-	-	5	1490	0,56	0,84	1,16	1,45	1,57
E4:UWEL12S - Trafo_12S	U31H7	-	-	5	1490	0,56	0,88	1,21	1,51	1,65
E4:UWEL12S - Trafo_12S	U12H8	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H8	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H8	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H9	-	-	1,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H9	-	-	1,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H9	-	-	1,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U12H10	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U23H10	-	-	0,5	1490	0	0	0	0	0
E4:UWEL12S - Trafo_12S	U31H10	-	-	0,5	1490	0	0	0	0	0

9 / 19 SERVER2012/Administrator EN (30.12.2016 07:20:47) a-eberle

Kommentar: PQ-Bericht Start: Mittwoch 01.04.2015 Dauer: DauerWert	ABC GmbH Bild-Ausdruck	a-eberle

Legende der Achsen:

'1' H7J03 - J03 - UW Etting - HST 7
'2' H7J04 - J04 - UW Etting - HST 7
'3' H7400V - 400V - UW Etting - HST 7
'4' H8J03 - J03 - UW Carl Zeiss - HST 8
'5' H8J04 - J04 - UW Carl Zeiss - HST 8
'6' H8400V - 400V - UW Carl Zeiss - HST 8
'7' U813J01 - J01 - UW Carl Zeiss - UST 81314
'8' U813J02 - J02 - UW Carl Zeiss - UST 81314
'9' U813J03 - J03 - UW Carl Zeiss - UST 81314
'10' U813J04 - J04 - UW Carl Zeiss - UST 81314
'11' U813J05 - J05 - UW Carl Zeiss - UST 81314
'12' U813J06 - J06 - UW Carl Zeiss - UST 81314
'13' U813J23 - J23 - UW Carl Zeiss - UST 81314
'14' U813J24 - J24 - UW Carl Zeiss - UST 81314

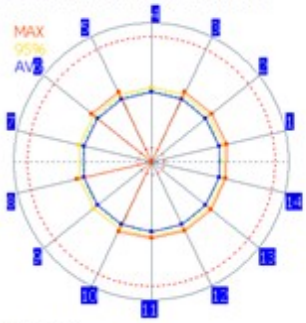


Abbildung 1: F

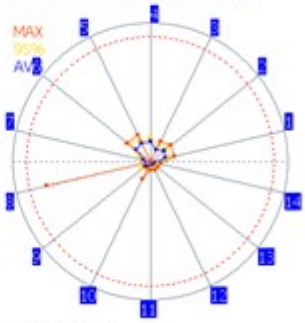


Abbildung 2: UUNS

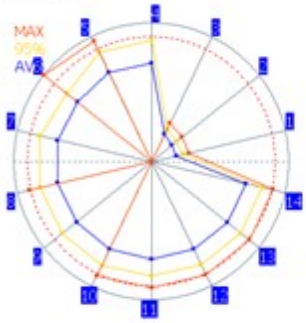


Abbildung 3: THD

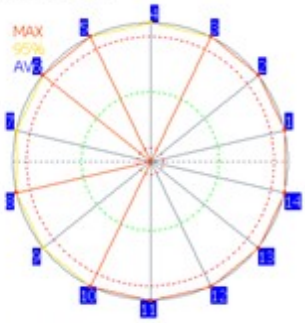


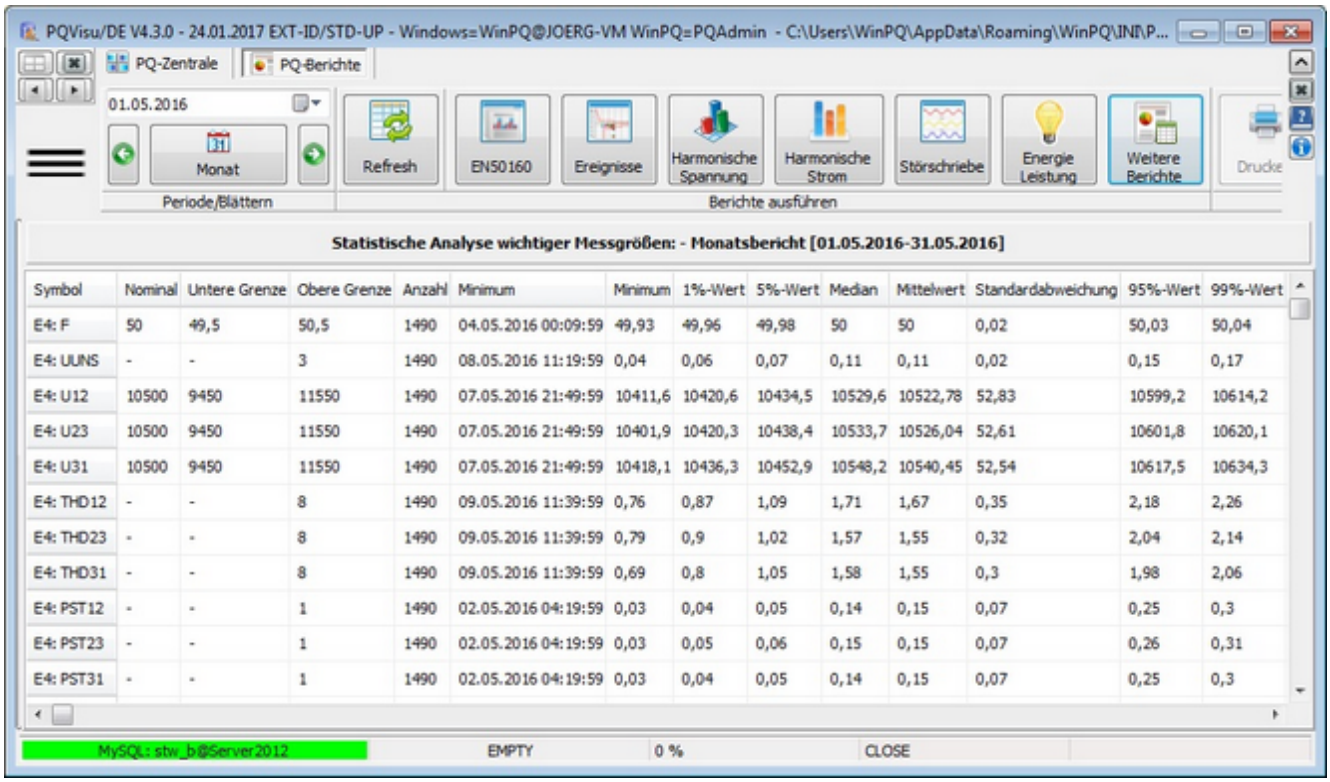
Abbildung 4: U

Measured-value statistics: (table)

Note: This report is only available in PQVisu!

Basic statistical parameters of PQ relevant measured variables (e.g. frequency, flicker, harmonic) are calculated. These are, for example:

- Nominal and limit values (if available),
- Minimum and maximum with time of occurrence,
- Mean, median and standard deviation,
- 1% and 99% values and their range,
- 5% and 95% values and their span.



Symbol	Nominal	Untere Grenze	Obere Grenze	Anzahl	Minimum	Minimum	1%-Wert	5%-Wert	Median	Mittelwert	Standardabweichung	95%-Wert	99%-Wert
E4: F	50	49,5	50,5	1490	04.05.2016 00:09:59	49,93	49,96	49,98	50	50	0,02	50,03	50,04
E4: UUNS	-	-	3	1490	08.05.2016 11:19:59	0,04	0,06	0,07	0,11	0,11	0,02	0,15	0,17
E4: U12	10500	9450	11550	1490	07.05.2016 21:49:59	10411,6	10420,6	10434,5	10529,6	10522,78	52,83	10599,2	10614,2
E4: U23	10500	9450	11550	1490	07.05.2016 21:49:59	10401,9	10420,3	10438,4	10533,7	10526,04	52,61	10601,8	10620,1
E4: U31	10500	9450	11550	1490	07.05.2016 21:49:59	10418,1	10436,3	10452,9	10548,2	10540,45	52,54	10617,5	10634,3
E4: THD12	-	-	8	1490	09.05.2016 11:39:59	0,76	0,87	1,09	1,71	1,67	0,35	2,18	2,26
E4: THD23	-	-	8	1490	09.05.2016 11:39:59	0,79	0,9	1,02	1,57	1,55	0,32	2,04	2,14
E4: THD31	-	-	8	1490	09.05.2016 11:39:59	0,69	0,8	1,05	1,58	1,55	0,3	1,98	2,06
E4: PST12	-	-	1	1490	02.05.2016 04:19:59	0,03	0,04	0,05	0,14	0,15	0,07	0,25	0,3
E4: PST23	-	-	1	1490	02.05.2016 04:19:59	0,03	0,05	0,06	0,15	0,15	0,07	0,26	0,31
E4: PST31	-	-	1	1490	02.05.2016 04:19:59	0,03	0,04	0,05	0,14	0,15	0,07	0,25	0,3

If limit values are exceeded, the affected values are marked in red.

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Technical parameters: (table)

Note: This report is only available in PQVisu!

This evaluation contains the following characteristics:

- Transient interruption (<=1 second)
- Short supply interruption (>1 second)
- Long supply interruption (>3 minute)
- DD/U deep dip (across all conductors)
- DD/U [threshold=90 %] (weeks exceeded >0 events)
- OV/U1-U3 mains frequency overvoltage (max value [%])
- OV/U1-U3 [threshold=200 %] (weeks exceeded >0 events)
- FVC/U1-3 fast voltage change (10ms values)
- Events: SVC/U1 slow voltage deviation

Evaluation of the 10-min continuous recording

- Number of 10-min intervals
- Frequency [Hz] (average)
- U1, U2, U3 [V] (average)
- U1, U2, U3 [%] maximum deviation from nominal value
- THD1, THD2, THD3 [%] (maximum)
- THD1, THD2, THD3 [threshold=8 %] (weeks exceeded >0 events)
- Flicker U1, U2, U3 (maximum)
- Flicker U1, U2, U3 [threshold=1 %] (weeks exceeded >5% of the intervals)
- Unbalance [%] (maximum)
- Unbalance [threshold=0 %] (weeks exceeded >0 events)
- U1 U2 U3_H2..25 [threshold=2 %] (weeks exceeded >0 events)
- U1 U2 U3_H2..25 [%] (maximum)

The selected calendar weeks are displayed in the table columns:

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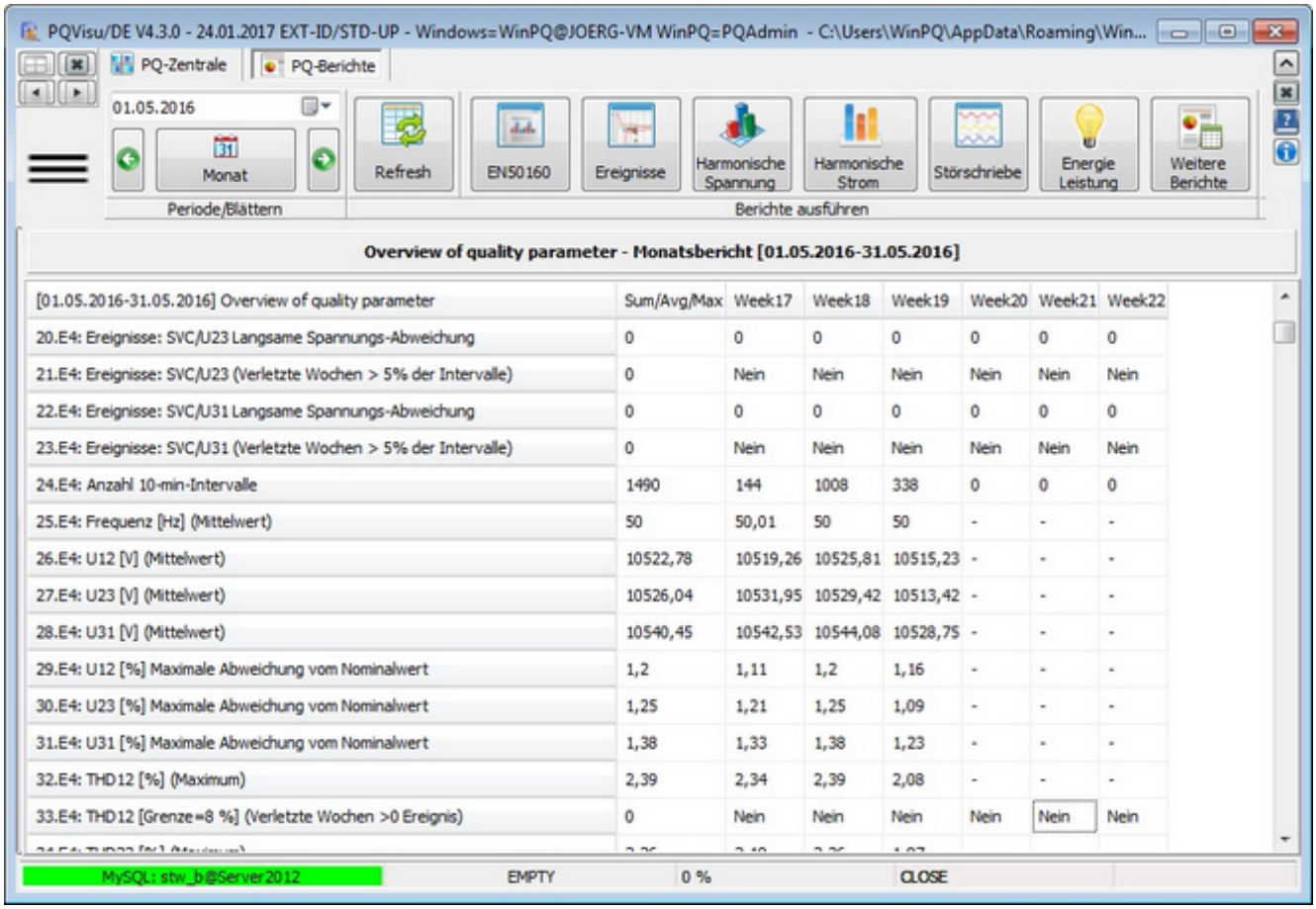
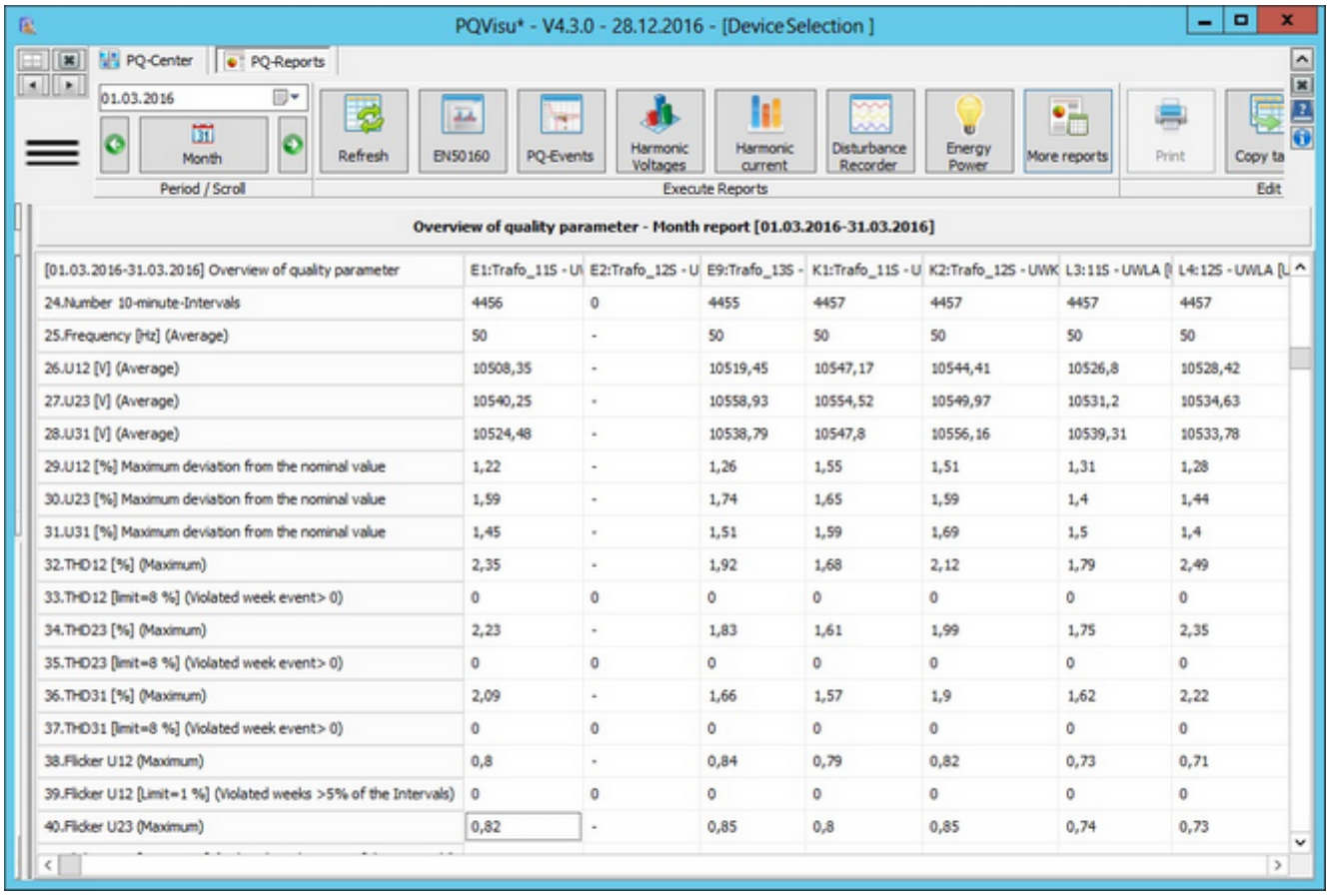


[01.05.2016-31.05.2016] Overview of quality parameter	Sum/Avg/Max	Week17	Week18	Week19	Week20	Week21	Week22
20.E4: Ereignisse: SVC/U23 Langsame Spannungs-Abweichung	0	0	0	0	0	0	0
21.E4: Ereignisse: SVC/U23 (Verletzte Wochen > 5% der Intervalle)	0	Nein	Nein	Nein	Nein	Nein	Nein
22.E4: Ereignisse: SVC/U31 Langsame Spannungs-Abweichung	0	0	0	0	0	0	0
23.E4: Ereignisse: SVC/U31 (Verletzte Wochen > 5% der Intervalle)	0	Nein	Nein	Nein	Nein	Nein	Nein
24.E4: Anzahl 10-min-Intervalle	1490	144	1008	338	0	0	0
25.E4: Frequenz [Hz] (Mittelwert)	50	50,01	50	50	-	-	-
26.E4: U12 [V] (Mittelwert)	10522,78	10519,26	10525,81	10515,23	-	-	-
27.E4: U23 [V] (Mittelwert)	10526,04	10531,95	10529,42	10513,42	-	-	-
28.E4: U31 [V] (Mittelwert)	10540,45	10542,53	10544,08	10528,75	-	-	-
29.E4: U12 [%] Maximale Abweichung vom Nominalwert	1,2	1,11	1,2	1,16	-	-	-
30.E4: U23 [%] Maximale Abweichung vom Nominalwert	1,25	1,21	1,25	1,09	-	-	-
31.E4: U31 [%] Maximale Abweichung vom Nominalwert	1,38	1,33	1,38	1,23	-	-	-
32.E4: THD12 [%] (Maximum)	2,39	2,34	2,39	2,08	-	-	-
33.E4: THD12 [Grenze=8 %] (Verletzte Wochen >0 Ereignis)	0	Nein	Nein	Nein	Nein	Nein	Nein

In the simplified form, only the sum data are displayed meaning that each device uses a table column:



[01.03.2016-31.03.2016] Overview of quality parameter	E1:Trafo_11S - U	E2:Trafo_12S - U	E9:Trafo_13S -	K1:Trafo_11S - U	K2:Trafo_12S - UWK	L3:11S - UWLA [	L4:12S - UWLA [L
24.Number 10-minute-Intervals	4456	0	4455	4457	4457	4457	4457
25.Frequency [Hz] (Average)	50	-	50	50	50	50	50
26.U12 [V] (Average)	10508,35	-	10519,45	10547,17	10544,41	10526,8	10528,42
27.U23 [V] (Average)	10540,25	-	10558,93	10554,52	10549,97	10531,2	10534,63
28.U31 [V] (Average)	10524,48	-	10538,79	10547,8	10556,16	10539,31	10533,78
29.U12 [%] Maximum deviation from the nominal value	1,22	-	1,26	1,55	1,51	1,31	1,28
30.U23 [%] Maximum deviation from the nominal value	1,59	-	1,74	1,65	1,59	1,4	1,44
31.U31 [%] Maximum deviation from the nominal value	1,45	-	1,51	1,59	1,69	1,5	1,4
32.THD12 [%] (Maximum)	2,35	-	1,92	1,68	2,12	1,79	2,49
33.THD12 [limit=8 %] (Violated week event> 0)	0	0	0	0	0	0	0
34.THD23 [%] (Maximum)	2,23	-	1,83	1,61	1,99	1,75	2,35
35.THD23 [limit=8 %] (Violated week event> 0)	0	0	0	0	0	0	0
36.THD31 [%] (Maximum)	2,09	-	1,66	1,57	1,9	1,62	2,22
37.THD31 [limit=8 %] (Violated week event> 0)	0	0	0	0	0	0	0
38.Flicker U12 (Maximum)	0,8	-	0,84	0,79	0,82	0,73	0,71
39.Flicker U12 [Limit=1 %] (Violated weeks >5% of the Intervals)	0	0	0	0	0	0	0
40.Flicker U23 (Maximum)	0,82	-	0,85	0,8	0,85	0,74	0,73

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Report settings

The basic settings required to display reports are specified centrally in PQVisu. The settings you choose apply to all reports.

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Caption of reports

With this dialog it is possible to change the caption of the generated reports.

Options Reports

Target characteristic: Q/Smax = f(U) | Active / reactive power diagram | Limits for power / load flow diagram | Harr

Title of reports | ITIC thresholds | UNIPEDE | DISQUAL | PQ-Events - statistic | measure statistic | Event filter | Flag

For the standard reports, the title can be adapted according to national or company standards

	ID of the Report	original title	Custom
2	NRS048	NRS048 - - Complete overview (Print)	NRS048 - - Complete overview (Print)
3	ENOverview	PQ-Events Mains-Overview (Druck)	PQ-Events Mains-Overview (Druck)
4	EnThreshold	EN50160 Mains: Threshold _Events (Print)	EN50160 Mains: Threshold & Events (Print)
5	ENMeasure	EN50160 Mains: Statistic _Events (print)	EN50160 Mains: Statistic & Events (print)
6	Disqual	DISQUAL SAIDI, SAIFI and CADI	DISQUAL SAIDI, SAIFI and CADI
7	Interrupt	Interruption of power supply	Interruption of power supply
8	TrgOverview	Recorder-Trigger Mains	Recorder-Trigger Mains
9	Spider	Statistical Overview measured values	Statistical Overview measured values
10	HeatMap	EN50160 Mains: Heatmap (Print)	EN50160 Mains: Heatmap (Print)
11	GPSMap	PowerQuality Map	PowerQuality Map
12	LoadFlow	Leistung: Lastfluss (Druck)	Leistung: Lastfluss (Druck)
13	CosPhi	Q/Smax=f(U) & Cos(Phi)=f(P)	Q/Smax=f(U) && Cos(Phi)=f(P)
14	PwrDiagram	Active / reactive power Diagram (CosPhi characteristic)	Active / reactive power Diagram (CosPhi characteri

OK | Cancel

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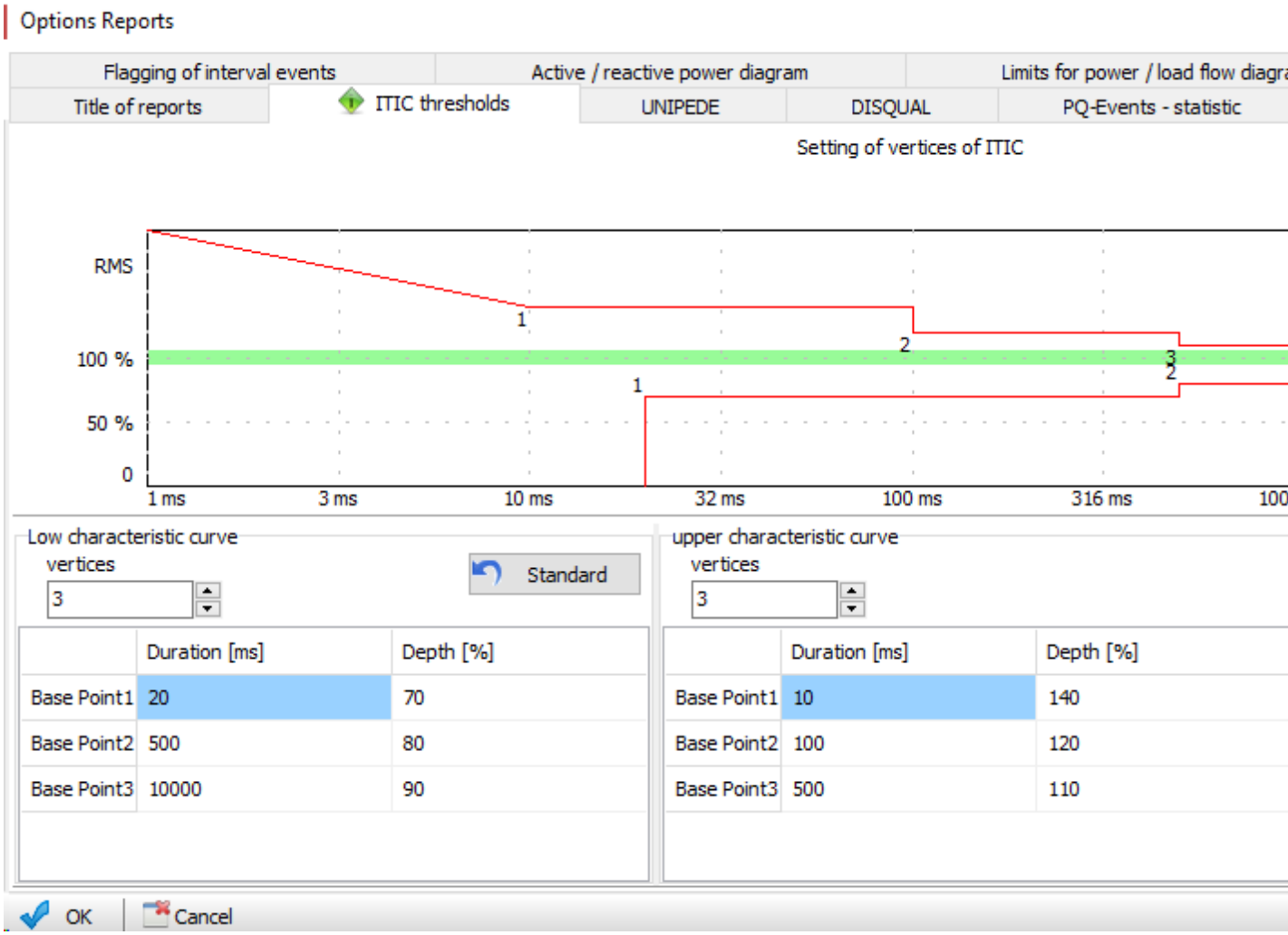
Naming devices

ITIC-Thresholds

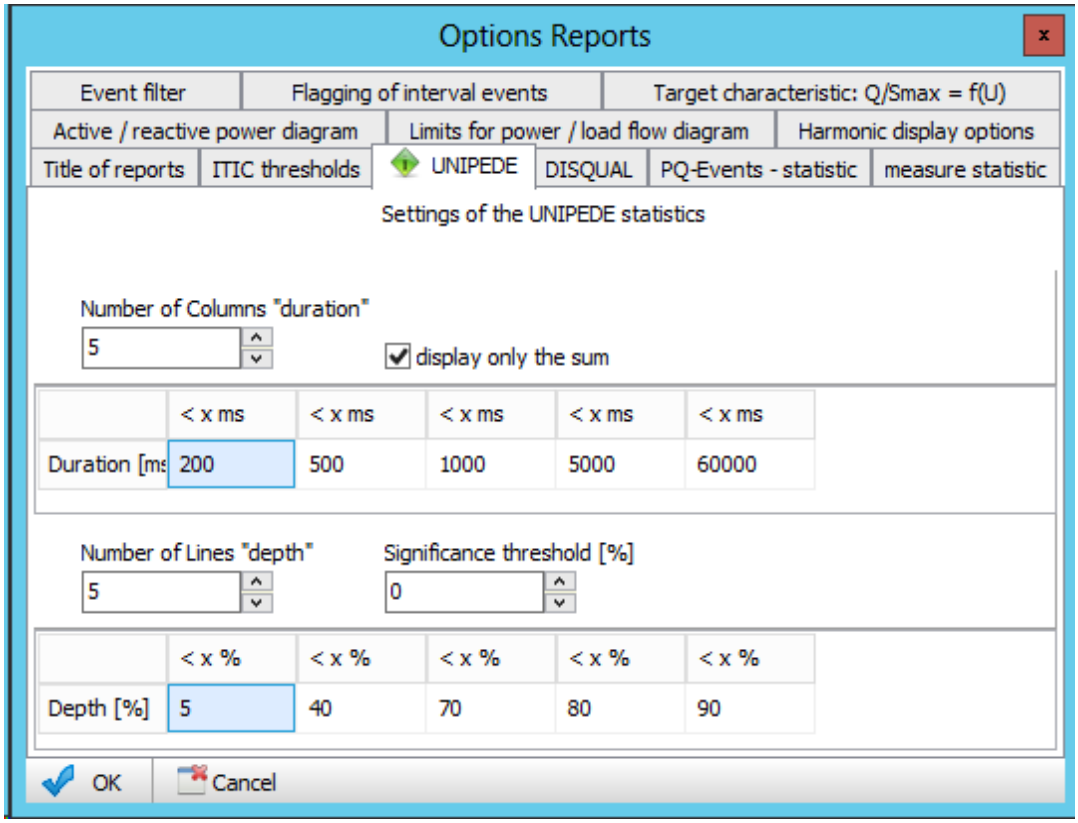
The ITIC-Display (Information Technology Industry Council) shows a disturbance (Voltage dip, Overvoltage and Interruption) in context of duration and depth of the incident. The standard display shows an upper and a lower threshold curve. Both limit curves can be parameterized. Both the number of corner points and their coordinates can be assigned freely. When a parameter is changed in the table, the graphical representation is immediately adapted.



The default values can be restored using the 'Standard' button.

UNIPEDE-Matrix

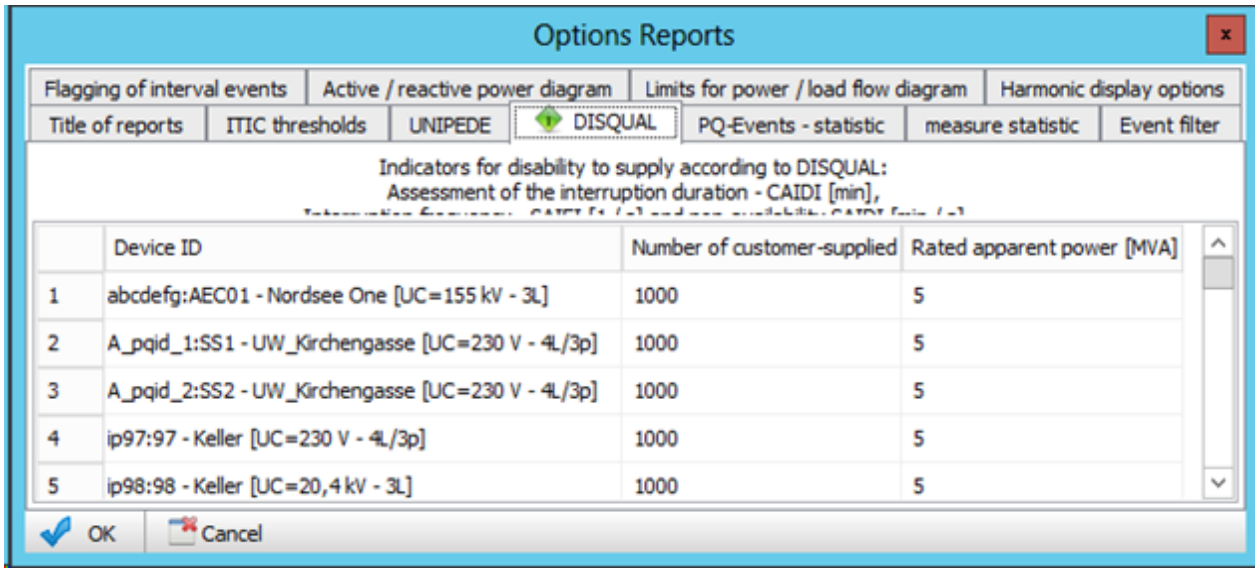
For the display duration/depth of events in tabular form, you can enter the number of steps and their value. These values must be ascending. This grid can also be displayed in the graphic ITIC display (via local menu).



DISQUAL

For the DISQUAL-Evaluation (DISQUAL: SAIDI, SAIFI und CAIDI) either the rated apparent power (method A – up from medium voltage) or the number of supplied customers (method B - low voltage) are required depending on the method.

For each measure device the corresponding values can be edited here.



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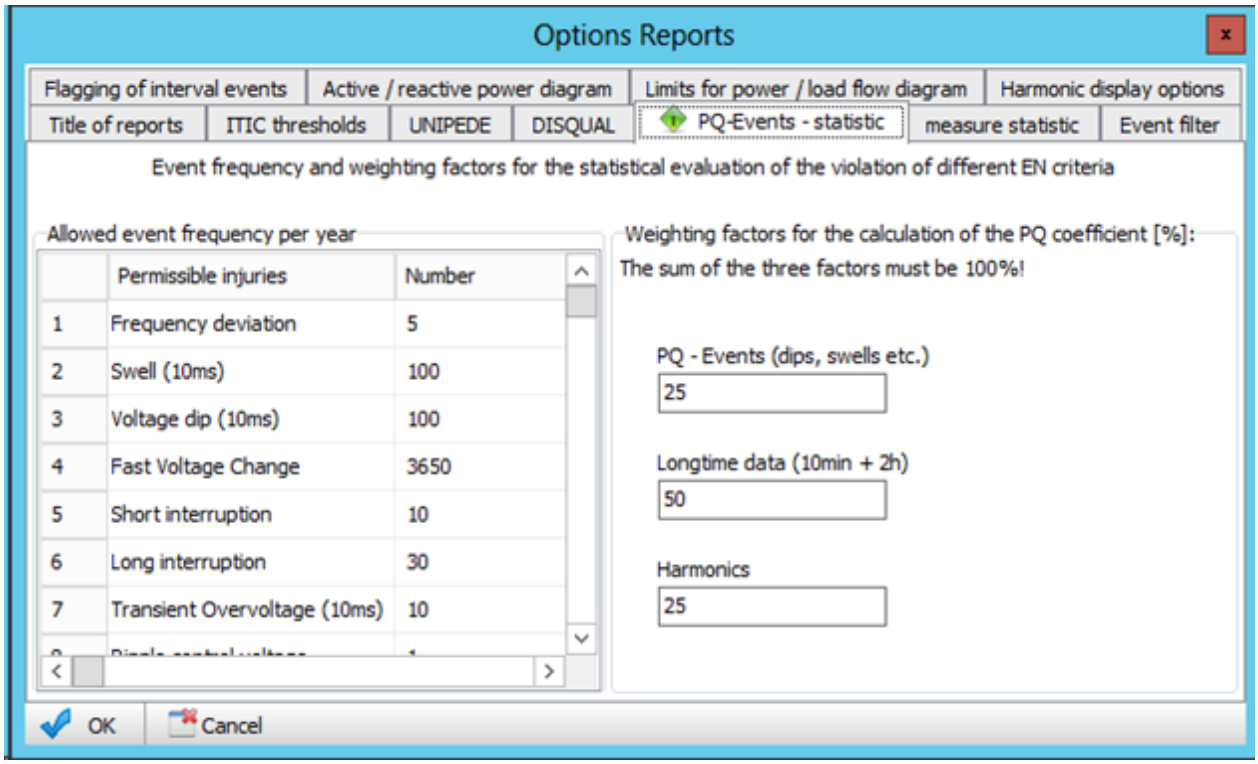
EN- Occurrences

In some reports, the maximum allowed number of events per period is considered. In the software, this is implemented in such a way that the maximum number per year is set in relation to the evaluated period. The annual values can be entered here.

Elsewhere, the program calculates a coefficient of the power quality reserve. Three parameters are included in the calculation: the occurrence of PQ events (dips, swells, etc.), the statistical evaluation of the long-term data, and a statistical evaluation of the harmonics. To calculate the sum coefficient, these factors can be weighted. The sum of all three factors must be 100%.



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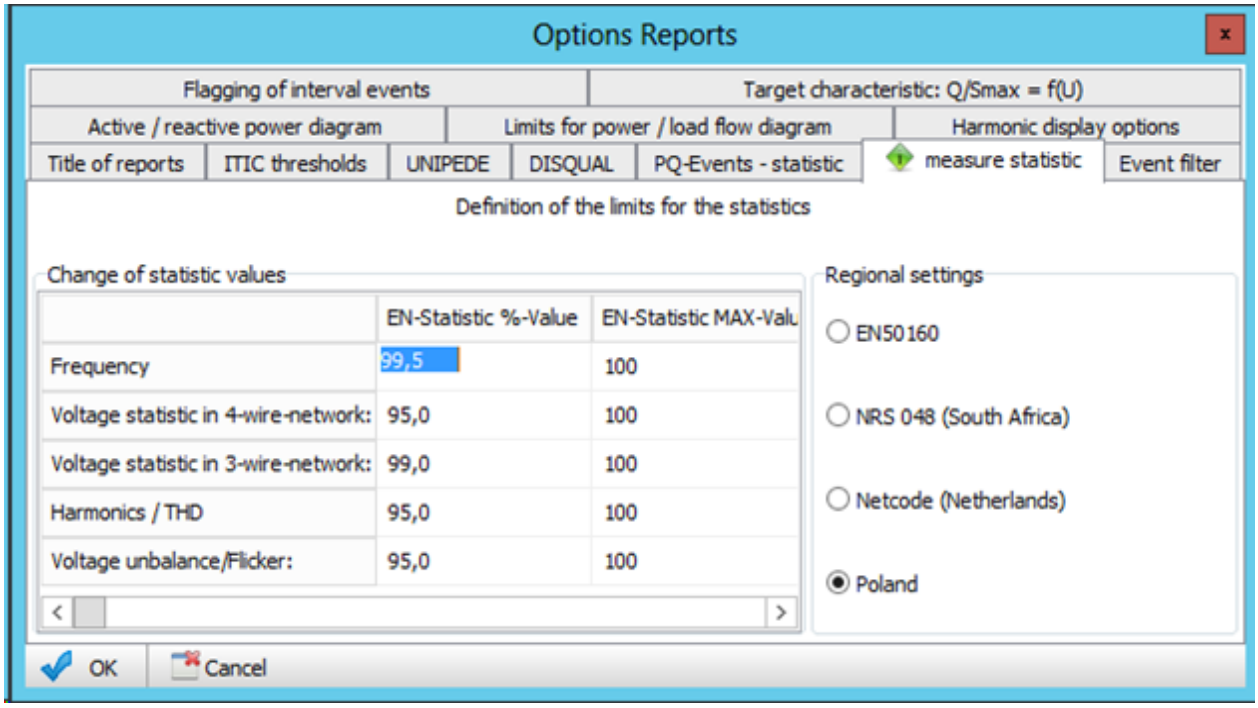
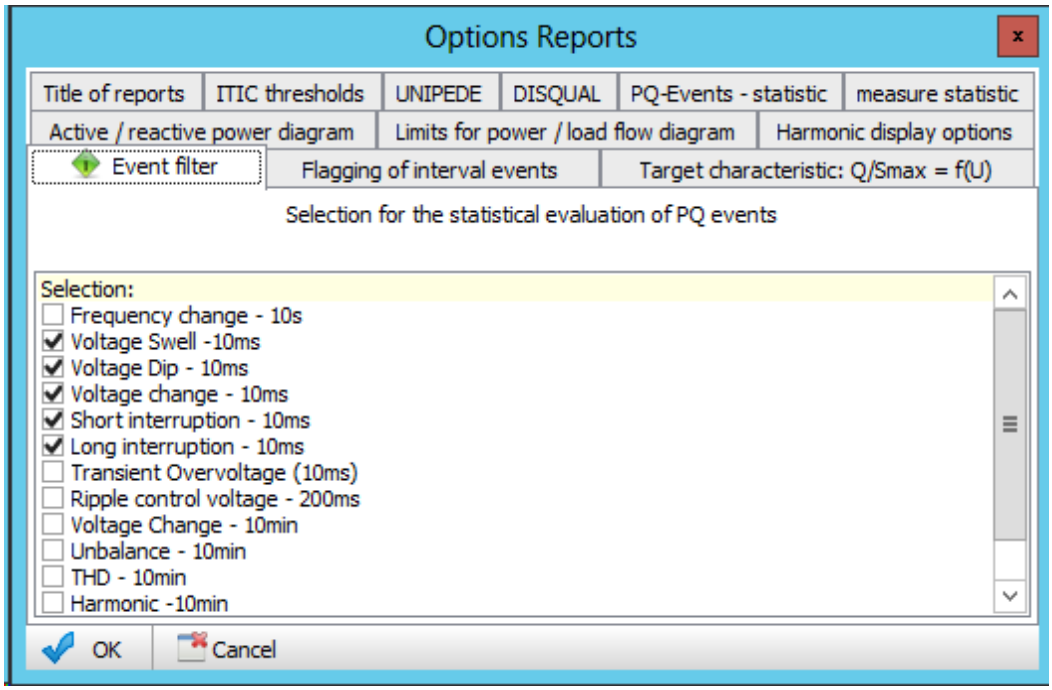
Norm-Thresholds

In some reports, the 95%- or similar X% -quantiles are used for the statistical analysis of the 10-min values in addition to the maximum value in the evaluation period. Because there are nationally different values, quantiles can be defined for the region in use.



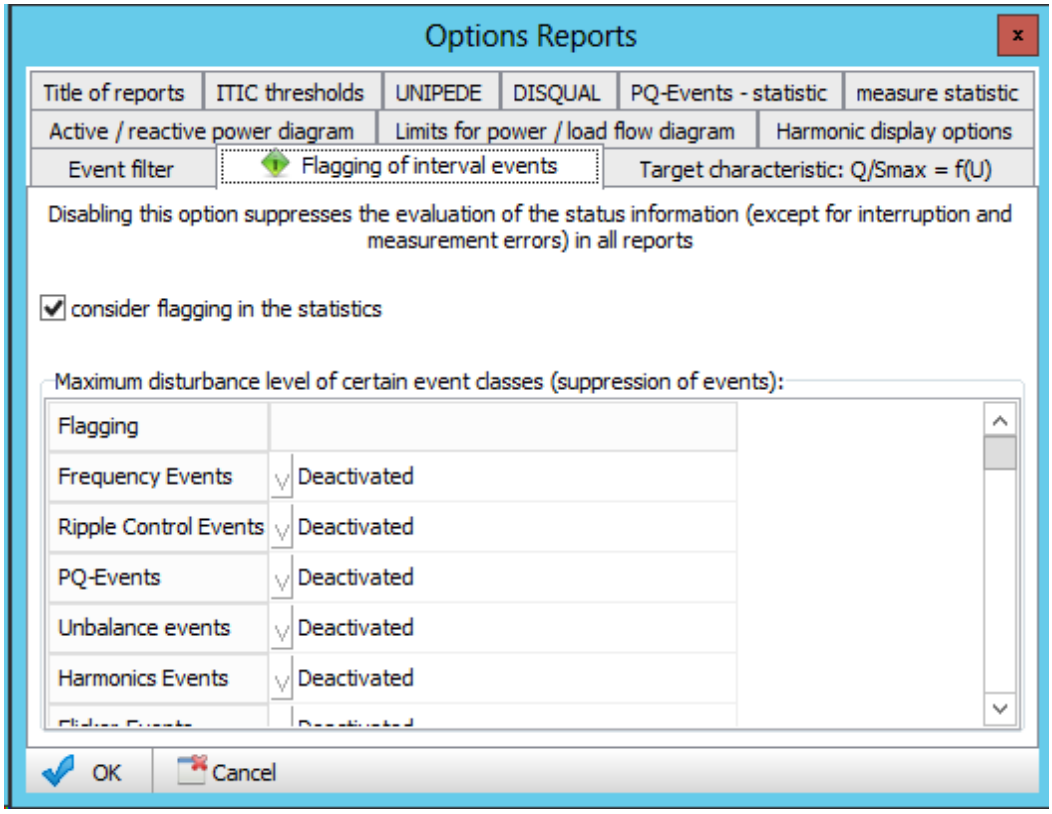
Event-Filter

Events generated by the measuring devices can be filtered for statistical analysis.



Flagging of interval events

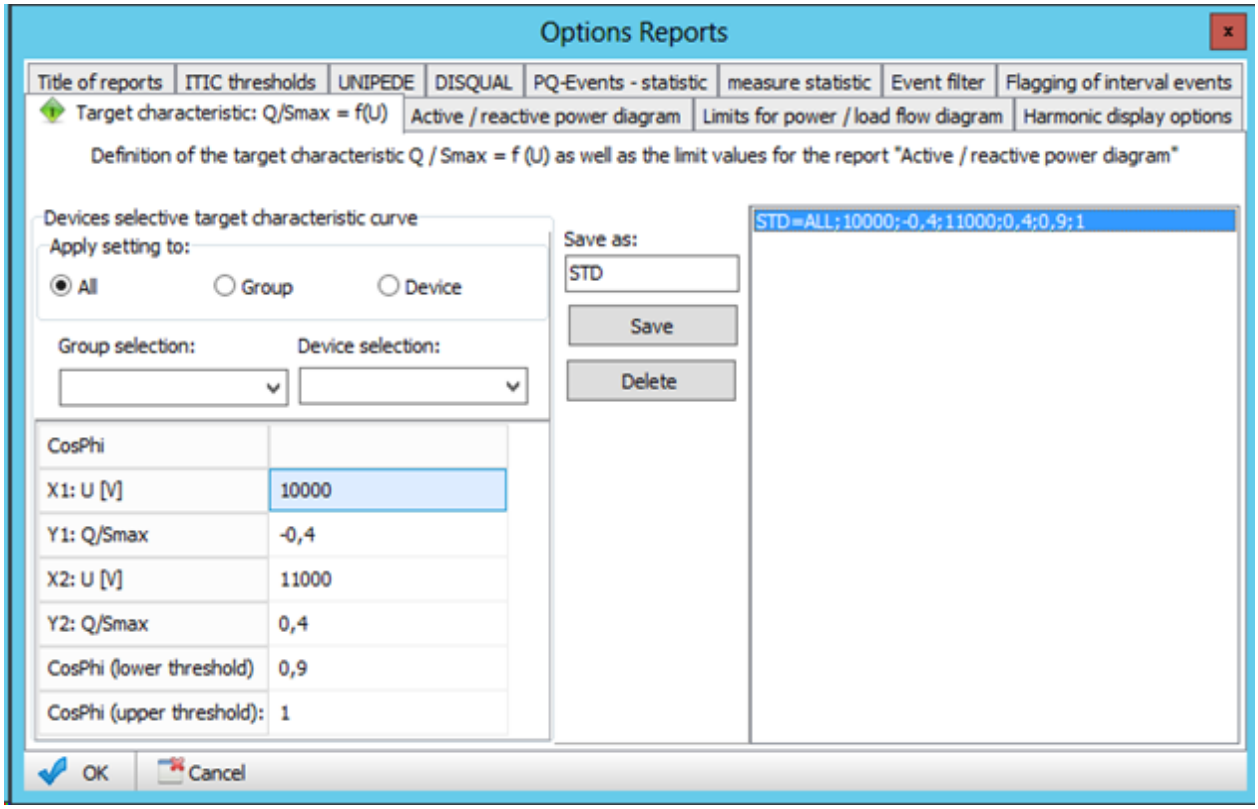
By default, 'flagged' measured values (intervals with voltage dips, overvoltages and interruptions) will not be not used in statistical evaluations. It is possible to deactivate this option within the software:



Target characteristic curve: Q/Smax = f(U)

This evaluation is about the parameters of the report Q/Smax=f(U) and CosPhi=f(P).

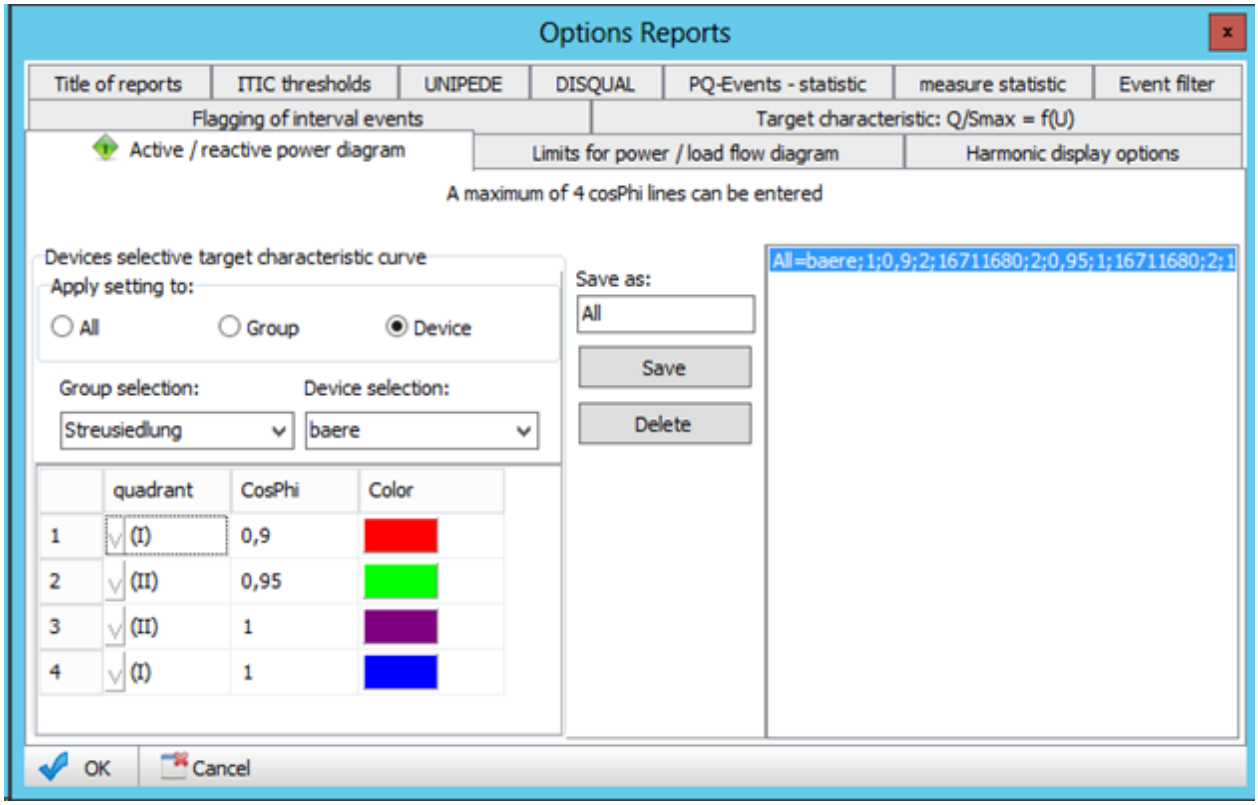
- For the first representation, a target characteristic is required. This desired characteristic (two break point X1/Y1 und X2/Y2) can be assigned here.
- For the CosPhi representation an upper and a lower threshold value can be assigned.



Corresponding examples can be found in the following section.

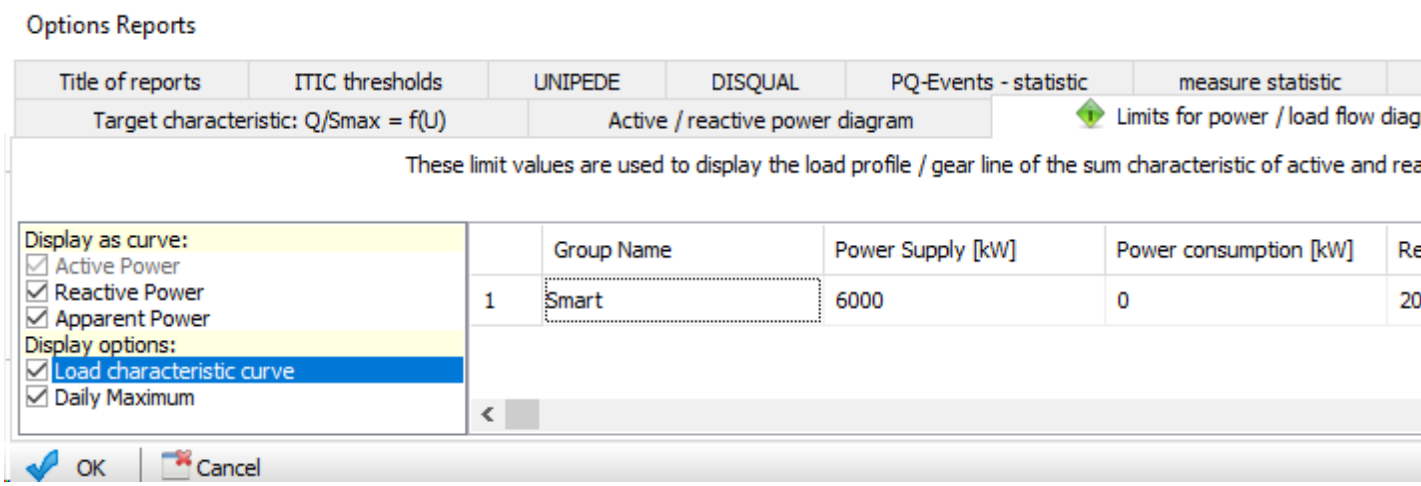
Wirk-/Blindleistungsdiagramm

For the display of the dependence on active and reactive power, up to 4 CosPhi values (for example, one per quadrant) can be defined. A color can be assigned to each characteristic.



An eaxmple is in the following section.

Power tresholds



An example can be found in the following section.

Display mode of the Harmonics

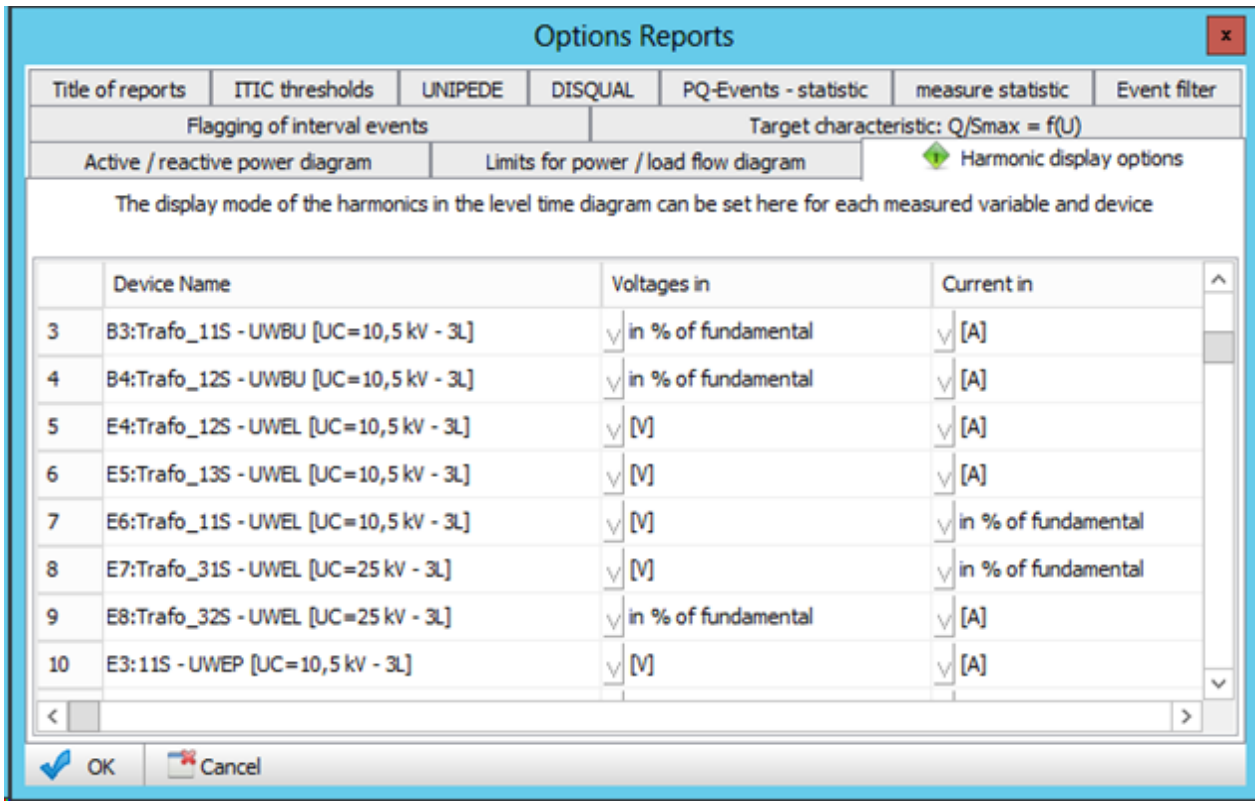
The display mode of current and voltage can be set separately. For the voltage applies:

- In [%] of basic oscillation
- In [V].

For the current applies:

- In [A]
- In [%] of basic oscillation
- In [%] of rated current.

For the display 'In % of rated current', the rated current must be entered in the next column.



According to these specifications, the measured values are automatically converted during the display.

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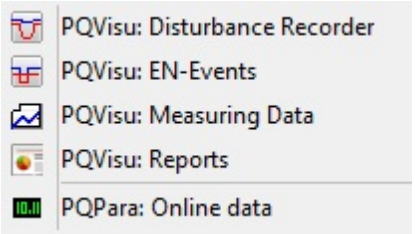
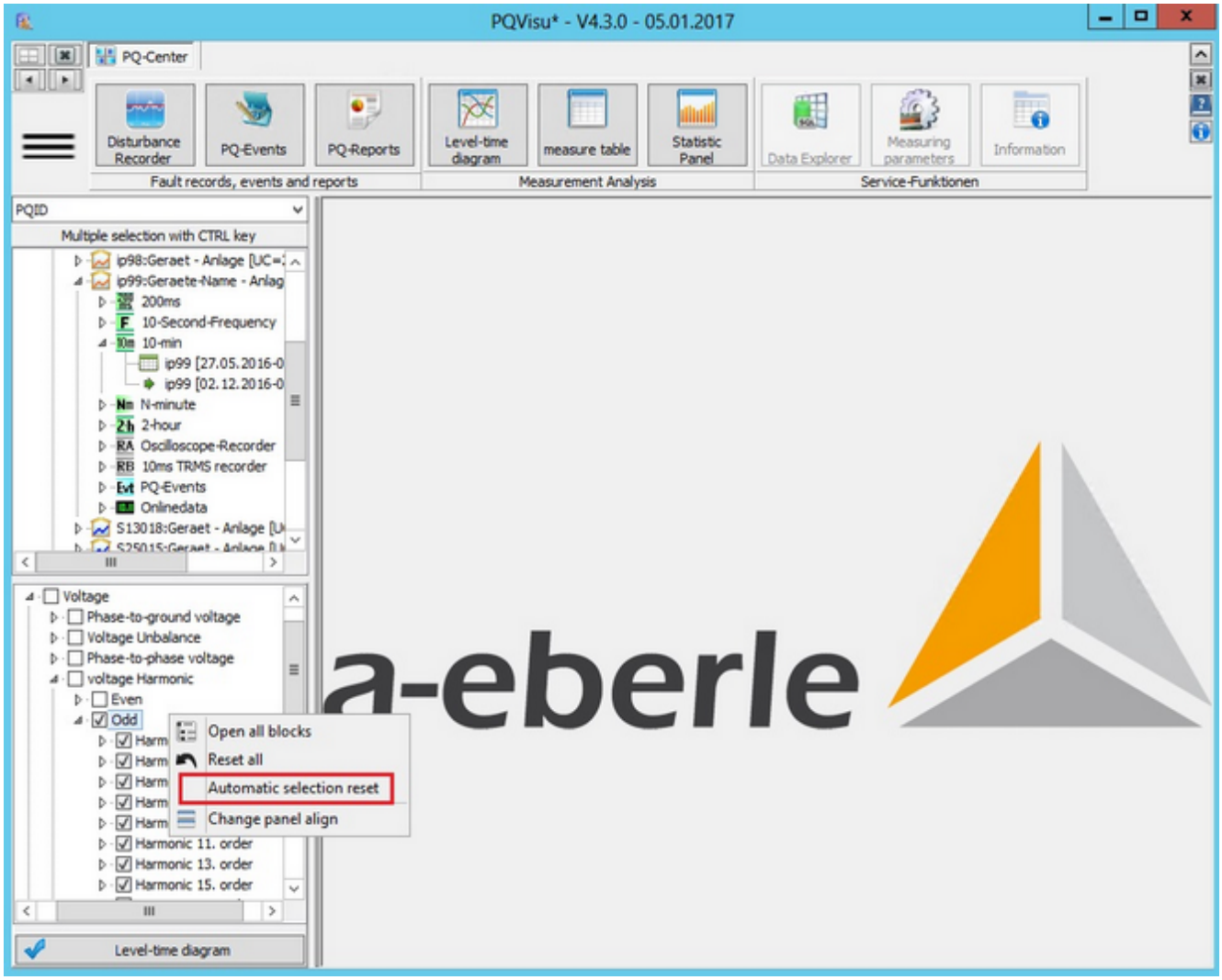
Measurement data (long-term recordings)

Display measurement data from a few devices



PQStart: The 'Measurement data' menu enables you to access all of the recordings and the long-term data stored in the SQL database. The 10-min recordings are particularly important because most of the EN 50160 standard evaluation is calculated from them. Measured values are selected by clicking on the measured value or selecting a group (e.g. all power). Enabling or disabling a parent node affects all of the child nodes. The first levels distinguish between: frequencies, voltages, currents and powers.



Right-clicking displays a local menu. Select 'Automatic selection reset ' to determine whether enabling a view disables all of the checked measurands or the last selection is saved.

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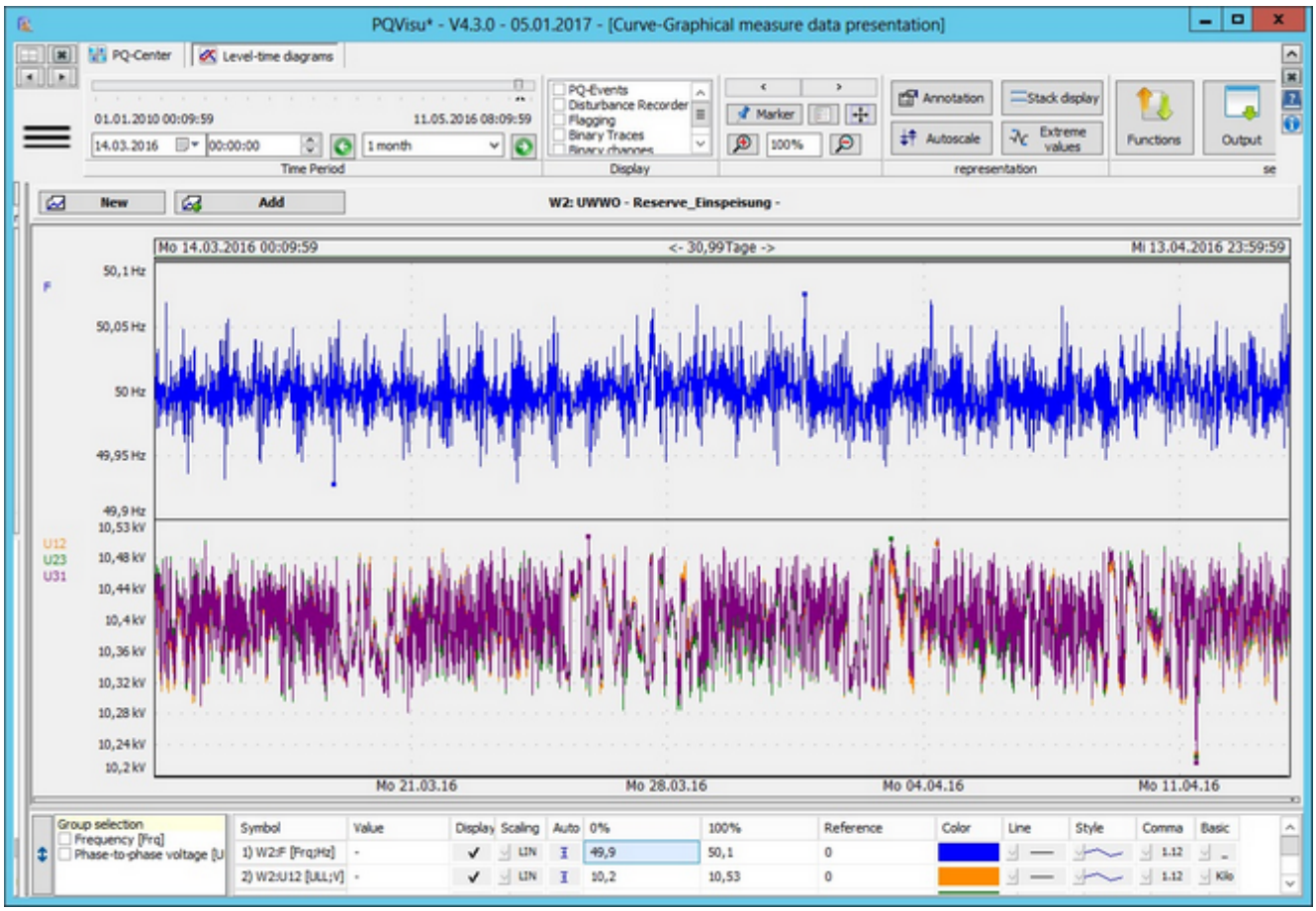

The view always occurs automatically for the last month (10-minute values). Scroll to move backward or forward a month. The Calendar enables you to select the start value for the time window. We recommend navigating the calendar with the arrow keys because the calendar opens, i.e. is activated, every time something shifts.

Different measurement values can be displayed together in a level-time diagram. This enables you, e.g. to see the relationship between the voltage fluctuations, the resulting flicker levels and the cause in the grid by means of the related current changes.

Minimum and maximum values:

The 10-minute data also contain extreme values for the intervals. As part of the configuration (on the measuring devices) you can choose between half periods and/or 200-ms extreme values.

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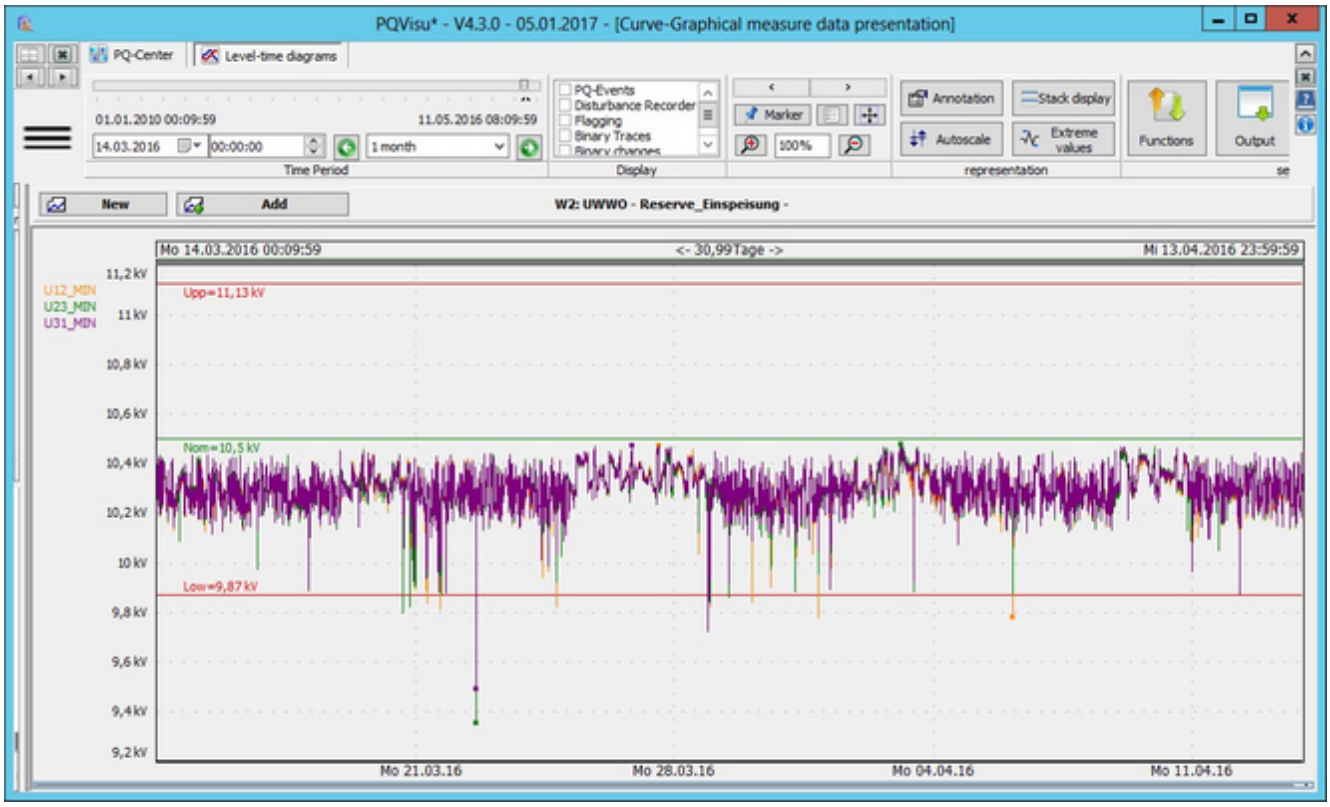
- 795 measures [02.12.2016 - 05.01.2017/2]
  - Frequency
  - Voltage
    - Phase-to-ground voltage
    - Voltage Unbalance
    - Phase-to-phase voltage
    - voltage Harmonic
      - Even
      - Odd
    - Interharmonic Voltages
    - U - Harmonic 2..9 kHz
    - Voltage extreme values
      - UEXTRU1_MIN - Min 1/2 cycle RMS value U1E / U1N [V]
      - UEXTRU1_MAX - Max 1/2 cycle RMS value U1E / U1N [V]
      - UEXTRU2_MIN - Min 1/2 cycle RMS value U2E / U2N [V]
      - UEXTRU2_MAX - Max 1/2 cycle RMS value U2E / U2N [V]
      - UEXTRU3_MIN - Min 1/2 cycle RMS value U3E / U3N [V]
      - UEXTRU3_MAX - Max 1/2 cycle RMS value U3E / U3N [V]
    - Flicker-extreme-values
    - short time Flicker
  - Currents
  - Power

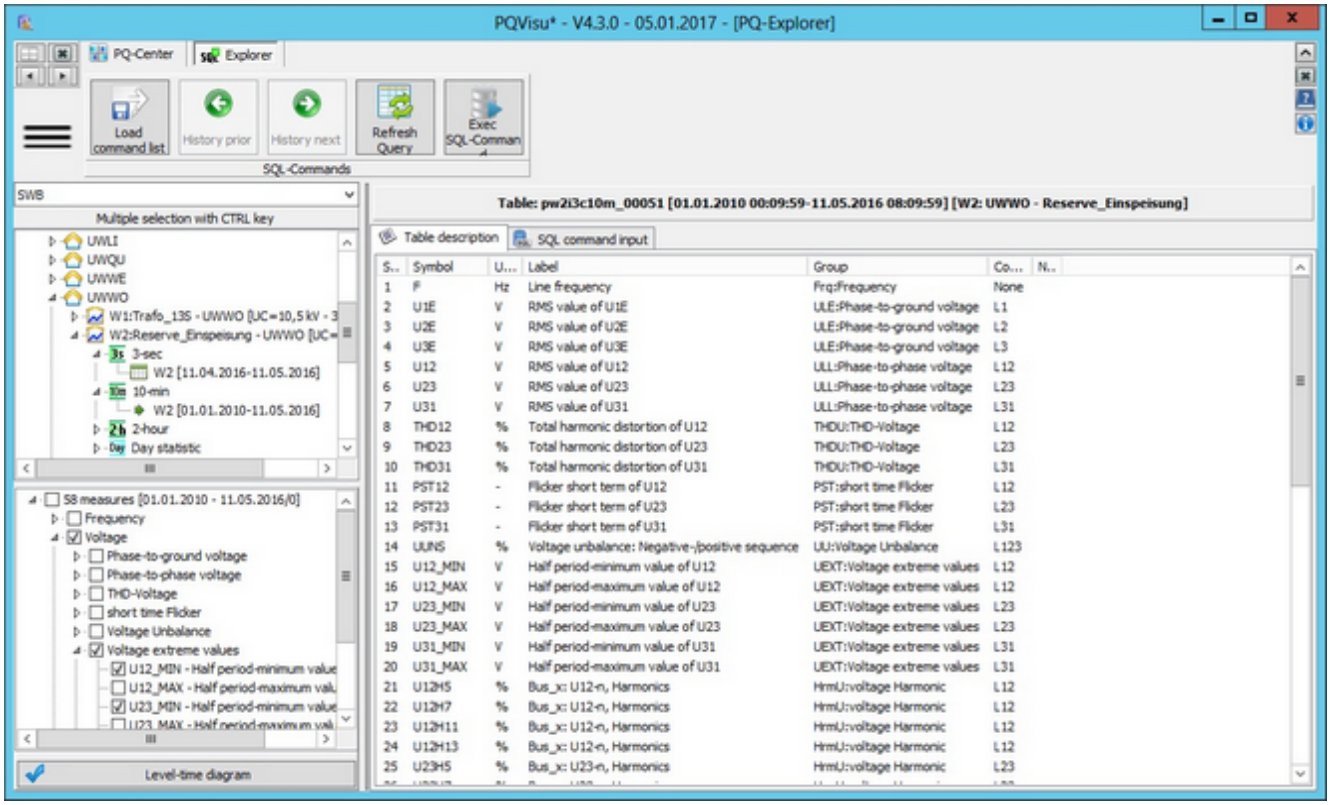
Example: Voltage U1E as 10-ms minimum and maximum value over a period of a month



This view also displays the grid failures that are contained in the long-term data.

Clicking on the Extreme value label button marks and labels the highest and lowest values in the view. For voltages, this value is also displayed as a percentage of the Voltage UC.

Selecting measurands for the level-time chart view



- The measurands are selected in two steps:
  - Devices and data class
  - Measurand group or individual measurands
- The group selection node is a simplified way of selecting and deselecting physically similar quantities (e.g. all phase-to-phase voltages, all conductor currents etc) with a click of the mouse.
- The buttons needed to view the data in the different forms are activated after the tables and measurands have been selected.
- The view in the right pane was activated by clicking on 'Data Explorer'. The view displays the texts for the measurand symbols.

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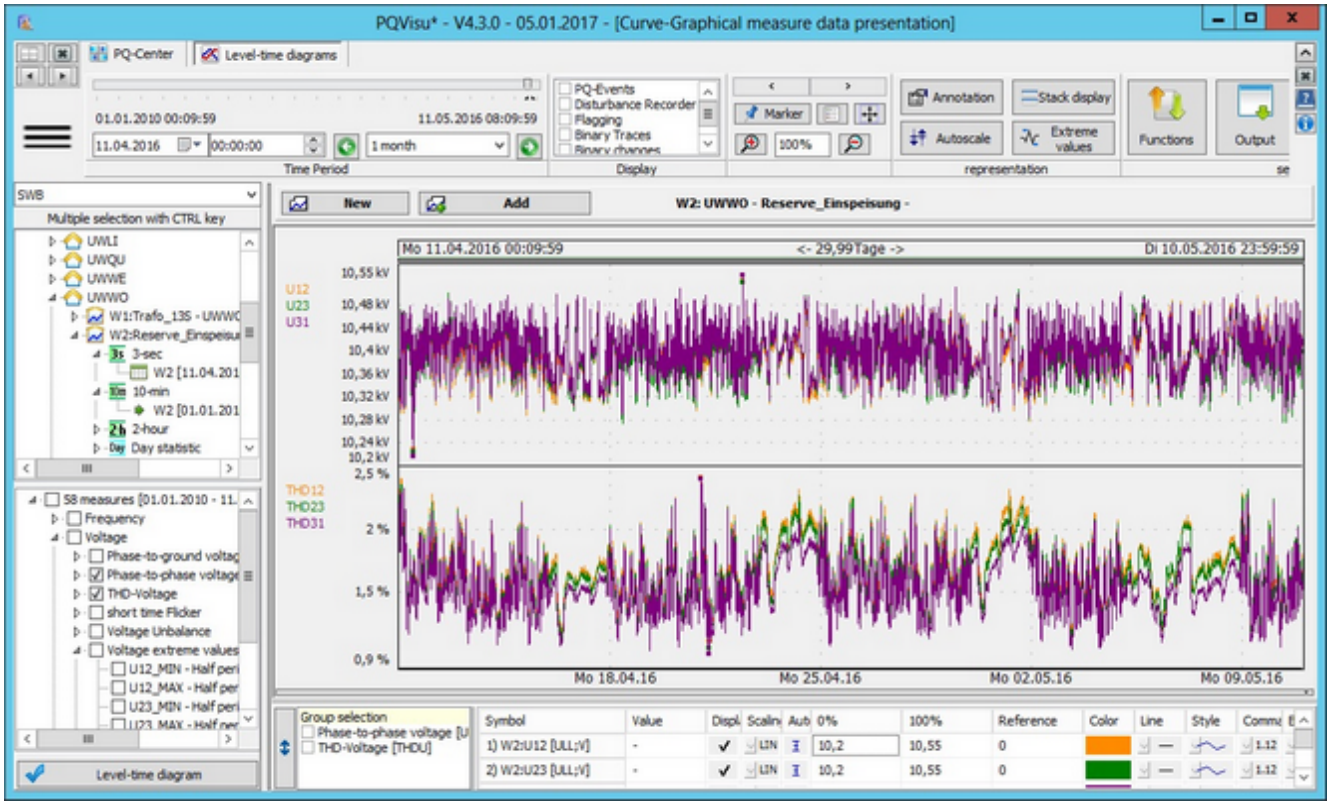
Look and feel of the curve view



The look and feel is similar to that of the error log with the following differences:

- The button bar (top left) with the timeline and the display functions and options are split into several sections.
- The main window has two new buttons, 'New' and 'Add' that enable you to change the selection on the active pane
- Quick selection of measurand groups (bottom left)
- Table to scale and change curve-specific options (bottom of the view)

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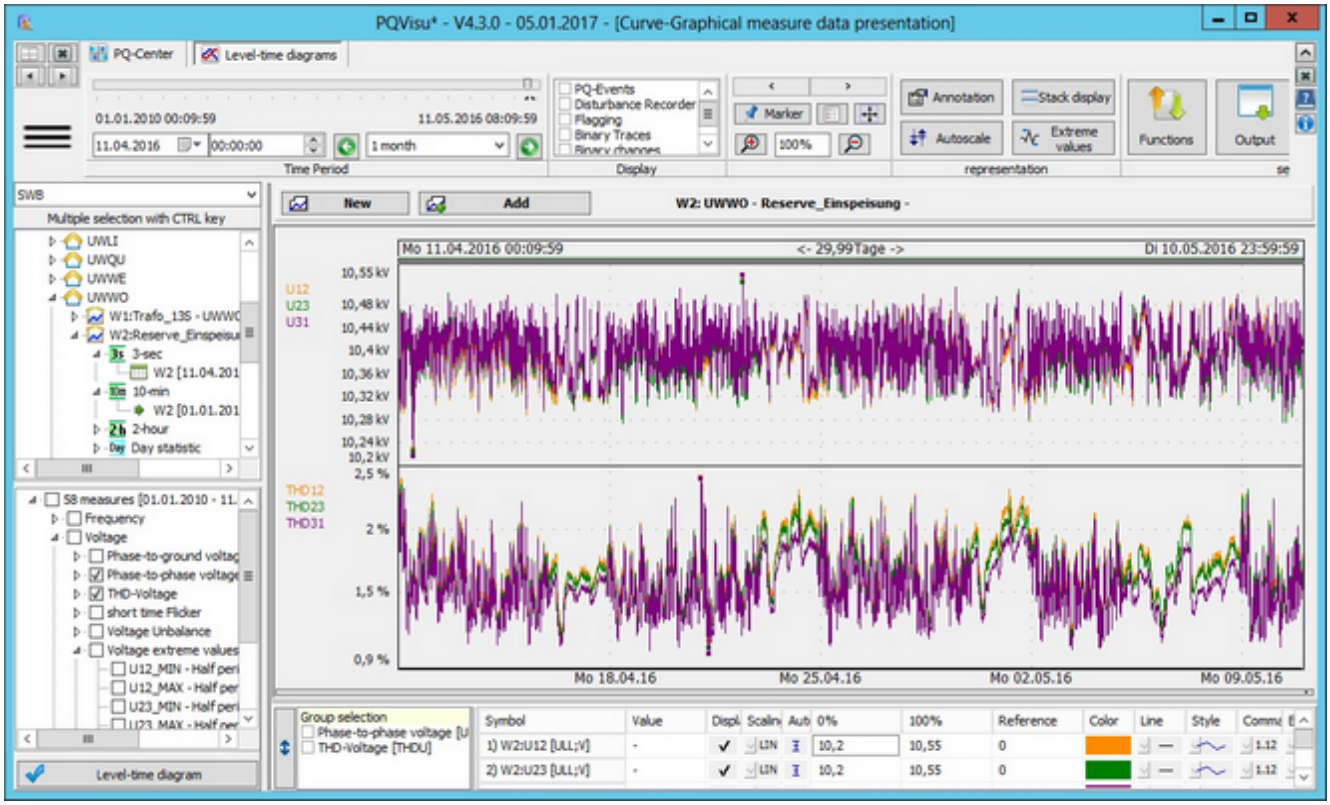
Navigation and description of the items



After selecting the table columns to display (measurand symbols), the time window can now be moved. The following options are available:

- Position pointer: Shows the relative position of the displayed data in relation to the available data. The nose corresponds to the start date of the display, the blue line to the scope. You can move the nose to another position.
- Calendar: We recommend expanding the calendar and then using the cursor keys to navigate. Changing the selection automatically retrieves and displays the next data subset.
- Time field: In case the 3-second value needs an exact time of day.
- Time domain selection: There are meaningful alternatives for data classes (e.g. week, month etc in the 10-minute data class).
- Right/left buttons: Starting from the current position, the user can easily navigate to the right or the left. This function can also be reproduced by dragging the mousein the graphic area (pressing and holding the left mouse button and dragging in the desired direction).

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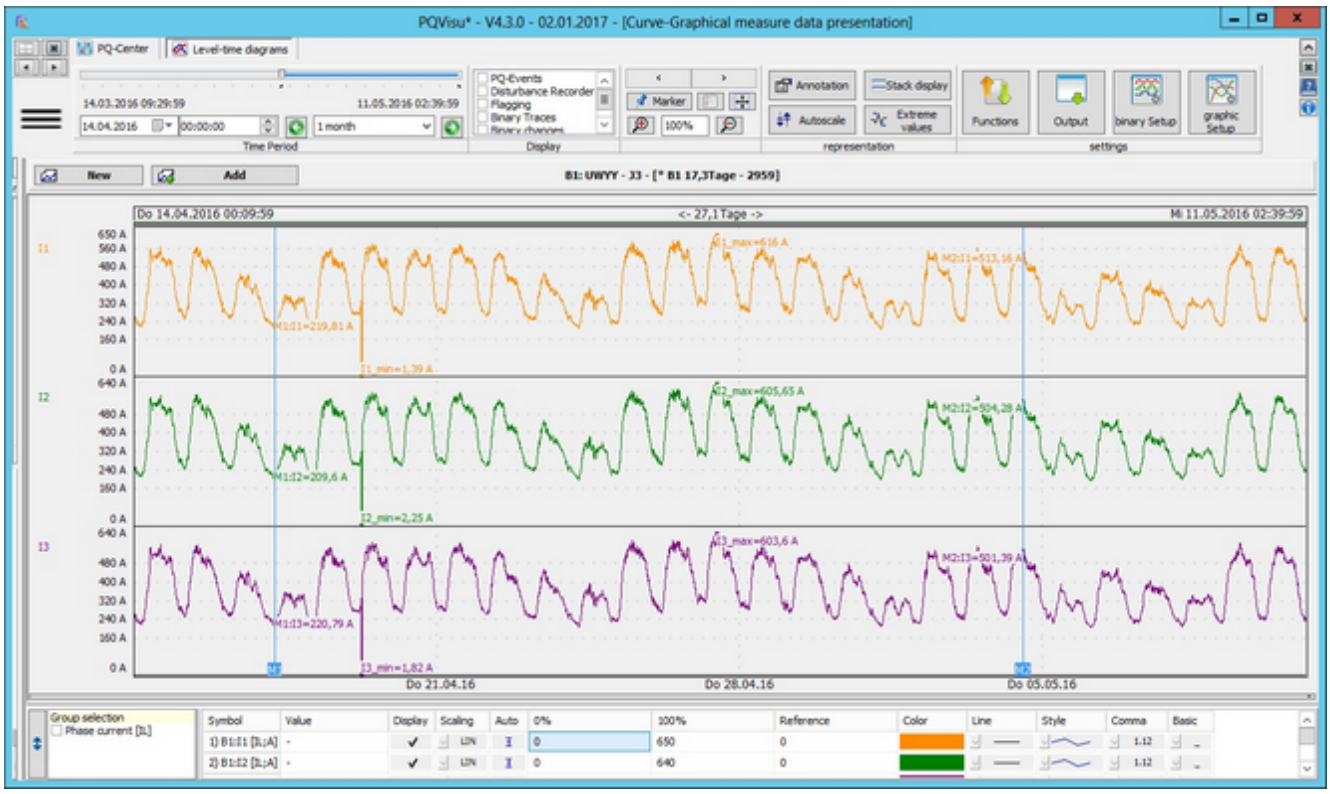
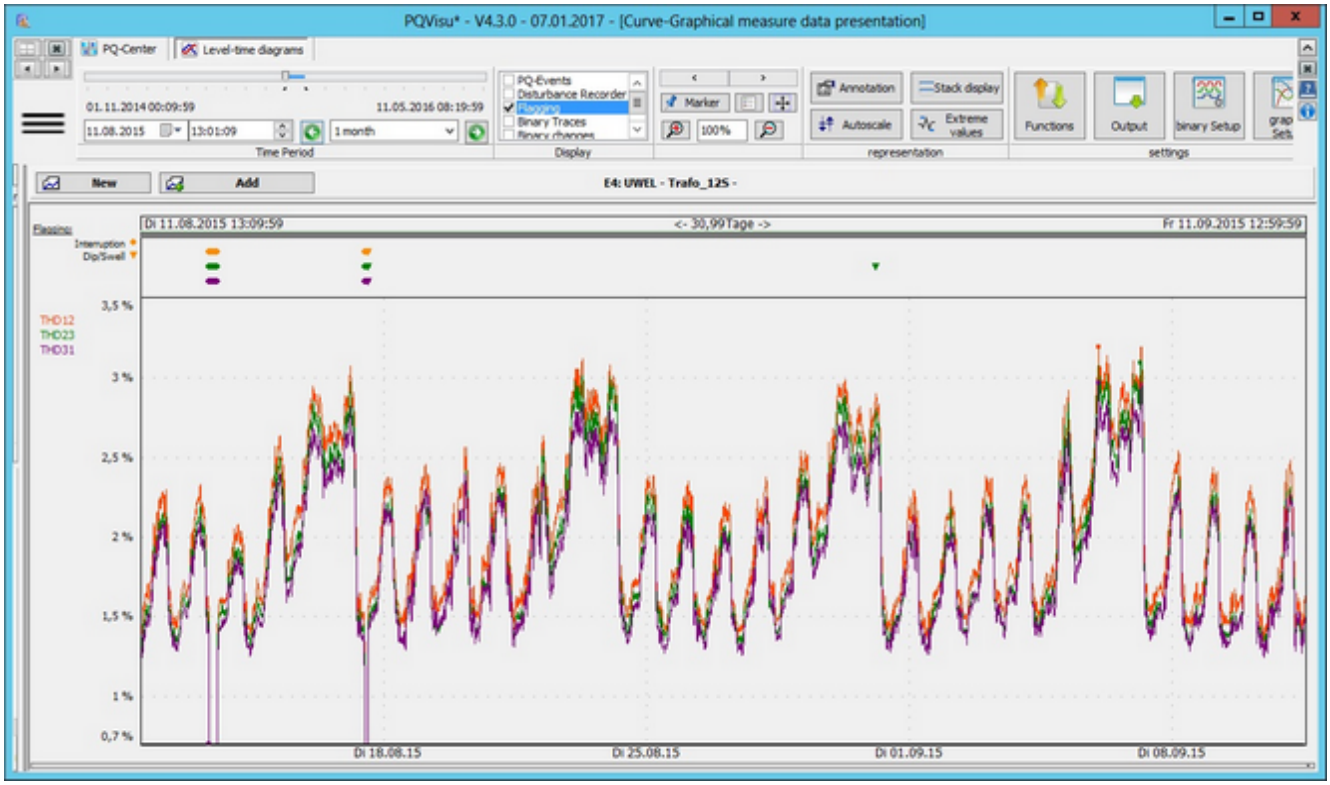
Different display options



- Clicking on the Extreme value label button marks the minimum and maximum positions on each curve and displays their values as numbers in the graphic.
- If you set markers beforehand (M1 and M2 in the above view), the measured values are also displayed at these positions.
- In the figure, the Stack display button was clicked. This displays each curve in its own section.

Showing measured-value flagging

'Flagging' marks intervals on the device in which events (voltage dips, voltage swells etc) occurred. These flagged measured values will not be considered in the later statistical evaluations of long-term data.



- Periods at which such events occurred can be displayed in the graphic by selecting 'Show flagging'.
- The type of event can be deduced from the shape of the small symbols (legend next to the display).
- The colour describes the conductor in which the error occurred first (the usual colour scheme applies: yellow, green, purple).

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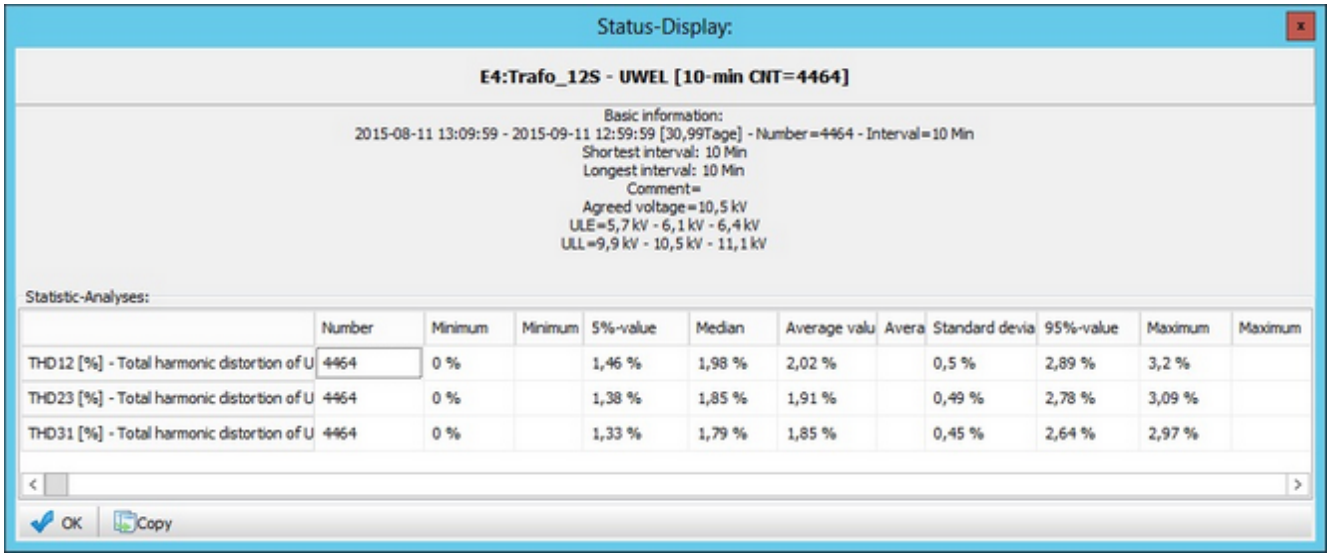
Including the status view in the analysis



	Number	Minimum	Minimum	5%-value	Median	Average valu	Avera	Standard devia	95%-value	Maximum	Maximum
THD12 [%] - Total harmonic distortion of U	4464	0 %		1,46 %	1,98 %	2,02 %		0,5 %	2,89 %	3,2 %	
THD23 [%] - Total harmonic distortion of U	4464	0 %		1,38 %	1,85 %	1,91 %		0,49 %	2,78 %	3,09 %	
THD31 [%] - Total harmonic distortion of U	4464	0 %		1,33 %	1,79 %	1,85 %		0,45 %	2,64 %	2,97 %	

- The status view is displayed by clicking on 'Status' in the button bar.
- The agreed voltage and the phase-to-phase and phase-to-earth trigger thresholds are displayed in addition to general information about the device.
- The interval between two measurement points is evaluated, making it easier to detect recording gaps.
- If markers were set, the marker distances are calculated and displayed.
- The table displays the extreme and average values of each quantity as an absolute value and a percentage against the agreed voltage.

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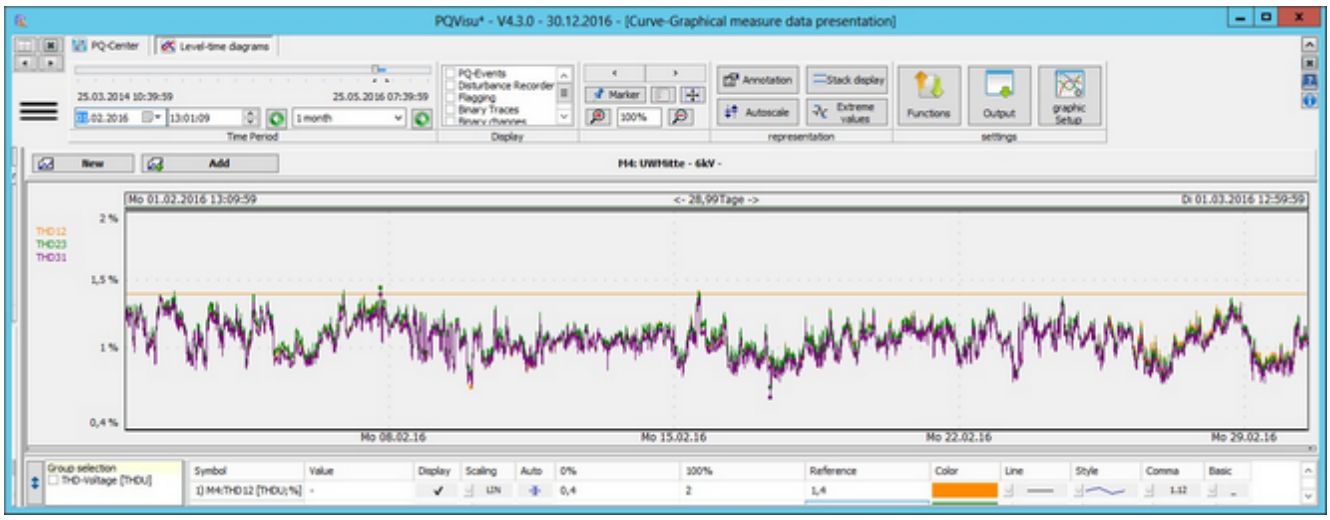
Including reference values in the view



- If you would like to see where the measured-value curve exceeds certain thresholds, use the reference column in the scaling table.
- A reference line is immediately (when you leave the table cell) entered in the graphic (in curve colour).
- The value '0' is interpreted as OFF.

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Showing additional statistical characteristics

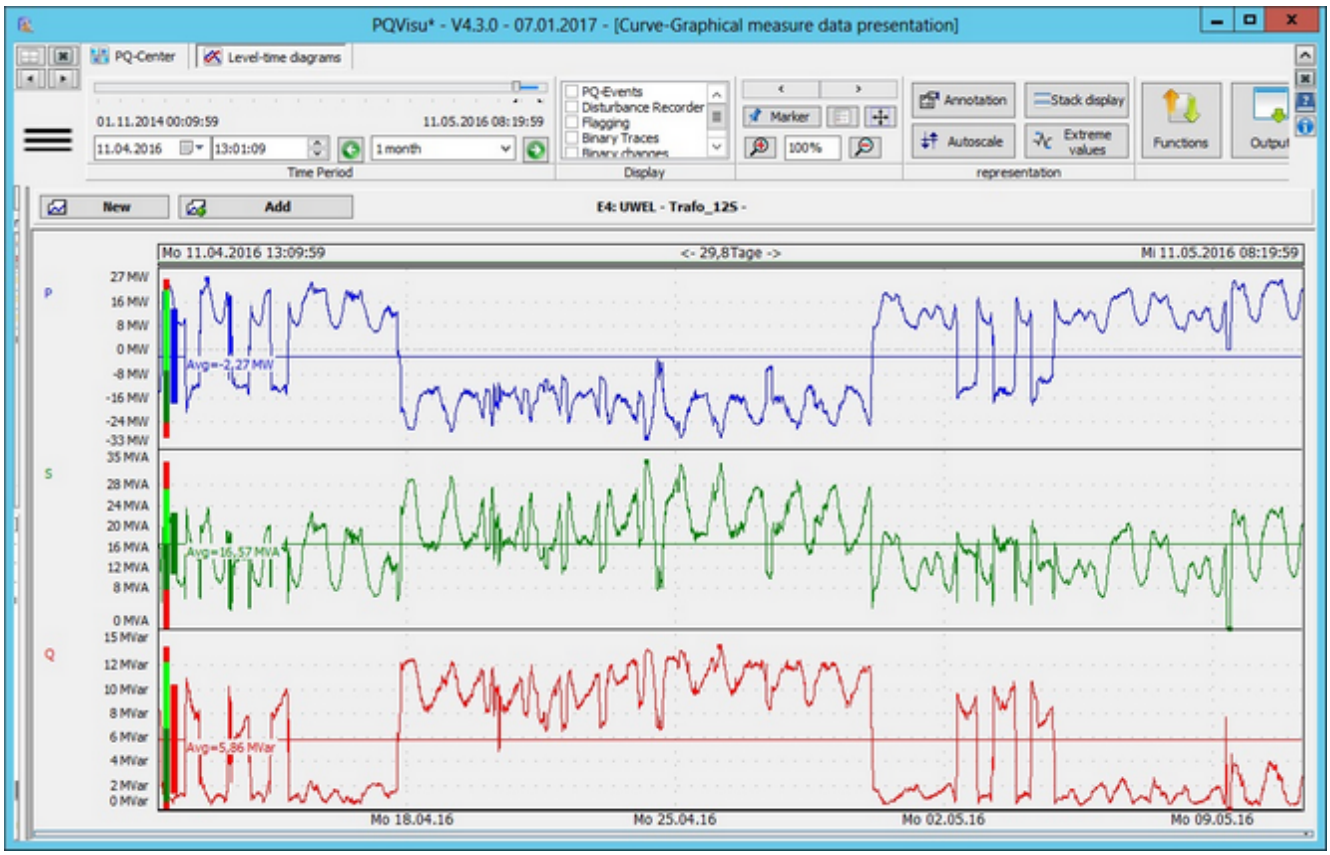

Figure: The average value

In addition to the average values, the minimum, 5%, 95% and maximum ranges are also marked in colour.

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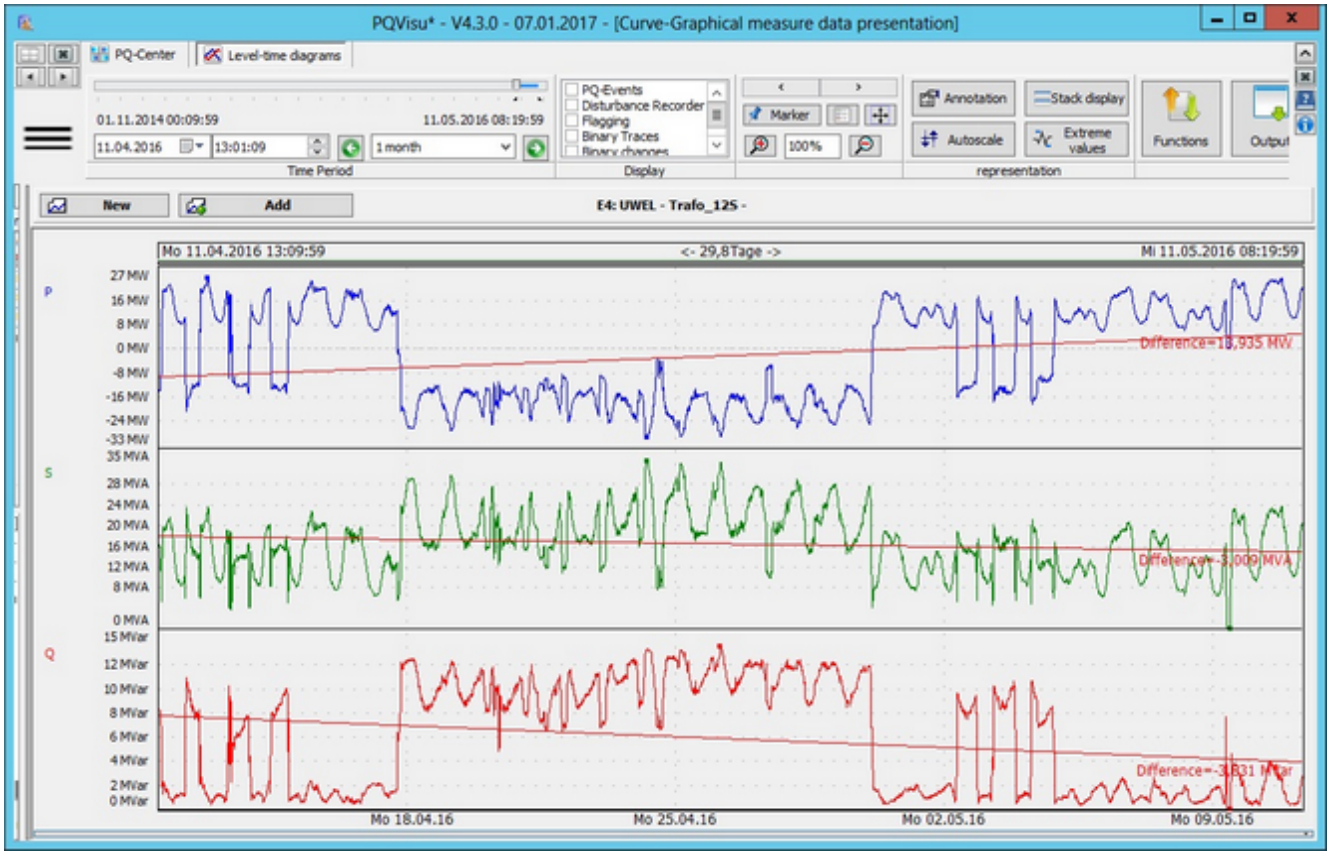

Figure: The regression line

1. Functions are available that enable you to directly display statistical characteristics.
2. Left is an example of the average value. The average value is displayed as a number.
3. A regression line is displayed on the right. This enables trend changes to be spotted. The numerical value is the difference between the intersections with the Y-axis at the beginning and the end of the view.

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Showing binary inputs

Binary inputs can be displayed in this graphic if the according device is able to record them.

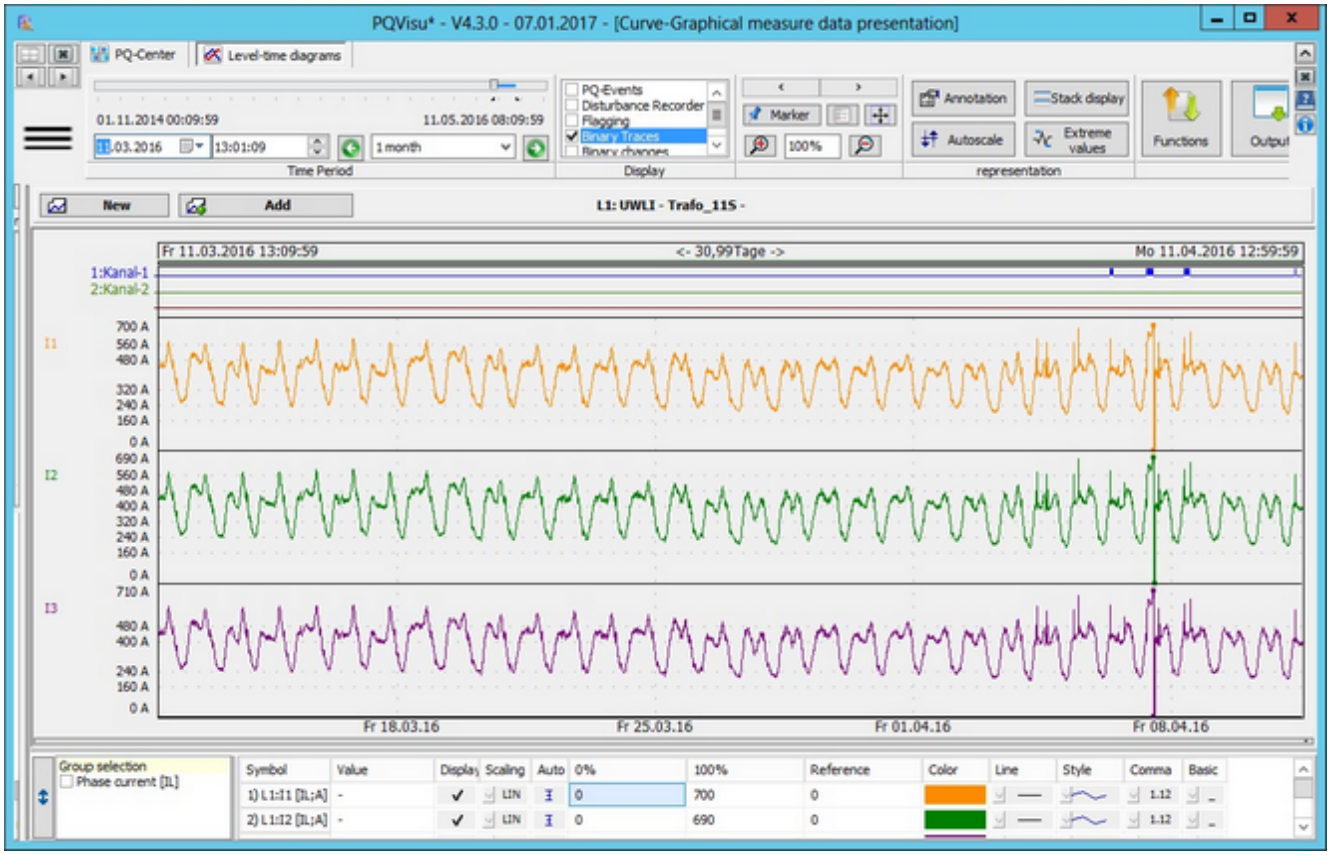

Figure: Graphical view with binary signal: Additional display

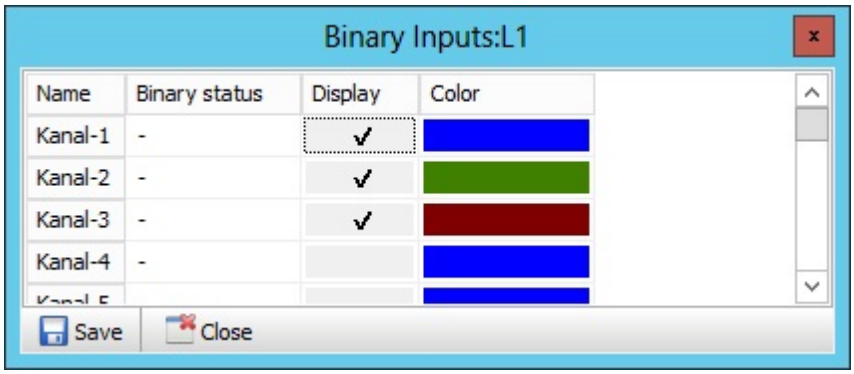

Figure: Configuring binary information Binary setup

- Information about the status change to the binary inputs is displayed by checking 'Show binary inputs' in the Display box at the top of the screen.
- Active areas are displayed as bars, inactive areas as lines.
- The information is extracted from the event list generated by PQI-D. The option must be enabled in PQAdmin.
- The view and the colour information can be changed at any time by clicking on Binary setup. The change is

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temporary until you click on Save setup and save the settings for the device to the database.

- In this dialog the binary channels can also be given individual names.
- If the curve cursor is used, the 'Binary status' is also displayed in the setup table.
- The 'Binary status' button stays in the foreground until the 'Close' button is clicked.

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Displaying PQ events in behaviour graphics

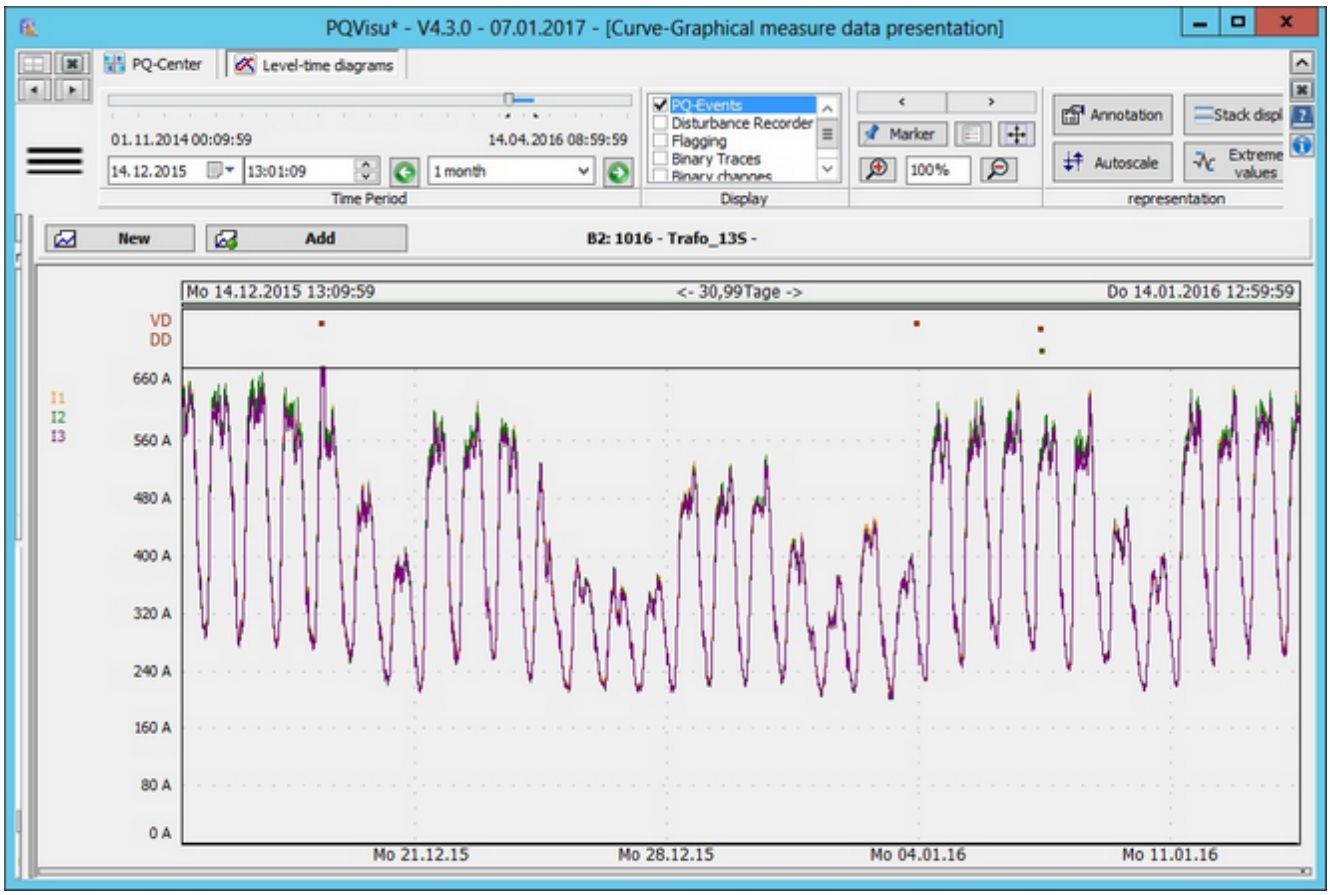

Figure: Showing PQ events in the 10-minute continuous recording

List of used abbreviations:

Frequency violation:	**10-ms events:**	**10-minute events:**	**2-hour events:**	Violation of analogue measurement ranges
• **DFN**: Deviation frequency near • **DFW**: Deviation frequency near	• **US**: Signal voltage • **OV**: Overvoltage • **VS**: Voltage swell • **VD**: Voltage dip • **FVC**: Fast voltage change • **DD**: Deep dip • **SI**: Interruption	• **PST**: Flicker short term • **SVC**: Slow voltage change • **THD**: Harmonic distortion • **HN**: Harmonics • **UU**: Unbalance	• **PLT**: Flicker long term	• **ANA**: Thresholds exceeded

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- The display and selection are similar to the previously discussed additional display options.
- The events (PQ violations such as dips, deep dips etc) are read from the PQ event table and positioned at the correct time.
- Error logs can be displayed accordingly. Their pixels are slightly bigger. Clicking on a pixel opens the corresponding error log.

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Comparing measurands across several devices

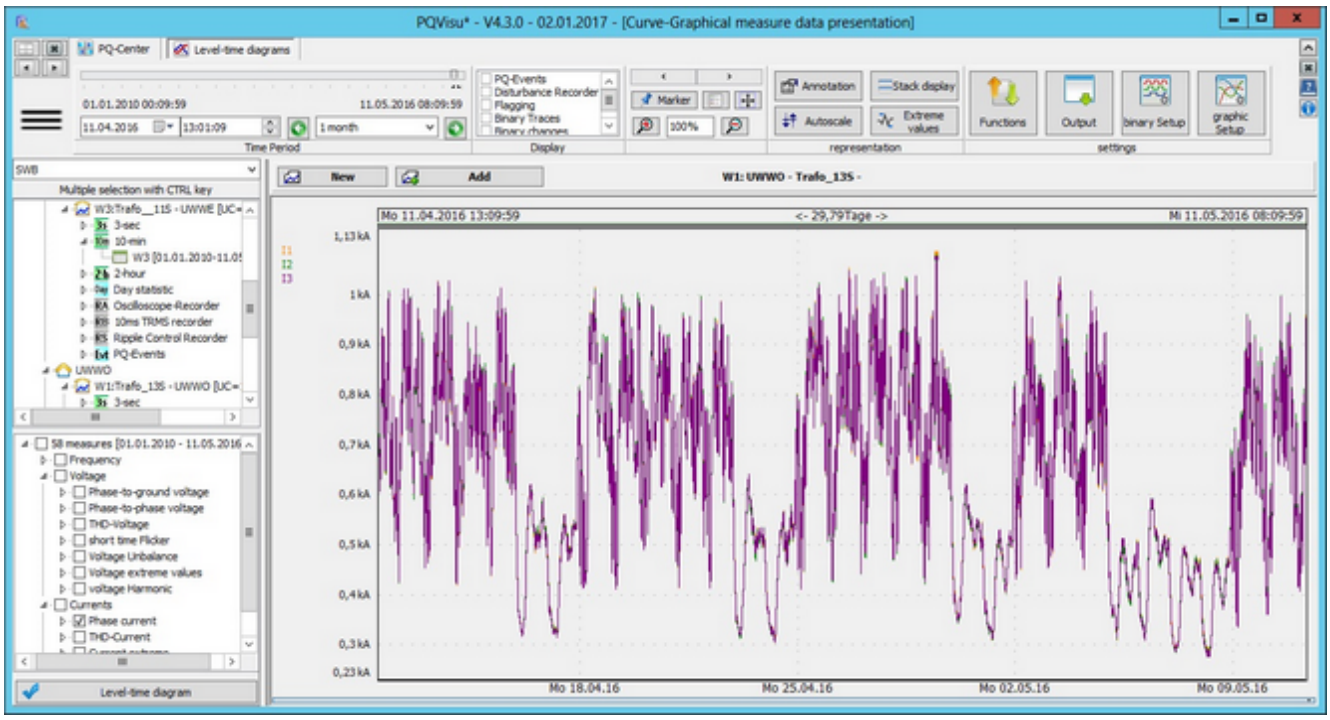

Figure: Data on one device:

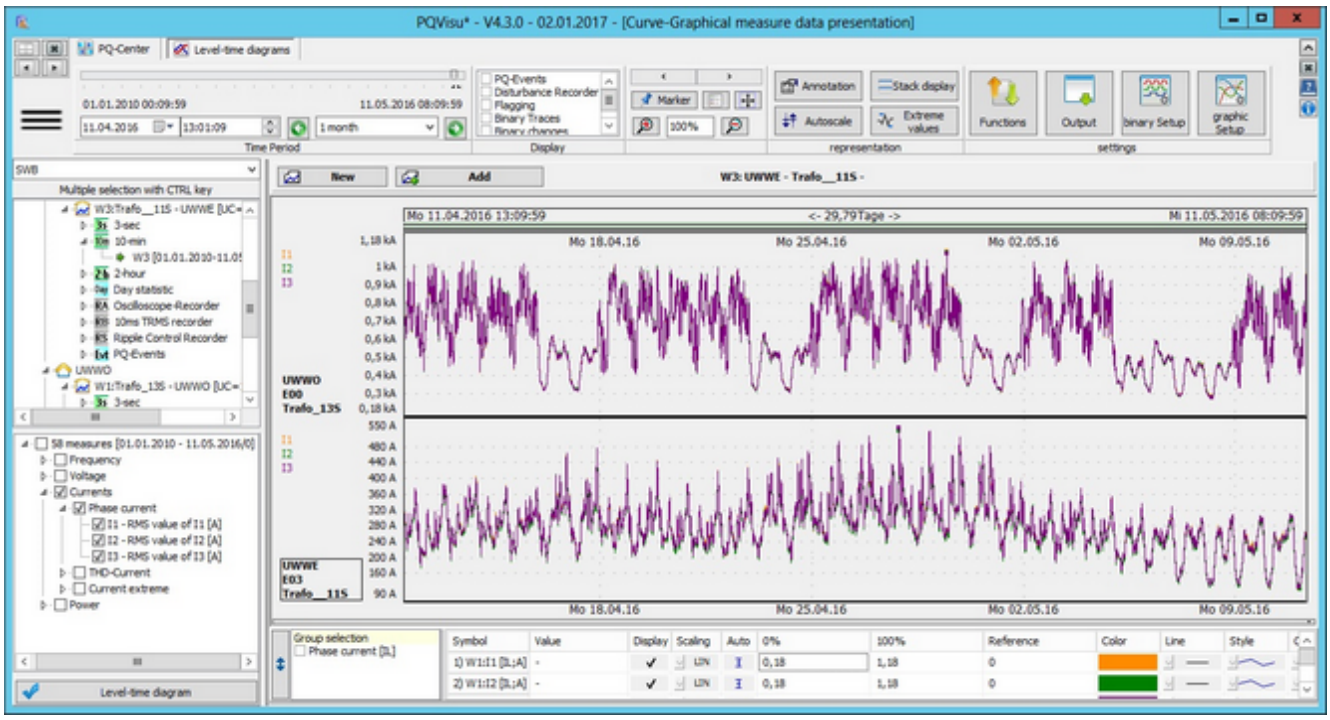

Figure: View: Data on two PQI-Ds in the same graphic

- To display data stored on two devices, start by displaying the data on one device.

- Then select the data on the device that you would like to view in the same window.
- Click on 'Add' instead of 'New' to split the window and display the two curves on top of each other.
- Moving the time window moves it for both devices at the same time.
- Deactivating the 'Time adjustment' option (right-click) enables you to move the time windows separately.

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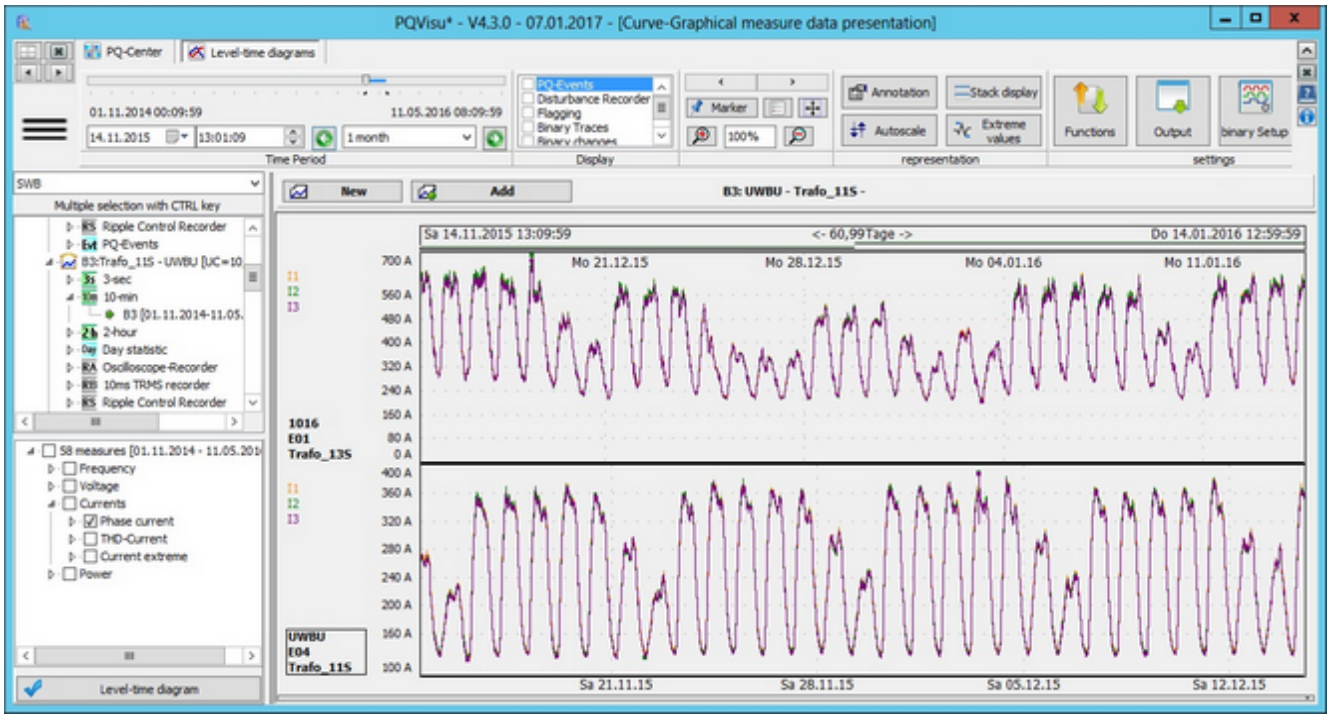
Several curves without 'time adjustment'



- When several curves are displayed, the **time adjustment** function shows whether the subdomains are automatically equilibrated (see previous example) when the time window is moved.
- In the above figure, the time adjustment function (right-click) is disabled.
- The window can now be moved individually for every subdomain.
- Each subdomain still uses all of the available space to display its data.
- The time is displayed in the time bar. In the example, the time domains do not overlap.

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Combined view (Sum of same symbols)

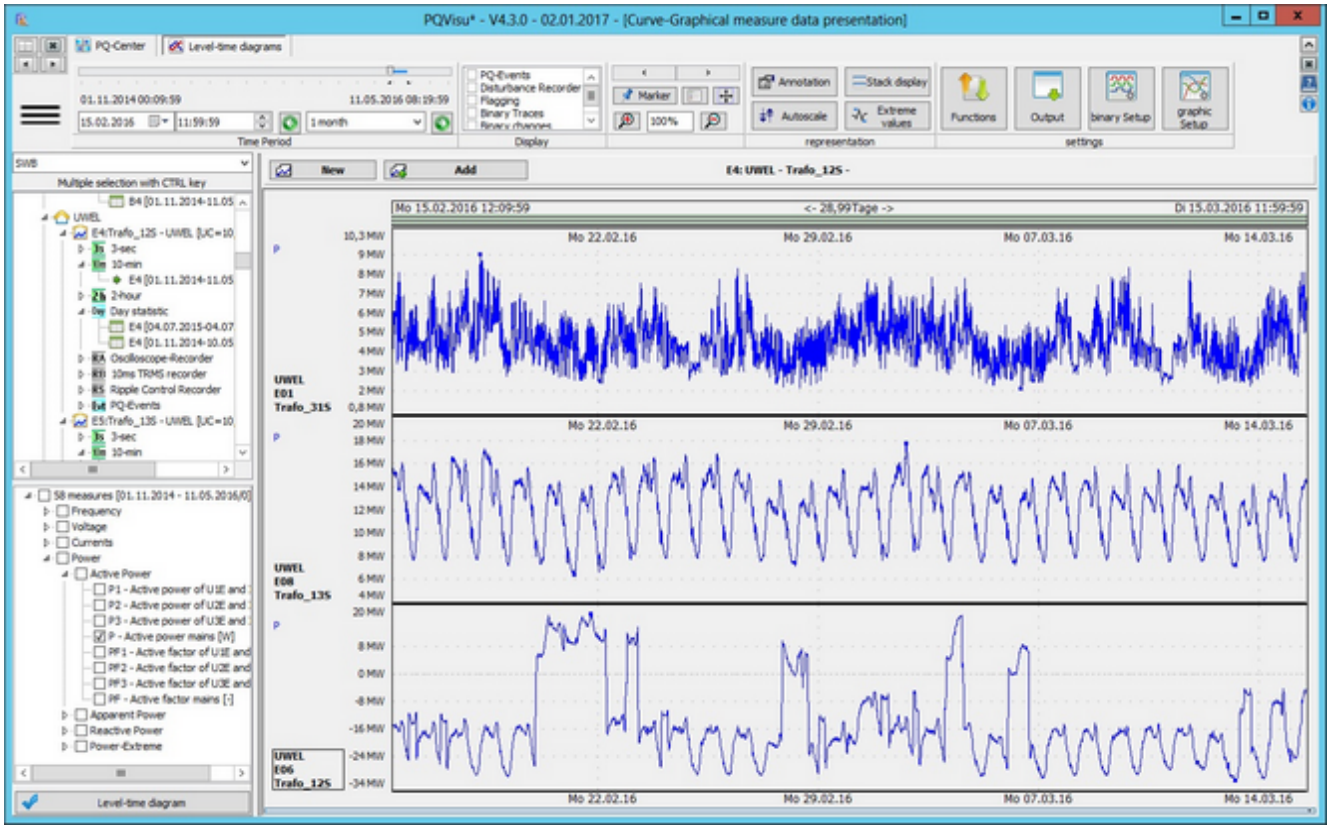


Figure: Active power on three different devices

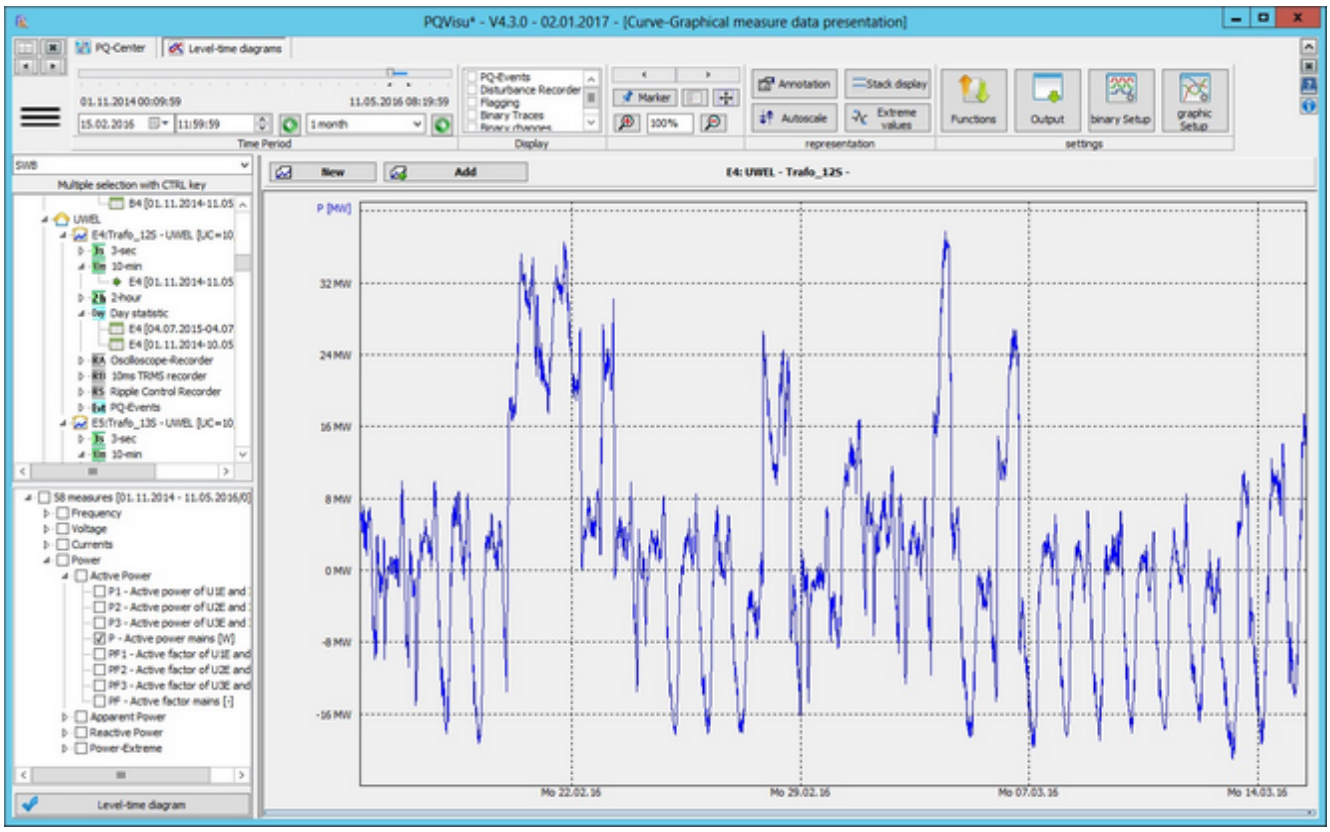
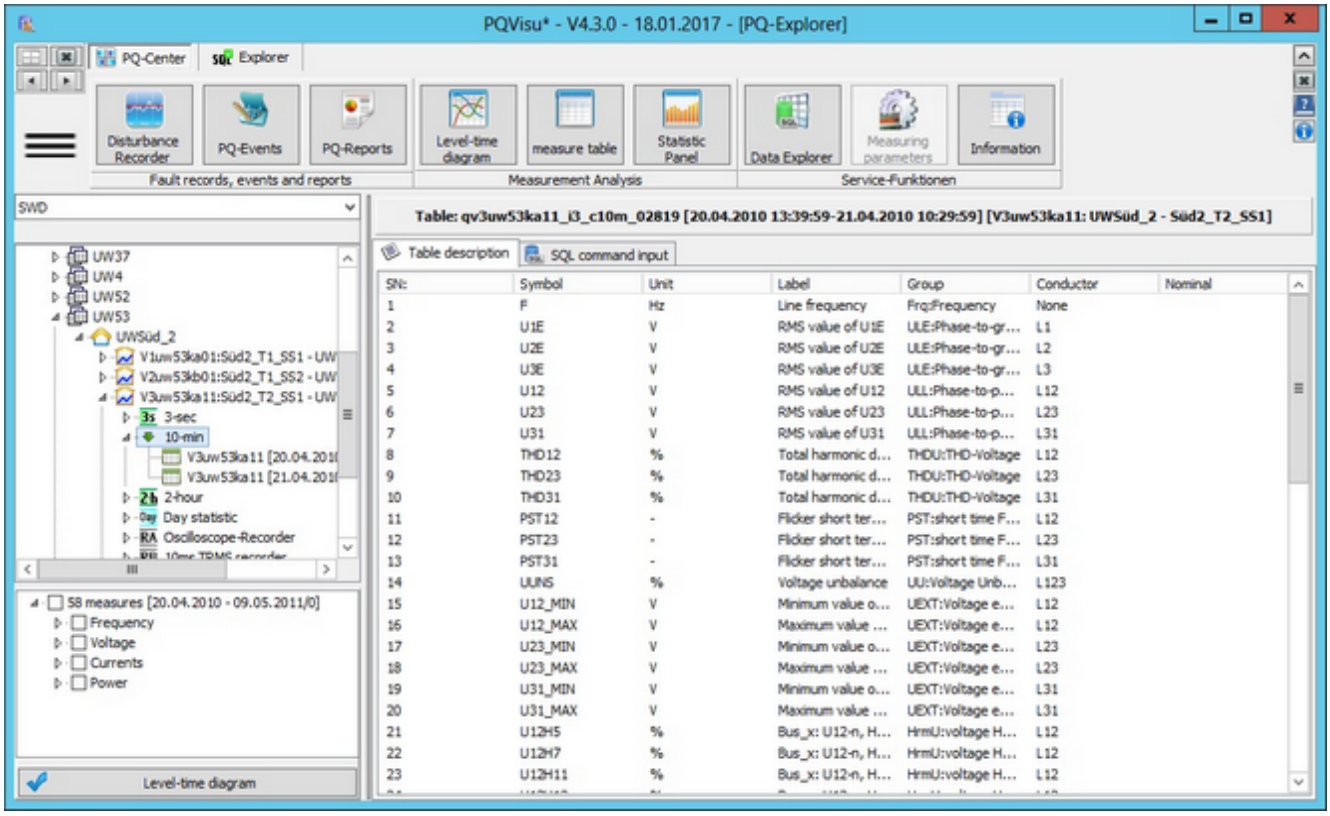


Figure: Active power as sum of these three devices

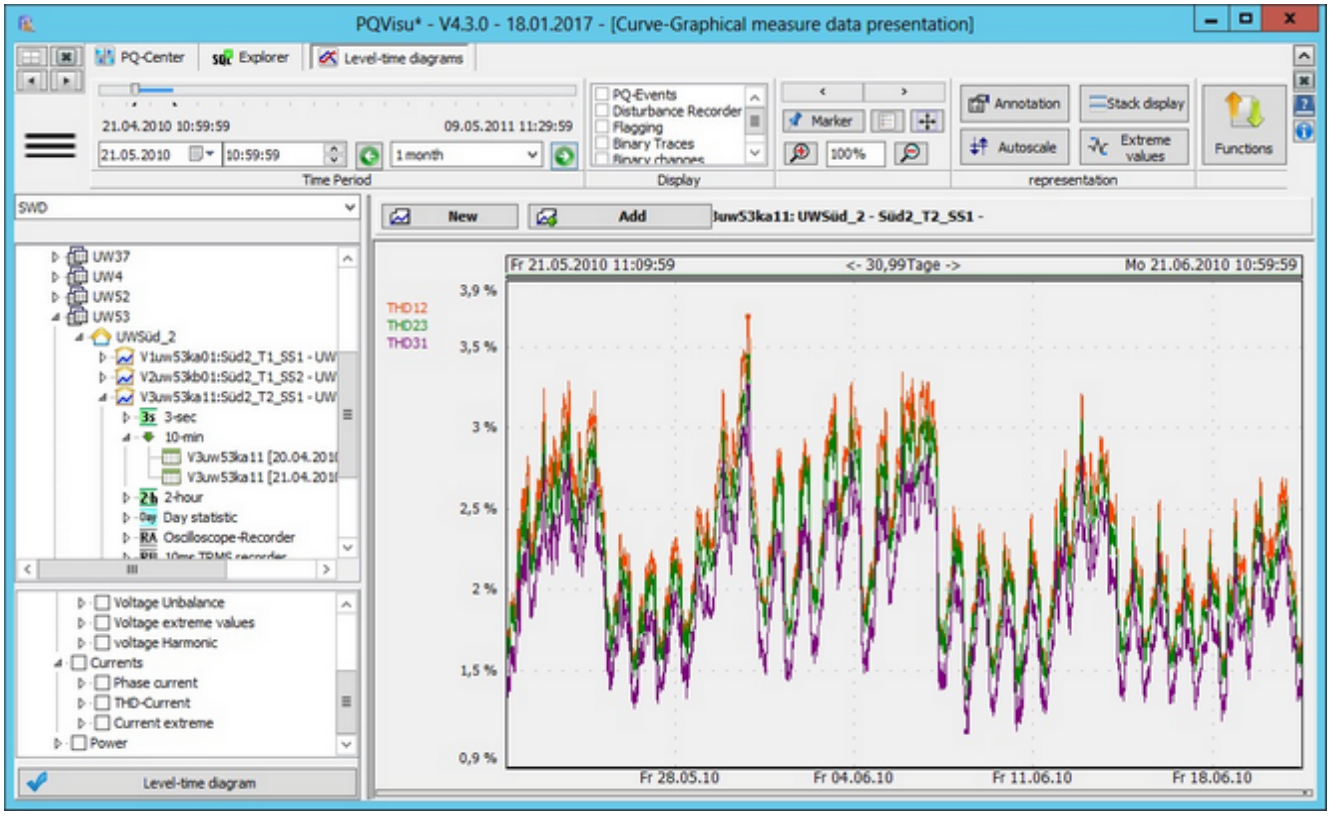
1. The 'Sum of same symbols' function is displayed by right-clicking in the graphic area or below the button functions.
2. The values in the same time intervals that are described by the same symbol (in the figure, a 'P'), are added and displayed as a locus.
3. Most of the other functions, such as the display of the extreme values and moving the displayed time window remain unchanged.
4. The values for the calculated curve and all of the other program data can be copied to a spreadsheet from the clipboard.

Selecting several device tables for a closed display



- This problem occurs because the configuration of the data classes (allocation of new or other measurands) was changed on the PQI-D (e.g., after a device has been repaired).
- In this case, new SQL tables are created with different structures for the same device/data class.
- You can use the multiple-selection function (or activate the parent node) to display a closed progression (at least of the measurands that are contained in all of the tables).
- Only the overlap of the available symbols is displayed in the symbol selection area. Everything else remains unchanged.

Consolidation into a closed curve:



1. The curve displayed here was created from the multiple-selection function described on the previous page.

2. As you can see, dates from '24.3.2010 to 09.05.2011' (the dates from 24.03-10.12.2010 are taken from the older table and the dates from 29.11.2010-09.05.2011 are taken from the second table) are available.

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Displaying measured values in tables

Enables users to access the exact measured values.

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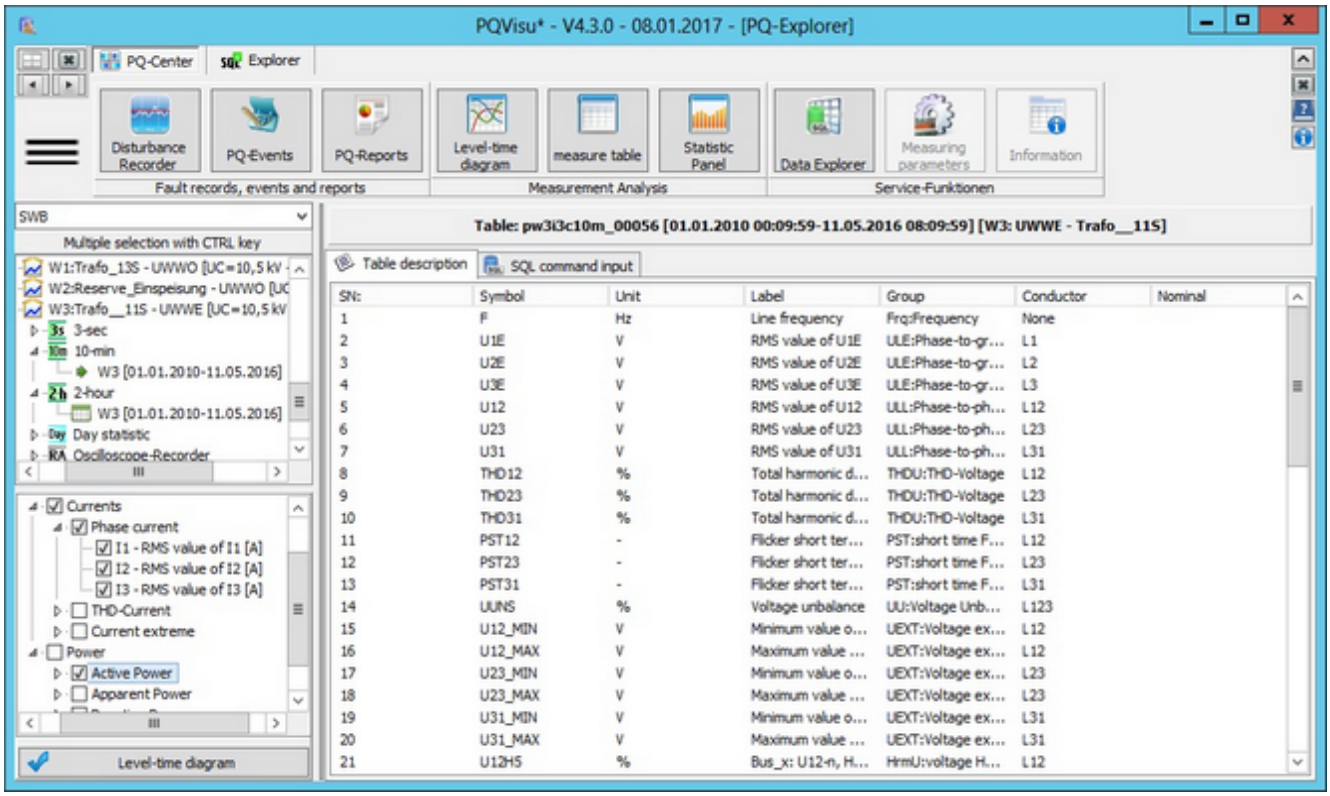
Selecting measurands for later display in tables



- The measurands are selected in three steps:
  - The device and the data class
  - A whole group of measurands or individual measurands
- The group selection field (parent accounts) is a simple way of selecting and deselecting physically similar quantities with a click of the mouse (e.g. all phase-to-phase voltages, all conductor currents etc.).
- You can then add or remove individual quantities (child nodes).
- After tables and measurands have been selected, use the buttons to navigate to the desired pane (e.g. measurand tables).

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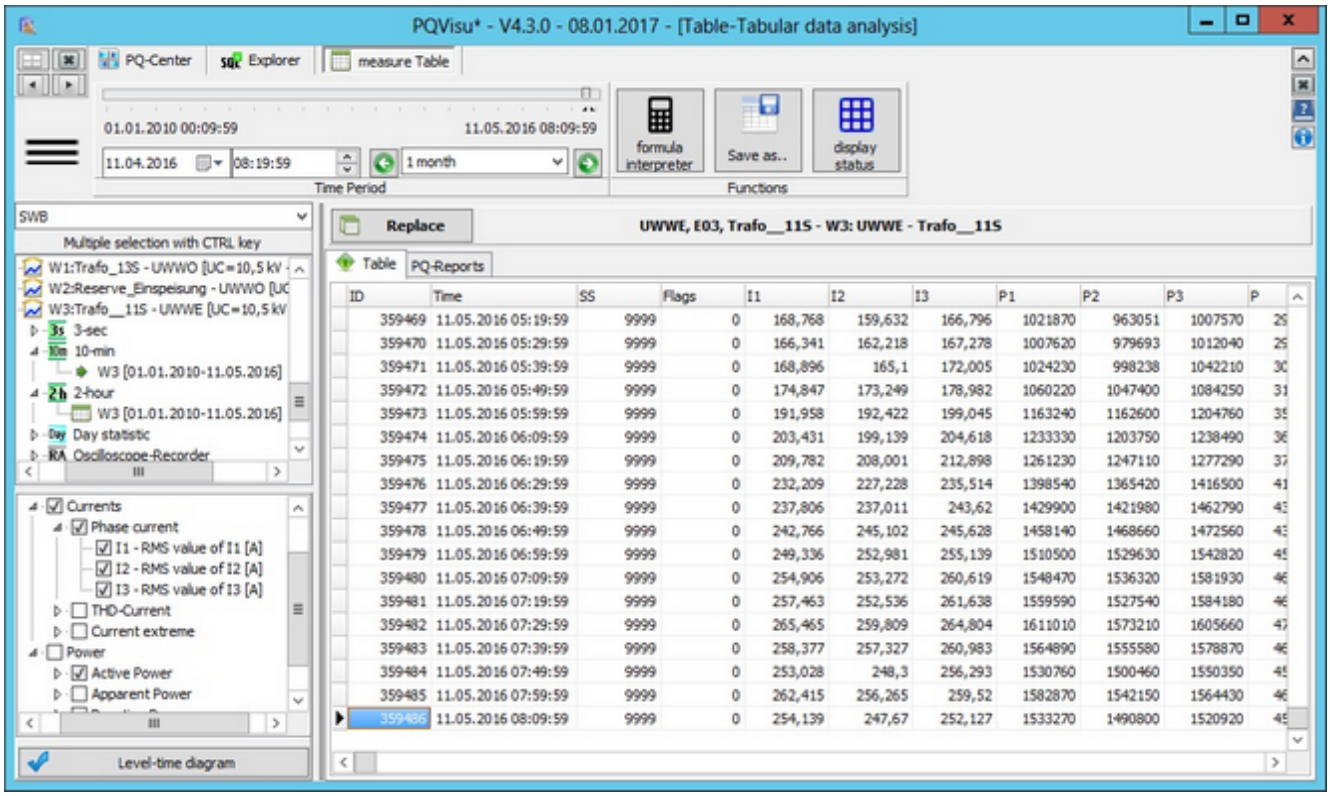
Look and feel of the measured value table



- The view contains a data pane, a navigation pane and a function pane.
- The navigation pane is similar to that in the graphical curve view, where it is also explained in detail.
- Clicking on the Replace button enables you to change the selection of the displayed measurands, if you changed the measurands (below left).

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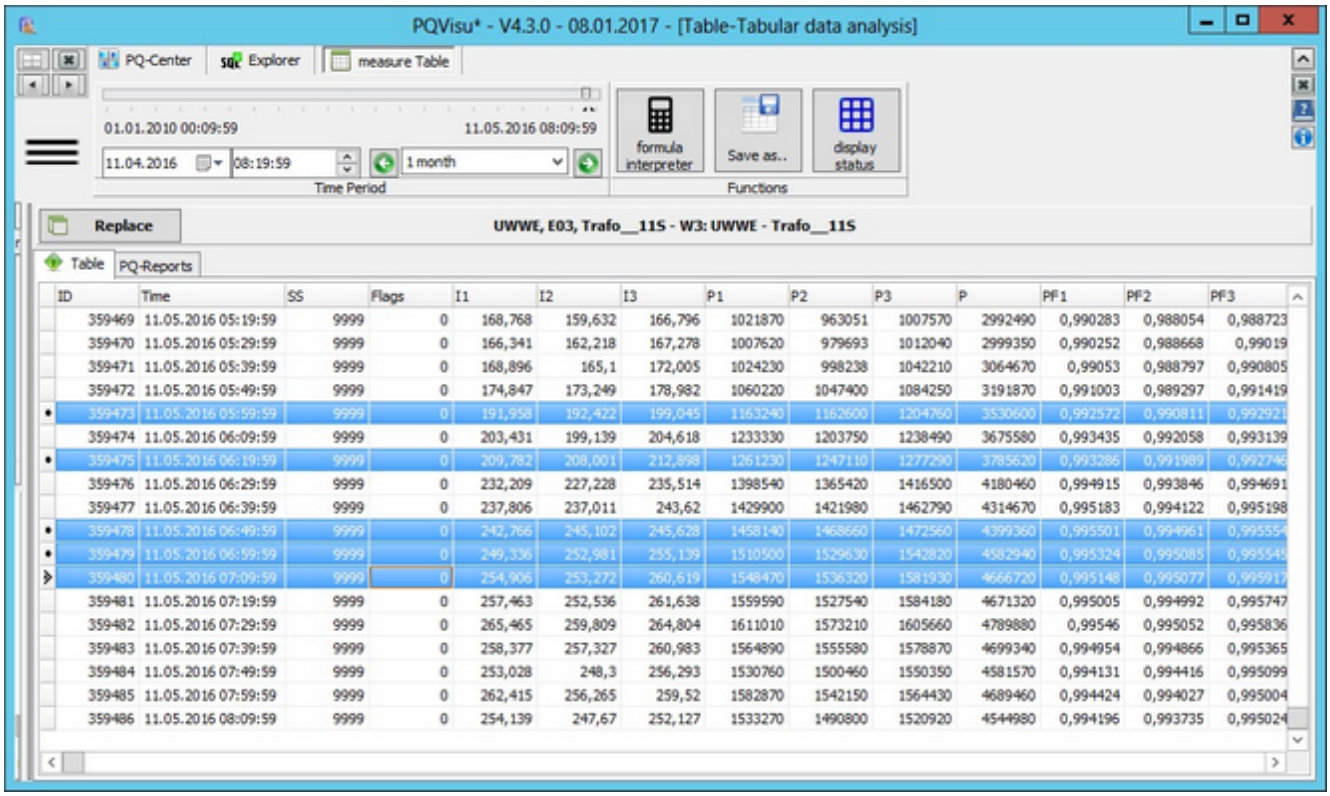
Exporting data for distribution



ID	Time	SS	Flags	I1	I2	I3	P1	P2	P3	P	PF1	PF2	PF3
359469	11.05.2016 05:19:59	9999	0	168,768	159,632	166,796	1021870	963051	1007570	2992490	0,990283	0,988054	0,988723
359470	11.05.2016 05:29:59	9999	0	166,341	162,218	167,278	1007620	979693	1012040	2999350	0,990252	0,988668	0,99019
359471	11.05.2016 05:39:59	9999	0	168,896	165,1	172,005	1024230	998238	1042210	3064670	0,99053	0,988797	0,990805
359472	11.05.2016 05:49:59	9999	0	174,847	173,249	178,982	1060220	1047400	1084250	3191870	0,991003	0,989297	0,991419
359473	11.05.2016 05:59:59	9999	0	191,958	192,422	199,045	1163240	1162600	1204760	3530600	0,992572	0,990811	0,992921
359474	11.05.2016 06:09:59	9999	0	203,431	199,139	204,618	1233330	1203750	1238490	3675580	0,993435	0,992058	0,993139
359475	11.05.2016 06:19:59	9999	0	209,782	208,001	212,898	1261230	1247110	1277290	3785620	0,993286	0,991989	0,992746
359476	11.05.2016 06:29:59	9999	0	232,209	227,228	235,514	1398540	1365420	1416500	4180460	0,994915	0,993846	0,994691
359477	11.05.2016 06:39:59	9999	0	237,806	237,011	243,62	1429900	1421980	1462790	4314670	0,995183	0,994122	0,995198
359478	11.05.2016 06:49:59	9999	0	242,766	245,102	245,628	1458140	1468660	1472560	4399360	0,995501	0,994961	0,995554
359479	11.05.2016 06:59:59	9999	0	249,336	252,981	255,139	1510500	1529630	1542820	4582940	0,995324	0,995085	0,995549
359480	11.05.2016 07:09:59	9999	0	254,906	253,272	260,619	1548470	1536320	1581930	4666720	0,995148	0,995077	0,995917
359481	11.05.2016 07:19:59	9999	0	257,463	252,536	261,638	1559590	1527540	1584180	4671320	0,995005	0,994992	0,995747
359482	11.05.2016 07:29:59	9999	0	265,465	259,809	264,804	1611010	1573210	1605660	4789880	0,99546	0,995052	0,995836
359483	11.05.2016 07:39:59	9999	0	258,377	257,327	260,983	1564890	1555580	1578870	4699340	0,994954	0,994866	0,995365
359484	11.05.2016 07:49:59	9999	0	253,028	248,3	256,293	1530760	1500460	1550350	4581570	0,994131	0,994416	0,995099
359485	11.05.2016 07:59:59	9999	0	262,415	256,265	259,52	1582870	1542150	1564430	4689460	0,994424	0,994027	0,995004
359486	11.05.2016 08:09:59	9999	0	254,139	247,67	252,127	1533270	1490800	1520920	4544980	0,994196	0,993735	0,995024

- You can copy some of the records or the whole table.
- To copy only certain records,
- press and hold the Ctrl key and click on the records you want to copy.
- You can also use the up and down arrow keys.
- The copy function will copy only the selected records or the whole table if no records are selected.

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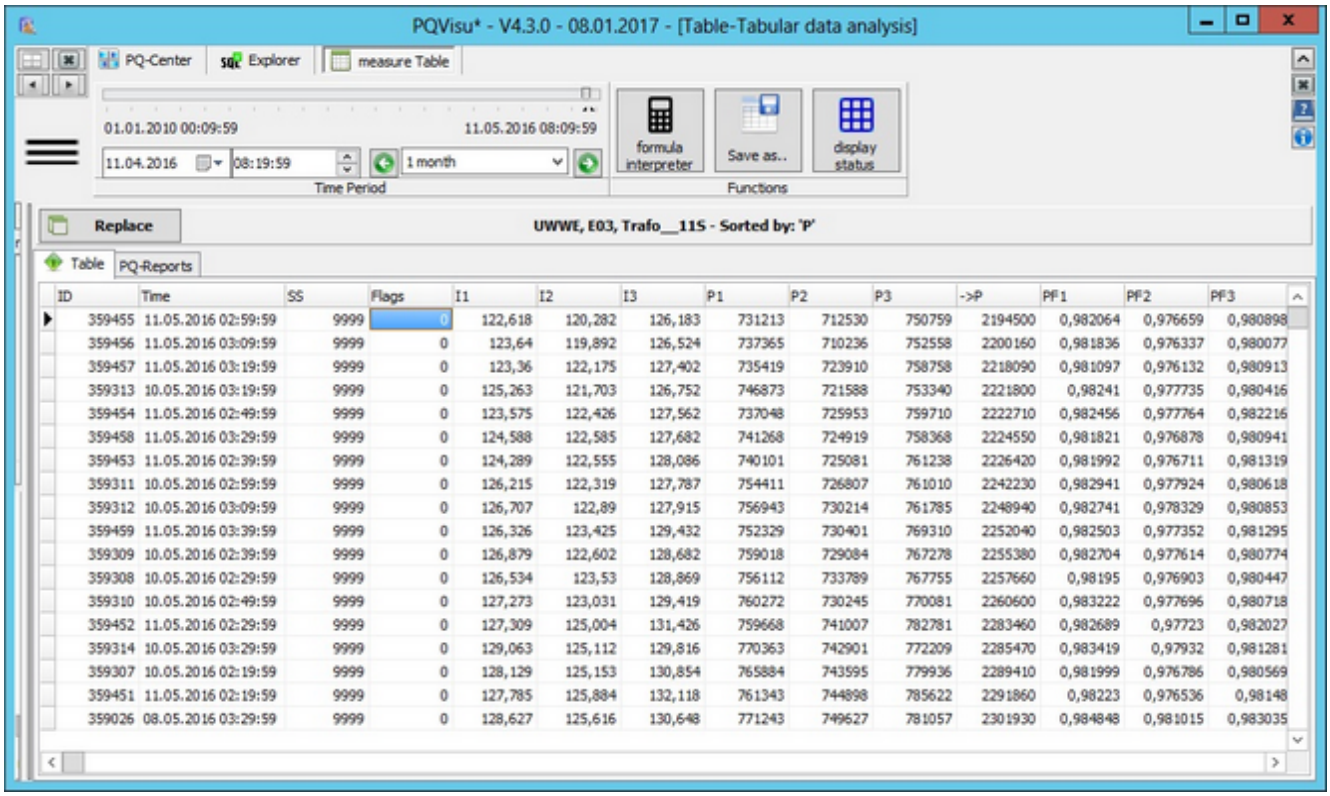
Sorting measured values



ID	Time	SS	Flags	I1	I2	I3	P1	P2	P3	->P	PF1	PF2	PF3
359455	11.05.2016 02:59:59	9999	0	122,618	120,282	126,183	731213	712530	750759	2194500	0,982064	0,976659	0,980898
359456	11.05.2016 03:09:59	9999	0	123,64	119,892	126,524	737365	710236	752558	2200160	0,981836	0,976337	0,980077
359457	11.05.2016 03:19:59	9999	0	123,36	122,175	127,402	735419	723910	758758	2218090	0,981097	0,976132	0,980913
359313	10.05.2016 03:19:59	9999	0	125,263	121,703	126,752	746873	721588	753340	2221800	0,98241	0,977735	0,980416
359454	11.05.2016 02:49:59	9999	0	123,575	122,426	127,562	737048	725953	759710	2222710	0,982456	0,977764	0,982216
359458	11.05.2016 03:29:59	9999	0	124,588	122,585	127,682	741268	724919	758368	2224550	0,981821	0,976878	0,980941
359453	11.05.2016 02:39:59	9999	0	124,289	122,555	128,086	740101	725081	761238	2226420	0,981992	0,976711	0,981319
359311	10.05.2016 02:59:59	9999	0	126,215	122,319	127,787	754411	726807	761010	2242230	0,982941	0,977924	0,980618
359312	10.05.2016 03:09:59	9999	0	126,707	122,89	127,915	756943	730214	761785	2248940	0,982741	0,978329	0,980853
359459	11.05.2016 03:39:59	9999	0	126,326	123,425	129,432	752329	730401	769310	2252040	0,982503	0,977352	0,981295
359309	10.05.2016 02:39:59	9999	0	126,879	122,602	128,682	759018	729084	767278	2255380	0,982704	0,977614	0,980774
359308	10.05.2016 02:29:59	9999	0	126,534	123,53	128,869	756112	733789	767755	2257660	0,98195	0,976903	0,980447
359310	10.05.2016 02:49:59	9999	0	127,273	123,031	129,419	760272	730245	770081	2260600	0,983222	0,977696	0,980718
359452	11.05.2016 02:29:59	9999	0	127,309	125,004	131,426	759668	741007	782781	2283460	0,982689	0,97723	0,982027
359314	10.05.2016 03:29:59	9999	0	129,063	125,112	129,816	770363	742901	772209	2285470	0,983419	0,97932	0,981281
359307	10.05.2016 02:19:59	9999	0	128,129	125,153	130,854	765884	743595	779936	2289410	0,981999	0,976786	0,980569
359451	11.05.2016 02:19:59	9999	0	127,785	125,884	132,118	761343	744898	785622	2291860	0,98223	0,976536	0,98148
359026	08.05.2016 03:29:59	9999	0	128,627	125,616	130,648	771243	749627	781057	2301930	0,984848	0,981015	0,983035

Questions such as how high and when did the highest voltages, the highest loads, the strongest harmonics occur.

1. Are easy to answer just by sorting the measured values contained in the table.
2. The values in the table are sorted by clicking on a column heading. The column the table is sorted on is indicated by an arrow.
3. Alternatively, you can right-click and sort the table by selecting one of the options in the context menu.
4. Sorting means that columns are completely reordered. This enables you to read all of the other quantities contained in the table.
5. The sort index is removed with the next SQL navigation, meaning that the primary index 'Time' is used as the only sort criterion.

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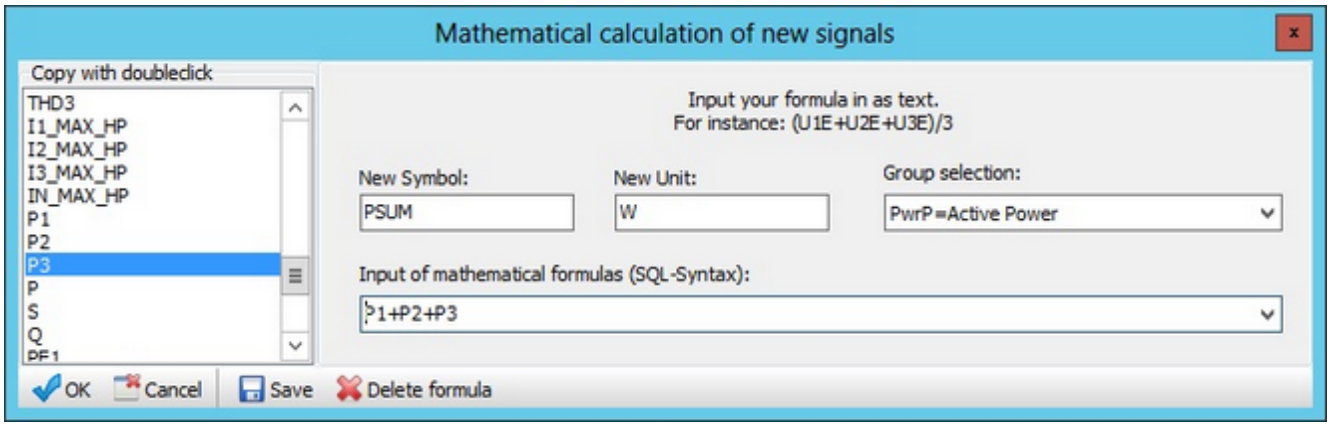
Calculating virtual channels



- This additional function enables you to calculate an additional channel from existing quantities,
- For example, to calculate an average value from several single signals, convert a measurand to a percentage of another measurand and more.
- For more information on adding formulas, see the document 'Displaying error logs'.
- Saving a formula adds it in the drop-down list so you can use it again at a later stage.

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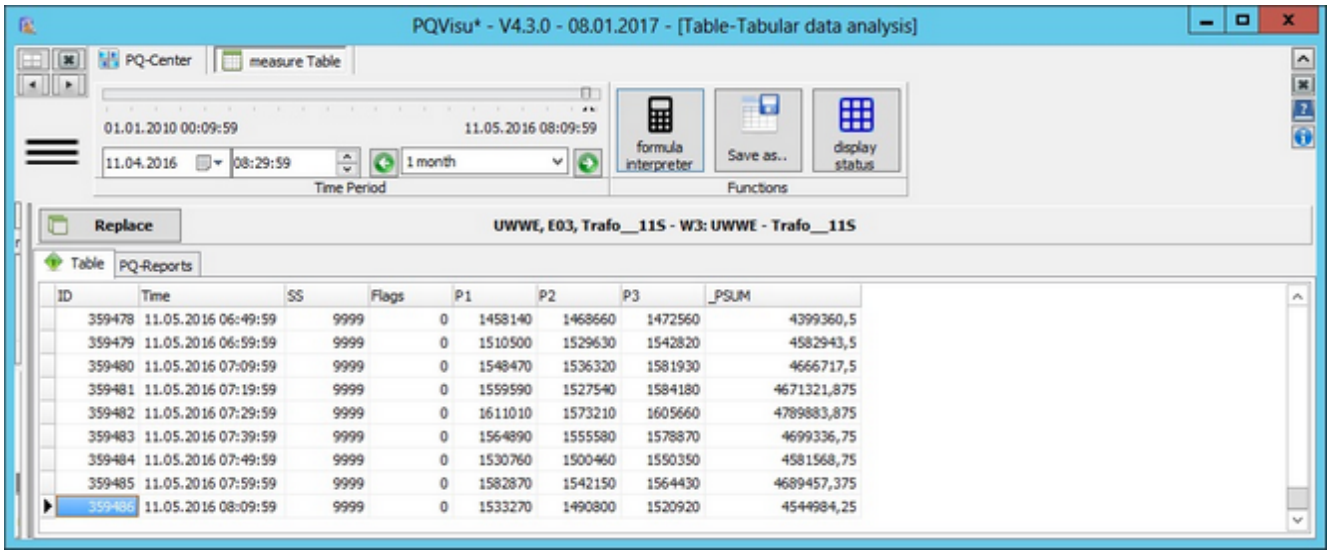
Displaying calculated channels



ID	Time	SS	Flags	P1	P2	P3	_PSUM
359478	11.05.2016 06:49:59	9999	0	1458140	1468660	1472560	4399360,5
359479	11.05.2016 06:59:59	9999	0	1510500	1529630	1542820	4582943,5
359480	11.05.2016 07:09:59	9999	0	1548470	1536320	1581930	4666717,5
359481	11.05.2016 07:19:59	9999	0	1559590	1527540	1584180	4671321,875
359482	11.05.2016 07:29:59	9999	0	1611010	1573210	1605660	4789883,875
359483	11.05.2016 07:39:59	9999	0	1564890	1555580	1578870	4699336,75
359484	11.05.2016 07:49:59	9999	0	1530760	1500460	1550350	4581568,75
359485	11.05.2016 07:59:59	9999	0	1582870	1542150	1564430	4689457,375
359486	11.05.2016 08:09:59	9999	0	1533270	1490800	1520920	4544984,25

- A new column for the calculated measurand is added on the right side of the table.
- The column is given the description from the previous dialogue field 'Symbol'.
- All of the functions (scroll, sort, mark, etc) that can be used with measurands can be used with calculated quantities.

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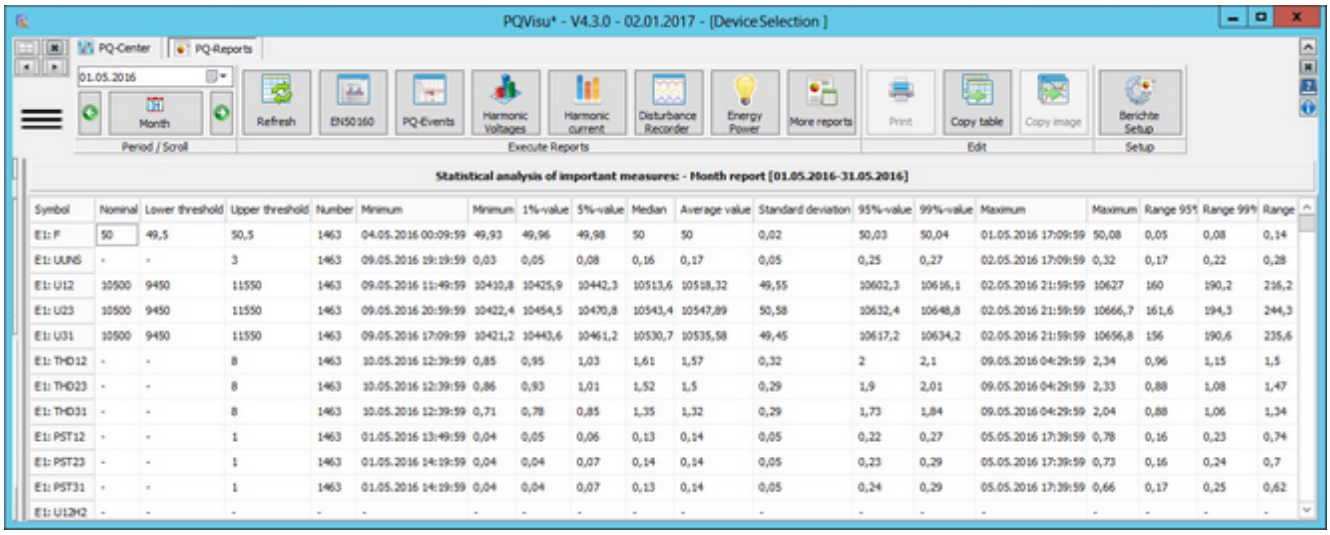
Creating reports from measurands



Symbol	Nominal	Lower threshold	Upper threshold	Number	Minimum	Minimum	1%-value	5%-value	Median	Average value	Standard deviation	95%-value	99%-value	Maximum	Maximum	Range 95%	Range 99%	Range
E1: F	50	49,5	50,5	1463	04.05.2016 00:09:59	49,93	49,96	49,98	50	50	0,02	50,03	50,04	01.05.2016 17:09:59	50,08	0,05	0,08	0,14
E1: UUN5	-	-	3	1463	09.05.2016 19:19:59	0,03	0,05	0,08	0,16	0,17	0,05	0,25	0,27	02.05.2016 17:09:59	0,32	0,17	0,22	0,28
E1: U12	10500	9450	11550	1463	09.05.2016 11:49:59	10410,8	10425,9	10442,3	10513,6	10518,32	49,55	10602,3	10616,1	02.05.2016 21:59:59	10627	160	190,2	236,2
E1: U23	10500	9450	11550	1463	09.05.2016 20:59:59	10422,4	10454,5	10470,8	10543,4	10547,89	50,58	10632,4	10648,8	02.05.2016 21:59:59	10666,7	161,6	194,3	244,3
E1: U31	10500	9450	11550	1463	09.05.2016 17:09:59	10421,2	10443,6	10461,2	10530,7	10535,58	49,45	10617,2	10634,2	02.05.2016 21:59:59	10656,8	156	190,6	235,6
E1: THD12	-	-	8	1463	10.05.2016 12:39:59	0,85	0,95	1,03	1,61	1,57	0,32	2	2,1	09.05.2016 04:29:59	2,34	0,96	1,15	1,5
E1: THD23	-	-	8	1463	10.05.2016 12:39:59	0,86	0,93	1,01	1,52	1,5	0,29	1,9	2,01	09.05.2016 04:29:59	2,33	0,88	1,08	1,47
E1: THD31	-	-	8	1463	10.05.2016 12:39:59	0,71	0,78	0,85	1,35	1,32	0,29	1,73	1,84	09.05.2016 04:29:59	2,04	0,88	1,06	1,34
E1: PST12	-	-	1	1463	01.05.2016 13:49:59	0,04	0,05	0,06	0,13	0,14	0,05	0,22	0,27	05.05.2016 17:39:59	0,78	0,16	0,23	0,74
E1: PST23	-	-	1	1463	01.05.2016 14:19:59	0,04	0,04	0,07	0,14	0,14	0,05	0,23	0,29	05.05.2016 17:39:59	0,73	0,16	0,24	0,7
E1: PST31	-	-	1	1463	01.05.2016 14:19:59	0,04	0,04	0,07	0,13	0,14	0,05	0,24	0,29	05.05.2016 17:39:59	0,66	0,17	0,25	0,62
E1: U12H2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- There is a selection area and a results area.
- Selection area: Time window, device selection and the area to run and edit the reports.
- The time window has special options:
  - You can set the current measured value table as the data source
  - You can select the time window from the two calendars in the Select time window pane.

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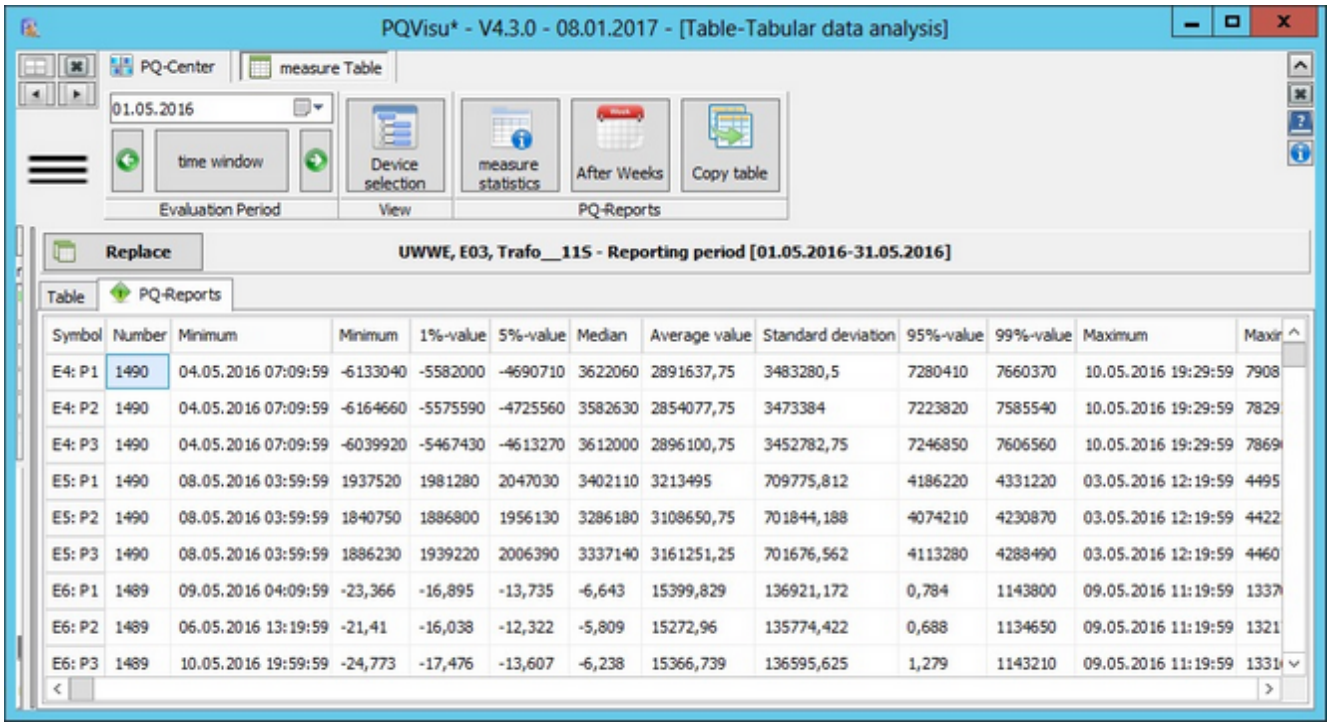
Measured-value statistics report



Symbol	Number	Minimum	Minimum	1%-value	5%-value	Median	Average value	Standard deviation	95%-value	99%-value	Maximum	Maxi
E4: P1	1490	04.05.2016 07:09:59	-6133040	-5582000	-4690710	3622060	2891637,75	3483280,5	7280410	7660370	10.05.2016 19:29:59	7908
E4: P2	1490	04.05.2016 07:09:59	-6164660	-5575590	-4725560	3582630	2854077,75	3473384	7223820	7585540	10.05.2016 19:29:59	7829
E4: P3	1490	04.05.2016 07:09:59	-6039920	-5467430	-4613270	3612000	2896100,75	3452782,75	7246850	7606560	10.05.2016 19:29:59	7869
E5: P1	1490	08.05.2016 03:59:59	1937520	1981280	2047030	3402110	3213495	709775,812	4186220	4331220	03.05.2016 12:19:59	4495
E5: P2	1490	08.05.2016 03:59:59	1840750	1886800	1956130	3286180	3108650,75	701844,188	4074210	4230870	03.05.2016 12:19:59	4422
E5: P3	1490	08.05.2016 03:59:59	1886230	1939220	2006390	3337140	3161251,25	701676,562	4113280	4288490	03.05.2016 12:19:59	4460
E6: P1	1489	09.05.2016 04:09:59	-23,366	-16,895	-13,735	-6,643	15399,829	136921,172	0,784	1143800	09.05.2016 11:19:59	1337
E6: P2	1489	06.05.2016 13:19:59	-21,41	-16,038	-12,322	-5,809	15272,96	135774,422	0,688	1134650	09.05.2016 11:19:59	1321
E6: P3	1489	10.05.2016 19:59:59	-24,773	-17,476	-13,607	-6,238	15366,739	136595,625	1,279	1143210	09.05.2016 11:19:59	1331

- The Measured-value statistics report is a device-wide report.
- All of the devices that were selected are taken into account (if applicable using the Groups button at the top right of the view).
- All of the measurand symbols displayed in the table are taken into account.
- The statistical evaluation calculates the following characteristics:
  - Minimum/maximum with time stamp
  - 1% value, 5% value, 95% value, 99% value
  - Median, average, standard deviation
  - The range over the 95% and 99% values as well as the range for the whole area.

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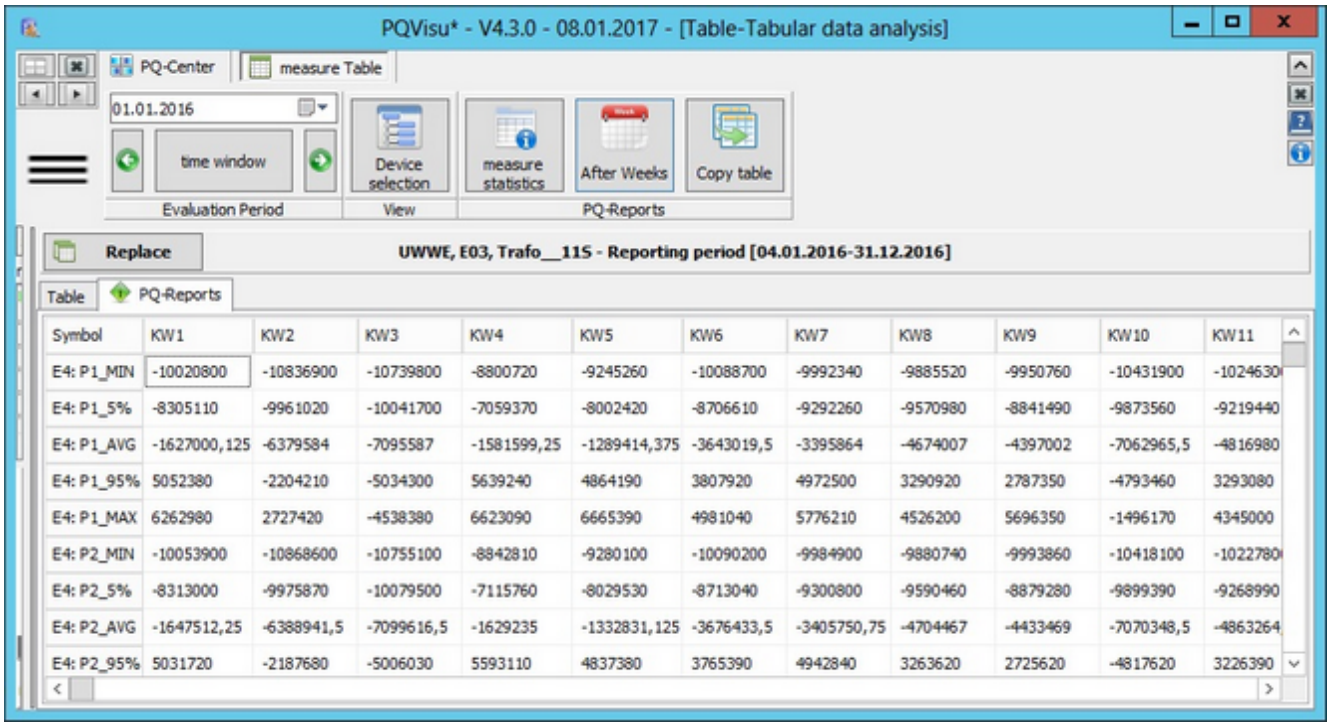
Weekly statistics



Symbol	KW1	KW2	KW3	KW4	KW5	KW6	KW7	KW8	KW9	KW10	KW11
E4: P1_MIN	-10020800	-10836900	-10739800	-8800720	-9245260	-10088700	-9992340	-9885520	-9950760	-10431900	-1024630
E4: P1_5%	-8305110	-9961020	-10041700	-7059370	-8002420	-8706610	-9292260	-9570980	-8841490	-9873560	-9219440
E4: P1_AVG	-1627000,125	-6379584	-7095587	-1581599,25	-1289414,375	-3643019,5	-3395864	-4674007	-4397002	-7062965,5	-4816980
E4: P1_95%	5052380	-2204210	-5034300	5639240	4864190	3807920	4972500	3290920	2787350	-4793460	3293080
E4: P1_MAX	6262980	2727420	-4538380	6623090	6665390	4981040	5776210	4526200	5696350	-1496170	4345000
E4: P2_MIN	-10053900	-10868600	-10755100	-8842810	-9280100	-10090200	-9984900	-9880740	-9993860	-10418100	-1022780
E4: P2_5%	-8313000	-9975870	-10079500	-7115760	-8029530	-8713040	-9300800	-9590460	-8879280	-9899390	-9268990
E4: P2_AVG	-1647512,25	-6388941,5	-7099616,5	-1629235	-1332831,125	-3676433,5	-3405750,75	-4704467	-4433469	-7070348,5	-4863264
E4: P2_95%	5031720	-2187680	-5006030	5593110	4837380	3765390	4942840	3263620	2725620	-4817620	3226390

- This report shows the statistics for the measured data in weeks (calendar weeks in the table columns).
- The evaluation period is the time window that is selected in a calendar.
- The measurands are displayed in the table cells (based on the current selection).
- Five values are calculated for each measurand:
  - Minimum and maximum
  - 5% value and 95% value
  - Average value

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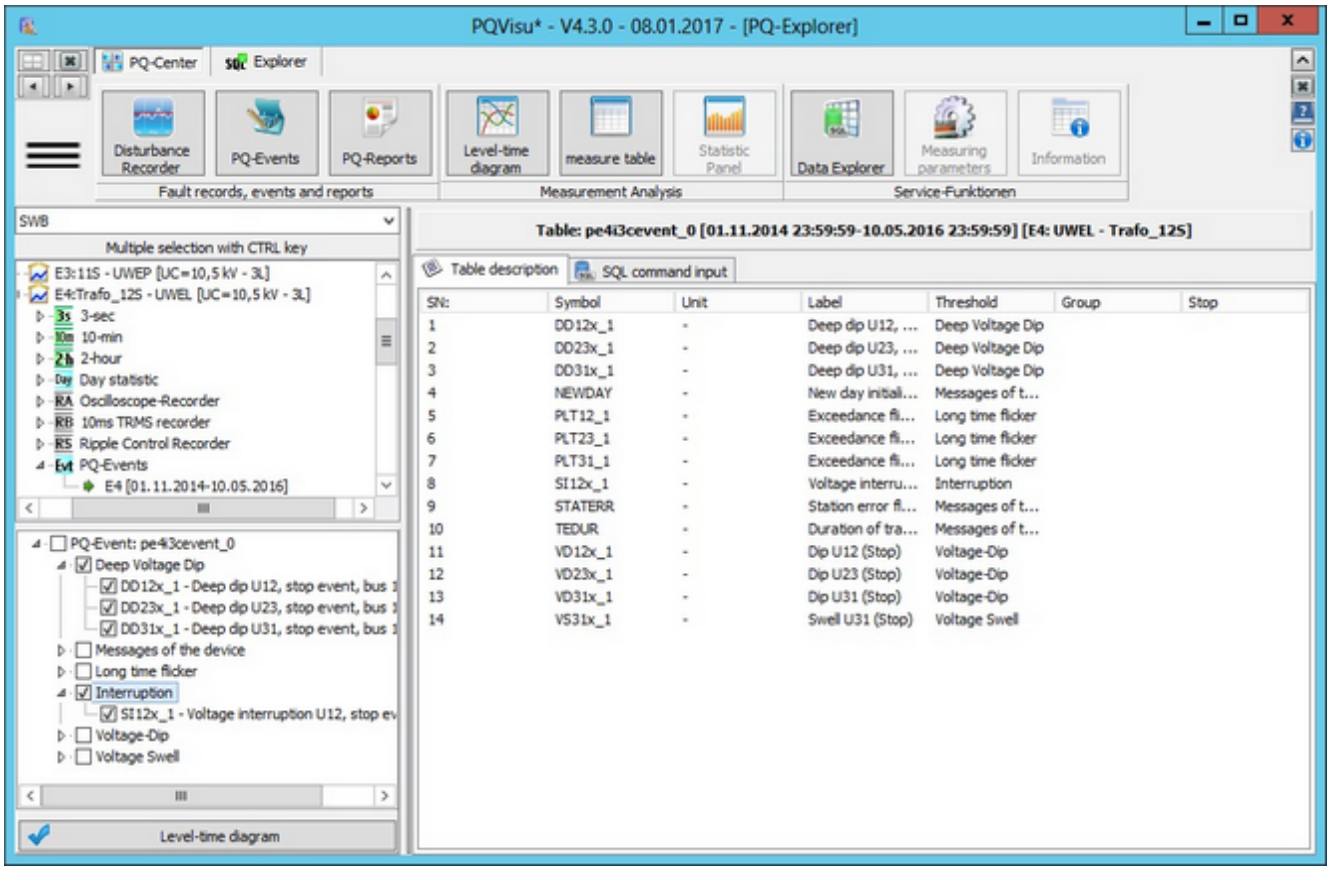
Selecting events for table views



- In addition to PQ events, event tables contain other events such as system notifications, binary status changes and the violation of the analogue ranges.
- In contrast to the measurement data views, a list of possible events is displayed in the selection field instead of table columns (measurands). This is why the filter for the view does not apply to table columns but to table rows (events of a specific type).
- Here too, there is a quick selection by event group (e.g., voltage dips, interruptions) or you can select each possible event individually (voltage swell in U1E, voltage dip in U31 etc).
- Click on the Measured value tables button to output the report.

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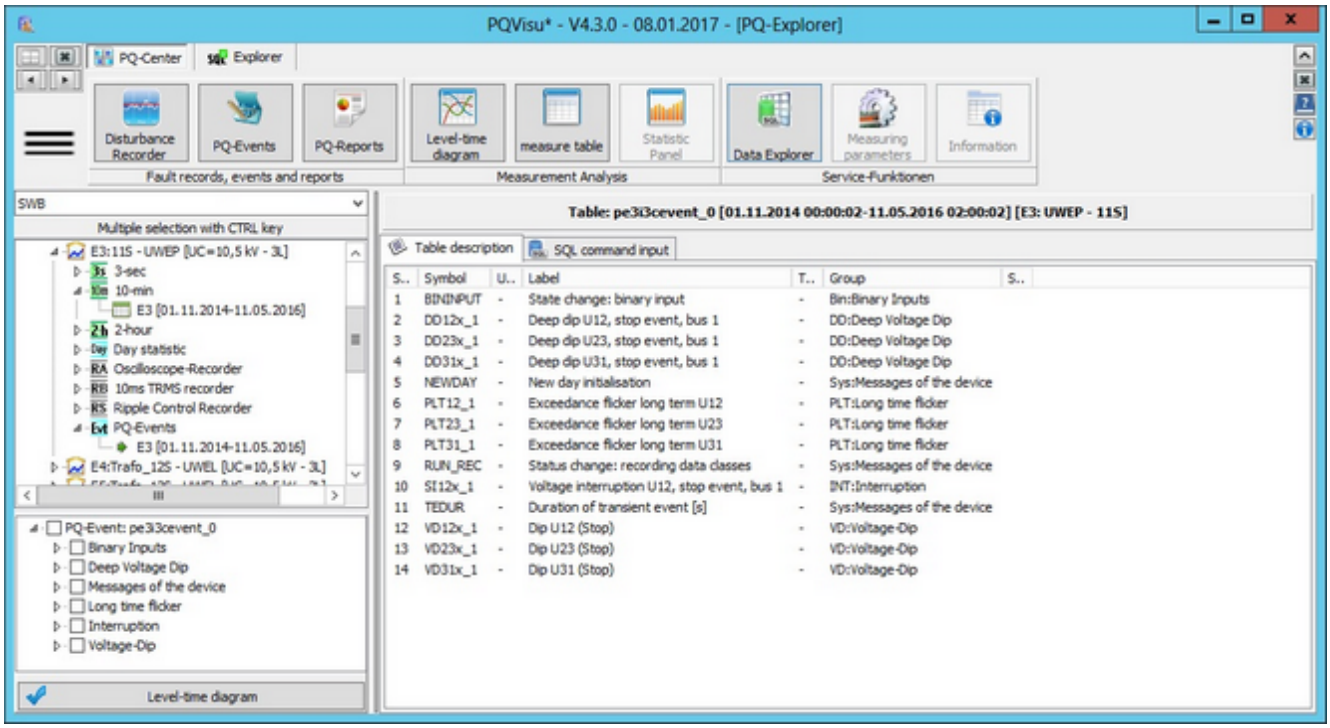
Displaying events in tables



- The table now only contains interruptions and voltage dip events (based on the filters).
- The sort function that is triggered by clicking on the column headings still works.
- The data can also be copied (row by row if need be) or saved in files.

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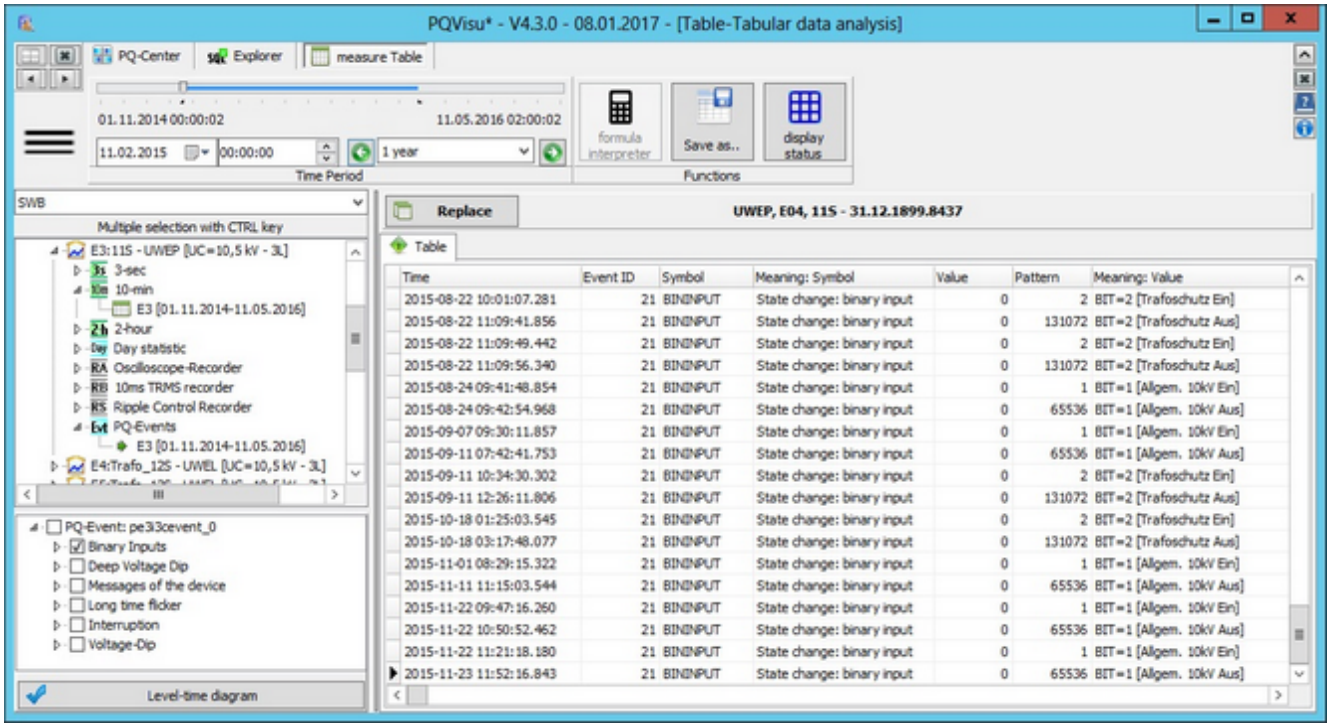
Displaying binary channels in a table



- The status at the binary input is recorded by default in the event tables.
- The table stores every change with a time stamp and bit pattern.
- The status is displayed as text in the view providing that the user entered the information (Example: 'Transformer protection OFF').

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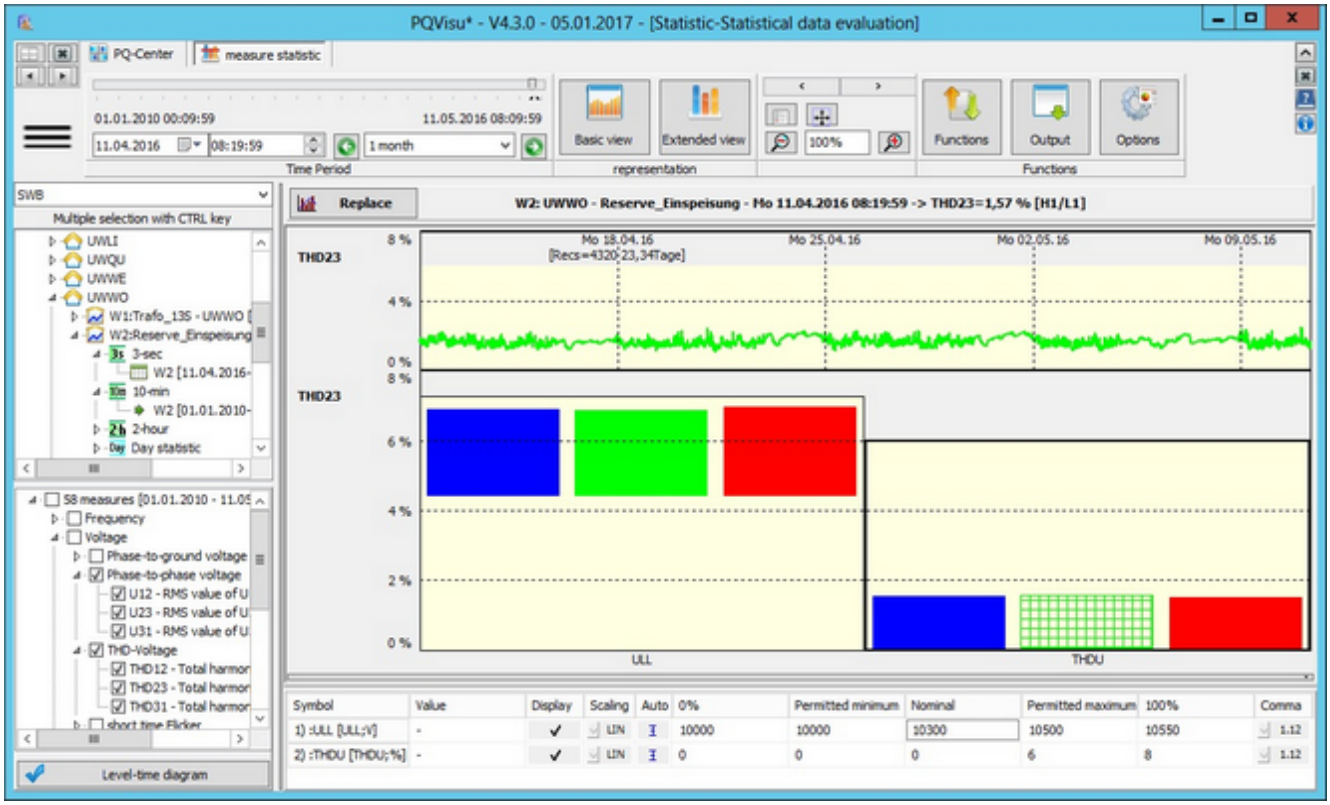
Selecting tables and measurands



- As with all of the evaluations, this one starts by selecting the measurands you want to display.
- All of the selection options (tables and then table columns) that have been discussed for tabular and curve displays are available.
- Try to select only a few measurands that you would like to analyze in more detail.
- In the figure, these are the three-phase power values and the THD values of the line voltage.
- The scaling values are specified in the table below the graphic. The 0% value and the 100% value create the view, the allowable minimum and allowable maximum columns should be seen as thresholds, which are highlighted in colour in the respective figures.

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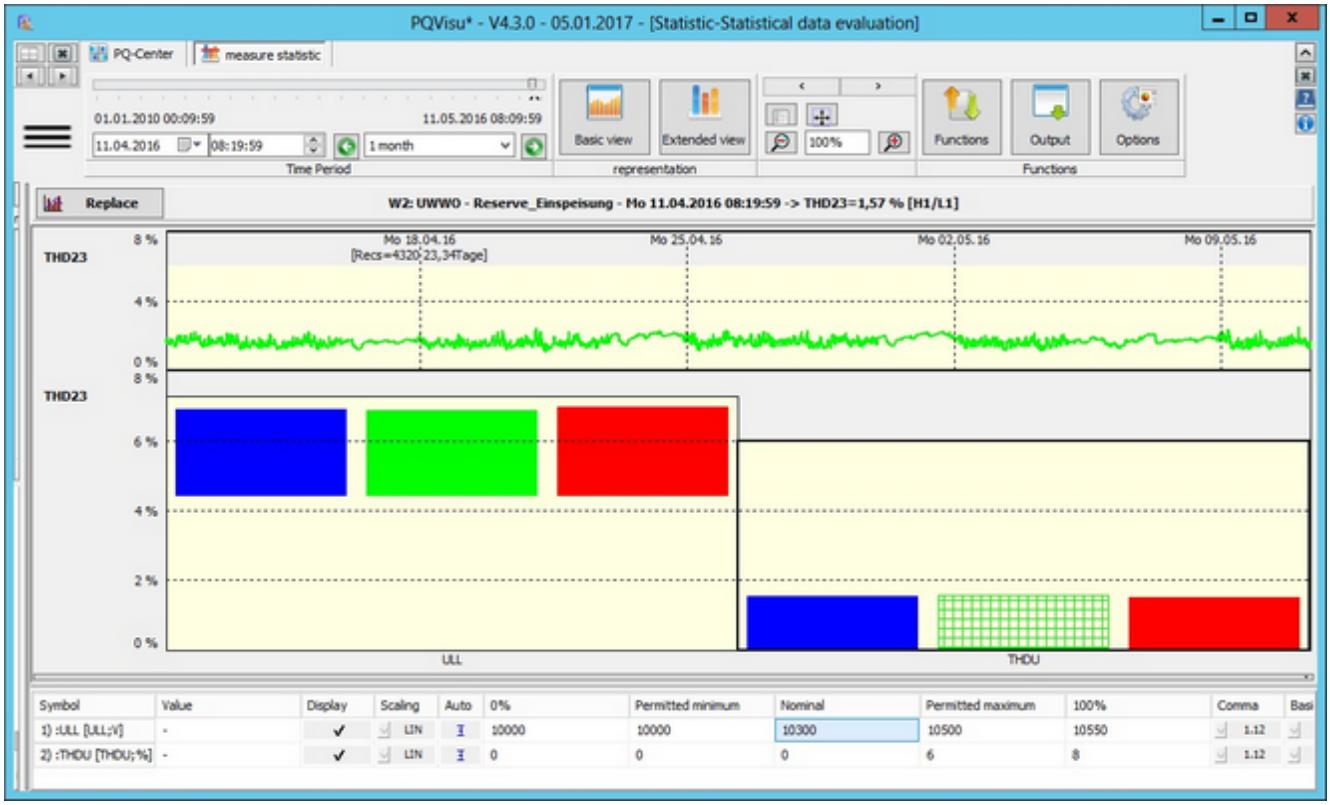
Explanation of the graphical view



- The graphics pane is split into two areas:
  - The main area displays the values measured at a recording point for the configured threshold.
  - The additional area at the top displays the time behaviour of the measurand (in this case a THD phase quantity) also for the threshold.
- Click in the main area to select other quantities (in the example, you can toggle between power and THD).
- Click in the additional area to access other measurement times. Alternatively you can change the position by moving the right/left slider. The graphic changes interactively.

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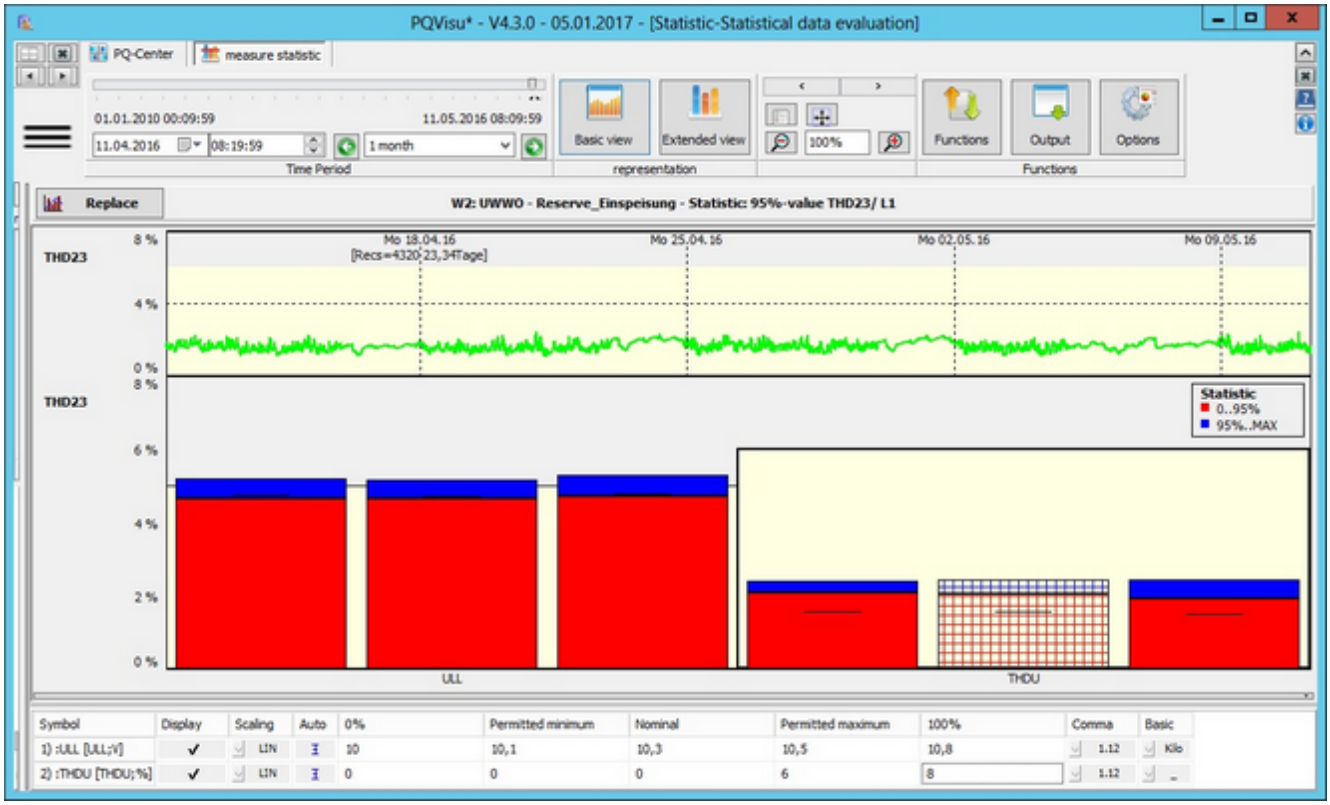
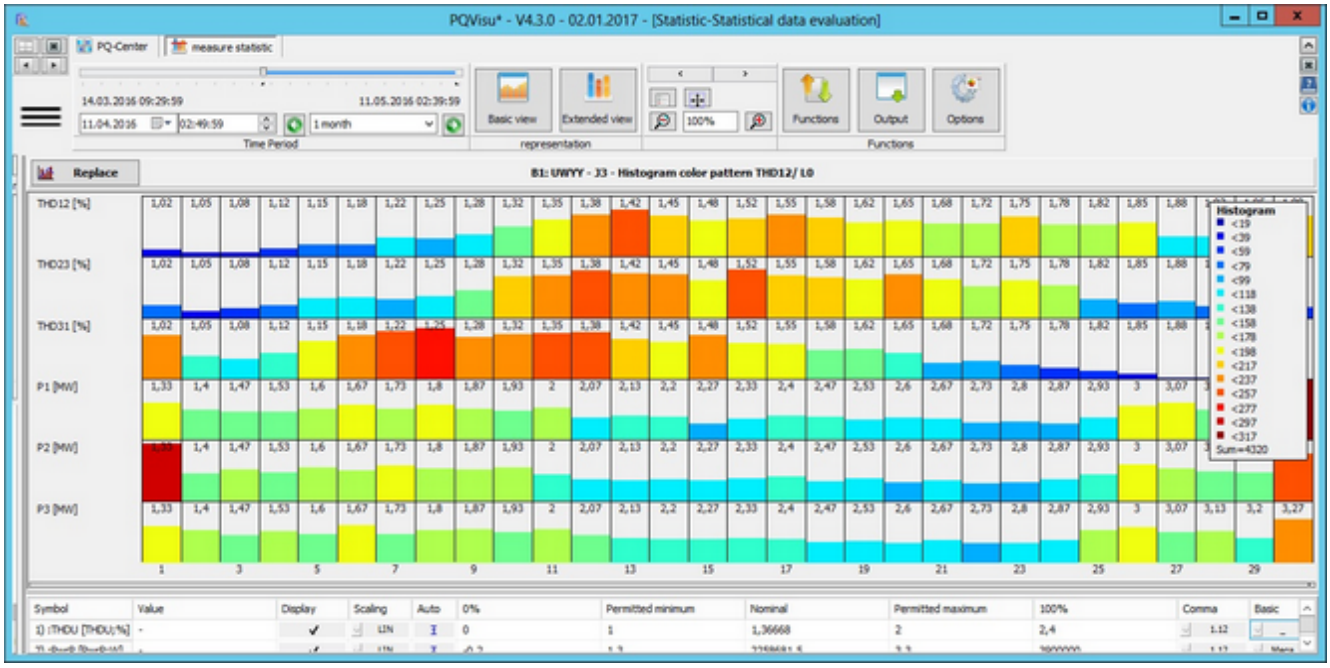
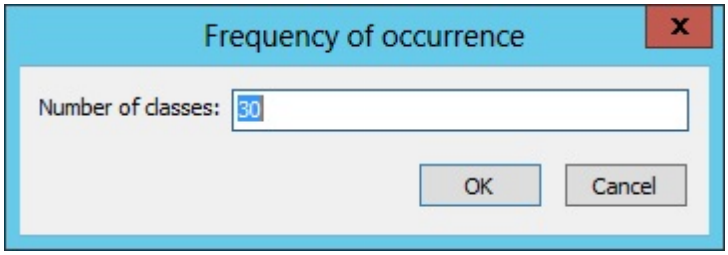
Displaying statistical characteristics (minimum, maximum, 5% and 95% value)



- Toggling the basic view takes you to the statistics overview, for example.
- The above figure displays the 5% Minimum, 5% Average, 95% Average and 95% Maximum in different colours.
- The bar with crosshatched rectangle is the current measurand the progression of which is printed in an additional area.

Display as colour frequency distribution:





Click on the 'Options' button to add/change the number of classes

- Toggling the basic view to Histogram (colour pattern), creates the above view.
- The measured values are distributed in range classes according to the allowed minimum/maximum.
- The measurands are arranged in a list. The colours in the different sections show which sections are the most active (each section represents a specific value range for a measurand).
- The scaling is based on the class with the highest activity (in the example, 4243 THD23 is in the 6th section).

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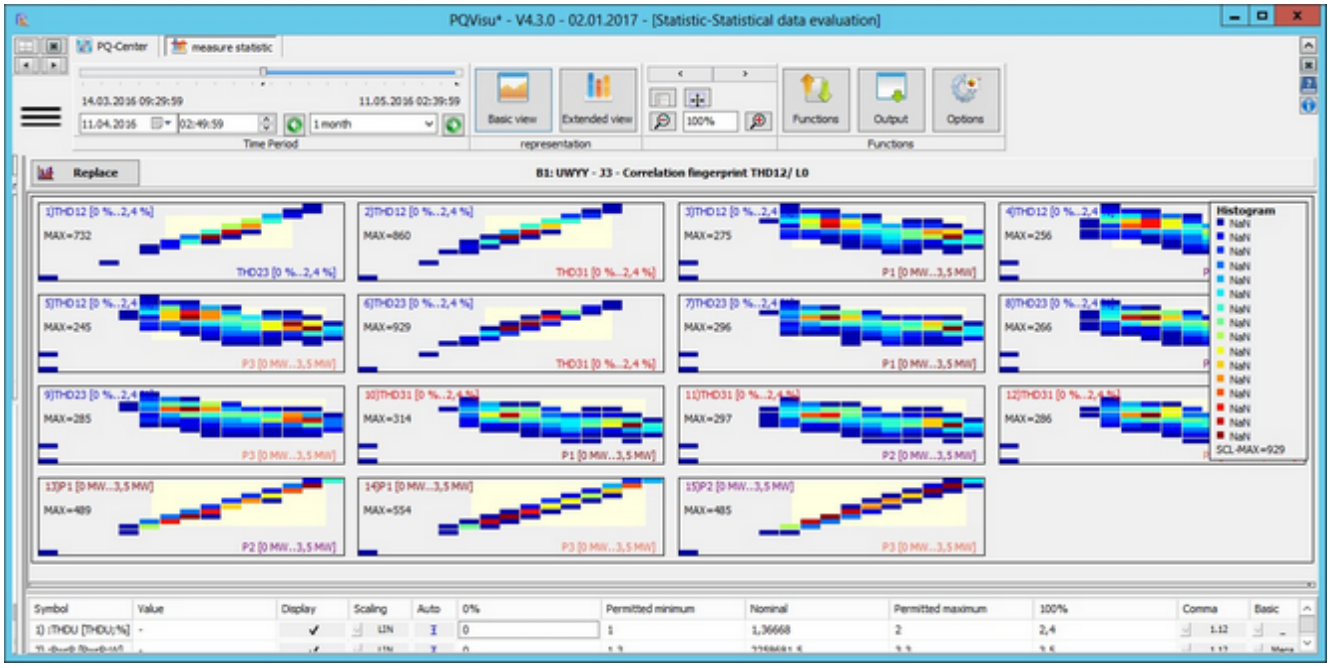
Display as correlation fingerprint:



- All of the measurands are correlated.
- The boundaries of the coloured regions are established by the minimum/maximum values specified in the table.
- The 'Number of fingerprint classes' is specified in a parameter under 'Options'.
- Each subregion is given a colour based on the number of measured values that are assigned to it. The minimum value on which the colour scale is based is shown on the Y-axis as Max=2095. Each image has its own maximum value.

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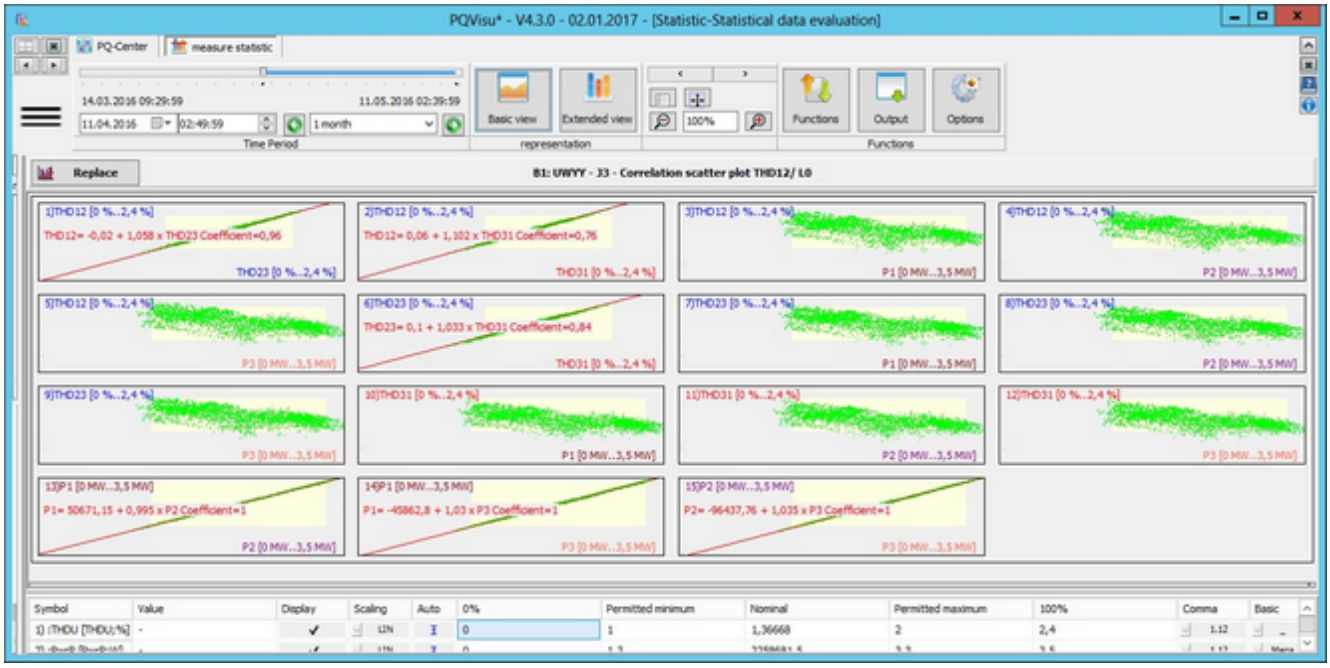
Display as correlation point cloud



- You can also switch to the 'Correlation point cloud' view if you wish.
- The explanation of the previous figure is the same for this one, except that the measurement points are displayed separately.

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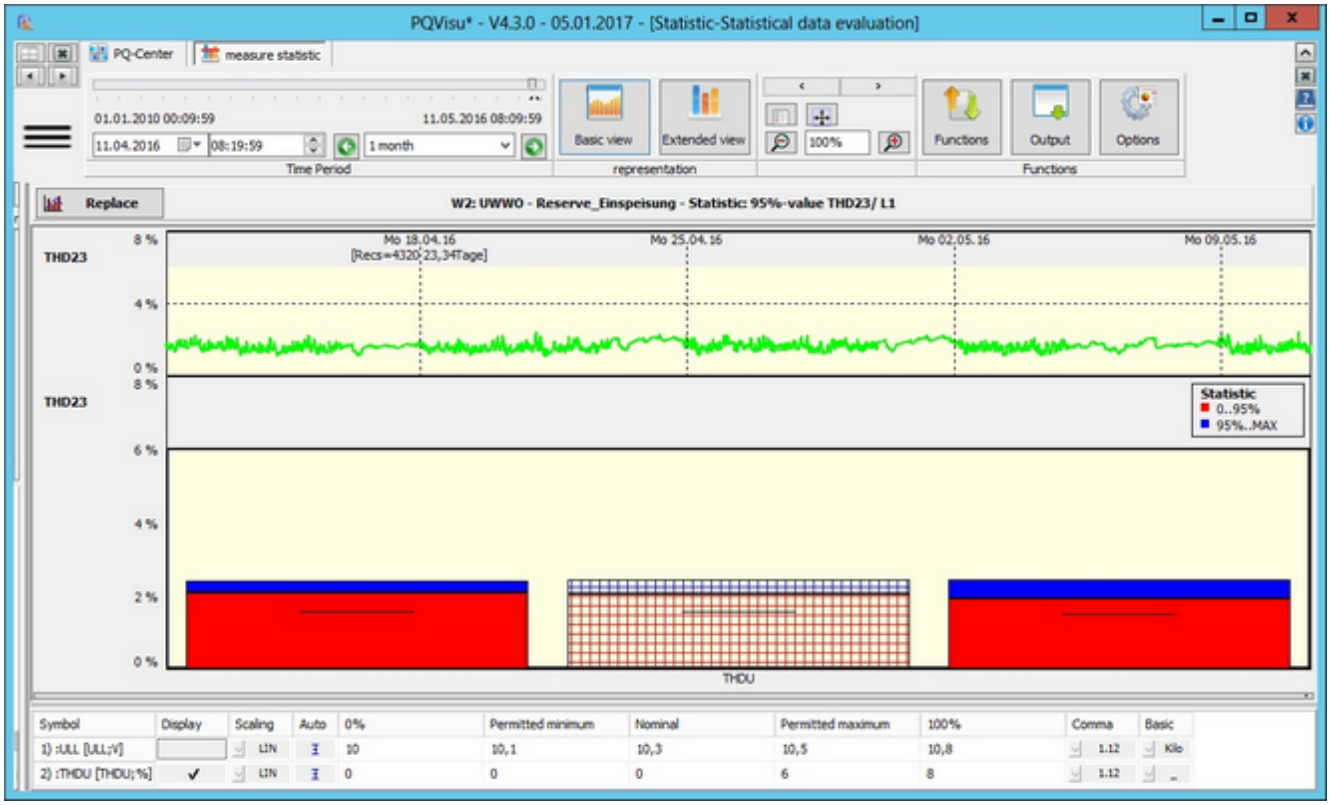
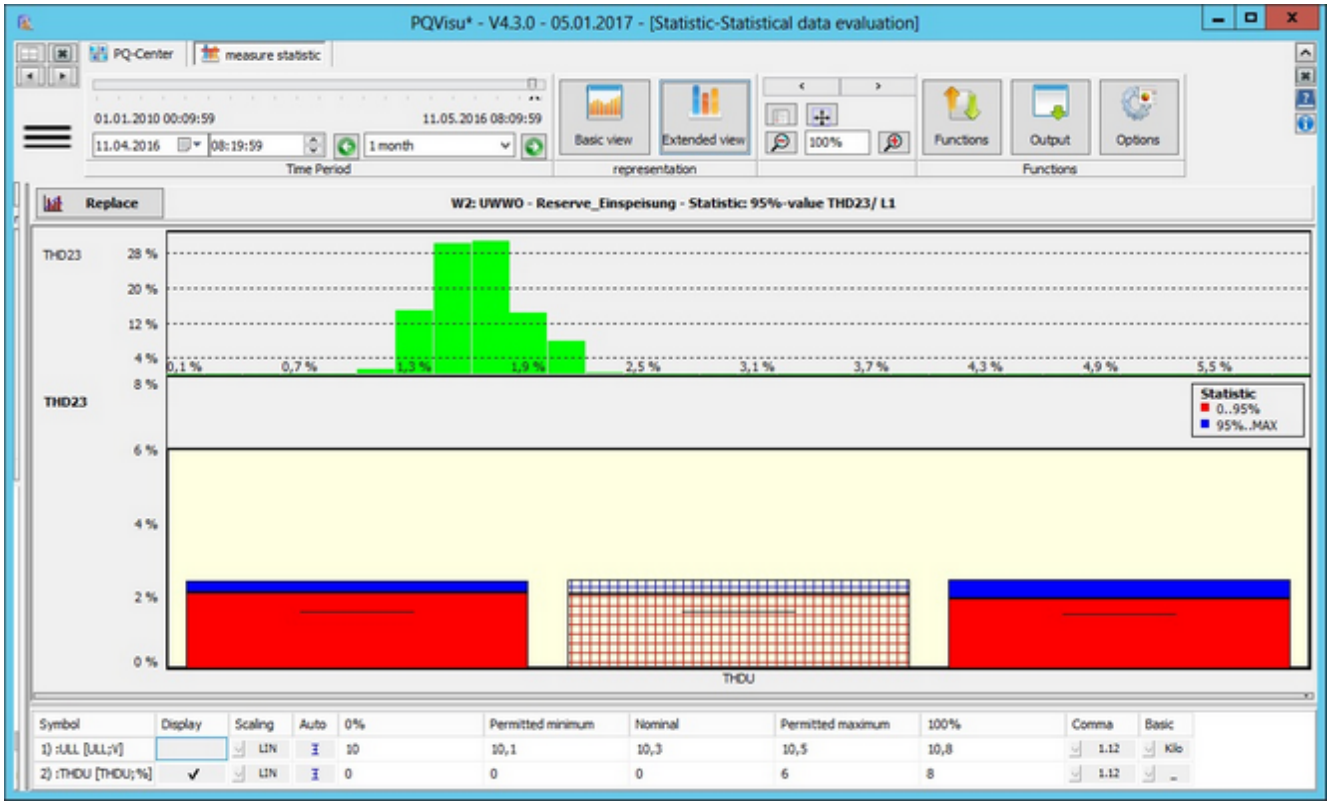
Extended view – Selected measurand as curve



- Selected measurand as curve: The figure displays the time behaviour of the quantity THD23 – recognizable by the crosshatching. Click the mouse to scroll through the quantities. Scrolling through the time behaviour changes the view in the main area.
- Histogram: Relative frequency
- Histogram: Cumulative frequency
- Histogram: Time dependent

Extended view - Histogram: Relative frequency



- The measured values of the active measurand (in the figure, phase power P2) are grouped in class ranges (e.g., 2 to 3 MW) and output as relative frequency distribution.
- The scaling/description of the Y-axis is in percent.
- The number of classes is specified under Options, and is used together with 'Allowed minimum/maximum' to calculate the class breadth.

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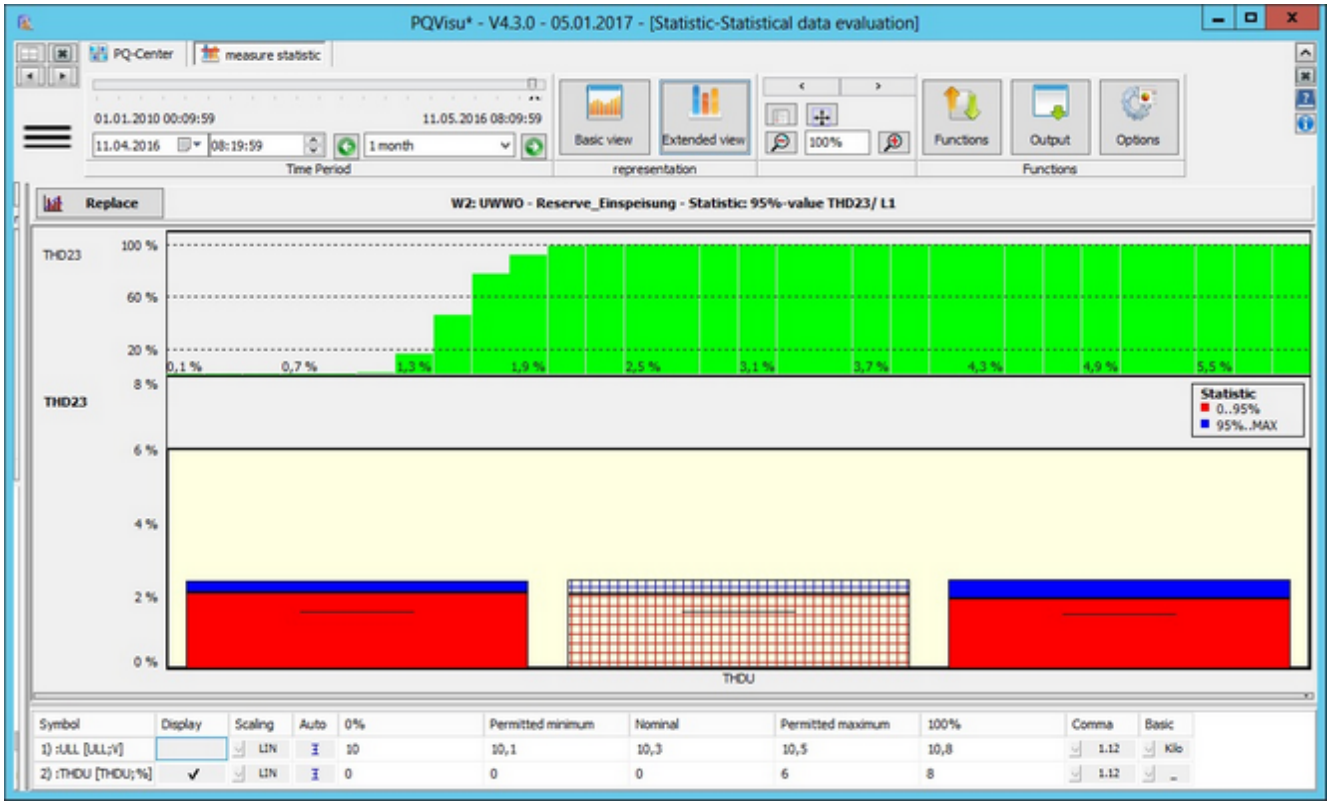
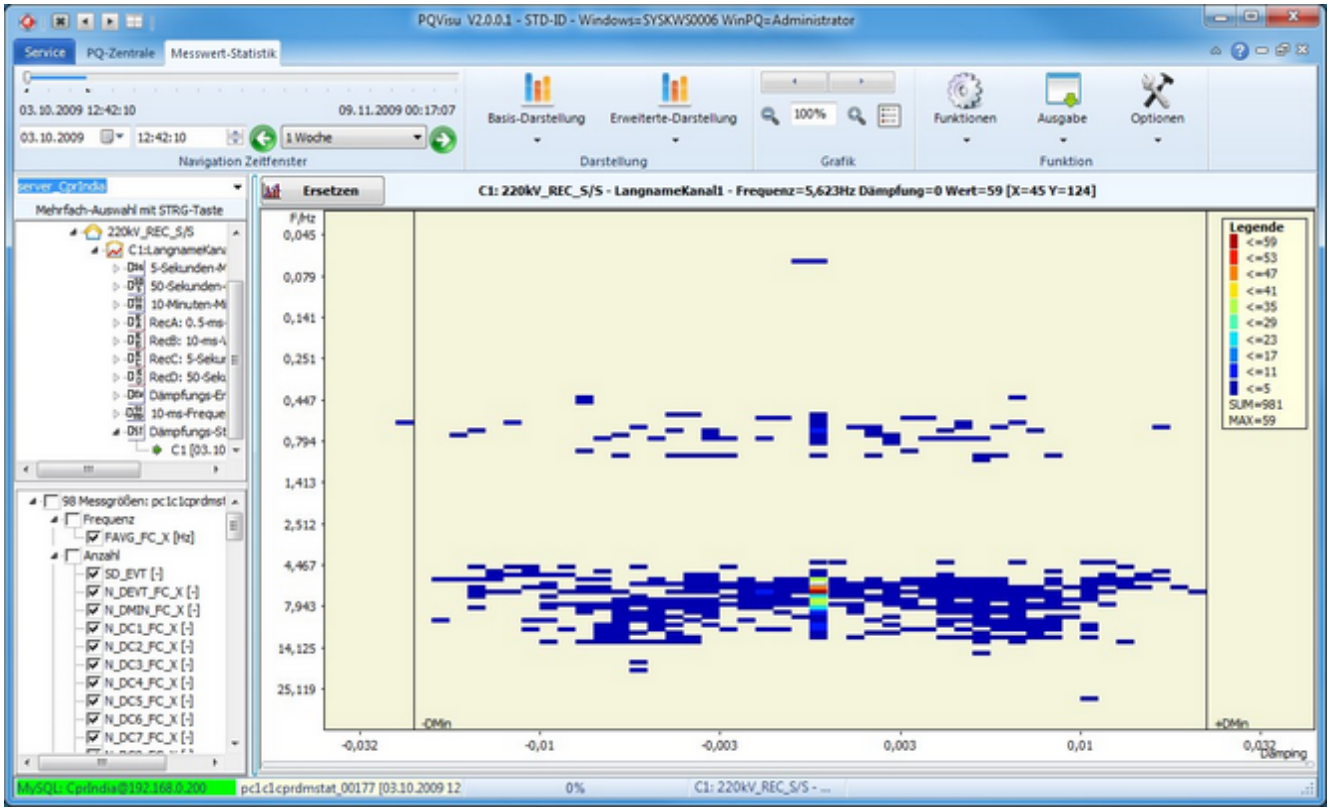
Extended view - Histogram: Cumulative frequency



- Same procedure as described in the previous example. This time the data are displayed as cumulative frequency distribution

Special views - CPR-D damping statistics



- All of the statistics are calculated on the device. A dataset represents the cumulative damping event since the start of the evaluation on the device.
- The graphic displays the class frequency as absolute value according to the colour code.
- Clicking on the graphic displays the frequency, the damping and the frequency for that point.
- You can zoom into the graphic.
- Right-clicking displays special functions such as 'Freeze scaling', 'Cumulative', and 'Histogram'.

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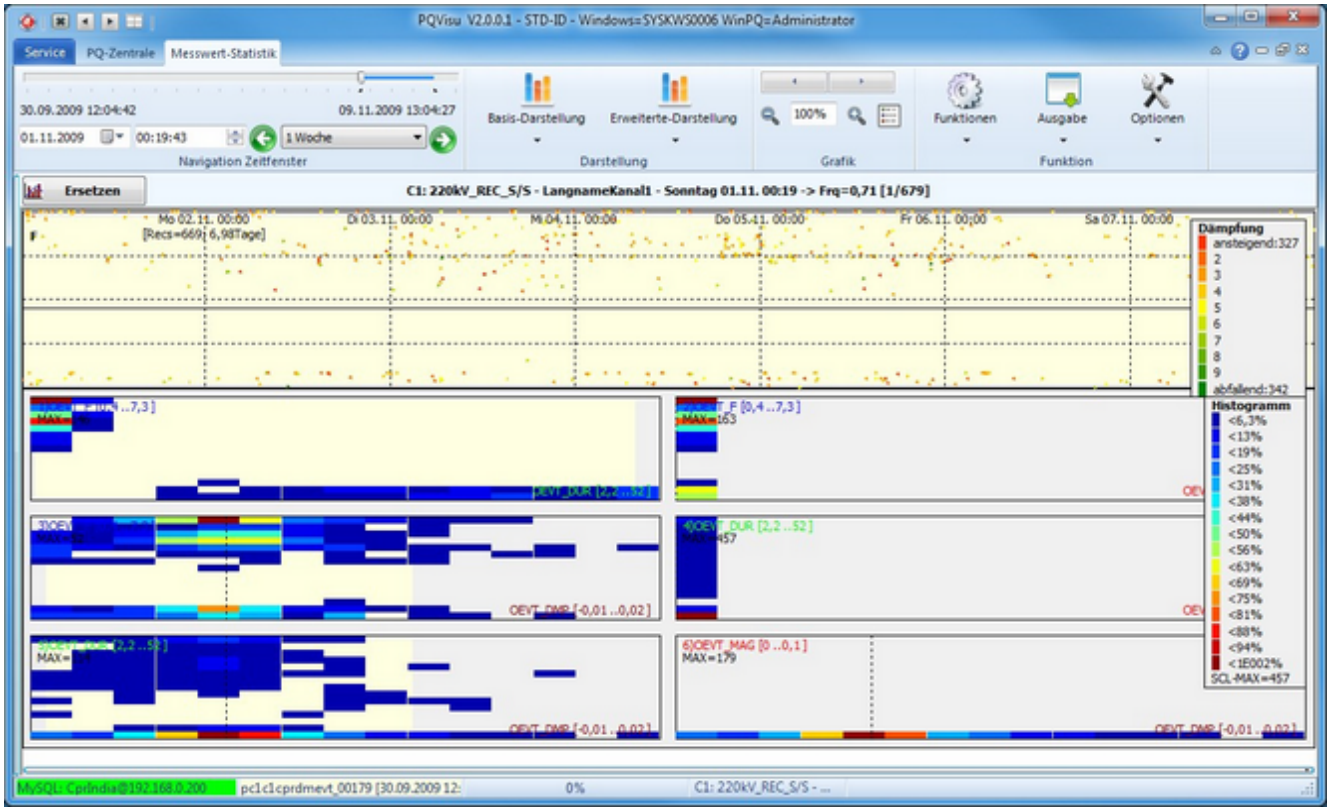
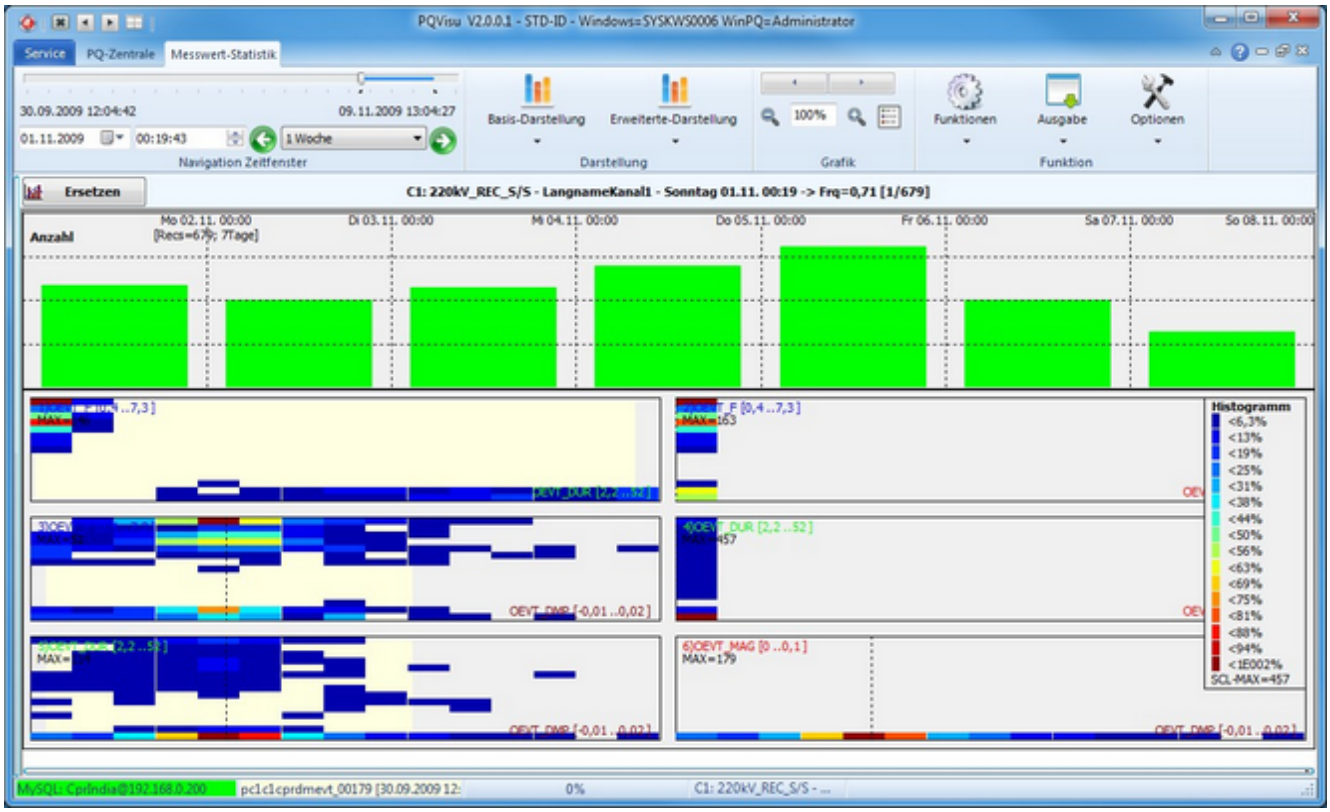
Special views - CPR-D damping events



- A damping event is defined by frequency, event duration, value and damping.
- These values are displayed graphically for a specific time window.
- The dependence of the events is displayed in the main view.
- The damping events are displayed with the correct time in the legend. The frequency of the event is displayed on the Y-axis, the damping is displayed in the form of a colour scale.

Special views – Time-frequency of damping events



- This view is generated by clicking on 'Options' and selecting 'Extended View'.
- This view displays the number of events by day as histogram.

Basic data

The basic data contain several system tables that are crucial to the functioning of WinPQ. These tables should only be changed under supervision.

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System management (PQAdmin) - Setting up the program environment

System management (PQAdmin) contains all of the functions needed to determine the behaviour and look and feel of the program.
A range of service functions (e.g. to access the database or schedule tasks) are available.

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General

This page summarizes the functions that users need to perform their job (e.g. evaluate binary inputs).

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Basic user setup

In the left pane, you can enter the company name (in the example: 'ABC GmbH') that you want to appear on the program's printouts/reports. Below that is a special selection field that automatically replaces the server's IP address when you click on the 'Create client' button or enable the appropriate option in PQStart (only with extended user policy). This setting is only needed if you have more than one network card.

Another important function, the basic folder for user data, is set in the centre pane. In earlier WinPQ versions, all of the data were stored in subfolders in the Program folder. In Windows Server 2008 and Windows 7 and later, access to and the modification of these data are very restricted by the Windows user account controls (https://en.wikipedia.org/wiki/User_Account_Control). This is why these data should be managed where every logged in user has full access permission to his or her setting files. The WinPQ software determines where configuration files from Windows system variables are stored. Two variables are proven and tested: %ProgramData% and %AppData%. %ProgramData% is recommended in cases where either the same user is WinPQ software or users are supposed to log in sequentially without special access permission levels. %AppData% is recommended in server environments (e.g. Citrix. For more information, see https://en.wikipedia.org/wiki/Citrix_Systems). These options are populated with default settings during the installation of WinPQ and can be changed here at a later stage if need be. The user-independent PQStart desktop is used to maintain the display (by default the user can generate his or her own desktop) in a central file. If the field contains a value, the user will not be able to save his or her desktops.

Below that are default folders for data export (PDF, Comtrade and PQDIF). If the user doesn't change anything, the files will be stored in the %ProgramData%\TMP folder.

The right pane contains more important program options:

General WinPQ options:

- 1.1 Extended device ID: This parameter is for information purposes only; it is set during the installation.
- 1.2 Group policies: If the group policies are enabled, the program can only be managed centrally (for information purposes only).
- 1.3 Display status: If this field is checked, a status line with important connection and other information is displayed in all WinPQ programs.
- 1.4 All Alert Beepers OFF: WinPQ does not emit an acoustic alarm.
- 1.5 Manage setup data user-selectively: Save settings (e.g. curve colors and scalings in PQVisu) globally or user sensitive.
- 1.6 Record binary inputs: This option must be checked in order to create tables for the management and recording of binary information.
- 1.7 Embed fonts in PDF files: Fonts are not embedded in PDF files by default because it is not necessary to do so. The descriptions can be displayed in exceptional cases (e.g. opening mobile devices). Embedding fonts increases the size of the PDF files.
- 1.8 3D graphic acceleration: Software rendering is used by default to configure the 3D graphics. Most graphic adapters support this feature so you should be able to use it.
- 1.9 Syslog output: Some programs (e.g. PQManager and PQSmartManager) can publish messages through the syslog protocol. Check this option if you wish to use this feature.

Device options:

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- 2.1 PQPara: ECL password function (password protection at the device level is managed by the parameterization software).

Options in PQStart:

- 3.1 Archive data view: This option displays long-term data directly in PQStart.
- 3.2 Generating virtual tables: Measurands can be combined across devices and displayed as a graphic.
- 3.3 Internet access: If the computer is connected to the internet, power quality maps can be displayed interactively using Google Maps.
- 3.4 Calculation of PQ coefficient: The PQ coefficient is only calculated if this option is enabled (in PQReport).

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Logo management

The Logos section enables you to specify which files are used in reports and printouts. The following formats are supported:

- JPG (https://en.wikipedia.org/wiki/JPEG),
- BMP (http://en.wikipedia.org/wiki/Windows Bitmap),
- PNG (http://en.wikipedia.org/wiki/Portable Network Graphics)

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WinPQ Client

There are several ways of using the WinPQ software over the network :

- Through a terminal server (Advantage: central installation only that is easy to maintain. Disadvantage: may incur additional license fees for a server operating system or Citrix). In this case, running WinPQ on a terminal server ensures that several users can work concurrently.
- Another option is to create a client from the server installation. The function to create and distribute the client is embedded in WinPQ.

The export function makes it very easy to configure new workstations. Instead of installing WinPQ on every workstation, you can use an existing version with the relevant data. The export function creates a PQClinet.exe file and several *.PQE files in the selected folder. These files can be copied to another computer (e.g. on a USB stick or over the network).

On the target computer, run 'PQClient.exe':

The program asks for the target folder (e.g. C:\Program Files\). Note that you may have to check the 'Run this program as an administrator' box. A WinPQ directory is automatically created in the selected folder and the files restored to it.
If the computer is running Windows XP (not recommended), the configuration files are automatically copied to the WinPQ folder. In all later versions of Windows, they are copied to %ProgramData%. The WinPQ .ini files are updated automatically.

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Automatic reporting

This is where you set up how PDF files are created from error logs and PQ reports and emailed. This is also where you set up the function where the report program sends an email when the status of a binary input changes.

In contrast to other WinPQ programs, PQAdmin does not immediately establish a connection to a database that remains open during the whole session. This is why:

- The user must first establish the connection to the database by clicking on 'Connect' (the default value can be selected from the menu if need be).
- The items can then be edited and saved to a database table by clicking on 'Save' so they can be used by the report program (this is why setup changes can be made from every workstation).
- Clicking on 'Save' saves the items in all of the sections (currently 1 to 9) and confirms the save by closing the section.
- Because the reports created in PQ Report should be handled by the Windows task scheduler, there is also a button that you can click to create an entry in the Windows task scheduler.

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Grouping devices

Groups can be used, for example, to send emails selectively so think about how you're going to use groups before setting them up. The left selection box contains all of the devices that exist in the database. They can be selected or deselected by checking or unchecking the checkbox. Enter a unique group name in the 'Group name' field. Click on 'Save' to add the selected devices to the group. These list entries consist of a name and a value. The program uses the name to determine whether a new list is being created or existing entries overwritten.

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Error logs

The general approach is the same as that described in the previous section.

The different types of fault recorder are selected in the left pane:

- Oscilloscope recorder
- 10-ms TRMS recorder
- 10-min harmonics recorder
- Ripple control signal recorder

The following parameters are set in the Output options pane:

Output Options:

- PDF: generate - indicates whether a PDF file is created and stored in the PDF output folder (user-definable on the User setup page).
- PDF: display - opens the document in the PDF viewer after it has been created (usually with Adobe Reader, the user context must be taken into account).
- PDF: print - sends the PDF file to the printer that is selected in the next pane.

Send E-Mail:

- Send email with PDF - sends an email with a PDF attachment to the selected recipient/group.
- Send Comtrade by email - converts the error log data to the Comtrade format before attaching the files to an email.
- Send PQDIF - converts the error log data to the PQDIF format before attaching the files to an email.
- Send information email - sending an email with the telephone number in the subject line triggers the mail server to send a text message.

View Options:

- Binary input view - displays the binary inputs as a graphic.
- Binary input - only changes - due to space restrictions, it is useful to only display inputs that have changed in the active time window

Data export:

- Comtrade - the data are converted to the Comtrade format and the file stored in the Comtrade folder.
- PQDIF - the data are converted to the PQDIF format and the file stored in the PQDIF folder.
- WinPQ App - the goal is to send error log data in order to display them on a mobile device with an Android

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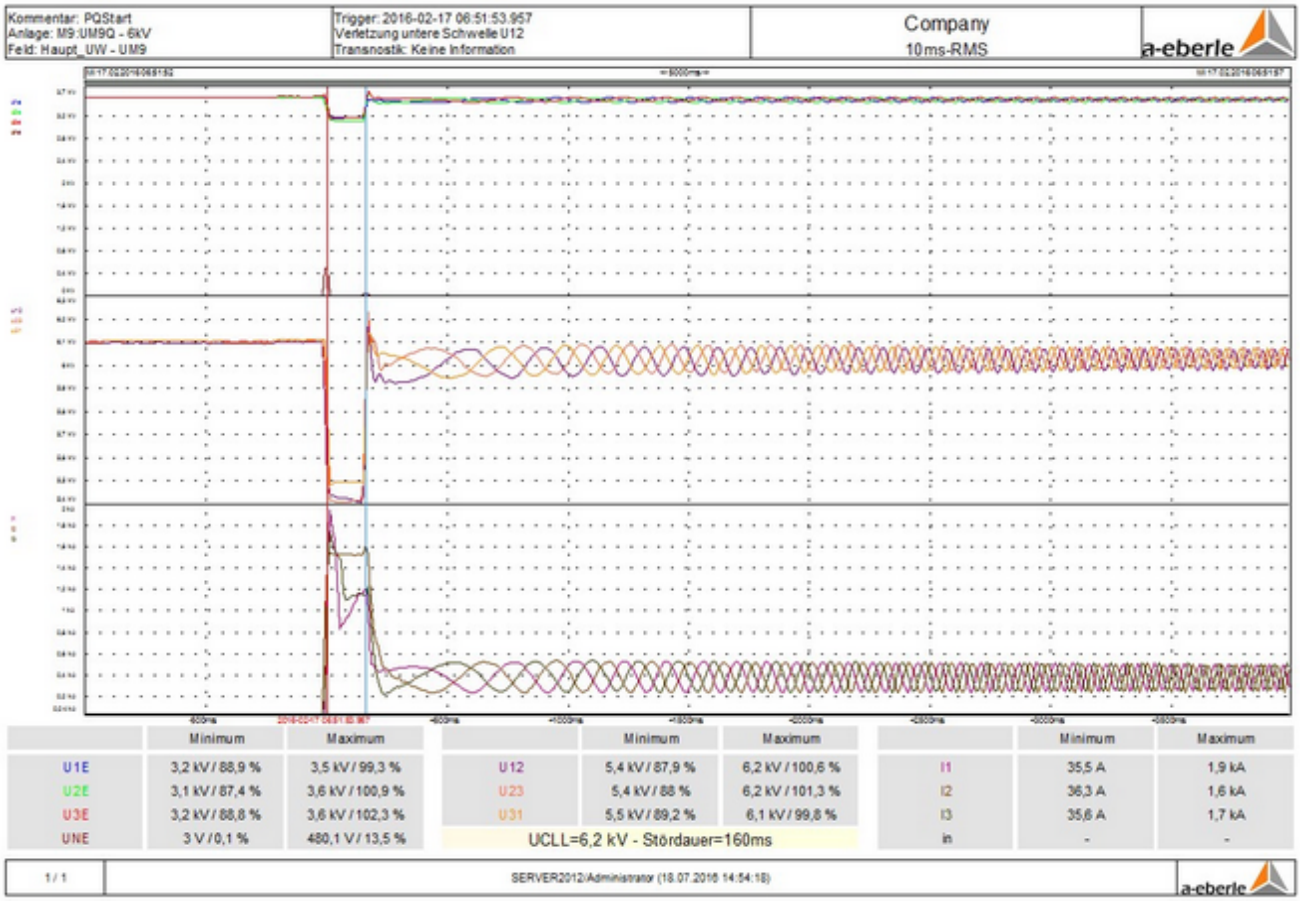
operating system.

Options:

- PDF: In subfolder: the files are stored in subfolders with the device ID.

The next figure shows the standard layout of the error log PDF files. The legend only shows voltages and currents. In addition to the extreme values (also in percent to the 'Agreed voltage'), the program also calculates the fault duration.



Power quality events

The idea is to gather events from the different measurement points and create an overview:

Kommentar: AutoReport
Start: Dienstag 29.09.2015 02:33:42
Dauer: 3,01Min

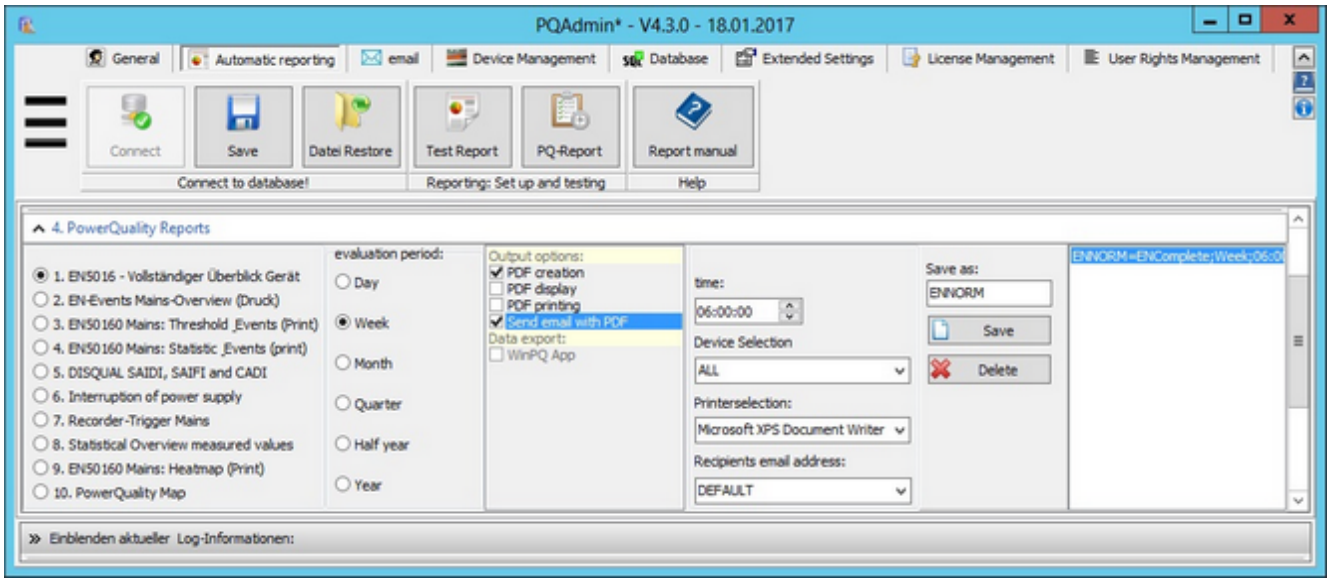
DREWAG
Bericht: Netz-Ereignisse

DREWAGNETZ

ID	Anlage	Gerät	Startzeit	UC	Dauer	Wert [V]	Wert [%]	Trigger-Ereignis
K5_2:9103HS	Plant	UW_Kaditz - 110kV	29.09.2015 02:33:42	110 kV	70ms	72,5 kV	65,9 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 2
K3:9103J29	Plant	UW_Kaditz - 20kV	29.09.2015 02:33:42	20,7 kV	60ms	14,9 kV	71,9 %	Dip U12
K4:9103J32	Plant	UW_Kaditz - 20kV	29.09.2015 02:33:42	20,7 kV	60ms	14,9 kV	72 %	Dip U12
E9_2:9100HS	Plant	UW_Neustadt - 110kV	29.09.2015 02:36:41	110 kV	60ms	73,8 kV	67,1 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 2
E9_1:9100HS	Plant	UW_Neustadt - 110kV	29.09.2015 02:36:41	110 kV	60ms	73,8 kV	67,1 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
W4_1:9110HS1	Plant	UW_Wilschdorf - 110kV	29.09.2015 02:36:42	112 kV	60ms	74,1 kV	66,2 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
A4:9104K12	Plant	UW_Johannstadt - 10kV	29.09.2015 02:36:42	10,4 kV	80ms	6,8 kV	65,7 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
W2_2:9110MS2	Plant	UW_Wilschdorf - 20kV	29.09.2015 02:36:42	20,7 kV	81ms	13,6 kV	65,5 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 2
B3:9109J31	Plant	UW_Nord - 20kV	29.09.2015 02:36:42	20,7 kV	60ms	13,4 kV	64,7 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
D4:9102E01	Plant	UW_Tolkewitz - 110kV	29.09.2015 02:36:42	112 kV	70ms	74,4 kV	66,5 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
A2:9104J13	Plant	UW_Johannstadt - 20kV	29.09.2015 02:36:42	20,7 kV	80ms	13,5 kV	65,4 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
D6:9102J33	Plant	UW_Tolkewitz - 20kV	29.09.2015 02:36:42	20,7 kV	71ms	13,8 kV	66,7 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
C6:9105J40	Plant	UW_Mitte - 20kV	29.09.2015 02:36:42	20,7 kV	70ms	13,7 kV	66,2 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
W1_1:9110MS1	Plant	UW_Wilschdorf - 20kV	29.09.2015 02:36:42	20,7 kV	79ms	13 kV	62,9 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
O6_1:9108HS	Plant	UW_Klotzsche - 110kV	29.09.2015 02:36:42	110 kV	60ms	74 kV	67,3 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
O1:9108J07	Plant	UW_Klotzsche - 20kV	29.09.2015 02:36:42	20,7 kV	79ms	14,4 kV	69,4 %	Dip U12
S1:9405J50	Plant	UW_Sued - 20kV	29.09.2015 02:36:42	20,7 kV	79ms	14,1 kV	68 %	Dip U12
D2:9102J23	Plant	UW_Tolkewitz - 20kV	29.09.2015 02:36:42	20,7 kV	81ms	13,3 kV	64 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1
A3:9104K09	Plant	UW_Johannstadt - 10kV	29.09.2015 02:36:42	10,4 kV	80ms	6,8 kV	65,7 %	Spannungseinbruch U12, Start-Ereignis, Ltg. 1

1 / 4 Benutzer (29.09.2015 02:53:53) a-eberle

Power quality reports



The procedure is pretty much the same as the one described in the previous sections.

The following reports can be generated

- EN 50160 - Full device overview
- EN - Grid event overview (print)
- EN 50160 grid: Thresholds and events
- EN 50160 grid: Statistics and events
- DISQUAL: SAIDI, SAIFI and CAIDI
- Power supply interruption
- Grid error log triggers
- Statistical overview of measured values
- EN 50160 grid: Heatmap (print)
- PQ map

The periods supported by the system are listed in the 'Evaluation interval' pane. The following always applies: A weekly report is generated on the first day of the week for the previous week, a monthly report is generated on the first day of the month for the previous month, etc. The 'Time' field defines the time at which the first report is generated. The first and last 10 minutes of the day are blocked to ensure that residual data can be read from the devices and included in the reports after the day has changed.

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Binary inputs

Here, you can define whether a user should be notified of status changes on the binary input. The trigger mask is defined on the left, followed by the device (groups are not possible – each device must be added separately) for which the conditions are to be evaluated. You must also enter the recipient's email address.

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System monitoring

The 10-minute data in the SQL database (for each device) are used to determine whether current data are still being transmitted to the database. If this is no longer the case (e.g. a measuring device or transmission path has failed) a notification email is sent with a user-definable time delay (to steady things).

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Exporting long-term data (NeQual, PQdiff)

This function collects data (continuous recording of the 10-minute measured values) over a time period and processes them so they can be used in other programs.

PQDIF export uses all of the standard quality measurands, such as:

- 10-s frequency
- 10-min voltage, unbalance, THD and harmonics
- 2-h flicker

The XML formats for NEQUAL files are predefined. Please see the specifications for VSE software.

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Email layout

This is where you determine the look and feel of emails. You can use a combination of text and variables. Variables are entered between % signs (e.g., %devicename%) and are replaced with the appropriate information in real time. The name of the output file is entered in the 'Format file name' field. This is especially important if the files are automatically forwarded (distribution through special communication channels). You can enter any text you want in the 'Email text' field.

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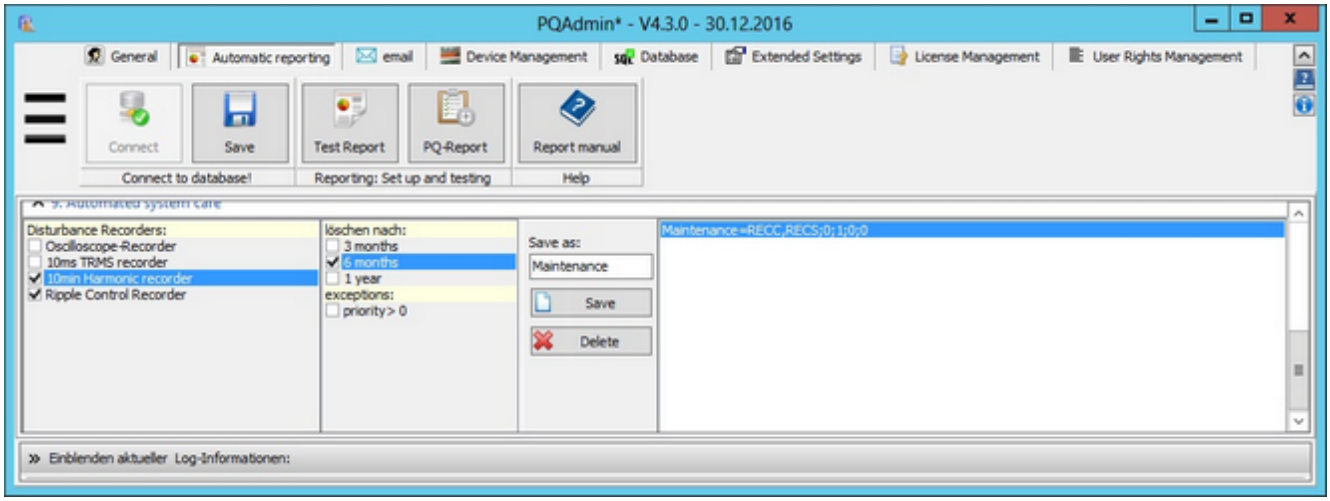
Automatic system maintenance



The purpose of this function is to automatically remove temporary data. For example, ripple control signals that are only needed for a few days. Another example are the recordings of 10-min harmonics when a threshold is exceeded. Because certain consumers create similar recordings from time to time, they don't have to be kept indefinitely.

Email - configure outgoing email

- The SMTP protocol (Simple Mail Transfer Protocol) is used for outgoing email. For more information see: http://de.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol
- The following encryptions are supported:
  - SSL: Here, 'SMTPPORT' is usually set to 465
  - STARTSSL: Here, 'SMTPPORT' is usually set to 465
- The basic data are entered in the top pane (user name and password are not always required on corporate networks).
- If the emails are to be sent to more than one recipient, enter as many email addresses as you want. The table scrolls automatically when you reach the last row and press the down-cursor. A context menu (displayed by right-clicking) is also available to add or delete entries to/from the table.
- In the Email group pane, you can add email recipients to groups.
- Programs that use this function will use the nicknames (e.g., 'JG', 'NG' or 'Service') to access the email addresses.
- Programs that send email, will check the group first and then the recipient. If a group is not found, the email is sent to the address that was entered in the 'TO' field in the basic data pane.

Additional information on problems with outgoing email:

- The original system messages are output in the LOG area of PQAdmin.
- If an email cannot be sent, check the settings of active anti-virus programmes and firewalls.
- Check whether the mail server is ready by running the 'Telnet' command at the DOS command prompt: TELNET <IP> or <Name> 25

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Managing devices

This is where the accesses to the 'PQI-DASmart' and 'PQI-D/DA' devices is configured. The devices can be accessed through RS-2332 (including modem) or TCP/IP (COM server in the module rack or device). For the 'PQI-DASmart', TCP/IP communication is a fixed part of the device.

From operating system 'Server 2008' or 'Windows 7', the 'Schedule task' button adds an entry to the Windows task scheduler with standard parameters for the daily start-up of PQManager or PQSmartManager.

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PQI-DA Smart device management

- The database id can have up to 10 characters and describes the identification under which the device will be handled in the database. This will keep the id linked to the IP so even when the device has to be exchanged the data will be handled with the same identifier.
- Every PQI-DA Smart device has its own IP interface, which is why a connection has to be created for each device. The port on the devices is set to Port 5040 by default - the current device value must be used here.
- Under Communication you can switch between the connection types: TCP/IP Unencrypted / SSH with IPv4 / SSH with IPv6.
  For the SSH connections, the M2M keys of the corresponding devices must be available.
- Data classes whose data are to be written to the database must be selected here. Every device has its own data class setup.
- Changes are saved by clicking on the central Save buttons. A feasibility test is performed before the setup is saved.
- In the 'Active' column, connections can be temporarily deactivated (e.g. removal for repair) without having to delete the connection data.
- The online data class is not a data class in the sense of PQI-DA Smart. Current measurement data are transferred to the database in real time meaning that they can be used in the PQStart tiles as online data.
- Logging can select devices, which should be extensivly logged in the log file. It is possible to log 4 devices at once. If there are selected more than 4 devices then the first 4 will be logged.

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PQI-D(A) device management

You can communicate **with the PQI-DA** in two ways: through an **RS-232**connection (if need be also through a modem) and through a **TCP/IP**connection (requires a TCP/IP to RS-232 converter on the device).

Description of the TCP/IP parameters:

- The PC software accesses the TCP/IP to RS-232 converter as TCP/IP client. It is assigned to (plug-in card in the 19" module rack) or is on the fault recorder (built in the PQI-DA). Use a suitable configuration program (e.g. WUTILITY or REGP-Loader) to assign the hardware a fixed IP address. The IP address is entered in the **'IP address'** column in the table.
- The number for the converter is defined by the hardware or by the user (default: **'8000 for WUT'** or **'1023 for PQI-DA'**).
- The communication port is the port for a TCP/IP server socket for a software**'PQRS232Server'**. Server ports must always be unique to a machine. They are not allowed to be generated twice by the same application or used by a running application/service.
- The time synchronization line determines whether the device time is continuously synchronized with the PC time. The time commands are transmitted approx every 30 min with a lead time of 30 ms to the full second:
  - **OFF**: The time is not adjusted (the device usually has a radio clock).
  - **PC → E-LAN**: The time is adjusted with the command 'ALL,TIME=..' (all devices are affected by the command. The runtimes in the E-LAN produce the first differences between the devices).
  - **PC → Local**: Only the time on the device connected to the PC is corrected 'AA:TIME=..'. Other devices can be synchronized through the incorporated time-bus (high accuracy).
  - **Local → PC** : A device's time is transferred to the PC server. This function should be used when a device is synchronized by a radio clock and the other devices in their own E-LAN segments do not have their own radio clock.
  - **PC → PQID**: The command is changed in such a way that only PQ devices are recorded by the time adjustment command.
- The WUT-COM server can be reset remotely. If the PC software repeatedly fails to receive data from the device, a RESET is triggered on port 8888. This option is enabled by entering the port number (not available for PQI-DA).
- The RESET command can also be used to regularly reset the Watchdog timer on the PQI-D.
- The comment field (here 'Connection name') is used to enter short information, e.g. the location of the device.
- Logging can select devices, which should be extensivly logged in the log file. It is possible to log 4 devices at once. If there are selected more than 4 devices then the first 4 will be logged.

Description of the RS-232 parameters:

- The first parameter is the interface number for the serial COM port (values from 1 to 255 are supported - only the available ports are listed).
- The next three parameters specify the transfer baud rate, parity and protocol (the default settings are:**'115200; None;OFF'** and should only be changed if and when absolutely necessary).
- If a modem is required, check Modem.
- The communication port is the server port used to exchange data with the client program (see previous section - TCP/IP communication).
- The Reset/Start parameters are used with a modem. After the device has successfully established a connection to the server, the device is notified with the command **'MSTOP'** that a call-back is not required today.

- See the previous section for an description of the subsequent parameters.

The following tables are used to change the most important INI entries in **'PQSmart Manager'**, **'PQManager'** and **'PQRS232Server'**:

- The first table is for the [**PROGRAM**] section in the PQRS2323Server.INI file.
- The second table is for the security of the TCP/IP access to the device data through the PQRS232Server. The program only grants access to the clients in this list. If the table does not contain any IP addresses, all of the incoming connections are accepted.
- The parameters for the [**PROGRAM**] section in **PQSmartManager**/**PQManager** are changed in the next two tables.
- By default, the following data classes are stored in the database: 10-minutes, 2-hours, daily statistics, recorder A,B, C,S and PQ events. If, for example, the 3-second values are also to be transferred, you can specify that here.
- You can specify which data classes are read out at the device level by editing the INI file manually. Feel free to contact the **a.eberle service team** if you need help.

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Database

The SQL basic functions start screen displays the following three functions:

- Basic database settings
- Database management (backup and restore)
- Database maintenance

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Basic database settings

Changes in this part are not normaly needed.

- The MySQL database is installed by default during the initial installation. In special cases you can install it later.
- Setting up the database environment: WinPQ users und permissions must be entered in the MySQL permissions database. This enables users to connect to the database. Read/write permissions can be assigned per user. The maintenance of certain basic settings (they're almost always sufficient) can be performed by the PQAdmin program.
- Reset and check the default connections resets the connections to the default settings and checks them. Note: This deletes all user-defined SQL connections.
- Change security settings in the MySQL permissions database: Enables passwords and network access to the individual MySQL accounts to be managed. These parameters are entered in the MySQL permissions database. You can use the tools provided by the database manufacturer (e.g. 'MySQL Workbench'). Default settings are almost always sufficient. For simple changes, the 'MySQL command prompt' is also sufficient.
- Creating, changing, testing, and deleting SQL connections: An SQL connection contains all of the key parameters that are need to establish a connection to the database server service and authenticate users. Use this menu item to maintain, create and test connections.
- A special feature of the 'SQL Server' from Microsoft is that authentication with the Windows account is possible. The permitted accounts must be set up by the database administrator with a suitable tool, e.g. 'MS SQL Server Management Studio'. On the WinPQ client side, simply leave the 'UserName' field blank.

The functions to manage SQL database access are summarized under point 1.4:

- SQL connections can be created using the functions'Save, Test, and Delete SQL connections'.
- The database servers **MySQL** (default or **MariaDB** as free equivalent) and **ORACLE** and **MS SQL** are supported by WinPQ.
- Three example connections for the supported databases are generated during the installation. The connection parameters should be accepted as they are specifiedin the **'SQL server', 'Oracle_Direct'** and **'ORACLE_Client'** templates.
- The password parameter must be entered **outside** of the table because the entry must be hidden.
- To create a new connection, select a functioning connection, change the necessary parameters and click on Save to save the new connection under **'ConnName'** (existing entries are potentially overwritten).
- Click on **'Test'** to make sure a connection to the database can be established. This is also a good time to check remote access to the network.
- If you are using an ORACLE database with an ORACLE client, user the **'ORACLE_Client'** template. In principle, **'Direct mode'** is sufficient, in which case you would start with the **'Oracle_Direct'** template.

Note: 'Delete connection' only deletes the reference to a database. Delete database permanently deletes the data in the designated database!

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Database management

- Manual database backups (designed primarily for MySQL, can be used with ORACLE and MS SQL with restrictions, these database backups are generally performed by the IT department): These backups are performed by running the MySQL command 'Backup table ..' on all of the database's tables. (This command is no longer available from MySQL 5.5. A possible alternative is described below.) You cannot run 'Backup table ..' to perform a backup directly on a network path. The path may not contain special characters, such as umlauts. Existing data with the same name (e.g. from pervious backups) are overwritten without warning.
- SQL database restore (same restrictions as described under Point 1): A restore is performed by running 'Restore table ..' from a local database directory. Existing tables are overwritten without warning.
- Database cleansing: Some data are deleted from the tables with a DateTime statement. This function can be run on all supported database servers (MySQL, ORACLE and MS SQL). You can run this function on specific data classes (e.g. 10-minute values remain intact). Error logs and PQ events that are classed with a higher priority (in the PQVisu table with log references or PQ events) can stay in the database if the 'Keep error logs with higher priority' option is enabled. Important: Make a full backup of your data before using this option.
- DateTime backup: (MySQL only): Only the data for a selected time frame are transferred (this function is useful, e.g. if you only want to give part of the data to a third party for evaluation). You can create an archive database by restoring these data to a new database (e.g. Archiv_2010, on the same SQL server or another machine).
- Automatic backup: Used to set up an automatic backup environment with PQDBBackup.

After selecting one menu entry a dialog will appear to select source and target options. There is a button on the right for selecting folders. Click on this button to create a new folder before running a backup.

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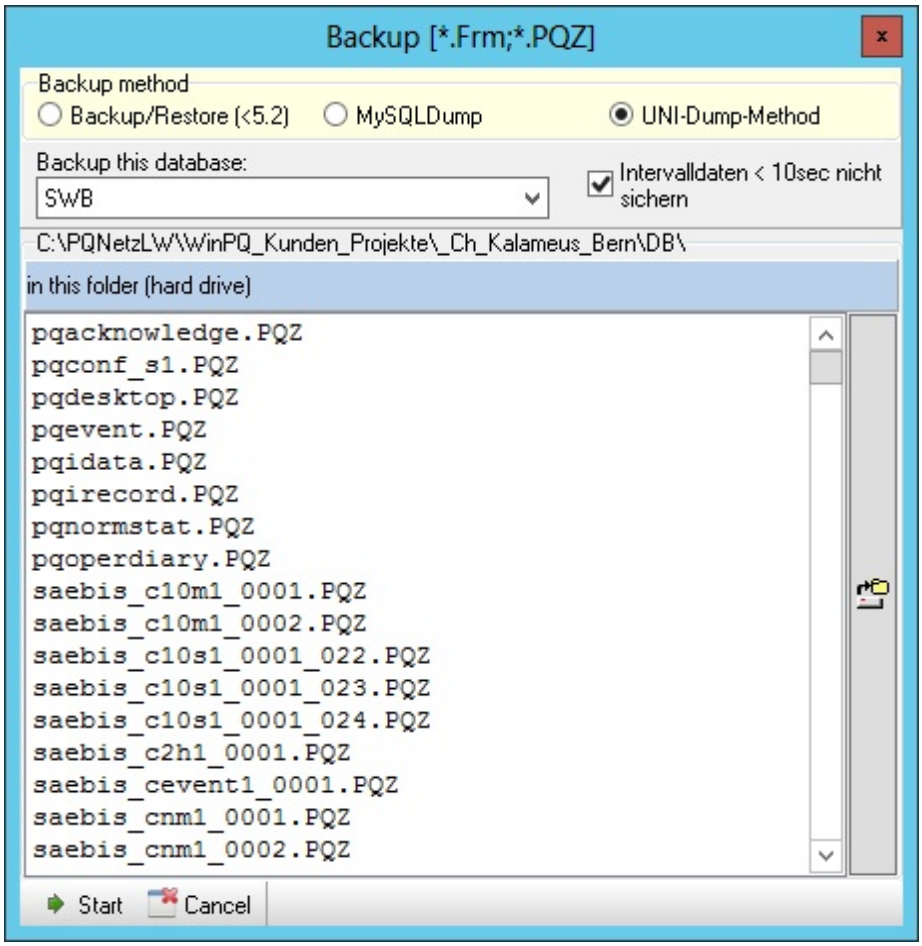
SQL backup from MySQL version 5.5:

The command combination 'Backup table..' and 'Restore table ..' is no longer available in MySQL from version 5.5. MySQL recommends using 'MySQLDump.exe' to back up data. This program is part of the standard WinPQ-MySQL installation. You can also use the UNIDump procedure to back up data. You can run this procedure on any database server, but it is also the most time intensive.

One of the advantages is that the backups can now be done over the network. A disadvantage is that the backup is in text format, which takes up more disk space and slows down the progress. When WinPQ recognizes a MySQL database from version 5.5, these are the only two options available. For earlier MySQL versions, users can choose the Backup/Restore option. The backup tool is fully integrated with the WinPQ function, meaning that the function has not changed in terms of behaviour. The backup and restore files are stored in a ZIP file with the extension PQZ. Because the files are automatically zipped there is not much difference in size compared with the previous format. Exactly one PQZ file is created for every SQL table.

The PQZ file contains the following files:

- MySQLDump process: Name.SQL (SQL commands with 'Create table..' and 'Insert into..'),
- UNIDump backup: Name.TBL (table structures in text format to reconstruct the 'Create table...' commands) and Name.UNI (data in text format).



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Setting up automatic backups with PQDBBackup

- This tool replaces the previous service program 'PQBackup'.
- About the Backup process option field: The description in the previous section also applies to MySQLDump and UNIDump.
- You can use the SUBFOLDER command to force the creation of subfolders: DAY, WEEK, MONTH, YEAR. This enables you to access older data during a restore if necessary.
- The SQLDEFAULT parameter enables you to select the connection for which the data are to be backed up.
- The BACKUPDELAY command enables you to define pauses in milliseconds (default 500 ms) between the actions to reduce the system load.
- The Parameter SHORTTERM excludes short interval data classes from the backup.
- TRAYICON=1 displays the program in the Windows file (beside the clock) as an icon and closes it automatically after the last data have been transferred. This setting is required if you want the Windows task scheduler to automatically start the program.

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Database Migration

This function can migrate existing data from one database server to another. This even works with different database servers. E.g. it is possible to migrate data from a MySQL Server to a Microsoft SQL Server or an Oracle Server and vice versa.

To migrate the data there are two steps involved:
1. The data from the source database needs to be exported in to a database independent file format. This step requires an additional license.
2. Importing the exported data into the target database. The format is automatically recognized by the normal restore procedures of WinPQ.

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Database maintenance

- Additional SQL functions: During a WinPQ update, the software verifies the structure of the database tables and modifies them if necessary. It can happen that data suddenly reappear (e.g. after restoring old backups) that do not match the current standard. Even when recognizable SQL query errors occur (e.g. in PQStart), we recommend using this function to verify/modify the database tables.
- When data class combinations are changed on the device, tables can be created that contain no or very few datasets. These datasets can be deleted from the database by running function 3.2 in the above list. Datasets with dates in the future or too far in the past are also deleted.
- 'Repair/optimize table' enables logically deleted datasets (this can save a lot of disk space or accelerate access to the database) to be physically deleted from a table.
- The other functions should only be run if and when necessary.

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MySQL-Update

If you have a BDEW maintenance contract or you have ordered a MySQL update, MySQL-Update is supported by the functions available here.

The first step of update function is to select the update file. This file will be provided by a-eberle. After the file has been selected, the rest of the update process runs automatically. At the end of the update, all SQL tables will be adapted to the new version of the database, which can take some time, especially from version 5.6 to version 5.7.

Please note:

- The update process must be started on the machine running the MySQL server.
- For large version steps (for example, from version 5.1.56 to version 5.7.10), the update must be made step by step over the Minor versions of MySQL: 5.1.x -> 5.5.x -> 5.6.x -> 5.7.x
- From MySQL version 5.7 the operating systems Windows Vista and Server 2008 are no longer supported.

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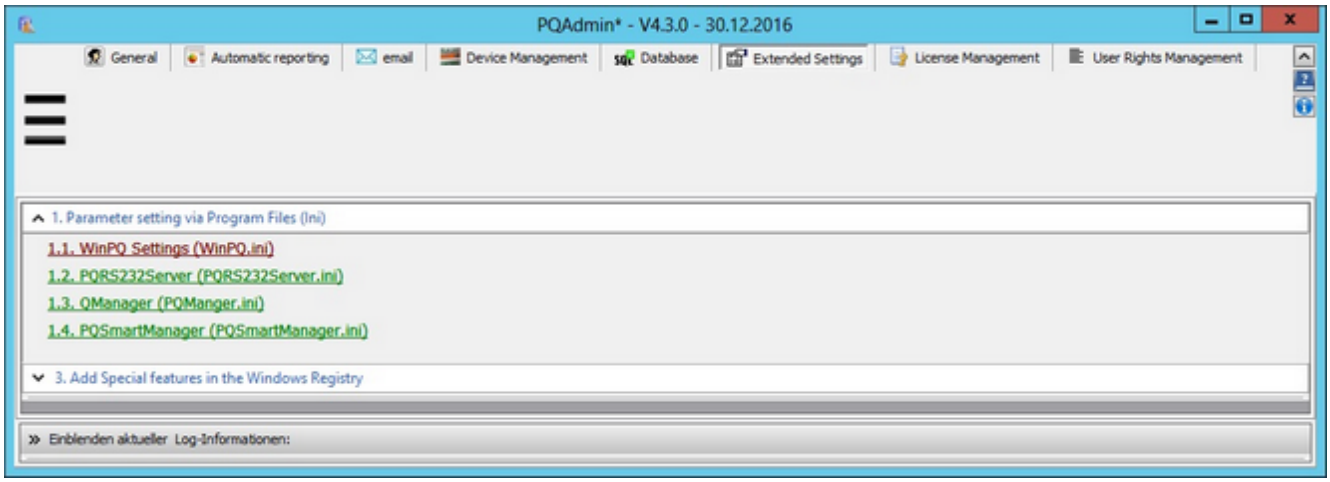
Advanced settings

Please be aware that most of this data is stored in the database so the settings on this page may only work under certain circumstances.



- It is generally recommended to edit INI files here because it ensures that the files are loaded from the right folders. This is especially useful if the files are not stored in the '..\WinPQ' directory.
- Right-clicking on an entry opens the INI file in the standard Windows editor used to process ASCII files. A key benefit is that this program is assigned the admin rights of the calling program, enabling files in the Program Files folder to be changed as well.

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Entering and changing licence codes:

Here you can enter and change the main licence or additional licences, for example, after upgrading to a higher licence that supports more devices. Clicking on 'Display/change licence code' displays the current licence code. If the verification of the new licence code fails, you can re-enter it up to three times.

You can view all of the licences you have under 'Display all available licences'.

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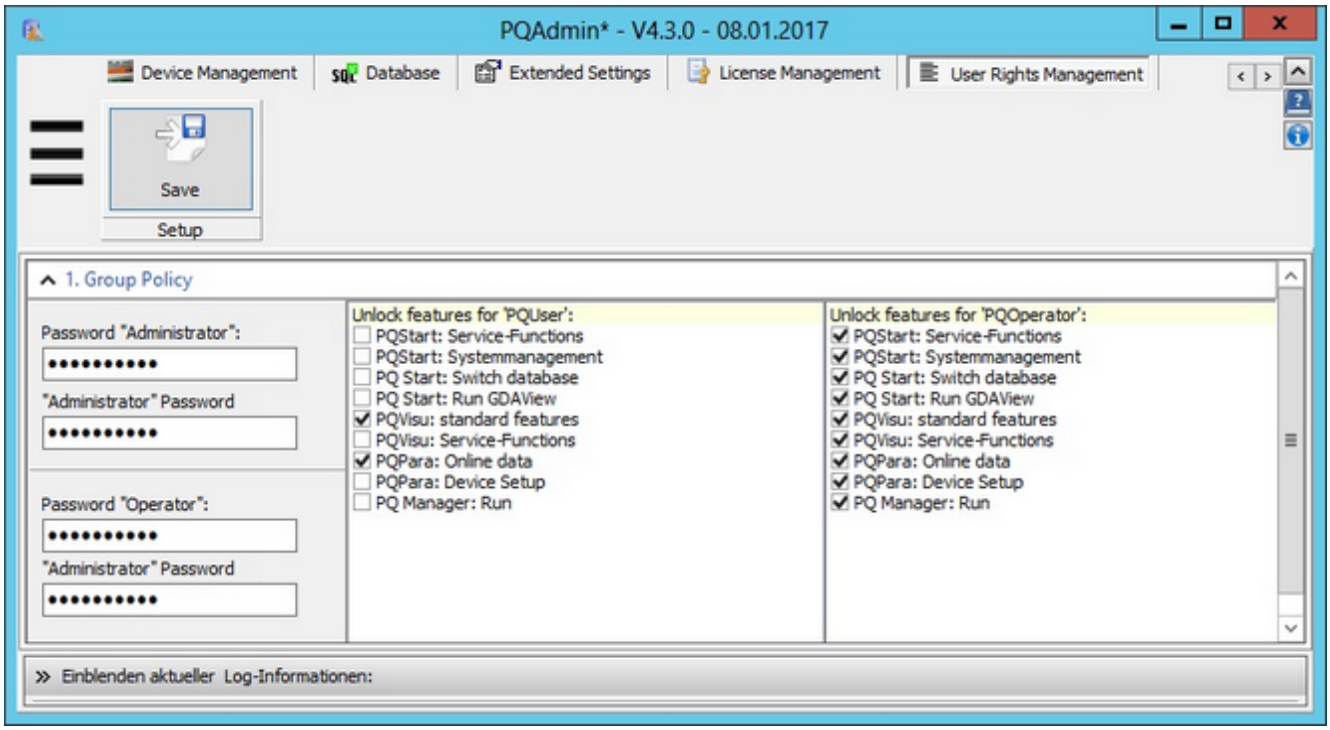
Simple user management

WinPQ supports three levels of access:

- the administrator – whose permissions cannot be restricted
- the operator – whose activity radius is defined in the 'PQOperator' selection field
- the user – who has a very limited activity radius, which is defined in the 'PQUser' selection field



The following assumptions apply:

- The account is activated by entering a password. If passwords are not used, a user is automatically an administrator.
- The user logs in once, the components he or she is allowed to use are started from a central location and his or her permissions are automatically inherited by the other programs. If no password or the wrong password is entered in the password field (PQStart or PQVisu), the user is automatically sent to the user level.

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Advanced user management

The advanced user management displays when the appropriate option is checked during installation. If the type of user management is selected, user and PQStart desktop data are managed centrally in the database. Users don't have to add a password to authenticate themselves but are assigned the relevant permissions through their Windows user name.

- **Connect**: Before the settings can be changed, you must'Connect'to the desired database.
- **Save**: After you have set all of the parameters, click on 'Save' to save the settings in the database.
- **Select Windows user**: Here you can select users from the Windows Active Directory.
- **Manual**: Click on 'Manual' to add users manually.

After the connection to the database has been established, the following reports can be edited:

Device groups:

Devices can be organized in groups so users can be given access to only certain devices. This setting is shared with the groups in the report section.

WinPQ user:

This is where users and their permissions are managed.

- **Windows user name**: Specifies the name of the user. The user name must be the same as the name of the user's Windows account. New users are added by clicking on 'Select Windows user' and 'Manual'.
- **Group policy**: The user is assigned a corresponding role such as PQAdmin, PQOperator or PQUser. The permissions associated with the individual roles are specified in the next step.
- **Desktop**: This is where you specify the desktop that the user sees when he or she starts PQStart. **NOTE:** In the advanced user management PQStart always starts with the desktop that you specify here. A different desktop cannot be opened from PQStart.
- **Station grouping**: The groups that you defined for the stations in the first step can be assigned to the users here.
- **Delete**: Deletes the selected user. Deleted users no longer have access to their client the next time WinPQ starts.

User management:

The permissions for the roles are set here. The settings are the same as those in the simple user management function.

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Log in

This function is needed in case the logged in user doesn't have all of the required permissions.

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Uninstalling WinPQ

The program is uninstalled in the 'Windows Control Panel'.

All of the files required to **'uninstall'** a **WinPQ** installation are integrated in the uninstaller.

NOTE: The database is also deleted if it was installed in the default folder (C:\Program Files (X86\WinPQ\).

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Software - Version: WinPQ 4.3

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