

Handbook

PVGuard[®] **User Manual**



Description

Describes the operation of the PVGuard Client program.

Date

13.04.2015

Version

2.1

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skytron® energy GmbH
Ernst-Augustin-Str. 15
D-12489 Berlin

Tel: +49 (0) 30 / 688 31 59-0
Fax: +49 (0) 30 / 688 31 59-894
Email: info@skytron-energy.com
www.skytron-energy.com

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1 Introduction

1.1 Target Group

This user manual is intended for qualified technical- and operations-personnel such as technicians, system administrators, designers and operators of photovoltaic (PV) power plants.

1.2 Contents

The manual describes how to install the software and use it properly and efficiently. We recommend that you first read [Chap. 3.2, Installation of PVGuard Client](#), and follow the steps explained there.

1.3 Text and Icons

The following text styles have been used to allow a better overview and for easier reading:

<i>Italic</i>	User interface terms, other terms, commands
Mauve text	Short-cuts (or keystroke combinations)
Spaced blue text	Terms defined in this paragraph
<u>Underlined</u>	Examples
Light blue	References to chapters, figures, websites, documents.

Notes and information have been shown with the following symbols:



Important: Follow the hints and instructions given in this manual.



Recommendations to simplify operation, tips, tricks, etc.

The name 'skytron®' has been used in the text to refer to the full company name *skytron energy GmbH*.

1.4 New Features in this Version

Version 2.1 provides the following new features:

1. Introduction of **Dashboards**. These are presentation views that a user can design themselves. For this a new tool, the Dashboard Designer, has also been introduced. The operation of the Dashboard Designer is described in a separate user manual.
2. Associated with the new Dashboard functionality, there is a new dialog box, the **skytron Cloud Browser**. This is used to upload images to the skytron servers, which can then be used later in Dashboards. See [Chap. 6.4, Views Menu - Alt+V, on p. 52](#).
3. The handling of **Time Zones** in the program has been improved. Now, each view, chart or table can be individually adjusted for time zone. See [Chap. 5.3, View Settings Menu, on p. 23](#).
4. In addition, a new **View Settings** menu has been introduced at the top-right corner of views, charts and tables, to bring a number of controls (time-zone, device naming, use of raw or normalized string currents) together into a consistent place. See [Chap. 5.3, View Settings Menu, on p. 23](#).
5. The displayed **Data Units and Multipliers** may now be flexibly adjusted by users. This supports easy switching between metric and imperial units, and, for example, scaling chart axes by multipliers of k, M etc. See [Chap. 8.2.2, Configuration Tables, on p. 83](#).
6. In cases where a number of PV plants share a common grid feed point, it is now possible to list these in a flat or **Hierarchical** manner in the View Navigator and Plant Explorer trees. See [Chap. 6.3.1.2, Tab: Look, on p. 47](#).

7. The window for **Email Settings** has been enhanced to allow several mailing lists to be defined for a plant for different error conditions, or using different templates. See [Chap. 12.1, Email Notifications](#), on p. 103.



skytron® has an on-going software development program, and therefore the diagrams and figures shown in the user manual may vary in places from those displayed actual graphical user interface.

1.5 Structure of the Document

- The first section, [Chap. 2, Brief Description, on p. 10](#), provides an overview to the program
- The prerequisites for installing the software are given next in [Chap. 3, System Requirements, Installation and Running, on p. 11](#).
- The key elements of the graphical user interface (GUI) are illustrated in [Chap. 4, GUI Overview, on p. 15](#).
- Details about 'views' used for monitoring plant can be found in [Chap. 7, View Descriptions, on p. 57](#)
- In [Chap. 12, Configuration Options, on p. 103](#) the setting up of e-mailed error messages and configuration of error conditions is described.
- The Appendices contain:
 - A reference list of the error types, and a list of terms used in the GUI ([Appendix I, Glossary, on p. 121](#)).
 - Explanations of the abbreviations used in the user manual and in the GUI ([Appendix II, Abbreviations, on p. 124](#)).
 - A reference to the program's menu commands and keyboard short-cuts ([Appendix III, Command Reference, on p. 125](#)).
 - A reference to the icons used in the program ([Appendix IV, List of Button Icons, on p. 127](#))
 - Directions about dealing with incoming alarm messages ([Appendix V, Fault Tracing, on p. 133](#)).



We recommend that you first read [Chap. 4, GUI Overview, on p. 15](#) before you start working with PVGuard Client.

2 Brief Description

2.1 What is PVGuard Client?

PVGuard Client is an intuitive and multilingual graphical user interface (GUI) to allow the flexible operation of the skytron® PV Monitoring system.

It is designed to monitor PV power plants of any size, and allows an operator or plant manager in a control room to monitor any number of PV power plants. The software also enables the prompt detection of problems, allowing speedy repair and maintenance work on the plant. It also provides tools to help you keep track of service activities.

PV power plants that use the system must be equipped with measuring equipment and data loggers. These devices poll the sensors and equipment at the site, and send the data over the internet to the skytron® data center, from where the data can be interrogated by PVGuard Client. In this way, the smooth functioning of the power plants can be ensured, helping to maximise the plant's yield.

2.2 Overview to PVGuard Client's Features

PVGuard Client provides:

- A set of standard views and summaries of the many parameters needed to provide a comprehensive picture of the situation in a plant ([Chap. 7, View Descriptions, on p. 57](#)).
- The ability to manage multiple plants from a single platform with one login.
- Comparison functions for components between different plants and across time zones
- Both discrete and comparative status and performance information, with a history dating back to the start of monitoring, in both chart and table formats ([Chap. 8, Charts and Tables, on p. 83](#)).
- Configurable user rights that allow the granting or denial of view access and to associated actions for control-room or service personnel (administered by skytron).
- Configurable error conditions ([Chap. 12.2, Configuring Errors, on p. 106](#)).
- An alarm handling module that provides information about classes of error conditions and allows operators to assign them an alarm status, dismiss them, export the alarm data and to associate them with entries in the service log ([Chap. 10, Alarms, on p. 89](#)).
- The ability to group inverters together into blocks as 'virtual' devices (must be configured by skytron).
- Derived measurement channels such as total yield (at the energy meter, inverter), total power (at inverter), standardized total yield, and total output.
- Calculation of the Performance Ratio or an intra-day Performance Index for the whole plant, its blocks and its individual inverters (prerequisites: data from radiation sensors and energy meter, and details about the installed power).
- Chronological documentation of operation, maintenance and repair activities ([Chap. 11, The Service Log, on p. 95](#)).
- The ability to configure charts and tables and save these in the database and print/export them into a number of common file formats for documentation, archiving or further processing in external programs ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#) and [Chap. 6.1, File Menu - Alt+F, on p. 41](#)).

3 System Requirements, Installation and Running

3.1 System Requirements

Operating system

- Java Version 6 or higher (Java Version 7 recommended)

Processor

- At least a dual-core processor (recommended 4 or more cores)

Memory

- RAM (minimum 2 GB, 8 GB recommended)
- Minimum 2 GB of free disk space

Video

- Recommended resolution: 1920x1080 pixels



To achieve the optimal performance from the internal caching mechanism, skytron recommends that you add the file extension *.db to the exception list of your anti-virus software. For information about the configuration of this exception list please refer to your anti-virus software manufacturer's documentation.



It may be useful to increase the cache size in the client configuration in order to maximize the PVGuard Client performance ([Chap. 6.3.1, Client Configuration - Alt+U, on p. 45](#)).

3.2 Installation of PVGuard Client



You will receive your individual user credentials from skytron. Use this data to install the program and establish a first connection.

When you install the software for the first time, follow the steps below:

1. Java SE Runtime is a necessary pre-requisite. Edition 7 (JRE 7) is recommended. It can be obtained from:
 - <http://www.java.com/de/download>
2. Load the most recent version of PVGuard Client on to your PC from the following link:
 - <http://www.pv-guard.com/login>
3. Use the login credentials provided by skytron:
 - user (e.g. *pvdownload*)
 - password
4. Double click the Java Webstart jnlp file to run it (you may save it if you wish, but it will not be required any further).
5. The dialog 'Connect' will open as shown in [Fig. 1 on p. 12](#).

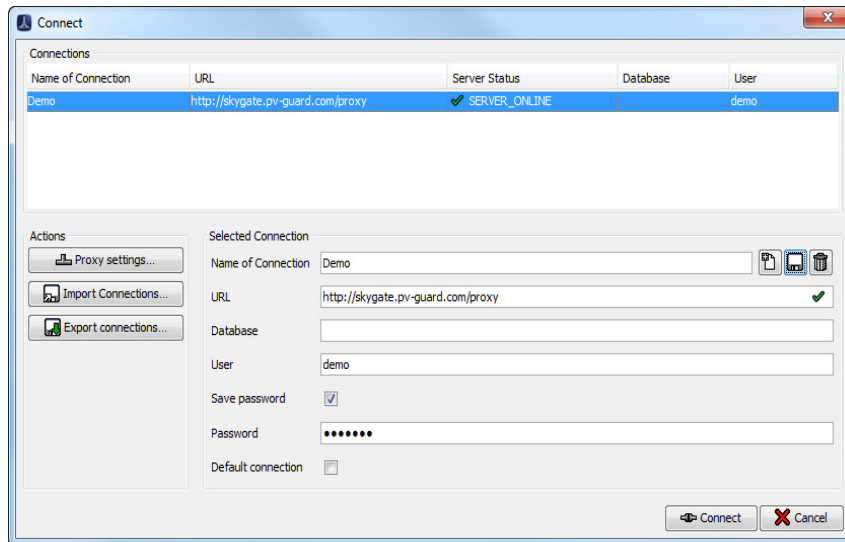


Fig. 1 Connect dialog - Selected Connection

6. Enter the following data into the entry fields of the *Selected Connection* panel
 - Name of Connection: Any name you wish
 - URL: *https://skygate.pv-guard.com/proxy*
 - Database: *<Leave blank>*
 - User: *<Use the data supplied by skytron>*
 - Password: *<Use the data supplied by skytron>*
 - Save Password: Activate this option box if you want avoid having to enter a password each time you use the program, and enter the password in the field below.
 - Default Connection: Tick this box if you would like to have this connection re-established automatically upon restart of the program.
7. Click the middle button *Save this Connection* in the upper right corner of the *Selected Connections* panel to save the connection settings and password.
8. Click 'Connect' to open PVGuard Client.

For a detailed description about connections see [Chap. 6.2, Connection Menu - Alt+C, on p. 42](#). A configuration file ([Chap. 6.3.3, Import Configuration File - Ctrl+I, on p. 51](#)) is created during the installation and stored on your PC.

At this point, the *Client Configuration* dialog will pop up as shown in [Fig. 2 on p. 12](#).



Fig. 2 Selecting the GUI language during the installation

Select the desired language of the GUI from the *Language* list and click *Save*.
The language selected here will remain the one in use, however it can be easily changed later.

3.3 Running the Program

Start the program by clicking the desktop icon. PVGuard Client will open using the default connection details (provided that you have saved a connection as the default). If there is no default connection, the dialog *Connect* will pop up. Select the desired connection and click *Connect*. If you hadn't saved a password, you will be prompted for one at this point. Then the program's main window will open. See [Chap. 6.2, Connection Menu - Alt+C, on p. 42](#).

4GUI Overview

Fig. 3 on p. 15 shows the structure of PVGuard Client's display.

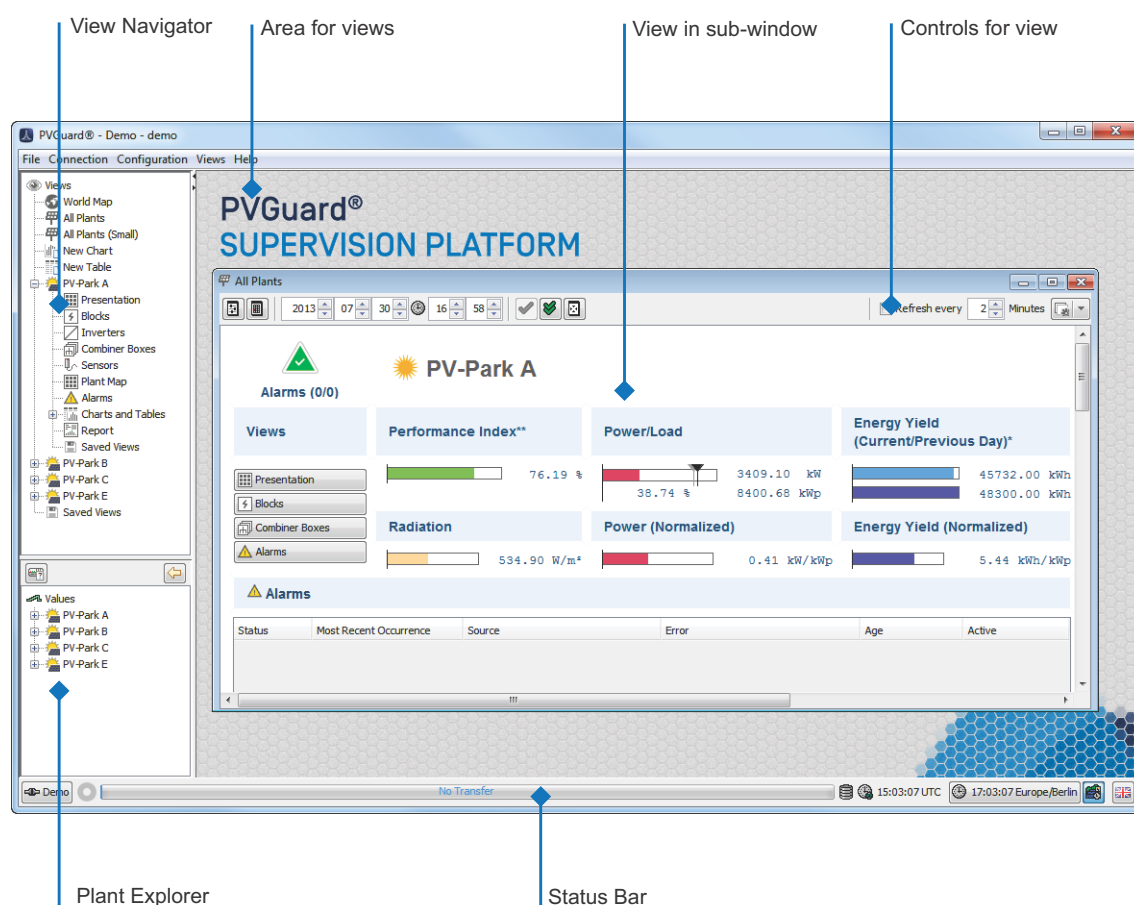


Fig. 3 PVGuard Client - display

The sizes of the panes can be varied by dragging the borders with the mouse. In addition, the left- or right-hand panes can be expanded to cover the full display by using the two arrows on the vertical separator, as shown below.

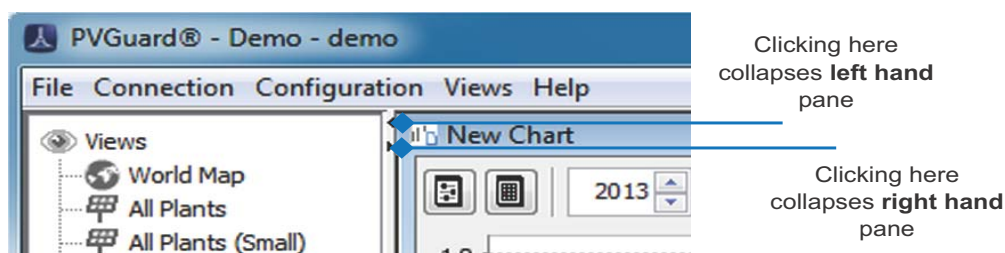



Fig. 4 Showing and hiding the panes

When you exit and restart the program, the panes will be restored to their default arrangement and size.

4.1 Sections of the GUI

4.1.1 View Navigator

The **View Navigator**, shown with the icon , is located in the upper left-hand pane of the program window. It lists all fixed and configurable views of the plant(s), arranged hierarchically. Views, when initially opened from the *View Navigator*, are displayed as separate sub-windows in the *Views* area.

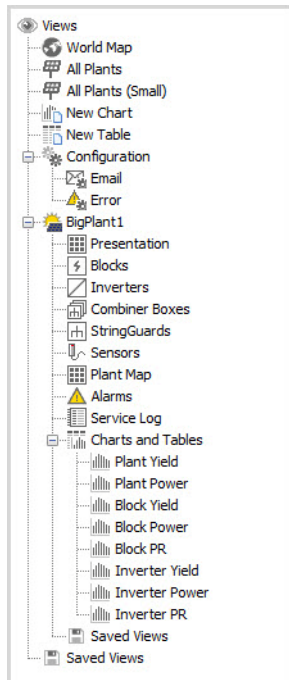


Fig. 5 Views are selected in the *View Navigator* and opened and displayed in the views window

To open a view:

- Left click on the entry in the *View Navigator*, or
- Right click on the entry in the *View Navigator* and select *Open* from the context menu or **Enter**.

The *View Navigator* is shown collapsed when you open the program. Left-click on a node in the tree with the mouse to expand the tree under the node.

4.1.2 Views

A **View** contains controls and indicators, charts, tables, text and data values from one or more plants that are being monitored. Some views are pre-defined by skytron; you can define other charts and tables yourself. Pre-defined views can show the data from the different components of a plant at a single moment (i.e. the actual data) or plot how the data has varied over a time period, or a combination of the two.

The data shown might be the raw data from the plant, adjusted raw data that takes account of factors such as missing values, or derived data such as performance ratios that are calculated from a number of different inputs.

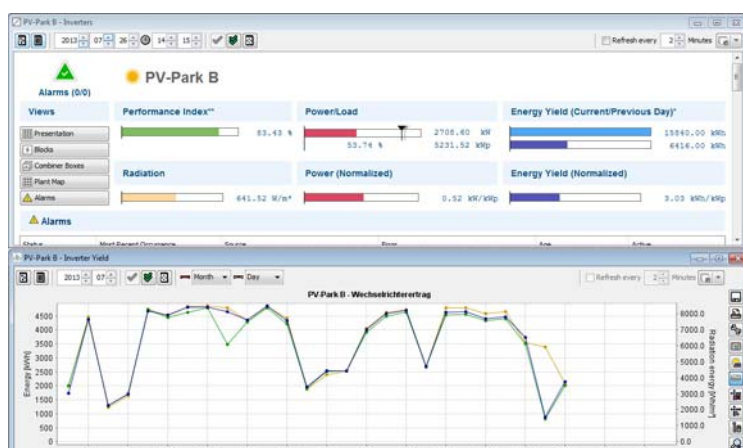


Fig. 6 Pre-defined views opened in tiled mode showing plant status and inverter yield

Views are displayed in a sub-window in the *Views* area. Open views can be arranged tiled or cascaded using commands in the *Views* menu. You can tab forward and backwards through the open views using the **Ctrl+right arrow** and **Ctrl+left arrow** key stroke combinations.

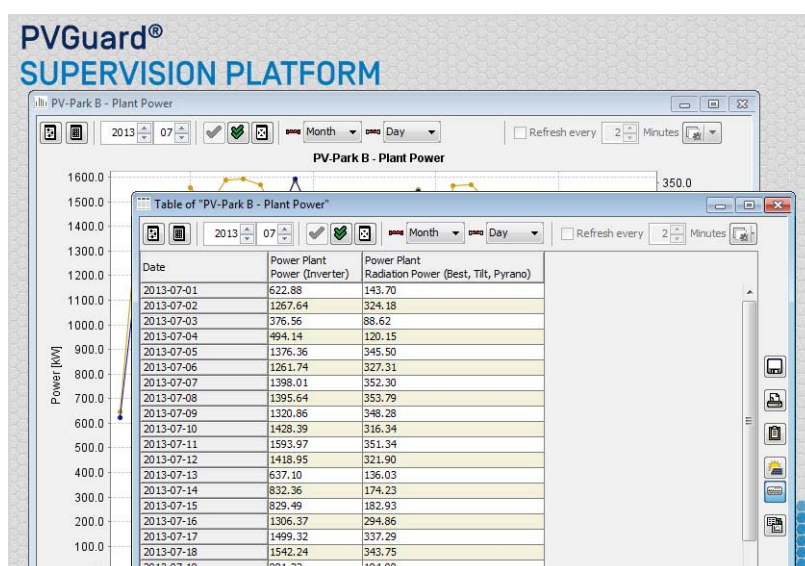


Fig. 7 Chart and table views opened in cascaded mode

Any view can be detached from the main window and displayed separately, for example on a second monitor ([Chap. 6.4, Views Menu - Alt+V, on p. 52](#) and [Fig. 8 on p. 18](#)).

Charts and table views include a **Configuration Table** at the bottom of the view sub-window, which defines the source and formatting of the data for each of the displayed data items.

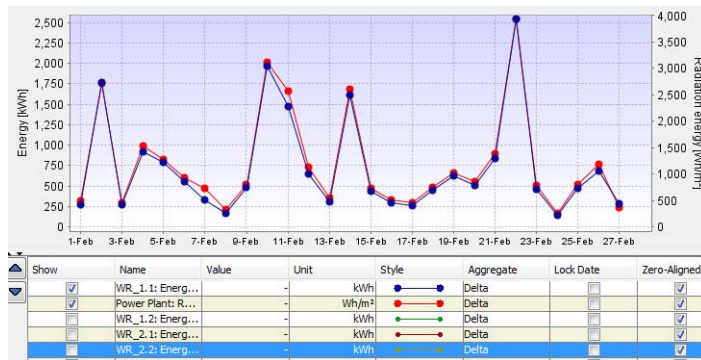



Fig. 8 Chart view showing Configuration Table (lower half)

The *Configuration Table* allows you to adapt the displayed data to suit your needs. The selected row in the table is always shown highlighted in the associated chart or table. The columns allow you to adjust the data as described below. See [Chap. 8.2.2, Configuration Tables, on p. 83](#) for more details.

Column	Description
Row Order	Changes the order of columns in a table view
Show	Makes a set of data visible or not on a chart
Name	The name of the data set
Value	The value of the data at a point (only when a single data point is selected)
Units	Sets the units and multipliers used to display the data
Style	Allows you to change the way the data points or lines in a chart are displayed
Aggregate	Lets you refine how the data for the respective time period is shown (e.g. maximum, mean etc.)
Lock Data	Fixes the data for that row to the particular date, e.g. to act as a reference data set
Zero Align	Produces relative comparisons of similar data on the vertical axis, based against zero
Show State Text	Sets whether digital states in a table are shown as numeric value or by their associated state name

Table 1 Columns of the Configuration Table

4.1.3 Plant Explorer

The **Plant Explorer** pane, shown with the icon , lists all measurement points in the equipment in each PV power plant. The measurement points can be selected from this tree and inserted into charts and tables.

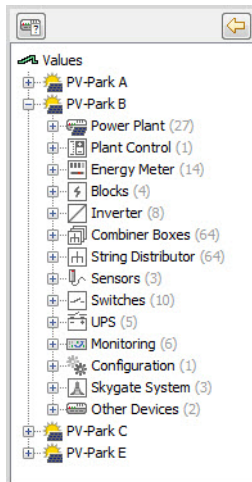


Fig. 9 Plant folder in the *Plant Explorer*

Each plant has a folder in the *Plant Explorer*. The structure of the folder depends on the arrangement of the respective plant and on its measuring equipment.

The measurement points of the equipment are represented as the leaves of the tree hierarchy. The grey number in brackets by a node name indicates the number of sub-branches under it.

The types of measurement points are described in [Appendix I, Glossary, on p. 121](#).

The buttons at the top of the pane allow you to:



Select how the type of name/alias is shown (e.g. your own, custom alias or the original device name). See [Chap. 5.10, Changing how Device Names are Displayed, on p. 33](#).



Jump to the entry in the *Plant Explorer* corresponding to a data item selected in a view. See [Chap. 5.11, Jump from Data Item to Entry in the Plant Explorer, on p. 34](#)

The measurement data and device states to be displayed in views are allocated from the points selected in the *Plant Explorer*. There are several ways of assigning them:


- *Drag & drop* (see [Chap. 5.9, Drag & Drop, on p. 32](#))
- Context menu commands. These are accessed by clicking with the right mouse key on a point and are a quick way to assign a point to a view, table or chart. The possible actions include:
 - *Alarms* - opens the Alarms view of the plant or device
 - *Add to "name of an open chart"*
 - *Add to "name of an open table"*
 - *Add to a new chart*
 - *Add to a new table*
 - *Rename*
 - *Restore original name*
 - *Reload*
- Multi-selections, which can be made with **Ctrl**+mouse click and **Shift**+mouse click
- Using the combination **Ctrl** + right mouse click on a point in the *Plant Explorer* allows you to add both this point and all similar measurement points to a chart or table.

5 Using the GUI

As shown in see [Fig. 3 on p. 15](#), the GUI includes a number of controls and other elements. Some are static; others can vary, depending on what you are doing in the GUI at that time. They provide you with several ways of using the display depending on your requirements and preferences. They include:

- Menus ([Chap. 6, The GUI Menu, on p. 41](#))
- Context menus ([Chap. 5.6, Context Menus, on p. 28](#))
- Button groups that appear when the mouse is over a symbol or region, for example charts ([Chap. 5.7, Mouseover Navigation, on p. 31](#)) or other symbols ([Chap. 5.7.2, Mouseover for Symbols and Indicators, on p. 32](#))
- Clickable sensor indicators in all views ([Chap. 5.8, Clickable Sensor Indicators, on p. 32](#))
- Adjustable device names ([Chap. 5.10, Changing how Device Names are Displayed, on p. 33](#))
- Tree-like navigation of Views and Plant ([Chap. 4.1.1, View Navigator, on p. 16](#), [Chap. 4.1.3, Plant Explorer, on p. 19](#))
- The ability to jump directly from a chart or table to the *Plant Explorer* ([Chap. 5.11, Jump from Data Item to Entry in the Plant Explorer, on p. 34](#))
- A time bar ([Chap. 5.2, Time Bar, on p. 21](#))
- Toolbar in charts and tables ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#))
- Text fields, list fields, option boxes
- Spinners, date pickers, sliders ([Chap. 5.2, Time Bar, on p. 21](#))
- Search fields ([Chap. 7.5.8, Plant Map, on p. 79](#))
- Keyboard commands, short-cuts ([Appendix III, Command Reference, on p. 125](#))

Numerous tooltips appear when you move the mouse over buttons, popups, windows, graphs, the cells in alarm tables, etc. They can help you, for example by explaining the meaning of symbols, describing graphs, naming devices, showing measurement values or error descriptions. They may also contain date and time information, which is displayed according to your selected time zone.

In addition, there are information buttons  that explain the data format of text input fields.

The following sections describe some of the main elements in more detail.

5.1 Status Bar

The status bar at the bottom of the display is divided into five sections (see [Fig. 10 on p. 20](#)).

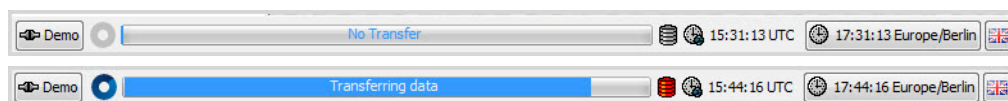


Fig. 10 Status bar appearance


These show the following buttons and information (from left to right):

1. Name and status of the current connection ([Chap. 6.2, Connection Menu - Alt+C, on p. 42](#))

 PVGuard Client is connected with the monitoring system.

 PVGuard Client is connected with the monitoring system through a SSL connection.

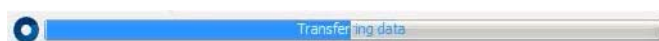
 PVGuard Client is disconnected from the monitoring system.

 A left mouse click here opens a pop up listing the saved connections. Right clicking on a connection in the list opens a context menu allowing you to *connect* to that system. You can also set the entry as the *default connection* or *edit* the connection's details.

2. A display of the progress of any data transfer:





At the start of the transfer.



While data is being transferred.

- ☐ No data is being transferred.

3.  Flashing red indicates device information is being cached on the PC's hard disk.
4. Current time according to UTC time standard (UTC = Coordinated Universal Time)
5.  16:21:29 Europe/Berlin Current time in the selected time zone of the PVGuard program (see [Chap. 6.3.1, Client Configuration - Alt+U, on p. 45](#)) combined with a button to allow changing to a different time zone.
6. Current language selected for the GUI; note this is not saved after a program restart (see [Chap. 6.3.1, Client Configuration - Alt+U, on p. 45](#))

 Flag of the currently selected language for the GUI

5.2 Time Bar

The time bar is situated at the upper margin of every view. You can use it to set the boundaries to the period of time over which the measurement data in the view is to be displayed. The appearance of the time bar may vary slightly from view to view. By default it shows the current date and time.

You can navigate within its fields and between the tools of the time bar using the **Tab** key. [Fig. 11 on p. 21](#) shows the time bar as it is shown above charts and tables while [Fig. 12 on p. 21](#) depicts it above standard views.



Fig. 11 Time bar above charts and tables




Fig. 12 Time bar above standard views

The time bar provides the following controls and actions:

Date/Time Slider

A set of date/time sliders is available in all views; when you open a view, they are hidden by default. They offer the following time resolution values (depending on the view and on the setting):

- 1 Year
- 1 Month
- 1 Week
- 1 Day
- 1 Hour
- 1 Minute

To display the date/time sliders above a view's contents, click . Set the desired date using the sliders or by pressing the **arrow right** and **left** keys.

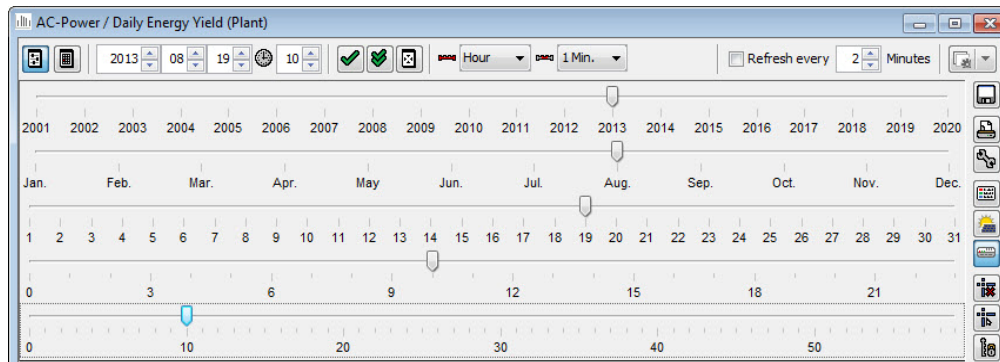


Fig. 13 Date/time sliders expanded

Click in the top row of the time bar to set the period and to load the data into the view for the time period you have just set.

Time Window and Data Resolution (Tables and Charts only)

The left hand control, Time Window, sets the period over which the data will be displayed. The right hand control, Measurement Data Resolution, determines the time resolution of the displayed measurements. Use these to set up the time axis (x-axis) of the chart.

Time Window	Allowed Data Resolution
Decade (only for certain types of data)	Year
Year	Month, Week, Day, Hour
Month	Week, Day, Hour, 15, 10, 5, 1 Minutes
Week	Day, Hour, 15, 10, 5, 1 Minutes
Day	Hour, 15, 10, 5, 1 Minutes
Hour	15, 10, 5, 1 Minutes

Calendar

A calendar control is contained in all views as an alternative means of entering dates. The control is hidden by default, but can be opened by clicking on .

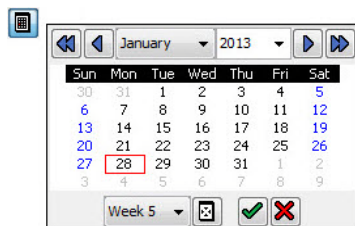


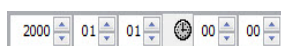
Fig. 14 Calendar

Double clicking on a day selects that date and closes the calendar window at the same time.

Click this button in the time bar or underneath the calendar set the date to today.

Use this control to select a particular calendar week. The day of week is unchanged.

Click to set the date and close the calendar, or to close it without setting a date.



Date /Time Controls

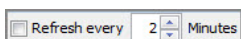
Alternatively, enter the date/time directly into the controls. No time setting is available in tables and charts.

Updating Values in the View

After you have set a date, click this button to load the values of this date into the view. (The button will then be deactivated after the click until you set another date.)

✓ Automatic Update of Data in the View

If you click the double check button, the data will be automatically re-loaded in the view each time you change the date. The ✓ control will be hidden until you click ✓ again, i.e. deactivate the automatic data update.



Refresh the View at Defined Intervals

If you activate the option *Refresh every xx Minutes*, the view will be refreshed with updated data at defined intervals. This function is disabled by default and, if enabled has a default setting of 2 minutes.



To activate automatic data refresh, the time range must be set to *Day* or *Hour* (see [Time Window and Data Resolution \(Tables and Charts only\)](#) in 4.1.3, *Plant Explorer*, on p. 22).

📅 Set Today's Date with One Click

Click this button to simply set the current date and load the current values into the view.

5.3 View Settings Menu

The *View Settings* menu, a pop-down box, is located at the top right-hand corner of every chart or table, next to the time bar.

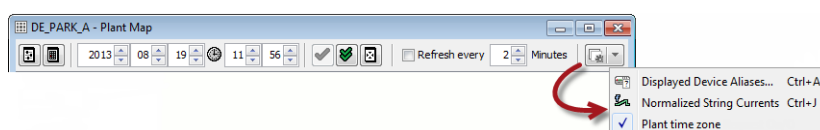


Fig. 15 View Settings control

When clicked, it reveals a number of settings controls that configure how the charts or tables are displayed. The actual controls present will vary from view to view; the possible controls are:

✓ Plant Time Zone

When activated (shown ticked), the **plant time** is used for that view. Otherwise times are converted to the **local time** of the chosen time zone for PVGuard. This can be adjusted, for example to UTC, in the Status Bar at the bottom-right of the PVGuard display. The default value for this control can be changed in the *Client Settings* dialog, see [Chap. 6.3.1, Client Configuration - Alt+U](#), on p. 45.

The use of local time or UTC time can be useful when you want to compare the data from two plants that are situated in two different time zones. In [Fig. 16 on p. 23](#), the left hand chart shows the data from two different plants in different time zones when each is shown in its local time. The right hand chart shows the same data plotted against the UTC time zone.

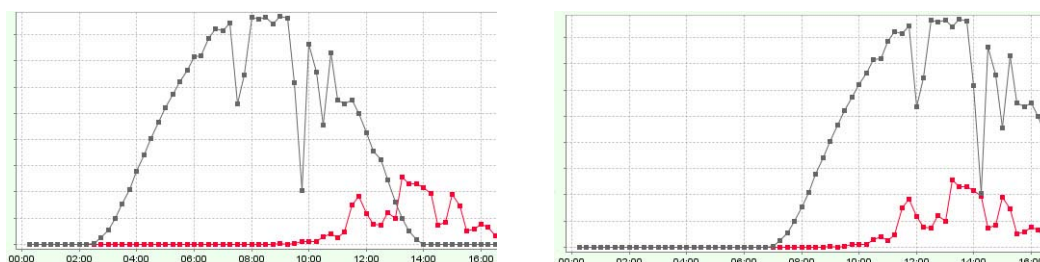


Fig. 16 Effect of switching to UTC when comparing plants in different time zones

Displayed Device Aliases

This opens up a dialog which allows you to set whether devices in views are referred to using their unique ids, the name they were originally given during plant setup, or any customized alias that has subsequently been defined. Note that the same function is available at the top of the Plant Explorer. See section [Chap. 5.10, Changing how Device Names are Displayed, on p. 33](#) for further details.

Normalized String Currents

The display of currents into combiner boxes can either be shown as an absolute current, or as a normalized current. The normalized value is adjusted to take account of, for example, the number of modules connected to that string. It thereby provides an easy comparison of the string performance. This control sets how these currents are shown. For further details, see [Raw vs. Normalized string-current values in the Combiner Boxes view in 7.5.4, Combiner Boxes, on p. 70](#).

5.4 Toolbars in Charts and Tables

A vertical toolbar will be displayed to the right of any charts or tables that may offer a number of functions as described below.

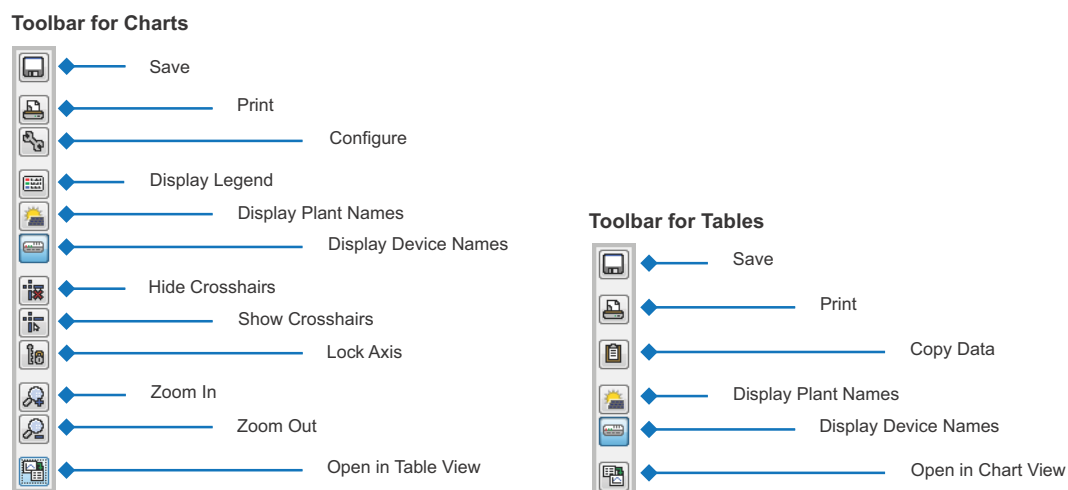


Fig. 17 Toolbars in charts (left) and tables (right)

5.4.1 Save (Charts & Tables) - Ctrl+S

View configurations can be saved in the *View Navigator* as described in [Chap. 5.16.1, Saving Views, on p. 38](#). In the toolbar, if you click the Save button, a context menu will appear with up to three save options: Save, Save As, Export.

Save (for changes)

This button appears in the toolbar as soon as you open a previously saved view, or if you create a new view and have already saved it once (using Save As). Clicking the button saves any changes to a saved view into the database.

Save As (first time a view is saved or for renaming it)

Click this button to save the current view into the database for the first time or to save it under a different name. In this case, a pop up dialog will appear allowing you to specify how you wish to save the view. See also [Chap. 5.16.1, Saving Views, on p. 38](#) for further details.

Exporting a View

Click this button to export a view into a commonly used file format. The exported view contains the data as it appears in the view (i.e. at that date/time) when it is exported. See also [Chap. 6.1, File Menu - Alt+F, on p. 41](#), where the supported data formats are also listed.

5.4.2 Copying Data into the Clipboard (Tables) - Ctrl+C

Click this button to copy data into the clipboard:

- If no data is selected, all of the table is copied
- Otherwise the selected data is copied, including any needed table headings

Copied data can then be pasted into other programs, such as a text editor or spreadsheet. See also [Chap. 10.5, Exporting Alarm Details, on p. 93](#).

5.4.3 Printing a View - Ctrl+P

Use this command to print out the current view with a configured printer. The printout contains the data as shown in the view when the print function is run.

5.4.4 Configuring a View (Charts) - Ctrl+K

Click this button to define the characteristics of a chart, such as colours, line widths, designations. The dialog *Chart Properties* opens, with three tabs.

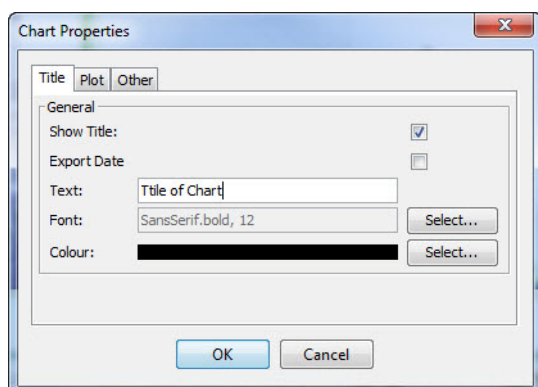


Fig. 18 Chart properties dialog

5.4.4.1 Tab: Title

This tab defines how the chart title appears.

- The field *Show Title* sets whether a title is to be displayed above the chart.
- *Export Date* defines whether the chart's date is to be appended to the title of any exports of the chart. (See also *Export* under [Chap. 6.1, File Menu - Alt+F, on p. 41](#))
- The field *Text* defines the title text.
- The fields *Font* (font, font size and style) and *Colour* (from palette) define the formatting of the title.

5.4.4.2 Tab: Plot

This tab contains three further sub-tabs: Domain Axis, Range Axis, Appearance.

Domain Axis (Horizontal)

This defines the horizontal (time) axis. The tab allows you to give the axis a text legend *Label* (default: none), and set the format of the label (*Font*, *Colour*).

In addition, in the lower area (*Other*), you can specify whether the time values should be shown on the axis *Show Tick Labels*, set their font (*Tick Label Font*), and also set whether marks should be shown at each tick point on the axis (*Show Tick Marks*).

Range Axis (Vertical)

This defines the left-hand, vertical data axis. The settings are similar to those of the horizontal Domain Axis, except that there is an additional tab, *Range*, in the lower (*Other*) area, where you can define whether the program should automatically select the optimal

value range on the axis (*Auto-Adjust Range*) or fields for the *Minimum Range Value* and *Maximum Range Value*, if you want to set the range yourself manually.

Appearance

Here, you can define whether the chart has a frame and, if so, how wide the frame's line will be (*Outline Stroke*, default: no frame). *Outline Colour* defines the frame's colour, and *Background Colour* assigns an overall background colour to the chart area within the frame.

5.4.4.3 Tab: Other

Here you can:

- Define whether anti-aliasing (*Draw Anti-Aliased*) is to be applied to smooth the appearance of the chart (default: anti-aliased)
- Assign a background colour to the area of the chart outside the frame (*Background Colour*).



You must save the chart to retain these settings ([Chap. 5.16.1, Saving Views, on p. 38](#)).

5.4.5 Showing/Hiding the Legend (Charts) - Ctrl+L

When creating a new chart, a legend can be displayed above the sets of measurement data ([Fig. 19 on p. 26](#)). Click this button to hide/show the legend.

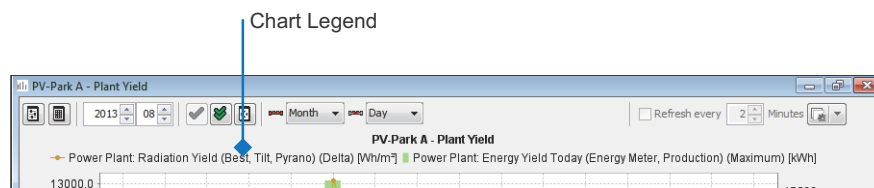


Fig. 19 Legend above a chart and curves

5.4.6 Show/Hide the Plant Name (Charts & Tables) - Ctrl+J

Clicking this button toggles whether the plant name is shown in the headings of the table views and how the name is shown *Configuration Table* for both chart and table views.

5.4.7 Show/Hide the Device Names (Charts & Tables) - Ctrl+D

Clicking this button toggles whether the device name is shown in the headings of the table views and how the name is shown *Configuration Table* for both chart and table views.

5.4.8 Hide the Crosshairs (Charts)

Normally crosshairs will appear when you click inside a chart. Click this button to hide the crosshairs.

5.4.9 Crosshairs Follow the Mouse (Charts) - Ctrl+R

Click this button if you want the crosshairs to follow the mouse as it moves over the chart. This mode ends as soon as you left click in the chart area or click the button again.

5.4.10 Lock the Values Axis - Ctrl+H

Usually the program adjusts the value axis (y-axis) of a chart to present it optimally depending on the current resolution and zoom factor. Clicking this button allows you to lock the range of this axis, to display the data in the way you want.

5.4.11 Zooming (Charts)

You can use the *Zoom* buttons of the toolbar to zoom in and out of the view in discrete steps. Other methods of zooming are explained in [Chap. 5.5, Zooming in Graphs, Navigating and Moving](#), on p. 27.

5.4.12 Displaying a Chart as Table - Ctrl+T

Click this button to transfer the values of the current chart into a new table view.


5.4.13 Displaying a Table as Chart - Ctrl+T

Click this button to transfer the values of the current table into a new chart view.

5.5 Zooming in Graphs, Navigating and Moving

You can zoom in and out of the graphs in charts and you can move the graph within the axes of the coordinate system. The following procedures are available:

Zooming in

- Keep the left mouse key pressed and select the area in the graph you would like to enlarge from the upper left to the lower right corner ([Fig. 20 on p. 27](#), left and [Fig. 21 on p. 27](#)). The selection will be shown as a rectangle. Then, release the left mouse key.
- Click into the graph, press **Ctrl** and turn the mouse wheel towards your finger tips.
- Right click into the chart and select *Zoom in* from the context menu.
- Click  in the toolbar.

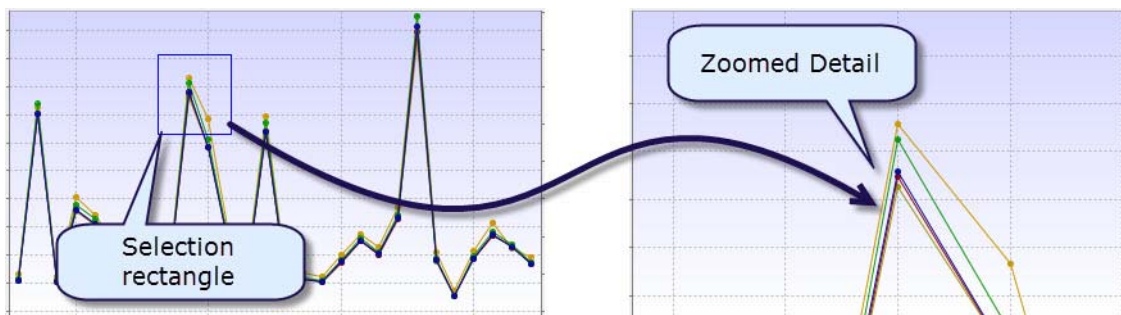


Fig. 20 Zooming into a graph using the selected area (left) - zoomed detail (right)

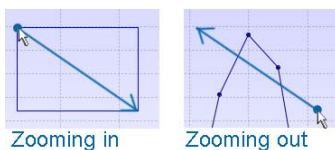



Fig. 21 Zooming into a graph (left) and out of the graph with the left mouse key pressed (right)

Zooming out

- Keep the left mouse key pressed and move the mouse slightly in the direction from the lower-right to the upper-left corner. Then, release the mouse key ([Fig. 21 on p. 27](#), right).
- Click into the graph, press **Ctrl** and turn the mouse wheel towards your wrist.
- Right click into the chart and select *Zoom out* from the context menu.
- Click  in the toolbar.

Moving

To shift the displayed area, move the mouse whilst keeping the centre mouse key (or mouse wheel) pressed. (Fig. 22 on p. 28).

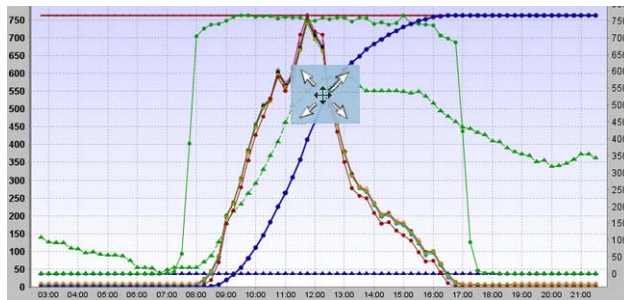


Fig. 22 Move a graph in the coordinate system with pressed left or centre mouse key

5.6 Context Menus

5.6.1 Context Menus in Charts

All charts have a context menu. You can display this by right clicking the mouse anywhere in the chart. The context menu may contain both commands and sub-menus. These include:

Properties

Opens the dialog *Chart Properties*. See [Chap. 5.4.4, Configuring a View \(Charts\) - Ctrl+K, on p. 25](#).

Copy

Copies the current chart into the clipboard so that it can be pasted into other programs.

Save as

The chart is saved as a file in a folder or drive. The following file formats are supported:

- as graphics file to *.png, *.gif, *.jpg, *.bmp
- as document to *.pdf,
- as graphics format to *.svg (vector format)
- as *.htm or *.html,
- as text file to *.csv, *.txt, *.nmf, *.ncf or *.dat

Print

See [Chap. 5.4.3, Printing a View - Ctrl+P, on p. 25](#).

Zoom in

Zoom into the chart either along *Both Axes*, or only the horizontal *Domain Axis* / vertical *Range Axis*.

Zoom out



Zoom out of the chart either along *Both Axes*, or only the horizontal *Domain Axis* / vertical *Range Axis*.

Auto Range

The program zooms to an optimal representation of the chart.

5.6.2 Context Menu in the Plant Explorer

Items listed in the *Plant Explorer* may have a context menu that can include the following commands:

 /  Add to <chart/table name>

Data from the right-clicked item is added to the given chart or table.

 *Add to new chart* /  *Add to new table*

A new chart or table is opened with data from the right-clicked item.

 *Alarms*

Clicking this button opens the *Alarms* view of the right-clicked item.


 *Log Entries*

Clicking this button opens the *Service Log*. The filter of the log will be automatically set to show entries associated with the corresponding device.

 *Rename - F2*

Click this button in the context menu of a device or plant to change its alias (i.e. name as displayed) in the *Plant Explorer*. The dialog *Rename* will open allowing you to change the name.

After you have renamed a device or plant, the command *Restore original alias* appears in the context menu.

 *Restore original name*


Use this command to restore the original name of a device or plant in the *Plant Explorer* after renaming. The command appears in the context menu only after renaming.



If the original names are displayed in a view ([Chap. 5.10, Changing how Device Names are Displayed, on p. 33](#)) and you rename a device, the original alias cannot be restored. The system will display a warning for you to acknowledge.

 *Reload*

Click this button to refresh the selected device's properties and configuration.

 *Device Properties*

Click this button to display information about the hardware and interconnection dependencies of the selected device.

Device Properties

Grünau: CB 01.01

Device ID: gr_nid_101070

Device Alias [Original]: CB 01.01

Installed Power [kWp]:

Serial Number:

Device Dependencies

Energy Drain: GP_02 gr_g011002

Receiving Terminal: IPC 192.168.10.11 gr_i011

Creation Date: 2013-02-01 18:34:30

Last Modification: 2013-02-12 19:19:49

Vendor: skytron energy GmbH

type	V_SK_COMBINER_BOX
ipc	11
c_changed	2013-02-12 18:19:49
class	GAK
reverse	FALSE
source_udid	gr_c011075


Save Close

Fig. 23 Dialog *Device Properties* in the context menu of a device in the *Plant Explorer*

In this dialog, the *Device Dependencies* fields show where this device is located in terms of two interconnection chains:

- The chain describing the Energy Drainage - how the energy flows from its point of capture to the point where it is fed into the grid network. This field in the popup shows which downstream device is the *Energy Drain* for the energy from the selected device.
- The chain describing the Communications Links - how messages from the devices are fed to the monitoring system. This field shows which downstream device is the *Receiving Terminal* for messages from this device.

Show State Information

For a device data channel that feeds digital state information or similar data (i.e. not analogue values), this button will appear in the device's context menu. Such devices, shown by a step icon  in the Plant explorer, might include inverters, trackers, PC equipment etc. Click on the button to view the state information from this device (see [Fig. 24 on p. 31](#)).

Properties

The *Properties* menu option opens a pop-up dialog that shows the value of many parameters that are used internally by PVGuard, such as the various plant/device/data channel identifiers (UPID, UDIDs, UVIDs). This information is mainly of use in troubleshooting problems in the application or, for example, when using separate programs that need such details (for example, the skytron FlexReportXL or skyAPI).

5.6.3 Context Menus in Views

State Information

In some views button symbols are used to show the overall status of the equipment (e.g. inverters). Right clicking the status button opens the dialog *Status Information*.

This dialog (Fig. 24 on p. 31) shows:



- Known state information about the device (a list of numbers or binary values, usually defined and programmed into the device by the manufacturer)
- The state information as interpreted by PVGuard Client, including a meaningful translation of the numeric value
- Severity of any error (i.e. whether an alarm will be triggered, see [Chap. 10.2, Alarm Status and Severity, on p. 91](#))
- The currently active state of the device

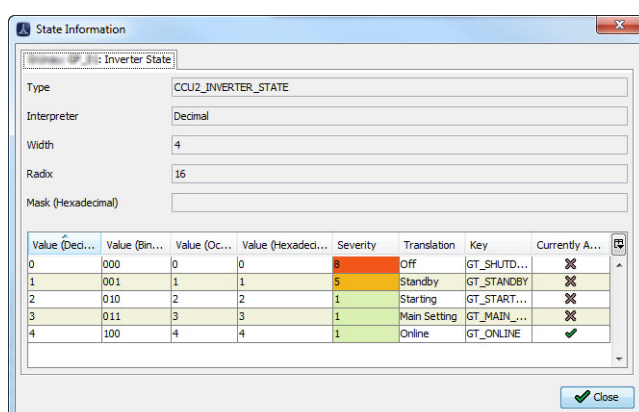


Fig. 24 State Information dialog

5.7 Mouseover Navigation

In certain cases, simply moving the mouse over a symbol or element of the display presents you with more information or means of navigation. This is known as mouseover.

5.7.1 Mouseover for Charts

The pre-defined views contain several sub-charts. If you move the mouse cursor over such a sub-chart, a button group appears. The buttons allow you to change the time period of the sub-chart or to open the chart in a new, stand-alone window.

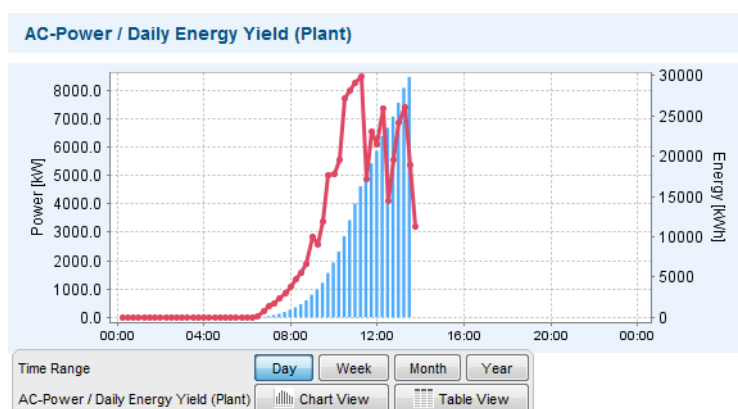


Fig. 25 Mouseover button group

Click a button in the group to change the displayed data or how the data is displayed:

- *Day* - The intra-day data is shown.
- *Week* - Displays the data for the current week.
- *Month* - Displays the data for the current month.
- *Year* - Displays the data for the current year.
- *Chart View* - Opens a new chart with the data.
- *Table View* - Opens a new table with the data.

5.7.2 Mouseover for Symbols and Indicators

The views contain indicators to represent devices and equipment. If you move the mouse over such an indicator or symbol, a tool tip will appear showing the current value of the data or its state.

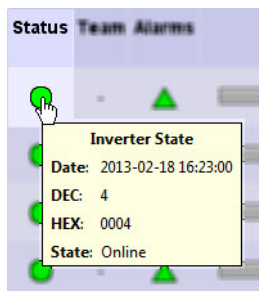


Fig. 26 Tool tip showing state information

In some cases a further control that gives you quick access to more detailed information will also appear. This control might include one or more of the following navigation buttons, as shown in the examples below:

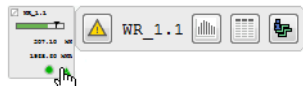






Fig. 27 Navigation buttons in mouseover control

-  Click this button to open the *Alarms* view of the device ([Chap. 10, Alarms, on p. 89](#)).
-  Click this button to open a new chart with the device's data.
-  Click this button to open a new table with the device's data.
-  Click this button to show the device's state (see [Context Menus in 5.4.4.3, Tab: Other, on p. 28](#)).

5.8 Clickable Sensor Indicators

You can open a diagram containing the data belonging to a sensor by using a single click on the sensor indicator or its associated data indicators. This is possible in all plant-related and summary views which include sensors and bar graphs.

5.9 Drag & Drop

Drag & drop is available in all views. To use it, click an element in the GUI with the left mouse key, drag the mouse with the key pressed to the desired location, and then release the mouse key.

Drag & drop can be used for:

- Inserting new measurement points from the *Plant Explorer* into charts, tables and *Configuration Tables*.

- Inserting data from displayed device indicators or symbols into charts (new, existing or embedded in other views). See [Fig. 28 on p. 33](#), left.
- Inserting data from bar graphs into charts (new, existing, embedded). See [Fig. 28 on p. 33](#), right.
- Changing the order of the measurement channels in the *Configuration Table*

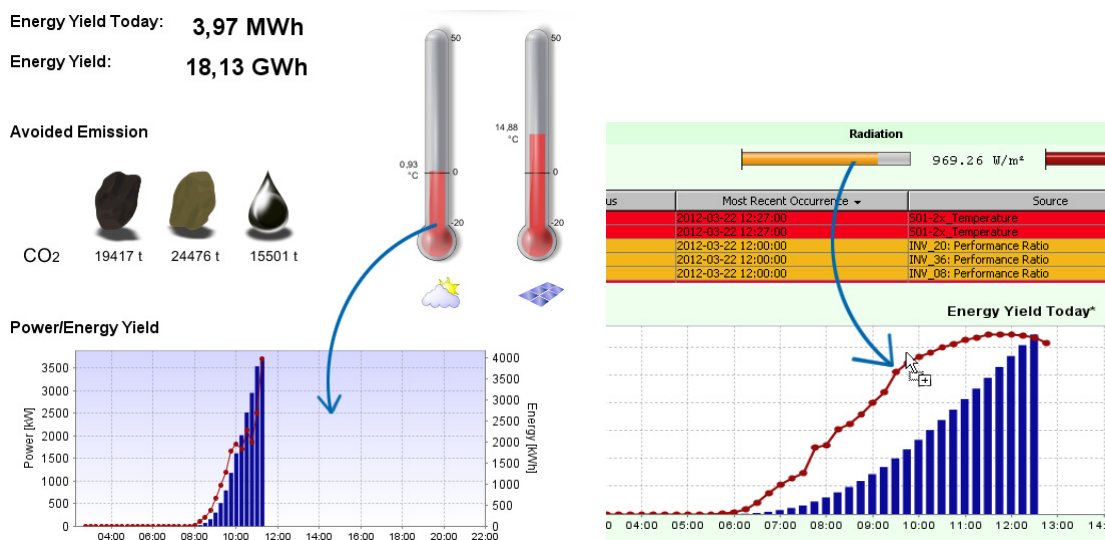


Fig. 28 Drag & drop procedure: presentation (left), blocks (right)

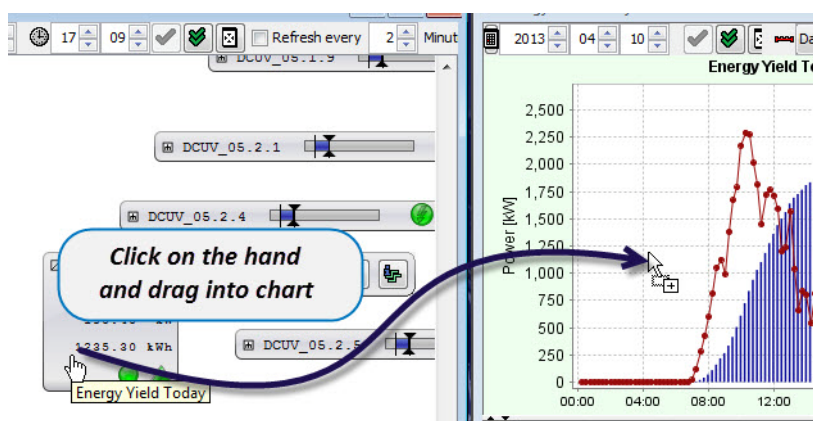



Fig. 29 Drag & drop procedure: tiled views

[Fig. 29 on p. 33](#) illustrates how the values of an inverter can be dragged from the *Plant Map* ([Chap. 7.5.8, Plant Map, on p. 79](#)) and dropped into the pre-defined *Plant Yield* chart (you may have to switch to tiled view for this (see [Chap. 6.4, Views Menu - Alt+V, on p. 52](#))).

5.10 Changing how Device Names are Displayed

Devices can be referred to in several ways:

- A unique identifier (ID) that is used for the internal communication between the equipment and PVGuard Client. However this may not be very meaningful to a user e.g. g120227.
- A name (also referred to as an 'alias') that is initially given to the equipment when PVGuard Client is first configured. This will be more useful to a user e.g. INV_01.
- A customized name (alias) given to the equipment by the users themselves, e.g. EAST_INVERTER, and which will be meaningful on charts and tables.

You can change which of these types of device name is displayed. To do so, click the button: 

- At the top of the *Plant Explorer* - to change those used in the *Plant Explorer*
- In the *View Settings* control at the top right of charts, tables and certain pre-defined views (e.g. the *Map* view). This control is described in [Chap. 5.3, View Settings Menu, on p. 23](#).

The dialog shown in [Fig. 30 on p. 34](#) will open:



Fig. 30 Dialog to *Change how device names are displayed*

Select the desired option:

- Use the custom, user-defined name ([Chap. 5.6.2, Context Menu in the Plant Explorer, on p. 28](#))
- Show the original device alias
- Show the device ID only (may be useful when tracking program issues).

5.11 🖱️ Jump from Data Item to Entry in the *Plant Explorer*

This operation enables you to add further data from a plant to your chart or table quickly and easily without having to search through the full tree of the *Plant Explorer*.

To use it:

1. When viewing a chart or a table, mark a data measurement channel in the *Configuration Table* below the view's chart or table.
2. Click the button above the *Plant Explorer* ([Fig. 9 on p. 19](#)).

The *Plant Explorer* will open at the position of the same measurement channel and mark it. This way, other measurement channels of the same device or plant can be found and drawn into the chart or table fast.

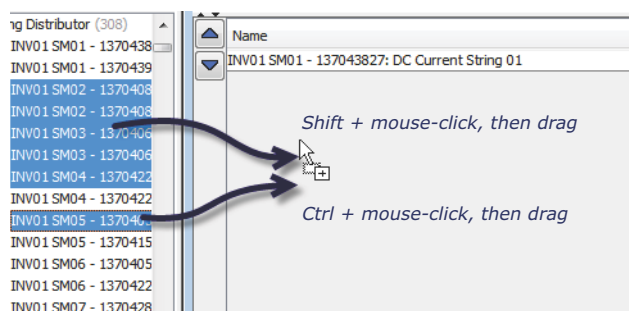
If the function is active and you select an alarm, the measurement channel causing the alarm opens up in the *Plant Explorer*.



The function remains active as long as the button is clicked. This is indicated by the changed colour of the button.

5.12 Multi-Selection

The multi-selection feature is available in the *Configuration Tables* of charts, tables, in the error and device configuration dialogs, in the *Alarms* view as well as in the *Plant Explorer*.



- **Ctrl+mouse click:**
Single, non-adjacent table entries are selected.
 - **Shift+mouse click:**
A series of adjacent table entries are selected.
- Both commands can be used in combination.

Fig. 31 Multiselection for drag & drop of values from the *Plant Explorer* to a *Configuration Table*

5.13 Working in Tables

Tables in Dialogs and Graphic Views

The tables offer you the following navigation and sorting options:

- Use of the *Find* options with **Ctrl+F** from any position in the dialog that contains the table:

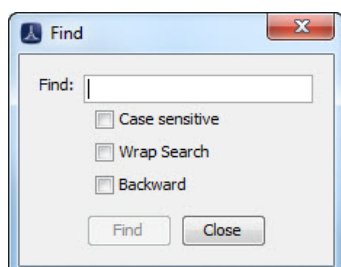



Fig. 32 *Find* dialog in tables

- Where a column of a table contains data that can be displayed in some sort of order, then clicking the header of the column will toggle a sort of the entries in ascending or descending order.

5.14 Filters

In some views that display lists of data, for example *Alarms* and the *Service Log*, the list in the view window might comprise many hundreds of entries. To simplify the use of these lists, a filter function is available allowing you to restrict the data displayed.

The filter function is shown as a small panel at the top of the view and is marked with the symbol .

This panel is initially closed, as shown in [Fig. 33 on p. 35](#) and only the default filter for the view (if any) is applied.

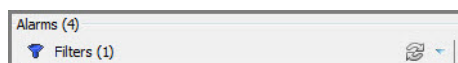


Fig. 33 Filter panel (closed) at the top of the *Alarms* view

Clicking on the filter panel causes it to open, as shown in [Fig. 34 on p. 36](#).

You can now choose to restrict the criteria for the data displayed: select the fields of the data which you want to use for filtering and set them to values you want to use from the choices the list.

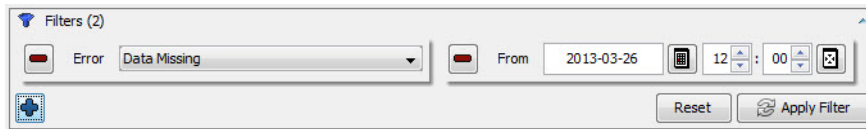


Fig. 34 Filter panel opened showing two filter items set

To use the filter panel:

- Click on the button to add a new criterion to the filter. A drop-down box will appear, showing a list of available fields; select the one you wish and a corresponding selection box will be added to the filter. The example here shows the fields 'Error' and 'From' being used for filtering the Alarms list.
- If you wish to remove a filter criterion, press the button at the side of the corresponding field.
- When you have completed your selection of how you want to filter the data, press the *Apply Filter* button and the view will be refreshed, showing only the filtered data.
- If you wish to remove all the filters you have set up, press *Reset* at the bottom of the panel. This will restore the filter to its original state.
- Clicking on the refresh symbol, , will reapply the filter settings again to the current data.

The filters are additive, so each filtered field you add to the filter list further restricts the displayed data (i.e. the filter is applied for field1 AND field2). It is only possible to filter on one value for each filter field type.

5.15 Exporting List Data

When dealing with *Alarms* or *Service Log* entries, you may wish to export the data from PVGuard Client into another format so that you can use it with another program - either just to view it or to process the data further. This is supported by the Export function. To export the data from the list, click the Export button and the *Export Preview* dialog will pop up.

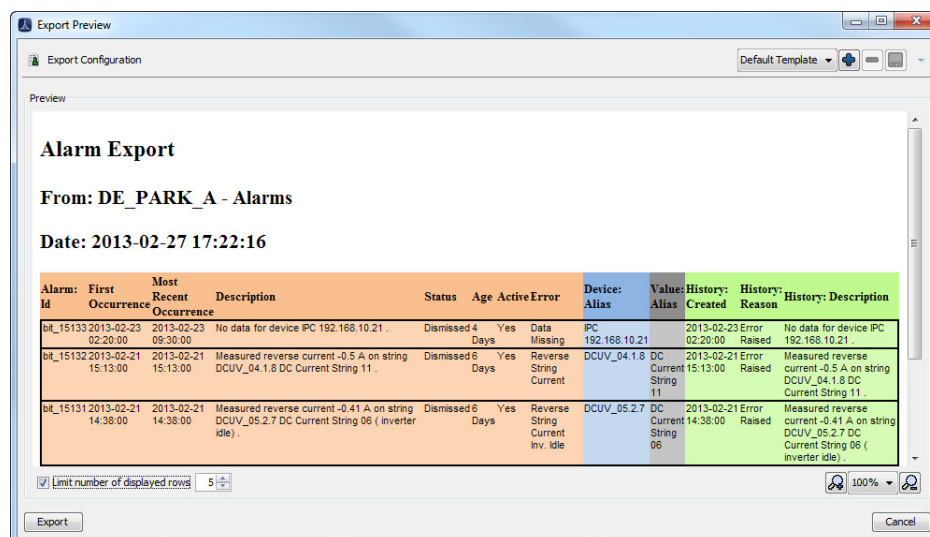


Fig. 35 Export Preview dialog

At the top of the *Export Preview* dialog you can configure what data is to be exported, and the column order/titles for the exported columns (see Fig. 35 on p. 36). If you perform a particular export regularly, you can save its configuration in a *Profile*; this is set at the top right of the dialog. Alternatively you can call up a previously saved export profile (see Chap. 5.15.2, *Export Profiles*, on p. 38).

Under the export configuration area of the dialog there is a preview pane showing how the data to be exported will actually appear. You can alter how the preview itself is shown at the bottom of the preview pane - how many rows of data are displayed and how the preview image is scaled.

5.15.1 Configuring the Data to be Exported

If you click on the Export Configuration label at the top left of the Export Preview dialog, the configuration area will expand as shown in [Fig. 36 on p. 37](#). The right hand side lists the fields already included in the export; on the left hand side, there is a list of the remaining fields available for export.

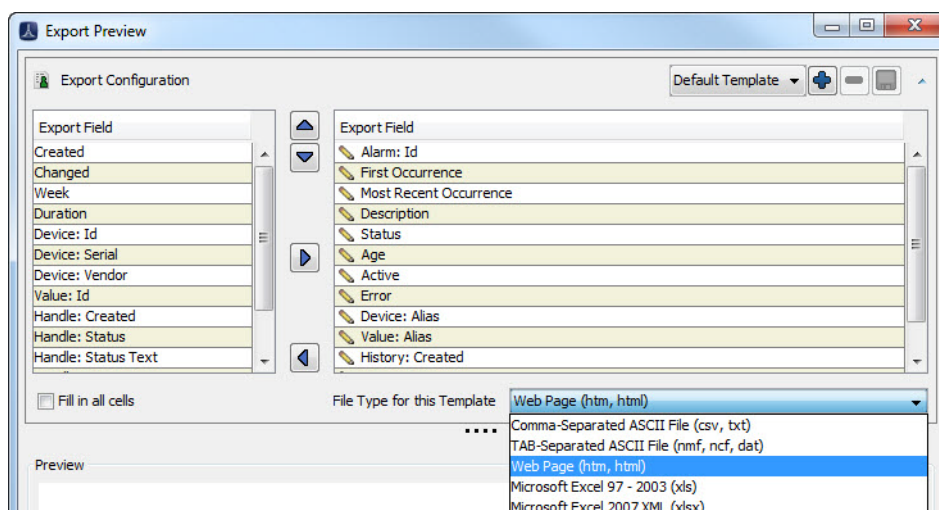


Fig. 36 Configuring which data fields to export

In the configuration pane you can:

- Add or remove fields from the export list. Either drag-and-drop them between the two panes or click the right/left pointing arrows: ◀ ▶.
- Change the order of exported data. Either drag-and-drop the fields vertically in the right hand pane, or select a row and move it higher/lower by clicking on the up/down pointing arrows: ▼ ▲.
- Rename the title of a data column in the exported list. Click the pencil symbol on one of the rows in the right hand pane edit the row name.

If the box *Fill in all cells* is ticked then the data for the output will be always exported. If this box is left blank and two or more rows of data have the same data in certain cells, then the data will only be included in the export for the top row of cells, and will be left blank for the remaining rows.

The first method (box ticked) is usually preferable when exporting the data for processing by another program. The second format (box left blank) is usually easier for reports that are meant for people. [Fig. 37 on p. 38](#) shows the difference between the two export formats.

Include repeated data is ticked

Subject	Category	Note
Service Log Entry 1	Category1	This is note 1 in log entry 1
Service Log Entry 1	Category1	This is note 2 in log entry 1
Service Log Entry 1	Category1	This is note 3 in log entry 1
Service Log Entry 2	Category2	This is note 1 in log entry 2
Service Log Entry 2	Category2	This is note 2 in log entry 2

Include repeated data is blank

Subject	Category	Note
Service Log Entry 1	Category1	This is note 1 in log entry 1
		This is note 2 in log entry 1
		This is note 3 in log entry 1
Service Log Entry 2	Category2	This is note 1 in log entry 2
		This is note 2 in log entry 2




Fig. 37 The difference in exported data when repeated rows are included or not

The selection box *File Type for this Profile* allows you to set the format of the output file, according to either generally recognised formats (.csv etc.) or program formats (e.g. Microsoft Excel).

Finally, click *Export* to save the exported data.

5.15.2 Export Profiles

Having set up a configuration, you can save it as a *Profile* on your local PC so that you can easily recall it.

- To save the current export settings under a profile name by clicking the plus symbol  at the top right of the dialog. You will be prompted to enter a name for the profile.
- You can open a previously saved profile by selecting its name in the selection box.
- Use the minus symbol  to remove the currently selected profile from the list.
- Clicking the save symbol  will save any changes you have made to the currently opened profile.

5.16 Saved Views

PVGuard Client allows you to save any views that you create or adapt from the pre-defined ones, so that you can easily customise them to meet your specific needs.

5.16.1 Saving Views

In the *View Navigator*, there are sub-directories named *Saved Views* under each plant folder. These are used to store the tables and charts you have set up for your own plant.

In addition, there is a further *Saved Views* directory that appears at the bottom of the tree when you save a chart or table that isn't associated with any specific plant, which is used for those tables and charts that hold data from several different plants.

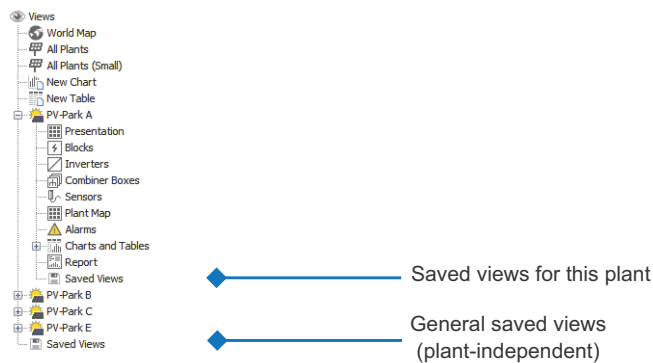




Fig. 38 Directories for Saved Views in the View Navigator

Charts are saved with the icon  and tables with . To save a view, follow the steps below:

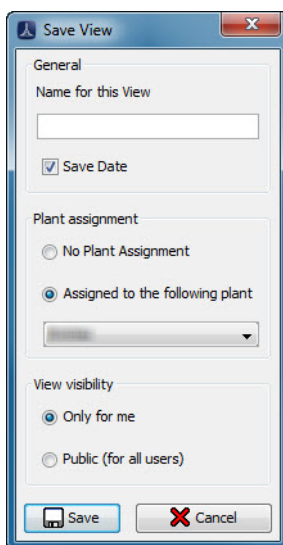



Fig. 39 Save View dialog

1. Select **Save as**. The dialog *Save View* will open (see [Fig. 38 on p. 39](#)).
2. Enter a name (or the new name when saving an existing view under a new name) into the text field *Name for this View*.
3. Tick the box *Save Date* if the measurement data in the view when it is re-opened should always be that as shown in the view at present. If you leave the box unchecked, on re-opening the data will be refreshed to the current date.
4. Select *No Plant Assignment* to save the view in the main folder of the *View Navigator*. Select *Assigned to the Following Plant* to save the view in the *Saved Views* folder of the plant you select from the list below.
5. Select in *View Visibility* field whether if you would like to make the view visible for all users (*Public, for all users*) or just for yourself (*Only for me*).

Once you have first saved a view, the **Save** command is used to save any changes to it. **Save as** can be used to save it under a new name, under a different plant folder, or with a different visibility.


5.16.2 Opening Saved Views

To open a saved view:

- Left click on the desired view in the *View Navigator* or
- Right click the desired view in the *Saved Views* directory and select **Open**  in the context menu.

5.16.3 Renaming Saved Views


To rename a saved view, follow the steps below:

1. Right click the view to be renamed in the *Saved Views* directory.
2. Select  *Rename* in the context menu. The *New Name* dialog will appear.
3. Type in the new name for the view.
4. Click *Ok* to confirm your action.

The view will appear in the *Saved Views* directory with its new name.

5.16.4 Deleting Saved Views

To delete a saved view, follow the steps below:

1. Right click the view to be deleted in the *Saved Views* directory.
2. Select  *Delete selected resource* in the context menu.

The view will disappear from the *Saved Views* directory.

5.17 Missing Device Data

Should PVGuard Client be missing data, then the following symbols will be shown in place of the indicator or data:



Blue travelling squares:

The program has requested plant data and is waiting for a reply from the plant.

Fig. 40 No data for a sensor, no reply received yet



Grey prohibited sign:

The program has requested plant data, however received a negative reply. This could mean there is no data, you do not have permission to see the data, or there is no connection to the data server.

Fig. 41 No data for a sensor, negative reply from plant

6 The GUI Menu



The menu commands are also available in the toolbars in the chart and table views and as keyboard short-cuts. The headings of the subsequent chapters contain all three command options (see also [Appendix III, Command Reference on p. 125](#)).

6.1 File Menu - Alt+F

This menu contains commands to save any open views and to exit the program.



File/Save (Charts and Tables) - Ctrl+S

As soon as you have opened a chart or table that had been previously saved with the *Save as* command, then the *Save* command becomes available to save any further changes to it under the same name. See also [Chap. 5.16, Saved Views, on p. 38](#).



File/Save as (Charts and Tables) - Ctrl+A

Select this command to save a chart or table view and to assign a name to it. The new name will be displayed in the title bar of the view. The saved view is stored in the *Saved Views* directory of the *View Navigator* and remains there until you explicitly delete it. See [Chap. 5.16, Saved Views, on p. 38](#).



File/Export (Charts, Tables, Map View) - Ctrl+E

A full view or a zoomed extract of a view can be exported with this command either as a table or as a graphic. The export file formats supported are:

- Pre-defined graphical views:
 - as a graphics file to *.png, *.gif, *.jpg *.bmp
 - as a document to *.pdf
- Charts:
 - as a graphics file to *.png, or
 - as a document to *.pdf
 - as formatted graphics to *.svg (vector format)
- Data from charts:
 - as *.htm or *.html
 - as a text file to *.csv, *.txt, *.nmf, *.ncf or *.dat
- Tables:
 - as *.htm or *.html
 - as a text file to *.csv, *.txt, *.nmf, *.ncf or *.dat

The export file contains the date that was set in the view prior when the export function was run.

On selecting the export command, the dialog *Exported Files* opens. For details, see [Chap. 6.4, Views Menu - Alt+V, on p. 52](#).



File/Print - Ctrl+P

Use this command to print out either the complete view or a zoomed detail from it. The output will contain the date that was set in the view when the print function was run. Views can be printed on a printer connected to your PC.



Close - Ctrl+F4

The current view is closed.

File/Exit - Alt+F4

Use this command to exit PVGuard Client.

6.2 Connection Menu - Alt+C

This menu contains the commands you need to define the connection settings as well as to connect with, and disconnect from the monitoring system.

Connection/Connect - Alt+L

Prior to working with PVGuard Client, you need to set up a connection to the monitoring system. To do this use the command *Connect* which opens the dialog *Connect*:

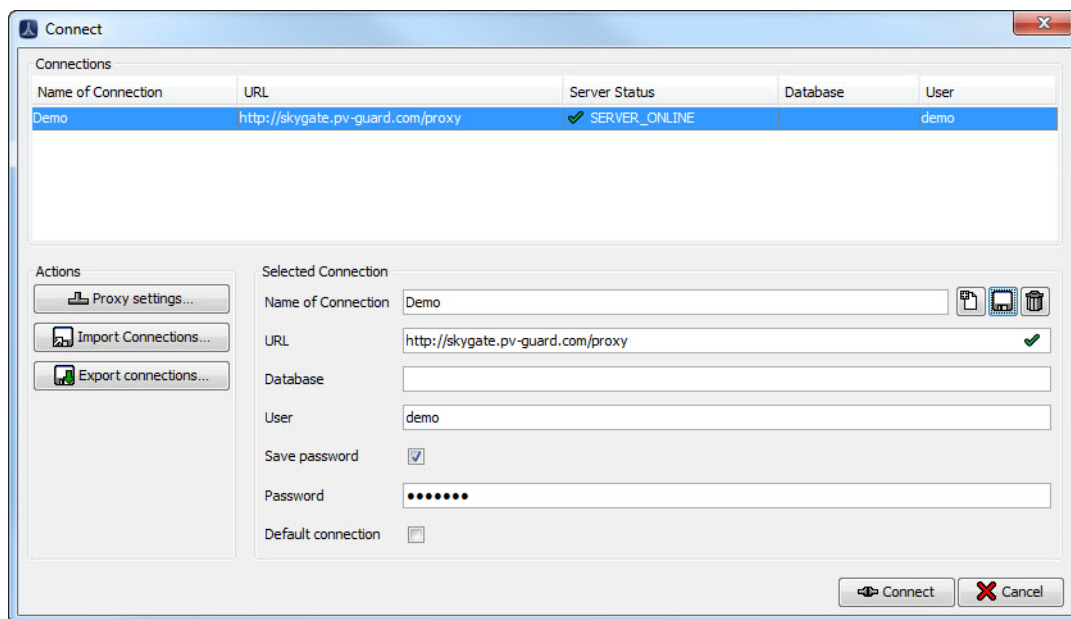


Fig. 42 Connect dialog

The panel *Connections* lists the names of all saved connections. You can select the desired connection from this list without having to re-enter the connection data.

- The *Connections* table can be sorted in the ascending or descending order of any of its columns by clicking on the header of a column.
- You can use the short-cut **Ctrl+F** at any time when your mouse is over the dialog to find a word in the *Connections* table (see [Chap. 5.13, Working in Tables, on p. 35](#)).
- By clicking on any cell in the table and then entering a letter will cause the selection to navigate to the first entry starting with the letter in that column.

Creating a New Connection

To create a new connection, enter the following information as delivered by skytron into the input fields of the dialog *Connect*.

- *Name of Connection* - individual, unique name of the connection
- *URL* - address of the data server
- *Database* - name of the database, if provided
- *User* - name of the user
- *Save Password*
Activate this option box to enter a password now; it will be saved and used whenever you try to reopen the program. Otherwise you will be prompted later for the password.
- *Password* - password for the connection

- *Default Connection*
Activate this option box if you would like to have this connection re-established automatically upon restart of the program.

Save the connection you have just defined.



We recommend that, where possible, you use a secure connection, whose URL starts with https (not http). This allows all the data to be transferred over the internet in a secure manner (using SSL or TLS technologies).

Sometimes the use of an https connection can give rise to problems, for example if it is not supported by your organisation's proxy servers; in this case an http connection can also be used. In rare cases secure connections can also appear to be a little slower, although this should not be noticeable if your computer meets the requirements defined in [Chap. 3.1, System Requirements, on p. 11](#).

You can always see whether a secure connection is being used by the padlock in the connection box of the status bar - see [Chap. 5.1, Status Bar, on p. 20](#).



Saving this Connection

Click this button to save the connection data entered before as connection. Assign the new connection a unique name. This name will appear in the *Connections* field on the left hand side of the dialog.



Any already existing connection with the same name will be overwritten without prompting.



Deleting a Connection

To delete a connection, select it in the *Connections* field and click this button. You will be prompted to confirm the deletion.



Connecting and Cancelling

Click *Connect* or press [Enter](#) to connect to the monitoring system; the *Connect* dialog will close.

Alternatively, double clicking a connection in the table of the *Connect* dialog or clicking the button in the status bar of the main display will select and connect to another saved connection ([Chap. 5.1, Status Bar, on p. 20](#)).



Import Connections...

Click this button to load saved or pre-defined connection data into PVGuard Client. The *Import Connections* dialog will open. Follow the steps below:

1. Browse for a connections file **.conn* or **.xml* and select it.
2. Click *Open*.
The dialog *Select Connections to Import* will open. It contains a table with connection data.
3. If you are importing a PVGuard Connection File (**.conn*) file, this will have been secured using a password. You will be prompted for the password.
4. Check the connection(s) you would like to import in the column *Import*.
 - Alternatively, click the *All* button above the list if you want to import all connections listed.
 - Or click the *None* button if you want to deselect all checked connections and start selecting again.

5. Check the option box *Append to configuration file* if you want the current configuration file to be extended by the connections selected.
 - Alternatively, leave this option box unchecked. The current connections will be replaced by the new selection of connections.
6. Click *Ok* to quit the confirmation dialog.

Export Connections...

Click this button to export connections from PVGuard Client.

Connections are stored in a PVGuard Connection File (.conn) format. This file is secured with a password. When exporting the data you will be first prompted to enter this password, which should contain more than 5 characters; any standard keyboard characters can be used.



Make sure you keep the password in a secure, yet accessible place. Without it you won't be able to open the file again.

Proxy Settings...

In most larger organisations, connections to the internet are made through a proxy server. In this case the correct settings must be given to PVGuard Client. Click this button to open the dialog *Proxy Settings* where you can define and modify these settings.

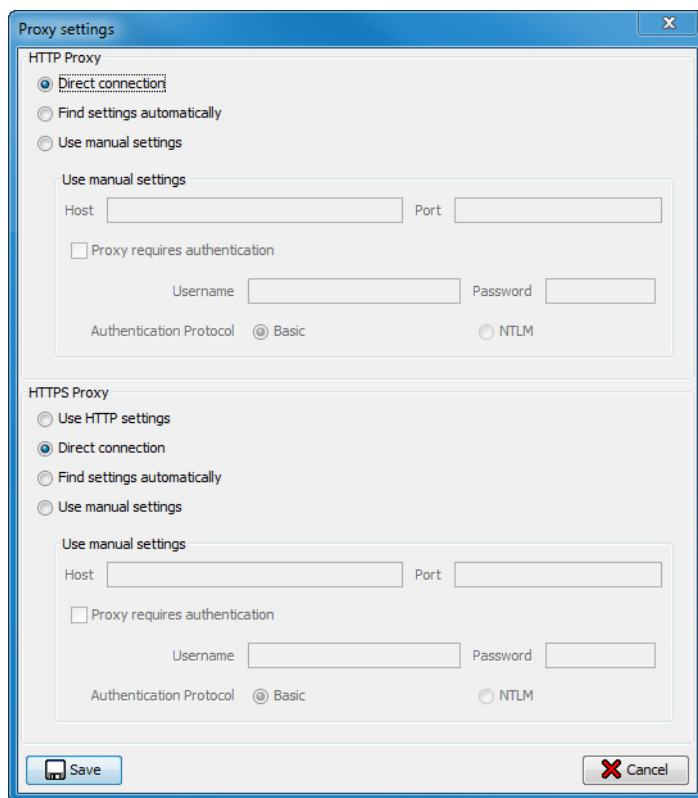


Fig. 43 Proxy Settings

The dialog has sections for http and secure, https connections:

- **HTTP Proxy** - These are the proxy settings for non-secured connections.
 - *Direct connection*
Select this option if you have a direct connection to the internet and do not use a proxy server.
 - *Find settings automatically*
Activate this option to have PVGuard Client use the proxy settings that are being used for other programs on your computer.
 - *Use manual settings*
Here you must manually enter the *Host* name and *Port* of the HTTP proxy to be used. Should the proxy server require authentication details, you can enter the corresponding values in the fields *Username*, *Password* and *Authentication Protocol*.
- **HTTPS Proxy** - These are the settings for secure settings using https.
 - *Use HTTP settings*
Activate this option to have PVGuard Client use the same proxy settings for secure and non-secured connections, for example the *Host* and *Port*.
 - The other entries function as described above for an HTTP proxy server.




If in doubt or you have problems making a connection, consult your organisation's computer systems administrator.



Saving Proxy Settings and Cancelling

Click **Save** or press **Enter** to take over the Proxy settings and return to the *Connect* dialog. To abort your settings, click *Cancel*.

Connection/Disconnect - Ctrl+Q

Click this button to disconnect the current connection to the monitoring system. No data is transferred to PVGuard Client anymore. To re-connect with the monitoring system, select  **Connections/Connect** - **Alt+L**.

6.3 Configuration Menu - Alt+O

This menu contains commands that help you configure PVGuard Client.

6.3.1 Client Configuration - Alt+U

Open the dialog using the menu command *Configuration/Client Configuration* or by pressing **Alt+U**.

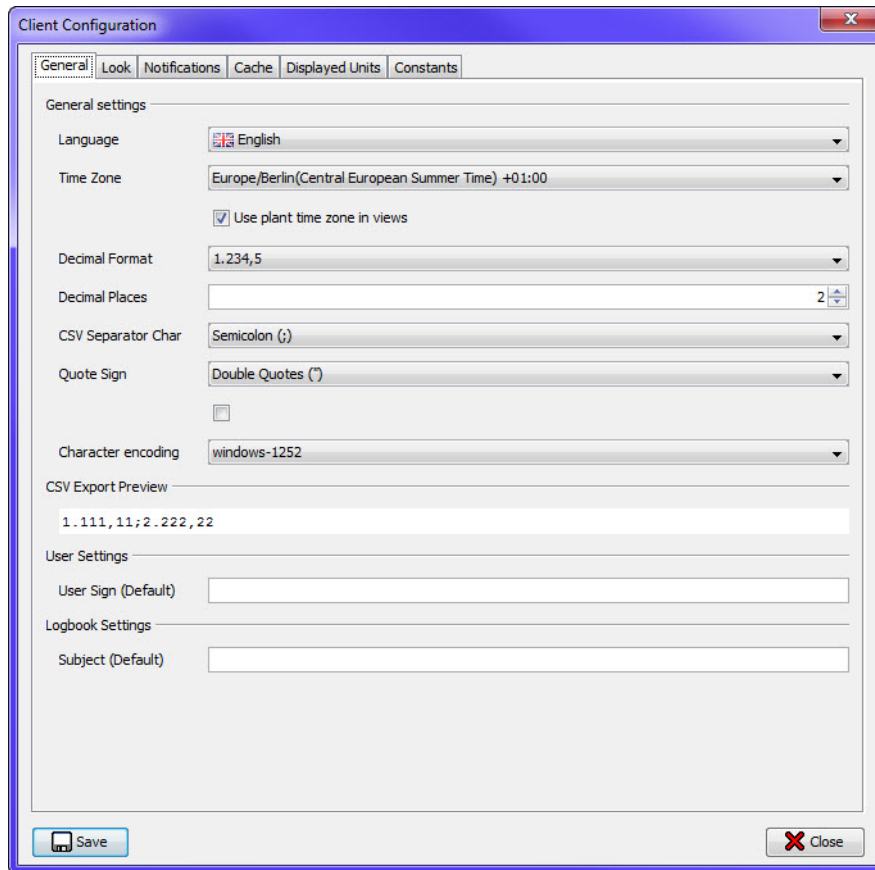


Fig. 44 Client Configuration

6.3.1.1 Tab: General

Language

Select the language you would like PVGuard Client to use from the *Language* list. The default is *English*.

Alternatively, you can change the language for your current log-in session by clicking the *Flag* button in the status bar ([Chap. 5.1, Status Bar, on p. 20](#)). A flag menu will open where you can change the language setting to that desired.



The language selected here is stored in the program settings and is used for future sessions; changing the language using the status bar only affects the current session.

Time Zone

Select which time zone from the *Time Zone* list is to be used for representing the data in the program. This will usually be your local time or UTC. For the current session, the default value can also be changed on the Status Bar (see [Chap. 5.1, Status Bar, on p. 20](#)).

In addition, you can set here whether the times shown in views, on the axes of charts or in tables are to use the program time zone, set here, or the plant time zone. Set the checkbox *Use plant time zone in views* accordingly.

Decimal Format

Select the characters you use for the decimal separator and thousands separator characters from this list.

Decimal Places

Choose the desired number of decimal places to be used in the range of 1-10. This applies both to the data shown in tables and that exported in CSV files. The setting is effective only after you restart PVGuard Client.

CSV Character Separator

If you export data in CSV format, the character chosen from the list under *CSV Character Separator* will be used to separate the data fields:

- Semicolon (;)
- Space ()
- Comma (,) - only allowed if the decimal separator character is a point

Default: *Semicolon (;)*.

User Quotes

- Activate this check box if you would like to put the values in quotes when exporting the data in CSV format.



You can only select comma as both a decimal separator and a CSV separator if you use quotes for the CSV export. If you select *Space* as CSV separator, quotes are set automatically.

Character Encoding

When you export data into a CSV file, the characters will be stored in a particular character encoding format. The best format depends on the language you are using - for example the US-ASCII format is often adequate for data in the English speaking world but cannot handle the accents used in many European languages. UTF-8 is an international standard that can handle most character sets. The best choice will also depend on which program you want to use to read the exported data.



Your computer systems administrator will be able to advise you about the best format.

CSV Export Preview

Here, you can see an example of how the data exported into a CSV file will look - with the selected number of decimal digits, the CSV separator character, quotes etc.

User settings

These settings allow you to:

- Set the default value that will be used for the *User Sign* field in various dialogs (for example in the Service log, see [Chap. 11.2, Editing the Log, on p. 99](#)).

Logbook Settings

- Specify a default text string that will be inserted in the *Subject* field of a new service-log entry.



Note that various place holder strings are available for this field; these will be replaced by corresponding values when the entry is actually created, for example to insert the current date. The available place holder values are shown in the tooltip for the field (i.e. hold the mouse over the field).

6.3.1.2 Tab: Look

Look and Feel

Select your preferred design for the program appearance from the list field.

Restore Window Arrangement

Activate this option if you want the previously saved window arrangement, as saved with the command *Save Window Layout* ([Views/Save Window Layout - Ctrl+Shift+S in 6.3.1.6, Tab: Constants, on p. 52](#)), to be restored after establishing a new connection.

Hierarchic plant representation

This is only relevant in cases where several plants feed into the grid through a single grid connection point. In this case, the individual plants can be logically organized by skytron to show them under a single node in the View Navigator and Plant Explorer. Alternatively, they will be shown as several discrete, separate plants. In these cases, the way in which the plants are shown can be set using this check-box.

Calculate Color of Alarm Indicators by



Alarms (10/85)

The colours of the triangular summary alarm indicators on many of the pre-defined views are determined by the individual states of a number of different alarms. This option allows you to set whether all alarms should be included in this calculation, or only those where the underlying error condition is still active. See also [Chap. 10, Alarms, on p. 89](#).

Displayed Alarm Count

The summary alarm indicators are displayed with a count of the number of discrete alarms that have been included in the calculation. The option here allows you to configure how the count is shown:

- all alarms are included, irrespective of the state of the underlying error
- only active alarms are included, where the error is still present
- both figures are given in the format (Active/All).

See also [Chap. 10, Alarms, on p. 89](#).

6.3.1.3 Tab: Notifications

This tab allows you to configure the notifications displayed with a new or acknowledged alarm or on the completion of an export action. For alarm notifications the *Alarms* view must be open.

Notification Event

Select from the list the notification type to be configured here. The options are:

- *Export Successful*
- *New Alarm*
- *Dismissed Alarm*
- *Default Notification*

Notification Type

Define in this group the action for the notification chosen above. The options are:

- No notifications are displayed - *None*
- The alarm or export is acknowledged by a dialog - *Dialog*
- A popup message is displayed - *Popup*
If you select this option, the *Popup Settings* below will be enabled.

Popup Settings

(These options are only enabled if the Notification Type is set to *Popup*).

Select the *Display Time (ms)* from the list within the value range 1.000-60.000 ms.

Activate the option box *Use Fade Effect* if you wish this effect.

Select the *Duration of Fade Effect (ms)* from the list within the value range 100-1,000 ms.

Activate the option box *Use Slide Effect* if you wish this effect.

Select the *Duration of Slide Effect (ms)* from the list within the value range 100-1,000 ms

Sound Settings

Here, you can define any audible warnings corresponding to the chosen notification. The options are:

- No sound at all - *No Sound*
- The default sound - *Default Sound*
- The system sound - *System Sound*
- An individual sound of your choice - *From File*
If you have selected this option, a file-selection dialog will open so that you can select the desired sound file; it must be in the *.wav format.

Test Notification

Click this button to test the notification defined before.

6.3.1.4 Tab: Cache

The cache is a data storage area in your PC that is used to store data you have queried from the skytron data sever. Both RAM memory and a file on the hard disk are used. Using the cache can result in significant speed improvements. In this tab you can configure whether the cache is used and how big it can grow. The sizes quoted refer to the size of the cache file used on the hard disk.

Cache Size

The current size of cache used on your PC is displayed at the top of the tab.

Clear Cache

Click this button to delete the contents of the cache memory. This is an advisable first step if you think the results being shown are suspect. Clearing the cache has no adverse effect except that initially the data display will be slower, since all data has to be re-fetched from the server.

Cache Enabled

Activate this option to cache plant, device, and measurement channel data. This will reduce data processing time.

Maximum Cache Size

Adjust the maximum size of the cache file (range 1 GB to 3 GB) using the slider. When the cache reaches this size, the oldest contents will be deleted automatically.

6.3.1.5 Tab: Displayed Units

This tab allows you to set the default units that are used in the PVGuard program to display logged values. Here, in certain cases, different defaults can be applied depending on the area of a plant the data relates too. So, for example, units of MWh might be selected for energy at a plant level, but kWh might be more appropriate for energy at an inverter level. See [Fig. 45 on p. 50](#).

The levels available include: Plant, Block and Inverter.

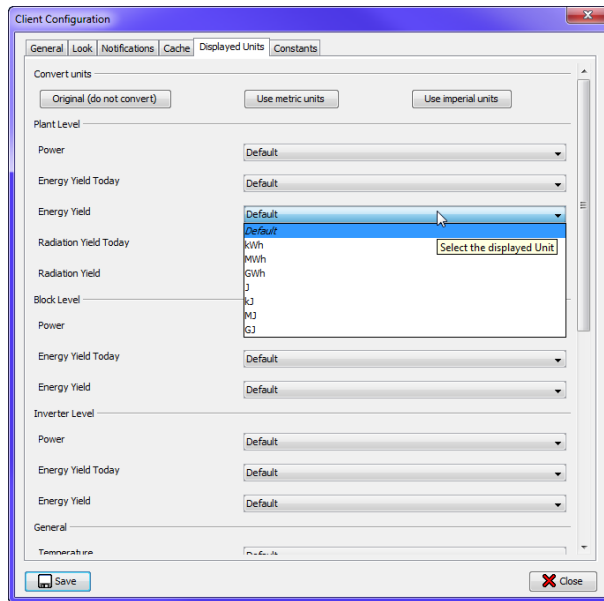


Fig. 45 Client Configuration: Displayed Units

The settings entered in this dialog will then be used as:

- The units at the corresponding level in pre-defined plant views.
- The initial units in charts and tables. Here, however these default units or multipliers can be changed in the Configuration Table at the bottom of the chart or table as described in [Chap. 8.2.2, Configuration Tables, on p. 83](#).

One major use of this feature is when changing the displayed units between metric and imperial units. In addition, to simplify this, two buttons are available at the top of the tab: *Use metric units* and *Use imperial units*.

Clicking either of these will act as a short cut and make suitable changes to the values below; for example, the units for temperature units will be set to Centigrade or Fahrenheit, and for area to m² or ft². Following the initial conversion, you can fine-tune the settings manually in the table.

If you click the button *Original (do not convert)*, then the units will revert to their original values. These depend on the source of the data channel:

- In cases where the data comes directly from the equipment itself, then the units in which that data is delivered from the equipment will be used.
- Where the data is a derived data channel, calculated by PVGuard, then the usual default for those units in PVGuard will be used.

6.3.1.6 Tab: Constants

The *Pollutants* table contains the constants which are used as the basis for calculating CO₂ and NO_x emissions that are avoided when a given amount of energy is produced using solar energy rather than by burning fossil fuels. The results, *Avoided emissions*, are displayed in the *Presentation* view ([Chap. 7.5.1, Presentation, on p. 63](#)) of each monitored PV power plant. They are calculated by the following formula:

$$E \text{ in [MWh]} \times f = M \text{ in [t]}$$

E= Energy

f = Constant

M= Mass of the respective resource

The contents can be edited here; to edit one of the constants, click in the number field and type in the new value.

6.3.2 Saving the Client Configuration and Cancelling

Click *Save* or press **Ctrl+S** to save your settings. To abort the configuration, click *Cancel*.

6.3.3 Import Configuration File - **Ctrl+I**

Importing settings using a configuration file reduces the amount of customization for PVGuard Client to a few mouse clicks. The configuration file contains the following settings:

- GUI language set in the dialog *Client Configuration*
- Time zone
- Number of digits after decimal separator
- Decimal separator
- CVS export settings: CVS separator, quotes/no quotes
- Look and feel
- Whether automatic restoration of window layout has been activated or not
- The way in which device names are displayed
- Whether the date is exported with diagrams or not
- Configuration of the tables in the *Alarms* view
- Maximum cache size on hard disk
- The pollutant constants used in calculating avoided emissions
- Configuration of the alarm notification settings

To import a configuration file, follow the steps below:

1. Select the import function through the menu or with **Ctrl+I**. The *Import Configuration File* window will open.
2. Browse for the *.xml configuration file and select it.
3. Click *Open*.
4. Confirm the warning saying that the present file will be overwritten.
 - Or click *Cancel* to abort the import.
5. Click *Ok* to confirm the successful import.

The configuration loaded into PVGuard Client through this action becomes effective immediately.

6.3.4 Export Configuration File - **Ctrl+Alt+E**

Exporting a configuration file can simplify the customization of PVGuard Client on another PC. The contents of the file are described in [Chap. 6.3.3, Import Configuration File - Ctrl+I, on p. 51](#). To export a configuration file, follow the steps below:

1. Select the command through the menu or with **Ctrl+Alt+E**. The *Export Configuration File* window will open.
2. Browse for the path to store the *.xml configuration file.
3. Assign a file name. The file extension *.xml will be added automatically.
4. Click *Save*.
5. Click *Ok* to confirm the successful export.

The exported configuration file is now available for importing into a version of PVGuard Client running on another computer.



skytron recommends that you re-export the configuration file if you upgrade to a new version of PVGuard Client (instead of using the configuration files of older program versions).

6.4 Views Menu - Alt+V

This menu contains commands to arrange open views on the screen.

All views selected in the views lie on top of each other. The view selected last lies on top of all open views. Views remain open until you close them explicitly. You can open the Views menu with the command Alt+V.

Views/Tile Views - Alt+Y



This command arranges all open views in tiled mode.

Views/Cascade Views - Alt+C

This command arranges all open views in cascaded mode.

Views/Save Window Layout - Ctrl+Shift+S

Select this command to have PVGuard Client remember the state of all open views as well as their arrangement on the screen, and then restore them again after you restart the program. This function is available only if you have previously activated the option *Restore Window Arrangement* in the *Configurations* dialog ([Tab: Notifications in 6.3.1, Client Configuration - Alt+U, on p. 48](#)). The following view settings will be restored:





- Any manually defined data-refresh interval for the view
- Whether the automatic refresh is *on* or *off*
- Whether normalized or real data values are displayed (i.e state of  button)
- Whether device aliases are displayed or your own device names (i.e state of  **view setting**)
- Whether the filter panel (Alarms, Service Log) is expanded or collapsed (see [Chap. 5.14, Filters, on p. 35](#))
- Whether the calendar panel is open in the Service Log, and its size settings (see [The Calendar in , on p. 97](#))

If you have no views open when you use this command, then the program will restart with no open views.

Views/Detach Current View - Alt+Shift+D

Select this command to detach the current or a selected view from a cascade or tile array, bring it to the top and display it in an own window. You can move this window to the second monitor as well if two monitors are connected to your PC.

A detached view is provided with an own menu that contains the following commands:

- *File* menu (see also [Chap. 6.1, File Menu - Alt+F, on p. 41](#))
 -  Export - Ctrl+E
 -  Print - Ctrl+P
 -  Close - Ctrl+F4
- *Views*
 -  Reattach View - Alt+Shift+D

Views/Show view in full screen mode - F11

Use this command to expand the current view to fill the monitor screen, for example, as a plant status screen or presentation display. To quit full screen mode, use *Esc* or *F11*.

Views/Capture snapshot

This convenience function creates a snapshot of the PV Guard program window, which is saved as a "pdf" document in the user's directory. This can be used to record a particular incident and as a means of sharing the information with other parties. (Some pdf reader programs also allow the annotation of pdf documents with comments.)

Views/Close All Views - Ctrl+Shift+W

Select this command to close all open views at once.

Exported Files

This command opens a dialog of the same name. It contains links to all files exported during the current program session, together with the date, time and status of the export process.

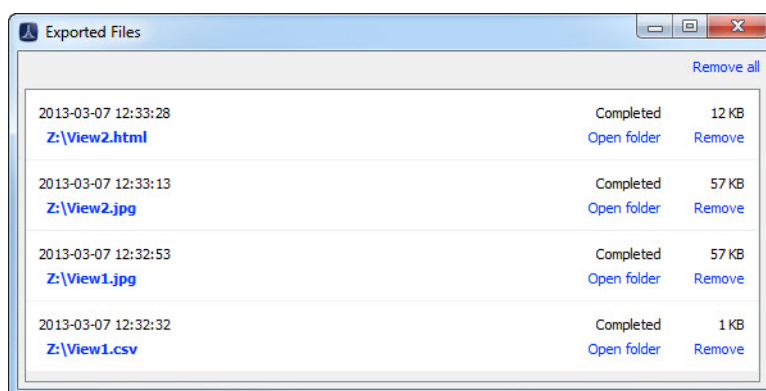


Fig. 46 Exported files

Actions

- Click a link - opens an exported file
- Click the link *Open folder* - opens the folder that contains the exported file
- Click *Remove* - removes the links of an exported file from the dialog (the exported file itself is not deleted)
- Click *Remove all* - empties the dialog (the exported files are unaffected)

To close the dialog, click the cross in the upper right corner.

Open PVGuard® Cloud Browser...

The skytron Cloud Browser allows you to store data such as images that are associated with PVGuard on the skytron servers - "in the Cloud". Currently the functionality is restricted to the uploading of images required for Dashboards and the Dashboard Designer; however in the future its functionality will be extended to include other data for PVGuard.

The browser will open as shown in Fig. 47 on p. 54. Here, the left-hand pane allows you to see the different categories of images or other data, and the pane on the right shows you a preview of the data items that have already been uploaded.

If you click on the Root folder, "/", you will see all items that have been uploaded. The subfolders show you a filtered view depending on whether you uploaded the data ("My Pictures") or whether the items were published by skytron for all users: this will be shown in the sub-folder "Picture Library".

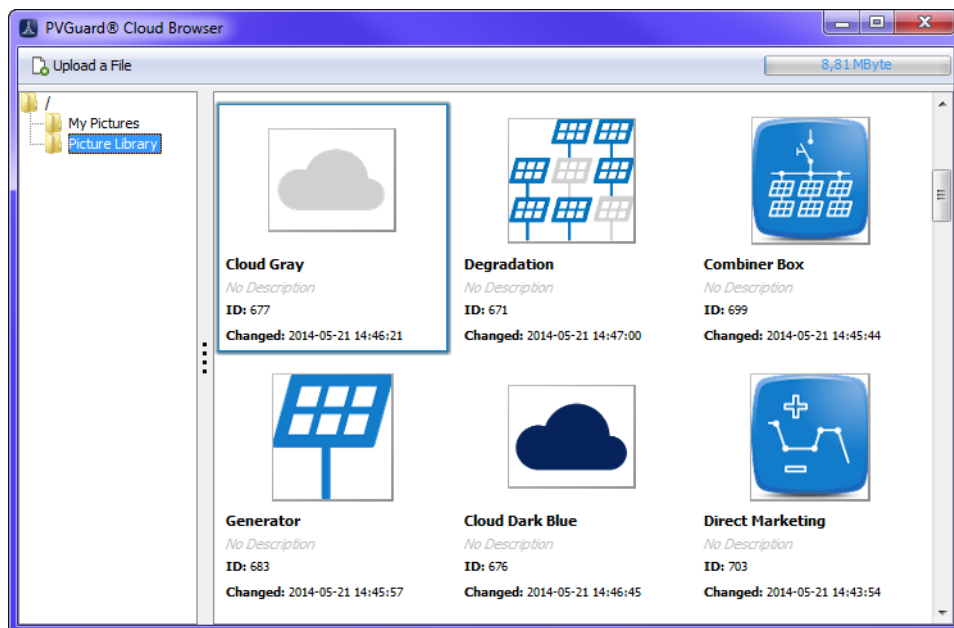


Fig. 47 Cloud Browser

Open Dashboard Designer...

This command will open the PVGuard Dashboard Designer, described in a separate manual.

6.5 Help Menu - Alt+H

The *Help* menu contains three commands to access program information and repair PVGuard Client.

6.5.1 Help - F1

Use this command to display the *PVGuard Client User Manual* in PDF format according to the language set in the GUI (currently German or English available). The manual will open in your PC's browser.

6.5.2 Troubleshooting/ Repair PVGuard Client

This command deletes all Cache memories, disconnects the current connection and restarts PVGuard Client.



You should only use this command in exceptional circumstances, for example if:

- Views do not open or display properly
- The names of devices or data points are not displayed properly

6.5.3 About - Alt+A

Use this command to open a window that displays the following information:

- Product name and version number of PVGuard Client
- Copyright information
- Registered trademarks of skytron® energy GmbH
- Information about third-party program libraries used by PVGuard Client together with their license and copyright details

- *System Information*
A button that displays of information that is useful for skytron's service department should you experience a system problem.

7 View Descriptions

7.1 Introduction

PVGuard Client offers pre-defined and customisable views for visualising plant and environmental data. The following pre-defined views are available:

- Global views of all plants monitored
- Views for each plant

Both view groups contain:

- Graphical views
- Geographical views
- Table views
- Chart views

Graphical views display among other specific items the following elements/data:

Performance Index and Performance Ratio

The Performance Index is an intra-day version of the Performance Ratio calculation. It describes the relationship between yield actually achieved and the yield that should be achievable by a particular plant, taking into account the solar irradiation. It forms a measure of the plant's performance at a particular point in time. The calculation requires actual solar irradiation data obtained from radiation sensors at the site.

Whereas Performance Ratio should be based on data averaged over at least a day's measurements, the Performance Index uses the values measured over the last 20 minutes. It can be calculated for the whole plant or for individual components of it.

Power/Load

This value, a percentage, is calculated as the ratio of the actual AC power at the present moment to the rated AC power of the inverter. The black needle in the indicator indicates the rated AC power while the grey needle indicates the installed DC generator power. If the instantaneous power exceeds the rated AC power of the inverter, or is >100%, the colour of the bar changes from this point of the scale, meaning that the plant is operating above its AC power rating (see [Fig. 48 on p. 57](#)).

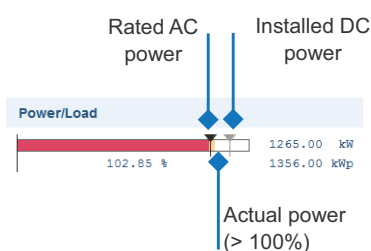


Fig. 48 Power/Load indicator, showing output greater than rated power of inverter

Indicators for Monitored Devices

The colour of these indicators shows the operational/error states of the corresponding device. The colours are:

Background colour	Alarm status	Colour of status LED	Operational state
Grey	There is no alarm for the device	Yellow	Off, waiting
Yellow	There is an alarm for the device	Green	On, MPP
Orange	There is an alarm for the device	Red	Error that will trigger an alarm if still present after a defined period of time
Red	There is an alarm for the device		

Table 2 Operation states (left) and error states (right) in the views




Fig. 49 Indicator for an inverter in the plant map: operational state = waiting (yellow); alarm state = alarm with severity red

Table 4 on p. 91 shows the alarm severity scale and their corresponding colour assignments.



The names of the operational states depend on the devices. For more details, see the corresponding manufacturers' documentation.

7.2 World Map

The world map shows the locations of the monitored plants  and the time bar (Chap. 5.2, Time Bar, on p. 21).

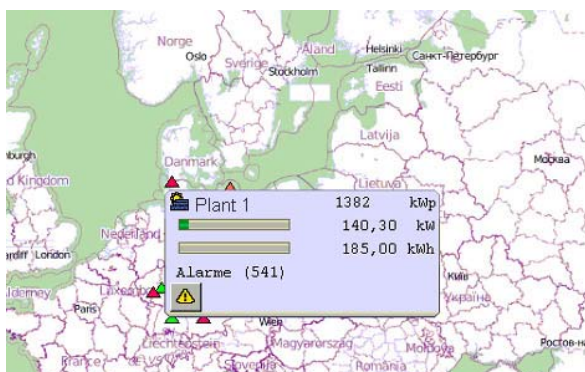


Fig. 50 World map showing details for one of the plants

Depending on the alarm state, the plants and plant sections are symbolized by triangular icons of different colours (Table 4 on p. 91).



To the left of the map, there is a pane listing those plants that are being monitored by PVGuard Client for you. If you click a plant from the list, the map will be re-centred on this site and a pop up with summary information about the plant will appear. There is a filter function in the *Search* text field above the list. You can hide or redisplay the left-hand pane by clicking the arrow button in the middle of the border between the map and list pane.

Mouseover and Tooltips

Moving the mouse over the coloured triangular icon of the desired location causes a pop up to appear by that plant that contains the following information for the plant:

- Name of the plant or plant section
- Installed power
- Current power
- Current yield
- Number of alarms

Actions

- To zoom into or out of the *World Map*:
 - Turn the mouse wheel
 - Zoom gradually in by double clicking the spot to be enlarged (beside a plant mark)
- Move the original or zoomed map with left mouse key pressed; the map will shift across the globe
-  Click this icon in the informational pop up to open the *Alarms* view of that plant
- Typing the name of a plant in the text field above the plant overview list will filter the list according to the entered text.
- Click  to hide or show the overview bar.

7.3 All Plants

This view gives you a summary of the most important real-time data for all plants being monitored under the current log-in. The data includes:

- Number of alarms, actual and installed power, actual and previous day's yield, graph of today's power output and total energy yield
- Irradiation, normalized power, normalized yield
- Alarms including their status, date of most recent occurrence, origin, error and age

This data is displayed in sections per plant. On the left hand side, there is a block of navigation buttons that can be used to open other plant views as an alternative to navigating through the *View Navigator*.

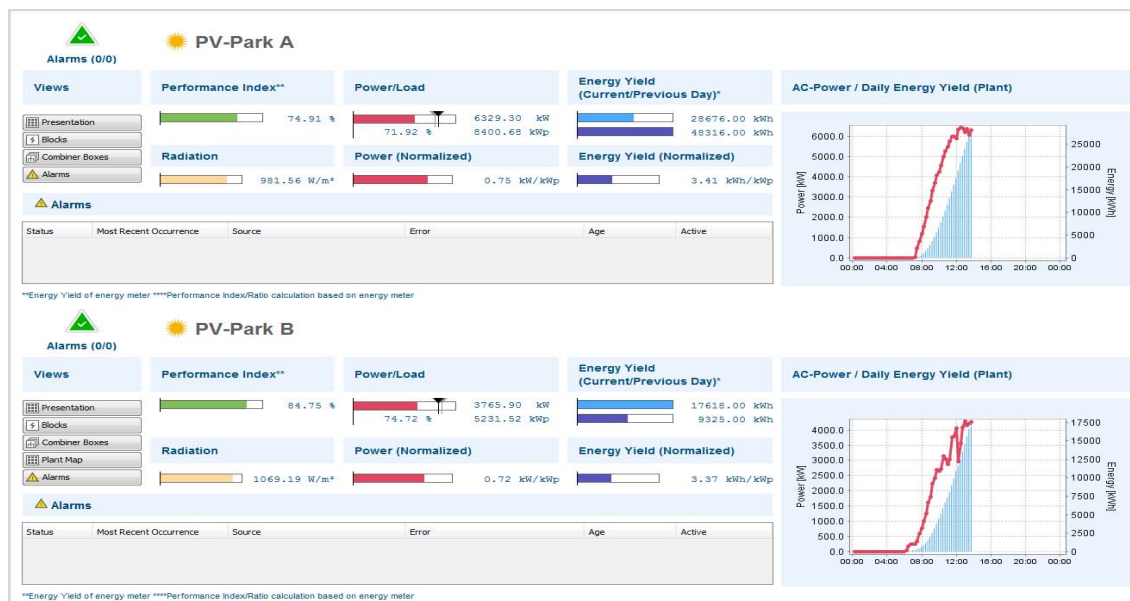


Fig. 51 All plants

Mouseover and Tooltips

- Triangle - Popup showing plant name and button that opens the *Alarms* view
- Chart - A block of navigation buttons will appear ([Chap. 5.7, Mouseover Navigation, on p. 31](#))



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation.

7.4 Plant Portfolio

This view was previously named from “All Plants (small)”.

This view provides a quick overview of the most important current data (default) of all plants being monitored. Each plant is listed in its own section with the following information:

- Performance Index; Absolute installed power; Output power & Loading (today, normalized)/radiation yield (today)/power (normalized)
- Open Log Entries: The number of open Service Log entries for each plant
- Alarms: all, and a selection from critical sections of the plant: inverters, strings, monitoring

Plant Name / Time Zone	Performance Index	Power/Load	Power (Normalized)	Open Log Entries	All Alarms	Specific Alarms			
						skycontrol	Inverter	Combiner Box	Monitoring
DE_PARK_A Europe/Berlin	 84,01 %	 2.915,90 kW 58,32 %	 0,54 kW/kWp	 (1)	 (3/5)	 (0/0)	 (0/0)	 (3/5)	 (0/0)
DE_PARK_C Europe/Berlin	 97,82 %	 163,00 kW 13,25 %	 0,12 kW/kWp	 (1)	 (0/0)	 (0/0)	 (0/0)	 (0/0)	 (0/0)
DE_PARK_D Europe/Berlin	 84,31 %	 341,40 kW 8,54 %	 0,07 kW/kWp	 (0)	 (0/0)	 (0/0)	 (0/0)	 (0/0)	 (0/0)

Fig. 52 Plant Portfolio


Mouseover and Tooltips

- Triangle - Popup showing plant name and button that opens the *Alarms* view



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation.

7.5 Views per Plant

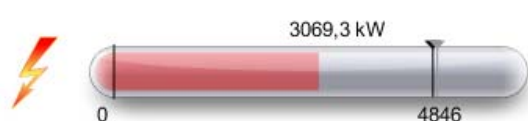
PVGuard Client contains a number of pre-defined views which are accessible from the  plant folder of the *View Navigator*. When you initially open a view, the current plant values are displayed. Using the time bar ([Chap. 5.2, Time Bar, on p. 21](#)) you can change the date for which the data is displayed.



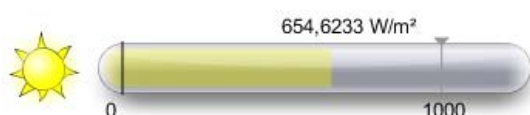
The number and type of views described in the subsequent chapters depend on the configuration of the PV power plant and on your personal user rights (administered by skytron). If a view cannot be displayed for any reason, the program will display a corresponding error message after you click the view in the *View Navigator*.

7.5.1 Presentation

The *Presentation* view shows a summary of the measured data for a plant at the current time.



This meter shows the current total power output of the plant, both graphically and numerically. The maximum value of the meter is the power installed in the plant. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power.



This meter shows the current solar irradiation at the plant's location. The maximum value of the meter is the highest possible solar irradiation at the site.

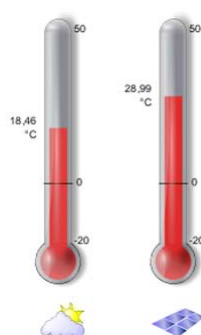
The grey mark indicates 1000 W/m².



The clock shows the local time and the sun's elevation at the plant. The hue of this indicator also changes from day to night.



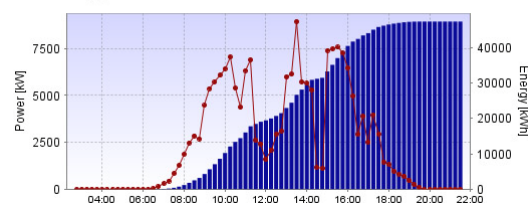
These indicators show the CO₂ emissions that have been avoided by using solar generation in the plant compared to the burning of coal, lignite, oil or gas respectively.



These two meters show the current ambient temperature (cloud symbol) and module temperature (PV module).

If the temperature is above zero degrees Celsius, the respective indicator is coloured red. If the temperature goes below zero, the indicator will be coloured blue.

Power/Energy Yield



At the bottom of the view, there is a graph of today's power/energy yield over the day. The red curve shows the power while the blue bars indicate the energy yield.

You can append other data to this chart by, for example, dragging data from the view's other interactive indicators and dropping them into the chart.

Mouseover and Tooltips

- Indicators - name of the measurement channel or data value (e.g. sun or fuel)
- Bar graph - measured values as text and number
- Sun/clock - position of the sun including elevation and azimuth
- Thermometer - measured data as text and value as number
- Chart - group of buttons

Actions

- Zoom in the *Presentation* view:
 - Press **Ctrl** and turn the mouse wheel
 - Press **Ctrl+Plus** and **Ctrl+Minus** on the numeric pad



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.2 Blocks

The view is headed by an overview of the block data at the current time (as default) at the selected plant:



The colour of the triangle that precedes the plant name shows the severity of any alarms. Green indicates no alarms. See [Table 4 on p. 91](#). The figure in brackets shows how many alarms apply - see [Tab: Look in 6.3.1.2](#), [Tab: Look, on p. 47](#) for details.

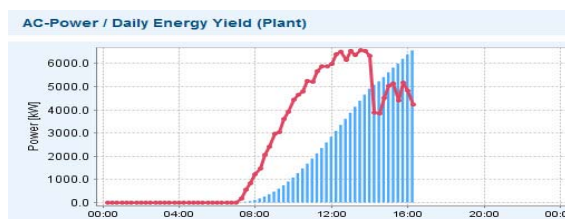
The plant name is displayed to the right of the triangle. Next come bar indicators for the following:

- Performance Index.
- Power/Load. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power. If no installed DC generator value has been given, the nominal AC power is used to normalize the power values.
- Energy yield values (current/previous day).

The next row starts with a block of navigation buttons, which can be used to open other views of the selected plant.

To the right of the button block, there are three bar displays that show the irradiation and the normalized power and energy yield.

Also to the right of the button block, there is an extract from the *Alarms* table (see [Chap. 10, Alarms, on p. 89](#)).



Next, comes a chart that shows today's power/energy yield.

The red curve represents the power while the blue bars indicate the energy yield.

You can extend the chart by dragging measurement values from the other indicators in the view and dropping them in the chart.

Then, all inverter blocks of the plant are listed including the following information:

- Block (name)
- Inverters (types and power)
- Installed DC power (number)
- Performance index (bar indicator and value)
- Power (bar indicator and value)
- Energy yield (value)
- Graphs for power/energy yield for the block's inverters of the block (see above)

At the end of the view, indicators and graphs for the weather sensors are displayed:

- Power
- Energy yield today
- Average radiation power in-plane to module (bar indicators with radiation values of all installed sensors)
- Module and ambient temperatures (indicators with temperatures e.g. RadGuard)

- Average radiation power per in-plane to module (chart with radiation values of all installed e.g. RadGuard)
- Module and ambient temperatures (chart with temperatures e.g. RadGuard).
- Ambient temperature, air pressure, humidity, current rain and hail, wind direction of the weather transmitter



If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.

Mouseover and Tooltips

- Triangle - Pop up showing name of the plant, button that opens the *Alarms* view
- Chart - group of buttons



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.3 Inverters

The view is headed by an overview of the inverter data at the current time (as default) at the selected plant:



The colour of the triangle that precedes the plant name shows the severity of any alarms. Green indicates no alarms. See [Table 4 on p. 91](#). The figure in brackets shows how many alarms apply - see [Tab: Look in 6.3.1.2](#), [Tab: Look, on p. 47](#) for details.

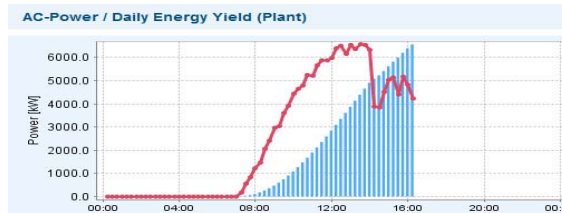
The plant name is displayed right of the triangle. Next come bar indicators for:

- Performance Index.
- Power/Load. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power. If no installed DC generator value has been given, the nominal AC power is used for the normalization of the power values.
- Energy yield values (current/previous day).

The next row starts with a block of navigation buttons, which can be used to open other views of the selected plant.

To the right of the button block, there are three bar displays that show the irradiation and the normalized power and energy yield.

Also to the right of the button block, there is an extract from the *Alarms* table ([Chap. 10, Alarms, on p. 89](#)).






Next comes a chart that shows today's curve of power/energy yield.

The red curve shows the power while the blue bars indicate the energy yield.

You can extend the chart by dragging values from the view's other indicators into the chart.

Mouseover and Tooltips

- Triangle - pop up showing name of the plant, button that opens the *Alarms* view
- Chart - group of buttons
- Circle - device state
- Triangle - window with the following buttons and information:
 -  Click this button to open the *Alarms* view of the inverter.
 - Inverter name
 -  Click this button to open a new chart view with the curves of the inverter.
 -  Click this button to open a new table view with the measurement values of the inverter.
 - How device names are shown
- Click a bar graph to open the corresponding chart.
- Click an indicator to open the corresponding chart.

The following information is displayed per inverter:

- *Name (device alias)*
- Nominal AC power
- Installed DC power
- Performance Index
- *Type*
- *Status*
 - Green: inverter on
 - Grey: inverter off
 - Yellow: inverter warning
 - Red: inverter failure; alarm will be triggered ([Table 4 on p. 91](#))
 - Other colours depending on the make of inverter
- *Team*
 - Dash (-) - The inverters are not in a master-slave configuration.
 - Single - There is no master-slave situation.
 - Master - The inverter is currently acting as *master* in the master-slave configuration.
 - Slave - The inverter is currently acting as *slave* in the master-slave configuration.
- *Alarms*
 - The triangles are coloured according to the alarm severity ([Chap. 10, Alarms, on p. 89](#)).
 - Moving the mouse over an alarm triangle causes a popup to appear that contains navigation buttons that open: the *Alarms* view, a new chart view, a new table view or the state information for the device ([Fig. 27 on p. 32](#)).
- *Power*
 - Bar indicator and value. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power.
 - You can drag any value and drop it in the power/energy yield chart.
- *Energy yield (number)*
 - You can drag any value and drop it in the power/energy yield chart.

At the end of the *Inverters* view information from the weather sensors are displayed:

- Average irradiation on the module plane and pyranometer (indicator with radiation values across all installed sensors)
- Module and ambient temperatures (indicator showing temperatures e.g. from RadGuard)
- Average irradiation on the module plane and pyranometer (graph with irradiation values e.g. from RadGuard)
- Module and ambient temperatures (graph with temperatures e.g. from RadGuard).



If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.

Mouseover and Tooltips

- Triangle - pop up showing name of the plant, button that opens the *Alarms* view
- Chart - group of buttons
- Click a bar graph to open the corresponding chart.
- Click an indicator to open the corresponding chart.



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.4 Combiner Boxes

The *Combiner Boxes* view shows all combiner boxes used in the plant, ordered according to their associated blocks.

Each indicator ([Fig. 53 on p. 69](#)) shows the name of the combiner box, followed by a bar indicator that visually indicates the minimum, mean and maximum values across the different input string input currents; the mean of the currents is also shown as a value. The various breakers, e.g. the overvoltage arresters, and their states are symbolized by a coloured symbols on the right of the combiner box indicator.

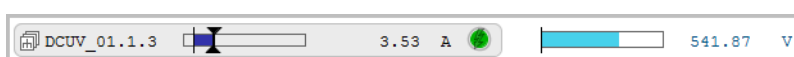


Fig. 53 *Combiner Boxes* view - DCUV without alarm, and with two state indicators

A bar display that indicates the voltage of the DC output is displayed next to each combiner box indicator, as shown in [Fig. 53 on p. 69](#).

If an alarm has been raised for that combiner box, the corresponding state indicator will be coloured yellow, orange or red (see [Table 4 on p. 91](#)) according to severity.

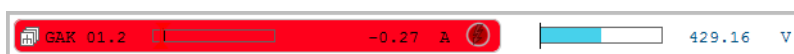


Fig. 54 *Combiner Boxes* view - String input showing alarm state (see also [Table 4 on p. 91](#))

Mouseover, Clicks and Tooltips

- Click the bar display in the combiner box indicator to open a chart plotting the individual string currents into this combiner box
- Moving the mouse over the combiner box indicator will cause a mouseover display to appear showing bar indicators and corresponding numeric values for the individual string currents, total combiner box current, system voltage, total power and box temperature. At the bottom there are navigation buttons to open an alarm view, and to display a chart or table of the data from the mouseover display ([Fig. 55 on p. 69](#))

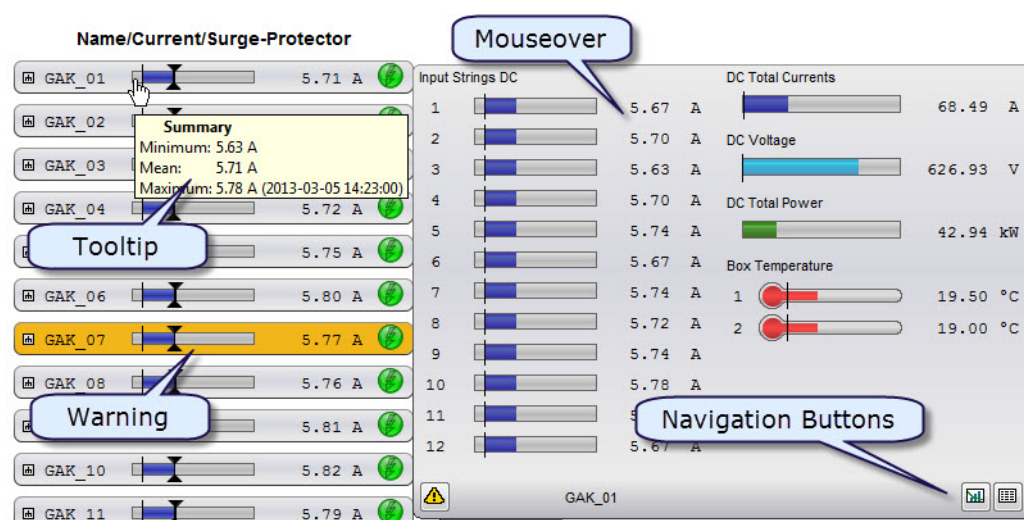





Fig. 55 *Combiner Boxes: Mouseover, Tooltip & Warning*

- Click any bar indicator of the mouseover display to open a chart plotting the corresponding measured data.
-  Click this button to open the *Alarms* view of the combiner box.
-  Click this button to open a new chart view plotting the string current, total current, system voltage, total power and room temperature, together with any state elements e.g. overvoltage arrester state.
-  Click this button to open a new table view of the same data as in the chart view.
- Moving the mouse over a bar indicator - either in the combiner box indicator or in its mouseover display - will, after a second or so, cause a tooltip to appear showing the minimum, mean and maximum values across the different string currents.
- Moving the mouse over a state button in the combiner box indicator will, after a second or so, cause a tooltip to appear showing the state of that state element (e.g. overvoltage arrester switch On/Off)

Show Normalized String Current Values

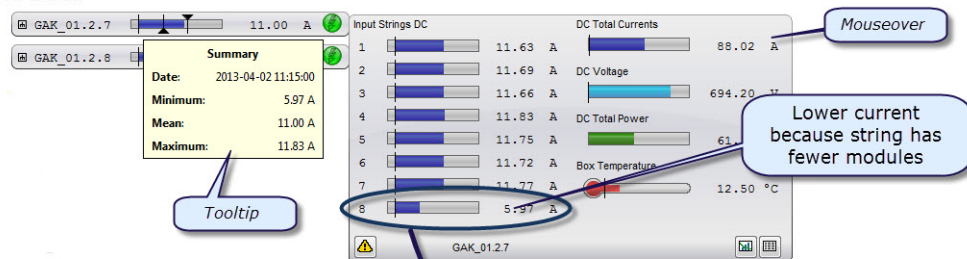
Sometimes a plant is built with different numbers of PV modules in the different strings that are combined in the combiner box. That means that the strings will always show diverging currents, and the corresponding bar indicators will always have different lengths. It then becomes difficult to compare the strings' performance.

In this case, you can switch the display to show normalized values. When the button *Show normalized string current values* (bottom of the view) is activated, the display changes as follows:

- The button itself at the bottom of the view is highlighted
- The bar indicator is filled with a striped pattern
- The string currents are shown with units *A
- The tooltip of the graph indicates the type of values shown

Fig. 56 on p. 70 illustrates this.

Raw Data



Normalised Data

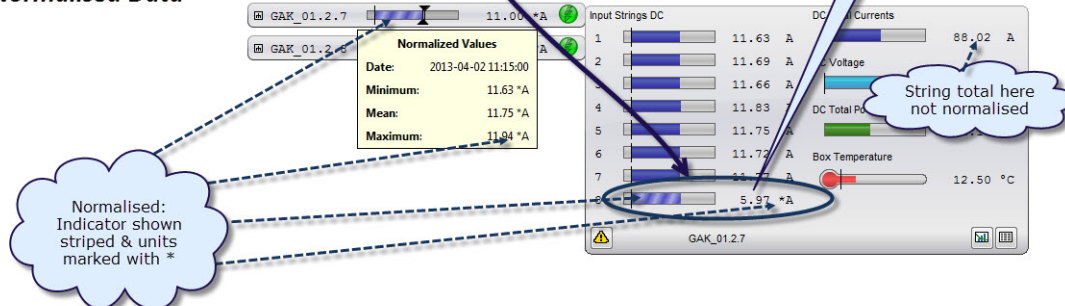



Fig. 56 Raw vs. Normalized string-current values in the *Combiner Boxes* view

To switch between the string-current values:

- Click  at the bottom of the *Combiner Boxes* view.
- For easier handling, the tooltip text changes according to the active mode from *Show normalized string-current values* to *Show real string-current values*.



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.5 Sensors

The view is headed by a graphical-numerical overview of the current values (default) of the selected plant:



The colour of the triangle that precedes the plant name shows the severity of any alarms. Green indicates no alarms. See [Table 4 on p. 91](#).

The figure in brackets shows how many alarms apply - see [Tab: Look in 6.3.1.2, Tab: Look, on p. 47](#) for details.

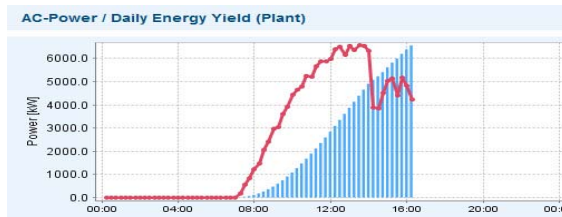
The plant name is displayed right of the triangle. Next come bar indicators for:

- Performance Index. If no installed DC generator value has been given, the nominal AC power is used for the normalization of the power values.
- Power/Load. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power.
- Energy yield values (current/previous day).

The next row starts with a block of navigation buttons. Click the buttons to open other views of the selected plant.

To the right of the button block, there are three bar displays that show the irradiation and the normalized power and energy yield.

Also to the right of the button block, there is an extract from the *Alarms* table ([Chap. 10, Alarms, on p. 89](#)).



Next, there is a chart that shows today's curve of power/energy yield.

The red curve is the power while the blue bars indicate the energy yield.

You can extend the chart by dragging measurement values from the view's other indicators into the chart.

At the end of the view, the following charts, bar graphs and indicators for all installed sensors in the PV power plant are displayed.



The amount of data displayed depends on the number/ kind of sensors installed in the plant.

Radiation values (from left to right):

- Name of radiation sensor in module plane
- Bar graph of power and current measurement value
- Bar graph of energy yield and current measurement value
- Name of radiation sensor in horizontal plane
- Bar graph of power and current measurement value
- Bar graph of energy yield and current measurement value

Temperature values of the radiation sensors (from left to right):

- Name of radiation sensor
- Bar graph of ambient temperature sensor and current measurement value
- Bar graph of module temperature sensor and current measurement value

Room temperature values of the PV power plant's temperature sensors (from left to right):

- Name of radiation sensor
- Bar graph of room temperature sensor and current measurement value
- Room temperature/time chart of all sensors



If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.

Measurement data of the weather transmitter (from left to right):

- Name of weather transmitter
- Ambient temperature
- Air pressure
- Humidity
- Current rain
- Current hail
- Wind direction

Measurement data of the wind sensor (from left to right):

- Name of the wind sensor
- Wind speed
- Wind direction
- Status
- Wind rose

Mouseover, Clicks and Tooltips

- Triangle - pop up showing name of the plant, button that opens the *Alarms* view
- Chart - group of buttons
- Click a bar graph to open the belonging chart.
- Click an indicator to open the belonging chart.



The operating options are explained in [Chap. 5, Using the GUI, on p. 20](#).

7.5.6 Energy Meters

The view is headed by a graphical-numerical overview of the current values (default) of the selected plant:



The colour of the triangle that precedes the plant name shows the severity of any alarms. Green indicates no alarms. See [Table 4 on p. 91](#).

The figure in brackets shows how many alarms apply - see [Tab: Look in 6.3.1.2, Tab: Look, on p. 47](#) for details.

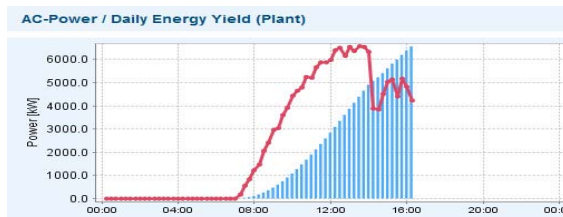
The plant name is displayed right of the triangle. Next come bar indicators for:

- Performance Index.
- Power/Load. The black mark indicates the nominal AC power while the grey mark shows the installed DC generator power. If no installed DC generator value has been given, the nominal AC power is used for the normalization of the power values.
- Energy yield values (current/previous day).

The next row starts with a block of navigation buttons, which can be used to open other views of the selected plant.

To the right of the button block, there are three bar displays that show the irradiation and the normalized power and energy yield.

Also to the right of the button block, there is an extract from the *Alarms* table ([Chap. 10, Alarms, on p. 89](#)).



Underneath, there is a chart that shows today's curve of power/energy yield in time.

The red curve is the power while the blue bars indicate the energy yield.

You can extend the chart by dragging measurement values from the view's interactive indicators and dropping them in the chart.

Next, the energy meters installed in the plant are listed. They are allocated to functional groups (only if existing). The measurement values in the view are related to these functional groups.

- Not allocated
 - *Energy Meter* - the device alias
 - *Status* - if measurement channel exists in the meter type
 - *Alarms* - The triangles are coloured depending on the alarm severity ([Chap. 10, Alarms, on p. 89](#)).
 - *Energy Yield Today* - bar chart and text. You can integrate the value into the power/yield chart by means of Drag & Drop.
 - *Energy Yield* - bar chart and text. You can integrate the value into the power/yield chart by means of Drag & Drop.
- Allocated to the plant
 - *Energy Meter* - the device alias
 - *Status* - if measurement channel exists in the meter type
 - *Alarms* - The triangles are coloured depending on the alarm severity ([Chap. 10, Alarms, on p. 89](#)).
 - *Energy Yield Today (Production)* - bar chart and text. You can integrate the value into the power/yield chart by means of Drag & Drop.

- *Energy Yield (Production)* - You can integrate the value into the power/yield chart by means of Drag & Drop.
- *Energy Yield Today (Consumption)* - bar chart and number. You can integrate the value into the power/yield chart by means of Drag & Drop.
- *Energy Yield (Consumption)*. You can integrate the value into the power/yield chart by means of Drag & Drop.
- Allocated to blocks
 - *Energy Meter* - the device alias
 - *Station* - name of the inverter station
 - *Status* - if measurement channel exists in the meter type
 - *Alarms* - The triangles are coloured depending on the alarm severity ([Chap. 10, Alarms, on p. 89](#)).
 - *Energy Yield Today (Production)* - bar chart and text. You can integrate the value into the power/yield chart by means of Drag & Drop.
 - *Energy Yield (Production)* - You can integrate the value into the power/yield chart by means of Drag & Drop.
 - *Energy Yield Today (Consumption)* - bar chart and number. You can integrate the value into the power/yield chart by means of Drag & Drop.
 - *Energy Yield (Consumption)*. You can integrate the value into the power/yield chart by means of Drag & Drop.
- Allocated to inverters
 - *Energy Meter* - the device alias
 - *Inverter* - the device alias of the associated inverter
 - *Rated AC Power* - AC power of the inverter
 - *Installed DC Power* - installed DC power of the inverter
 - *Status* - if measurement channel exists in the meter type
 - *Alarms* - The triangles are coloured depending on the alarm severity ([Chap. 10, Alarms, on p. 89](#)).
 - *Energy Yield Today* - of inverter, bar chart and text. You can integrate the value into the power/yield chart by means of Drag & Drop.
 - *Energy Yield* - you can integrate the value into the power/yield chart by means of Drag & Drop.

At the end of the view, the following charts, bar graphs and indicators of all radiation and temperatures sensors of the PV power plant are displayed:

Left-hand side:

- *Radiation Power (Average, Tilt, Pyrano)* - bar graph and number, value of radiation sensors in module plane
- *Radiation Power (Average, Horizontal, Pyrano)* - bar graph and number, value of horizontal radiation sensors
- Chart: radiation power over time

Right-hand side:

- *Module Temperature (Average)* - meter indicator and number, value of module temperature sensors
- *Ambient Temperature (Average)* - meter indicator and number, value of ambient temperature sensors
- Chart: temperature over time



If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.

Mouseover, Clicks and Tooltips

- Triangle - pop up showing name of the plant, button that opens the *Alarms* view
- Chart - group of buttons
- Click a bar graph to open the corresponding chart.
- Click an indicator to open the corresponding chart.



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.7 Plant Control

This view is only present for those plant that include output power regulation. The exact appearance of the view may also depend on the plant and equipment configuration. The view as described below represents a sophisticated plant control system, including power limiting and active/reactive power control.

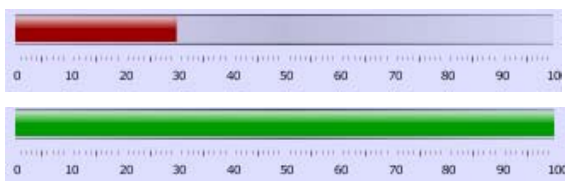
The view is headed by a summary overview of the data from the selected plant at the current time:



The colour of the triangle that precedes the plant name shows the severity of any alarms. Green indicates no alarms. See [Table 4 on p. 91](#).

The figure in brackets shows how many alarms apply - see [Tab: Look in 6.3.1.2](#), [Tab: Look, on p. 47](#) for details.

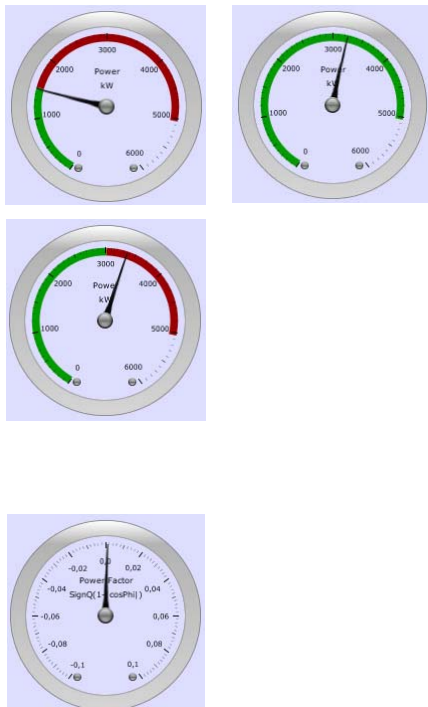
The plant name is displayed to the right of this.



Next comes a bar indicator that reflects the *Active Power Limit*. If a limit is being applied, the bar is shown red and shows by what percentage limit is in force. If no limit is in force, the bar is coloured green and fills the chart up to the 100% mark.

The next row starts with a block of navigation buttons, which can be used to open other views of the selected plant. inductive or capacitive

To the right of the navigation buttons comes a control panel with gauges showing:



Active Power

The needle indicates the current active AC power of the plant in kW.

If the power is being limited, the green section shows the actual accepted power output and the red section indicates the blocked output.

If no limit is in force, the power output is shown green and shows the current active power.

The range of the gauge reflects the maximum possible active power output of the plant.

Power Factor

This needle indicates the deviation between the plant's actual power factor and the ideal power factor of 1 (i.e. 100% active power). That is:
indicated power factor = (1- Power Factor).

In addition, the direction of deviation shows whether the reactive power is capacitive (-) or inductive (+).

The gauge has a range -0.1 through 0 to +0.1, representing power factors of 0.9 to 1.0, with negative or positive phase angles.

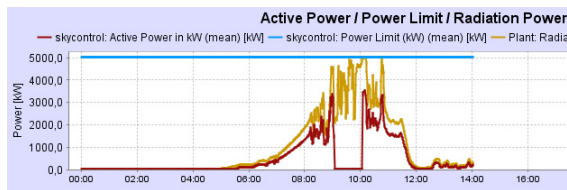


Reactive Power

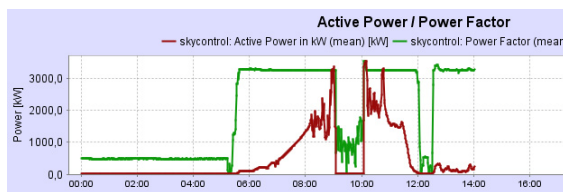
This needle indicates the amount of reactive power being produced. If reactive power is being generated because the active power is being limited, the needle of the active power gauge will be in the red sector, showing the power loss (see active power gauge, bottom left).

Underneath the gauges, an excerpt from the *Alarms* table in the *Alarms* view ([Chap. 10, Alarms, on p. 89](#)) is displayed.

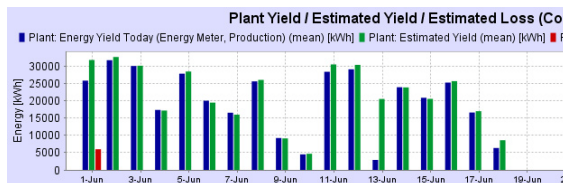
Finally, three charts are displayed:



The upper chart examines plots today's data for *Active Power/Power Limit/Radiation Power*. You can extend the chart by dragging other data items from the view's other indicators and dropping them in the chart.



The middle chart plots the relation of *Active Power* and *Power Factor* for today.



The bottom chart examines the yield for the month to date. It plots *Plant Yield* and *Estimated Plant Yield* together with the data for *Estimated Loss* (skycontrol) on a daily basis for the current month.

Mouseover and Tooltips

- Triangle - name of the control unit, and a button that opens the *Alarms* view of this unit
- Bar indicator - tooltip with measured data as text, click to open the corresponding chart
- Gauge display - tooltip with measured data as text, click to open the corresponding chart
- Chart - button group



See [Chap. 5, Using the GUI, on p. 20](#) for a general explanation of the indicators.

7.5.8 Plant Map

Each PV power plant has a plant *Map* view. This can be opened by clicking the corresponding entry in the plant folder of the *View Navigator* or through that entry's context menu. If no plant map has been incorporated, the program will display an appropriate error message.




The *Map* view shows the arrangement of the rows of PV modules. Every combiner box, inverter and sensor is represented by an indicator. If an alarm has been raised by a device, its indicator will colour-coded according to the alarm severity (see [Table 4 on p. 91](#)).

7.5.8.1 Mini-map

A **mini-map** of the plant is shown as an overlay in the upper left-hand corner of the plant map. Enclosed with a rectangular frame, it shows where the enlarged displayed area of the plant map lies within the overall plan. If you move in the main plan, the *mini-map* will follow; correspondingly you can move the frame within the *mini-map* and the main plan will follow.

Devices with alarms are also colour-coded in the *mini-map* ([Table 4 on p. 91](#)).

The *mini-map* is headed by three buttons:

-  Show/hide the *mini-map*.
-  Show/hide the measuring devices in the *mini-map*.
-  Show/hide any background picture in the *mini-map*.

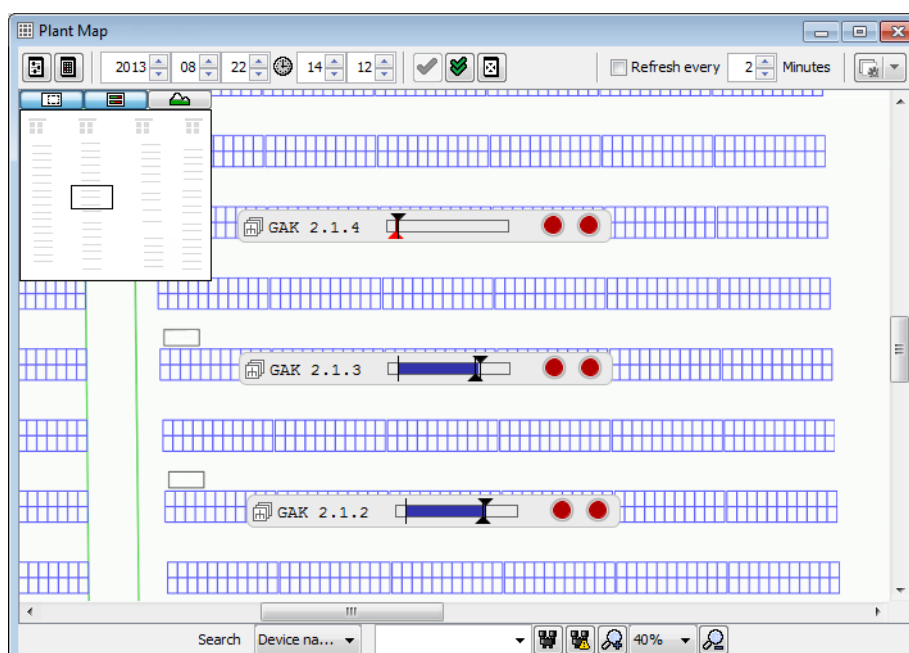










Fig. 57 Plant map with *mini-map*

You can carry out the following actions in the *Map* view:

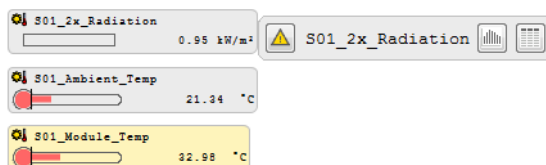
- To zoom in/out in the *Plant Map* view:
 - Press **Ctrl** and turn the mouse wheel
 - Press **Ctrl+Plus** or **Ctrl+Minus** on the numeric pad of the keyboard
 -  Click this button below the map to zoom in the map (max. 200 %), or select a zoom factor from the list.
 -  Click this button below the map to zoom out of the map, or select a zoom factor from the list.
 - Select *Auto* from the zoom list to display the entire map to the largest scale possible in the window.

-  This button works with the two *Search* entry boxes to its left. It allows you to find particular devices on the map.
 - The first *Search* box allows you to select whether you want to search by a *Device Name* (i.e. as displayed in the indicators on the map) or a Unique Device Identifier (*UDID*, as given in the Device Properties dialog - see [Chap. 5.6.2, Context Menu in the Plant Explorer, on p. 28](#)).
 - The second *Search* box is for the text of the name or UDID you are searching for. When you start entering text, the drop down list will show all entries starting with that text and an option will be suggested, greyed out.
 - Select a device and press **Enter** or click the search button.
 -  Click this button below the map to search for devices with an alarm.
 - Enter a *Device Name* (contained in an indicator on the map) to find alarms in a particular device group. If you enter any character, a list of all possible devices will popup. Select a device and press **Enter** or click the search button.
 - Clear the entry field if you would like to find any alarm.
-  Any device found - with or without an alarm - is initially highlighted blue; the highlighting will, however, fade over a few seconds.
-  If no device can be found, an error message will be displayed.
-  Click this button to display the normalized string current values (see also [Chap. 7.5.4, Combiner Boxes, on p. 69](#)).
 - To move the *Map* view, zoom in, keep one of the mouse keys pressed and move the mouse.

 The cursor must not be positioned over an indicator.




7.5.8.2 Mouseover and Tooltips

skyCONNi-Radiation

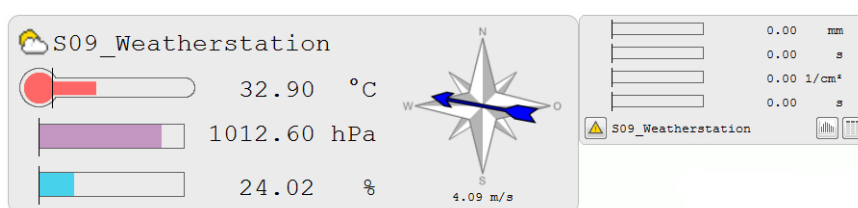


This indicator shows the current values of the solar irradiation, ambient temperature (upper) and module temperature (lower). If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.

If you move the mouse over the indicators, a pop up with a group of navigation buttons and the device's unique ID (UDID) will appear:




-  Click this button to open the *Alarms* view of the device.
-  Click this button to open a new chart view showing the radiation power, module temperature and ambient temperature curves.
-  Click this button to open a new table view showing the radiation power, module temperature and ambient temperature values.

Weather Transmitter

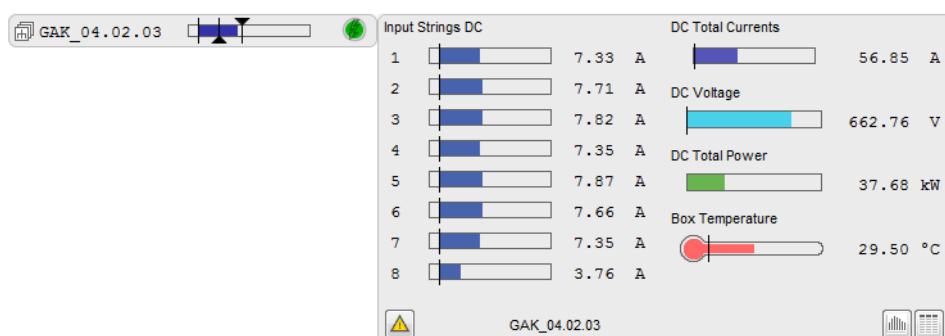


The *Weather Transmitter* indicator shows the current values of the ambient temperature (upper), air pressure and humidity. If the temperatures are above zero degrees Celsius, the indicators are coloured red. If the temperatures are below zero, the indicators are coloured blue.




Move with the mouse over the indicator to show a pop up with bar indicators showing the amount and duration of any actual rainfall of any actual hail and its duration. Underneath this is listed the UDID together with the following navigation buttons:

-  Click this button to open an *Alarms* view for the device.
-  Click this button to open a new chart view showing the ambient temperature, air pressure, relative humidity, wind speed and direction, current and accumulated rain and hail duration curves.
-  Click this button to open a new table view showing the same information as in the above chart but in tabular format.

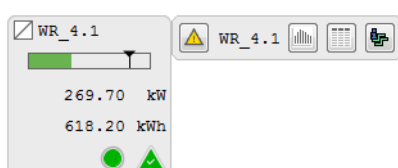
Combiner Box



The indicator in the centre represents the combiner box with a bar indicator showing the mean of the individual string currents. Moving the mouse over the indicator causes a pop up to appear showing the values of the individual string currents and summaries.

-  Click this button to open an *Alarms* view for the device.
-  Click this button to open a new chart view showing the ambient temperature, air pressure, relative humidity, wind speed and direction, current and accumulated rain and hail duration curves.
-  Click this button to open a new table view showing the same information as in the above chart but in tabular format.





Inverter



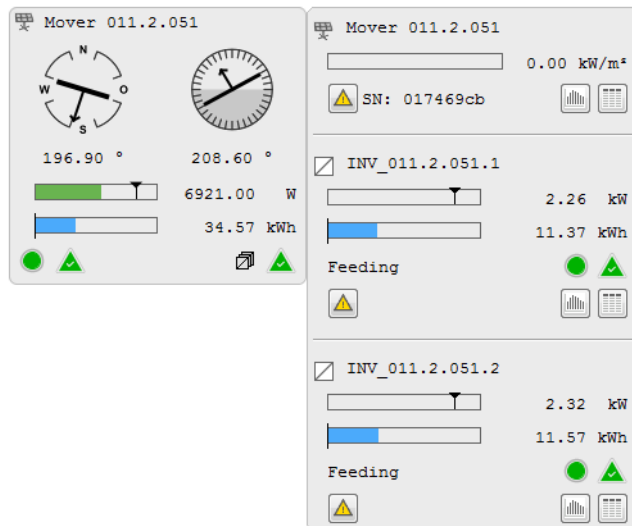
The left hand indicator represents the inverter, showing the current values of the AC active power and today's energy yield.

- The ball in the lower right corner indicates the device status ([Table 4 on p. 91](#))
- The triangle shows the inverter's alarm status ([Table 2 on p. 58](#)).

Moving the mouse over the indicator causes a pop up to appear with a group of navigation buttons and the device's UDID:

-  Click this button to open the *Alarms* view of the device.
-  Click this button to open a new chart view with the mode, today's yield and AC power output curves.
-  Click this button to open a new table view with the mode, today's yield and AC power output values.
-  Click this button to show the device's state






Tracker/Mover



The left hand indicator represents the mover showing its current azimuth and elevation values, as well as the total AC active power and today's total energy yield for the corresponding inverters. The device and alarm status of the mover is indicated in the lower left corner ([Table 2 on p. 58](#)); in the lower right corner the combined alarm status of the corresponding inverters is shown.

Moving the mouse over the indicator will cause a pop up to appear showing an indicator and value for the tracker's detected irradiation, and for the inverters showing the AC active power, today's energy yield and device and alarm state.

The popup windows also contain a group of navigation buttons each and the UDID:

-  Click this button to open the *Alarms* view of the device.
-  Click this button to open a new chart view showing the mode, today's yield and AC power output curves.
-  Click this button to open a new table view showing the mode, today's yield and AC power output values.
-  Click this button to open a chart showing the device status ([Table 2 on p. 58](#)).
-  Click this button to open the *Alarms* view of the device ([Table 4 on p. 91](#)).

8 Charts and Tables

8.1 Hints

PVGuard Client includes both pre-defined and customizable charts and tables.

The *Charts and Tables* folder is contained in the plant folder of the *View Navigator*; some of the views are predefined, however you can also configure charts and tables yourself and save them. They are usually stored in the subdirectory *Saved Views* of the plant folder in the *View Navigator* ([Chap. 5.16, Saved Views, on p. 38](#)).

You can modify charts and tables by adding and removing measurement values from the *Plant Explorer* as well as by hiding and showing measurement values.

You can view the current data (default when opening a view) and data of a selected point or period of time ([Chap. 5.2, Time Bar, on p. 21](#)) in charts and tables.



The operating options are explained in [Chap. 5, Using the GUI, on p. 20](#).

8.2 Captions, Configuration Tables and Labels

PVGuard Client adds titles, labels, a caption and a *Configuration Table* to each chart view and a *Configuration Table* to each table view.

8.2.1 Caption (Charts only)

The caption above the chart contains the following information:

- Pictograms with colour and shape of a curve
- Names of the measurement channels
- Preceding the names (optional): plant name and device name ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#))

8.2.2 Configuration Tables




Multi-selection of measurement channels is available in the *Configuration Tables*. In this way, you can change features and options like *Show*, *Aggregate* and *Lock Date* for several selected measurement channels in a single operation.

Charts


The *Configuration Table* underneath a chart contains the following information:

- *Show*: option to show/hide measurement channels
- *Name* - name of measurement channel
- Preceding the name (optionally): plant name and device name ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#)) Ctrl+D
- *Value* - Once you have clicked into the chart, the measurement values are displayed in this column.
- *Unit* - dimension unit of the measurement value. Clicking this cell in the *Configuration Table* will open a drop-down box in which suitable units and multipliers for that measurement channel are displayed. The default units are determined from those set in the Client Settings dialog - see [Chap. 6.3.1.5, Tab: Displayed Units, on p. 49](#).
- *Style* (see [Chap. 8.2.3, Style Dialog, on p. 85](#))



- **Aggregate** - Click into such a table cell to select from the list field that opens:
 - *Mean* value over the relevant period
 - *Minimum* value over that period
 - *Maximum* value over that period
 - *List* - for state values, this lists the separate values measured over the period
 - *Delta* - difference to the previous measurement value
 - *Sum* - sum of all values within the specified measurement interval
-  The aggregates of several or all measurement channels can be changed at once using multi-selection of measurement channels in the *Configuration Table*.
- **Zero-Aligned** - Check this box to display several graphs with parameters of the same kind but different value ranges, in a single diagram with a range axis starting at zero.
- **Lock Date** - Activate this option box to lock the date that follows the name of the measurement channel in the table. If the date of the view is changed, this measurement channel remains set on the locked date. This allows you to compare measurement channels at different points of time.

Tables

The *Configuration Table* underneath a table contains the following information:

- **Name** - name of measurement channel
- Preceding the name (optional): plant name and device name ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#)) - Ctrl+D
- **Unit** - dimension unit of the measurement value. Clicking this cell in the *Configuration Table* will open a drop-down box in which suitable units and multipliers for that measurement channel are displayed. The default units are determined from those set in the Client Settings dialog - see [Chap. 6.3.1.5, Tab: Displayed Units, on p. 49](#).
- **Aggregate** - Click into such a table cell to select from the list field that opens:
 - *Mean* value over the relevant period
 - *Minimum* value over that period
 - *Maximum* value over that period
 - *List* - for state values, this lists the separate values measured over the period
 - *Delta* - difference to the previous measurement value
 - *Sum* - sum of all values within the specified measurement interval
-  The aggregates of several or all measurement channels can be changed at once using multi-selection of measurement channels in the *Configuration Table*.
- **Lock Date** - Activate this option box to display the date that follows the name of the measurement channel in the table. If the date of the view is changed, this measurement channel remains set on the locked date. This allows you to compare measurement channels at different points of time.
- **Show State Text** - Where the table shows digital state information for a device, clicking this box will replace the numeric values displayed in the table columns with their textual equivalents (see also [State Information in 5.4.4.3, Tab: Other, on p. 31](#)).

Moving and Removing Measurement Channels in Configuration Tables

-  Click the arrow buttons left of the *Configuration Table* to change the order of the measurement channels. A measurement channel moved to the top of the table lies on top as curve in the chart.
-  Click this button in the lower left corner of the *Configuration Table* or press **Del** to remove a measuring channel from the table and from the chart (for chart views).

Changing the Column Width

To change the column widths of the table, follow the steps below:

1. Move the mouse over a column border in the table header until a horizontal double arrow appears.
2. Press the left mouse key.
3. Drag the border to the desired position with the left mouse key pressed.
4. Release the mouse key.



The appearance of the graphs and the information depth of the designations can be defined by the tools of the toolbar ([Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#)).

8.2.3 Style Dialog

The *Style* dialog is available in the *Configuration Table* of a chart. It helps you define the appearance of each single curve. To do so, follow the steps below:

1. Double click a curve in the *Style* column of the *Configuration Table*.
The *Style* Dialog will open.

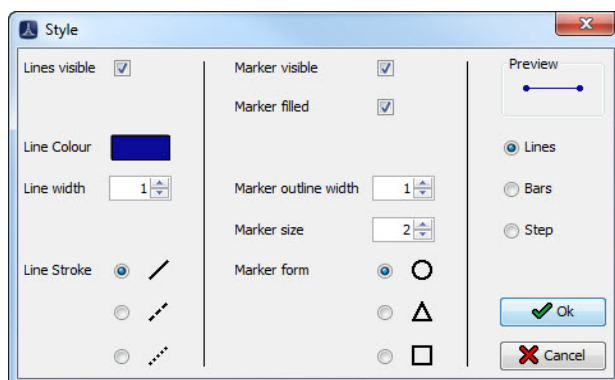


Fig. 58 Style dialog in charts

Lines Visible

Activate this option if you would like to display the full graph including line and measurement values. If the option is not active, only the measurement values are displayed in the chart with the time resolution set in the time bar and the *Shape Form* defined in the *Style* dialog.

Line Colour

Click the coloured square and select a colour for the curve from the colour palette.

Line Width

Select the line width within the range of 1-20 px.

Line Stroke

Select one of the line strokes:

- Continuous line
- Dashed line
- Dotted line

Shapes Visible

Activate this option if you would like to mark the measurement values in the curve as per resolution defined in the time bar.

Shapes Filled

Activate this option if you would like to display the marks of the measurement values filled with colour.

Shape Outline Width

In this spinner field, select the line width of the marks of the measurement values within the range of 1-20 px.

Shape Size

Set the width/height or diameter of the marks of the measurement values within the range of 1-20 px.

Shape Form

Select a shape for the marks of the measurement values: circle, triangle, square.

Preview

View how the graph whose appearance you are just defining will look like.

Lines/Bars/Step

Select one of the options of representation for your graph: *Bars* and *Step* will not show any marks for measurement values. The according properties are therefore irrelevant.

✔ *Save Style* or ✖ *Cancel Style Definition*

After you have finished defining a style, click ✔ *Ok* to take over the new style into the chart. The dialog will close.

If you do not want to take over the new style or interrupt the definition, click ✖ *Cancel*. The dialog will close.

8.2.4 Mouseover and Tooltips (in Charts only)


- Graph - tooltip with the following information from left to right:
 - Plant name (optional)
 - Device name (optional)
 - Measurement channel
 - Measurement value
 - Date and time

8.3 Creating a New Chart

Create a new chart by clicking *New Chart* in the *View Navigator*. An empty chart will be displayed in the views window.

Then, click through the *Plant Explorer* to find the desired values. Drag the values and drop them in the chart. See [Chap. 4.1.3, Plant Explorer, on p. 19](#), [Chap. 5.6, Context Menus, on p. 28](#) and [Chap. 5.9, Drag & Drop, on p. 32](#).

PVGuard Client adds one entry for each measurement channel to both the caption and the *Configuration Table* ([Chap. 8.2.2, Configuration Tables, on p. 83](#)).

Alternatively, you can convert each table into a chart by clicking  in the toolbar of the chart. See [Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#).




A measurement channel selected in the diagram or in the *Configuration Table* is displayed in the diagram.

8.4 Creating a New Table

Create a new table by clicking *New Table* in the *View Navigator*. An empty table will be displayed in the views window.

Then, click through the *Plant Explorer* to find the desired values. Drag the values and drop them in the table. See [Chap. 4.1.3, Plant Explorer, on p. 19](#), [Chap. 5.6, Context Menus, on p. 28](#) and [Chap. 5.9, Drag & Drop, on p. 32](#).

PVGuard Client adds one entry for each measurement channel to the *Configuration Table* ([Chap. 8.2.2, Configuration Tables, on p. 83](#)).

Alternatively, you can convert each chart into a table by clicking  in the toolbar of the chart. See [Chap. 5.4, Toolbars in Charts and Tables, on p. 24](#).

The column widths both in the table and in the *Configuration Table* can be adjusted. To do so, grab the border line in the table head with the left mouse key pressed until a horizontal double arrow appears. Then, drag the border line to the desired position and release the left mouse key.



Click into a line of the *Configuration Table* to highlight the belonging column with measurement values in the table above. This way you can also display a column without scrolling when the value table exceeds the size of your monitor.

9 Predefined Charts & Tables

9.1 Plant Yield

This is a combined bar/curve chart that contains the graphs of the corrected radiation energy per square meter (curve) and of the corrected energy yield per day (bar) for the current month.

9.2 Plant Power

This is a combined bar/curve chart that contains the graphs of the mean power (curve) and the average radiation power per day (bar) for the current month.

9.3 Block Yield

This is a curve chart with the graphs of the corrected energy yields of all inverter blocks and the corrected radiation energy for the current month.

9.4 Block Power

This is a chart with the curves of the power values of all inverter blocks and the corrected radiation energy of the current month.

9.5 Block PR

This is a chart with the curves of the performance-ratio values of all inverter blocks and of the plant of the current day.

9.6 Inverter Yield

This is a chart with the curves of the corrected energy yields of all inverters and the corrected radiation energy of the current month.



This chart is not available for all plants.

9.7 Inverter Power

This is a chart with the curves of the power values of all inverters and the corrected radiation energy of the current month.

9.8 Inverter PR

This is a chart with the curves of the performance-ratio values of all inverters and of the plant of the current day.

10 Alarms

There are many ways in PVGuard Client to open the *Alarms* view, so as to simplify their administration. The starting points include:

- As a top level entry for a plant in *View Navigator* tree
- From context menus for devices or plants in the *Plant Explorer*
- Directly from symbols in many of the views
- By mouseover functions in view windows

Once the Alarms view is opened, it will look similar to [Fig. 59 on p. 89](#):

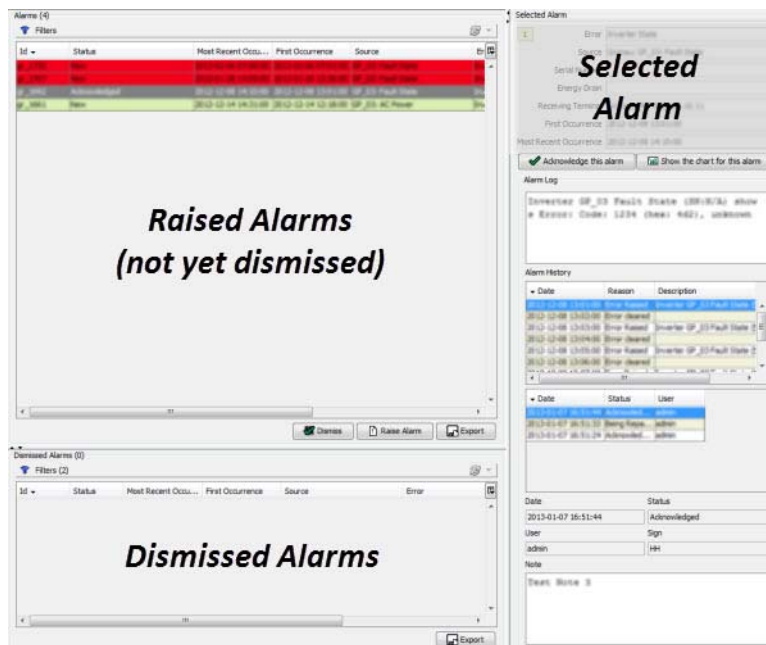


Fig. 59 The Alarms view and its elements

In the upper left corner of the *Alarms* view, there is the *Raised Alarms* table. This table lists every alarm until it has been dismissed. The table includes the following data about each alarm:

- *Id* - a unique alarm number
- *Status* - every alarm has a status assigned to it e.g. New, Acknowledged
- *First Occurrence* - when alarm was first triggered, date and time
- *Most Recent Occurrence* - latest triggering, date and time
- *Source* - what device or other source triggered the alarm
- *Error* - details of the underlying error
- *Age* - how long the alarm has been raised
- *User* - the person that is dealing with the alarm
- *Active* - whether the underlying error condition that caused the alarm is still present

Once it has been processed and dismissed, an alarm moves to the *Dismissed Alarms* table in the lower left quadrant of the *Alarms* view. You can also open a dismissed alarm and view its details. Both the *Raised Alarms* and *Dismissed Alarms* tables include a filter panel at the top to restrict the number of entries shown (see [Chap. 5.14, Filters, on p. 35](#)).

The right hand side of the *Alarms* view, *Selected Alarm*, shows detailed information about the selected alarm on the left hand side and allows you to process that alarm.



PV Guard Client can be configured to notify you when a new alarm occurs or when an alarm has been dismissed - either automatically or by another client. The Alarms view must be open for this to occur. See [Chap. 6.3.1, Client Configuration - Alt+U, on p. 45](#) for the configuration settings.

10.1 Configuring the Columns of the Alarms Table

You can customize the appearance of the *Raised Alarms* and *Dismissed Alarms* tables as follows:

- To select the columns you would like to display:
 - Click the *Configure Columns* button on the right of the table header. A menu will open (see [Fig. 60 on p. 90](#)).
 - Click the desired entry. The selected column will be displayed in the table (ticked in the menu) or removed (cleared in the menu).
 - Repeat for any further columns.
- To sort the alarms in ascending or descending order for a particular column:
 - Click the header of the column you would like sort the alarms against.
 - Use **Ctrl+F** to pop up a search dialog (see [Chap. 5.13, Tabellenoptionen, on p. 33](#)).

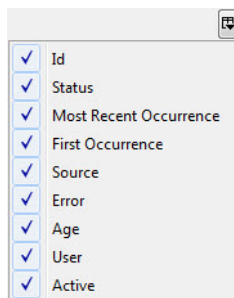


Fig. 60 Menu for configuring columns of the *Raised Alarms* and *Dismissed Alarms* tables



The column configuration and order is stored in the program settings and will be restored next time you restart the program.

10.2 Alarm Status and Severity

To help manage alarms, each is given a status and a severity. The status can have one of the possible values shown in [Table 3 on p. 91](#).

Status	Meaning
New	Status when an alarm is first raised
Acknowledged	Aware of the alarm, but no action taken yet; the underlying error may not have been fixed.
Being Repaired	A repair has been initiated.
Repaired	The repair is complete.
Dismissed	The alarm has been fully processed; any repair has been signed-off.

Table 3 Alarm status

You can change the status setting by clicking the *Dismiss* button at the bottom of the *Raised Alarms* list or the *Acknowledge this alarm* button in the alarm status area, and setting the status in the *Dismiss Alarm* dialog (see [Chap. 10.4, Acknowledging Alarms, on p. 92](#)).

In addition, each alarm is attributed with a degree of severity, having a defined colour. The degree of severity of the selected alarm is displayed in the box that precedes the *Error* field. The following degrees of severity have been defined:





Colour	Error type
 Green	No error, alarm, or warning
 Yellow	Warning
 Light orange, through to	Errors of different severities; alarms
 Dark red	

Table 4 Alarm colours

10.3 Alarm Details

On the right hand side of the *Alarms* view is the *Selected Alarm* area. This gives fuller details about the currently selected alarm.



At the top is a small pane showing summary information:

- The *Error* field shows the name of the error that triggered the alarm.
- The *Source* field lists the plant, the device and the data channel where the error occurred.
- The *Serial Number* of the faulty device, if defined, is given here. The error notification itself is displayed as a standardized text that contains the data values, either as an absolute value or a percentage.
- The *Energy Drain* and *Receiving Terminal* fields describe the position of the device within the power interconnection chain and the communications interconnection chain respectively. See the description under [Device Properties in 5.4.4.3, Tab: Other, on p. 29](#).
- *First Occurrence* and *Most Recent Occurrence* display timestamps showing when the error occurred.

This error information is followed by the buttons *Acknowledge this Alarm* and *Show the chart for this Alarm*.

10.4 Acknowledging Alarms

To acknowledge an alarm, follow the steps below:

1. Click  *Acknowledge this Alarm*.
The dialog *Dismiss Alarm* will open. The alarm to be acknowledged appears in the *Selected Alarms* list of the dialog.
2. Enter any remark into the text field *Notes*, for example, that you have notified the service department or that it is a known error.
3. Enter your name or sign into the field *User Sign*.
4. Select and assign an alarm handling *Status* from the list field (see [Chap. 10.2, Alarm Status and Severity, on p. 91](#)).
5. Confirm your entries and selections with  *Ok*.

If you have assigned the status *Dismissed* to the alarms, they will appear in the lower *Dismissed Alarms* table after you close the pop up dialog. An alarm remains in the *Raised Alarms* table until has been fully processed and closed by assigning the status *Dismissed*.




You can dismiss several alarms at once by using the multi-select option.

Creating a Service Log Entry for Alarms

The *Dismiss Alarm* dialog also provides a short-cut for creating an entry in the *Service Log* (see [Chap. , To navigate within the fields of the dialog Raise Alarm, use the Tab key., on p. 94](#)) for those alarm(s) that you selected.

Press the button *Create Log Entry* at the bottom of the dialog and the *Edit Log Entry* dialog will pop up. Here, you can add further information concerning the selected alarms, for example any notes. The alarms and their associated devices will be automatically linked with the entry (under for example the tab *Alarms* in the dialog). Once you have completed the mandatory fields in the dialog, you will be able to save the new *Service Log* entry (or press *Cancel* to abort the creation of the entry).

10.4.1 Charting an Alarm's State

Select an alarm and click the  button to view a chart that depicts the state of the selected alarm regardless of its dismissal status. The chart opens showing the relevant state data of the device associated with the alarm, from the time of the first occurrence of the error.



When analysing the data we recommend that you select a 1-minute resolution for the chart.

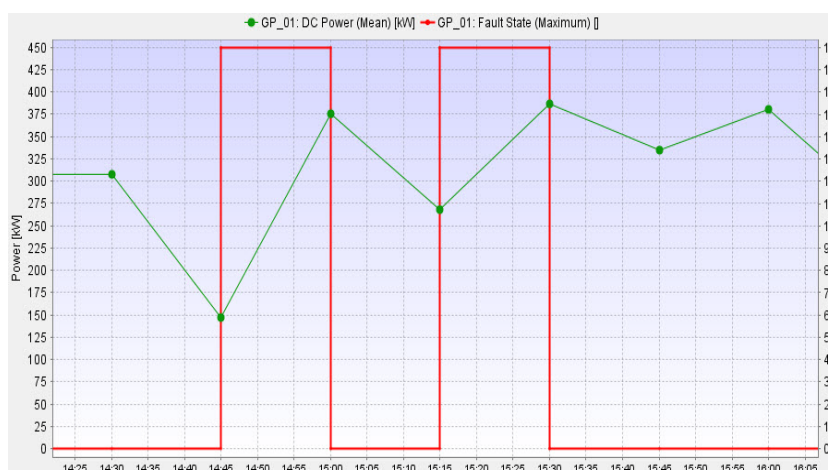


Fig. 61 Chart of an alarm, showing DC power and inverter state

10.4.2 Alarm Log and History

The middle section of the *Selected Alarm* area contains the *Alarm Log* and *Alarm History* panes. The *Alarm Log* shows the details about the cause of the alarm. The *Alarm History* includes two panels: the top panel describes the changes of the state of the underlying error that triggered the alarm (when the error was raised and cleared); the lower shows the progression of the alarm's status - from its initial acknowledgement to its final dismissal.

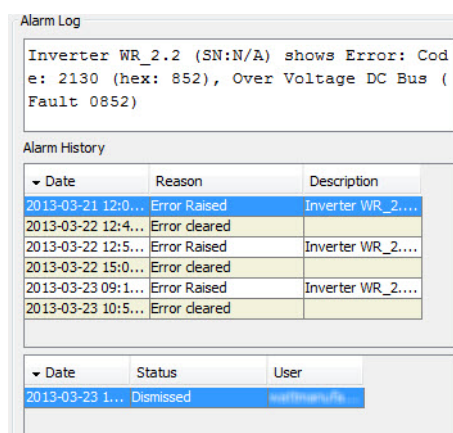


Fig. 62 Alarm Log and History

10.5 Exporting Alarm Details


Alarms can be exported into a file in a number of different formats.

- To export raised alarms (i.e. those not yet dismissed), use the filter at the top of the *Raised Alarms* table to set the criteria for the alarms you wish to export. The alarms will be shown in the table. Then click the *Export* button underneath the *Raised Alarms* table.
- To export dismissed alarms, use the filter at the top of the *Dismissed Alarms* table to set the criteria for the alarms you wish to export. The alarms will be shown in the table. Then click the *Export* button underneath the *Dismissed Alarms* table.

In both cases, the *Export Preview* dialog will next appear, allowing you to configure how you want the output data to appear. Details about the *Export Preview* dialog can be found in [Chap. 5.15, Exporting List Data, on p. 36](#). Once you have done this, click the *Export* button at the bottom of the *Export Preview* dialog and you will be able to export the files into a file of your choice.

10.6 Manually raising an Alarm

As plant manager, you might also need to raise an alarm yourself, for example, if you have noticed a malfunction. Such alarm is listed in the *Alarms* table just like any other alarm. To raise an alarm, follow the steps below:

1. Click *Raise Alarm* under the *Raised Alarms* table. The dialog *Raise Alarm* opens.
2. Click in the *Plant Explorer* and select the faulty device or measurement channel. Your selection will appear in the *Alias* field.
3. From the *Error Type* list, select *Device not available* or *User error*.
4. From the list *Status*, select one of the error states *New*, *Acknowledged*, *Being Repaired* or *Dismissed*.
5. Edit the fields *First Occurrence* and *Most Recent Occurrence*. Default setting: current date and time.
6. Enter details of the error into the field *Notes*.
7. Enter your name or sign into the field *User Sign*.
8. Confirm your entries with  *Ok*.

The manual alarm will then appear in the *Alarms*, with the name *Manual Error*. A manually raised alarm is handled in the same way as automatically triggered alarms.



To navigate within the fields of the dialog *Raise Alarm*, use the **Tab** key.

11 The Service Log

If available for your plant configuration, the *Service Log* helps you to keep a record of service and maintenance activities on the plant, and to tie these records together with the data from the plant - measured data, alarms, errors and equipment status.

The log consists of a list of entries, each of which refers to a particular service incident (e.g. an inverter malfunction) or event (e.g. planned maintenance). An entry might include several notes (observations, telephone calls, details of site visits etc.), be linked to one or more pieces of equipment in the plant (inverter, combiner box, module, string etc.). It may be connected with one or more alarms, and can also be associated with other service log entries.

The *Service Log* function helps you to store with all this information together in a single place.

Service Log

Entry No: 221
Opened: 12.06.2012 19:15
Closed: 17.06.2012 18:00

Subject: Low string voltage on EAST_04

Notes:

Date/Time	Description
12.6.12 19:15	Low string voltages reported
13.6.12 19:14	Low string voltages again
14.6.12 20:09	Site check: neighbour has crane working on site - crane is throwing shadow
17.6.12 10:00	Neighbour says crane removed
17.6.12 18:00	Checked: String voltages normal

Alarms:

Date/Time	Description
12.6.12 19:15	Low string voltage on EAST_04_221
12.6.12 19:15	Low string voltage on EAST_04_222
12.6.12 19:15	Low string voltage on EAST_04_282

Devices:

Date/Time	Description
12.6.12 19:15	Module EAST_04_221
12.6.12 19:15	Module EAST_04_222
12.6.12 19:15	Module EAST_04_282

Associated Log Entries:

Date/Time	Description
-	

List of the various actions taken before issue was resolved

Often an incident will be triggered by, or associated with certain alarms on the system

The equipment involved must be identified for future traceability

Sometimes one log entry will be in some way associated with other entries, e.g. when the problem is intermittent

Fig. 63 Service Log concept

For traceability, each entry has a start and ending time-stamp; however entries may overlap in time. They can be assigned to a category of your choice and can also be given a ticket number, allowing them to be associated with other event or incident reporting systems. Entries may also be classified as Open or Closed.

11.1 Viewing the Log

The service log for a power plant is opened by clicking on the *Service Log* entry for that plant in the *View Navigator*. The view of the Service Log will open in a new window in the *Views* area. Initially, all entries in the service log for the selected plant are shown collapsed (just showing the subject, an id, date, and whether it is still open) arranged with the newest entry first.

The service log may also be opened from the alarm handling dialog (see [Chap. 10.4, Acknowledging Alarms, on p. 92](#)) or from the context menu of the Plant Explorer (see [Chap. 5.6.2, Context Menu in the Plant Explorer, on p. 28](#)). In these cases it will be opened with a filter to show only the relevant entries.

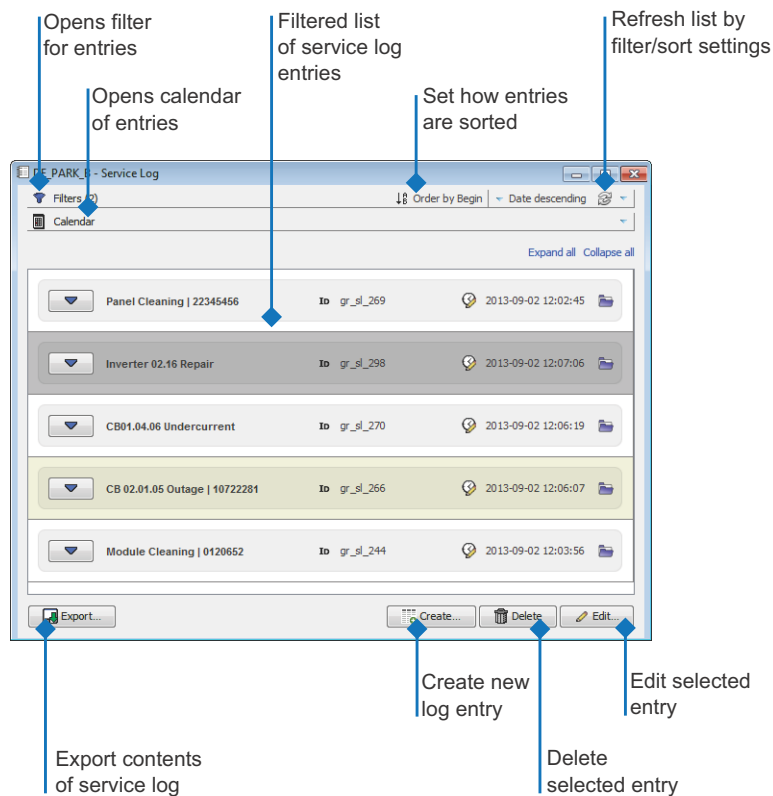




Fig. 64 Service log with all entries collapsed

Any of the entries may be expanded by clicking on the expand button , which also serves to contract the open entries again (now shown as ). Alternatively you can use *Expand all* or *Collapse all* to expand/contract all entries in the table.

Once opened, log entries appear as shown in [Fig. 65 on p. 97](#). Each entry includes various filing information such as start date, a category, a user name, whether open or closed. Its main body is a tabbed box, letting you see the core details of the entry: the *Notes*, *Alarms*, associated *Devices and Values*, and any other *Log Entries* with which this one is linked. *Notes* are initially shown collapsed, with only the first line visible; clicking on this line will cause the note to expand to show its full text (click again on the first line and the note will collapse again).

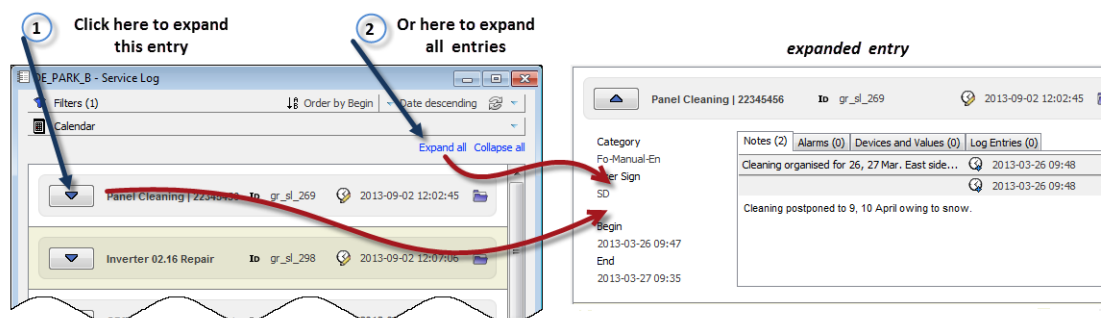
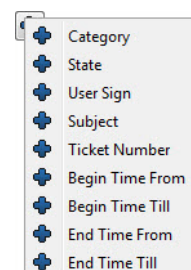


Fig. 65 Service Log, showing an expanded entry

Filtering the Service Log

Since the list of entries might be long, there is a filter function at the top of the list. ([Chap. 5.14, Filters, on p. 35](#)) The filter allows you to restrict the entries as follows:

- Those created by a particular user, given by their *Sign* initials
- Those allocated to a particular *Category*
- Those starting or ending with a particular *Subject* text. In addition the wild-card character '*' can be used anywhere within the text.
- Those with a particular *State* (Open/Closed)
- Those created or ending *Before* or *After* a particular date/time
- Those with a particular *Ticket Number*.



Order of Entries

In addition to filtering, you can change the order in which the entries in the view are listed by using the two sorting options at the right hand side of the filter box (see [Fig. 66 on p. 97](#)):

The left hand option sets which field will be used for the sorting: e.g. Order by *Begin* time-stamp, *End* time-stamp, *Changed* time-stamp (i.e. when last modified), *Category*, *Title* etc. The right hand option sets the direction of sorting e.g. lowest to highest, first to last, or visa-versa.

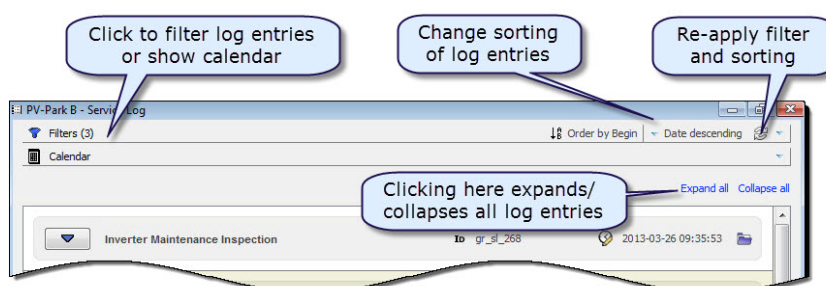







Fig. 66 Service Log header

The Calendar

Another way of navigating the Service Log is provided by the *Calendar* function beneath the *Filter*. This is opened by clicking on the  symbol, which then expands as shown in [Fig. 67 on p. 98](#).

The left hand pane shows a monthly calendar. It can be navigated using the  or  buttons (previous or next month) and  or  buttons (previous or next year). To change the size of this calendar, displaying more or fewer months, you can drag on the right-hand or lower borders of this calendar pane.

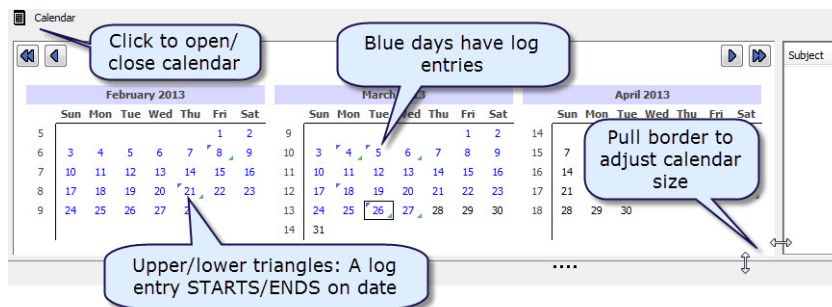


Fig. 67 Calendar function of the Service Log

Any dates in the calendar for which a service log entry applies (i.e. the date is between or on the *Begin* or *End* dates of the entry) are coloured blue. Otherwise dates are black. Further, a date on which a service log entry begins or ends is shown by a violet upper triangle (Begin) or green lower triangle (End) on that date in the *Calendar* (see Fig. 67 on p. 98).

Clicking on any date in the *Calendar* will cause the Service Log entries that were applicable on that date to be shown in the right hand pane of the *Calendar*. If the begin or end dates of the entry fall within the scope of the left-hand calendar pane, then the date in the list will be shown violet or green, matching the triangle on the date itself (see Fig. 68 on p. 98).

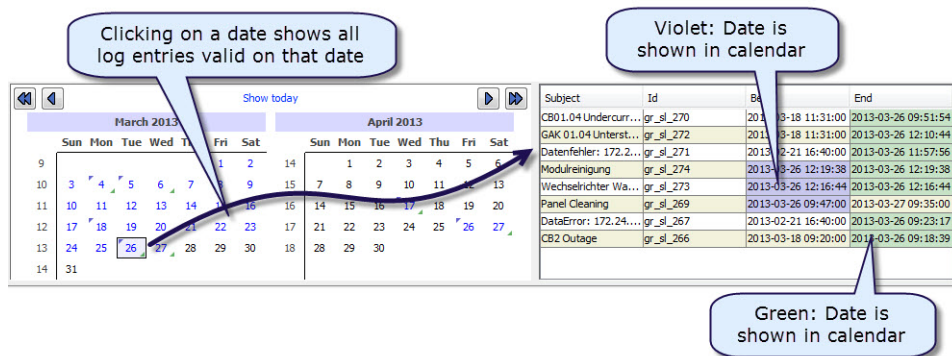


Fig. 68 Calendar function of the Service Log, showing entries for a particular date

Clicking on any entry on the right-hand pane displays and selects the chosen entry in the filtered Service Log table below. It also highlights the period for that entry in the left-hand calendar (see Fig. 69 on p. 98).

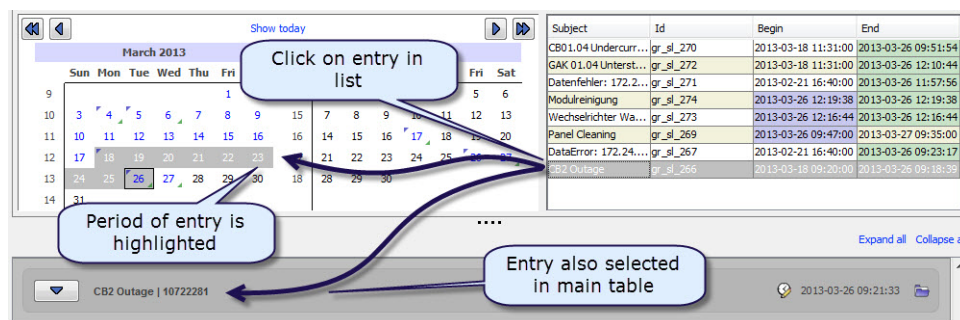
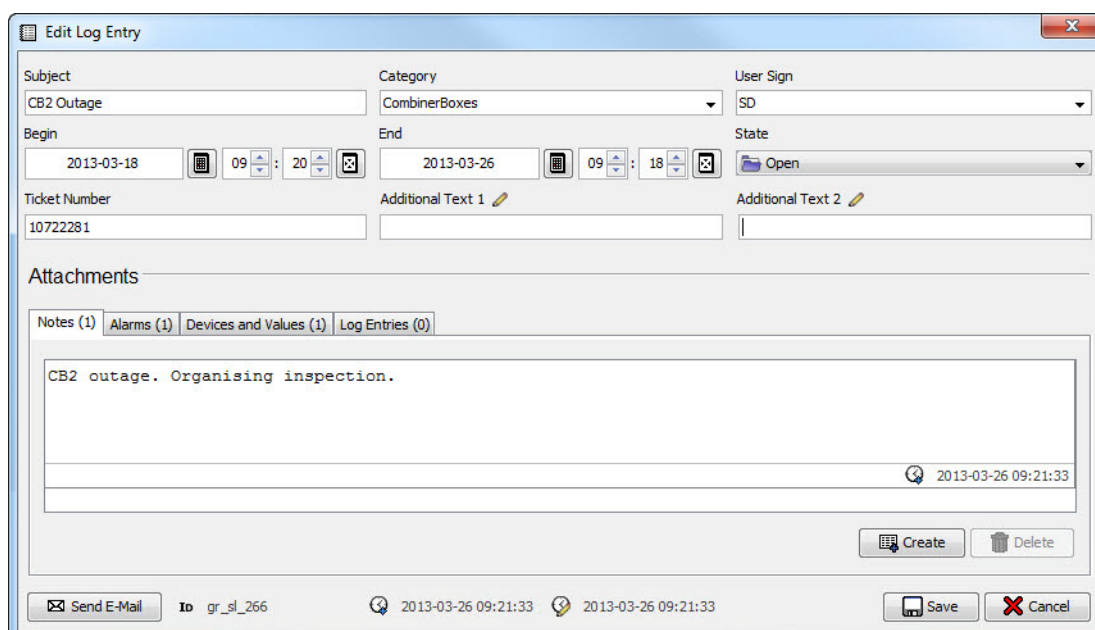


Fig. 69 Calendar function of the Service Log, showing a highlighted log entry

11.2 Editing the Log

Three buttons at the bottom left of the log allow you to *Add*, *Edit* or *Remove* the entries (depending on your user rights). In the first two cases, the *Edit Log Entry* dialog will appear as shown in [Fig. 70 on p. 99](#). Double clicking on any entry in the log will also open this dialog.



The dialog box is titled "Edit Log Entry". It contains several input fields and sections:

- Subject:** A text field containing "CB2 Outage".
- Category:** A dropdown menu showing "CombinerBoxes".
- User Sign:** A dropdown menu showing "SD".
- Begin:** A date and time picker showing "2013-03-18 09:20".
- End:** A date and time picker showing "2013-03-26 09:18".
- State:** A dropdown menu showing "Open".
- Ticket Number:** A text field containing "10722281".
- Additional Text 1:** An empty text field with a pencil icon.
- Additional Text 2:** An empty text field with a pencil icon.
- Attachments:** A section with tabs for "Notes (1)", "Alarms (1)", "Devices and Values (1)", and "Log Entries (0)". The "Notes" tab is active, showing a text area with "CB2 outage. Organising inspection." and a timestamp "2013-03-26 09:21:33".
- Buttons:** "Create", "Delete", "Send E-Mail", "Save", and "Cancel".
- Footer:** Displays "Id: gr_sl_266" and two timestamps: "2013-03-26 09:21:33".

Fig. 70 Edit Log Entry dialog

Upper Section - Subject, Categories, etc.

The first three rows of the dialog contain the key information for cataloguing the log entry (e.g. that you can use in filtering the Service Log). You cannot save the entry until you have completed the three mandatory fields in the top row.

- **Subject:** The title of the entry (any text). If a filter has been set for subject, then the default value for the subject will match that used for the filter; otherwise it will be taken from the value entered in the configuration settings (see [Logbook Settings in 6.3.1.1, Tab: General, on p. 47](#)).
- **Category:** Any value out of the pop-down list. You can also enter a completely new text entry here, which will then become available in the list. In addition, an auto-completion prompt will propose a possible value as soon as you start typing. If a filter has been set for category, then the default value of the category will match the filter value.
- **User Sign:** The creator (owner) of the entry. The default value will be taken from the value entered in the configuration settings (see [User settings in 6.3.1.1, Tab: General, on p. 47](#)).
- **Begin:** Start date/time of the event or incident. Defaults to the current time and date. Values in the future are also possible for planned activities.
- **End:** End date/time of the event or incident. Functions similarly to *Begin*.
- **State:** Either Open or Closed. This is for your own information only - the field has no effect on the entry itself, such as locking it. However it can be useful as a filter.
- **Ticket Number:** Any text you choose. This field is designed for linking this entry with any other incident tracking systems you may have. The entry is stored for your reference and is not used for any other processing by PV Guard Client.
- **Additional Text1/2:** Can be used for any data or metrics you wish. You can rename these fields by clicking on the field title or the pencil icon.



Tip: To make filtering easier when the log contains many entries, it may be helpful to establish a convention for the text you use for the subject field, and to define your categories carefully.

Dialog Body - Service Event or Incident Details

The main part of the dialog allows you to enter the specific details about the service event or incident, using a tabbed box with the headings described below:

- **Notes:** Any text concerning the entry. You can add as many individual notes as you wish.
- **Alarms:** Any alarms that are associated with the entry (see [Chap. 10, Alarms, on p. 89](#)). You can either drag & drop alarms from the Alarms list in the *View Navigator* or use the *Add* button to pop up a list of all alarms in the plant.
- **Devices and Values:** Shows the equipment or derived data (e.g. performance ratio) associated with the log entry. You can link devices from the *Plant Explorer* to the entry; for this, either drag & drop then from the *Plant Explorer* into the list, or use the *Add* button to pop up a list from which you can select the wanted devices and data channels.
- **Log Entries:** Sometimes a log entry will be associated in some way with another log entry; for example a service log entry about low power from a module might be later coupled with an entry concerning shade at the site. You can make such an association in this tab. Click *Add* to display a pop up showing the service log entries for the plant.



Note: If a device or an alarm is shown as 'Not Allowed', this usually means that you don't have sufficient user rights in PVGuard Client to see that item. It could also mean that this device has subsequently been removed from the system.

At the bottom of each tab there are two buttons:

- *Add* either inserts a new row for editing (notes) or pops up a dialog in which you can choose the relevant item (alarm, device, contact etc.).
- *Remove* will first prompt you with a confirmation dialog, before removing the associated item.

Footer: Send Email

Apart from *Save* or *Cancel*, the footer contains the *Send Email* button

- An e-mail will be drafted with text based on the log entry.
- The e-mail subject will be the *Subject* of the entry, together with any ticket number entered
- The e-mail body will be taken from the contents of the *Notes* and the *Alarms* tabs of the log entry.

11.3 Removing Entries from the Log

Should you need to remove an entry from the log for any reason, select the entry and click *Remove*. You will be prompted to confirm the removal before the entry is finally removed.

11.4 Exporting the Log

You can export the log in one of many different formats by clicking on the *Export* button at the bottom right of the log. See [Chap. 5.15, Exporting List Data, on p. 36](#).



Although you can rename the two fields *Additional Text 1* and *Additional Text 2* in the *Service Log*, when exporting the log entries, the new names will not be shown in the dialog

used to configure the export fields. Instead the names *Additional Text 1* and *Additional Text 2* will appear. However, they will be correctly displayed in the title row of the exported data. See also [Upper Section - Subject, Categories, etc. in 11.2, Editing the Log, on p. 99.](#)

11.5 Creating Service Log Entries from Alarms

As a quick means of documenting any alarms that are raised in your plant in the service log, together with any further information, a short cut has been provided in the dialog for processing the alarms. See [Chap. , Creating a Service Log Entry for Alarms, on p. 92.](#)

12 Configuration Options

12.1 Email Notifications

Overview

To ensure optimum plant operation, PVGuard includes the ability for you to send e-mails about your plant's status to one or more mailing lists.

Any number of mailing lists can be defined, with the same or different recipients. The mails to these lists may be triggered according to different sets of conditions. So, for example, you could define one e-mail list for alarms that are raised by inverters, and another for alarms from the monitoring system.

The e-mails may be sent under the following conditions:

- Daily status reports
- Whenever an alarm is raised for a specific sort of error
- Whenever an alarm is raised for in a particular type of device (e.g. inverter)
- According to defined combinations of device types and error types

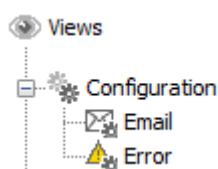
E-mails are sent with a Subject of: *<Plant Name> - new Alarms(count)*. The message contains relevant status and error information such as:

- Plant
- Current power
- Energy Yield Today
- Performance Ratio
- Tables containing the performance ratio and energy yield values per block for the current and previous days
- Number of errors
- List of all non-dismissed errors with date/time, device name and name of the error

Any non-dismissed errors will be carried forward into the next email, causing the list to grow.

12.1.1 Configuring the distribution of E-Mails

To configure the E-Mail lists, open the e-mail configuration window by clicking on the folder *Configuration > E-Mail* in the View-Navigator pane.



The e-mail configuration window will open, as shown in [Fig. 71 on p. 104](#). On the left of the window is a *selection* pane listing all your configured e-mail lists. Selecting any of these lists will cause the settings for that list to appear in the *Definition* pane on the right.

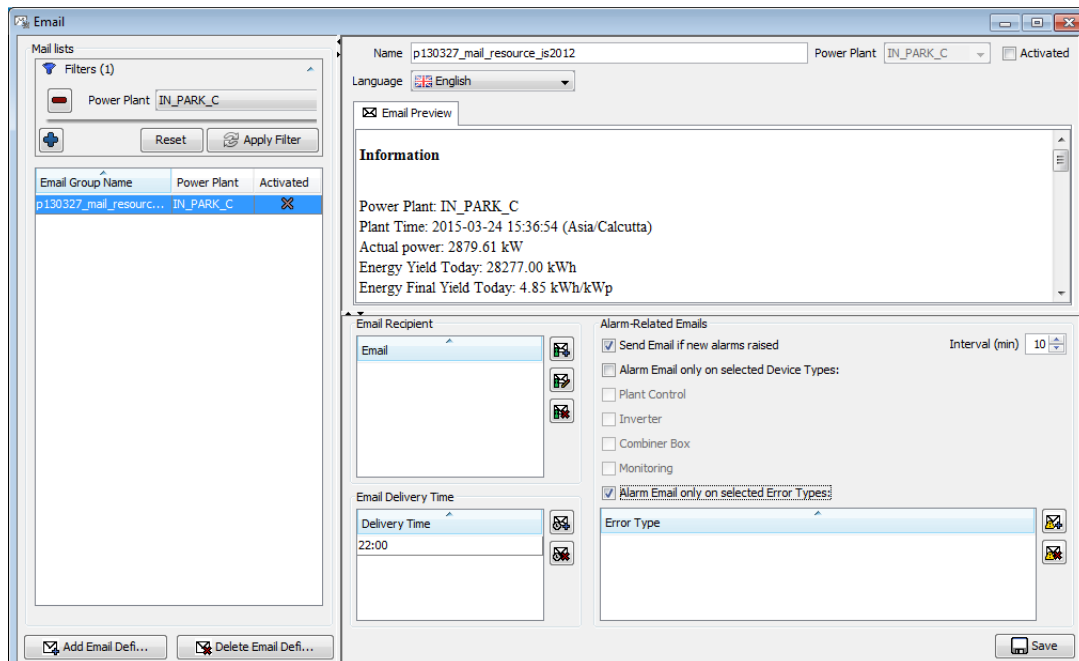


Fig. 71 Email dialog

12.1.2 The Selection pane (left-hand side)

The main part of the selection pane shows a list of all those mailing lists you have set up so far. The pane shows: the name of the e-mail list, the associated power plant, and a marker to show whether the list is active. Active lists are shown with a tick ✓. Although an email list may be defined at any time, it will only be used once it has been set active.

At the top of the list is a *Filter* control, to let you restrict the list to:

- Those that are currently active (or not)
- Those for a particular plant

For more details on *Filters* see [Chap.5.14, Filters, on p. 35](#).

At the bottom of the list are two buttons to allow you to *Add* a new list or to *Delete* an existing one. If you *Add* a new list, you will have to give the following information in a definition dialog:

- A name for the new list (you can use normal characters and spaces, but not special symbols such as '<' or '?').
- The power plant concerned
- The language that is to be used for the e-mail content
- The template to use to define the e-mail content and format. The templates are predefined by skytron.

12.1.3 The Definition pane (right-hand side)

Each email list can be configured as follows:

Definition Pane Header

- Here, you can define whether emails are to be sent to this list or not: If e-mails are to be sent, tick the *Activated* option box. Remember always to press *Save*. The list will be shown as Active once the update has been synchronized with the PVGuard servers.
- The language used for the emails: select the language to use in the *Language* field.




- The name of the entry in the *Selection* pane: use the *Name* field.

Email Preview

This area gives you a preview of how the e-mail will appear for your plant.



Email Recipients

This section allows you to define the recipients of the email. The mails will be sent to the recipients defined in this list.

- To add a new recipient, click . A new, blank entry will appear, where you can add the email address.
- To edit an existing email address, select the entry and click  or double click on the entry; the entry will become editable.
- To delete an entry, select it and click .

Delivery Time

This section enables you to define the time of delivery for daily e-mails about plant status.



- To create a new Delivery Time, click ; a new line with the dummy entry 0:00 will be added to the table. Double click on this entry to edit the time.
- To edit an existing Delivery Time, double click on the entry concerned and edit it.
- To remove a delivery time, select the time concerned and click . The entry will be removed from the list.



All times given must be stated in terms of the PVGuard Client time.

Alarm-triggered Email delivery

In addition to daily status mails, you can configure PVGuard to dispatch emails after new alarms have been raised. This is defined in the *Alarm-Related E-Mails* section of the dialog.

- To activate these mails, check the option box *Send Email if new alarms raised*
- The spinner field *Interval (min)* sets how often (0-50 minutes) the system will check for new alarms. If a new alarm has been raised and not yet dismissed within this time interval, then an email will be dispatched.
- You can also refine the trigger so that it is restricted to a particular device type or types by clicking *Alarm Email only on selected Device Types* and then choosing the relevant device types in the list below.
- In addition, you can refine the trigger to a particular type of error by checking the box *Alarm Email only on selected Error types*. The two buttons to the right of the *Error Type* table will then be enabled, and allow you to define one or more error conditions out of the list in the table. The mail will be sent if ANY of the conditions error occurs.
 - The top button  allows you to add a new error condition - you will be prompted to choose an error condition from a list.
 - The bottom button  allows you to delete the selected existing condition from the list.

Saving the Changes

When you have finished defining the content and triggers for the mail, always press **Save**.

12.2 Configuring Errors

PVGuard Client gives you the option to define, activate and modify groups of error conditions for different errors.



An **error** is the deviation of at least one (calculated) value outside of defined margins. It arises when at least one component fails or changes its state in such a way as to disturb the functioning of the component.

An **error condition** is a concrete definition of an error, in terms of configurable parameters against which raw or derived data from a plant is tested, and which results in an alarm being triggered. The same error might result from the presence of any of several different error conditions.

An **error group** is the set of components that are checked using the same parameters for a particular error condition.

An **alarm** is raised when an error occurs in at least one component.

To define errors and error groups, proceed as follows:

- Open the *Configuration* folder  in the *View Navigator*.
- Select *Error* . The *Errors* dialog will open in the views window. This dialog comprises three panes: *Error Groups*, *Parameters* and *Components*. It is shown in [Fig. 72 on p. 106](#).

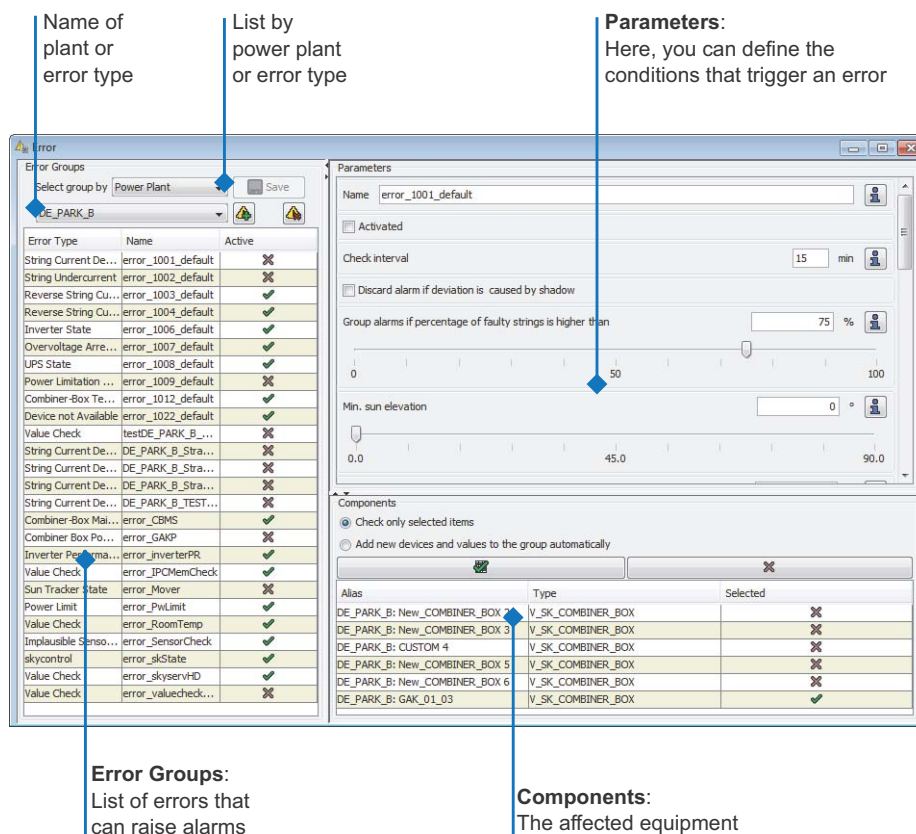







Fig. 72 Errors dialog

-  Button to create new error group
-  Button to save error group
-  Button to delete error group
-  Button to include component in check
-  Button to exclude component from check

 Button to view informative text about a parameter

Error Groups pane

Here you can set how the error groups are to be listed (select one of two options):

- *By Power Plant:* In this case, the error types that apply to a particular PV power plant are displayed together with their error group and whether this error type is active (i.e. whether the error conditions are actively being tested).
- *By Error Type:* Alternatively, all PV power plants are listed where a particular error type is applicable, together with the error group and whether the error type is active.

The table lists the names of the corresponding error conditions, whether each is currently being tested and either the name of the plants to which they apply or the error type to which each belongs. New error groups can be defined or deleted in the dialog.







Parameters pane

This is where you define or edit the parameters of a particular error group selected in the *Error Groups* pane. In this pane you can:

- Set whether the error check is active or not (if not, no errors will be raised)
- Define how often the error check is to be carried out by entering a time value (1-60 minutes) into the field *Check Interval*.
- Set other parameters involved in the error condition; these will vary from error to error.

Components pane

Here, you can define the components in the PV power plant to which this error condition applies. For most error types there will be a predefined list of components to which the error condition might apply - these will depend on the error concerned and plant configuration. You can define whether these individual components are to be tested as part of the error check by marking the individual devices shown in this pane:

- Mark the devices or measurement channels to be checked in the *Alias* column and click  to select them. They will appear in the *Selected* column and be marked by a tick .
- Or click  to disable the check on a device or measurement channel. It will then be marked by  in the *Selected* column.
- Two options may be displayed at the top of the *Components* group. These apply when new equipment is added to the plant which would also be included in this error check. Choose which applies:
 - *Check only selected items*
Your selection remains unchanged and the new device is not included in the check until you the next manual change the selected items.
 - *Add new values and devices to the group automatically*
If new devices are installed and are relevant for this check, they will be selected and included in the error group automatically. The *Value Check* error type behaves slightly differently. In this case the *Components* pane appears as in [Fig. 73 on p. 108](#). On the left hand side there is a list of potential components to be included in the check, similar to the *Plant Explorer*.
 - Add the devices or measurement channels to be included either by double clicking the required entries in the list of plant components or by using the arrow button . Double clicking components in the *Plant Explorer* can also be used.
 - Remove devices from the error check by clicking .

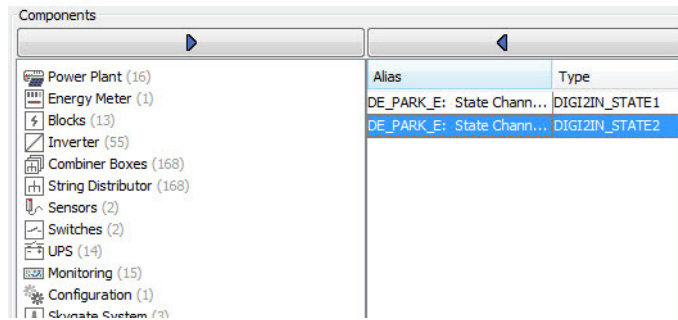


Fig. 73 Value Check error configuration

12.2.1 Error Types

The following error types are available:

- *String Current Deviation*
- *Reverse String Current*
- *Reverse String Current Inv. Idle*
- *String Undercurrent*
- *UPS State*
- *Combiner-Box Temperature*
- *Combiner-Box Power State*
- *Combiner-Box Main Switch*
- *Performance Ratio*
- *Inverter Power*
- *Inverter Status*
- *Mover State*
- *Active Power Limitation*
- *Power Limitation Communication*
- *Overvoltage Protection*
- *Medium Voltage*
- *Missing Data*
- *Value Check*
- *Implausible Data*
- *skycontrol State*

12.2.2 Configuring Error Groups

When you configure error conditions, always carry out the following steps, regardless of the error condition:

1. Click  to add a new error group to the table. The dialog *Add new error group* will popup.

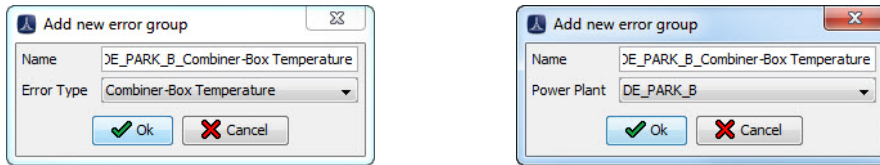





Fig. 74 Dialog *Add new error group*

2. Type a name for the error group into the input field *Name*.
3. Depending on the settings in the *Error Group* window, allocate the desired *Power Plant* or the *Error Type*.
4. Confirm the dialog with *Ok* or click *Cancel* to abort your entries.

The new error group will be added to the table and marked automatically while the editing fields in the *Parameters* window become active.



As soon as you have edited the first field or moved a slider, the *Save* button turns active. If a value is missing or invalid, its field is coloured light red.

5. If necessary, change the name of the error group.
6. Activate the check box *Activated*. The error group will obtain the status activated  in the table after saving.
7. Enter into the text field *Check Interval* every how many minutes a check for the error condition is to be carried out. The value range depends on the error type (typically 5-59 minutes).
8. Click *Save* on top of the *Error Group* window to save your definition. The error group will appear in the table with *Name*, *Plant* and its respective status *Active*  or inactive .



You can save the error group only if all values are valid. If not, the respective fields are coloured light red.




The table can be sorted as to their column entries. To do so, click on the desired column head.


9. Continue with the definition of the error-specific parameters such as value ranges, deviations, threshold values, etc. This is described for every possible error condition in [Chap.12.2.4, Settable Error Conditions, on p. 110](#).

12.2.3 Deactivating and Deleting the Error Check

Deactivating an Error Group

Deactivate the option box *Activate* for an error condition selected in the table if you would like to temporarily deactivate this error condition. Click *Save* to transfer the deactivation to the plant. The error condition will be marked with the status inactive  in the table.

Deleting an Error Group

Select the error group to be deleted in the table and click . The error group will be deleted from the database upon confirmation of the safety query.

12.2.4 Settable Error Conditions

12.2.4.1 String Current Deviation

Alarms are raised for this error when the output current of any string(s) in a group shows a significant deviation from the group mean, so helping to identify faulty strings. To prevent false alarms, a number of additional conditions are used to refine the test.

Self-learning for shade

1. This additional condition can detect when a string current deviation has been caused by shading. If so, this will be added as a note in the alarm message. If you do not want to receive alarms for this type of string current deviation, activate the check-box *Discard alarm if deviation is caused by shadow*, which will reduce the number of regularly-occurring, unavoidable low-string-current alarms.

Snow or Soiling

Many similar alarms are often triggered when snow falls or there is significant soiling of the modules.

2. A percentile figure can be entered into the field *Group alarms if percentage of faulty string is higher than*. Then just a single alarm giving the number of faulty strings will be raised if this proportion of the strings raise the same fault together.
3. To prevent alarms being triggered in low sunlight conditions, or if there is row shading in your plant, define the *Min. sun elevation* in degrees at which the error check is to start. This condition is usually better than using, say, a time of day.
4. Use the slider *Min. current* or enter a minimum current (from 0.1-10 A) that must be reached before the error check is performed.



The mean value of the non-selected string currents must be above this minimum before the error check is carried out.

Select the value in such a way as to exclude weak-light situations. Such situations can cause relative string-current deviations which do not represent an actual error. For example, set the minimum current to the value expected at a radiation value of 300 W/m².

5. Entering a percentage figure or using the slider for *Bandwidth* sets an allowable percentage by which the string current of all strings going into a combiner box can change before the error check is performed.

The single strings are compared with each other during this error check, so one would expect the radiation to be similar during the check interval. The *Bandwidth* defines an allowable percentage change in string current within the time interval for the results to be still deemed valid. If the *Bandwidth* percentage is set too low, the check won't be performed often enough. If it is set too high, false alarms, e.g. caused by clouds, may be triggered.

The bandwidth can be set by viewing the string currents on a cloudless day and setting it above the observed normal deviation.

6. Use the *Deviation* slider or enter a percentage by which one string current is allowed to deviate from the mean current of the other string currents.

Here, you can define by how large a percentage a string current is allowed to deviate from the other string currents into the same combiner box before an alarm is released. The alarm is triggered if the monitored string current deviates more than the allowed amount, (and the error condition has been activated).

Manually Setting Error Check Limits to Account for Shade

Shading may cause unwanted alarms, therefore PVGuard Client has a function to automatically recognize shading. In addition, you can specifically exclude certain areas from the check, where objects throw shade over your PV plant at certain times of the day/year.

To do this, you define a solar orbit window (a rectangle defined by elevation and azimuth values), within which checking either takes place or is excluded:

7. Activate the option box *Limit checks according to sun position window* to enable fine tuning of the check conditions for cases where there is shade is caused by objects. The following option boxes and text fields will be enabled.
8. Activate the option box *Exclude the sun position window* if the check is to be carried out for any azimuth except that defined by the sun position window. Leave the option box unchecked to carry out the check only in the defined sun position window
9. Define the *Max. sun elevation* for the sun position window from 0-90 ° (the minimum solar elevation has already be defined).
10. Specify a sun position window throughout an azimuth range by setting the *Min. sun azimuth and Max. sun azimuth*.

You can use the solar orbit diagrams from your yield survey to identify any shading from objects. If necessary, create several error groups covering combiner boxes which are shaded similarly.

In the following, find two examples for the configuration of the error check depending on the sun position. See also [Fig. 75 on p. 111](#) and [Fig. 76 on p. 112](#):

Example 1: Shading by rows and by a tree

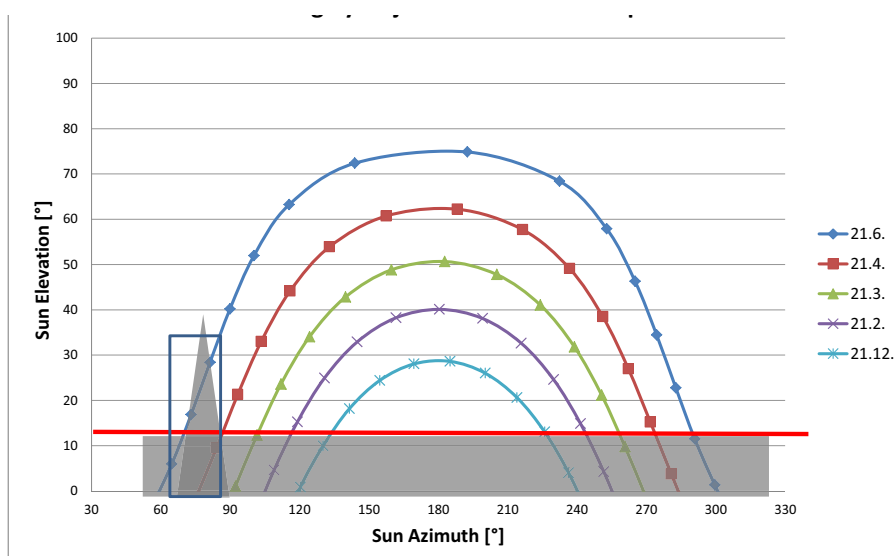
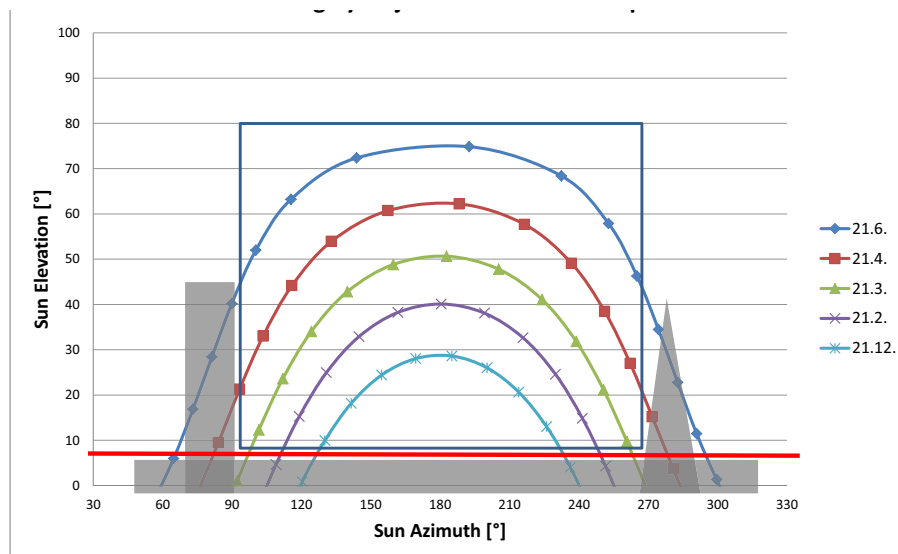


Fig. 75 Sun's orbit diagram shading by rows and objects: [example 1](#)

Solar elevations less than 15° will produce row shading. In addition, a tree in the East will also produce shade when the sun's direction lies within the rectangle shown. String-current deviations will occur under both these conditions. In this case, the rectangle represents a solar window in which error checking should be excluded. The error condition should therefore be defined as follows:

- *Min. Elevation* 15°
- *Use Sun Position Window* Activated
- *Exclude Window* Activated
- *Max. Elevation* 35°
- *Min. Azimuth* 60°
- *Max. Azimuth* 85°

Example 2: Shading by rows and by two objects beside the module rowsFig. 76 Sun's orbit diagram shading by rows and objects: example 2

Here, the range with a solar elevation below 9° is affected by row shading. Further, a chimney in the East and a tree in the West cause module shading at certain solar positions. In this case, the rectangle represents a solar window in which error checking should be carried out. The error condition should therefore be defined as follows:

- *Min. Elevation* 9°
- *Activate Use Sun Position Window*
- *Leave Exclude Window* unchecked
- *Max. Elevation* 80°
- *Min. Azimuth* 90°
- *Max. Azimuth* 270°

12.2.4.2 Reverse String Current

This error check monitors the reverse string currents. An alarm is triggered as soon as any reverse string current exceeds the maximum allowed value. If the inverter is running (sinking the energy produced) then this error can indicate a serious fault in that string.

Enter the following parameters:

1. Use the slider or enter a value into the field *Current* on a scale from -0.5-0 A.

12.2.4.3 Reverse String Current Inv. Idle

Similarly to [Chap.12.2.4.2, Reverse String Current, on p. 112](#), this error check monitors the reverse string currents, but only when the inverter is in its idle state. An alarm is triggered when there is a reverse string current that exceeds a maximum defined value. In the absence of a running inverter to sink the produced energy, this alarm will occur when stronger strings force reverse currents into weaker strings. It can be used to qualify the simple Reverse String Current alarm.

Enter the following parameters:

1. Use the slider or enter a value into the field *Current* in on a scale from -0.5-0 A.

12.2.4.4 String Undercurrent

This error check monitors the string currents. An alarm is triggered as soon as the current falls below the permissible minimum current. Raises an alarm if the current in a string falls below the defined minimum current under daylight conditions.

Snow or Soiling

Many similar alarms are often triggered when snow falls or there is significant soiling of the modules.

2. A percentile figure can be entered into the field *Group alarms if percentage of faulty string is higher than*. Then just a single alarm giving the number of faulty strings will be raised if this proportion of the strings raise the same fault together.
3. To prevent alarms being triggered in low sunlight conditions, or if there is row shading in your plant, define the *Min. sun elevation* in degrees at which the error check is to start. This condition is usually better than using, say, a time of day.
4. Use the slider *Current* or enter a minimum current (from 0.1-10 A). This is the minimum expected string current when there is sufficient irradiation.



The mean value of the non-selected string currents must be above this minimum before the error check is carried out.

Select the value in such a way as to exclude weak-light situations. Such situations can cause relative string-current deviations which do not represent an actual error. For example, set the minimum current to the value expected at a radiation value of 300 W/m².

5. Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.
6. Use the slider or enter a *Min. radiation* value in W/m² to define the value at which the error check should start.

Error Check Limitation Depending on Sun Position in Case of Shading

See [Manually Setting Error Check Limits to Account for Shade in 12.2.4.1, String Current Deviation, on p. 111](#).

12.2.4.5 UPS State

This error check monitors if the uninterrupted power-supply units (UPS). An alarm is triggered if a monitored UPS has reported a fault condition for longer than the defined *Check Interval*.

12.2.4.6 Combiner Box Temperature

This error check is to prevent damage to combiner boxes through overheating. It monitors the temperature sensor of the combiner box; an alarm is triggered if:

- The reported temperature exceeds the defined permissible maximum temperature.
- The temperature of any single combiner box significantly exceeds the average combiner-box temperature.
- The temperature of any single combiner box is significantly lower than the average combiner-box temperature. In this case an *Implausible Data* alarm is triggered (see also [Chap.12.2.4.17, Implausible Data, on p. 120](#))

Enter the following parameters:

1. Use the slider *Start checking at a temperature of* or enter the lowest temperature in °C at which the error check is to start.
2. Use the slider *Max. permissible temperature* or enter the highest temperature in °C that a combiner box is allowed to reach before an alarm is triggered.
3. Use the slider *Permissible temperature deviation* or enter a temperature value in the range of 1-20 °C, to define the maximum temperature deviation for any single combiner box from the mean temperature of all combiner boxes before an alarm is triggered.

12.2.4.7 Combiner-Box Power State

This error check monitors the state of the combiner boxes in terms of the via the voltage applied and the power. An alarm is triggered if over the full check interval, the voltage of one combiner box exceeds the average voltage of all combiner boxes by more than the given open-circuit voltage offset. A further alarm is triggered if the voltage of a combiner box rises suddenly while the power output

clearly plunges at the same time. If all combiner boxes show this fault simultaneously, an inverter alarm is triggered ([Chap.12.2.4.12, Inverter Power, on p. 116](#)).

Enter the following parameters:

1. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss alarms if the error condition does not apply anymore.
2. Use the slider *Offset idle voltage* or enter the voltage offset (1-400 V) between MPP and the open circuit voltage offset, at which an alarm is to be triggered.
3. Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.
4. Use the slider or enter a value (0-2000 W/m²) for the *Min. radiation* value at which the error check is to start.

12.2.4.8 Performance Index

This error check identifies impaired PV plant output as a result of reduced power output from, or a total failure of one or more inverters. The performance index (short-term performance ratio) values of inverters, blocks and the power plant are monitored. An alarm is triggered as soon as this performance index falls below a defined threshold value. The check is only carried out when the irradiation exceeds a defined value.



A radiation sensor is required to deliver data for the calculation of the performance index. This sensor should be mounted in-plane of the module in order to obtain valid values for the performance-index.

Enter the following parameters:

1. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss alarms if the error condition does not apply anymore.
2. Use the slider *Low performance ratio alarm threshold* or enter the performance index in percent at which an alarm will be triggered, should the value fall below this threshold.
3. Use the slider *Average expected performance ratio* or enter the performance index in percent to define the threshold above which alarms will be automatically dismissed if this option has been set.
4. Select the radiation sensor to be monitored from the *Radiation sensor* list.
5. Use the slider or enter a *Min. radiation* value of 0-2000 W/m² at which the error check is to start.
6. Use the slider or enter a *Min. sun elevation* value in degrees at which the error check is to start.

12.2.4.9 Inverter State



To view all known states of an inverter's measurement channels and their degrees of severity, right click the inverter entry in the *Components* window and select *Show State Information*.


This check reads the status data from the inverters. An alarm is triggered once an inverter has been in an error state of greater than a defined severity for more than a certain time. Additionally, a minimum level of irradiation can be set as a condition for the check, and also a minimum AC output power.

Enter the following parameters:

1. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss alarms if the error state does not apply anymore.

2. Use the slider *Min. fault severity for alarms* or enter a value to define the lowest severity of a fault that is to trigger an alarm.
3. Use the slider *Max. alarm severity for auto-dismissal* or enter a value to define the severity below which alarms will be automatically dismissed.
4. Use the slider *Min. fault duration for alarm* or enter a time period in minutes to define the delay before an alarm for a faulty inverter is triggered.

Additional test on AC power output

Inverters have measurement channels which output state information (e.g. error states). They are marked with a yellow error sign as part of their icons  in the *Plant Explorer*. As soon as an error state is reported on such a channel, an alarm message is generated, containing the exact error code and, where possible, a decoded message.

If the inverters of your PV power plant have no such measurement channels or are unable to report output losses reliably, you can additionally activate a check of the AC output. In this check, all inverters of the plant are compared against each other. As soon as one inverter's output power exceeds a defined threshold of its rated power, alarms will be generated for any other inverters that are not producing output within a set period. You can also add

5. To include this check of the AC output power, activate the option box *Additionally, check inverter AC power output*.
6. Use the slider *Min. duration of AC power drop for alarm* or enter the time period (in minutes) of the delay before triggering alarms for other inverters that do not have any output.
7. Use the slider *Min. AC output power* or enter a threshold value (percentage of the rated AC power) an inverter should reach before the AC output check is activated.

Irradiation threshold

To prevent triggering of false alarms under low-light conditions, you can also add a minimum threshold for irradiation; no alarms will be raised if this threshold has not been exceeded.

8. Activate the checkbox *Selectively disable alarms while radiation is below threshold* if you would like to include the irradiation level in the test.
9. Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.
10. Use the slider or enter the *Min. radiation* value in W/m² at which the error check is to start.
11. Use the slider *Severity of alarms to be disabled* or enter a value to specify the alarms that are to be disabled if the radiation is below threshold.

12.2.4.10 Tracker (Mover) State

This error check monitors the positions of the trackers. An alarm is triggered if a tracker's position deviates significantly from the calculated solar azimuth and elevation. Further, you can set the position in which a tracker should be parked during storms and overnight.

Enter the following parameters:

1. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss any raised alarms if the error condition does not apply anymore.
2. Use the slider or enter a *Min. fault duration* value (0-30 minutes) to define how long a fault condition can last before an alarm is triggered.
3. Use the slider or enter into the field *Allowed azimuth deviation* a horizontal angle (0-360 °) for the tracker's maximum deviation from the calculated azimuth before an alarm is triggered.
4. Use the slider or enter into the field *Allowed elevation deviation* a vertical angle (0-90 °) for a tracker's maximum deviation from the calculated elevation before an alarm is triggered.
5. Use the slider or enter into the field *Storm state elevation* an angle (0-90 °) above the horizon for the elevation of a tracker during storms and at night.

6. Use the slider or enter into the field *Min. sun elevation* an angle (0-90 °) above the horizon for the minimum elevation of the sun before the check is enabled.
7. Use the slider or enter into the field *Min. elevation* the minimum angle (0-90 °) the tracker is allowed to be positioned above the horizon (assuming no storm) before an alarm is triggered.

12.2.4.11 Overvoltage Protector

This error check monitors the over-voltage protection in the combiner boxes. An alarm is triggered as soon as an over-voltage protector triggers.

Enter the following parameters:

1. Activate the checkbox *Raise alarm on state equals 1 (raise alarm on 0 if unchecked)*, if the release of the over-voltage protector is signalled by a logical '1'.
Leave the option box unchecked if the release of the over-voltage protector is signalled by a logical „0“.



The signal for the release of the over-voltage protector '1' or '0' depends on the hardware installed.

12.2.4.12 Inverter Power

This check extends the Performance Index error check ([Chap.12.2.4.8, Performance Index, on p. 114](#)). The AC output power of the inverters is monitored whenever there is sufficient irradiation. This allows the detection of yield losses.

Enter the following parameters:

1. Use the slider or enter a *Min. expected power* value (0-100 kW). An alarm is triggered after the AC output power drops below this value.
2. Use the slider or enter a *Min. duration of AC power drop for alarm* value of 0-60 minutes to define the time for which the minimum expected power may remain below the threshold before an alarm is triggered.
3. Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.
4. Use the slider or enter a *Min. radiation* value (0-2000 W/m²). The check will start whenever the irradiation is over this value.

12.2.4.13 Active Power Limitation

This error check monitors the active (real) power limiting carried out automatically by a control unit such as skycontrol or skycontrol light as a requirement of the electricity utility. An alarm is triggered when power limiting begins. The period of the limiting can be determined from the time of the most recent occurrence of the alarm.

Enter the following parameters:

1. Use the slider or directly enter a value for *Power Limit change per Minute for Alarm* (as a percentage of current output). An alarm is triggered if the power limit changes more than this value over a minute.

12.2.4.14 Medium Voltage

This error check monitors the medium voltage at the power analyser, assuming no UPS is operating at the transfer station. An alarm is triggered when the voltage drops below the value defined here.

Enter the following parameters:

1. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss any raised alarms when the error condition no longer applies.
2. Use the slider or enter a *Min. expected voltage* value (0-120,000 V) for the lowest output voltage for which the error check will be undertaken.

12.2.4.15 Data Missing

This error check detects any devices that are not delivering any data to the monitoring system. An alarm is triggered for each device selected as soon as PVGuard Client recognises that it has not received any measurement data for longer than the given check interval.

Enter the following parameters:

1. Enter a value in *Check aggregate* as the maximum interval in minutes allowed without data from any monitored component before an alarm is triggered.

Additionally, the error check can be made conditional on the irradiation. In this case enter the following parameters:

Additional check depending on radiation power

1. Activate the option box *Check as long as radiation is above minimum*.
2. Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.
3. Use the slider or enter a *Min. radiation* value in W/m² which the error check is to start at.
4. Use the slider or enter a *Min. sun elevation* in degrees to carry out the check.




skytron recommends that you gather all equipment in your plant that is switched off at night into a single group with the irradiation condition configured. If the plant has no radiation sensor, drag the *Elevation* measurement channel from *Other Devices* in the *Plant Explorer* into the field *Radiation sensor*. If this is the case, type in the elevation value into the input field *Min. radiation*.

It is also recommended that you include any irradiation sensors in a data-missing test. In this case the test should not be made conditional on irradiation.

12.2.4.16 Value Check

This error check can be set up with arbitrary tests on the data from the PV power plant. Customizable alarms can triggered as soon as the monitored data violates the defined margins and thresholds or digital channels change state. In addition this test also provides a simple mechanism for checking a number of pre-defined, secondary channels such as room temperature or equipment memory.

1. Either use Drag & Drop or the arrow key  to drag the devices or measurement channels you would like to monitor from the list of components in the *Components* group to the selected components column on the right. You can also use items directly from the *Plant Explorer*.

Click  to remove a device or measurement channel from the error check.



You may see these tests implemented with no items listed in the *Components* pane. In this case the test will usually be configured as a simple test on one of the predefined groups of secondary channels.

Enter the following parameters:

2. Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss alarms if the error condition does not apply anymore.

3. Optionally select a secondary set of data channels from the list *Always check these values* whose values you would like to check in addition to any selected under *Components* (assuming the other conditions apply).

These secondary channel tests include a range of convenience checks such as:

- Tests on all data from any device in the plant representing a room temperature
- Tests on available free memory space the on compact flash card of the IPCs
- Tests on free hard disc space on the skyserver devices
- etc.

4. Enter the message text into the field *Alarm text*, this will be sent with every alarm.
5. Digital signals monitored: Activate the check box *Raise alarm on state change of digital signals* if you would like to monitor a digital signal and be notified if and when the device in question changes state (e.g. is switched on or off).
 - Use the options *Alarm on rising edge* and *Alarm on falling edge* to trigger the alarm according to how the state changes - for example, if the device is switched on or off. Activate either or even both options accordingly.



The signal assignment depends on the hardware installed.

6. Activate the check box *Check only as long as the radiation is within the defined range* if you would like to restrict the check to daytime, night etc.
 - Select the radiation sensor to be monitored from the list *Radiation sensor*.
 - Use the slider or enter the lowest radiation into the field *Min. radiation* value (W/m²) at which the error check is to start.
 - Use the slider or enter the highest radiation into the field *Max. radiation* value (W/m²) up to which the error check is to be carried out.
7. Analogue values monitored:
 - Enter a value in W/m² into the field *Upper limit* up to which an alarm is to be triggered.
 - Enter a value in W/m² into the field *Lower limit* from which an alarm is to be triggered.



The unit is automatically adjusted according to the data being checked.



It is also possible to check values that are outside the defined range. To do so, exchange the *Upper limit* and *Lower limit* values.

8. From the list *Aggregate* select which aggregate of the values the error check is to be based on:
 - *Mean*
 - *Maximum*
 - *Minimum*
 - *Sum* (of all values in the defined check interval)

Below, two examples are shown for defining a check on digital and analogue data.

Example 1: Monitoring a digital signal, for example an open door contact


A skyCONNi-Digi2In is connected to the door-open contact of a switch cabinet. If the door is opened without deactivation of the signalling contact, for example by break or any unauthorized access, an alarm is triggered.

Follow the steps below to receive an alarm message if the switch cabinet is opened by break:

1. Click to create a new *Error Group*.
2. Assign a *Name*, for example *SwitchCabinet_Open_X* in the dialog *New error group*.

3. Confirm the dialog with *Ok*.
4. Select the entry for this name in the *Error Groups* list.
5. In the *Parameters* pane:
 - Check the option box *Activated* in order to activate the error check.
 - Enter 1 minute into the field *Check interval*. This will ensure a continuous check on the switch cabinet.
 - Activate the option box *Automatically dismiss alarms on state change* if you wish to automatically dismiss alarms when the error condition does not apply anymore, i.e. when the door contact is closed again.
 - From the list *Always check these values* select *None*.
 - Type the text into the field *Alarm message* which is to be sent with the alarm, for example *Unauthorized access to switch cabinet X - door open*.
 - Activate the option *Raise alarm on state change of digital values* to trigger alarms when the door contact opens and closes.


The options *Alarm on rising edge* and *Alarm on falling edge* trigger an alarm if the switch cabinet X is opened or closed. Activate the options according to the hardware installed. At least the option indicating the door contact open should be set.

6. In the *Components* pane, mark the measurement channel *State Channel 1* and/or *State Channel 2* of the skyCONNi-Digi2In in the listed components under *Other Devices/Other/SC-2x_Digital_input (2)* and click  .
 The measurement channel will then be listed right in the component window with its *Alias* and *Type*.

Example 2: Checking an analogue value, for example grid frequency

For inverters to feed into the grid correctly, the grid frequency must be in the range 49.5-50.3 Hz. If the frequency is not in this range, alarms are to be raised.

Follow the steps below in order to receive an alarm in case of a low-grid-frequency inverter shut down:

1. Click  to create a new *Error Group*.
2. Assign a *Name*, for example *Grid frequency* in the dialog *New error group*.
3. Confirm the dialog with *Ok*.
4. Select the entry for this name in the *Error Groups* list.
5. In the *Parameters* pane:
 - Check the option box *Activated* in order to activate the error check.
 - Enter 15 minutes into the field *Check interval*.
6. In the *Components* pane, drag the *Grid Frequency measurement+* channel of the inverters to be monitored from the list of components.
7. Then define the following other parameters in the *Parameters* pane:
 - Activate the option box *Automatically dismiss alarms on state change* to automatically dismiss alarms when the error condition no longer applies.
 - Select *None* from the list *Always check these values* to just check the grid frequency.
 - Enter a message text into the field *Alarm text*. This text will be sent with each alarm.
 For example: *Inv. grid frequency below 49.5 Hz - Inv shut down*
 - Activate the option box *Check only while radiation is within given values*. This will block alarms raised due to insufficient radiation.
 - Select the radiation sensor to be monitored from the list *Radiation sensor*. If no suitable sensor is available in your PV power plant, use the data channel *Sun Position/Elevation*.

- Enter the lowest possible radiation in W/m² into the field *Min. value for check*. The error check won't be carried out for irradiation values less than this (e.g. at night).
- Enter the value 2000 (W/m²) into the field *Max. value for check* so that this limit will never be triggered and the test will always run during the day.
- Enter 49.5 Hz into the field *Lower limit*. If the grid frequency falls below this value, an alarm is raised.
- Enter a value of 50.1- 50.3 Hz into the field *Upper limit*. If the grid frequency exceeds this value, an alarm is raised.
- Select from the list *Aggregate* which aggregates of the grid frequency value the error check is to be based on. The *Mean* and *Minimum* values are suitable for this example.

12.2.4.17 Implausible Data

The measured data from all module, room and ambient temperature sensors are checked for plausibility. An alarm is triggered if the data values jump unusually, show excessive deviations from the average of similar data, or if they exceed the definable marginal values.

Enter the following parameters:

1. Use the slider *Max. temperature deviation at midnight* or enter a temperature (0-30 °C) as the maximum value a sensor is allowed to deviate from the mean value of all other sensors of the same type at midnight.
2. Use the slider *Max. temperature deviation per minute* or enter a temperature (0-20 °C) as maximum amount by which a temperature reading may change per minute.
3. Use the slider *Lowest valid temperature* or enter the lowest temperature value (-273-0 °C) for the minimum reading from a sensor before an alarm is triggered.
4. Use the slider *Highest valid temperature* or enter the highest temperature value (0- 200 °C) for the maximum reading from a sensor before an alarm is triggered.

Appendix

I Glossary

Term	Definition
Aggregate	Mathematical function that combines together several data values to produce a single result. Examples: Maximum, minimum, mean values.
Alarm	An operator warning following the occurrence of an error in at least one component.
Alarm severity	Classification which is automatically assigned to alarms depending on the alarm's source, i.e. on the type of error. Helps in alarm processing, uses colour coding.
Alias, device name	Name of a device which is independent of the hardware and thus of the device and its manufacturer. It facilitates to identify a device in the <i>Plant Explorer</i> , in the indicators and when using the search functions.
Anti-aliasing	Reduces aberrations that occur due to the pixel grid when computer graphics are created.
Configuration table	Table underneath a chart, table in a view that lists the data channels that are plotted in the chart or table, and defines how they will appear. Further channels may be added from the <i>Plant Explorer</i> (e.g. by drag and drop).
Delta	Difference between two data points. For each interval, for example 15 minutes, the difference between the first and the last data value is calculated.
Device Name, alias	Name of a device which is independent of the hardware and thus of the device and its manufacturer. It facilitates to identify a device in the <i>Plant Explorer</i> , in the indicators and when using the search functions.
Error	Deviation of at least one calculated value from defined, allowable margins. Caused by the failure of at least one component or where the component's status deviates in such a way as to impact its function. Triggers an alarm.
Error condition	Exact definition of the criteria that describe an error whose occurrence is to trigger an alarm. The error can be recognized by several different error conditions. Error conditions contain configurable parameters.
Error group	All components that are tested for a an error condition using the same parameters.
Minimum value	Lowest data value (e.g. string current) measured within the defined check interval.
Performance Index	An equivalent calculation to Performance Ratio but measured on an intra-day basis. Since it doesn't average a full day's readings, the range of performance index values obtained may be wider than that the performance ratio for the same plant or equipment.
Performance Ratio	Ratio of irradiation to final AC output for a PV plant.
Performance Ratio (Energy Meter)	Plant-Energy-Meter-Performance Ratio, based on energy measurement by energy meters (opposing to that by inverters)
Performance Ratio (Inverter)	Plant-Inverter-Performance Ratio, based on energy measurement by inverters (opposing to that by energy meters)
Sum	Sum of all values in the defined measurement interval. <u>Example:</u> If the interval is set to 15 minutes, each value displayed in the diagram or table is the sum of the original values (usually minute value) in the respective 15-minutes interval.
Plant Explorer	Contains all measurement values allocated to the measuring equipment per PV power plant in a tree. The measurement values are taken from here and inserted into charts and tables.

Term	Definition	continued
<i>Data/Plant</i> (in the <i>Plant Explorer</i>) Measurement values related to the plant	Ambient temperature (average) average temperature calculated from the values measured by all ambient temperature sensors installed in the plant	
	DC current (inverter) total DC current input of all inverters in the plant	
	Energy yield (energy meter, production) total energy yield from plant commissioning till current moment measured by the energy meters installed in the plant.	
	Energy yield today (energy meter, production) total energy yield from plant commissioning till current moment measured by the energy meters installed in the plant.	
	Energy yield (energy meter, production, normalized) total energy yield from plant measured by the energy meters installed in the plant, value normalized to the plant's total rated power	
	Energy yield today (energy meter, production, normalized) total energy yield from the plant of the current day measured by the energy meters installed in the plant, value normalized to the plant's total rated power	
	Energy yield (inverter, production) total energy yield from plant commissioning till current moment measured by the inverters installed in the plant.	
	Energy yield today (inverter, production) total energy yield from plant commissioning till current moment measured by the inverters installed in the plant.	
	Energy yield (inverter, production, normalized) total energy yield from plant measured by the inverters installed in the plant, value normalized to the plant's total rated power	
	Energy yield today (inverter, production, normalized) total energy yield from the plant of the current day measured by the inverters installed in the plant, value normalized to the plant's total rated power	
	Module temperature (average) average temperature calculated from the values measured by all module temperature sensors installed in the plant	
	Power total power of the plant	
	Power (normalized) total output power of the plant normalized to the total rated plant power	
	Radiation power (average) average radiation power of all radiation sensors	
	Radiation power (average, tilt, cell) average radiation power of all sensors in-plane to module (at plant location)	
	Radiation yield accumulated radiation energy yield (at plant location)	
	Radiation yield (average, tilt, cell) accumulated radiation energy yield in-plane to module (at plant location)	
	Radiation yield today accumulated radiation energy yield of current day (at plant location)	
	Radiation yield today (average, tilt, cell) accumulated radiation energy yield measured by several sensors of current day (at plant location)	

Term	Definition	continued
View	Contains indicators, charts, tables, text and values to be viewed, edited or both.	
View Navigator	Contains all fix and configurable views hierarchically to be selected for display in the views window.	

Table 5 Terms and definitions

II Abbreviations

Abbreviation	Definition
AC	Alternating current
CO ₂	Greenhouse gas created during the combustion of non-nuclear, carbonaceous combustible.
DC	Direct current
DCUV	Direct current subdistribution
DNO	Distribution network operator
GUI	Graphical user interface
IPC	Industry PC, acts as a data logger
MPP	Maximum power point, optimum working point of solar cell
MT-AT	Module and ambient temperature sensors, part of RadGuard-MT-AT
MV	Medium voltage (normally refers to voltages above 1kV and below 75kV)
NSM	Network security management
PC	Personal computer
PR	Performance ratio, efficiency factor of a PV power plant
PV	Photovoltaics
SCADA	Supervisory control and data acquisition
SSL	Secure socket layer; protocol for secure data transfer through the Internet
UDID	Unique device identifier
UPS	Uninterrupted power supply (of data loggers and data servers)
UVID	Unique value identifier
IN	Inverter
WR	Inverter (from German: Wechselrichter)

Table 6 Abbreviations

III Command Reference

Menu Commands

Table 7 on p. 125 contains the operations available from the PVGuard Client menu.

Menu	Menu Command	Short-cut	Action
File		Alt+F	Opens the <i>File</i> menu
	Save	Ctrl+S	Saves the changes of a saved view
	Save as (at least one view open)	Ctrl+A	Saves a view into the database
	Export (at least one view open)	Ctrl+E	Saves a view in the selected file format on your PC or on a drive
	Print	Ctrl+P	Prints a view
	Close	Ctrl+F4	Closes the active view
	Exit	Alt+F4	Exits PVGuard Client
Connection		Alt+C	Opens the <i>Connection</i> menu
	Connect	Alt+L	Opens the dialog <i>Connect</i>
	Disconnect	Ctrl+Q	Disconnects the current connection
Configuration		Alt+O	Opens the <i>Configuration</i> menu
	Client Configuration	Alt+U	Opens the dialog <i>Client Setting</i>
	Import Configuration File	Ctrl+I	Displays warning that present configuration file will be overwritten
	Export Configuration File	Ctrl+Alt+E	Opens the dialog Export Configuration File
Views		Alt+S	Opens the <i>Views</i> menu
	Tile Views (at least one view open)	Alt+Y	Arranges all open views as tiles
	Cascade Views (at least one view open)	Alt+C	Arranges all open views as cascade
	Save Window Layout	Ctrl+Shift+S	Saves the arrangement of open views and displays it after restarting the program
	Detach Current View (at least one view open)	Alt+Shift+D	Removes the selected view from an array of tiles or from a cascade and displays it on top
	Reattach View (in detached view)	Alt+Shift+D	Reattaches the detached view to the main program window
	List of all open views (at least one view open)	Ctrl+n (n is a number)	Lists all open views for selection
	Close All Views (at least one view open)	Ctrl+Shift+W	Closes all open views at once
	Close	Ctrl+F4	Closes the active view
	Exported Files...		Opens a dialog showing all exported files
	Open PVGuard Cloud Browser...		Opens the Cloud Browser showing uploaded images
	Open Dashboard Designer...		Opens a tool to create or edit Dashboard views
Help		Alt+H	Opens the <i>Help</i> menu
	Help	F1	Opens the user manual as *.pdf
	About	Alt+A	Provides information about the manufacturer and the version of the software and list the registered trademarks used

Table 7 Menu commands



The *File* and *Views* menus are dynamic; you must have at least one view open to see the complete set of commands available.

Other Operations

Table 8 on p. 126 lists the other operations that are available in PVGuard Client views.

View	Short-cut/ Mouse Action	Action
All dialogs	Esc	If currently editing a field in the dialog, discard any changes. Otherwise close dialog without saving any changes.
	Tab	Jump forwards/backwards from one field of dialog to next.
	Shift+Tab	
All zoomed views and charts	Ctrl+Tab	For dialogs with several tabs, jump forwards/backwards between tabs
	Ctrl+Shift+Tab	
All zoomed views and charts	Quick move of mouse towards upper left corner with right mouse key pressed	Return to a full display of contents
Chart	Esc	Hides the crosshairs
Chart	left mouse key pressed	Selects an area and enlarges the area selected this way after releasing the mouse key
Chart	left mouse click	Show the cross-hairs
Chart	centre mouse key/mouse wheel pressed	Moves a chart or chart view within the coordinate system
Chart	Ctrl+P	Prints out a chart
Chart	Ctrl+R	Hides the crosshairs
Chart/table	Del	Deletes a measurement channel selected in the configuration table
Chart/table	Ctrl+D	Shows/hides device name
Chart/table	Ctrl+J	Shows/hides the plant name
Chart/table	Ctrl+S	Opens another toolbar with save buttons
Chart/table	Ctrl+T	Represents chart values as table
Chart/Table/Map/ Values tree	F5	Refreshes data
Connect dialog, Alarms tables	Ctrl+F	Text search
Plant map	left/right mouse key pressed	Moves the plant map in "fit window" and zoomed situation
Saved view	Del	Deletes a saved view from the database
Saved view	F2	Opens an edit dialog to rename the view
Table	Ctrl+A	Selects the whole table
Table	Ctrl+C	Copies a table or marked table sections into the clipboard
Table	Ctrl+H	Locks the range axis
Table	Ctrl+K	Opens the dialog
Table	Ctrl+L	Shows/hides the caption above the chart
Table	Esc	Deselect table cells
Plant Explorer	F2	Opens the dialog to rename device or plant
Views window	Ctrl+left	Navigates to the previous view
Views window	Ctrl+right	Navigates to the next view
World map	left mouse key pressed	Moves the world map in "fit window" or zoomed situation

Table 8 Keyboard short-cuts

IV List of Button Icons

This appendix provides a reference list of many of the icons used in the program.

View Navigator

The icons used in the View Navigator are listed in [Table 9 on p. 127](#).




























Icon	Describes
	Top (root) of View Navigator tree
	Map showing locations of plants across the world
	Folder with all views for a plant
	Pre-defined view of plant or equipment status
	Opens a new, blank chart
	Opens a new, blank table
	Administer user permissions (reserved for future use)
	Administer sending of automatic emails
	Configure error conditions used to trigger alarms
	Administer device configuration (reserved for future use)
	Open the presentation view or plan of the plant
	Open a view of the block status
	Open a view of the inverter status
	Open a view of the plant controller
	Open a view of the energy meter status
	Open a view showing all combiner boxes
	Open a view of the sensor status
	Open Alarms View
	Open Service Log
	Folder for predefined charts and tables
	Report generator function
	A pre-defined chart
	Folder for saved charts & tables
	Saved chart (private)
	Saved chart (public)
	Saved table (private)
	Saved table (public)

Table 9 Icons used in View Navigator

Icons used for devices in the Plant Explorer

The *Plant Explorer* lists all devices that are monitored in a PV power plant, and their data channels. The icons used to represent devices, or folders of devices, are listed in [Table 10 on p. 128](#).




















Icon	Describes
	Top (root) of Plant Explorer tree
	A complete PV plant
	Plant controller(s)
	Energy meter(s)
	Any blocks the plant has been divided into
	Inverter(s)
	Trackers/movers
	Combiner boxes
	String distributors
	Sensor devices
	UPS devices
	Switches/isolators
	Plant configuration
	Skygate system or a directory for them
	Other device or a directory for them
	Monitoring system; Industrial PC (IPC)
	Temperature sensor
	Solar sensor, position of sun
	Weather station or a directory for them

Table 10 Icons used for devices or folders in the Plant Explorer

Data channel icons in the Plant Explorer

The Plant Explorer ultimately lists data channels that can be used in charts or tables. The icons used at this, lowest level of the Plant Explorer depict the type of data listed. The icons used are listed in [Table 11 on p. 129](#).

Some data is analogue, for example measurements of voltage, current, power, energy. Other is digital, representing distinct states, for example operational states or error codes.

The symbols are coloured either green. Green symbols represent data that comes directly from the device concerned. Blue symbols are used for data that is mapped, that is the data concerns a certain device, but is actually obtained (all or in part) from another device. For example, the DC String Currents associated with a certain Combiner Box are obtained from the associated String Distributor equipment.

The data can also be distinguished between raw and derived or normalized forms. Raw data represents a direct reading from the equipment concerned; derived or normalized data represents the result of PV Guard undertaking some sort of calculation or function on data from one or more data sources. This form is represented by an 'f' in the symbol.












Icon	Describes
Analogue Data	
	A raw analogue data value (not energy)
	A derived, calculated or normalized analogue data value
	A raw, energy data value, shown relative to the starting date/time of a displayed chart or table.
	A derived, calculated or normalized energy value, shown relative to the starting date/time of a displayed chart or table.
	A cumulative depiction of a raw analogue energy value.
	A cumulative depiction of a derived, calculated or normalized energy value.
	Today's energy data - a raw energy value
	Today's data for a derived, calculated or energy value
Digital (State) Data	
	Any digital state value
	A digital error value from the device
	A digital operational-status value from the device

Table 11 Icons used for data channels in the Plant Explorer

General icons used in the GUI











Icon	Describes
	Save. For saving an item (able/chart/view) or setting into a file or to the database under an existing name
	Save As. For saving a table/chart/view under a new name
	Export a view, chart, table, alarms, service log entries etc.
	Search for a particular piece of equipment
	Search through devices that have raised alarms
	Zoom in
	Zoom out
	Show normalized or real data in view (only for Combiner Box or Plant Map views)
	Change the way that device names are shown in view
	Remove a data channel from the current view

Table 12 General icons used in the program window or in views

Icons used in the Status Bar











Icon	Describes
	Connected
	Connected using a secure connection
	Not connected
	Data transfer idle
	Transferring data
	No activity to local cache memory
	Reading/writing local cache memory
	Time in UTC (i.e. independent of local time zone)
	Local time of plant
	Switch between plant local time and UTC

Table 13 Other icons used in the Status Bar

Icons used in Equipment Symbols (inverters, combiner boxes etc.)




Icon	Describes
	State mouseover shows equipment state information
	Alarm status. Mouseover shows equipment alarm information
	Overvoltage indicator. Mouseover shows status of overvoltage protection

Table 14 Other icons used in the Equipment Symbols

Icons used in Context Menus





Icon	Describes
	Open alarms view
	Open chart view
	Open table view
	Open digital state information

Table 15 Icons used in the main Context Menus

Icons used in the Date Selector in Views





Icon	Describes
	Open the date slider panel
	Open calendar
	Set date to today
	Automatically reload data whenever date is changed

Table 16 Other icons used in the Date Selector

Icons used in the View Toolbars













Icon	Describes
	Save view
	Print chart, table etc.
	Change settings for chart or table
	Show legend
	Show plant name in legend
	Show device names in legend
	Remove cross hairs from chart
	Show cross hairs on chart
	Lock range axis
	Chart to table
	Table to chart
	Copy to clipboard

Table 17 Icons used in the Toolbar of view sub-windows

Icons used in Filters (Alarms, Service Log etc)





Icon	Describes
	Show filter panel
	Apply or refresh filter
	Add new condition to filter
	Remove condition from filter

Table 18 Icons used for Filters

Icons used in Email & Alarm Configuration









Icon	Describes
	Show information or help
	Add error group
	Remove error groups
	Add mail recipient
	Edit mail recipient
	Delete mail recipient
	Add mailing time
	Delete mailing time

Table 19 Icons used for Email configuration

Icons used in Service Log









Icon	Describes
	Rename or edit item
	Add item to service log
	Remove item from service log
	Send item as mail
	Date/time created
	Date/time changed
	Service log open item
	Service log closed item

Table 20 Icons used for the Service Log

Icons used in Alarms View




Icon	Describes
	Raise manual alarm
	Change columns in alarm view
	Export alarms

Table 21 Icons used in the Alarms view

V Fault Tracing

Fault ID		Error Description
<i>Combiner Box Temperature</i>		<i>The ArrayGuard CB01 shows a temperature which seems to be too high: e.g. 50 °C</i>
Device	Combiner box	
Cause	The torque values required for all connections at the combiner box are not kept. DC main switch or other connections are defect. The altitude of the sun in the morning or evening (no serious problem).	
Solution	➔ First check if high temperature is a temporary or a persisting problem. <i>Temporary problem:</i> ➔ Check all screw connections and retorque them if necessary (see ArrayGuard installation manual). ➔ Check the cabinet with a thermographic camera - have defect components replaced. <i>Persisting problem:</i> ➔ View the location of the combiner box in the field. The sun's altitude or radiation in the morning or evening can cause the combiner box to warm up more than the others during this time. In this case, no solution is required.	
<i>String Back Current</i>		<i>Measured Backcurrent -1.2 A on String DCUV 1.1</i>
Device	Combiner box	
Cause	No production of string or combiner box. Combiner box is shut down. Inverter sometimes shuts down without inverter error.	
Solution	➔ Check if combiner box is switchend on. ➔ Check if inverter is producing.	➔ Check if string is properly connected. ➔ Check plug connection of string.
<i>String Back Current with Inverter Idle</i>		<i>Measured Backcurrent -1.2 A on String DCUV 1.1</i>
Device	Combiner box, inverter	
Cause	Inverter is idle, no production in combiner boxes and/or inverter	
Solution	➔ Check inverter for alarms and status.	
<i>String Current Deviation</i>		<i>Current in DCUV 1.1 differs from the other strings by up to -50%</i>
Device	Combiner box, string	
Cause	Blown fuse, defect module, improper string connection, shading in the morning and/or evening	
Solution	First check if measurement channel is assigned 100%. If not: ➔ Check since when the string current has been deviating. ➔ If deviation occurs only in the morning/evening, the modules are probably shaded during this time. Check if current deviation is only a few percent or 100%. If 100%: ➔ Check if the fuse is defect. ➔ Replace the fuse if necessary (see ArrayGuard installation manual). If e.g. 15% but constant: ➔ Check the module. ➔ Check the string connection.	
<i>Overvoltage Arrester</i>		<i>Arrester CB 1.1 activated.</i>
Device	Combiner box	
Cause	Overvoltage arrester has released.	
Solution	➔ Have the overvoltage arrester replaced.	

Error ID		Error Description
<i>String Under Current</i>		<i>Measured Undercurrent # A on String DCUV 1.1(Radiation: # W/m²) .</i>
Device	Combiner box, string	
Cause	String has less current than other strings of the combiner box with the same radiation value.	
Solution	<ul style="list-style-type: none"> ➡ Check if the module string is shaded. ➡ Check if less modules are installed. 	<ul style="list-style-type: none"> ➡ Check if the fuse is defect. ➡ Replace the fuse if necessary (see ArrayGuard installation manual). ➡ Check the string connection.
<i>Inverter State</i>		<i>Inverter Inv 9 shows Error: 18.</i>
Device	Inverter	
Cause	Various	
Solution	➡ Refer to the inverter manual.	➡ If you cannot find a solution in the manual, contact the inverter's manufacturer.
<i>Power Limit</i>		<i>Plant 1 is limited to 50%-70% active power.</i>
Device	skycontrol	
Cause	Power reduction by distribution network operator (DNO)	
Solution	➡ This is a pending issue of DNO.	
<i>skycontrol State</i>		<i>SkyControl shows error #</i>
Device	skycontrol	Solution ➡ Check current plant values.
Status	SKYCONTROL_ALARM_BIT_1=Missing	
Explan.	Actual power reduction value is given.	
Status	SKYCONTROL_ALARM_BIT_2=Missing	
Explan.	Power factor value is given.	
Status	SKYCONTROL_ALARM_BIT_3=Active	
Explan.	Plant power exceeds power reduction limitation.	
Status	SKYCONTROL_ALARM_BIT_4=Plant	
Explan.	Power factor currently exceeds the power factor boundary.	
<i>UPS State</i>		<i>UPS Error # on device UPS 02.</i>
Device	UPS types DTOP and AKKUTEC	
Status	DTOP - Battery current - value DTOP - Battery OK - status 1=OK, 0=error DTOP - Battery voltage - value DTOP - Current - value DTOP - Grid OK - status 1=OK, 0=error DTOP - NTC OK - status 1=OK, 0=error DTOP - Source - value DTOP - Voltage - value	Solution ➡ Check battery current and voltage. ➡ Check on site if device is properly installed.
Status	AKKUTEC - Battery temperature - value AKKUTEC - Internal battery resistance (av) - value AKKUTEC - Output current - value AKKUTEC - Output voltage - value AKKUTEC - FAULT_STATE_BIT_00=Fuse-Watch - status AKKUTEC - FAULT_STATE_BIT_01=Battery - status AKKUTEC - FAULT_STATE_BIT_02=Battery - status AKKUTEC - FAULT_STATE_BIT_03=Sync-Signal - status AKKUTEC - FAULT_STATE_BIT_04=UPS-Operation - status	Solution Check fault state: ➡ Check internal battery resistance. ➡ Check battery current.

Fehler-ID / Error ID		Fehlerbeschreibung / Error Description
<i>Data Missing</i>		<i>No data for device IPC03.</i>
Device	Energy meters Inverters Combiner boxes IPC THYTRONIC	RadGuard Pyranometers DTOP XXX 2T_1 (interior temperature sensor in combiner box) microspace
Cause	Various	
Solution	First check if data have been missing for a few minutes only (temporary problem) or for a long period of time (persisting problem). If all IPCs show this error it is likely that the plant is disconnected from the Internet.	If only a few devices are affected and data has been missing for a long period of time: ➔ Check the CANBUS fuse. ➔ Reset the CANBUS. ➔ Check the inverter communications board. ➔ Check the CAN connections at the device whose data is missing.
<i>User 10</i>		<i>User Error (manually)</i>
Device	Various	
Cause	Error manually raised by user.	

Table 22 Fault tracing

Contact and Service Address



skytron® energy GmbH Hotline
Ernst-Augustin-Straße 12
D-12489 Berlin

<http://www.skytron-energy.com>
service@skytron-energy.com

service

skycontrol summer

skycontrol winter

commissioning

Mon-Fri 9-16 hrs

Mon-Sun 7-19 hrs

Mon-Sun 9-17 hrs

Mon-Fri 9-17 hrs

+49(0)30 688 31 59-100

+49(0)30 688 31 59-101

+49(0)30 688 31 59-101

+49(0)30 688 31 59-102