**SOFTWARE**

# POWER STUDIO

# INSTRUCTION MANUAL

**( M98200201-03-05A )**

**CIRCUTOR S.A.**

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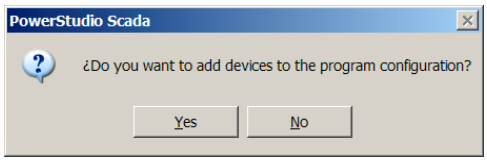
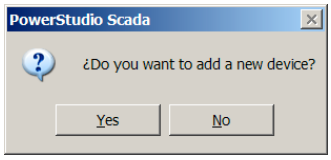
# 1 Running the Program for the First Time

When you run the program for the first time, you will be asked if you wish to add devices.




Selecting '*Yes*' will allow us to add devices as explained below in section 2.2.2.1 Adding a Device.

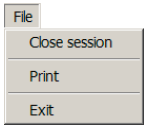
Once the device is added, you will be asked if you wish to add more devices.




If the selection is '*Yes*', a new device will be added, otherwise the normal running of the program will start.

# 2 Menu Bar

## 2.1 File Menu

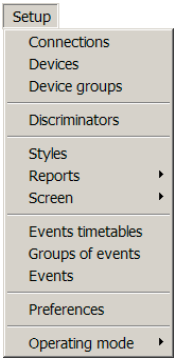



'*Close session'*: This allows you to close the authenticated user session, meaning we can prevent unauthorised users from accessing the program resources by using the session of an authorised user. When closing the session, the main window of the program will remain empty until another user introduces his/her details in order to access resources.

'*Print'*: This carries out the same function as the print button on the toolbar.

'*Exit*': This brings the running of the program to a finish.

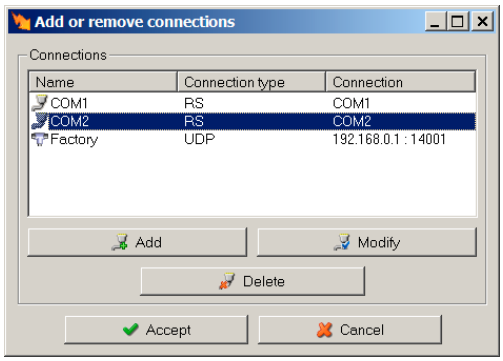
## 2.2 Configure Menu




This menu can be used to configure the main parameters of the software.

### 2.2.1 Connections

This menu option can be used to configure the communications ports to be used by the software in order to communicate with the different configured devices.

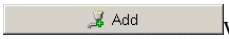



We can configure two types of connection:

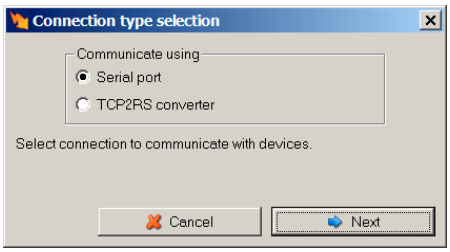
*Serial port*. It will be identified by COMX, in which X will indicate the communications port.

*Network communication.* It will be identified by XXX.XXX.XXX.XXX:YYYYY in which XXX.XXX.XXX.XXX will indicate the IP address and YYYYY the communication port.

### 2.2.1.1 Adding a Connection

Clicking on the button 

will bring up the following dialogue:




From which the type of connection to be used for communication with the devices will be selected.

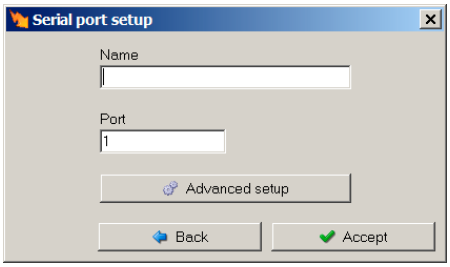
***Serial Port Communications***: It will correspond to a physical port of the PC.

***TCP2RS Converter***: The software will communicate with the devices through an Ethernet connection, using a TCP2RS converter for the Ethernet communication conversion to RS-232 or RS-485 communication.

Clicking on the *'Next'* button will bring up the configuration dialogue corresponding to the type of connection selected.

#### 2.2.1.1.1 Communications Serial Port

The following dialogue corresponds to the configuration of a communications serial port:

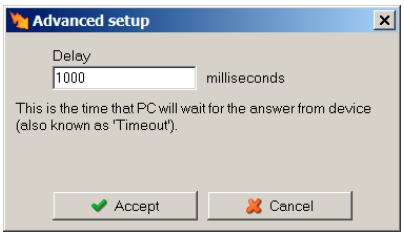



In which:

***Name:*** Alphanumeric field which will uniquely identify the connection throughout the program. Two connections with the same name cannot exist in the configuration.

***Port***: Serial port number which the software will use for communication with the devices.

***Advanced setup:*** Allows us to configure a series of additional parameters in the connection.

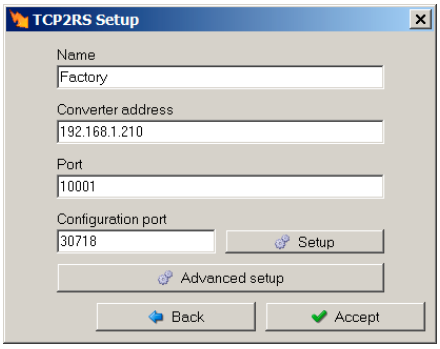



In which:

- ***Delay:*** Value in milliseconds. This value, known as "*Timeout*", will be used to control the time which the PC will await the response from the device. The value introduced shall be added to the time by defect which the PC will wait for the response from the device.

#### 2.2.1.1.2 TCP2RS Converter

The following dialogue corresponds to the configuration of a connection using a TCP2RS converter:




In which:

***Name***: Alphanumeric field which will uniquely identify the connection throughout the program. Two connections with the same name cannot exist in the configuration.

***Converter address***: This corresponds to the address which the program will use to communicate with the converter. This parameter can be an IP address or a name.

***Port***: This will correspond to the communications port.

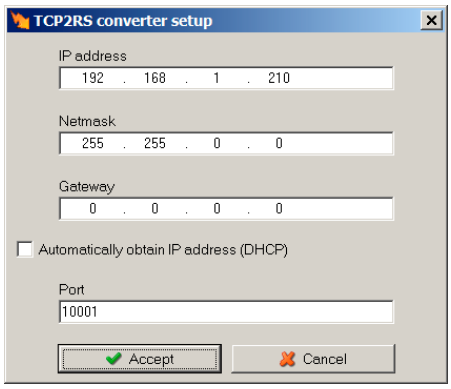
***Configuration port***: This will correspond to the communications port, through which the program may configure the converter. By defect this port is 30718.

In order to communicate with a TCP2RS converter through a router, the following steps should be followed:

1- In the field *'Converter address'*, enter the router's IP address.
2- In the field *'Port'*, enter the communications port and redirect this port in the router to the communications port of the converter.
3- Redirect the configuration port in the router to port 30718 of the converter.

NOTE: In order to know how to redirect the ports, see the router manual.

***Parameters***: Clicking on the button will bring up a dialogue in which we can configure a series of parameters for the converter.




In which:

- *IP Address*. It will correspond to the IP address through which we can communicate with the converter.

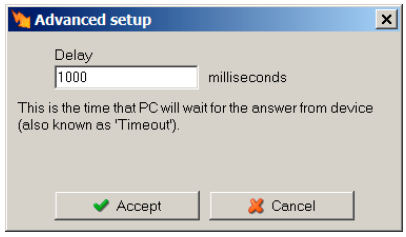
- *Netmask*. This corresponds to the sub-network mask used in the network to which the converter is connected.

- *Gateway*. This corresponds to the address of the gateway when the converter is not in the same network as the PC which contains the software.

- *Automatically obtain IP address (DHCP).* This option will be enabled when we wish for the converter to receive the IP address automatically through a DHCP server.

- *Port*. Will correspond to the communications port of the converter.

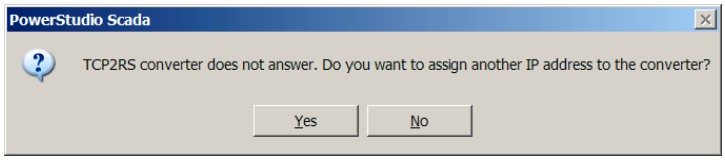
***Advanced setup.*** This allows us to configure a series of additional parameters in the connection.




In which:

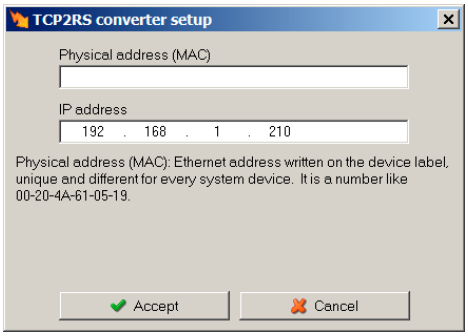
- *Delay*. Value in milliseconds. This value, known as "*Timeout*", will be used to control the time which the PC will await the response from the device. The value introduced shall be added to the time by defect which the PC will wait for the response from the device.

When clicking on '*Accept*', the software will try to detect the TCP2RS converter. If it is not detected, the converter is new and does not have an IP address assigned to it, or it has an IP address different to that entered in the field '*Converter address*'. In this case, it will ask if you wish assign an IP address to the converter.



It is only possible to assign an IP address to the converter if the converter is in the same network as the PC from where the software is run.

If the answer is *'Yes'*, the following dialogue will appear, allowing us to assign an IP address to a converter.

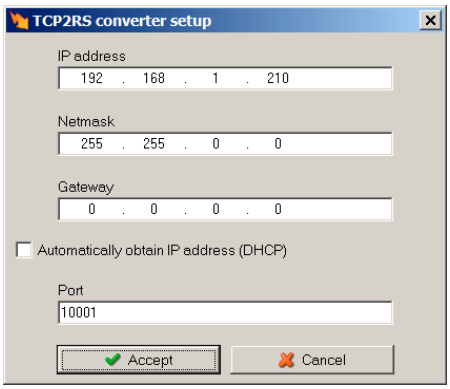



In which:

***Physical address (MAC).*** Ethernet address in the tag of each device, which is unique and different in all the network devices. It is the hardware address which all network interfaces have. It will be of this kind: 00-20-4A-61-05-19.

***IP Address***. IP address to be assigned to the converter with the physical address entered in the previous field.

If it has been possible to assign the IP address to the converter, the following dialogue will be displayed:



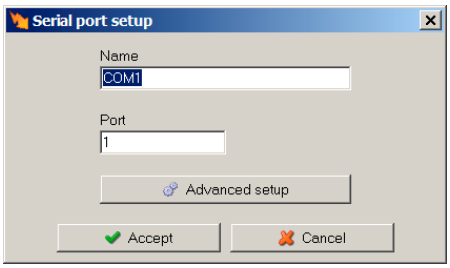

We can finish configuring the remaining parameters in order to communicate with the converter.

### 2.2.1.2 Modifying a Connection

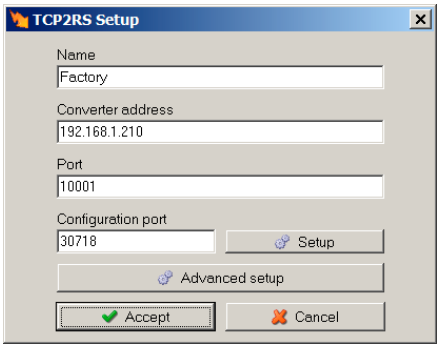
Clicking on the button

depending on the kind of connection, will bring up the corresponding modification dialogue.

For a serial connection, the dialogue will be as follows:




And for an Ethernet connection:



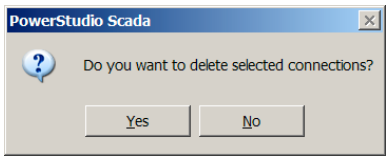

These two dialogues are explained in section 2.2.1.1. Adding a Connection.

### 2.2.1.3 Deleting Connections

The button

will only be enabled if we select one or more connections from the list.

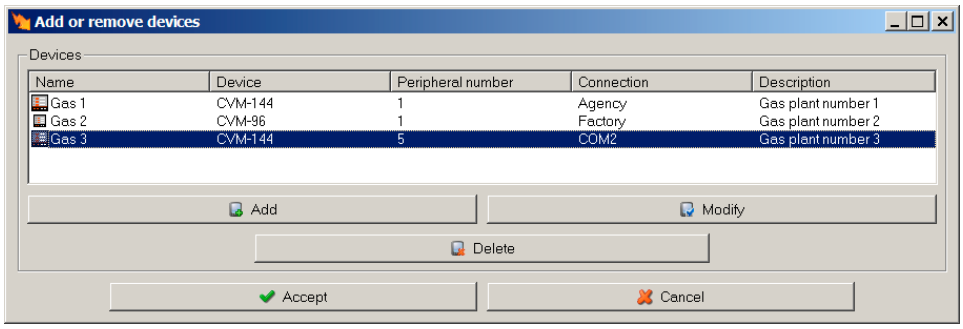
Clicking will bring up the following dialogue:




Clicking *'Yes'* will delete the connections selected in the connections list.

## 2.2.2 Devices

Clicking on this option will bring up the following dialogue:

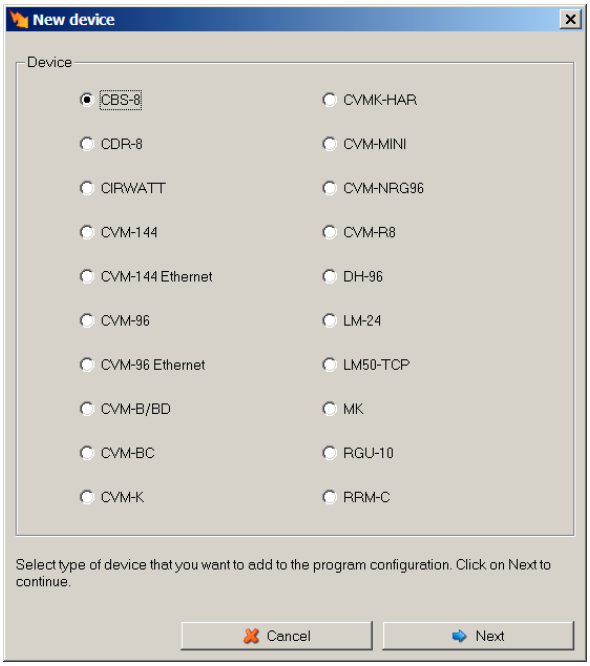



In which the list with the configured devices is displayed.

### 2.2.2.1 Adding a Device

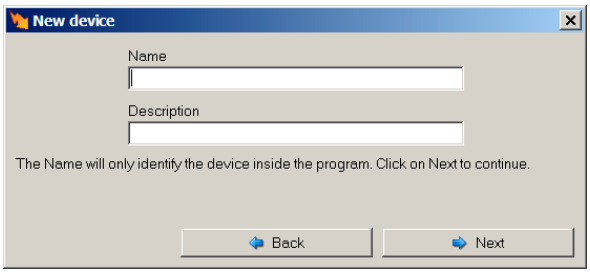
Clicking on the button

will bring up a dialogue to select the type of device to be added.




Clicking the button

will bring up the dialogue:

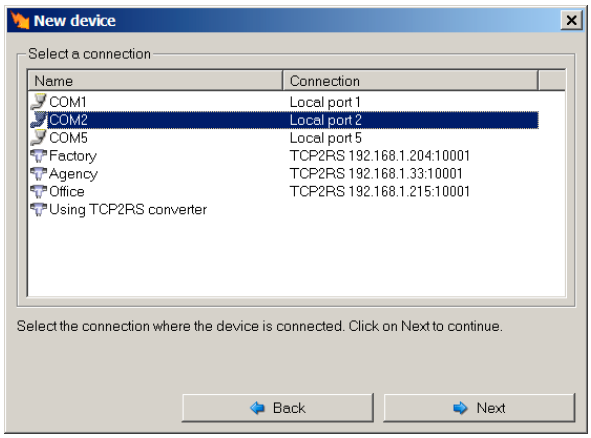



In which:

***Name***: This will be alphanumeric, uniquely identifying the device within the program. Two devices with the same name cannot exist in the configuration.

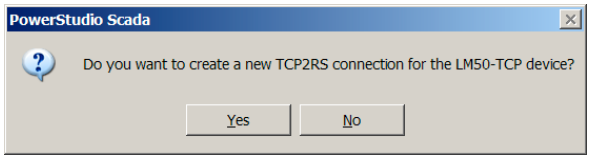
***Description***: Alphanumeric data in order to enter a brief description of the device.

The dialogue in which we can select the connection to which the device is connected will then appear.

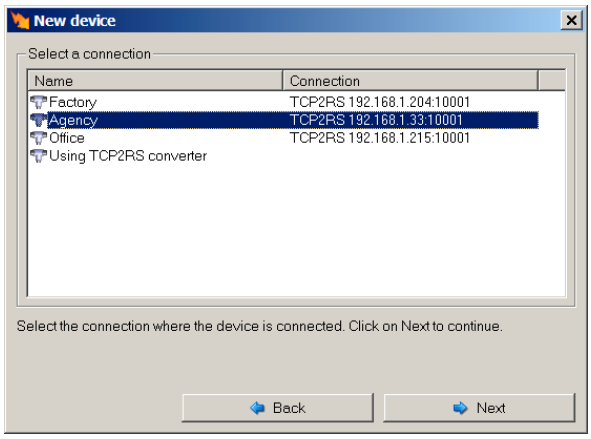



The connections list will show all the local PC ports and all the configured connections.

If the device directly incorporates the Ethernet connection, such as the LM50-TCP or the CVM-144 Ethernet, instead of bringing up the connection selection screen, it will be necessary to create a TCP2RS connection or select a previously created one.

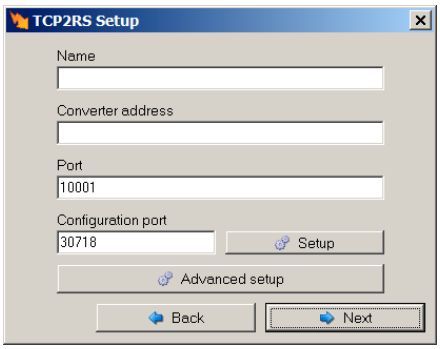



The connection of this type of devices is dealt with in the same way as for a TCP2RS converter, meaning that an associated TCP2RS connection will be added for each device which is added to the configuration. If the answer is '*Yes*', TCP2RS new connection dialogue will open, see section 2.2.1.1.2 TCP2RS Converter. To the contrary, the following dialogue will appear, allowing us to select the connection to which the device is connected.



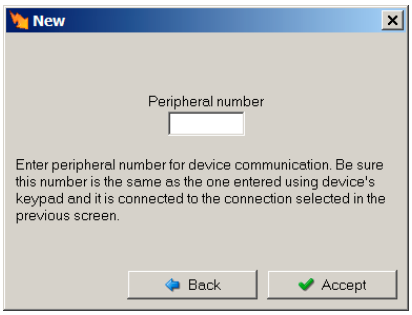

The list of connections will only show the configured TCP2RS connections.

Selecting the option *'Using TCP2RS converter'*, configure the TCP connection with the following dialogue:




This dialogue was explained in section 2.2.1.1.2 TCP2RS Converter.

Finally, the device configuration dialogue will appear, allowing us to enter the peripheral number for the communication of the device.

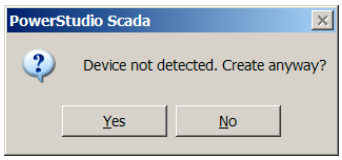



The following table shows the range of possible peripheral numbers for each of the devices

| Number of peripherals | | |
|---|---|---|
| Device | Minimum | Maximum |
| CBS-8 | 1 | 255 |
| CDR-8 | 1 | 255 |
| CIRWATT | 1 | 255 |
| CVM-144 | 1 | 255 |
| CVM-144 Ethernet | 1 | 1 |
| CVM-96 | 1 | 255 |
| CVM-96 Ethernet | 1 | 1 |
| CVM-B/BD | 1 | 99 |
| CVM-BC | 1 | 255 |
| CVM-K | 1 | 99 |
| CVM-K HAR | 1 | 99 |
| CVM-MINI | 1 | 255 |
| CVM NRG-96 | 1 | 255 |
| CVM-R8 | 1 | 99 |
| DH-96 | 1 | 255 |
| LM-24 M | 1 | 255 |
| LM50-TCP | 1 | 1 |
| MK-D | 1 | 255 |
| RGU-10 | 1 | 99 |
| RRM-C | 1 | 255 |

Clicking on

the software will search for the device, with the following message being displayed if it is not found:




In which, if the answer is '*Yes*', the device will similarly be created, although it has not been detected.

If the speed of the detected device is different to 19200 bps, the software will, provided it is possible in the device, change this speed to 19200 bps.

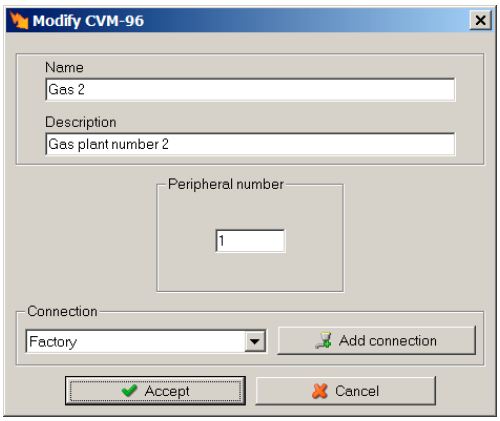
### 2.2.2.2 Modifying a Device

This button will be enabled when only one device is selected from the list.

Clicking on this button

will bring up a dialogue in which to modify the parameters of the device. This dialogue will depend on the device selected. This is explained in detail in the section for the corresponding device.

By way of example, the dialogue for modifying a CVM-96 III is shown.

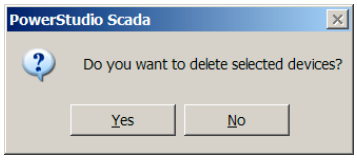


### 2.2.2.3 Deleting Devices

The button

will only be enabled if we select one or more devices from the list.

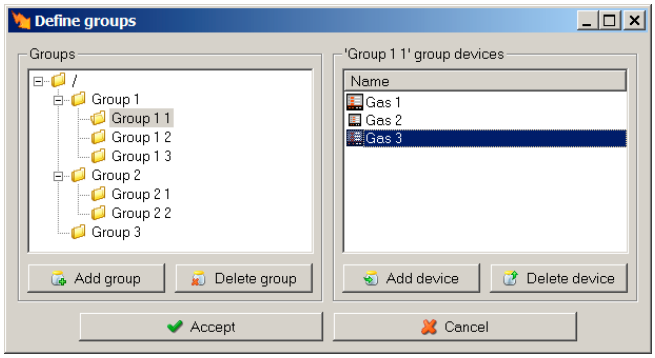
Clicking will bring up the following dialogue:




Clicking on *'Yes'* will delete all the devices selected.

## 2.2.3 Groups of Devices

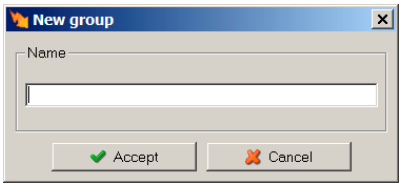
We can use this option to group together devices. It is possible to have one single device in different groups, and to have groups of groups.



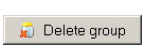

The left-hand part of the dialogue will correspond to the defined groups. The tree structure (with son and father nodes) will facilitate the display of the dependency between groups.

/ This will be the root group of the tree. When new devices are added, these will automatically be added to this root group.

Clicking will add the group as son of the selected group (father). In order to add it, simply enter a name of the group in the dialogue




The names of the son groups cannot be repeated within one same father group, although it is possible to repeat the names of groups in different father groups.

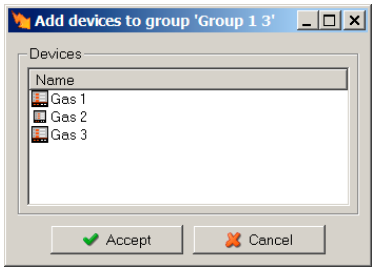


Clicking will delete the selected group, along with all son groups. It is possible to delete any group with the exception of the group / (root group).

The right-hand part of the dialogue is made up of the list of devices belonging to the selected group of the tree.

For better identification, the name of the group will be indicated in the description of the list 'Group 1 1' group devices

Add device Clicking on the button will bring up the following dialogue:




Showing the list of configured devices which do not belong to the group. Clicking on the 'Accept' button will add them to the group of devices selected in the list.

Delete device It will only be enabled if there are devices selected in the devices list. Clicking on this button will delete the selected devices of the corresponding group.

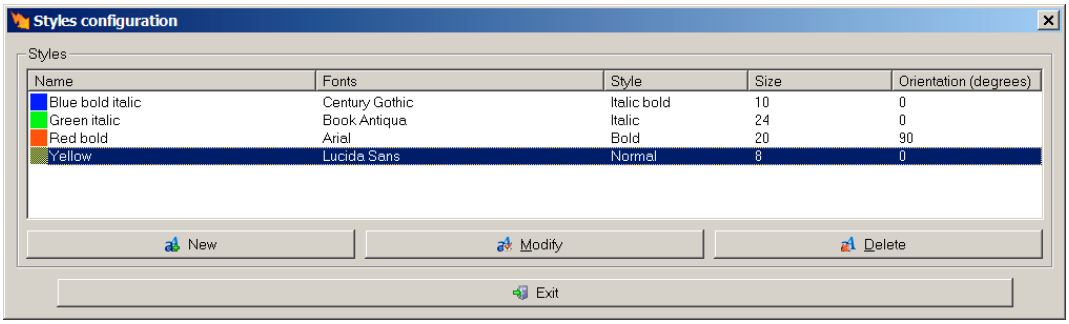
## 2.2.4 Discriminators

Allow us to add, modify or delete discriminators.

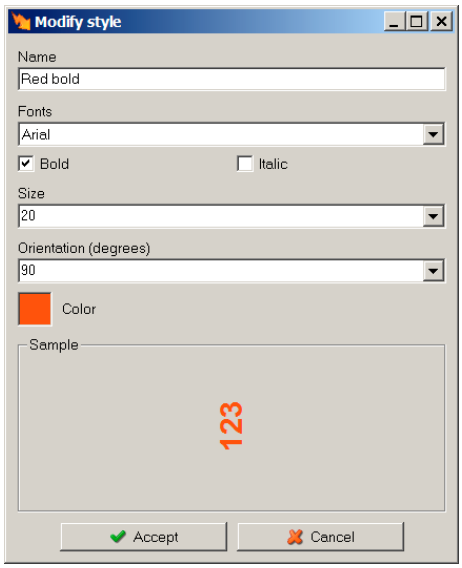
The discriminator configuration is explained in detail in chapter 7 of this manual.

## 2.2.5 Styles

We can use this option to add, modify or delete the font styles to be used to show the values on the different SCADA screens and reports. Each of the styles is made up of a colour and a font format.




By clicking on the '*New*' or '*Modify*' button we can add or modify a style.

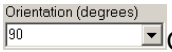


Corresponds to the name of the style. This name will uniquely identify the style in the SCADA, it also being the name of the file in which the style configuration will be stored.

Will correspond to the font type used for the text.

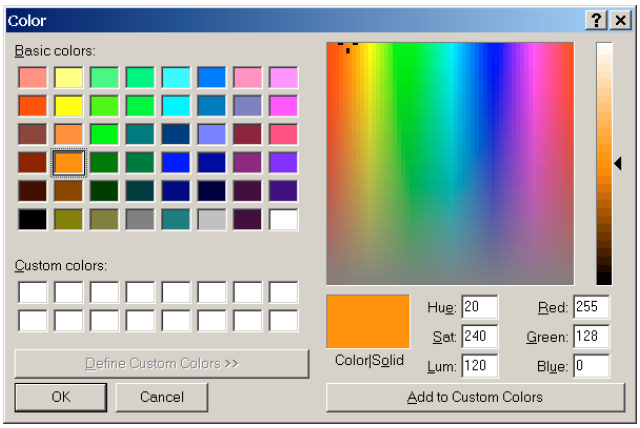
Corresponds to the font style. Depending on the selected font, we can choose bold and/or italics.

Corresponds to the font size. The size may be between 1 and 90. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.



Corresponds to the text direction. The orientation (expressed in degrees) must be between 0 and 350. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.

Clicking on this button will allow us to select the style colour.



Displays an example of how the style will look.

The '*Delete*' button will only be enabled if there are styles selected in the style list. Clicking on this button will delete the selected styles.

### 2.2.6 Reports

We can use this option to add, modify or delete reports. This section is explained in more detail in chapter 8.

### 2.2.7 Screens

We can use this option to add, modify or delete the different screens which will form part of the SCADA. This section is explained in more detail in chapter 9.

### 2.2.8 Events Timetables

We can use this option to configure the different disabling of events timetables. This section is explained in more detail in chapter 10.

### 2.2.9 Groups of Events

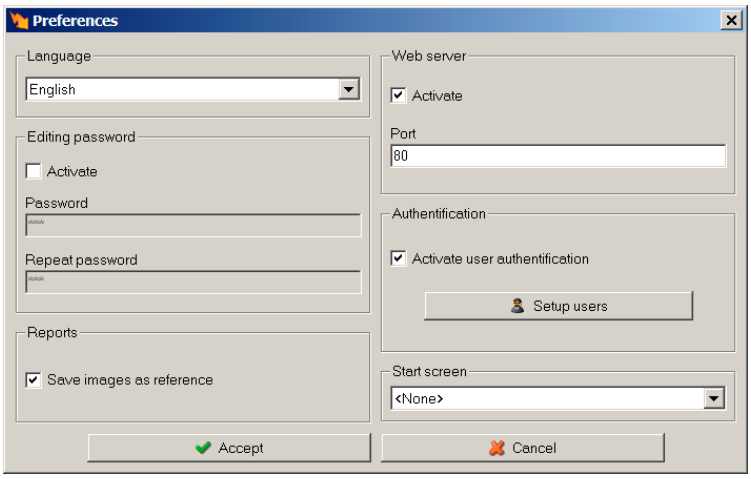
We can use this option to configure events groups. This section is explained in more detail in chapter 10.

### 2.2.10 Events

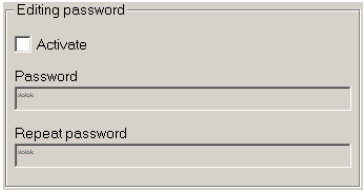
We can use this option to configure a series of events in the software, configuring a disable timetable for the event or carrying out a series of actions when the event comes about, whilst it is active or when it finishes. This section is explained in more detail in chapter 10.

### 2.2.11 Preferences

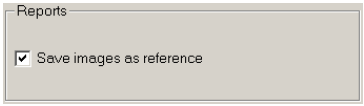
This option can be used to configure a series of general parameters for the application.



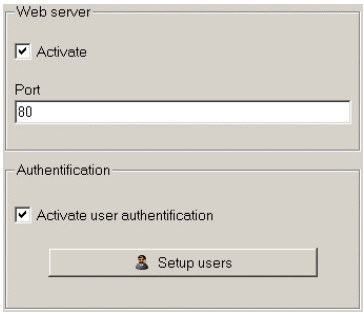
This selector can be used to select the language of the application.



We can enable Activate or disable Activate the possibility of blocking by using this password in edit mode. This password must have at least 8 characters.



If this option is enabled, all the images inserted in reports will be stored in the application with a reference to the same. This means that if any of these images are deleted, renamed or moved from outside of the program, the correspondence with the application will be lost and the image will not be displayed in the application. If the option is disabled, inserting an image in a report will produce a copy of the same to be added to the application files.



We can enable Activate or disable Activate the possibility of using the application as a Web server. If the Web server option is enabled, we can, using an Internet browser, display the measurement parameters for the devices connected to the local PC on a remote PC (see chapter 12). Likewise, using the option *'Activate user authentification'*, we can request a name and password for the user trying to access the application via remote PC, hence allowing access to a series of resources of the application and refusing access to other users. The '*Setup users*' button allows us to choose which resources will be available to each authorised user. The user configuration is explained in detail in section 2.2.11.1 User Authentication.

This selector can be used to select the initial screen when the application is displayed through the Web server. See section 12 Remote Access to the Application Using JAVA.

### 2.2.11.1 User Authentication

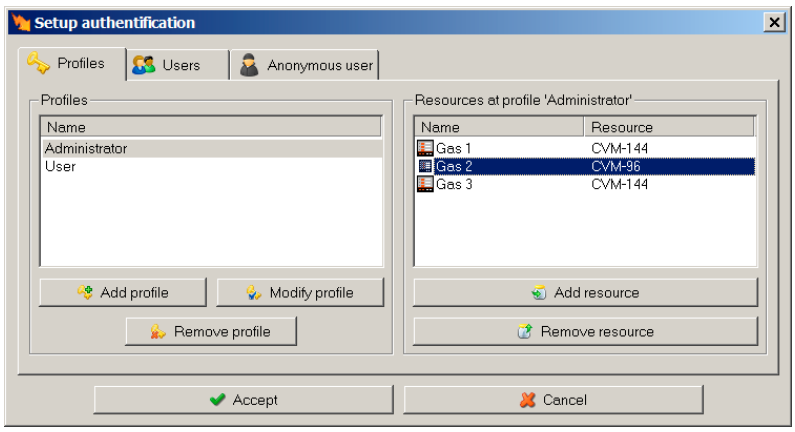
This section explains how the access of remote users to the application resources is configured.

A series of profiles are defined. These profiles contain the resources to which access is permitted, allowing us to assign a resource to more than one profile.

Likewise, the users for whom access to the application resources is authorised are defined. Each of the users shall have a name and password, which shall be used by the application for authentication, thus preventing access by unwanted users. All authorised users shall have one or more profiles assigned to them, allowing access to all the resources contained in the profiles. A profile may be assigned to several different users.

Finally, we can enable access for anonymous users. This anonymous user will not have a name or a password, allowing access to any remote user without the need for authentication. As with other users, one or more profiles can be assigned to allow access to different application resources.

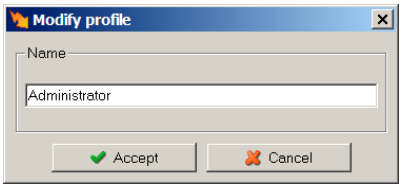
### 2.2.11.1.1 Profiles




This dialogue can be used to define the different profiles for remote access to the application resources.

The list located to the left of the dialogue shows the profiles, whilst the list on the right shows the resources associated to the selected profile.

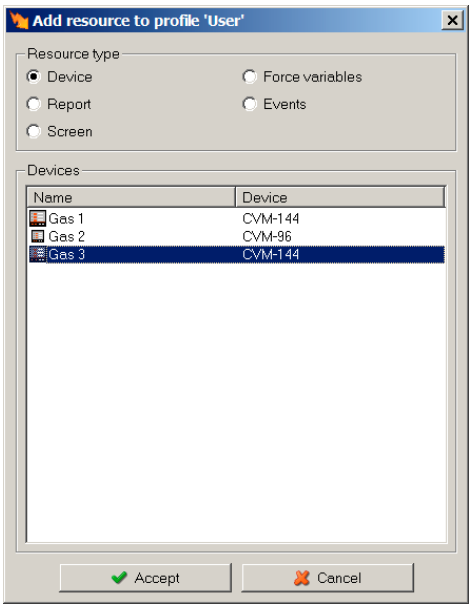
Clicking on the *'Add profile'* or *'Modify profile'* buttons will open the following dialogue:




This dialogue is to specify or modify, depending on the button clicked on, the name of the profile. This name will be used to identify the profile and will be unique (two profiles with the same name cannot exist).

Clicking on *'Remove profile'* will delete the profiles selected in the profile list.

Use the *'Add resource'* button to add resources to a profile. Clicking this button will bring up the dialogue



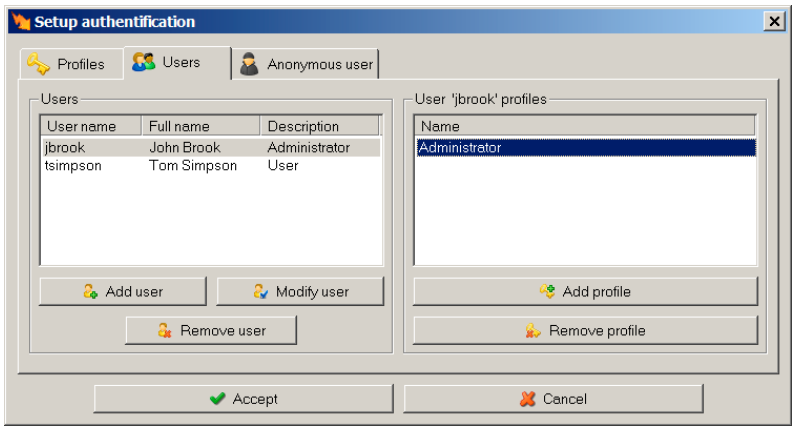

Where we can choose between the different types of resources to be added to a profile. The list will only display the resources of the selected type, and of these only those which have not been previously added to the profile.

The different types of resources which can be added to a profile will be:

- ***Device***: Devices configured in the software.
- ***Report***: This will show the different reports which have been defined. See section 2.2.6.
- ***Screen***: This will show the different SCADA screens of the application. See section 2.2.7 Screens.
- ***Force variables***: This will display the SCADA screens in which it is possible to force one or several variables. See section 9 SCADA
- ***Events***: This will display the different events resources (see section 2.2.10 Events) which can be added to a profile:
  - *Active events visualization*. Allows us to display (or not) active events.
  - *Notified events visualization*. Allows us to display (or not) the events which need to be notified.
  - *Event recongnition*. It will allow a notified event to be recognised.
  - *Events Viewer*. It will display the list of events (notified or not) which have been stored on file.

If you wish to remove resources from a profile, select those resources to be eliminated from the profile in the resources list and click on the *'Remove resource'* button. It must be remembered that these resources will only be removed from the profile list and will in no case be deleted from the main application.

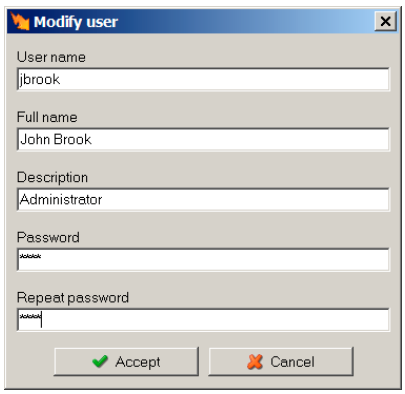
#### 2.2.11.1.2 Users




This dialogue can be used to define the users who will have access to the application resources.

The list located to the left of the dialogue shows the configured users, whilst the list on the right shows the profiles assigned to the user selected in the user list.

To add or modify a user, click on the corresponding button *'Add user'* or *'Modify user*'.




In which:

**User name:** This is an alphanumeric field which uniquely identifies the user. This field will be used to authenticate the user whenever necessary.

**Full name:** It will correspond to the complete user name.

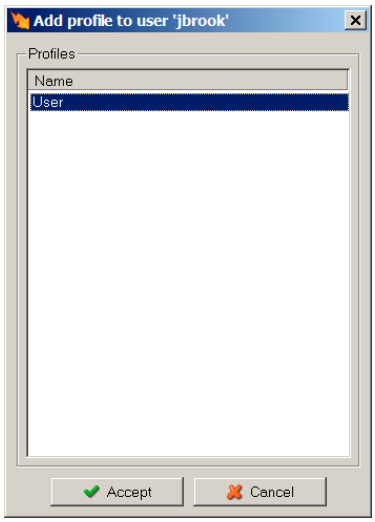
**Description:** Field which allows us to enter a brief description of the user.

**Password:** Password to be used to prevent unwanted users from accessing application resources.

**Repeat password:** Field to be used to validate the password entered in the previous field. The values entered in the fields 'Password' and 'Repeat password' must be the same in order for password to be valid.

If you wish to delete one or more users, select the users you wish to delete from the user list and click on the *'Remove user'* button.

Clicking on the *'Add profile*' button will allow us to assign new profiles to the user selected in the user list.

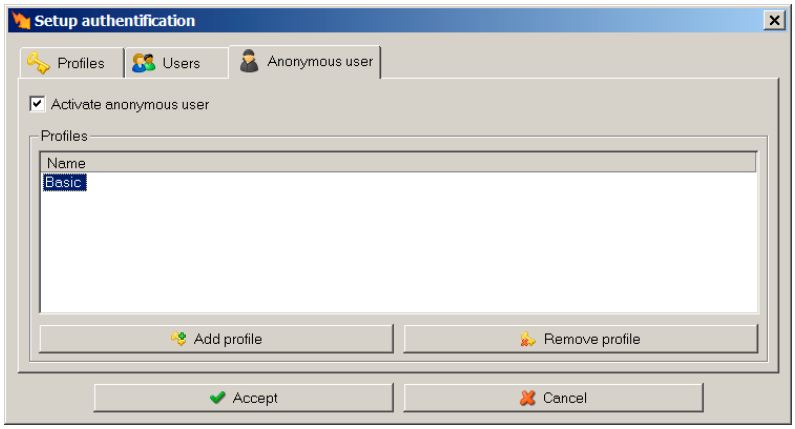



The dialogue will only display those profiles which had not been previously assigned to the user. In this case, clicking on the user '*jbrook*' will only display the 'User' profile, since it is the only one which has not been assigned to the user. Clicking on *'Accept'* will assign the profiles selected in the list to the user.

In order to delete the profiles of a user, select those profiles you wish to delete for the user from the profiles list and click on the *'Remove profile' button.* It must be remembered that these profiles will only be removed from the user's profile list and will in no case be deleted from the application.

#### 2.2.11.1.3 Anonymous User

There is a special type of user which, from now on, will be known as anonymous user. The main difference between this user and other users is that no name or password is necessary. Anonymous users can access the application resources to which he/she has access without having to enter a name and password. In order to prevent unwanted access, we can disable this user and have greater control over who can access the resources and who cannot.




Enabling or disabling the option *'Activate anonymous user'* will enable (or not) the option to allow an anonymous user by way of remote access via the Web.

The list will show the profiles assigned to the anonymous user, with the operation of the buttons '*Add profile*' and '*Remove profile*' being the same as for any other user (see section 2.2.11.1.2 Users).

## 2.2.12 Working Mode

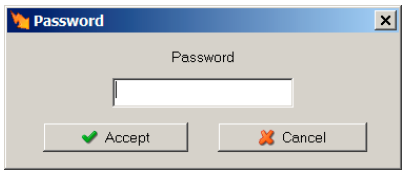
There are two modes of operation: edit and run.

In run mode we can display the values of the devices, make graphs and tables, run a SCADA screen, make a report, and any other software function which does not involve the modification of any configuration parameters, both with regards to the general configuration of the software and the individual configuration of each device.

In edit mode, in addition to the run mode functions, we can modify the configuration parameters for the software and the configured devices. In this operation mode it is possible to edit the SCADA screens and reports, and carry out actions such as add display controls, modify controls, etc. Once the SCADA screens have been edited, it is necessary to move to run mode in order to run the said screens.

We can use this password to block the edit mode, thus preventing any possible modification of the configuration, either by mistake or by unauthorised persons. In order to enable the edit password, select the most suitable option in the preferences dialogue (see section 2.2.11 Preferences).

When moving from run mode to edit mode, with the edit password enabled, enter the correct password in the following dialogue:




Otherwise you will not be able to enter in edit mode.

## 2.3 Edit Menu

### 2.3.1 Cut

This option can be used to place any object of the reports or SCADA screens on the clipboard in order to move to another position on the same screen.

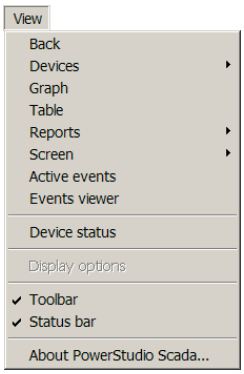
### 2.3.2 Copy

This option can be used to copy the graph, table or control of the SCADA or report screens to the clipboard.

### 2.3.3 Paste

This option can be used to paste the previously cut or copied information into a SCADA or report screen.

## 2.4 View Menu

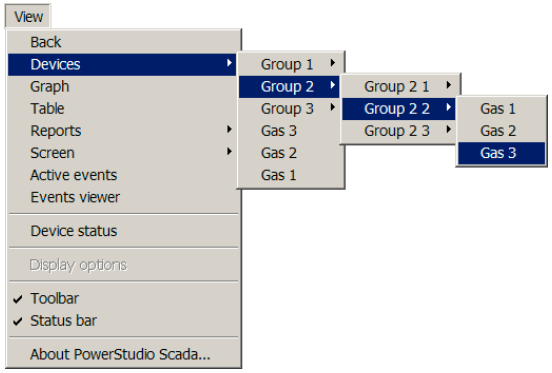



### 2.4.1 Back

This option allows us to go easily to the previous screen.

### 2.4.2 Devices

Clicking on devices will open a menu, with the groups and devices configured, as follows:




From which we can choose the device to display the variables to be measured.

The drop down menu can have two types of different elements:

Group 2 ▸ Here the symbol ▸ will indicate that it is a group, and another menu will open with the elements which make up the group.

Gas 1 This will be the name of the configured devices. Clicking on one of these names will display the variables which this device can measure.

### 2.4.3 Graph

Clicking on *'Graph'* will show the graphs for the variables selected for the device.

The graphs are explained in chapter 6.

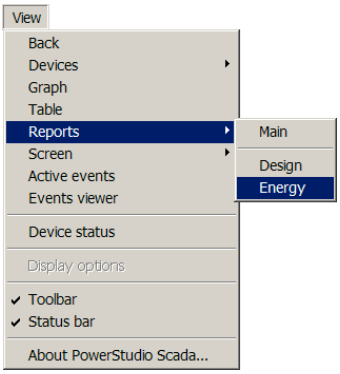
### 2.4.4 Table

Clicking on *'Table'* will show the tables with the values of the variables selected for the device.

The tables are explained in chapter 6.

### 2.4.5 Reports

Clicking on *'Reports'* will open a drop-down list with the different configured reports, such as the following:

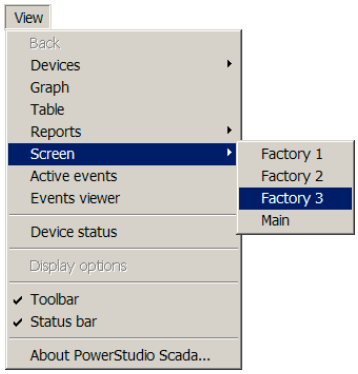



From which we can choose the report to be displayed.

The display of reports is explained in chapter 8.3.

## 2.4.6 Screens

Clicking on *'Screen'* will open a drop-down list with the different configured screens, such as the following:




From which we can choose the report to be displayed.

The display of SCADA screens is explained in chapter 9.3.

## 2.4.7 Active Events

Clicking on *'Active events'* will display a window which informs of which events are active.

The events are explained in chapter 10 Events

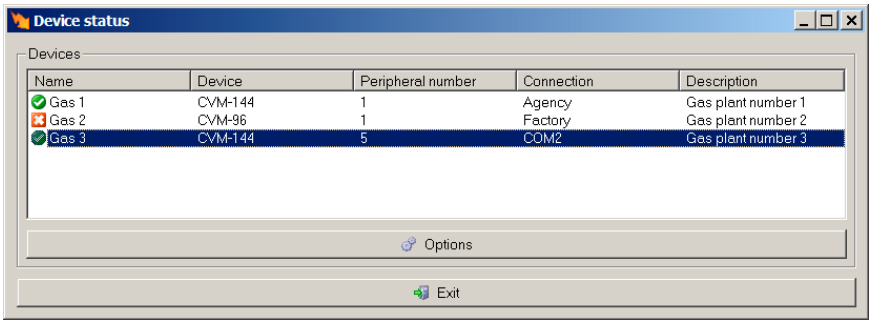
## 2.4.8 Events Viewer

Clicking on *'Events viewer'* will display a table with a list of saved events.

The events are explained in chapter 10 Events.

## 2.4.9 Device status

Clicking on this option will bring up the following dialogue




Here we can see the current status of all the configured devices.

There are 6 possible statuses:

The device communicates correctly.

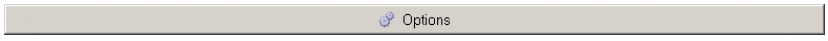
The device communicates correctly, but one of the phase connections in the device is incorrect.

The device does not communicate.

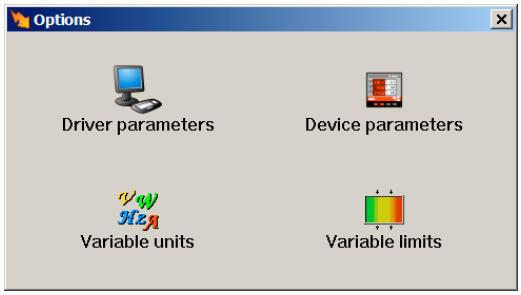
The device still has not started up. When starting up, the software needs to read a series of device parameters in order to start the status.

The communications port could not be opened in order to establish communication with the device.

Communication with the device has been established, but the version detected is incompatible with the software, or the device detected is different to that configured in the software.




This button will only be enabled when there is a device selected from the list. Clicking on this will bring up a dialogue in which we can configure both the device parameters and the parameters for the display on-screen of the different variables. The options dialogue will depend on the type of device selected, as explained in detail in the corresponding device section. By way of example, the options dialogue of a CVM-96 III is shown.




## 2.4.10 Display Options

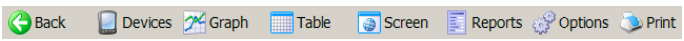
This contains the parameters to modify the on-screen display of the values of the devices, tables or graphs.

This menu option will depend on what is being displayed on screen, as explained in the corresponding sections where the devices, tables and graphs are explained.

## 2.4.11 Toolbar

This option can be used to display or hide the toolbar.

This bar contains the main elements of the View menu.




- ***Back***: see section 2.4.1
- ***Devices***: See section 2.4.2
- ***Graph***: See section 2.4.3
- ***Table***: See section **¡Error!No se encuentra el origen de la referencia.**
- ***Screen***: See section 2.4.6
- ***Reports***: See section 2.2.6
- ***Options***: See section 2.4.10
- ***Print***: This will only be enabled when a graph, table or report sheet is being displayed.

## 2.4.12 Status Bar

This option can be used to display or hide the status bar.

To the right of the bar is a series of icons showing, when necessary, information on the status of the program. Double-clicking on the corresponding icon will show additional information on the meaning of each of the same.

The icons displayed will be:

Initialisation of devices. Only displayed whilst starting communication with the devices.

Communication error. Will be displayed when it is not possible to communicate with at least one of the devices.

Non-permitted notified events. Will be displayed whenever the authenticated user, provided authentication is enabled, does not have permission to display the notified events. Although the user does not have permission to display the events, these shall continue to be monitored and registered.

Active Events. Will be displayed when at least one event is enabled.

Edit mode. Will be displayed in order to indicate that the program is editing.

## 2.4.13 About

Shows information on the software.

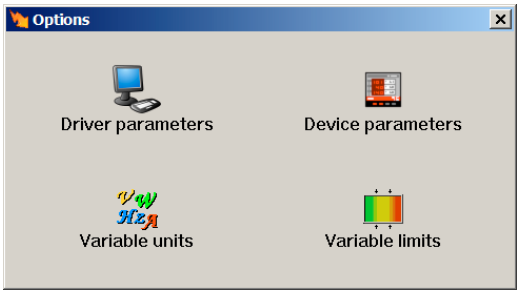
# 3 Device Configuration

## 3.1 Driver Options Configuration

We can access the options of a device from

- *Options button of the device status screen*. See section 2.4.9 Device status
- *View Menu*. See section 2.4.10 Display Options.
- *Toolbar*. See section 2.4.11 Toolbar

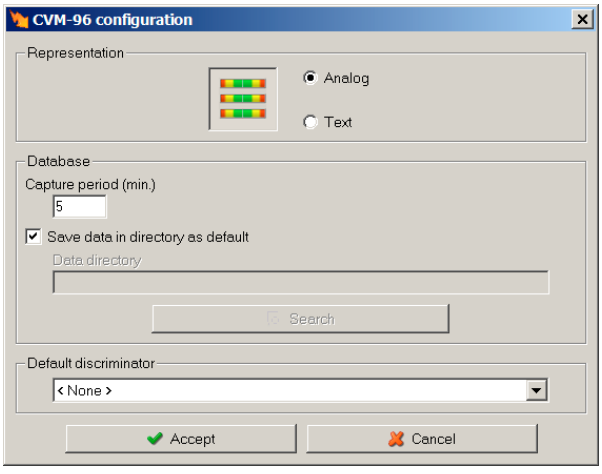
The options menu for a CVM-96 device is as follows




This section describes those options which are common to all or the majority of drivers.

These options are described using device CVM-96 as an example. It is possible that other devices need to configure another type of options, not detailed in this section, in which case detailed explanation will be contained in the corresponding device section.

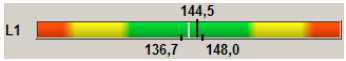
### 3.1.1 Driver Parameters




From this screen we can configure the type of display of the variables on screen and configure where to save the data file.

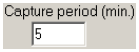
There are two types of data representation.

Analogue representation, the variables will be represented graphically by way of bars as




Here the instantaneous, maximum and minimum values are represented.

Text mode representation, the variables will be represented as




The capture period in minutes is entered in this field. This time indicates the time interval passing between the registers stored on the computer's hard drive.

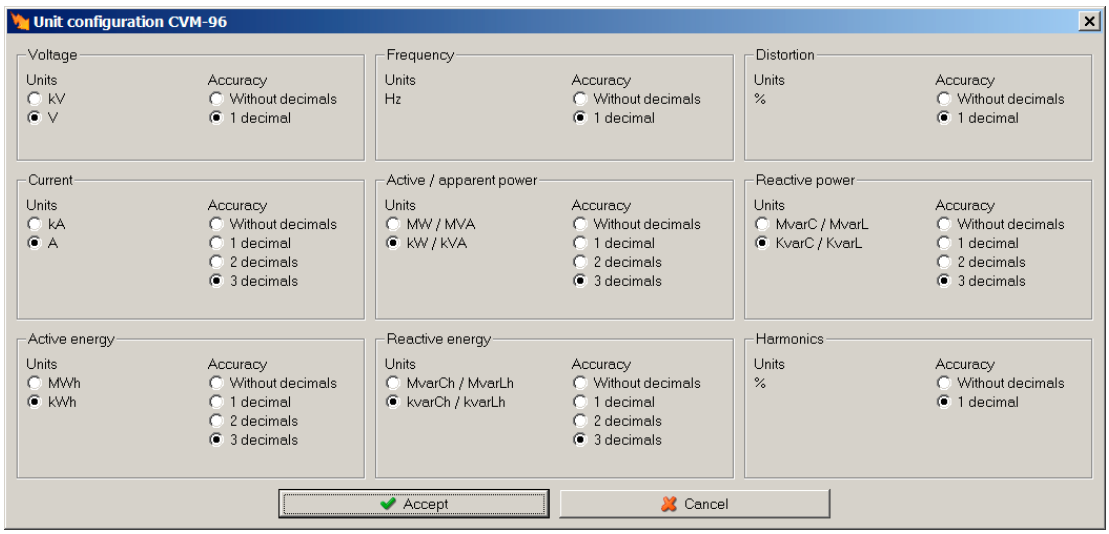
Checking this option will indicate that the device data, once read, will be stored in the directory where the software stores all data by defect. Should you wish to save the data in a directory different to the defect directory, uncheck this option and enter the directory in the field 'Data directory'.

Should you wish to store the data in a different directory to the defect directory, this field will show the directory where all the said data are stored. Clicking on the button

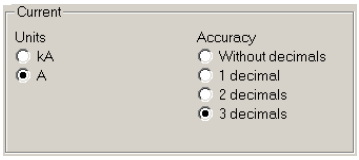
will allow us to change the data directory.

This selector can be used to assign a discriminator by defect to the device. This option will only appear in those devices which have variables which can be discriminated. If a discriminator is selected, when making graphs or tables, the variables will initially be displayed as discriminated, although it is also possible to see the variables without discrimination, or to display the discriminated variables by way of another discriminator different to be one by defect.

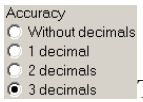
## 3.1.2 Variable units



This dialogue can be used to configure the units and the number of decimals with which to display the variables onscreen. This type of configuration does not affect the equipment, and is used only for the display of the values on screen.

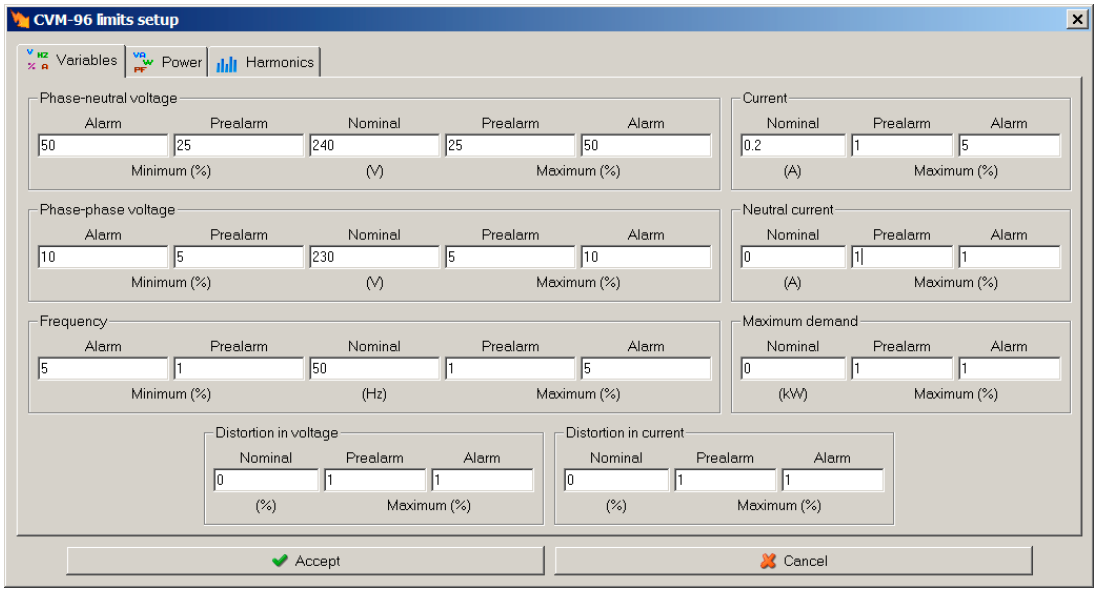


The units in which the variables are shown are selected. In any case, all the current variables will be displayed in A.

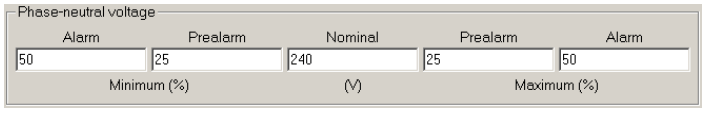


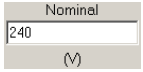
The precision in the display of the variables is selected. In this case, all the current variables will be displayed with 3 decimals.

## 3.1.3 Variable limits

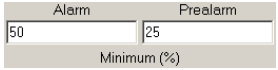



This dialogue can be used to configure the nominal values of the variables, along with a series of margins to show on screen when a variable measures unusual values.

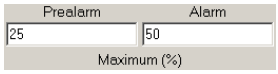


Nominal value of the variable. The units in which this value is expressed are in brackets. If the nominal value is 0, the alarm will remain disabled. For the power factor, the nominal value must be 1 to enable the alarm, or 0 to disable it.



Nominal value percentage for pre-alarm or alarm signals. In this case, a pre-alarm will be set off when the value of the variable is between 25% and 50% below the nominal value, whilst the alarm will be set off if the same is below 50%. For the power factor, directly introduce the desired alarm and pre-alarm value between +0.0 and –0.0.



Nominal value percentage for pre-alarm or alarm signals. In this case, a pre-alarm will be set off when the value of the variable is between 25% and 50% above the nominal value, whilst the alarm will be set off if the same is above 50%. For the power factor, directly introduce the desired alarm and pre-alarm value between +0.0 and –0.0.

If the pre-alarm value is equal to the alarm value, the pre-alarm zone will be disabled, passing directly from normal status to alarm status. The way to display the pre-alarm and alarm signals will be indicated later on, when the different values screens are explained.

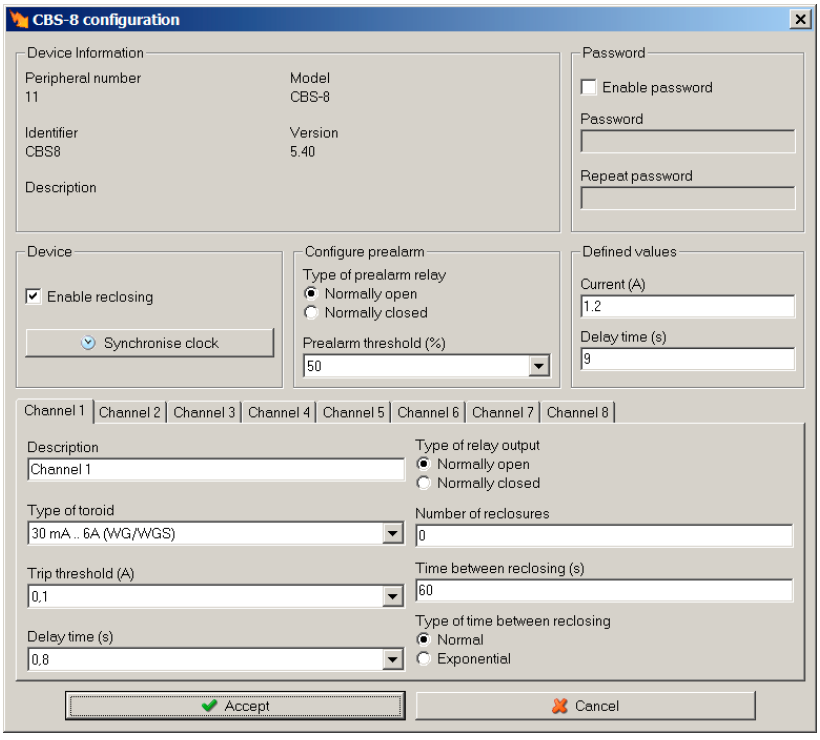
## 3.2 CBS-8

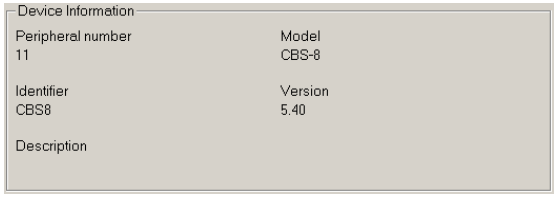
### 3.2.1 Driver Options

The options menu shall be as follows:

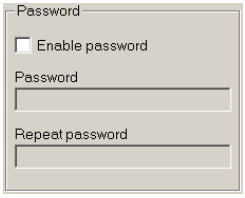
#### 3.2.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

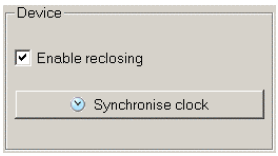


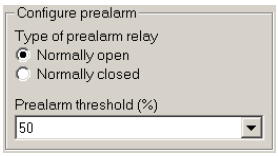
Displays general information.




This selector allows us to enable or disable the configuration password for the parameters of the device. When this password is enabled, the operator will be asked for the key in order to access this screen or the screen which will allow the modification of the parameters in the values display window (see modify button in 3.2.2 Displaying Values)

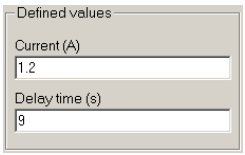



This selector allows the channel reconnections to be enabled or disabled in the equipment. Depending of whether the reconnections are enabled or not, some of the channel configuration fields will be enabled or disabled. If you click on 'Synchronise clock' button it will send to the device the present hour from PC.

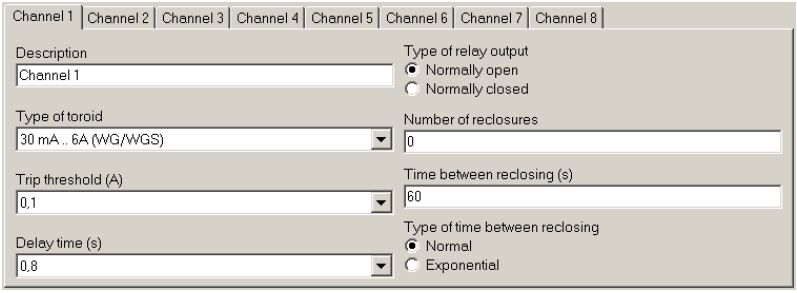



We can configure:

- *Type of prealarm relay*. Prealarm relay operation mode common for all channels of the device.
- *Prealarm threshold*. Prealarm threshold of the equipment. Can vary between 50 and 100% of the minimum tripped threshold of the device channels.




It will be possible to configure a tripped threshold and a user-personalised delay time. These parameters are common for all the channels of the device. Depending on the mode selected, the personalised threshold may be marked or not.




Shows the configuration of a channel.

As it is only be possible to see the configuration of one channel at a time, click on one of the channels to display the corresponding configuration.

Alphanumeric data which allows us to enter a brief description of the channel for easy identification.

Toroid type connected to the channel. There are three possible selection options:

- Channel disabled
- Fullscale channel of 6A (30mA .. 6A)
- Fullscale channel of 60A (300mA .. 60A)

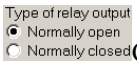
Channel trip threshold, depending on the type of toroid connected, the available values will be:

| Toroid 30 mA…6A | | Toroid 300 mA...60A | |
|---|---|---|---|
| 30 mA | 1 A | 300 mA | 10 A |
| 50 mA | 1.5 A | 500 mA | 15 A |
| 100 mA | 2 A | 1 A | 20 A |
| 200 mA | 2.5 A | 2 A | 25 A |
| 300 mA | 3 A | 3 A | 30 A |
| 400 mA | 3.5 A | 4 A | 35 A |
| 500 mA | 4 A | 5 A | 40 A |
| 600 mA | 4.5 A | 6 A | 45 A |
| 700 mA | 5 A | 7 A | 50 A |
| 800 mA | 5.5 A | 8 A | 55 A |
| 900 mA | 6 A | 9 A | 60 A |
| Personalised [1] | | Personalised | |

[1] Only if the personalised tripped threshold value does not exceed 6A.

Delay time of the channel, the possible values will be:

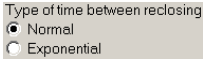
| Instantaneous | Selective | 0.1 s |
|---|---|---|
| 0.4 s | 0.8 s | 1 s |
| 3 s | 5 s | 10 s |
| Personalised | | |



Channel output relay working mode.

Number of reconnection attempts. The relay will be locked when this number is exceeded.

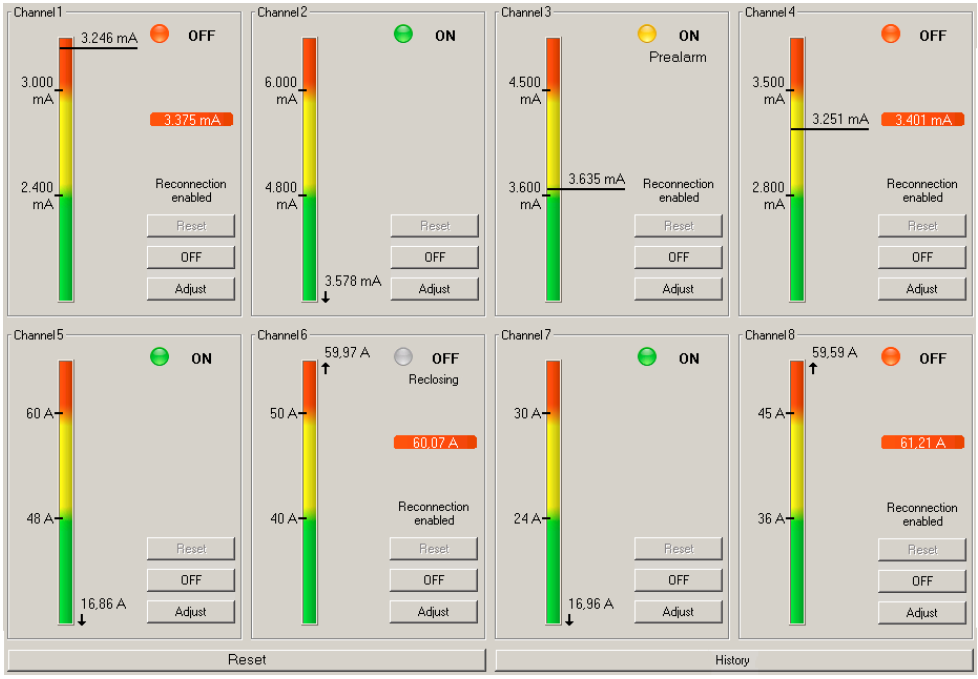
Time between reconnections.



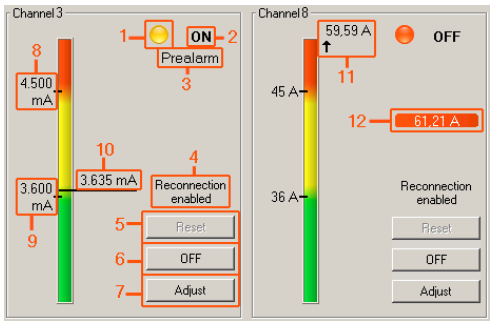
Reconnection time working mode.

## 3.2.2 Displaying Values

The CBS-8 device will display the following values screen:




In which:




1. Status of the Channel:

   - Status ON.
   - Status of pre-alarm.
   - Status OFF.

2. Status of the Relay:

   - ON. Non-lockable Channel
   - OFF. Lockable Channel

3. Additional information on the status of the channel:

   - *Prealarm*: Prealarm enabled
   - *Reconnection*: Channel disconnected with timed reconnection process.
   - *Remote*: Channel disconnected by external tripped, not automatically reconnectable.

4. Reconnection enabled. Informs that the reconnections for the channel have been enabled.

5. Reset Button. If the channel has not tripped, the button will remain disabled. Clicking the button will reset the channel.

6. OFF Button. External disconnection of the channel. The button will remain disabled if the channel has not been tripped.

7. Adjustment Button. Allows the programming of the sensitiveness and delay of the channel. It also shows information of the channel.

8. Tripped threshold value configured for the channel.

9. Prealarm value configured for the channel.

10. Instantaneous differential current value of the channel.

11. When the instantaneous differential current value of the channel exceeds the limits of the values bar, either by excess or by defect, indication will be given as shown in the figure (arrow below the value)

12. Differential current value detected when the channel trip comes about.

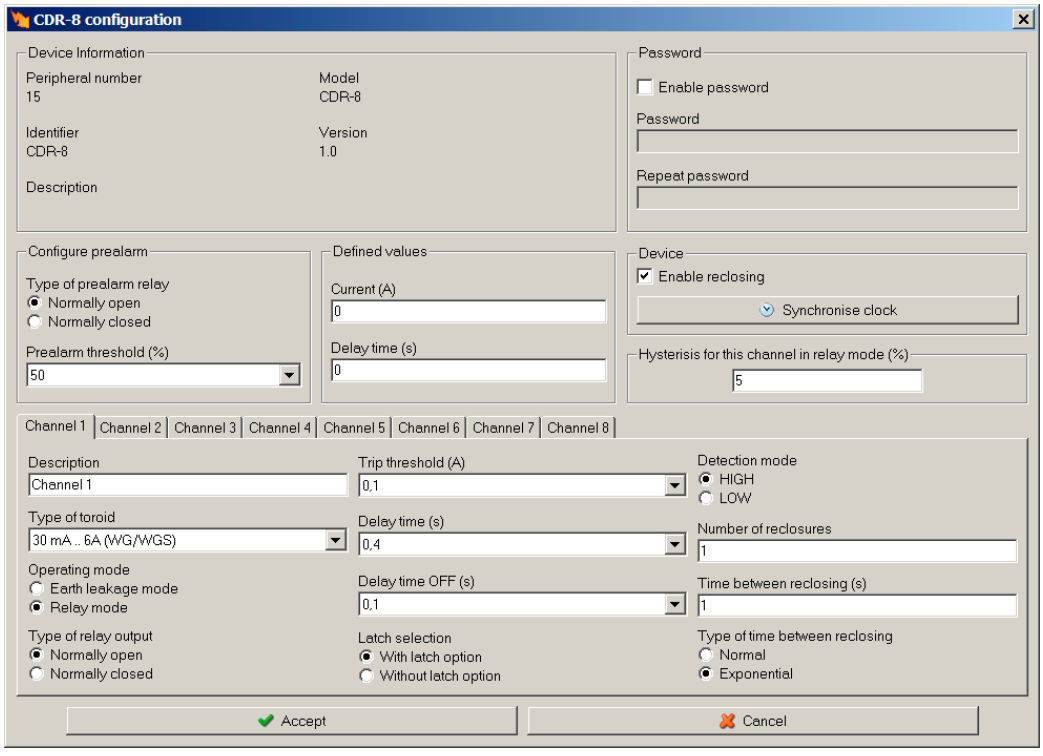
## 3.3 CDR-8

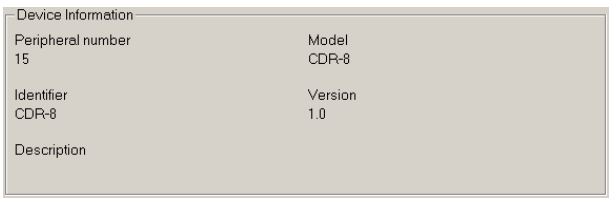
### 3.3.1 Driver Options

The options menu shall be as follows:

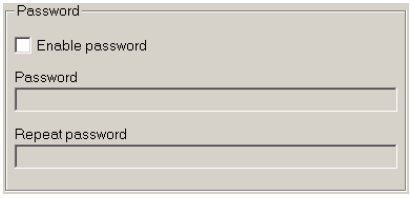
#### 3.3.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accepe*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

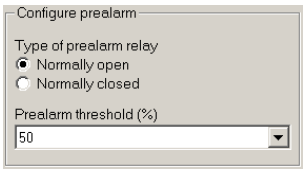


Displays general information.

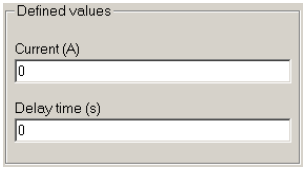



This selector allows us to enable or disable the configuration password for the parameters of the device. When this password is enabled, the operator will be asked for the key in order to access this screen or the screen which will allow the modification of the parameters in the values display window (see modify button in 3.3.2 Displaying Values)

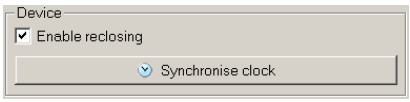



We can configure:

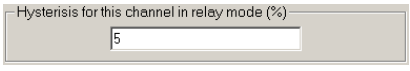
- *Type of prealarm relay*. Prealarm relay operation mode common for all channels of the device.
- *Prealarm threshold.* Prealarm threshold of the equipment. Can vary between 50 and 100% of the minimum trigger threshold of the device channels.



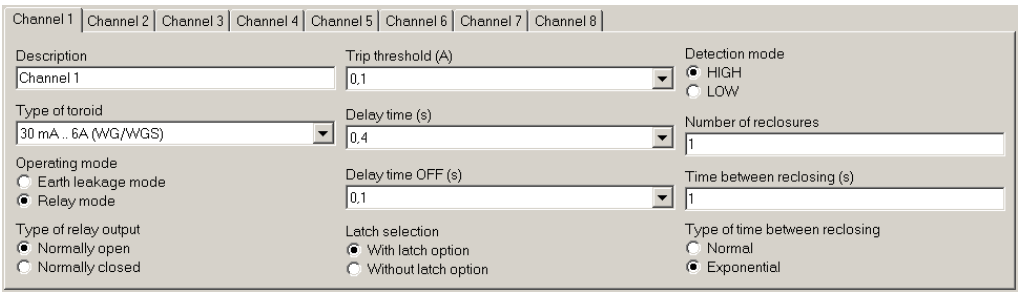

It will be possible to configure a tripped threshold and a user-personalised delay time. These parameters are common for all the channels of the device. Depending on the mode selected, the personalised threshold may be marked or not.




This selector allows the channel reconnections to be enabled or disabled in the equipment. Depending of whether the reconnections are enabled or not, some of the channel configuration fields will be enabled or disabled. If you click on ‘Synchronise clock’ button it will send to the device the present hour from PC.



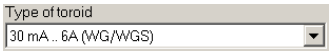

% of hysterisis for the connection and reconnection of the channel in relay mode.



Shows the configuration of a channel.

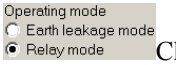
As it is only be possible to see the configuration of one channel at a time, click on one of the channels to display the corresponding configuration.

Alphanumeric data which allows us to enter a brief description of the channel for easy identification.

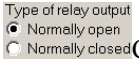


Toroid type connected to the channel. There are three possible selection options:

- Channel disabled
- Fullscale channel of 6A (30mA .. 6A)
- Fullscale channel of 60A (300mA .. 60A)



Channel working mode. Depending on the mode selected, some of the configuration options of the channel may be disabled.



Channel output relay working mode.

Channel tripped threshold, depending on the type of toroidal connected, the available values will be:

| Toroidal 30 mA...6A | | Toroidal 300 mA...60A | |
|---|---|---|---|
| 30 mA | 1 A | 300 mA | 10 A |
| 50 mA | 1.5 A | 500 mA | 15 A |
| 100 mA | 2 A | 1 A | 20 A |
| 200 mA | 2.5 A | 2 A | 25 A |
| 300 mA | 3 A | 3 A | 30 A |
| 400 mA | 3.5 A | 4 A | 35 A |
| 500 mA | 4 A | 5 A | 40 A |
| 600 mA | 4.5 A | 6 A | 45 A |
| 700 mA | 5 A | 7 A | 50 A |
| 800 mA | 5.5 A | 8 A | 55 A |
| 900 mA | 6 A | 9 A | 60 A |
| Personalised [1] | | Personalised | |

[1] Only if the personalised tripped threshold value does not exceed 6A.

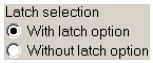
Delay time of the channel, depending on the work mode selected, the possible values will be:

| Instantaneous | Selective | 0.1 s |
|---|---|---|
| 0.4 s | 0.8 s | 1 s |
| 3 s | 5 s | 10 s |
| 60 s [1] | Personalised | |

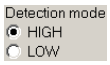
[1] Only if the channel works in relay mode.

Delay time in the resetting of the channel when working in relay mode, the possible values will be:

| 0.1 s | 0.4 s | 0.8 s |
|---|---|---|
| 1 s | 3 s | 5 s |
| 10 s | 60 s | Personalised |

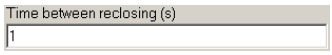


Channel lock selection when working in relay mode.

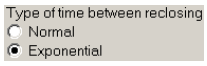


Trip due to low current (LOW) or excess current (HIGH) selection of the channel when working in relay mode.

Number of reconnection attempts. The relay will be locked when this number is exceeded.



Time between reconnections.

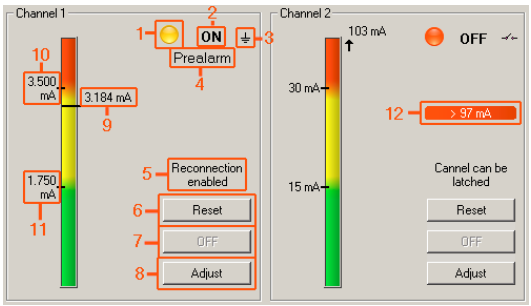


Reconnection time working mode.

## 3.3.2 Displaying Values

The CDR-8 device will display the following values screen:

In which:




1. Status of the Channel:

- Status ON.
- Status of pre-alarm.
- Status OFF.

2. Status of the Relay:

   - ON. Non-lockable Channel
   - OFF. Lockable Channel

3. Channel working mode:

   - Differential mode
   - Relay mode

4. Additional information on the status of the channel:

   - *Prealarm*: Prealarm enabled
   - *Reconnection*: Channel disconnected with timed reconnection process.
   - *Remote*: Channel disconnected by external trigger, not automatically reconnectable.

5. Additional information on the channel:

   - *Reconnection enabled*. Informs that the reconnections for the channel have been enabled. Only if the channel works in differential mode
   - *Channel can be latched*. Informs that the channel will be locked when the tripped is produced, with a manual or remote reset of the said channel being necessary. Only if the channel works in relay mode.

6. Reset Button. If the channel has not tripped, the button will remain disabled. Clicking the button will reset the channel.

7. OFF Button. External disconnection of the channel. The button will remain disabled if the channel has not been tripped.

8. Adjustment Button. Allows the programming of the sensibility and delay of the channel. It also shows information of the channel.

9. Instantaneous differential current value of the channel. When the instantaneous differential current value of the channel exceeds the limits of the values bar, either by excess or by defect, indication will be given as shown in the figure (arrow below the value).

10. Tripped threshold value configured for the channel.

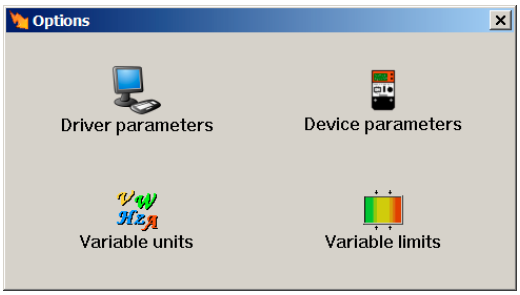
11. Prealarm value configured for the channel.

12. Differential current value detected when the channel tripped comes about.

## 3.4 CIRWATT

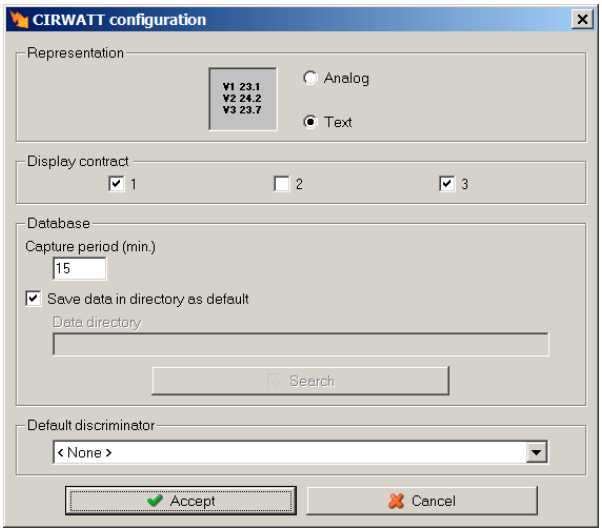
### 3.4.1 Driver Options

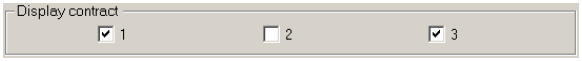
The options menu shall be as follows:




The options *'Variables Units'* and *'Variable limits'* are detailed in sections 3.1.2Variable units3.1.3 and Variable limits respectively.

### 3.4.1.1 Driver Parameters



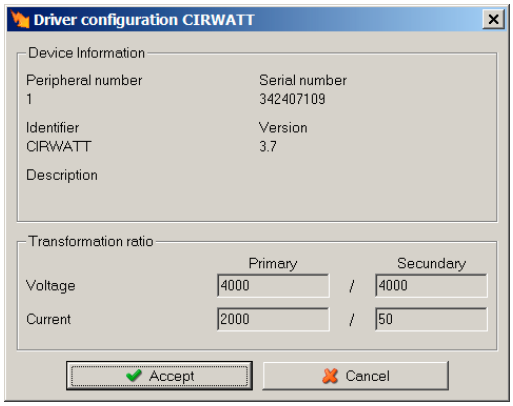



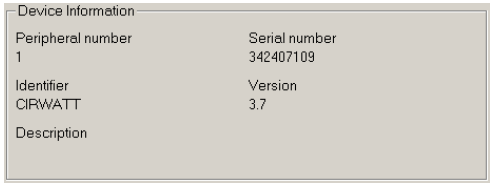

This allows us to select the contracts to be displayed on screen. We can use these selectors to select the contracts to be displayed on screen. In this case, the driver will display contracts 1 and 3, and will hide contract 2. These parameters will only affect the onscreen display of the contracts of the CIRWATT device, at no time affecting the internal configuration of the same.

The remaining parameters are detailed in section 3.1.1 Driver Parameters.

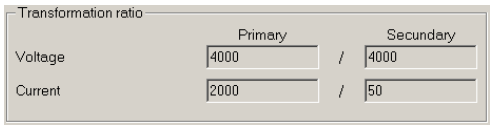
### 3.4.1.2 Device Parameters

This screen will allow us to display a series of information and internal parameters of the device.




Displays general information.

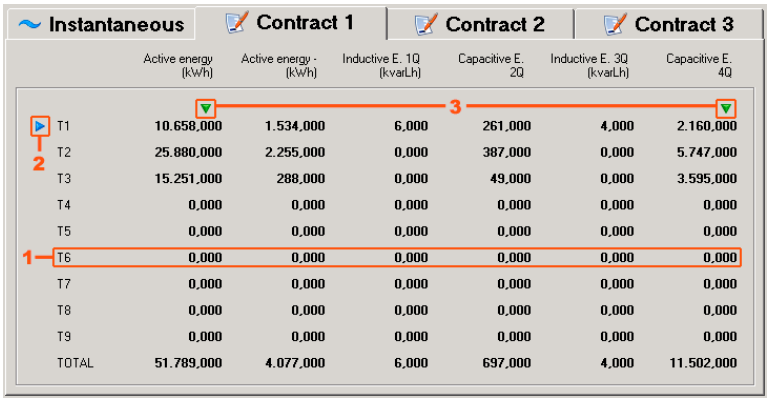



**Voltage transformation ratio**: Shows the relationship between the primary and secondary voltage program in the device.

**Current transformation ratio**: Shows the relationship between the primary and secondary current program in the device.

## 3.4.2 Displaying Contracts

The CIRWATT device will display the following screen when viewing a contract:




In which:

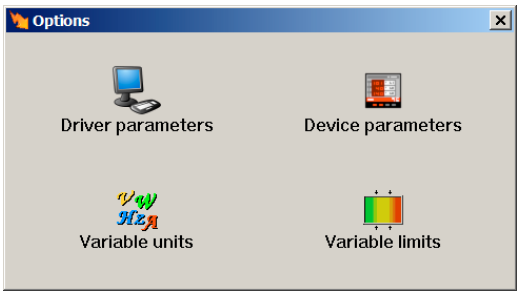
1. Corresponds to the information of a tariff of the contract.
2. Selects the active tariff of the contract.
3. Selects the active set.

We can display the desired contract by selecting the different tabs. As indicated in section 3.4.1.1 Driver Parameters it is possible to select the contracts to be displayed without the appearance of the tab corresponding to the hidden contracts. For example, if we only wish to display contracts 1 and 3, the tabs will be as follows:

# 3.5 CVM-144

## 3.5.1 Driver Options

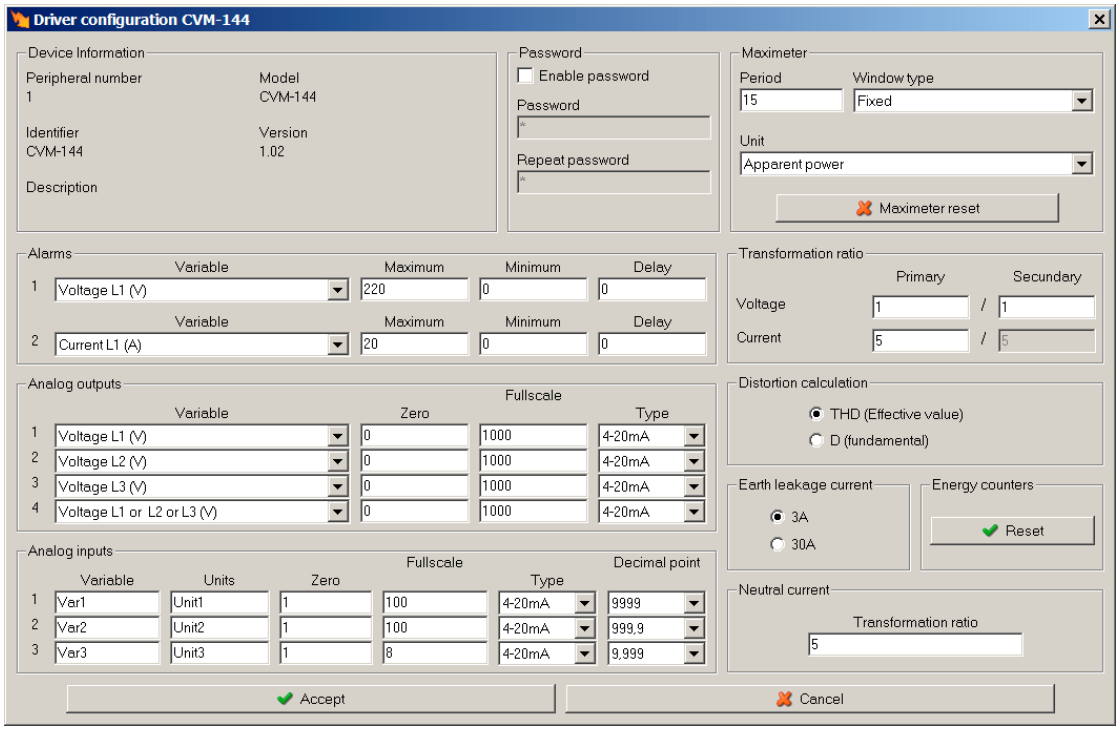
The options menu shall be as follows:



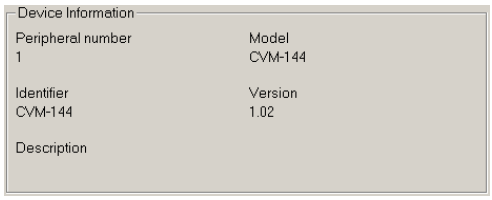

The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

### 3.5.1.1 Device Parameters

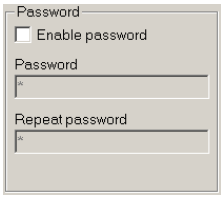
This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.



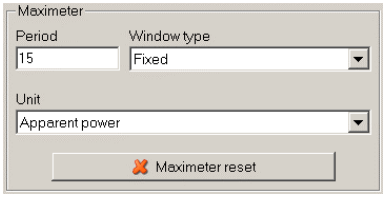

Depending on the device connected, some of the fields may be disabled.




Displays general information.




Allows us to enable or disable the password to block the configuration using the keyboard of the device.

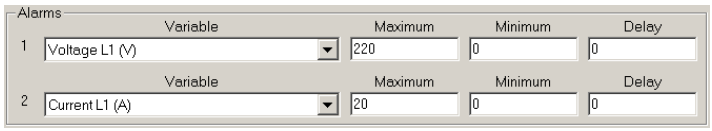



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

**Window type:** Type of window used to store the value of the maximeter, which may be fixed or sliding.

**Unit**: The maximum demand can be calculated with active power III, apparent power III, current III or phase current depending on the device.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.



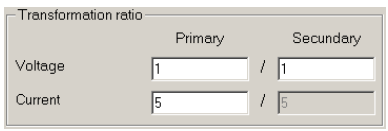

This section shows the configuration of the device relay outputs, and the option to configure them with the required values.

**Variable**: This field indicates the parameter associated to the relay. The output is programmed as an alarm, allowing control of any of the parameters measured by the CVM-144. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

**Minimum**: This box indicates the minimum value to control.

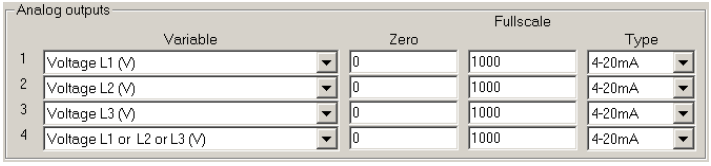
**Delay**: Alarm delay in seconds. The maximum value is 9999 seconds.



**Voltage transformation ratio**: Programming of the primary and secondary voltage. The product between the primary value and the current primary must be equal to or lower than 20,000,000 The primary value, depending on the fullscale, must be between 1 and the corresponding value of the following table:

| Fullscale | Maximum value |
|---|---|
| 110v | 99,999 |
| 275v | 70.000 |
| 300v | 70,000 |
| 500v | 40,000 |

**Current transformation ratio**: This is the current primary of the device. Can be between 1 and 10,000 A. The current secondary is 5A in the CVM-144.



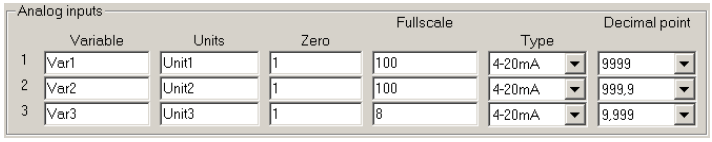

This section shows the configuration of the device analogue outputs, and the option to configure them with the required values.

**Variable:** Allows us to select any parameter which the CVM-144 measures, with the exception of the parameters corresponding to energy.

**Zero:** Parameter value to which the scale zero is assigned.

**Fullscale:** Parameter value to which the maximum scale value is assigned.

**Type:** Output type, allows us to choose output 0 – 20 mA, 4 – 20 mA or 0 – 10 V, depending on the device.




**Variable:** Indicates the name associated to the analogue input.

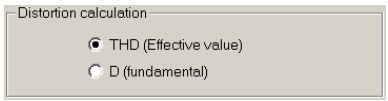
**Units:** Indicates the type of unit which the variable represents.

**Zero:** Parameter value to which the scale zero is assigned.

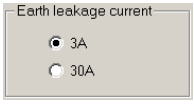
**Fullscale:** Parameter value to which the maximum scale value is assigned.

**Type:** Input type, allows us to choose input 0 – 20 mA, 4 – 20 mA or 0 – 10V, depending on the device.

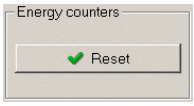
**Decimal point:** Position of the decimal point. Only if the device allows us to display the analogue inputs with real measurement values.



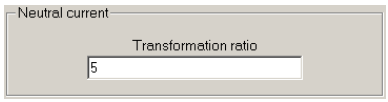

This selector can be used to configure the type of distortion which the device will calculate.




This selector can be used to configure the earth leakage current of the device. Only for those devices which can measure earth leakage current.




Clicking the button will reset the device energy counters.

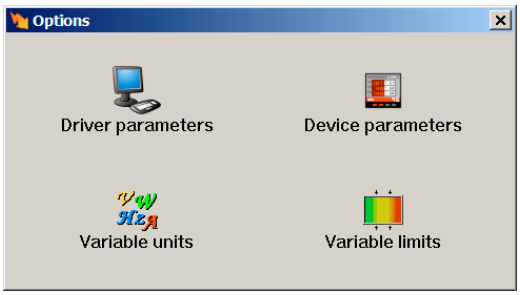



Configuration of the neutral current transformation ratio. Only for those devices which can measure neutral current currents.

# 3.6 CVM-96

## 3.6.1 Driver Options

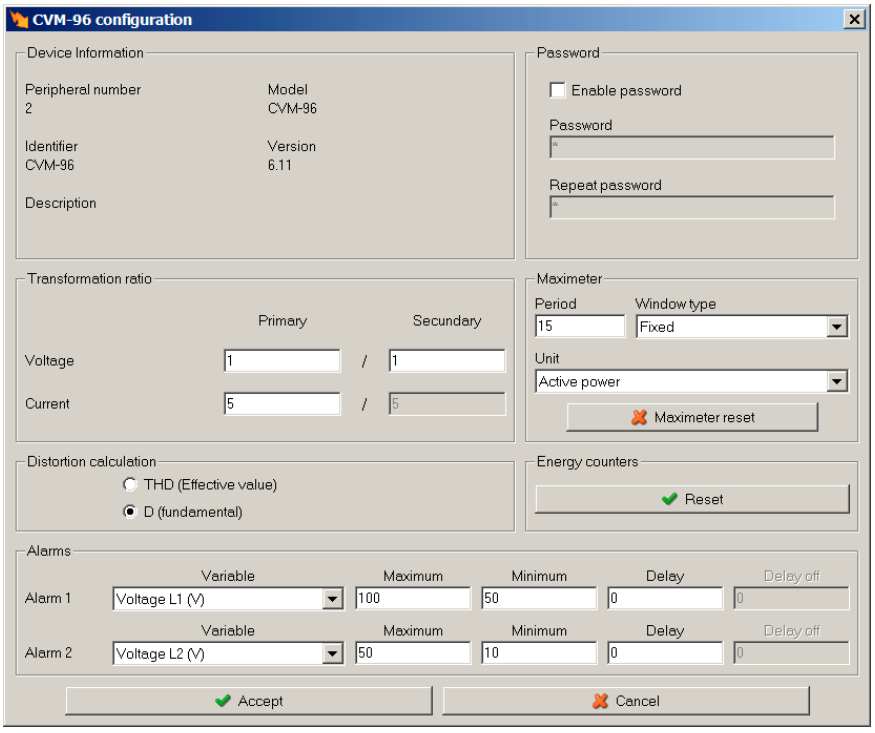
The options menu shall be as follows:

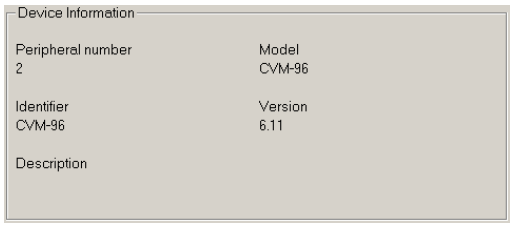



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

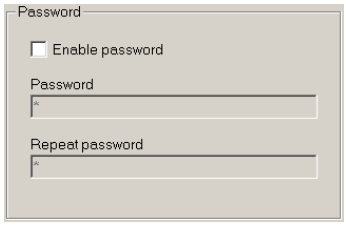
### 3.6.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on 'Accept' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

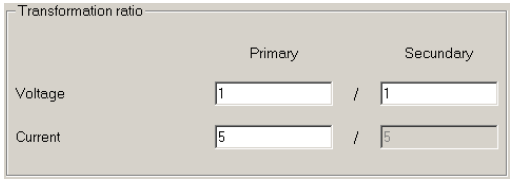





Displays general information.




Allows us to enable or disable the password to block the configuration using the keyboard of the device.

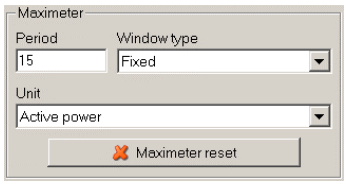



Depending on the version connected, the programming of the voltage transformation may be disabled.

**Voltage transformation ratio**: Programming of the primary and secondary voltage. The product between the primary value and the current primary must be equal to or lower than 20,000,000 The primary value, depending on the fullscale of the equipment, must be between 1 and the corresponding value of the following table:

| Fullscale | Maximum value |
|---|---|
| 110v | 99,999 |
| 275v | 70,000 |
| 300v | 70,000 |
| 500v | 40,000 |

**Current transformation ratio**: This is the current primary of the device. Can be between 1 and 10,000 A. The current secondary is 5A in the CVM-96.

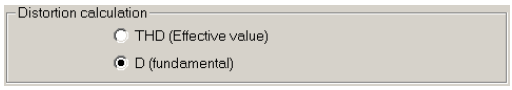



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

**Window type**: Type of window used to store the value of the maximeter, which may be set or sliding.

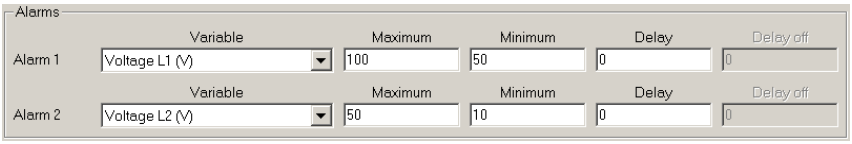
**Unit**: The maximum demand can be calculated with active power III, apparent power III, current III or phase current depending on the device.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.




This selector can be used to configure the type of distortion which the device will calculate.

Clicking the button will reset the device energy counters.




This section shows the configuration of the device relay outputs, and the option to configure them with the required values.

**Variable**: This field indicates the parameter associated to the relay. The output is programmed as an alarm, allowing control of any of the parameters measured by the CVM-96. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

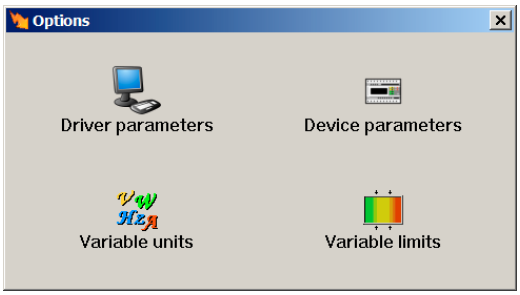
**Minimum**: This box indicates the minimum value to control.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds.

## 3.7 CVM-B/BD

### 3.7.1 Driver Options

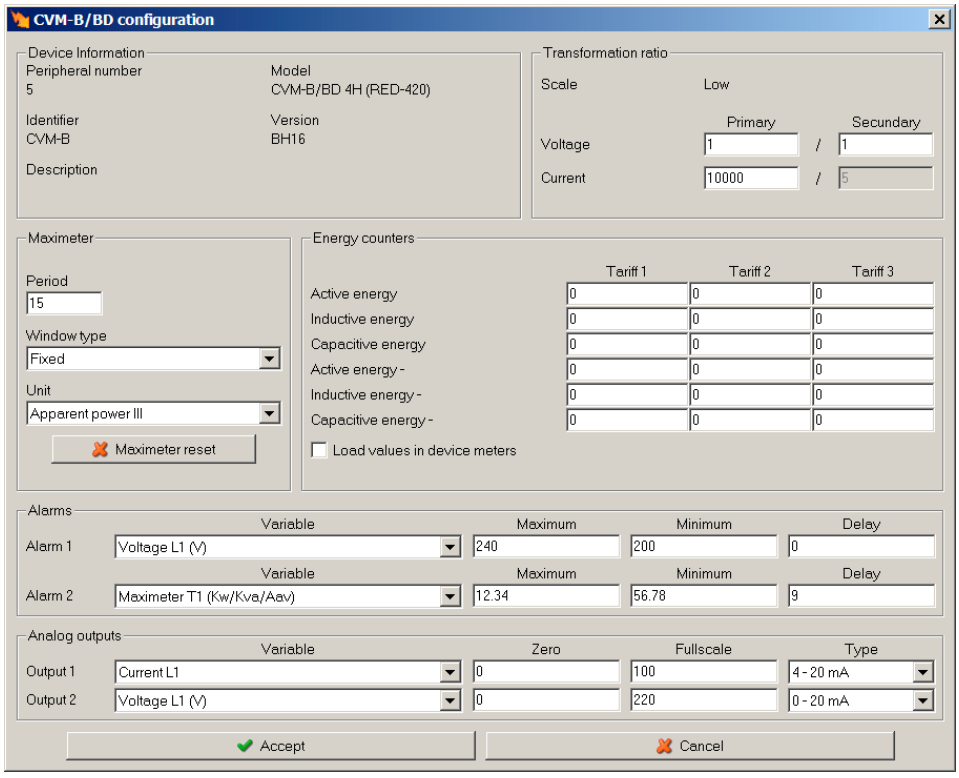
The options menu shall be as follows:

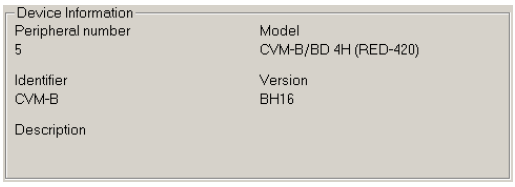



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

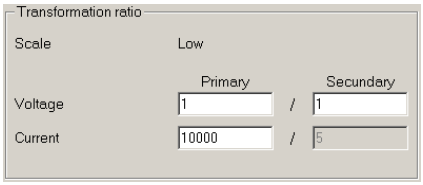
#### 3.7.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.



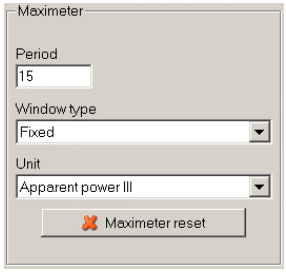



Displays general information.




**Voltage transformation ratio**: Programming of the primary and secondary voltage. The primary value of the voltage must be between 1 and 500000 V and the secondary between 1 and 999. Moreover, the primary divided by the secondary must be lower than 9090.

**Primary of the current transformer**: This is the current primary of the device. Can be between 1 and 10000 A. The current secondary is 5A in the CVM-K.

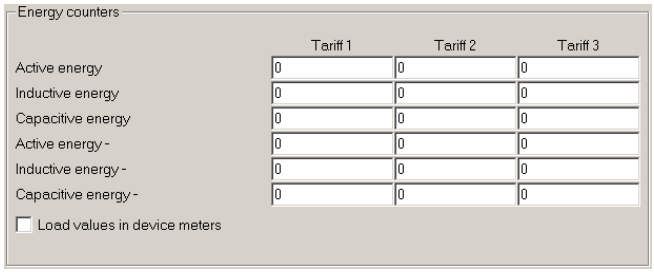



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

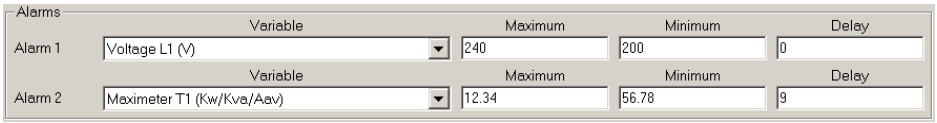
**Window type**: Type of window used to store the value of the maximeter, which may be set or sliding.

**Unit**: The maximum demand can be calculated with active power III, apparent power III or current III.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.




This part of the configuration corresponds to the energies of the device. Depending on the type of device, some or all of the fields may be disabled. If we check the selector , the energy counters will load the values introduced in the corresponding boxes when sending the configuration.




If the connected device has relay outputs, configuration is possible with the required values.

**Variable**: Parameter associated to the output relay. The output is programmed as an alarm, allowing control of any of the parameters measured by the CVM-B/BD. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

**Minimum**: This box indicates the minimum value to control.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds.

If the connected device has analogue outputs, configuration is possible with the required values.

**Variable**: Parameter associated to the analogue output. As analogue output we can select any output measured by the CVM-B/BD.

**Zero**: Parameter value to which the scale zero is assigned.

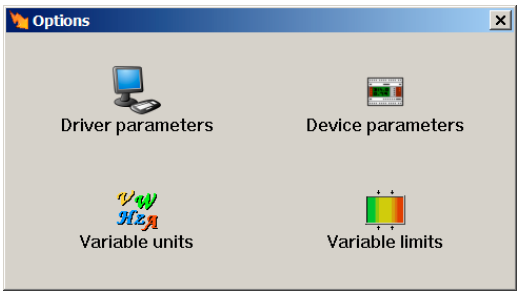
**Fullscale:** Parameter value to which the maximum scale value is assigned.

**Type**: Input type, allows us to choose between 0-20 mA and 4-20 mA.

# 3.8 CVM-BC

## 3.8.1 Driver Options

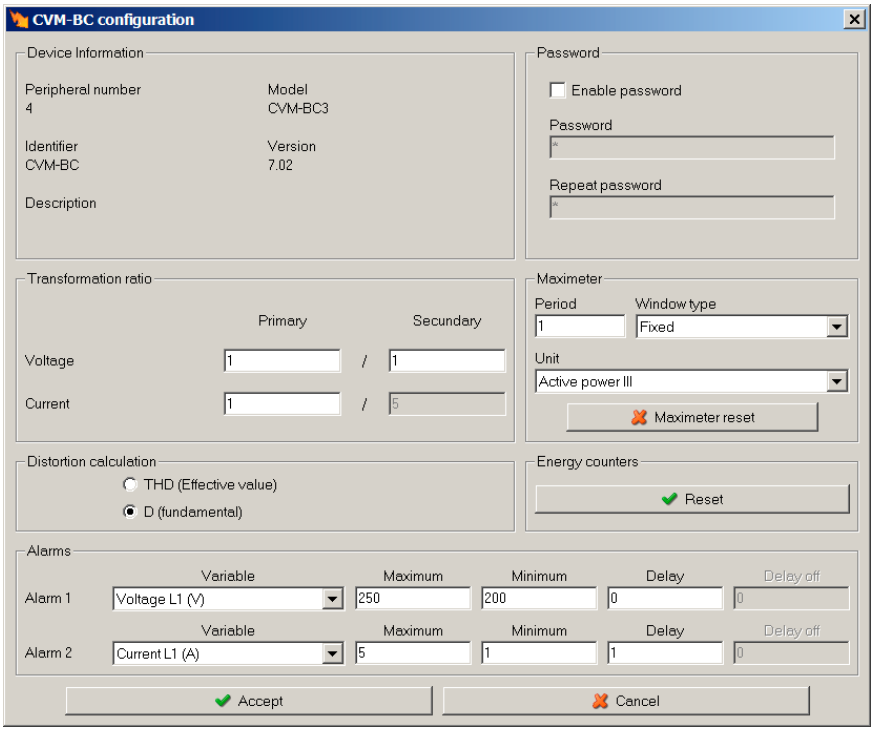
The options menu shall be as follows:

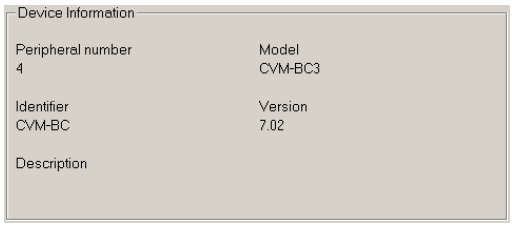



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

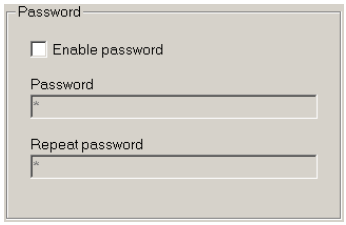
### 3.8.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

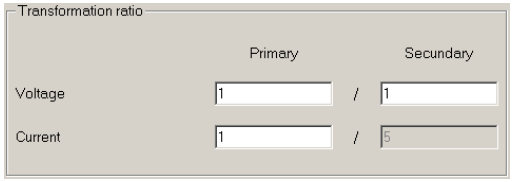





Displays general information.




Allows us to enable or disable the password to block the configuration using the keyboard of the device.

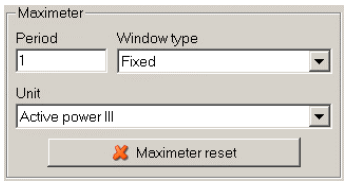



Depending on the version connected, the programming of the voltage transformation may be disabled.

**Voltage transformation ratio**: Programming of the primary and secondary voltage. The product between the primary value and the current primary must be equal to or lower than 20,000,000 The primary value, depending on the fullscale, must be between 1 and the corresponding value of the following table:

| Fullscale | Maximum value |
|---|---|
| 110v | 99,999 |
| 275v | 70,000 |
| 300v | 70,000 |
| 500v | 40,000 |

**Current transformation ratio**: This is the current primary of the device. Can be between 1 and 10,000 A. The current secondary is 5A in the CVM-BC.

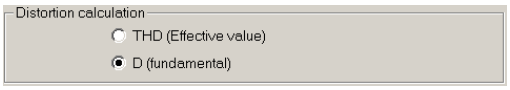



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

**Window type**: Type of window used to store the value of the maximeter, which may be set or sliding.

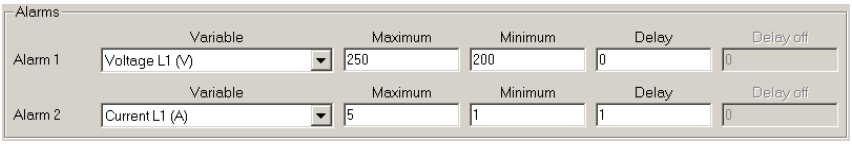
**Unit**: The maximum demand can be calculated with active power III, apparent power III, current III or phase current depending on the device.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.




This selector can be used to configure the type of distortion which the device will calculate.

Clicking the button will reset the device energy counters.




This section shows the configuration of the device relay outputs, and the option to configure them with the required values.

**Variable**: This field indicates the parameter associated to the relay. The output is programmed as an alarm, allowing control of any of the parameters measured by the CVM-BC. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

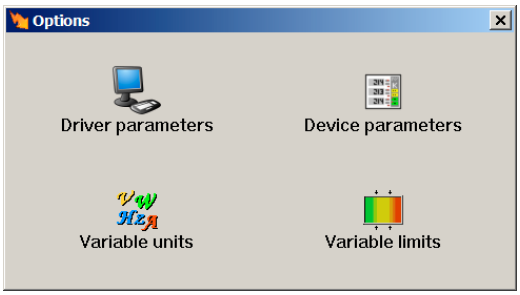
**Minimum**: This box indicates the minimum value to control.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds.

# 3.9 CVM-K

## 3.9.1 Driver Options

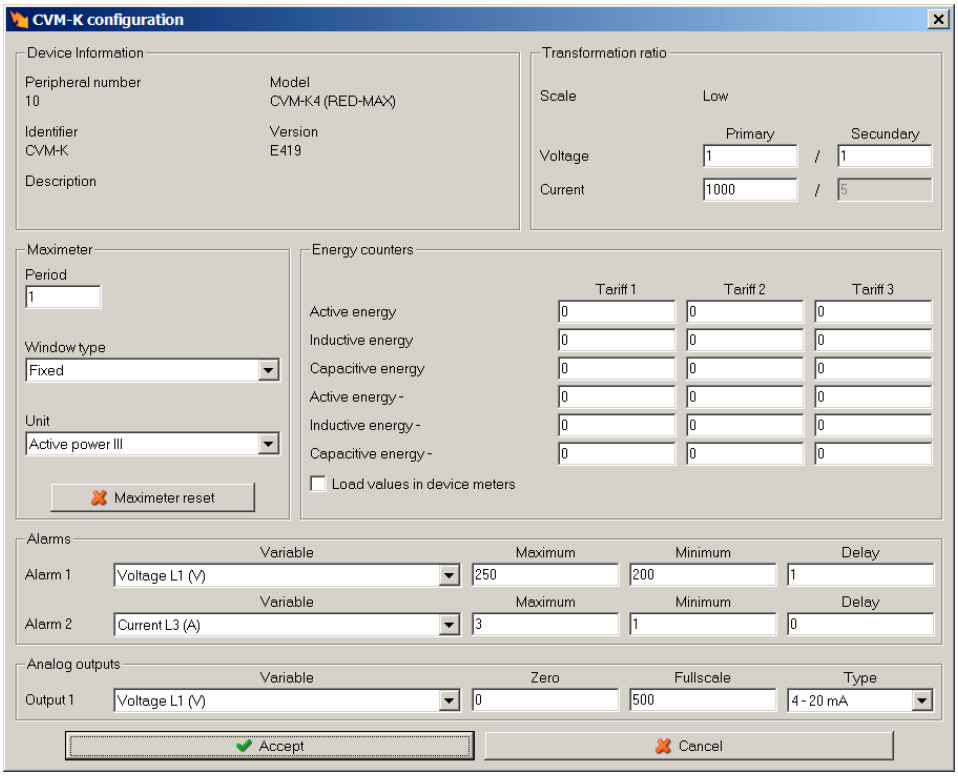
The options menu shall be as follows:

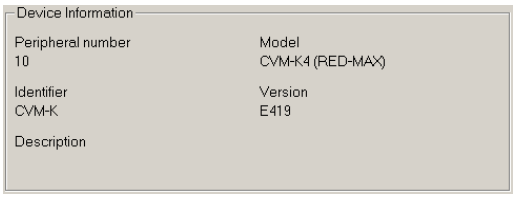



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

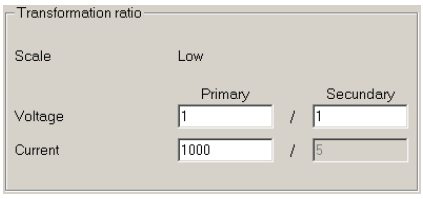
### 3.9.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.



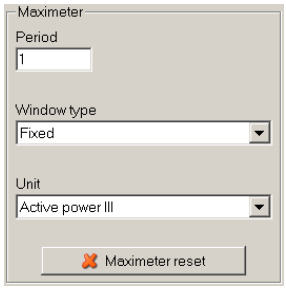



Displays general information.




**Voltage transformation ratio**: Programming of the primary and secondary voltage. The primary value of the voltage must be between 1 and 500000 V and the secondary between 1 and 999 V. Moreover, the primary divided by the secondary must be lower than 9090.

**Primary of the current transformer**: This is the current primary of the device. Can be between 1 and 10,000 A. The current secondary is 5A in the CVM-K.

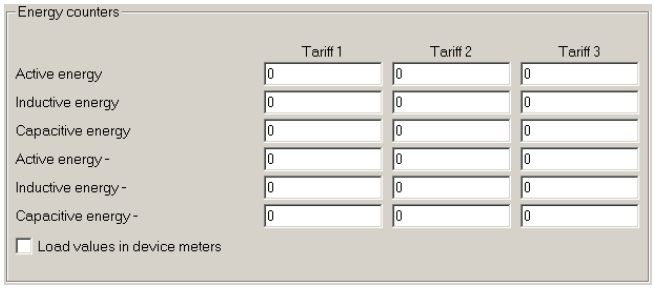



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

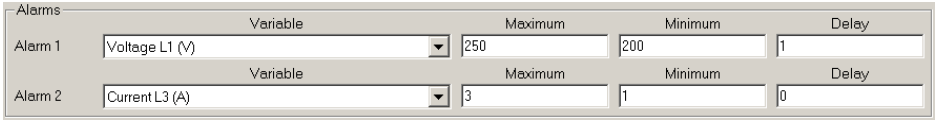
**Window type**: Type of window used to store the value of the maximeter, which may be set or sliding.

**Unit**: The maximum demand can be calculated with active power III, apparent power III or current III.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.




This part of the configuration corresponds to the energies of the device. Depending on the type of device, some or all of the fields may be disabled. If we check the selector, the energy counters will load the values introduced in the corresponding boxes when sending the configuration.



If the connected device has relay outputs, configuration is possible with the required values.

**Variable**: Parameter associated to the output relay. The output is programmed as an alarm, allowing control of any of the parameters measured by the CVM-K. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

**Minimum**: This box indicates the minimum value to control.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds.

If the connected device has an analogue output, configuration is possible with the required values.

**Variable**: Parameter associated to the analogue output. As analogue output we can select any output measured by the CVM-K.

**Zero**: Parameter value to which the scale zero is assigned.

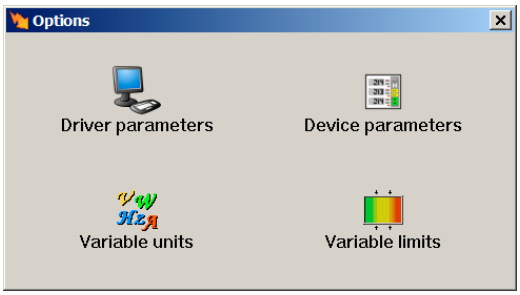
**Fullscale:** Parameter value to which the maximum scale value is assigned.

**Type**: Input type, allows us to choose between 0-20 mA and 4-20 mA.

# 3.10 CVM-K HAR

## 3.10.1 Driver Options

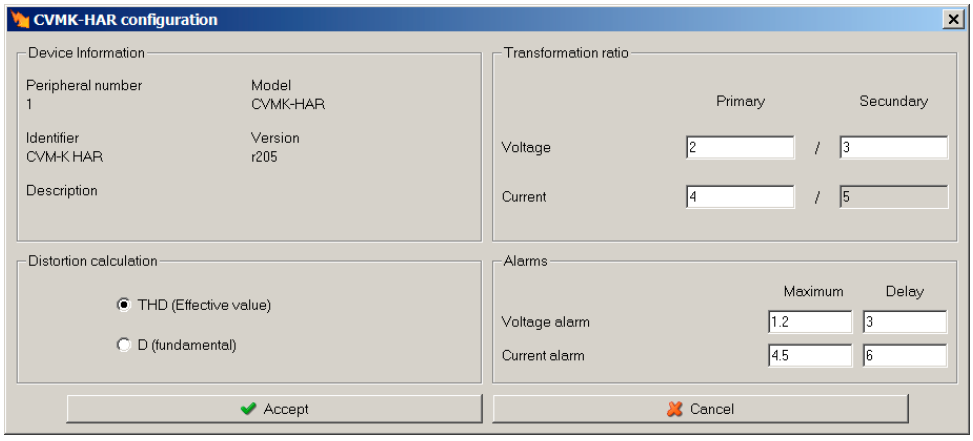
The options menu shall be as follows:

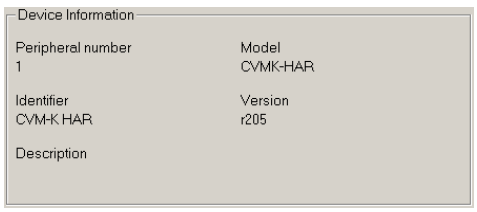



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

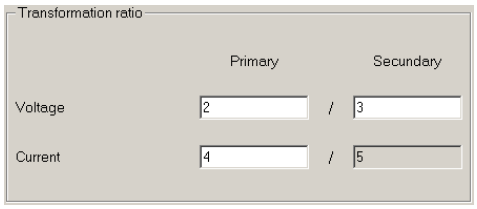
### 3.10.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.



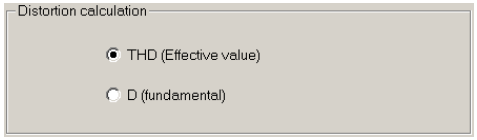




Displays general information.

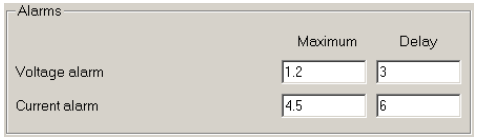



**Voltage transformation ratio**: Programming of the primary and secondary voltage. The primary value of the voltage must be between 1 and 999999 V and the secondary between 1 and 999 V. The product between the primary value and the current primary must be equal to or lower than 20,000,000

**Primary of the current transformer**: This is the current primary of the device. Can be between 1 and 10000 A. The current secondary is 5A in the CVM-K HAR.




This selector can be used to configure the type of distortion which the device will calculate.




If we have an additional module with two relay outputs, we can configure as alarm mode with the THD or D variables in voltage and in current.

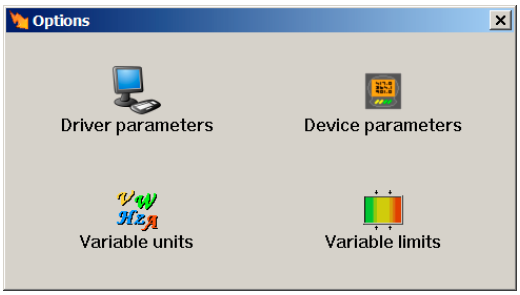
Maximum value. When the value read by the CVM-K HAR device exceeds the programmed value, the device will close the contact corresponding to the programmed alarm. The maximum value programmed will be a % of the THD or D.

Delay, both to the connection and the disconnection of the alarm relay. This value will be expressed in seconds.

# 3.11 CVM MINI and CVM NRG-96

## 3.11.1 Driver Options

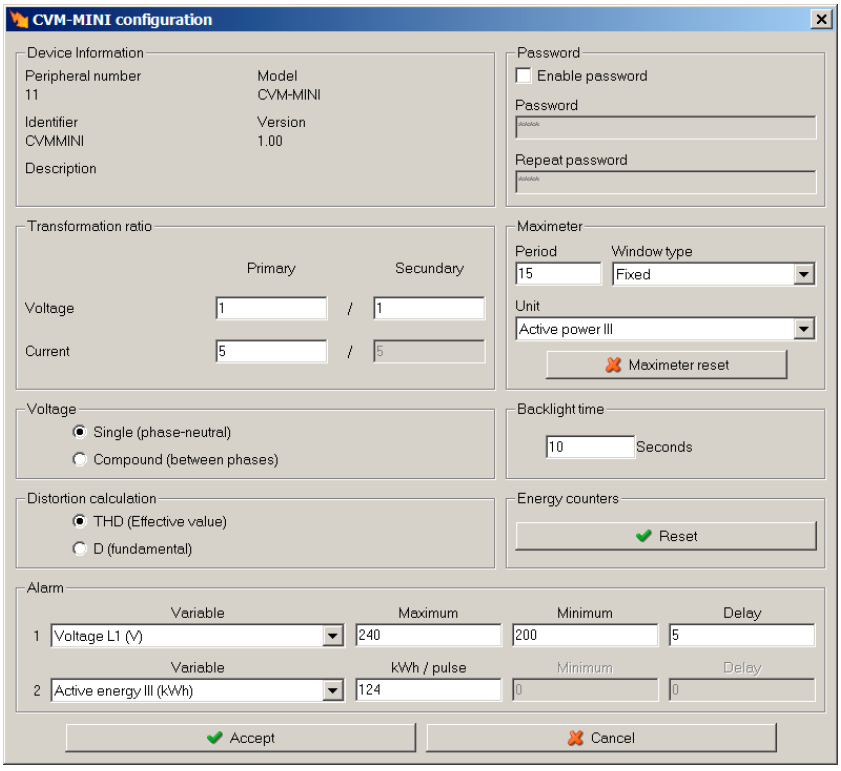
The options menu shall be as follows:

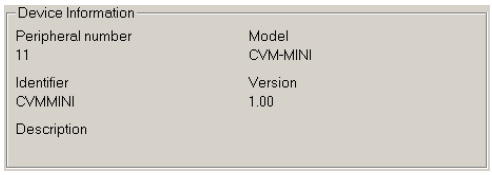



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limitsrespectively.

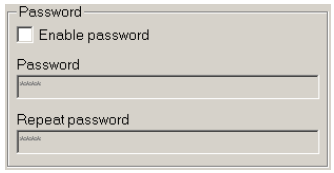
### 3.11.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

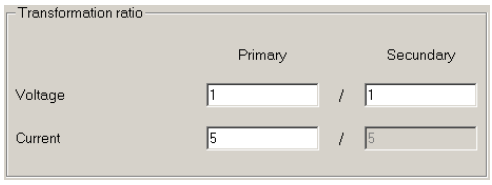





Displays general information.




Allows us to enable or disable the password to block the configuration using the keyboard of the device.

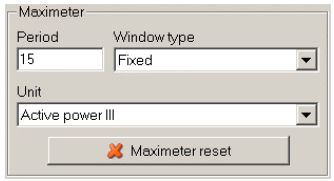



Depending on the version connected, the programming of the voltage transformation may be disabled.

**Voltage transformation ratio**: Programming of the primary and secondary voltage. The product between the primary value and the current primary must be equal to or lower than 20,000,000 The primary value, depending on the fullscale of the equipment, must be between 1 and the corresponding value of the following table:

| Fullscale | Maximum value |
|---|---|
| 110V | 99,999 |
| 250V | 70,000 |
| 275V | 70,000 |
| 300V | 70,000 |
| 500V | 40,000 |

**Current transformation ratio**: This is the current primary of the device. Can be between 1 and 10,000 A. The current secondary is 5A in the CVM-96.

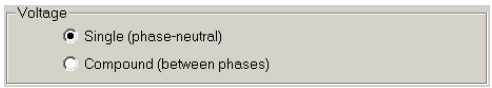



**Period**: This is the maximeter integration period, which may vary between 1 and 60 minutes.

**Window type**: Type of window used to store the value of the maximeter, which may be set or sliding.

**Unit**: The maximum demand can be calculated with active power III, apparent power III, current III or phase current depending on the device.

**Maximeter reset**: Clicking on this button will reset the device's maximeter.

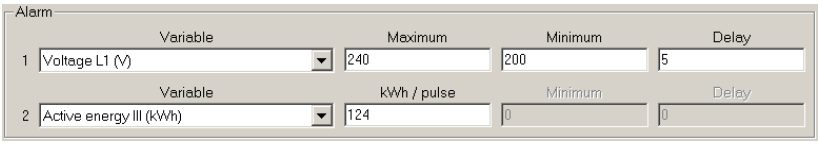


Selection of the type of voltage calculated.

Configuration of the type of backlight disconnection. The value should oscillate between 0 and 99 seconds.

This selector can be used to configure the type of distortion which the device will calculate.

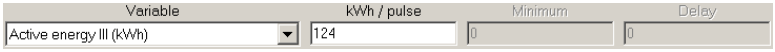
Clicking the button will reset the device energy counters.




This section shows the configuration of the device relay output, and the option to configure it with the required values. For devices CVM NRG-96 we can configure only one relay outputs.

**Variable**: This field indicates the parameter associated to the relay. The output is programmed as an alarm or energy pulse, allowing control of any of the parameters measured by the device. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control. Should an energy variable be selected, the value of each pulse will be indicated. It will be displayed in the following manner



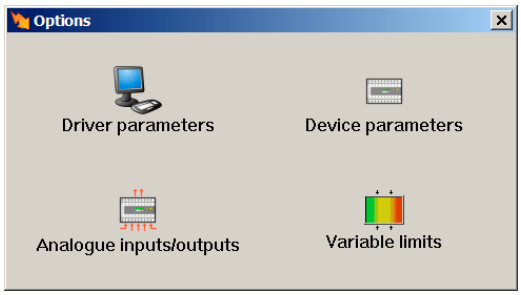

**Minimum**: This box indicates the minimum value to control. If we select an energy variable, this field will remain disabled.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds. This field will remain disabled if an energy variable is selected.

# 3.12 CVM-R8

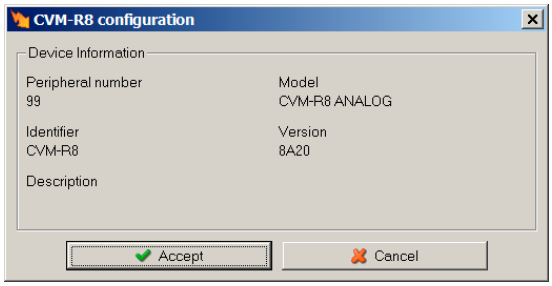
## 3.12.1 Driver Options

The options menu shall be as follows:



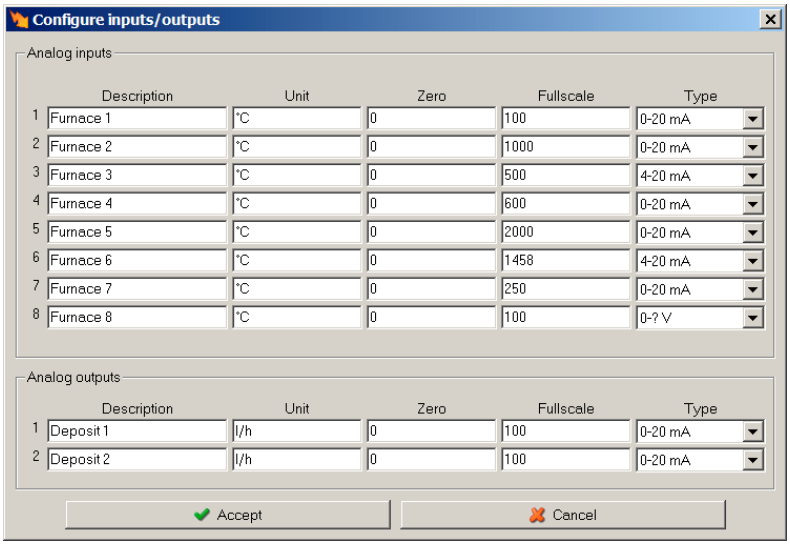

### 3.12.1.1 Device Parameters

For CVM-R8 it will not be possible to configure any parameter of the device, displaying only information about the same.




### 3.12.1.2 Analogue Inputs and Outputs

From this dialogue we can configure the analogue inputs in the CVM-R8 devices which have analogue inputs and/or outputs.



**Description:** Alphanumeric data which allows us to enter a brief description for easy identification.

**Unit:** Alphanumeric data which allows us to enter a brief description of the units.

**Zero**: Parameter value to which the scale zero is assigned.

**Fullscale**: Parameter value to which the maximum scale value is assigned.

**Type**: Input type, allows us to choose between 0-20 mA, 4-20 mA and 0-? V.

#### 3.12.1.3 Limits of the Variables

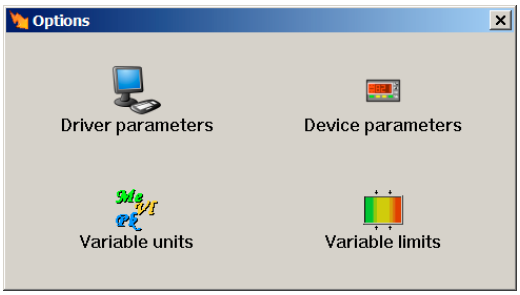
Only for CVM-R8 devices with analogue inputs.

This option is detailed in section 3.1.3 Variable limits.

# 3.13 DH-96

## 3.13.1 Driver Options

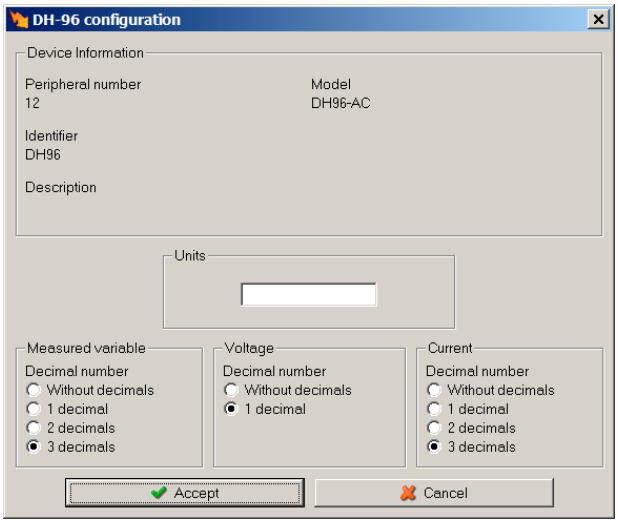
The options menu shall be as follows:

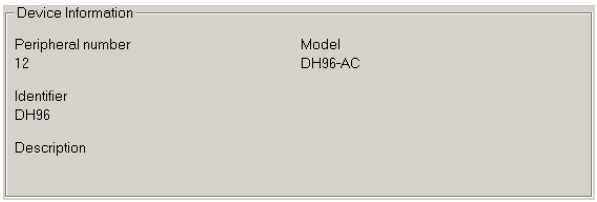



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

### 3.13.1.1 Device Parameters

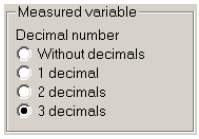
In DH-96 devices it is not possible to modify the internal parameters, it being possible only to modify them manually using the device keyboard. In order to obtain more information on how to modify the parameters, see the manual which is supplied with the device.



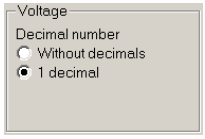




Displays general information.

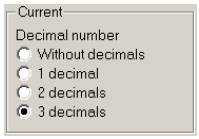
Alphanumeric data which allows us to enter a brief description of the measurement units of the DH-96. These units will be shown in the data display, in no case being sent to the device.



Only for DH-96 AC,  DH-96 CT, DH-96 DC, DH-96 WG units. The number of decimals with which to display the variables measured in the equipment is configured. This parameter will only be used as information of the equipment, at no point will it be sent or read from the equipment.



Only for DH-96 CPM units. The number of decimals with which to display the voltage in the equipment is configured. This parameter will only be used as information of the equipment, at no point will it be sent or read from the equipment.



Only for DH-96 CPM units. The number of decimals with which to display the current in the equipment is configured. This parameter will only be used as information of the equipment, at no point will it be sent or read from the equipment.

## 3.14 LM-24 M

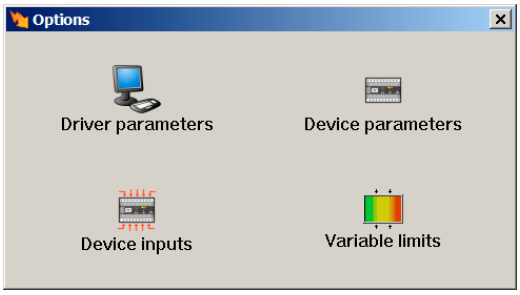
**This software will only communicate with LM-24 M devices.**

### 3.14.1 Driver Options

We can access the options of the LM-24 M from

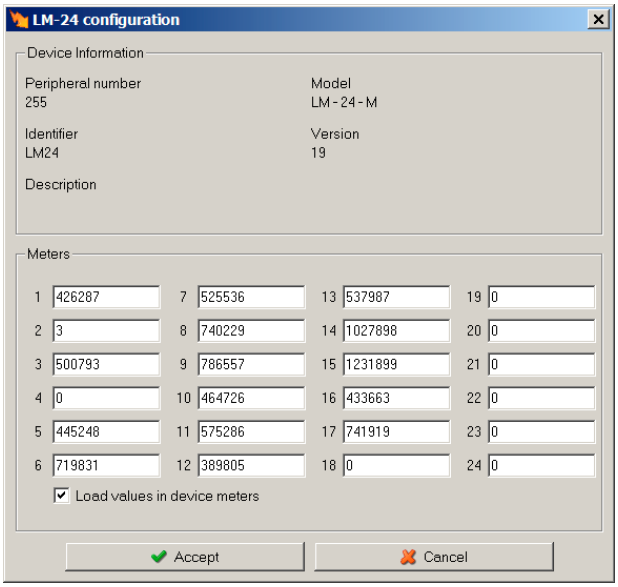
- *Options button of the device status screen*. See section 2.4.9 Device status
- *View Menu*. See section 2.4.10 Display Options.
- *Toolbar*. See section 2.4.11 Toolbar

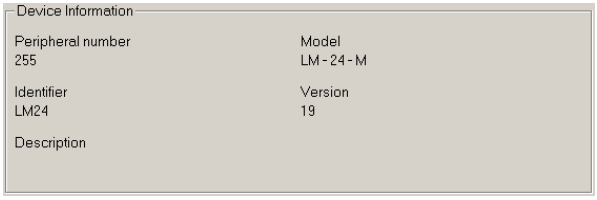
The options menu shall be as follows:



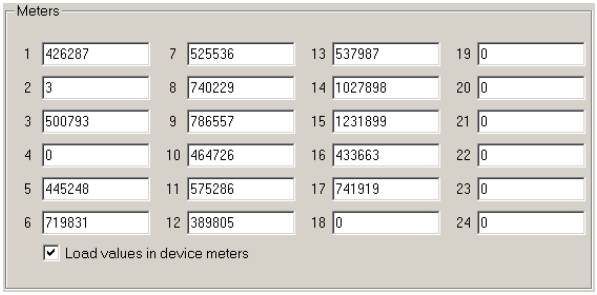

#### 3.14.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.





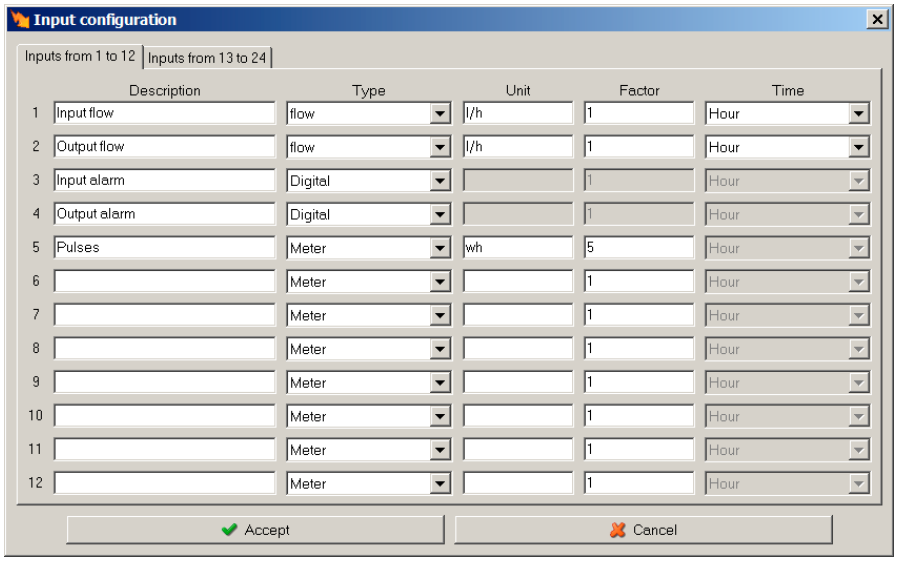

Displays general information.




This part of the configuration corresponds to the energies of the device. If, when sending the configuration, we check the selector , the counters will load the values entered in the corresponding boxes.

### 3.14.1.2 Inputs

From this dialogue we can configure how to deal with the inputs of the LM-24 M.




**Description:** Alphanumeric data which allows us to enter a brief description of the input for easy identification.

**Type:** Type which will define how the input will be treated. The types may be flow, counter or digital:

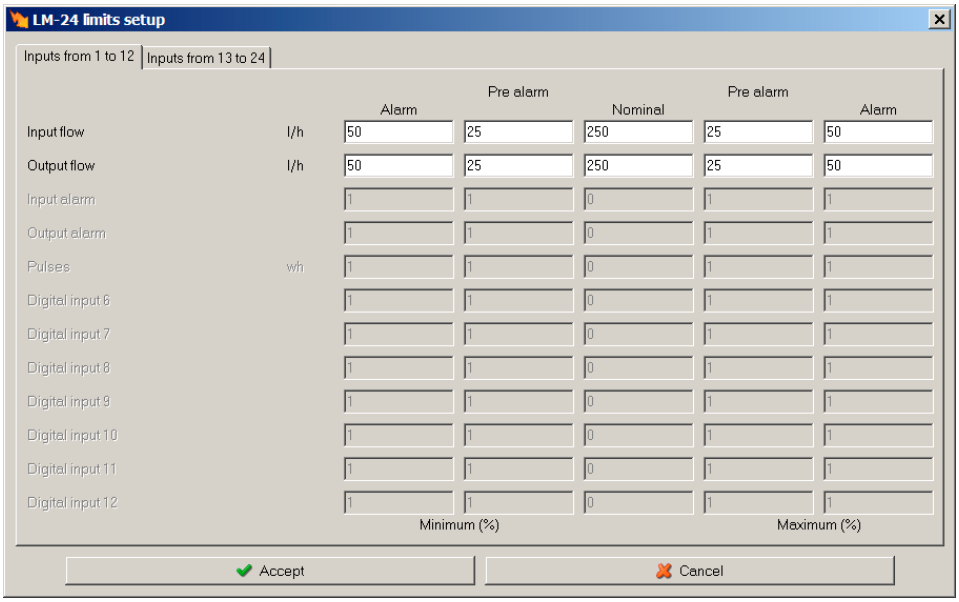
- **Flow:** The inputs will be treated as flow.
- **Meter:** The values displayed shall be the value of the LM-24 M counter.
- **Digital:** We will see the status of the input of the LM-24 M, open or closed.

**Unit:** Alphanumeric data which allows us to enter a brief description of the analogue input units.

**Factor**: Only when the type is flow or counter. Value which must be considered to generate a pulse.

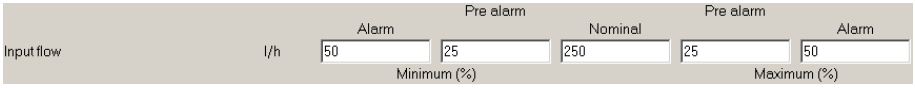
**Time**: Only when the type is flow. Parameter to make the calculations of the flow value. The possible values are hour and minute.

### 3.14.1.3 Limits of the Variables




The limits can only be defined for flow type counters.

This dialogue can be used to configure the nominal values of the flow counters, along with a series of margins to show onscreen when a variable measures unusual values.




The name ‘Input flow’ corresponds to the input description introduced in the input dialogue, see section 3.14.1.2 Inputs.

The option *‘Variable limits’* is detailed in section 3.1.3 Variable limits.

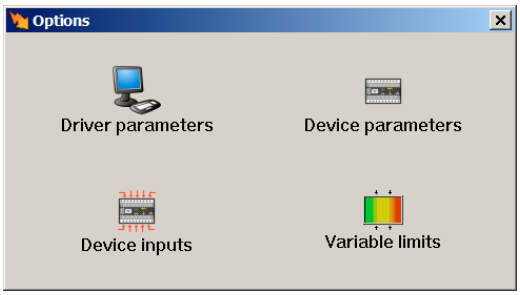
# 3.15 LM50-TCP

## 3.15.1 Driver Options

We can access the options of the LM50-TCP from:

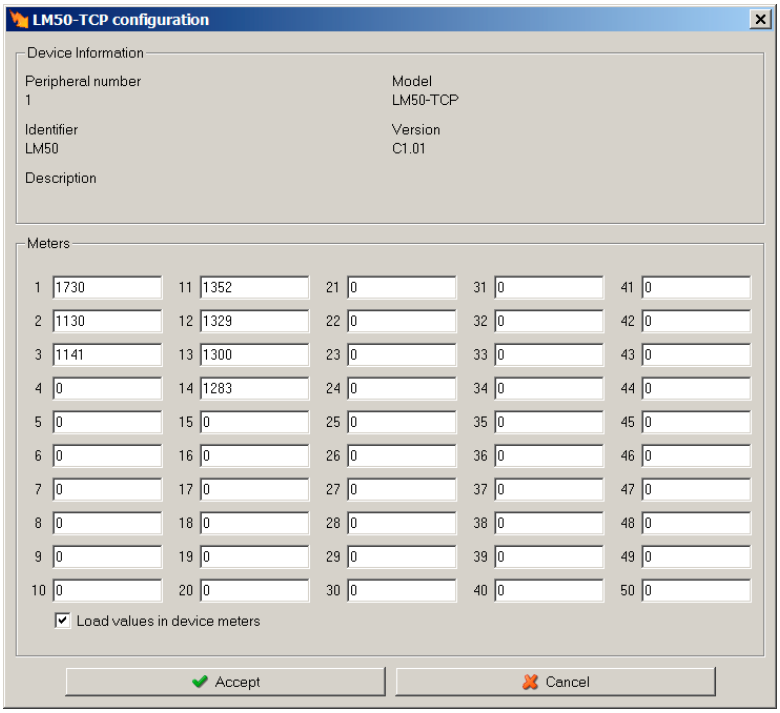
- *Options button of the device status screen*. See section 2.4.9 Device status
- *View Menu*. See section 2.4.10 Display Options.
- *Toolbar*. See section 2.4.11 Toolbar

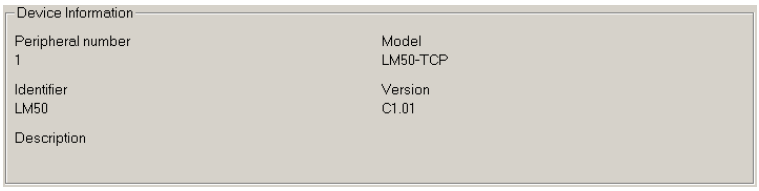
The options menu shall be as follows:



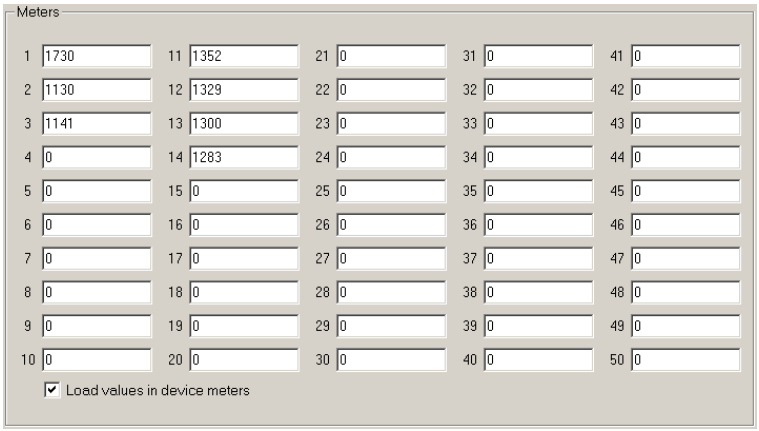

### 3.15.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on '*Accept*' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.





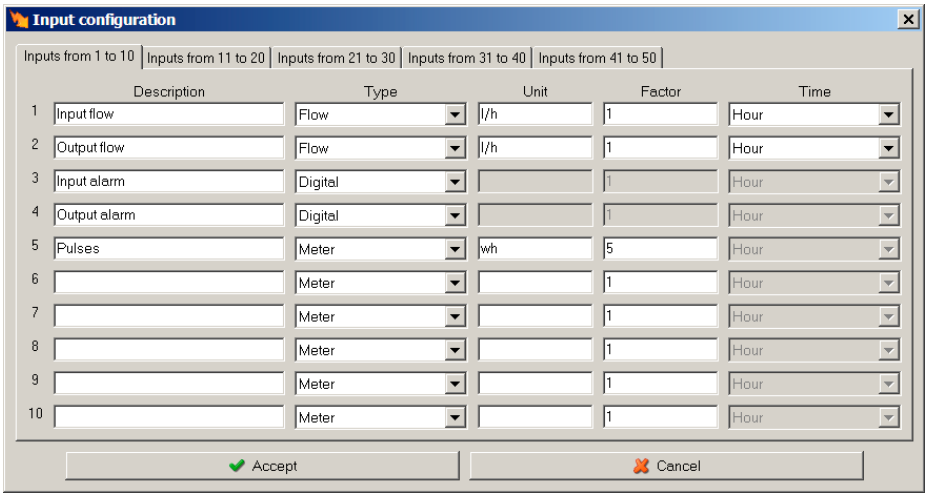

Displays general information.




This part of the configuration corresponds to the energies of the device. If we check the selector, the energy counters, which have been modified, will load the values introduced in the corresponding boxes when sending the configuration.

### 3.15.1.2 Inputs

From this dialogue we can configure how to deal with the inputs of the LM50-TCP.




**Description:** Alphanumeric data which allows us to enter a brief description of the input for easy identification.

**Type:** Type which will define how the input will be treated. The types may be flow, counter or digital:

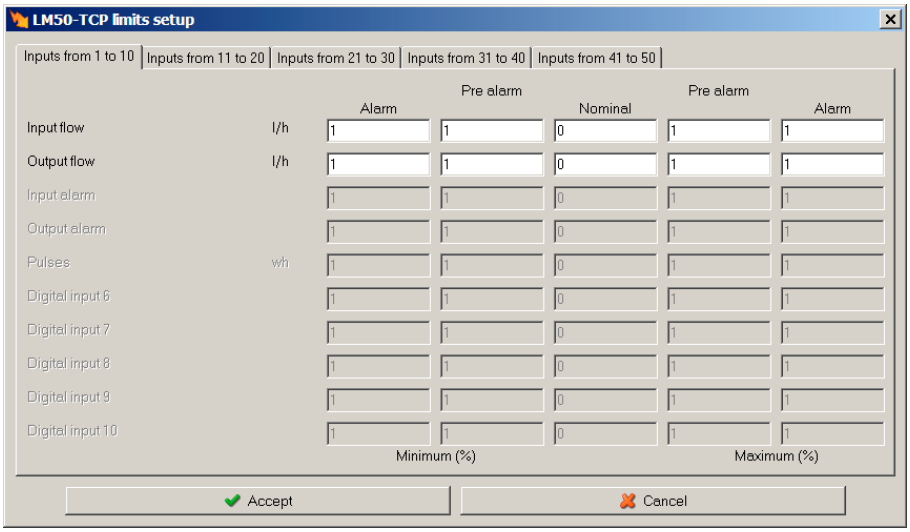
- **Flow:** The inputs will be treated as flow.
- **Meter:** The values displayed shall be the value of the LM50-TCP counter.
- **Digital:** We will see the status of the input of the LM50-TCP, open or closed.

**Unit:** Alphanumeric data which allows us to enter a brief description of the analogue input units.

**Factor**: Only when the type is flow or counter. Value which must be considered to generate a pulse.

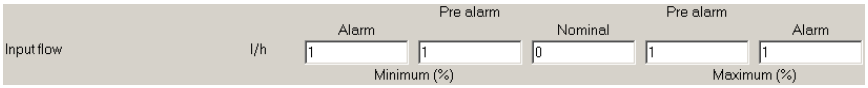
**Time**: Only when the type is flow. Parameter to make the calculations of the flow value. The possible values are hour and minute.

### 3.15.1.3 Limits of the Variables




The limits can only be defined for flow type counters.

This dialogue can be used to configure the nominal values of the flow counters, along with a series of margins to show onscreen when a variable measures unusual values.



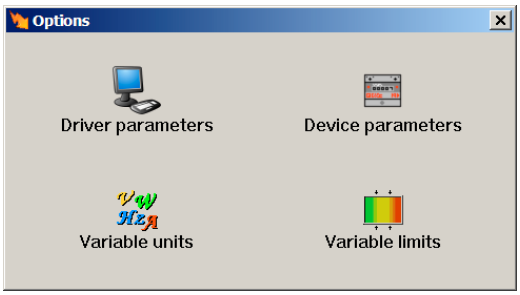

The name ‘Input flow’ corresponds to the input description introduced in the input dialogue, see section 3.15.1.2 Inputs.

The option *‘Variable limits’* is detailed in section 3.1.3 Variable limits.

# 3.16 MK-D

## 3.16.1 Driver Options

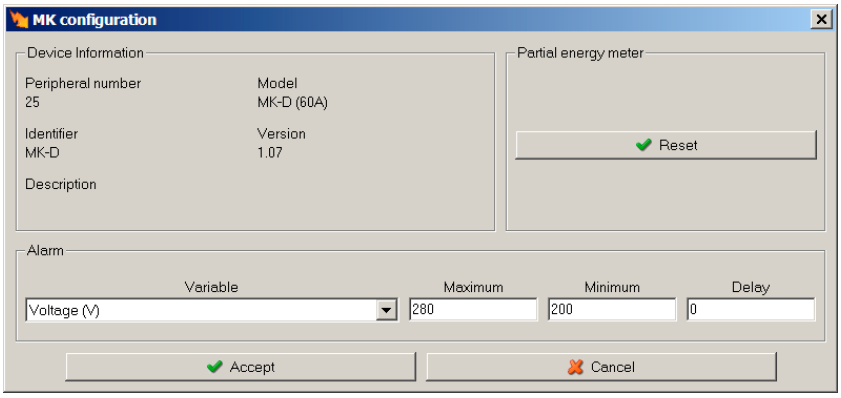
The options menu shall be as follows:

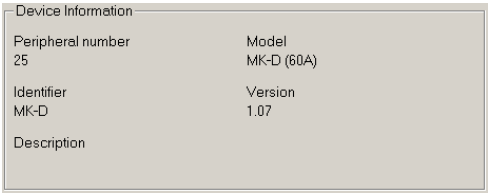



The options *'Variable units'* and *'Variable limits'* are detailed in sections 3.1.2 Variable units and 3.1.3 Variable limits respectively.

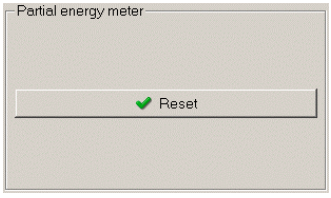
### 3.16.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on 'Accept' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.




Displays general information.



Clicking the button will reset the partial energy counter.

This section shows the configuration of the device relay output, and the option to configure it with the required values.

**Variable**: This field indicates the parameter associated to the relay. The output is programed as an alarm, allowing control of any of the parameters measured by the device. The units in which the maximum and minimum values of the alarm are expressed are in brackets.

**Maximum**: This box indicates the maximum value to control.

**Minimum**: This box indicates the minimum value to control.

**Delay**: Delay of the alarm in seconds. The maximum value is 9999 seconds.

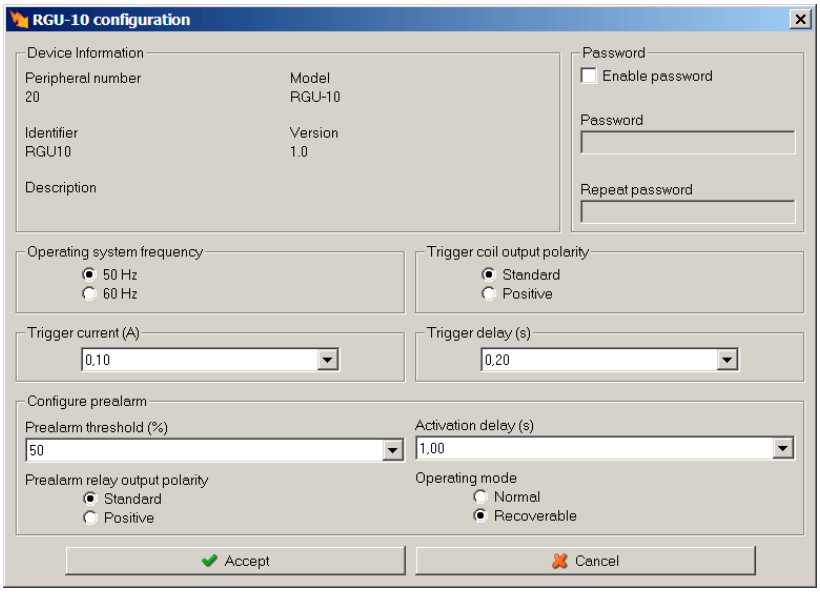
# 3.17 RGU-10

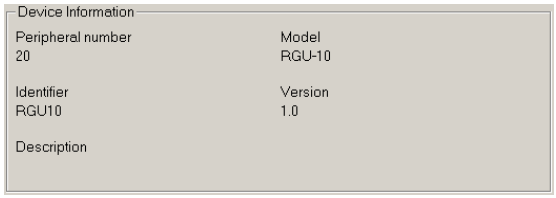
## 3.17.1 Driver Options

The options menu shall be as follows:

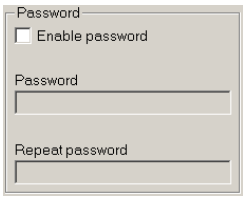
### 3.17.1.1 Device Parameters

This screen will allow us to configure the internal parameters of the device. When the dialogue opens, the software will read the settings for the device. When complete, click on 'Accept' for the software to send information on changes to the device. In no case will this information be stored on the hard drive of the PC.

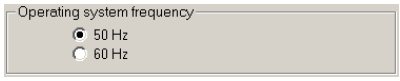


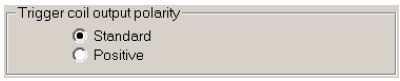

Displays general information.




This selector allows us to enable or disable the configuration password for the parameters of the device. When this password is enabled, the operator will be asked for the key in order to access this screen or the screen which will allow the modification of the parameters in the values display window (see modify button in 3.17.2 Displaying Values).




Work Network Frequency Configuration.



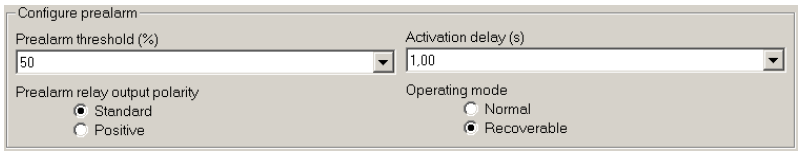

Configuration of the polarity of the trigger coil relay output, allowing the selection of one of the two possible options (standard or positive).

Channel trigger threshold configuration. It will be possible to select one of next values:

| | | |
|---|---|---|
| 0,03 A | 0,10 A | 0,30 A |
| 0,50 A | 1,00 A | 3,00 A |
| 5,00 A | 10,00 A | 30,00 A |

It allows to select the delay time in the shot between one of next values:

| | | |
|---|---|---|
| Instantaneous | Selective | 0,02 s |
| 0,10 s | 0,20 s | 0,30 s |
| 0,40 s | 0,50 s | 0,75 s |
| 1,00 s | 3,00 s | 5,00 s |
| 10,00 s | | |




It will be possible to configure the pre-alarm parameters:

- *Prealarm threshold*. Here we can define a % of the nominal current for the enabling of the prealarm, this value will vary between 50% and 90%.
- *Activation delay*. Allows the configuration of the delay time in the enabling of the pre-alarm. It allows to select the delay time in the prealarm activation between one of next values

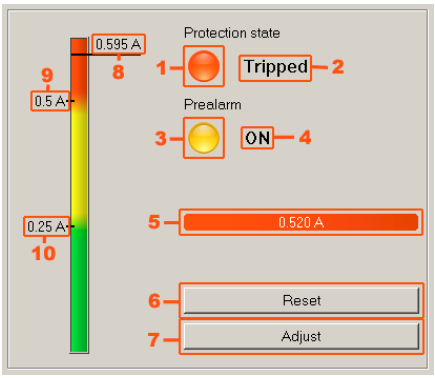
| | | |
|---|---|---|
| 0,02 s | 0,10 s | 0,20 s |
| 0,30 s | 0,40 s | 0,50 s |

| | | |
|---|---|---|
| 0,75 s | 1,00 s | 3,00 s |
| 5,00 s | 10,00 s | |

- *Prealarm relay output polarity* .
- *Operation mode*

## 3.17.2 Displaying Values

The RGU-10 device will display the following values screen:




In which:

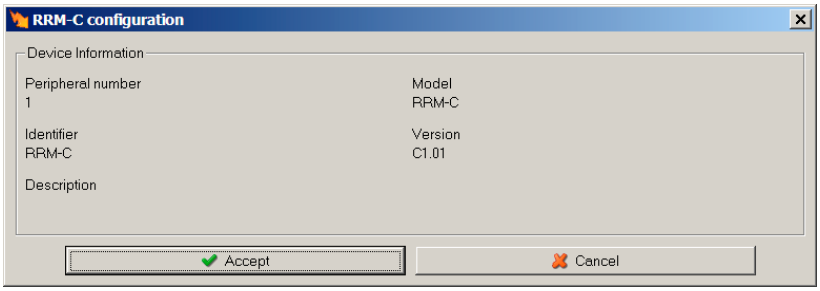
1. Status of the protection
   - Not triggered.
   - Triggered.
2. Additional information on the status of the protection.
3. Status of Pre-Alarm
   - Not enabled
   - Pre-alarm enabled
4. Additional information on the status of the pre-alarm.
5. Stray Current Value Detected in the Channel Trigger. This information is only visible when the channel is triggered.
6. Reset Button. If the channel has not triggered, the button will remain disabled. Clicking the button will reset the channel.
7. Adjustment Button. Shows information on the channel and allows some parameters to be modified.
8. Instantaneous Stray Current Value. If the value exceeds the upper or lower limits of the values bar, this will be indicated with an arrow underneath the value).
9. Trigger threshold value configured for the channel.
10. Pre-alarm value configured for the channel.

## 3.18 RRM-C

This device does not keep a log, for which reason it is not possible to make graphs or tables of any parameter shown by the device.

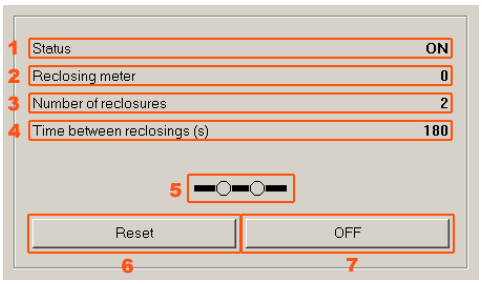
### 3.18.1 Driver Options

Clicking on the 'Options' button will display information, such as the model and the version, of the device.




### 3.18.2 Displaying Values

The RRM-C device will display the following values screen:




In which:

1. Displays the status of the device.
2. Displays the number of current reconnections.
3. Number of reconnections configured in the device.
4. Time between reconnections configured in the device.
5. Status of the Device Relay.

6. '*Reset*' Button. Clicking the button resets the device.
7. '*OFF*' Button. Clicking the button triggers the device.

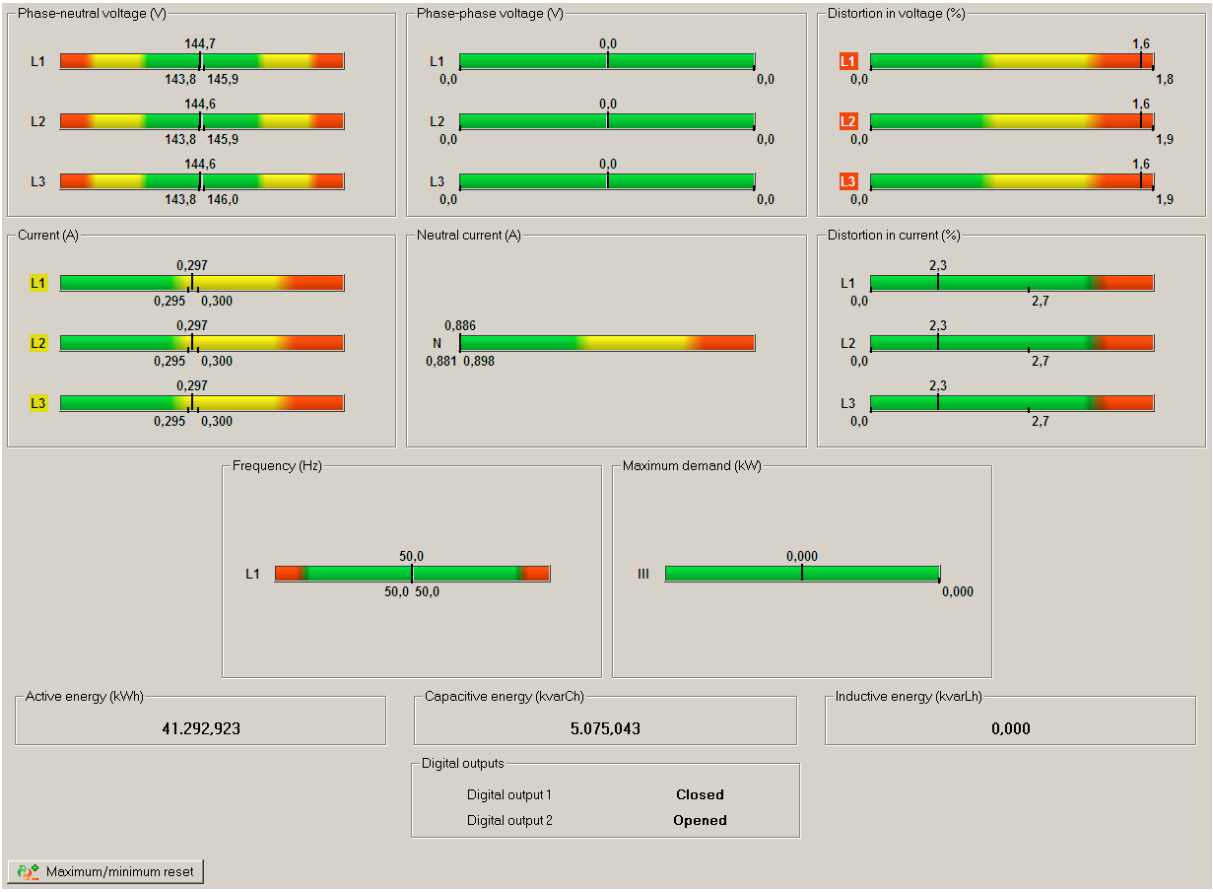
# 4 Displaying Values

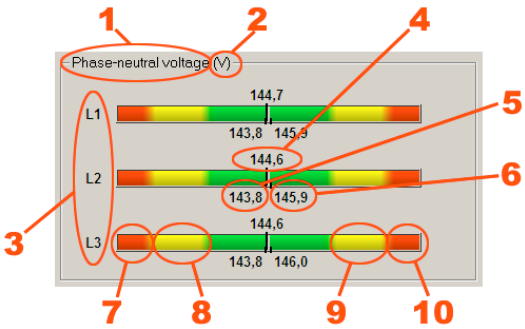
The display of the values measured by each of the devices can be represented in two different manners: analogue mode and text mode.

The displays in this section will depend on the type of device connected, in this case using a CVM-96.

## 4.1 Analogue Representation

This view graphically shows the maximum, minimum and instantaneous values of the variables.



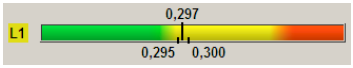




Each of the variables is made up of:

1. Name of the variable.
2. Units in which the values of the variable are expressed.
3. Phase labels.

4. Instantaneous value.
5. Minimum value
6. Maximum value.
7. Danger zone below nominal value.
8. Warning zone below nominal value.
9. Warning zone above nominal value.
10. Danger zone above nominal value.

When the instantaneous value of a variable is in the warning zone, indication will be given in the following manner:

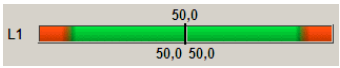



Marking the background of the phase label yellow.

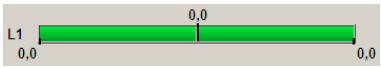
And when it is in the danger zone, in this other manner:

Marking the background of the phase label red.

When the warning value and the danger value are the same, the warning zone will not be displayed, as follows:



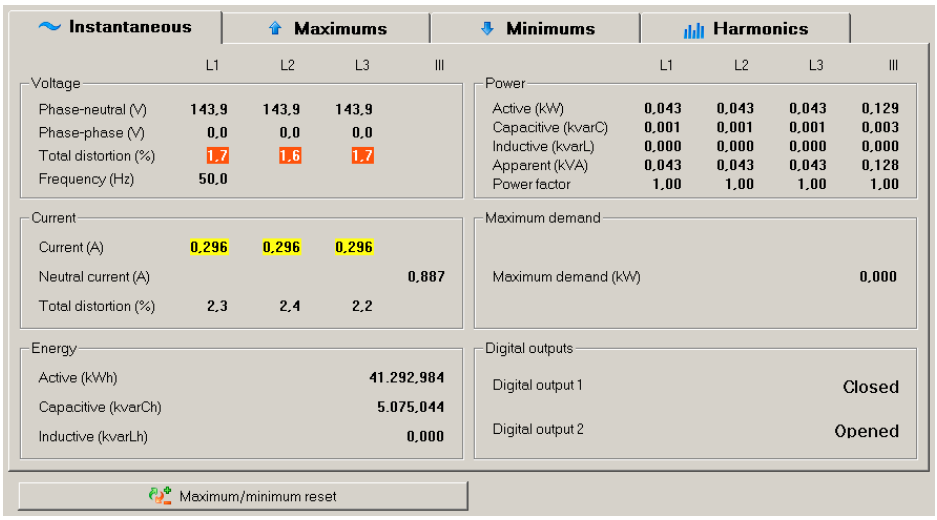

Finally, when the alarm is disabled, a bar will be displayed as follows:




In those devices in which it is possible to reset the maximum and minimum values, the lower part of the display will show the following button

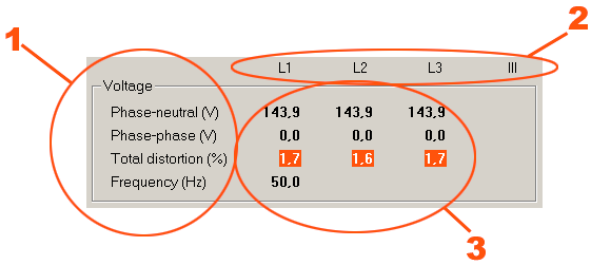
(See section 4.3 Reset Maximum and Minimum Values).

## 4.2 Representation in Text Mode




This view shows the values of the variables in text form.

We can use these tabs to select the different types of values measured by the device.



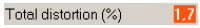

The display in text mode is made up of:

1. Name of the variables.
2. Phase labels.
3. Values of the variables.

When the instantaneous value of a variable is in the warning zone, indication will be given in the following manner:

Showing the variable value with a yellow background.

And when it is in the danger zone, in this other manner:




Showing the variable value in white with a red background.

In those devices in which it is possible to reset the maximum and minimum values, the lower part of the display will show the following button

(See section 4.3 Reset Maximum and Minimum Values).

## 4.3 Reset Maximum and Minimum Values

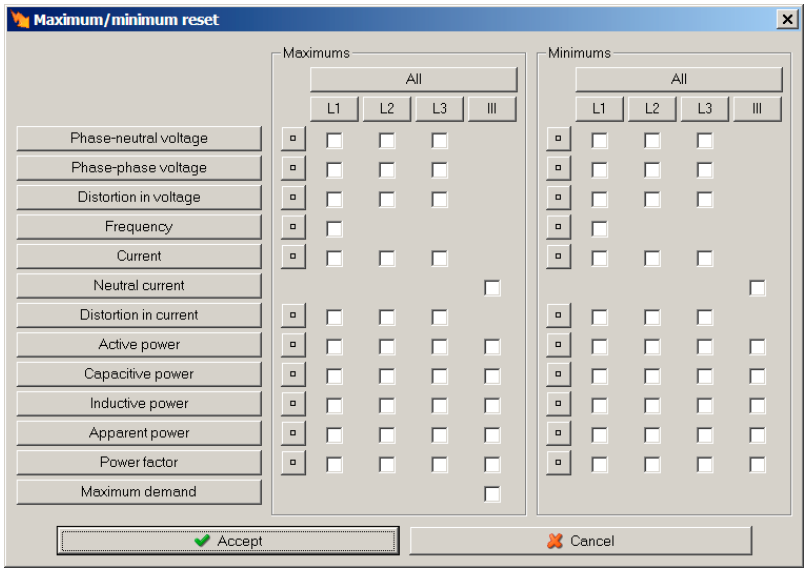
In those devices which measure maximum and minimum values of the variables, it will be possible to reset the said values, choosing which values are desired for the reset. Depending on the connected device (as the DH96), instead of resetting the maximum and minimum values, other variables (trough and peak in the DH96) are reset. The button on the display screen may, in the case of the DH96, be different

, although the operation will be similar to that explained in this section.

The dialogues displayed in this section will depend on the device selected, using in this case a CVM-96 III device.

We can reset the maximums and minimums of the variables by clicking on the button

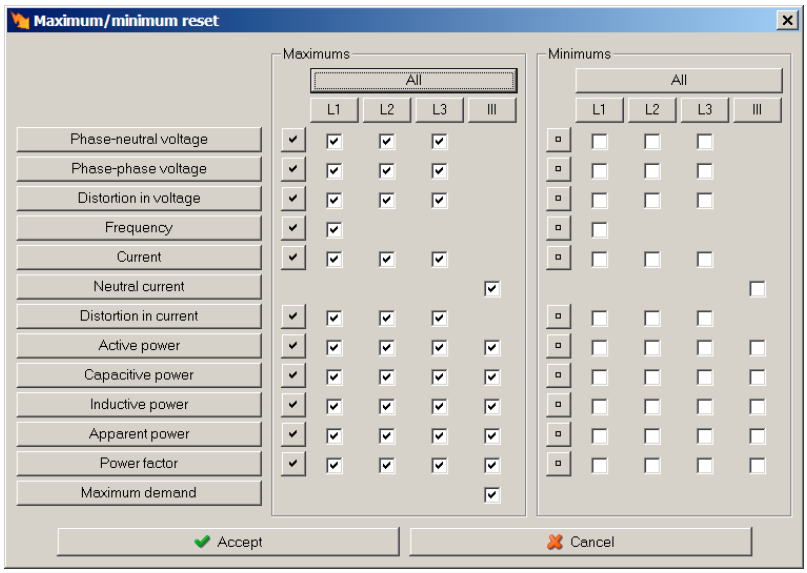
. Clicking will bring up the following dialogue:



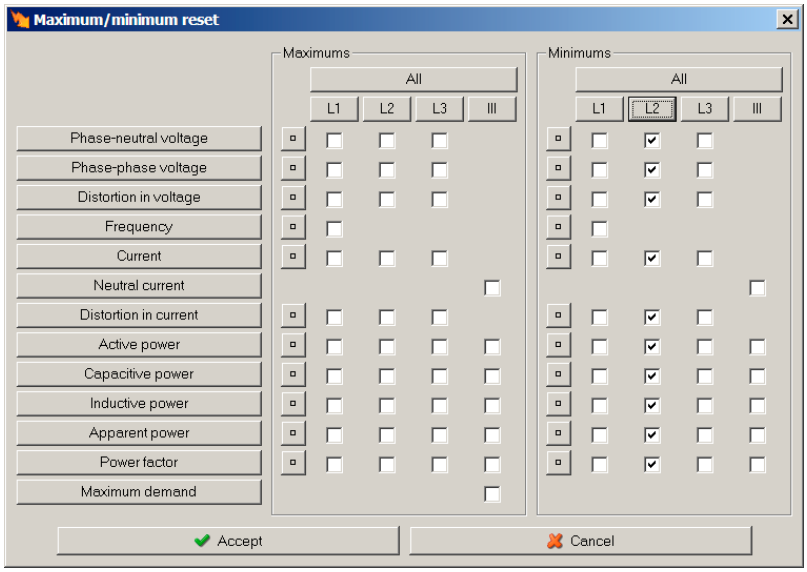

Here we can select the variables to use in the reset of the maximums and minimums.

Clicking on the button

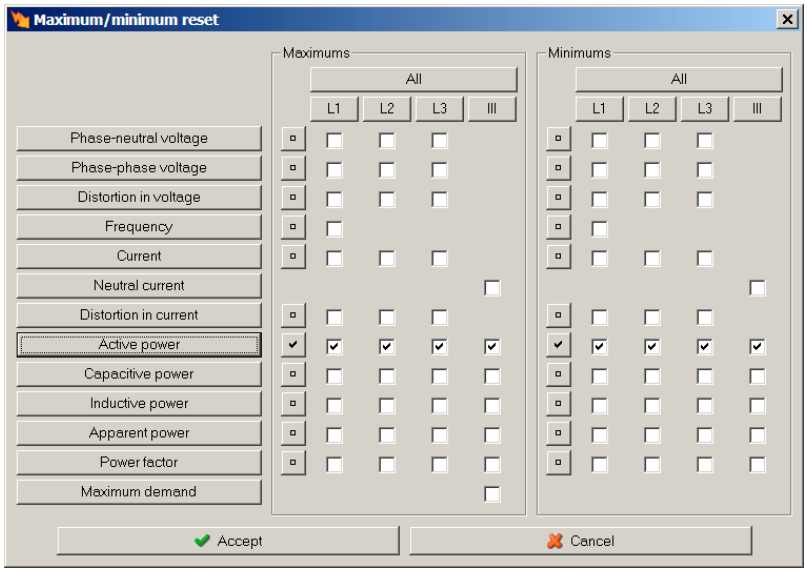
will select or deselect all the maximum or minimum variables, depending on the button which has been clicked on.



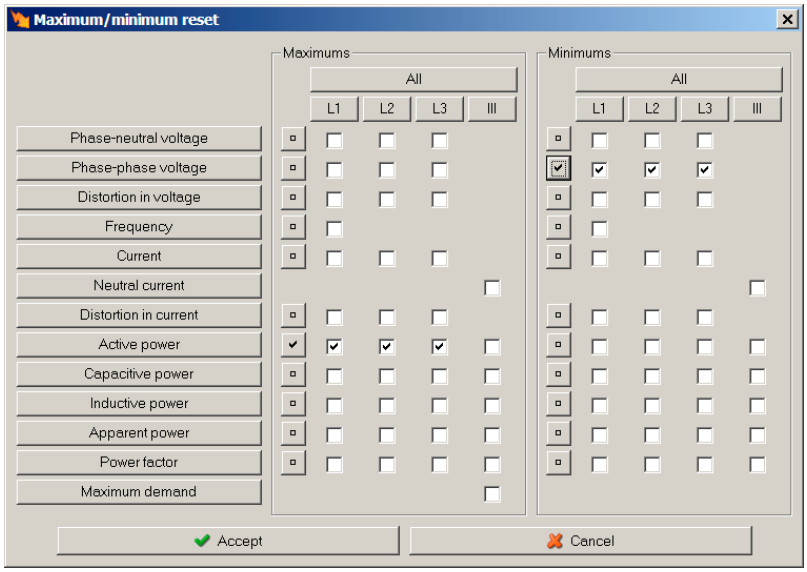

Clicking on one of the phase buttons will select or deselect only the variables of this phase.




Clicking on one of the variables, for example will select or deselect only the maximums and minimums of this variable.



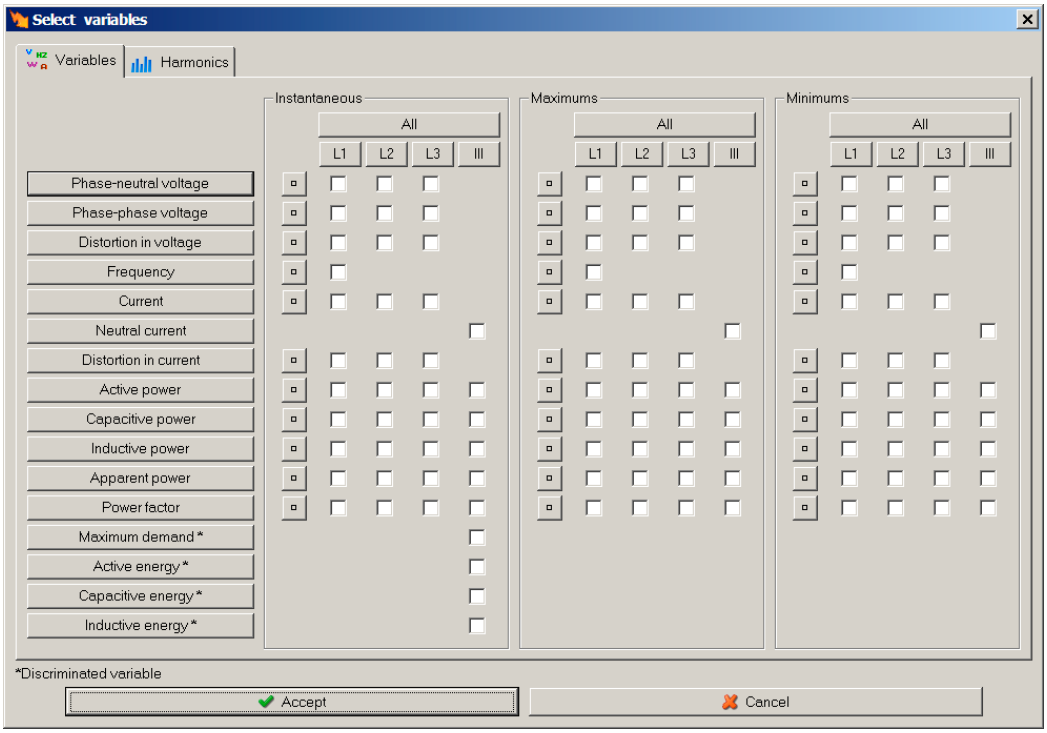

Finally, by clicking on ▫ we can select the phases 1, 2 and 3, of maximums and minimums, in accordance with the button pressed. If the three phases are selected, the button changes to ☑, with the 3 phases being deselected when clicking on the button.



# 5 Selection of Variables

Whenever necessary, the selection of one or more variables of a device will bring up the variables selection dialogue. We can select both analogue variables (voltage, current, power, etc), and, when possible, digital variables.

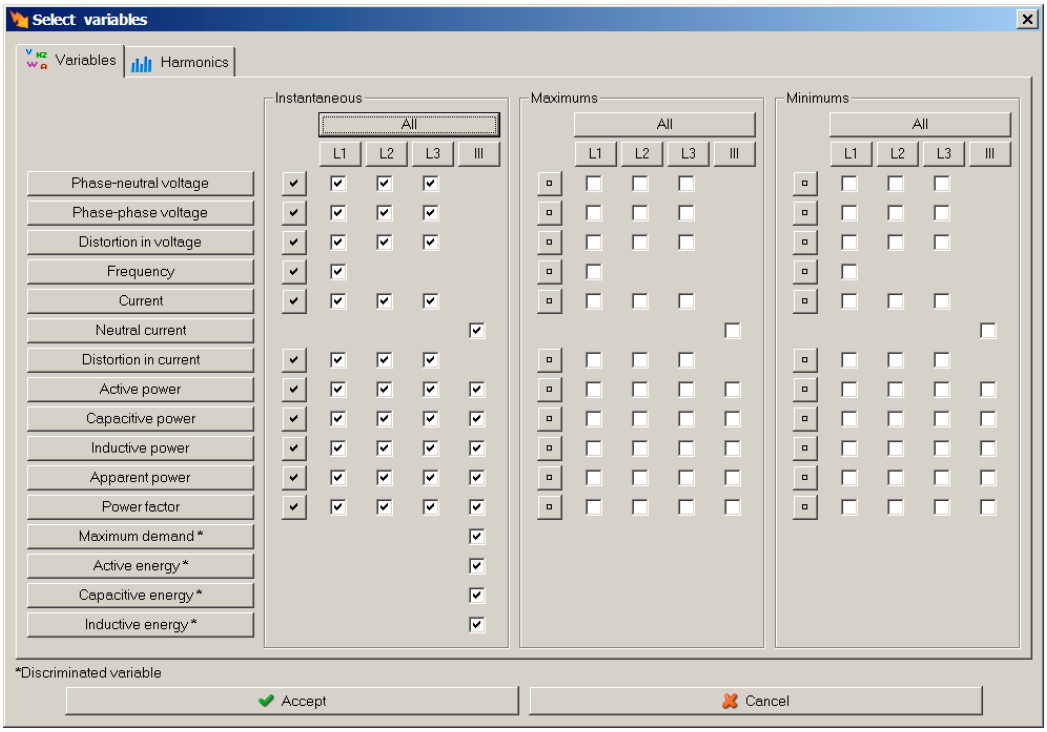
Firstly the analogue variables selection will be detailed. This dialogue will depend on the device connected, using, for the explanation of this section, the one corresponding to a CVM-96.



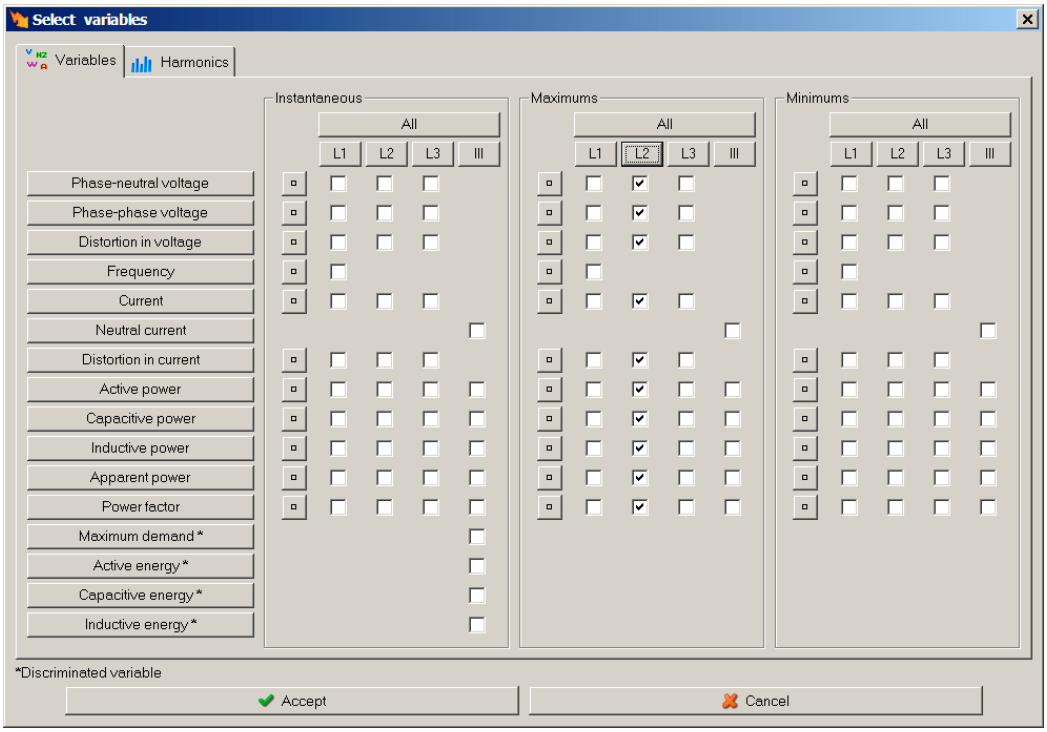

This will show the variables to be selected. If a variable is checked, it will appear as ☑ and cannot be unchecked.

If a discriminator has been selected, either by defect or otherwise, the variables which can be discriminated will appear selected in the button as Active energy *, and clarification will appear in the lower part of the screen *Discriminated variable

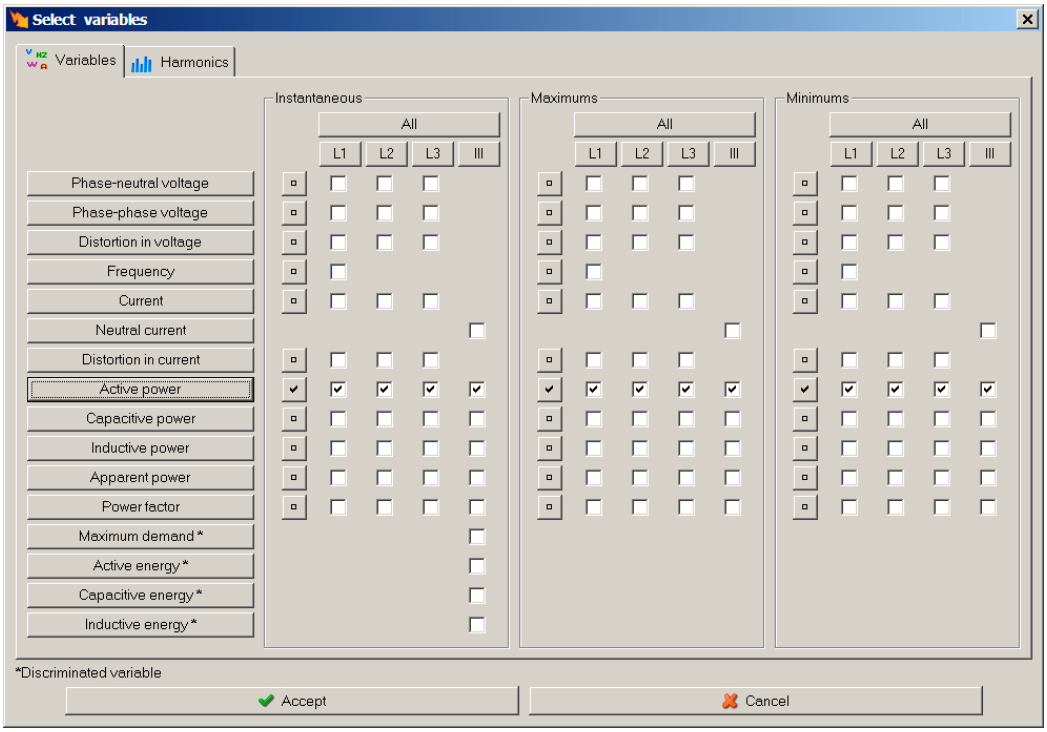
Clicking on the button All will select or deselect all the variables.



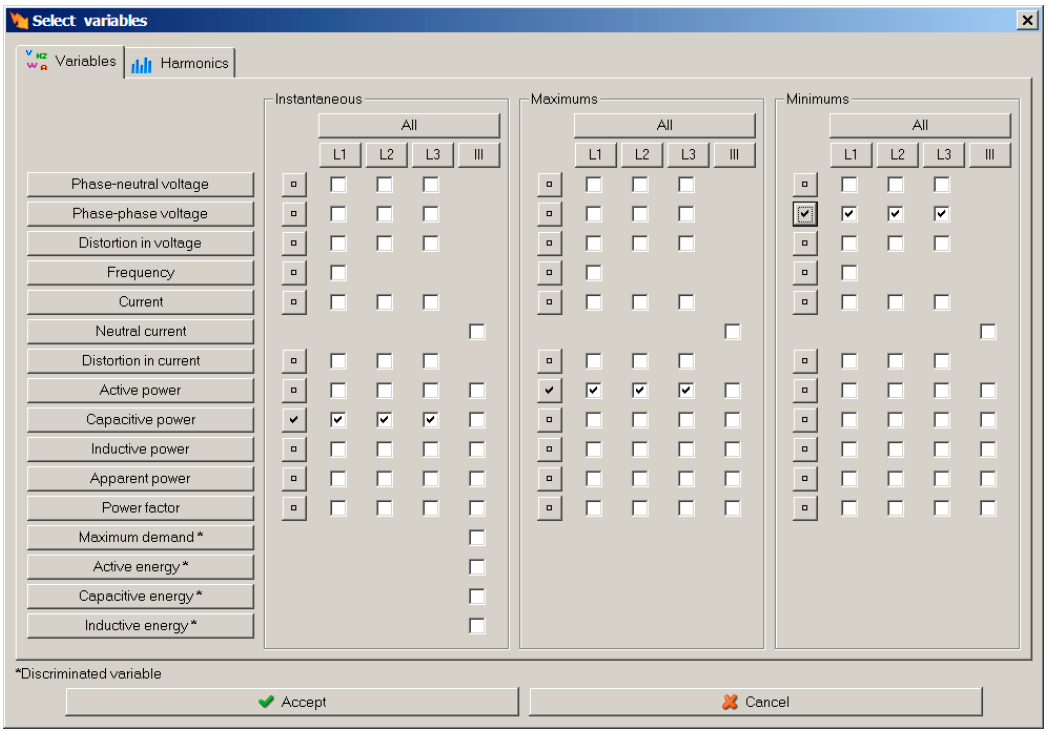

Clicking on one of the phase buttons L1 L2 L3 III will select or deselect only the variables of this phase.




Clicking on one of the variables, for example Active power, will select or deselect all the boxes of this variable.




Finally, by clicking on ▫ we can select the phases 1, 2 and 3, of instantaneous, maximums and minimums, in accordance with the button pressed. If the three phases are selected, the button changes to ☑, with the 3 phases being deselected when clicking on the button.



# 6 Graphs and Tables

We can display the graph or table options from:

*View Menu*. See section 2.4 View Menu.
*Toolbar*. See section 2.4.11 Toolbar.

## 6.1 Selection of the Variables

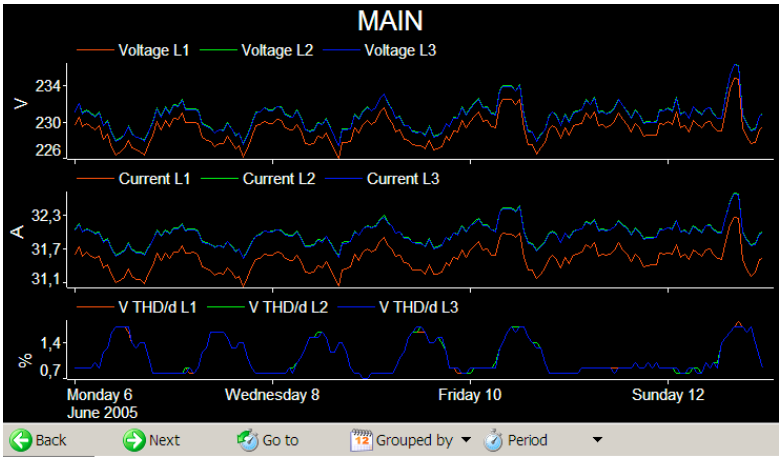
In order to select the variables to be displayed in the graphs or in the tables, we can act in two different manners:

By way of the driver variables selection window. See chapter 5. This will appear if no variable is selected in the display screen.
First selecting the variables on the display screen. Left click on a variable to select it. If, moreover, we keep the shift key pressed down whilst clicking on the variable, the instantaneous, maximum and minimum variables will be selected at the same time.

The variables are as follows when checked:

In this case, the instantaneous and maximum variables of phase 1 are selected.

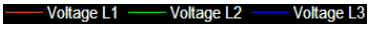
## 6.2 Graphs




The graph shows the evolution of the selected variables.

When displaying a graph, clicking on the '*Table*' option will display the values table of the variables of the graph.

The program automatically separates the variables depending on their type. In this case it can be seen that it has separated the voltages of the currents, although, as will be seen later on, this distribution can be modified.



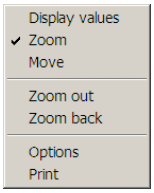

Legend corresponding to the voltages, indicating the colour and the name corresponding to each variable.

If the variables of one single device are displayed, the name of the device will appear as the title of the graph, in this case '**MAIN**'. However, if the table displays variables of different devices, the name of the device will appear next to the name of variables, for example:

If we move the cursor over the graph, a label will be displayed with information of the variables present in the axis on which the cursor is moving. The date, time and value of the variables of the axis will be displayed.

We can left click the mouse to enable/disable this characteristic.

Right clicking the mouse on a graph will bring up:




'*Display values*' will allow us to change to the values display mode when in zoom mode.

'*Zoom*' allows us to change the graph cursor to a magnifying glass. We can zoom in on this area by drawing a rectangle on the graph and keeping the left mouse button pressed down. We can make accumulative zooms. In order to undo the zoom function, it is necessary to right click on the graph again and select one of the two new options:

- *Zoom out*: This will undo all the zooms carried out.
- *Zoom back*: This will undo the last zoom.

'*Move*' will allow us to change to scroll mode, in which the cursor turns into a hand for scrolling forwards or backwards when the zoom is on. Left click the mouse on the graph and keep it pressed down whilst moving the mouse in order to move the graph.

'*Options*' allows us to access the graph options (explained in chapter 6.2.2).

'*Print*' will allow us to print the graph.

## 6.2.1 Graph Toolbar

This toolbar allows us to group together values, display different time periods, go to a specific time period, etc.

### 6.2.1.1 Back

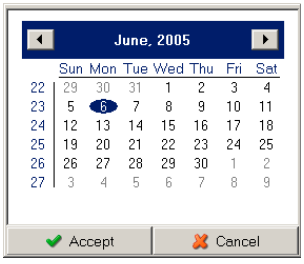
The graph will display the values of the previous period. For example, if we display the values by weeks, the values for the previous week will be displayed.

### 6.2.1.2 Next

The graph will display the values of the next period. For example, if we display the values by weeks, the values for the next week will be displayed.

### 6.2.1.3 Go to

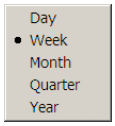
Clicking on this option will bring up the following dialogue:




Where we can select the day to be displayed. If, for example, we display values by weeks, the week containing the selected day will be displayed.

### 6.2.1.4 Grouped by

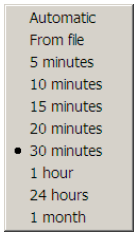
Clicking on this option will bring up the following menu:




Where we can choose the period of time to show in the graph. For example, if we select '*Month*', the graph will display the values corresponding to a month.

### 6.2.1.5 Period

Clicking on this option will bring up the following menu:




Where we can choose the group of values to be shown in the graph.

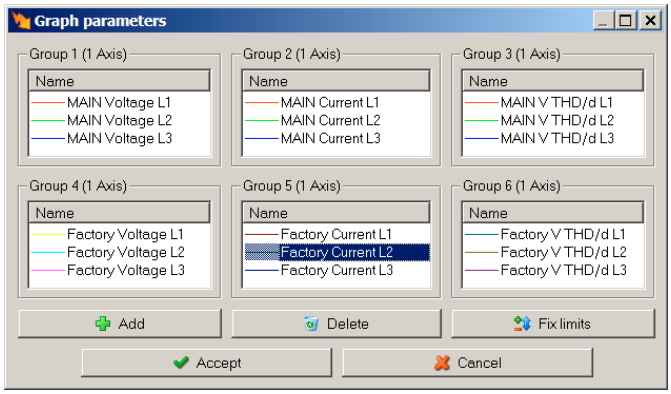
## 6.2.2 Graphs Options

We can display the graph options from:

*View Menu*. See section 2.4.10 Display Options.
*Toolbar*. See section 2.4.11 Toolbar.

The graph options allow us to add or delete variables from a graph, including different devices, modify the colour and aspect of the values, change the distribution of the values, etc.

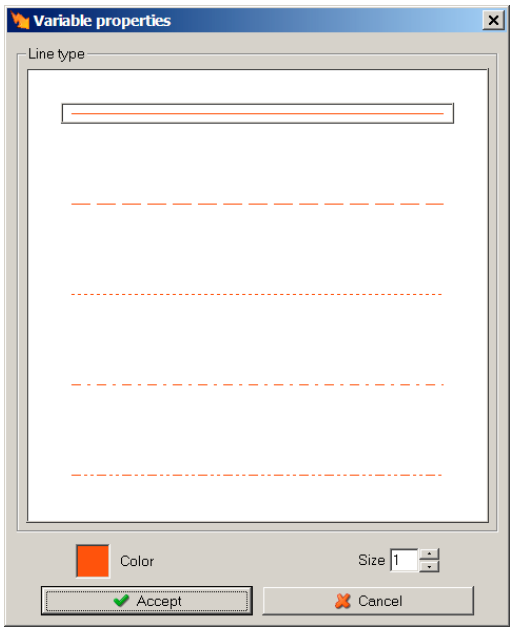
The graph options screen is as follows:




Here we can see the six subgroups which, as a maximum, the graphs can have.

Group 1 (1 Axis) Next to each group we can see the number of axes which make up the variables contained in the group. The number of total axes must not exceed 6.

MAIN Voltage L1 This indicates the colour, type of line, name and device to which the variable belongs. Click twice on the variable to bring up the following dialogue.

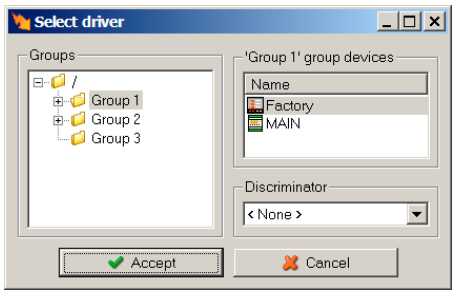



Here we can modify the type of line and the colour of the variable in the graph. The type of line will appear marked with a rectangle, clicking on will allow us to choose a different colour to display the variable in the graph, whilst clicking on we can change the thickness of the continuous line.

In order to move one or more variables from one group to another, follow these steps:

1. Select the variables to be moved from the source group.
2. Click on one of the selected variables.
3. Without releasing the mouse, move the cursor towards the destination group.
4. Release the mouse and the variables will move to the destination group.

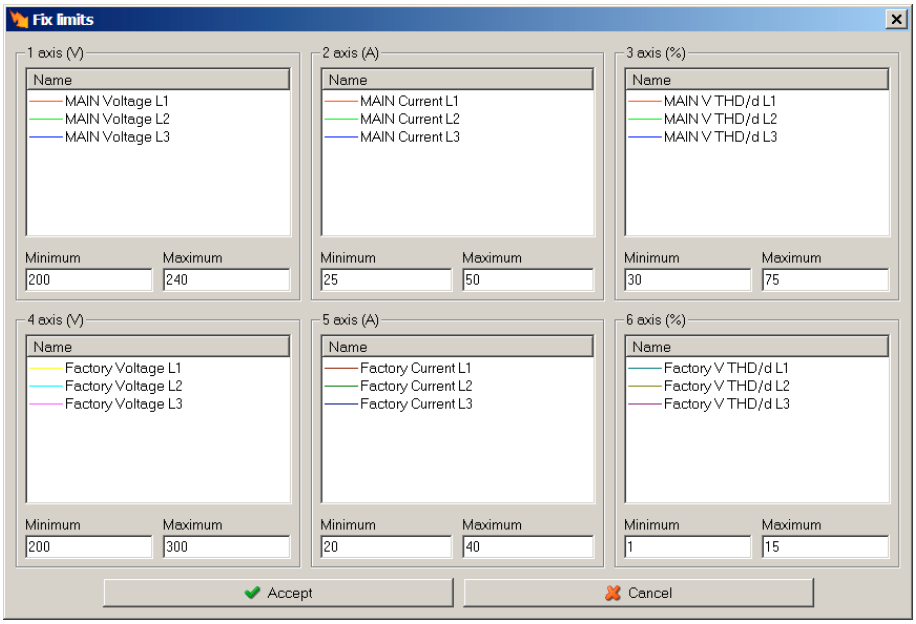
To add variables to the graph, click on the button , bringing up the following dialogue:



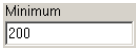

Showing the configured groups and devices. Once we have selected the device for which we wish to select the variables, the variables selection dialogue for this device will appear. In order to see how the variables are selected depending on the device, see the section corresponding to the explanation of the device.

In order to delete variables from the graph, first select those variables you wish to delete and click on the button

Finally, by clicking on we can set the ends of the different axes which make up the graph.



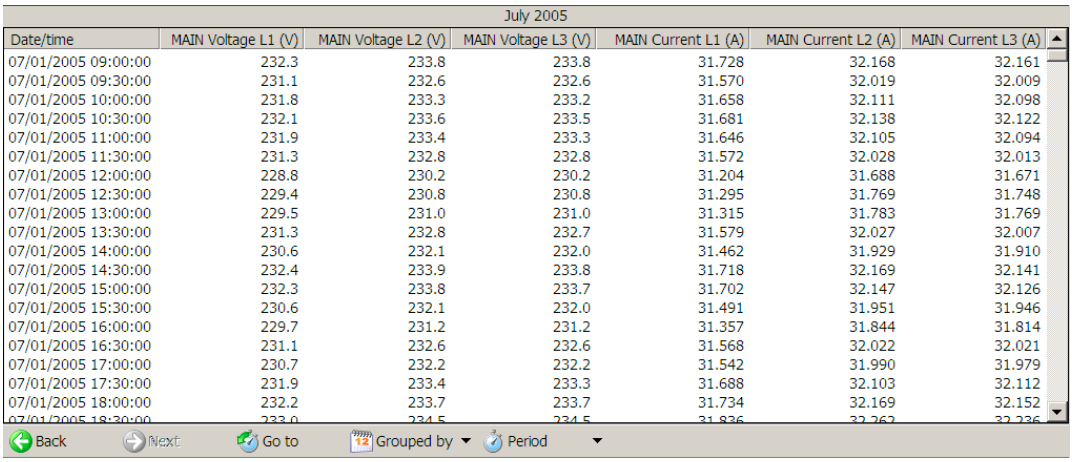

1 axis (V) Next to each axis we can see the units, which will show the values in the graph.




With this value, the minimum value of the values axis of the graph will be indicated.

With this value, the maximum value of the values axis of the graph will be indicated.

## 6.3 Tables



July 2005

| Date/time | MAIN Voltage L1 (V) | MAIN Voltage L2 (V) | MAIN Voltage L3 (V) | MAIN Current L1 (A) | MAIN Current L2 (A) | MAIN Current L3 (A) |
|---|---|---|---|---|---|---|
| 07/01/2005 09:00:00 | 232.3 | 233.8 | 233.8 | 31.728 | 32.168 | 32.161 |
| 07/01/2005 09:30:00 | 231.1 | 232.6 | 232.6 | 31.570 | 32.019 | 32.009 |
| 07/01/2005 10:00:00 | 231.8 | 233.3 | 233.2 | 31.658 | 32.111 | 32.098 |
| 07/01/2005 10:30:00 | 232.1 | 233.6 | 233.5 | 31.681 | 32.138 | 32.122 |
| 07/01/2005 11:00:00 | 231.9 | 233.4 | 233.3 | 31.646 | 32.105 | 32.094 |
| 07/01/2005 11:30:00 | 231.3 | 232.8 | 232.8 | 31.572 | 32.028 | 32.013 |
| 07/01/2005 12:00:00 | 228.8 | 230.2 | 230.2 | 31.204 | 31.688 | 31.671 |
| 07/01/2005 12:30:00 | 229.4 | 230.8 | 230.8 | 31.295 | 31.769 | 31.748 |
| 07/01/2005 13:00:00 | 229.5 | 231.0 | 231.0 | 31.315 | 31.783 | 31.769 |
| 07/01/2005 13:30:00 | 231.3 | 232.8 | 232.7 | 31.579 | 32.027 | 32.007 |
| 07/01/2005 14:00:00 | 230.6 | 232.1 | 232.0 | 31.462 | 31.929 | 31.910 |
| 07/01/2005 14:30:00 | 232.4 | 233.9 | 233.8 | 31.718 | 32.169 | 32.141 |
| 07/01/2005 15:00:00 | 232.3 | 233.8 | 233.7 | 31.702 | 32.147 | 32.126 |
| 07/01/2005 15:30:00 | 230.6 | 232.1 | 232.0 | 31.491 | 31.951 | 31.946 |
| 07/01/2005 16:00:00 | 229.7 | 231.2 | 231.2 | 31.357 | 31.844 | 31.814 |
| 07/01/2005 16:30:00 | 231.1 | 232.6 | 232.6 | 31.568 | 32.022 | 32.021 |
| 07/01/2005 17:00:00 | 230.7 | 232.2 | 232.2 | 31.542 | 31.990 | 31.979 |
| 07/01/2005 17:30:00 | 231.9 | 233.4 | 233.3 | 31.688 | 32.103 | 32.112 |
| 07/01/2005 18:00:00 | 232.2 | 233.7 | 233.7 | 31.734 | 32.169 | 32.152 |

Back Next Go to Grouped by Period

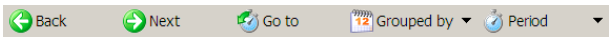
The table shows the evolution of the selected variables.

When displaying a table, clicking on the '*Graph*' option will display the graph of values of the variables of the graph.

The first column will display the date and time, and the next columns will display the values of the selective variables. The title of each column will correspond to the name of the variable and the units in which it is displayed.

### 6.3.1 Table Toolbar

This toolbar allows us to group together values, display different time periods, go to a specific time period, etc.




#### 6.3.1.1 Back

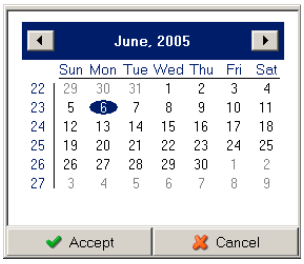
The table will display the values of the previous period. For example, if we display the values by weeks, the values for the previous week will be displayed.

### 6.3.1.2 Next

The table will display the values of the next period. For example, if we display the values by weeks, the values for the next week will be displayed.

### 6.3.1.3 Go to

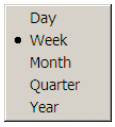
Clicking on this option will bring up the following dialogue:




Where we can select the day to be displayed. If, for example, we display values by weeks, the week containing the selected day will be displayed.

### 6.3.1.4 Grouped by

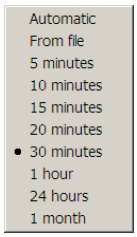
Clicking on this option will bring up the following menu:




Where we can choose the period of time to show in the graph. For example, if we select '*Month*', the table will display the values corresponding to a month.

### 6.3.1.5 Period

Clicking on this option will bring up the following menu:




Where we can choose the group of values to be shown in the graph.

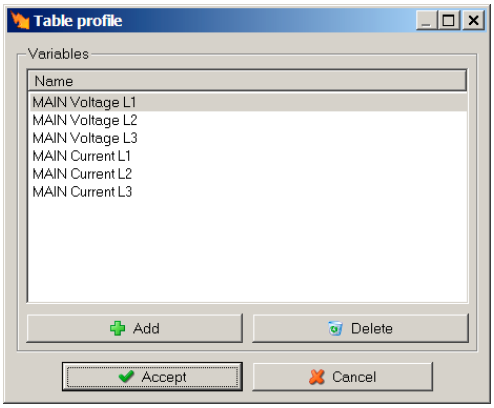
## 6.3.2 Table Options

We can display the table options from:

View menu. See section 2.4.10 Display Options
Toolbar. See section 2.4.11 Toolbar

The options of the tables will allow us to add or delete variables.

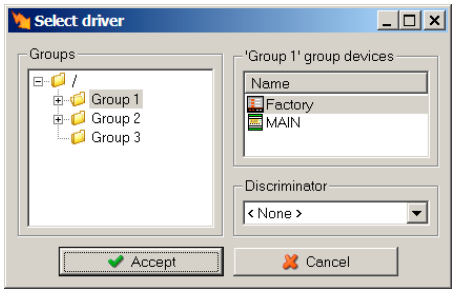
The table options screen is as follows:




Here we can see the list of variables selected. The name of the device to which they belong appears in front of the name of the variables.

To add variables to the graph, click on the button

, bringing up the following dialogue:




Showing the configured groups and devices. Once we have selected the device for which we wish to select the variables, the variables selection dialogue for this device will appear.

In order to delete variables from the graph, first select those variables you wish to delete and click on the button

# 7 Discriminators

PowerStudio provides a complete series of tools which allow the definition of energy discriminators and their subsequent analysis, along with the study of the data collected by the devices in a powerful and intuitive manner.

The study of a discriminator provides a consistent result in an energy consumption representation for each type of hour (counter) defined at any moment. This representation can be displayed either in table or graph format.

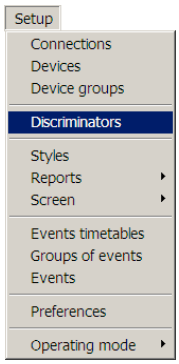
Likewise, it is possible to study these data, displaying them in different time intervals or grouping them together in different periods. Moreover, we can display them in intervals of one year grouped together by month, in intervals of a month grouped together by day, etc.

As can be seen, the discriminator studies consist basically of defining the discriminators (typically a calendar) and applying the said discriminator to all the data stored by a device. We will then obtain a representation of the study carried out which can be configured in line with the needs of the user (and visible both in graph and table format).

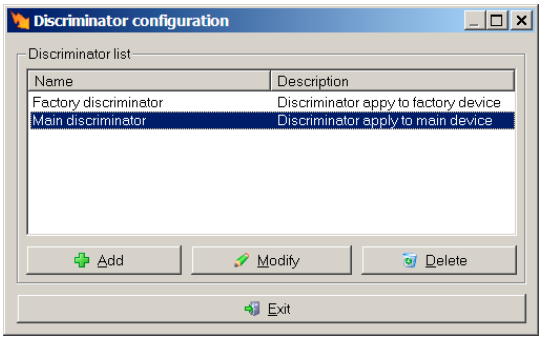
## 7.1 Discriminator Configuration

The first step should be the configuration of the discriminators we wish to apply to the data for analysis. The user can add new discriminators and delete or modify the existing discriminators.

In order to handle these actions, select the option *'Discriminators'* from the *'Setup'* menu.

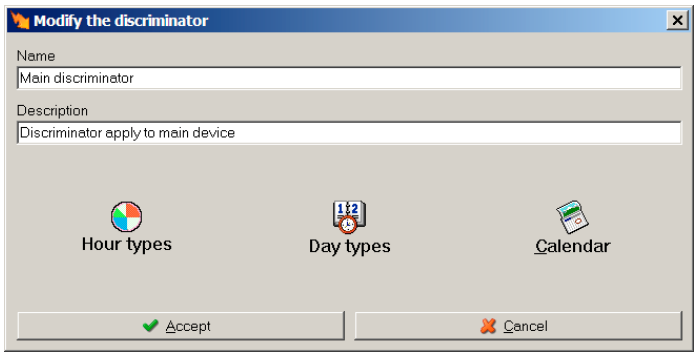



The following dialogue will appear:

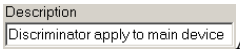



From which we can add, delete or modify discriminators.

Clicking on the *'Add'* or *'Modify'* button in the *'Discriminator configuration'* dialogue will bring up the following dialogue:



Alphanumeric data which allows the unique identification of the discriminator.



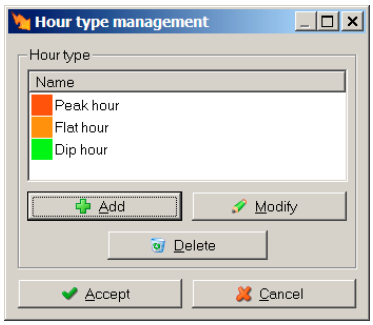
Alphanumeric data which allows us to enter a brief description of the discriminator.

Configures the different types of hours defined in the discriminator.

Configures the different types of days defined in the discriminator.

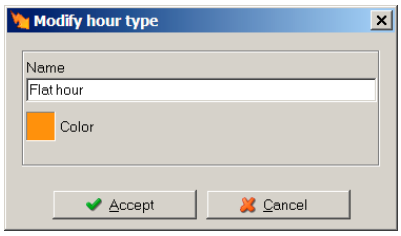
Configures the discriminator calendar.

## 7.1.1 Types of Hours




This dialogue can be used to add, delete or modify the different discriminator hour types. These types of hour are the basic elements in the definition of the discriminators. Here the registered consumption (maximum demand and energy) are distributed in accordance with the calendar.

Typically the types of hours correspond to the different prices which can be applied to the energy consumed in accordance with the corresponding time zone or day. Adding or modifying will bring up the following dialogue:

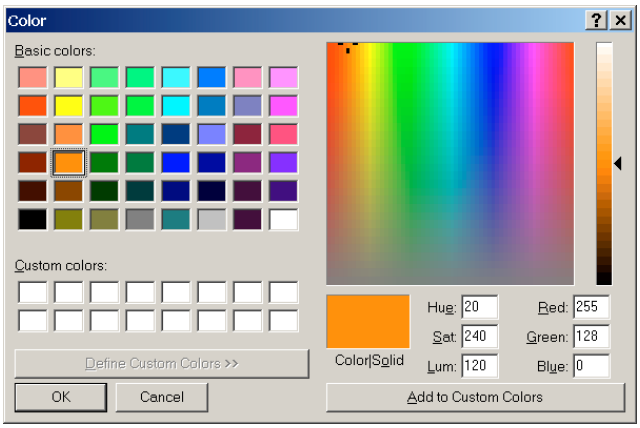



In which:

Alphanumeric data which allows us to uniquely identify the type of hour within the rate.

Colour which visually identifies the discriminator, which will be used for the graphic representation of the results of applying this discriminator to the data stored by any device (all the counters of the different maximum demand and energy variables).

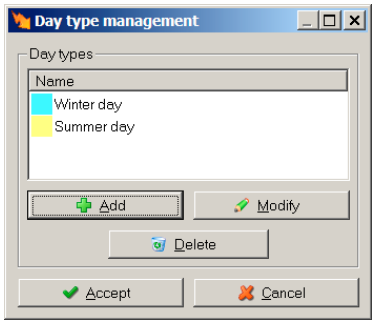
Click on the colour table to bring up the following dialogue, where we can configure the colour for the type of day.



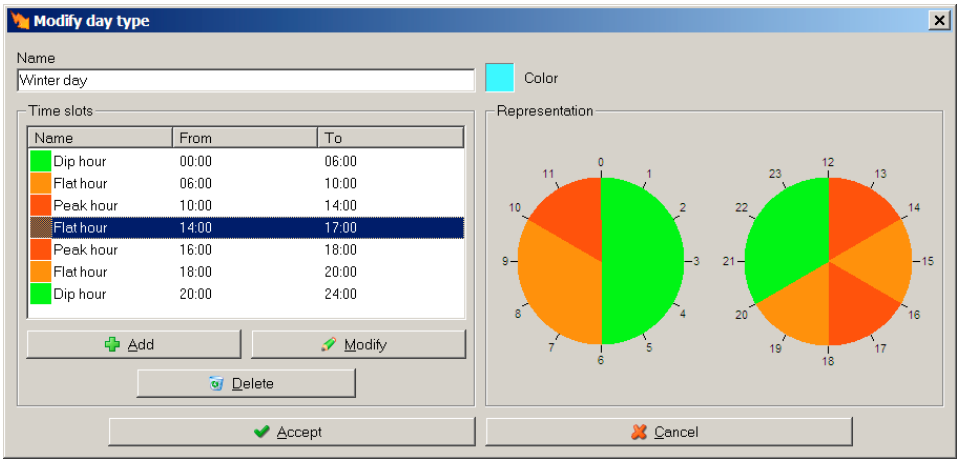

Clicking on the *'Delete'* button will delete all the types of hours which are selected in the list.

After defining the types of hours, we will distribute the same in each day, defining the different types of days which will make up our discriminator.

## 7.1.2 Types of Day



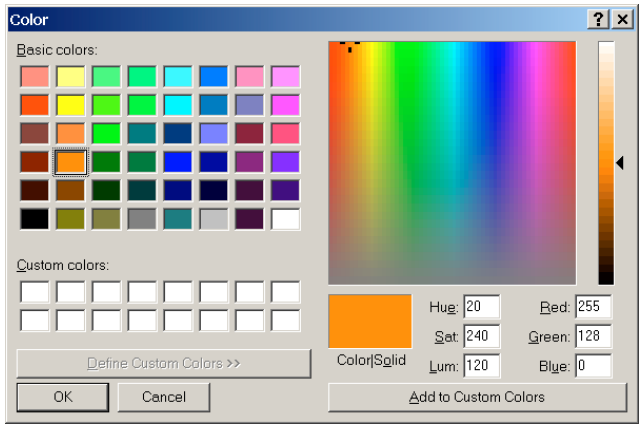

This dialogue can be used to add, delete or modify the different discriminator day types. Adding or modifying will bring up the following dialogue:

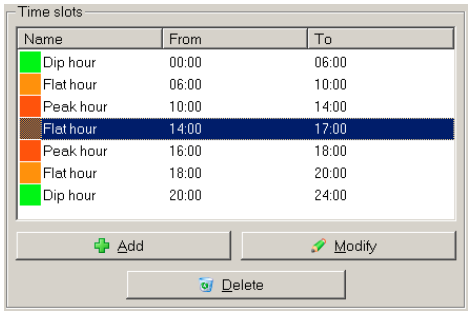



As can be seen, the definition of a type of day involves indicating the types of hour into which it is divided (for example, a Sunday may have the entire day defined as a type of reduced tariff, whilst a working day may be divided in two zones of day and night).

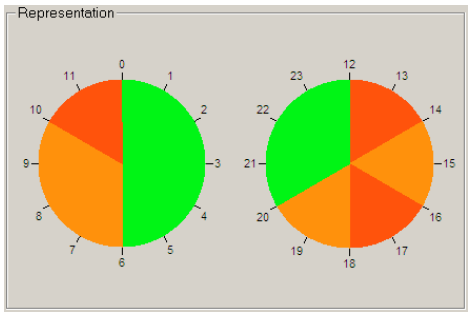
Alphanumeric data which allows us to uniquely identify the type of day within the discriminator.

Colour which visually identifies the type of day within the tariff. Click on the colour table to bring up the following dialogue , where we can configure the colour for the type of day.



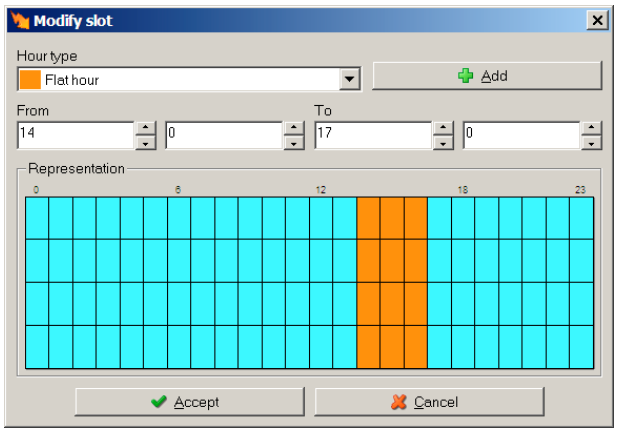



Time zones which configure the type of day. These zones must fill up the 24 hours of the day, but without overlapping. In practice, the different zones of a day indicate that the energy is billed in a different manner in each of the same, depending on the hour in question.




Graphic representation of the time zones. This provides us with visual orientation of how we are defining this type of day (we will quickly see, amongst other things, if any zones are still not defined)

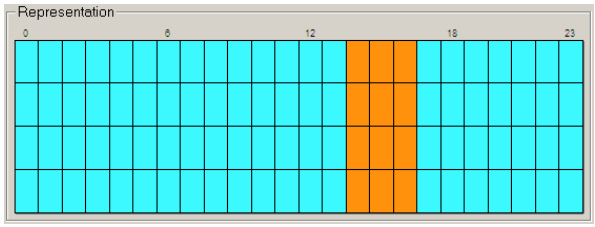
Adding or modifying a time zone will bring up the following dialogue:



Corresponds to the type of time zone. These types of hour will be configured in section 7.1.1 Types of Hours.

This button can be used to add new types of hour to the discriminator.

Selection of numeric form of the time zone.



Graphic representation of the time zone. Each column will represent an hour of the day, with the rows being periods of 15 minutes. In order to select the zone, proceed as follows:

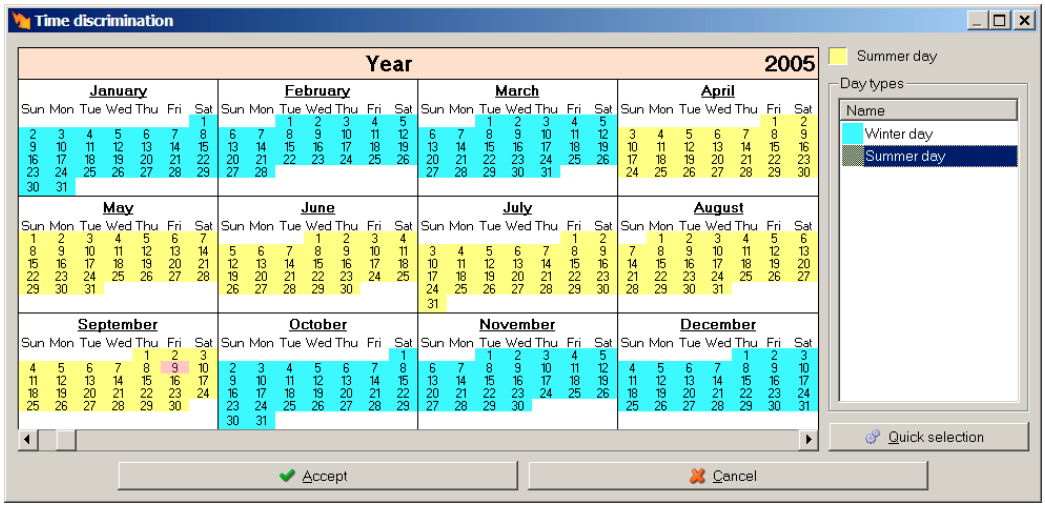
- Click on the initial of the zone.
- Without releasing the mouse, drag it towards the final of the zone.
- Release the button, and the zone will remain painted in the colour for the time of day.

It is possible to manually define the zone in a numerical manner, but this is only useful if we wish to define the zone with the accuracy of minutes (for example, a zone between 10.10 a.m. and 3.40 p.m.).

This dialogue only allows us to define a continuous time zone.

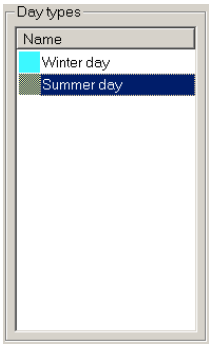
## 7.1.3 Calendar

Once the types of day which will make up the discriminator are defined, we shall distribute them in the global calendar. To this end, we shall distribute all the days previously created in the discriminator definition process in the said calendars.




We can assign the types of days not only to the days of the current year, but also to those of previous and forthcoming years. In order to select the days, we can proceed in the following ways:

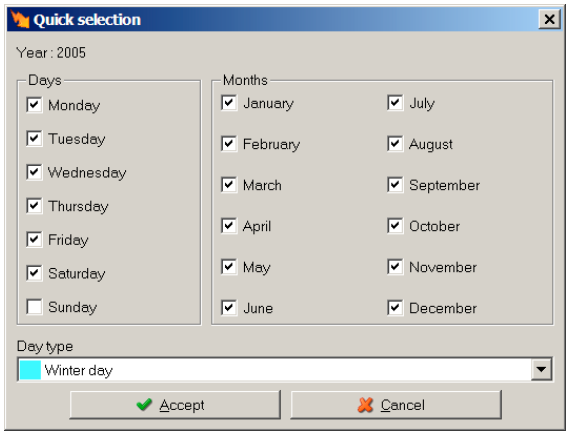
- Click twice on a day, highlighting only the selected day.
- Click once on an initial day and then, whilst keeping the SHIFT key pressed down, click on the final day, thus selecting all the days between the first and last.
- By means of the quick selection option.




List of the different types of day configured in the tariff.

Summer day Type of day to be assigned to the calendar if selections of the same are made. Whenever no type of day is selected, Deleting... will be displayed, indicating that the days in the calendar will be deleted rather than selected.

Quick selection We can use this option to make automatic selections. The following dialogue will appear



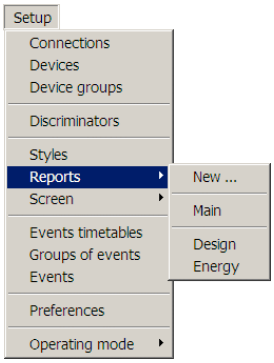

In this case, all the working days of the year 2005 will be checked with the type of day *'Winter day'*.

# 8 Reports

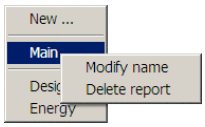
The option ‘Reports’ in the ‘*Setup*‘ menu allows us to design templates upon which the reports can be drawn up.

## 8.1 Adding, Modifying and Deleting Reports.

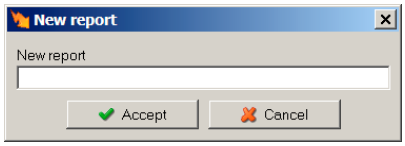
To create, modify or delete reports, click on the option ‘*Reports*’ in the ‘*Setup*’ menu. Several options will then appear, depending on the existence of previously created reports.




As we can see in the figure, we have the option ‘*New*’, which allows us to create a new report followed by the names of the reports created up until this moment (where appropriate). Right click on any of the existing reports to access the options to modify names and delete reports.




If we have selected the option ‘*New*’, a window will appear in which we can choose the name of the new report to create.

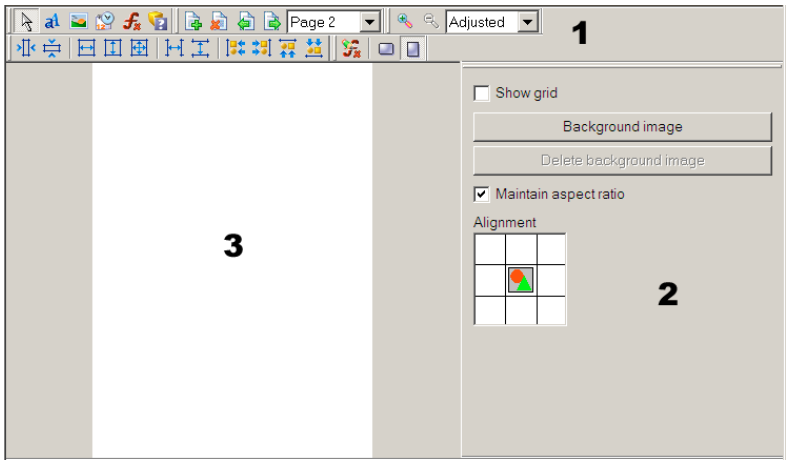



If you have selected the option ‘*New*’ or any of the already existing reports, the report design window will open.

## 8.2 Report Design Window

You must be in edit working mode in order to edit reports (see section 2.2.12 Working Mode).

The report design window appears as follows:




The window is divided into three areas:

- Tools (1)
- Information panel (2)
- Report sheet (3)

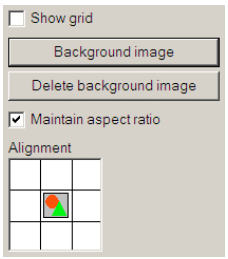
The tools allow us to configure the design of the reports in a simpler way.

The information panel will allow us to access all the configuration options of a control which is being added to the design of the report and which is selected at this moment.

The report sheet is the design view of the report.

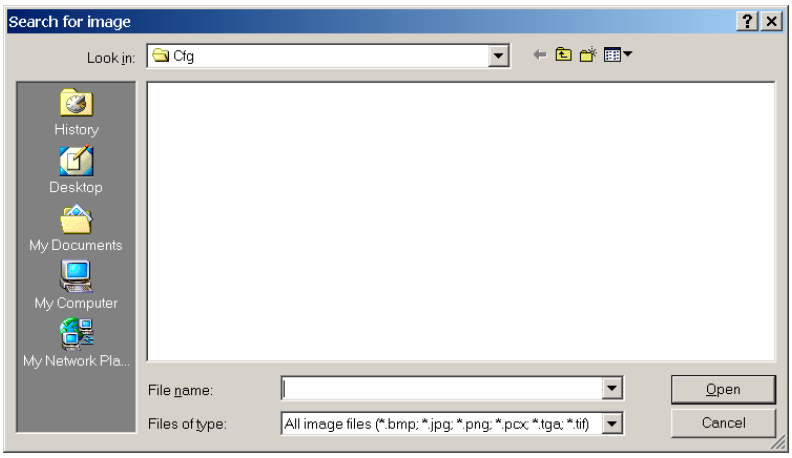
In this manner, we can use the tools (1) to insert controls in the report sheet (3), the properties for which can be configured in the information panel (2).

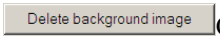
When a new report is created, the configuration properties for the background of the report in the information panel will appear by defect. These properties are the same as those which appear if, at any moment, there is no control selected.



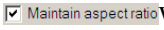
The option '*Show grid*' allows us to display or hide the help grid for the positioning of objects on screen. If the grid is displayed, the objects will be automatically aligned at the points of the grid.

We can use this option to select an image to appear as a background for the report.

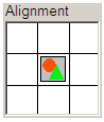


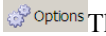
Clicking on this button will delete the current background image.



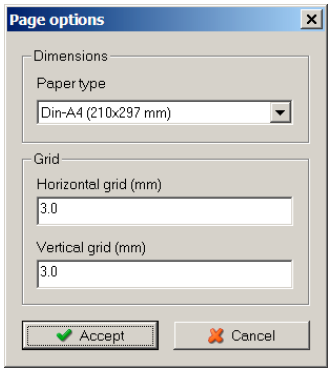
When enabled, this option will maintain the proportional width and height of the selected background image. Disabling will force the image to occupy the whole width and height of the report sheet, expanding or contracting its size as appropriate.



Allows us to situate the image chosen as background in any of the seven positions defined in the figure.

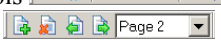


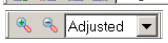
This button (located in the upper toolbar) allows us to configure the characteristics of the grid and the size of the report sheet we are detailing:




The size of the report sheet will be selected from a list of standard paper sizes (DIN-A4, A3, A2, etc.), and the size of the grid will specify, in millimetres, the distance between one point of the grid and another in horizontal or vertical.

With regards to the tools, there are several kinds, grouped together according to their use:

- Actions tools
- Position tools
- Pages tools 

- Zoom tools 

- Various tools

## 8.2.1 Actions Tools

### 8.2.1.1 Select Controls

This tool allows us to select one or more controls situated in the report sheet in order to edit the properties or to apply another tool. Simply click on a control to select it. In order to select more than one control, keep the left mouse button pressed down and draw a rectangle which covers the controls you wish to deal with. The controls outside of the rectangle will become or remain unselected.

The behaviour of this tool can be modified by keeping the *Control* or *Shift* key pressed down. If, when selecting controls, we keep the *Control* key pressed down, we can invert the selection (i.e. select the controls which are not selected, or deselect those which are selected), If, when selecting controls, we keep the *Shift* key pressed down, we can add those controls which are not selected to those which are.

### 8.2.1.2 Text Control

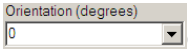
This tool allows us to include fixed text chains in the report. Once the tool is selected, it is necessary to draw a rectangle on the report sheet, keeping the left mouse button pressed down. The properties which can be configured from this control are:

We can choose a previously created text style, or create a new personalised one.

Will correspond to the font type used for the text.

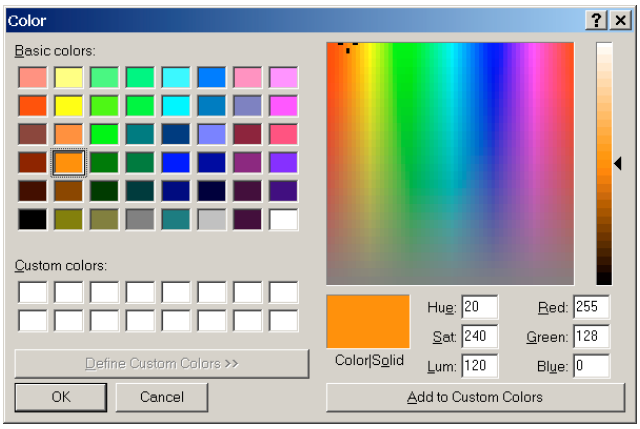
Depending on the selected font, we can choose bold and/or italics.

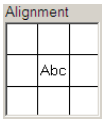
Corresponds to the font size. The size may be between 1 and 90. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.



Corresponds to the text direction. The orientation (expressed in degrees) must be between 0 and 350. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.

Clicking on this button will allow us to select the text colour.





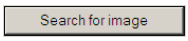
Will allow us to decide in which part of the rectangle defined in the report sheet the text will be situated.

The text to be displayed is written here.

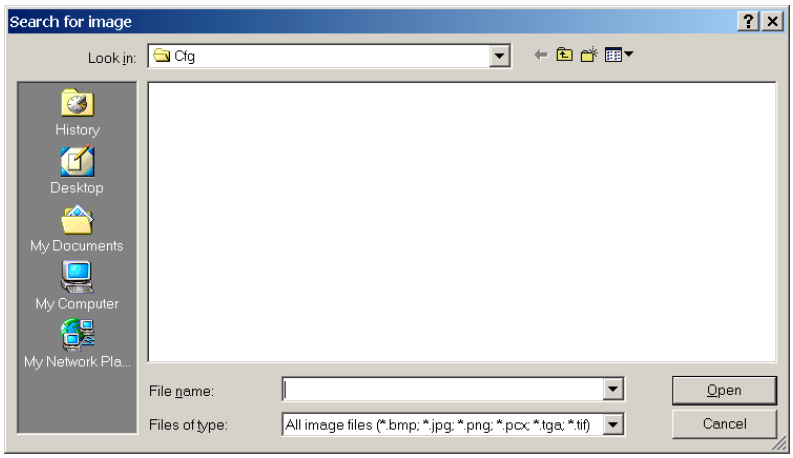
This button will allow us to add as style the personalised configuration we have defined for the control of active text, and to use this style in the other controls.

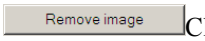
### 8.2.1.3 Image Control

This tool allows us to include fixed images in the report. Once the tool is selected, it is necessary to draw a rectangle on the report sheet, keeping the left mouse button pressed down. The properties which can be configured from this control are:

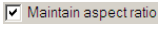


We can use this option to select an image to assign to the control to be shown in the report.

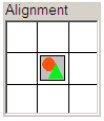


Clicking on this button will delete the current background image.



When enabled, this option will maintain the proportional width and height of the selected image. Disabling will force the image to occupy the whole width and height of the rectangle defined in the report sheet, expanding or contracting its size as appropriate.



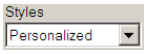
Will allow us to decide in which part of the rectangle defined in the report sheet the image will be situated.

### 8.2.1.4 Date Control

This tool allows us to include a date in the report (current or other). Once the tool is selected, it is necessary to draw a rectangle on the report sheet, keeping the left mouse button pressed down. The properties which can be configured from this control are:

This option allows us to choose the type of date to be displayed in the report sheet. We can choose between:

- *Free date*: Any set date defined by the user.
- *Actual date*: The date at the moment the report is made.
- *Begin date*: The initial data period date on which the report is carried out.
- *End date*: The final data period date on which the report is carried out.

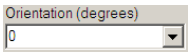


We can choose a previously created text style, or create a new personalised one for the date.

This corresponds to the type of font used for the text of the date.

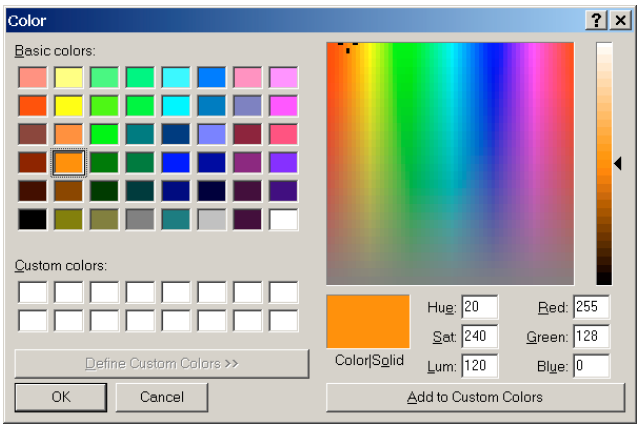
Depending on the selected font, we can choose bold and/or italics.

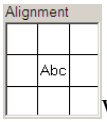
Corresponds to the font size of the text of the date. The size may be between 1 and 90. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.



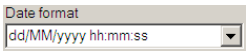
Corresponds to the direction of the text of the date. The orientation (expressed in degrees) must be between 0 and 350. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.

Clicking on this button will allow us to select the date text colour.



Will allow us to decide in which part of the rectangle defined in the report sheet the date text will be situated.



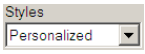
Here we can establish the format of the date. Several have been predefined. We can enter this manually using the keyboard. The character “d” indicates that this position should show the day of the month (1-31); the character “M” indicates that this position should show the month of the year (1-12); the character “y” indicates that this position should show the year; the character “h” indicates that this position should show the hour (0-23); the character “m” indicates that this position should show the minute (0-59); and the character “s” indicates that this position should show the seconds (0-59). If you wish to force any of the previous fields to have a minimum number of digits, enter the characters you desire (if we want the hour to have three digits, enter the characters “hhh”). It is also possible to enter text in any part of the date by using inverted commas (“text”).

This option will only appear if we have selected ‘*Free date*’. In this case we can specify a specific date to show in the report.

This button will allow us to add as style the personalised configuration we have defined for the control of active text, and to use this style in the other controls.

### 8.2.1.5 Formula Control

This tool allows us to include a formula in the report (the report will show the final result). Once the tool is selected, it is necessary to draw a rectangle on the report sheet, keeping the left mouse button pressed down. The properties which can be configured from this control are:

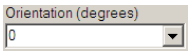


We can choose a previously created text style, or create a new personalised one for the formula.

This will correspond to the font type used for the text of the formula.

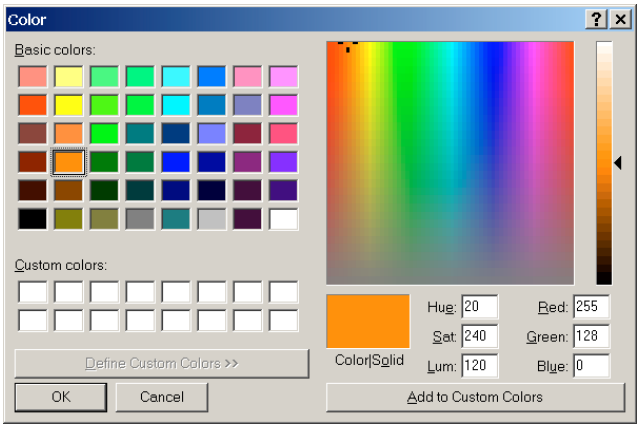
Depending on the selected font, we can choose bold and/or italics.

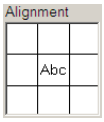
Corresponds to the font size of the text of the formula. The size may be between 1 and 90. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.



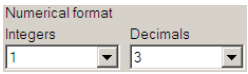
Corresponds to the direction of the text of the formula. The orientation (expressed in degrees) must be between 0 and 350. It will be possible to introduce the size using the keyboard, or by dropping down a selection to see the available options.

Clicking on this button will allow us to select the colour of the text of the formula.

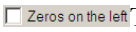


Will allow us to decide in which part of the rectangle defined in the report sheet the formula text will be situated.

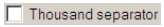


By way of these selectors, we can specify the number of whole and decimal figures to be displayed for the value resulting from the calculation of the formula.

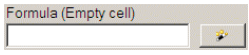


This option is only available when a specific number of integrals has been selected in the previous option. Should the value resulting from the formula not reach the specified number of integrals, the remaining spaces will be filled with zeros.

This option is only available when a specific number of decimals has been selected in the previous option. Should the value resulting from the formula not reach the specified number of decimals, the remaining spaces will be filled with zeros.

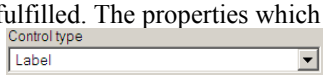


A separator for the thousands in the value resulting from the formula will be displayed. This separator will depend on the regional configuration of the system in which the program is running.



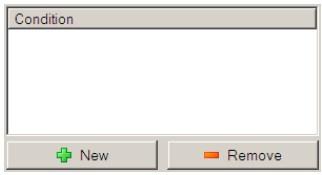
Here we specify the formula which will give place to the result to be displayed in the report sheet. This can be entered manually or using the wizard button (see appendix14.2 Expressions and Conditions).

### 8.2.1.6 Conditional Control

This tool allows us to include both a control and the previously defined data (text label, image, date, formula) in the report, which will only be shown when a specific condition is fulfilled. The properties which can be configured for this tool will be conditioned by the type of control chosen in 

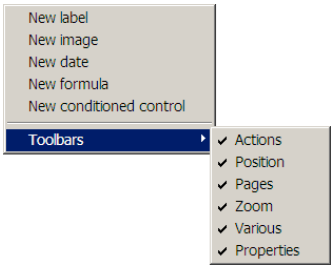
The common options will be:

Here we specify the condition which will give place to the appearance in the report sheet of the chosen control. This can be entered manually or using the wizard button (see appendix14.2 Expressions and Conditions).



Once the condition is specified, clicking on the 'New' button will add the condition to the list of conditions. In order to delete a condition from the list, simply select it and click on the 'Remove' button. When there is more than one condition in the list, the control is enabled when one or more conditions are fulfilled.

You can also right click on the report sheet in order to add controls. Similarly, we can show or hide the toolbars.




### 8.2.1.7 Common Action Tools Options

Any control inserted in the report sheet can be resized and moved. In order to resize a control, simply place the mouse pointer on one side of the control rectangle and keep it pressed down whilst moving in the desired direction. In order to move a control, keep the left mouse button pressed down and move the mouse in the required direction. It is also possible to move more than one control at the time, grouping them together within a rectangle. In order to group together two or more controls, keep the left button of the mouse pressed down and move the mouse to draw a rectangle which contains the controls to be moved.

In order to delete the control inserted in the report sheet, use the option '*Cut*' from the '*Edit*' menu, or press the *Delete* key. This menu includes the options '*Copy*' and '*Paste*' which, as their names indicate, can be

used to make duplicates of controls by way of cut and paste. This can also be done using combinations of the *Control* + *C* keys to copy, and *Control* + *V* to paste.

### 8.2.2 Position Tools

*Centre horizontally*: This tool requires, at least, one control to be selected for use. This can be used to horizontally align one or several controls situated in the report sheet. The control or controls will align themselves on the sheet by moving left or right. If, when using this option, we keep the *Control* key pressed down, we can align each of the controls selected independently of the others.

*Centre vertically*: This tool requires, at least, one control to be selected for use. This can be used to vertically align one or several controls situated in the report sheet. The control or controls will align themselves on the sheet by moving up or down. If, when using this option, we keep the *Control* key pressed down, we can align each of the controls selected independently of the others.

*Resize horizontally*: This tool requires, at least, two controls to be selected for use. This can be used to modify the horizontal size of a control in line with another existing one. In order to make the adjustment, keep the 'Control' key pressed down and use the left mouse button to select the different controls to be resized. The last control selected shall be taken as the reference to carry out the resizing of the others, in other words, all the selected controls will have a horizontal size equal to that of the last control selected.

*Resize vertically*: This tool carries out the same function as the horizontal resizing tool, but with regards to the vertical size of the last control selected.

*Resize vertically and horizontally*: This tool allows us to carry out the vertical and horizontal resizing simultaneously.

*Redistribute space horizontally*: This tool requires, at least, three controls to be selected for use. This can be used to modify the horizontal position of the selected controls, hence allowing the same distance between them. In other words, the controls to which this tool has been applied will each have the same distance on the sides (left and right).

*Redistribute space vertically*: This tool carries out the same function as the horizontal space redistribution tool, but this time for the vertical.

*Align left*: This tool requires, at least, two controls to be selected for use. This can be used to align the position of a control at the level of the most left-hand section of another. In order to make the adjustment, keep the Control key pressed down and use the left mouse button to select the different controls to be aligned. The last control selected shall be taken as the reference to carry out the aligning of the others, in other words, all the selected controls will be aligned to the left at the level of the last control selected.

*Align right*: This tool carries out the same function as the left alignment tool, but this time to the right of the last control selected.

*Align top*: This tool requires, at least, two controls to be selected for use. This can be used to align the position of a control at the level of the most upper section of another. In order to make the adjustment, keep the 'Control' key pressed down and use the left mouse button to select the different controls to be aligned. The last control selected shall be taken as the reference to carry out the aligning of the others, in other words, all the selected controls will be aligned at the top at the level of the last control selected.

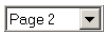
*Align bottom*: This tool carries out the same function as the upper alignment tool, but this time below the last control selected.

### 8.2.3 Page Tools

*Add page*: This tool allows us to add a new page to the report. The reports can have several pages with different content. Each of these pages are associated to a single report, and the only common element for the different pages of a report are the formulae.

*Delete Page*: This tool will delete the page which is active at the moment the button is clicked on.

*Next page / Previous page*: These tools allow us to move around the different pages which make up a report (where appropriate).



This control can be used to directly display a page of the report without having to advance page by page with the aforementioned tools. Clicking on the same will open up a list of pages available for the report which is active at this moment.

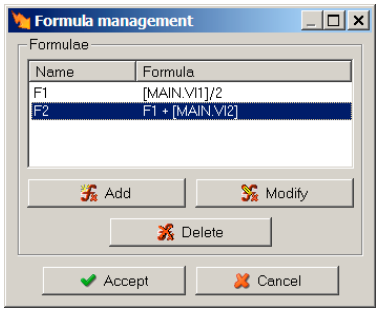
### 8.2.4 Zoom Tools

*Zoom In/Out*: These tools can be used to zoom in or out on the image which is currently defined for the display of the report sheet.

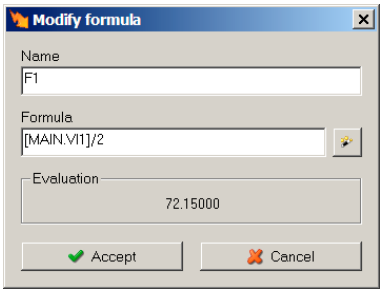
This control is used to indicate a specific zoom to apply to the report sheet. The values go from 50% to 1000%. There is also the possibility to configure it in ‘Ajusted’ mode, which will adapt the zoom in line with the report sheet being displayed, showing it as large as is possible given the screen resolution where the program is running.

## 8.2.5 Various Tools

*Configure formula*: This tool can be used to define formula which can be applied, or to make reference to the same in any of the pages of the report for which they have been defined. Clicking on this button will bring up the following window:




Clicking the '*Delete*' button will delete the formula which is selected. By clicking on '*Add*' or '*Modify*', the formula modification window opens:

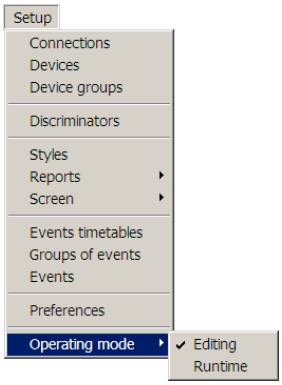



Here we can give a name to the formula and detail it (see appendix14.2 Expressions and Conditions).

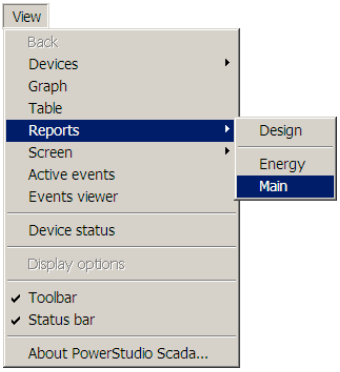
*Horizontal/vertical orientation*: This tool allows us to define the direction of the report sheet. The controls are not reorganised when changing from horizontal to vertical, or vice versa, for which reason it is possible that some are not displayed when making this type of changes. Nevertheless, these controls will continue to exist and will become visible if the change is made again.

## 8.3 Displaying Reports

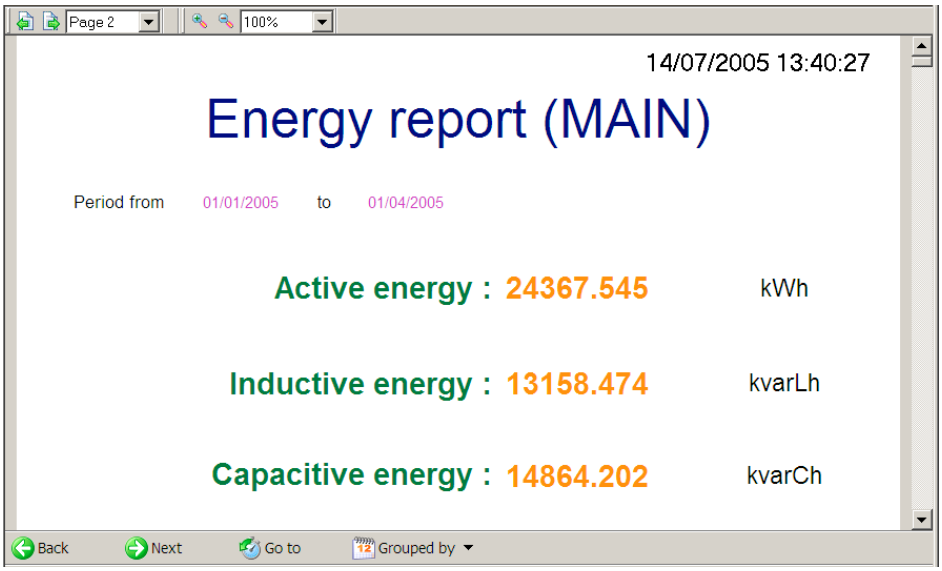
To display a report, change the work mode from '*Editing*' to 'Runtime'. This change is carried out through the menu Setup->Operating mode:



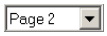

Once in '*Runtime*' mode, the option '*Reports*' in the 'View' menu will be enabled:

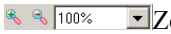



This option can be used to display the reports configured in edit mode. When accessing any of the created reports, the same will be shown on screen in display mode, along with some options for the zoom, or to choose the page to display:



*Previous/next page*: These buttons are used to go forward or backward through the different pages which make up the report.

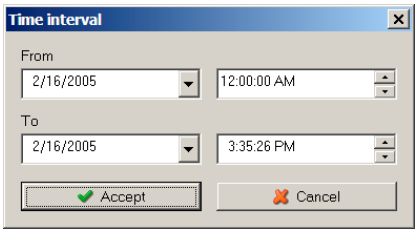
 By way of this drop-down control we can directly access one of the pages making up the report.

 Zoom Tools: Already explained in chapter 8.2.4.

This button can be used to print the active report. Remember that, unless otherwise specified in the print properties, all the pages which make up the report will be printed, and not only those which are displayed.

This toolbar will allow us to determine the interval at which the values in the active report will be displayed. In other words, if, for example, the interval is a week and the formula corresponds to the equipment energy, the report will display the energy consumed by this equipment during the week.

The '*Grouped by' button* allows us to define the specific time interval upon which the calculations will be based. We can choose an interval of a day, week, month, three-month, year or other defined by the user. If the latter is selected, a window such as the one below will be displayed in order to manually choose the interval:




The '*Back*' and '*Next*' buttons will allow us to move forward or back, selecting the previous or following one respectively. The '*Go to*' button will allow us to specify a specific day of the calendar.

# 9 SCADA

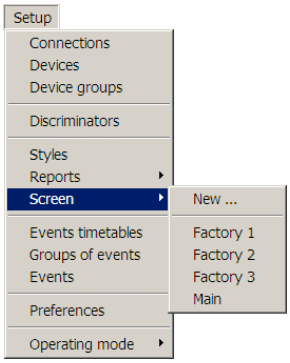
The SCADA allows us to display one or more windows, with or without a background image, incorporating display controls, thus converting the PC into a powerful and versatile synoptic table of the installation.

The purpose is to generate an application, made up of one or more screens, which can work autonomously in the defined installation.

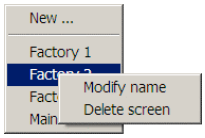
A standard application would be made up of a main screen which will be used as the base upon which others will appear in line with needs at each moment. The number of screens is only limited by the conditions of the PC in which the program is running.

## 9.1 Adding or Removing a Screen

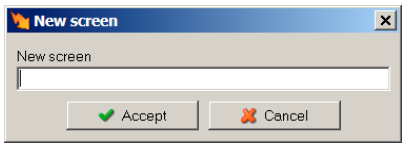
To create, modify or delete screens in the SCADA, click on the option '*Screen*' in the '*Setup*' menu. Several options will be displayed, depending on the existence of previously created SCADA screens.




As we can see in the figure, we have the option '*New*', which allows us to create a new screen followed by the names of the screens created up until this moment (where appropriate). Right click on any of the existing screens to access the options to modify names and delete screens.




If we have selected the option '*New*', a window will appear in which we can choose the name of the new screen to create. This name will uniquely identify the SCADA screen.




If you have selected the option '*New*' or any of the already existing screens, the SCADA screen design window will open.

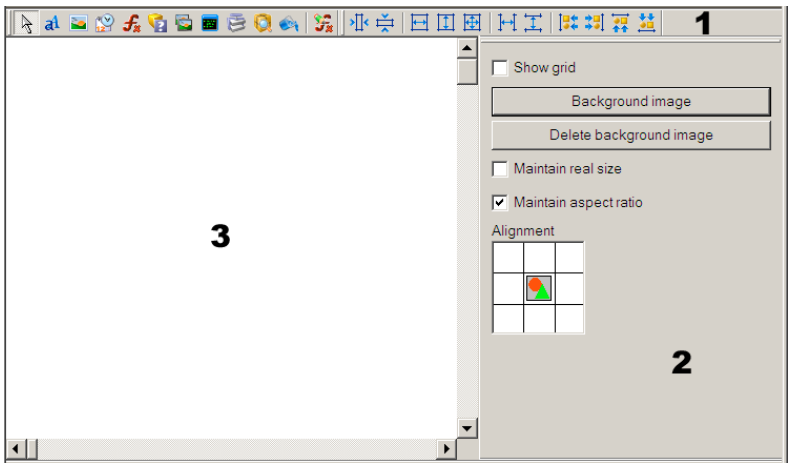
## 9.2 Editing SCADA Screens

You must be in edit working mode in order to edit screens.

We can use the screen edit to add, modify or delete screen controls. These controls can display the value of a variable, carry out different actions, colour in an area of the screen, etc.

The aim of the screen is to display the status of the installation in a simple matter, allowing us to see the situation of the different lines of the plant, show the electrical variables of the installation, etc. To this end we shall use the screen controls.

The SCADA screen edit window appears as follows:




The window is divided into three areas:

- Tools (1)
- Information panel (2)
- SCADA screen (3)

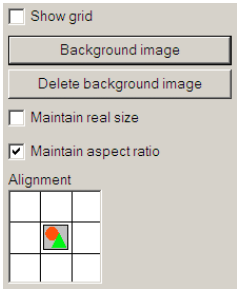
The tools allow us to configure the design of the SCADA screens in a simpler way.

The information panel will allow us to access all the configuration options of a control which is being added to the design of the SCADA screen and which is selected at this moment.

The SCADA screen is the design view, from where the controls will be implemented.

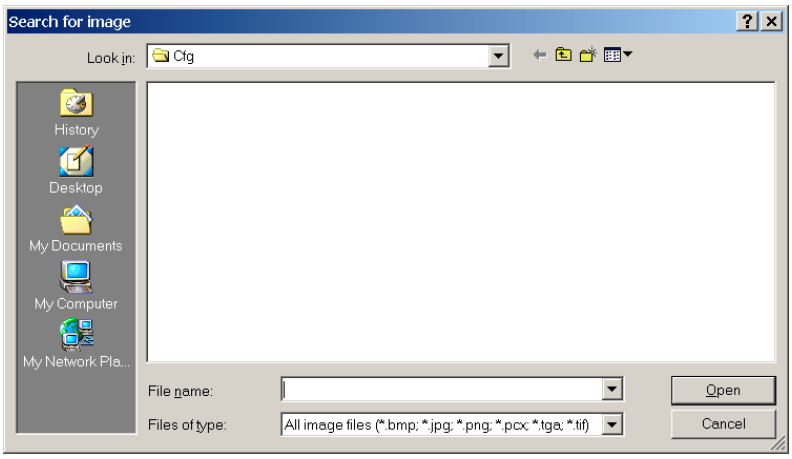
In this manner, we can use the tools (1) to insert controls in the SCADA screen (3), the properties for which can be configured in the information panel(2).

When a new SCADA screen is created, the defect configuration properties for the SCADA screen background will be displayed in the information panel. These properties are the same as those which appear if, at any moment, there is no control selected.

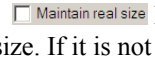


The option '*Show grid*' allows us to display or hide the help grid for the positioning of objects on screen. If the grid is displayed, the objects will be automatically aligned at the points of the grid.

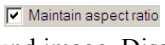
We can use this option to select an image to appear as a background for the SCADA screen.



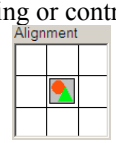
Clicking on this button will delete the current background image.



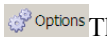
If this option is enabled, the picture configured for the background image will be displayed in real size. If it is not enabled, it will be adapted to the margins of the SCADA screen.



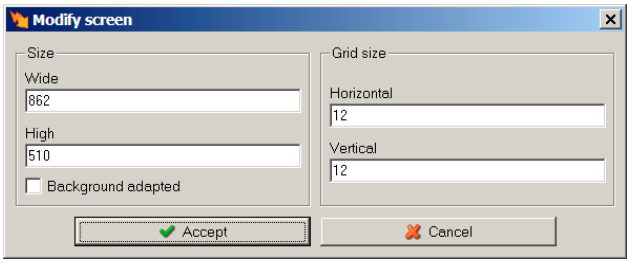
When enabled, this option will maintain the proportional width and height of the selected background image. Disabling will force the image to occupy the whole width and height of the SCADA screen, expanding or contracting its size as appropriate.

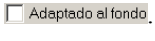


Allows us to situate the image chosen as background in any of the seven positions defined in the figure.



This button (located in the upper toolbar) allows us to configure the characteristics of the grid and the size of the SCADA screen we are detailing:




The width and height of the screen are measured in pixels and the size of the grid will specify, in pixels, the distance between one point of the grid and another in horizontal or vertical. If a background image is selected, the size of the SCADA screen can be adapted to the size of this background by checking the box 

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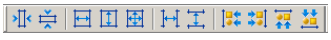
With regards to the tools, there are several kinds grouped together in accordance with their use:

- Actions Tools
- Position Tools 

## 9.2.1 Actions Tools

The following actions tools have been explained in chapter 8 Reports.

- *Select controls*: see section 8.2.1.1
- *Text control*: see section 8.2.1.2
- *Image control*: see section 8.2.1.3
- *Date control*: see section 8.2.1.4
- *Formula control*: see section 8.2.1.5
- *Conditional control*: see section 8.2.1.6
- *Configure formula*: see section 8.2.5

### 9.2.1.1 Screen Control

This tool allows us to include access to another SCADA screen on the SCADA screen. The properties which can be configured from this control are:

Here the destination screen accessed when clicking on the control inserted in the SCADA screen is specified.

### 9.2.1.2 Run Control

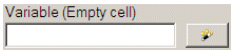
This tool allows us to include access to another application present in the system in the SCADA screen. The properties which can be configured from this control are:

Here the complete path of the application to be called when clicking on the control inserted in the SCADA screen is specified. For example: C:\WINDOWS\SYSTEM32\CALC.EXE.

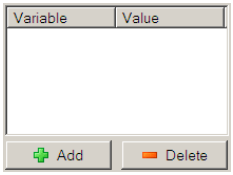
This will specify parameters (where necessary) to be added to the application call indicated in '*Program*'.

### 9.2.1.3 Force Variables Control

This tool will allow us to force the value of the variables which can be forced, such as those in the equipment with digital outputs. The properties which can be configured from this control are:



Here the variable at which the value will be forced is specified. This can be entered manually or using the wizard button (see appendix 14.2 Expressions and Conditions).



Once the variable is specified, clicking on the '*New*' button will add this variable to the list of forced variables. In order to delete a condition from the list, simply select it and click on the '*Delete*' button. All the variables in the list at the moment we click on the control in run mode will be forced to the status established in each of the same, defined below.

Here the action to be carried out when the control is enabled in run mode (open or close) is specified. This selector will appear when the values to which it is possible to force the variable is a specific values list (for example, for a digital output the options will be open or close). If, on the other hand, the variable can be forced to any value (for example a counter) a field will be displayed in which to manually enter the said value.

### 9.2.1.4 Display Control

This tool allows us to display screens of values of devices, reports, alarms, etc. The properties which can be configured from this control are:

This drop-down list can be used to select the types of data to be displayed. Depending on the option chosen, a series of secondary options will be displayed:

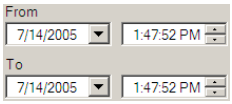
- ***Devices***: By selecting this option, the control will become a shortcut to the screens showing the variables of a device. The options available will be:

  
  By way of this drop-down menu, we can choose the device for which the variables screen will be displayed when clicking on the control in run mode.

- ***Reports:*** By selecting this option, the control will become a shortcut to a previously defined report (see chapter 8). The options available will be:

  
  Here the report to be displayed when clicking on the control in run mode is chosen.

  
  We can also choose the type of group for the data to be shown in the report. Selecting the *'User defined'* option will bring up the following fields

  Here the period for which the report is to be displayed is specified.

- ***Active events***: By using this option, the control will become a shortcut to the active events display window (see 10.5 Active Events).

- ***Events Viewer***: By using this option, the control will become a shortcut to the display window for the events stored in the files. The options available will be:

  
  This will correspond to the events group for which the registers are to be filtered.

  
  We can also choose the type of group for the data to be shown in the graphs or tables.

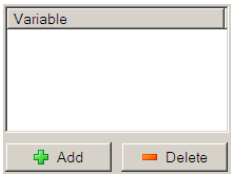
  
  The total count list can be directly displayed or not (see 10.6 Events Viewer).

- ***Values***: By using this option, the control will be used to make a graph or a table of one or several variables of one or several pieces of equipment. The options available will be:

  
  We can choose between graph and table.

  
  We can also choose the type of group for the data to be shown in the graphs or tables.

  
  Likewise, the period of the samples for the graphs or tables can be specified.



Here the variables to be represented by way of a graph or a table will be added. Clicking on the 'Add' button allows us to select the variables we wish to add (see section 5 Selection of Variables).

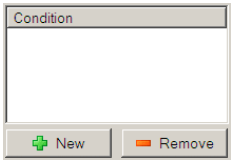
Once selected, the variables appearing in the list can be deleted using the button

.

### 9.2.1.5 Floodfill Control

The floodfill control allows us to change the colour of the uniform background areas or wallpaper image (which have all the pixels of the same colour), whether regular or irregular. The edit mode appearance will be
, showing the pixel point from which the filling of the area will start. In run mode this will not be displayed, changing the colour of the zone started by the pixel shown by the point in edit mode. The properties which can be configured from this control are:

Here the condition which must been fulfilled for the application to paint the zone in the selected colour in run mode is specified. This can be entered manually or using the wizard button
(see appendix14.2 Expressions and Conditions).



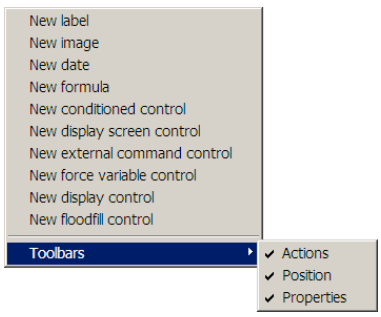
Once the condition is specified , clicking on the '*New*' button will add the condition to the list of conditions. In order to delete a condition from the list, simply select it and click on the *'Remove'* button. When there is more than one condition in the list, the control is enabled when one or more conditions are fulfilled.

Allows us to choose which colour will be used for filling in.

If this box is enabled, it will show, in edit mode, a simulation of the end floodfill control result, painting the filling area as would be the case in run mode if the selected condition is fulfilled.

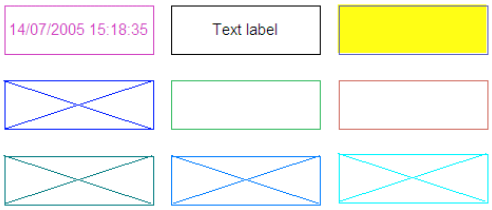
### 9.2.1.6 Common Action Tools Options

You can also right click on the SCADA screen in order to add controls. Similarly, we can show or hide the toolbars:

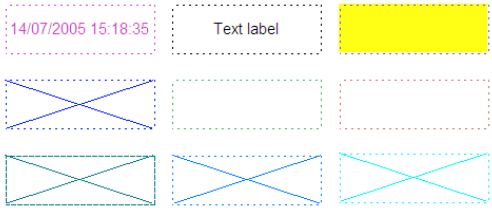


Any control inserted in the SCADA screen can be resized and moved. In order to resize a control, simply place the mouse pointer on one side of the control rectangle and keep it pressed down whilst moving in the desired direction. In order to move a control, keep the left mouse button pressed down and move the mouse in the required direction. It is also possible to move more than one control at the time, grouping them together within a rectangle. In order to group together two or more controls, keep the left button of the mouse pressed down and move the mouse to draw a rectangle which contains the controls to be moved.

The controls inserted in a SCADA screen have the following appearance in normal mode:




When the controls are selected, a dotted line is shown around the same:



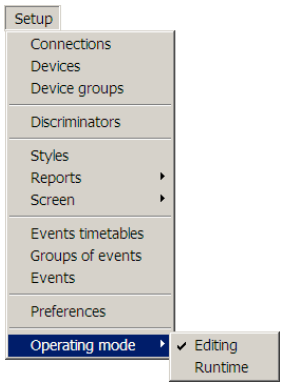

In order to delete a control inserted in the SCADA screen, select it and use the option '*Cut*' from the '*Edit*' menu, or press the *Delete* key. This menu includes the options '*Copy*' and '*Paste*' which, as their names indicate, can be used to make duplicates of controls by way of cut and paste.

### 9.2.2 Position Tools

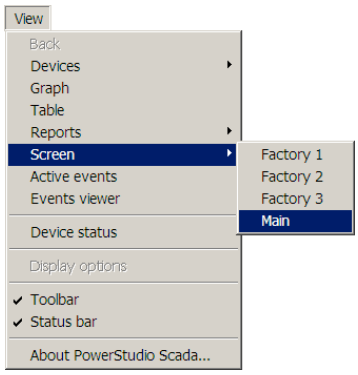
The working of the positioning tools is the same as explained in chapter 8.2.2 but applied to the SCADA screen controls.

## 9.3 Displaying SCADA Screens

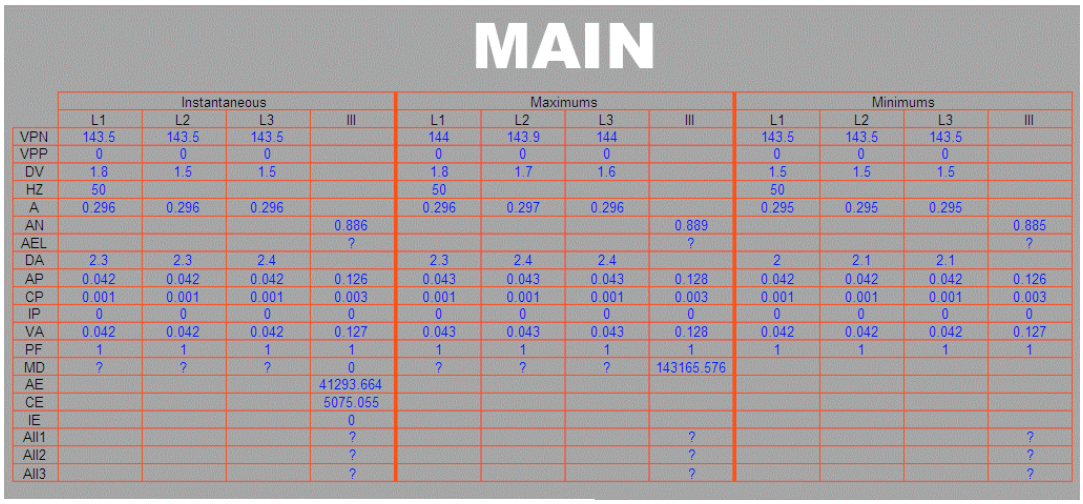
In order to display a SCADA screen, change the working mode from '*Editing*' to '*Runtime'*. This change is carried out through the menu Setup->Operating mode:




Once in '*Runtime*' mode, the option '*Screen*' in the '*View*' menu will be enabled:




This option can be used to display the SCADA screens configured in edit mode. When accessing any of the screens created, the same will be shown on screen in display mode.

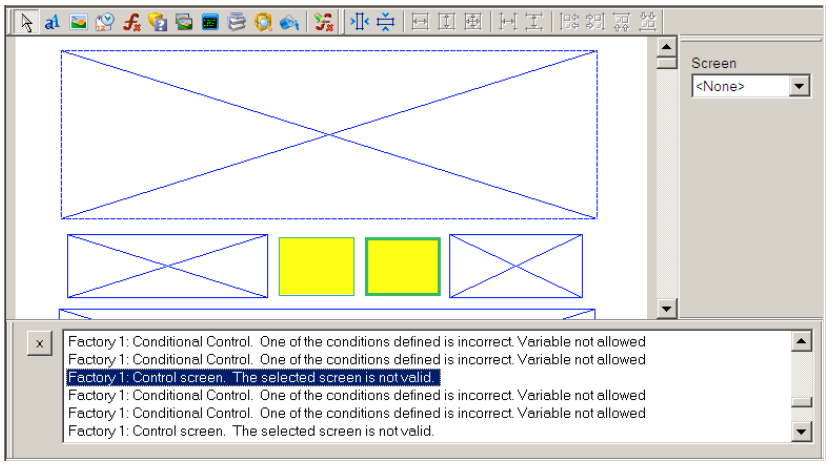



| | Instantaneous | | | | Maximums | | | | Minimums | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L1 | L2 | L3 | III | L1 | L2 | L3 | III | L1 | L2 | L3 | III |
| VPN | 143.5 | 143.5 | 143.5 | | 144 | 143.9 | 144 | | 143.5 | 143.5 | 143.5 | |
| VPP | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | |
| DV | 1.8 | 1.5 | 1.5 | | 1.8 | 1.7 | 1.6 | | 1.5 | 1.5 | 1.5 | |
| HZ | 50 | | | | 50 | | | | 50 | | | |
| A | 0.296 | 0.296 | 0.296 | | 0.296 | 0.297 | 0.296 | | 0.295 | 0.295 | 0.295 | |
| AN | | | | 0.886 | | | | 0.889 | | | | 0.885 |
| AEL | | | | ? | | | | ? | | | | ? |
| DA | 2.3 | 2.3 | 2.4 | | 2.3 | 2.4 | 2.4 | | 2 | 2.1 | 2.1 | |
| AP | 0.042 | 0.042 | 0.042 | 0.126 | 0.043 | 0.043 | 0.043 | 0.128 | 0.042 | 0.042 | 0.042 | 0.126 |
| CP | 0.001 | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.003 |
| IP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VA | 0.042 | 0.042 | 0.042 | 0.127 | 0.043 | 0.043 | 0.043 | 0.128 | 0.042 | 0.042 | 0.042 | 0.127 |
| PF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MD | ? | ? | ? | 0 | ? | ? | ? | 143165.576 | | | | |
| AE | | | | 41293.664 | | | | | | | | |
| CE | | | | 5075.055 | | | | | | | | |
| IE | | | | 0 | | | | | | | | |
| All1 | | | | ? | | | | ? | | | | ? |
| All2 | | | | ? | | | | ? | | | | ? |
| All3 | | | | ? | | | | ? | | | | ? |

When moving to run mode, it will be necessary to generate the application for operation in real time. When generating the application, the program will create a binary file with all the SCADA configuration, whether screens, styles or controls. The generation of the application will be carried out automatically when moving from edit mode to run mode, or when, having started the program in run mode, there is no application binary file, or the same is invalid.

When the application is generated, the existence of possible errors in the SCADA screens is checked. Once generated, if there are any errors, the program will give the possibility of displaying the said errors and correcting them. If there are any errors in the generated application, it is possible that in real time the behaviour of the controls with errors is not as desired, for which reason we recommend generating applications without errors.

An example of a screen with errors would be:




The lower list shows the different errors found in any of the screens of the application.

The error information is made up of the name of the screen, the control which has caused the error and a brief description of the error encountered.

When double-clicking on one of the error lines, the program will go automatically to the screen where the error is located and select the control where the said error is detected.

# 10 Events

The program will only show events when it is in run mode; edit mode is where we add, modify or delete the different events used to alert of possible dangerous or exceptional statuses of the installation.

The events may be notified. In this case, the events will be shown by way of a pop-up screen at the moment of activation, with this remaining on screen until recognised and disabled.

Moreover, we can define a disable timetable for each event. In other words, we can define in which periods the event will not be valid, and hence will not be taken into account in the software.

It will also be possible to associate an annotation every time the event is enabled, in order to, for example, save the value of a variable which has caused the event.

Finally, for each of the possible event statuses, we can define a series of actions which the software will run whilst the event is in each of the said states. The possible states will be:

*Activation*: This will come about when the condition of event is fulfilled. For example, a value has exceeded an established limit.

*While is active*: This will come about whenever the condition of event is fulfilled, once the event has been enabled.

*Recognition*: This will come about when the operator carries out any event recognition action. This status will only be possible if the event is notified.

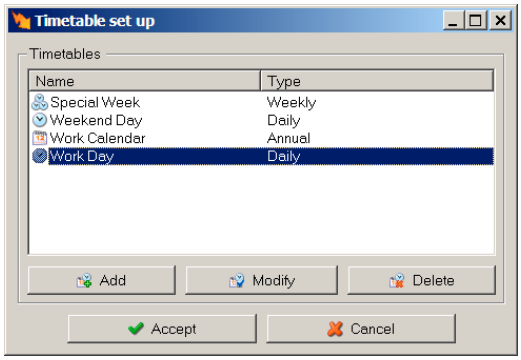
*Disable or restore*: This comes about when the condition of event ceases to exist. For example: if we defined an event such as the variable exceeding a specific value, disabling will take place at the moment it no longer exceeds the said value.

## 10.1 Events Timetables

We can define a disable timetable for each event. In this case, the time zones in which the event will not be taken into account will be marked.

The zones in which the event will not be taken into account will be shown in the timetables. Unless otherwise indicated (in other words the zones are not configured), the event will be taken into account and the program will supervise the status of the event, assessing the condition configured in the event.

In order to configure the events, click on the option '*Events timetables*' in the '*Setup*' menu. The following dialogue will appear:



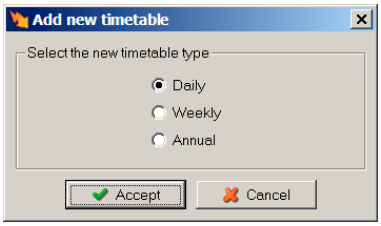

Here we can see the different timetables configured. We can configure 3 types of different timetables

*Daily*: The disable zones of a day are configured.

*Weekly*: The disable zones of a week are configured. When selecting the different days of the week, the previously configured '*Daily*' types will be used.

*Annual*: The disable zones are configured by way of a calendar. As with the '*Weekly*' type, the days will be selected from the previously configured '*Daily*' types.

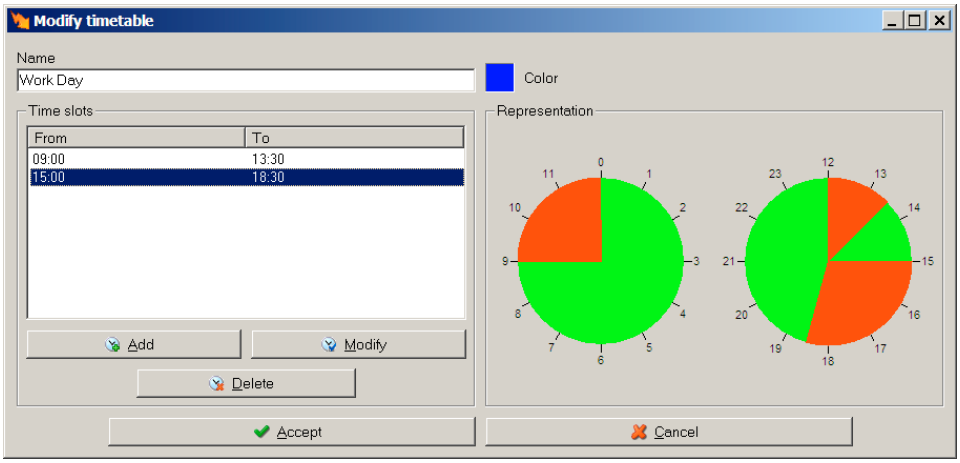
Clicking on the button '*Add*' will bring up the following dialogue:




Here the type of timetable to be added is selected. Once added, the type of timetable cannot be changed. If we add a '*Daily*' type, clicking on the '*Modify*' button will modify the '*Daily*' type, not allowing us to change to another type such as '*Weekly*' or '*Annual*'.

### 10.1.1 Daily

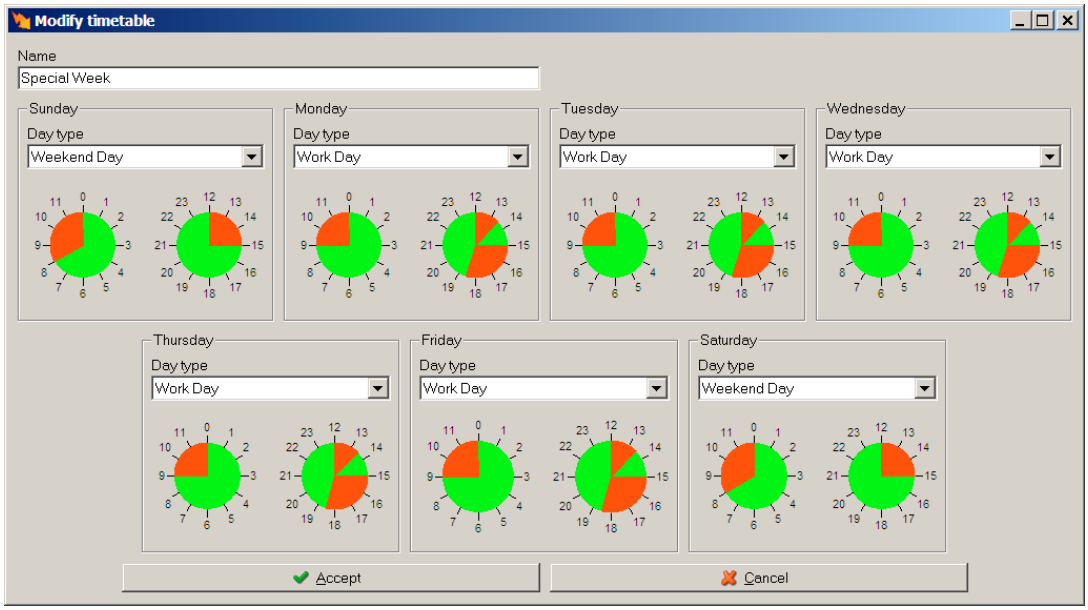
This type of timetable will correspond to a day. In the events which have a daily type selected, the disable zones will be the same for all days.



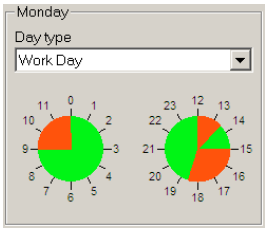

The working of the configuration of the types of day is the same as explained for the types of day of the discriminators (see 7.1.2 Types of Day), with the difference that we do not have different types of hours, but rather the timetable interval is established without taking into account the events (zones marked in red in the representation of the day).

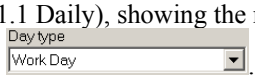
## 10.1.2 Weekly

This type of timetable will correspond to a week. In the events which have this week type selected, the disable zones will be the same for all weeks of the year.



Alphanumeric data which allows us to uniquely identify the type of week within the events times.



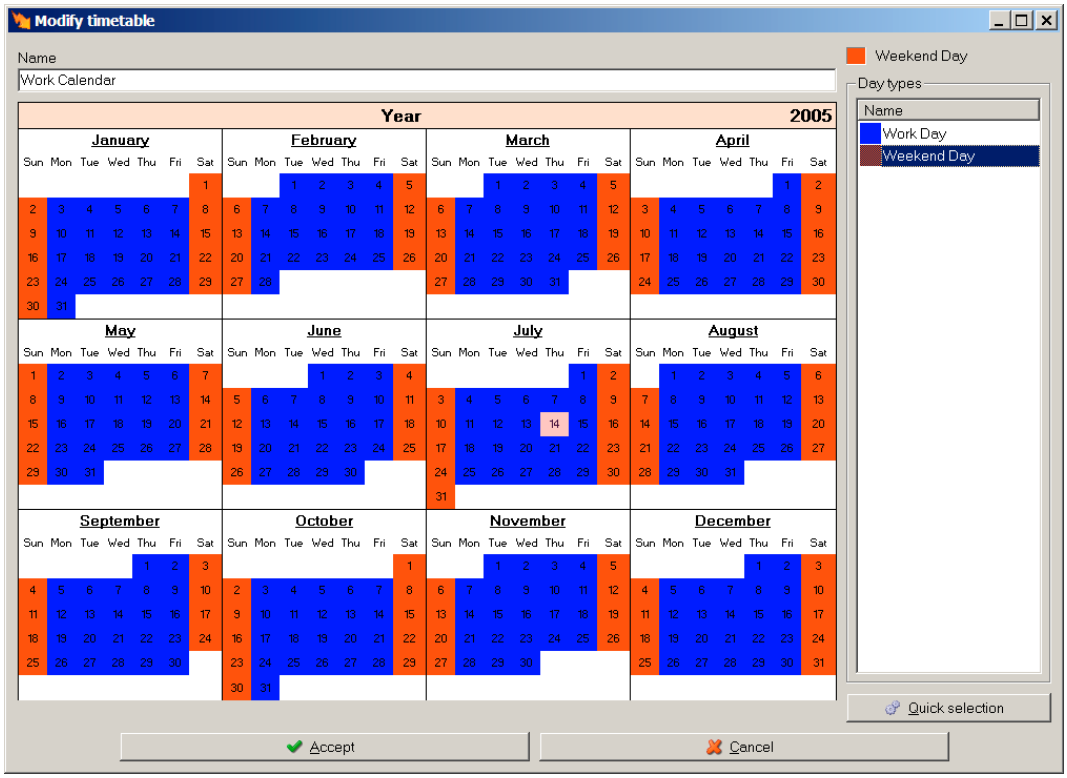

Configuration for each of the 7 days of the week, where the '*Day type*' selector will contain the different types of days configured (see 10.1.1 Daily), showing the representation of the type of day selected. It is also possible not to select any type of day 

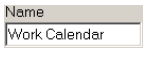
. In this case the event will not be disabled during this day.

## 10.1.3 Annual

This type of timetable will correspond to a calendar, in which we can configure the different types of days for several years.

As is the case with the weekly type, the different types of day which can be selected will correspond to the different configured daily types.



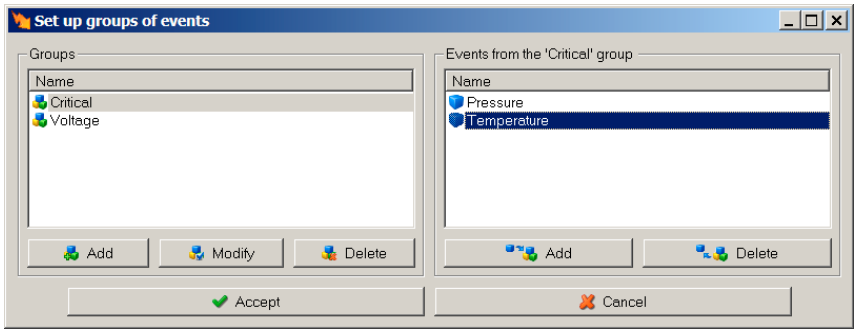




Alphanumeric data which allows us to uniquely identify the type of year within the events times.

The working of the configuration of the calendar is the same as explained for the calendar of the discriminators (see 7.1.3 Calendar).

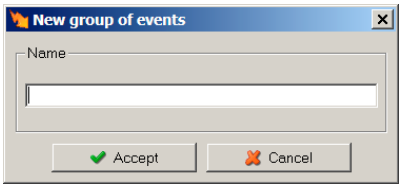
## 10.2 Groups of Events

In order to better display the time when showing the events viewer, allowing us to filter and only show a type of events, the events can be classified in groups, allowing one same event to be assigned to more than one group. The option '*Groups of events*' of the '*Setup*' menu allows us to configure the different events groups.



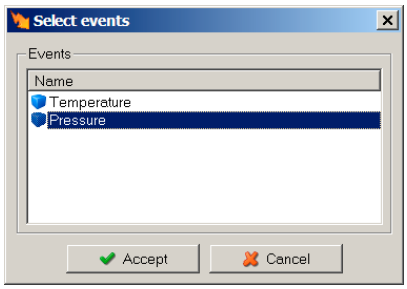

The list to the left shows all the groups of events configured, whilst the list to the right shows the events which have been assigned to the group selected in the groups list.

Allow us to add, modify or delete events groups. Adding or modifying will bring up the following dialogue:



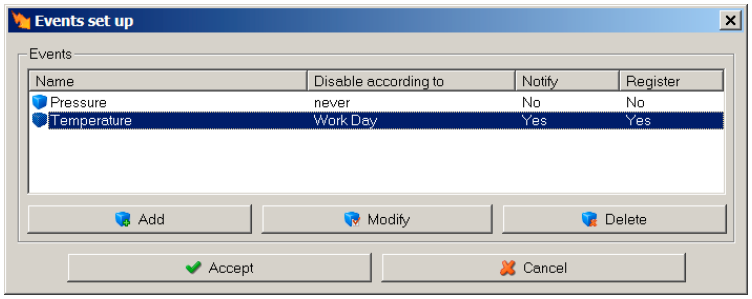

In which to enter the name of the event. This name will uniquely identify the group.

Allow us to add or delete events from the events group selected in the groups list. Deleting an event from the group will only eliminate it from the group, in no case will it be completely eliminated from the events configuration. Clicking on the '*Add*' button will bring up a list with the events which do not belong to the group, where the events to be added can be selected.



## 10.3 Events Configuration

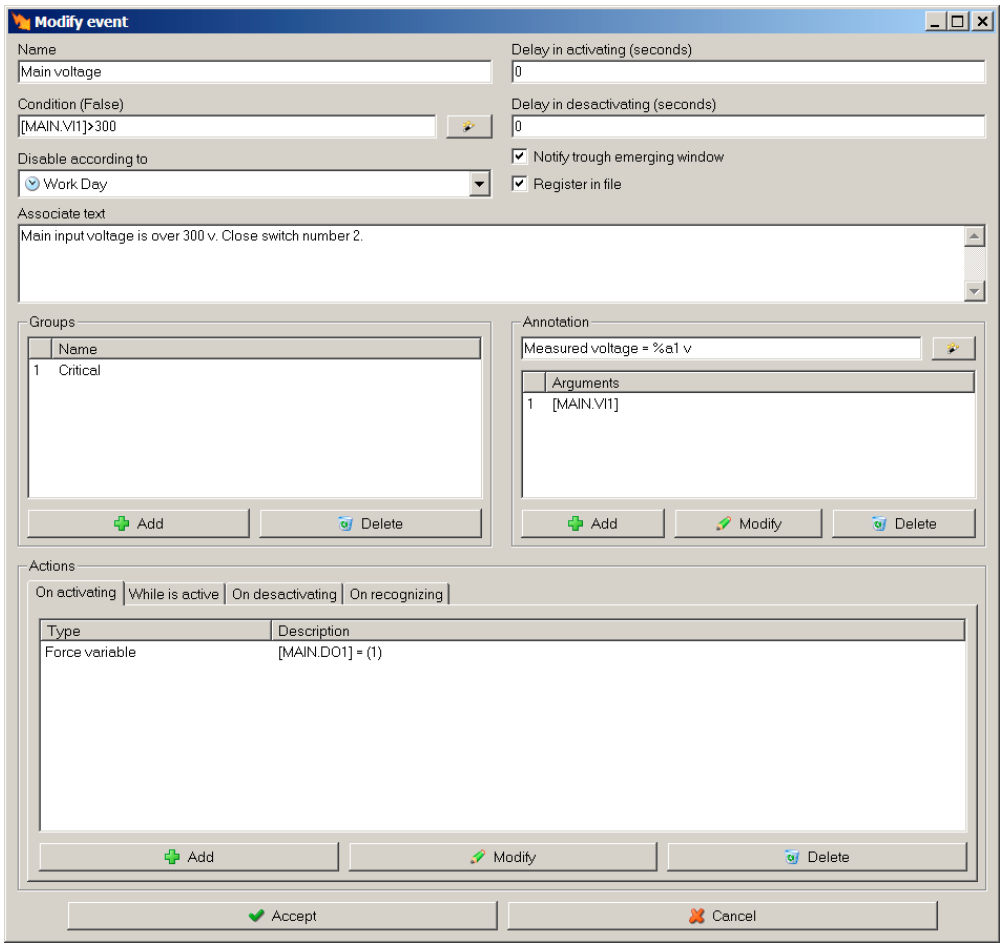
In order to add, modify or delete events, the '*Events*' option must be selected in the '*Setup*' menu. The following dialogue will appear:




Here the configured events are displayed; the disable timetable will be notified and finally registered.

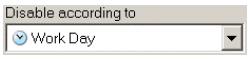
By clicking on '*Delete*', the events selected in the events list will be deleted.

By clicking on '*Add*' or '*Modify*', a new event will be created or an existing event will be modified. The following dialogue is used to create or modify an event.

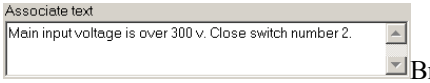


Name which will uniquely identify the event in the application

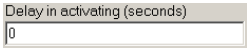
Condition of the event. The event will be enabled when the condition is true, remaining disabled if not. This can be entered manually or using the wizard button (see section 14.2.1 Wizard for the Creation of Expressions and Conditions)



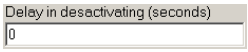
Allows us to select the disable timetable of the event. Should no timetable be selected, the event will always be supervised by the application. Should an event have a disable timetable selected, if the event is active and the timetable is disabled, the event will be disabled.



Brief description of the event.



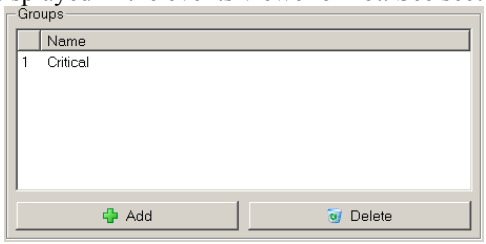
This value corresponds to the delay in the enabling of the event in seconds. The event will be enabled whenever the activation condition comes about during at least the time indicated in this field. For example: if the activation delay is 5 seconds, in order to activate the event the activation condition must come about during at least 5 consecutive seconds; if the condition were to be fulfilled during 4 seconds, the event would not be enabled.



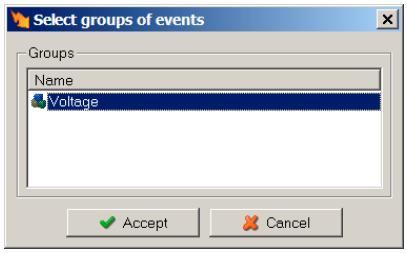
This value corresponds to the delay in the disabling of the event in seconds. The event will be disabled when, being enabled, the activation condition is not fulfilled during at least the time indicated in this field, as is the case with the delay in the activation.

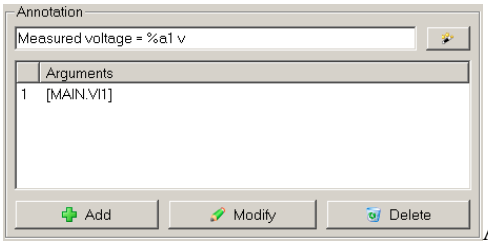
Checking or unchecking this box will indicate whether the event should be notified or not. Should the event be notified, when enabled the program will display a pop-up screen, see section 10.4 Activation of Notified Events.

Checking or unchecking this box will indicate whether the event will be registered or not, and hence whether it can be displayed in the events viewer or not. See section 10.6 Events Viewer

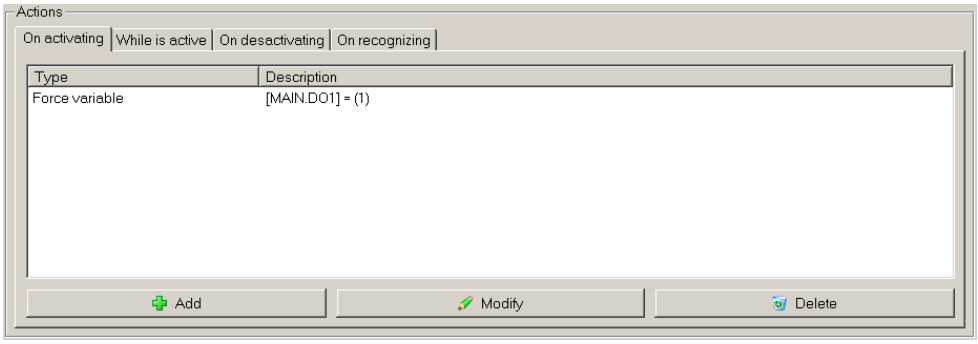



Here we can see the list of groups to which the event belongs (see 10.2 Groups of Events). Clicking on the ‘Add’ button will bring up a dialogue with the list of groups to which the event does not belong, allowing the selection of the groups to which you wish to add the event.






Allows us to configure an annotation which will be calculated at the moment of activation of the event, which can be used, for example, to know the value detected of a variable which has caused the event to be enabled. The annotations will be explained in more detail in section 10.3.1 Annotation.




This allows us to configure a series of actions for each event status. The actions will be explained in more detail in section 10.3.2 Actions.

## 10.3.1 Annotation

The annotation of an event will correspond to a text, with a series of variable parameters, which shall be associated to the activation of an event.

The parameters will be replaced by their corresponding value when the event is enabled, for which reason two different annotations may exist for two different activations of one single event.

As was previously explained, one of the uses of the annotations is to register the value of a specific variable at the moment of activation of the event, thus allowing us to display extra information in the events viewer.

Described below are the different parameters which can be used in the annotation.

| Parameter | Description |
|---|---|
| %n | Name of the event |
| %c | Condition of the event |
| %b | Delay in enabling |
| %e | Delay in disabling |
| %d | Name of the disable timetable |
| %t | Text associated to the event |
| %gx | Name of the group x, in which x will be the order of the group within the list of groups. The order will be shown with a number to the left of the group name. |
| %ax | Argument x, in which x will be the order of the argument within the arguments list . The order will be shown with a number to the left of the group name. The arguments will be explained in more detail section 10.3.1.1 Arguments. |
| %% | Character% |

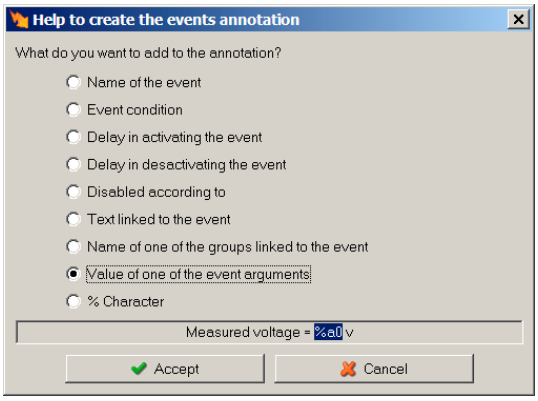
Each of these parameters will be replaced correspondingly when the event is enabled, for example if the annotation is:

***The event called '%n' was enabled when the voltage was %a1 V.***

When the event is enabled, the annotation created for this activation will be specifically:

***The event known as 'Main voltage' was enabled when the voltage showed 256 V.***

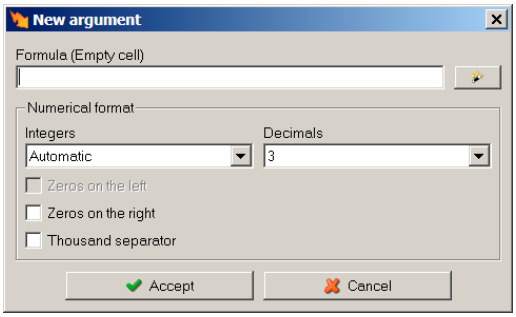
In order to facilitate the creation of the annotation, click on the wizard button to bring up the following dialogue:




Here we can select the type of parameter to be added to the annotation.

### 10.3.1.1 Arguments

In order to create the annotation, a series of arguments can be defined. Each argument will consist of a formula and the representation format of the value of the formula, as can be seen in the following dialogue:




Both the formula and the numerical format were described previously in 8.2.1.5 Formula Control.

When the event is enabled, if the argument is used for the creation of the annotation, the program will assess the formula and represent it in accordance with the configured format.

## 10.3.2 Actions

For each event, it is possible to define a series of actions to be carried out in each event status.

In accordance with the status of the event, the actions will be divided into:

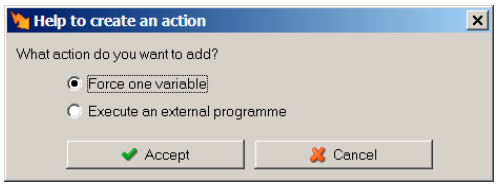
*On activating*: These actions are only run once, when the event is enabled.

*While is active*: Whilst the event is active, this group of actions will be constantly run. Remember to take care when configuring the actions, since, as they are continually running, they could block the system or the connected devices.

*On desactivating*: These actions are only run once, when the event is disabled.

*On recognizing*: These actions are only run once, when the operator recognises the event. This group of actions is only available when the event needs to be notified.

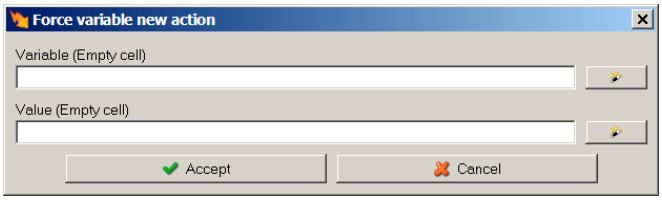
Adding an action will bring up the following dialogue:




This dialogue should be used to select the type of action to be carried out. Once selected, click on the '*Accept*' button to bring up the window corresponding to the type of action added.

### 10.3.2.1 Forcing a Variable

This type of action will allow us to change the value of a variable, such as a digital output or a counter.

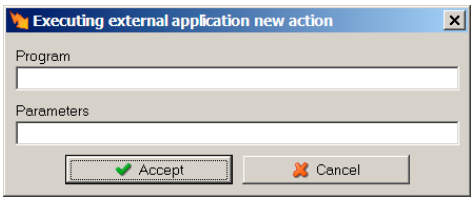



In order to configure the action, enter an expression, which will correspond to the variable we wish to force, and another expression which will correspond to the value at which we wish to force the variable.

Both the expression of the variable and the value can be entered manually or using the corresponding wizard .

### 10.3.2.2 Running an External Program

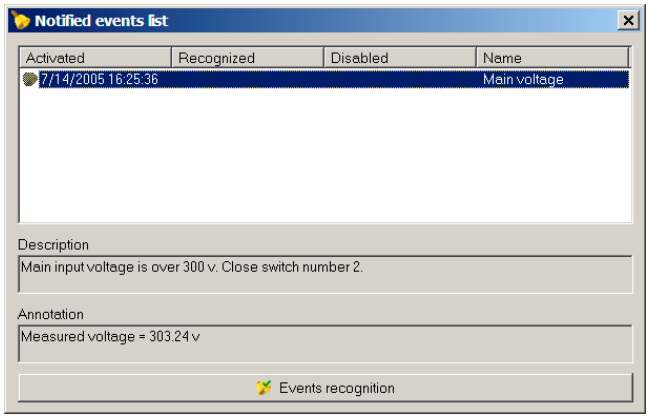
This action will allow us to run an external application that is present in the system, such as, for example, listening to an audio file.




The full application path must be configured, as this will be called on when the action is run (for example: C:\WINDOWS\SYSTEM32\CALC.EXE") and specify the parameters (where appropriate) which will be added to the application call.

## 10.4 Activation of Notified Events

When an event condition which must be notified is fulfilled (only in runtime mode), a window with the list of notified events automatically opens, with one or more events enabled. This list will remain open until all the notified events are recognised and disabled.



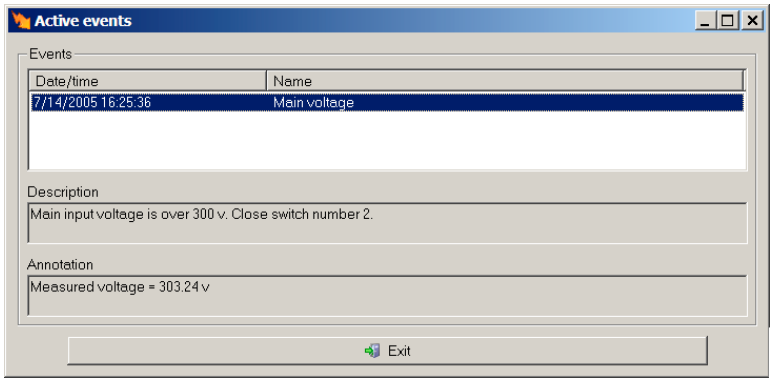

The first column corresponds to the date and time of activation of the event, the second one corresponds to the date and time of recognition of the event (if this column is empty, it will mean that the event has not been recognised), whilst the third column corresponds to the disable time and date. The final column corresponds to the event name, for identification. The event will not disappear from the list until it is recognised and disabled, it being possible to have a disabled but non-recognised event.

When selecting an event, the lower tables will show the description of the event, and, if configured, the annotation for this event at the moment of activation.

Clicking on the '*Events recognition*' button will recognise the pending events which have been selected in the list of notified events.

## 10.5 Active Events

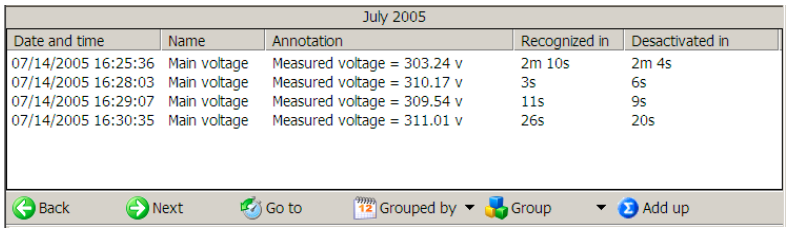
It is also possible to display the list of all the active events (both notified and non-notified) by selecting the option '*Active events*' in the '*View*' menu. A window such as the following will open:




Here we can see the events which are enabled: the date and time at which the event came about, and its name. If we select an event from the list, its description will appear, along with the annotation, if necessary.

## 10.6 Events Viewer

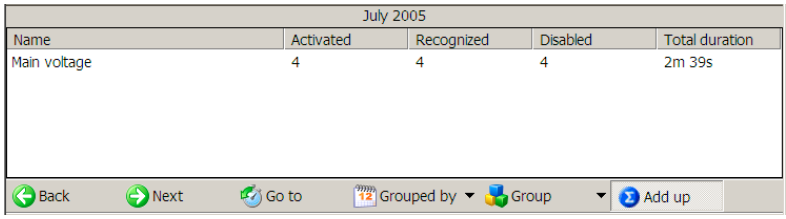
In order to display the events stored in files, select the option '*Events viewer*' in the '*View*' menu.




The information of the events viewer can be displayed in two different manners, detailed or total. The first of these (see previous image) will correspond to a detailed list of all the events which have come about. The columns of this list will indicate the following:

- *Date and time*: This corresponds to the date and time of activation of the event.
- *Name*: Event identifier.
- *Annotation*: Annotation generated in the activation of the event, provided the event has a configured annotation.
- *Recognized in*: Time, in seconds, taken to recognise the event. If this field is blank, it will mean that the alarm has not been recognised. If the event has not been notified, '<not applied>' will appear, indicating that the event will not be recognised due to it not being notified.
- *Desactivated in*: Time, in seconds, taken to disable the event. If this field is blank, it will mean that the event has not been disabled (if it is the last event registration) or that the program could not detect when the event was disabled.

The second way to display the events viewer data will show how many times each event has been enabled, recognised and disabled.




The columns of this list will indicate the following:

- *Name*: Event identifier.
- *Activated*: Shows the number of times the event has been enabled.
- *Recognized*: Shows the number of times the event has been recognised in those events which have been notified. If the event is not notified, '<not applied>' will be displayed.
- *Disabled*: Shows the number of times the event has been disabled.
- *Total duration*: Accumulated time, in seconds, passed between all enabling and disabling of the events. Here we can calculate the time the enabling and disabling of the event came about. If the number times it has been enabled is greater than the

number of times it has been disabled, the accumulated time will only be of those events for which the disabling and, in consequence, the time passed between enabling and disabling, are known.

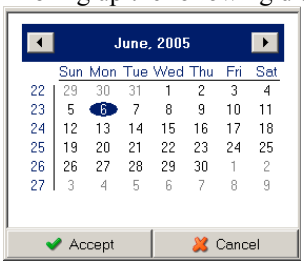
## 10.6.1 Event Viewer Toolbar

This toolbar allows us to group together values, display different time periods, go to a specific time period, etc.

'*Back*': The events viewer will show the events of the previous period. For example, if we display the events by weeks, the events for the previous week will be displayed.

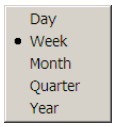
'*Next*': The events viewer will show the events of the next period. For example, if we display the events by weeks, the events for the next week will be displayed.

'*Go to*': Clicking on this option will bring up the following dialogue:



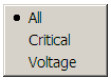

Where we can select the day to be displayed. If, for example, we display events by weeks, the week containing the selected day will be displayed.

'*Grouped by*': Clicking on this option will bring up the following menu:




Here we can choose the period of time for the events viewer to show. For example, if we select '*Month*', the events viewer will display the events corresponding to a month.

'*Group*': Clicking on this option will bring up a menu with the defined events groups:




Here we can choose the group to filter the data in the events viewer. For example: if we select '*Critical*', only those events corresponding to the group 'Critical' will be displayed. In order to display all the events, select the option '*All*'.

'*Add up*': This changes the events viewer from detailed list to total list.

# 11 DDE - Dynamic Data Exchange.

Any Windows-based application which has DDE functions can establish Dynamic Data Exchange links with PowerStudio.

DDE (Dynamic Data Exchange) is a Windows protocol between applications. We can act in client mode (request data from other applications) and/or server mode (supply data to other applications). The PowerStudio program acts in server mode, in other words, once a communication has been established with another Windows application (Excel, Paradox, Word, Programs in C, Visual Basic, etc.) PowerStudio provides this with the values read in the drivers. In this manner, for example, we can see voltage, current, etc, in real time and in Excel.

Those applications which allow us to force a value through the DDE can modify a parameter of the driver, for example digital outputs internal registers, etc.

The DDE communication which is established has the following characteristics:

☞ The link which is established is of the *hotlink* kind. In other words, PowerStudio warns the client applications when the data have changed, with the latter requesting the same when necessary.

☞ The program can send data via DDE to several applications, the only limitation being the memory capacity of the PC.

☞ A link for each of the requested variables is established for each client.

☞ The DDE protocol basically involves three elements: the ***Conversation***, the ***topic***, and the ***item***.

***Conversation*** The *Conversation* is a text, distinguished in the applications, which has to be unique per application. This means that questions and answers from different applications are not crossed. In our case it is: "**PWSTDValues**". For example "=**PWSTDValues**|Device1!VI1".

***Topic*** The *Topic*, as is the case with the *Item*, does not have a specific meaning, but rather depends on the use given to it by each application. In the case of PowerStudio, the *Topic* identifies the device from which we wish to obtain information. For example "=PWSTDValues|**Device1**!VI1". When the name of the device contains spaces (Device 1), this must be indicated between single inverted commas (') "=PWSTDValues|**'Device1'**!VI1"

***Item*** The *Item* is the element which the applications request, voltage phase 1, frequency, relay status, etc. For example "=PWSTDValues|Device1!**VI1"**.

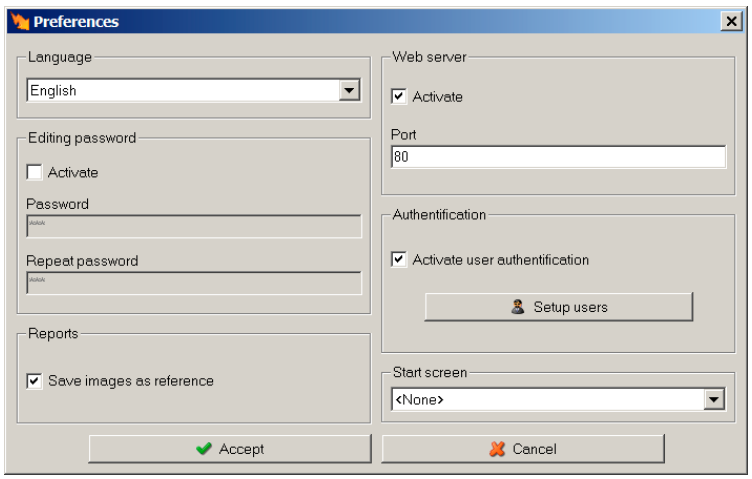
In appendix 14.1 Variables are details of the expression which should be used to access the variables of the devices.

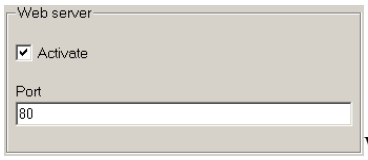
# 12 Remote Access to the Application Using JAVA

PowerStudio has a function which allows users to access SCADA screens and display the instantaneous values which are being measured by the devices through a remote connection. We can also make graphs and access the lists of registered values using the equipment.

## 12.1 Enable Web Server

This function is enabled using the option '*Preferences*' in the '*Setup*' menu.




We can enable

or disable

the possibility of using the application as a Web server. In '*Port*' we can specify the port to be enabled for access from the remote computer (by defect 80).

***Note***: We recommend keeping the defect port (80), unless the computer running PowerStudio is a Web server. In this case we can use any available port.

***Note***: If the box '*Activate user authentification*' is checked, all access restrictions to device values screens, SCADA screens, etc, will be applied to the remote user of the application trying to access the same.

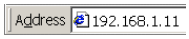
Switch to '*Runtime*' mode in order to enable the Web server.

## 12.2 Establish Remote Connection

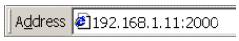
In order to use remote access, both computers (the server with PowerStudio installed, with the Web server enabled, and the computer to be used to establish the client connection) must be in the same network or connected to the Internet and accessible using routers (ask the systems administrator if this communication exists or is possible).

The remote application works by way of a Java applet. If the computer does not have Java installed, you can download the modules necessary when accessing each application window in which they are necessary.

In order to access the application remotely, it is necessary to open the Internet browser which is installed on the system (Internet Explorer, Netscape, Mozilla, etc.) and, if the defect port has been set in the PowerStudio configuration (80), simply write the IP address of the server computer in the browser's address bar.




If you have specified a different connection port (not 80), you must add the chosen port number, preceded by ":", to the end of the IP address.




A window such as the following will open:

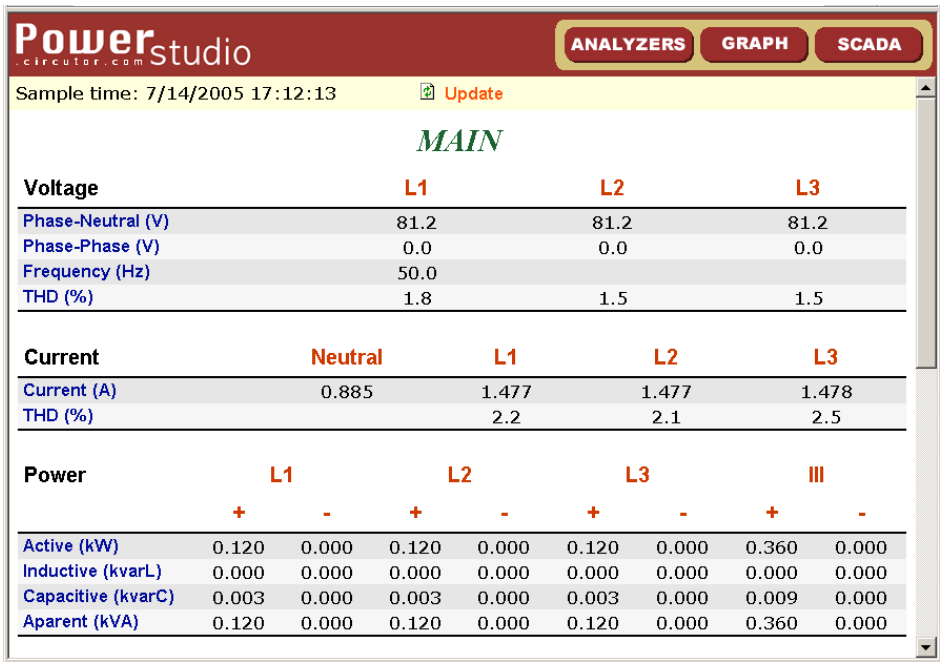
Here we can begin to interact with the application.

### 12.2.1 Analyzers

Clicking on the '*Analyzers*' button in the main remote application window will open a new window in which we can select a device from amongst those configured in the system.

If we have devices groups, these will be shown in a tree structure, allowing us to open each branch to display the devices included in each group or subgroup.

'*Close*' will close the device selection window, whilst clicking on any of the devices listed will open up the values screen of the same in the main application window.




| Voltage | L1 | L2 | L3 |
|---|---|---|---|
| Phase-Neutral (V) | 81.2 | 81.2 | 81.2 |
| Phase-Phase (V) | 0.0 | 0.0 | 0.0 |
| Frequency (Hz) | 50.0 | | |
| THD (%) | 1.8 | 1.5 | 1.5 |

| Current | Neutral | L1 | L2 | L3 |
|---|---|---|---|---|
| Current (A) | 0.885 | 1.477 | 1.477 | 1.478 |
| THD (%) | | 2.2 | 2.1 | 2.5 |

| Power | L1 | | L2 | | L3 | | III | |
|---|---|---|---|---|---|---|---|---|
| | + | - | + | - | + | - | + | - |
| Active (kW) | 0.120 | 0.000 | 0.120 | 0.000 | 0.120 | 0.000 | 0.360 | 0.000 |
| Inductive (kvarL) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Capacitive (kvarC) | 0.003 | 0.000 | 0.003 | 0.000 | 0.003 | 0.000 | 0.009 | 0.000 |
| Aparent (kVA) | 0.120 | 0.000 | 0.120 | 0.000 | 0.120 | 0.000 | 0.360 | 0.000 |

The upper left hand part of the window will show the date and time of the data displayed. In order to update the data, click on '*Update*' (located in the upper central section of the window).

In order to display the values of another device, we need to access the '*Analyzers*' window again and select another device.

## 12.2.2 Graph

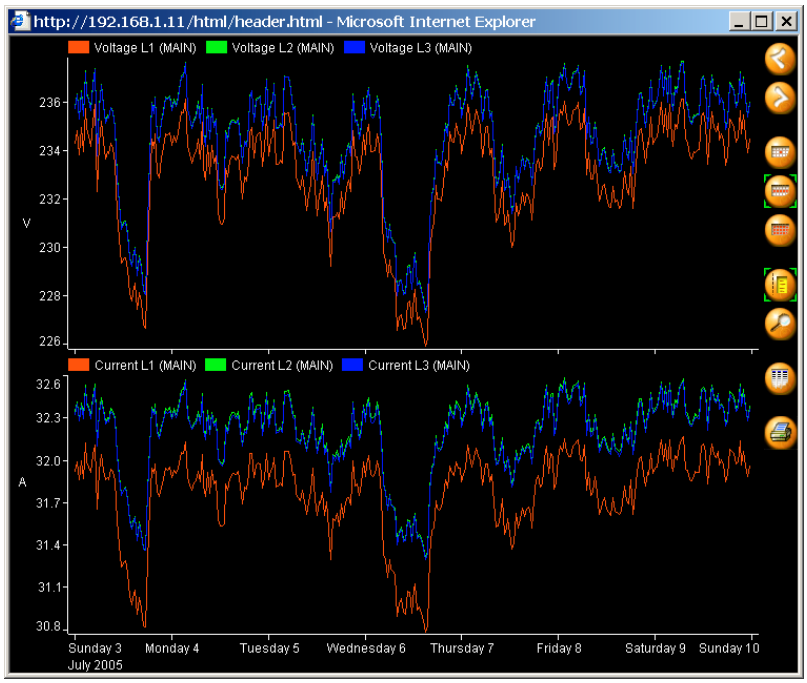
The remote access can also be used to recover the data registered by the devices in the server equipment by way of the carrying out of graphs or tables.

In order to make a graph, it is necessary to first select the variables which are going to form part of the same.

In order to select a variable, simply click on the value which represents it. This value will then light up. If we wish to unselect the variable, simply click on the value again.

It is possible to select more than one variable at a time. For example, if we wish to select all the power variables of phase L1, simply click on '*L1*' in the section '*Power*'. Similarly, in order to select all the variables of the different active power phases, simply click on '*Active*' in the same section, '*Power*'.

Once all the desired variables have been selected, (maximum 25), click on '*Graph*' to access the graph window.




Depending on the number of variables selected and their type, one or more axes will be created in which to represent the values.

The right-hand part of the window will show several controls which allow us to interact with the graph:

B*ack*: The graph will display the values of the previous period. For example, if we display the values by weeks, the values for the previous week will be displayed.

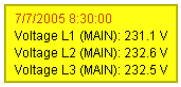
F*orward*: The graph will display the values of the next period. For example, if we display the values by weeks, the values for the next week will be displayed.

Grouped *by day*: Select one day as the period of time to display in the graph.

Grouped *by week*: Select one week as the period of time to display in the graph.

Grouped *by month*: Select one month as the period of time to display in the graph.

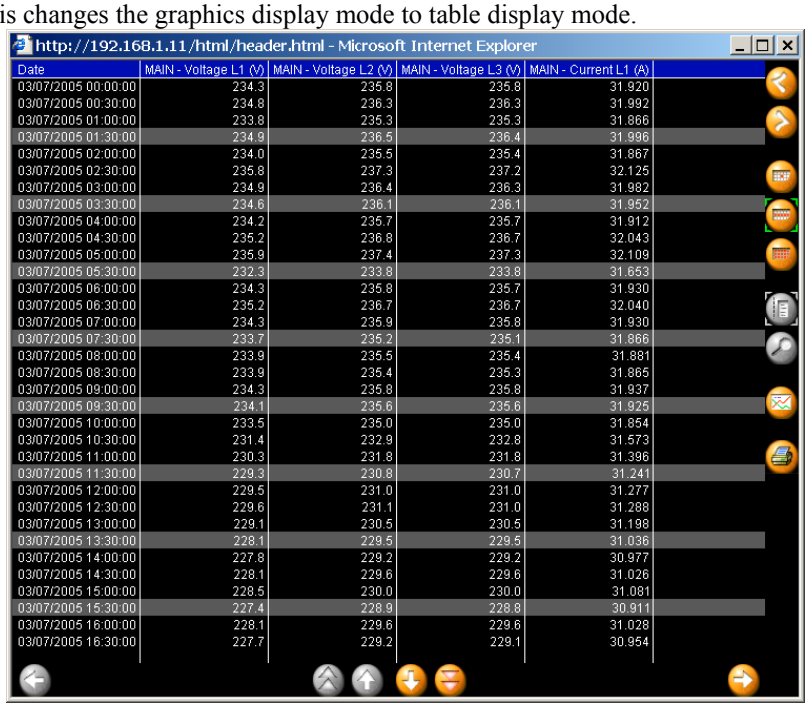
S*ee values*: If this option is enabled, clicking on any point of the graph will bring up a label with information on the value of the variables at this point (date, time and values).



*Zoom in*: If this option is enabled, we can zoom in on the graph using the aforementioned method of drawing a rectangle in the desired zoom area whilst keeping the left mouse button pressed down. If

we have used the zoom, this button will change to , which can be used to return the graph to its original state.

List: This changes the graphics display mode to table display mode.



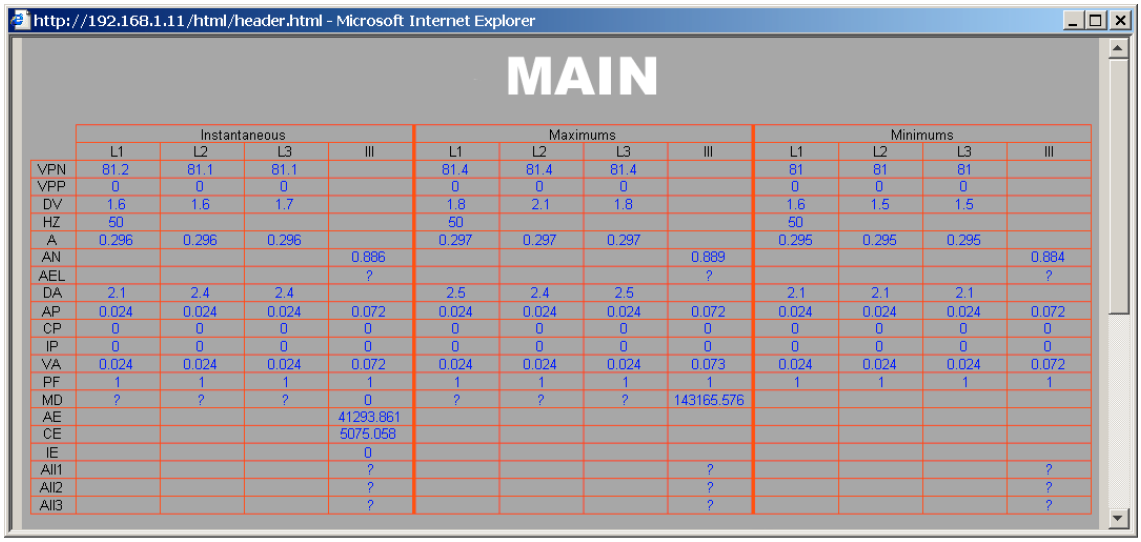

| Date | MAIN - Voltage L1 (V) | MAIN - Voltage L2 (V) | MAIN - Voltage L3 (V) | MAIN - Current L1 (A) |
|---|---|---|---|---|
| 03/07/2005 00:00:00 | 234.3 | 235.8 | 235.8 | 31.920 |
| 03/07/2005 00:30:00 | 234.8 | 236.3 | 236.3 | 31.992 |
| 03/07/2005 01:00:00 | 233.8 | 235.3 | 235.3 | 31.866 |
| 03/07/2005 01:30:00 | 234.9 | 236.5 | 236.4 | 31.996 |
| 03/07/2005 02:00:00 | 234.0 | 235.5 | 235.4 | 31.867 |
| 03/07/2005 02:30:00 | 235.8 | 237.3 | 237.2 | 32.125 |
| 03/07/2005 03:00:00 | 234.9 | 236.4 | 236.3 | 31.982 |
| 03/07/2005 03:30:00 | 234.6 | 236.1 | 236.1 | 31.952 |
| 03/07/2005 04:00:00 | 234.2 | 235.7 | 235.7 | 31.912 |
| 03/07/2005 04:30:00 | 235.2 | 236.8 | 236.7 | 32.043 |
| 03/07/2005 05:00:00 | 235.9 | 237.4 | 237.3 | 32.109 |
| 03/07/2005 05:30:00 | 232.3 | 233.8 | 233.8 | 31.653 |
| 03/07/2005 06:00:00 | 234.3 | 235.8 | 235.7 | 31.930 |
| 03/07/2005 06:30:00 | 235.2 | 236.7 | 236.7 | 32.040 |
| 03/07/2005 07:00:00 | 234.3 | 235.9 | 235.8 | 31.930 |
| 03/07/2005 07:30:00 | 233.7 | 235.2 | 235.1 | 31.866 |
| 03/07/2005 08:00:00 | 233.9 | 235.5 | 235.4 | 31.881 |
| 03/07/2005 08:30:00 | 233.9 | 235.4 | 235.3 | 31.865 |
| 03/07/2005 09:00:00 | 234.3 | 235.8 | 235.8 | 31.937 |
| 03/07/2005 09:30:00 | 234.1 | 235.6 | 235.6 | 31.925 |
| 03/07/2005 10:00:00 | 233.5 | 235.0 | 235.0 | 31.854 |
| 03/07/2005 10:30:00 | 231.4 | 232.9 | 232.8 | 31.573 |
| 03/07/2005 11:00:00 | 230.3 | 231.8 | 231.8 | 31.396 |
| 03/07/2005 11:30:00 | 229.3 | 230.8 | 230.7 | 31.241 |
| 03/07/2005 12:00:00 | 229.5 | 231.0 | 231.0 | 31.277 |
| 03/07/2005 12:30:00 | 229.6 | 231.1 | 231.0 | 31.288 |
| 03/07/2005 13:00:00 | 229.1 | 230.5 | 230.5 | 31.198 |
| 03/07/2005 13:30:00 | 228.1 | 229.5 | 229.5 | 31.036 |
| 03/07/2005 14:00:00 | 227.8 | 229.2 | 229.2 | 30.977 |
| 03/07/2005 14:30:00 | 228.1 | 229.6 | 229.6 | 31.026 |
| 03/07/2005 15:00:00 | 228.5 | 230.0 | 230.0 | 31.081 |
| 03/07/2005 15:30:00 | 227.4 | 228.9 | 228.8 | 30.911 |
| 03/07/2005 16:00:00 | 228.1 | 229.6 | 229.6 | 31.028 |
| 03/07/2005 16:30:00 | 227.7 | 229.2 | 229.1 | 30.954 |

The controls '*See values*' and '*Zoom in*'. The controls to move about the table and to move about the different selected variables are enabled . In order to return to the graph display mode, simply click on .

*Print*: This will open the print preferences window, in order to print the graph or table which is being displayed.

## 12.2.3 SCADA

Another of the remote access functions is to enable access to SCADA screens defined in the server equipment. Clicking on the '*SCADA*' button we can access the main screen of the SCADA (defined in preferences).




| | Instantaneous | | | | Maximums | | | | Minimums | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L1 | L2 | L3 | III | L1 | L2 | L3 | III | L1 | L2 | L3 | III |
| VPN | 81.2 | 81.1 | 81.1 | | 81.4 | 81.4 | 81.4 | | 81 | 81 | 81 | |
| VPP | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | |
| DV | 1.6 | 1.6 | 1.7 | | 1.8 | 2.1 | 1.8 | | 1.6 | 1.5 | 1.5 | |
| HZ | 50 | | | | 50 | | | | 50 | | | |
| A | 0.296 | 0.296 | 0.296 | | 0.297 | 0.297 | 0.297 | | 0.295 | 0.295 | 0.295 | |
| AN | | | | 0.886 | | | | 0.889 | | | | 0.884 |
| AEL | | | | ? | | | | ? | | | | ? |
| DA | 2.1 | 2.4 | 2.4 | | 2.5 | 2.4 | 2.5 | | 2.1 | 2.1 | 2.1 | |
| AP | 0.024 | 0.024 | 0.024 | 0.072 | 0.024 | 0.024 | 0.024 | 0.072 | 0.024 | 0.024 | 0.024 | 0.072 |
| CP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VA | 0.024 | 0.024 | 0.024 | 0.072 | 0.024 | 0.024 | 0.024 | 0.073 | 0.024 | 0.024 | 0.024 | 0.072 |
| PF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MD | ? | ? | ? | 0 | ? | ? | ? | 143165.576 | | | | |
| AE | | | | 41293.861 | | | | | | | | |
| CE | | | | 5075.058 | | | | | | | | |
| IE | | | | 0 | | | | | | | | |
| AII1 | | | | ? | | | | ? | | | | ? |
| AII2 | | | | ? | | | | ? | | | | ? |
| AII3 | | | | ? | | | | ? | | | | ? |

The function of the SCADA screens remotely accessing the application is the same as when accessing the same from the equipment where PowerStudio is running.

# 13 System Requirements

Microsoft Windows versions NT, 2000, XP.

PC Pentium II 350 MHz or greater.

128 MB of RAM memory (minimum, we recommend 256 MB).

50 MB of hard drive free.

CD-ROM drive.

Monitor SVGA 1024x768 or bigger.

Windows compatible mouse.

In multi-user systems (Windows NT, 2000 and XP) the software will only work correctly if installed as administrator or user with administrator privileges.

# 14 Appendices

## 14.1 Variables

In order to use references to the variables measured by the devices in SCADA, reports, graphs and tables, it is necessary to know the encoding used by the software for each of the same.

The basic encoding is made up of the device name and the variable code separated by a point.

*name.variable*

In this manner, the software will know which variable is involved and which device should be asked for the value of the said variable.

This encoding (name-variable) can be used in the formulae, graphs and tables, although in the case of reports, graphs and tables we can only display the variables which have been saved in values log files.

On those occasions on which we wish to discriminate a variable, provided the variable can be discriminated, for instance in the case of energy, the discriminator information will be added to the basic encoding.

*discrimiantor_name@hour_type_name#name.variable*

Here the name of the discriminator to be used and the name of the type of hour upon which the variable values will be discriminated are indicated.

This type of encoding with discriminators can only be used in reports, graphs and tables, and with variables which have been saved in values of log files.

For better understanding, the variables will be shown in separate tables, depending on the type of variable measured by the devices. The columns situated to the left will correspond to the type of variable: whether the variable is instantaneous, maximum or minimum, the phase to which it corresponds, or any other information depending on the variable, and finally the code used (for example the instantaneous phase-neutral voltage of phase 1 will correspond to code VI1). On the other hand, the columns situated to the right of each table will correspond to the devices which can measure each of the variables, indicating by way of an ‘X’ if the variable will be measured by the device, and by way of an ‘O’ if the variable will be measured depending on the version of the device.

## 14.1.1 Voltage

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase-neutral voltage | Inst. | L1 | VI1 | X | X | X | X | X | X | X | X | X | X |
| | | L2 | VI2 | X | X | X | X | X | X | X | X | X | |
| | | L3 | VI3 | X | X | X | X | X | X | X | X | X | |
| | | III | VI | | | | X | | X | | X | | |
| | Max. | L1 | VMX1 | | X | X | | X | | | X | X | X |
| | | L2 | VMX2 | | X | X | | X | | | X | X | |
| | | L3 | VMX3 | | X | X | | X | | | X | X | |
| | | III | VMX | | | | | | | | X | | |
| | Min. | L1 | VMN1 | | X | X | | X | | | X | X | |
| | | L2 | VMN2 | | X | X | | X | | | X | X | |
| | | L3 | VMN3 | | X | X | | X | | | X | X | |
| | | III | VMN | | | | | | | | X | | |

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase-phase voltage | Inst. | L1 | VI12 | X | X | X | X | X | X | X | X | X | |
| | | L2 | VI23 | X | X | X | X | X | X | X | X | X | |
| | | L3 | VI31 | X | X | X | X | X | X | X | X | X | |
| | | III | VI123 | | | | X | | | | | | |
| | Max. | L1 | VMX12 | | X | X | | X | | | X | X | |
| | | L2 | VMX23 | | X | X | | X | | | X | X | |
| | | L3 | VMX31 | | X | X | | X | | | X | X | |
| | | III | VMX123 | | | | | | | | | | |
| | Min. | L1 | VMN12 | | X | X | | X | | | X | X | |
| | | L2 | VMN23 | | X | X | | X | | | X | X | |
| | | L3 | VMN31 | | X | X | | X | | | X | X | |
| | | III | VMN123 | | | | | | | | | | |

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage distortion | Inst. | L1 | DVI1 | | X | X | O | X | O | X | X | X | |
| | | L2 | DVI2 | | X | X | O | X | O | X | X | X | |
| | | L3 | DVI3 | | X | X | O | X | O | X | X | X | |
| | Max. | L1 | DVMX1 | | X | X | | X | | | X | X | |
| | | L2 | DVMX2 | | X | X | | X | | | X | X | |
| | | L3 | DVMX3 | | X | X | | X | | | X | X | |
| | Min. | L1 | DVMN1 | | X | X | | X | | | X | X | |
| | | L2 | DVMN2 | | X | X | | X | | | X | X | |
| | | L3 | DVMN3 | | X | X | | X | | | X | X | |

## 14.1.2 Current

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current | Inst. | L1 | AI1 | X | X | X | X | X | X | X | X | X | X |
| | | L2 | AI2 | X | X | X | X | X | X | X | X | X | |
| | | L3 | AI3 | X | X | X | X | X | X | X | X | X | |
| | | III | AI | | | | X | | X | | X | X | |
| | Max. | L1 | AMX1 | | X | X | | X | | | X | X | X |
| | | L2 | AMX2 | | X | X | | X | | | X | X | |
| | | L3 | AMX3 | | X | X | | X | | | X | X | |
| | | III | AMX | | | | | | | | X | X | |
| | Min. | L1 | AMN1 | | X | X | | X | | | X | X | |
| | | L2 | AMN2 | | X | X | | X | | | X | X | |
| | | L2 | AMN3 | | X | X | | X | | | X | X | |
| | | III | AMN | | | | | | | | X | X | |

| | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neutral current | Instantaneous | ANI | | O | O | O | O | O | | X | X | |
| | Maximum | ANMX | | O | O | | O | | | X | X | |
| | Minimum | ANMN | | O | O | | O | | | X | X | |

| | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stray current | Instantaneous | AELI | | O | | | | | | | | |
| | Maximum | AELMX | | O | | | | | | | | |
| | Minimum | AELMN | | O | | | | | | | | |

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current Distortion | Inst. | L1 | DAI1 | | X | X | O | X | O | X | X | X | |
| | | L2 | DAI2 | | X | X | O | X | O | X | X | X | |
| | | L3 | DAI3 | | X | X | O | X | O | X | X | X | |
| | Max. | L1 | DAMX1 | | X | X | | X | | | X | X | |
| | | L2 | DAMX2 | | X | X | | X | | | X | X | |
| | | L3 | DAMX3 | | X | X | | X | | | X | X | |
| | Min. | L1 | DAMN1 | | X | X | | X | | | X | X | |
| | | L2 | DAMN2 | | X | X | | X | | | X | X | |
| | | L3 | DAMN3 | | X | X | | X | | | X | X | |

## 14.1.3 Frequency

| | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM K HAR | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Instantaneous | HZI | X | X | X | X | X | X | X | X | X | X |
| | Maximum | HZMX | | X | X | | X | | | X | X | X |
| | Minimum | HZMN | | X | X | | X | | | X | X | |

## 14.1.4 Power

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apparent Power | Generated | Inst. | L1 | VAI1 | X | X | X | X | X | X | X | X | |
| | | | L2 | VAI2 | X | X | X | X | X | X | X | X | |
| | | | L3 | VAI3 | X | X | X | X | X | X | X | X | |
| | | | III | VAI | X | X | X | X | X | X | X | X | |
| | | Max. | L1 | VAMX1 | | X | X | | X | | X | X | |
| | | | L2 | VAMX2 | | X | X | | X | | X | X | |
| | | | L3 | VAMX3 | | X | X | | X | | X | X | |
| | | | III | VAMX | | X | X | | X | | X | X | |
| | | Min. | L1 | VAMN1 | | X | X | | X | | X | X | |
| | | | L2 | VAMN2 | | X | X | | X | | X | X | |
| | | | L3 | VAMN3 | | X | X | | X | | X | X | |
| | | | III | VAMN | | X | X | | X | | X | X | |
| | Consumed | Inst. | L1 | NVAI1 | | | | | | | X | X | |
| | | | L2 | NVAI2 | | | | | | | X | X | |
| | | | L3 | NVAI3 | | | | | | | X | X | |
| | | | III | NVAI | | | | | | | X | X | |
| | | Max. | L1 | NVAMX1 | | | | | | | X | X | |
| | | | L2 | NVAMX2 | | | | | | | X | X | |
| | | | L3 | NVAMX3 | | | | | | | X | X | |
| | | | III | NVAMX | | | | | | | X | X | |
| | | Min. | L1 | NVAMN1 | | | | | | | X | X | |
| | | | L2 | NVAMN2 | | | | | | | X | X | |
| | | | L3 | NVAMN3 | | | | | | | X | X | |
| | | | III | NVAMN | | | | | | | X | X | |

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Active power | Generated | Inst. | L1 | API1 | X | X | X | X | X | X | X | X | X |
| | | | L2 | API2 | X | X | X | X | X | X | X | X | |
| | | | L3 | API3 | X | X | X | X | X | X | X | X | |
| | | | III | API | X | X | X | X | X | X | X | X | |
| | | Max. | L1 | APMX1 | | X | X | | X | | X | X | X |
| | | | L2 | APMX2 | | X | X | | X | | X | X | |
| | | | L3 | APMX3 | | X | X | | X | | X | X | |
| | | | III | APMX | | X | X | | X | | X | X | |
| | | Min. | L1 | APMN1 | | X | X | | X | | X | X | |
| | | | L2 | APMN2 | | X | X | | X | | X | X | |
| | | | L3 | APMN3 | | X | X | | X | | X | X | |
| | | | III | APMN | | X | X | | X | | X | X | |
| | Consumed | Inst. | L1 | NAPI1 | | | | | | | X | X | |
| | | | L2 | NAPI2 | | | | | | | X | X | |
| | | | L3 | NAPI3 | | | | | | | X | X | |
| | | | III | NAPI | | | | | | | X | X | |
| | | Max. | L1 | NAPMX1 | | | | | | | X | X | |
| | | | L2 | NAPMX2 | | | | | | | X | X | |
| | | | L3 | NAPMX3 | | | | | | | X | X | |
| | | | III | NAPMX | | | | | | | X | X | |
| | | Min. | L1 | NAPMN1 | | | | | | | X | X | |
| | | | L2 | NAPMN2 | | | | | | | X | X | |
| | | | L3 | NAPMN3 | | | | | | | X | X | |
| | | | III | NAPMN | | | | | | | X | X | |

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Capacitive power | Generated | Inst. | L1 | CPI1 | X | X | X | X | X | X | X | X | |
| | | | L2 | CPI2 | X | X | X | X | X | X | X | X | |
| | | | L3 | CPI3 | X | X | X | X | X | X | X | X | |
| | | | III | CPI | X | X | X | X | X | X | X | X | |
| | | Max. | L1 | CPMX1 | | X | X | | X | | X | X | |
| | | | L2 | CPMX2 | | X | X | | X | | X | X | |
| | | | L3 | CPMX3 | | X | X | | X | | X | X | |
| | | | III | CPMX | | X | X | | X | | X | X | |
| | | Min. | L1 | CPMN1 | | X | X | | X | | X | X | |
| | | | L2 | CPMN2 | | X | X | | X | | X | X | |
| | | | L3 | CPMN3 | | X | X | | X | | X | X | |
| | | | III | CPMN | | X | X | | X | | X | X | |
| | Consumed | Inst. | L1 | NCPI1 | | | | | | | X | X | |
| | | | L2 | NCPI2 | | | | | | | X | X | |
| | | | L3 | NCPI3 | | | | | | | X | X | |
| | | | III | NCPI | | | | | | | X | X | |
| | | Max. | L1 | NCPMX1 | | | | | | | X | X | |
| | | | L2 | NCPMX2 | | | | | | | X | X | |
| | | | L3 | NCPMX3 | | | | | | | X | X | |
| | | | III | NCPMX | | | | | | | X | X | |
| | | Min. | L1 | NCPMN1 | | | | | | | X | X | |
| | | | L2 | NCPMN2 | | | | | | | X | X | |
| | | | L3 | NCPMN3 | | | | | | | X | X | |
| | | | III | NCPMN | | | | | | | X | X | |

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inductive power | Generated | Inst. | L1 | IPI1 | X | X | X | X | X | X | X | X | |
| | | | L2 | IPI2 | X | X | X | X | X | X | X | X | |
| | | | L3 | IPI3 | X | X | X | X | X | X | X | X | |
| | | | III | IPI | X | X | X | X | X | X | X | X | |
| | | Max. | L1 | IPMX1 | | X | X | | X | | X | X | |
| | | | L2 | IPMX2 | | X | X | | X | | X | X | |
| | | | L3 | IPMX3 | | X | X | | X | | X | X | |
| | | | III | IPMX | | X | X | | X | | X | X | |
| | | Min. | L1 | IPMN1 | | X | X | | X | | X | X | |
| | | | L2 | IPMN2 | | X | X | | X | | X | X | |
| | | | L3 | IPMN3 | | X | X | | X | | X | X | |
| | | | III | IPMN | | X | X | | X | | X | X | |
| | Consumed | Inst. | L1 | NIPI1 | | | | | | | X | X | |
| | | | L2 | NIPI2 | | | | | | | X | X | |
| | | | L3 | NIPI3 | | | | | | | X | X | |
| | | | III | NIPI | | | | | | | X | X | |
| | | Max. | L1 | NIPMX1 | | | | | | | X | X | |
| | | | L2 | NIPMX2 | | | | | | | X | X | |
| | | | L3 | NIPMX3 | | | | | | | X | X | |
| | | | III | NIPMX | | | | | | | X | X | |
| | | Min. | L1 | NIPMN1 | | | | | | | X | X | |
| | | | L2 | NIPMN2 | | | | | | | X | X | |
| | | | L3 | NIPMN3 | | | | | | | X | X | |
| | | | III | NIPMN | | | | | | | X | X | |

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Power factor | Generated | Inst. | L1 | PFI1 | X | X | X | X | X | X | X | X | |
| | | | L2 | PFI2 | X | X | X | X | X | X | X | X | |
| | | | L3 | PFI3 | X | X | X | X | X | X | X | X | |
| | | | III | PFI | | X | X | X | X | X | X | X | |
| | | Max. | L1 | PFMX1 | | X | X | | X | | X | X | |
| | | | L2 | PFMX2 | | X | X | | X | | X | X | |
| | | | L3 | PFMX3 | | X | X | | X | | X | X | |
| | | | III | PFMX | | X | X | | X | | X | X | |
| | | Min. | L1 | PFMN1 | | X | X | | X | | X | X | |
| | | | L2 | PFMN2 | | X | X | | X | | X | X | |
| | | | L3 | PFMN3 | | X | X | | X | | X | X | |
| | | | III | PFMN | | X | X | | X | | X | X | |
| | Consumed | Inst. | L1 | NPFI1 | | | | | | | X | X | |
| | | | L2 | NPFI2 | | | | | | | X | X | |
| | | | L3 | NPFI3 | | | | | | | X | X | |
| | | | III | NPFI | | | | | | | X | X | |
| | | Max. | L1 | NPFMX1 | | | | | | | X | X | |
| | | | L2 | NPFMX2 | | | | | | | X | X | |
| | | | L3 | NPFMX3 | | | | | | | X | X | |
| | | | III | NPFMX | | | | | | | X | X | |
| | | Min. | L1 | NPFMN1 | | | | | | | X | X | |
| | | | L2 | NPFMN2 | | | | | | | X | X | |
| | | | L3 | NPFMN3 | | | | | | | X | X | |
| | | | III | NPFMN | | | | | | | X | X | |

## 14.1.5 Energies

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apparent Energy | Generated | III | VAE | | | | | | | X | X | |
| | Consumed | III | NVAE | | | | | | | X | X | |

| | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Active energy | Generated | | L1 | AE1 | X | | | | | | | | |
| | | | L2 | AE2 | X | | | | | | | | |
| | | | L3 | AE3 | X | | | | | | | | |
| | | | III | AE | X | X | X | X | X | O | X | X | X |
| | | | Tariff 1 | AET1 | | | | X | | O | | | |
| | | | Tariff 2 | AET2 | | | | O | | O | | | |
| | | | Tariff 3 | AET3 | | | | O | | O | | | |
| | | Contract 1 | Tariff y (y: 1..9) | AEC1Ty | X | | | | | | | | |
| | | | Total | AEC1TOT | X | | | | | | | | |
| | | Contract 2 | Tariff y (y: 1..9) | AEC2Ty | X | | | | | | | | |
| | | | Total | AEC2TOT | X | | | | | | | | |
| | | Contract 3 | Tariff y (y: 1..9) | AEC3Ty | X | | | | | | | | |
| | | | Total | AEC3TOT | X | | | | | | | | |
| | | | Partial | PAE | | | | | | | | | X |
| | Consumed | | L1 | NAE1 | X | | | | | | | | |
| | | | L2 | NAE2 | X | | | | | | | | |
| | | | L3 | NAE3 | X | | | | | | | | |
| | | | III | NAE | X | | | O | | O | X | X | |
| | | | Tariff 1 | NAET1 | | | | O | | O | | | |
| | | | Tariff 2 | NAET2 | | | | O | | O | | | |
| | | | Tariff 3 | NAET3 | | | | O | | O | | | |
| | | Contract 1 | Tariff y (y: 1..9) | NAEC1Ty | X | | | | | | | | |
| | | | Total | NAEC1TOT | X | | | | | | | | |
| | | Contract 2 | Tariff y (y: 1..9) | NAEC2Ty | X | | | | | | | | |
| | | | Total | NAEC2TOT | X | | | | | | | | |
| | | Contract 3 | Tariff y (y: 1..9) | NAEC3Ty | X | | | | | | | | |
| | | | Total | NAEC3TOT | X | | | | | | | | |

| | | | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Capacitive energy | Consumed | III | | | | CE | | X | X | X | X | O | X | X | |
| | | Tariff 1 | | | | CET1 | | | | X | | O | | | |
| | | Tariff 2 | | | | CET2 | | | | O | | O | | | |
| | | Tariff 3 | | | | CET3 | | | | O | | O | | | |
| | | 2Q | L1 | | | CE2Q1 | X | | | | | | | | |
| | | | L2 | | | CE2Q2 | X | | | | | | | | |
| | | | L3 | | | CE2Q3 | X | | | | | | | | |
| | | | III | | | CE2Q | X | | | | | | | | |
| | | | Contract | 1 | Tariff y (y: 1..9) | CE2QC1Ty | X | | | | | | | | |
| | | | | | Total | CE2QC1TOT | X | | | | | | | | |
| | | | | 2 | Tariff y (y: 1..9) | CE2QC2Ty | X | | | | | | | | |
| | | | | | Total | CE2QC2TOT | X | | | | | | | | |
| | | | | 3 | Tariff y (y: 1..9) | CE2QC3Ty | X | | | | | | | | |
| | | | | | Total | CE2QC3TOT | X | | | | | | | | |
| | Generated | III | | | | NCE | | | | O | | O | X | X | |
| | | Tariff 1 | | | | NCET1 | | | | O | | O | | | |
| | | Tariff 2 | | | | NCET2 | | | | O | | O | | | |
| | | Tariff 3 | | | | NCET3 | | | | O | | O | | | |
| | | 4Q | L1 | | | NCE4Q1 | X | | | | | | | | |
| | | | L2 | | | NCE4Q2 | X | | | | | | | | |
| | | | L3 | | | NCE4Q3 | X | | | | | | | | |
| | | | III | | | NCE4Q | X | | | | | | | | |
| | | | Contract | 1 | Tariff y (y: 1..9) | CE4QC1Ty | X | | | | | | | | |
| | | | | | Total | CE4QC1TOT | X | | | | | | | | |
| | | | | 2 | Tariff y (y: 1..9) | CE4QC2Ty | X | | | | | | | | |
| | | | | | Total | CE4QC2TOT | X | | | | | | | | |
| | | | | 3 | Tariff y (y: 1..9) | CE4QC3Ty | X | | | | | | | | |
| | | | | | Total | CE4QC3TOT | X | | | | | | | | |

| | | | | | | | CIRWATT | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inductive energy | Consumed | III | | | | IE | | X | X | X | X | O | X | X | |
| | | Tariff 1 | | | | IET1 | | | | X | | O | | | |
| | | Tariff 2 | | | | IET2 | | | | O | | O | | | |
| | | Tariff 3 | | | | IET3 | | | | O | | O | | | |
| | | 1Q | L1 | | | IE1Q1 | X | | | | | | | | |
| | | | L2 | | | IE1Q2 | X | | | | | | | | |
| | | | L3 | | | IE1Q3 | X | | | | | | | | |
| | | | III | | | IE1Q | X | | | | | | | | |
| | | | Contract | 1 | Tariff y (y: 1..9) | IE1QC1Ty | X | | | | | | | | |
| | | | | | Total | IE1QC1TOT | X | | | | | | | | |
| | | | | 2 | Tariff y (y: 1..9) | IE1QC2Ty | X | | | | | | | | |
| | | | | | Total | IE1QC2TOT | X | | | | | | | | |
| | | | | 3 | Tariff y (y: 1..9) | IE1QC3Ty | X | | | | | | | | |
| | | | | | Total | IE1QC3TOT | X | | | | | | | | |
| | Generated | III | | | | NIE | | | | O | | O | X | X | |
| | | Tariff 1 | | | | NIET1 | | | | O | | O | | | |
| | | Tariff 2 | | | | NIET2 | | | | O | | O | | | |
| | | Tariff 3 | | | | NIET3 | | | | O | | O | | | |
| | | 3Q | L1 | | | NIE3Q1 | X | | | | | | | | |
| | | | L2 | | | NIE3Q2 | X | | | | | | | | |
| | | | L3 | | | NIE3Q3 | X | | | | | | | | |
| | | | III | | | NIE3Q | X | | | | | | | | |
| | | | Contract | 1 | Tariff y (y: 1..9) | IE3QC1Ty | X | | | | | | | | |
| | | | | | Total | IE3C1TOT | X | | | | | | | | |
| | | | | 2 | Tariff y (y: 1..9) | IE3QC2Ty | X | | | | | | | | |
| | | | | | Total | IE3QC2TOT | X | | | | | | | | |
| | | | | 3 | Tariff y (y: 1..9) | IE3QC3Ty | X | | | | | | | | |
| | | | | | Total | IE3QC3TOT | X | | | | | | | | |

All energy variables can be discriminated.

## 14.1.6 Maximum Demand

| | | | | CVM 144 | CVM 96 | CVM B/BD | CVM BC | CVM K | CVM MINI | CVM NRG 96 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maximum demand | Instantaneous | L1 | MDI1 | O | O | | O | | O | O |
| | | L2 | MDI2 | O | O | | O | | O | O |
| | | L3 | MDI3 | O | O | | O | | O | O |
| | | III | MDI | O | O | | O | | O | O |
| | | Tariff 1 | MDIT1 | | | O | | O | | |
| | | Tariff 2 | MDIT2 | | | O | | O | | |
| | | Tariff 3 | MDIT3 | | | O | | O | | |
| | Instantaneous Maximum | L1 | MDIMX1 | O | O | | O | | O | O |
| | | L2 | MDIMX2 | O | O | | O | | O | O |
| | | L3 | MDIMX3 | O | O | | O | | O | O |
| | | III | MDIMX3 | O | O | | O | | O | O |
| | | Tariff 1 | MDIMXT1 | | | O | | O | | |
| | | Tariff 2 | MDIMXT2 | | | O | | O | | |
| | | Tariff 3 | MDIMXT3 | | | O | | O | | |
| | Maximum | L1 | MDMX1 | O | O | | O | | O | O |
| | | L2 | MDMX2 | O | O | | O | | O | O |
| | | L3 | MDMX3 | O | O | | O | | O | O |
| | | III | MDMX | O | O | | O | | O | O |
| | | Tariff 1 | MDMXT1 | | | O | | O | | |
| | | Tariff 2 | MDMXT2 | | | O | | O | | |
| | | Tariff 3 | MDMXT3 | | | O | | O | | |

All maximum demand variables can be discriminated.

## 14.1.7 Harmonics

| | | | | CVM 144 | CVM 96 | CVM K HAR | CVM MINI | CVM NRG 96 |
|---|---|---|---|---|---|---|---|---|
| Voltage harmonics | L1 | x (1..15) | ARMxV1 | | | X | X | X |
| | | x (16..50) | | | | X | | |
| | L2 | x (1..15) | ARMxV2 | | | X | X | X |
| | | x (16..50) | | | | X | | |
| | L3 | x (1..15) | ARMxV3 | | | X | X | X |
| | | x (16..50) | | | | X | | |

| | | | | CVM 144 | CVM 96 | CVM K HAR | CVM MINI | CVM NRG 96 |
|---|---|---|---|---|---|---|---|---|
| Current harmonics | L1 | x (1..15) | ARMxA1 | O | O | X | X | X |
| | | x (16..31) | | | O | X | | |
| | | x (32..50) | | | | X | | |
| | L2 | x (1..15) | ARMxA2 | O | O | X | X | X |
| | | x (16..31) | | | O | X | | |
| | | x (32..50) | | | | X | | |
| | L3 | x (1..15) | ARMxA3 | O | O | X | X | X |
| | | x (16..31) | | | O | X | | |
| | | x (32..50) | | | | X | | |

## 14.1.8 Inputs and Outputs

| | | | | CIRWATT | CVM 144 | CVM 96 | CVM BC | CVM R8 | CVM MINI | CVM NRG 96 | LM24 | LM50 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Inputs | Inst. | 1 | AII1 | | O | | | O | X | | | | |
| | | x (2..3) | AIIx | | O | | | O | | | | | |
| | | x (4..8) | | | | | | O | | | | | |
| | Max. | 1 | AIMX1 | | O | | | O | X | | | | |
| | | x (2..3) | AIMXx | | O | | | O | | | | | |
| | | x (4..8) | | | | | | O | | | | | |
| | Min. | 1 | AIMN1 | | O | | | O | X | | | | |
| | | x (2..3) | AIMNx | | O | | | O | | | | | |
| | | x (4..8) | | | | | | O | | | | | |
| Digital Inputs | x (1..4) | | DIx | | O | | | O | | | X | X | |
| | x (4..18) | | | | | | | O | | | X | X | |
| | x (19..24) | | | | | | | | | | X | X | |
| | x (25..50) | | | | | | | | | | | X | |

The analogue input of the CVM-MINI devices will correspond to the temperature variable measured by this type of devices.

| | | | CIRWATT | CVM 144 | CVM 96 | CVM BC | CVM R8 | CVM MINI | CVM NRG 96 | LM24 | LM50 | MK D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Digital outputs | 1 | DO1 | X | O | O | O | O | X | X | | | X |
| | 2 | DO2 | X | O | O | O | O | X | | | | |
| | 3 | DO3 | X | | | | O | | | | | |
| | 4 | DO4 | X | | | | O | | | | | |
| | x (5..18) | DOx | | | | | O | | | | | |

The digital outputs may be forced to 0 (the output will remain open) or to 1 (the output will be closed).

## 14.1.9 Counters

| | | | LM24 | LM50 |
|---|---|---|---|---|
| Counter | x (1..24) | Cx | X | X |
| | x (25..50) | | | X |

The value of the counters in the LM50 devices may be forced between 0 and the maximum value permitted by the device. See the device manual for more details on this maximum value.

All counter variables can be discriminated.

## 14.1.10 Special Device Variables

### 14.1.10.1 CBS-8, CDR-8

| | | | | CBS 8 | CDR 8 |
|---|---|---|---|---|---|
| Differential current | Instantaneous | Channel x (x: 1..8) | AELIx | X | X |
| | Detected | | AELDx | X | X |
| Status of the output | | | STx | X | X |
| Pre-Alarm Relay Status | | | DOx | X | X |
| Pre-Alarm Relay Status | | | DO0 | X | X |

| *Status of the channel output* | *Value* |
|---|---|
| Not triggered | 0 |
| Differential current exceeded. | 1 |
| Output triggered | 2 |
| Output locked | 3 |

| *Pre-Alarm Relay Status* | *Value* |
|---|---|
| Not enabled | 0 |
| Enabled | 1 |

In the CBS-8 and CDR-8 devices we can reset to channel x forcing the status variable (STx) to the value 16.

We can also remotely trigger the channel x forcing the variable RFCx to 1 in order to enable the remote trigger or 0 to disable it.

### 14.1.10.2 DH-96

| | | | DH-96 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AC | CPM | CT | DC | FT | SG | TMP | WG |
| Voltage | Instantaneous | VI | | X | | | | | | |
| | Maximum | VMX | | X | | | | | | |
| | Minimum | VMN | | X | | | | | | |
| Current | Instantaneous | AI | | X | | | | | | |
| | Maximum | AMX | | X | | | | | | |
| | Minimum | AMN | | X | | | | | | |
| Active power | Instantaneous | API | | X | | | | | | |
| | Maximum | APMX | | X | | | | | | |
| | Minimum | APMN | | X | | | | | | |
| Active energy | | AE | | X | | | | | | |
| Measurement | | ME | X | | X | X | X | X | X | X |
| Peak | | PK | X | | | X | X | X | X | X |
| Trough | | VL | X | | | X | X | X | X | X |

### 14.1.10.3 RGU-10

| | | RGU 10 |
|---|---|---|
| Effective stray current value. | AELI | X |
| Effective stray current value of the channel trigger. | AELDx | X |
| Status of the pre-alarm trigger output | DO0 | X |
| Status of the coil trigger output | DO1 | X |

| *Status of the pre-alarm trigger output* | *Value* |
|---|---|
| Not enabled | 0 |
| Enabled | 1 |

| *Status of the coil trigger output* | *Value* |
|---|---|
| Not triggered | 0 |
| Triggered | 1 |

In order to reset the channel in the RGU-10 devices, force the variable RST to the value 0.

### 14.1.10.4 RRM-C

| | | RRM-C |
|---|---|---|
| Reconnection counter | RC | X |
| Number of selected reconnections | RN | X |
| Time between reconnections | RT | X |
| Status of the Device | ST | X |

| *Status of the Device* | *Value* |
|---|---|
| Unknown | 65535 |
| Connected | 0 |
| Blocked | 1 |
| External trigger | 2 |
| Magnetothermal trigger | 4 |
| Communications trigger | 8 |
| External trigger and communications | 10 |

In the RRM-C devices, the status of the device can be forced to 16 to reset or 17 for the external device trigger.

## 14.1.11 Status of the Devices

Occasionally it will be necessary to know the status of a device, for example when we wish to enable an event when a device stops communicating. The variable STATUS is used to know the status.

*name.STATUS*

Below are the possible values which this status variable may have.

| *Status of the Device* | *Value* |
|---|---|
| The device functions correctly. | 1 |
| Device not initialised, initial communication with the device has not been established. | 4 |
| The communications port is incorrect or does not exist. | 18 |
| Communication errors with the device are produced. | 34 |
| The device type with which we wish to communicate is different to the specified device. | 66 |
| The device communicates correctly, but it has been detected that one or more of the phases is not properly connected. | 130 |
| The version of the device is incompatible with the software. | 258 |

## 14.2 Expressions and Conditions

Many parts of the program allow the inclusion of expressions or conditions. In order to enter these, there is a standard text control accompanied by a help button which will guide you through the editing process.

In an expression or condition which can use real numbers (in accordance with IEEE 754-1985 Standard, in which, amongst other aspects, it is stipulated that the decimal separator is the symbol "**.**"), parenthesis ("**(**" and "**)**"), addition operators ("**+**"), subtraction operators ("**-**"), multiplication operators ("*****"), division operators ("/") and power operators ("^"). Some valid examples would be:

```
2*(4.56^2)
1-(2.12-4)/2
```

The following mathematical functions can also be used:

**`sqrt(exp)`**: Square root of the expression "*exp*"
**`log(exp)`**: Neperian logarithm of the expression "*exp*"
**`exp(exp)`**: Number "*e*" elevated to the expression "*exp*"
**`sin(exp)`**: Sine on the expression "*exp*" (in radiants)
**`cos(exp)`**: Cosine of the expression "*exp*" (in radiants)
**`tan(exp)`**: Tangent of the expression "*exp*" (in radiants)
**`asin(exp)`**: Arcsine of the expression "exp"
**`acos(exp)`**: Arccosine of the expression "*exp*"
**`atan(exp)`**: Arctangent of the expression "*exp*"
**`atan2(exp1, exp2)`**: Extended arctangent of the expression "*exp1/exp2*"
**`log10(exp)`**: Base 10 logarithm of the expression "*exp*"

We should remember some details of these functions. The square root function will return an error if the expression is negative. The logarithmic functions ("***log***" and "***log10***") will return an error if the expression is less than or equal to zero. The Arctangent ("***atan***") assesses a range which goes from-π/2 to π/2 and returns zero if the expression is zero. The extended Arctangent function ("***atan2***") assesses a range which goes from -π to π and returns zero if both expressions are zero. The functions Arcsine ("***asin***"), Arccosine ("***acos***"), Arctangent ("***atan***") and extended Arctangent ("***atan2***") return the result in radiants. The functions are not case sensitive.

Both the expressions and the conditions can make reference to variables of devices added in the system. In order to refer to one of these variables, enter its name between square brackets ("**[**" y "**]**"). The name of a device is made up of two parts separated by a point ("**.**"). The part to the left is the name of the device, and the part to the right is the code of the variable of the said device (see the corresponding appendix for the codes of variables allowed for each device). Some valid examples would be:

```
2*[CVM144.VI1]
[CVM K 1.AE]+[CVM K 2.AE]+[CVM K 3.AE]
```

In some parts of the program it is possible to apply a discriminator to the variable, in other words to see the value of the said discriminated variable in accordance with a calendar. This is possible, for example, in the reports or graphs, and only for some specific variables, for example the energy variables.

In order to refer to the discrimination of a variable we should indicate, to the left of the variable, the name of the discriminator plus the exvoltage "**.XDCT**" followed by the symbol "**@**" and the type of time we wish to access. In this manner, for example, if we have defined a discriminator with the name ' '*Tariff*' which contains two types of hour "*H1*" and "*H2*", we can refer to both in the following manner:

```
[Tariff.XDCT@H1#CVMK.AE]
[Tariff.XDCT@H2#CVMK.AE]
```

It should be emphasised that after the name of the tariff we should find the extension "**.XDCT**", followed by the symbol "**@**", of the name of the type of hour and the symbol "**#**". Remember that not all the variables of the devices can be discriminated; see the variables codes appendix for details on which variables of each device can be discriminated.

In some parts of the program, such as in the reports and the SCADA screens, we can also refer to variables previously defined in a formulae list. Both in the reports and in the SCADA screens, we can have a list of expressions identified by a text which we can then use in the control of formulae or in the conditional control. In this manner, if we have defined an expression and we have given it the identifier "*F1*", we can use it in other expressions:

```
F1*2.0-1.3
1-sqrt(F1)
```

It should be remembered that the identifier of an expression (name of the variable) cannot begin with a numerical digit, although they can be contained in the same.

Finally, in those places in which a condition is required, it will be possible to use the operators less than ("<"), greater than (">"), less than or equal to ("<="), greater than or equal to (">="), equal to ("=="), different to ("**!**="), logical "Y" ("**&&**"), logical "O" ("||") and logical "NO" ("**!**").

Remember that the comparison operators require the expressions to the left and to the right to both be of the numerical kind, whilst the logical operators require the expressions to be conditions. In this manner, examples of correct conditions would be:

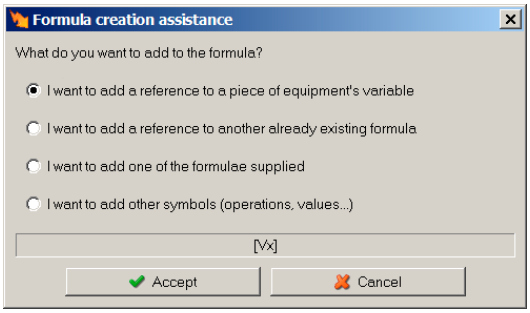
```
[CVMK.VI1]>(240-F1)
(F1!=10 && [CVMK.VI3]<=20)
```

Expressions and variables are always of the numerical type (real), whilst the conditions are of Boolean type.

## 14.2.1 Wizard for the Creation of Expressions and Conditions

PowerStudio has a wizard for the creation of expressions and conditions. We can access this wizard by clicking on the button , which is next to the text controls, where we can manually enter expressions and conditions.

Clicking on this button will bring up the following window:




Here we can select what we wish to add to the expression. The option will be added in the position of the cursor in the text control associated to the expression. The lower part of the dialogue shows where we will insert that to be added:

- [Vx]. If we wish to add a reference to a variable of a unit
- Fx. If we wish to add a reference to another already defined formula.
- F(x). If we wish to add one of the functions provided.
- x. If we wish to add other symbols.

The options of the wizard shall be as follows:

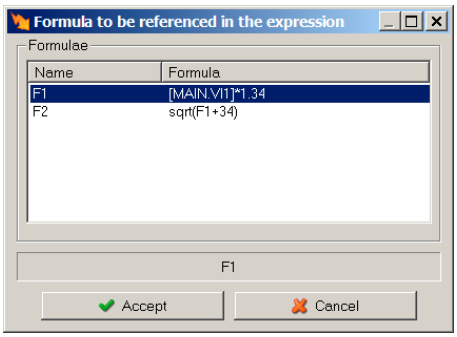
- *Add a reference to a variable of a device*: Selecting this option will display a window in which we can choose the device for the adding of one of the variables to the formula.

  Likewise, we shall have the option of specifying a previously defined specific discriminator (see chapter 7) by way of the selection using the control:

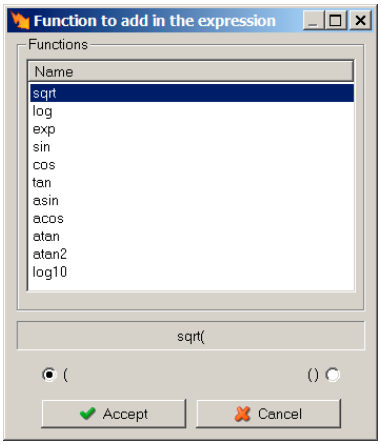
  

  Once we have chosen the unit and the discriminator (where appropriate), the variables selection window will be displayed, allowing us to choose the variable to be inserted in the formula (see 5 Selection of Variables).

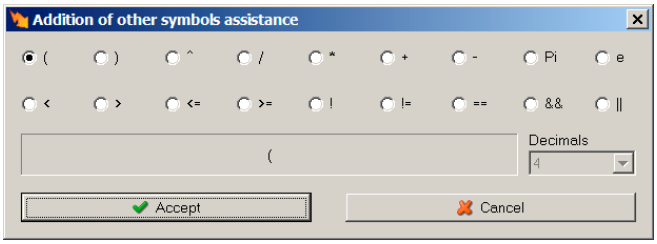
- *Add a reference to an already defined formula*: This option allows us to insert a reference to another previously defined formula in the formula. This option is only available in reports and SCADA screens. Selecting this option will display a window in which we can select a previously defined formula:




- *Add one of the functions provided*: This option allows us to access a list of typical mathematical functions which can be inserted in the formula being edited:




- *Add other symbols*: This option allows us to insert typical symbols such as comparers, logical functions, basic symbols, specific mathematical numbers, etc, in the formula.




Depending on whether what we are creating corresponds to an expression or a condition, some of the symbols will be disabled and hence cannot be selected.

## 14.3 XML Services

PowerStudio provides a series of XML services to allow, in certain aspects, communication with other applications.

**NOTE**: All requests must use the date format DDMMYYYY (two digits for the day, two for the month and 4 for the year) and hour format HHMMSS (two digits for the hour, two for the minute and two for the seconds). In information for the date and time, the format will be made up of the date and time formats together (DDMMYYYYHHMMSS).

### 14.3.1 127.0.0.1/services/events/notified.xml

This service allows us to know the list of all active events notified by PowerStudio.

```
<notifiedEvents>
      <event>
            <id> … </id>
            <name> … </name>
            <Description> … </Description>
            <annotation> … </annotation>
            <dateTime> … </dateTime>
            <ackDateTime> … </ackDateTime>
            <disableDateTime> … </disableDateTime>
      </event>
      …
</notifiedEvents>
```

In which:

- *notifiedEvents*: Main field which will identify the XML as a response to the notified events request.
- *event*: Will correspond to the information of each of the notified events:
  - *id*: Identifier of the notified event message.
  - *name*: Name of the event
  - *description*: Description of the event
  - *annotation*: Annotation of the event created at the moment of activation. Only when the event has an annotation configured.
  - *dateTime*: Date and time at which the event is enabled.
  - *ackDateTime*: Date and time at which the event is recognised. This field will not appear if the event has not been recognised.
  - *disableDateTime*: Date and time at which the event is disabled. This field will not appear if the event remains active.

### 14.3.2 127.0.0.1/services/events/acknowledge.xml

This service can be used to recognise the active events notified in PowerStudio. This XML will be sent by the external application to PowerStudio.

```
<eventsAck>
      <id> … </id>
      …
</eventsAck>
```

In which:

- *eventsAck*: Main field which will identify the XML as a recognition request of active and notified events.
- *id*: Identifier of the notified event message, corresponding to the field <id> of the request. 127.0.0.1/services/events/notified.xml

### 14.3.3 127.0.0.1/services/events/actived.xml

This service allows us to know the active events list, whether notified or not.

```
<activedEvents>
      <event>
            <id> … </id>
            <name> … </name>
            <Description> … </Description>
            <annotation> … </annotation>
            <dateTime> … </dateTime>
      </event>
      …
<activedEvents>
```

In which:

- *activedEvents*: Main field which will identify the XML as a response to the active events request.
- *event*: Will correspond to the information of each of the active events:
  - *id*: Identifier of the active event message.
  - *name*: Name of the event
  - *description*: Description of the event
  - *annotation*: Annotation of the event created at the moment of activation. Only when the event has an annotation configured.
  - *dateTime*: Date and time at which the event is enabled.

### 14.3.4 127.0.0.1/services/events/information.xml

By way of this request, we can obtain general information on the events configured in the program. This information will later be used to know part of the information contained in the stored events registers (see 14.3.5).

```
<eventsInformation>
      <eventsGroups>
            <eventsGroup>
                  <id> … </id>
                  <name> … </name>
            </eventsGroup>
            …
      </eventsGroups>
      <events>
            <event>
                  <id> … </id>
                  <name> … </name>
                  <notify> … </notify>
                  <eventsGroups>
                        <eventsGroup> … </eventsGroup>
                        …
                  </eventsGroups>
            </event>
            …
      </events>
</eventsInformation>
```

In which:

- *actividInformation*: Main field which will identify the XML as a response to the events information request.
- *eventsGroups*: List of events groups:
  - *eventsGroup*: Information on each of the events groups:
    1. *id*: Group identifier
    2. *name*: Name of the group
- *events*: List of events:
  - *event*: Information on each of the events:
    1. *id*: Event identifier
    2. *name*: Name of the event
    3. *notify*: This indicates if the event will be notified (T) or not (F)
    4. *eventsGroups*: List of groups to which the event belongs:
       *eventsGroup*: Identifier of the group to which the event belongs. Corresponds to the field `<eventsGroups><eventsGroup><id>` of the groups list.

### 14.3.5 127.0.0.1/services/events/logger.xml?begin=01082002?end=02082002

This request will return the list of events registered between the dates "*begin*" and "*end*".

```
<loggerEvents>
      <record>
            <id> … </id>
            <eventId> … </eventId>
            <annotation> … </annotation>
            <dateTime> … </dateTime>
            <ackDelay> … </ackDelay>
            <disabledDelay> … </disabledDelay>
      </record>
      …
</loggerEvents>
```

In which:

- *loggerEvents*: Main field which will identify the XML as a response to the registered events request.
- *record*: Information on each of the events registers:
  - *id*: Register identifier.
  - *eventId*: Event identifier. Corresponds to the field `<events><event><id>` (see 14.3.4)
  - *annotation*: Annotation of the registered event.
  - *dateTime*: Date and time at which the event is enabled.
  - *ackDelay*: Time taken in seconds to recognise the event. This field will not appear if the event was not recognised or not notified.
  - *disabledDelay*: Time taken in seconds to disable the event. This field will not appear if the event was disabled, or if the program was unable to register the disabling.

### 14.3.6 127.0.0.1/services/scada/forcevariables.xml?id=screen.xscn

This request can be used to send the order to force variables to PowerStudio. The request shall include the name of the SCADA screen for the forcing of the variables in order to, where appropriate, check the authentication (see 2.2.11.1 User Authentication)

```
<forceVariables>
      <forceVar>
            <forceName> … </forceName>
            <forceValue> … </forceValue>
      </forceVar>
      …
</forceVariables>
```

In which:

- *forceVariables*: Main field which will identify the XML as a request to force variables.
- *forceVar*: Information on each of the variables to be forced:
  - *forceName*: Name of the variable with format dispositivo.variable (see 14.1 Variables). Only variables which can be forced, for example digital output variables.
  - *forceValue*: Value at which we wish to force the variable.

## 14.3.7 127.0.0.1/services/logger/varInfo.xml?var=device.variable

Returns information on one or more variables. Each of the variables for which information is to be obtained should be included in the request as:

```
?var=device.variable
```

For example, in order to request two variables:

```
…?var=device1.variable1?var=device2.variable2
```

It is possible to request information of variables of different devices.

```
<varInfo>
      <var>
            <id> … </id>
            <title> … </title>
            <sampleMode> … </sampleMode>
            <measureUnits> … </measureUnits>
            <unitsFactor> … </unitsFactor>
            <decimals> … </decimals>
            <userUnitsFactor> … </userUnitsFactor>
            <userDecimals> … </userDecimals>
      </var>
      …
<varInfo>
```

In which:

- *varInfo*: Main field which will identify the XML as a response to the variables information request.
- *var*: Information on each of the variables requested:
  - *id*: Name of the variable in format device.variable (see 14.1 Variables)
  - *title*: Brief description of the variable.
  - *sampleMode*: Type of variable, mode used to group together the values of the variable:
    1. *none*: No type
    2. *Average*: Medium value.
    3. *max*: Maximum value
    4. *min*: Maximum value
    5. *pfAverage*: Power factor, medium value
    6. *pfMax*: Power factor, maximum value
    7. *pfMin*: Power factor, minimum value
    8. *last*: Last value
    9. *differential*: Differential value between the current and previous value.
  - *measureUnits*: Units of the variable:
    1. #NONE
    2. #V
    3. #A
    4. #VA
    5. #W
    6. #VARL
    7. #VARC
    8. #PF
    9. #HZ
    10. #PERCENT
    11. #WH
    12. #VARLH
    13. #VARCH

14. #DATETIME
15. #MONETARY
16. If not preceded by #, it is a unit defined by the user.

- *unitsFactor*: Power of 10 indicating the value at which the variable is multiplied in the log file.
- *decimals*: Decimals of this variable.
- *userUnitsFactor*: Power of 10 indicating the value at which the user wishes to display the value of the variable.
- *userDecimals*: Decimals with which the user wishes to display the variable value.

### 14.3.8 127.0.0.1/services/logger/records.xml?begin=29032003?end=02042003?var=dev.var

Returns unregistered information on one or more variables between the beginning and end dates. Each of the variables for which information is to be obtained should be included in the request as:

```
?var=device.variable
```

For example, in order to request two variables:

```
…?var=device1.variable1?var=device2.variable2
```

It is possible to request variables of different devices.

```
<recordGroup>
      <period> … </period>
      <record>
            <dateTime> … </dateTime>
            <fields>
                  <field>
                        <id> … </id>
                        <value> … </value>
                  </field>
                  …
            </fields>
      </record>
      …
</recordGroup>
```

In which:

- *recordGroup*: Main field which will identify the XML as a response to the variables register request.
- *period*: Registration period. Will inform of the time passed between registers.
- *record*: Will identify each of the registers:
  - *dateTime*: Date and time of the sample.
  - *fields*: List of the variables:
    1. *field*: Will correspond to each of the requested variables:
       *id*: Identifier of the variable in format device.variable (see 14.1 Variables)
       *value*: Value of the variable.

## 14.3.9 127.0.0.1/services/values/some.xml?var=device.variable

Returns the instantaneous value of the variable at the moment the XML request is made. Each of the variables for which the value is to be obtained should be included in the request as:

```
?var=device.variable
```

For example, in order to request two variables:

```
…?var=device1.variable1?var=device2.variable2
```

It is possible to request variables of different devices.

```
<values>
      <variable>
            <name> … </name>
            <value> … </value>
      </variable>
      …
</values>
```

In which:

- *values*: Main field which will identify the XML as a response to the variables values request.
- *variable*: List of the variables:
  - *name*: Identifier of the variable in format device.variable (see 14.1 Variables)
  - *value*: Value of the variable.

## 14.3.10 127.0.0.1/services/devices/devices.xml

Returns the list of configured devices.

```
<devices>
      <id> … </id>
      …
</devices>
```

In which:

- *devices*: Main field which will identify the XML as a response to the device list request.
- *id*: Name of each of the devices.

## 14.3.11 127.0.0.1/services/devices/deviceInfo.xml?id=device

Returns information on devices. Each one of the devices for which we wish to obtain information must be included in the request as:

```
?id=device
```

For example, in order to request two devices:

```
…?id=device1?id=device2
```

```
<devices>
      <device>
            <id> … </id>
            <type> .. </type>
            <var>
                  <id> … </id>
                  <title> … </title>
                  <sampleMode> … </sampleMode>
                  <measureUnits> … </measureUnits>
                  <unitsFactor> … </unitsFactor>
                  <decimals> … </decimals>
                  <userUnitsFactor> … </userUnitsFactor>
                  <userDecimals> … </userDecimals>
            </var>
            …
      </device>
      …
</devices>
```

In which:

- *devices*: Main field which will identify the XML as a response to the device information request.
- *device*: Information on each of the devices requested:
  - *id*: Name of the device.
  - *type*: Type of device (for example CVM144)
  - *var*: Information on each of the variables of the device:
    1. *id*: Name of the variable in format device.variable (see 14.1 Variables)
    2. *title*: Brief description of the variable.
    3. *sampleMode*: Type of variable, mode used to group together the values of the variable:
       *none*: No type.
       *Average*: Medium value.
       *max*: Maximum value.
       *min*: Maximum value.
       *pfAverage*: Power factor, medium value
       *pfMax*: Power factor, maximum value
       *pfMin*: Power factor, minimum value
       *last*: Last value.
       *differential*: Differential value between the current and previous value.
    4. *measureUnits*: Units of the variable:
       #NONE
       #V
       #A
       #VA
       #W

#VARL
#VARC
#PF
#HZ
#PERCENT
#WH
#VARLH
#VARCH
#DATETIME
#MONETARY
If not preceded by #, it is a unit defined by the user.

5. *unitsFactor*: Power of 10 indicating the value at which the variable is multiplied in the log file.
6. *decimals*: Decimals of this variable.
7. *userUnitsFactor*: Power of 10 indicating the value at which the user wishes to display the value of the variable.
8. *userDecimals*: Decimals with which the user wishes to display the variable value.

# 14.4 FAQ

## 14.4.1 None of the Equipment Communicates, What Is Happening?

Check that the equipment is on and in a mode in which communication is possible, ensuring, particularly, that it is not in configuration mode or starting up. Check that the equipment is correctly connected to the PC. Check that there is no possibility of any type of interference in the cable run from the device to the PC. Check that the grid is not overloaded with an excessive number of devices. If the equipment connects by way of a 232-485 converter, check that the switches are in the correct position. Ensure that the equipment bus does not have devices which communicate at different speeds or have the same device number. Check that the PC port works correctly.

## 14.4.2 A TCP2RS Converter Does Not Communicate, What Is Happening?

Check that the equipment is on and connected to the communications network. Check that there is no possibility of any type of interference in the cable run from the converter to the PC. Check that the PC is correctly connected to the communications network and can communicate with other equipment connected to the network (for example with another PC). If we are using a router, check that the communications port is redirected, in the router, to the converter address.

## 14.4.3 I Cannot See the Applet, What Is Happening?

Check that the local computer has the Microsoft Internet Explorer, Netscape (Mozilla) or Firefox browser installed. Ensure that JRE Java virtual machine 1.5 (5.0) or later is installed. If it is not, the browser will offer information and guide us through the installation process.

If the Applet appears but displays a message warning that "***communication is not possible with the server***" or "***the required information could not be recovered***", ensure that the program is in running mode and the Web server is enabled.

## 14.4.4 The Applet Does Not Show the Texts Correctly, What Is Happening?

It is possible that some types of letters applied to the controls when designing a report or a SCADA screen do not exist in the machine from which the Applet is downloaded and, in consequence, the type of letter chosen may be significantly different to the original.

## 14.4.5 The Values Display Is Not What I Expected, What Is Happening?

It is possible that a conditional control or a formula refers to a variable of a device which does not communicate or which has not been interrogated for the first time. Nothing will be displayed in a SCADA screen if we are dealing with a condition. If we are dealing with a formula, a dash ("-") will appear until the value can start. In a report, if there are no data in this period and we cannot assess the condition of a conditional control, nothing will be displayed. If we cannot assess a formula, the definition of the same will be displayed.

It may occur that, when assessing the formula, we come across an invalid operation, such as the square root of a negative number or a zero division. In this case the SCADA screen will show a question mark ("?") and the report will show the definition of the formula. If we cannot assess the condition of a conditional control, nothing will be displayed.

### 14.4.6 An Event Is Not Behaving as I Expected, What Is Happening?

If the event is not produced when you believe it should be, or vice versa, check that the condition can be fulfilled, and ensure that the event is enabled at some point by the calendar and that the condition can be fulfilled during this interval. Check that the devices involved in the assessment of the condition of the event communicate correctly and ensure that the program is in running mode. Check that you have permission to see this type of events and that the notify and/or register box is checked.

If the event does not appear to have carried out the actions defined, check the events list to see if it has come about. If the event has still not produced the programd action or actions, check that the equipment upon which it should have acted is on and communicating correctly. Should the action involve the running of an external application, check that the said application is correctly installed and that the command and the parameters are correct (you can put this action in a run control in a SCADA screen to test if it is working as expected).

### 14.4.7 I Can't Paint the Graph Properly, What Is Happening?

If the graph appears to have missing points, check that this is not due to the variables being represented with different periods.

If the bar graphs have widths which are not correct, ensure that the values are separated by the distance of the driver period. For example, if a device saves data every 5 minutes and we change the period to 15 minutes, the bars will be superimposed when displaying the bar graphs for the values prior to the change of period (every 5 minutes). If we change the period to a lower value, the bars prior to the change will appear narrower than necessary. In any case, the bar graphs of values separated by the distance shown in the Driver registration period will always appear correctly.

If you cannot see any values where you think there should be, ensure that you have not zoomed in on an area without values, and that the Y axis is not forcing levels for which values do not exist.

### 14.4.8 The Paint Pot Is Not Working Correctly, What Is Happening?

If, when placing paint pot in a SCADA screen, this does not behave in the manner expected, ensure that:

**1.-** The condition or conditions defined are correct for each colour.

**2.-** The area in which the control is positioned has a uniform colour. It is possible that the area upon which the paint pot is positioned has different coloured points with very similar tones, which, at first sight, appear the same. The paint pot control only propagates through identical colours.

**3.-** The area to be filled with the colours defined in the control do not form part of another control. The paint pot only interacts with the screen background, in no case does it take into account the other controls. Do not try to use the paint pot to fill, for example, an image added by way of the image type control.

### 14.4.9 Can I Launch External Applications from the Applet?

For security reasons, Java Applets have significant limitations with regards to access to the resources of the local machine on which they are running. One of these restrictions is not being able to run applications in the local machine. Nevertheless, this restriction can be disabled by adding the following line to the *java.policy* permissions file situated in the installation of the JRE virtual machine:

```
permission java.io.FilePermission "<<ALL FILES>>", "execute";
```

It must be remembered, however, that the Applet cannot directly display files from the run control in the way SCADA can. Hence, if we wish to display an image in the Applet, it is not enough to simply enter the name of the image in the run control, but rather we should enter the application we wish to use to show the image and, as a parameter, the image to show.

**Note**: The option to launch external applications very much depends on the system in which the Applet is running, and it is highly probable that it will only work in the system for which the application has been developed.

### 14.4.10 How Can I See the Applet from a Machine Which Is Not Running Windows?

The Applet can be displayed without carrying out any other special action from all operating systems which have Java virtual machine 1.5 (5.0) or later and an HTML browser installed. Amongst others, the following fulfil these requirements: Windows, Linux, Solaris SPARC, Solaris x86, Solaris AMD64, Linux AMD64, etc.

### 14.4.11 How Can I Draw a Line in a Report or SCADA Screen?

Although there is no specific tool to draw lines, it is possible to carry out this function in two different manners:

**1.-** Draw the lines you wish in the background image beforehand.

**2.-** If you wish to draw vertical and/or horizontal lines and you find the aforementioned method impractical, it is possible to carry out this function by way of a simple trick. The procedure involves obtaining a solid rectangular or square image of the colour you like for the line (this may even consist of a single pixel image). Then add an image control and assign the previous box to it. Disable the fields "*M*aintain real size" and "*Ma*intain aspect ratio" and use the control to obtain the desired thickness of the horizontal and/or vertical line.

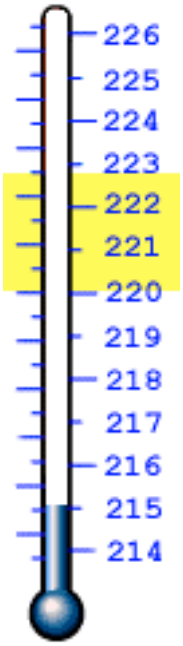
## 14.4.12 How Can I Simulate a Circuit Breaker Control?

In order to simulate the behaviour of a circuit breaker (for example to act on a digital output), we need a conditional control and two controls to force the variable. The conditional control would contain two images, one with a representation of an open switch, with the condition that the digital variable should be 1, and another with the representation of a closed switch, with the condition that the digital variable should be 0.

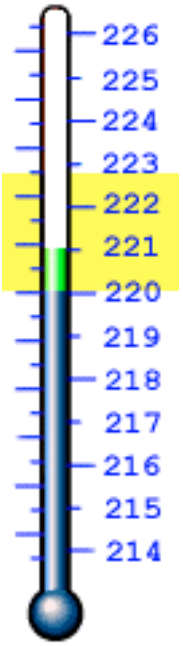
A control is positioned on the left-hand part of the control to force a variable with the digital output value at 1, whilst another control is positioned on the right-hand section to force a variable with output value at 0.

## 14.4.13 How Can I Simulate a Level Control?

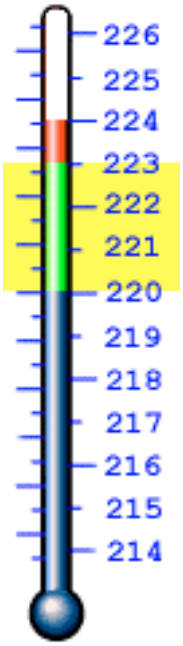
There are two ways of carrying out a level control in a SCADA screen. The first involves using a conditional control, where each control is an image with a different level and where each condition indicates what should be fulfilled to reach this level. Next we will see some images of a specific example with its conditions:




**[CVM K 1.VI1] == 215**




**[CVM K 1.VI1] == 221**




**[CVM K 1.VI1] == 224**

Another option would be to draw the level control in the SCADA screen background and use different paint pot controls to paint the desired area.

### 14.4.14 How Can I Change the Properties of a Control in Accordance with a Condition?

The control properties cannot be changed in accordance with a condition. Nevertheless, we can simulate the change of these properties using a conditional control. Thus, for example, if we wish to change the colour of a text in accordance with a condition, we shall add a conditional control with two text type controls which are exactly the same but of a different colour, and we shall specify which conditions need to be fulfilled for each one to be shown. Likewise, we can change the direction, font, size, etc.

We can also make a control be an image or a text in accordance with a condition using, as in the previous case, the conditional control.

### 14.4.15 How Can I Know the Status of a Device?

All the drivers have a variable known as STATUS which shows the status of the device by way of a numerical value (for example, [CVM144.STATUS]). The meaning of this variable is the same for all the devices and can be used in conditional expressions (see the appendix to check the types of variables and their possible values).

### 14.4.16 How Can I Show Documents from a SCADA Screen?

We can use the run control to show documents previously stored in the PC. If we wish to show a PDF file, we can directly enter the name of the same (including its complete path) in the program field, in such a manner that the said file will open in the related, defined program when running the screen and clicking on the control. Likewise, we can do this with any file type which has an associated program to open it (DOC, TXT, HTML, WAV, MP3, MPG, AVI, etc).

**Note**: This option will not work in systems which do not run Windows, nor when using the Applet.

### 14.4.17 How Can I Obtain an Event According to the Status of a Device?

In order to produce an event according to the status of one or several devices, use the STATUS variable of the said devices in the event activation condition. The possible values of the STATUS variable can be seen in the variables types appendix.

### 14.4.18 How Can I Produce Sounds in Response to an Event?

In order to produce a sound in response to an event, we should add an action to run an external program, entering the corresponding the sound file (WAV, MP3, etc) and its full path in the program field. In order for the action to take effect, you will need to have installed a program which can playback this type of files (such as, Windows Media Player, Sonique, Winamp, etc).

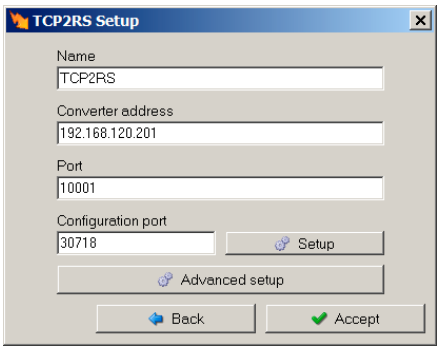
## 14.4.19 How Can I Show Documents in Response to an Event?

In a similar manner to the previous point, adding an action to run an external program and entering the file to be shown (PDF, TXT, DOC, etc.) and its corresponding path in the program field. In order for the action to take effect, you will need to have installed a program which can read this type of files (such as, Microsoft Word, Adobe Acrobat Reader, etc).

## 14.4.20 How Can I Communicate with a TCP2RS Converter by way of a Router?

To communicate with a TCP2RS converter located in a sub-network different to the network in which the software is located, we can use a router as the connection element between the two networks, as shown in the following image.

The TCP2RS converter should be added in the following manner:




1- Enter the router address (192.168.120.201) in the box *'Converter address'*.
2- Redirect the port *'10001'* and *'30718'* in the router to the converter address (192.168.15.205) (see router manual).