CVM-A1500

CONFIGURATION GUIDE

(M145H01-03-18A)

CE

SAFETY PRECAUTIONS

Follow the warnings described in this manual with the symbols shown below.

	DANGER Warns of a risk, which could result in personal injury or material damage.

	ATTENTION Indicates that special attention should be paid to a specific point.

If you must handle the unit for its installation, start-up or maintenance, the following should be taken into consideration:

	Incorrect handling or installation of the unit may result in injury to personnel as well as damage to the unit. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire. Read the manual carefully prior to connecting the unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.
	Refer to the instruction manual before using the unit In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the unit and /or installations.

CIRCUTOR, SA reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

CIRCUTOR, SA reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

CIRCUTOR, SA on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.circutor.com

	CIRCUTOR, recommends using the original cables and accessories that are supplied with the device.

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REVISION LOG

Table 1: Revision log.

Date	Revision	Description
09/18	M145H01-03-18A	Versión Inicial

Note: *Device images are for illustrative purposes only and may differ from the actual device.*

1.- CVM-A1500 INITIAL CONFIGURATION

1.1.- DATE AND TIME

From the main menu, go to the setup menu and select the **Date and Time** menu .

Set the date and time using the screen of **Figure 1**

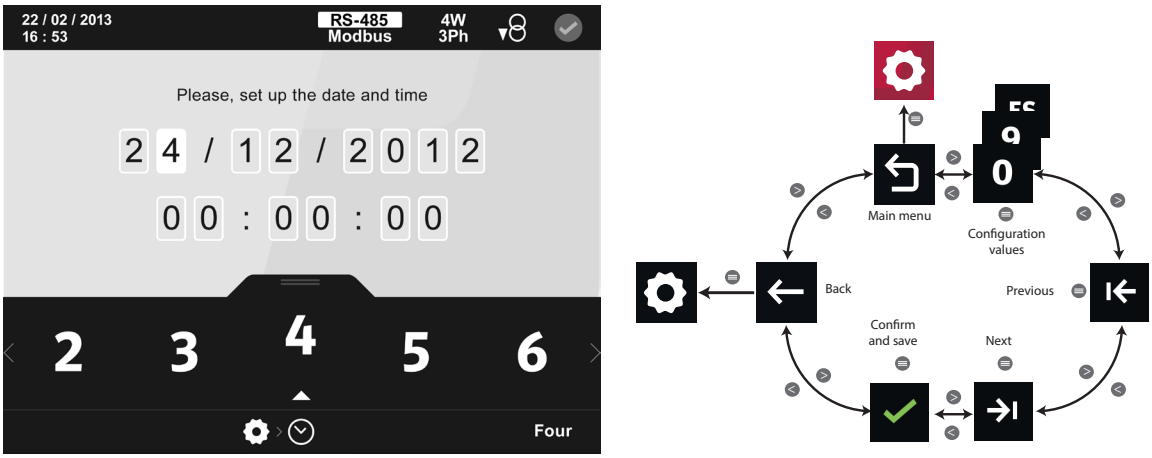


Figure 1: Date and time configuration screen.

1.2.- TIME ZONE

Select options +1, + 2, etc. to adjust the time in accordance with geographical location, **Figure 2**. Check the daylight saving time option if applicable.

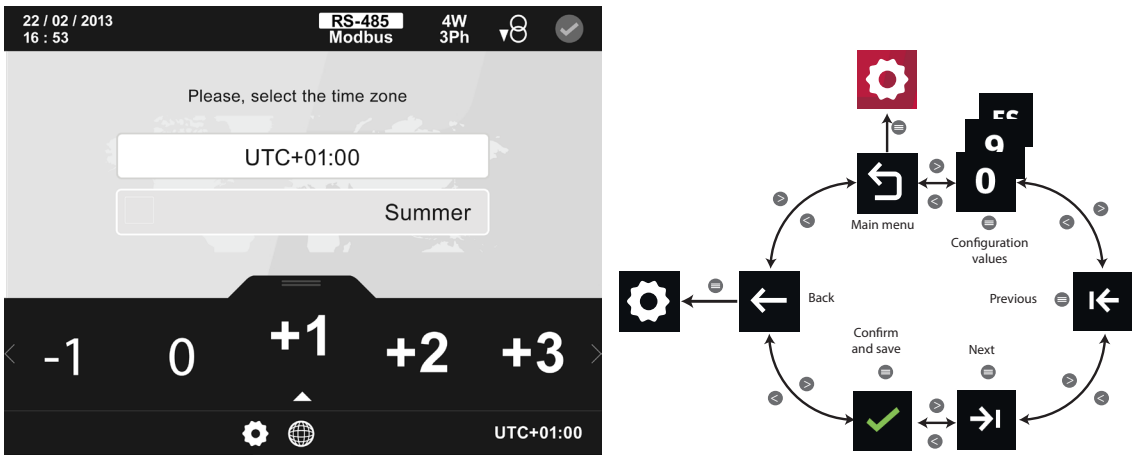


Figure 2: Date and time configuration screen.

1.3.- MEASUREMENT CONNECTION MODE

From the main menu, go to the setup menu and select the **Measurement connection mode** menu .

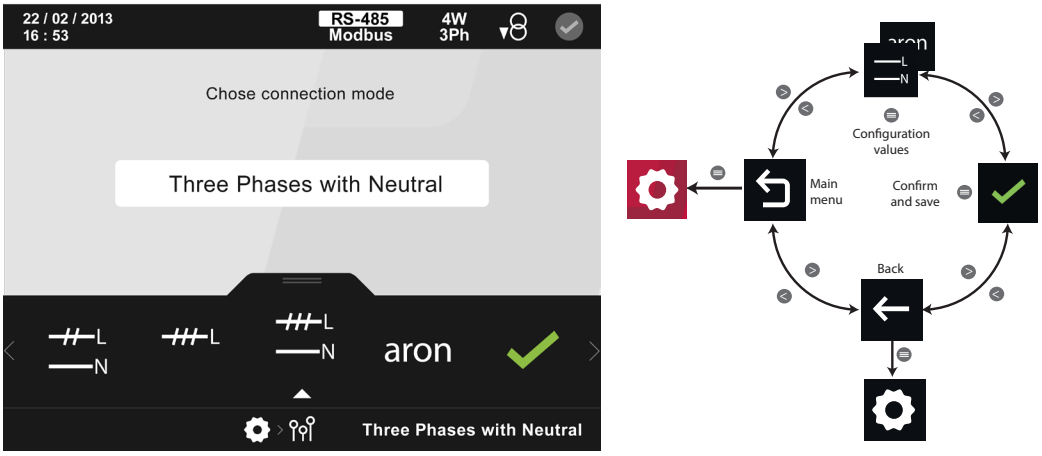


Figure 3: Measurement connection mode configuration screen.

●The configuration values are:

Single-phase, Two-phase, Two-phase with neutral Three-phase, Three-phase with neutral, aron Aron.

Refer to the **CVM-A1500** (**M136B01-03-xxx**) manual access schemes of different modes of connection to the mains.

1.4.- INSTALLATION DATA

From the main menu, go to the setup menu and select the **Installation data** menu .

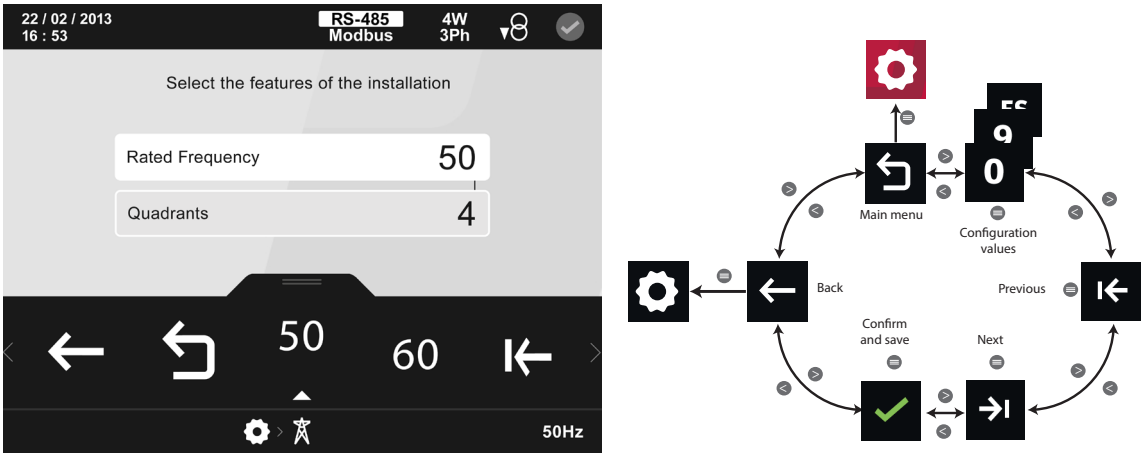


Figure 4: Installation features configuration screen.

Configure the 50 or 60 Hz mains frequency to adapt the device's sampling to the waveform frequency.
This screen is also used to configure the option of 2 or 4 quadrants, calculating and displaying Consumption or Consumption and Generation data.

1.5.- RATIO OF VOLTAGE TRANSFORMERS

From the main menu, go to the setup menu and select the **Ratio of voltage transformers** menu **.**

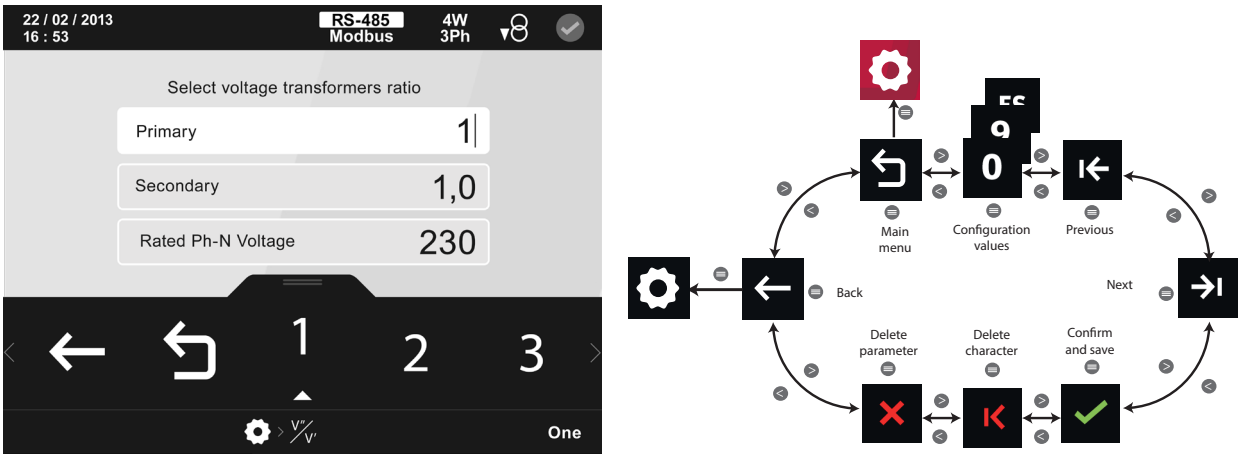


Figure 5: Voltage transformer ratio configuration screen.

Full-scale voltage must be configured for the voltage transformers in the voltage **Primary**. The primary and secondary voltage ratio will be from 1 to 1.0 when measuring directly up to 1000 V phase-phase or 600 V phase-neutral.

It is important to correctly configure the **Rated Ph-N Voltage**, as it is the reference used by the analyser to detect quality events (overvoltages, gaps or interruptions).

Example 1: *25000V / 110V ratio transformers are available, the device configuration should be:*

- ✓***Primary:*** *25000*
- ✓***Secondary:*** *110*
- ✓***Rated Ph-N Voltage:*** *25000 / √3 ≈ 14434*

According to Standard IEC 41000-4-30, the voltage values the events would be detected at are therefore as follows:

- ✓***Overvoltage*** *→ 110% on Phase-Neutral rated voltage ≈ 15877 VPh-N*
- ✓***Voltage gap*** *→ 90% on Phase-Neutral rated voltage ≈ 12990 VPh-N*
- ✓***Voltage interruption*** *→ 10% on Phase-Neutral rated voltage ≈ 1443 VPh-N*

Example 2: *In low voltage with direct measurement ,no ratio transformers, the device would be configured as follows:*

- ✓***Primary:*** *1*
- ✓***Secondary:*** *1.0*
- ✓***Rated Ph-N Voltage:*** *127 or 230 depending on the installation.*

1.6.- RATIO OF CURRENT TRANSFORMERS

From the main menu, go to the setup menu and select the **Ratio of current transformers** menu A″/A′.

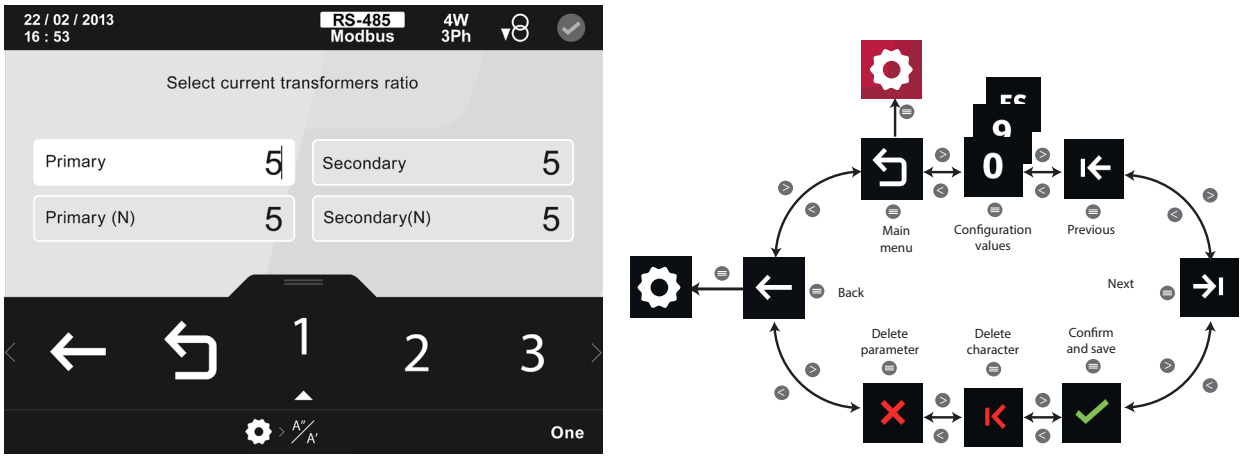


Figure 6: Current transformer ratio configuration screen.

Select the **primary** and **secondary** current according to the connected transformers. The **CVM-A1500** accepts.../5 ../1 A and MC efficient transformers.

The neutral current ratios are not shown when a connection to the mains is configured for measurement without neutral.

The secondary ratio can be configured as ".../A" whenever there is no transformer for neutral current measurement. In this case, the device will obtain the neutral current using mathematical calculations based on the other configuration parameters.

1.7.- DEFINING QUALITY EVENT DETECTION LIMITS

From the main menu, go to the setup menu and select the **Quality** menu Q.

Select **Quality Events** from the two options shown in the menu.

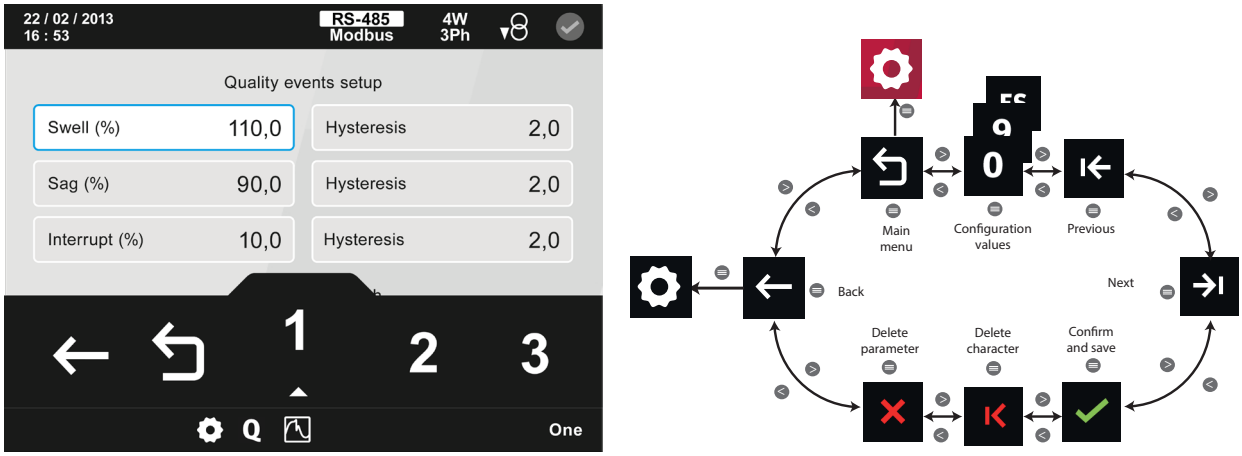


Figure 7: Quality events setup screen.

The **CVM-A1500** shows the default values configured for event detection according to standard

IEC41000-4-30.

The **CVM-A1500** can be configured to be more sensitive if the installation requires lower % supply voltage quality events to be detected. For example, the overvoltage value could be configured to 105% and the gap value to 95%, as well as increasing the % interruption value.

The hysteresis value can also be increased to avoid detection of several consecutive interrelated quality events.

1.8.- CONFIGURATION OF THE ALARM FOR THE DETECTION OF QUALITY EVENTS

From the main menu, go to the setup menu and select the **Relay digital outputs** menu .

Note : *It is necessary that the device has the expansion module of Digital Inputs / Outputs installed*

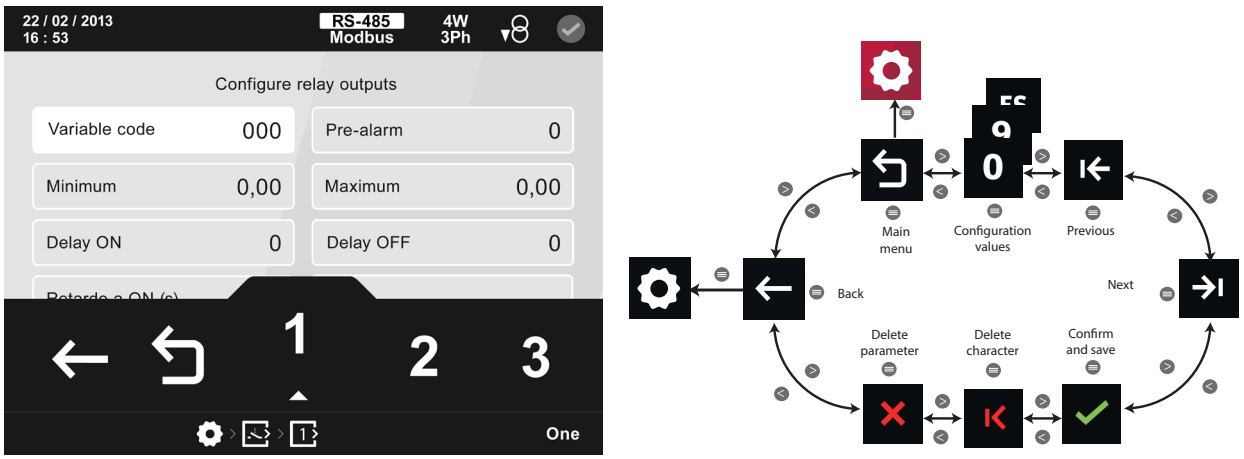


Figure 8: Configuration screen of relay digital outputs.

From this screen the transistor or relay digital outputs are configured, being able to relate them to any instantaneous parameter that the device measures or calculates. This relationship is made using the **variable code** parameter indicated in the equipment manual tables (**M136B01-03-xxx**).

Exemple: Set the code of variable **112** (Detect quality event in any phase).This variable is temporarily activated from **0** to **1** in quality event detection in any phase.

Table 2: Code of the quality variables used for programming the digital and transistor outputs.

Quality variables								
Variable	**Phase**	**Code**	**Phase**	**Code**	**Phase**	**Code**	**Phase**	**Code**
Instantaneous Flicker (Pinst)	L1	94	L2	95	L3	96	-	-
PST Flicker (Pst)	L1	97	L2	98	L3	99	-	-
K Factor	L1	100	L2	101	L3	102	-	-
Voltage peak factor	L1	103	L2	104	L3	105	-	-
Current peak factor	L1	106	L2	107	L3	108	-	-
Quality event	L1	109	L2	110	L2	111	III	112

Table 2 (Continuation) :Code of the quality variables used for programming the digital and transistor outputs.

Variable	Phase	Code	Phase	Code	Phase	Code	Phase	Code
Transient	L1	113	L2	114	L3	115	III	116

Configure the alarm trigger values as follows:

- ✓**Minimum :** 0
- ✓**Maximum :** 1
- ✓**Pre-alarm :** 0
- ✓**Delay ON :** 0
- ✓**Delay OFF :** 0
- ✓**Output status :** N/A
- ✓**Latch :** Disable

With this configuration, the configured relay contact will close temporarily for two seconds when detecting any type of quality event (overvoltage, gap or interruption) in any of the three phases.

2.- DATA DISPLAY - WEB SERVER

2.1.- CONFIGURATION OF THE IP ADDRESS IN THE CVM-A1500

From the main menu, go to the setup menu and select the **Expansion modules** menu . In this menu select the **Datalogger module** .

Access the **Configuration of DHCP activation/deactivation** TCP AUTO screen, and disable the automatic IP assignment.

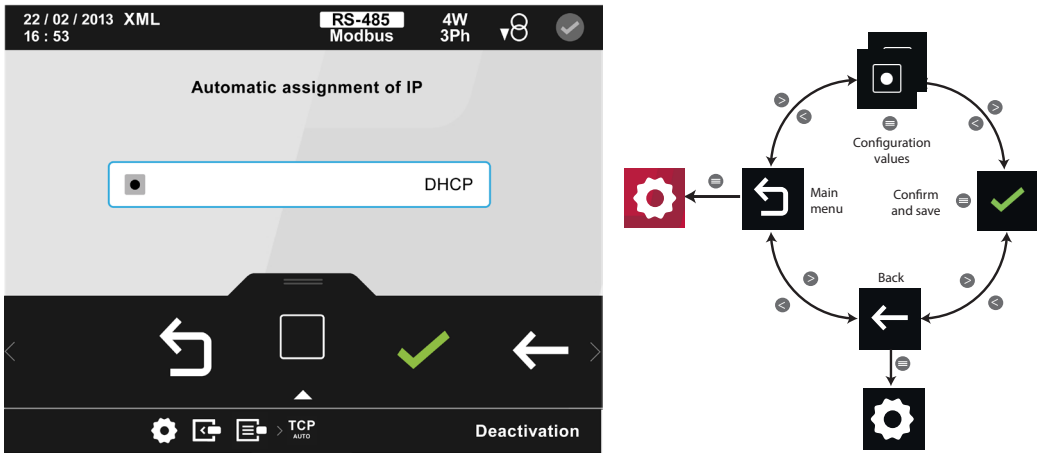


Figure 9: Datalogger module setup screen (TCP Auto).

Access the **Manual Configuration of the TCP parameters** TCP MANUAL screen, and configure a known IP address (***Exemple :*** 10.0.107.112).

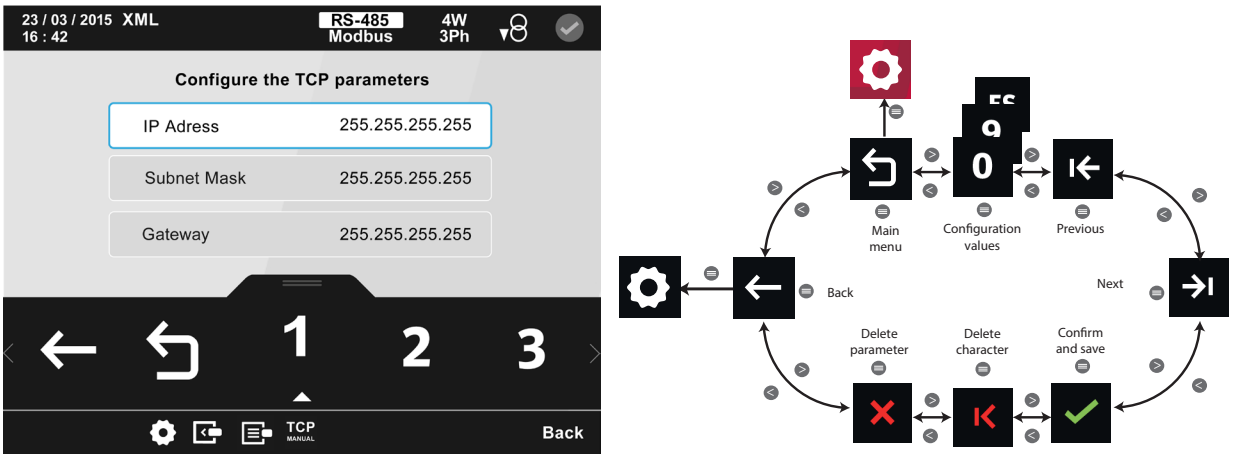


Figure 10: Manual TCP Parameter setup screen.

Connect the device to the PC using an Ethernet cable, no crossover cable required.

2.2.- CONFIGURATION OF A STATIC IP ADDRESS ON THE PC

Access the **Properties of the Local Area Connection of the PC** and select **Internet Protocol Properties version 4 (TCP / IPv4), Figure 11.**

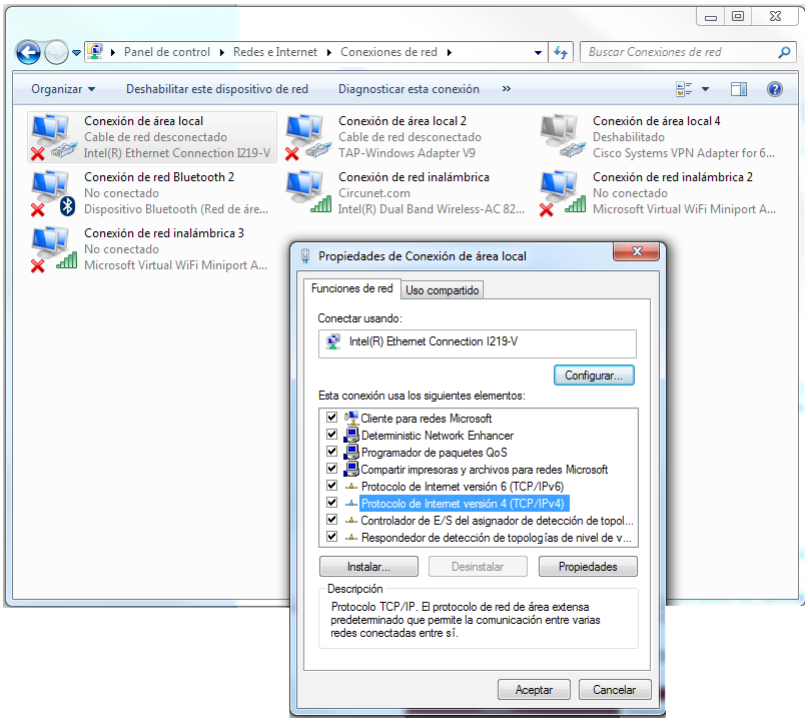


Figure 11: Local area connection properties.

Select "**Use the following IP address**" and configure, for example (10.0.107.1 / 255.255.255.0), **Figure 12**.

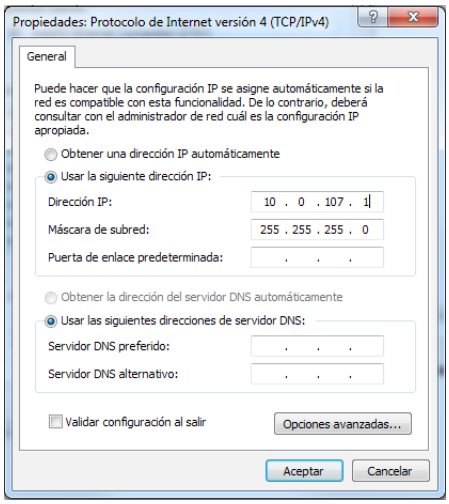


Figure 12: Properties: Internet protocol version 4 (TCP/IPv4).

Run the web browser on the PC (preferably Google Chrome).

Enter the address configured in the **CVM-A1500** in the browser bar. The **CVM-A1500** web server will appear, **Figure 13.**

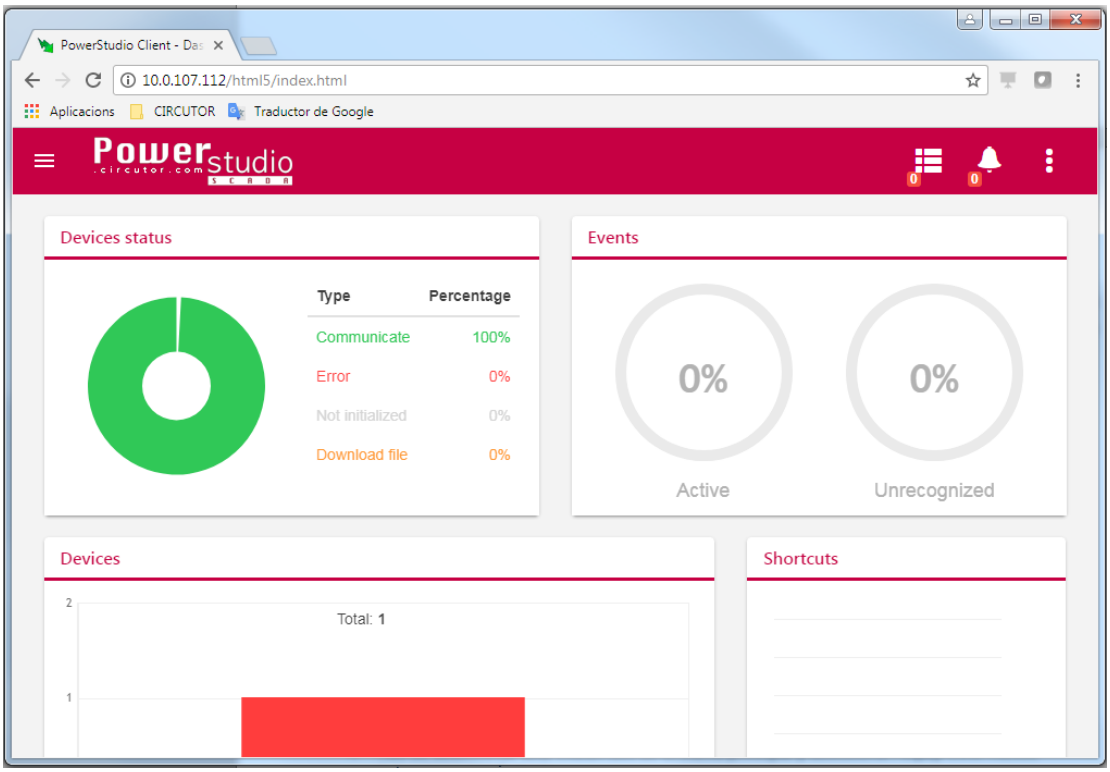


Figure 13: CVM-A1500 Web server.

2.3.- GENERATING A QUALITY EVENT IN THE **CVM-A1500** DEMO KIT

The kit has three red push-buttons to cause a voltage gap/interruption in each of the three phases separately.

Check that all three buttons are not pressed. Enter the measurement menu and show Phase-Neutral voltage; this should be 230 or 127 V, as appropriate.

Press one of the buttons to trigger a Quality event.

A **Blue** indicator will appear in the top right of the device. A Power Quality event in the last 24 hours is indicated. The **Blue** indicator will disappear if 24 hours pass without event detection.

2.4.- DISPLAY AND DOWNLOAD DATA

Expand the main menu and select the **Table** or **Graph** menu.
Select the **CVM-A1500** device folder in the next window and select the **CVM-A1500** device, **Figure 14**.

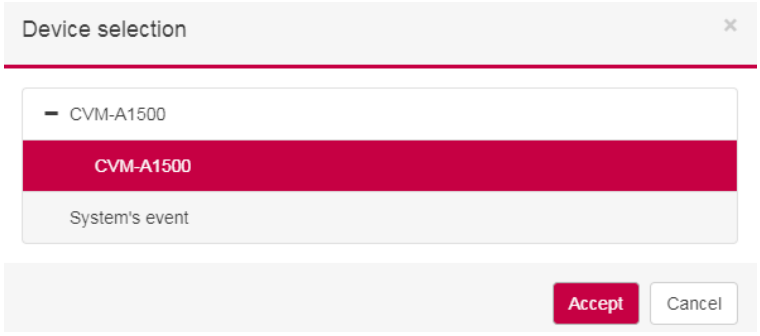


Figure 14:Select the CVM-A1500 device.

Select the standard option in the displayed window, **Figure 15**.

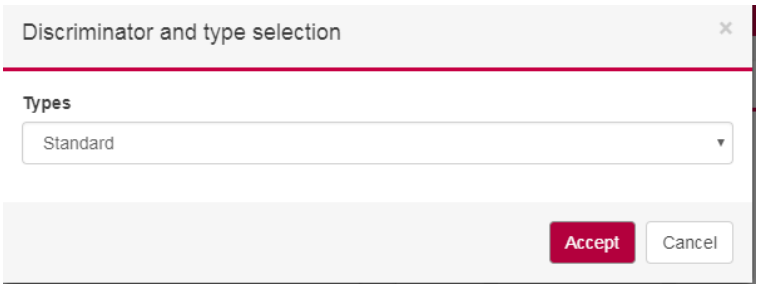


Figure 15:Select the Standard option.

2.4.1.- STANDARD VARIABLES LOGS

Select in the **General** and **Power** tabs the variables to be displayed in a graph or in a table, **Figure 16**.

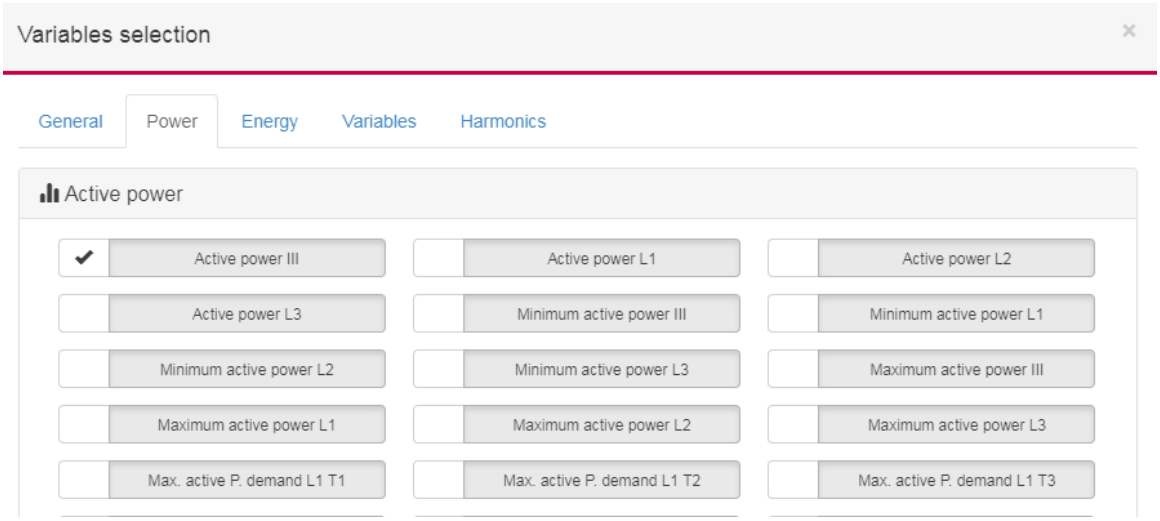


Figure 16:Variables selection.

Collapse all the variables menus by clicking on each title bar of the variables group until the **Accept** button is shown, and then click on it.

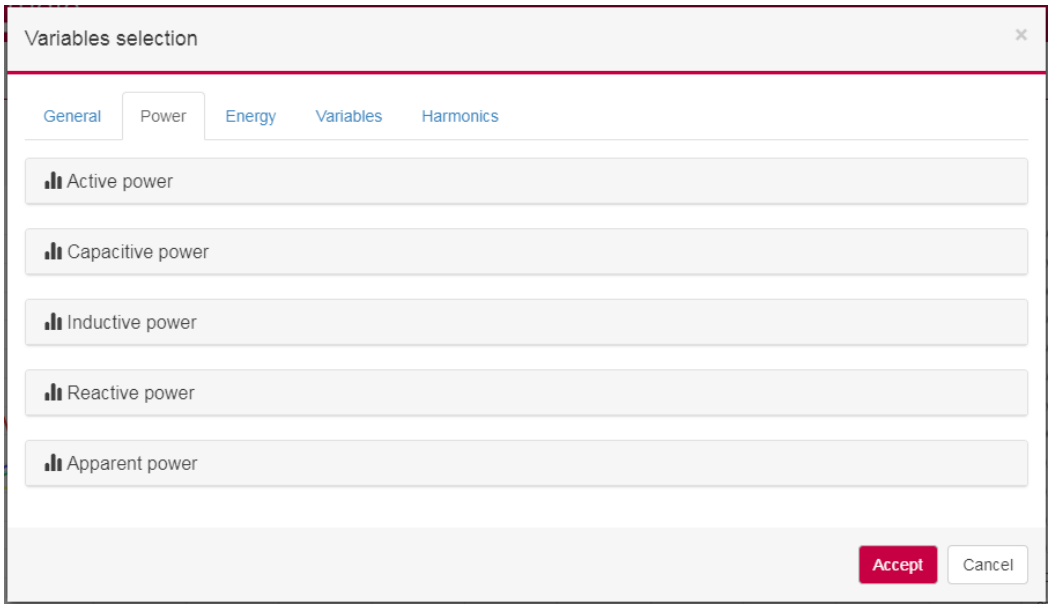


Figure 17:Variables selection.

The **CVM-A1500** Web Server will display the data in the form of a Table or Graph after a few seconds, as previously selected, **Figure 18** and **Figure 19**.

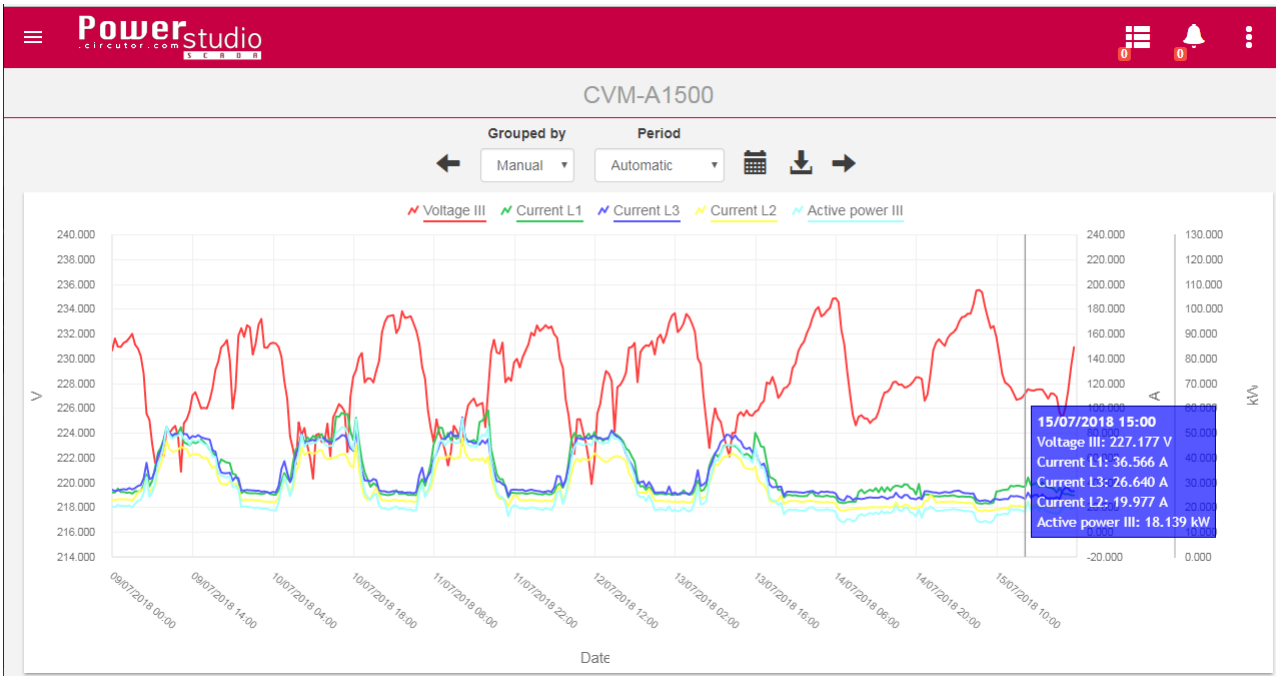
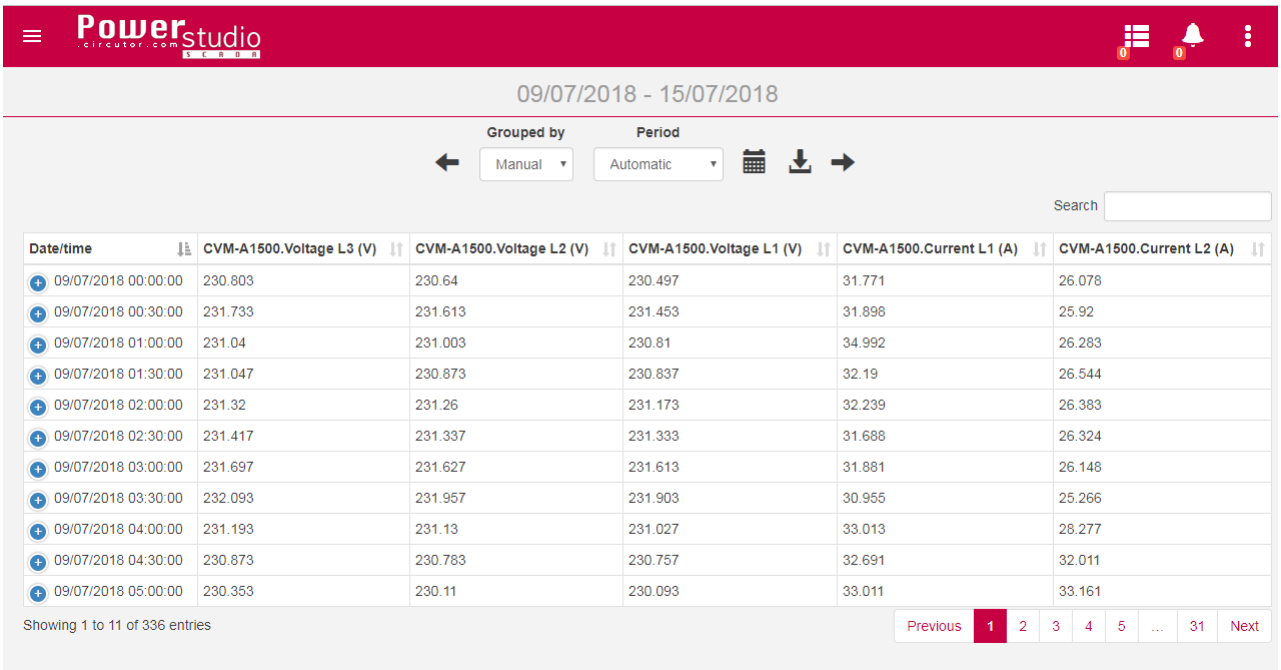


Figure 18: Visualization of the data in the form of a graphic.

- These data can be downloaded to a JPG image by clicking on the icon.



Date/time	CVM-A1500.Voltage L3 (V)	CVM-A1500.Voltage L2 (V)	CVM-A1500.Voltage L1 (V)	CVM-A1500.Current L1 (A)	CVM-A1500.Current L2 (A)
09/07/2018 00:00:00	230.803	230.64	230.497	31.771	26.078
09/07/2018 00:30:00	231.733	231.613	231.453	31.898	25.92
09/07/2018 01:00:00	231.04	231.003	230.81	34.992	26.283
09/07/2018 01:30:00	231.047	230.873	230.837	32.19	26.544
09/07/2018 02:00:00	231.32	231.26	231.173	32.239	26.383
09/07/2018 02:30:00	231.417	231.337	231.333	31.688	26.324
09/07/2018 03:00:00	231.697	231.627	231.613	31.881	26.148
09/07/2018 03:30:00	232.093	231.957	231.903	30.955	25.266
09/07/2018 04:00:00	231.193	231.13	231.027	33.013	28.277
09/07/2018 04:30:00	230.873	230.783	230.757	32.691	32.011
09/07/2018 05:00:00	230.353	230.11	230.093	33.011	33.161

Showing 1 to 11 of 336 entries

Previous 1 2 3 4 5 ... 31 Next

Figure 19: Visualization of the data in the form of a table.

- These data can be downloaded to an Excel spreadsheet in CSV format by clicking on icon.

2.4.2.- ENERGY PERIODS LOGS

The **CVM-A1500** power analyser can measure total energy, by phase and by three tariffs, both in consumption and in generation.

To have the energy data in a given period, select **Energy type III** variables to display total energy, or **L1**, **L2** and **L3** for energies by phase.

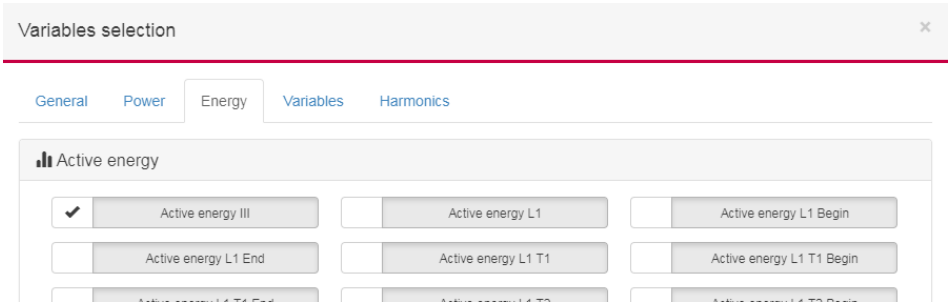


Figure 20:Variables selection.

- The "**Begin**" and "**End**" variables take the meter reading back to the beginning (**Begin**) and end (**End**) of the selected period.

Collapse all the variables menus by clicking on each title bar of the variables group until the **Accept** button is shown, and then click on it.

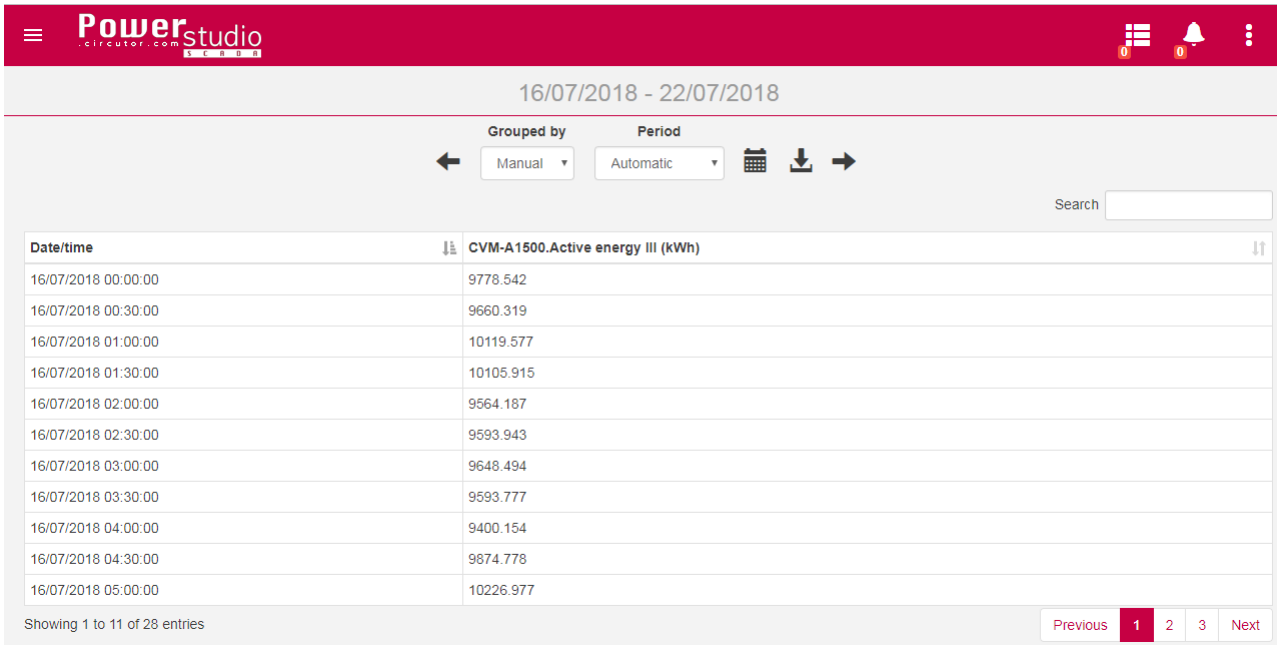


Figure 21:Visualization of the data in the form of a table.

- These data can be downloaded to an Excel spreadsheet in CSV format by clicking on icon.

These data can be converted to graphic format using the **Graph** icon in the Web server menu.

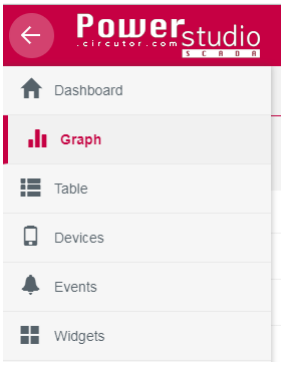


Figure 22: Web server menu.

The information in the above table, **Figure 21,** is displayed in **Graph** format after a few seconds.

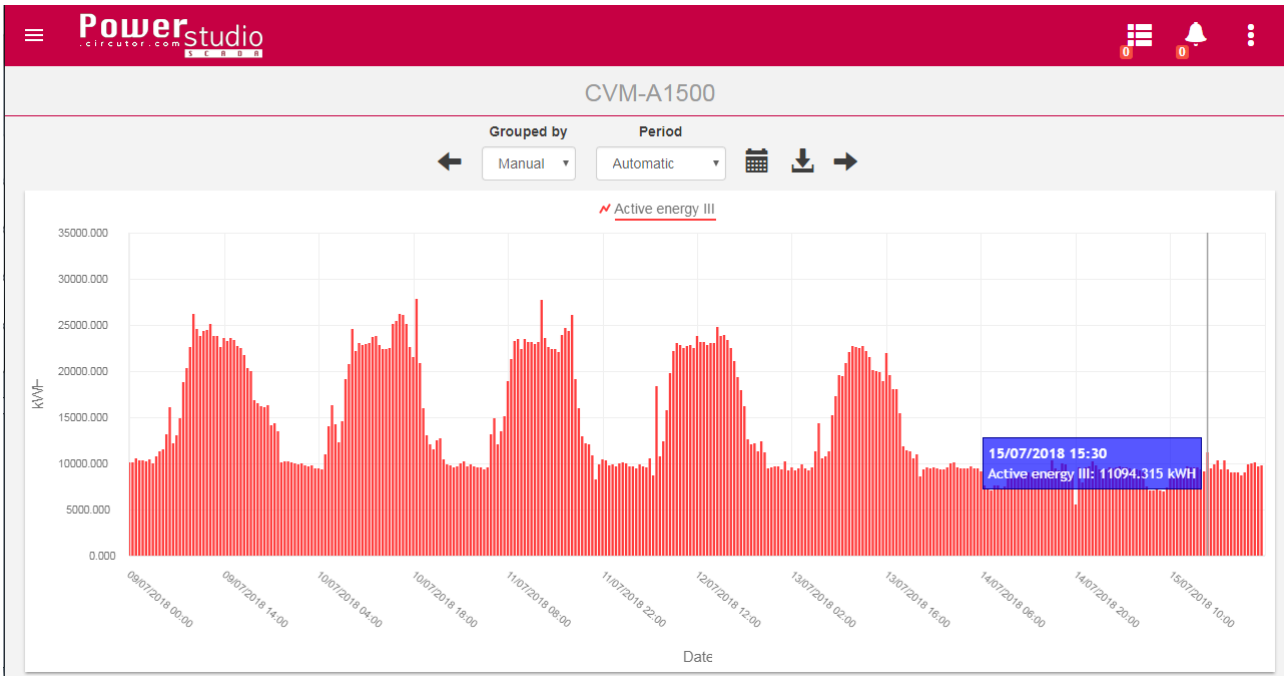


Figure 23:Visualization of the data in the form of a graphic.

- These data can be downloaded to a JPG image by clicking on the icon.

The closing period can be changed by selecting different resolutions for the data displayed, using the start and end of period control or calendar control .

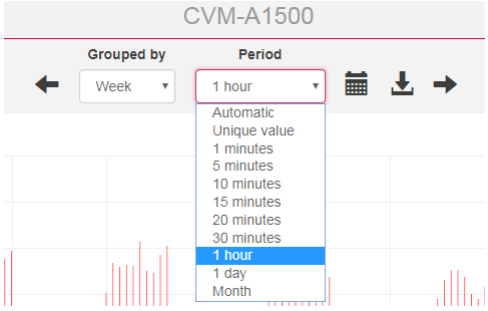


Figure 24: Changing the display period.

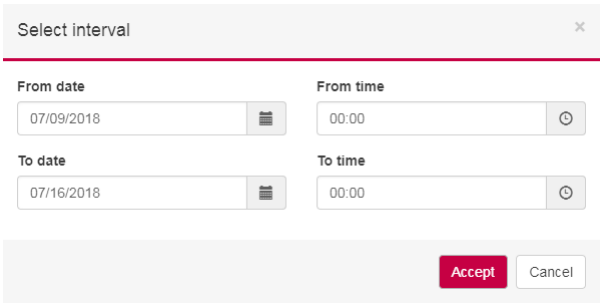


Figure 25:Changing the display period.

2.4.3.- QUALITY EVENTS LOGS

Select the **Harmonics** tab (this will be changed to a tab called **Quality** in future versions), and select the variables shown in the image. Click on the header of the group of variables to minimize them.

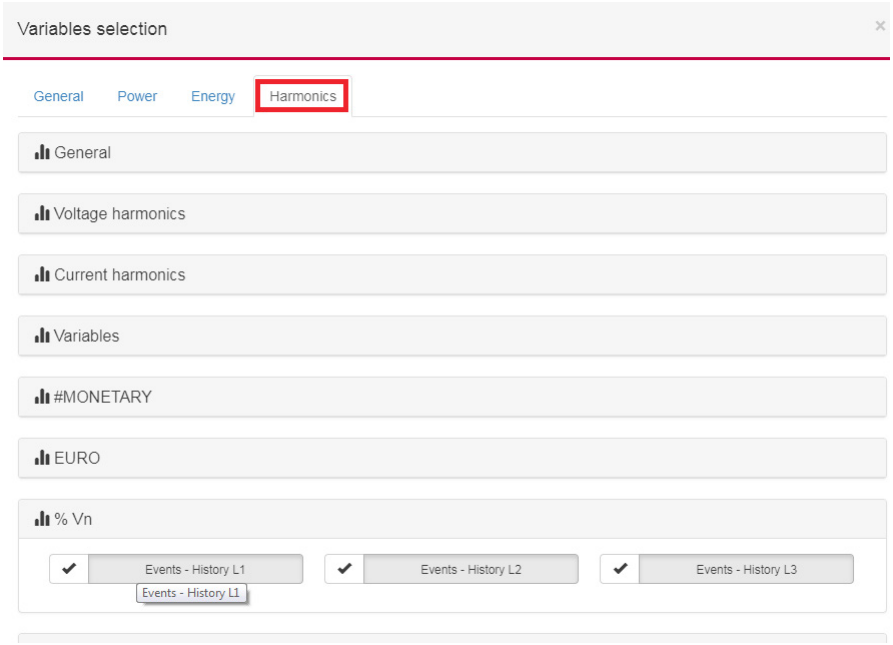


Figure 26:Variables selection.

The Web server will display the table in **Figure 27.**

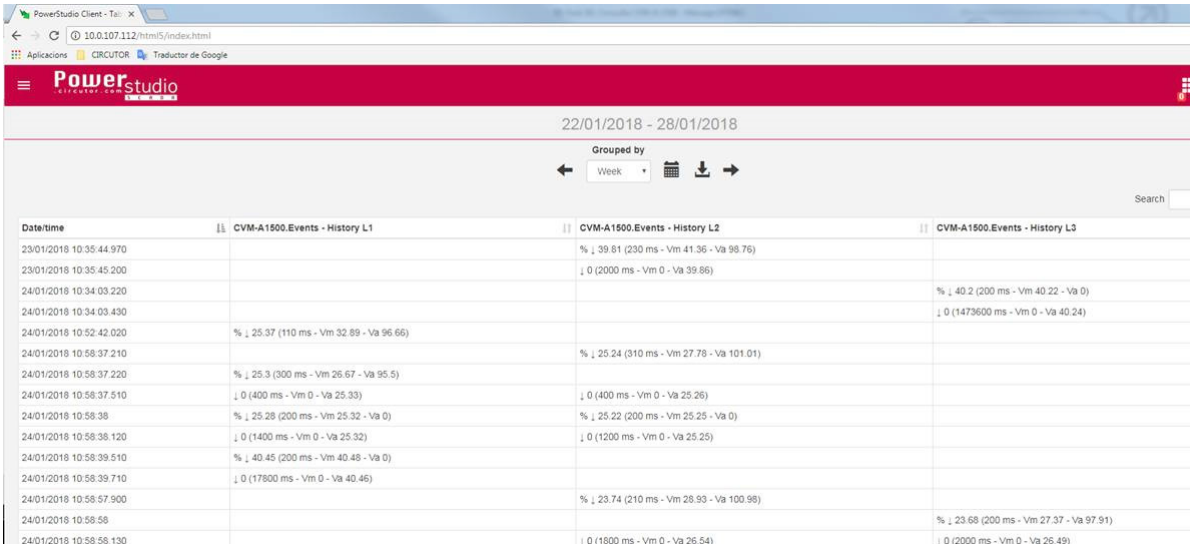


Figure 27:Table of quality events.

● The first column shows the event detection date and time. In the hour they are indicated until the milliseconds.

● The events detected by each phase are shown in each column.

● A different icon is displayed to identify each event type (Overvoltage, Gap or Interruption).

Note : *According to standard, when detecting a interrupt event, the Gap event and the interrupt event must first be recorded separately.*

● The % of phase-neutraL voltage which triggered the detection is shown.

● In parentheses, it is shown:

- ✓ The length of the event in ms (milliseconds).
- ✓ The % of phase-neutral voltage measured, **Vm**, over the duration of the event.
- ✓ The % of phase-neutral voltage prior, **Va**, prior to the detected event is shown.

These data can be downloaded to an Excel spreadsheet in CSV format by clicking on icon.

In the graph of **Figure 28**, all detected events are displayed according to their Phase-Neutral voltage% and duration.

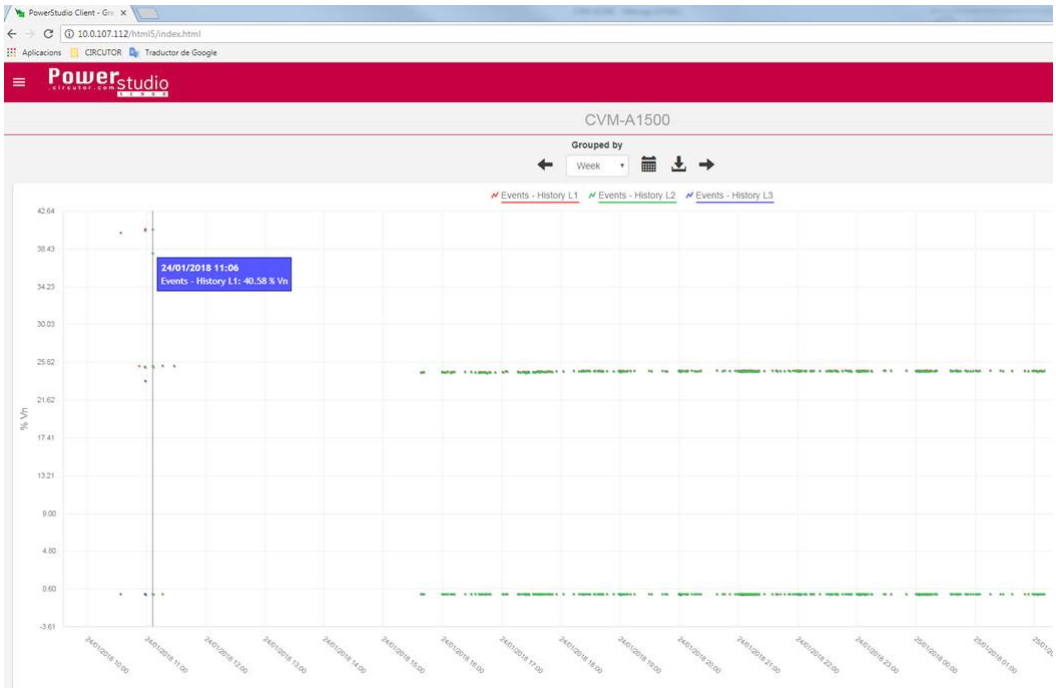


Figure 28: Graphic of quality events.

● These data can be downloaded to an Excel spreadsheet in CSV format by clicking on icon.

2.4.3.1.- Display of an extended waveform

Expand the main menu and select the **Graph** menu.
Select the **CVM-A1500** device folder in the next window and select the **CVM-A1500** device.
On the screen in **Figure 29** select "**Waves form (extended)**"

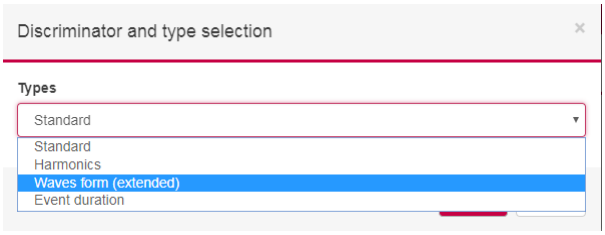


Figure 29:Select Waves form extended.

Select the variables to be displayed in the graph, **Figure 30.**

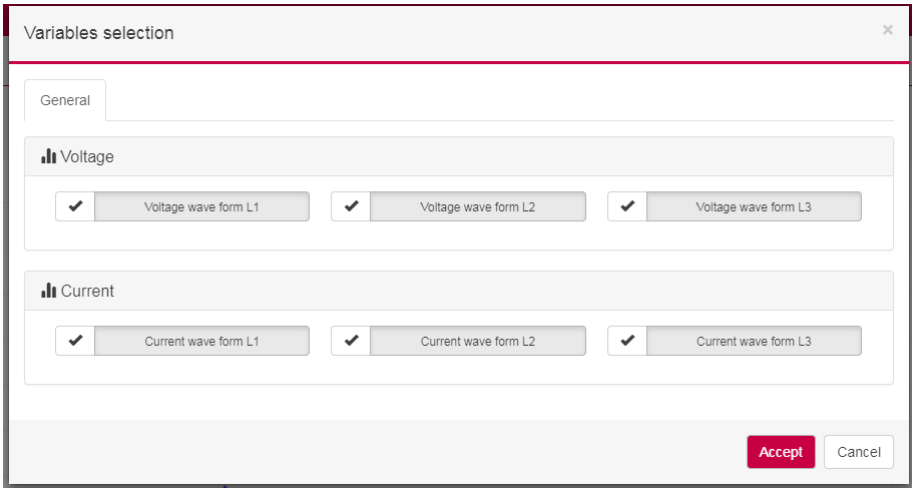


Figure 30: Variables selection.

After clicking on Accept, the **CVM-A1500** web server will display the last waveform recorded, **Figure 31.**

Figure 31:Display a waverform.

- These data can be downloaded to a JPG image by clicking on the icon.

Note: *In section **5.2** of the manual of the **CVM-A1500** (**M136B01-03-xxx**), it explains how to view, through the device screen, the registered quality events and their associated information.*

3.- CVM-A1500 ADVANCED CONFIGURATION - PowerStudio EMBEDDED

3.1.- INSTALLATION OF **PowerStudio SCADA** (Editor)

Download the **PowerStudio SCADA** version from **CIRCUTOR**'s website.

Run the installation on a 64-bit operating system. User, company, and serial number are information fields.
Choose the customised setup option during installation, and select the Client and Editor option.
Follow the steps in the wizard to finish installing.

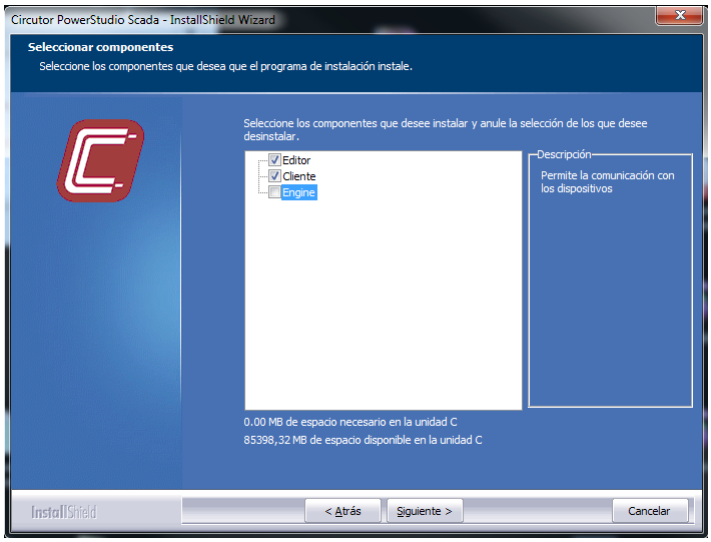
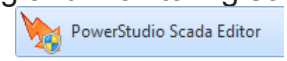


Figure 32: PowerStudio SCADA installation.

3.2.- IMPORTATION AND EXPORT OF THE **PowerStudio EMBEDDED** APPLICATION IN **CVM-A1500**

Once the editing and monitoring software is installed, run the **PowerStudio SCADA** editor by clicking on the 

icon in the start menu.

If a window is displayed to include new devices, choose no.

Click on the IMPORT button after running the **PowerStudio SCADA** editor.

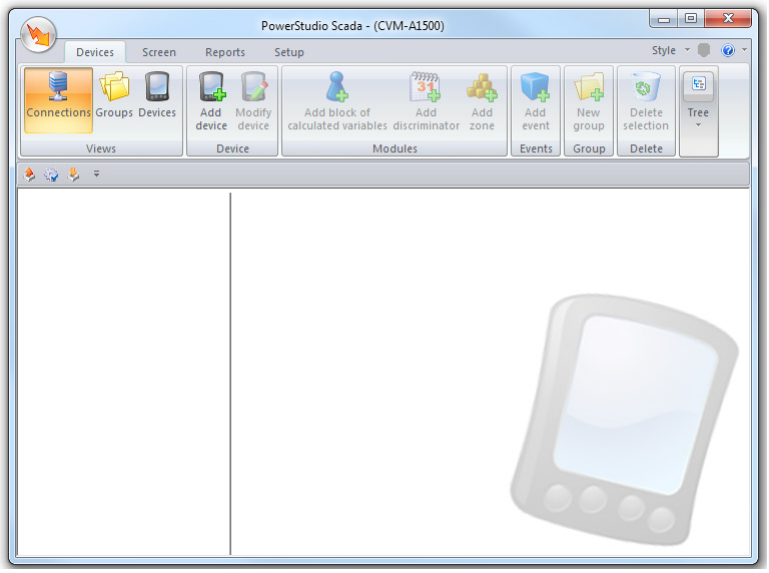


Figure 33: PowerStudio editor.

On the screen that appears, **Figure 34**, enter the IP address assigned to the **CVM-A1500**. The port is always **80**.

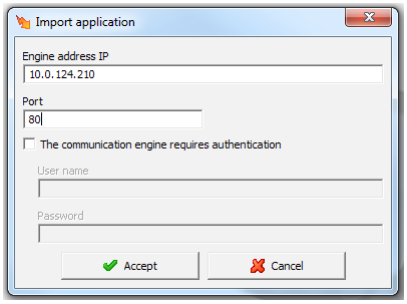


Figure 34: Import data.

After clicking on Accept, the system will import the **CVM-A1500** embedded system settings into the editing environment.

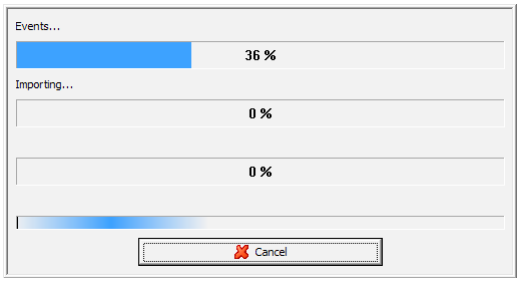


Figure 35: Import data.

All the advanced settings options offered by **CIRCUTOR**'s **PowerStudio** embedded system are available once the import process is finished, **Figure 36**.

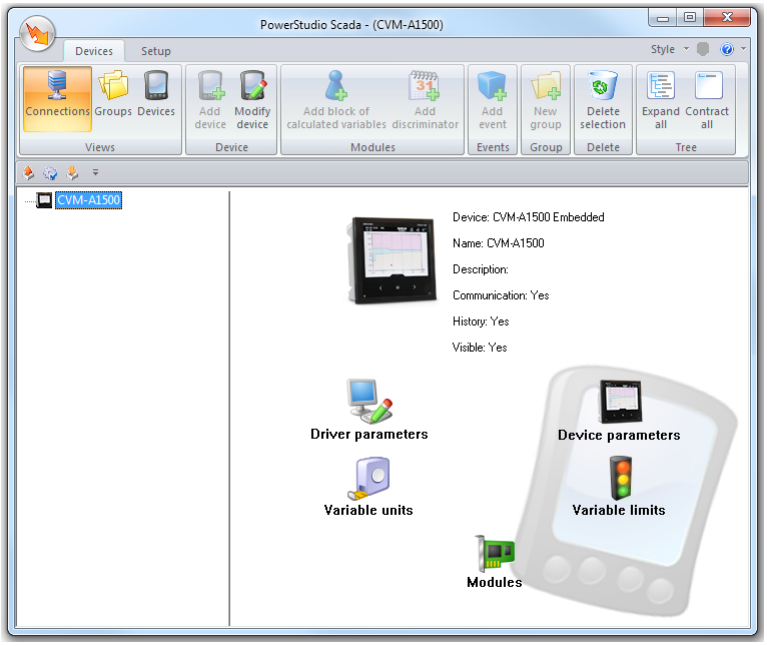


Figure 36:PowerStudio embedded.

Once made the changes in the advanced configuration of **PowerStudio** embedded of the **CVM-A1500**, it is necessary to send the application with the new configurations so that the Web server implements them in the system. To do this, click on the Export button. .

3.3.- CONFIGURATION OF ADDITIONAL VARIABLES WITH MATHEMATICAL CALCULATIONS

The **CVM-A1500**'s **PowerStudio** embedded system allows new variables to be generated using data from the analyser itself. These variables may contain relatively complex calculations.

For it, import the **CVM-A1500 PowerStudio** embedded system application into the **PowerStudio** Editor, and go to the **Setup** tab.

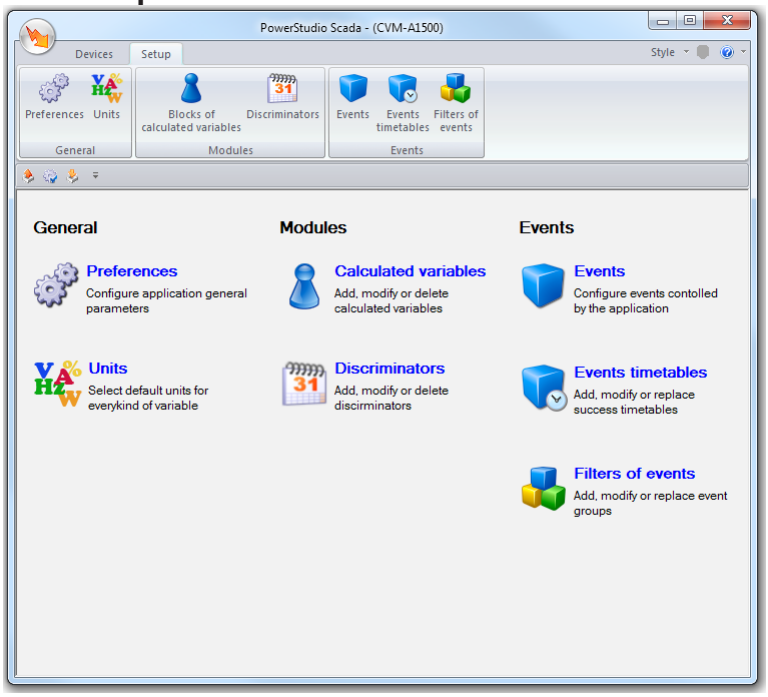


Figure 37: PowerStudio.

Go to **Calculated variables** module, **Figure 38**, click **Add** and enter a name for the group of variables.
If you want to record the variables the group will contain, check the **save** option and define the recording period.

Registering groups of variables with a recording period of less than 10 minutes is not recommended. If less time is configured, the system may not have enough memory to record the variables for the entire analyser for the remainder of the current month.
At the start of a new month, the embedded system provides the space necessary for the following month, deleting all the records for the oldest month if there is not enough memory.

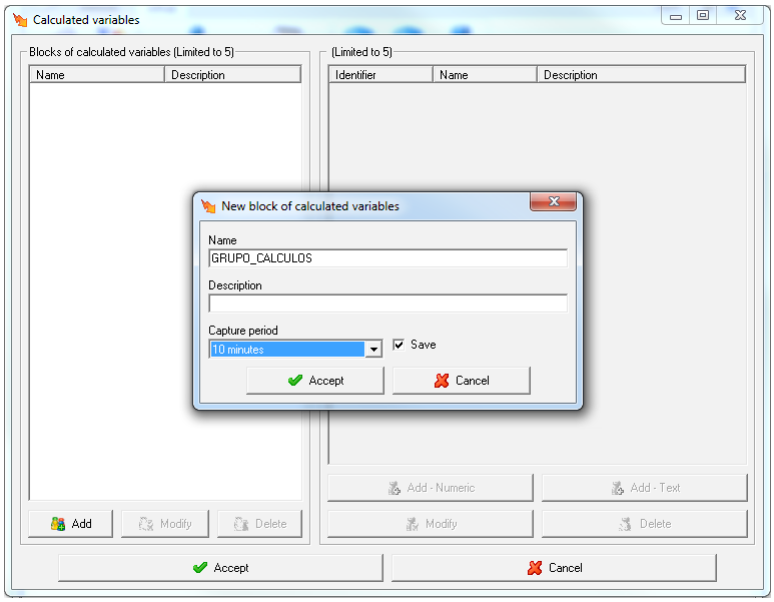


Figure 38: Calculated variables screen.

Then generate as many variables as required in the group of variables created, and configure the available options. See the complete **PowerStudio** manual for more information about the functions of these settings.

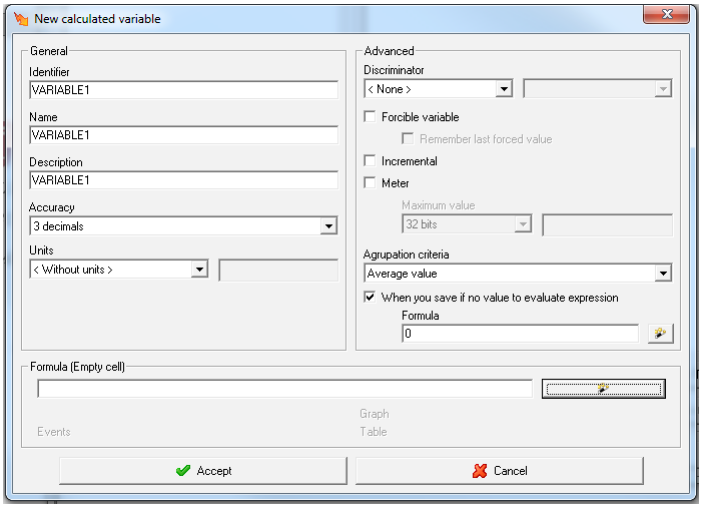


Figure 39:New calculated variable screen.

Click on the **Wizard** button to generate the formula of the variable that is being configured.

The screen in **Figure 40** appears, where they are displayed the options to access different items

that can make up the syntax to generate the formula:

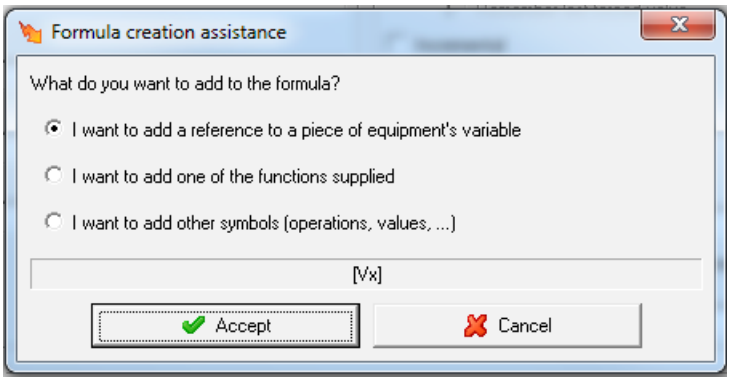


Figure 40: Formula creation assistance.

● The first option will help you to choose a variable integrated in the device, or a variable integrated in another group of previously created variables.

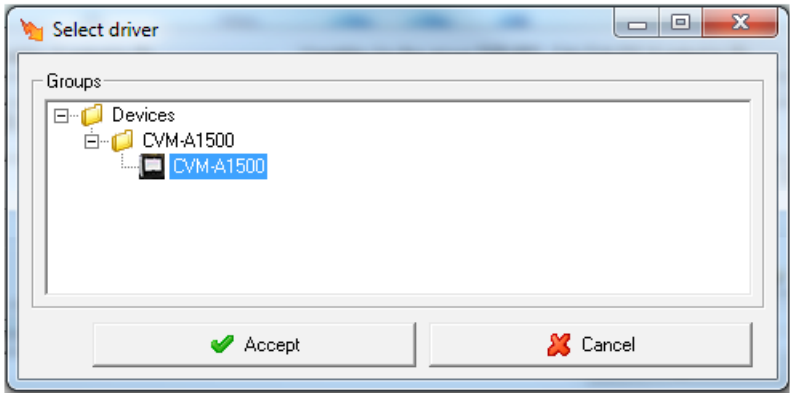


Figure 41:First option.

● The second option gives access to the special mathematical calculation functions available in the embedded system. See the **PowerStudio** manual for more information on each of these functions.

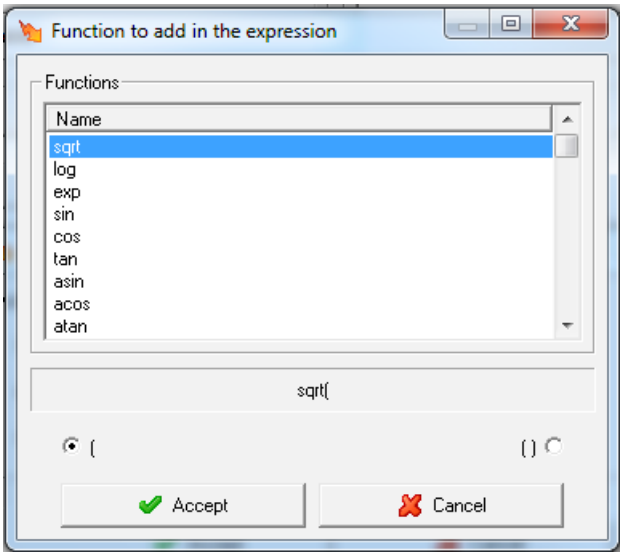


Figure 42:Second option.

●The third option shows the logical operations and symbols to complete the formula.

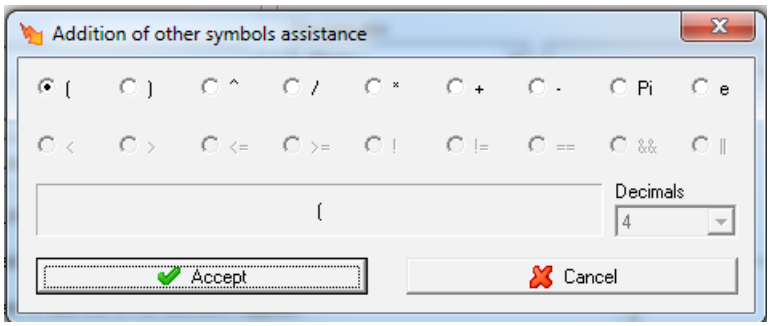


Figure 43:Third option.

As an example, configure a group of variables containing three variables set up as follows, **Figure 44**.
The maximum is 5 groups of variables with 5 variables.

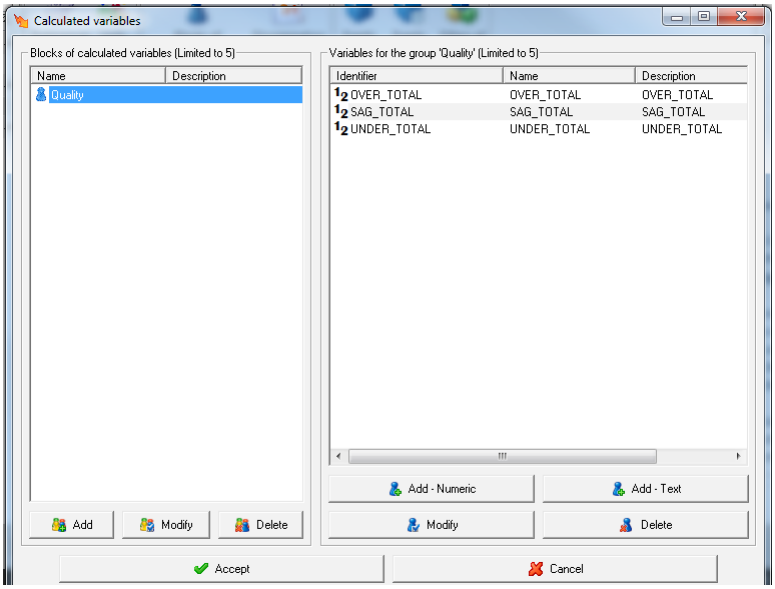


Figure 44:Calculated variables, example.

Define each variable as indicated in **Figure 45**.

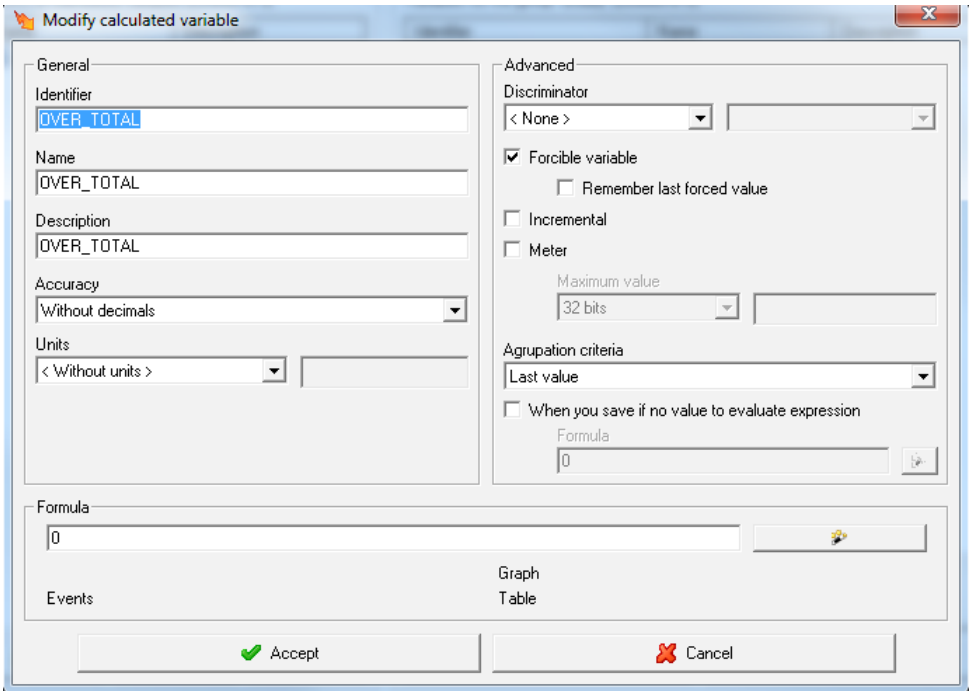


Figure 45:Calculated variables, modify calculated variable.

All three variables must have the **Forcible variable** option enabled, as a **Agrupation criteria** *Last value*. The formula must contain a zero.

3.4.- CONFIGURATION OF ALARMS FOR SENDING EMAILS

The **CVM-A1500**'s **PowerStudio** embedded system is capable of sending e-mails according to a condition programmed in the **events** module. It can also be used to set up mailing lists to send mail to different users at the same time.

To configure this feature, it is necessary to pre-program the account and the outgoing mail server from which the embedded **PowerStudio** system will send the mail. To do this, access the **Preferences** module,**Figure 46.**

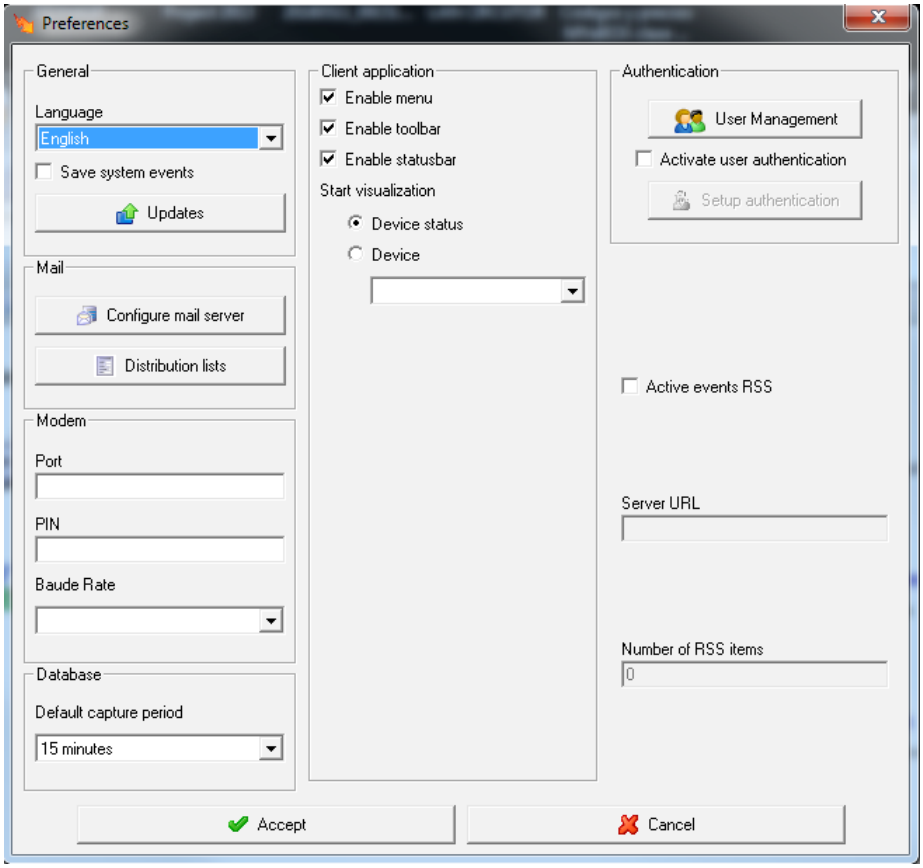


Figure 46:Preference modules.

Click on the **Configure mail server** button

.

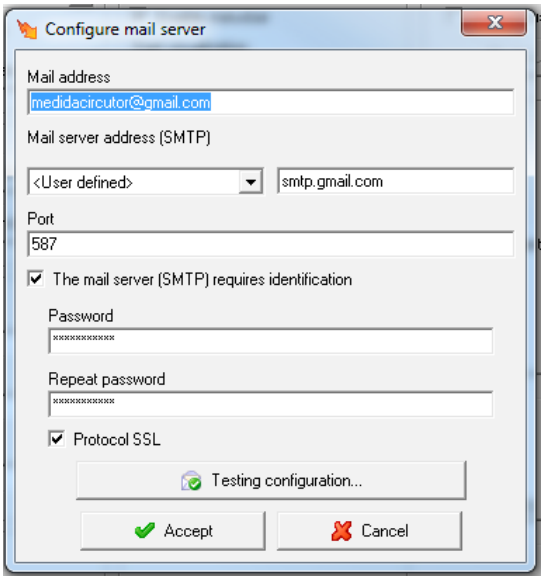


Figure 47: Configure mail server.

Click on the test button

to ensure that the account settings are correct and the embedded system has connectivity to the configured mail server.

If the outgoing server does not work properly, check the account settings and ensure the **CVM-A1500** has Ethernet connectivity and the mail server is accessible.
If you are sure the settings and connectivity are correct, click on **Accept** and carry out the steps detailed below to automatically send a test email using the event settings.

Once the mail server and outgoing account are configured, go to the main **Setup** panel and select **Events** to generate a new event.

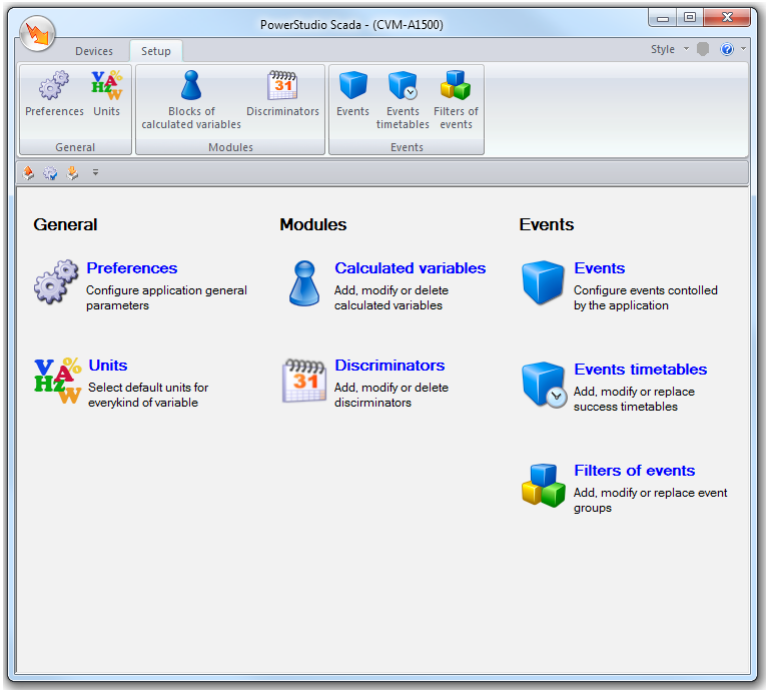


Figure 48:Main Panel: Setup tab.

On the screen of **Figure 49** add a new event. The **PowerStudio** embedded system in the **CVM-A1500** supports up to 10 events.

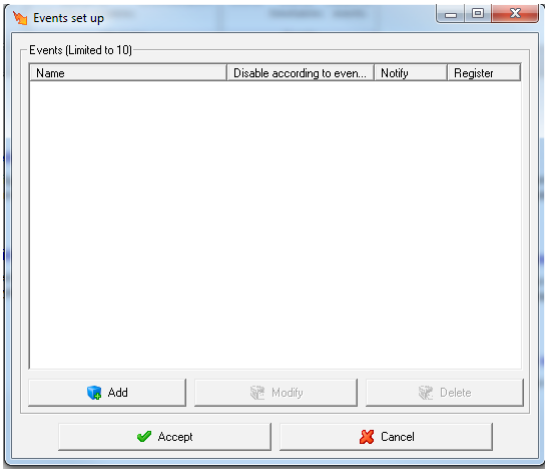


Figure 49:Add a new event.

As an example, configure an event to send an email in the case of detecting an overvoltage in any of the three phases.

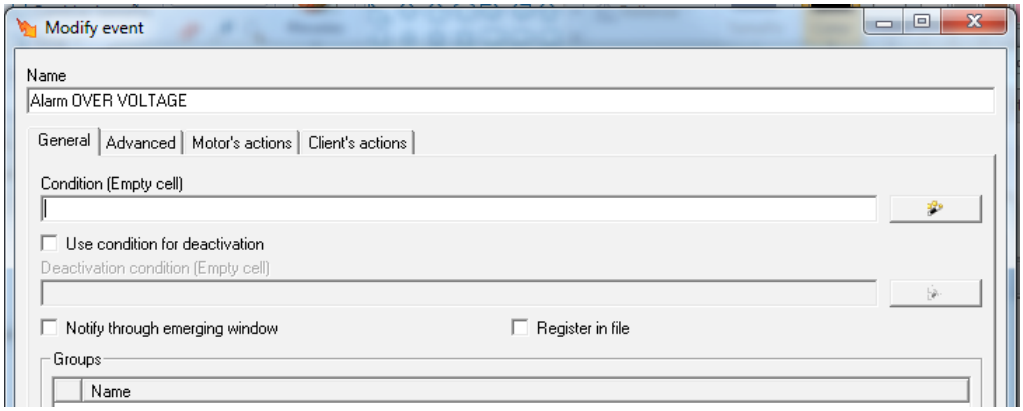


Figure 50: Modify event.

Click on the **Wizard** button to generate the activation condition.

Select the **Quality** tab and check the **Overvoltage counter Phase 1** variable**, Figure 51.**

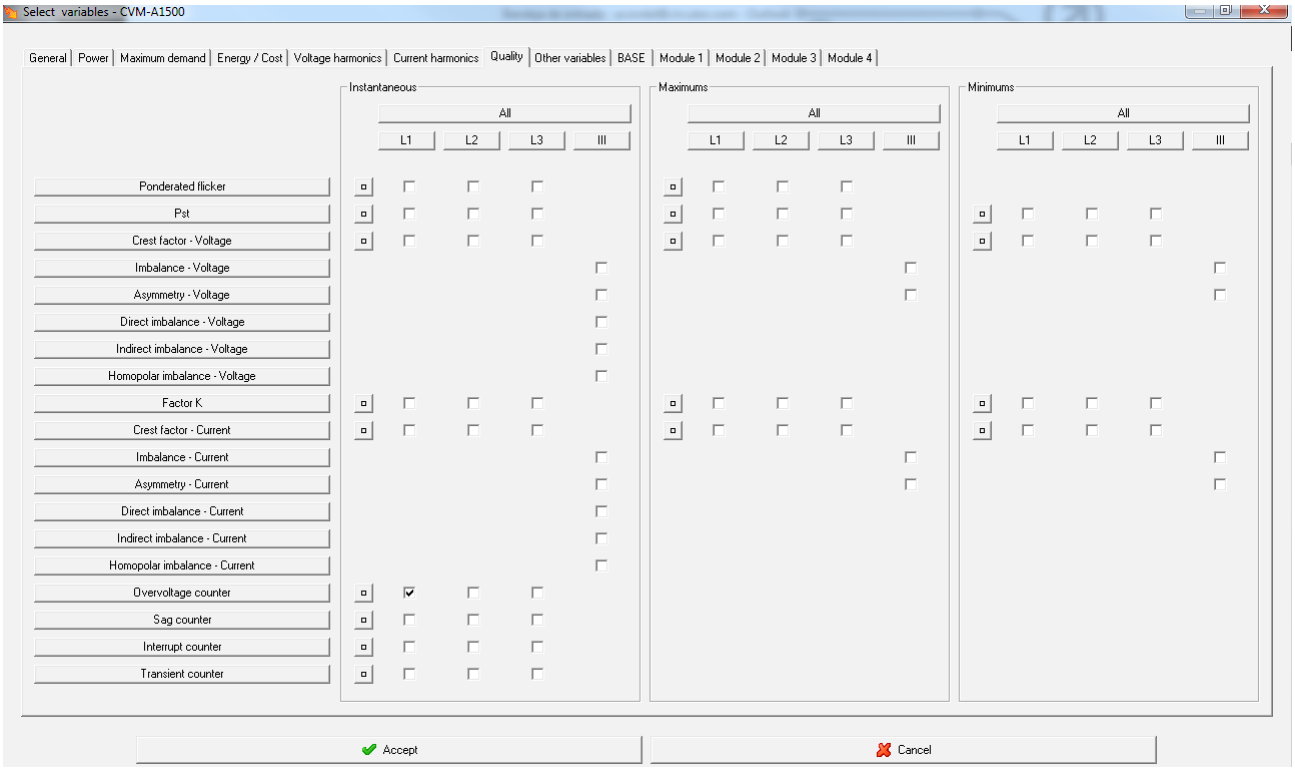


Figure 51:Select variables.

After clicking **Accept**, the following expression is displayed in the formula field. After clicking OK, the following expression is displayed in the formula field. This expresses the overvoltage counter of Phase 1 of the**CVM-A1500**:

[CVM-A1500.OCEVQ1]

Complete the formula with the following expression. The number of overvoltage events of the three phases are therefore added up.

[CVM-A1500.OCEVQ1] + [CVM-A1500.OCEVQ2] + [CVM-A1500.OCEVQ3]

The activation condition of the event needs a comparison in order to be carried out. It will be compared with the variable calculated in previous steps.

[CVM-A1500.OCEVQ1] + [CVM-A1500.OCEVQ2] + [CVM-A1500.OCEVQ3] > [R$CAL_Quality.OVER_TOTAL]

To include the variable **[R$CAL_Quality.OVER_TOTAL]** in the formula, select the **Wizard** button followed by the group of calculated variables.

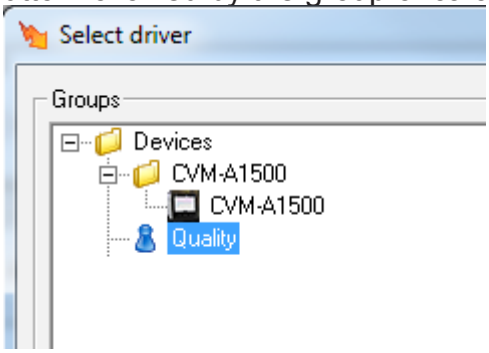


Figure 52:Selection of the calculated variables (Step 1).

On the screen of **Figure 53**, choose the variable that will contain the value of the number of total overvoltage events of the three phases.

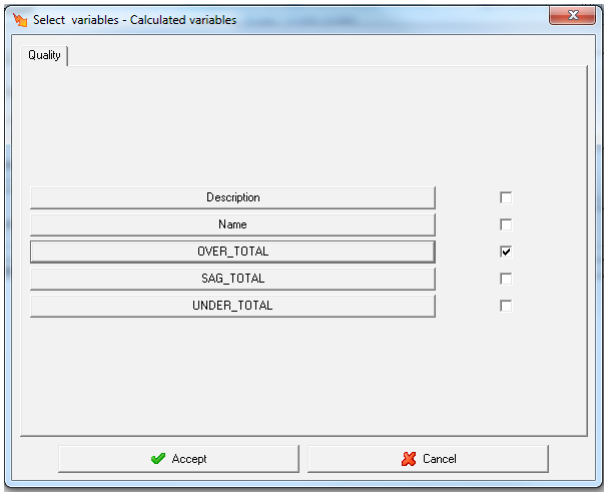


Figure 53:Selection of the calculated variables (Step 2).

The **action** the **CVM-A1500 PowerStudio** embedded system is to run must be configured once the event activation condition is defined. This is done by selecting **Motor's actions** and the **On activating** tab**, Figure 54.**

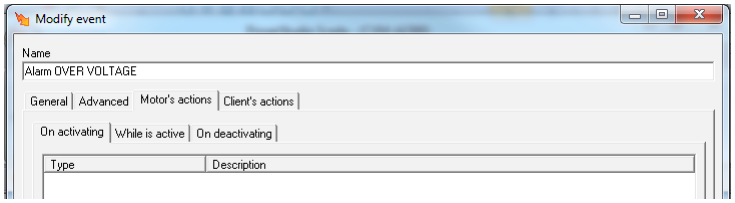


Figure 54:Selection of the calculated variables (Step 3).

Click on the **Add** button and select the **Send mail** option**, Figure 55**.

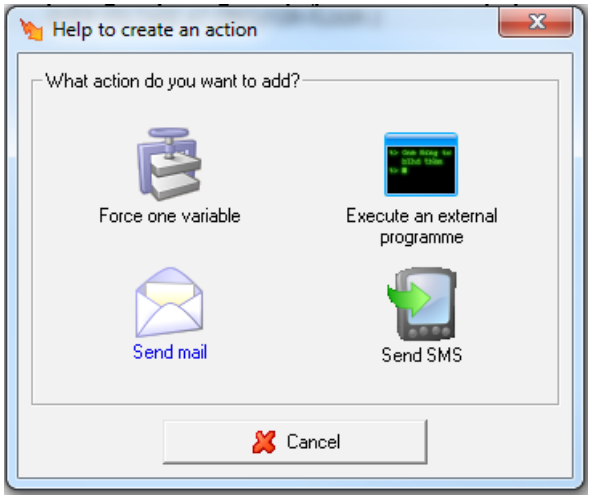


Figure 55:Selection of the calculated variables (Step 4).

Then include a text message and indicate email address of its recipient, **Figure 56**.

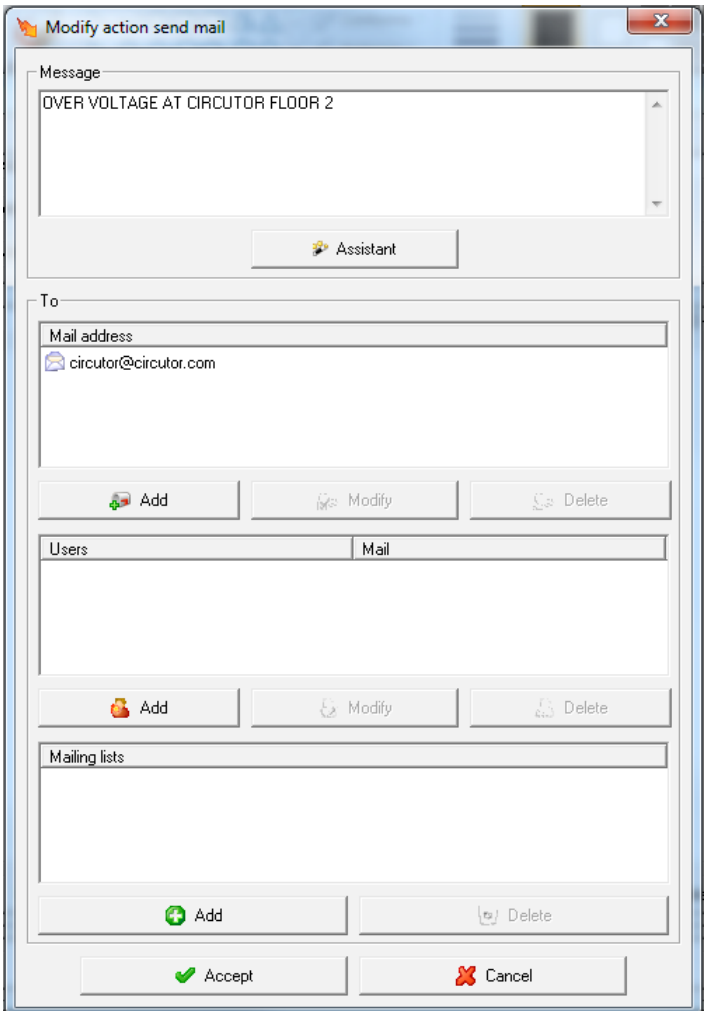


Figure 56:Selection of the calculated variables (Step 5).

Finally, the new total value from adding together the overvoltage meters of the three phases is passed to the associated variable, which it is compared with to activate the event.

Select **Add** new event, and choose the **Force one variable** option,

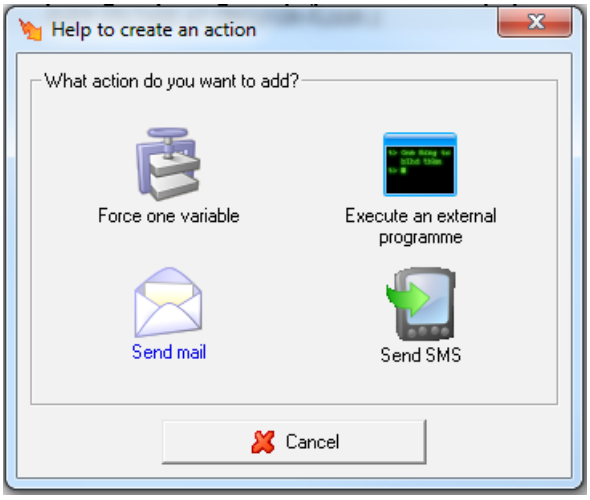


Figure 57:Selection of the calculated variables (Step 6).

Click on the **Wizard** button to search for the previously calculated variable for the overvoltage event.

Using the same button, then select the **CVM-A1500** overvoltage meter for line 1 and finish configuring the sum with the other two overvoltage events meters of the other two phases.

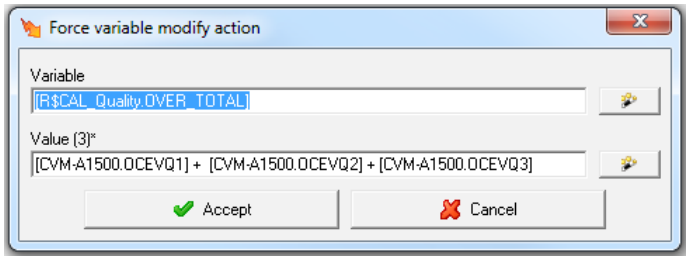


Figure 58:Selection of the calculated variables (Step 7).

Click on **Accept** in all windows.

Finally, **Export** the application as explained above, in order to apply the changes to the **CVM-A1500 PowerStudio** embedded system.

From now on, the **CVM-A1500** embedded system will send an email every time it detects overvoltage in any of the three phases.

The same settings can be used for the other two types of events, Gaps and Interruptions, following the same steps as above. Remember to **Export** the application to the **CVM-A1500** power analyser to apply the changes.

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