



Em² Server

**Web application
for energy monitoring of
conventional plants.**

User manual

SUMMARY

1	PRELIMINARY REMARKS	5
1.1	EM ² -SERVER PURPOSE	5
1.2	GENERAL OVERVIEW	6
1.3	DATA IMPORT PROCESSES	6
1.4	USER LICENCE	6
1.5	IT SECURITY	7
2	VIRTUAL MACHINE SETUP	8
3	EM²-SERVER	11
3.1	ACCESS TO THE SYSTEM	11
3.2	PRELIMINARY INFORMATION	11
3.2.1	REMOTE DEVICE	11
3.2.2	PHYSICAL INSTRUMENT	11
3.2.3	VIRTUAL INSTRUMENT	12
3.2.4	PLANT HIERARCHY	12
3.2.5	INDUSTRIAL MONITORING	12
3.2.6	FIELD DATA READING	12
3.2.7	EM ² -SERVER	12
3.3	HOME PAGE	12
3.3.1	NAVIGATION MENU	15
3.4	MONITOR	16
3.4.1	COMPARATIVE CHART	17
3.4.2	CURRENT	19
3.4.3	POWER FACTOR	19
3.4.4	ANALOGUE VARIABLES	21
3.5	MAIN DC METER TABLES	22
3.5.1	VOLTAGES	22
3.5.2	POWER	22
3.6	ZOOM FUNCTION	23
3.7	ANALYSIS	25
3.8	CONTROL PANEL	29
3.9	LOAD PROFILE	31
3.10	ALARMS	34
3.11	INFORMATION	36
3.12	EXPORT / COSTS	37
3.13	DATABASE	37
3.14	COSTS	39
3.14.1	SINGLE INSTRUMENT – SINGLE CALENDAR/CONTRACT	39
3.14.2	MULTIPLE INSTRUMENTS – SINGLE CALENDAR/CONTRACT	40
3.14.3	SINGLE INSTRUMENT – MULTIPLE CALENDARS/CONTRACTS	41
4	CONFIGURATION	43
4.1	INSTRUMENT	43
4.1.1	CREATE INSTRUMENT	43
4.1.2	MODIFY INSTRUMENT	44
4.1.3	INSTRUMENT AGGREGATION	44
4.1.4	TOTALIZER AGGREGATION	45
4.1.5	DEFAULT CALENDAR	46
4.1.6	MANAGE LEVELS	47
4.1.6.1	MANAGE LEVEL 1	47
4.1.6.2	MANAGE LEVEL 2	48
4.1.6.3	INSTRUMENTS / LEVEL 2	48
4.1.6.4	LEVEL 2 / LEVEL 1	49
4.1.7	DELETE INSTRUMENT	49

4.2	SERVER.....	50
4.2.1	NEW COMMAND.....	50
4.2.1.1	USER MANAGEMENT – ADD USER.....	51
4.2.1.2	USER MANAGEMENT – DELETE USER.....	51
4.2.1.3	NETWORK – NTP SERVER.....	51
4.2.1.4	NETWORK – E-MAIL CONFIGURATION.....	51
4.2.1.5	CONFIGURATION MANAGEMENT – UPDATE FIRMWARE.....	52
4.2.1.6	CONFIGURATION MANAGEMENT – RESET DATABASE.....	53
4.2.1.7	CONFIGURATION MANAGEMENT – SCAN NETWORK INSTRUMENTS.....	53
4.2.1.8	CONFIGURATION MANAGEMENT – SAMPLING INTERVAL.....	53
4.2.1.9	CONFIGURATION MANAGEMENT – COPY CONFIGURATION.....	53
4.2.1.10	EMERGENCY – RESTART.....	53
4.2.1.11	NETWORK – TUNNELLING.....	53
4.2.2	COMMAND HISTORY.....	54
4.2.3	DEVICE MANAGEMENT.....	55
4.2.4	TARIFFS.....	56
4.2.5	SYSTEM.....	62
4.2.5.1	LAN SETTINGS.....	62
4.2.5.2	NTP SETTINGS.....	63
4.2.5.3	E-MAIL.....	63
4.2.5.4	TUNNELLING.....	64
4.2.6	SYNOPTICS.....	64
4.2.7	CUSTOMER LOGO.....	66
4.2.8	SHOW LICENCES.....	67
4.2.9	SHOW ACCOUNT.....	67
4.2.10	USER / INSTRUMENT.....	68
4.2.11	SOFTWARE UPDATE.....	69
5	HOW-TO.....	70
5.1	LICENSING A VMUC DEVICE.....	70
5.2	REPLACING THE SERVER.....	70

1 Preliminary Remarks

This document must be regarded as an operating manual providing information about the use of the functions available in the EM2 Server management and monitoring system.

1.1 EM²-SERVER PURPOSE

Em²-Server is a Web-oriented tool for the management and monitoring of one or more conventional energy plants.

It allows to get information about the plant, view daily, monthly and yearly chart trends, export data to CSV and Excel format, send commands to remote devices.

The system can manage the following items:

- Multi-level hierarchical structure:
 - o Instrument level (real and virtual instruments)
 - o First aggregation level
 - o Second aggregation level
- User roles (Administrator, user)
- Instrument list
- Command management
- Alarms

The main functions are:

- Daily, monthly and yearly monitoring charts of various items, like power, current, voltage, environmental sensor trend
 - Detailed information about each plant or device
 - Device management function, allowing to aggregate them into virtual instruments
 - Map displaying in graphic form the world geo-location of aggregated instruments
 - Alarm panel, with acknowledgement function
 - E-mail management from server Tool for data export in Excel© 2010 standard format
-

1.2 GENERAL OVERVIEW

It highlights the following items:

1. Reading, interpretation and import process for the data from field devices.
2. Data compression and analysis database.
3. Internet/Web interface with the users (system administrators, analysis users).

1.3 DATA IMPORT PROCESSES

Data are imported by Em²-Server through a Web Server.

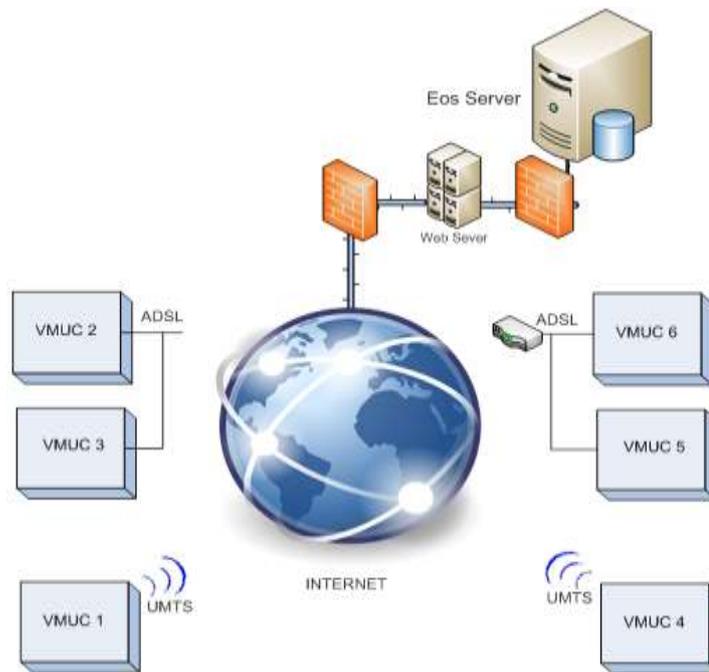


Figure 1: General architecture

Once configured, the field VMU-C modules replicate their data to the Em²-Server system.

1.4 USER LICENCE

The Em²-Server software can accept data from the installations only if it is duly equipped with a properly installed licence key. On a daily basis, Em²-Server checks the consistency of the key by connecting through the Internet to the Carlo Gavazzi License Management System on a secure HTTPS port.

In case of licence key inconsistency, or should the software fail to connect to the Carlo Gavazzi servers (for example because outbound HTTPS connections are blocked by a firewall), if the above conditions persist for **4 weeks (28 days)**, Em²-Server will disable the data reading functions from the field installations. When

connection to the License Management System is restored, and if licence keys are consistent, data exchange with the field will resume. Also, in the case it is necessary to move the Em²-Server virtual machine from one physical server to another, to follow the relevant procedure to avoid license disabling (with the subsequent stop of data-logging features).

1.5 IT SECURITY

Em²-Server is designed to be as safe as possible from IT security threats. Despite this, you should take into account that IT security is a process which depends on the individual components, on the infrastructures connecting them and on the usage procedures. For this reason the user shall be responsible for implementing all the systems (like firewalls) and procedures required to protect his installation hacking attempts or malicious software which may affect its security.

2 VIRTUAL MACHINE SETUP

Em²-Server is supplied as a virtual machine including Linux operating system, PostgreSQL database and Em²-Server application software on DVD media in .OVF format.

The Virtual machine (hereinafter referred to as VM) is compatible with the VM hosting software VMWARE® in its different solutions (we recommend that you visit the site <http://www.vmware.com/> for an overview of the solutions and to verify the system hardware requirements)⁽¹⁾ .

The ideal target for server solutions is the VMWARE vSphere⁽²⁾ platform, but it can be installed on any Virtual Machine Host among the VMWARE® solutions which are compatible with the OVF file supplied in the VMWARE release in use (the release may change for reasons associated with technological update and IT security; the user shall ensure that its infrastructure is up-to-date and compatible with the supplied OVF file).

On vSphere install the virtual machine:

File -> Deploy OVF template

Then select the concerned file.

For the first login of the virtual machine on vSphere use the following credentials:

Username: **customer**
Password: **customer**

Note: Before the first start-up make sure you have temporarily disabled the network adapter.

The main screen (Desktop) of the virtual machine shall be as shown in the following image.



Figure 2: Desktop virtual machine

Notes:

(1) Carlo Gavazzi has signed no technical or business agreement with VMWARE®. This solution has been chosen for its worldwide diffusion

(2) *The instructions below refer to the vSphere hosting platform; the user may decide to use an alternative VMWARE® platform and the installation of the VM in OVF format shall follow the guidelines provided by the VMWARE® documents*

The password may be modified from a Linux terminal, through the “password” icon on the desktop. Double-clicking on it will display a screen; click on “Run in terminal” and type the new password twice.

The user owns the permissions required to modify the IP address of the machine.

To modify the network settings double-click on “network”.

A screen will be displayed; click on “Run in terminal”.



Figure 3: Command execution confirmation

Enter the user password “customer”.

The screen shown in the figure will be displayed:.



Figure 4: Network setting editing panel

Login with credentials: admin/admin

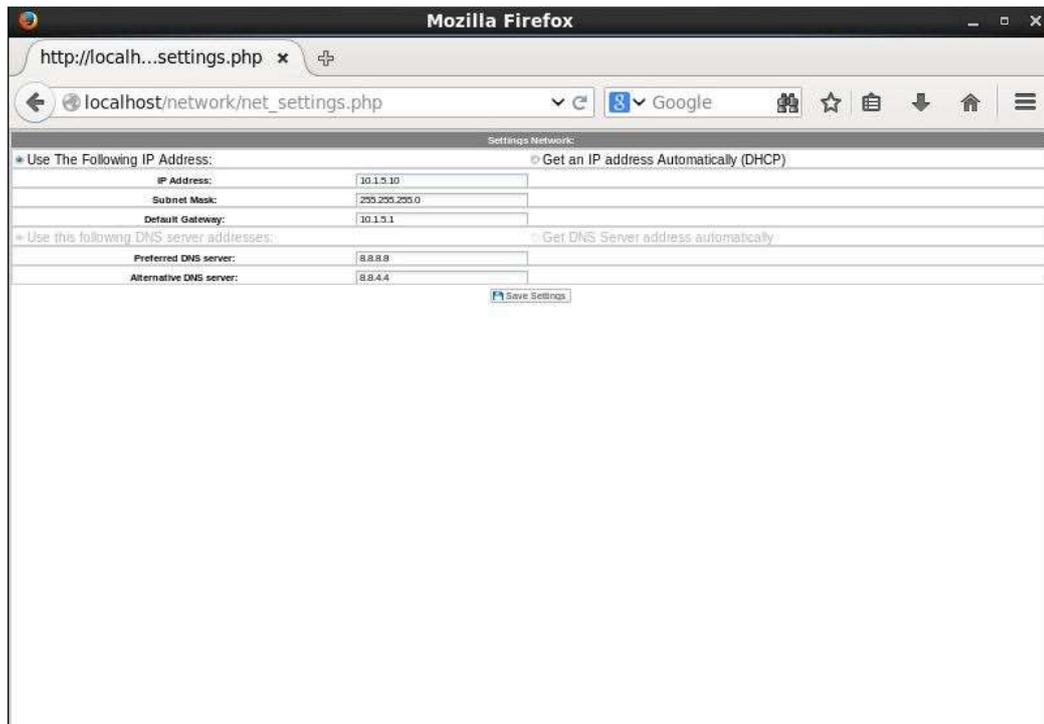


Figure 5: Network setting editing panel – Network parameters

Enter the different network parameters using the arrow keys of the keyboard to navigate between the fields.
After filling in the fields, select SAVE and press Enter.

Access the VMWARE machine settings and enable the network BEFORE rebooting.

The initial screen will be displayed; select "Save&Quit" and press Enter.

Once the process is completed you need to restart the machine to apply the changes. On the desktop double click on reboot; the system will be restarted.

After rebooting run the "Show IP" application to display the current machine IP (If set to DHCP it allows to identify the IP it received).

Now access the portal through the Browser

http:\\xxx.xxx.xxx.xxx

The user is also authorised to è shut down the Linux virtual machine, by double-clicking on the "Shutdown" icon.

3 EM²-SERVER

3.1 ACCESS TO THE SYSTEM

Em²-Server basically operates through TCP/IP communications, by means of an highly interactive user interface based on a Web Server, and communicates with the VMU-C devices through a Web Service.

Em²-Server has no preset address; once the virtual machine is initialised, connect to the system by typing in the browser the relevant IP address specified by the provider in case of Internet access; if the virtual machine has been installed inside an intra-net, use the LAN IP to connect;



Figure 5: Login Page

The following are the default username and password:

Username	Password	Username
admin	admin	Administrator

It is essential that you modify the default password, as otherwise unwanted users might be able to access the system, above all when using an Internet connection.

3.2 PRELIMINARY INFORMATION

3.2.1 REMOTE DEVICE

"Remote device" indicates the VMU-C field module constantly replicating data to the Em²-Server server.

3.2.2 PHYSICAL INSTRUMENT

"Physical instrument" indicates a real instrument connected to a remote VMUC.

3.2.3 VIRTUAL INSTRUMENT

"Virtual instrument" indicates a virtual instrument created by aggregating one or more instruments (whether real or virtual).

3.2.4 PLANT HIERARCHY

The Em²-Server system is based on a three-level hierarchy:

- Level 1: First level of aggregation;
- Level 2: Second level of aggregation; This level is displayed in the map if coordinates are specified;
- Instrument level: This level, the last one, is the level with the actual instrument.

Hybrid aggregations with a different order are not allowed.

3.2.5 INDUSTRIAL MONITORING

The Em²-Server system provides full management of distributed photovoltaic installation monitoring, allowing to manage through a centralised Web interface the field data read by the VMU-C devices.

3.2.6 FIELD DATA READING

This term indicates a datum or a set of data directly read by the VMU-C. The VMU-C transmits its data and alarms by PUSH on a secure Web-Service provided by Em²-Server. The user shall be responsible for ensuring that the VMU-C and Em²-Server network connection allow reliable communications, with a properly sized bandwidth.

3.2.7 EM²-SERVER

This term indicates the central server where all data shall be replicated. The installation must be accessible from the Internet to allow the communication with the remote VMU-C. The user shall be responsible for properly and securely configuring the network infrastructure (including routers, firewalls, modems and any other required device).

3.3 HOME PAGE

The figure below shows the EM2-Server home page:

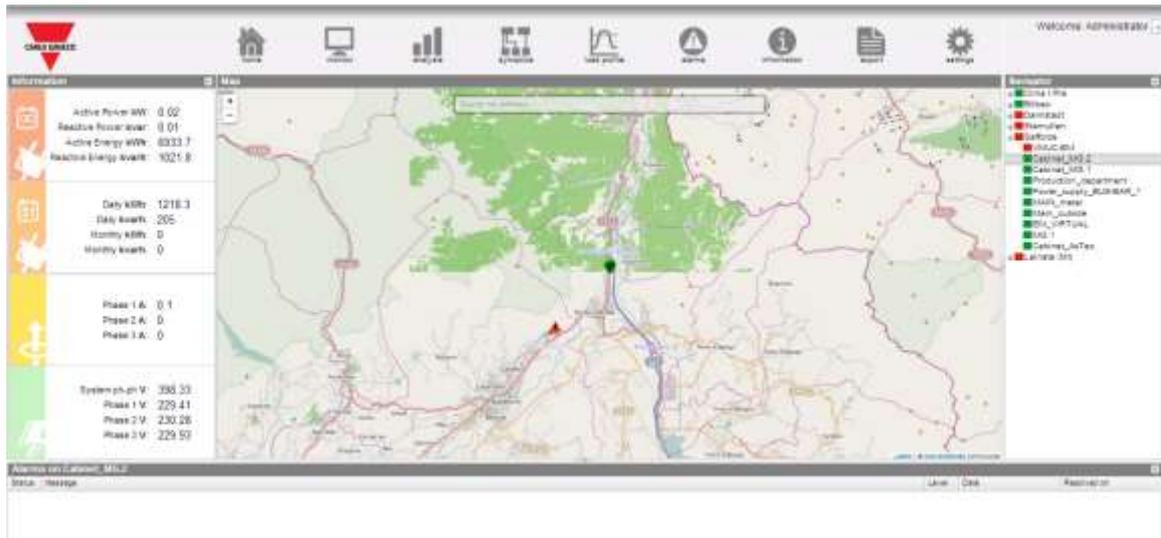


Figure 6: Em² Home page.

In particular, we have highlighted the following items, which are always available while using the software:

- Main Menu: It includes the Navigation Menu
- Lh Frame: Starting from the top we have:
 1. Summary data. (Automatic data update)
 - Instant active AC power – Instant power (kW) consumed by the plant. The piece of data comes from the selected Energy meter
 - Instant reactive AC power – Instant power (kvar) consumed by the plant. The piece of data comes from the selected Energy meter
 - Total active AC energy – Total energy consumed by the plant since its switch-on. The piece of data comes from the selected Energy meter
 - Total reactive AC energy – Total reactive energy consumed by the plant since its switch-on. The piece of data comes from the selected Energy meter
 2. Period data. (Automatic data update)
 - Daily active AC energy – Energy consumed by the plant since the beginning of the day. The piece of data comes from the selected meter
 - Daily reactive AC energy – Reactive energy consumed by the plant since the beginning of the day. The piece of data comes from the selected meter
 - Monthly active AC energy – Energy consumed by the plant since the beginning of the month. The piece of data comes from the selected meter
 - Monthly reactive AC energy – Reactive energy consumed by the plant since the beginning of the month. The piece of data comes from the selected meter
 3. Current data: (Automatic data update)
 - L1 current:
 - L2 current:

- L3 current:
4. LN voltage data (automatic data update)
- LL Sys voltage:
 - L1n voltage:
 - L2n voltage:
 - L3n voltage:
 -
- Rh Frame (Navigator): It provides a tree view of the hierarchy existing in Em²-Server on three levels:
 - Level 1
 - Level 2 (The one displayed on the map)
 - Physical or virtual instrument
 - Alarm Frame: It provides the list of recent alarms for the selected item. If you select a an instrument or a higher level, for example, the alarm panel is updated with the alarms associated with the selected item.
 - Map Frame: It provides a map showing the location of the different "Level 2" containers at international level. The map has an automatic zoom function allowing to display in a single screen all the monitored devices.

3.3.1 NAVIGATION MENU

Home

It allows to return to the main page. Clicking a further menu will restore the screen which was displayed before clicking "Home".

Monitor

It allows to display in graphic form the trends of the dimensions measured by the selected energy meter, also allowing to view them in real time.

Analysis

It allows to analyse multi-track history trends of variables from one or more instruments, according to preset or custom aggregations

Synoptic

It allows to display in graphic form the synoptics, sets of active icons arranged on user-defined layouts (wiring diagrams, maps...), showing in real time the status of the alarms and of the main dimensions of the affected instruments

Load Profile

It allows to perform in-depth analyses of the load profiles of any meter, in order to:

- a) Keep track of the typical daily consumption profile
- b) Infer the appropriate tariff profile in terms of maximum power

Alarms

It allows to display the alarms which have occurred on the instruments, to acknowledge them and to filter/sort them as desired

Information

A tab displaying the plant rated characteristics.

Export / Costs

It allows to export stored data to xls format according to 2 modes:

- a) DB: fully configurable export of all the variables managed in the database
- b) Costs: export of an active Excel file containing the extrapolation of the data related to the final cost or to the cost simulated according to the supply contract being considered

Configuration (Only available for Administrator users)

It allows to access the system configuration menu.

Note: An online manual is available as a WebHelp inside the User Menu in the top right section of the screen

3.4 MONITOR

This section is devoted to the analysis of the data of the meter selected in the hierarchy tree, and allows to display in the main chart the trend of the main variables, like Current/Power Factor for each individual phase, System voltage (star and line), Power (active and reactive system power), analogue variables like Temperature, signal from pulse and analogue input (when available and anyway coming from VMU-P EM modules).

Graphic functions:

Charts consist of an X-axis, showing day hours from 05:00 a.m. to 10:00 p.m., and of as many Y-axes as the number of dimensions to be displayed. Each Y axis has its own full scale appropriately sized for the dimension it refers to. To enable or disable a curve, simply click on the name of the variable the curve refers to, located below the X axis. The curve is immediately displayed or removed.

Hovering the mouse over the chart area will show a window displaying the relevant value of each variable.



Figure 7: Em2 comparative chart with option menu.

In the top right section, two icons are displayed in the chart area:

- *Print chart*

Clicking on the “print” button located in the top right section of the chart area you can specify which printer shall be used to print the chart .

- *Export*

Clicking on the “Export” button located in the top right section of the chart area, you can export the chart data in the following formats:

- SVG
- CSV



Figure 8: Em2 comparative chart with option menu.

The analysis includes six different types of variables which can be accessed through the “buttons” in the top bar:

1. **“Comparative”** – the system displays the compared power parameter kWsys between two different periodicities.
2. **“Currents”** – the system displays the three tracks referring to the three phase currents (AL1, AL2 and AL3).
3. **“Power factor”** – the system displays the three tracks referring to the three individual phase power factors (PF1, PF2 and PF3).
4. **“Power”** – the system displays the two tracks referring to the system powers (active and reactive system power).
5. **“Voltages”** – the system displays the two tracks referring to the system voltages (star and line system voltage).
6. **“Analogue variables”** - variables like Channel1 temperature, Channel2 temperature, signal from pulse and analogue input (mA or mV). These variables can only be monitored if the VMU-P EM module is installed and appropriately connected and configured.

Select the desired day and press “Refresh chart” button.

Note: the date field cannot be edited; date can only be selected through the relevant calendar.

Note: If chart is not displayed and a white area with the caption “No data to display” appears, it means that no data is available for the selected time interval.

3.4.1 COMPARATIVE CHART

This chart displays the trend of the power absorbed by the plant during the current day and during the previous one, with the sample resolution defined in the VMU-C (minimum 5 minutes).

The day selected for the comparison can be changed from the option panel.

On the abscissa axis the chart displays the hours of the day from 00:00 to 23:55, while on the ordinate axis it displays the power in kW; the maximum ordinate value is set automatically by an autorange function.

The chart is automatically updated every 5 minutes. Hovering the mouse cursor over the chart area will display the relevant power value.

You can also select 3 different chart types:

- *On a daily basis* (DAY): the system displays the charts referring to the trend of the current day and of the previous one.
- *On a weekly basis* (WEEK): the system displays the histograms referring to the trend of the current week and of the previous one (always from Monday to Sunday).
- *On a monthly basis* (MONTH): the system displays the histograms referring to the trend of the current month and of the previous one (always from the first to the last day of the month).

The option panel can be opened and closed through the button located in the top right section of the “Options” bar.

Besides allowing to select one of the different available charts, the menu in question includes a section specifying the resolution of the chart to be analysed:

- Day: Hourly display of the selected day;
- Month: Display of all the days of the selected month;
- Year: Display of all the months of the selected year.

If choosing the hourly display the user can select the time range he wishes to display, and thus the starting and end time for the day to be analysed.

This chart includes the “Weekly” option, allowing to display a comparison between the current and the previous week.

Note: The user cannot select the reference week, as comparing two non-continuous week would be meaningless.

The third frame varies according to the chart the user wishes to display in some options. All frames allow to choose the chart type:

- Line: Line chart;
- Area: Line chart with coloured area;
- Bar: Bar chart.

If the user selects the current date, a check box will be displayed at the bottom; it allows to disable the chart automatic refresh, which is enabled by default.

Hold

Figure 9: Monitor Window; Detail of automatic refresh lock

3.4.2 CURRENT

The chart displays the three phase currents. These currents refer to the main instrument (real or virtual according to the system configuration settings).

Data may be displayed:

- on a daily, monthly or yearly basis;
- with reference to the AC or DC dimension.



Figure 10: Em2 current chart with option menu.

Note: in charts the sampling frequency (current values for each phase), depends on the storage interval set on VMU-C, which can be equal to 5,10,15,30,60 minutes.

3.4.3 POWER FACTOR

The Chart allows to compare the 3 individual phase Power Factors (PF1, PF2 and PF3). These values refer to the main instrument (real or virtual according to the system configuration settings).

Data may be displayed on a daily, monthly or yearly basis.



Figure 11: Em2 power factor chart with option menu.

Note: in charts the sampling frequency (current values for each phase), depends on the storage interval set on VMU-C, which must be equal to 5,10,15,30,60 minutes.

3.4.4 ANALOGUE VARIABLES

By selecting “Analogue variables” you can display the 4 magnitudes listed below:

- a. “Temperature 1 (channel 1 of the VMUP) °C”
- b. “Temperature 2 (channel 2 of the VMUP) °C”

Note: these inputs (channel 1 and 2) for temperature measurement can read data from “Pt100” or “Pt1000” probes with 2 or 3 wires.

- c. “Frequency input (VMUP pulse input)”

Note: the pulse frequency input allows to measure a frequency signal for flow or speed measurements.

- d. “Analogue input (analogue input “mV” or “mA” of the VMUP)”

Note: the “mV” type analogue input is available on the module VMUP2TIWXSEM The “mA” type input is available on the module VMUP2TCWXSEM.



Figure 12: Em² analogue variable chart with option menu.

Note: the sampling frequency in charts (analogue variables, temperature and pulse signal), depends on the storage interval set on VMU-C, which may be equal to 5,10,15,30,60 minutes.

3.5 MAIN DC METER TABLES

The voltage, current and power charts include a selector allowing to choose whether the chart shall be displayed with reference to, AC or DC.

The following paragraphs explain the charts displayed with reference to AC.

3.5.1 VOLTAGES

The chart displays the system DC voltage.

These values refer to the main instrument (real or virtual according to the system configuration settings).

Data may be displayed on a daily, monthly or yearly basis.



Figure 13: Em² voltage chart with option menu.

Note: in charts the sampling frequency (current values for each phase), depends on the storage interval set on VMU-C, which must be equal to 5,10,15,30,60 minutes.

3.5.2 POWER

The chart compares the 2 system power magnitudes (kW: DC system power).

These values refer to the main instrument (real or virtual according to the system configuration settings).

Should the reference instrument be virtual, the powers shown in the chart represent the sum of the system powers (kW) measured by each individual real instrument.

Data may be displayed on a daily, monthly or yearly basis.



Figure 14: Em² power chart with option menu.

Note: in charts the sampling frequency (current values for each phase), depends on the storage interval set on VMU-C, which must be equal to 5,10,15,30,60 minutes.

3.6 ZOOM FUNCTION

The Zoom function is available in any chart display page; it allows to magnify a given area of the chart, to analyse in greater detail the displayed data.

The ZOOM function is fast and instantaneous. The following is the sequence of the operations to be performed:

The following is a sample chart, which the user wishes to analyse in greater detail. The user, in particular, wishes to analyse the area framed in orange:

Move the pointer “” to point “A”, then using the mouse (holding the left button pressed) drag the pointer to point “B” (Fig. 17).

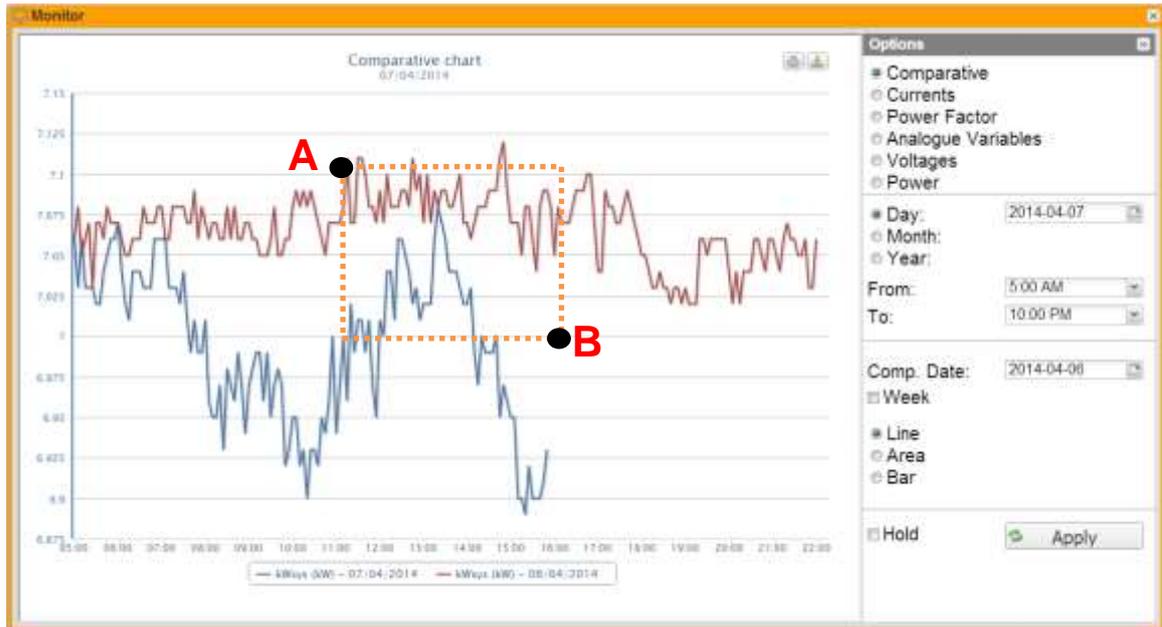


Figure 15: Zoom function

As soon as the left mouse button is released, the zoomed area will be immediately highlighted (Fig. 18) and you'll be able to analyse in greater detail the chart trend in the highlighted section



Figure 16: Zoomed area

The zoom function is available for all chart formats, whether histograms or areas.

3.7 ANALYSIS

The analysis functions allows to perform analytical or comparative displays on one or more instruments, according to predefined trends (variable aggregations) or to trends configured from time to time.



Figure 17: Analysis page.

The analysis page includes 3 main sections:

- Top bar - A
- Option menu on the right side - B
- Chart area on the left side - C

The top bar allows the user to select the periodicity he wishes to analyse; more specifically, it includes the following controls:

- Left arrow: It regenerates the chart of a time period preceding the one being considered;
- Right arrow: It regenerates the chart of a time period preceding the one being considered;
- Date: This control allows to select the day to be analysed. It should be noted that if the user is analysing for example the month, the analysis is performed over the WHOLE month the selected day belongs to; the same applies to all the other time ranges which can be selected.
- View mode:
 - o Daily: Data displayed with a minimum resolution corresponding to the resolution of field-read data;
 - o Weekly: Data displayed with a minimum resolution corresponding to the minimum resolution of field-read data;
 - o Monthly: Data displayed with daily resolution;
 - o Yearly: Data displayed with monthly resolution.

In daily view mode the page includes a further check box allowing to lock the view. By default it is unchecked; as a consequence, every 30 seconds the chart is automatically refreshed.

On the right side there is the “Variables” option panel.

In the upper section the user can select an analysis instrument; once it has been selected, the system will display the trends of the charts predefined by Carlo Gavazzi; if they are selected, the system will load in the underlying table a set of variables which shall be plotted into a chart when the user presses the “Apply” button.

The user, however, can manually select each individual variable to be added by simply pressing the “Add variable” button.

Pressing the button will display a window into which the user shall enter the following data:

- Select the desired instrument;
- Select the desired variable;
- Select a colour to be associated with the series;
- Select the variable set type between maximum / average / minimum;
- Select the chart type for the desired set (Line or Area).



Figure 18: Focus on single variable adding window

Press “Confirm” to add the variable you wish to analyse to the list.

Under the variable list there is a check box called “Show tariffs”; if it is selected, the system will display the tariff time bands. This view is ONLY available if a default calendar has been selected for the instrument being analysed and if the daily or weekly view is enabled.

If there are sets of different type, the relevant axes are created for better chart reading.

Axis types are:

- Voltage V
- Current A
- Power kW

- Energy kWh
- Power kVA
- Energy kVAh
- Power kvar
- Energy kvarh



Figure 19: Example with multiple axes

Note: If the user has selected a set of variables to be displayed from more than one device, tariffs will not be displayed.

After building the variable list, the user can display the chart by pressing the “Apply” button.

Graphic functions:

Charts consist of an X-axis, showing day hours from 00:00 a.m. to 12:00 p.m., and of as many Y-axes as the number of dimensions to be drawn. Each Y axis has its own full scale appropriately sized for the dimension it refers to. To enable or disable a curve, simply click on the name of the variable the curve refers to, located below the X axis. The curve is immediately displayed or removed.

Hovering the mouse over the chart area will show a window displaying the relevant value of each variable.

In the top right section, two icons are displayed in the chart area:

- *Print chart*

Clicking on the “print” button located in the top right section of the chart area you can specify which printer shall be used to print the chart .

- *Export*

Clicking on the “Export” button located in the top right section of the chart area, you can export the chart data in the following formats:

- SVG
- CSV

3.8 CONTROL PANEL

The synoptic page opens a window displaying the default synoptic.
The top bar includes a combo box allowing to select the synoptic to be displayed.

The synoptic layout is exactly as configured by the user in the specific section.
Under the instruments there is an icon, whose colour depends on the instrument alarm status:

- Green: no alarm
- Red: alarm on

The system power (kWsys) of the instrument being analysed is displayed next to the alarm icon.



Figure 20: Synoptic menu

Hovering the mouse over the instrument will display a tooltip window providing some information about the instrument, including:

- VLN
- VLL
- Total kWh
- Last day kWh
- List of the last 3 alarms

If clicking on the instrument the tooltip will be locked and won't disappear when the mouse is moved outside the instrument area. This allows to compare 2 instruments by just locking a tooltip and hovering the mouse over other instruments.

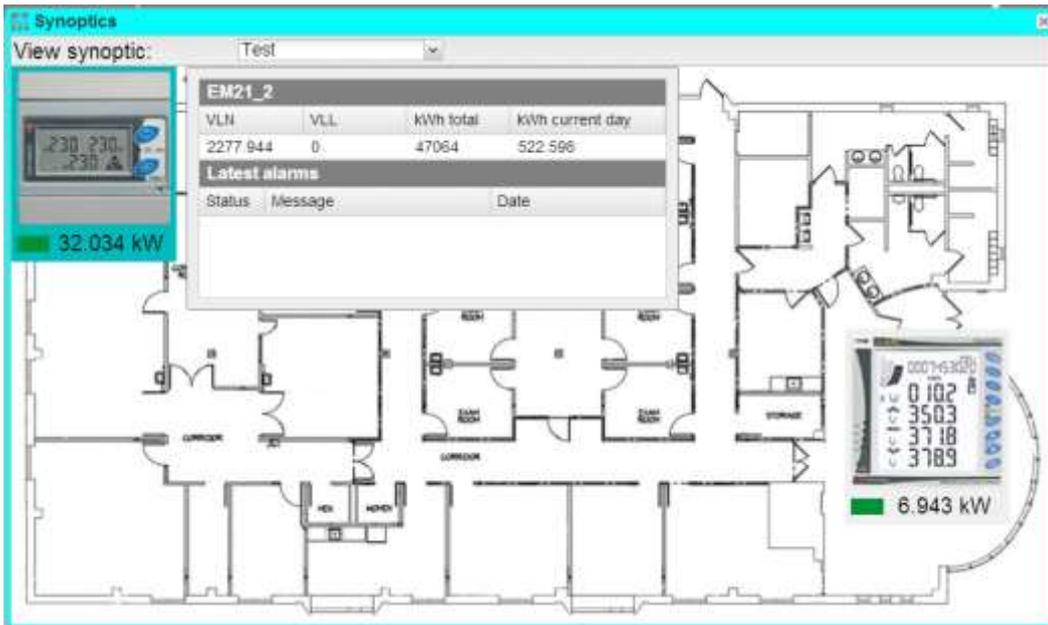


Figure 21: Synoptic menu with tooltip

You cannot lock more than one instrument; when clicking on an other instrument, the letter will get the focus and the other one will be closed.

3.9 LOAD PROFILE

This function allows to keep track of the load profile of the chosen meter, as a statistical analysis of the desired time frame; it also allows to choose a standard pre-loaded calendar (corresponding to the official calendar of the facility being analysed) or to set the desired week days (e.g. all days except Saturday and Sunday). From the statistical analysis the function allows to extrapolate the mean, median, maximums, minimums and confidence intervals at 99.5%, 95% or 68,5%, to properly evaluate the trend of consumptions in the desired time frame.

The page is divided into two sections:

- Chart
- Option panel

The option panel allows to configure the view to be analysed.

From the drop-down menu of the Instrument you can select the instrument you wish to analyse; once the instrument has been selected, if it is associated with a default electric calendar, the latter will be automatically selected in the “Calendar” menu.

Select the desired analysis period; it should be noted that the larger it is, the longer the chart loading time will be.

Once you have selected the time frame, the system will automatically display in the underlying grid the list of all existing closing days; to modify the selection, just select or deselect the associated row.

From the calendar section, besides, the system will pick all the thresholds existing in the selected time frame for the dmd power (where the dmd interval must be defined in the Default Calendar section of the configuration parameters).



Figure 22: Load profile menu with days of analysis picked from the calendar

You can also define whether the closing days must be automatically taken into account from the calendar or be manually set.

If the manual selection is set, the system will display the week day list; if the day is selected it will be included in the calculation, otherwise it won't.



Figure 23: Load profile menu with manually selected days

Once settings are completed you can display the chart by pressing the “Chart” button or export a standard Excel file by pressing the “Export” button.

The plotted/exported data are:

- Mean
- Median
- Sigma1(Disabled by default)
- Sigma2(Disabled by default)
- Sigma3
- Negative sigma1(Disabled by default)
- Negative sigma2(Disabled by default)
- Negative Sigma3
- Max(Disabled by default)
- Min(Disabled by default)
- List of all the thresholds set to kWsys associated with the selected calendar in the chosen time frame. (Disabled by default)

Graphic functions:

Charts consist of an X-axis, showing day hours from 00:00 a.m. to 12:00 p.m., and of as many Y-axes as the number of dimensions to be displayed. Each Y axis has its own full scale appropriately sized for the dimension it refers to. To enable or disable a curve, simply click on the name of the variable the curve refers to, located below the X axis. The curve is immediately displayed or removed.

Hovering the mouse over the chart area will show a window displaying the relevant value of each variable.

In the top right section, two icons are displayed in the chart area:

- *Print chart*

Clicking on the “print” button located in the top right section of the chart area you can specify which printer shall be used to print the chart .

- *Export*

Clicking on the “Export” button located in the top right section of the chart area, you can export the chart data in the following formats:

- SVG
- CSV

3.10 ALARMS

This section is dedicated to alarm management and display occurred on a system.

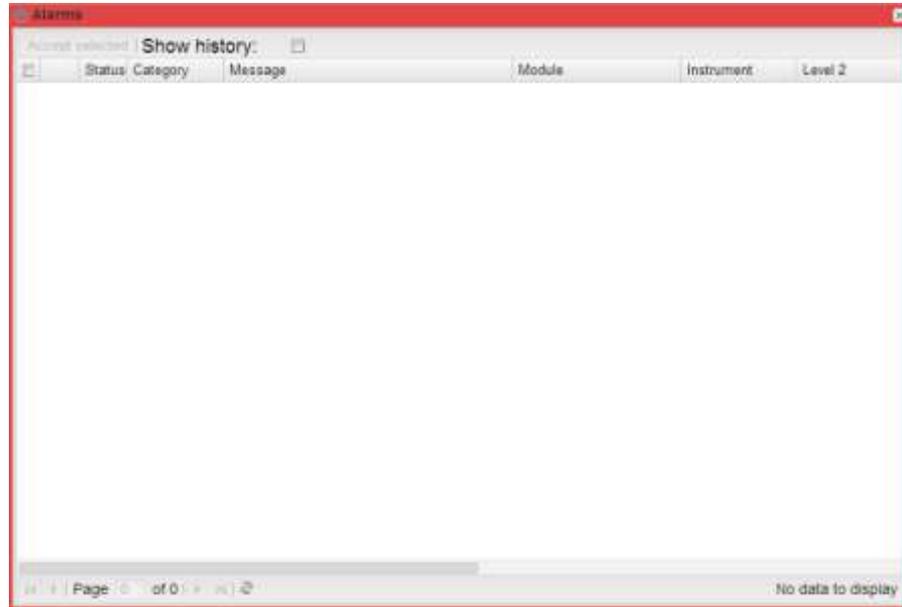


Figure 24: Alarms menu

Note: alarm classification cannot be changed by user.

This table shows the list of alarms stored in VMU-C in chronological order from the most recent.

- Fields of Alarms table

The Alarms table shows the following fields:

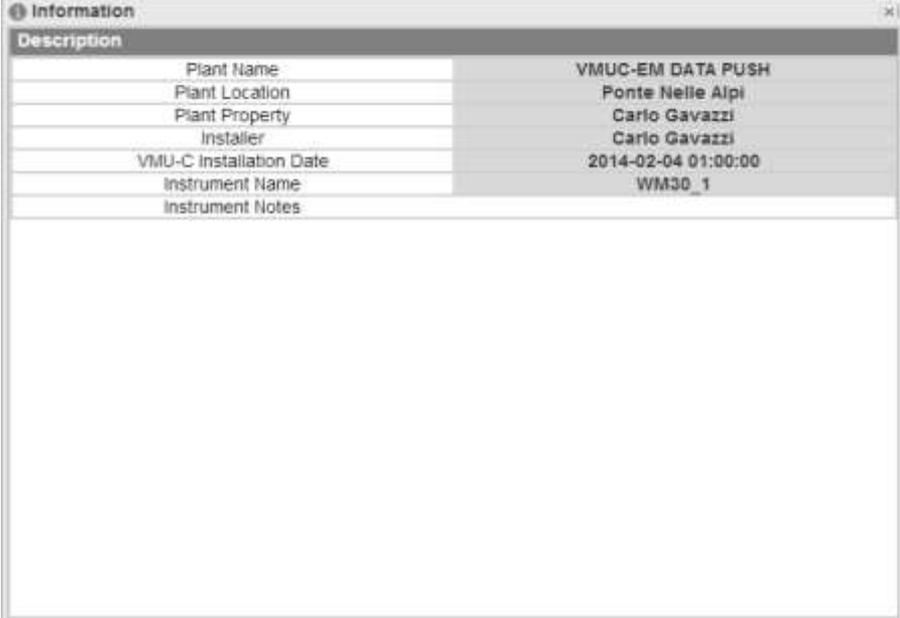
1. Magnifying glass icon: If clicked, this icon allows to refresh all the context menus for the device associated with the alarm in question.
2. Message: Alarm description.
3. Module: Address of the primary device (VMU-C or relevant VMU-M) and position of the secondary device (VMU-S or VMU-P or VMU-O) which raised the alarm in the EM2-Array chain.
4. Instrument: Name of the alarm source device
5. Level 2: Name of the Level 2 container
6. Level 1: Name of the Level 1 container
7. *Date*: Date on which the alarm occurred.
8. *Resolved on*: Date on which the alarm finished. If alarm still exists, the field is blank.
9. *Area*: Indication of the alarm source area (if specified).

10. Acknowledged on: Date on which the alarm was acknowledged by the user.

11. Acknowledged by: User who acknowledged the alarm.

3.11 INFORMATION

This section displays the data and characteristics of the monitored energy meter, whether it is a physical or a virtual instrument



The screenshot shows a window titled 'Information' with a 'Description' section. Below this section is a table with two columns: labels on the left and values on the right. The labels are: Plant Name, Plant Location, Plant Property, Installer, VMU-C Installation Date, Instrument Name, and Instrument Notes. The corresponding values are: VMUC-EM DATA PUSH, Ponte Nelle Alpi, Carlo Gavazzi, Carlo Gavazzi, 2014-02-04 01:00:00, WM30_1, and an empty field.

Description	
Plant Name	VMUC-EM DATA PUSH
Plant Location	Ponte Nelle Alpi
Plant Property	Carlo Gavazzi
Installer	Carlo Gavazzi
VMU-C Installation Date	2014-02-04 01:00:00
Instrument Name	WM30_1
Instrument Notes	

Figure 25: Instrument information menu

The information includes:

1. “*Plant name*”: Name of the VMUC associated with the selected instrument;
2. “*Plant location*”: Installation location;
3. “*Plant property*”: VMUC owner;
4. “*Installer*”: Name of the VMUC installer;
5. “*VMUC installation date*”: VMUC installation date;
6. “*Instrument name*”: Name of the selected instrument;
7. “*Instrument notes*”: Notes associated with the instrument.

3.12 EXPORT / COSTS

This section allows to export the data stored in the VMU-C in XLS format or through a chart, and to analyse the costs of the different instruments.

The main page is divided into two main tabs:

- Export tab: This tab allows to export the data of all system variables in graphic form or through a standard Excel spreadsheet. There is no constraint as to the chosen parameters; as a consequence you can also export variables from different instruments.
- Costs tab: This tab allows to analyse the costs of one or more meters associated with one or more calendars/contracts. This allows to compare different instruments with each other, or to compare the same instrument with different contracts, to perform budget and/or final analyses based on the consumption data recorded in the system history and on the contract data entered by the user.
- The result is available as an Excel spreadsheet, automatically generating a pivot table which allows to quickly analyse the calculated data. The spreadsheet includes internal functions designed to let the user perform further analyses.

3.13 DATABASE

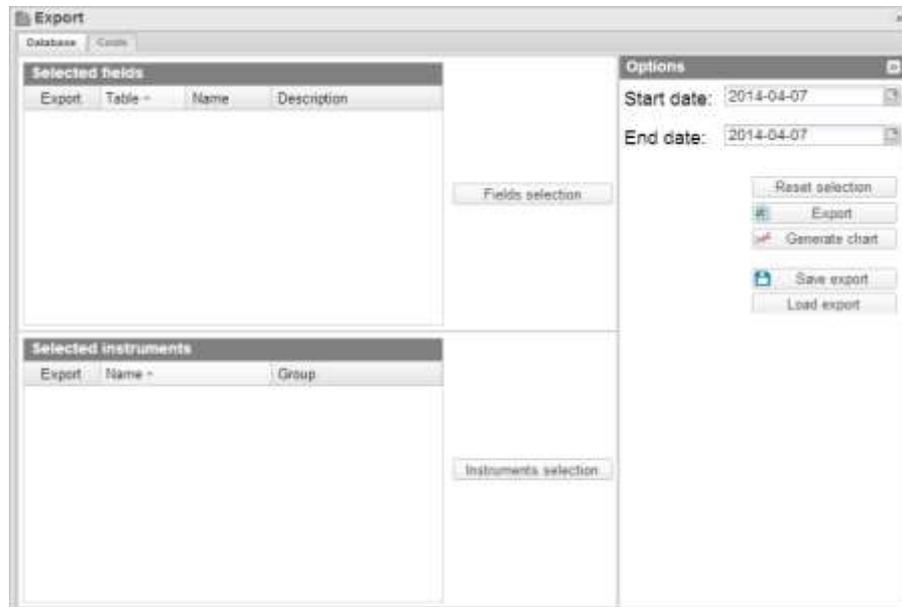


Figure 26: Export menu

The main page of the “Database” menu includes 3 main frames:

- Field Selection: This frame allows to quickly see the fields selected for export; the “Fields Selection” button on the right allows to select them.

- Selected Instruments: This frame allows to quickly see the selected instruments; the “Instruments selection” button on the right allows to select them.
- Options: In this frame you can select the starting date and the end date for export, restore the default value for all the selections, export data in Excel format and generate the corresponding chart.

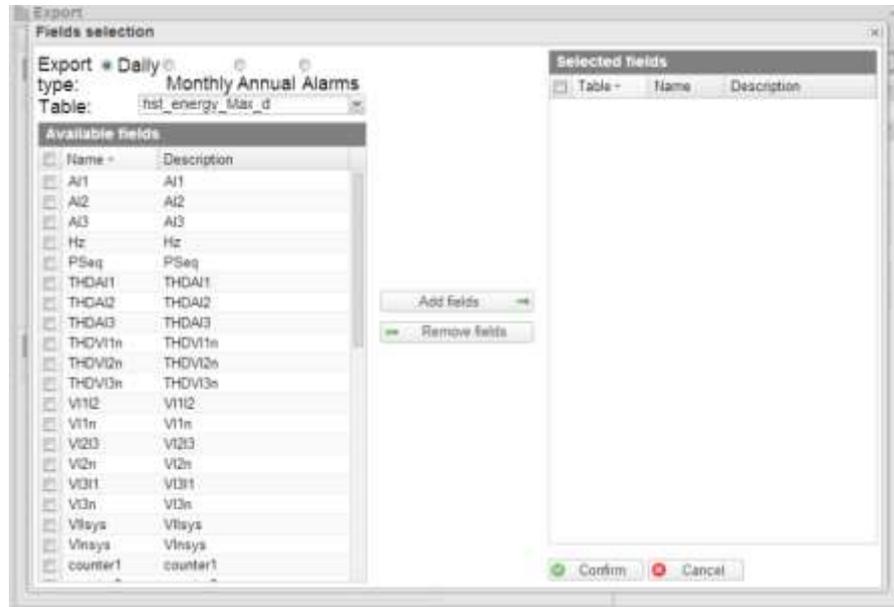


Figure 27: Export menu - fields selection

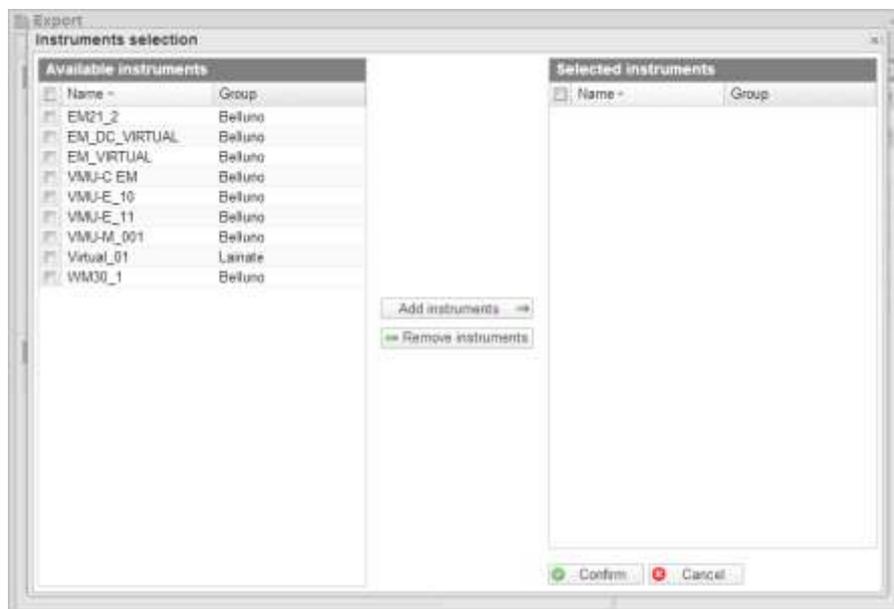


Figure 28: Export menu - instruments selection

After selecting the desired fields and instruments, in the option panel you can select the time frame for the analysis (Starting date and end date).
The page includes the following buttons:

- Reset selections: it resets all the previously selected values;
- Export: It exports the file in standard Excel 2010 format;
- Generate chart: It generates the chart with the selected variables in a new browser tab;
- Save export: It allows to save all the selected settings in a file on the hard disk. This allows to easily exchange the predefined Export configurations between the different users of the Em² Server system and to historicize the performed analyses
- Load export: It allows to load a previously saved analysis from the hard disk.

3.14 COSTS

It allows to analyse the costs of one or more meters associated with one or more calendars/contracts. This allows to compare different instruments with each other, or to compare the same instrument with different contracts, to perform budget and/or final analyses based on the consumption data recorded in the system history and on the contract data entered by the user.

The result is available as an Excel spreadsheet, automatically generating a pivot table which allows to quickly analyse the calculated data. The spreadsheet includes internal functions designed to let the user perform further analyses.

This page is divided into three sections:

- Instrument(s) selection section
- Calendar(s) selection section
- Option section

First of all we'll explain the different options, as the instrument and calendar selection panels will automatically change according to the choice.

In the option panel you can choose between 3 different types of cost analysis:

- Single instrument – Single calendar
- Multiple instruments – Single calendar
- Single instrument – Multiple calendar

You also have to select the time frame for the analysis (Analysis starting and end date).

3.14.1 SINGLE INSTRUMENT – SINGLE CALENDAR/CONTRACT

This mode allows to display the costs of an instrument associated with a single calendar/contract.

The instrument selection panel, therefore, will include a drop-down menu allowing to select the instrument. If any default calendars are associated with the instrument, they will be automatically selected in the calendar selection panel.

However you can modify the selections in question.

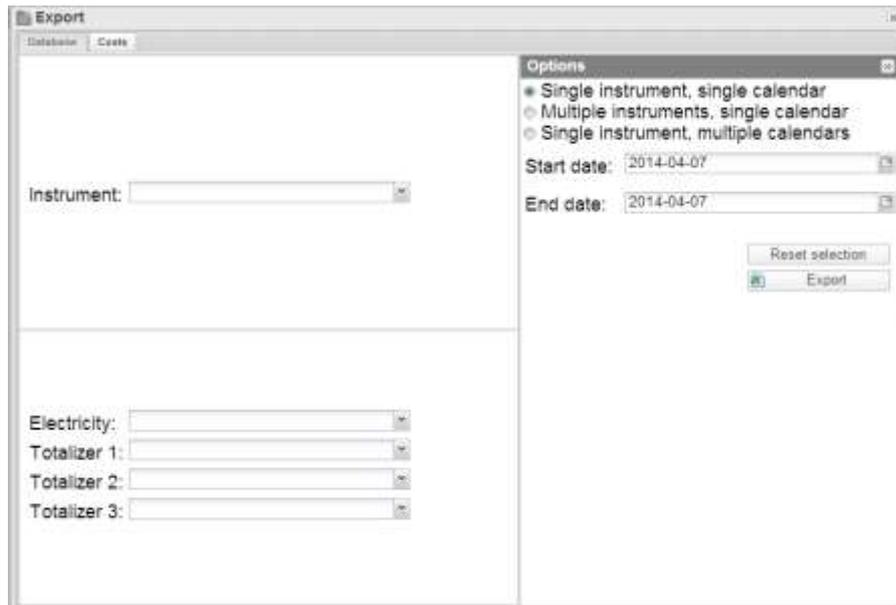


Figure 29: Costs menu - Single instrument single calendar

By pressing the export button you can export a standard Excel 2010 file which will display:

- a) A spreadsheet with some push-buttons guiding the user through the available choices
- b) A spreadsheet containing the extracted data in table form
- c) A spreadsheet containing a report Table/Pivot form consistent with the chosen parameters, allowing quick user interaction

3.14.2 MULTIPLE INSTRUMENTS – SINGLE CALENDAR/CONTRACT

This mode allows to display the costs of one or more instruments associated with a single calendar/contract.

The instrument selection panel, therefore, will include a grid containing the list of the instruments to be analysed. Pressing the instrument select button will display a window allowing to select one or more instruments to be added to the analysis. Select the electric calendars and the ones of the 3 totalisers.

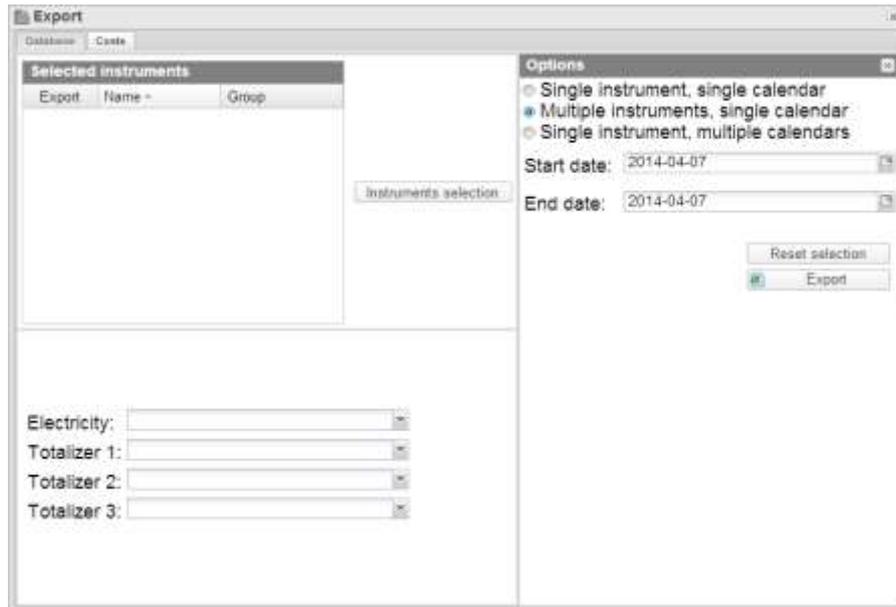


Figure 30: Costs menu - Multiple instruments, single calendar

By pressing the export button you can export a standard Excel 2010 file which will display:

- A spreadsheet with some push-buttons guiding the user through the available choices
- A spreadsheet containing the extracted data in table form
- A spreadsheet containing a report Table/Pivot form consistent with the chosen parameters, allowing quick user interaction

3.14.3 SINGLE INSTRUMENT – MULTIPLE CALENDARS/CONTRACTS

This mode allows to display the costs of an instrument associated with multiple calendars.

The instrument selection panel, therefore, will include a drop-down menu allowing to select the instrument. If any default calendars are associated with the instrument, they will be automatically added to the calendar selection panel.

In the calendar selection panel, then, you'll be able to add further analysis calendars by pressing the "Add calendar" button. Pressing this button will display a window with 4 drop-down menu, for the electric calendar and for that of the 3 totalisers.

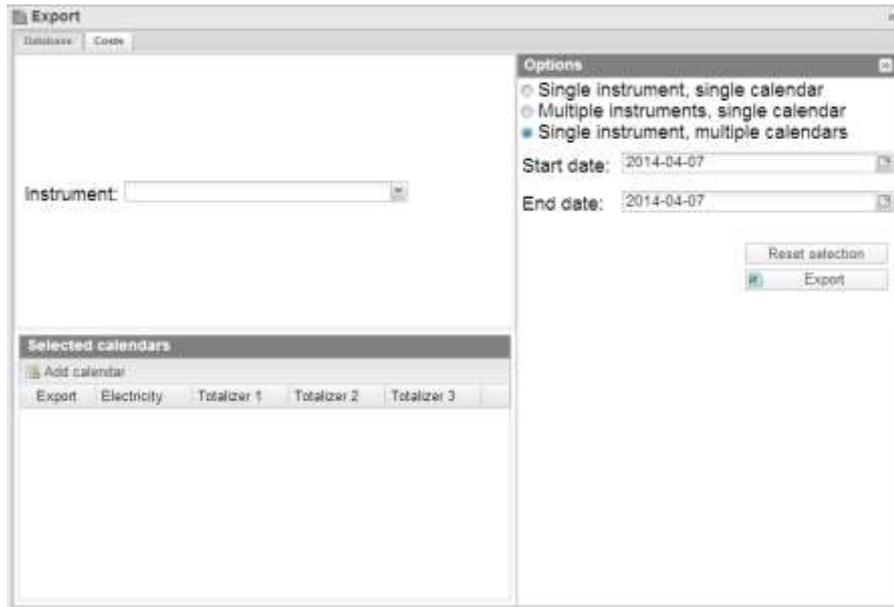


Figure 31: Costs menu - Single instrument, multiple calendars

By pressing the export button you can export a standard Excel 2010 file which will display:

- a) A spreadsheet with some push-buttons guiding the user through the available choices
- b) A spreadsheet containing the extracted data in table form
- c) A spreadsheet containing a report Table/Pivot form consistent with the chosen parameters, allowing quick user interaction

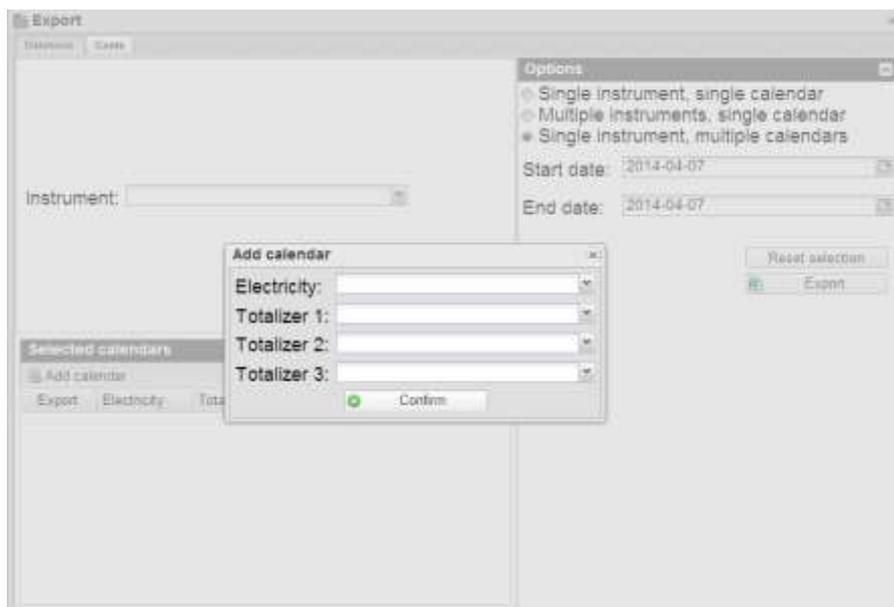


Figure 32: Costs menu, adding a calendar to the list

4 CONFIGURATION

4.1 INSTRUMENT

4.1.1 CREATE INSTRUMENT

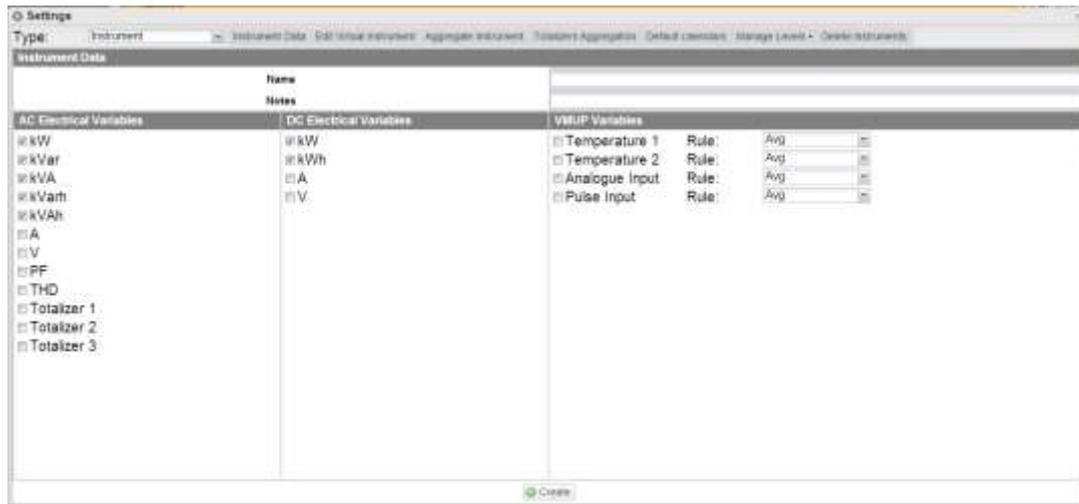


Figure 33: Virtual instrument creation page

This function allows to create virtual instruments as aggregates of real and/or virtual instruments. The created virtual instruments can be associated with the same functions available for real instruments, and their rank is exactly the same on every level.

To create a virtual instrument, first of all you need to enter some parameters, including:

- Virtual instrument name
- Notes associated with the virtual instrument

You can also select the single variable which can be aggregated in the virtual instrument being created.

More specifically, the variables which can be selected are:

- AC electric variables:
 - o kW (Selected by default)
 - o kVar (Selected by default)
 - o kVA (Selected by default)
 - o kVarh (Selected by default)
 - o kVAh (Selected by default)
 - o A
 - o V
 - o PF
 - o THD
 - o Totalizer 1
 - o Totalizer 2
 - o Totalizer 3
- DC electric variables:
 - o kW (Selected by default)
 - o kWh (Selected by default)
 - o A

- V
- VMU-P variables:
 - Temperature 1
 - Temperature 2
 - Analogue Input
 - Pulse input

For the VMU-P variables you can also select the type of operation to be performed during the aggregation stage (the user will have to take care of selecting the operation which meets the application requirements).

4.1.2 MODIFY INSTRUMENT

The plant modification page has the same layout as the instrument creation page described above and allows to modify the parameters defined during the creation of the instrument itself.

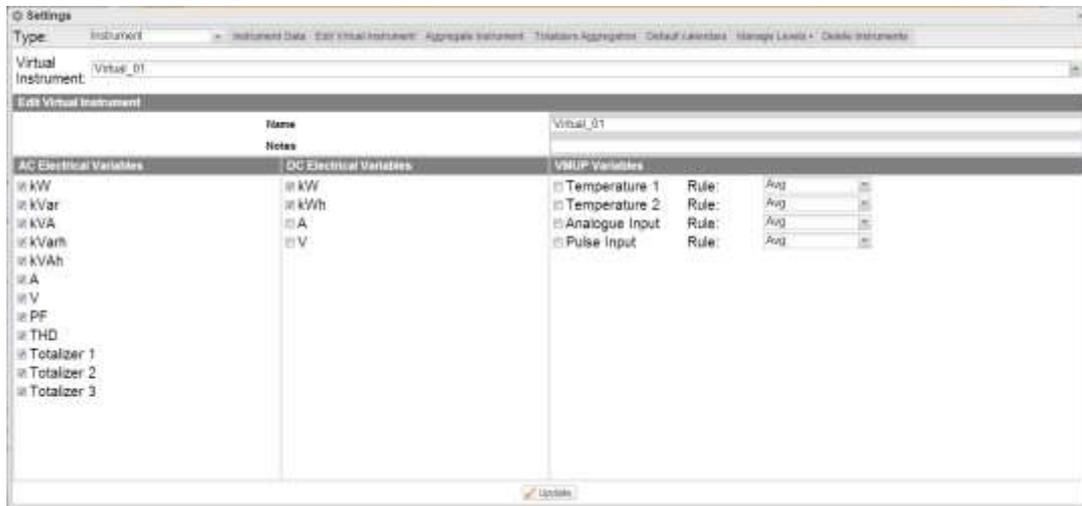


Figure 34: Virtual instrument modification

You need to select the instrument you wish to modify from the combo box at the beginning of the page.

4.1.3 INSTRUMENT AGGREGATION

This page allows to associate a real or virtual instrument to a virtual instrument. The list of the available instruments is displayed in the left section of the page, while the list of the already associated instruments is displayed in the right section.

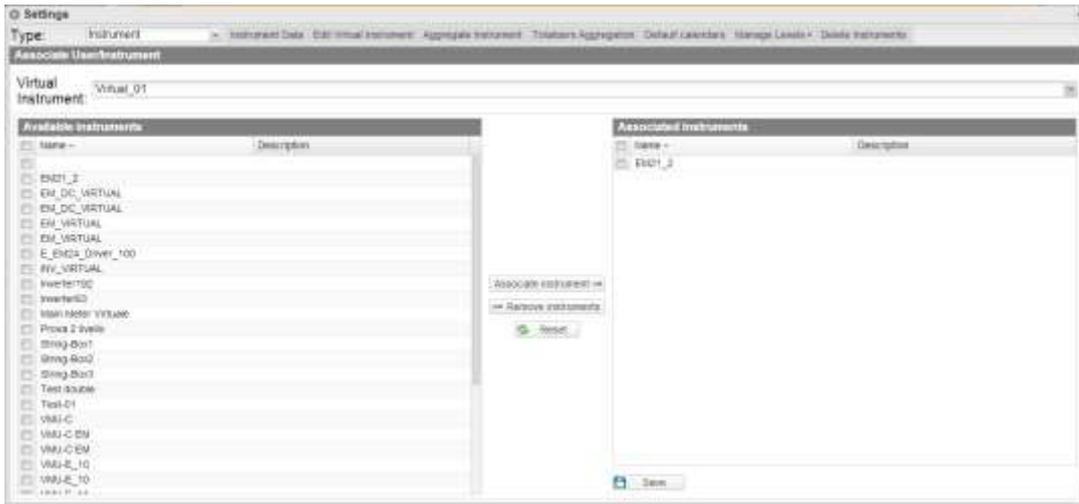


Figure 35: Instrument aggregation page.

Once the selection is completed click on the Save button to save the changes. The reset button clears any unsaved changes.

4.1.4 TOTALIZER AGGREGATION

Totalizers are generally reserved for the counting of items like H₂O, gas,... which can be measured through pulse meters which are available in some of the Carlo Gavazzi instruments (e.g.: EM24) and can be aggregated as described below.

The Carlo Gavazzi instruments allow to manage up to 3 internal totalizers, which will be referred to as T1,T2,T3 in the paragraphs below.

First of all you need to remember that for each aggregated instruments the three totalizers can be connected differently in the various instruments. In fact a totalizer connected as T1 in instrument 1 might have to be aggregated with totalizer T2 in instrument 2; as a consequence you need to create some “baskets”, that is containers allowing to select how the different totalizers are associated in the various instruments.

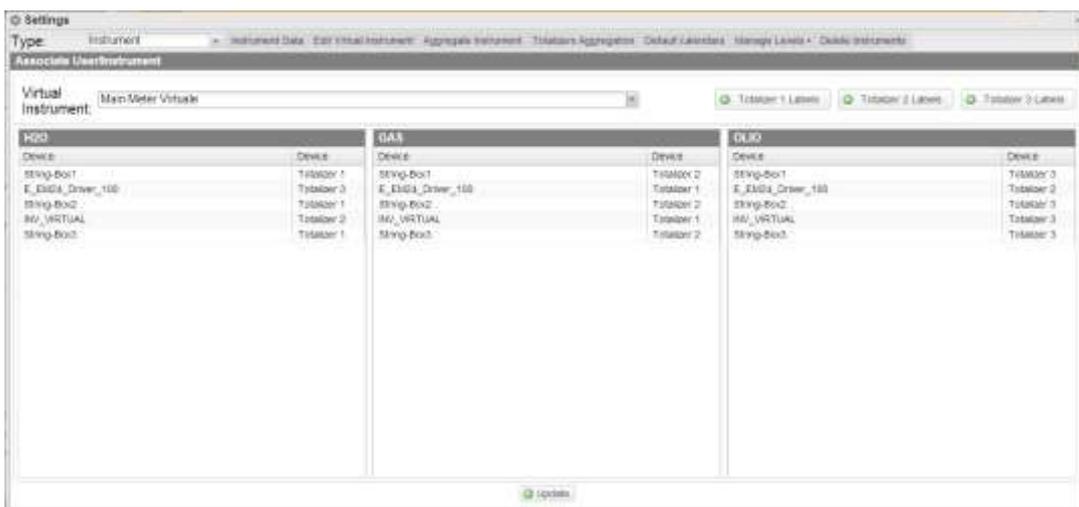


Figure 36: Totalizer basket configuration page

For example:

Instrument 1
Totalizer 1 = Air
Totalizer 2 = Gas

Instrument 2
Totalizer 1 = Gas
Totalizer 2 = Air

When creating the virtual instrument I decide to aggregate totalizer 1 and totalizer 2, but not totalizer 3.

As a consequence, my basket in the virtual instrument must be configured as follows:

Basket 1:

Instrument 1 -> Totalizer 1
Instrument 2 -> Totalizer 2

Basket 2:

Instrument 1 -> Totalizer 2
Instrument 2 -> Totalizer 1

You can edit the Basket 1 and Basket 2 label, for example to Air and Gas. This way the proper name is assigned to the virtual instrument.

More specifically, the operations to be performed in the page are the following:

Select the virtual instrument you wish to manage from the combo-box. Once you have selected the instrument, only the frames of the totalizer enabled during instrument creation or modification will be enabled; more specifically, the parameters to be selected are totalizer 1, totalizer 2 and totalizer 3.

You can modify the labels associated with the totalizers using the top buttons. This allows to “redefine” the totalizer, to make it more suitable for the intended use.

If the three boxes are enabled, you can select for each row which of the three totalizers of the single instrument corresponds to the virtual instrument “basket”.

4.1.5 DEFAULT CALENDAR

This menu allows to set the default calendar for the 4 sections:

- Electricity
- Totalizer 1
- Totalizer 2
- Totalizer 3

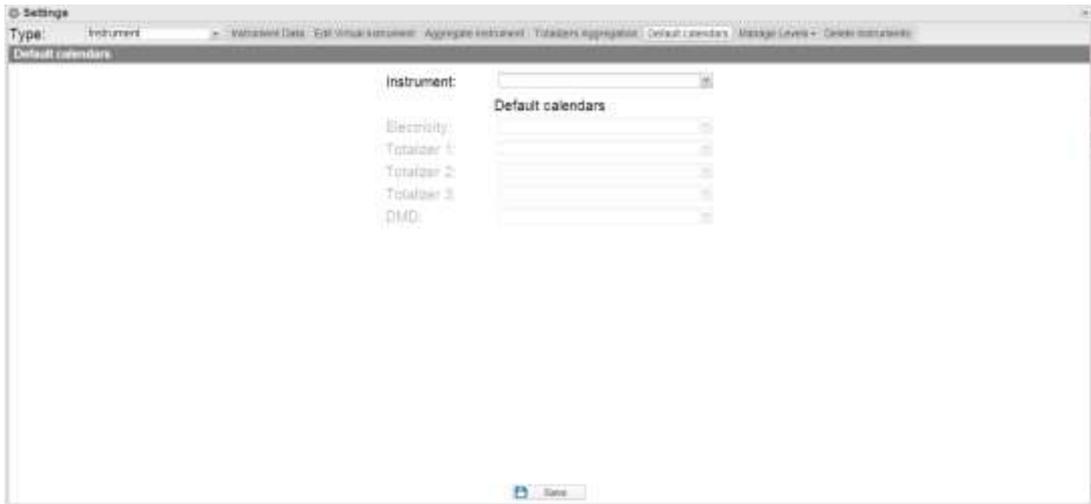


Figure 37: Default calendar page

You can also select the DMD parameter associated with the calendar/power supply contract.

4.1.6 MANAGE LEVELS

This menu contains 4 sub-menus:

- Manage level 1
- Manage level 2
- Instruments / Level 2
- Level 2 / Level 1

4.1.6.1 MANAGE LEVEL 1

The table shows all the levels “1” included in Em²-Server. You can add one by clicking on the “Add Level 1” button at the top.

To modify a level just click on the magnifying glass in the row of the level you wish to edit.

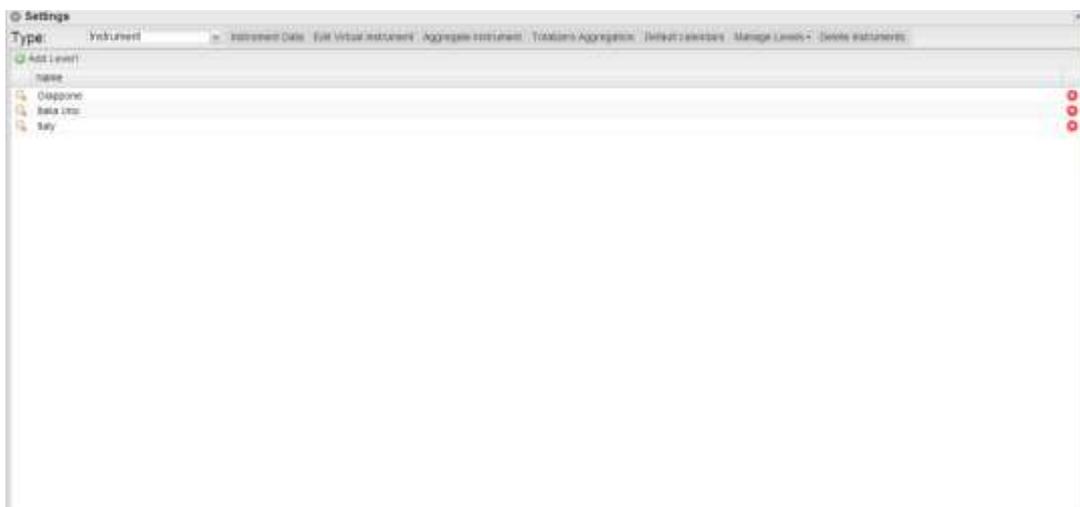


Figure 38: Level 1 Management Page

Analogously, clicking on the x at the end of the row will delete the associated level.

4.1.6.2 MANAGE LEVEL 2

The table shows all the levels 2 included in Em²-Server. You can add one by clicking on the “Add Level 2” button at the top.

To modify a level just click on the magnifying glass in the row of the level you wish to edit.



Figure 39: Level 2 Management Page

When adding or modifying a level, besides the name you can add/edit the point map coordinates. Analogously, clicking on the x at the end of the row will delete the associated level.

4.1.6.3 INSTRUMENTS / LEVEL 2

This page allows to associate an instrument with a level 2 container.

The list of the available instruments is displayed in the left section of the page, while the list of the associated instruments is displayed in the right section.

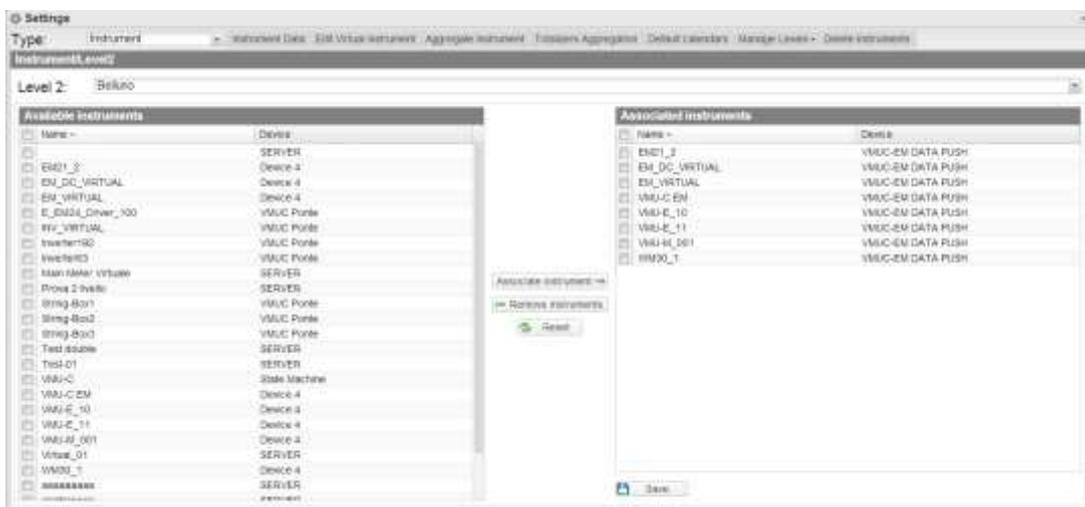


Figure 40: Instrument / Level 2 association page

Once the plant setting is completed click on the Save button to save the changes. The reset button clears any unsaved changes.

4.1.6.4 LEVEL 2 / LEVEL 1

This page allows to associate a level 2 with a level 1 container. The list of the available level 2 is displayed in the left section of the page, while the list of the level 2 is displayed in the right section.

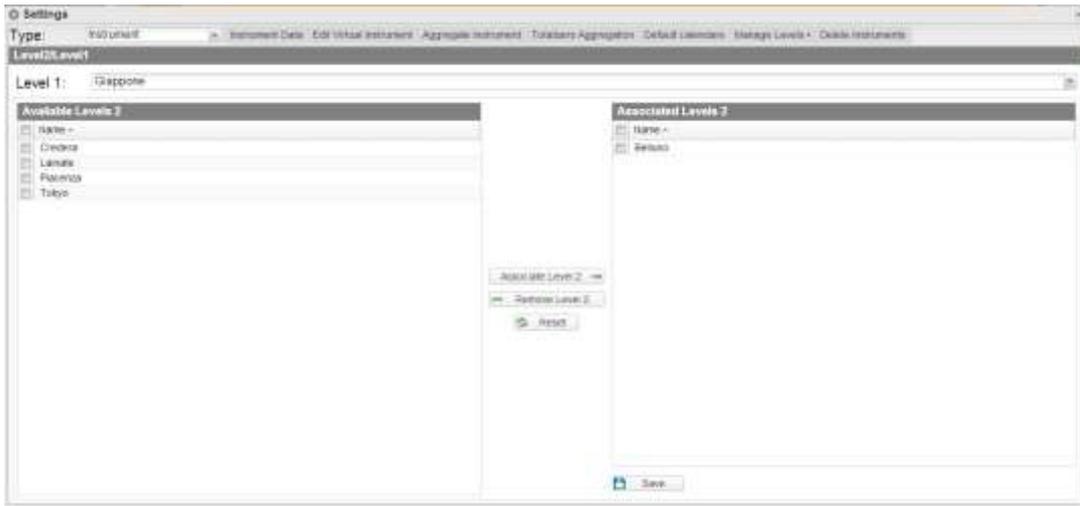


Figure 41: Level 1 / Level 2 association page

Once the plant setting is completed click on the Save button to save the changes. The reset button clears any unsaved changes.

4.1.7 DELETE INSTRUMENT

The page displays a list of the virtual instruments.

The operations which can be performed on the instruments are:

- Freezing the instrument
- Deleting the instrument

You can freeze an instrument by clicking on the black icon with the ice crystal in the row associated with the virtual instrument.

You can delete an instrument by clicking on the red icon in the row associated with the virtual instrument.

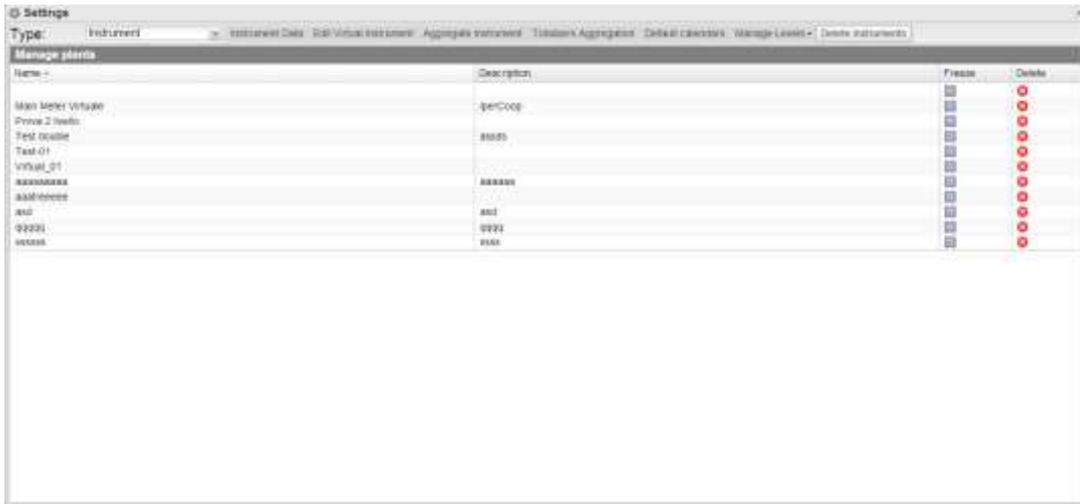


Figure 42: Delete Instruments Page.

4.2 SERVER

4.2.1 NEW COMMAND

To send a new command you need to click on “Commands – New Command”. The system will display a page with a command selection menu in the top section and the main command focus in the bottom section.

The top menu consists of:

User Management	Network	Configuration Management	Emergency
Add User	NTP Server	Update Firmware	Restart
Delete User	E-Mail Configuration	Reset Database	
	Tunnelling	Instrument scanning	
		Sampling interval	
		Copy configuration	

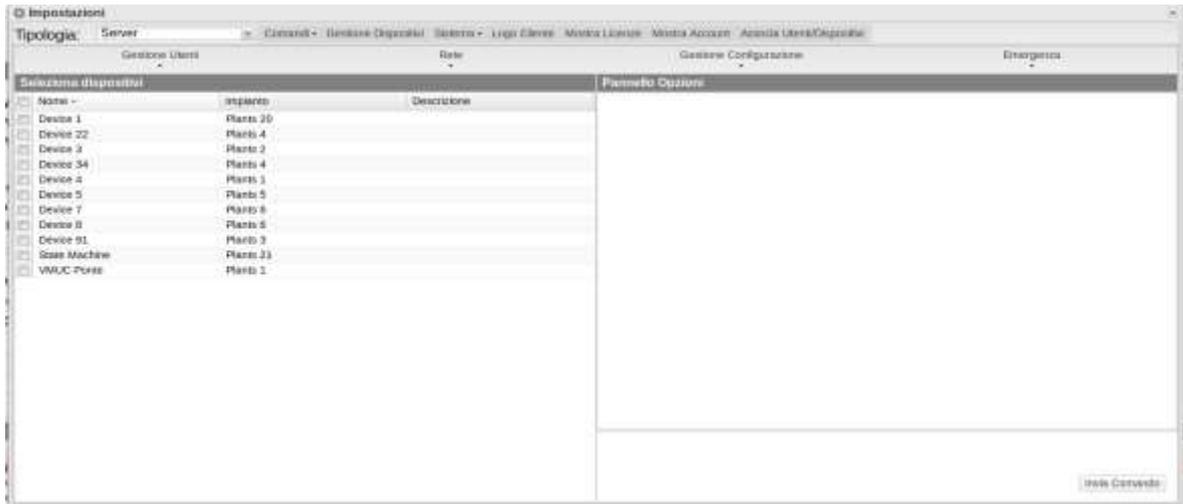


Figure 43: New Command Page.

The "Select Devices" panel displays the list of the devices a command may be sent to; you can select both a single VMUC and a group of VMUC; you can also select a single VMUC, a group of VMUCs or all the VMUCs (broadcast), by clicking on the box in the table header.

If there are any fields that need to be managed/filled in they are displayed in the "Options Panel".

If a device is selected and the VMU-C has properly replicated its configuration to the server, the VMU-C information is pre-loaded in the options panel.

Once you have filled in the fields to be edited click on the "Send Command" button.

4.2.1.1 USER MANAGEMENT – ADD USER

The system will display in the options panel the fields allowing to enter the Username and the Password to be added to the VMU-C.

4.2.1.2 USER MANAGEMENT – DELETE USER

The system will display a drop-down list allowing to select the user to be deleted. If N devices are selected, only the users shared by the devices will be displayed.

4.2.1.3 NETWORK – NTP SERVER

The system will display a frame in the Options panel, allowing to enable clock synchronisation from the network and to specify two NTP servers for the synchronisation.

4.2.1.4 NETWORK – E-MAIL CONFIGURATION

VMU-C can send alarm emails or SMS to multiple receivers at the same time and according to preset rules. This page contains two separate configuration screens, in

order to create two separate users groups to send communications to. The “Send for” selection field allows to filter the type of alarm messages to be sent to the relevant receivers.

Fill in the fields in both screens according to the following specifications:

“*Receivers' addresses*”: E-mail addresses of receivers the alarm messages are sent to.

Note: You may specify multiple addresses; in that case addresses must be separated by a semicolon (;) without any space.

“*Re*”: Subject of email to be sent. (Ex. *Alarm from FV Plant*).

“*SMS addresses*”: Specify the phone number (complete with international prefix) to which the message shall be sent when an event occurs.

“*Action*”:

- “*Send email*”: Check to enable email sending.
- “*Send SMS*”: Check to enable SMS sending.

Note: To be able to send any mails, the outgoing mail server must be appropriately configured in the system. (See paragraph “*EMAIL*”)

Note: If the e-mail is not received, check outgoing mail server settings, receiver's address, VMU-C reachability from Internet.

Note: Should the SMS fail to be received, check that the specified cell phone number is correct. Also check that the international prefix has been entered correctly.

Send for”: Selections allow to select and filter the alarm type the e-mail and/or the SMS is to be sent for. If not sent, the event is anyway stored and visible on monitor from Alarms list. Details of alarm types:

- “*Alarms*”: High-priority alarms.
- “*Warning*”: Low-Medium priority alarms.
- “*Events*”: Opening/Closing of digital inputs and outputs
- “*Commands*”: Variation of parameters on VMU modules

For further details on alarm types, refer to “Alarm display” paragraph. Press “Save setting” key to store settings.

4.2.1.5 CONFIGURATION MANAGEMENT – UPDATE FIRMWARE

There are no options in the Options panel; the command is sent and the VMU-C is aware of the address of the server from which the updated firmware has to be downloaded.

4.2.1.6 CONFIGURATION MANAGEMENT – RESET DATABASE

This command allows to delete all the DB history data until a given date. In the Options panel you can choose the date in question.

4.2.1.7 CONFIGURATION MANAGEMENT – SCAN NETWORK INSTRUMENTS

This command requests that the VMU-C performs a new scanning of the instruments existing on its network (Fieldbus).

4.2.1.8 CONFIGURATION MANAGEMENT – SAMPLING INTERVAL

Enter into the relevant field in the Options panel the value in seconds of the sampling interval for the devices connected to the VMU-C.

4.2.1.9 CONFIGURATION MANAGEMENT – COPY CONFIGURATION

The system will display a selection menu in the Options panel, allowing to choose the device from which the configuration shall be downloaded.

4.2.1.10 EMERGENCY – RESTART

This command requests that the VMU-C restarts the device.

4.2.1.11 NETWORK – TUNNELLING

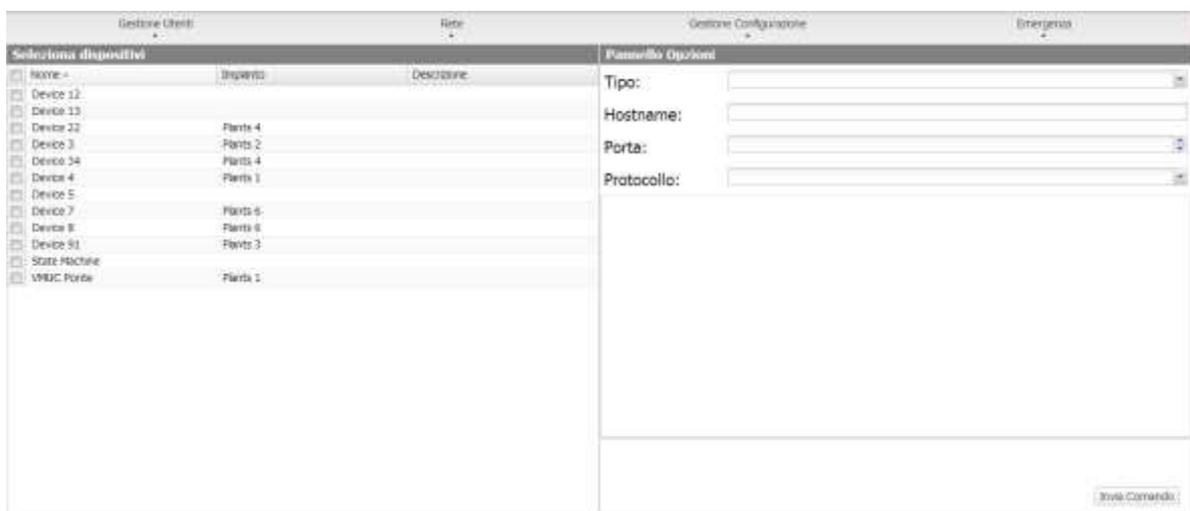


Figure 44: Tunnelling Commands Page.

Tunnelling is a process allowing to remedy any problems caused by firewall restrictions on a device, allowing to channel a flow of HTTP or SSH data on a communication channel crossing the firewall from the inside to the outside (and thus in safe mode). To issue a Tunnelling request you need to select a single Device and fill in all the fields displayed in the box on the right.

As a consequence, select:

- Requested tunnelling type:
 - o Local: This selection allows to request a tunnel to the local server in use.
 - o Remote: This selection allows to request a tunnel to a third-party server supporting the reverse tunnel (server authorised and enabled by Carlo Gavazzi).
- Hostname: Name of the host to connect to
- Port: Port number to be used for the tunnel on server
- Protocol:
 - o SSH: Request for SSH protocol tunnelling, to be able to use a SSH client connection (function available at Carlo Gavazzi technical support).
 - o HTTP: Reverse tunnel of the HTTP protocol: this allows to display the Web server on the VMU-C being tunnelled.

Usage sample.

- Select the desired VMU-C from the device list;
- Select the "Local" type;
- Select a server port; (NB: The port in question must be open on the firewall)
- Protocol: HTTP

5 minutes after the request (if the command execution time has been set to 5 minutes) the tunnel will be active and you'll be able to manage it from the menu: System -> Tunneling.

4.2.2 COMMAND HISTORY

Clicking on Command History allows to display a page containing the list of all commands, sorted by last sent date.

The bottom section hosts the pagination bar, allowing to:

- Return to the first page
- Go back by one page
- Enter the number of the page you wish to display
- Go forward by one page
- Display the last page
- Refresh the displayed data.

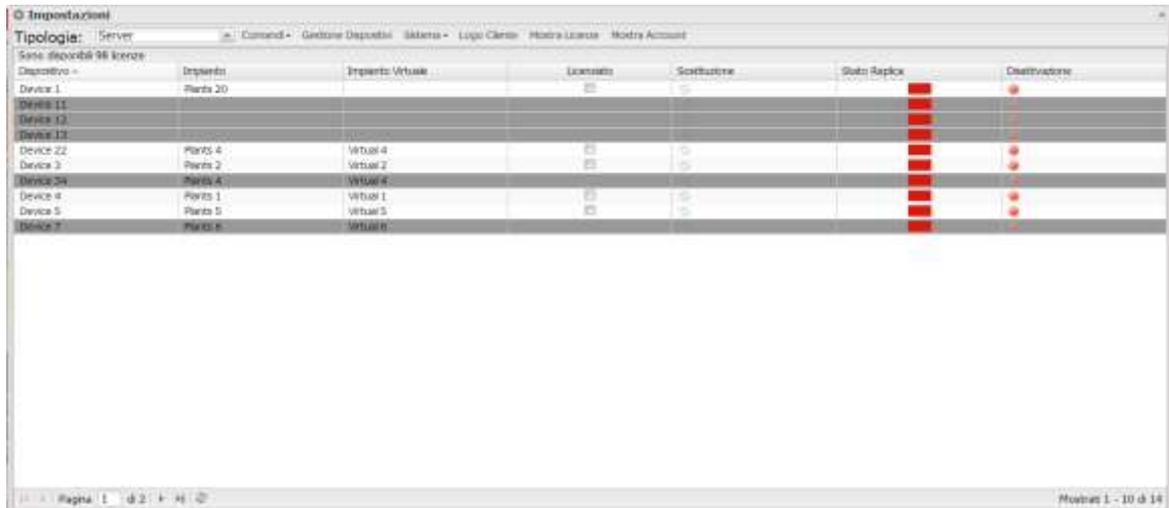
Status	Dispositivo	Porte	Tipologia	Parametri	Data Inviata
Device 1	Ports 20	Ports 20	Add User	_User:veppo,_Pass:pppo	2013-12-05 14:38:44
Device 1	Ports 20	Ports 20	Add User	_User:uicco,_Pass:pppo	2013-12-05 18:38:41
Device 4	Ports 1	Ports 1	Full configuration copy...	pppo	2013-10-07 18:04:20
VMUC-Porte	Ports 1	Ports 1	Local Alarm filtering	jan75@gmail.com;alexandro.farin@gavazzio.it;arnes.olori@gavazzio.it;marco.meneghetti@gavazzio.it;VMU-C 115 A...	2013-10-07 17:46:31
State Machine	Ports 1	Ports 1	Delete User	gavazzi	2013-10-07 18:10:56
Device 24	Ports 4	Ports 4	Delete User	gavazzi	2013-10-07 18:10:56
Device 4	Ports 1	Ports 1	Full configuration copy...	connwood.tak	2013-10-03 17:58:57
Device 22	Ports 4	Ports 4	Full configuration copy...	connwood.tak	2013-10-03 17:58:57
Device 4	Ports 1	Ports 1	Full configuration copy...	connwood.tak	2013-10-03 17:58:57
Device 4	Ports 1	Ports 1	Full configuration copy...	4000	2013-10-03 17:58:18

Figure 45: Command History Page.

4.2.3 DEVICE MANAGEMENT

This page allows to display the list of all the VMU-C devices which have connected to Em2-Server.

The devices are sorted alphabetically; the bottom section hosts the pagination bar, allowing to navigate the pages.



Dispositivo	Impianto	Impianto Virtuale	Licenziato	Sostituzione	Stato Riplica	Disattivazione
Device 1	Plants 20		<input type="checkbox"/>	<input type="checkbox"/>		
Device 11						
Device 12						
Device 13						
Device 22	Plants 4	Virtual 4	<input type="checkbox"/>	<input type="checkbox"/>		
Device 3	Plants 2	Virtual 2	<input type="checkbox"/>	<input type="checkbox"/>		
Device 24	Plants 4	Virtual 4	<input type="checkbox"/>	<input type="checkbox"/>		
Device 4	Plants 1	Virtual 1	<input type="checkbox"/>	<input type="checkbox"/>		
Device 5	Plants 5	Virtual 5	<input type="checkbox"/>	<input type="checkbox"/>		
Device 7	Plants 6	Virtual 6	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 46: Device Management Page.

The table includes the following fields:

- Device: Name of the device
- Plant: Name of the plant it is aggregated to
- Virtual Plant: Name of the virtual plant it is aggregated to
- Licensed: Whether the user has activated the licence on the device in question
- Replacement: You may click the icon to replace the piece (Fig. 49). When clicking the icon the system will display a window allowing to select the device replacing the device selected in the table. Check the send command box to automatically generate a configuration copy sending command.
- Replication Status: A coloured status icon indicating that data have been successfully replicated (green colour), or a replication error (red colour); the icon turns to red after 3 failed replications.
- Disable: Clicking the icon allows to disable the device. If it is red the device is disabled and CANNOT be activated; if it is green, instead, the device may be disabled by clicking on the icon and confirming the operation in the confirmation window. Disabling the device, therefore, is an IRREVERSIBLE operation.



Figure 47: Device Management Page.

4.2.4 TARIFFS

Clicking on the “Tariffs” menu displays the grid containing the list of all the calendars created by the user.

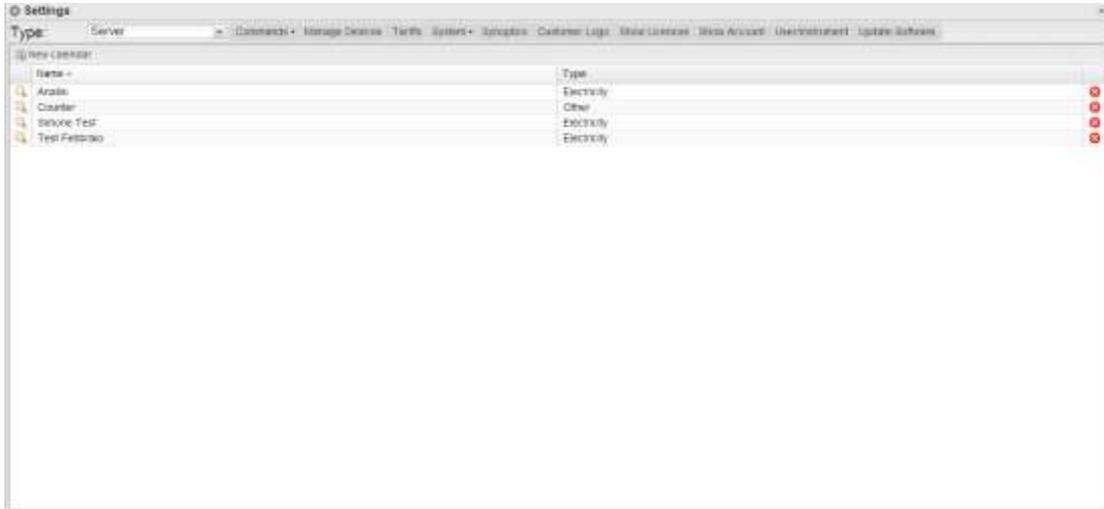


Figure 48: Tariffs Management Page.

You can create a new calendar by clicking on the “Add Calendar” menu in the top section.

A screenshot of a "Create tariff" dialog box. It contains several input fields: "Name:" (text input), "Color:" (dropdown menu), "kWh price:" (text input with "0" and a "€" symbol), "kvarh price:" (text input with "0" and a "€" symbol), "kVAh price:" (text input with "0" and a "€" symbol), "kWh threshold:" (text input), and "kVAh threshold:" (text input). Each price and threshold field has up and down arrow buttons. At the bottom, there is a "Save" button with a floppy disk icon.

Figure 49: Adding a new calendar

The system will display a window allowing to enter the following information:

- Name of the calendar to be created;
- Calendar type;
- Choice between importing data from a calendar and creating a new calendar.
- If you choose to import the data from a calendar, first select the calendar, then choose whether you wish to import the whole calendar or only some “sections”.
- If you choose partial import, you can select the items to be imported by checking them, among:
 - o Season;

- Vacations;
- Closing days;
- Holidays;
- Special days.

You can delete a calendar from the list by clicking on the red X at the end of the row. You can also edit any previously entered parameters.

The 'Edit tariff' dialog box contains the following fields and controls:

- Name:** Text input field containing 'Prima'.
- Color:** Color selection dropdown menu showing a yellow color.
- kWh price:** Spin box with value '1' and a small 'X' button.
- kvarh price:** Spin box with value '2' and a small 'Y' button.
- kVAh price:** Spin box with value '3' and a small 'Z' button.
- kWh threshold:** Spin box with value '250'.
- kVAh threshold:** Spin box with value '5'.
- Save:** Button with a floppy disk icon and the text 'Save'.

Figure 50: Calendar parameter editing

Clicking on the magnifying glass will grant access to the global view of the single calendar.

The window has 4 tabs:

- Tariffs
- Profiles
- Periods
- Whole calendar

When the window is opened, the default active tab will be the tariff one, displaying a list of all created tariffs.

Name	Color	Delete
Prima	Yellow	X
Prova	Red	X
Seconda	Green	X
Test	Purple	X

Figure 51: Tariff list

You can create a new tariff by clicking on the “Add Tariff” menu in the top section.

The system will display a window allowing to enter the following information:

- Tariff name
- Colour to be associated with the tariff for immediate identification
- kWh price: Numerical cost value per kWh. Also enter the associated currency;
- kvarh price: Numerical cost value per kvarh. Also enter the associated currency;
- kVAh price: Numerical cost value per kVAh. Enter the associated currency;
- kW threshold: Numerical threshold value on the kW value, allowing to identify any extra-peak values associated with the variable during analysis;
- kVA threshold: Numerical threshold value on the kVA value, allowing to identify any extra-peak values associated with the variable during analysis;

Press Save to save the newly added tariff.



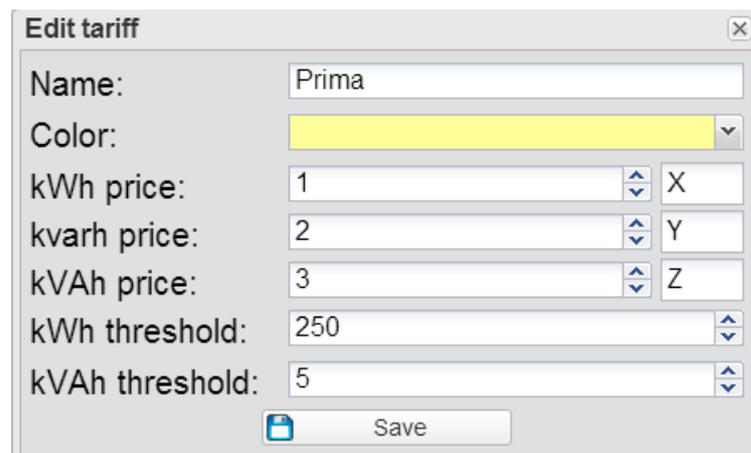
The 'Create tariff' dialog box includes the following fields:

- Name: [Text input]
- Color: [Dropdown menu]
- kWh price: [0] [Spinner] [€]
- kvarh price: [0] [Spinner] [€]
- kVAh price: [0] [Spinner] [€]
- kWh threshold: [Text input] [Spinner]
- kVAh threshold: [Text input] [Spinner]

Save button: [Save]

Figure 52: New tariff

You can delete a tariff from the list by clicking on the red X at the end of the row.



The 'Edit tariff' dialog box includes the following fields:

- Name: Prima
- Color: [Yellow highlight]
- kWh price: 1 [Spinner] X
- kvarh price: 2 [Spinner] Y
- kVAh price: 3 [Spinner] Z
- kWh threshold: 250 [Spinner]
- kVAh threshold: 5 [Spinner]

Save button: [Save]

Figure 53: Edit tariff

Clicking on the magnifying glass will display a value editing window allowing to modify all the values associated with the tariff (The fields in the window are identical to the ones contained in the creation window).

Clicking on the profile tab will display the associated window.

Near the combo box in the top section you can click on the “Add Profile” button. Enter a new profile name and select a colour associated with the profile, then press Confirm.

The newly created profile will be automatically selected in the combo box. You can edit another profile by just selecting it from the combo box.

When selecting the profile in the combo box, the system will display near the Add profile menu the "Edit name/colour" button, allowing to edit the information in question, and the “Delete” button, allowing to delete the selected profile.

The grid under the bar displays a list of all the hours of the day, allowing to associate a previously created tariff to each of them.

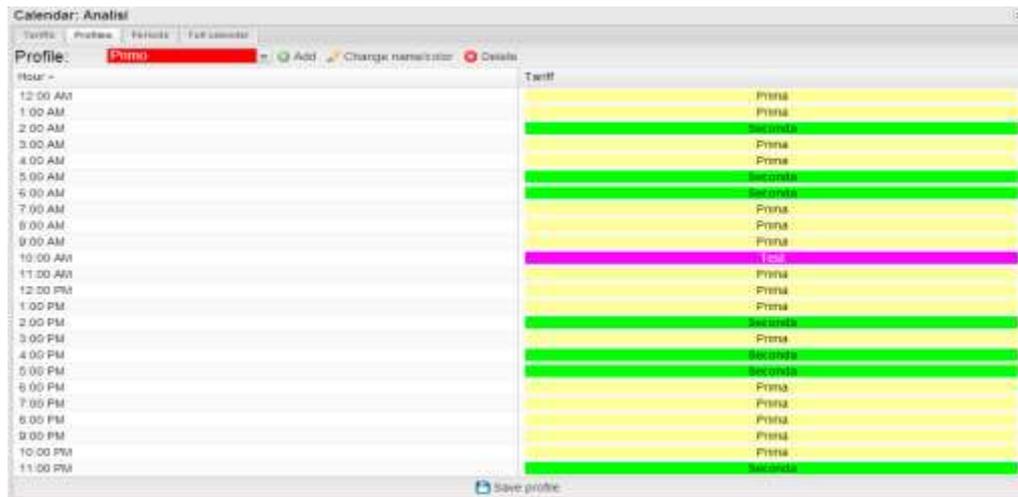


Figure 54: Profile management

Clicking on the table cell in the “Tariff column” associated with the desired hour will display a combo box allowing to select the desired tariff.

Once the operation is completed press the “Save Profile” button.

The “Periods” tab contains a grid displaying a list of all periods.

The bar in the top section contains the following information:

- Reference year, editable;
- Add period: A button allowing to add a new period;
- Add / Remove holiday.

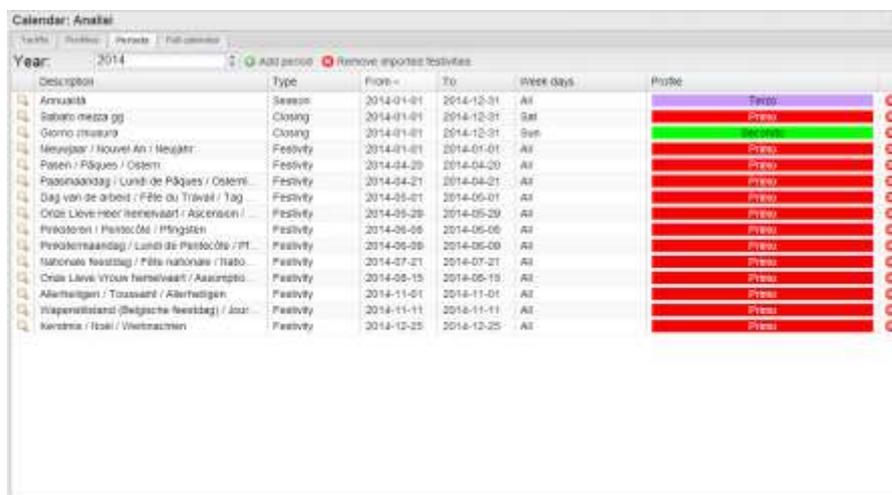


Figure 55: Period management

The displayed information includes:

- Edit: Magnifying glass allowing to edit the period parameters
- Description: Description associated with the period
- Type: Period type
- From: Period starting date
- To: Period end date
- Week days: List of the week days associated with the period
- Profile: Tariff profile associated with the period
- Delete: a red X allowing to delete the associated period

A note regarding the period type; there are different types of periods, with different priorities. Starting from the lowest priority, they are:

- Season: This type indicates an arbitrarily long period during the year, with similar characteristics
- Vacations:
- Closing:
- Holiday:
- Special event:

Clicking on the add period button will display a window prompting the user to enter some information:

- Period description
- Profile: Combo box allowing to select the tariff profile
- Period type;
- From: Season starting date
- To: Season end date

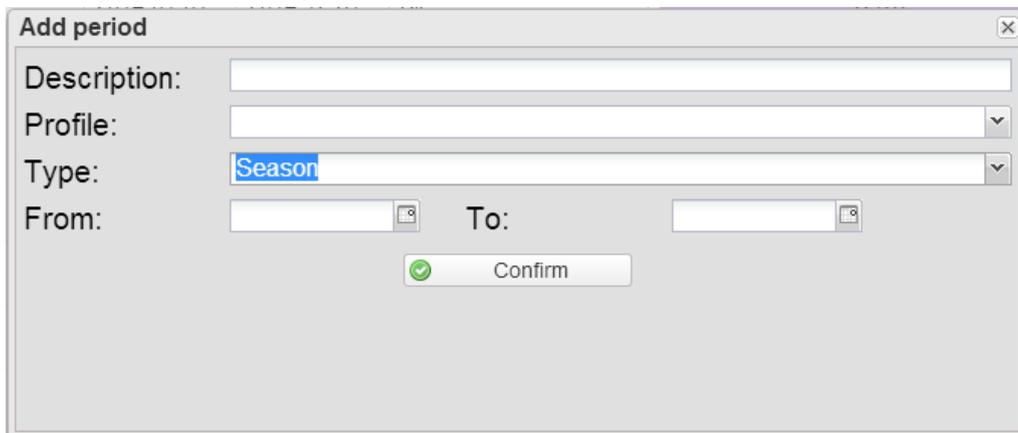


Figure 56: Add period

In the same window, if you select the "Vacation"/"Closing" period type you can select more options, including:

- Single day: A one-day vacation
- Interval: A longer vacation
- Date interval: If you have chosen the "single day" option it allows to select the single day; if you have chosen the "interval" option it allows to set the vacation starting and end date.
- If you have chosen the "date interval" option, you can also select the week days to be associated with the vacation; by default all days are selected.

In the same window, if you select the “Holiday”/”Special Day” period type you can select more options, including:

- Holiday date: Single holiday date
- Closing: Check allowing to specify whether the holiday is a closing day or not.

Clicking on “Import holidays” you can automatically import the holidays from an external site. In the window which will be displayed select:

- Country: Select the desired country from the list;
- Tariff profile: Tariff profile to be associated with all the days which will be imported.

After the holidays have been imported the button caption will become “Remove imported holidays”; by clicking on the button you’ll be able to remove all the previously imported holidays. It should be noted that any manually added holidays will not be removed.

From the “Whole calendar” tab you can display in graphic form the whole calendar of the selected year, coloured according to the previously set periods.



Figure 57: Whole calendar display

You can also copy any seasons from previous years by clicking on the button “Copy from previous year”.

If there are any seasons for the current year they will be removed.

Clicking on a day allows to set a special event, along with the relevant tariff profile.

4.2.5 SYSTEM

4.2.5.1 LAN SETTINGS

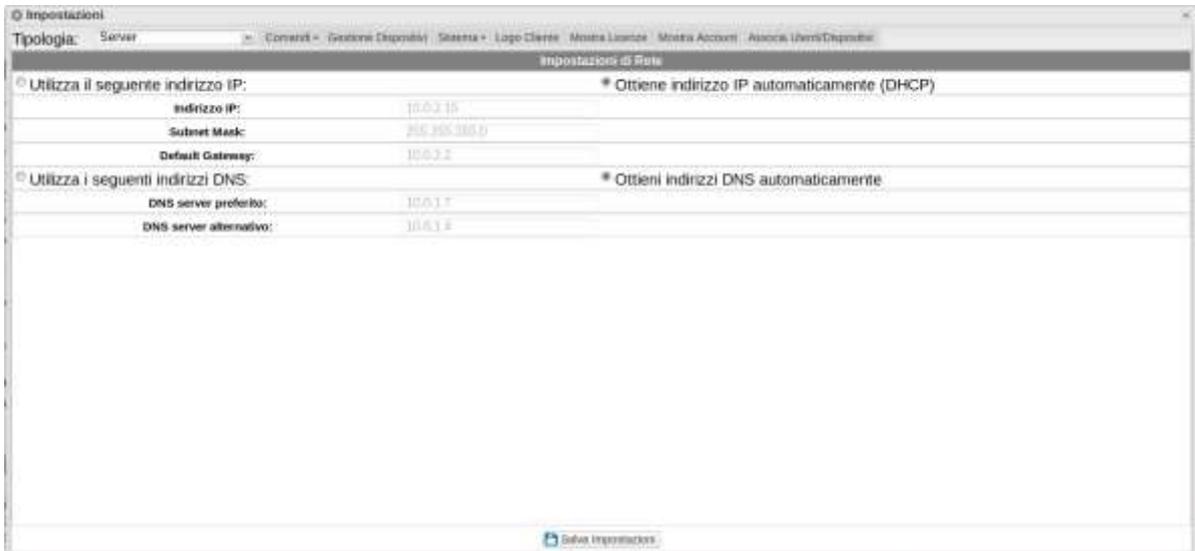


Figure 58: LAN setting page.

To configure the LAN port, you can choose between two options:

- *Obtain an IP address automatically (DHCP)* (see “A” area) : the address is automatically acquired when switching on the VMU-C from a DHCP server, which must exist inside the network the port is connected to. The IP address will be dynamic and not known in advance. In this case you can reach Em²-Server from within the same network by typing on the browser the Machine Name assigned to it.
- *Use the following IP address (Static routing)* (see “B” area): you need to manually specify an IP address along with a network mask and a default gateway.

In the absence of a network administrator who can provide the correct network parameters, assign an address belonging to the same class as those of the other existing devices (e.g.: ADSL router), and indicate “255.255.255.0” as the network mask.

The default gateway is only mandatory if you plan to access Em²-Server through the Internet using the LAN connection; in this case, indicate in this field the IP address of the ADSL router.

Finally, you can manually specify the addresses of the primary and secondary DNS servers to be used to access the Internet (*Use the following DNS server addresses*); as an alternative, if the LAN port is set to DHCP mode, you can allow Em²-Server to acquire the DNS servers from the DHCP server (*Obtain DNS server address Automatically*).

Press the “Save configuration” button to store the network configuration. The system needs to be able to access the Internet from the inside to the outside of its local network for the following services:

- *To send e-mails to the configured SMTP server.*

- To synchronise the date and time settings through the NTP service (if configured).
- To communicate through port 80 with the Reverse Tunnel server.
- To communicate with the Carlo Gavazzi licence authorisation server

4.2.5.2 NTP SETTINGS

You can set up to two NTP servers. Enabling this server type allows to constantly synchronise the DATE and TIME data; this service also allows the Em²-Server to know in which geographic area it has been installed.

Sincronizzazione Orologio	
Attiva sincronizzazione orologio dalla rete	<input checked="" type="checkbox"/>
NTP Server 1:	0.it.pool.ntp.org
NTP Server 2:	1.it.pool.ntp.org

Figure 59: NTP setting page.

4.2.5.3 E-MAIL

This page allow to edit the settings of the outgoing mail account. The following fields may be edited:

- Sender's Address: Enter the address of the mail sender
- Sender's Name: Enter the alias of the e-mail address you wish to display when a mail is received from the server
- Sender's SMTP: SMTP server used to send the e-mails
- SMTP Server User Name: e-mail address user name
- SMTP Server Password: e-mail address password

Configurazione Server Mail	
Indirizzo Mittente	gavazzi@gavazzi.it
Nome Mittente	Gavazzi EM2
SMTP Mittente	smtp.xxxx.com
Nome Utente server SMTP	mail@xxx.it
Password Server SMTP	xxxx

Figure 60: E-MAIL setting page.

4.2.5.4 TUNNELLING

This page allows to display all open tunnels, both pending and active.

The displayed information includes:

- Device: Name of the device the tunnel has been sent to;
- Plant: Name of the plant the device is aggregated into (not used in Em²-Server; only applies to Eos-Server);
- Virtual Plant: Name of the virtual plant the plant is aggregated to not used in Em²-Server; only applies to Eos-Server);
-
- Hostname: Name of the server the tunnel has been sent to;
- Protocol: It specifies whether it is a HTTP or SSH tunnel;
- Local: If it is checked the tunnel has been created on the Em²-Server; if it is not checked the tunnel has been created on a third-party server;
- Go to: In case of HTTP tunnel, clicking this icon allows to display the Web site of the device connected to the tunnel;
- Delete: It generates a tunnel deletion command on the remote device.

If the tunnel is yet to be activated 20 minutes after the request, delete it and repeat the request



Dispositivo	Impianto	Impianto virtuale	Hostname	Porta	Protocollo	Locale	Vai a	Elimina
Device 11	Plants 5		88.32.230.187	64400	HTTP	<input type="checkbox"/>		

Figure 61: Tunnelling setting page.

4.2.6 SYNOPTICS

The grid displays the list of all the synoptics configured in the system.



Figure 62: Synoptic list

You can add a synoptic by pressing the “Add synoptic” button.

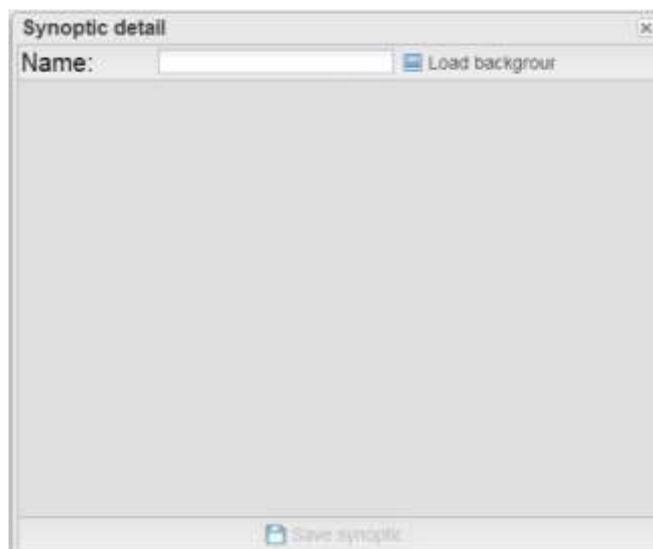


Figure 63: Add synoptic

The system will display a window, prompting you to enter a name to be associated with the synoptic in question and to load a background image from the computer. You can now load a bitmap image containing a wiring diagram, a graphic layout, a plant map or any graphic diagram you may wish to use to aggregate a group of instrument. After loading the image you can add the instruments (energy meters). Click on the save button to add the new synoptic to the list. Then click on the magnifying glass next to the synoptic to be set.



Figure 64: Modifying the synoptic

The system will display a window, allowing to add an instrument to the synoptic; the instrument in question is selected from the available instrument list.

Note: An instrument can be included in one synoptic only.

You can modify the synoptic window size by just enlarging it.

Each added instrument can be analogously resized.
Click on "Save synoptic" to save the changes.

4.2.7 CUSTOMER LOGO

Clicking on Load allows to load a customer logo which shall be displayed at the top right in the home page. The logo size is 280x73. If an image is larger it shall be automatically resized. We recommend that you create an image having the same proportions as the standard logo.



Figure 65: Logo setting page.

4.2.8 SHOW LICENCES

This page allows to enter a licence code.

The Licences table includes the following fields:

- Status: If the icon is green the licence is properly activated; if it is red, the licence is disabled
- Licence Code: Entered licence code
- Devices: Number of devices permitted by the entered licence
- Entering Date: Licence code entering date
- Delete: An icon allowing to delete a licence code

Stato	Codice Licenza	Dispositivi	Data Ingresso
●	799081829meMyyjCj/	100	2013-12-02 18:31:43
●	00H8xgrjgk4q.RA.	0	2013-12-02 18:31:43

Figure 66: Licence setting page.

4.2.9 SHOW ACCOUNT

The page contains a grid displaying a list of all created accounts.

The following information is available for each account:

- Name: Name associated with the account owner
- User: Account user name
- Level: Level of visibility/authorisations:
 - o Administrator: A user with top authorisations
 - o User: A user with limited authorisations; it can display the different system parameters, but it cannot set them. It is only allowed to change the language of the account in use.
- View: Account viewing level:
 - o Instrument: Instrument level visibility; any higher level items (level 2 and level 1) are not displayed in the portal
 - o Level 2: Level 2 visibility; any level 1 items are not displayed in the portal.
 - o Level 1: Maximum visibility level.
- Edit: Clicking the button will open a bottom section allowing to edit the account settings;

- Delete: Clicking on the button will delete the account associated with the selected row.

Clicking on the “Add user” button will open a section allowing to add an account. Information to be entered is:

- Displayed name: Name associated with the account owner
- User: Account user name
- Password: Password defined for the account
- Level: Level of visibility/authorisations:
 - o Administrator: A user with top authorisations
 - o User: A user with limited authorisations; it can display the different system parameters, but it cannot set them. It is only allowed to change the language of the account in use.
- View: Account viewing level:
 - o Instrument: Instrument level visibility; any higher level items (level 2 and level 1) are not displayed in the portal
 - o Level 2: Level 2 visibility; any level 1 items are not displayed in the portal.
 - o Level 1: Maximum visibility level.

Clicking on “Save settings” will create the new account.

The account editing panel is identical to the creation panel, except for the password. For safety reasons, the password cannot be edited; it can only be reset. Resetting the password will set a password which is identical to the account user name.

4.2.10 USER / INSTRUMENT

This page allows to associate an instrument with a user.

The list of the available instruments is displayed in the left section of the page, while the list of the associated instruments is displayed in the right section.

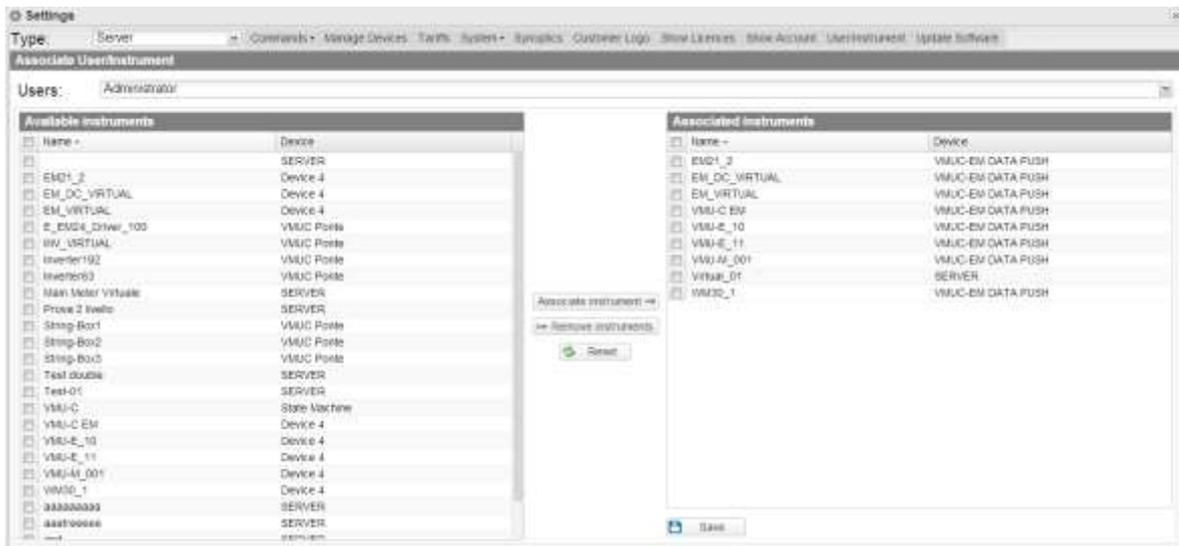


Figure 67: Instrument / User association page

Once the plant setting is completed click on the Save button to save the changes. The reset button clears any unsaved changes.

4.2.11 SOFTWARE UPDATE

This page allows to upgrade the Em²-Server software.
The page displays the current software version.
The only valid update packages are the ones supplied by the Carlo Gavazzi sale network and technical support.

Select the software to be loaded by clicking on the “Browse..” button; the ONLY valid format is tar.gz.

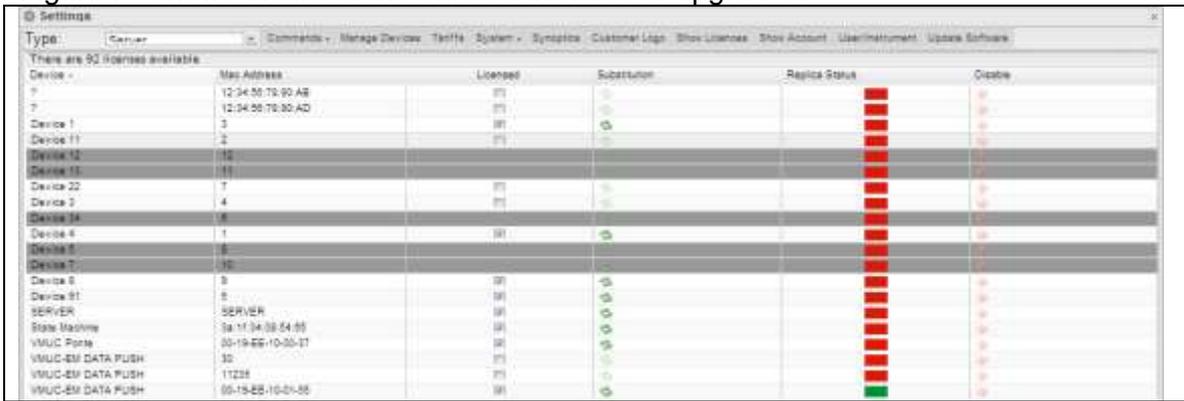
After selecting the file click on “Load file”; the upgrade process will start.

Once loading is completed click on OK to start the software updating process. Once the procedure is completed the system will display the home page.

5 How-To

5.1 LICENSING A VMUC DEVICE

Figure 70 shows the list of the entered licences or upgrades.



The screenshot shows a web interface for device management. At the top, there are navigation tabs: Settings, Carrier, Commands, Manage Devices, Tariffs, System, Synctool, Customer Logs, Show Licenses, Show Account, User/Instrument, and Update Software. Below the tabs, it says "There are 92 licenses available". The main content is a table with the following columns: Device #, Mac Address, Licensed, Subscription, Replica Status, and Enable. The table lists various devices, including Device 1 through Device 31, SERVER, State Machine, VMUC Ports, and VMUC-EM DATA PUSH. The Replica Status column contains red and green bars, and the Enable column contains red and green arrows.

Device #	Mac Address	Licensed	Subscription	Replica Status	Enable
Device 1	12:34:56:78:90:AB	<input type="checkbox"/>			<input type="checkbox"/>
Device 11	12:34:56:78:90:AD	<input type="checkbox"/>			<input type="checkbox"/>
Device 12		<input type="checkbox"/>			<input type="checkbox"/>
Device 13		<input type="checkbox"/>			<input type="checkbox"/>
Device 22		<input type="checkbox"/>			<input type="checkbox"/>
Device 3		<input type="checkbox"/>			<input type="checkbox"/>
Device 14		<input type="checkbox"/>			<input type="checkbox"/>
Device 4		<input type="checkbox"/>			<input type="checkbox"/>
Device 5		<input type="checkbox"/>			<input type="checkbox"/>
Device 7		<input type="checkbox"/>			<input type="checkbox"/>
Device 8		<input type="checkbox"/>			<input type="checkbox"/>
Device 9		<input type="checkbox"/>			<input type="checkbox"/>
Device 10		<input type="checkbox"/>			<input type="checkbox"/>
Device 11		<input type="checkbox"/>			<input type="checkbox"/>
Device 12		<input type="checkbox"/>			<input type="checkbox"/>
SERVER	SERVER	<input type="checkbox"/>			<input type="checkbox"/>
State Machine	3a:1f:34:88:54:85	<input type="checkbox"/>			<input type="checkbox"/>
VMUC Ports	00-19-65-10-00-07	<input type="checkbox"/>			<input type="checkbox"/>
VMUC-EM DATA PUSH	3D	<input type="checkbox"/>			<input type="checkbox"/>
VMUC-EM DATA PUSH	1123E	<input type="checkbox"/>			<input type="checkbox"/>
VMUC-EM DATA PUSH	00-15-68-10-01-08	<input type="checkbox"/>			<input type="checkbox"/>

Figure 70: Device management screen

Figure 71 shows the list of all the VMUC which have actually communicated with Em²-Server

You can licence one of the listed devices by just clicking in the box (thus checking it), provided any licences are available.

5.2 REPLACING THE SERVER

In the original virtual machine, delete the entries of the licences, to be able to use the codes in question in the new server.

To replace the server you first need to create the new virtual machine and initialise it as you did for the one already running, then following the relevant procedure to allow duplicating a server instance without disabling the relevant license and thus the server

