CARLO GAVAZZI

Web–Server VMUC

Web–Server solution for photovoltaic applications

Instruction manual
Version A14

SUMMARY

1 INSTALLATION

1.1 INTRODUCTION

This manual provides a comprehensive guide to VMUC (WebServer) installation, configuration and commissioning; it is addressed to technical staff members having an average knowledge of IT and of TCP/IP networking basic principles.

VMUC is a web server and provides a comprehensive system allowing to monitor the devices installed in a Photovoltaic System, like inverters, electrical energy meters, environmental sensors and string controls (Eos-Array).
The software and all the components needed for panel operation require no installation of additional software components.

1.2 PACKAGE CONTENT
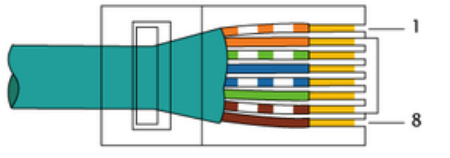
VMUC is supplied in a package including the following components:

- VMUC

1.3   TECHNICAL CHARACTERISTICS

VMUC is micro PC, totally fanless and without any moving components, providing WebServer functions; thanks to the use of industrial hardware, to its extremely small size, to its low energy consumption and to the low noise level it is ideal for monitoring applications requiring features like sturdiness and reliability along time; it can be installed in both technical and inhabited environments, without requiring any special caution during installation, usage and maintenance.

The following table provides a summary list of the product characteristics:

Ports and connections	1 X 12 to 28Vdc power supply (**A1+** and **A2-**) 2 X RS-485 (COM1 and COM2) : <table><tr><td rowspan="3">COM1</td><td>Data – (A-)</td></tr><tr><td>Data + (B+)</td></tr><tr><td>GND</td></tr><tr><td rowspan="3">COM2</td><td>Data – (A-)</td></tr><tr><td>Data + (B+)</td></tr><tr><td>GND</td></tr></table> 1 X RJ-45 connector for 10/100 Base-T Ethernet [Communication] [Communication port – Default IP: *192.168.1.110*] Pin 1 TX+ Pin 2 TX- Pin 3 Rx+ Pin 6 Rx- EIA/TIA-568B 1 X standard USB 1 X mini USB (through a dedicated driver it allows to access the system through the IP address 192.168.254.254) 1 X slot for micro SD or SDHC memory card
Absorption	5W Max.
Operating conditions	-25°C to 40°C
COM port termination	Both COM ports are internally terminated with a value of 150Ω and polarised with two 511Ω resistors (from "B+" to +5V and from "A-" to GND). As a consequence no other external connection is required.

VMU−C

VMU-C dimensions

1.4 INSTALLATION AND CONNECTIONS

To install the VMU-C you need to perform the following steps:

- Connect the DC 24Vdc power supply (12Vdc to 28Vdc) through an appropriately sized feeder (recommended feeder: SPM3-241)

- Connect the inverters and the electric energy counters (if any) to the RS-485 (COM2) port. The different "paralleled" devices may communicate at different baud rates (communication speeds) and use different communication protocols.

- Connect the Eos-Arrays to the RS-485 (COM1) ports

  You can connect up to 10 Eos-Array systems (VMU-M along with the relevant modules).

  All the Eos-Arrays connected to the COM1 port shall be configured with the same baud rate and the same sampling time.

  > *The log data recorded throughout the day shall be available to be shown in graphical form for 6 months.*
  > *The daily data, that is the sum mary values of each day shall be available to be shown in graphical form for 10 years.*

- Connect the system to the data network through a standard Ethernet cable, using the LAN communication port configured with the default static IP address 192.168.1.110

- (Optional) Connect the GPRS/EDGE/UMTS/HSDPA modem by means of the VMU-W module through inner bus.

When switching on the VMU-C, the following LEDs will light up on the front panel: green "ON" LED (indicating the machine is powered), orange "BUS" LED (indicating LAN door activity), orange "COM1" and COM2 LEDs (indicating COM door activity), blue "USB" LED (indicating the presence of an USB device) and red "AL" LED (indicating the presence of any alarm condition); when connecting the network cable, the Ethernet port LEDS will light up as well.

After connecting and powering the VMU-C, access its configuration Web pages as described in the next chapter.

2 GENERAL OVERVIEW

2.1 ABOUT VMU-C

VMU-C is a photovoltaic plant monitoring Web server based on Web technology. Once properly set up, the VMU-C software can be used through the net – both LAN and Internet – through any PC or device equipped with a common Internet browser.
As VMU-C is based on the Web technology, it can be accessed and browsed as a common Web site; the data and status display function for the devices installed in the plant (inverters, strings, environmental sensors) is based on the innovative AJAX technology, allowing to send and receive information without having to reload the graphical pages.

2.2 ACCESSING THE SYSTEM

To access the system, you first need to establish a network connection between your PC and VMU-C, using the LAN port existing on the device; you have two options:

- Directly connect the two machines (VMU-C and PC) through network cable
- Connect both machines (VMU-C and PC) to your local network
- Directly connect the two machines (VMU-C and PC) through a USB/mini-USB cable.

The VMU-C default address is **192.168.1.110** ; in both connection configurations, this implies that, in order to be able to communicate with VMU-C your PC must belong to the same sub-network; that means its IP address must be *"*192.168.1.x*"*, where "x" must be a number not equal to 100 and ranging between 1 and 254.
If using a mini-USB cable to connect the devices, the address must be 192.168.254.254.
If your network configuration is different (the first 3 number are not the prescribed ones) you need to temporarily modify your network configuration as specified above; then, as described below, after accessing the software you can modify the VMU-C network parameters, to make it compatible with your network, and finally restore your original network configuration.

VMU-C

After configuring your IP address, open an Internet browser and type the following address: http://192.168.1.110

Note that a secondary backup IP address is available in the case of a misconfiguration of the primary address: 192.168.253.254

The system will display the following access page:
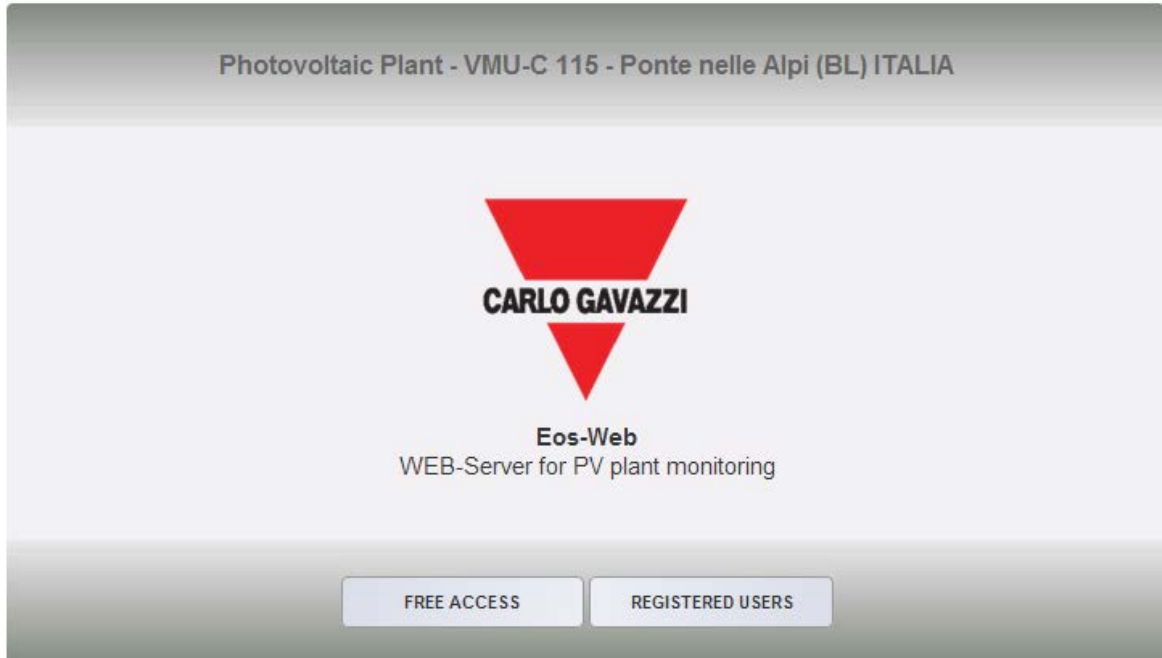
System access page

Clicking the "REGISTERED USERS" button will access the Login page:

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.

2.3 THE MAIN SCREEN

The figure below shows the VMU-C home page:
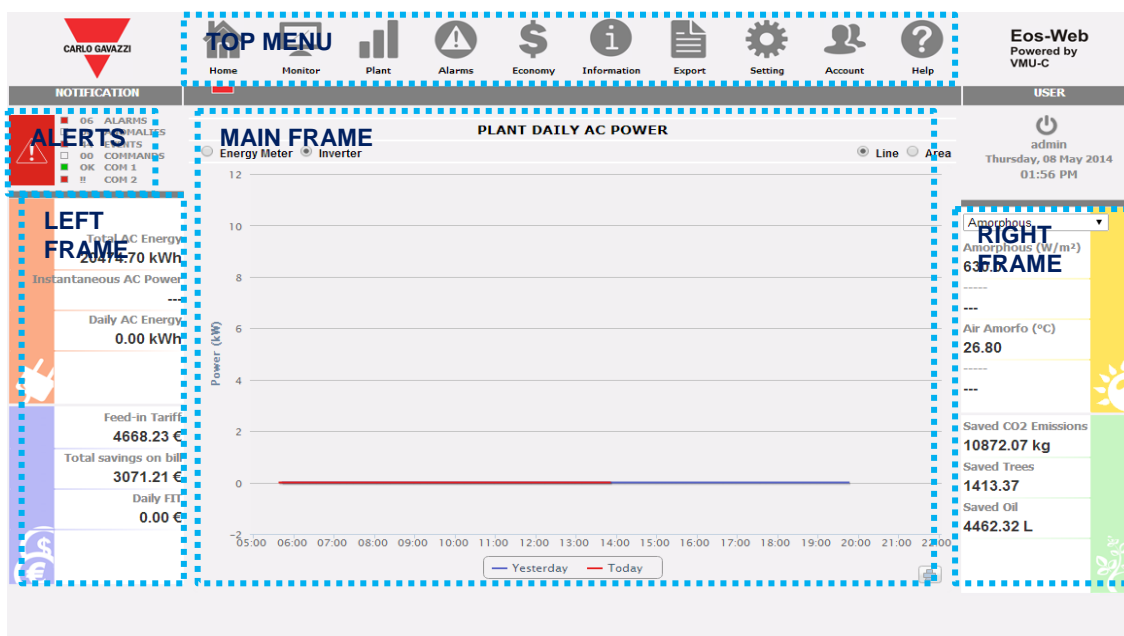
Home Page

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

a) *TOP MENU:* It includes the Icons allowing to select all the product's functions
b) *ALERTS:* This section shows the status of the system in terms of RS485 ports (COM1 and COM2 status) and in terms of systems alerts (open ALARMS,WARNINGS,EVENTS,COMMANDS counters); the color code is the following one:
   a. *COM1 and COM2:*
      i. GREEN: communication OK
      ii. RED: communication problems
      iii. GREY: COM port not enabled
   b. ALARMS,WARNINGS,EVENTS,COMMANDS:
      i. RED: open alerts present
      ii. GREY: no open alerts
   By clicking on the main alert icon, the alarm page will be opened

VMU-C

c) _LEFT FRAME:_ Starting from the top we have:

1) Production data. (Automatic data update)

Total AC Energy
20474.70 kWh

Instantaneous AC Power

Daily AC Energy
0.00 kWh
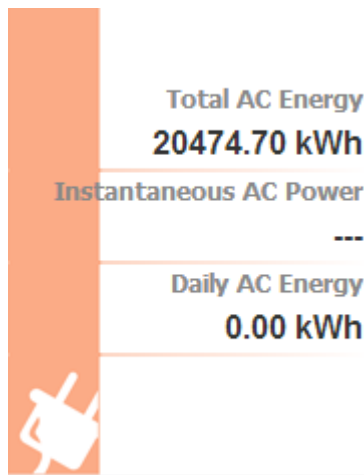
1) Total AC energy – Total energy delivered by the plant since its switch-on. Data are collected from the reference energy meter, according to the settings indicated in section "Energy meter configuration".

2) Instantaneous AC power – Instantaneous power (kW) generated by the plant. Data are collected from the reference energy meter, according to the settings indicated in section "Energy meter configuration".

3) Daily AC energy – Daily energy delivered by the plant in the present day. Data are collected from the reference energy meter, according to the settings indicated in section "Energy meter configuration".

Note: should the plant include no energy meters, VMU-C will create a virtual one, representing the sum of the data (kWh and kW) provided by the inverters.

2) Economic Data. (Automatic data update)

Feed-in Tariff
4668.23 €

Total savings on bill
3071.21 €

Daily FIT
0.00 €
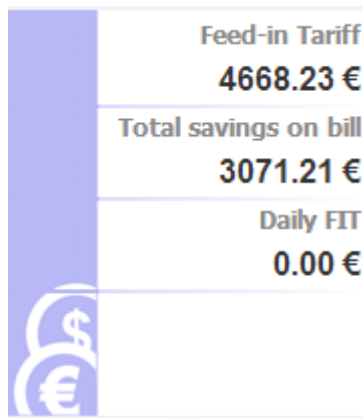
1) Feed-In Tariff: Total Amount (€) received as an Incentive.

Calculation:

Total Incentive = Total AC Energy x Incentive

2) Total Savings on bill / Total Amount of Sold Energy (€): this depends on the settings made in "System Data" → "Economic Data" Self-consumption / Sale

Calculation:

Total Sold Energy Amount = Total AC Energy x Amount paid for the sale of 1 kWh of Energy

3) Daily FIT / Daily Sold Energy (in the current day) (€): this depends on the settings made in: "System Data" → "Economic Data" Self-consumption / Sale

Calculation:

Daily incentive (saving on bill) = AC Energy of the current day x Cost of 1 kWh of Energy

Total Sold Energy Amount = Total AC Energy of the current day x Amount paid for the sale of 1 kWh of Energy

d) _RIGHT FRAME:_ From top to bottom:

VMU-C

1) Environmental sensor data. (Automatic data update)

Amorphous ▼
Amorphous (W/m²)
960.0

Air Amorfo (ºC)
28.50
------
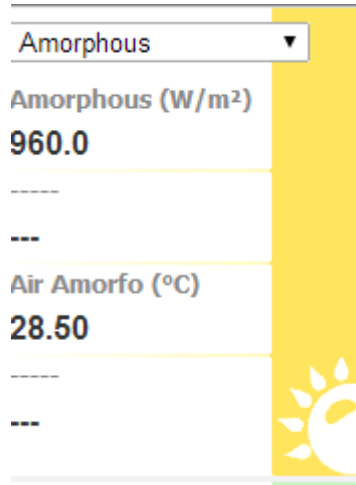
1) Zone selection control: it allows to select the environmental zone of interest

2) Solar Radiation: solar irradiance (W/m^2) measured in the zone of choice

3) Module Temperature – Temperature (°C) measured in the zone of choice.

4) Ambient Temperature - Temperature (°C) measured in the zone of choice.

Wind Speed – Wind Speed (m/s) measured in the zone of choice.

Note: Dotted lines instead of data mean that information is not available. This occurs when: the sensor is not installed; data is incorrect; there is no communication from the sensor.

2) Environmental data. (Automatic data update)

Saved CO2 Emissions
10872.07 kg
Saved Trees
1413.37
Saved Oil
4462.32 L
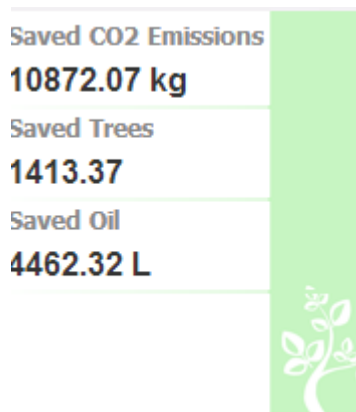
1) Saved CO_2 emissions – The calculation refers to the Total AC Energy generated by the plant (see 'Total AC Energy' in "Production data") Measuring unit: kilogram (kg).

Calculation:

A kWh used by the final user, produced by a thermoelectric plant, corresponds to an emission into air of about 0.53kg of CO_2. We can thus state that a kWh produced by a photovoltaic plant prevents the emission into air of 531g of CO_2. We'll thus have: Saved CO_2 emissions = 0.531 x Total AC Energy (kWh)

2) Equivalent trees - The calculation refers to the Total AC Energy produced by the plant [see 'Total AC Energy' in "Production data"].

Calculation:

Equivalent Trees = Saved CO2 Emissions x 0.13

3) Saved Oil - The calculation refers to the Total AC Energy produced by the plant [see 'Total AC Energy' in "Production data"]. Measuring unit: Litres (L).

Calculation:

Saved Oil = TOE x 7.33 x 159

TOE = [0.187 x Total AC Energy (kWh)]/1000

1 TOE (Tonne of Oil Equivalent)= 7.33 oil drums

1 oil drum = 159 litres of oil

e) *MAIN FRAME:* It displays the main information relevant to the present . In the bottom section it also displays a text band containing the main system data: name, location, plant type (fixed/tracker/mixed), peak power.

VMU-C

2.3.1 NAVIGATION MENU

Hover your mouse over the icons to display their meaning in text form in the bottom section. Click on the icon to access the relevant section which will be displayed in the Main Frame.

Home

It allows to return to the main page.

Monitor

It allows to display the production data in graphical form, comparing Solar Radiation, Temperature, Powers and Efficiencies.

Plant

It allows to display in graphical form all the acquired system data.

Alarms

It allows to display the alarms that have been raised in the plant.

Economy

It allows to display in graphical form the value of incentives, sales and savings.

Information

A tab displaying: VMU-C status information and the PV plant characteristics.

Export

It allows to export data to standard Excel® compliant format.

Settings (Only available for Administrator users)

It allows to access the system configuration menu.

Account (Only available for Administrator users)

It allows to access the Account management question.

Help

It allows to open the online HELP documentation focusing on the present context.
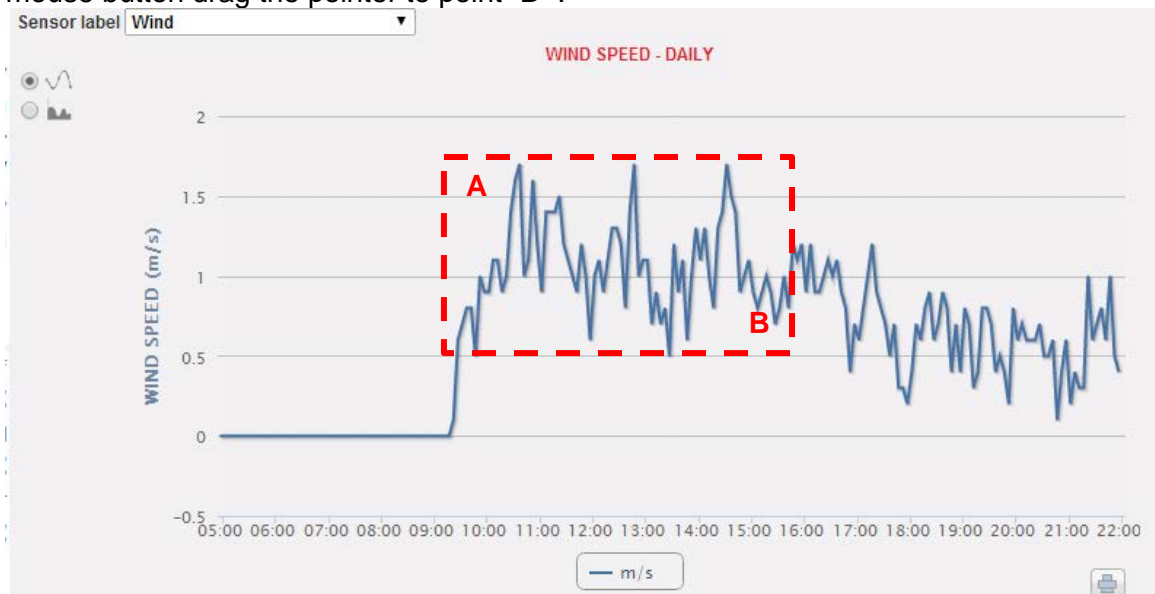
2.4   GENERAL CHART FEATURES

2.4.1   ZOOM FEATURE

You can use the ZOOM function in any Chart display page, it allows you to zoom a particular area of the graph for further analysis.

The ZOOM function is fast and easy. The picture below shows the sequence of operations to perform:

Example of a graph that you want to further analyze. In particular, we want to analyze the area highlighted with the orange dotted area:

Move your mouse pointer " ↖ " to point "A" and using the mouse hold down the left mouse button drag the pointer to point "B" :

Zoom Function

As soon as the left mouse button is released, the zoomed area is highlighted the performance of the charts can be further analysed:

Zoomed area

The zoom function is available for all chart types (histogram and area charts).
By the RESET ZOOM button it is possible to come back to the initial scaling.

2.4.2 REFRESH FEATURE

By the refresh button, available in each chart
in bottom-left position, it is possible to refresh
the displayed view

2.4.3 PRINT FEATURE

By the PRINT button, available in each chart
in bottom-right position, it is possible to print
the present chart

VMU–C

3 SETTINGS

Clicking on the "Settings" icon in the Navigation Menu will grant access to the whole system Configuration section.

Settings

The software will display three main configuration menus (*SYSTEM, PLANT and SENSORS*):
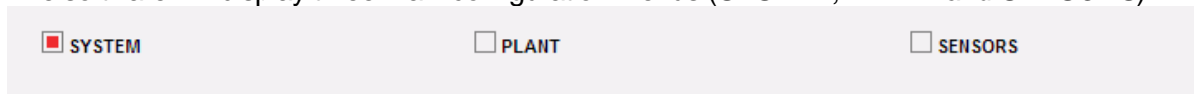
3.1 "SYSTEM" CONFIGURATION

Clicking on the "SYSTEM" menu will display the following sub-menus:

DATA PLANT ▶
LAN SETTING
NTP SERVER
DP SERVICE ▶
FTP SERVICE ▶
MODEM
ALARMS
PLANNING
E-MAIL
FIRMWARE ▶
TOOLS
LANGUAGE
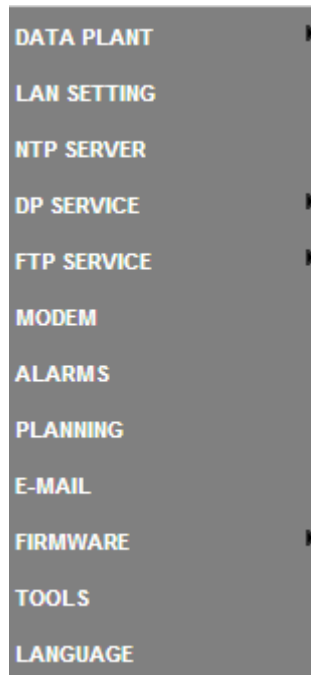
3.1.1 DATA PLANT SETTING

The "*PLANT DATA*" menu allows to access the plant description page and the project page:

DATA PLANT ▶ DESCRIPTION
LAN SETTING PROJECT

3.1.1.1 "DESCRIPTION" SETTING

Clicking on the "DESCRIPTION" menu will display the main page providing a plant description:

PLANT DESCRIPTION

Plant Name	VMU-C 115
Plant Location	Ponte nelle Alpi (BL) ITALIA
Plant Property	Carlo Gavazzi S.p.A.
Installer	Carlo Gavazzi S.p.A.
PV Modules Installation Date	2011-12-01 yyyy-mm-dd
VMU-C Installation Date	2011-12-01 yyyy-mm-dd

TECHNICAL DATA   **FINANCIAL HIGHLIGHTS**

Plant Type	◉ Fixed ○ Mixed ○ Tracking		Feed-in Tariff	◉ Own ○ Sale	
			Currency	€	
PV Modules Total area	70.8	m²	Incentive	0.228	€/kWh
Number of Inverters	3		Cost	0.15	€/kWh
Number of Strings	8		% Sold Energy		%
Peak power of Plant	8.88	kW	Sale		€/kWh

Save Setting

Plant Description

The "***Plant description***" section allows the insertion of the general data of the plant to make the plant management easier.

The "***Technical data***" section displays technical data (surface, amount of inverters and strings, plant rated power). These data cannot be edited; the relevant fields are populated by the software referring to the system configuration data (see chapter "Configuring the areas" and "Configuration of VMU-S modules"). "Total area of PV modules" indicates the product between the surface of each photovoltaic module and the total number of modules installed in the system.

Note: If the VMU-S modules were not configured in the system, the fields "Peak Power Plant" and "Total area of PV modules" can be configured directly by entering the two values previously calculated by the user

The "***Economic data***" section allows to choose between two options: "*Own*" and "*Sale*". Choosing "*Sale*" will also enable two more fields: "SALE", specifying the amount paid for each sold kWh and *"Sold Energy % Estimate"* (in case of partial transfer). The latter parameter ranges between 0-100% and modifies the equivalent monetary value obtained from the sale of energy.
By default yield data are acquired from the energy meters and displayed as the sum of the individual values. The selection affects the subsequent calculation of economic counter-values, the data shown in "Left frame" and "Right frame" and the total efficiency calculated.

Press "Save setting" to store data.

Note: The decimal separator the decimal point.

VMU-C

3.1.1.2 "PROJECT" SETTING

Clicking on the "PROJECT" menu will display the main page providing a plant description:

MONTHLY PLANNED YIELD INDEX (KWH/KWP)

PV Modules Installation Date 2011-12-01

	First Installation Value	Annual Corrected Value		First Installation Value	Annual Corrected Value
January	45.0 kWh/kWp	40.6125	July	110.0 kWh/kWp	99.275
February	60.0 kWh/kWp	54.15	August	120.0 kWh/kWp	108.3
March	70.0 kWh/kWp	63.175	September	110.0 kWh/kWp	99.275
April	80.0 kWh/kWp	72.2	October	100.0 kWh/kWp	90.25
May	90.0 kWh/kWp	81.225	November	80.0 kWh/kWp	72.2
June	100.0 kWh/kWp	90.25	December	40.0 kWh/kWp	36.1

Annual Yeld Corrective Factor 5.0 %   Expected Energy on Current Year 907.0125 kWh/kWp

Save

Project Settings

In this configuration page the user shall specify the "YIELD" (kWh/kWp) expected by the plant for each month. He shall also indicate the "Annual Yield Corrective factor" of installed panel performance. VMU-C will automatically calculate the "Correct Annual Value", which will take into account the installed value and the decay due to panel ageing, for each month. VMU-C will also automatically provide the "Expected Energy for the current year".

3.1.2 LAN SETTINGS

Clicking on "LAN Settings" will grant access to the page shown below.

NETWORK SETTING

VMU-C Name	VMU-C [0] [1] (Example: VMU-C01)

○ Use the following IP Address:　　　　　　　　○ Get an IP address Automatically (DHCP)

IP Address:	192.168.3.115
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.3.18

○ Use the following DNS server addresses:　　　○ Get DNS Server address automatically

Preferred DNS server:	192.168.3.2
Alternative DNS server:	

Save Setting

DYNAMIC IP ADDRESS MANAGEMENT

☑ Enable Dynamic DNS　　Server Dynamic DNS [DynDns.it ▼]

Hostname	vmuc.ponte01.ns0.it
Username	vmuc.ponte01
Password	cgcuwp123

Save Setting

LAN Settings

This page consists of 2 sections:

1) <u>*Network Settings*</u>

There are two options:

- *Get an IP address automatically (DHCP)* : 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 it is possible to reach VMU-C from within the same network by typing on the browser the Machine Name assigned to it (e.g. VMU-C01).

- *Use the following IP address (Fixed IP):* it is necessary 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 needed to access VMU-C through the Internet using the LAN connection; in this case, indicate in this field the IP address of the ADSL router

Finally, it is possible 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, VMU-C could obtain the DNS servers from the DHCP server *(Obtain DNS server address Automatically).*

Press the "Save configuration" button to store the network configuration. To apply the new settings, VMU-C needs to be automatically restarted; wait until the count-down is over; then you'll routed back to the home page.

The system requires to have access to the Internet for the following services:

- *To send e-mails to the configured SMTP server (port 25, outbound).*

- *To synchronise the date and time settings through the NTP service (port 123,outbound)*

- *To be accessed remotely by Carlo Gavazzi personnel people in the case of maintenance requested by the customer (port 22 and 80, inbound)*

- *To push data to an FTP server, if the FTP service is activated (port 21,outbound)*

- *To be polled by a remote service using the relevant set of HTTP commands (port 80, inbound)*

- *To download a new firmware version by Carlo Gavazzi's servers (port 21 outbound)*

- *To push data to Eos-Server or VMU-Y (port 80, 443 outbound)*

- *To execute remote commands sent by Eos-Server and VMU-Y (port 80,22 outbound)*

> *Note: to make VMU-C accessible from Internet through a LAN connection it is necessary to adopt re-routing policies on the relevant router modem (NAT-Port forwarding) to which it is connected.*

2) *Dynamic public IP address management*

Should you not have at your disposal a static public IP address allowing to reach the VMU-C from the Internet, but should you have to use any public IP addresses dynamically assigned by your ISP (Internet Service Provider), you may resort to DNS services keeping the dynamic public IP address constantly synchronised with a domain name. The services supported by VMU-C are *DynDns.org*, *DynDns.it* and *No-ip.com*. To access the service of choice, you need to connect to http://www.dyndns.org/ (or http://www.dyndns.it/ or http://www.No-ip.com/), register by creating an account and finally create a new "Dynamic DNS host". The term "Dynamic DNS host" indicates a domain address which shall then be typed into the browser's address bar to reach VMU-C. (E.g. VMUC.No-ip.com). When registering to DynDNS.org (or to an equivalent site) you shall provide a Username and a Password that VMU-C will use to authenticate with the server.

To enable the management of the dynamic public IP address you need to:

- Check "Enable dynamic DNS".
- Type the name of the chosen Dynamic DNS host.
- Type the Username and Password provided during account registration.
- Click on "Save settings"

DYNAMIC IP ADDRESS MANAGEMENT

☑ Enable Dynamic DNS	Server Dynamic DNS	DynDns.it ▼
	Hostname	vmuc.ponte01.ns0.it
	Username	vmuc.ponte01
	Password	cgcuwp123
	Save Setting	

Dynamic public IP address management

The service will be available after about 6 minutes.

Notes:

1)Relaying on dynamic DNS services is often necessary when the Internet connection is established through a GPRS/UMTS modem or when you don't have any static IP address on your ADSL line. Mobile telephony operators, in fact, are unlikely to provide a static IP address.

2)Carlo Gavazzi developed the client software to communicate to the above Dynamic DNS services, nonetheless Carlo Gavazzi has no technical or commercial agreement with the aforementioned companies.

3.1.3 CONFIGURING THE NTP SERVER

Clicking on "NTP SERVER" will grant access to the page shown below.

CLOCK SYNCHRONISATION	
Enabling Network Clock Synchronisation	☑
NTP Server 1 :	ntp1.inrim.it
NTP Server 2 :	ntp2.inrim.it
Save Setting	

NTP Server

It is possible to configure up to 2 NTP servers. Enabling this server type allows to constantly synchronise the DATE and TIME data; this service also allows the VMU-C to know in which geographic area it has been installed.

It is mandatory to connect to an NTP service in the case VMU-C is used with Eos-Server or VMU-Y.

3.1.4 DP SERVICE

The DP service is the highly secure and efficient protocol that VMU-C uses to exchange information with Eos-Server and VMU-Y.
The protocol is based on a Web-Service oriented architecture based on HTTP.
Please check Eos-Server and VMU-Y documentation for information about those systems.
Both Eos-Server and VMU-Y allow users to build distributed systems where VMU-C PV is a gateway in a charge of gathering data from the plant and route information to a centralized database (Eos-Server/VMU-Y)
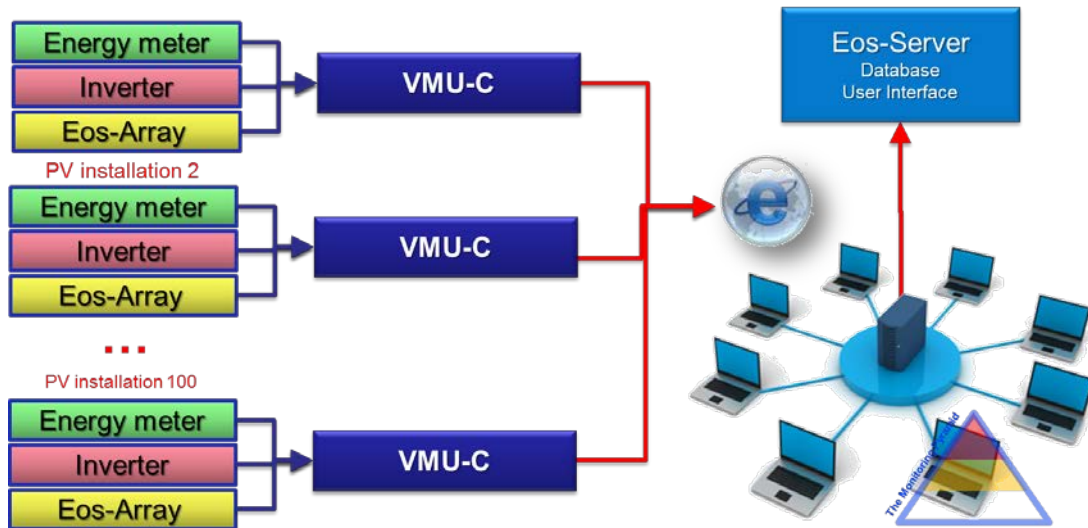
Eos-Server architecture

DP Service Menu

3.1.4.1 DP SERVICE SETTING

By selecting the Setting submenu it is possible to access the DP Service configuration page.

DP Service configuration

The parameters to set to successfully join the Eos-Server/VMU-Y are:

Parameter	Description
Server Address	It is the internet address of the Eos-Server / VMU-Y
GPS coordinates	The GPS coordinates of the VMU-C; they may be set manually or by using the Map on the bottom
Upload time interval	It is the time interval between two distinct data upload transactions from VMU-C to Eos-Server/VMU-Y It depends on available bandwidth (on both sides), amount of data to push, Internet congestion. Typically "10 minutes" is a good compromise
Command Processing interval	It is the time interval between two distinct request-for-commands transactions from VMU-C to Eos-Server/VMU-Y; VMU-C asks Eos-Server / VMU-Y for commands at scheduled intervals and processes them accordingly. Typically it is equal to "Upload time interval"

The available commands are:

Command	Description
Test Connection	It allows to check if the configured parameters are good, and it is possible to establish a connection between VMU-C and Eos-Server/VMU-Y
Send	It allows to send from VMU-C to Eos-Server/VMU-Y: • Full configuration (after having finalized the VMU-C's configuration) • Partial configuration (after having updated the

	VMU-C's configuration)
	• Command request (to force VMU-C to check if there are any pending commands on Eos-Server/VMU-Y)
Save setting	To save the configuration

Notes:
1) *It is always advisable to fully finalize the VMU-C configuration before sending it to Eos-Server*
2) *VMU-C can successfully join Eos-Server only if the necessary license plan has been installed in the target server*

3.1.4.2 DP SERVICE LOGS

Two sets of Logs are available within the data push section:
• Logs of transactions successfully completed
• Logs of transaction with errors
In both cases, up to 500 records are stored.

LOGS ERROR

1	Data 2014-02-17 15:19:25	2014-02-17 15:19:25	Base64 decoding error
2	Data 2014-02-13 10:03:26	2014-02-13 10:03:27	Base64 decoding error
3	Data 2014-02-12 09:48:15	2014-02-12 09:48:16	Base64 decoding error
4	Data 2014-02-07 11:19:04	2014-02-07 11:19:04	Base64 decoding error
5	Data 2014-02-03 14:47:35	2014-02-03 14:47:36	Base64 decoding error
6	Data 2014-01-31 15:07:53	2014-01-31 15:07:54	Operation not permitted for an unlicensed device
7	Data 2014-01-31 15:07:24	2014-01-31 15:07:25	Operation not permitted for an unlicensed device
8	Data 2014-01-31 15:06:55	2014-01-31 15:06:56	Operation not permitted for an unlicensed device
9	Data 2014-01-31 15:06:27	2014-01-31 15:06:27	Operation not permitted for an unlicensed device
10	Data 2014-01-31 14:55:44	2014-01-31 14:55:45	Operation not permitted for an unlicensed device
11	Data 2014-01-31 14:55:15	2014-01-31 14:55:16	Operation not permitted for an unlicensed device
12	Data 2014-01-31 14:54:44	2014-01-31 14:54:44	Operation not permitted for an unlicensed device
13	Data 2014-01-31	2014-01-31	Operation not permitted for an unlicensed device

Data push logs

3.1.5 FTP SERVICE CONFIGURATION

By clicking on "FTP SERVICE" the following 3 sub-menu are presented:

3.1.5.1 AVAILABLE COMMUNICATION PROTOCOLS

Two different protocols are available in the FTP section:
   a) FTP – Push: it works by uploading files to a remote server upon a preconfigured schedule
   b) HTTP – Pull: by means of an HTTP API (application program interface) it is possible for a remote client to poll data from the VMU-C on request

Both the protocols can be used together paying care not to exceed with HTTP-Pull requests (by sending too many requests at the same time it is possible to exceed the capacity of VMU-C thus causing overload).
In any case, neither FTP-Push nor HTTP-pull can be used together with the DP protocol (they match 2 different scenarios)

3.1.5.2 FTP SERVICE SETTING

By clicking on "SETTING" it is possible to configure the parameters needed to enable data communication from VMU-C to the customer's FTP server:

FTP Service

The relevant fields must be completed according to the following guideline:
- "Enable FTP Service": to be checked to enable data communication (both by FTP-push and HTTP-pull); both HTTP-pull and FTP-push are available at the same time.

In the case FTP communication is needed, the following fields must be completed:
- "Server Address": it is the Internet address of the FTP server to which VMU-C will upload data
- "Remote directory": the remote FTP server's directory to which data will be uploaded
- "Server user": the user name authorized to access the remote FTP server's directory
- "Server password": the password to be used together with the "Server user" to access the remote directory
- "Upload time interval" (hh:mm) : the interval time between two successive FTP upload actions (in the range 10 minutes – 24 hours)
- "Alarms Flag": to be checked to enable the VMU-C's alarms upload to the FTP server
- "Measurements Flag": to be checked to enable the VMU-C's measurement upload to the FTP server
- "First Delivery" (date/time): date and time of the first upload action to the FTP server

In the case it is needed to exchange data using HTTP-pull, the VMU-C will send its response to an HTTP query sent by the remote system (automated HTTP client); for security reasons an authentication is needed to poll data, and the following fields must be completed prior to be able to perform HTTP requests:
- "Client User": user name to authenticate on VMU-C while executing a query
- "Client Password": password to authenticate on VMU-C while executing a query

Press "Save Configuration" to confirm configuration changes.

After having completed the relevant fields for FTP communication it is suggested to push "Test connection" so as to check that everything is working correctly; in the case the configuration is correct, this is the VMU-C's output:

3.1.5.3 LOGs OK

By clicking on the "LOGs OK" item, the following screenshot will appear, reporting all the FTP transactions completed correctly

LOGS OK

	DATE / TIME	IP ADDRESS	FILE	DETAILS
1	2014-03-24 17:55:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-55-07_S.csv	
2	2014-03-24 17:45:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-45-07_S.csv	
3	2014-03-24 17:35:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-35-07_S.csv	
4	2014-03-24 17:25:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-25-07_S.csv	
5	2014-03-24 17:15:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-15-07_S.csv	
6	2014-03-24 17:05:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-17-05-07_S.csv	
7	2014-03-24 16:55:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-55-07_S.csv	
8	2014-03-24 16:45:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-45-07_S.csv	
9	2014-03-24 16:35:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-35-07_S.csv	
10	2014-03-24 16:25:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-25-07_S.csv	
11	2014-03-24 16:15:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-15-07_S.csv	
12	2014-03-24 16:05:08	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-24-16-05-08_S.csv	

3.1.5.4 LOGs ERROR

By clicking on the "LOGs ERROR" item, the following screenshot will appear, reporting all the FTP transactions not completed correctly

LOGS ERROR

	DATE / TIME	IP ADDRESS	FILE	DETAILS
1	2014-03-13 17:05:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-13-17-05-07_S.csv	No route to host
2	2014-03-11 12:45:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-11-12-45-07_S.csv	Connection timed out
3	2014-03-10 17:45:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-10-17-45-07_S.csv	Connection timed out
4	2014-03-04 15:45:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-03-04-15-45-07_S.csv	EOF
5	2014-01-21 14:15:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-01-21-14-15-07_S.csv	Connection timed out
6	2014-01-17 12:35:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-01-17-12-35-07_S.csv	No route to host
7	2014-01-13 11:05:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-01-13-11-05-07_S.csv	Connection timed out
8	2014-01-12 17:15:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-01-12-17-15-07_S.csv	EOF
9	2014-01-03 10:25:07	88.32.230.187	VMU-C_BL3080002001U_AR_2014-01-03-10-25-07_S.csv	EOF
10	2013-12-28 00:55:07	88.32.230.187	VMU-C_BL3080002001U_AR_2013-12-28-00-55-07_S.csv	Empty VAR file
11	2013-12-28 00:55:07	88.32.230.187	VMU-C_BL3080002001U_AR_2013-12-28-00-55-07_S.csv	FTP_VAR_QRY&test_client@omega&13881 7781&1388188380&ALL&ALL&2013-12-28-00-55-07&S
12	2013-12-28 00:55:07	88.32.230.187	VMU-C_BL3080002001U_	Status=0 (0)

Note: for both the FTP and HTTP based communication protocols, the file format and the HTTP query parameters are available on request as Developer's technical manual.

3.1.6   THE VMU-W MODEM

3.1.6.1 INSTALLING AND CONFIGURING THE VMU-W MODEM

Connecting the VMU-W module

To connect the Modem (VMU-W) to VMU-C you will have to perform the following steps:

- Make sure the VMU-C and the VMU-W are not powered.
- Connect the VMU-W to the VMU-C through the auxiliary bus on the left side of the VMU-C.
- Make sure the **SIM is not protected by a PIN code** (should that be the case, disable the protection).
- Insert the SIM into the VMU-W modem through the special slot.
- Connect the antenna and put it in a place assuring proper signal reception.
- Restore the power supply of both devices (VMU-C and VMU-W).
- Make sure that both devices are located in a dry place, protected against rain and dust.

On the front side of VMU-W there are two LEDs, whose meaning is the following:

1) Green LED: *Steadily on* => the equipment is powered.
2) Blue LED: *Off* => no power supply. *Fast blinking* => searching for the cover signal / not registered / switching off. *Slow blinking* => Service is registered and signal is available. *Steadily on* => communication under way.

Fig. 9/b – VMU-W

VMU-C

By clicking on "MODEM" it is possible to access the configuration of the parameters which allow VMU-W based communication. It is needed to complete all the fields from the following form:

Modem configuration

The web page includes 5 areas:
- a) MODEM CONNECTION STATUS
  - Signal = Modem's signal level (RX)
  - Model = full Modem's part number
  - Network registration = Mobile network to which the modem is connected
  - Data connection = connection status
  - IP address = IP address assigned to the device by the mobile network
- b) MODEM CONFIGURATION
  - Modem Enabling = to be checked to enable the VMU-W modem
  - Internet Connection Enabling= to be checked to enable data communication over Internet
  - SMS Enabling= to be checked to enable SMS alarm dispatching
- c) MODEM SETTING FOR INTERNET CONNECTION
  - Provider = APN provider for data connection
- d) SMS COMMANDS
  - Password = numeric password to be set to allow user to send SMS commands to the VMU-W (see the relevant section below)
  - Confirm password = field used to confirm the password above
- e) MODEM WATCHDOG
  - See section   below

3.1.6.2 MODEM WATCHDOG

Modem Watchdog

It is possible to overcome common issues in mobile communication by means of 3 different mechanisms:
1) Ping Reboot: if enabled, VMU-C + VMU-W sends a PING to the defined IP address (to be chosen as a reliable always ON server on Internet). In the case of repeated lost answer from the PING, the system reboots
2) Scheduled reboot: the system reboots each interval time (chosen in the relevant parameter field)
3) SMS command: see next section

3.1.6.3 SMS COMMANDS

SMS COMMANDS SETTINGS

The following command are available by sending SMS to the VMU-W's SIM number:

Command	Syntax	Notes
VMU-C Reboot	REBOOT PASSWORD (e.g. REBOOT 1234)	Password defined by the user in the relevant section in the page above; the system sends an acknowledge to the calling phone (REBOOT OK)
Data communication ON	DATA MODEM ON PASSWORD (e.g. DATA MODEM ON 1234)	Password defined by the user in the relevant section in the page above; the system sends an acknowledge to the calling phone (DATA MODEM ON OK)
Data communication OFF	DATA MODEM OFF PASSWORD	Password defined by the user in the relevant section

	(e.g. DATA MODEM OFF 1234)	in the page above; the system sends an acknowledge to the calling phone (DATA MODEM OFF OK)
Public IP inquiry	IP PASSWORD (e.g. IP 1234)	Password defined by the user in the relevant section in the page above; the system sends the IP address by SMS to the calling phone

3.1.7 ALARM SENDING CONFIGURATION

Clicking on the "ALARMS" item will grant access to the page shown below.

	Configuring Alarming - Group 1
Recipients Addresses	alessandro.fardin@gavazziacbu.it;ermes.cellot@gavazziacbu.it;marco.meneghel@gavazziacb
Object	VMU-C 115 Alarm Group1
Action	☑ Send Mail **Test Mail** ☐ Send SMS Phone Number **Test SMS**
Send for:	☑ Alarms ☑ Anomalies ☑ Events ☐ Commands
	Configuring Alarming - Group 2
Recipients Addresses	alessandro.fardin@gavazziacbu.it
Object	VMU-C 115 Alarm Group2
Action	☑ Send Mail **Test Mail** ☐ Send SMS Phone Number **Test SMS**
Send for:	☑ Alarms ☑ Anomalies ☐ Events ☐ Commands
	Save Setting

Outgoing mail configuration

VMU-C can send alert emails and/or SMS to more recipients at the same time and according to predefined rules. This page contains two separate configuration screens, in order to create two separate users groups to send communications to. In "Send for" selection field, alarm messages can be filtered to be sent to the relevant receivers.

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

Field	Description
Recipients addresses	Email addresses of the alarm messages' recipients *Note: Addresses must be separated by semicolon (;) with no space.*
Object	Email's Subject
Action	• Send Mail: to send the alerts by email • Send SMS: to send the alerts by SMS (to the phone number on the right)
Phone number	Recipient's phone number including international prefix code
Send for:	It is possible to choose which category of alerts must be delivered to recipients among Alarms, anomalies, events, commands (more information on the alarms section) . • "*Alarms*": High-priority alerts. • "*Warning*": Low-Medium priority alerts. • "*Events*": Opening/Closing of digital inputs and outputs • "*Commands*": Change of parameters on Eos-Array

3.1.8 PLANNING

Clicking on the "Planning" item will grant access to the page shown below.

SCHEDULING SENDING DATA VIA MAIL		
Recipients Addresses	alessandro.fardin@gavazziacbu.it;ermes.cellot@gavazziacbu.it;marco.meneghel@gavazziacb	
Action	☑ Send Mail	**Test Mail**
Send Plant Data	☑ Daily	☑ Weekly
	☑ Monthly	☑ Yearly
	Save Setting	

Email scheduler

- *Scheduling Sending data via Mail*

  VMU-C allows scheduling an email sending with a XLS file attached, containing the system production data for the period selected in "Send Data Plant".
  The email can be sent to more recipients at the same time.

  > *Note: To be able to send any mails, the outgoing mail server must be appropriately configured in the system.*

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

  "*Recipients addresses*": Email addresses of recipients of the relevant data

  > *Note: Addresses must be separated by semicolon (;) with no space.*

  "*Action*": Enable/disable schedule:

  - "*Send email*": Check to enable email sending.

    > *Note: To be able to send any mails, the outgoing mail server must be appropriately configured in the system.*

  - "*Test Mail*": Press this key to receive a test email at the email addresses specified in "Receivers' addresses" field.

    > *Note: If the email is not received, check outgoing mail server settings, receiver's address, VMU-C's connection to Internet.*

  "*Send Data Plant*": Check email sending period.

  - "*Daily*": every day at 11.59 p.m., an XLS file is sent with daily production data. The file will have the following structure:

Date 2012-07-16	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
11:15	0.40	4.5	0.60	6.60	764.00
11:20	0.40	4.6	0.50	6.60	774.00
11:25	0.40	4.6	0.60	6.70	782.00
11:30	0.40	4.7	0.60	6.80	791.00
11:35	0.40	4.7	0.50	6.80	799.00

Daily file format

- ▪ "*Weekly*": an XLS file containing the production data of each day of the week that just ended is sent at 11:59 p.m. of each Sunday. The file will have the following structure:

Date 2012-07-01	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
09:45	0.30	3.0	0.30	4.20	470.00
09:50	0.20	3.0	0.40	4.30	486.00
09:55	0.30	3.1	0.40	4.50	502.00
10:00	0.20	3.2	0.30	4.60	519.00
....	....	....	....	....	....
22:00	0.00	0.0	0.00	0.00	0.00
Date 2012-06-30	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
....	....	....	....	....	....
09:35	0.20	2.8	0.30	4.00	438.00
09:40	0.40	2.9	0.30	4.10	450.00
09:45	0.20	2.9	0.40	4.10	458.00
09:50	0.20	3.0	0.30	4.20	470.00
....	....	....	....	....	....
22:00	0.00	0.0	0.00	0.00	0.00
Date 2012-06-29	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
....	....	....	....	....	....
09:20	0.20	2.7	0.30	3.90	398.00
09:25	0.20	2.8	0.30	4.00	438.00
09:30	0.30	2.9	0.40	4.10	456.00
09:35	0.30	3.0	0.30	4.30	470.00
09:40	0.20	3.1	0.40	4.40	484.00
....	....	....	....	....	....
22:00	0.00	0.0	0.00	0.00	0.00
Date 2012-06-28	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
05:00	0.00	0.0	0.00	0.00	0.00

Weekly file format

"Weekly" file format

- ▪ "*Monthly*": on the last day of the month at 11.59 p.m., a .xls file is sent with summarized (daily total production) and detailed production data for every day of the month. The file will have the following structure:

Date	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
01-06-2012	23.70	5.6	33.80	8.10	290.79
02-06-2012	15.10	4.9	21.30	7.00	211.61
03-06-2012	10.90	5.3	15.40	7.70	134.34
04-06-2012	5.90	1.1	7.90	1.60	64.10
05-06-2012	30.90	6.0	44.50	8.70	361.53
06-06-2012	12.80	3.4	17.90	4.80	163.46
07-06-2012	18.30	5.5	26.20	7.80	241.81
08-06-2012	18.20	5.1	24.20	7.30	201.54

Monthly file format

- ▪ "*Yearly* ": on December 31st at 11:59 p.m., a .xls file is sent with summarized (daily total production) production data for all months of the year.

Date	AC Energy on period (read from inverters) (kWh)	AC Instantaneous Power (read from inverters) (kW)	Energy on period (read from energy meters) (kWh)	Instantaneous Power (read from energy meters) (kW)	Solar Irradiation (W/m2)
gen-12	348,0	4.7	504,0	6.90	429.35
feb-12	298,0	5.1	433,0	7.50	461.95
mar-12	332,0	4.7	479,0	6.90	266.35
apr-12	331,0	4.9	478,0	7.10	375.32
mag-12	334,0	4.5	482,0	6.60	432.25
giu-12	273,0	4.7	395,0	6.80	323.22
lug-12	316,0	4.9	457,0	7.10	381.43

Yearly file format

3.1.9 E-MAIL CONFIGURATION (OUTGOING MAIL SERVER)

Clicking on the "E-MAIL" item will grant access to the page shown in Fig. 15.

CONFIGURING OUTGOING MAIL SERVER	
Sender Address	vmuc.ponte@gmail.com
Sender Name	VMU-C-PONTE
Server SMTP	smtp.gmail.com
Username Server SMTP	vmuc.ponte
Password Server SMTP	··········
	Save Setting

Outgoing mail configuration

The outgoing mail server configuration is necessary to send alarms or production data emails. If configuration is incomplete or incorrect, VMU-C cannot send communication by email.

Fill in the fields according to the following specifications:

- "*Sender address*": E-mail address associated with VMU-C. If the address is not a valid address the e-mail sent by VMU-C might be considered as SPAM.

- "*Sender name*": Name appearing on email. (Da/ From)

- "*SMTP server*": Address of SMTP server for outgoing mail.

- "*SMTP server username*": Username for access authentication to SMTP server.

- "*Password Server SMTP*": Password for access authentication to SMTP server.

Press "Save setting" key to store settings.

Note: To ensure proper operation of email alerting, refer also to "Alarm configuration" paragraph.

Note: Should you use a SMTP server not requiring the configuration of the "UserName" and "Password" fields, when configuring VMU-C don't fill in the two fields in question.

3.1.10 UPDATING THE VMU-C FIRMWARE

Clicking on the "FIRMWARE" item will grant access to the page shown below.

VMU-C FIRMWARE UPDATE	
VMU-C Serial Number	BL3080002001U
MAC Address	00-19-EE-10-00-37
Installed Firmware Version	Ver. NEWG_PUSH_A14_A26
VMU-C Update	Browse... Load
Check FTP Server for Latest Update	Check
Download Update Package	Download
Install Update Package	Install
Timestamp	Status
2014-05-09 07:15:20	FTP Connection Error (Code: -6)

Firmware update

This page is split in 2 areas relevant to 2 ways of updating the VMU-C:
  a) Manual update
  b) Automatic update

3.1.10.1   MANUAL UPDATE

Manual update allows to upgrade the current firmware release by uploading and installing a new firmware package file (provided by Carlo Gavazzi organization) by means of a PC. Pressing the "Browse" button will open a window allowing to specify where the firmware update file has been saved; as soon as you select the file, VMU-C will display the above window again, replacing the "Browse" caption with "OK" (the update file must be obtained from the Carlo Gavazzi technical support. Pressing the "Load" button will open a window prompting user to confirm the firmware update operation. As soon as the update operation is confirmed, the system will prompt you to confirm the operation under way.

La pagina all'indirizzo 192.168.2.71 dice:

This procedure will update automatically VMU-C. Are you sure you want to continue?

OK   Annulla
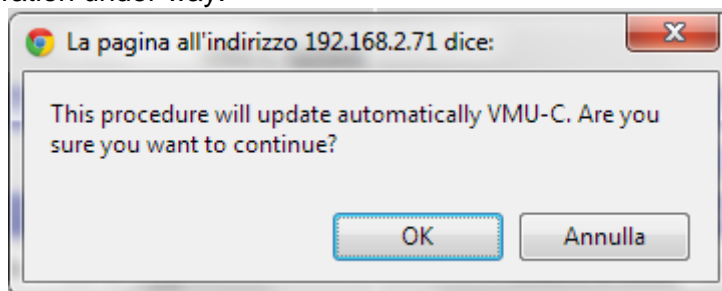
FIRMWARE update confirmation

As soon as user gives OK to proceed with the firmware update operation the system will display the screen shown below:

VMU–C

Firmware update splash screen

Time to finalize installation depends on the actual VMU-C load (in tems of connected devices), Internet connection speed and size and complexity of the update package.

Note: the time necessary to the system for loading the update depends on the speed of the Internet/LAN connection between the PC and VMU-C and could last for several minutes, particularly in connection with cellular modem. Wait for the report to confirm the successful download.

*Notes: **updating operation cannot be interrupted after launching the Update command. Do not launch a new update before the system has completed the first one.***

*Notes: **Major updates introducing brand new important features need time to be finalized. Updating from firmware release A13 to firmware release A14 could last an hour in the case of a VMU-C managing 64 Modbus devices on COM1, and 15 Eos-Arrays on COM2***

3.1.10.2   AUTOMATIC UPDATE
The automatic update is managed by the following subsection of the main Firmware Update page:

Check FTP Server for Latest Update	Check
Download Update Package	Download
Install Update Package	Install

Automatic update

The process is menu – driven, and it is thus error-proof; the three steps are:

Button	Action
Check	Checks if a new updating package is ready on Carlo Gavazzi's servers
Download	Enabled if CHECK is successful; it starts the package download from Carlo Gavazzi's servers; at the end of the download step it is possible both to start installation and also to check again (the latter chance is useful in the case the download has not been followed by Install and time has passed by
Install	Enabled if DOWNLOAD is successfully finalized; it starts the package installation

Note: the time necessary to the system for loading the update depends on the speed of the Internet/LAN connection between the PC and VMU-C and could last for several minutes, particularly in connection with cellular modem. Wait for the report to confirm the successful download.

Notes: **Major updates introducing brand new important features need time to be finalized. Updating from firmware release A13 to firmware release A14 could last an hour in the case of a VMU-C managing 64 Modbus devices on COM1, and 15 Eos-Arrays on COM2**

3.1.11 FIRMARE UPLOAD – SERVER SETTINGS

After having been officially authorized by Carlo Gavazzi, an user could setup a firmware update server in its own IT infrastructure. This is useful in the case of complex organizations needing to apply special firmware deployment policies.
In this case it is possible to configure an alternate server, under the user responsibility, to be accessed as the VMU-C firmware repository.

FIRMWARE UPDATE - SERVER SETTINGS

Carlo Gavazzi Official FTP Server ⦿
Custom FTP Server ◯
FTP Server Address
Remote Directory /
Server User
Server Password

Save Setting

Test Connection

Firmware Update –custom FTP server

By the relevant fields it is possible to configure the client so as to communicate with the FTP server :
- FTP server address: IP or Internet address of the target FTP server
- Remote directory: directory where the firmware packages are stored within the FTP server
- Server user: user name to access the above directory
- Server password: password to access the above directory

VMU-C

Note: setting up a custom FTP repository needs special training on the relevant procedures to allow firmware package deployment. Please contact Carlo Gavazzi Support for further information.

3.1.12 THE TOOLS MENU

The TOOLS menu

By the tools menu it is possible to:
  a) Reboot VMU-C
  b) Setting up Time and Date
  c) Resetting VMU-C

3.1.12.1 VMU-C REBOOT

VMU-C can be restarted through the "REBOOT" button.

After issuing the command you will be prompted to confirm that you wish to proceed,
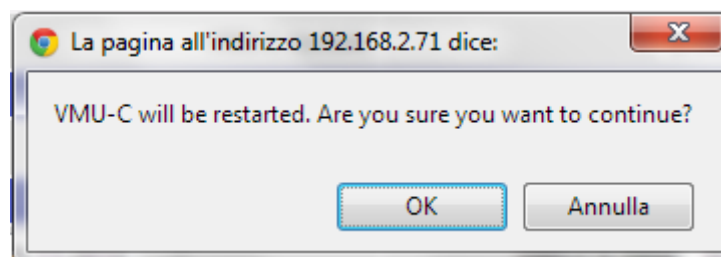
then a countdown will displayed. When it is completed, you will be addressed back to the home page .

SYSTEM	PLANT	SENSORS

In 23 seconds you will be redirected to VMU-C's Homepage
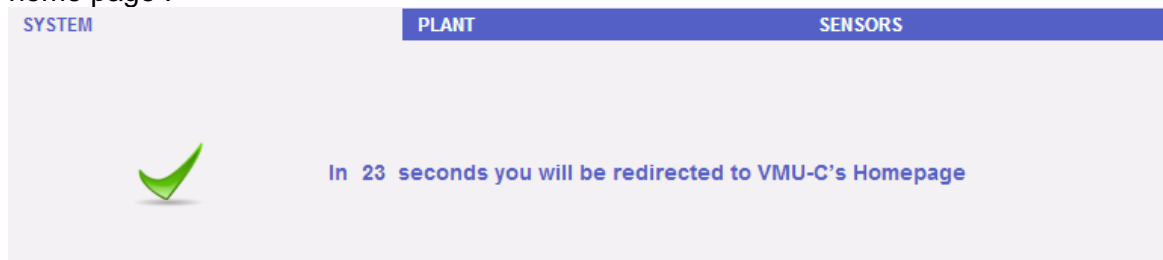
Note: during update and restart, web pages can show error messages as VMU-C cannot be temporarily reached.
Wait for a few seconds before restoring connection.

3.1.12.2 DATE AND TIME CONFIGURATION AND EOS-ARRAY DEVICE SYNCHRONISATION

By pressing the "*Set*" button you can set the VMU-C internal date and time on all the VMU-M devices connected to VMU-C. If you select the "Synchronise with …" function the date and time sent to the VMU-C and as a consequence to the VMU-M devices connected to it will be those of the PC in use .

SETTING VMU-C´S DATE AND TIME - EOS-ARRAY´S SYNCHRONIZATION

VMU-C´s Date 15-05-2014 [...]   VMU-C´s Time 10 | 41 | 19 hh:mm:ss

☐ Synchronize with PC´s time   **Adjust**

3.1.12.3 RESETTING SYSTEM DATA

VMU-C provides 5 different Reset commands :

SYSTEM DATA RESET	
Password	Confirm Password
Yield Data Reset	Reset
Events Reset	Reset
Eos-Arrays, Environmental Sensors and Energy Meters Reset	Reset
Reset of Yield Data and Plant Settings	Reset
Restore Factory Settings	Reset

1) Yield data reset: it will reset all the production data stored in the internal memory of VMU-C and in the VMU-M devices connected to it (if a memory card has been installed in VMU-C, it is not affected by the Reset command).

2) Events reset: it will reset all the events stored in VMU-C and in the VMU-M devices connected to it (if a memory card has been installed in VMU-C, it is not affected by the Reset command).

3) Eos-Array, environmental sensor and meter reset: it will reset all the environmental sensor data recorded in VMU-C and in the VMU-M devices connected to it (temperatures, radiance and wind speed), as well as the values of the plant kWh meters (if a memory card has been installed in VMU-C, it is not affected by the Reset command).

4) Yield data and plant settings reset: It combines the three Reset commands described above; it also resets the plant configuration (it doesn't reset the data concerning the IP address, the SMTP mail server data and all the previously input e-mail addresses).

5) *Restore Factory Settings*: it performs the reset operations described at point 4; it also resets all the settings like IP address, SMTP server and alarm management by e-mail (if a memory card has been installed in VMU-C, it is not affected by the Reset command). Default data (factory settings) will be restored.

Note: to be able to execute any of the reset commands described above , you first need to enter the Administrator "Password".

3.1.13 LANGUAGE SETTING

Place the mouse on "SYSTEM", a drop-down menu appears; click on "LANGUAGE"; the relevant section will be displayed, as shown below. From the drop-down menu select the desired language. The system will also display the currently set engineering units.

LANGUAGE	
Language Selecion English UK ▼	🇬🇧
ENGINEERING UNITS	
Dimensions	m
Solar Irradiation	W/m²
Wind Speed	m/s
Date Format	Day - Month - Year
Time Format	Hours : Minutes : Seconds AM/PM
Data Export: Decimal Separator	, ▼
TIME ZONE	
Area	Location
Europe ▼	Rome ▼
Apply	

Language setting

You will also have to define the following information, necessary to define the timezone:
- Geographic area
- Location

This information is required for time management inside VMU-C.
The Data export decimal separator section allows to choose between dot "." And comma "," to separate decimal digits in exported XLS files (see Export Sections).

4 PLANT CONFIGURATION

Hovering the mouse over "PLANT" will display a drop-down menu consisting of three items: "COM SETUP" , "DRIVER" and "SETTING"
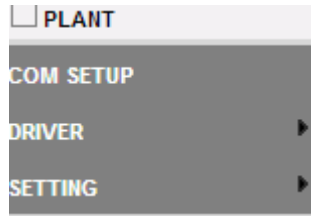
Plant Configuration Menu

4.1 COM SETUP

Hovering the mouse over "COM Setup" will grant access to the page shown below, relevant to COM1 port according to the relevant RS485 parameters.
The configuration of the "COM 2" port must be carried out during the configuration of the energy meters / inverters connected to VMU-C.

COM PORT SETUP	
COM1 (EOS-ARRAY)	
Baud Rate	9600
Parity	None
Data bits	8
Stop bits	1
Save Setting	

COM port Setup

Note: The communication port RS485 (COM 1) is specifically designed for the communication with the VMU-M belonging to the system and controlled by VMU-C.

Press "Save setting" to store data.

4.2 DRIVERS

When hovering the mouse over "DRIVERS", the system will display the items:
- LIST
- IMPORT
- DRIVER UNLOCK

4.2.1 DRIVERS LIST

AVAILABLE DRIVER LIST			
BRAND	**DRIVER**	**VERSION**	**INSTRUMENT**
ABB	PVS800	0.3	Inverter
ABLEREX	ABLEREX-HELIOS	2.3	Inverter
AEG	AEG_PROTECT_MODBUS	2.3	Inverter
AEG	AEG_PROTECT_PV10	2.3	Inverter
ANSWER DRIVE	SOLARGATE1	1.3	Inverter
ANSWER DRIVE	SOLARGATE2	1.3	Inverter
AROS_SOLAR_TECHNOLOGY	Centralized	0.6	Inverter
AROS_SOLAR_TECHNOLOGY	TL	0.5	Inverter
ASTRID ENERGY ENTERPRISES	COPERNICO	1.0	Inverter
BONFIGLIOLI	RPS	1.2	Inverter
CARLO GAVAZZI	EM21	2.2	Energy Meter
CARLO GAVAZZI	EM21_PF	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV0	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV5	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV5_PF	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV6	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV9_AV2	2.2	Energy Meter
CARLO GAVAZZI	EM24_AV9_AV2_PF	2.2	Energy Meter
CARLO GAVAZZI	EM26_AV5	2.2	Energy Meter
CARLO GAVAZZI	EM26_AV5_PF	2.2	Energy Meter
CARLO GAVAZZI	EM26_AV6	2.2	Energy Meter
CARLO GAVAZZI	EM26_AV6_PF	2.2	Energy Meter
CARLO GAVAZZI	EM33	2.2	Energy Meter
CARLO GAVAZZI	HINRG	0.3	Inverter

Drivers List

The list of the available drivers shows the brand/models of devices (inverters and energy meters) with which VMU-C may be connected by RS485 and immediately operated.

4.2.2 DRIVER IMPORT

DRIVER IMPORT PROCEDURE	
Select the file using the ´Browse´ button	Browse...
Press the ´Load Driver´ key to load the selected driver	Load Driver
Confirm New Driver Activation	Activate

Driver Import

Clicking on the "IMPORT" item will grant access to the page shown above, allowing to import any new drivers made available by "Carlo Gavazzi Controls" .. Once the new driver(s) loading procedure is completed, press the "Activate" button to actually enable the driver.

> *Note: due to the complexity of the implemented functions, some driver require that some low-level firmware functions are enabled at the same time. In this case you may have to update the whole VMU-C firmware.*

4.2.3 DRIVER UNLOCK

DRIVER UNLOCK PROCEDURE

Insert Activation Code	
Activate	

Driver Unlock

Some drivers require an activation code provided by Carlo Gavazzi organization . Please contact Carlo Gavazzi support for further information.

4.3 PLANT SETTING

When hovering the mouse over "Setting", the system will display the two items WIZARD and SAVE CONFIGURATION .
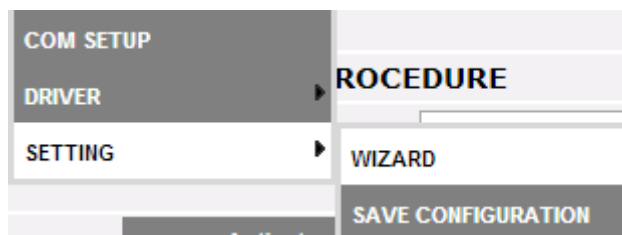
If the VMU-C configuration has already been completed, clicking on the SAVE CONFIGURATION item will allow to export it to a file with "DB" extension and to save it to one's PC, allowing it to be uploaded to the present or different VMU-C at a later time.

Clicking on the WIZARD item will grant access to the page shown below, displaying four new sub-menus:
*   Detect Connected Instruments
*   Manual configuration
*   Restore Configuration
*   Import

Plant Configuration Wizard

Clicking on the "*Find Connected Devices*" item will grant access to the page shown in above; through the "Start Scanning" command, it allows to launch the procedure of "self-detection" of the modules connected to the auxiliary bus of VMU-C and of the devices connected to the COM1 communication port (VMU-M and relevant modules).

Note: before starting the configuration procedure described below, the relevant Mod-BUS address (Mod-BUS node number) must have been assigned for all the VMU-M modules. There must not be two devices having the same node number on the same communication bus.

Note: the scanning operation can only detect the devices which are properly connected and powered. The self-detection operation only refers to the COM1 communication bus. Any devices existing on COM2 shall be configured manually.

Once the connected device automatic detection procedure has been completed, the system will display the amount of devices identified for COM1 and local bus. Should you see that all the devices connected to the COM 1 and local ports have been recognised, you can stop the automatic scanning.

Once the scanning procedure has been completed, it is possible to save the relevant information by clicking "Save Configuration" Clicking on the "*SaveDetected Configuration*" item will grant access to the page shown below.

MANUAL SETUP

| START | Inverter | EM | VMU-O | VMU-P | | | VMU-M | VMU-C | VMU-S | END |

| Back | | | | Next | |

| VMU-M | | | | Add | |

Address　　　**Description [Devices Connected]**

		String-Box1			Modify
●	2	String-Box2 [03]		Remove	Modify
●	3	String-Box3 [03]		Remove	Modify

Manual Setup section

The further steps are explained in the Manual Setup section-

4.3.1 MANUAL SETUP

By the manual setup it is possible to configure the connection between VMU-C and any device connected by RS485 and/or local bus (Eos-Arrays, Inverters, Energy meters).

MANUAL SETUP

| START | Inverter | EM | VMU-O | VMU-P | | | VMU-M | VMU-C | VMU-S | END |

| Back | | | | Next | |

| VMU-M | | | | Add | |

Address　　　**Description [Devices Connected]**

		String-Box1			Modify
●	2	String-Box2 [03]		Remove	Modify
●	3	String-Box3 [03]		Remove	Modify

Manual Setup section

Address　　　**Description [Devices Connected]**

		String-Box1			Modify
●	2	String-Box2 [03]		Remove	Modify
●	3	String-Box3 [03]		Remove	Modify

Connected Eos-Arrays Section

By the bottom section of the page it is possible both to remove and modify the present set up in terms of connected VMU modules

Note: The green LEDS shown in figure can switch to 3 different colours, having three different meanings:
*- **GREEN** : Configuration OK and serial communication enabled*

VMU-C

> *- **YELLOW** : Configuration OK but serial communication **not** enabled.*
> *- **RED** : Configuration data error. Communication with the relevant module will be impossible*

- Clicking on the "Modify" button you can display and modify the structure of each individual VMU-M , adding or removing any VMU- modules.
- You can modify the serial communication address of the specific VMU-M module.
- You can assign a specific group description (this way it might be easier to identify the box during monitoring)
- You can also associate a further descriptive note with the specific VMU-M module.
- The command "Enable VMU-M module communication in COM1 network" basically enables the communication between the VMU-C master and the relevant box. Otherwise during the scanning of all the connected boxes the VMU-C master shall not enquire this specific VMU-M.

Connected VMU modules

- Clicking on the "Next" button from the "Manual Configuration" page will grant access to the configuration of the individual devices, like Inverters, Energy meters and VMU modules.

4.4 INVERTER CONFIGURATION

Clicking on the "Next" button from the "Manual Configuration" will grant access to the inverter configuration .

Wizard: Inverter step

4.4.1 ADDING AN INVERTER

Clicking on the "***Add***" button will display the mask allowing to select the model and the relevant configuration (see below). Click on the "Edit" button to access the detailed Inverter configuration .

New Inverter configuration

Here is the list of the relevant parameters to be configured:

Parameter	Description
Brand	Drop down menu allowing to select the inverter's brand among the list of existing drivers
Model	Drop down menu allowing to select the inverter's model among the list of existing drivers
Address	Modbus address of the inverter Note: pay care not configuring 2 devices with the same Modbus address
Description	Description: label to be assigned to the inverter. We recommend that you name inverters in progressive order to easily identify them during data or alarm search.

Parameter	Description
Inverter COM2 communication enabling	Clicking on the relevant box will enable the serial communication of the inverter with VMU-C
Notes	Additional notes
Baud rate	RS485 parameter
Data bits	RS485 parameter
Parity	RS485 parameter
Stop bits	RS485 parameter

Note: many inverters do not use MODBUS protocols to exchange data; in that case, the above table may have a different set of parameters to be configured, according to the relevant communication protocol.

When pressing the "Save" button the inverter is inserted and added to the list as shown below.

Inverters list

Note: **The "Description" field box** in figure 26 can be displayed in 3 different colours, having as many different meanings:

- **GREY :** Configuration OK and serial communication enabled
- **YELLOW :** Configuration OK but serial communication **not** enabled.
- **RED :** Configuration data error. Communication with the relevant module will be impossible

---

4.4.2 INVERTER DELETION

Press the "Remove" button to remove an inverter from the configured inverter list.

Inverter list

A message will be proposed to the user to confirm deletion:

Press 'YES' to confirm deletion or "NO" to cancel. When pressing "YES" the inverter is removed from the Inserted Inverter list. <u>All data acquired from VMU-C up to that moment on the deleted inverter are eliminated and cannot be restored.</u>

> *Note: any change in Inverters configuration will take effect only after the new configuration has been sent to the system by reaching the end of the wizard. It is not necessary to restart VMU-C to apply the new configuration.*

4.5 ENERGY METERS CONFIGURATION

Clicking on the "Next" button again from the "Manual Configuration" page will move to the next step in the wizard and grant access to the Energy Meter configuration page (see below).

Energy Meter configuration

4.5.1 ADDING ENERGY METERS

Clicking on the "**Add**" button will display the mask allowing to select the model and the relevant configuration .
Click on the "Modify" button to access the detailed Energy Meter configuration :

Energy meter configuration

Parameter	Description
Brand	Drop down menu allowing to select the energy meter's brand among the list of existing drivers
Model	Drop down menu allowing to select the energy meter's model among the list of existing drivers
Address	Modbus address of the energy meter *Note: pay care not configuring 2 devices with the same Modbus address*
Description	Description: label to be assigned to the energy meter. We recommend that you name energy meters in progressive order to easily identify them during data or alarm search.
Energy Meter COM2 communication enabling	Clicking on the relevant box will enable the serial communication of the energy meter with VMU-C
Meter for consumed energy enabling	Enable the energy consumption measuring instrument: the energy measured by this instrument shall be considered as having been consumed. This value will not be used for the calculation of efficiency (Total and/or BOS).
Enable Total AC Energy measurement instrument	Total meter for generated energy enabling: Click on the relevant box if there is only 1 Energy Meter installed for generated energy metering (don't click on this box when multiple meters are installed).
AC Energy totaliser contribution	If there are 2 or more Energy Meters, you can define whether the energy metered by this device must be summed to the energy produced by the other instruments (to obtain the total produced energy) or if for any reasons the specific meter shall not be considered.
Notes	Additional notes
Baud rate	RS485 parameter
Data bits	RS485 parameter
Parity	RS485 parameter
Stop bits	RS485 parameter

When pressing the "Save" button the Energy Meter is inserted and added to the list as shown below:

Energy meters list

> *Note:* **The "Description" field box** can be displayed in 3 different colours, having as many different meanings:
>   - **GREY :** Configuration OK and serial communication enabled
>   - **YELLOW :** Configuration OK but serial communication **not** enabled.
> - **RED :** Configuration data error. Communication with the relevant module will be impossible

4.5.2 DELETING ENERGY METERS

Press the "Remove" to remove an instrument from the list of the configured Energy Meters.

Address	Description	Model		
	EM			Add
---	New_Instrument	---	Remove	Modify
100	E_EM24_Driver_100	EM24_AV9_AV2	Remove	Modify
101	New_1	EM24_AV5	Remove	Modify
102	New_2	EM24_AV5	Remove	Modify
103	New_3	EM24_AV5	Remove	Modify

Energy meters list

A confirmation message will be displayed :

MANUAL SETUP

Do you confirm the deletion of the selected instrument?
Instrument: New_Instrument

Yes	No

Press 'YES' to confirm deletion or "NO" to cancel. If you press "YES" the Energy Meter is removed from the Inserted Meter list. All data acquired from VMU-C up to that moment on the deleted Energy Meter are definitely eliminated.

> Note: any change in the Energy Meters' configuration will take effect only after the new configuration has been sent to the system through a control. It is not necessary to restart VMU-C.

4.6 CONFIGURATION OF VMU-O MODULES

If during the "device auto-detection" stage one or more VMU-O modules have been identified (there may be up to 3 VMU-O modules for each group), the system will display the screen shown below.

The Eos-Array auto-detection procedure operates in 'self-teaching' mode; that means it scans all the devices existing on the COM1 port, records their location and displays the current configuration.

VMU-O module configuration

In the area marked by the orange dots the system will automatically display the information concerning the source base module (VMU-C or VMU-M) and the location of the VMU-O module within the Array system.

Indicate for each of the two outputs (Output1 and Output2) the function to be applied (Remote, Alarm, Clock):

VMU-O usage modes

- *Remote*: Activation and deactivation are performed through a special command sent by the operator through VMU-C.
- *Alarm*: The output is associated with an alarm condition coming from local modules (i.e. VMU-S voltage setpoint). This selection also allows to define the initial state of the relay (Normally closed or Normally open).

VMU-C

- *Clock*: Activation and deactivation are carried out at the time set in VMU-C.
- *Global*: The output is associated with an alarm condition coming from VMU-C (i.e. Production loss alarm). This selection also allows to define the initial state of the relay (Normally closed or Normally open).

4.7 CONFIGURATION OF VMU-P MODULES

If during the "device auto-detection" stage one or more VMU-P modules have been identified the system will display the screen shown in Fig. 52 (for each ARRAY group there may be at most 1 VMU-P module; VMU-C can manage up to 11 groups).

The Eos-Array auto-detection procedure operates in 'self-teaching' mode; that means it scans all the devices existing on the COM1 port, records their location and displays the current configuration.

VMU-P configuration

In the area on top of the screenshot above the system will automatically display information concerning the source base module (VMU-C or VMU-M) and the location of the VMU-P module within the Array system.

For each module is possible to set-up which temperature measurements shall be monitored (Air/cell temperature or both) and with which type of sensor (chosen between Pt100 or Pt1000 probes, with 3 or 2 wires).

For each module it is also possible to enable (or disable) the radiance and wind speed measurements.

4.7.1 CONFIGURING ALARMS ON VMU-P MODULES

Each VMU-P module can manage specific alarms for each of the managed variables:

Module temperatures	Ambient Temperatures	Solar Irradiation	Wind	Error Management	
Alarm Type					Disabled ▼
Alarm Set-point 1 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*					0.0
Alarm Set-point 2 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*					0.0
Alarm Activation Delay Filter (seconds) *(On-Time Delay)*					0

VMU-P alarm configuration

- *Cell temperature*
- *Air temperature*
- *Radiance*
- Wind speed

For each alarm you can define the activation thresholds and the relevant usage mode:
- Up alarm: Treshold1 equal to or higher than Threshold2
- Down alarm: Threshold1 lower than Threshold2

Each individual alarm can remain disabled, or be enabled as a Virtual Alarm, or you can link each individual alarm to a digital output .
Each alarm can be associated with a different "Delay on activation" value (a value expressed in seconds, which can range between 0 and 3600).

For the configuration of the radiance and wind speed alarm, besides the alarm thresholds Threshold1 and Threshold2, you need to set the data referring to the specific installed sensor:

Module temperatures	Ambient Temperatures	Solar Irradiation	Wind	Error Management
Electrical Scale - Min. Value (mV)				0.0
Electrical Scale - Max. Value (mV)				77.9
Display Scale - Min. Value (W/m²)				0
Display Scale - Max. Value (W/m²)				1000
Alarm Type				Virtual ▼
Alarm Set-point 1 (W/m²) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*				1100
Alarm Set-point 2 (W/m²) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*				1090
Alarm Activation Delay Filter (seconds) *(On-Time Delay)*				0

Solar irradiance sensor configuration

- Electric Scale – Minimum Value (mV): conversion parameter allowing to obtain the radiance measurements (minimum value of the input signal).
- Electric Scale – Maximum Value (mV): conversion parameter allowing to obtain the radiance measurements (maximum value of the input signal).
- Displayed Scale – Minimum Value (W/m2): Minimum value (in W/m2) to be displayed at the minimum input value (mV).
- Displayed Scale – Maximum Value (W/m2): Maximum value (in W/m2) to be displayed at the maximum input value (mV).

VMU-C

Module temperatures	Ambient Temperatures	Solar Irradiation	Wind	Error Management	
Maximun Value of Measuring Electric Scale (Hz)				300.0	
Maximun Value of Display Scale (Hz) = (m/s)				30.0	
Alarm Type				Disabled ▼	
Alarm Set-point 1 (m/s) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*				0.0	
Alarm Set-point 2 (m/s) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*				0.0	
Alarm Activation Delay Filter (seconds) *(On-Time Delay)*				0	

Wind speed configuration

- Electric scale measurement maximum value (Hz): conversion parameter allowing to obtain the wind speed measurements (maximum frequency value the sensor can generate).
- Maximum displayed scale value (m/s): Wind speed value at the maximum frequency signal value.

You can also set the activation of an alarm in case of errors in the operation of the module itself. Each alarm is associated with one or more error conditions on the module. You can associate the managed errors with an output to be activated. The list allowing to select the Output associated with the alarm shall include the output of the VMU-O modules existing in the group with the Alarm setting .

Module temperatures	Ambient Temperatures	Solar Irradiation	Wind	Error Management	
Error description: Error in the programmed parameters					Virtual ▼
Error description: Short circuit on probe channel 1; Probe disconnected on channel 1; Short circuit on probe channel 2; Probe disconnected on channel 2					Virtual ▼

Module operation alarms triggering

4.8 CONFIGURING ZONES

The VMU-C monitoring system allows to manage multiple ZONES inside the same system. The term ZONES indicates different areas inside the same photovoltaic field which, due to their exposure or to the technology in use, are expected to behave differently. You can set up to 15 different zones. Each zone must be associated with a VMU-P module.

Zone configuration

Pressing the "Edit" button grants access to the zone configuration page :

Individual Zone configuration

The parameters to be entered are described below:

- *Description*: Descriptive field
- *Reference VMU-P module*: each zone must have a reference VMU-P module. The radiance and temperature data obtained through the relevant VMU-P module shall be used to calculate the efficiency of the individual zone.
- *String efficiency calculation type*: the system provides 3 different efficiency calculation methods: a) No radiance/temperature measurement but comparison between strings. b) Through the measurement of radiance and cell temperature. c) Through the measurement of radiance and air temperature.

- *String control down alarm (%)*: Set the value (%) for the string control. The set value refers to the string power value calculated as median or Match Max . In the example shown above, should a string show a power value lower than 50% of the power value calculated according to the median of the individual strings, the relevant alarm shall be triggered.
- Photovoltaic module width (mm): module dimension (please refer to the technical data sheet of the panels in use).
- Photovoltaic module length (mm): module dimension (please refer to the technical data sheet of the panels in use).
- Photovoltaic module temperature coefficient of Pmpp (%/°C): value of the photovoltaic module Max power as a function of the module temperature (please refer to the technical data sheet of the panels in use).
- Photovoltaic module TSA (sq m): Total String Zone. Specific ZONE value in sq m (the value is calculated automatically).
- Photovoltaic module NOCT (°C): Nominal operating cell temperature (please refer to the technical data sheet of the panels in use).
- Photovoltaic module OPL (mm): Other Power Loss (please refer to the technical data sheet of the panels in use).
- Photovoltaic module Pmax (W): Maximum nominal power of the photovoltaic panel (please refer to the technical data sheet of the panels in use).
- External display DPY reference Zone: used to define the relevant parameter in the case an external Carlo Gavazzi LED display with communication with VMU-C is in use.

4.8.1 PRODUCTION LOSS ALERT

PRODUCTION LOSS ALERT

No production alarm irradiation threshold (W/m²) 120.0

	Enabling	Efficiency threshold (%)
VMU-M	Virtual	60.0
Inverter	Disabled	
Energy counters	Disabled	

Back   Save

Production loss alert

Within the Zone configuration section it is also possible to set-up the production loss alerts.
The relevant parameters are:

Parameter	Description
No production alarm irradiation threshold	Level of solar irradiance below which the alert is not triggered (to avoid sunrise/sunset false positives)
Enabling	Selection field in use to enable the relevant component (VMU-M, Inverter, Energy meter) to trigger the alarms *Note: it is possible to set up production loss triggers on one, two, all, or none of the named devices*
Efficiency threshold	In the case of production loss alert at VMU-M level, it is possible to configure the efficiency threshold below which the alert is triggered

Press the "Previous" button to return to the previous mask without saving any changes to the set data. If you press the "Save" button, the input data shall be confirmed and ready to be transferred into VMU-C.

Repeat the operation described above for each individual ZONE.

4.9 LINKING ZONES

Pressing the "NEXT" button again will grant access to the screen allowing to link the individual items (VMU-M , VMUC , Inverter , Energy meter) with the relevant zone .
The first tab allows to link VMU-C and or VMU-M to the desired zone, by means of the combo box on the right.

ZONES - VMU-M LINK

VMU	INVERTER	ENERGY COUNTERS		
MODULE		**DESCRIPTION**		**ZONE**
VMU-C		String-Box1		Amorphous ▼
VMU-M		String-Box2		Polycrystalline ▼
VMU-M		String-Box3		Monocrystalline ▼

VMU to Zone linking Section

The second tab (below) allows to link Inverters to zones and also to finalize the production loss alerting configuration for the inverter case. The following fields must be configured:
- Zone: zone linked to the inverter on the left. It is the zone in which PV modules feeding the relevant inverter are installed; it is needed to compare environmental conditions (and thus expected production) Vs. actual production so as to possibly trigger the production loss alarm.
- Rated power: it is the nominal power of the inverter on the left
- Production loss threshold: it is the rate evaluated on Rated Power, below which the production loss alarm is triggered

VMU	INVERTER	ENERGY COUNTERS		
DESCRIPTION		**ZONE**	**RATED POWER (kW)**	**NO PRODUCTION THRESHOLD (%)**
Inverter63		No Zone ▼	1.0	8.0
Inverter192		No Zone ▼	2.0	9.0
New_Instrument		No Zone ▼	3.0	10.0

Inverter to Zone linking Section

The third tab (below) allows to link Energy meters to zones and also to finalize the production loss alerting configuration for the Energy Meter case. The following fields must be configured:
- Zone: zone linked to the inverter on the left. It is the zone in which PV modules feeding the relevant inverter are installed; it is needed to compare environmental conditions (and thus expected production) Vs. actual production so as to possibly trigger the production loss alarm.
- Production loss threshold: it is the absolute value of AC Power, below which the production loss alarm is triggered

VMU	INVERTER	ENERGY COUNTERS		

DESCRIPTION	ZONE	NO PRODUCTION THRESHOLD (kW)
E_EM24_Driver_100	No Zone ▼	4.0
New_1	No Zone ▼	5.0
New_2	No Zone ▼	6.0
New_3	No Zone ▼	7.0
New_Instrument	No Zone ▼	0.0
New_Instrument	No Zone ▼	0.0

Energy meter to Zone linking Section

If you press the "NEXT" button, the newly defined configuration shall be saved and you shall access the next screen.

4.10 CONFIGURING THE MANUAL COMMANDS FOR THE OUTPUTS OF THE VMU-O MODULES

Pressing the "NEXT" button again will grant access to the screen allowing to configure the manual commands of the relay outputs on the VMU-O modules .
Through this function, by using a manual command, you'll be able to remotely activate or deactivate (through the Internet) the digital outputs of the VMU-O modules installed on-field.

Note: To be able to use this function, the outputs on the VMU-O modules must be set to REMOTE control.

Note: You can create up to 20 manual commands.

VMU-O output configuration

- In the "A" column you can associate each command with a label you can use to easily identify the function the command in question will activate (for example "Outdoor lighting switch-on").
- The "B" column allows to associate the descriptive label (see the above paragraph) with the digital output defined for the purpose. Opening the drop-down menu will display the list of all the outputs previously set to REMOTE control .

Commands 1-10	Commands 11-20		
Command	Description		Base Module
1	a		VMU-M_020 (Pos. 11 Ch 1) ▼
2	b		---
3			VMU-M_020 (Pos. 11 Ch 1)
4			VMU-M_020 (Pos. 11 Ch 2)
			VMU-M_022 (Pos. 10 Ch 1)
5			VMU-M_022 (Pos. 10 Ch 2)
6			VMU-M_023 (Pos. 11 Ch 1)
			VMU-M_023 (Pos. 11 Ch 2)
7			VMU-C (Pos. 6 Ch 2)
			VMU-C (Pos. 8 Ch 1)
8			VMU-M_001 (Pos. 8 Ch 2)
9			--- ▼

VMU-O output configuration

4.11 CONFIGURING THE VMU-M MODULES

Pressing the "NEXT" button again will grant access to the screen allowing to configure the VMU-M modules connected to VMU-C .

START	Inverter	EM	VMU-O	VMU-P			VMU-M	VMU-C	VMU-S	END

Back		Next

Base Module VMU-M	String-Box2 (Addr. 2)

VMU-M

Inputs	Theft Alarm	Other Alarms Group 1

Channel Function	None ▼
Temperature Probe	Pt100 3-Wire ▼
Temperature 1 - Alarm Working Mode	None ▼
Alarm Set-point 1 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	0.0
Alarm Set-point 2 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	0.0
Alarm Activation Delay Filter (Seconds) *(On-Time Delay)*	0
Temperature 2 - Alarm Working Mode	None ▼
Alarm Set-point 1 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	0.0
Alarm Set-point 2 (°C) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	0.0
Alarm Activation Delay Filter (Seconds) *(On-Time Delay)*	0

VMU-M configuration

- The "Base module" box displays the previously defined label and the ModBus address of the specific VMU-M module.
- The Tabbed Section on the bottom is used for the configuration of the digital or temperature inputs, for the "Anti-theft" alarms (if any) and for other general alarms. The paragraphs below will describe the three pages.

4.11.1 VMU-M INPUTS CONFIGURATION

Inputs:
In this section you have to define the use of the inputs on the VMU-M module:
- NONE: The module inputs will have no use.

VMU-C

- For TEMPERATURE reading (on one or two channels; probe type: Pt100 or Pt1000, 2 or 3 wires).
- DIGITAL: <u>Digital input "1"</u> shall be used to read the status (Open/Closed) of a digital contact (for example to detect whether the DC protection has tripped or not). <u>Digital input "2"</u> : it cannot be used.

Note: When inputs are used for temperature reading you also have to define whether you wish to manage the ALARM function for each channel. In this case you have to set the values of "Threshold 1" and of "Threshold 2" (for values of "T1" exceeding or equal to those of "T2" you will get a MAXIMUM alarm; for values of "T1" lower than those of "T2" you will get an alarm with MINIMUM operation). You also have to define whether the alarm must be VIRTUAL or REAL (associated with a relay output of VMU-O) .

4.11.2 ANTITHEFT ALARM

In this section you have to define the use of the THEFT ALARM function .

Antitheft alarm configuration

Note: This function can only be activated if the VMU-O AT module is installed

Note: When the function is enabled, you need to define whether the alarm must be VIRTUAL or REAL (associated with a relay output) .

4.11.3 OTHER ALARMS GROUP

In this section you have to define the use of further alarms managed by VMU-:

VMU-M: other alarms group

Note: Should VMU-C detect that the VMU-M programming is inconsistent with the modules connected to it, you can choose whether the error shall not be managed or whether an alarm shall be triggered on a physical output.

*Note: Repeat the **VMU-M MODULE CONFIGURATION** procedure for each of the VMU-M modules connected to the VMU-C.*

Pressing the "NEXT" button again will grant access to the screen allowing to fully configure the VMU-C module .

4.12 CONFIGURING THE VMU-C MODULES

VMU-C module configuration

The paragraphs below describe the individual pages allowing to configure the available functions:

- **<u>GENERAL</u>**: it allows to set a password whose function is protecting the devices against unwanted configuration changes or reset commands.
  In this page you also have to define whether String Efficiency calculation should be enabled or not (YES / NO).
  Also in this page you have to configure the calculation method for the *String Control* function; you can choose between the following three options:
  o **Disabled:** String control is not enabled.
  o **Median:** this function can only be used if there are at least two strings (VMU-S modules). This calculation method is recommended for large size plants. The reference power value is the result of the median, calculated by the VMU-C module, between all the VMU-S modules. The alarm condition occurs when one of the powers measured for each string exceeds the set percentage limit with respect to the reference.

    Note: the median indicates the number occupying the central position in a set of numbers; that means one half of the numbers has a value which is higher than the median, while the other half has a lower value. For example, the median of 2, 3, 3, 5, 7 and 10 is 4.

  o **matching maximum value:** this function can only be used if there are at least two strings (VMU-S modules). This calculation method is recommended for small size plants. The reference power value is the highest values measured between the different strings. The alarm condition occurs when one of the powers measured for each string exceeds the set percentage limit with respect to the reference.

Note: The tripping threshold for this alarm is defined in the ZONE configuration page, under *"Down alarm string control (%)"* and is common to the whole system

4.12.1 VMU-C CONFIGURATION: ENGINEERING UNITS

It allows to set the engineering units for the *Temperature* (°C or °F), *Dimensions* (m or ft) and <u>Radiance</u> (W/m2 or W/ft2) measurements:

VMU-C: engineering units

4.12.2 VMU-C CONFIGURATION: DATA LOGGING

VMU-C: data logging

It allows to activate the Data Logging function and to define the relevant storage interval .

Note: The storage interval can be set between a minimum of 5 min. and a maximum of 60 min. The available values are: 5min – 10min – 15min – 30min – 60 min.

4.12.3 VMU-C CONFIGURATION: BOS

VMU-C: BOS configuration

It allows to activate an alarm associated with the calculation of the BOS (Balance Of System) Efficiency. The operating modes of the alarm are: *Disabled*, activated as a *virtual alarm*, activated and *associated with a physical output*

> *Note: You will have to set the "Threshold 1" and "Threshold 2" values (for values of "T1" exceeding or equal to those of "T2" you will get a MAXIMUM alarm; for values of "T1" lower than those of "T2" you will get an alarm with MINIMUM operation). You can also set a delay for alarm triggering (the value is expressed in "hours", from a minimum of 0 to a maximum of 24. The value shall be increased or decreased using the "+" and "-" buttons).*

> *Note: To be able to associate the BOS alarm with a physical output, the VMU-O module must belong to the VMU-C group.*

4.12.4 VMU-C CONFIGURATION: TOTAL EFFICIENCY

| START | Inverter | EM | VMU-O | VMU-P | | | VMU-M | VMU-C | VMU-S | END |

Back   Next

VMU-C

| General | Engineering Unit | Data Logging | BOS | Total Efficiency | String Control | String Efficiency | Theft Alarm | Other Alarms Group 1 |

Alarm Working Mode		Disabled ▼
Alarm Set-point 1 (%) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*		0.0
Alarm Set-point 2 (%) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*		0.0
Alarm Activation Delay Filter (Hours) *(On-Time Delay)*		0 [-] [+]

VMU-C: Total efficiency

It allows to activate an alarm associated with the calculation of the Total Efficiency. The operating modes of the alarm are: _Disabled_, activated as a _virtual alarm_, activated and _associated with a physical output_ .

> *Note: You will have to set the "Threshold 1" and "Threshold 2" values (for values of "T1" exceeding or equal to those of "T2" you will get a MAXIMUM alarm; for values of "T1" lower than those of "T2" you will get an alarm with MINIMUM operation). You can also set a delay for alarm triggering (the value is expressed in "hours", from a minimum of 0 to a maximum of 24. The value shall be increased or decreased using the "+" and "-" buttons).*
> *Note: To be able to associate the Total Efficiency alarm with a physical output, the VMU-O module must belong to the VMU-C group.*

4.12.5 VMU-C CONFIGURATION: STRING CONTROL

It allows to select the operating mode of the alarm associated with the _String Control_ function . The operating modes of the alarm are: _Disabled_, activated as a _virtual alarm_, activated and _associated with a physical output_ .

MANUAL SETUP

| START | Inverter | EM | VMU-O | VMU-P | | | VMU-M | VMU-C | VMU-S | END |

Back   Next

VMU-C

| General | Engineering Unit | Data Logging | BOS | Total Efficiency | String Control | String Efficiency | Theft Alarm | Other Alarms Group 1 |

| Alarm Working Mode | | Virtual ▼ |

VMU-C: string control

Note: If enabled, the alarm shall operate according to the mode selected in the GENERAL configuration page

---

Note: To be able to associate the String Control alarm with a physical output, the VMU-O module must belong to the VMU-C group.

Note: The tripping threshold for this alarm is defined in the ZONE configuration page, under "Down alarm string control (%)" and is common to the whole system.

4.12.6 VMU-C CONFIGURATION: STRING EFFICIENCY

It allows to enable the single string efficiency alarm. The operating modes of the alarm are: *Disabled*, activated as a *virtual alarm*, activated and *associated with a physical output* .

VMU-C: String Efficiency

Note: If enabled, the alarm shall operate according to the mode selected in the ZONE configuration page under "String efficiency calculation type" and is common to the whole system.

Note: To be able to associate the String Efficiency alarm with a physical output, the VMU-O module must belong to the VMU-C group.

Note: For each string you can set a different String Alarm threshold. The tripping mode for this alarm has to be set in the configuration page of the individual VMU-S modules .

4.12.7 VMU-C CONFIGURATION: THEFT ALARM

VMU-C: Theft Alarm

It allows to enable the single string efficiency alarm. The operating modes of the alarm are: *Disabled*, activated as a *virtual alarm*, activated and *associated with a physical*

output   . Please note that at least one VMU-O AT module is necessary to use this function.

4.12.8 **VMU-C** CONFIGURATION: OTHER GROUPS

This section allows to configure *Other Alarms* of general type :
o *COM1 and/or COM2 port communication alarm:* should a device connected to the COM1 and/or COM2 communication ports stop working (communicating) for more than 30 sec. (if configured) the system will trigger the alarm.
o *Inverter event alarm:* should the VMU-C receive an alarm notification from the Inverters connected to it (through the COM2 communication door), if the function has been configured the system will trigger the alarm.

VMU-C: other groups

Note: To be able to associate these Other alarms with a physical output, the VMU-O module must belong to the VMU-C group.

4.13 CONFIGURING THE VMU-S MODULES

Pressing the "NEXT" button again will grant access to the screen allowing to fully configure the VMU-S modules .

VMU-S Configuration

The paragraph below describe the four main zones highlighted above:

- **BASE MODULE** ("A" area): It indicates to which "master" module (VMU-C or VMU-M) the specific VMU-S module is connected. The master module communication address on RS485 bus is indicated in brackets.
- **VMU-S MODULE POSITION** ("B" area): It indicates the position of the specific VMU-S module within the group it belongs to.
- **ALARM MANAGEMENT for each individual VMU-S module** ("C" area): For each individual VMU-S module you can define an alarm for each one of the following variables: *Voltage, Current, Power, Efficiency, String Control and Other Alarms*.
  - o **Voltage, Current, Power:** Alarm setting for these variables follows the same rules: You have to set the "Threshold 1" and "Threshold 2" values. For values of "T1" exceeding or equal to those of "T2" you will get a MAXIMUM alarm; for values of "T1" lower than those of "T2" you will get an alarm with MINIMUM operation. You can also set a delay for alarm triggering (the value is expressed in "hours", from a minimum of 0 to a maximum of 3600). The operating modes of the alarm are: *Disabled*, activated as a *virtual alarm*, activated and *associated with a physical output* .

VMU-S: Voltage configuration

o **Efficiency:** Alarm setting for these variables must comply with the following provisions: Select whether this alarm shall be activated or not, then set the "Threshold 1" and "Threshold 2" values. For values of "T1" exceeding or equal to those of "T2" you will get a MAXIMUM alarm; for values of "T1" lower than those of "T2" you will get an alarm with MINIMUM operation. You can also set a delay for alarm triggering (the value is expressed in "minutes", from a minimum of 0 to a maximum of 60 (see below).

Number of PV Modules						4
Voltage	Current	Power	Efficiency	String Control	Other Alarms Group 1	

Alarm Working Mode	Alarm ▼
String Efficiency Alarm Set-point 1 (%) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	75.0
String Efficiency Alarm Set-point 2 (%) *(S1 >= S2 Up Alarm; S1 < S2 Down Alarm)*	85.0
Alarm Activation Delay Filter (Minutes) *(On-Time Delay)*	20 - +

VMU-S: Efficiency configuration

o **String Control**: The Alarm setting (below) in this page results in the activation of the "String Control" function for the string in question: all the powers of each string shall be compared with each other, according to the alarm activation value and to the set calculation method (Median or with reference to the Maximum value); should the power value of a string fall outside the acceptability window, the "String Control" alarm shall be triggered.
You can also set a delay for alarm triggering (the value is expressed in "minutes", from a minimum of 0 to a maximum of 60.

VMU-S						
Number of PV Modules						4
Voltage	Current	Power	Efficiency	String Control	Other Alarms Group 1	

String Control Alarm	Alarm ▼
Alarm Activation Delay Filter (Minutes) *(On-Time Delay)*	0 - +

VMU-S: string control

Note: To be able to associate this alarm with a physical output, the VMU-O module must belong to the VMU-C group.

Note: The calculation of the String Efficiency and the management of the String Control function are integrated into the VMU-C module.

o **Other Group Alarms**: This page allows to enable or disable the following alarms:
- *Inconsistent programming parameters*
- *String not connected*
- *Negative current or voltage in the string*
- *High temperature inside the VMUS module*

VMU-S: other alarms

Note: To be able to activate one or more of the alarms listed above, there must be at least a VMU-O module in the same group. If there is no I/O module the alarms cannot be activated.

- **Copy Parameters ….** ("D" area): By clicking on the box "Copy parameters on next VMU-S module" (below) you can copy all the newly entered configuration data to the VMU-S module following the current one. This function is particularly useful when all the VMU-S modules existing in the installation have to be configured in the same way. With a single command, the newly set VMU-S module configuration will be copied and transferred to all the subsequent VMU-S modules.
  Through the "***Search***" function you can quickly switch to a VMU-S module which is not exactly adjacent to the newly configured module (you first have to select the source group (VMU-M or VMU-C) and then the position of the VMU-S module inside the group.
  By clicking on "Copy configuration to all VMU-S Modules", the present VMU-S configuration will be copied to all the VMU-S modules. This is a quick way to configure in a single step, complex homogeneous systems

VMU-S: copy parameters

4.14 SENDING THE SYSTEM CONFIGURATION

Once the last VMU-S module has been configured, the system will display the configuration end screen; all the data are ready to be loaded into the MASTER VMU-C module. Data will only become operational after you have issued the "Send Plant Data" command.

MANUAL SETUP

| START | Inverter | EM | VMU-O | VMU-P | | | VMU-M | VMU-C | VMU-S | END |

Back

Send Plant Data
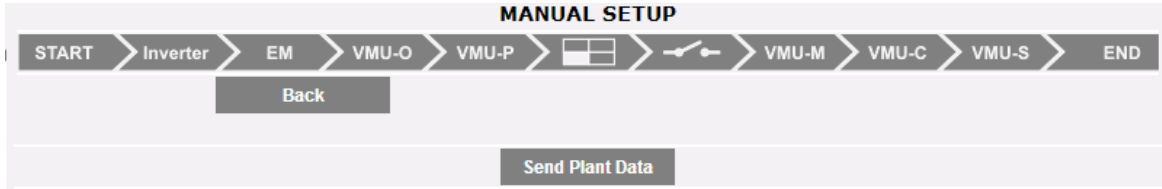
VMU-C's configuration ready to be saved

Once data transfer is completed the system will display again the main screen granting access to the VMU-C configuration .

VMU-C SETTINGS

Autoscan Devices Connected to VMU-C	Find Connected Devices
Perform the manual configuration of the devices connected to the VMU-C	Manual Setup
Resume Configuration	Resume Configuration
Load Configuration from File	Import
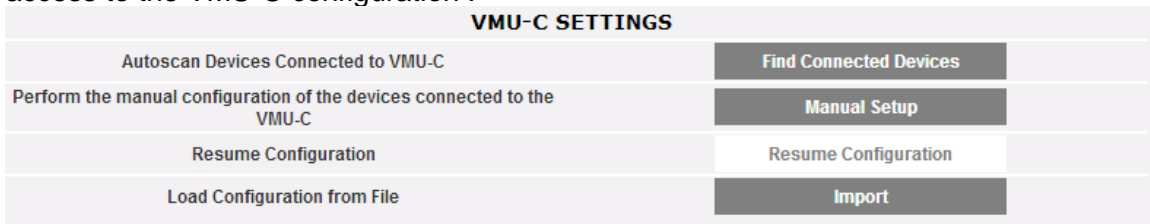
Configuration completed

4.15 RESUME CONFIGURATION(OF THE SYSTEM)

If for any reason you should exit the "*VMU-C Configuration*" procedure during system configuration, pressing the "Resume Configuration" button you will directly return to the point where the configuration procedure had been interrupted.

Resume Configuration	Resume Configuration
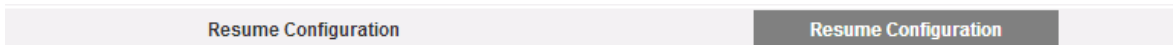
Resume configuration

4.16 IMPORT (SYSTEM CONFIGURATION)

If a plant configuration had previously been exported using the "*SAVE*" command below:

☐ PLANT   ☐ SENS

COM SETUP

DRIVER   ▶   [NGS

SETTING   ▶   WIZARD

SAVE CONFIGURATION
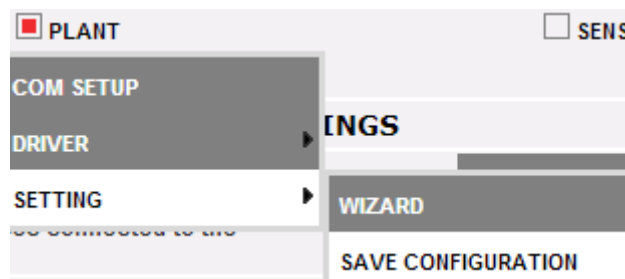
Save configuration

now using the "*IMPORT*" command the configuration can be loaded again into the same system or into a new one, thus avoiding having to re-enter all the configuration data.

Load Configuration from File	Import

Import configuration

4.17 CONFIGURING "SENSORS"

When you hover the mouse over "SENSORS" the system will display a drop-down menu showing the list of the sensors VMU-C can manage:
- SOLAR IRRADIATION
- MODULE TEMPERATURE
- AMBIENT TEMPERATURE,
- OTHER TEMPERATURES
- WIND SPEED
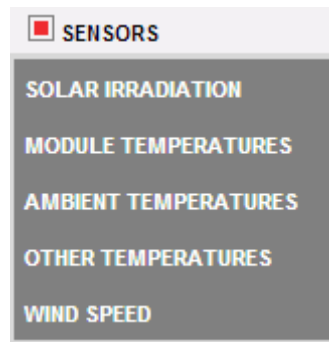
Sensor configuration

VMU-C can manage three different types of environmental sensors:

- Solar radiance sensors (Carlo Gavazzi's PVS1V,PVS1A,PVS2A)
- Temperature sensors (Carlo Gavazzi's TEMPSOL)
- Sensors measuring the wind speed (Carlo Gavazzi's DWS-V-DAC13)

4.17.1 SOLAR IRRADIATION SENSORS

By selecting this optional, the relevant page showing the list of available sensors is presented:

CONFIGURATION SOLAR IRRADIATION SENSOR			
DESCRIPTION	VMU-M		
Policrystallin	String-Box2	▶	Details
Amorphous	String-Box1		Details
Monocrystallin	String-Box3		Details

Solar sensors list

By clicking the "details" button, the "Sensor details" section is opened, allowing to view the configuration details and set a label for the sensor:

SENSOR DETAILS

Name	Policrystallin
Address VMU-M	String-Box2
Position VMU-P	3
Save	Reset	Cancel

Solar sensor details

This section allows to configure each sensors which has previously been configured (and enabled) in the VMU-M and VMUP modules installed in the system.
For each sensor, you can display the details listed below:
- *Name*: in this space you can enter a name or description allowing to easily identify the sensor;
- *VMU-M address* (or VMU-C address): ModBus address of the VMU-M or VMU-C module the sensor is connected to;
- *VMU-P position:* It indicates the position of the VMU-P module within the group.

4.17.2 MODULE TEMPERATURE SENSORS

By selecting this optional, the relevant page showing the list of available sensors is presented:

MODULE TEMPERATURE (VMU-P CHANNEL 1)

DESCRIPTION	VMU-M	
None Amorfo	String-Box1	Details
Panel Poly	String-Box2	Details
Panel Mono	String-Box3	Details

Sensors list

By clicking the "details" button, the "Sensor details" section is opened, allowing to view the configuration details and set a label for the sensor:

SENSOR DETAILS

Name	None Amorfo
Address VMU-M	String-Box1
Position VMU-P	5
Channel	1
Save	Reset	Cancel

Sensor details

This section allows to configure each sensors which has previously been configured (and enabled) in the VMU-M and VMUP modules installed in the system.
For each sensor, you can display the details listed below:
- *Name*: in this space you can enter a name or description allowing to easily identify the sensor;
- *VMU-M address* (or VMU-C address): ModBus address of the VMU-M or VMU-C module the sensor is connected to;
- *VMU-P position:* It indicates the position of the VMU-P module within the group.

4.17.3 AMBIENT TEMPERATURE SENSORS

By selecting this optional, the relevant page showing the list of available sensors is presented:

AMBIENT TEMPERATURE (VMU-P CHANNEL 2)		
DESCRIPTION	**VMU-M**	
Air Amorfo	String-Box1	Details
None Poli	String-Box2	Details
None Mono	String-Box3	Details

Sensors list

By clicking the "details" button, the "Sensor details" section is opened, allowing to view the configuration details and set a label for the sensor:

SENSOR DETAILS		
Name	Air Amorfo	
Address VMU-M	String-Box1	
Position VMU-P	5	
Channel	2	
Save	Reset	Cancel

Sensor details

This section allows to configure each sensors which has previously been configured (and enabled) in the VMU-M and VMUP modules installed in the system.
For each sensor, you can display the details listed below:

- o *Name*: in this space you can enter a name or description allowing to easily identify the sensor;
- o *VMU-M address* (or VMU-C address): ModBus address of the VMU-M or VMU-C module the sensor is connected to;
- o *VMU-P position:* It indicates the position of the VMU-P module within the group.

4.17.4 OTHER TEMPERATURES SENSORS

By selecting this optional, the relevant page showing the list of available sensors is presented:

OTHER TEMPERATURES (VMU-M)		
Description	**VMU-M**	
NO LABEL	String-Box2	Details
NO LABEL	String-Box2	Details
NO LABEL	String-Box3	Details
NO LABEL	String-Box3	Details

Sensors list

By clicking the "details" button, the "Sensor details" section is opened, allowing to view the configuration details and set a label for the sensor:

SENSOR DETAILS	
Name	
Address VMU-M	2
Channel	1
Save	Reset	Cancel

Sensor details

This section allows to configure each sensors which has previously been configured (and enabled) in the VMU-M and VMUP modules installed in the system.

For each sensor, you can display the details listed below:

- o *Name*: in this space you can enter a name or description allowing to easily identify the sensor;
- o *VMU-M address* (or VMU-C address): ModBus address of the VMU-M or VMU-C module the sensor is connected to;
- o *VMU-P position:* It indicates the position of the VMU-P module within the group.

4.17.5 WIND SPEED SENSORS

By selecting this optional, the relevant page showing the list of available sensors is presented:

CONFIGURATION WIND SENSOR		
DESCRIPTION	VMU-M	
Wind (dis)	String-Box1	Details
Wind	String-Box2	Details
Wind1 (dis)	String-Box3	Details

Sensors list

By clicking the "details" button, the "Sensor details" section is opened, allowing to view the configuration details and set a label for the sensor:

SENSOR DETAILS	
Name	
Address VMU-M	2
Channel	1
Save	Reset	Cancel

Sensor details

This section allows to configure each sensors which has previously been configured (and enabled) in the VMU-M and VMUP modules installed in the system.

For each sensor, you can display the details listed below:

- o *Name*: in this space you can enter a name or description allowing to easily identify the sensor;
- o *VMU-M address* (or VMU-C address): ModBus address of the VMU-M or VMU-C module the sensor is connected to;
- o *VMU-P position:* It indicates the position of the VMU-P module within the group.

5 HOME PAGE

Click on "Home" icon in the Navigation menu to access the content shown below, displaying the trend of the power delivered by the plant during the current day and during the previous one, with a sample resolution of 5 minutes.
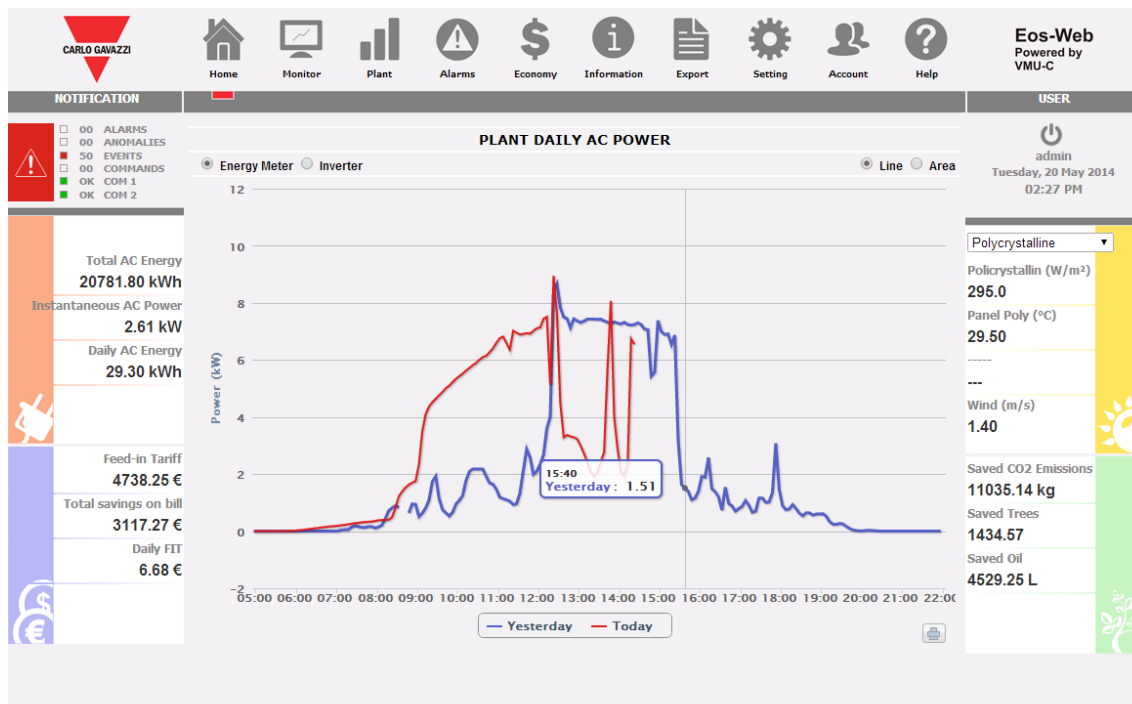
Home Page

The chart can be displayed in "Line" or "Area" mode (see below) by selecting the relevant button located in the top right.
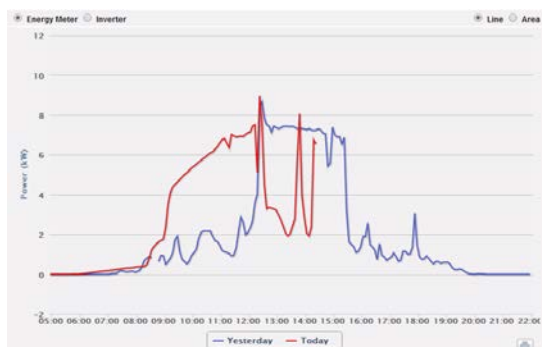
Line Mode
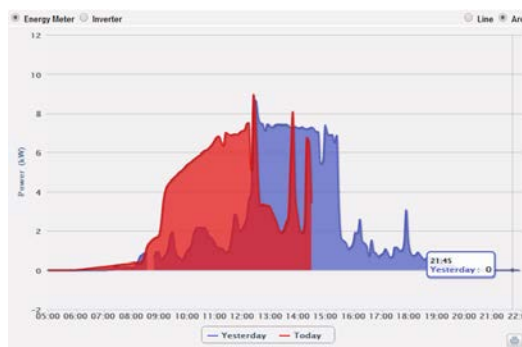
Area Mode

On the abscissa axis the chart displays the hours of the day from 5:00 to 22:00, while on the ordinate axis it displays the power in kW; the maximum ordinate value is sized

according to the plant peak power. The chart is automatically updated every 5 minutes. Hover the mouse over the chart area to show the relevant power value .

You can also choose the source of the data shown in the chart: Inverter or Energy Meter .

Notes: Clicking on the "print" button located in the bottom right of the chart area , you can specify which printer shall be used to print the chart

Print Button

6 MONITOR MENU

This section is dedicated to production data analysis. With the help of chart comparisons on such data as power, solar irradiation, temperatures and efficiencies, the system allows to analyse the relationships between the typical productivity elements of a photovoltaic system. Click on "Monitor" icon in the Navigation menu to access the content (see below).

Accessing Monitor Menu

The system is monitored in its two parts:

a) DC part - monitored by VMU-S string controls
b) AC part - monitored by production meter or, if not available, directly from inverters.
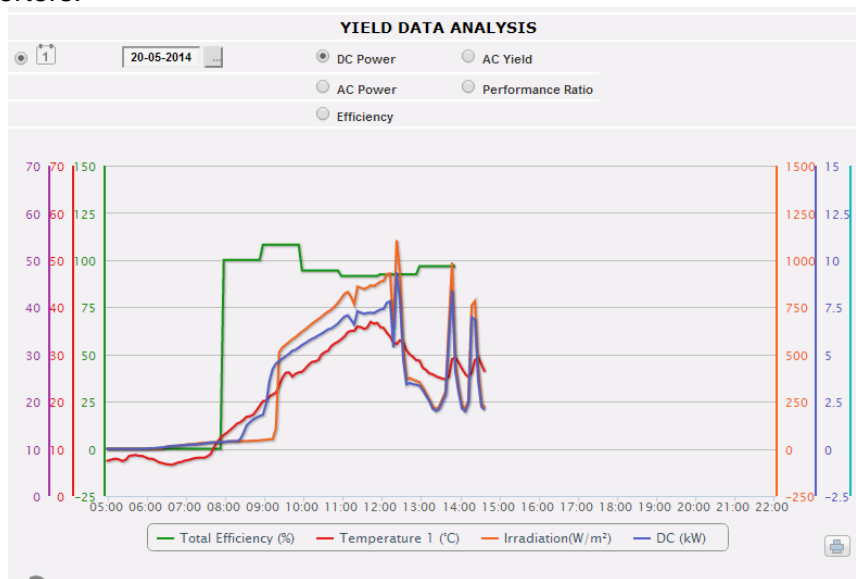
Monitor Menu in action

The main controls in the page are:

Section	View
Date selector	
Chart selector	
Trace selector	
Chart refresh	
Chart printing button	

The available options in the Chart selector are:

1. *"DC power"* - the direct current part upstream of VMU-S modules is analysed (string control).
2. *" "AC Yield" (kWh/kWp)* – the analysis compares the produced energy value (kWh) with the maximum design power value (kWp).
3. *"AC power"* - the alternating current part is analysed.
4. *"Performance Ratio" – The system displays* the ratio between the produced energy (AC) and the energy which can be produced (AC).
5. *Efficiency"* – the different efficiencies are compared.

a) <u>*Graphic functions*</u>

Charts consist of an X-axis, showing day hours from 05:00 to 22:00., 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 without any page refresh.
Hovering the mouse over the chart area will show a window displaying the relevant value of each variable.

Note: If chart is not drawn and a white area appears with "No data to display" writing, it means that no data is available for the selected day.

6.1 "DC POWER" CHART
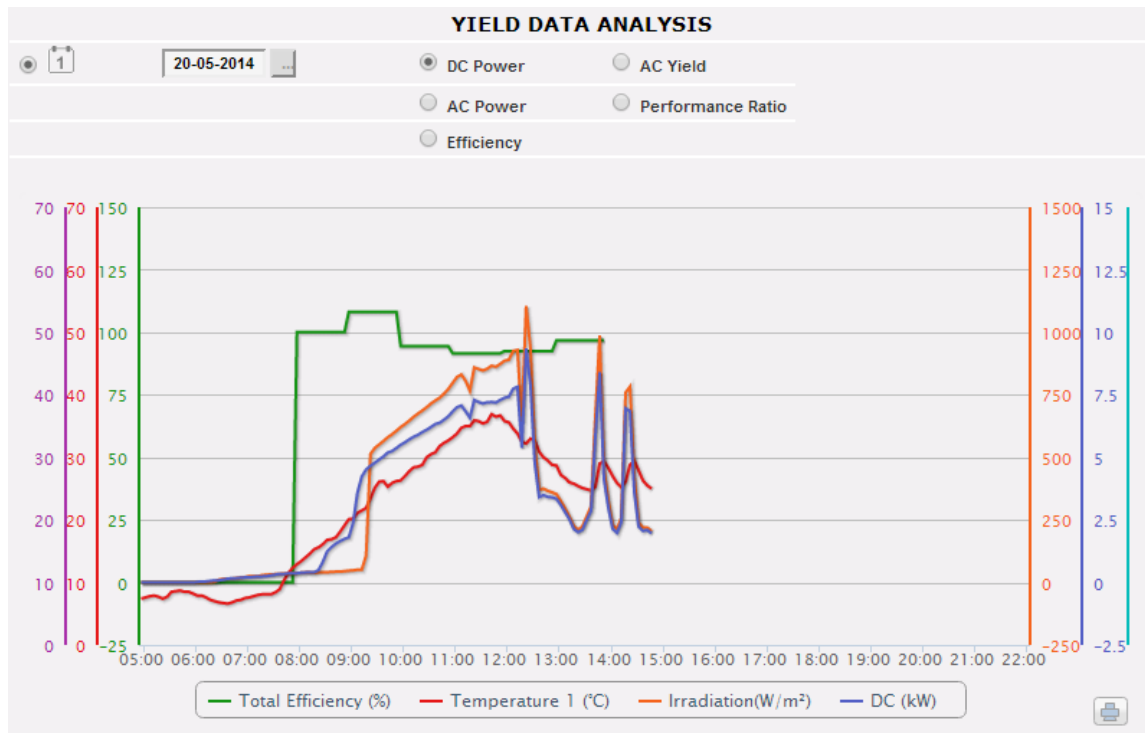
Monitor – DC Power

The chart displays 4 dimensions:

a) *Total efficiency*": the total string efficiency is a percentage value derived from the ratio between the theoretical production value and the value really measured by VMU-S string control.
To calculate the theoretical production value, temperature and solar irradiation are necessary; if these environmental sensors are not available, the theoretical value considered is the max string power value among the read ones (calculation by comparison).
VMU-C can calculate string efficiency in three different ways, according to its configuration.

- Calculation with solar irradiation and temperature sensor located on module.
- Calculation with solar irradiation and room temperature sensor.
- Calculation without solar irradiation and temperature sensor.

> *Note: String efficiency calculated can exceed 100 under low solar irradiation condition, thus power delivered by modules. The value higher than 100 must be understood like an error due to measure resolution or solar irradiation sensor position.*

> *Note: temperature and solar irradiation sensors used to calculate string efficiency must be configured like reference sensors.*

b) "*DC power*" : The direct current power is expressed in kW and is the result of the sum of all the power values read by the Eos-Arrays.

c) "*Solar irradiation*": The solar irradiation is expressed in W/m² and acquired by solar irradiation sensor.

d) "*Temperature*": The temperature is expressed in °C and acquired by the temperature sensor.

Note: by changing the selection in the environmental box, the relevant environmental parameters are changed within the Monitor chart accordingly (pushing the REFRESH button is necessary)
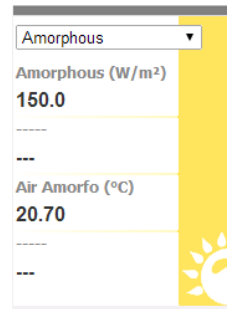
Amorphous ▼
Amorphous (W/m²)
150.0

Air Amorfo (ºC)
20.70

Note: The chart sampling frequency (irradiation, temperature and power), depends on the storage interval set on the VMU-C. It can be: 5,10,15,30,60 minutes. For the Efficiency chart calculation is averaged every 60 minutes.

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*Note: **all the data displayed in graphic form on VMU-C are calculated as an average of all the samples acquired by the system in the storage interval.***

6.2 "EFFICIENCY" CHART
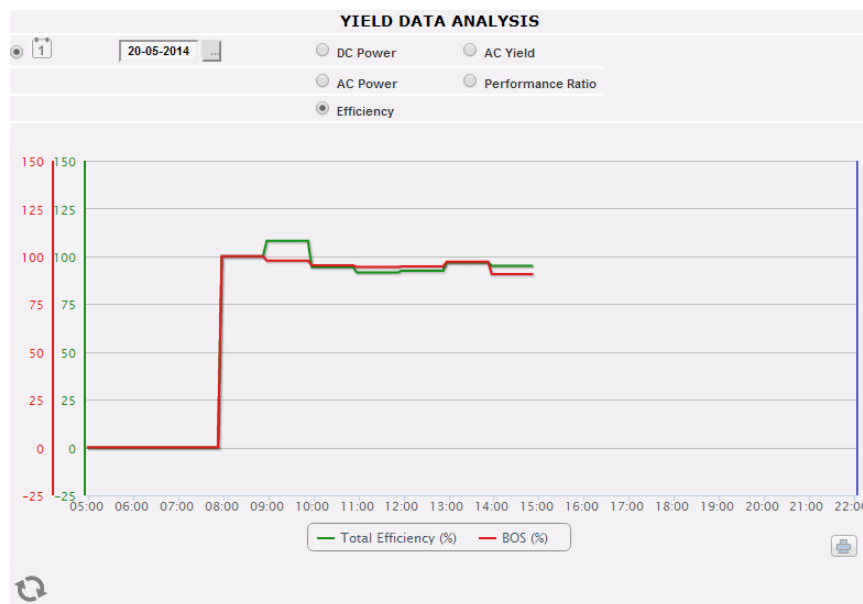
Monitor – Efficiency chart

The chart compares 2 dimensions:

a. "*Total efficiency*": This is the value shown in the "*DC power*" chart (Fig. 98).

b. *BOS efficiency*": BOS (Balance of system) is calculated by comparing two energy values within the same time interval: value of AC energy acquired from

reference production meter and DC energy value acquired by VMU-S string control.

The time interval between samples on the chart is 60 minutes.

Note: "BOS efficiency" can only be calculated if a main reference energy meter is inserted into VMU-C.

6.3 "AC YIELD" CHART

AC Yield - Monthly
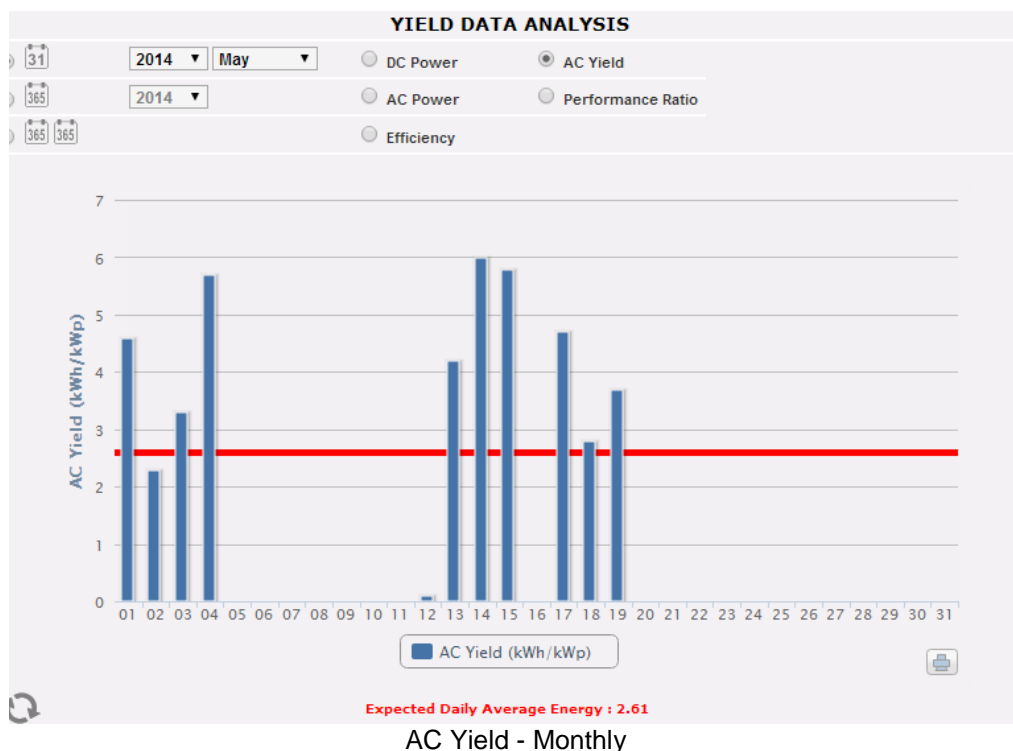
The chart allows to compare 2 dimensions:

a. "*Daily yield (kWh/kWp)":* Each histogram (in light blue) represents the yield of the relevant day. The term "Yield" indicates the ratio between the AC energy (kWh) produced in the day being analysed and the rated power (kWp) of the plant itself. The order of magnitude of this piece of data (in a sunny day) will typically range between 4 and 6.

b. "*Expected daily yield (kWh/kWp)*": The red line shows the average monthly yield expected for the relevant plant (the estimated value is also shown in the chart section under "Estimated average daily energy: x,xx". This value is fixed for all the days belonging to the same months.

You can also choose display on a yearly basis where each histogram will represent the yield in the specified month. Even in this case the term "Yield" indicates the ratio between the AC energy (kWh) produced in the month being analysed and the rated power (kWp) of the plant itself.

In this case the data represented by the red line (expected yield) are data set during configuration in the "Project" page.
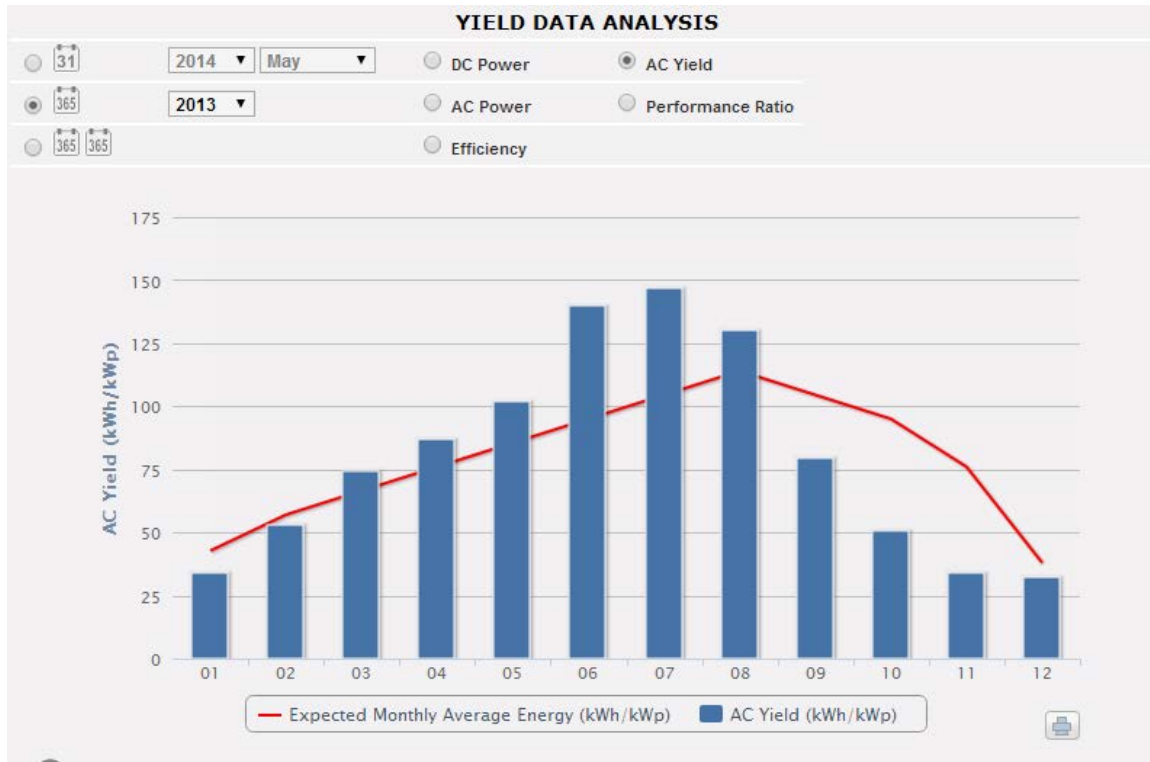
AC Yield - Yearly

Also available is a further display scale, in which each individual histogram represents the yield of the year in question.

Note: The calculation of "AC Yield" is available only if an AC meter is connected as main AC energy reference to VMU-C

6.4 "AC POWER" CHART
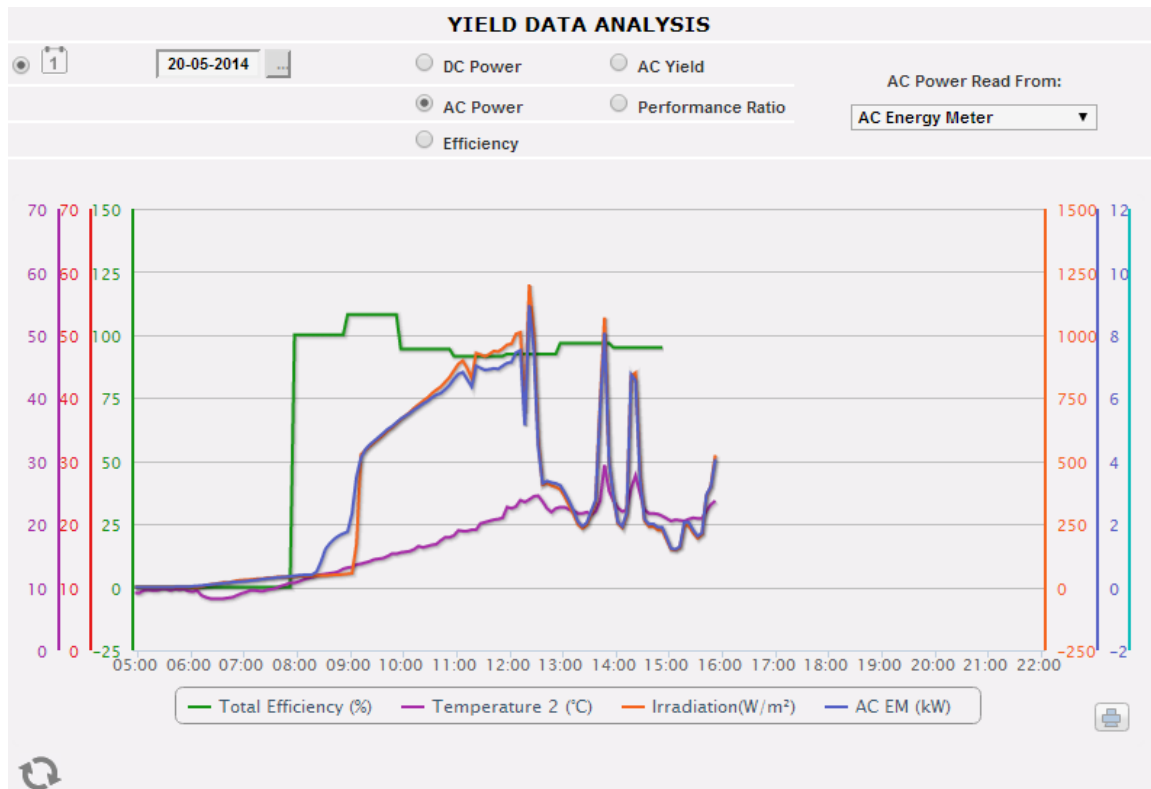
AC Power

The chart displays 4 dimensions:

a. "*Total efficiency(%)*": the total efficiency is a percentage value derived from the ratio between a theoretical production value and the value which is really measured by AC production meter or inverters.
The system uses the values from the meter or from the inverters.
To calculate the theoretical production value, temperature and solar irradiation are necessary; **if these environmental sensors are not available, the total efficiency cannot be provided.**

> *Note: Total efficiency calculated can exceed 100 under low solar irradiation condition, thus power delivered by modules. The value higher than 100 must be understood like an error due to measure resolution or solar irradiation sensor position.*

> *Note: temperature and solar irradiation sensors used to calculate string efficiency must be configured like reference sensors.*

b. "*AC power*": Power in alternating current expressed in kW. Through the menu shown in figure above you can set the data source. The AC power data can be read from:
   - Main energy meter (set up like a reference meter in configuration phase)
   - Inverter
   - Main energy meter +Inverter (with two distinct curves)
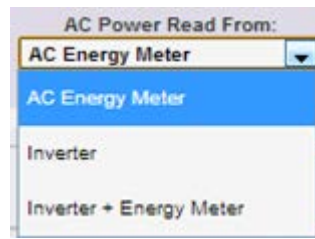
Fig. 106 – AC power display selection menu

c. "*Irradiation*": The solar irradiation is expressed in W/m^2 and acquired by reference solar irradiation sensor.

d. "*Temperature"*: The temperature is expressed in °C and acquired by reference temperature sensor.


Note: The chart sampling frequency (irradiation, temperature and power), depends on the storage interval set on the VMU-C. It can be: 5,10,15,30,60 minutes. For the Efficiency chart calculation is averaged every 60 minutes.

6.5 "PERFORMANCE RATIO" CHART
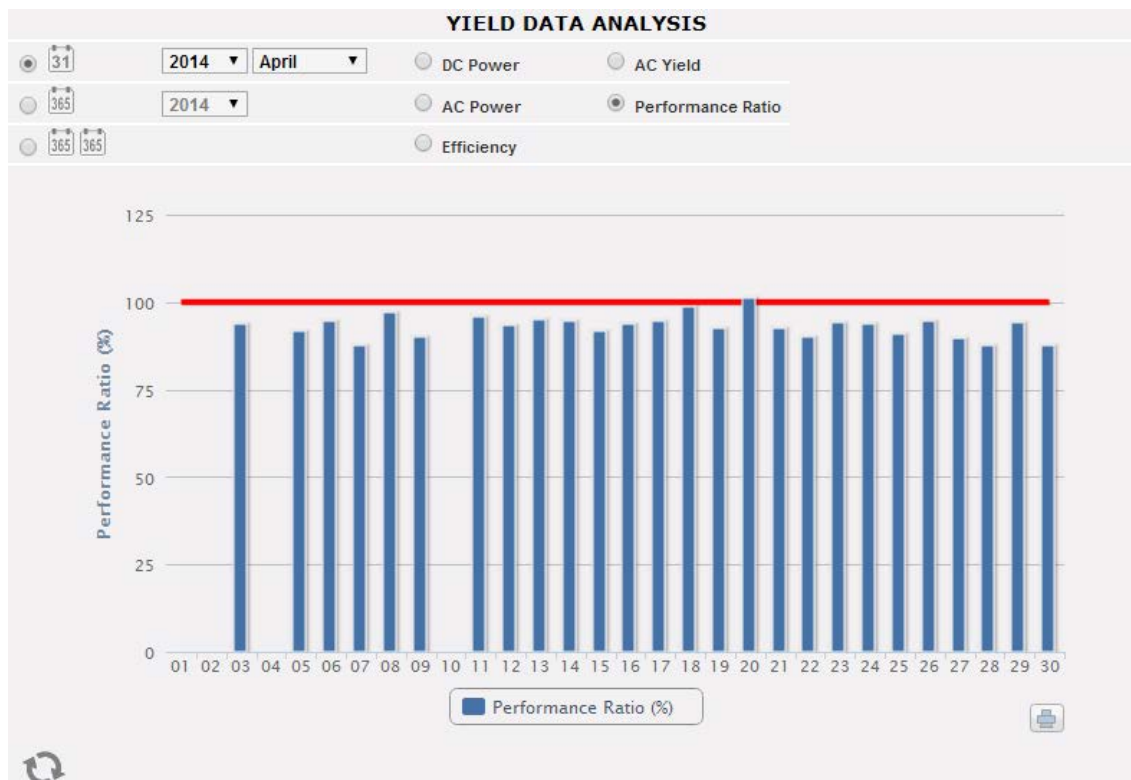
Performance Ratio

The chart allows to display the performance index for each individual day of the selected month.
Each histogram represents the daily performance of the specified day. The "Performance" value (also called "Performance Ratio") defines the ratio between the

actual energy yield (actually produced AC energy) and the possible theoretical yield (Energy which can potentially be produced in the same period). This value (theoretically always equal to 100%) will indicate the quality of the plant operation. This doesn't depend on the installed power value, nor from the panel orientation, nor from different irradiation values. For this reason, through this parameter you can compare photovoltaic plants connected to the network and located in different parts of the world.

You can also choose the display on a yearly basis, where each individual histogram will represent the yield of the specified month .

Note: "Performance ratio" is available only if there is a main reference AC meter connected to VMU-C and at the same time DC energy is provided by the VMU-S modules

7 PLANT

In this section the system displays in graphical form all the historical data acquired by VMU-C read from the different devices. Click on "Plant" icon in the Navigation menu for accessing this section:

Plant Icon
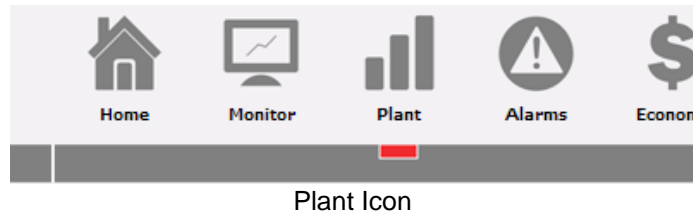
A menu at the top of the page grants access to the following sections:

Plant Menu
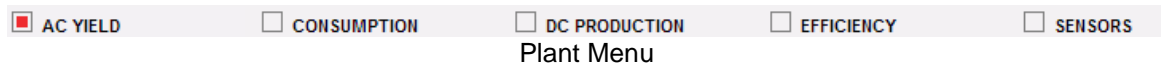
1. "*AC YIELD*": For Inverters and Energy Meters (EM).
2. "CONSUMPTION": balancing production Vs. consumption data
3. "*DC PRODUCTION*": Dedicated to VMU-S string control.
4. "*EFFICIENCY*": Dedicated to efficiencies: Total, Eos-Array, Inverter, BOS.
5. "*SENSORS*": Dedicated to environmental sensors.

7.1 AC YIELD

When hovering the mouse over "AC PRODUCTION" the system will display the following items; "ALL INVERTERS", "SINGLE INVERTER" , "TOTAL EM" and "PARTIAL EM" .

AC Yield menu
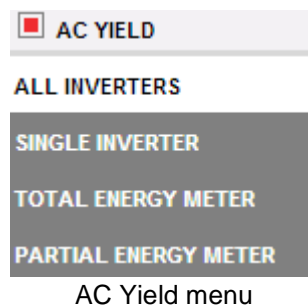
7.1.1 ALL INVERTERS

The power/energy curve represents the sum of all contributions from inverters monitored on the system, within the time interval selected. When building this curvethe system will only consider the inverters whose field "AC energy totaliser contribution" is set to "YES" (see configuration page).

A. Date selection
- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the available range, either on AC or DC side

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized according to the plant peak power.
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.

Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5,10,15,30,60 minutes.

7.1.2 SINGLE INVERTER

When hovering the mouse over "AC PRODUCTION" and selecting the "SINGLE INVERTER" item, you will access to the content shown below..
As you access the page, the system will display the daily trend of the power delivered by each individual inverter monitored by the system in the specific plant. Each curve has a different colour and can be identified by legend on chart bottom. Use the "INVERTER NAME" menu to display the production curve of every single inverter, as well.
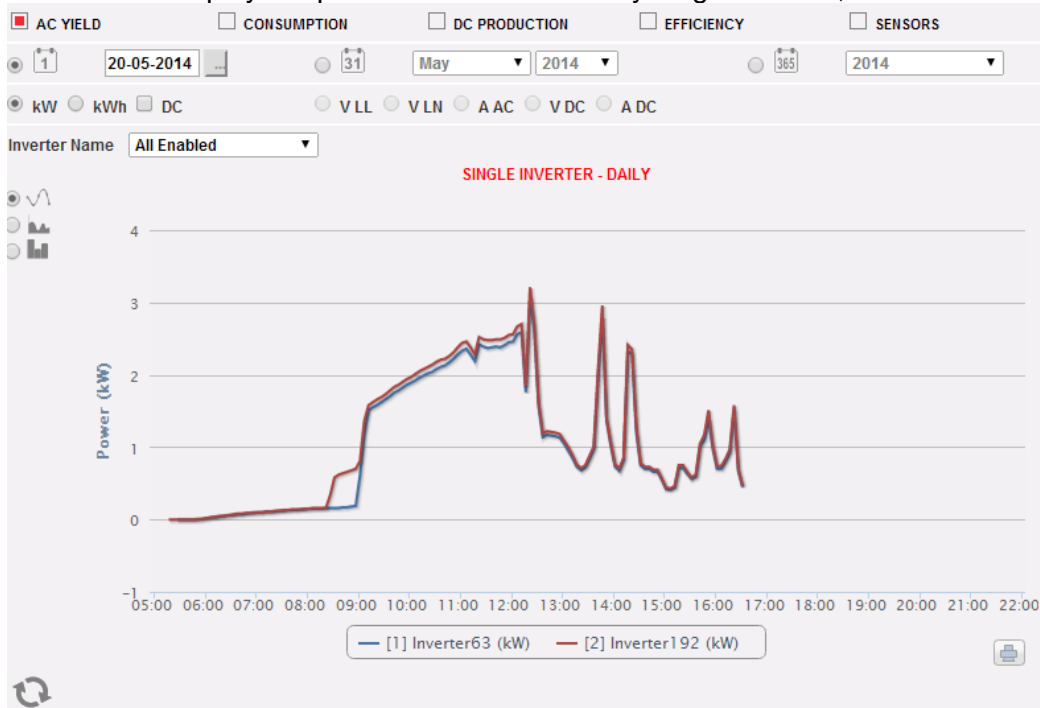
Single Inverter

This page consists of 3 sections:

A	
B	
C	

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the available range, either on AC or DC side

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized according to the plant peak power.
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

Note: Comparing production trends of various inverters allows to easily identify any production abnormalities on the system.

Note: all keys and selections outside the dark grey area do not need "Update chart" function. After a few seconds the chart will update automatically.

Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.

Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5, 10, 15, 30, 60 minutes.

7.1.3 TOTAL ENERGY METER

When hovering the mouse over "AC PRODUCTION" and selecting the "TOTAL EM" item, you will access to the content shown below.
As you access the page, the system will display the daily trend of the power measured by the TOTAL meter or by the virtual meter representing the sum of all the values read by the partial meters installed in the specific plant. When building this curve, obviously, the system will only consider the energy meters whose field "AC energy totaliser contribution" is set to "YES" (see configuration page).

Total Energy meter

This page consists of 3 sections:

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the pool available from the energy meter

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized according to the plant peak power.
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

> *Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.*

> *Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5,10,15,30,60 minutes.*

7.1.4 PARTIAL ENERGY METERS

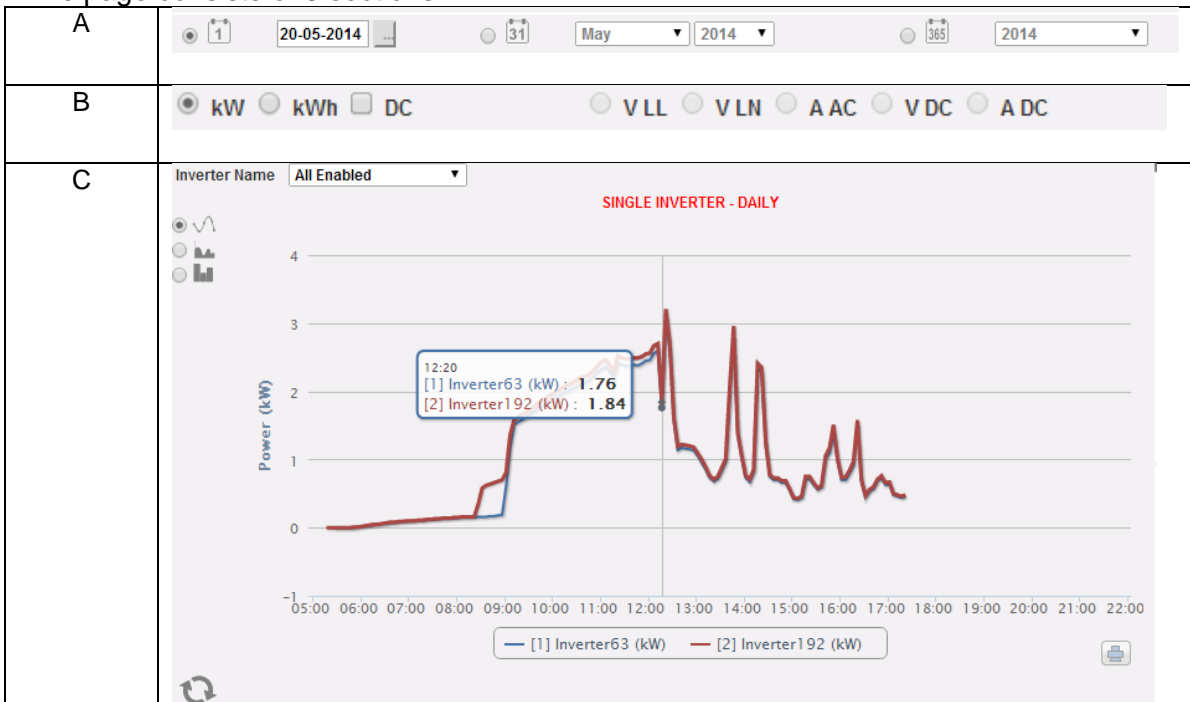When hovering the mouse over "AC PRODUCTION" and selecting the "PARTIAL EM" item, you will access to the content shown below.
As you access the page, the system will display the daily trend of the power measured by each individual energy meter monitored by the system in the specific plant. Each curve has a different colour and can be identified by legend on chart bottom. Use the "Energy meter name" menu to display the production curve of a specific instrument, as well.

VMU-C

Partial Energy Meter

This page consists of 3 sections:

A	
B	
C	

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection

It is possible to select the desired variable in the available range, either on AC or DC side

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized according to the plant peak power.
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

Note: Comparing production trends of various Energy meters allows to easily identify any production abnormalities on the system.

Note: all keys and selections outside the dark grey area do not need "Update chart" function. After a few seconds the chart will update automatically.
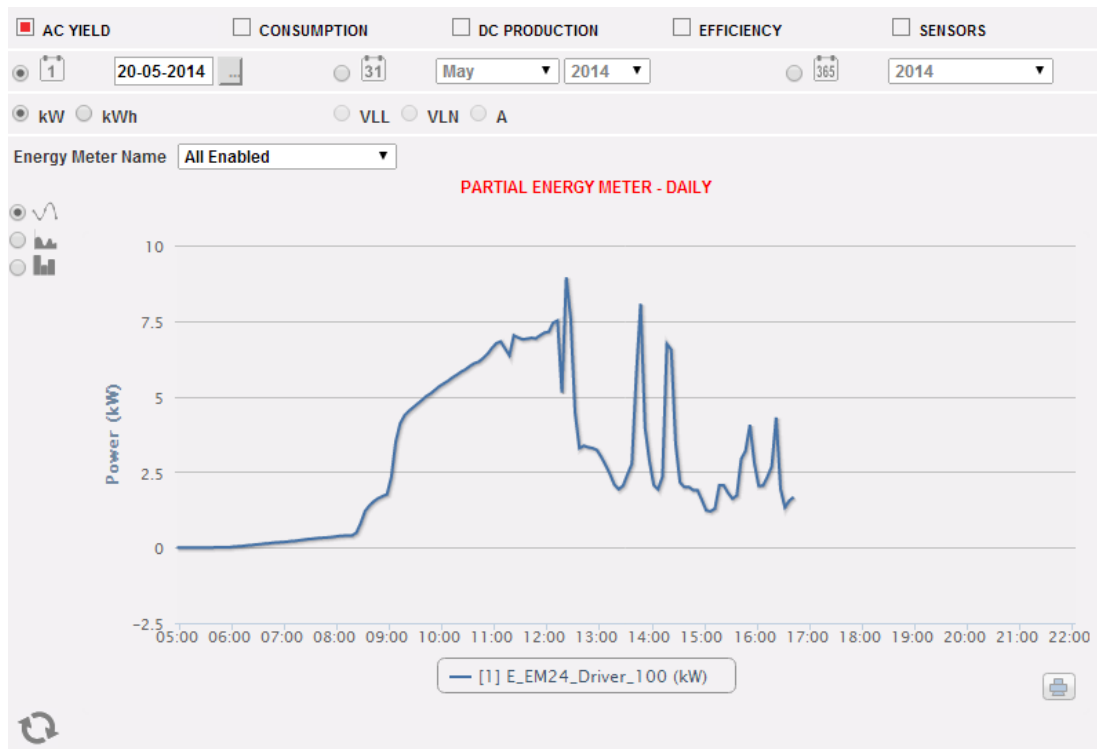
Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.

Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5, 10, 15, 30, 60 minutes.

7.2 CONSUMPTION

Hovering the mouse over "Consumption" will display the items allowing to select the string graphical data display mode: "Total Energy Meter", "Partial Energy Meter", "Energy Balance" .

■ CONSUMPTION

TOTAL ENERGY METER

PARTIAL ENERGY METER

ENERGY BALANCE

Consumption Menu

7.2.1 TOTAL ENERGY METER

When hovering the mouse over "CONSUMPTION" and selecting the "TOTAL EM" item, you will access to the content shown below. Data are relevant to Energy Meters configured for measuring Energy consumption (see the relevant Wizard section).
As you access the page, the system will display the daily trend of the power measured by the TOTAL meter or by the virtual meter representing the sum of all the values read by the partial meters installed in the specific plant. When building this curve, obviously, the system will only consider the energy meters whose field "AC energy totaliser contribution" is set to "YES" (see configuration page).

Total Energy meter

This page consists of 3 sections:

A	⊙ 1 20-05-2014 ... ○ 31 May ▼ 2014 ▼ ○ 365 2014 ▼
B	⊙ kW ○ kWh ○ V LL ○ V LN ○ A

C	TOTAL ENERGY METER - DAILY

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the pool available from the energy meter

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized .
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.

Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5,10,15,30,60 minutes.

7.2.2 PARTIAL ENERGY METERS

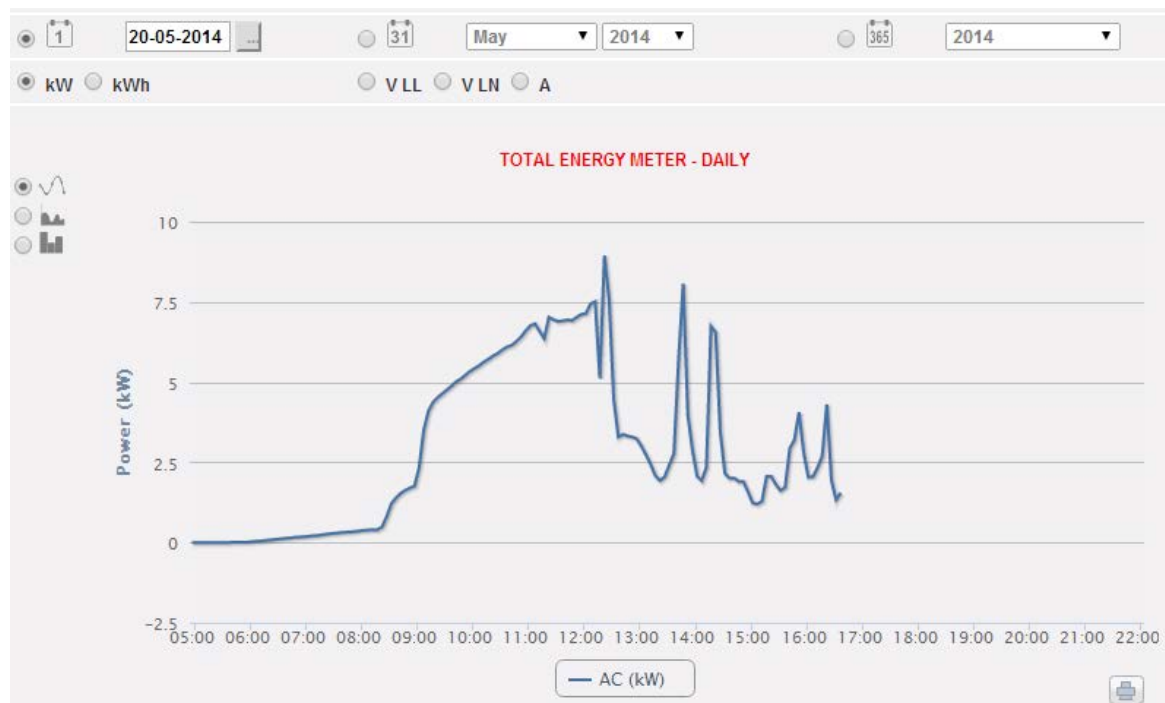When hovering the mouse over "CONSUMPTION" and selecting the "PARTIAL EM" item, you will access to the content shown below. Data are relevant to Energy Meters configured for measuring Energy consumption (see the relevant Wizard section).

As you access the page, the system will display the daily trend of the power measured by each individual energy meter monitored by the system in the specific plant. Each curve has a different colour and can be identified by legend on chart bottom. Use the "Energy meter name" menu to display the production curve of a specific instrument, as well.

Partial Energy Meter

This page consists of 3 sections:

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the available range, either on AC or DC side

C. Chart section.
On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays the requested variable, with a full scale appropriately sized .
In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

Note: Comparing production trends of various Energy meters allows to easily identify any production abnormalities on the system.

Note: all keys and selections outside the dark grey area do not need "Update chart" function. After a few seconds the chart will update automatically.

Note: we recommend that you use the "Line" or "Area" display for the daily Power data and the Bar display (for histograms) for the monthly and yearly energy data.

Note: The sampling frequency depends on the storage interval set on VMU-C. It can be: 5, 10, 15, 30, 60 minutes.

7.2.3 ENERGY BALANCE

When hovering the mouse over "CONSUMPTION" and selecting the "Energy balance" item, you will access to the content shown below. Data are relevant both to the main Energy Meter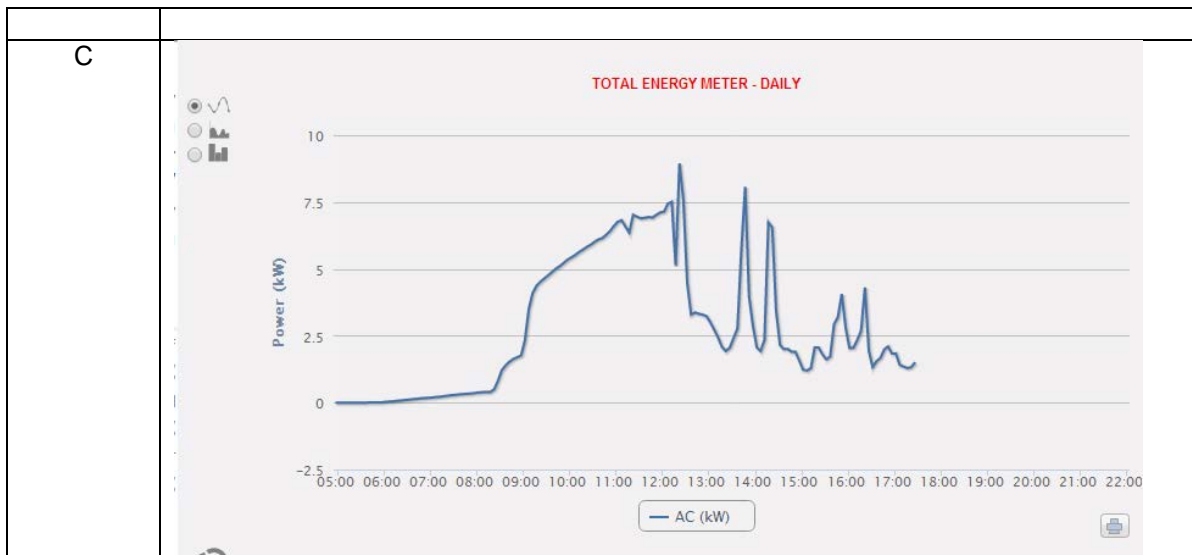 configured for measuring Energy consumption and the main Energy meter configured for measuring consumed energy(see the relevant Wizard section).
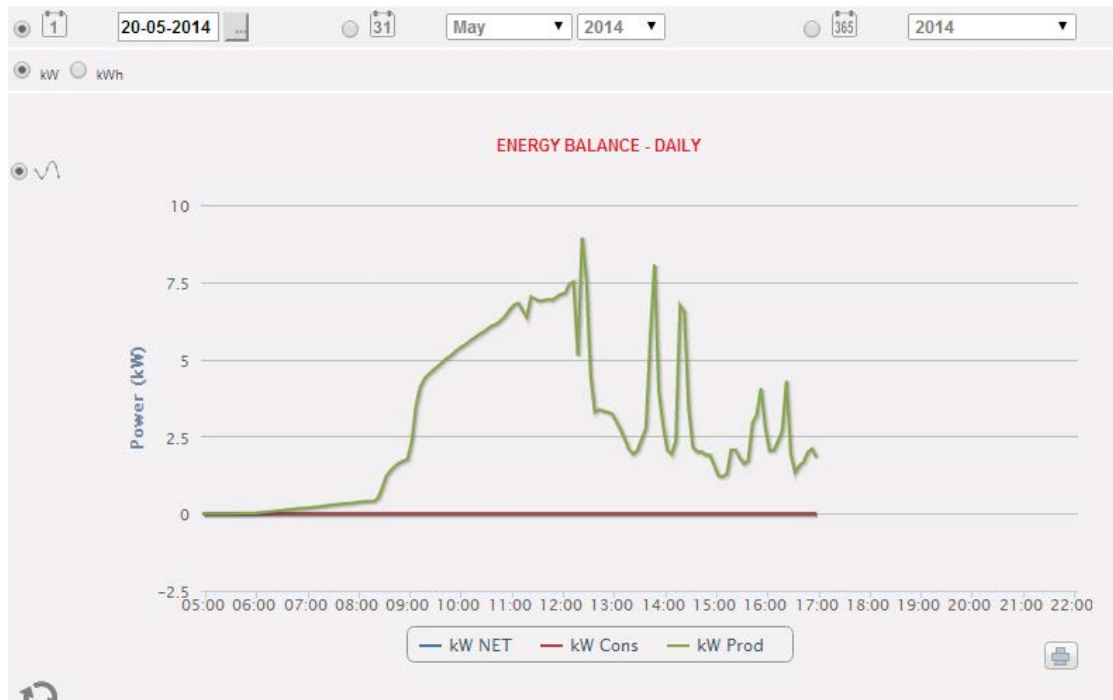
Energy balance

This page consists of 3 sections:

A	
B	
C	

A. Date selection

- Daily: it shows the daily trend of the variable on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the average of the variable, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the average of the variable, for each month of the selected year. (To choose the year use the special selection menu next to the field)

B. Variables selection
It is possible to select the desired variable in the available range, kW or kWh

C. Chart section.
   On the abscissa axis (X) the chart displays time; the dimension (hours, days, months) depends on the selected display type (daily, monthly, yearly). On the ordinate axis (Y) the chart displays:
   - Consumed energy/power (according to selection)
   - Produced energy/power (according to selection)
   - Net balance (as Consumed minus Produced energy/power)
   , with a full scale appropriately sized according to the plant peak power.
   In the top left of this section there is a menu allowing to select the graphical display mode: Line, Area, Bar.

7.3   DC PRODUCTION

Hovering the mouse over "DC PRODUCTION" will display the items allowing to select the string graphical data display mode: "ALL STRINGS" or "SINGLE STRING" .
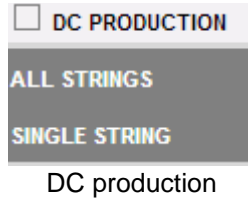
DC production

7.3.1   ALL STRINGS

When hovering the mouse over "DC PRODUCTION" and selecting the "ALL STRINGS" item, you will access the content shown below.
The power/energy curve represents the sum of all contributions from the individual strings monitored in the system, within the selected time interval.
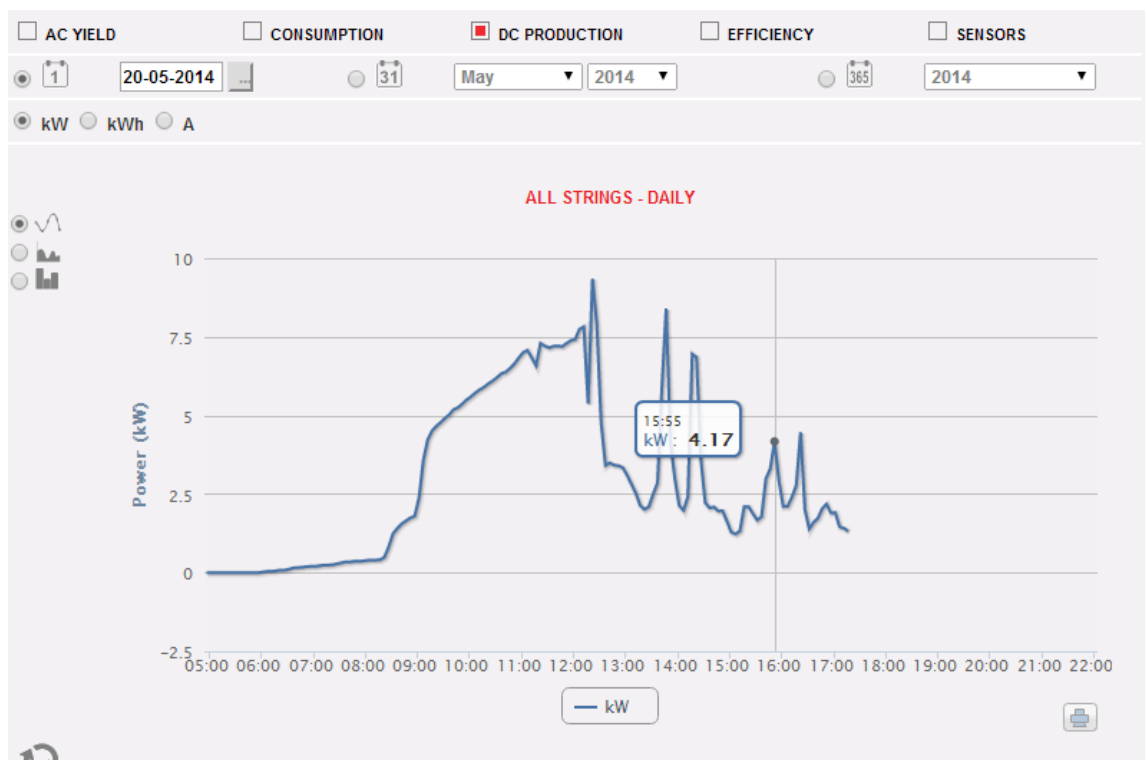
DC –All strings

This page consists of 3 sections:

A	
B	

C
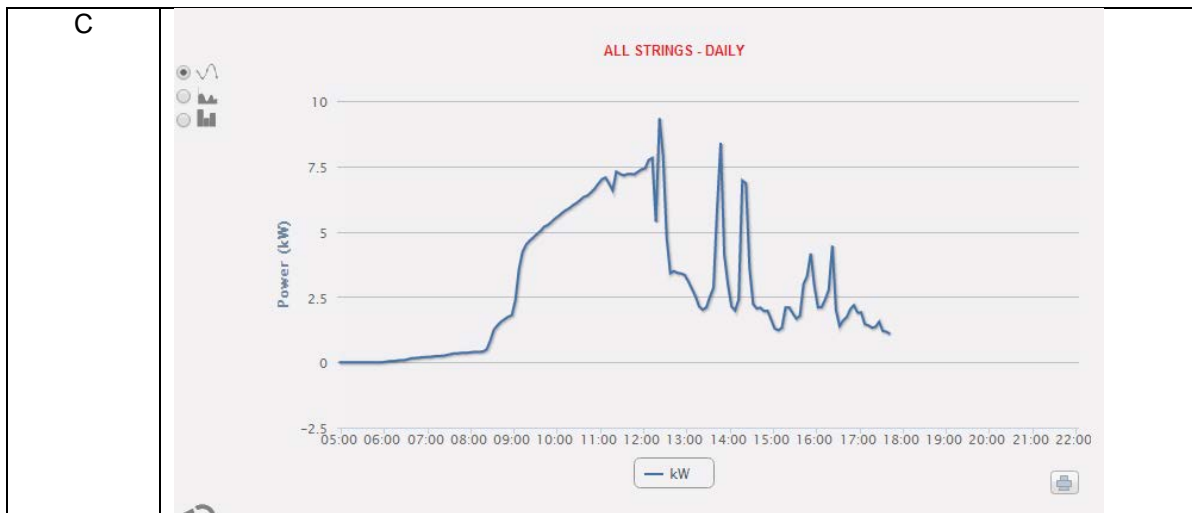
A. "Section A" for search and selection (at the page top)
    Buttons to select the display type are shown in dark grey:

    ▪ Daily: it shows the daily trend of DC power or DC energy or DC current on the
      selected day. (To choose the day use the special calendar which can be
      accessed through the button next to the date field)
    ▪ Monthly: it displays the maximum DC power, the maximum DC current or the total
      DC energy produced for each day of the selected month. (To choose the month
      and year use the special selection menus next to the field)
    ▪ Yearly: it shows the maximum DC power, maximum DC current or total DC
      energy produced for every month of the selected year. (To choose the year use
      the special selection menu next to the field)

    After selecting the display type press the "Refresh Chart" button.

    On the left, displayed in light grey, there are:
    1. The buttons allowing to select the type of dimension to be included in the chart:
        DC power, DC energy and DC current.

B. Chart section.
    On the abscissa axis (X) the chart displays time; the dimension (hours, days, months)
    depends on the selected display type (daily, monthly, yearly). Y-axis shows power in
    kW or energy in kWh or current in A with a properly-dimensioned scale end.
    In the top left of this section there is a menu allowing to select the graphical display
    mode: Line, Area, Bar.

    Note: it is recommended to use "Line" or "Area" display for daily data and Bar
    display for monthly and yearly data.

    Note: The time interval between a chart sample and the other one depends on
    storing time interval set up on VMU-C. It can account for 5,10,15,30,60 minutes.

7.3.2 SINGLE STRING

When hovering the mouse over "DC PRODUCTION" and selecting the "SINGLE STRING" item, you will access the content shown below.
As you access the page, the system displays the daily trend of the power delivered by each individual string of a specific group (EosArray) monitored by the system. Each curve has a different colour and can be identified by legend on chart bottom. Through the "STRING MODULE" menu you can display the specific string production curve.
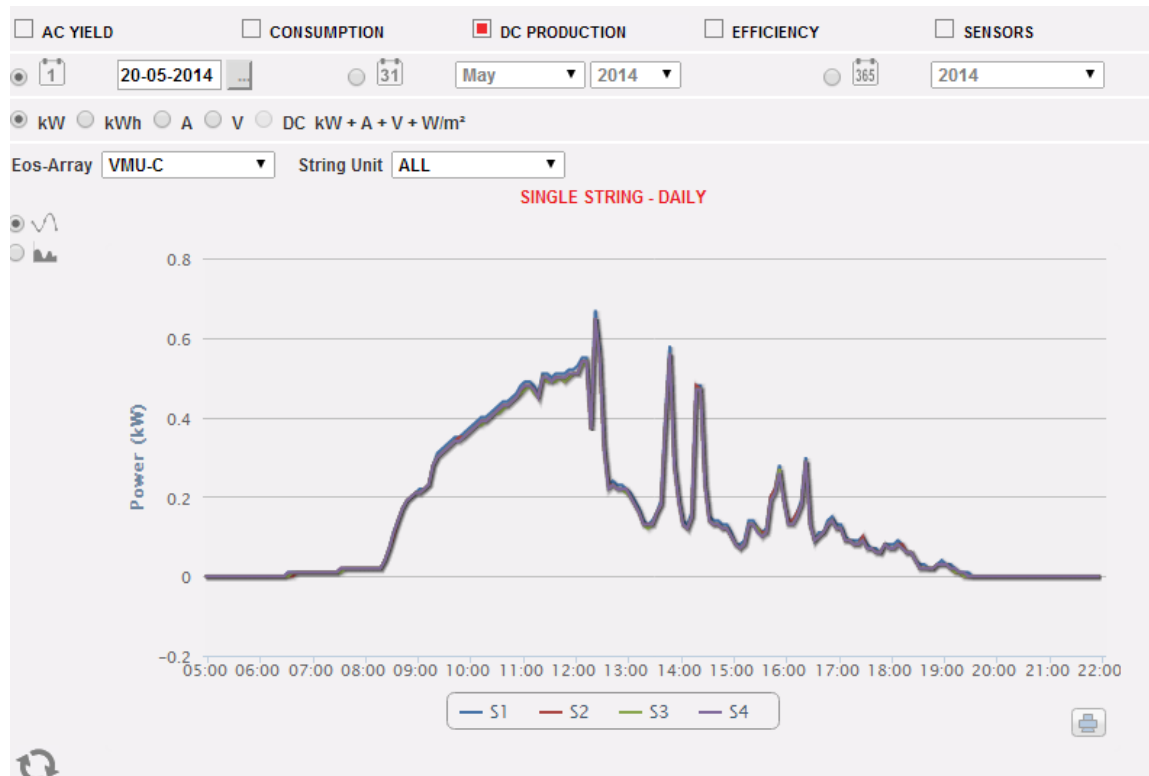
Single string

This page consists of 3 sections:

VMU-C

In this page you can watch the trend of the electric values (kW, kWh, A and V) of the individual strings controlled by the on-field VMU-S modules. In particular, two display types exist:

1. Chart with aggregated data from multiple VMU-S string controls (belonging to the same EosArray group).
2. Chart with data from a single VMU-S string control (single VMU-S module).

- *Chart with data coming from several VMU-S string controls.*

    This section displays data from all VMU-Ss under the VMU-C or a specific VMU-M (to be selected through the special menu shown in **Section B**). Data can be displayed by:

    a) (All) - Several curves, one for each VMU-S selected, displayed at the same time.
    b) (Single string) - A single curve built using the data from the individual VMU-S specified through the menu shown in **Section B.**

    "All" is the default mode and it shows all the curves of VMU-Ss under the VMU-C or the selected VMU-M at the same time. Comparing various curves allows to easily identify any production abnormalities on a specific string. The bottom legend allows finding the relevant VMU-S.

    Follow the sequence of operations below to search and graphically view the electric dimension required:

    1. *Selection of the VMU-C or of the VMU-M connected to it*

        Through the special menu shown in **Section B**, you can select the VMU-C or the VMU-M you are interested in. The VMU-C or the VMU-M must be selected to identify all VMU-Ss under it, to be monitored and compared.

    2. *Selection of date/month/year of display*

        At the top of the **Section A** there are the buttons allowing to select the display interval:

        - Daily: it shows the daily trend of DC power or DC energy or DC current on the selected day. (To choose the day use the special calender which can be accessed through the button next to the date field)
        - Monthly: it displays the maximum DC power, the maximum DC current or the total DC energy produced for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
        - Yearly: it shows the maximum DC power, maximum DC current or total DC energy produced for every month of the selected year. (To choose the year use the special selection menu next to the field)

    3. *Selection of electric dimension required*

        Through the special menu shown in **Section B** in the above figure, you can select the desired electric dimension.

> *Note*: "DC Power+Current+Voltage+Solar Irradiation" selection is disabled for the display of aggregated data from more VMU-S string controls. It will only be enabled for charts with data from a single VMU-S string control.

the electric dimensions which can be selected are:

- *"DC Power (kW)"* : chart shows the trend of power in kW within the time interval chosen.

- *"DC Energy (kWh)*: chart shows the trend of delivered energy (kWh) within the time interval chosen.

- *"DC Current (A)*: chart shows the trend of current in A within the time interval chosen.

- *"DC Voltage (V)*: chart shows the trend of voltage in V within the time interval chosen.

4. *Display of the desired chart*

Press "Refresh chart" to view the desired chart.

- *Charts with data coming from a single VMU-S string control.*

To draw chart of a specific VMU-S string control, follow the sequence below:

1. *Selection of the VMU-C or of the VMU-M connected to it*

Through the special menu shown in **Section B** you can select the VMU-C or the VMU-M you are interested in. VMU-M must be selected to identify all VMU-Ss under it, to be monitored and compared.

2. *Selection of date/month/year of display*

Buttons to select the display interval are shown in **Section A** top side:
- Daily: it shows the daily trend of the selected electrical dimension, in the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
- Monthly: it shows the maximum DC power, maximum DC current, maximum DC voltage or total DC energy produced for every day of the selected month. (To choose the month and year use the special selection menus next to the field)
- Yearly: it shows the maximum DC power, maximum DC current, maximum DC voltage or total DC energy produced for every month of the selected year. (To choose the year use the special selection menu next to the field)

3. *Searching for the desired VMU-S*

Through the "String module" menu shown **Section B**, select the VMU-S module you wish to analyse. The "DC Power+Current+Voltage +Solar Irradiation" selection becomes active.

Note: The list contains some numbers corresponding to the position of the VMU-S in the chain of the devices under the VMU-C or VMU-M. If the "VMU-S" list is empty that means under the VMU-M selected at point 1 there is no VMU-S.

4. *Selection of electric dimension required*

Through the special menu shown in **Section B**, you can select the desired electric dimension to be included in the chart.

Selection keys available are the following:

- *"DC Power (kW)"* : chart shows the trend of power in kW within the time interval chosen.

- *"DC Energy (kWh)*: chart shows the trend of delivered energy (kWh) within the time interval chosen.

- *"DC Current (A)*: chart shows the trend of current in A within the time interval chosen.

- *"DC Voltage (V)*: chart shows the trend of voltage in V within the time interval chosen.

- *"DC Power+Current+Voltage+Solar Irradiation*": chart shows the four dimensions at the same time, within the chosen time interval. Chart type for this selection is shown below
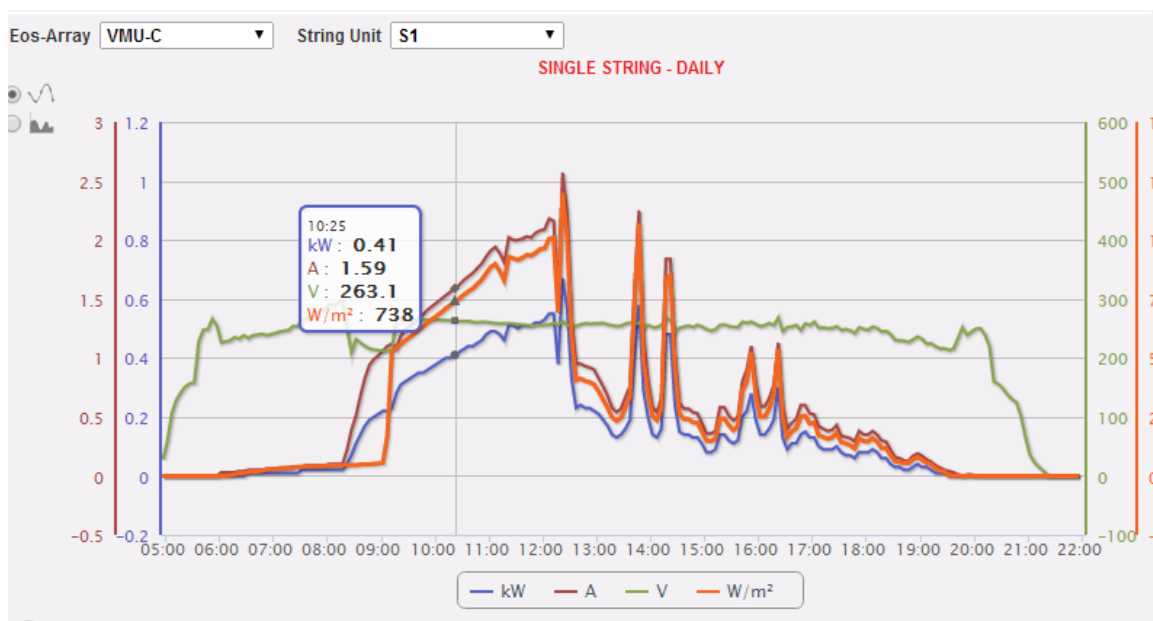
DC Power+Current+Voltage+Solar Irradiation

.

As already mentioned above, this type of chart allows to show or hide curves by clicking on the legend located at the bottom of the relevant axis.

To display another VMU-S among those available with the same criteria, click again "String Modules" and select the desired item from the VMU-S list. On the contrary, to change the electric dimension type, repeat the sequence starting from point 3.

- *Graphic mode selection*

To change the graphic display mode, use the relevant selection menu on top left side .
Area and bar keys are disabled if the search type does not allow for representation.

> *Note*: it is recommended to use "Line" or "Area" display for daily data and Bar display for monthly and yearly data.

- *Time distance between two following samples*

The time interval between a chart sample and the other one depends on storing time interval set up on VMU-C. It can account for 5,10,15,30,60 minutes.

- *Graphic display of value*

Place the mouse above the chart area to show the relevant frame showing the type of dimension, date it refers to, relevant value expressed in the measure unit shown on Y-axis.

- *Chart printing*

Clicking on the "*Print*" button located in the bottom right of the chart area you can specify which printer shall be used to print the chart .

7.4 EFFICIENCY

When you hover the mouse over "EFFICIENCY" the system will display a menu allowing to select the desired type among the following:

1. "TOTAL/ZONE":
2. "EOS-ARRAY"
3. "INVERTER"
4. "BOS"

Some charts might not be available in case some components are not configured in VMU-C; these include:
- temperature and solar irradiation
- the main energy meter
- Inverter
.
The following functions are common to all charts in "EFFICIENCY" section.

- *Graphic display of value*

  Place the mouse above the chart area to show the relevant frame showing the type of dimension, date it refers to, relevant value expressed in the measure unit shown on Y-axis.

- *Print chart*

  Clicking on the "*Print*" button located in the bottom right of the chart area you can specify which printer shall be used to print the chart

7.4.1 TOTAL EFFICIENCY

The total efficiency is the result derived from the ratio between a theoretical production value and the value which is really measured by AC production meter or inverters. The system uses the values from the meter or from the inverters according to the setting made in the plant configuration menu.

To calculate the theoretical production value, temperature and solar irradiation are necessary; **if these environmental sensors are not available, the total efficiency cannot be provided for.**

Note: temperature and solar irradiation sensors used to calculate total efficiency must be configured like reference sensors.

From the "EFFICIENCY" menu, click on the "TOTAL" item; the system will display the page shown below. As soon as you access this page, the chart shows total efficiency trend for the current day; select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.

The available graphs are:
- Total efficiency (for the whole plant)
- Single Zone efficiency (up to 15 zones)

Total efficiency

On left-hand top side of the chart, a selection menu exists for graphic display mode (Line or Area).

Note: The sampling frequency is fixed to 60 minutes and cannot be modified.

7.4.2 EOS-ARRAY EFFICIENCY - ALL STRINGS

String total efficiency derives from ratio between production technical value and direct current power value really measured by VMU-S string controls. To calculate theoretical production value, temperature and solar irradiation are necessary; **if these**

environmental sensors are not available, the string total efficiency cannot be provided for.

Note: temperature and solar irradiation sensors used to calculate total efficiency must be configured like reference sensors.

Note: String total efficiency calculated can exceed 100 under low solar irradiation condition, thus power delivered by modules. The value higher than 100 must be understood like an error due to measure resolution or solar irradiation sensor position.

From "EOS-ARRAY→EFFICIENCY" menu, click on "ALL STRINGS" item; the system will display the page shown below.
As soon as you access this page, the chart shows total efficiency trend for the current day; select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.

All Strings efficiency

In the top left of the chart there is a menu allowing to select the graphic display mode.

Note: The time interval between a chart sample and the other one depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

7.4.3 EOS-ARRAY EFFICIENCY - SINGLE STRING

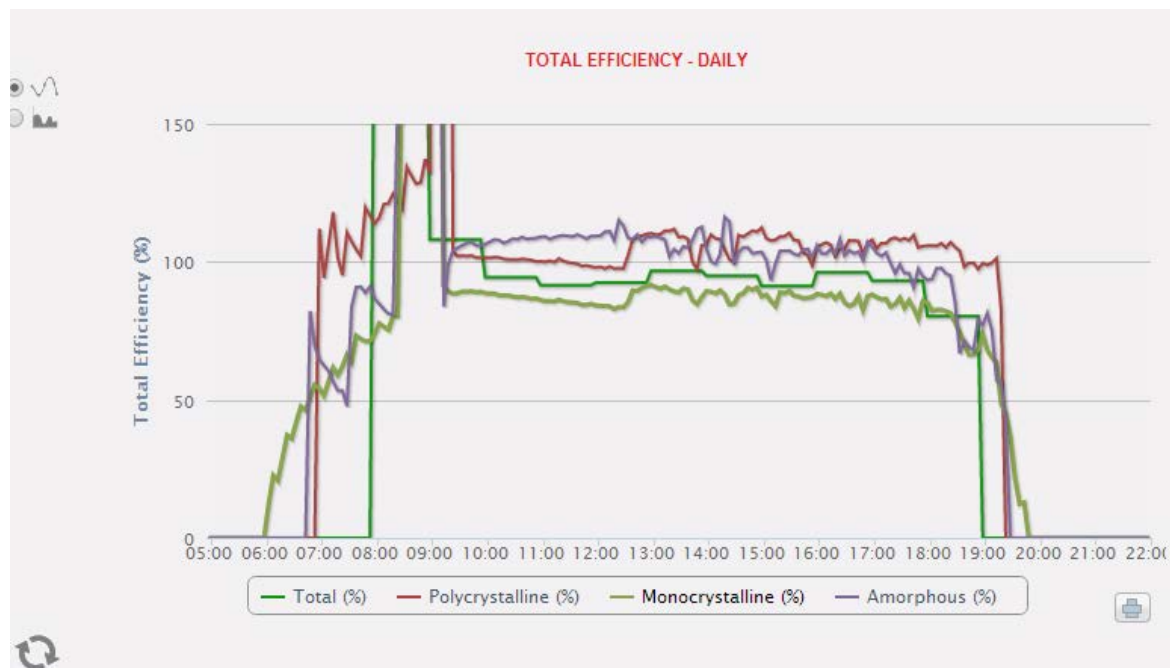The string efficiency derives from ratio between production technical value and direct current power value really measured by VMU-S string control selected. To calculate the theoretical production value, temperature and solar irradiation are necessary; **if these environmental sensors are not available, the string efficiency cannot be provided for.**

Note: temperature and solar irradiation sensors used to calculate total efficiency must be configured like reference sensors.

> *Note*: String total efficiency calculated can exceed 100 under low solar irradiation condition, thus low power delivered by modules. The value higher than 100 must be understood like an error due to measure resolution or solar irradiation sensor position.

From "EOS-ARRAY EFFICIENCY→" menu, click on "SINGLE STRING" item; the system will display the content shown below.

As you access the page, the chart display the efficiency curves of all the VMU-S string controls under the VMU-C (or under one of the VMU-M connected to it) selected in the EOS-ARRAY combo-box shown below; curves can be identified through the bottom legend. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
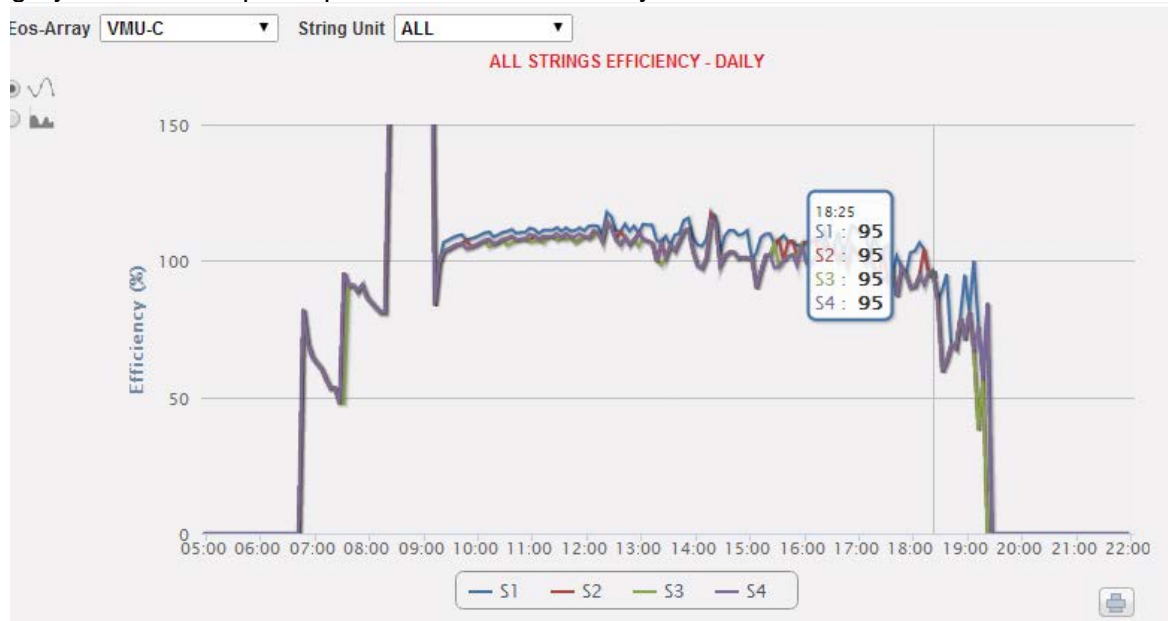
Single String Efficiency

This page consists of 3 sections:

To display the efficiency of a single string, follow the sequence below:

1. *Selection of the VMU-C or of the relevant VMU-M*

Through the special menu shown above (Top left position), you can select the VMU-C or one of the VMU-M connected to the VMU-C for which you wish to conduct a more in-depth analysis. VMU-M must be selected to identify all VMU-Ss under it, to be monitored and compared.

2. *Selection of date/month/year of display*

   Buttons to select the display interval are shown in Section A top side:

   - Daily: it shows the daily trend of VMU-S efficiency on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
   - Monthly: it shows the maximum efficiency of the selected VMU-S, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
   - Yearly: it shows the maximum efficiency of the chosen VMU-S, for every month of the selected year. (To choose the year use the special selection menu next to the field)

3. *Searching for the desired VMU-S*

   Through the controls available in **Section B** select the VMU-S module you are interested in.
   The list contains some numbers corresponding to the position of the VMU-S in the chain of the devices under the VMU-C or one of the VMU-M connected to it.
   Select the desired VMU-S → VMU-C will process the chart, which will be displayed on-screen after a few seconds.

   > *Note*: If the "VMU-S" list has no items, it means there is no VMU-S under the VMU-C or under one of the VMU-M connected to it.

4. *Select the desired graphic mode among the available ones: "Line, Area".*

   > *Note*: The chart is displayed automatically without having to click on the "Refresh Chart" button.

   If you wish to display another VMU-S among the available ones with the same criteria, click again on the "String module" menu and select the desired item in the VMU-S list.

7.4.4 INVERTER EFFICIENCY

The inverter efficiency **is not calculated by VMU-C**, but it's the VMU-C itself which expects **to receive this piece of data from the inverter**.

> *Note*: Should the efficiency data not be available by the Inverter in use, VMU-C will show a flat chart (with all the values set to "0").

From the "EFFICIENCY" menu, click on the "INVERTER" item; the system will display the content shown below.
As soon as you access this page, the chart shows the efficiency curve of the individual inverters for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
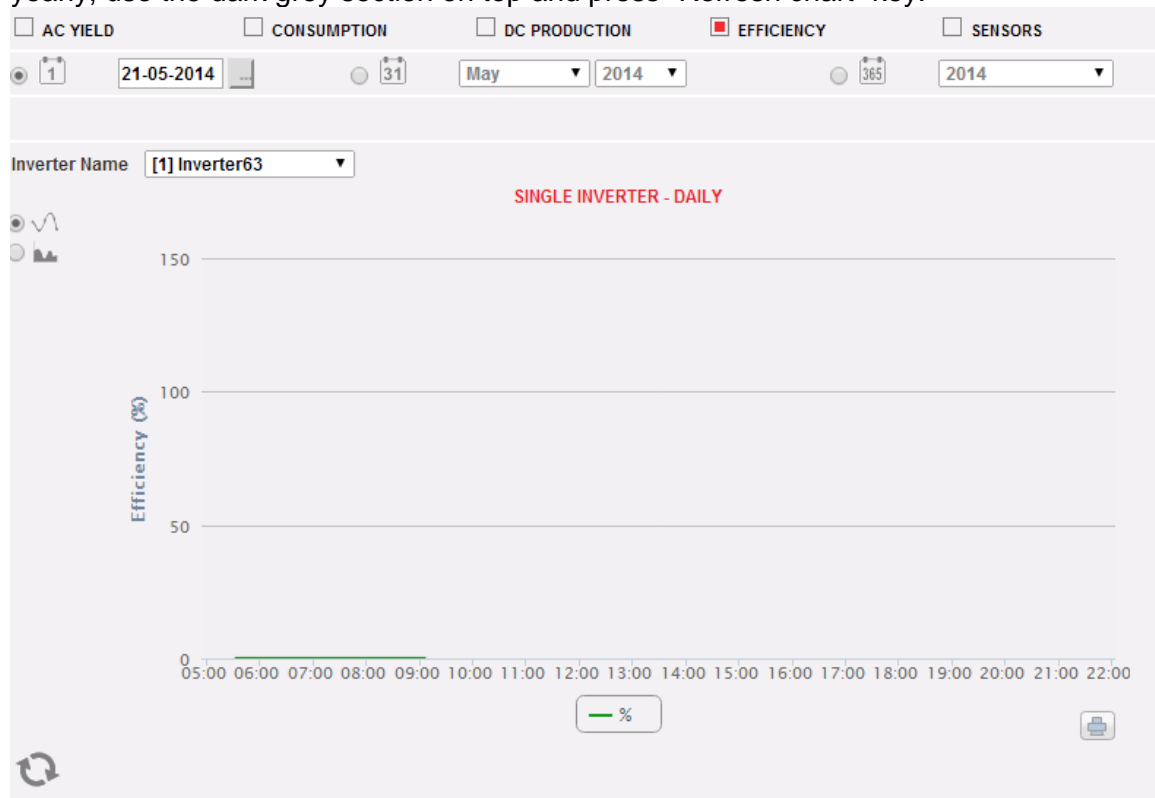
Inverter efficiency

In the top left (dotted area "A") of the chart there is a menu allowing to select the graphic display mode: display by *LINE* or by *AREA.*

> *Note*: The time interval between a chart sample and the other one depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

As you access the page, the chart displays the efficiency curves of all the inverters connected to the VMU-C. The curves can be identified through the bottom legend. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press the "Refresh chart" key .

VMU-C

To display the efficiency of a single inverter, follow the sequence below:

1. *INVERTER selection*

   Through the "**Inverter name**" menu ,you can select the individual Inverter whose efficiency you wish to analyse.

2. *Selection of date/month/year of display*

   To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.

   Buttons to select the display interval are in the top side:

   - Daily: it shows the daily trend of Inverter efficiency on the selected day. (To choose the day use the special calendar which can be accessed through the button next to the date field)
   - Monthly: it shows the maximum efficiency of the selected Inverter, for each day of the selected month. (To choose the month and year use the special selection menus next to the field)
   - Yearly: it shows the maximum efficiency of the chosen Inverter, for every month of the selected year. (To choose the year use the special selection menu next to the field)

   Note: if the "Inverter name" list is empty that means no inverter is configured in the VMU-C module.

3. *Select the desired graphic mode among the available ones: "Line, Area".*

   Note: The chart is displayed automatically without having to click on the "Refresh Chart" button.

   If you wish to display another Inverter among the available ones, click again on the "Inverter Name" menu and select the desired item from the list.

   Note: The time interval between a chart sample and the other one depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

7.4.5 BOS EFFICIENCY

BOS (Balance of System) efficiency is calculated as the ratio between:
- the AC energy measured by the reference energy meter
- and the total DC energy produced by the photovoltaic field measured by the VMU-S string controls;

the two energies are measured in the same time interval.
BOS efficiency cannot be calculated without a reference energy meter.

From the "EFFICIENCY" menu, click on the "BOS" item; the system will display the content shown below.
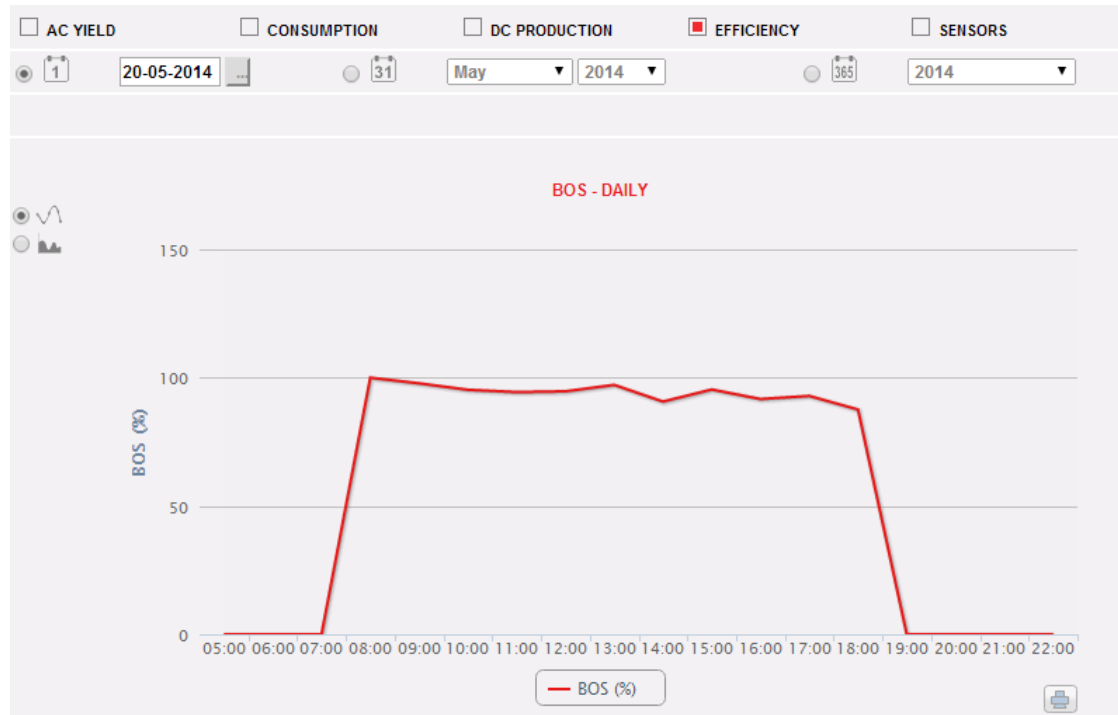
BOS efficiency

As soon as you access this page, the chart shows the BOS efficiency curve for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.

In the top left of the chart there is a menu allowing to select the graphic display mode.

Note: Interval between samples in "daily" view is 60 minutes.

7.5 ENVIRONMENTAL SENSORS

When you hover the mouse over the "SENSORS" item the system will display a menu allowing to select the desired sensor among the following:

1. "SOLAR IRRADIATION".
2. "AMBIENT TEMPERATURE".
3. "MODULE TEMPERATURES"
4. "WIND SPEED".
5. "OTHER TEMPERATURES"
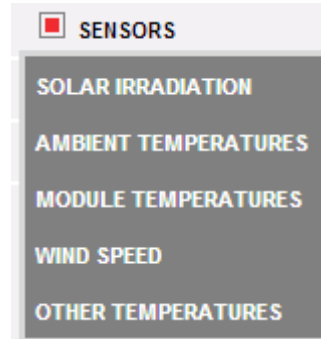
The following functions are common to all charts in "SENSORS" section.

- *Graphic display of value*

  Place the mouse above the chart area to show the relevant frame showing the type of dimension, date it refers to, relevant value expressed in the measure unit shown on Y-axis.

- *Print chart*

  Clicking on the "*Print*" button located in the bottom right of the chart area you can specify which printer shall be used to print the chart .

VMU-C

7.5.1 SOLAR IRRADIATION SENSORS

The curve is only available if at least one solar irradiation sensor exists. Otherwise, "SENSOR NOT AVAILABLE" message is displayed.

From the "SENSORS" menu click on the "SOLAR IRRADIATION" item; the system will display the content shown below.
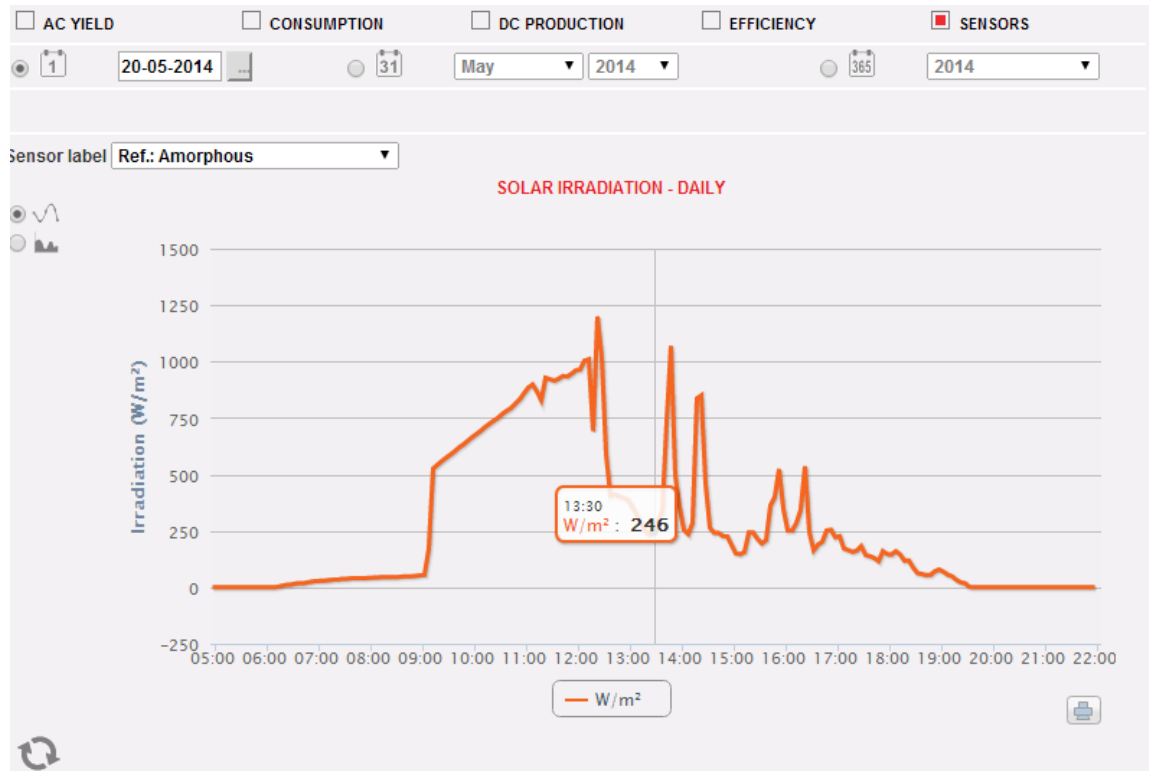
Solar irradiation sensor

As soon as you access this page, the chart shows the solar irradiation in W/m^2 as measured by reference sensor, for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
On left-hand top side of the chart, a selection menu exists for graphic display mode (Line or Area).

Note: The time interval between a chart sample and the other one in "daily" display mode depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

Should the plant include multiple solar irradiation sensors, use the combo-box **Sensor Label.**

7.5.2 AMBIENT TEMPERATURE

The curve is only available if at least one temperature sensor exists. Otherwise, "SENSOR NOT AVAILABLE" message is displayed.

From the "SENSORS" menu, click on the "AMBIENT TEMPERATURE" item; the system will display the content shown below.

Ambient temperature

As soon as you access this page, the chart shows the temperature in °C as measured by reference sensor, for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
On left-hand top side of the chart, a selection menu exists for graphic display mode (Line or Area).

> *Note*: The time interval between a chart sample and the other one in "daily" display mode depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

Should the plant include multiple temperature sensors, multiple curves will be displayed (with the chance for the user to disable them by the bottom-centre control)

7.5.3 MODULE TEMPERATURES

The curve is only available if at least one temperature sensor exists. Otherwise, "SENSOR NOT AVAILABLE" message is displayed.

From the "SENSORS" menu, click on the "MODULE TEMPERATURE" item; the system will display the content shown below.

Module temperature

As soon as you access this page, the chart shows the temperature in °C as measured by reference sensor, for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
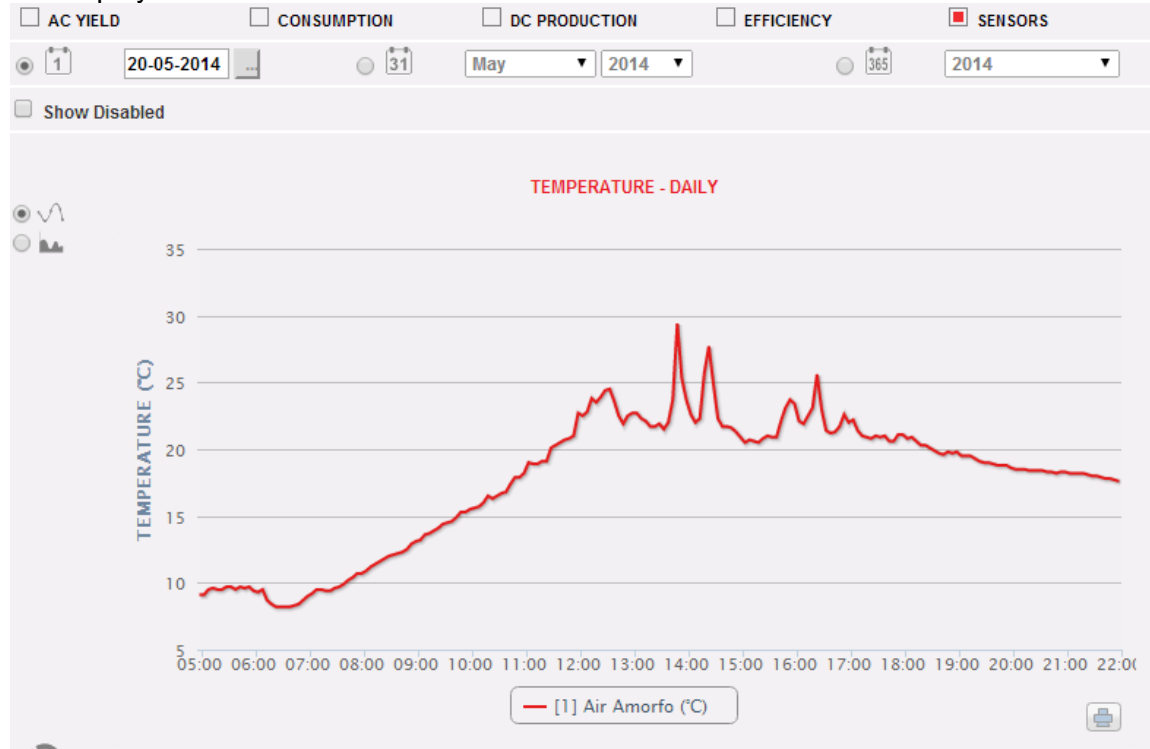On left-hand top side of the chart, a selection menu exists for graphic display mode (Line or Area).

Note: The time interval between a chart sample and the other one in "daily" display mode depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

Should the plant include multiple temperature sensors, multiple curves will be displayed (with the chance for the user to disable them by the bottom-centre control)

VMU–C

7.5.4 WIND SPEED SENSORS

The curve is only available if at least one wind speed sensor exists. Otherwise, "SENSOR NOT AVAILABLE" message is displayed.

From the "SENSORS" menu, click on the "WIND SPEED" item; the system will display the content shown below.
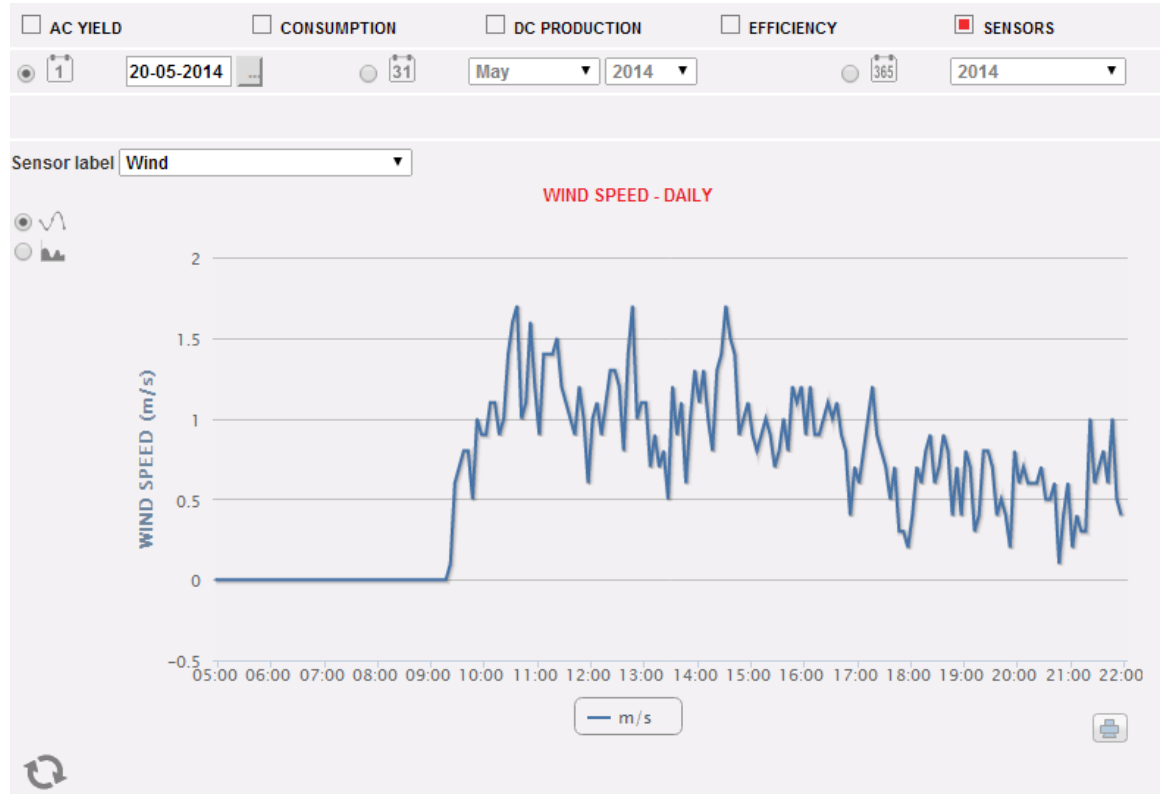
Wind Speed

As soon as you access this page, the chart shows the wind speed in m/s as measured by reference sensor, for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
In the top left of the chart there is a menu allowing to select the graphic display mode.

Note: The time interval between a chart sample and the other one in "daily" display mode depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

Should the plant include multiple wind speed sensors, use the selection menu **Sensor Label**.

7.5.5 OTHER TEMPERATURES

The curve is only available if at least one temperature sensor exists. Otherwise, "SENSOR NOT AVAILABLE" message is displayed.

From the "SENSORS" menu, click on the "OTHER TEMPERATURE" item; the system will display the content shown below.
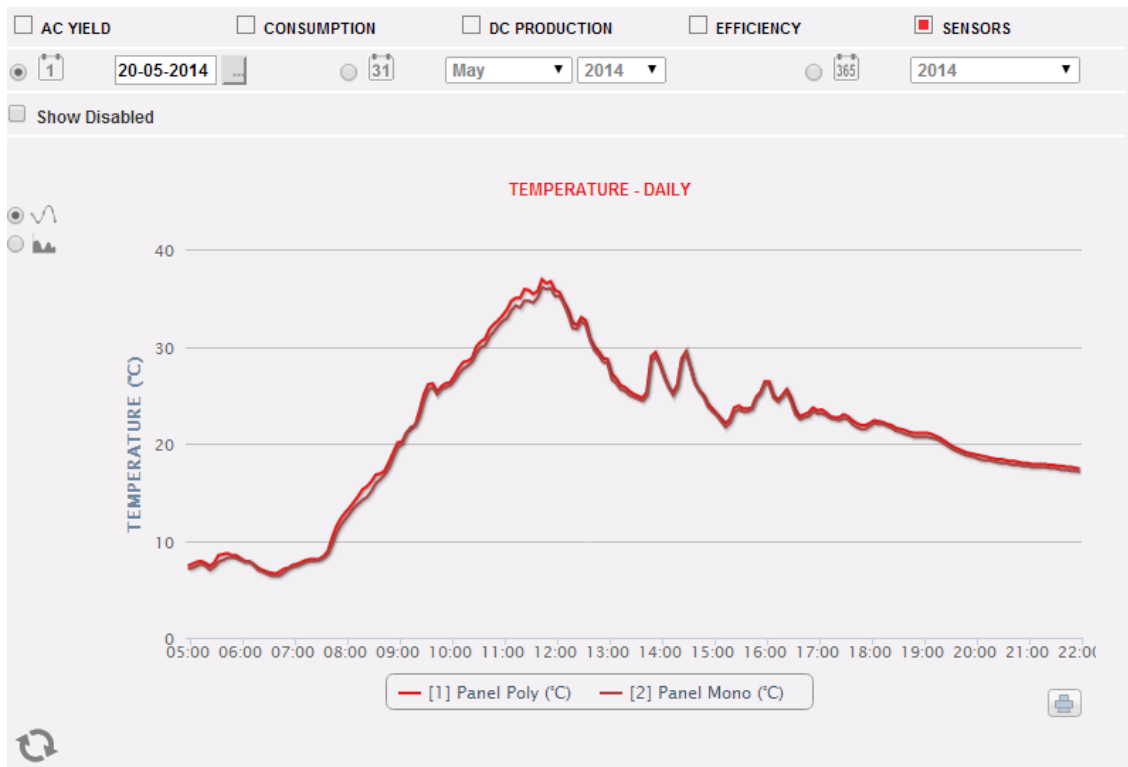
Other temperatures

As soon as you access this page, the chart shows the temperature in °C as measured by reference sensor, for the current day. To select another date or a time interval such as monthly or yearly, use the dark grey section on top and press "Refresh chart" key.
On left-hand top side of the chart, a selection menu exists for graphic display mode (Line or Area).
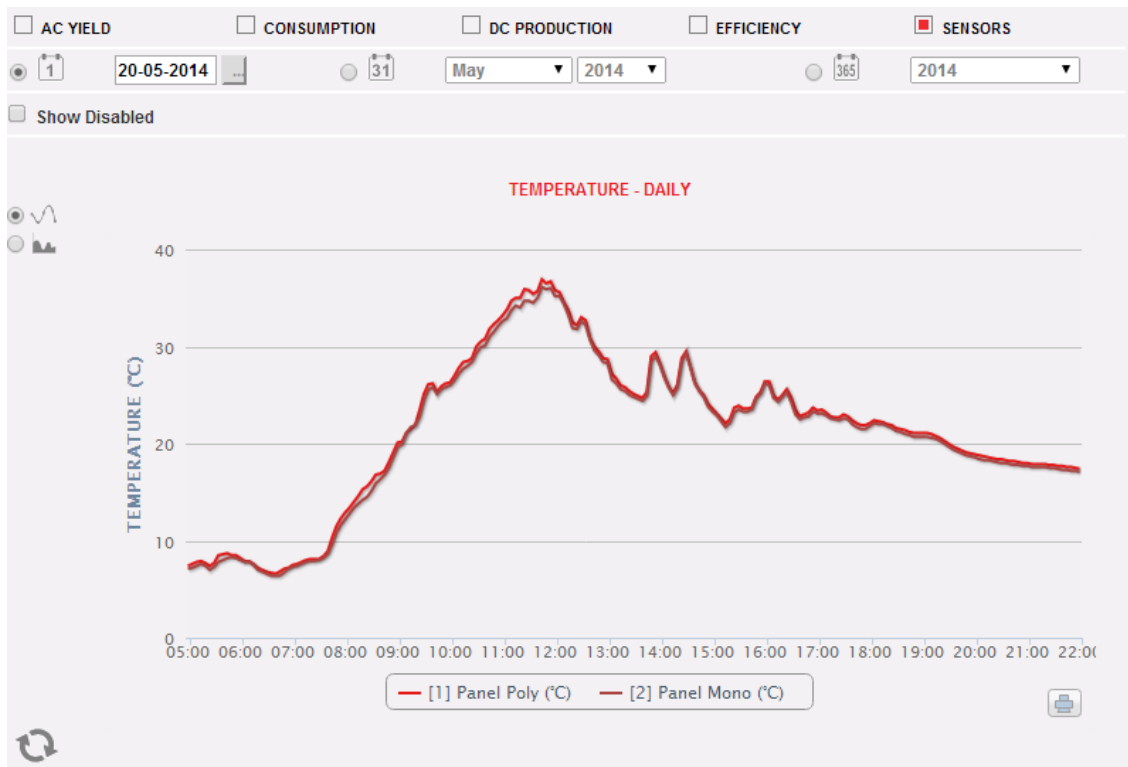
Note: The time interval between a chart sample and the other one in "daily" display mode depends on storing time interval set up on VMU-C. It can be: 5,10,15,30,60 minutes.

Should the plant include multiple temperature sensors, multiple curves will be displayed (with the chance for the user to disable them by the bottom-centre control)

8 ALARMS

This section is dedicated to alarm management and display occurred on a system. Click on "Alarms" icon in the Navigation menu to access the content shown below .

ID	Message	Description	Module	Start Date	Start Time	End Date	End Time	Zone	Hide
5247	Power On	String-Box1	VMU-C	19-05-2014	01:52:01 PM			Amorphous	☐
5246	Power Off	String-Box1	VMU-C	19-05-2014	01:51:26 PM			Amorphous	☐
5243	Power On	String-Box3	VMU-M	19-05-2014	01:51:30 PM			Monocrystalline	☐
5242	Power On	String-Box2	VMU-M	19-05-2014	01:51:30 PM			Polycrystalline	☐
5241	Power Off	String-Box3	VMU-M	19-05-2014	01:51:25 PM			Monocrystalline	☐
5240	Power Off	String-Box2	VMU-M	19-05-2014	01:51:25 PM			Polycrystalline	☐
4144	Power On	String-Box1	VMU-C	22-04-2014	08:49:14 AM			Amorphous	☐
4143	Power Off	String-Box1	VMU-C	22-04-2014	08:48:46 AM			Amorphous	☐
4140	Power On	String-Box3	VMU-M	22-04-2014	08:48:53 AM			Monocrystalline	☐
4139	Power On	String-Box2	VMU-M	22-04-2014	08:48:53 AM			Polycrystalline	☐
4138	Power Off	String-Box3	VMU-M	22-04-2014	08:48:47 AM			Monocrystalline	☐
4137	Power Off	String-Box2	VMU-M	22-04-2014	08:48:48 AM			Polycrystalline	☐
4075	Power On	String-Box1	VMU-C	11-04-2014	08:31:02 AM			Amorphous	☐
4074	Power Off	String-Box1	VMU-C	11-04-2014	08:30:35 AM			Amorphous	☐
4071	Power On	String-Box3	VMU-M	11-04-2014	08:30:43 AM			Monocrystalline	☐
4070	Power On	String-Box2	VMU-M	11-04-2014	08:30:43 AM			Polycrystalline	☐

Alarms

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

> *Note*: alarm classification cannot be changed by user.

Alarms are divided into four categories, each one with a different colour assigned.

☑ Alarms	All problems provoking lack of energy production to the system or indicating a serious malfunction on devices monitored are classified like "Alarms".
☑ Anomalies	All statuses arising from devices controlled and warning improper operation are classified like "Warning". They can be a problem in short/medium/long period. The analysis of the notified abnormality is the responsibility of the user.
☑ Events	All status changes in digital inputs and outputs on Eos-Array are classified as "Event".
☑ Commands	All parameter changing operations performed inside Eos-Array through Eos-Array Soft are classified as "Command".
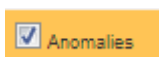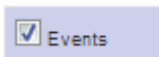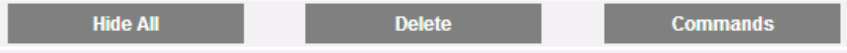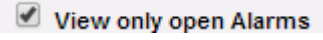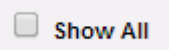
The following controls are available:

Alerts filter To filter the desired subset of alerts	☑ Alarms ☑ Anomalies ☑ Events ☑ Commands
Buttons bar Allowing to : -HIDE ALL: to apply the HIDE check to all the alarms -DELETE: to delete all the alarms -COMMANDS: to open the COMMANDS page (see the further section)	Hide All Delete Commands
View only open alarms check To include only open alarms in the list	☑ View only open Alarms
Show All check To view all the alarms including the hidden ones	☐ Show All

- *Fields of Alarms table*

    The Alarms table shows the following fields:

    1. "*ID*": Event identification number (Alarm or Abnormality or Event or Command). This meter is only reset when all existing messages have been deleted.
    2. "Message": Alarm description.
    3. "Description": Name/Label assigned to the device during configuration.
    4. "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 Eos-Array chain.
    5. "*Start date*": Date when alarm occurred.
    6. "*Start time*": Time when alarm occurred.
    7. "*End date*": Date when alarm finished. If alarm still exists, the field is blank.
    8. "*End time*": Time when alarm has finished. If alarm still exists, the field is blank.
    9. "*Zone*": Indication of the alarm source area (if specified).
    10. "Hide": If flagged, the alarm line will be automatically hidden.

    > *Note*: To view all alarms, including the hidden ones, check "Show all" on top right side. If selected, a hidden alarm can be viewed again by simply removing the relevant check from "Hide".

8.1 COMMANDS

PLANT SETUP - COMMANDS

All Outputs Test   [ON] [OFF]

Commands setup

The COMMANDS setup page is opened by the relevant PUSH button in the Alarms section.
By this page it is possible to change explicitly the ON or OFF status of the relevant output configured in the VMU-O module (see the relevant instructions in the Configuration Wizard section)

9 ECONOMY

This section is dedicated to the economic analysis of photovoltaic system. Economic of sold and saved energy are calculated, together with any incentives. Click on "Economy" icon in the Navigation menu to access the content shown below.
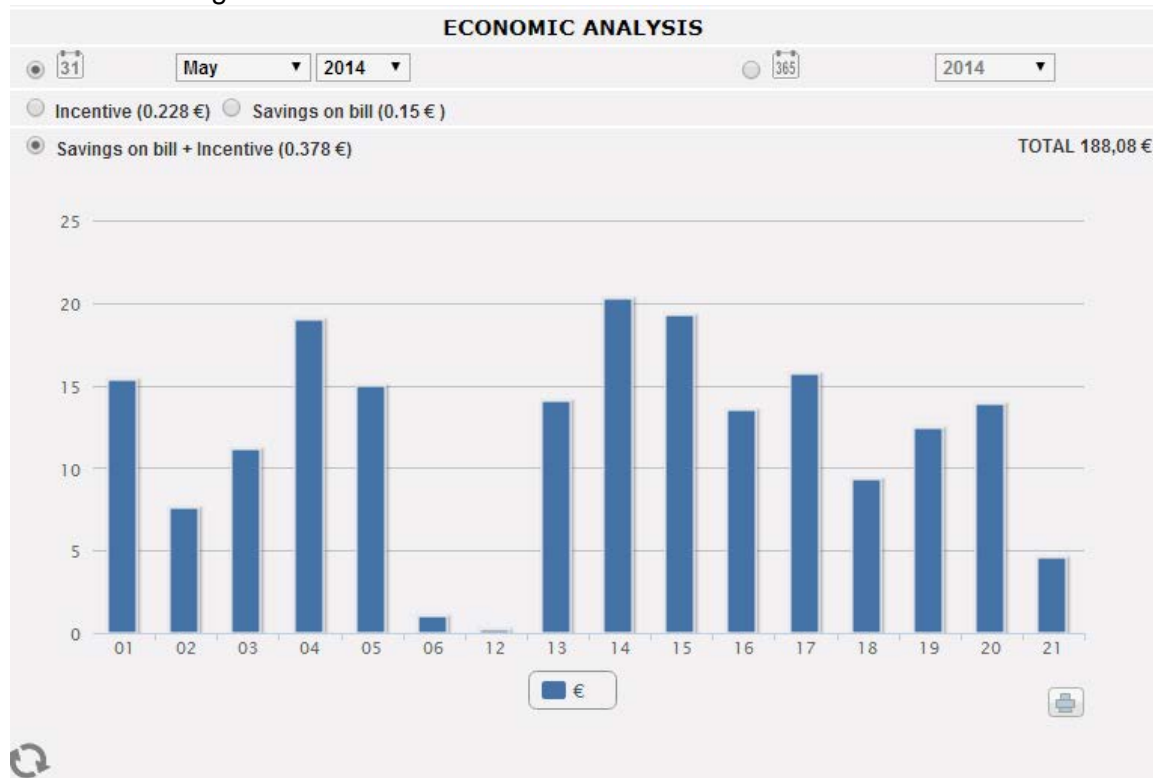
Economy

As soon as you access this page, the chart shows the total amount in Euro ("Saving on bill +Incentive") for all days of the current month. To select another month or a yearly time interval, use the dark grey section on top and press "Refresh chart" key.
The available selections , depend on the settings you made during configuration in the "Economic Data" section.

If during configuration you set "**Self-consumption**" as plant type, available items will be:

1. "*Incentive (…€)*": Click on "*Incentive*" to automatically view the chart with the amounts obtained from incentives. Values specified are calculated and stored by the system every day at 11:59 p.m., considering the amount paid for each kWh (set up in "Economic data" section in system data configuration and total value of energy produced during the day in kWh.

2. *Savings on bill (… €)*": Click to automatically view the chart with the amounts obtained from energy not purchased but self-produced. Values specified are calculated and stored by the system every day at 11:59 p.m., considering the "Price per kWh of energy purchased", set up in "Economic data" and total value of energy produced during the day in kWh.

3. *Savings on bill + Incentive (… €)*": Click to automatically view the chart with amounts resulting from the sum of Incentive and Savings on bill described in paragraphs 1 and 2.

If during configuration you selected "**Sale**" as a plant type, the available selection buttons will be the same as those of the self-consumption scheme, plus the following:

1. "*Sold energy (.. €)*": Click to automatically view the chart with the amounts obtained from energy sales. Values specified are calculated and stored by the system every day at 11:59 p.m., considering the "AMOUNT paid for each kWh sold", set up in "Economic data" and total value of energy produced during the day in kWh.

2. *Sold en. (..€) + Incentive*": Click to automatically view the chart with the amounts resulting from the sum of incentive and energy sold described in the above paragraphs.

On top right side (green dotted area), the total value (in €) of selection set up is given, as paid/saved in the selected month/year.

If the time interval selected is "Yearly" type, values shown are calculated at the end of each month like the addition of all relevant daily values.

Note: Total daily energy produced (kWh) is considered in calculations. Data can come from the reference external energy meter or from the Inverters, if no energy meter exists.

Note: Each time configuration of economic parameter is changed, amounts are recalculated from scratch.

---

10 INFORMATION

This section shows the data and characteristics of the monitored photovoltaic system. Click on the "Information" icon in the Navigation menu to access the content shown below.

Information page

There are 2 sub-selections available from the information page:
1. VMU-C Status
2. Plant characteristics

10.1 VMU-C STATUS

By this page it is possible to check in real time the main configuration settings relevant to the VMU-C device.

VMU-C STATUS	PLANT CHARACTERISTICS

VMU-C STATUS

VMU-C SERIAL NUMBER : BL3080002001U
MAC ADDRESS : 00-19-EE-10-00-37
FIRMWARE VERSION : NEWG_PUSH_A14_A32

CONNECTED VMU-M : 2
CONNECTED INVERTERS : 2
CONNECTED AC METERS : 1

ETHERNET STATUS :
MODEM STATUS :
SERVER SYNC STATUS :

VMU-C Status

Parameter	Description
VMU-C Serial Number	It is the unique S/N of the VMU-C
MAC Address	It is the unique MAC address of the VMU-C's Ethernet port
Firmware version	The present firmware version in use in the VMU-C
Connected VMU-M	The connected VMU-M's count (on COM1)
Connected Inverters	The connected Inverter's count (on COM1)
Connected AC Meters	The connected Energy Meters' count (on COM1)
Ethernet Status	The Ethernet status (RED in the case of issues)
Modem Status	The VMU-W modem status (RED in the case of issues)
Server Sync Status	The status of data synchronization with the remote Eos-Server or VMU-Y in the case one of those systems is in use (RED in the case of issues)

10.2 PLANT CHARACTERISTICS

By this page it is possible to check in real time the main configuration settings relevant to the PV installation.

VMU-C STATUS			■ PLANT CHARACTERISTICS	
PLANT CHARACTERISTICS				
Plant Name	VMU-C 115			
Plant Location	Ponte nelle Alpi (BL) ITALIA			
Plant Property	Carlo Gavazzi S.p.A.			
Installer	Carlo Gavazzi S.p.A.			
PV Modules Installation Date	01-12-2011		VMU-C Installation Date	01-12-2011
Technical Data			**Financial Highlights**	
Plant Type	FIXED		Feed-in Tariff :	OWN
PV Modules Total area	70.8 m²		Incentive	0.228 €/kWh
Number of Inverters	3		Cost	0.15 €/kWh
Number of Strings	8		% Sold Energy	%
Peak power of Plant	8.88 kW		Sale	€/kWh

Monthly Planned Yield index (kWh/kWp)					
January	45.0	May	90.0	September	110.0
February	60.0	June	100.0	October	100.0
March	70.0	July	110.0	November	80.0
April	80.0	August	120.0	December	40.0
Annual Yeld Corrective Factor: 5.0 %			Yearly Expected Yield: 904.5 kWh/kWp		

Plant characteristics

This page consists of four sections:

1. *Description*": Plant characteristics are specified here.
2. *Technical data*": Technical data of photovoltaic plant is specified here.
3. *Financial highlights*": Economic values are specified here.
4. "*Monthly Planned Yield Index (kWh/kWp)*":   It indicates the expected monthly production index for the current year. This calculation takes into account the ""*Annual Yield Corrective Factor*" index set in the configuration page. The "*Yearly expected yield*" line also includes the value resulting from the sum of the production index of each individual month.

11 DATA EXPORT

This section allows to export the data stored in VMU-C in xls format.
Click on the "Export" icon in the Navigation menu to access the content shown below.

EXPORT DATA

Time Period

○ Interval   21-05-2014 [...] ▸ 21-05-2014 [...]

◉ Monthly   May ▼   2014 ▼

○ Yearly   2014 ▼

◉ ALARMS

○ EOS-ARRAY   String-Box1 ▼

○ TEMPERATURE

○ SOLAR IRRADIATION

○ WIND SPEED

○ INVERTERS   All ▼

○ ENERGY METER   All ▼

Export Data

Export page

In this area, the type of data to be exported and the relevant period can be chosen.
Generate file by pressing the "*Export data*" button.
The generate Excel® compliant file can be open or saved on one's own PC.

You can export the following data types:

- **Alarms**: A .XLS file is generated, containing the chronology of all alarms occurred in the system and organized according to the same graphic layout as "Alarms" web section. The saved file name will be of the following type: "ALARMS_dd_mm_yyyy.xls"

- **Eos-Array**: This selection allows to export the electric values acquired by string control(s) of all VMU-S units in a specific Eos-Array managed directly by the VMU-C or by one VMU-M selected through the relevant combo-box control.

  Data export for all VMU-S string controls under the VMU-C or a specific VMU-M

  The generated Xls file contains the values of all VMU-S under the VMU-C or the selected VMU, divided by electric dimension type. The first two columns show date and time, followed by groups of "n" columns containing Power (kW), Energy (kWh), Efficiency(%). Select the address of the desired VMU-M or VMU-C by the combo-box
  As far as the exported file is concerned: the number following the VMU-M_" indication specifies the RS-485 address assigned to the VMU-M' during programming. The saved file name will be of the following type: "VMU-

M_dd_mm_yyyy.xls" Click on "Export data". xls file is generated containing data of the selected day .

EOS-ARRAY : String-Box1 (modbus 1)

Date	Power VMU-S 1 (kW)	Power VMU-S 2 (kW)	Power VMU-S 3 (kW)	Power VMU-S 4 (kW)	Energy VMU-S 1 (kWh)	Energy VMU-S 2 (kWh)	En
01/05/2014	55,858	54,85	53,363	53,579	1340,6	1316,4	
02/05/2014	55,917	54,908	53,421	53,638	1342	1317,8	
03/05/2014	56,008	54,996	53,508	53,725	1344,2	1319,9	
04/05/2014	56,163	55,146	53,658	53,875	1347,9	1323,5	
05/05/2014	56,283	55,263	53,775	53,988	1350,8	1326,3	
06/05/2014	56,304	55,279	53,783	54	1351,3	1326,7	
07/05/2014	56,308	55,279	53,783	54	1351,4	1326,7	
08/05/2014	56,321	55,283	53,783	54	1351,7	1326,8	
09/05/2014	56,333	55,288	53,783	54	1352	1326,9	
10/05/2014	56,346	55,292	53,783	54	1352,3	1327	
11/05/2014	56,35	55,292	53,783	54	1352,4	1327	
11/05/2014	56,35	55,292	53,783	54	1352,4	1327	
12/05/2014	56,363	55,296	53,783	54	1352,7	1327,1	
12/05/2014	56,362	55,296	53,783	54	1352,7	1327,1	
13/05/2014	56,475	55,404	53,896	54,112	1355,4	1329,7	
14/05/2014	56,638	55,563	54,054	54,271	1359,3	1333,5	
15/05/2014	56,792	55,717	54,204	54,421	1363	1337,2	
16/05/2014	56,9	55,821	54,308	54,525	1365,6	1339,7	
17/05/2014	57,029	55,942	54,429	54,646	1368,7	1342,6	
18/05/2014	57,104	56,017	54,504	54,721	1370,5	1344,4	
19/05/2014	57,204	56,113	54,6	54,817	1372,9	1346,7	
20/05/2014	57,317	56,221	54,708	54,925	1375,6	1349,3	

Eos-Array data export

- "*Temperature*": The selection allows to export the temperature values of all the sensors configured as active ("Enable") in VMU-C. The generated XLS file will contain two columns specifying the date and time, followed by as many columns as the number of the temperature sensors .

Date	Time	TEMPERATURE VMU-P (String-Box2) T1 °C	TEMPERATURE VMU-P (String-Box3) T1 °C	TEMPERATURE VMU-P (String-Box1) T1 °C	TEMPERATURE VMU-P (String-Box2) T2 °C	TEMPERATURE VMU-P (String-Box3) T2 °C	TEMPERATURE VMU-P (String-Box1) T2 °C
21/05/2014	00:00:00	15,9	15,6	---	---	---	16,6
21/05/2014	00:05:00	16	15,7	---	---	---	16,7
21/05/2014	00:10:00	16,1	15,8	---	---	---	16,7
21/05/2014	00:15:00	16,1	15,8	---	---	---	16,7
21/05/2014	00:20:00	16,2	15,8	---	---	---	16,7
21/05/2014	00:25:00	16,1	15,8	---	---	---	16,6
21/05/2014	00:30:00	16	15,7	---	---	---	16,6
21/05/2014	00:35:00	16	15,7	---	---	---	16,3
21/05/2014	00:40:00	16	15,7	---	---	---	16,2
21/05/2014	00:45:00	16	15,6	---	---	---	16.1

Temperature export

- "*Solar irradiation*": The selection allows to export the solar irradiation values of all the sensors configured in VMU-C. The generated XLS file will contain two columns specifying the date and time, followed by as many columns as the number of the solar irradiation sensors, each containing the relevant values in W*m^2 .

Date	Time	VMU-P (String-Box2) Solar Irradiation W/m²	VMU-P (String-Box3) Solar Irradiation W/m²	VMU-P (String-Box1) Solar Irradiation W/m²
21/05/2014	00:00:00	0	11	0
21/05/2014	00:05:00	0	11	0
21/05/2014	00:10:00	0	11	0
21/05/2014	00:15:00	0	11	0
21/05/2014	00:20:00	0	11	0
21/05/2014	00:25:00	0	11	0
21/05/2014	00:30:00	0	11	0
21/05/2014	00:35:00	0	11	0
21/05/2014	00:40:00	0	11	0
21/05/2014	00:45:00	0	11	0
21/05/2014	00:50:00	0	11	0
21/05/2014	00:55:00	0	11	0
21/05/2014	01:00:00	0	10	0

Solar irradiance export

- "*Wind speed*": The selection allows to export the wind speed values of all the sensors configured in VMU-C. The generated xls file will contain two columns specifying the date and time, followed by as many columns as the number of the wind speed sensors, each containing the relevant values in m/s .

Date	Time	VMU-P (String-Box2) Wind Speed m/s	VMU-P (String-Box3) Wind Speed m/s	VMU-P (String-Box1) Wind Speed m/s
21/05/2014	00:00:00	0,1	---	---
21/05/2014	00:05:00	0,5	---	---
21/05/2014	00:10:00	0,4	---	---
21/05/2014	00:15:00	0	---	---
21/05/2014	00:20:00	0,1	---	---
21/05/2014	00:25:00	0	---	---
21/05/2014	00:30:00	0	---	---
21/05/2014	00:35:00	0	---	---

Wind speed export

- "***Inverters***": The selection allows to export the electric values acquired by the Inverters monitored by VMU-C. The generated XLS file contains the values divided by electric dimension type. The first two columns show date and time, followed by groups of "n" columns (equivalent to the number of inverters) containing all the electric dimensions made available by the inverters themselves. There are 3 types of selection available by the combo box on the right:

Selection	Description
ALL	It extracts: AC ENERGY AC POWER AC VOLTAGE DC POWER DC ENERGY EFFICIENCY For each inverter connected to VMU-C (it includes disabled inverters in the case the user needs historical data from them)
ALL ENABLED	It extracts: AC ENERGY AC POWER AC VOLTAGE DC POWER DC ENERGY EFFICIENCY For each ENABLED inverter connected to VMU-C
SINGLE INVERTER (LABEL)	It extracts: AC ENERGY AC POWER VLNSYS VL1N VL2N VL3N VLLSYS VL1L2 VL2L3 VL3L1 AL1 AL2 AL3 KWL1 KWL2 KWL3

		DC KWh DC KW DC VOLTAGE DC CURRENT EFFICIENCY For the selected inverter (Note: only variables available by the inverter can be extracted)		

Date	Time	Inverter192 (kWh)	Inverter192 (kWsys)	Inverter192 (Vlnsys)	Inverter192 (Vl1n)
21/05/2014	05:25:00	8237,9	0	0	0
21/05/2014	05:30:00	8237,9	0	0	0
21/05/2014	05:35:00	8237,9	0	0	0
21/05/2014	05:40:00	8237,9	0	0	0
21/05/2014	05:45:00	8237,9	0	11,305	0
21/05/2014	05:50:00	8237,9	0	91,094	0
21/05/2014	05:55:00	8237,9	0	217,431	0
21/05/2014	06:00:00	8237,9	0	231,022	0
21/05/2014	06:05:00	8237,9	0,005	231,906	0
21/05/2014	06:10:00	8237,9	0,018	232,678	0
21/05/2014	06:15:00	8237,9	0,022	232,533	0
21/05/2014	06:20:00	8237,9	0,026	232,749	0
21/05/2014	06:25:00	8237,9	0,04	234,08	0
21/05/2014	06:30:00	8237,9	0,052	234,294	0
21/05/2014	06:35:00	8237,9	0,059	234,544	0
21/05/2014	06:40:00	8237,9	0,079	233,893	0
21/05/2014	06:45:00	8237,9	0,11	234,089	0

Inverter Data Export

- "***Meters***": The selection allows to export the progressive energy values counted by all the meters configured in VMU-C. The generated XLS file will contain two columns specifying the date and time, followed by as many columns as the number of the monitored meters, containing the relevant values .
- There are 3 types of selection available by the combo box on the right:

| Selection	Description
ALL	It extracts: AC ENERGY AC POWER For each Energy meter connected to VMU-C (it includes disabled meters in the case the user needs historical data from them)
ALL ENABLED	It extracts: AC ENERGY AC POWER For each ENABLED Energy meter connected to VMU-C
SINGLE INVERTER (LABEL)	It extracts: AC ENERGY AC POWER VLNSYS VL1N VL2N VL3N VLLSYS VL1L2 VL2L3 VL3L1 AL1

	AL2 AL3 KWL1 KWL2 KWL3 For the selected energy meter (Note: only variables available by the energy meter can be extracted)

Date	Time	AC Energy Meter E_EM24_Driver_100 (kWh)	AC Energy Meter E_EM24_Driver_100 (kWsys)	AC Energy Meter EM_VIRTUAL_NET (kWh)	AC Energy Meter (kV
21/05/2014	00:00:00	20789,4	0,003	---	
21/05/2014	00:05:00	20789,4	0,003	---	
21/05/2014	00:10:00	20789,4	0,003	---	
21/05/2014	00:15:00	20789,4	0,003	---	
21/05/2014	00:20:00	20789,4	0,003	---	
21/05/2014	00:25:00	20789,4	0,003	---	
21/05/2014	00:30:00	20789,4	0,002	---	
21/05/2014	00:35:00	20789,4	0,003	---	
21/05/2014	00:40:00	20789,4	0,003	---	
21/05/2014	00:45:00	20789,4	0,003	---	
21/05/2014	00:50:00	20789,4	0,003	---	
21/05/2014	00:55:00	20789,4	0,002	---	
21/05/2014	01:00:00	20789,4	0,002	---	
21/05/2014	01:05:00	20789,4	0,002	---	
21/05/2014	01:10:00	20789,4	0,002	---	
21/05/2014	01:15:00	20789,4	0,002	---	

Energy meter Data Export

12 ACCOUNT

Clicking on the "Account" icon in the Navigation menu will grant access to the Account Configuration section allowing to manage users' access to the system.
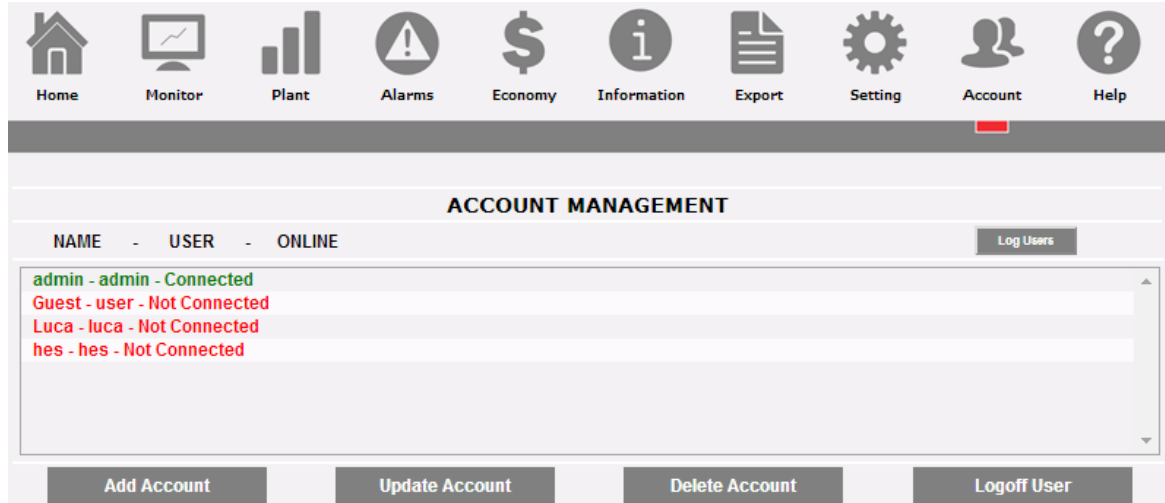
Account Menu

12.1 ACCOUNT MANAGEMENT

System accesses are managed by creating two user types with different privileges.

A. "*Administrator*" type user – Administrator user has access to all software areas: System configuration, Account configuration, Data display.

B. "*User*" type user – "User" user has only access to Data display area.

The system has a default Administrator type, with these characteristics:

Username	Password	Username
admin	admin	Administrator

It is recommended to modify the default user during the first configuration.

Note: An Administrator type user must always exist in the system, otherwise access to System configuration and Account configuration areas is not allowed any more. To restore Administrator user, in the case of misconfiguration, contact Carlo Gavazzi technical assistance.

To know which users are now online, and see the user access LOG, just push the "LOG USERS" button. Logged-in users are shown in green and are marked with "Logged-in"; other users are shown in red and are marked with "Not logged-in".

12.2 NEW ACCOUNT INSERTION

Press the "*Add account*" button. In the bottom section of the page the system will display the content shown below.

ADD ACCOUNT

NAME	
Username	
Password	
LEVEL	User ▼

Add	Reset	Cancel

ADD ACCOUNT

Fill in the fields according to the following specifications:

- "*Name*": Username.

  Note: It is recommended to never assign the same "Name" to two different users.

- "*USERNAME*": Username for system access.

  Note: Two users with the same "Username" cannot be entered.

- "*PASSWORD*": Password for system access.

- "*LEVEL*": User level: User/Administrator.

Press "Reset" key to delete the contents of various fields; "Cancel" to cancel operation. Press "Add" key to enter account and add it to the list.

12.3 UPDATE ACCOUNT

Select the account to be modified from the Inserted accounts list. Press the "*Update*" button. In the bottom section of the page the system will display the content shown below.

UPDATE ACCOUNT

NAME	Guest
Username	user
Password	••••
LEVEL	User ▼

Save	Reset	Cancel

Update Account

Changes follow rules described in the ADD section and considering that Username field cannot be changed. Press the "Reset" button to cancel the modifications; "Cancel" to cancel the operation. Press the "Update" button to modify the account.

12.4 ACCOUNT DELETION

Select the account to be deleted from the list . Press the "*Delete account*" button. The confirmation message appears on the centre of the page. Press "OK" key to confirm deletion or "Cancel operation" to cancel.

12.5 ACCOUNT LOG-OFF

The administrator user can disconnect a user in the list by a forced log-off operation. Each connected user is displayed in green in the list with the "Connected" status aside. Select the account to be disconnected from the list . Press the "*User Log-off*" button. All the users connected with that Username are disconnected and re-addressed to the home page.

12.6 VMU-C ACCESSES LOG

Clicking on the "Log Users" button will open a window containing the chronology of the accesses to VMU-C complete with date and time . Lines in green show the users presently online.

User	Logged	IP	Last Login
admin	Connected	192.168.3.104	21-05-2014
admin	Connected	88.32.230.180	21-05-2014
admin	Not Connected	88.32.230.180	21-05-2014
admin	Not Connected	88.32.230.180	21-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	20-05-2014
admin	Not Connected	88.32.230.180	19-05-2014
admin	Not Connected	88.32.230.180	19-05-2014
admin	Not Connected	192.168.3.76	19-05-2014
admin	Not Connected	192.168.3.75	19-05-2014

Access LOG

The chronology keeps access data for a week; date and time refer to login phase.

Click on the logged IP address to have information about the connecting IP.

13 BACK-UP OF DATA

- *Data backup on external memory (optional)*

  With the help of a "Micro SD" or "SDHC" memory card appropriately inserted into the relevant slot or directly using a PenDrive connected to the USB port, it is possible to backup the data stored in the VMU-C database.

  > *Note*: **the backup Micro SD card is not included in VMU-C. the maximum capacity of the Micro SD card or of the PenDrive is of 16GB.**

  - *Micro SD installation*

    1. Open the flap located on the VMU-C front panel. Identify the slot specifically designed for the insertion of the "Micro SD" memory cards
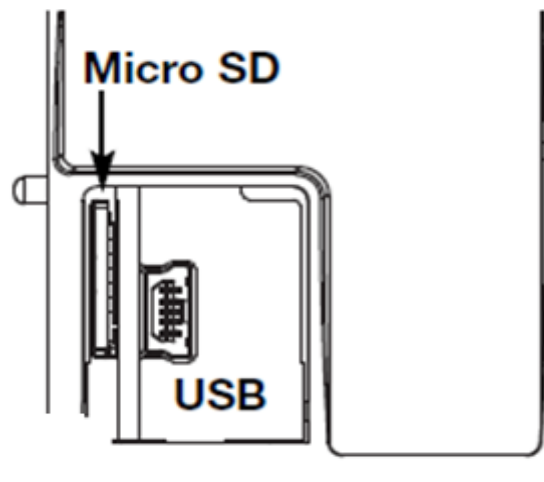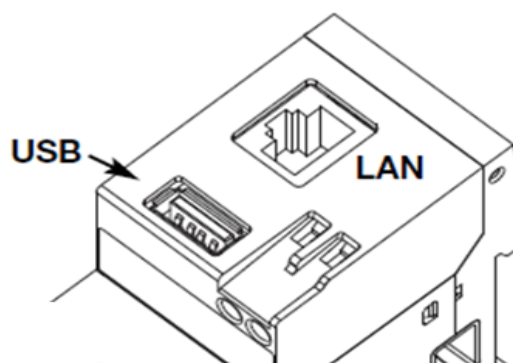

    Slot for Micro SD cards

    2. Insert the Micro SD card, making sure it is not write-protected and it is properly formatted (FAT32).

    3. Close the flap back. Warning: if the flap is not properly closed VMU-C will not enable any writing or reading operation (flap closing is controlled by a micro switch located under the flap.

    4. As soon as the flap is closed, VMU-C will install the newly inserted memory card and transfer the BACK-UP data. As long as the installation and writing operations are under way, the front "ON" LED (green) will blink. Warning: opening the flap during the writing stage will stop the data transfer process and may potentially damage the Micro SD memory.

  - *Pen-drive installation*

    1. Identify the USB port specifically designed for the insertion of the "Pen Drive" memory .

Slot for Micro SD cards

2. Insert the Pen-drive, making sure it is not write-protected and it is properly formatted (FAT32).

3. As soon as you have inserted the Pen-drive, VMU-C will install the newly inserted memory and transfer the BACK-UP data. As long as the installation and writing operations are under way, the front "USB" LED (blue) will blink. Warning: disconnecting the Pen-drive during the writing stage will stop the data transfer process and may potentially damage the Micro SD memory.

The Back-up operation starts as soon as the memory device (micro SD or Pen Drive) is inserted. At the end of the operation, the memory device will contain a folder named VMUC_"VMU-C name" whose content is described below:
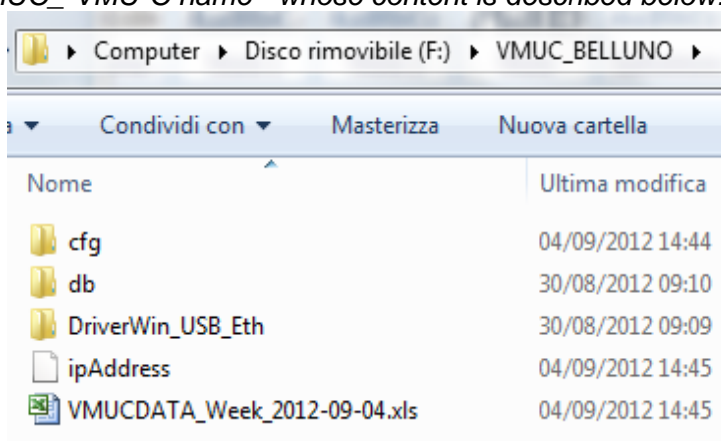
VMU-C' s backup folder content

Note: The name of the folder VMU-C automatically creates at switch-on (or when the memory device is inserted) consists of a fixed part "VMUC, automatically followed by the name assigned to the VMUC itself (For example the folder name might be something like VMUC_BELLUNO). This operation, which VMUC performs automatically, will prevent the databases of different VMUC from being overwritten.

VMU-C

- *Folder "**cfg**"*
- *Folder "**db**"*
- *Folder "**DriverWin_USB_Eth**"*
- *File "**ipAddress**"*
- *EXCEL file "**VMUCDATA week_......**"*

The _**"cfg" folder**_ contains two files:
1) <u>EWgeneral.db</u>: *it contains the general system configuration, like the IP address, the planned operations, the e-mail addresses for the sending of scheduled messages or in case of alarm, etc.*
2) <u>EWplant.db</u>: *it contains the plant configuration (the system configuration, like installed modules, RS485 network addresses, threshold settings, etc.).*

**"db" folder** *It contains the whole VMU-C database. This folder contains all the data stored in VMU-C and updated up to 12:00 p.m. of the previous day. Should the VMU-C get damaged and have to be replaced, this folder allows to move the whole Database and the relevant configuration from the damaged instrument to the new one through a "**Disaster-Recovery**"-type function*

_**"DriverWin_USB_Eth" folder**_ *it contains a Windows driver allowing to connect the VMU-C to the PC through the mini USB communication port. In this case the reference address (fixed and not editable) is 192.168.254.254. To access the VMU-C through the mini USB port use a USB => mini USB cable and type through the browser in use the address 192.168.254.254; the log-in page will be displayed again.*

**"ipAddress" file**: *it contains the IP addresses of the connected devices.*

> *Note: We recommend that you use "Notepad" to display this file.*

EXCEL file "VMUCDATA week_......": Excel file containing all the data logged by VMU-C in the last 7 days. The file (Fig. 157) will contain the following variables:
- *AC energy for the period (read from Inverters) kWh*
- *Average power for the period (read from Inverters) kW*
- *AC energy for the period (read from Energy Meter) kWh*
- *Average power for the period (read from Energy Meter) kWh*
- *Average solar irradiation for the period W/m^2*

> *Note: For all the variables mentioned above, the period corresponds to the logging interval set on VMU-C. This interval can be of: 5,10,15,30,60 minutes.*

	A	B AC Energy on period (read from inverters) (kWh)	C AC Instantaneous Power (read from inverters) (kW)	D Energy on period (read from energy meters) (kWh)	E Instantaneous Power (read from energy meters) (kW)	F Solar Irradiation (W/m2)
1	Date 2012-07-29					
86	12:00	0.40	4.5	0.50	6.50	776.00
87	12:05	0.40	4.5	0.60	6.60	784.00
88	12:10	0.40	4.6	0.50	6.60	789.00
89	12:15	0.40	4.6	0.60	6.70	805.00
90	12:20	0.40	4.7	0.50	6.80	812.00
91	12:25	0.40	4.7	0.60	6.80	810.00
92	12:30	0.40	4.6	0.60	6.70	799.00
93	12:35	0.40	4.6	0.50	6.60	790.00
94	12:40	0.30	4.7	0.60	6.80	815.00
95	12:45	0.40	4.8	0.60	6.90	831.00
96	12:50	0.40	4.8	0.50	7.00	845.00
97	12:55	0.40	4.8	0.60	7.10	852.00
98	13:00	0.40	4.8	0.60	7.00	841.00
99	13:05	0.40	5.2	0.60	7.60	826.00

Excel backup file

If the memory device (micro SD or Pen Drive) is left inserted into VMU-C, at 12:00 p.m. o'clock, on a daily basis VMU-C adds a new file containing the data of the just expired day (same formatting as the previous file).

New daily backup file

13.1 CONFIGURATION RESTORE FROM FILE

If the VMU-C configuration has previously been saved on a PC, it can be re-imported by simply following the procedure described below:

- Click on the "*SETUP*" icon => Click on the "*PLANT*" button => Click on the "*CONFIGURATION*" button => Click on the "*WIZARD*" button => Click on the "*IMPORT*" button

The system will then display a "Configuration import from file …" mask .

Configuration import

Through the "***Browse***" button specify the path of the location where the configuration file had been previously saved on the PC.
As soon as the relevant file has been selected , you'll be able to issue the "***Import***" command.

13.2 RESTORE FROM USB OR SD BACKUP (DISASTER RECOVERY)

If a memory pen or a micro SD memory card is inserted in VMU-C the following screen will be displayed:

SYSTEM	PLANT	SENSORS
	Load Configuration from File	
Select the file using the "Browse" button		Browse...
	Import	
	Import Configuration from USB	
	VMUC_VMU-C	
◉ Import Plant Configuration		○ Disaster Recovery
	Import	
	Import Configuration from microSD	
	VMUC_VMU-C	
◉ Import Plant Configuration		○ Disaster Recovery
	Import	

Database Restore

The screen in question allows to access two distinct operations:
- Plant Configuration Import
- Disaster Recovery

13.2.1 CONFIGURATION RESTORE

This operation is exactly equivalent to the "Configuration restoration from File" described above. Whenever an external memory device (Pen-drive or micro-SD) is inserted into VMU-C, a copy of the system configuration (Arrays, Inverters, Energy Meters' configuration) will be automatically created; the copy in question can then be imported through a special command.

Import Configuration from USB		
	VMUC_VMU-C	
◉ Import Plant Configuration		○ Disaster Recovery
	Import	
Import Configuration from microSD		
	VMUC_VMU-C	
◉ Import Plant Configuration		○ Disaster Recovery
	Import	

Configuration Restore

13.2.2 DATABASE RESTORE

This operation allows to import into a VMU-C the Database of another VMU-C (this function can be very useful in case the machine should have to be replaced as a consequence of a failure). The "Disaster Recovery" function imports into the new machine all the previously saved data (data-logger + events) on the failed VMU-C.
This function is only available if the back-up memory device (Pen-drive or micro SD) is left constantly inserted into the VMU-C.

Import Configuration from USB		
VMUC_VMU-C		
○ Import Plant Configuration		◉ Disaster Recovery
Import		
Import Configuration from microSD		
VMUC_VMU-C		
○ Import Plant Configuration		◉ Disaster Recovery
Import		

Database Restore