

**MORE THAN
METERING**

**ENERGY
CCM**



CCM_{2-W}

**Single-phase and
neutral metering** device
for measuring electrical
variables in switches.

USER MANUAL

CcM2-W

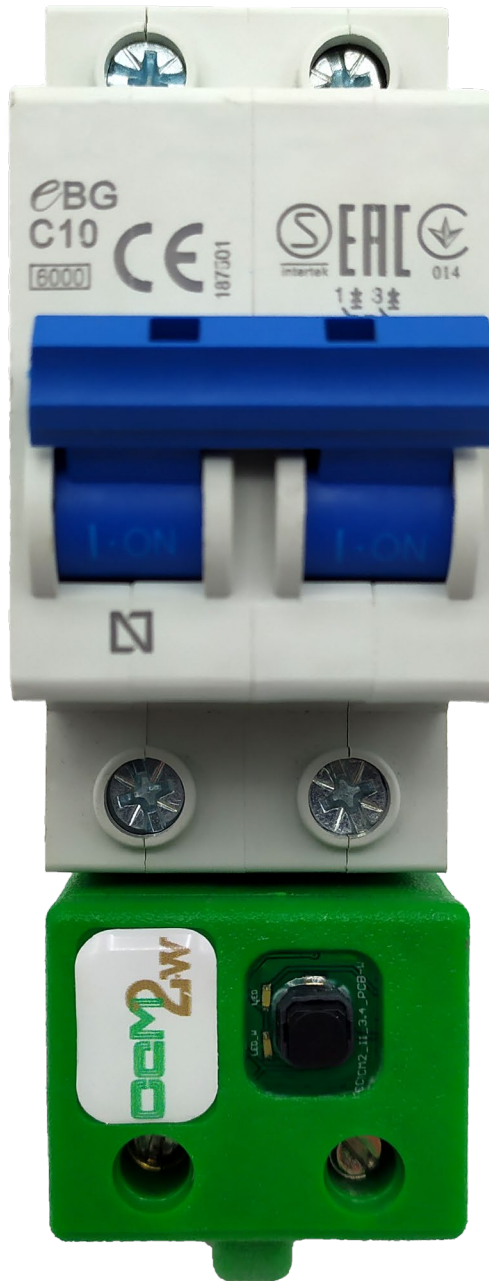
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... Take care of you*

www.energyccm.com



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1. INTRODUCTION

CcM2-W is one of the devices from the CcM product family designed to measure electrical parameters (voltage, current, energy, etc.) in single-phase installations with a neutral wire.

The CcM product range consists of a set of devices used for the monitoring of electrical parameters inside the electrical switchboard in single- and three-phase installations. It is best suitable for installation in thermal-magnetic switches or residual-current circuit breakers.

The CcM product range includes various types: the “principal” devices (CcM2, CcM3 y CcM4), which may connect to form a principal communications bus; the factory isolated devices (CcM2-W) only communicate via WiFi, but since they are able to measure all electrical parameters and are self-powered, they are included as principal devices; the “secondary” devices, which connect to the principal devices to form a secondary communications bus with the principal device as a master providing power supply through the connecting cable.

In the specific case of CcM2-W the user will be able to have a wireless access to the collected data using a WiFi interface integrated in the device. This device has a special isolated design and only communicates via WiFi, making it ideal for domestic use or linked to the general master in an industrial installation, to monitor remote points or electrical panels isolated from other CcM devices.

The device behaves similarly to an energy meter or a grid analyser. Inserted directly into a thermal-magnetic switch or a single-phase residual-current circuit breaker, the device is connected in series with the consumption line, registering voltage, intensity, active and reactive power and energy.

As it can be combined and used with different devices within the product range, the CcM product family offers multiple configuration options and allows users to configure the most convenient solution for both, their domestic and industrial installations. Installations can be wireless, connected with

a communication cable or mixed. The devices can be connected to each other and create communication buses, establishing configurable master-slave hierarchies. If it is needed for the installation, it is also possible to have a device isolated from the rest like in the case of CcM2-W. Using data reading software, CcM2-W is able to complement the remaining devices metering in remote and concrete spots, which could be the individual area of a hotel room with the remaining metering of the general areas.

1.1 CONTENTS OF THE BOX

Inside the box you should find:

- 1x CcM2-W
- Data sheet

1.2 DEVICE DOCUMENTATION

CcM2-W documentation includes this manual and its data sheet. All documents can be downloaded from our web page www.energyccm.com.

1.3 ABOUT THIS MANUAL

The aim of this manual is to explain and describe as clearly as possible the correct use and features of the CcM2-W device, within the CcM product family. For this purpose, it includes technical data as well as user instructions and specifications to provide information about its correct functioning.

This document is subject to regular updates. The contents of this manual might change partially or completely and it is the responsibility of the users to make sure that they are using the latest version of the user manual. Monsol Electronic reserves the right to modify the manual without previous notice.

2. TECHNICAL SPECIFICATIONS

Maximum operation current	63 Arms
Current measurement range	[0.2 – 63] Arms
Maximum allowed voltage	300 Vrms
Signal frequency	50 / 60 Hz
Current measurement error	< 0.5 % RD
Voltage measurement error	< 0.2 % RD
Active energy measurement error	< 1 % RD
Reactive energy measurement error	< 2 % RD
Communication protocol	Modbus RTU over TCP
Connectivity	WiFi 802.11b/g/n
Average response time	0.1 s
Maximum consumption	1 W
Power supply	85 – 300 Vrms
Total dimensions	36 x 50 x 35 mm
Comb dimensions	5 x 12 x 3 mm

2.1 ENVIRONMENTAL CONDITIONS

Operating altitude	0...2000 m
Operating temperature	-25...+50 °C
Overvoltage category	III (according to IEC 61010-1 + IEC 61010-2-030)
Protection degree	IP20
Pollution degree	2
Relative humidity	0...95 % at 45 °C
Protection against over-current	External device (thermal-magnetic switches or residual-current circuit breakers)

The mains supply voltage may fluctuate up to $\pm 10\%$ of the nominal voltage. Similarly, temporary over-voltages may occur on the mains supply voltage, ensuring proper operation of the device.

3. SAFETY INSTRUCTIONS

Please read the below safety instructions and precautions before installation and use of the CcM2-W device.

3.1 SYMBOLS

The following symbols are used in this manual to highlight and emphasise important information. The general meanings of the different symbols used in the manual, and those present in the marking of the device, is as follows



General caution



Electrical hazard



General information



Prohibited



Single-phase + neutral current



Reinforced insulation



CE marking

3.2 PURPOSE

This device is designed to measure voltage, current, power and energy in a single-phase electrical installation connected directly to the load side of the thermal-magnetic switch or residual-current circuit breaker for use in both industrial and domestic installations.

The system devices should only be used for this purpose. Monsol Electronic is not liable for any damages caused by an inappropriate installation, use or maintenance of the system.

To ensure safe use, the system modules must only be used in compliance with the instructions in this manual. Legal and safety regulations must also be considered to ensure correct use.

3.3 TRANSPORT DAMAGE CHECK

Immediately after receiving the package, make sure that the packaging as well as the device have no signs of damage. At the same time, check that the order is complete, having in mind the contents of the box defined in section 1.1. If the packaging shows any sign of damage, impact or tear, damage of the system modules themselves should be suspected and they should not be installed. If this occurs, please contact Monsol Electronic's customer service.

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E-mail: info@energycm.com

Web: www.energycm.com

Address: Monsol Electronic

Calle la Gitanilla, 17, Nave 1

29004 Málaga (Spain)

3.4 STAFF

This system should be installed, handled and replaced solely by qualified staff. The final user of this manual is staff who can handle the devices.

Qualification of the staff mentioned herein must meet all the safety-related standards, regulations and legislation applicable to the installation and operation of this system in the country concerned.



The responsibility to select qualified staff always lies with the company that the staff works for. It is also the responsibility of the company to assess the ability of the worker to carry out any kind of work and ensure their safety. At the same time, staff must comply with workplace health and safety regulations. It is the responsibility of the company to provide their staff with the training necessary for handling electrical devices and to make sure that they familiarize themselves with the contents of this user manual.

3.5 SPECIAL HAZARDS

The devices are designed to form a part of an industrial or domestic electrical installation. Corresponding safety measures must be observed. Additional safety requirements should be specified by the company who has installed or configured the system.



High amount of current constantly circulates through the system and any physical contact could cause a serious injury. Please ensure that only qualified staff has access to the devices and make sure that the system is switched off or disconnected during handling.

3.6 INSTALLATION PLACE

The devices within the CcM family should be installed in watertight enclosures that comply with IP65 standards outdoors and IP55 standards indoors to be protected from corrosion and humidity.

3.7 ALTERATIONS



It is strictly prohibited to carry out any kind of alterations or modifications to the system.

3.8 CLEANING AND MAINTENANCE

Cleaning and maintenance works should only be carried out when the devices are disconnected from the grid. Before taking any action, make sure that the system has been correctly disconnected, preventing the current to go through them, generally deactivating the circuit breaker where the device is connected.



Do not try to repair the device on your own in case of any malfunction. If this occurs, contact Monsol Electronic's customer service. The system does not require any special cleaning or maintenance, except for standard physical maintenance required by any current conducting electrical device connected with screws and terminals that need to be tightened.

3.9 GENERAL HAZARDS RESULTING FROM NON-COMPLIANCE WITH SAFETY STANDARDS

The technology employed in the manufacturing of the system modules ensures safe handling and operation. Nonetheless, the system might pose hazards if it is used by unqualified staff or handled in a way that is not specified in this user manual. Any person in charge of the installation, putting into operation, maintenance or replacement of a CcM family device must first read and understand this user manual, especially the safety recommendations.

3.10 GENERAL SAFETY REQUIREMENTS



Operator.

The person in charge of handling the electrical device is responsible for the safety of persons and property.



Disconnection

Before starting any work, disconnect the circuit breaker and check the absence of voltage in every cable that supplies voltage to the working site.



Prevention from inadvertent connection

Avoid re-connection of the system using signs, closing or blocking the working site. Accidental reconnection might cause serious injuries.



Verification of absence of voltage in the system

Determine conclusively, using a voltmeter, that there is no voltage in the system. Check all the terminals to make sure that there is no voltage in the system (every single phase).



Covering the adjacent components conducting voltage and restricting the access to electrical devices

Cover all the system components conducting voltage which could cause injuries while carrying out the works. Confirm that dangerous areas are clearly marked.

4. DEVICE DESCRIPTION



Figure 1 Picture of the CcM2-W device

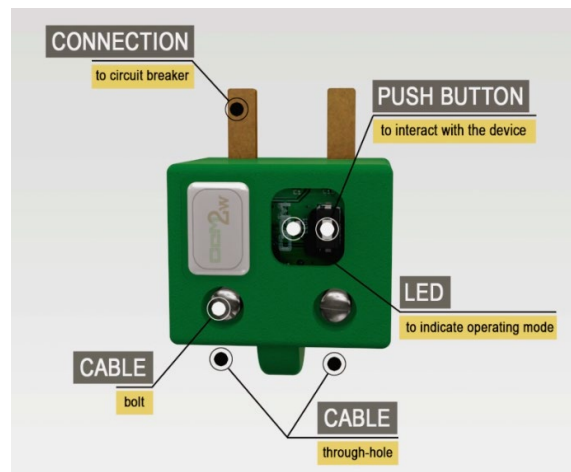


Figure 2 Graphic description of CcM2-W

As depicted in Figure 2, the device consists of:

- **CONNECTION COMB:** It is a metallic contact, through which electric current is fed before it leaves through the cable connected on the opposite end. These combs are inserted in the thermal-magnetic switch or residual-current circuit breaker, which hosts them.
- **LED:** This is a status LED that indicates operating mode of the device.
- **PUSH BUTTON:** A push button to interact with the device and reset the WiFi configuration.
- **CABLE THROUGH-HOLE:** The hole serves as an entrance for the electric cable, which is fastened by the upper bolt.
- **CABLE BOLT:** Once the electric cable, through which the measured electric current will flow, is inserted, the bolt will ensure that it stays fixed in the right place at all times.

4.1 IDENTIFICATION

In the enclosure of the equipment, the user will find an identification sticker with a QR code like the one shown in Figure 3, in which the serial number and MAC address of the device are coded. These serial number and MAC are unique and are also written next to the QR code.



Figure 3 Identification QR code

5. INSTALLATION



Due to electrical hazard during installation, it will be necessary to ensure that the installation zone meets the necessary safety conditions.

In order to install CcM2-W follow these steps:

5.1 STEP 1: SAFETY



Make sure that the protection device is deactivated (thermal-magnetic switch or residual-current circuit breaker) by activation of the break switch marked in green in the following figures..

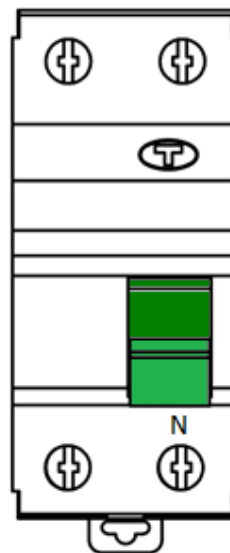


Figure 4 Residual-current circuit breaker

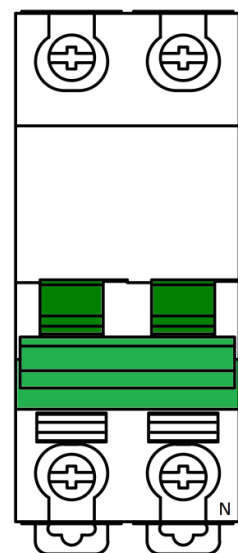


Figure 5 Thermal-magnetic switch

5.2 STEP 2: DISCONNECTION OF CURRENT LINES

Loosen the bolts of the lines L and N of the lower part (output current) and unplug the cables coming from the residual-current circuit breaker/thermal-magnetic switch (Figure 6).

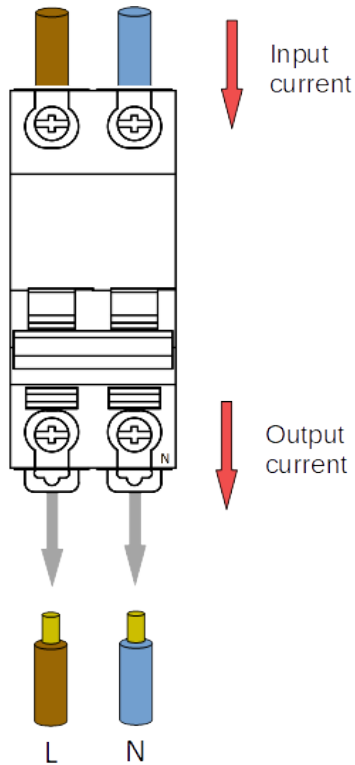


Figure 6 Disconnection of current lines

5.3 STEP 3: CONNECTION OF THE CABLES TO CCM2-W

Once you unplug the output current cables, plug them at the back (the part furthest from the connection comb) of the CcM2-W device and tighten the bolts to hold the cables (Figure 7).

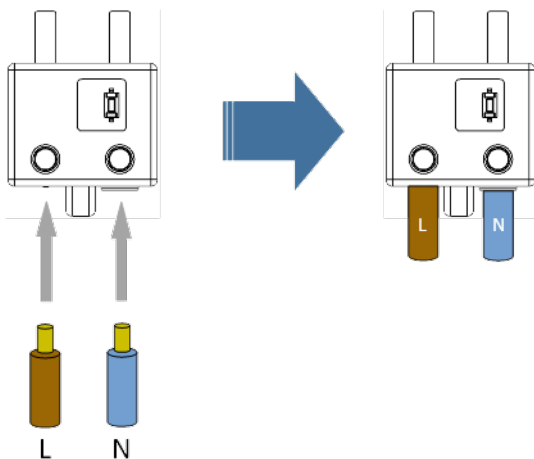


Figure 7 Connection of the cables in CcM2-W

5.4 STEP 4: CONNECTION OF CCM2-W TO THE SWITCH

Once all the electric cables are inserted in the cable through-holes of the CcM2-W device, connect it to the protection device (thermal-magnetic switch/residual-current circuit breaker) by inserting the combs in the through-holes of the output current cable and tighten the bolts of the residual-current circuit breaker/ thermal-magnetic switch until it is held properly and connects to electricity (Figure 8).

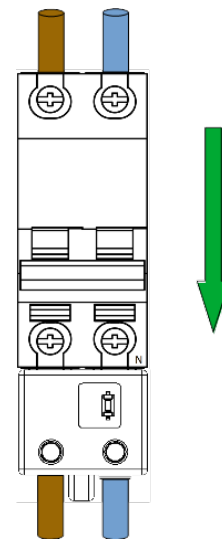


Figure 8 Connection of CcM2-W to the switch



!IMPORTANT!

The device considers the positive charge to be flowing from the comb into the cable through-hole. If the device is connected in the opposite direction at the opposite end of the switch, the CcM2-W will not be protected by the thermal-magnetic switch/residual-current circuit breakers.

It is suggested on the CcM2-W to connect the Neutral wire to the right hole (Figure 8), however, this is not a limiting condition. The unidirectional mode is configured by default in the CcM2-W (section 6.2.1), meaning that the device will automatically detect the direction of the current flow and designate it as the direction of energy consumption of the building. This way, the user can connect the device to the top or the bottom of the circuit breaker without worrying about the power sign.

5.5 STEP 5: COMMUNICATION

The communication in the principal bus between the CcM2-W device and its general master (PC or PLC) is wireless using the WiFi module integrated in the device.

6. OPERATION

6.1 OPERATING MODES

The device has two operating modes, which may be configured using the push button:

6.1.1 Reading mode

It is the default mode. The CcM2-W takes snapshot measures and the upper LED flashes twice every 5 seconds in order to indicate that everything works correctly.

6.1.1.1 Measurements

The CcM2-W is able to take measurements of the following parameters:

- Voltage RMS
- Current RMS
- Power factor
- Active, reactive and apparent power
- Active, reactive and apparent energy
- Signal frequency

In order to read each parameter, see the memory map on section 9.

Likewise, the CcM2-W device is able to detect whether there have been any power supply breakdown, reading register 34:

Valor del registro 34	Significado
'0' (0)	No breakdown
'1' (1)	Power supply breakdown

Table 1 Reboot flag values

Once the register has been read, its value returns to '0'.

6.1.2 Reset Mode

When this mode is activated the CcM2-W will start and restore the default values deleting the WiFi configuration. The cumulative energy records are not reset in this mode; in order to reset all the values, a specific Modbus command is needed. To perform this task, the user shall write '0x8484' in the register 500 (see the memory map in section 9).

In order to perform this reset operation, it is necessary to keep the push button pressed until the lower LED remains permanently lit, then the button can be released. Subsequently, the CcM2-W device will return to the reading mode.

6.2 CURRENT FLOW DIRECTION CONFIGURATION

Two working modes are defined depending on the direction of the current flowing through the device: unidirectional or bidirectional. These work modes can be configured by the user through the embedded configuration website (section 6.3.1), using the CcManager (see user manual available at www.energycm.com) or directly through a Modbus command, typing in the register 504 (see memory map in section 9).

6.2.1 Unidirectional mode

Default mode (value '0' in register 504). Only one direction of the current flow is considered (consumed energy), which is detected by the CcM device. In this manner, the user does not have to worry about the power sign, regardless of where in the circuit breaker (upper or lower part) he or she has installed the CcM2-W. In other words, it does not matter whether the current flows from the combs to the CcM2-W rear side or vice-versa, all of the current will be considered positive (consumed energy).

6.2.2 Bidirectional mode

User configurable mode (value '1' in register 504). In this mode, both current flow directions are considered, being able to measure and store the energy

consumed and generated, taking as a reference the current flow defined in Figure 9. Every electrical parameter (current, active and reactive power, active and reactive energy, etc.) will be measured with respect to this reference.

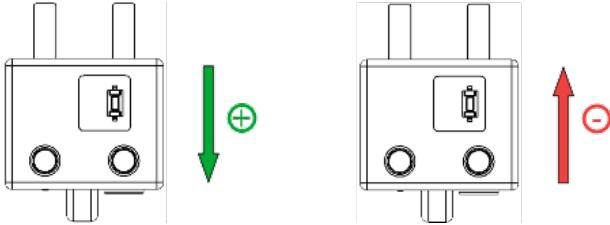


Figure 9 Positive and negative current flow direction (by default)

If desired by the user, on account of the position of the CcM4 installed in the distribution board, he or she would be able to reverse the current flow reference, and thus the device will consider as positive the current flowing from the cable hole to the comb (value '2' in register 504).

6.3 CONNECTION CONFIGURATION

The device has various operating modes, which may be configured using a web portal “embedded” in the CcM2-W device.

Once the CcM2-W device starts for the first time, it will act as an **Access Point** (section 6.3.1) for its configuration. Once it is configured and the local WiFi network (router) is selected to link it to data transfer to the cloud, the device will change to the **Client** mode (section 6.3.2). In the Client mode the data may be read and transferred to the EnergyCcM software tool (Cloud mode) or to a third-party server using connection to a fixed IP (Gateway mode) or via FTP (FTP mode).

6.3.1 Access Point Mode

This is the default operating mode, which is accessed when the device is turned on for the first time or after a reset.

Below, you will find a description of the process to configure the CcM2-W using the web portal, which is embedded in the device. There are two options to access the configuration of the WiFi device.

First and the most user friendly access is via an An-

droid application (App) “Energy CcM”, which enables its configuration using any of the WiFi devices from the product range. It also enables visualisation of data from these and the remaining devices using the EnergyCcM web portal if required (see section 8 of this manual) when the device has been set in Cloud mode.



In case you do not have an Android device with the application, the device may be configured using the web portal embedded in the device mentioned earlier.

The CcM2-W device will generate an open WiFi network called “CCM_XX:XX”, where “XX:XX” are the last 4 digits of the MAC address, which can be found on the product label or the series number, which appears on the sticker on the device. When the CcM2-W has power supply and is turned on, it should search WiFi networks from any device with connectivity 802.11 and then it will be able to find the new network generated by CcM2-W among available networks as shown in the example in Figure 10. The network in question is an open network without password.

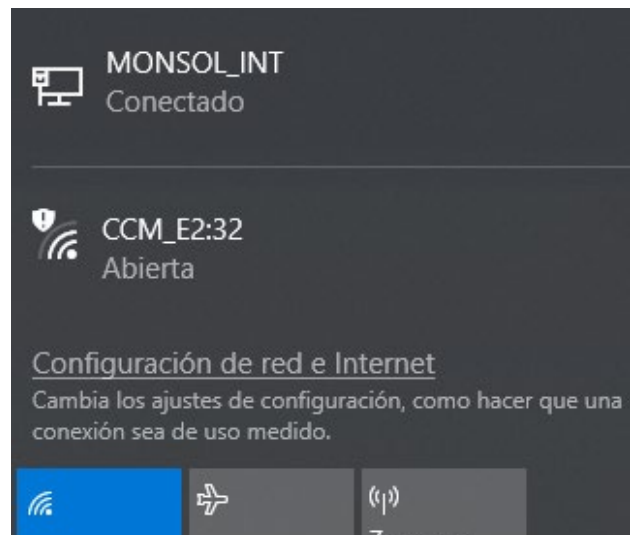


Figure 10 WiFi network created by the CcM WiFi device

In order to configure the CcM2-W device and add credentials for the WiFi network with Internet access, which will be used to send the data, the device used to search the new WiFi networks (PC, PLC, tablet, smart phone, etc.) needs to connect to the network generated by the CcM2-W device (“CCM_XX:XX”) and access the generated or embedded web of the CcM2-W device. Once connected to the WiFi network of the CcM tool, you should open your web browser and write **http://192.168.4.1/** in the address bar.

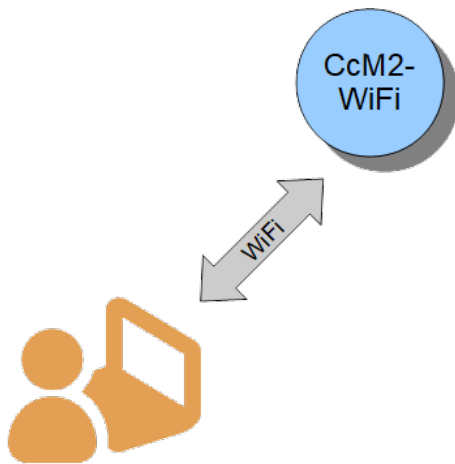


Figure 11 Connection to WiFi Access Point

Once you write the address (<http://192.168.4.1/>), you will get to the configuration page “CCM Config Web” (Figure 12) of the web embedded in the CcM device, where the WiFi connection configuration may be completed.

The screenshot shows the 'CCM Config Web' interface. At the top, it displays the CCM logo and the URL 'energyccm.com'. Below the logo, there is a 'Scan again' link. A table lists two detected networks: 'MONSOL_CLIENTE' with a signal strength of -70db and 'MONSOL_INT' with a signal strength of -69db. Below the table, there is a prompt to 'Click or write your Network name' followed by input fields for 'WiFi name' and 'password'. There is also a field for 'CCM_WiFi Hostname:' with the default value 'changename'. The page includes sections for 'Set meter current flow mode' (set to 'Unidirectional (recommended)') and 'Set communication mode selection' (with radio buttons for Gateway, Cloud, and FTP). A note explains that Gateway mode uses Modbus RTU over TCP/IP. There are input fields for 'New IP:', 'New GW:', and 'New NetMask:'. An optional 'Access password' field is also present. A 'Send' button is at the bottom. At the very bottom, the device's serial number and firmware version are listed: 'CCM SN: 4294967295 CCM FW: 1917 WiFi FW: s0009j'.

Figure 12 Configuration page CcM Config Web.

Once the network is selected from the list, its name will appear in the “SSID” field. If you are certain that you know the name of the network, you can write it directly in the “SSID” field (not recommended).

Once you have finished, write the password of the selected WiFi network in the password field. The CcM2-W device will be linked to the WiFi network and use it to send the data to the Energy CcM server, or it can be connected wirelessly to obtain the data depending on the type of communication that the user requires (see section 6.3.1.1).

The following field that appears is “CCM_WiFi Hostname” where you can assign a name to the CcM2-W device for later identification in your WiFi network, for example “engine_room”. By default the field is set as “ChangeName”.



If you have several CcM2-W devices connected to the same network, make sure to assign different “hostnames” to each one of them. Keep in mind that the assigned names shouldn’t contain spaces (“ ”) or exceed 20 characters in length.

Next, in the “Set meter current flow mode” section, the user shall configure the device according to the direction of the current: unidirectional or bidirectional mode (section 6.2).

Finally, in the “Set communication mode selection” part you should select one of the two types of connection, in which the device will operate once it is connected to the WiFi network in client mode, described in the following section.

6.3.1.1 Connection types

6.3.1.1.1 Cloud Mode

The Cloud mode is the recommended type of connection.

In this configuration, once the CcM2-W connects to its WiFi network, it will automatically send requests to the CcM device, which will host it, and it will start to send data every minute to the Energy CcM server using its local network. This data can be visualised on a computer, tablet or smartphone using the web platform EnergyCcM (scada.energyccm.com). See section 8 EnergyCcM at the end of this manual.

The user shall select the time zone in which the CcM device is installed, in order to obtain the timestamp of each data.

Figure 13 Detail of Cloud mode selection

Optional: When you click on the “Advanced Settings” box on Figure 13, you will see fields enabling configuration of a static IP address (“New IP”), gateway portal (“New GW”) and network mask (“New NetMask”) for your network (Figure 14). It is also possible to create a password to lock the configuration of the CcM (“Access password”), so that it cannot be modified by anyone without the user permission.

Figure 14 Detail of “Advanced settings” in Cloud mode selection

If you do not click on the “Advanced Settings” box and therefore do not fill in the fields, the router will automatically assign a random IP address each time the CcM2-W device connects.



It is recommended to assign a static IP address to be able to access the embedded web of the CcM2-W device in the Client mode (section 6.3.2) and to change its configuration. In case you assign a dynamic IP, which is unknown to the user (automatically assigned by the router), and you do not have the Energy CcM app, the user will not be able to return to or to access the embedded web. In order to change it, you will need to reset the CcM2-W and restart the configuration.

RESET: In order to reset the configuration of CcM2-W, you should keep the button pressed until the lower LED remains permanently lit. Once you have done this, the device will return to the **Access Point mode** and it should restart the configuration (section 6.3.1).

Once you finalize the “Connection Type” configuration, you should press the “Send” button to validate the device configuration.

In case the device does not obtain a valid IP address, either because the selected IP is not valid in case a static IP is assigned or because the routing device is unable to provide an IP in case a dynamic IP is assigned, the CcM2-W device will remain in the Point of Access mode. Conversely, if the configuration is successful, the CCM2-W will change to **Client mode** (described in section 6.3.2).

6.3.1.1.2 Gateway Mode

It is a transparent communication mode where the CcM2-W device does not request or send data and only acts as an information gateway for an external device outside the CcM family to request and acquire data from the device, which hosts the CcM2-W. In this type of connection, the device will be accessible as a bus using the TCP/IP server in port 502 following the Modbus RTU protocol. You will be able to access it using any Modbus RTU over TCP control tool.

In order to configure this connection type, you should select the “Gateway” option, which will show fields enabling configuration of a static IP, gateway portal (“New GW”) and network mask (“New Net-Mask”) for your network (Figure 15), in the same way as in the previous section. It is also possible to create a password to lock the configuration of the CcM (“Access password”), so that it cannot be modified by anyone without the user permission.

Set communication mode selection

Gateway Cloud FTP

Gateway mode: To communicate with CCM's using Modbus RTU over TCP/IP interface.

Fill to configure static IP

New IP:

New GW:

New NetMask:

Access password(optional):

Figure 15 Detail of Gateway mode selection

Once you finalize the “Connection Type” configuration, you should press the “Send” button to validate the device configuration.

In case the device does not obtain a valid IP address, either because the selected IP is not valid with a static IP assigned or because the routing device is unable to provide an IP with a dynamic IP assigned, the CcM2-W device will remain in the Point of Access mode. Conversely, if the configuration is successful, the CCM2-W will change to Client mode (described in section 6.3.2).

6.3.1.1.3 FTP mode

In this configuration, the CcM2-W, once linked to the user’s local WiFi network, will automatically interrogate the CcM device that hosts it and send the data in CSV format to the server designated by the user.

Set communication mode selection

Gateway Cloud FTP

FTP mode: To send data to a client FTP server

Server / port:

FTP folder:

User / Pass:

▼

Advanced Settings

Figure 16 Detail of FTP mode selection

Selecting the FTP option (Figure 16) will display the external server configuration boxes:

- “Server/port”: Server URL and access port
- “FTP folder”: Name of the folder where the CSV files with the collected data will be saved. This folder must be created previously by the user.
- “User/pass”: FTP username and password.
- Time zone: Drop-down list to select the time zone in which the device is located.

Optional: When you click on the “Advanced Settings” (Figure 16) checkbox, you will see fields enabling configuration of a static IP address (“New IP”), gateway (“New GW”) and network mask (“New NetMask”) for your network (Figure 17). It is also possible to create a password to lock the configuration of the CcM (“Access password”), so that it cannot be modified by anyone without the user permission.

Set communication mode selection

Gateway
 Cloud
 FTP

FTP mode: To send data to a client FTP server

Server / port:

FTP folder:

User / Pass:

Europe/Madrid

Advanced Settings

Fill to configure static IP

New IP:

New GW:

New NetMask:

Access password(optional):

Send

Figure 17 Detail of “Advanced settings” in FTP mode selection

If you do not click on the “Advanced Settings” box and therefore do not fill in the fields, the router will automatically assign a random IP address each time the CcM2-W device connects.



It is recommended to assign a static IP address to be able to access the embedded web of the CcM2-W device in the Client mode (section 6.3.2) and to change its configuration. In case you assign a dynamic IP, which is unknown to the user (automatically assigned by the router), and you do not have the Energy CcM app, the user will not be able to return to or to access the embedded web. To change it, you will need to reset the CcM2-W and restart the configuration.

RESET: To reset the configuration of CcM2-W, you should keep the button pressed for over 10 seconds. Once you have done this, the device will return to the Access Point mode and it should restart the configuration (section 6.3.1).

Once you finalize the “Connection Type” configuration, you should press the “Send” button to validate the device configuration.

In case the device does not obtain a valid IP address, either because the selected IP is not valid with a static IP assigned, or because the routing device is unable to provide an IP when a dynamic IP is assigned, the CcM2-W device will remain in the **Point of Access mode**. Conversely, if the configuration is successful, the CcM2-W will change to **Client mode** (described in section 6.3.2).

6.3.2 Client Mode

Once the CcM2-W device is configured, it will be connected to the local WiFi network selected during the “Access Point” configuration (section 6.3.1) and it will have an internet connection. The “embedded” web of CcM2-W may be accessed from any device with 802.11 connectivity using the assigned IP in the address bar of your browser (for example <http://192.168.1.117/>).

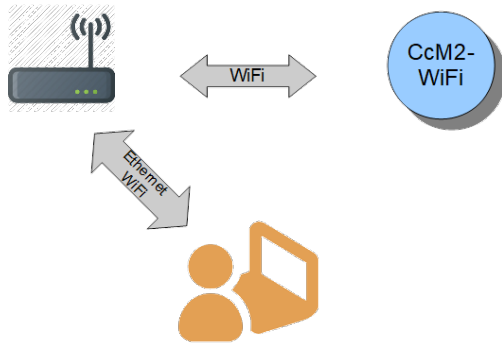


Figura 18 Conexión modo cliente

If you do not know the IP because it is assigned as dynamic, you should follow these steps depending on the operating system (Windows, Linux, iOS or Android) of the device, from which you would like to access the embedded web of the CcM2-W device:

- **Device with Microsoft operating system (Windows 7, 8, 10):**
 - You should install the “Bonjour” tool available on the Apple website: https://support.apple.com/downloads/bonjour_for_windows
 - Once this is done, open the web browser and enter the device name (“device host-name” in Figure 12) followed by “.local”. By default: <http://ChangeName.local/>
- **Device with Linux based operating system (for example Ubuntu):**
 - Open a web browser and enter the device name. By default: <http://ChangeName.local/>
- **Device with iOS operating system:**
 - Open a web browser and enter the device name. By default: <http://ChangeName.local/>
- **Device with Android operating system (RECOMMENDED OPTION):**
 - Install the Energy CcM application (section 7).

When you finalize the access to the device, the embedded web page “CcM Web Server” will appear in your browser (Figure 19).

At this stage, depending on the connection set in the previous section 6.3.1.1, you will have several tabs available in the upper menu:

- **Settings:** Configuration page of the device network parameters (“CCM Config Web”) described in section 6.3.1.
- **Data:** This tab will only be available in the Cloud (section 6.3.1.1.1) and FTP (section 6.3.1.1.3) connection type.. On this page, you will be able to see a summary of the most relevant data registered on the CcM2-W.
- **Restore:** The page to restore the default values of the CcM2-W device, and thus, to return to the Access Point mode (section 6.3.1).

6.3.2.1 Settings

By selecting “Settings” in the upper menu, the screen will appear as per Figure 19.

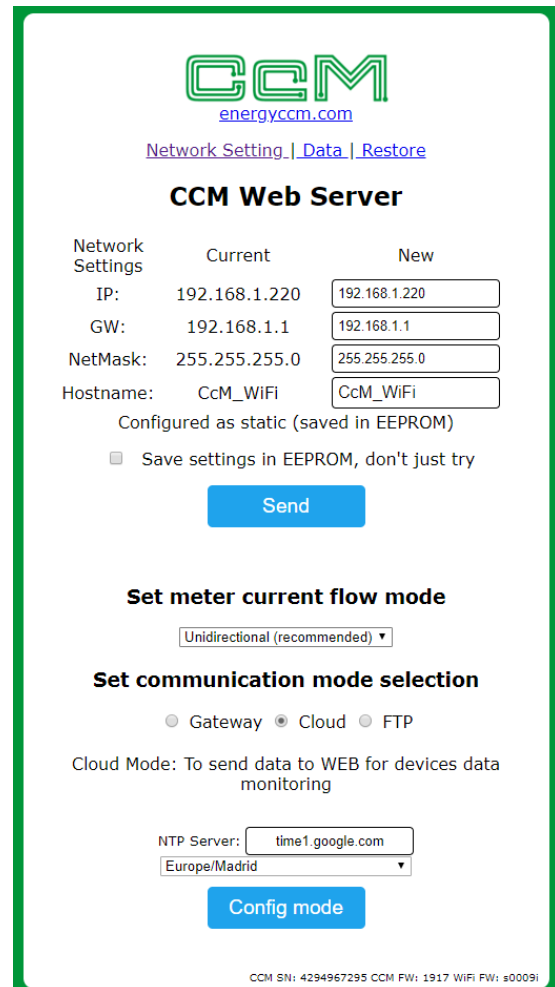


Figura 19 CcM Web Server – Settings

On this page you can change (if required) the network configuration of CcM2-W in the same way as described in section 6.3.1.1.

On this screen you have the option “Save settings in EEPROM, don’t just try”, available. This option enables for the new configuration (IP, GW, NetMask and Hostname) to remain permanently recorded in the device. Thus, if the power supply of CcM2-W is disconnected, the configuration values will stay. If you just want to make sure that the configured values are valid, do not select this option. In this way, if you disconnect power supply of CcM2-W, it will return to the same network configuration as prior to pressing “Send” (Figure 19).

Furthermore, in the section “Set communication mode selection” the connection type of the CcM2-W device may be changed between the ones mentioned in section 6.3.1.1: Cloud, Gateway or FTP. By pressing the “Config mode” button, the selection made in the “Set current flow mode” and “Set communication mode selection” fields will become implemented.



If the user has assigned a password to lock the configuration (see section 6.3.1.1), it will be necessary to enter it in order to change the settings in “Network Setting” (Figure 20). Once logged in, the session may be closed on the “Restore” page (Figure 23).



Figura 20 CcM Web Server – Login

6.3.2.2 Data

This screen primarily serves for basic data visualisation.



This page only appears available in Cloud mode (section 6.3.1.1.1) and FTP mode (section 6.3.1.1.3), because in Gateway mode (section 6.3.1.1.2) the device only acts as a gateway.

Tras seleccionar “Data” en el menú superior, se mostrará la pantalla que podemos ver en la Figura 21.

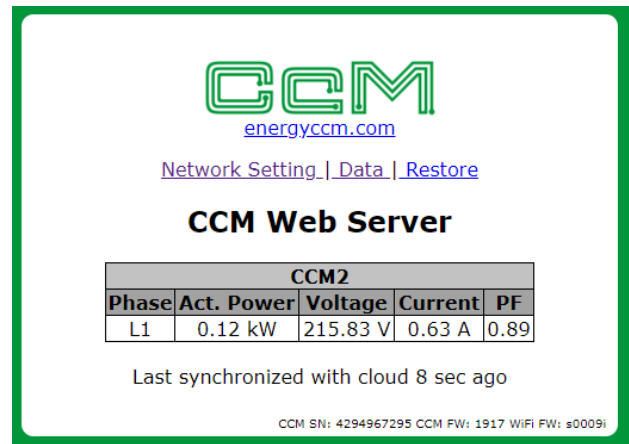


Figure 21 CcM Web Server – Data

In the “CCM2” table, you can see the following parameters related to the metering realized by the CcM2-W device in the phase to which it is connected. In each case:

- “Act. Power”: Active RMS Energy.
- “Voltage”: RMS Voltage.
- “Current”: RMS Current.
- “PF”: Power Factor.



For data visualisation, graphs, reports and storage of historical data, it is recommended to use the Energy CcM Android app to configure and register the device in the Energy CcM server and use the free EnergyCcM tool (www.energyccm.com), configuring the CcM2-W in Cloud mode. To do this, it is necessary to create a user on the Energy CcM platform, and to associate the device through its serial number.

6.3.2.3 Restore

By selecting “Restore” in the upper menu, the screen will appear as per Figure 22.



Figura 22 CcM Web Server – Restore

By pressing the “Restore” button on this screen, the factory settings of CcM2-W will be restored (device configuration, network parameters, name of the WiFi network to which the device connects and its password), returning to the Access Point mode (section 6.3.1).

Another way to restore the CcM2-W device is by using the available push button. If at any time the button is pressed for more than 10 seconds, it will reset the device to factory settings..



If the user has assigned a password to lock the configuration (see section 6.3.1.1), it will be necessary to enter it in order to restore the device (Figure 20). Once logged in, the session may be closed on the “Restore” page (Figure 23).

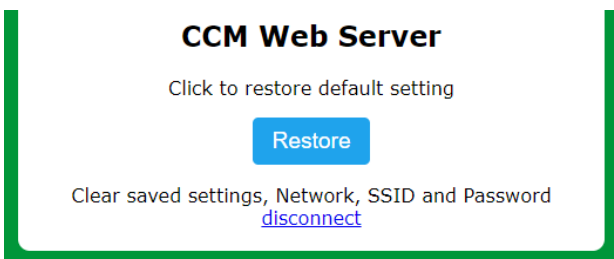


Figura 23 CcM Web Server – Restore – Disconnect

6.3.3 Memory

If the device loses its connection to the Internet in Cloud of FTP mode, it starts storing the collected data to be uploaded as soon as the Internet connection is recovered. The CcM2-W has enough memory to store data for several months, taking into account the latency set by default:

Latency	Time frame
10 seconds	First 24 hours
1 minute	Second 24 hours
15 minutes	Henceforth

Table 2 Memory data storage latency

When the CcM2-W recovers the Internet connection, it starts uploading the stored data while continuing to take new measurements. All the data is saved with the time stamp of the moment of measurement.

6.4 FIRMWARE UPDATE

It is possible to update the firmware of the CcM2-W locally. To do this, the user must access the IP address of the device, for example:

`http://192.168.1.220/firmware`

When accessing the “/firmware” page, a pop-up window for logging in will appear:

- User: ‘ccm’
- Password: Password defined by the user in the configuration process (section 6.3.1.1). By default, ‘update’.

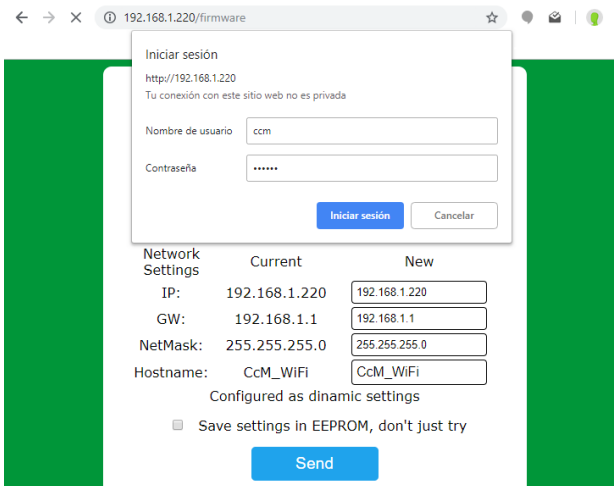


Figure 24 Firmware update

Once logged in, the user shall select the firmware update file and upload it by pressing the “Update” button. If the update has been successful, the message “Update Success! Rebooting...” shall appear, and the device will reboot.

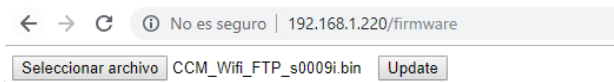


Figure 25 Firmware update – File

7. ENERGY CcM APP

If you decide to configure the CcM2-W using the Android application, you should download it from the Google Play Store by searching “Energy CcM” or using the following link:

<https://play.google.com/store/apps/details?id=com.energyccm.app>

Once the application is downloaded and installed, run it. At startup, the app will check the following (Figure 26):

- Registered users
- CcMs to be configured
- Configured CcMs in the user history
- Configured CcMs and connected to the same WiFi network than the Android device

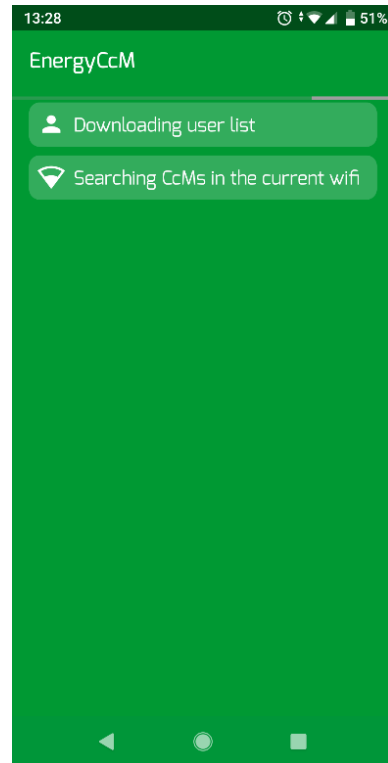


Figure 26 Energy CcM App – Home

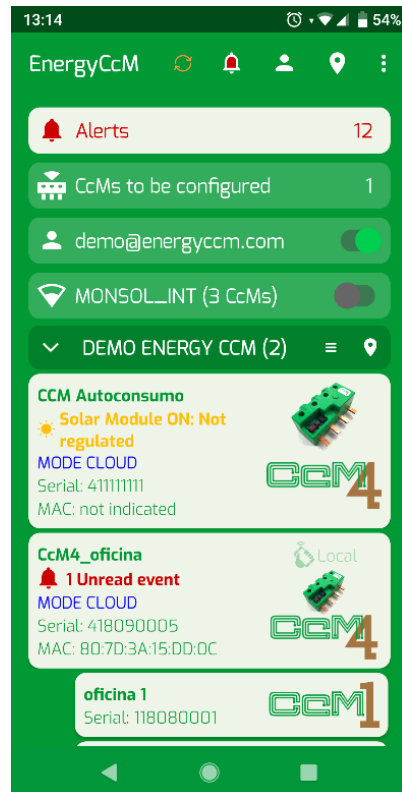


Figure 27 Energy CcM App – Main Menu

On the first screen (Figure 27) you will see the main menu with various sections:

- Users in the app: Manage EnergyCcM users (section 8).
- CcM to be configured: Search new CcM devices, which have not been configured (new reachable WiFi network searches).
- WiFi network to which the Android device is connected: Search for CcM devices, which have been configured and are connected to the same WiFi network.

7.1 USER MANAGEMENT

By clicking the user management icon, the first screen as shown in Figure 28 will appear. In this section you may:

- Create new users of the EnergyCcM web portal
- Register a user in the application, which already exists and which you created before using the EnergyCcM web portal or the app.

The user will enter its credentials and will be able to check the configured and linked devices (Figure 28).

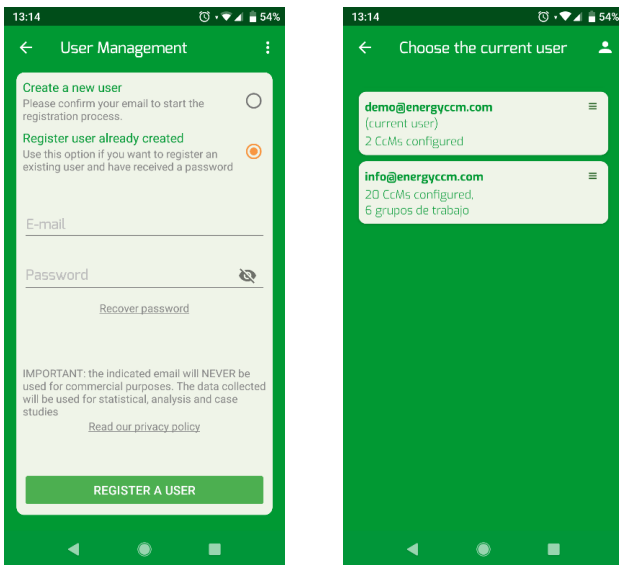


Figure 28 Energy CcM App – EnergyCcM User management

7.2 CCMS TO BE CONFIGURED

At the “CcM to be configured” section at list of the nearby CcM WiFi or CcM2-W devices in Access Point mode will appear. They generate their own WiFi network “CCM_XX:XX”, as per the example in Figure 29. By selecting the nearby device that you wish, the user will be able to see the consumption in real time, directly connecting to the device WiFi network; or to configure it, in a similar way as explained in section 6.3.

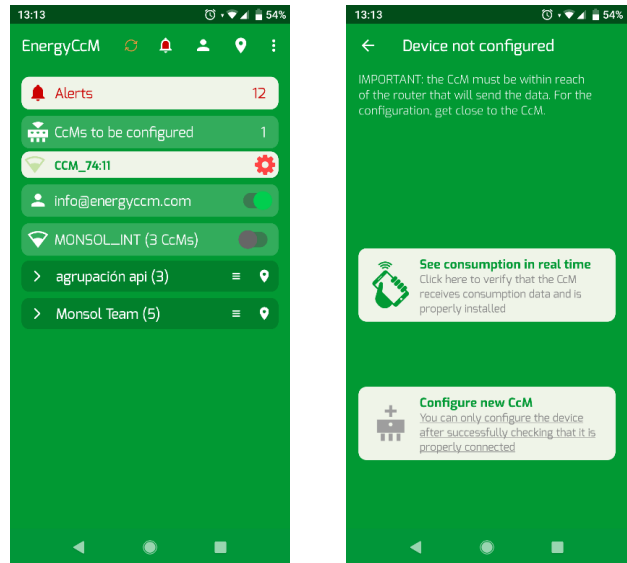


Figure 29 Energy CcM App – CcMs to be configured

To configure the device, the user will only have to follow the steps indicated in the app (Figure 33):

1. Choose the WiFi to which the CcM device will be connected
2. Name the device (hostname)
3. Configure the current direction (section 6.2)
4. Configure the communication mode: Cloud, FTP or Gateway (section 6.3.1.1)
5. Set device time zone
6. Associate user and group
7. Detail auxiliary information (notes, location and photo)
8. Set configuration password (optional)

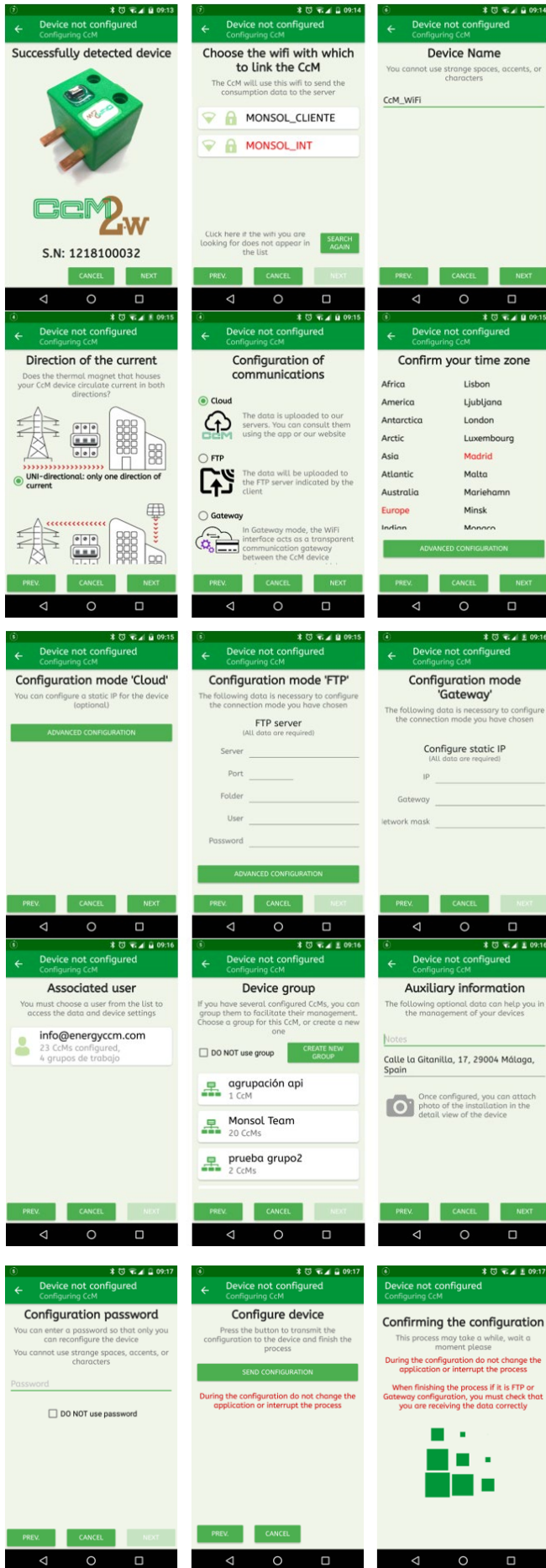


Figure 30 App Energy CcM – CcMs to be configured – Configuration process

Once the configuration is finalized, the device in question will have connected to the local WiFi network and the user will be able to visualize it in the section of already configured CcM devices.

7.3 CCMS ALREADY CONFIGURED

From the app, the user will be able to change the WiFi to which the Android device is connected, in order to search for CcMs configured and connected to the same network. Selecting a CcM already configured, the details of this device are shown (Figure 31):

- Consumption in real time (if the Android device is connected to the same WiFi network as the CcM).
- Consumption study (Cloud mode), based on the data uploaded to the EnergyCcM server.
- Configuration of the device.
- Configuration of alarms

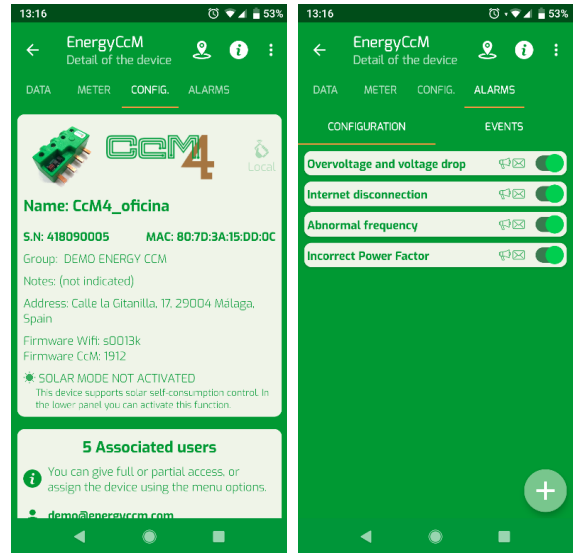


Figure 31 Energy CcM App – Already configured CcM devices

8. ENERGY CcM SCADA WEB

The EnergyCcM Portal is a web platform created by Monsol Electronic in order to offer its users a tool to visualize data from their CcM devices. The link to access the web portal is the following:

scada.energyccm.com

Using this platform, the user may link to his or her EnergyCcM account the principal CcM devices, which have WiFi connectivity either because it is already integrated in the device (CcM2-W) or because it was paired with a CcM WiFi peripheral.

Thus, the EnergyCcM platform enables to unify various types of CcM devices installations (wireless or connected with a communication cable, using WiFi or general master data hub such as a PLC or a PC) in a single web portal accessible via any device with Internet connection (PC, smartphone, tablet, etc.) EnergyCcM does not only enable to link the CcM devices, but also to configure them in working groups, to view real-time and historical data, to download them in files, which may be manipulated by the user, to generate graphs and actuate on the devices.

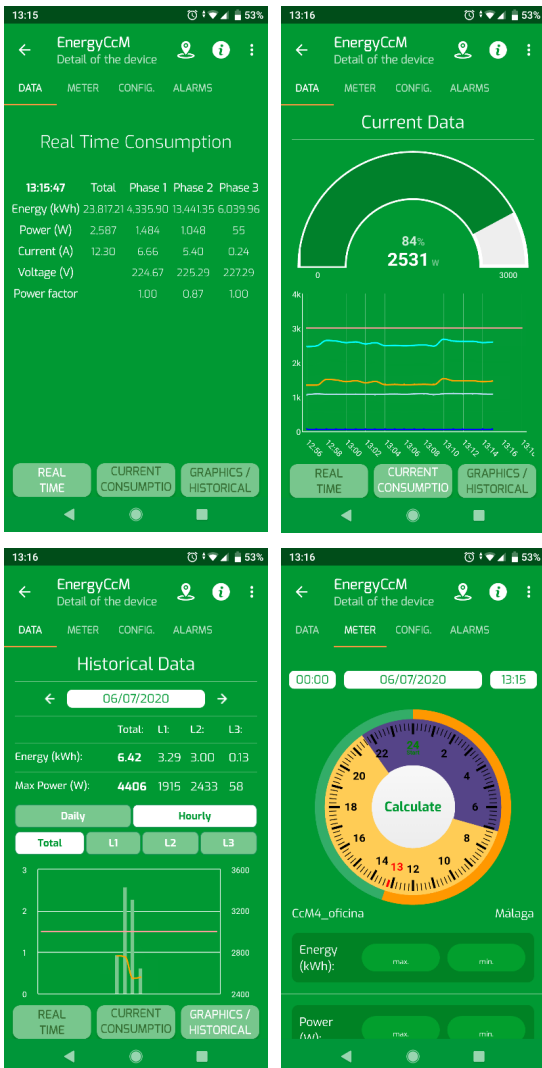




Figura 32 EnergyCcM – Real-time data

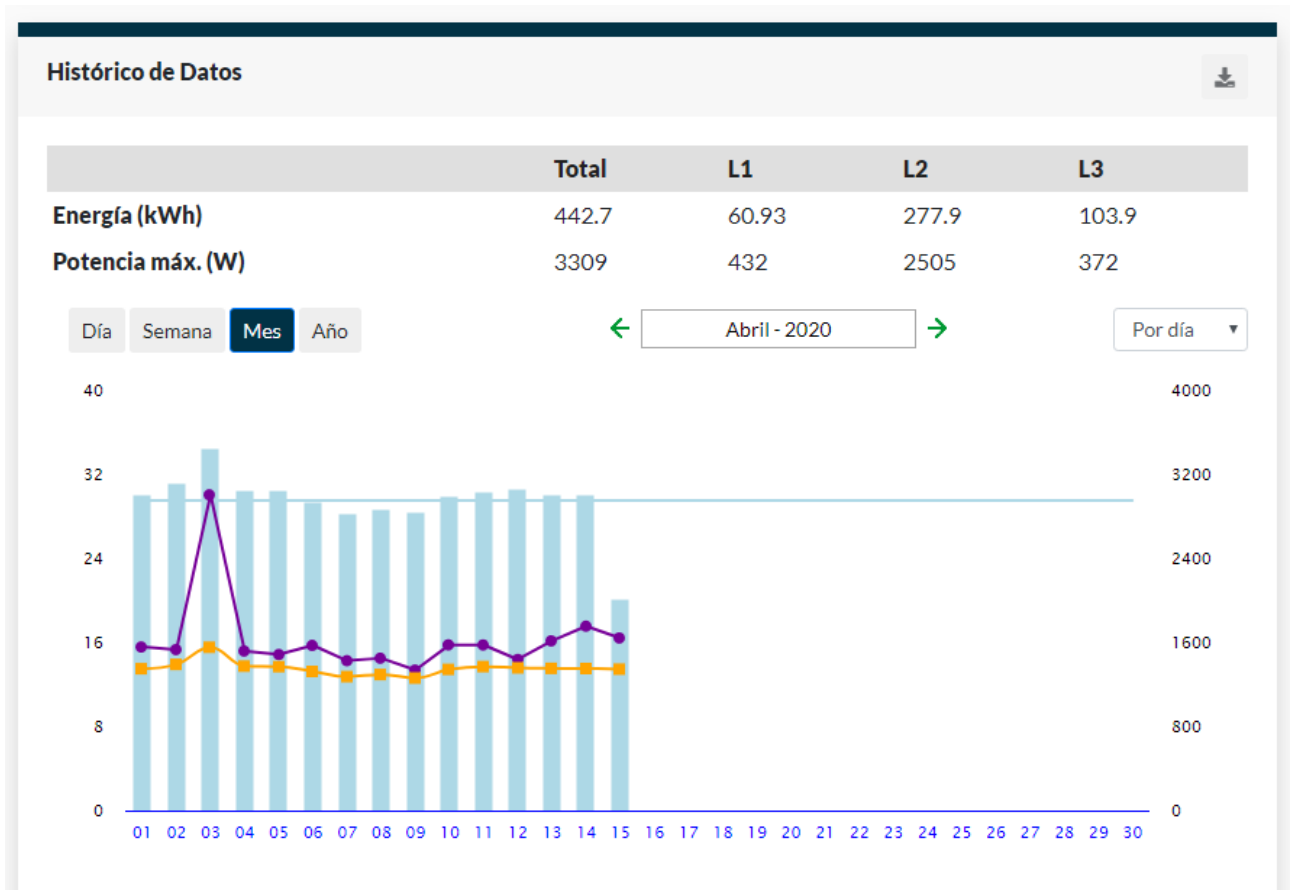


Figura 33 EnergyCcM – Graphics and historic data

9. MEMORY MAP

ID AND CONTROL REGISTERS				
Description	Modbus register	Length	Type	Unit
Product identification code	0	1	R	hex
Serial Number	1	2	R	hex
Modbus ID	3	1	R/W	-

MEASUREMENT REGISTERS				
Description	Modbus register	Length	Type	Unit
RMS current	20	2	R	Arms x 100
RMS voltage	22	2	R	Vrms x 100
Voltage failure	34	1	R	-
Power factor	36	1	R	PF x 1000
Active energy - Quadrants 1 and 4	40	2	R	Wh
Active energy - Quadrants 2 and 3	46	2	R	Wh
Reactive energy - Quadrant 1	52	2	R	varh
Reactive energy - Quadrant 2	54	2	R	varh
Reactive energy - Quadrant 3	56	2	R	varh
Reactive energy - Quadrant 4	58	2	R	varh
Active power	88	2	R	W
Reactive power	94	2	R	var
Apparent power	100	2	R	VA
Signal frequency	140	1	R	Hz x 100
Apparent energy	160	2	R	VAh

CONTROL REGISTERS FOR DEVELOPERS				
Description	Modbus register	Length	Type	Unit
Energy registers restart (writing 0x8484)	500	1	W	-
Device restart (writing 0x8484)	501	1	W	-
Unidirectional/bidirectional working mode (section 6.2)	504	1	R/W	-

Table 3 Memory map CcM2-W



To ensure data consistency, it is recommended to leave an interval of at least 1 second between requests of the entire data block.
For example, if the user structures the requests in two data blocks, they should be spaced as shown in the following figure:

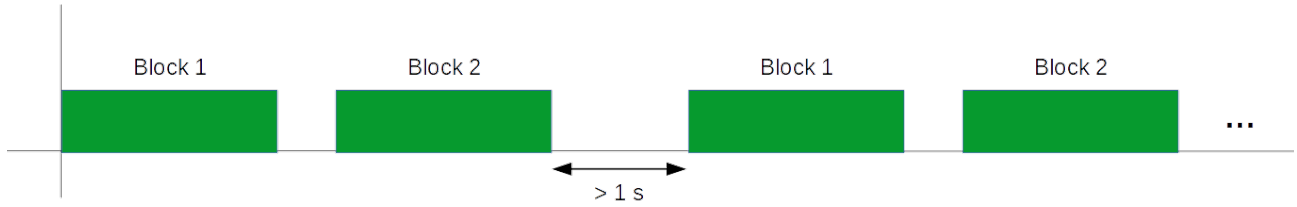


Figura 34 Intervals between requests for complete data blocks



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