Power analyzer

CVM-D50

INSTRUCTION MANUAL

(M449B01-03-26A)

CE


22
PAP

SAFETY PRECAUTIONS

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

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

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

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

Incorrect handling or installation of the device may result in injury to personnel as well as damage to the device. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire.

Read the manual carefully prior to connecting the device. Follow all installation and maintenance instructions throughout the device's working life. Pay special attention to the installation standards of the National Electrical Code.

Refer to the instruction manual before using the device

In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the device and / or installations.

CIRCUTOR S.A.U. reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

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

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

www.circutor.com

CIRCUTOR S.A.U. recommends using the original cables and accessories that are supplied with the device.

CONTENTS

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

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
05/24	M449B01-03-24A	First Version
08/25	M449B01-03-25A	Changes in the following sections: 7.2. - 9.
01/26	M449B01-03-26A	Changes in the following sections: 8.3.5.4. - 9. - 12.

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	In compliance with the relevant European directive.
	Double insulation
	Device covered by European directive 2012/19/EC. At the end of its useful life, do not leave the unit in a household waste container. Follow local regulations on electronic equipment recycling.
⎓	DC current
~	AC current

1.- VERIFICATION UPON RECEPTION

Check the following points when you receive the device:

a) The device meets the specifications described in your order.
b) The device has not suffered any damage during transport.
c) Perform an external visual inspection of the device prior to switching it on.
d) Check that it has been delivered with the following:
- An installation guide,
- 1 retainer to secure the device to the DIN rail,
- 4 connectors.
- 2 terminal covers.

If any problem is noticed upon reception, immediately contact the transport company and/or **CIRCUTOR's** after-sales service.

2.- PRODUCT DESCRIPTION

The **CVM-D50** is an device that measures, calculates, and displays the main electrical parameters in single-phase networks, two-phase networks (with or without neutral), balanced three-phase networks with ARON measurement, or unbalanced networks. The measurement is performed in true RMS value using three AC voltage inputs and three current inputs.

There are three device versions based on the current input type:

✓ **CVM-D50-ITF** Indirect current measurement using 5A or 1A transformers.
✓ **CVM-D50-MC** Indirect current measurement using efficient transformers from the MC1 and MC3 series.
✓ **CVM-D50-FLEX** Current measurement using Rogowski sensors.

The device includes:

- **3 keys** for navigating through different screens and configuring the device.
- **2 LEDs** indicators: CPU and ALARM.
- **LCD** display to visualize all parameters.
- **Ethernet** communication.
- **Wi-Fi** communication.

3.- DEVICE INSTALLATION

3.1.- PRIOR RECOMMENDATIONS

In order to use the device safely, it is critical that individuals who handle it follow the safety measures set out in the standards of the country where it is being used, use the necessary personal protective equipment, and pay attention to the various warnings indicated in this instruction manual.

The **CVM-D50** device must be installed by authorised and qualified staff.

The power supply plug must be disconnected and measuring systems switched off before handling, altering the connections or replacing the device. It is dangerous to handle the device while it is powered.

Also, it is critical to keep the cables in perfect condition in order to avoid accidents, personal injury and damage to installations.

The manufacturer of the device is not responsible for any damage resulting from failure by the user or installer to heed the warnings and/or recommendations set out in this manual, nor for damage resulting from the use of non-original products or accessories or those made by other manufacturers.

If an anomaly or malfunction is detected in the device, do not use it to take any measurements.

Inspect the work area before taking any measurements. Do not take measurements in dangerous areas or where there is a risk of explosion.

Disconnect the device from the power supply (device and measuring system power supply) before maintaining, repairing or handling the device's connections.
Please contact the after-sales service if you suspect that there is an operational fault in the device.

3.2.- INSTALLATION

The device must be installed on an electric panel or enclosure, attached to a DIN rail (IEC 60715).

The minimum recommended distance between rails for installing the **CVM-D50** device is 150 mm.

> Terminals, opening covers or removing elements can expose parts that are hazardous to the touch while the device is powered. Do not use the device until it is fully installed.

The device must be connected to a power circuit that is protected with gL (IEC 60269) or M class fuses with a rating of 0.5 to 2 A. It must be fitted with a circuit breaker or equivalent device, in order to be able to disconnect the device from the power supply network.

The temperature rating of insulation of wires connected to the device will be at minimum 62°C.

3.3.- PANEL MOUNTING ACCESSORY (72 x 72 mm)

Note: *The 72 x 72 mm panel mounting accessory is an accessory that is sold separately.*

CIRCUTOR has a panel mounting accessory of the **CVM-D50** equipment so that it can be installed on 72 x 72 mm panels.

Figure 1: CVM-D50 with panel mounting accessory.

Figure 2 shows the installation of the panel mounting accessory to the **CVM-D50**.

> Disconnect all power supplies and measuring equipment from the device before carrying out the installation of the panel mounting accessory.

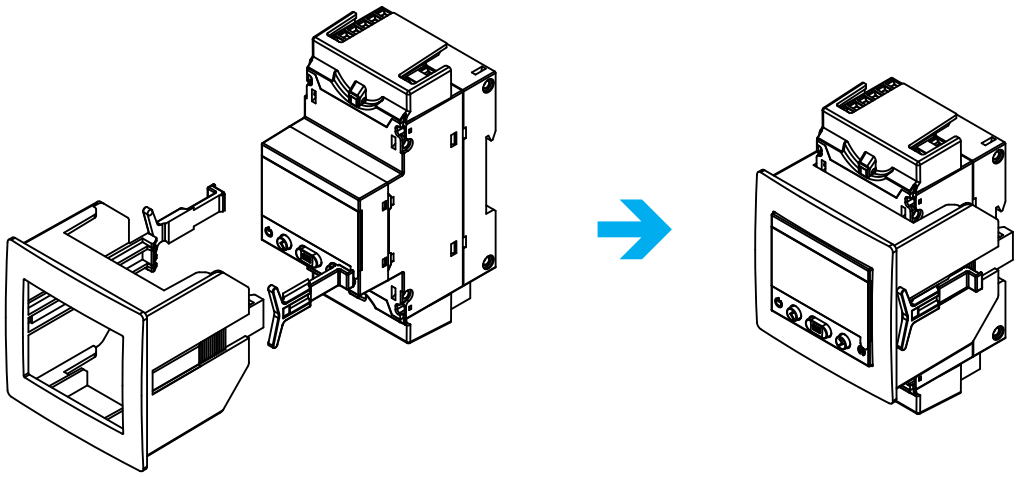


Figure 2: Installation of the panel mounting accessory.

Table 3: Technical features.

Technical features	
Protection degree	IP40
Enclosure	Self-extinguishing V0 plastic

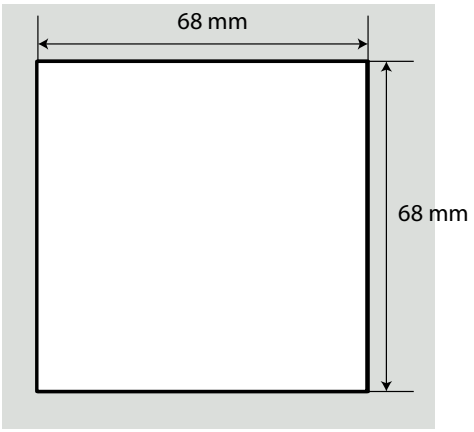


Figure 3: Panel cut-out.

3.4.- CVM-D50-FLEX: ROGOWSKI SENSORS

The **CVM-D50-FLEX** model measures currents using flexible sensors, based on the Rogowski coil principle.
The flexibility of the sensor allows it to measure an alternating current irrespective of the position of the conductor.

CIRCUTOR has 2 Rogowski sensor model that can be used with the devices: **FLEX-MAG** and **MFC-FLEX.**

Note: *For more information, consult the corresponding sensor guide.*

Table 4: Position error.

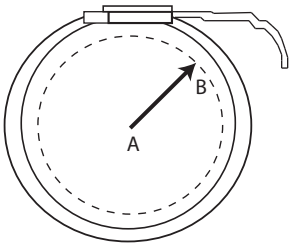
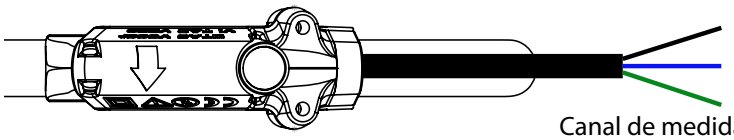
Position		Error	
		FLEX-MAG	MFC-FLEX
	A	± 1%	< 1%
	B	A ± 3%	< 1%

Table 5: Probe cable terminal connections

Probe cable terminal connections
FLEX-MAG
 **Black :** Shield (SHLD) **Blue:** Common (C) **Green:** Measuring channel (L1, L2, L3, N)
MFC-FLEX
 **White** (OUT+): Measuring channel (L1, L2, L3, N) **Blue** (OUT-): Common (C) **Grey:** Shield (SHLD)

3.5.- DEVICE TERMINALS

3.5.1.- MODELS CVM-D50-ITF AND CVM-D50-MC

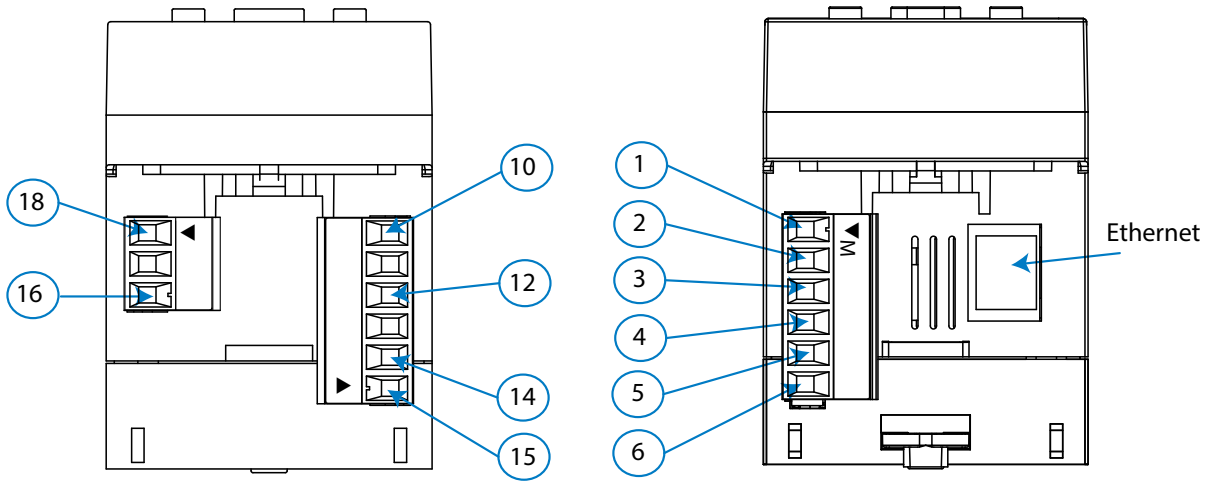


Figure 4: CVM-D50 terminals: Up - Down.

Table 6: Device terminals: CVM-D50-ITF and CVM-D50-MC.

Device terminals	
16: A1 ~ **+**, Power supply	**2: S2**, Current input L1
18: A2 ~ **-**, Power supply	**3: S1**, Current input L2
10: VL1, Voltage input L1	**4: S2**, Current input L2
12: VL2, Voltage input L2	**5: S1**, Current input L3
14: VL3, Voltage input L3	**6: S2**, Current input L3
15: N, Neutral voltage input	**Ethernet:** Ethernet connection
1: S1, Current input L1	

3.5.2.- MODEL CVM-D50-FLEX

Table 7: Device terminals: CVM-D50-FLEX.

Device terminals	
16: A1 ~ **+**, Power supply	**2: L2**, Current input L2
18: A2 ~ **-**, Power supply	**3: L3**, Current input L3
10: VL1, Voltage input L1	**4:** Without connecting
12: VL2, Voltage input L2	**5: C**, Common current input
14: VL3, Voltage input L3	**6: SHLD**, GND for current input
15: N, Neutral voltage input	**Ethernet:** Ethernet connection
1: L1, Current input L1	

3.6.- CONNECTION DIAGRAM

3.6.1.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION: CVM-D50-ITF MODEL

Measurement system: 4-3Ph

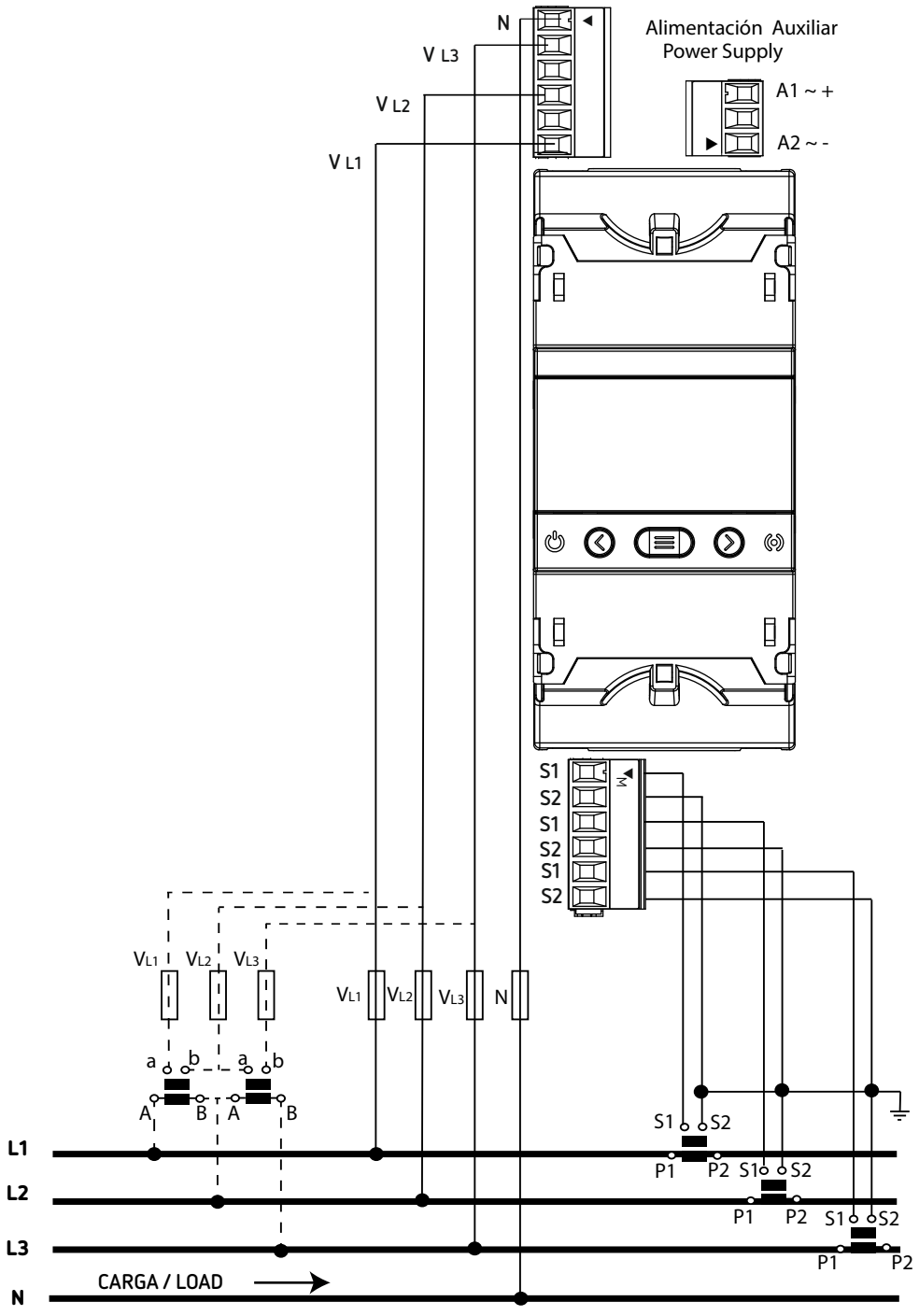


Figure 5: Three-Phase measuring with a 4-wire connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.2.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION: CVM-D50-MC MODEL

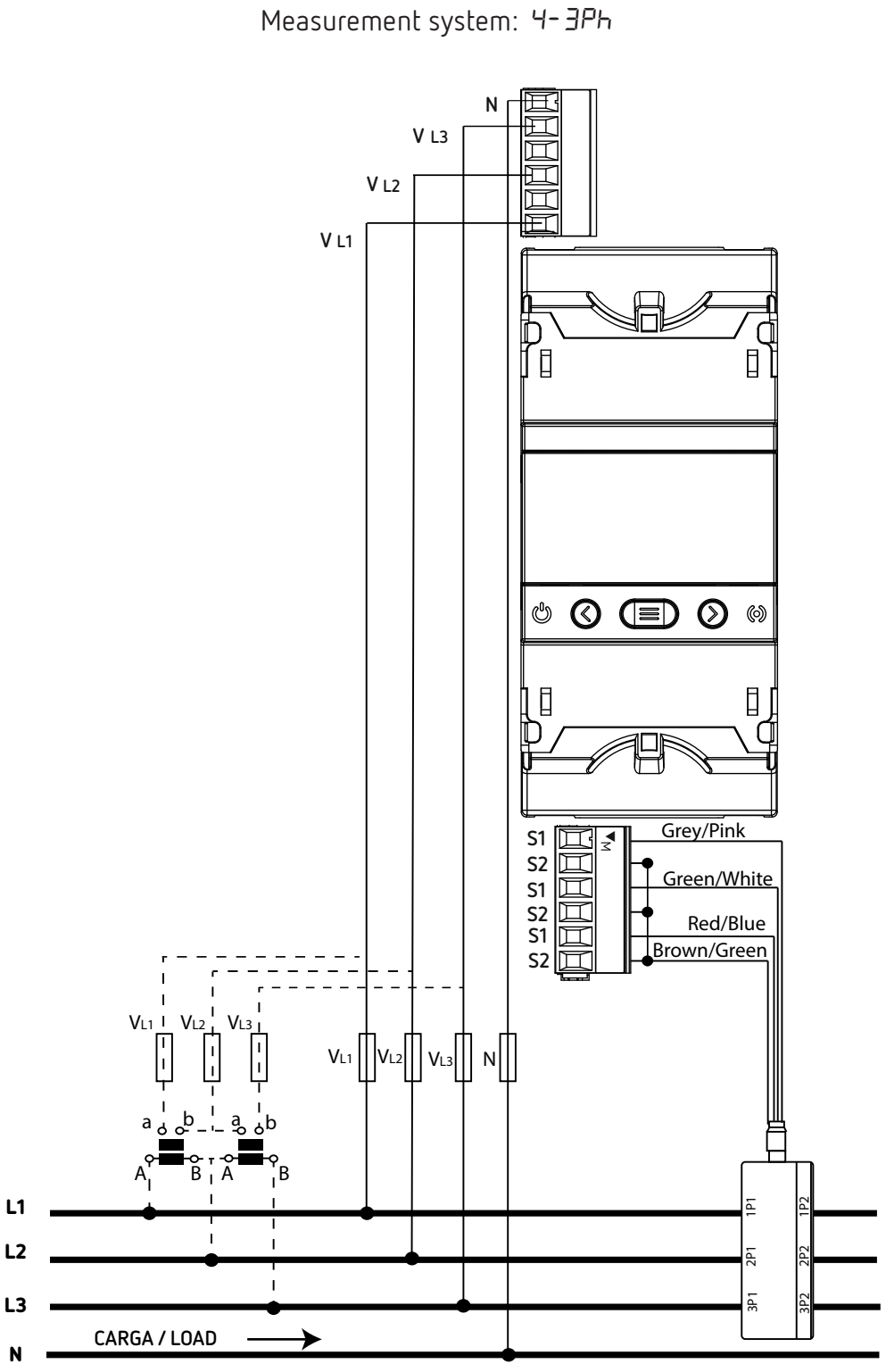


Figure 6: Three-Phase measuring with a 4-wire connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.3.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION: CVM-D50-FLEX MODEL

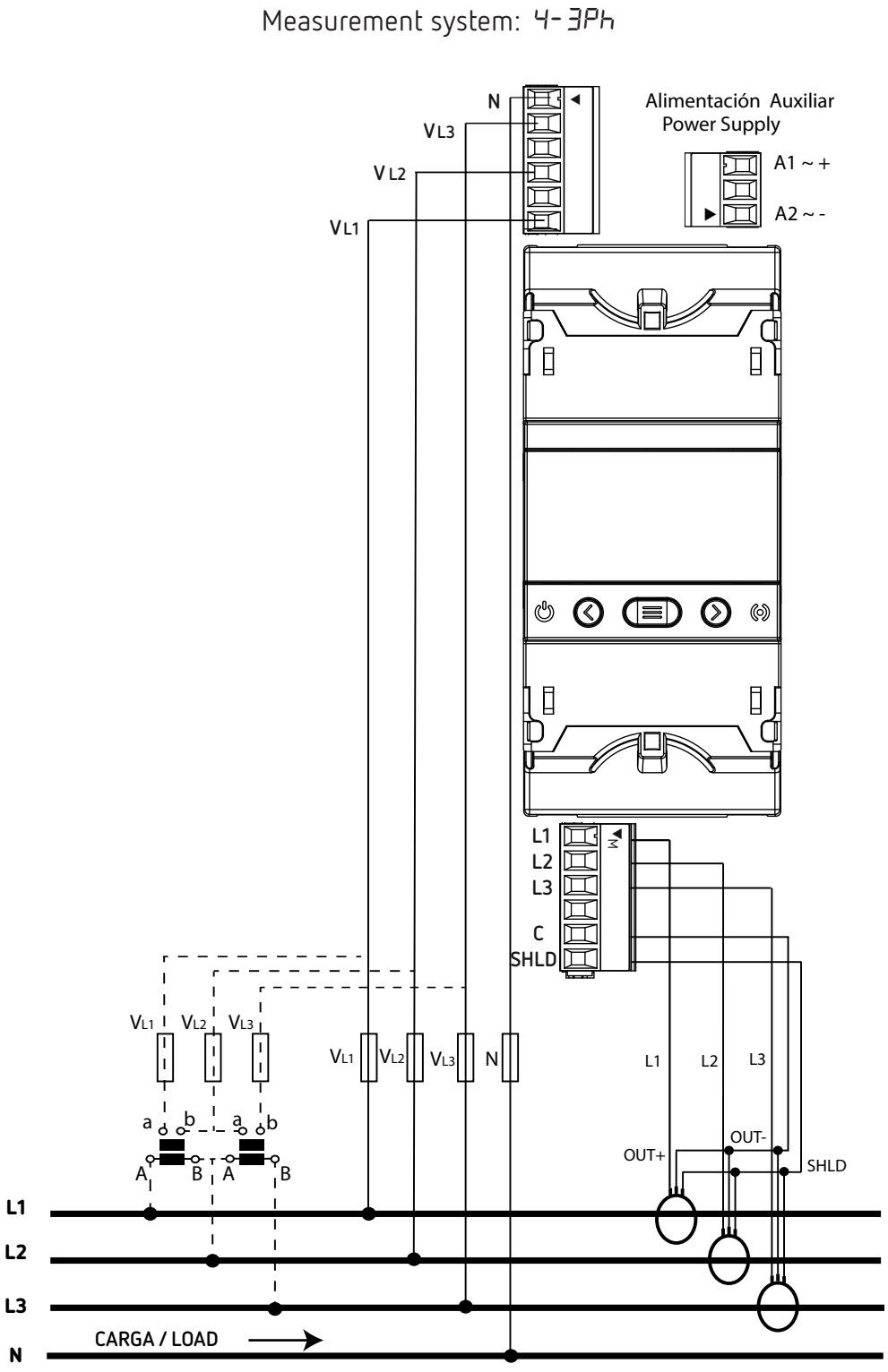


Figure 7: Three-Phase measuring with a 4-wire connection: CVM-D50-FLEX.

It is mandatory connect the **SHLD** terminal of the probe.

3.6.4.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-ITF MODEL

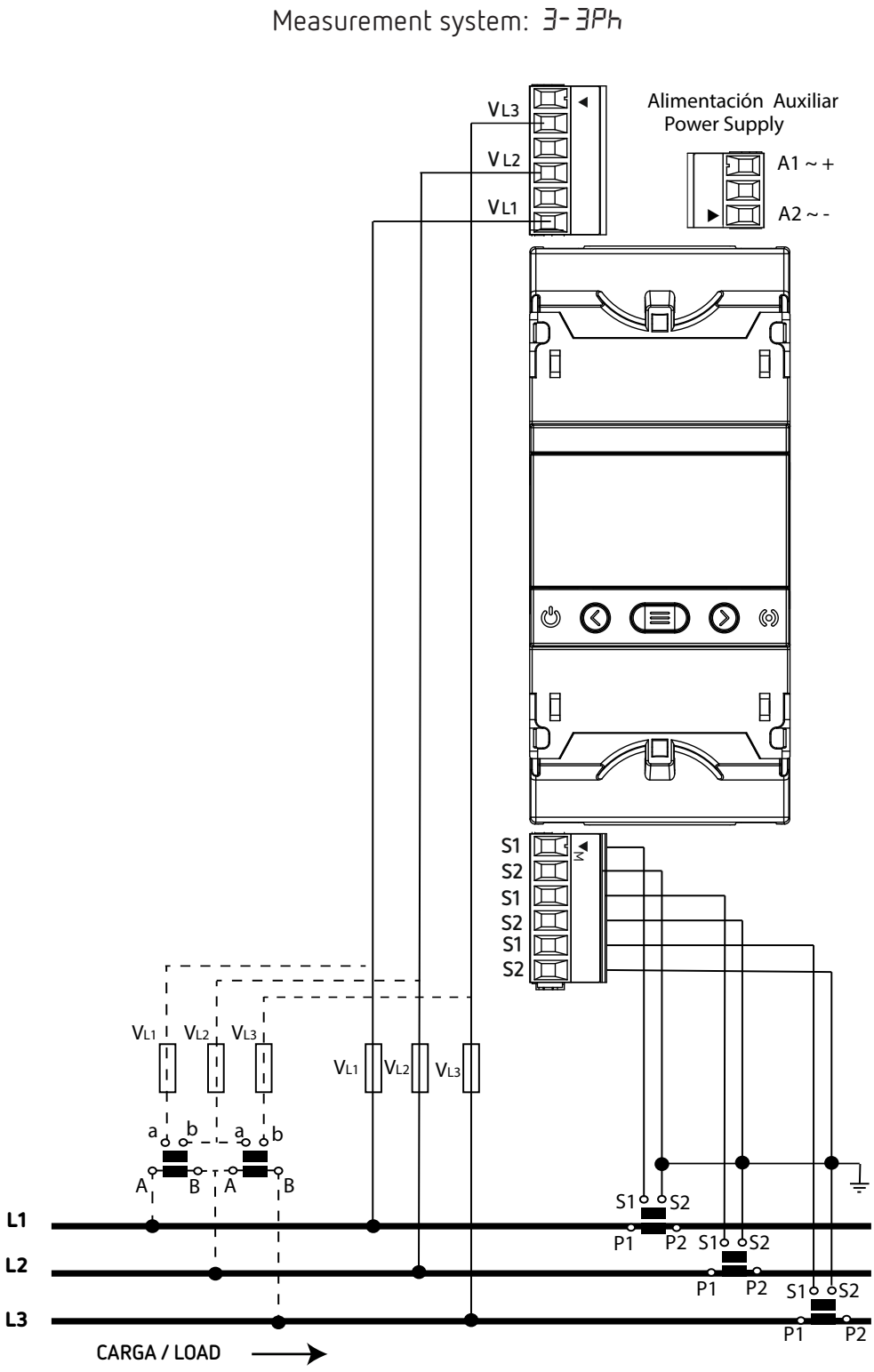


Figure 8: Three-Phase measuring with a 3-wire connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.5.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-MC MODEL

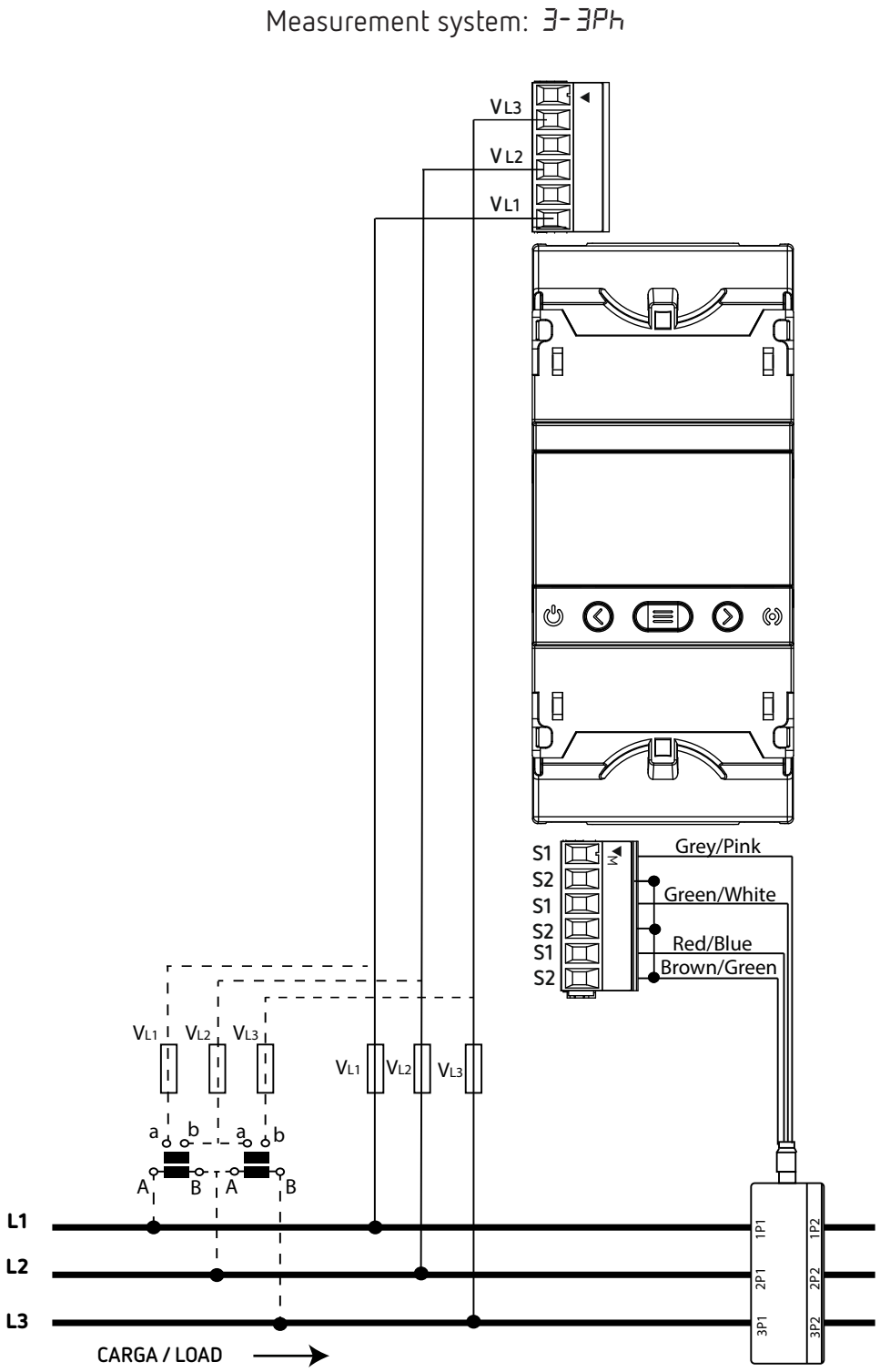


Figure 9: Three-Phase measuring with a 3-wire connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.6.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-FLEX MODEL

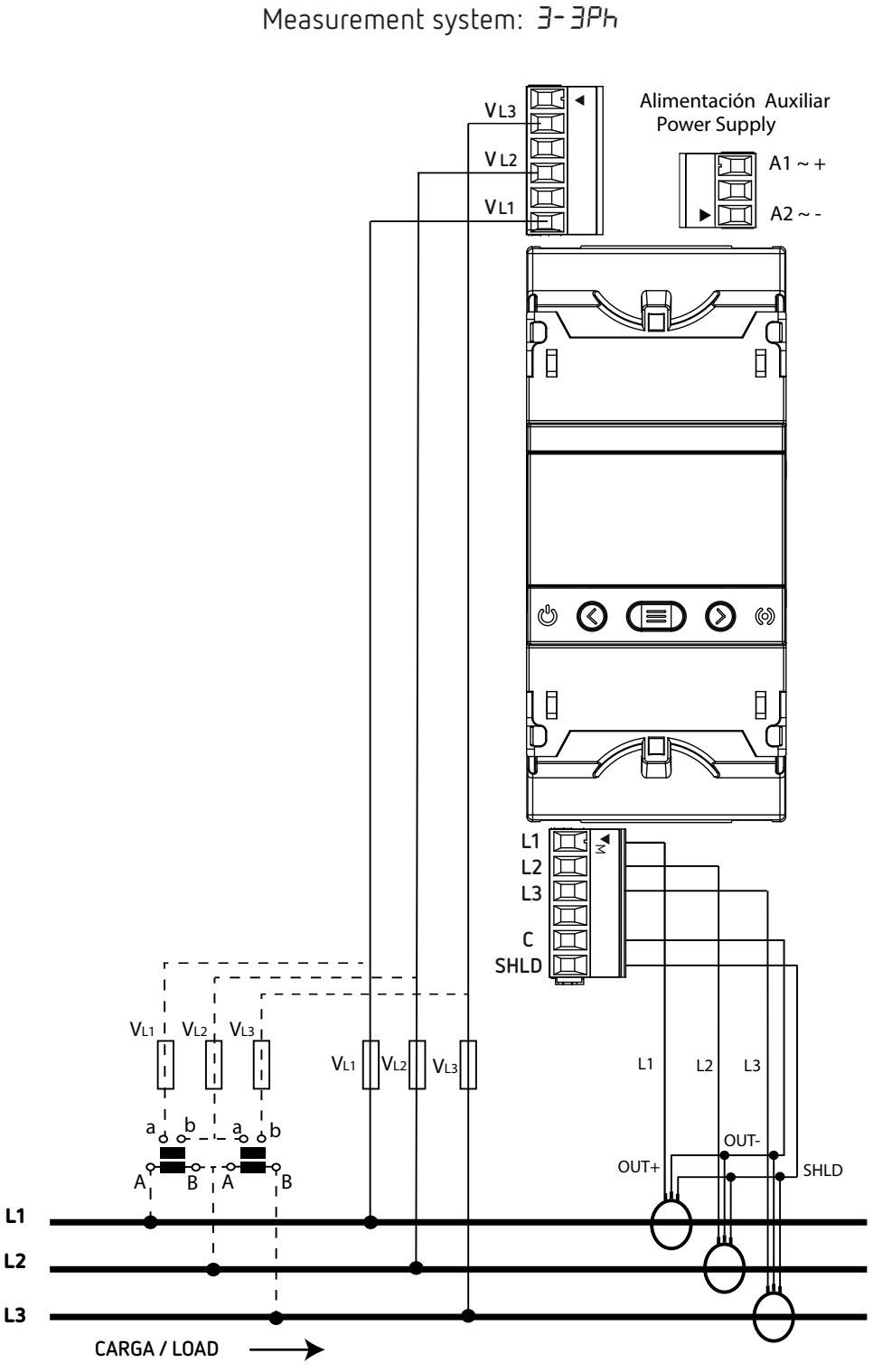


Figure 10: Three-Phase measuring with a 3-wire connection: CVM-D50-FLEX.

It is mandatory connect the **SHLD** terminal of the probe.

3.6.7.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION AND TRANSFORMERS WITH AN ARON CONNECTION: CVM-D50-ITF MODEL

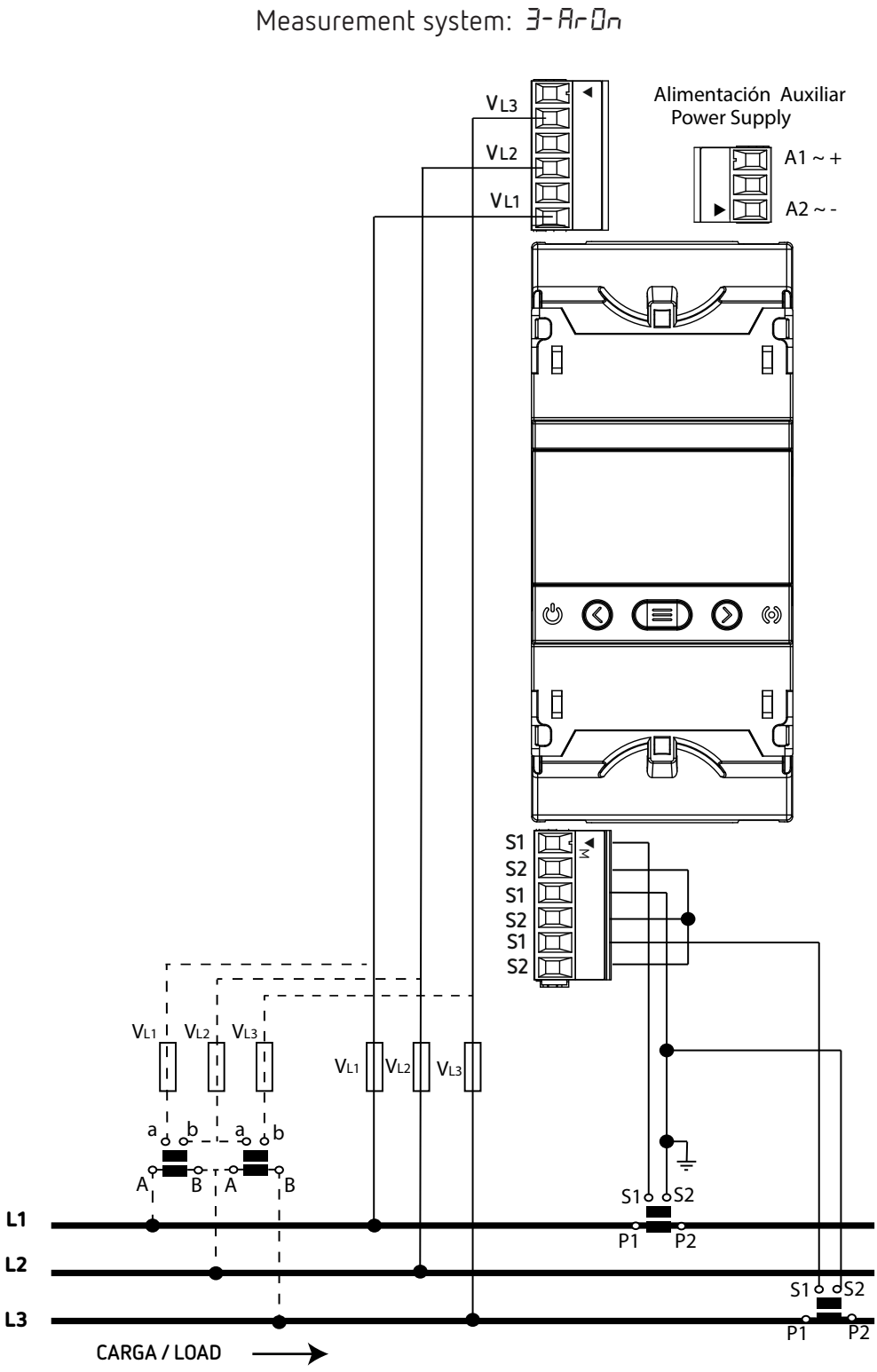


Figure 11: Three-Phase measuring with a 3-wire connection and transformers with an ARON connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.8.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION AND TRANSFORMERS WITH AN ARON CONNECTION: CVM-D50-MC MODEL

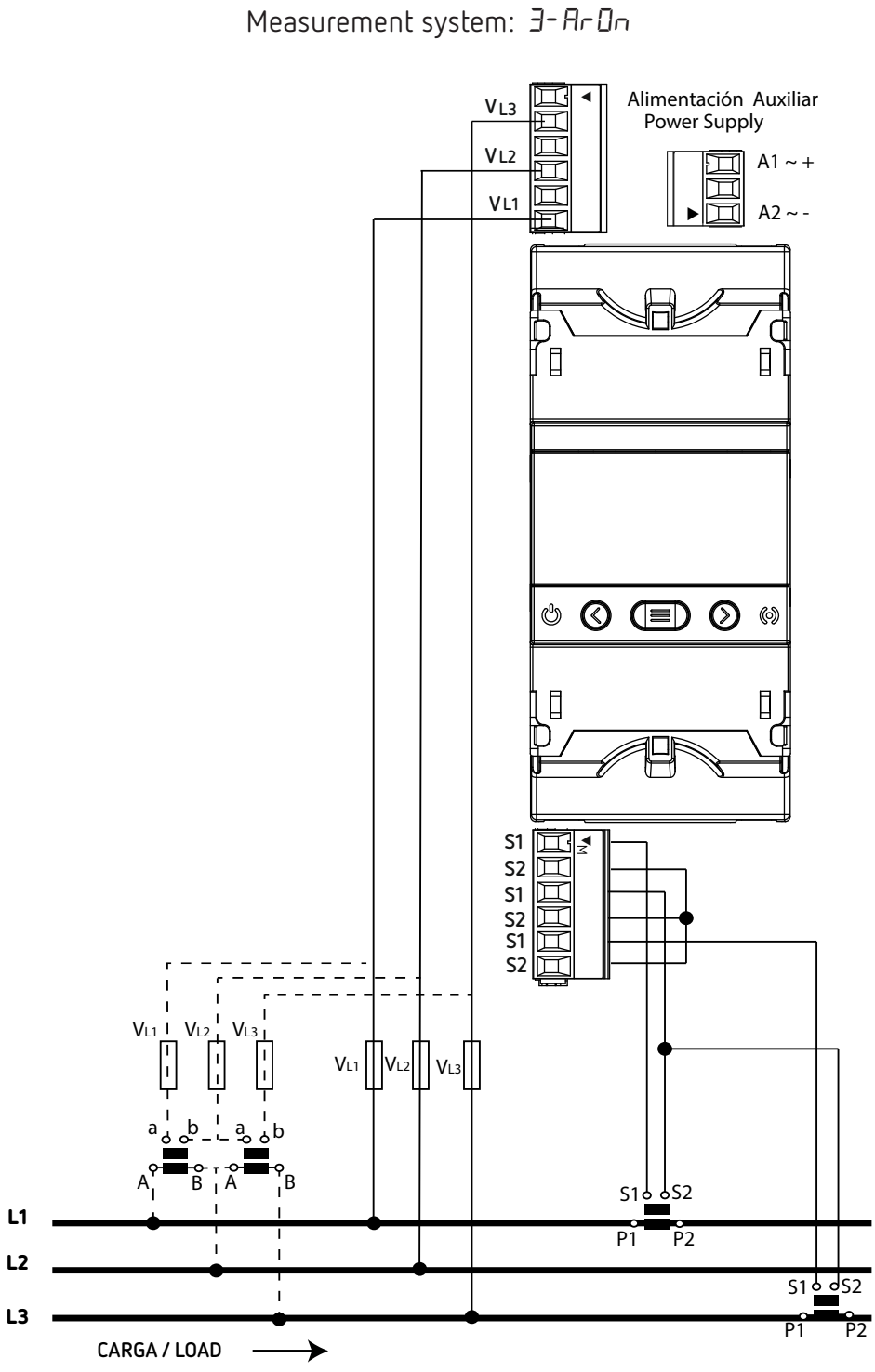


Figure 12: Three-Phase measuring with a 3-wire connection and transformers with an ARON connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.9.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-ITF MODEL

Measurement system: 3-2Ph

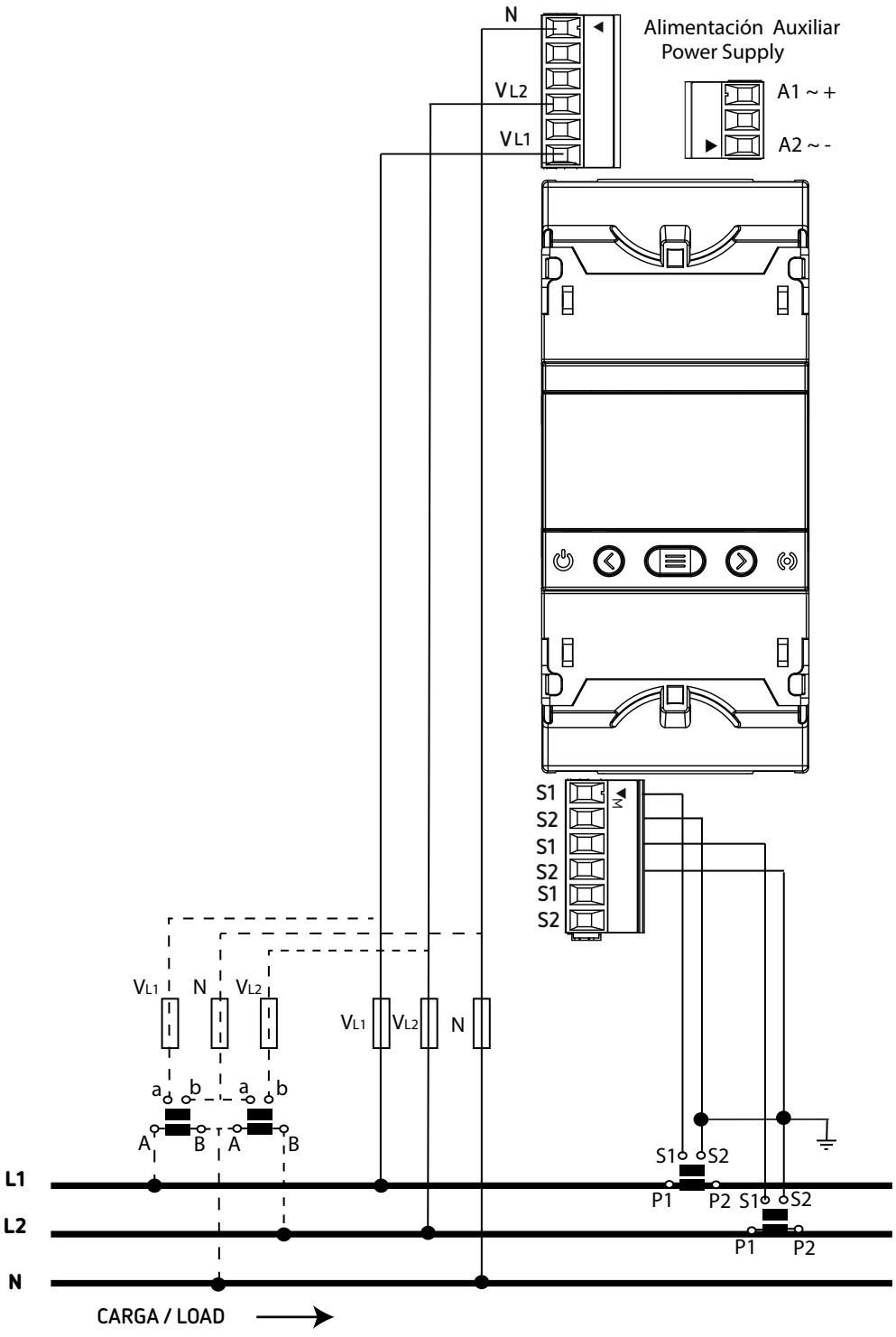


Figure 13: Measuring Two-Phase Networks with a 3-wire connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.10.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-MC MODEL

Measurement system: 3-2Ph

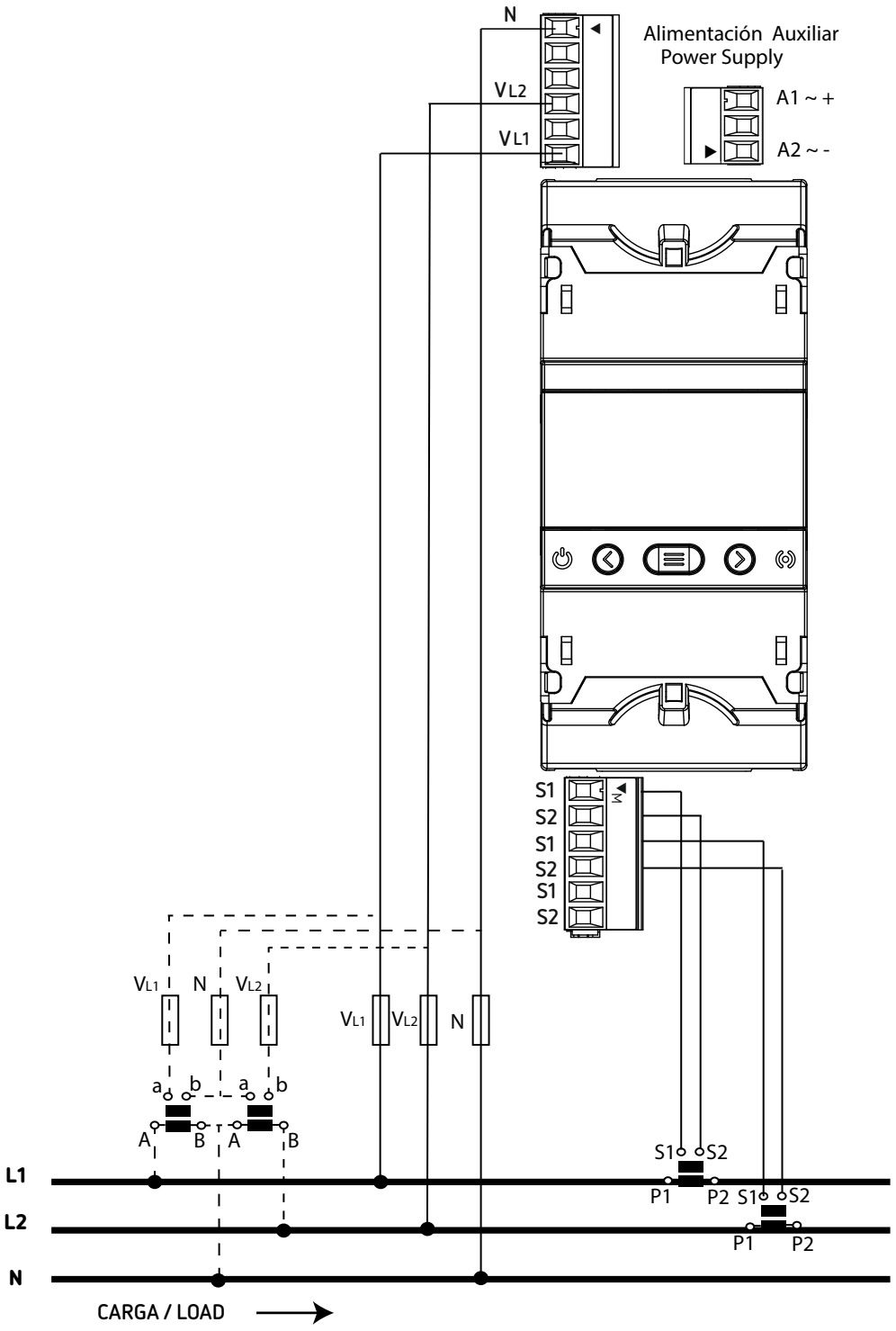


Figure 14: Measuring Two-Phase Networks with a 3-wire connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.11.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION: CVM-D50-FLEX MODEL

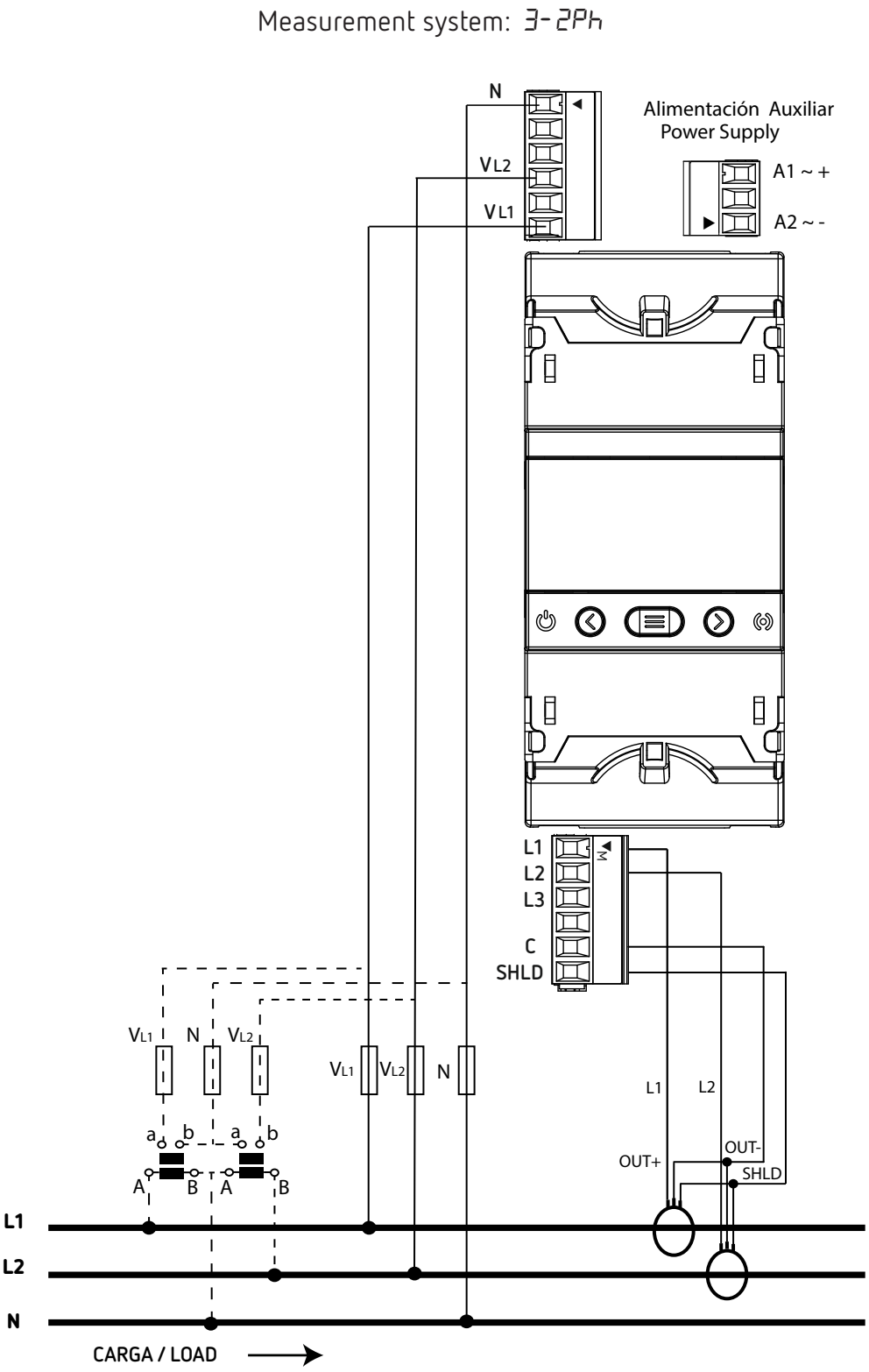


Figure 15: Measuring Two-Phase Networks with a 3-wire connection: CVM-D50-FLEX.

It is mandatory connect the **SHLD** terminal of the probe.

3.6.12.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION: CVM-D50-ITF MODEL

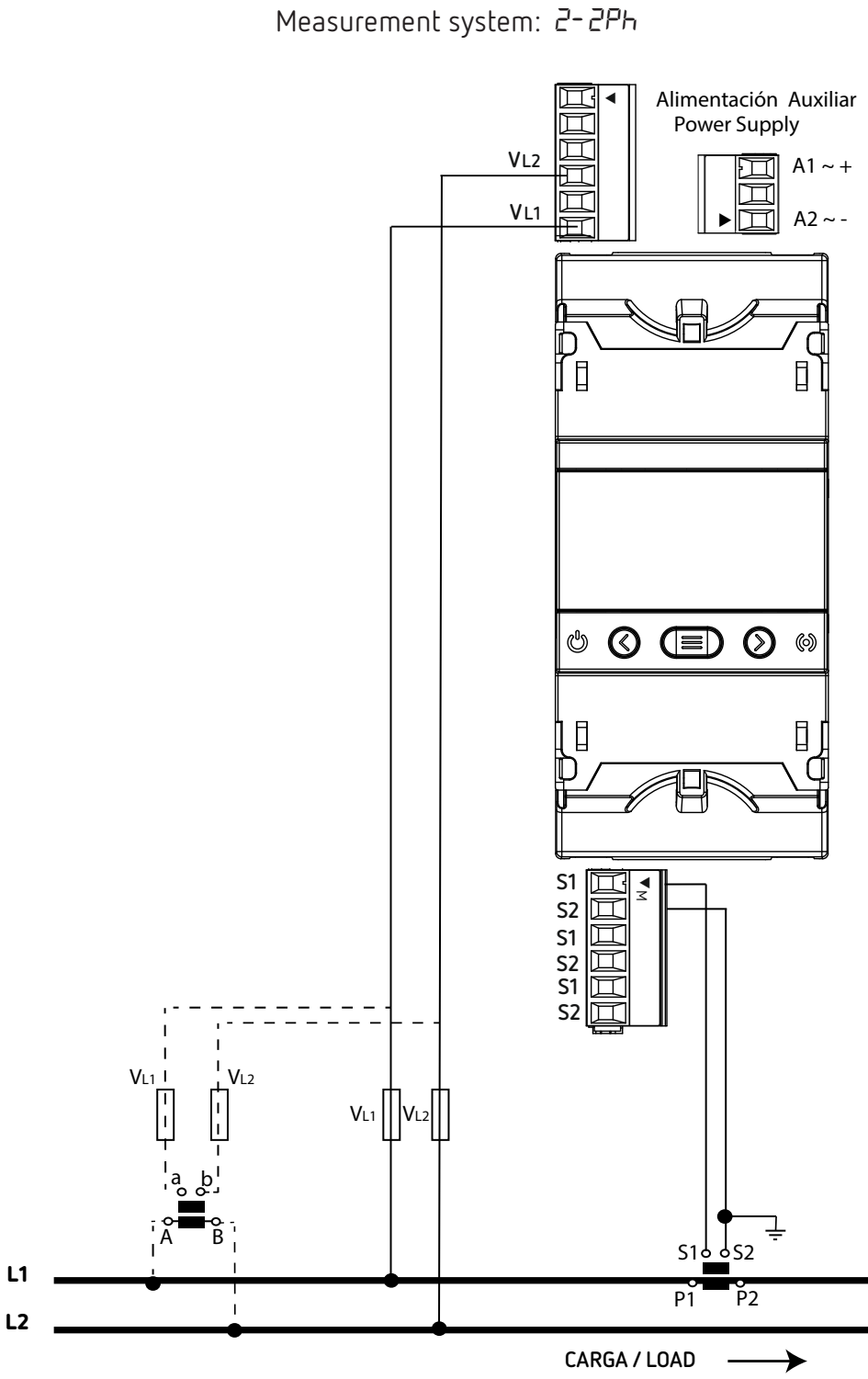


Figure 16: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.13.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION: CVM-D50-MC MODEL

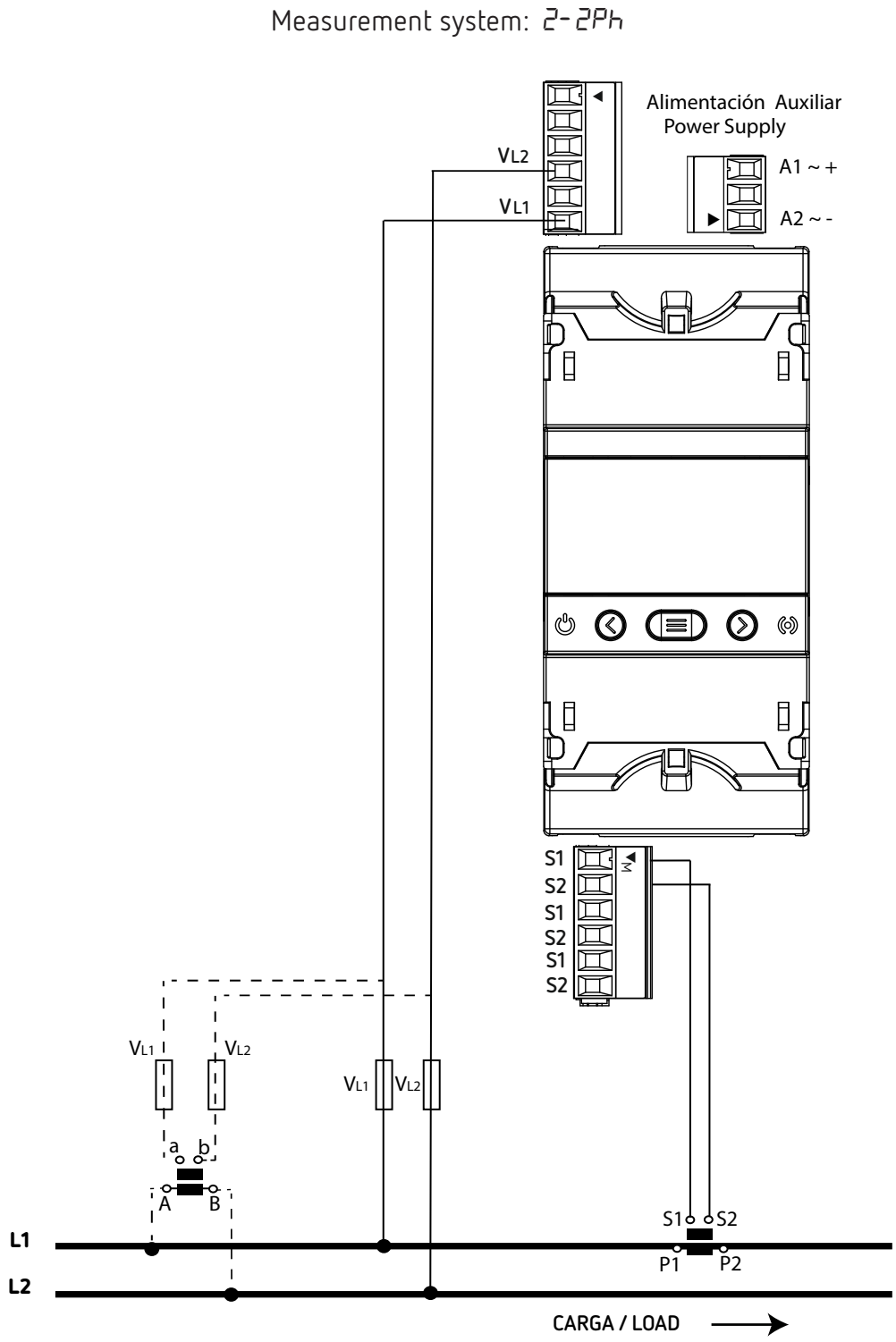


Figure 17: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.14.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION: CVM-D50-FLEX MODEL

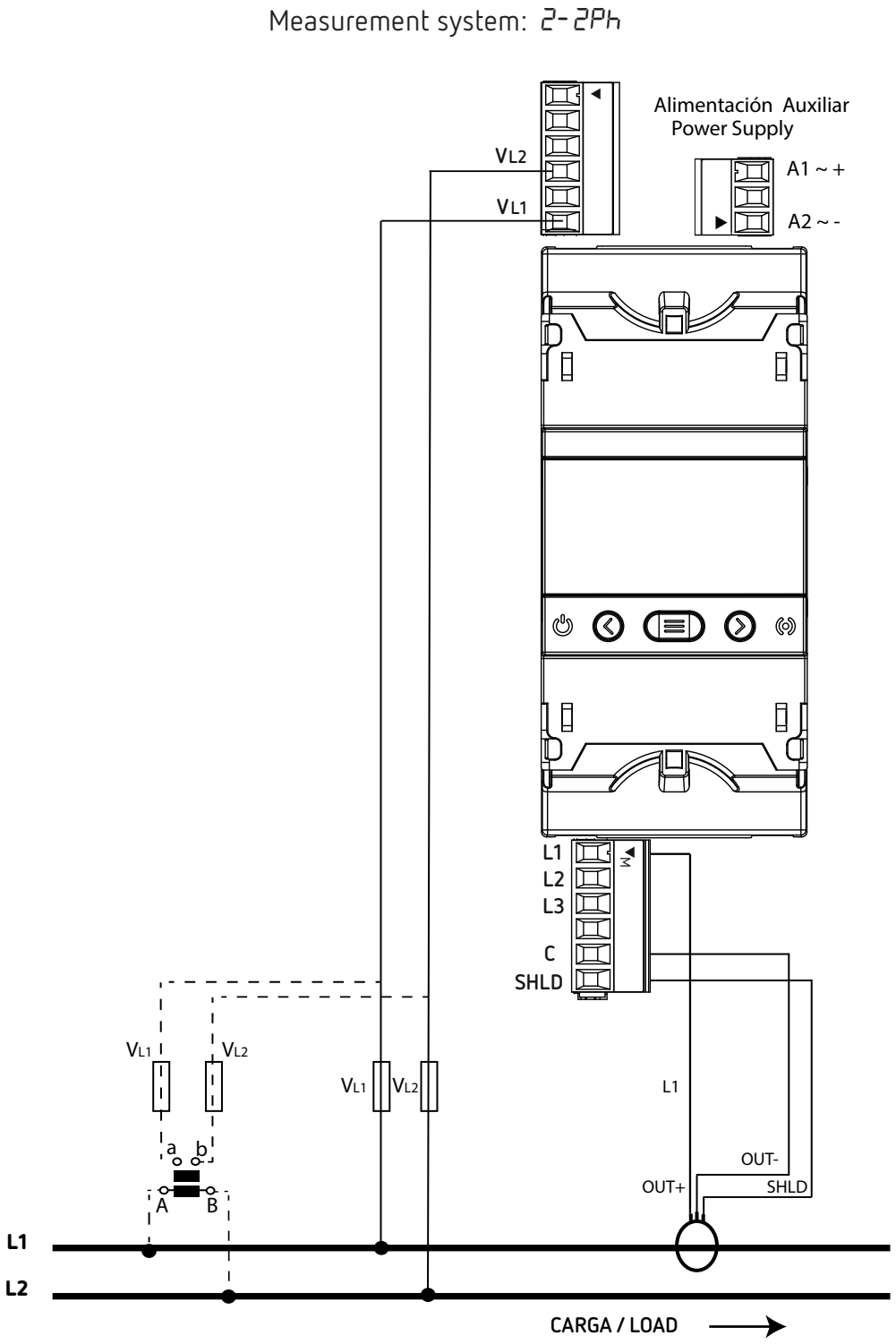


Figure 18: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection: CVM-D50-FLEX.

It is mandatory connect the **SHLD** terminal of the probe.

3.6.15.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION: CVM-D50-ITF MODEL

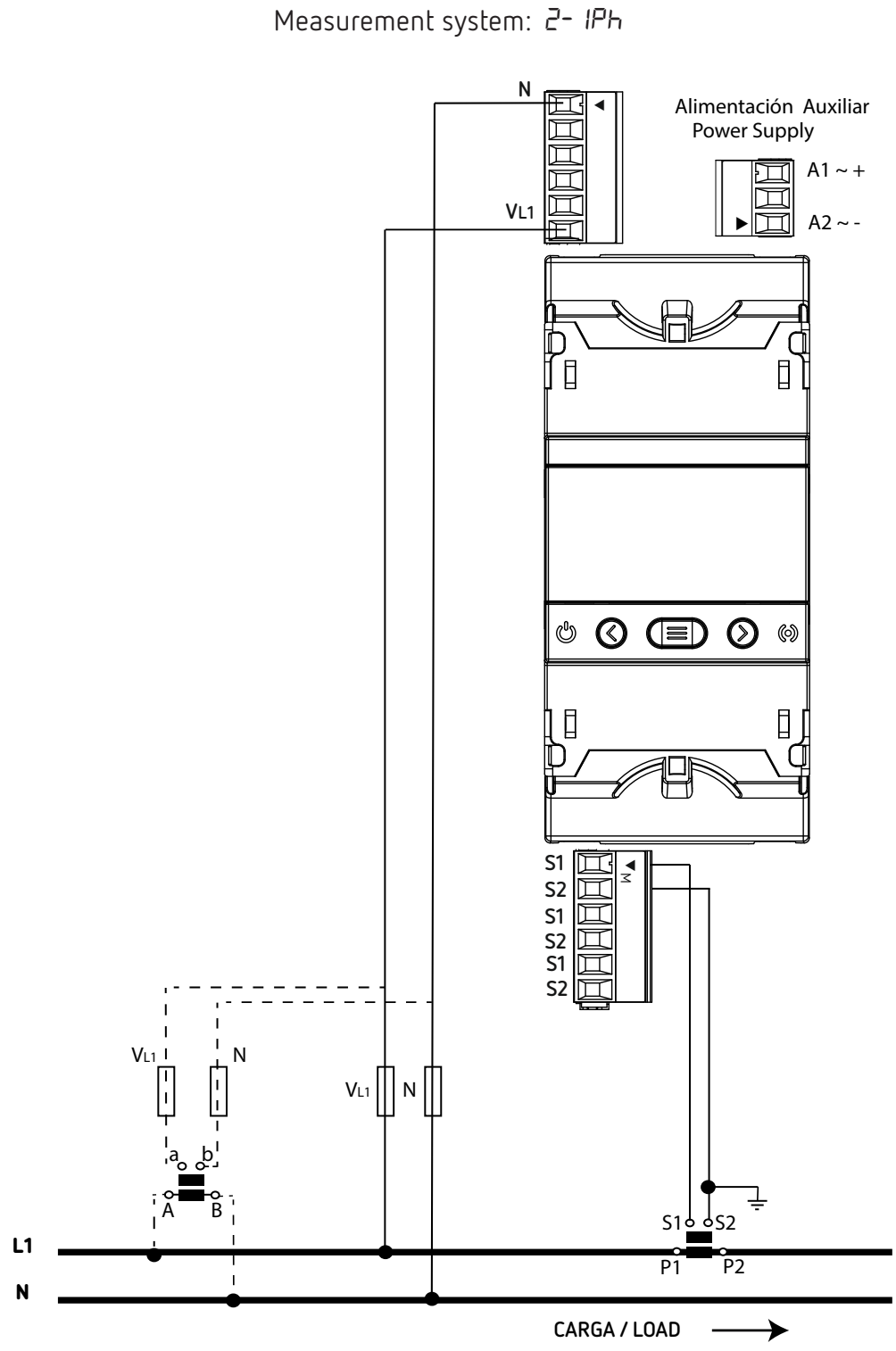


Figure 19: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection: CVM-D50-ITF.

To guarantee the insulation of the device and its category, it is necessary to earth the S2 terminals of the transformers.

3.6.16.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION: CVM-D50-MC MODEL

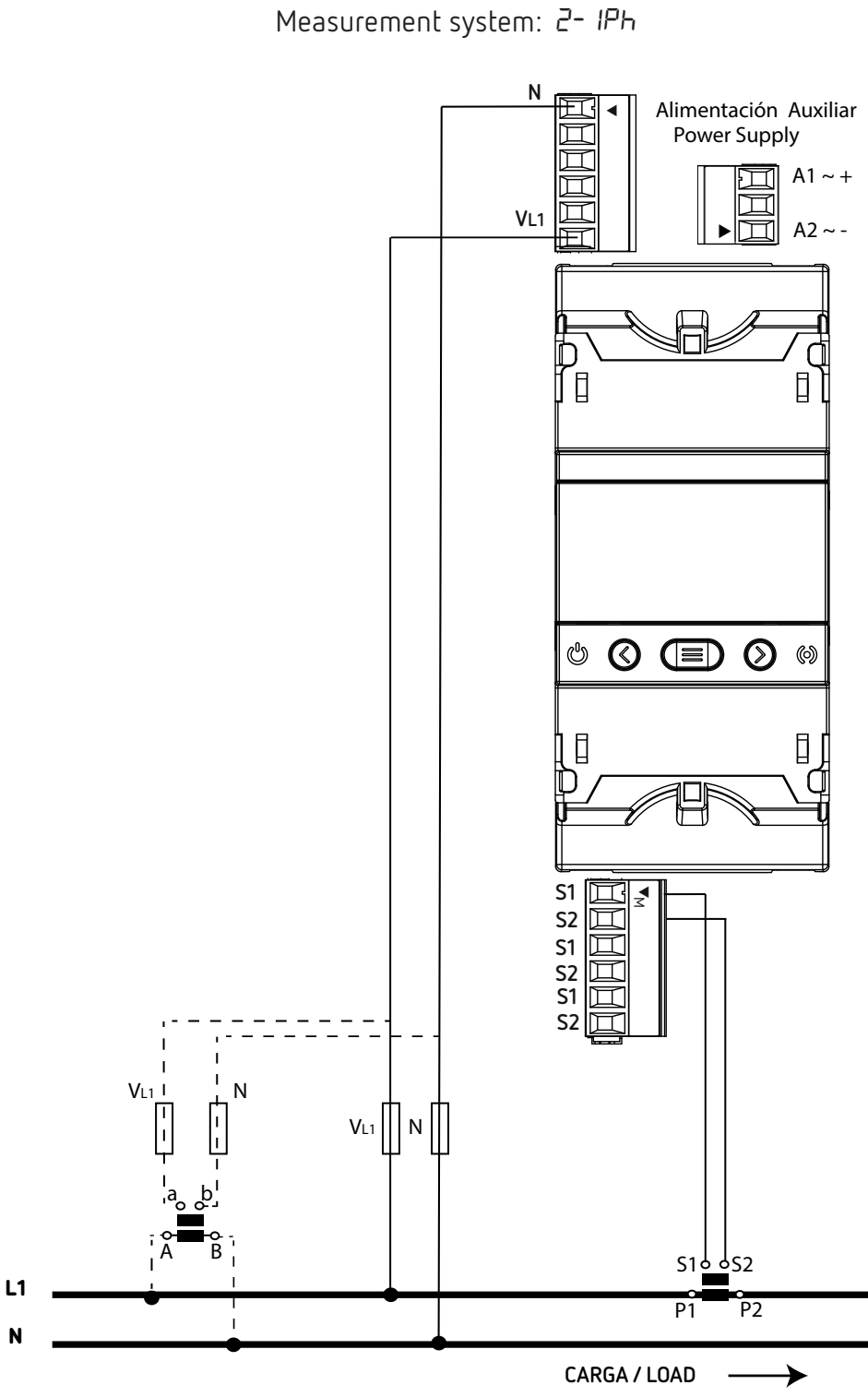


Figure 20: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection: CVM-D50-MC.

Note: *Do not connect MC1 current transformers to ground.*

The MC transformer secondary value is set to 0.250 A (fixed value).

3.6.17.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION: CVM-D50-FLEX MODEL

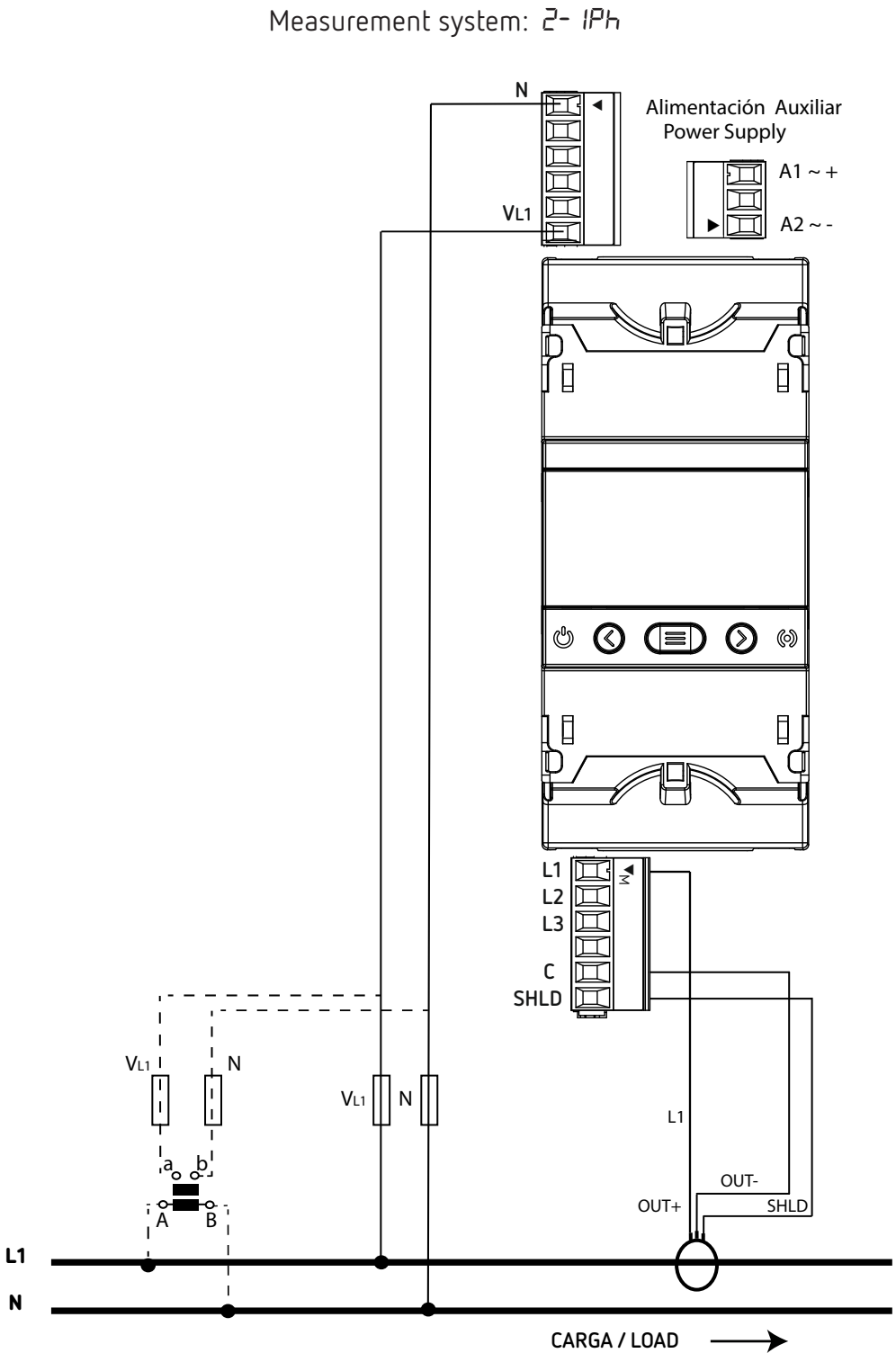


Figure 21: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection: CVM-D50-FLEX.

It is mandatory connect the **SHLD** terminal of the probe.

4.- OPERATION

The **CVM-D50** is a four-quadrant power analyzer (consumption and generation).
The device can operate according to three different measurement conventions:

- ✓ **CIRCUTOR** measurement convention.
- ✓ **IEC** measurement convention.
- ✓ **IEEE** measurement convention.

The measurement convention configuration is done through the settings menu "*6.6.- MEASUREMENT CONVENTION*" or via the device's web page (*"7.5.11.2.- Measurement"*).

✓ **CIRCUTOR** measurement convention

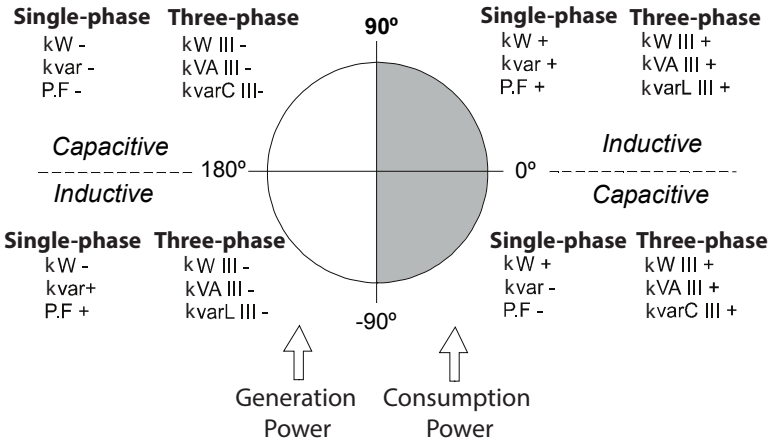
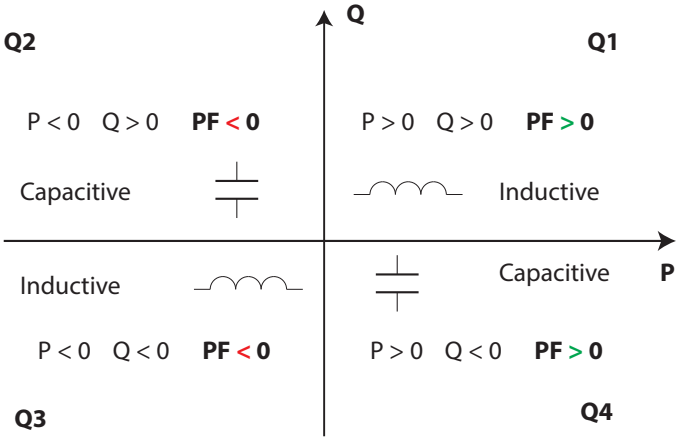


Figure 22: CIRCUTOR measurement convention.

✓ **IEC** measurement convention

Operation in the 4 quadrants (Q1, Q2, Q3, Q4)



cos φ values in the receiver operating mode (Q1,Q4)

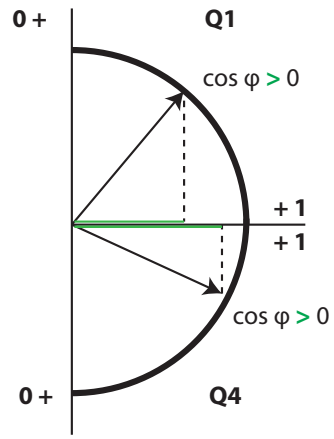
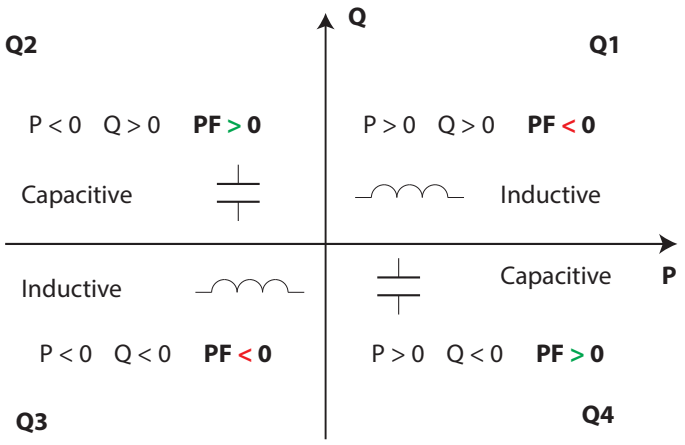


Figure 23: IEC measurement convention.

✓ **IEEE** measurement convention

Operation in the 4 quadrants (Q1, Q2, Q3, Q4)



cos φ values in the receiver operating mode (Q1,Q4)

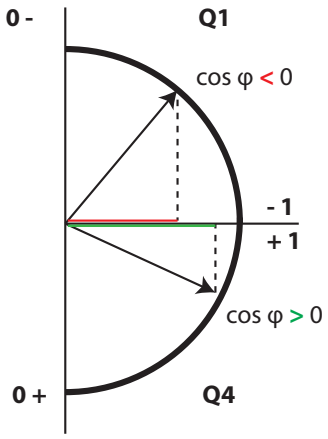


Figure 24: IEEE measurement convention.

4.1.- MEASURING PARAMETERS

The device displays the electrical parameters shown in **Table 8**.

Table 8: Measuring parameters of the CVM-D50.

Parameter	Units	Phases L1-L2-L3	Total III	Maxim. value	Minim. value
Phase-Neutral voltage	V	✓	✓	✓	✓
Phase-Phase voltage	V	✓	✓	✓	✓
Current	A	✓	✓(1)	✓	✓
Neutral Current(1)	A	-	✓	✓	✓
Frequency	Hz	-	✓	✓	✓
Active Power	W	✓	✓	✓	✓
Apparent Power	VA	✓	✓	✓	✓
Reactive Power(1) (2)	var	✓	✓	✓	✓
Inductive Reactive Power - Consumption (1) (3)	$kvar^L$	✓	✓	✓	✓
Inductive Reactive Power - Generation (1) (3)	$kvar^L$	✓	✓	✓	✓
Capacitive Reactive Power - Consumption (1) (3)	$kvar_C$	✓	✓	✓	✓
Capacitive Reactive Power - Generation (1) (3)	$kvar_C$	✓	✓	✓	✓
Power factor	PF	✓	✓	✓	✓
Cos φ (1) (3)	φ	✓	✓	✓	✓
THD % Voltage	%	✓	-	✓	✓
THD % Current	%	✓	-	✓	✓
Harmonic decomposition Voltage (31st harmonic)	harm V	✓	-	-	-
Harmonic decomposition Current (31st harmonic)	harm V	✓	-	-	-
Total Active Energy (Tariff 1 + Tariff 2)	kWh	✓(1)	✓	-	-
Total Inductive Reactive Energy (Tariff 1 + Tariff 2)	$kvar^Lh$	✓(1)	✓	-	-
Total Capacitive Reactive Energy (Tariff 1 + Tariff 2)	$kvar_Ch$	✓(1)	✓	-	-

Table 8 (Continuation): Measuring parameters of the CVM-D50.

Parameter	Units	Phases L1-L2-L3	Total III	Maxim. value	Minim. value
Total Apparent Energy (Tariff 1 + Tariff 2)	kVAh	✓(1)	✓	-	-
Active Energy Tariff 1	kWh	✓(1)	✓	-	-
Inductive Reactive Energy Tariff 1	kvarLh	✓(1)	✓	-	-
Capacitive Reactive Energy Tariff 1	kvarCh	✓(1)	✓	-	-
Apparent Energy Tariff 1	kVAh	✓(1)	✓	-	-
Active Energy Tariff 2	kWh	✓(1)	✓	-	-
Inductive Reactive Energy Tariff 2	kvarLh	✓(1)	✓	-	-
Capacitive Reactive Energy Tariff 2	kvarCh	✓(1)	✓	-	-
Apparent Energy Tariff 2	kVAh	✓(1)	✓	-	-
Maximum Current Demand (1) (3)	A	✓	-	-	-
Maximum Demand of Active power (1) (3)	W	-	-	✓	-
Maximum Demand of Apparent Power (1) (3)	VA	-	✓	✓	-
Maximum Demand of Inductive Power (1) (3)	varL	-	✓	✓	-
Maximum Demand of Capacitive Power (1) (3)	varC	-	✓	✓	-
Parameter	**Units**	**Tariff: T1-T2**		**Total**	
No. of hours	hours	✓ (1) (3)		✓	
Cost	-	✓ (1) (3)		✓	
CO_2 Emissions	$kgCO_2$	✓ (1) (3)		✓	

(1) Variable visible via communications, see ***"7.5.- MODBUS COMMANDS"***.

(2) Variable visible on the web page, see ***"8.- WEBSITE"***.

(3) Variable visible on the display, see ***"5.- DISPLAY"***.

4.2.- KEYBOARD FUNCTIONS

The **CVM-D50** has 3 keys that allow you to browse between the various screens and program the device.

Key functions on measuring screens (**Table 9**):

Table 9: Key functions on measuring screens.

Key	Short keystroke	Long keystroke (2 s)
<	Previous screen	Display of minimum value
>	Next screen	Display of maximum value
≡	Switching between the different display menus	Accessing the programming menu
≡ + >	-	Display of the Maximum Demand
< + >	-	Unlocks the active alarm
< + ≡	-	Display of the Ethernet and Wi-Fi communications screens.
< + ≡ + >	-	Display of device information screens.

Key functions on harmonics screens (**Table 10**):

Table 10: Key functions on harmonics screens.

Key	Short keystroke	Long keystroke (2 s)
<	Output of the harmonics screens	-
>	Next screen	-
≡	Browsing the different types of harmonics	Accessing the programming menu

Key functions on the programming menu, query mode (**Table 11**):

Table 11: Key functions on the programming menu, query mode.

Key	Short keystroke	Long keystroke (2 s)
<	Previous screen	Programming output
>	Next screen	Programming output
≡		Entering and exiting the edit mode of the programming menu

Key functions on the programming menu, edit mode (**Table 12**):

Table 12: Key functions on the programming menu, edit mode.

Key	Keystroke
<	Skips to the previous digit that can be edited (flashing)
≡	Increases the digits (0-9) or rotates between the different options.
>	Skips to the next digit that can be edited (flashing)

4.3.- DISPLAY

The device features a backlit LCD display that shows all the parameters listed in **Table 8**.
The display is divided into two areas (**Figure 25**):

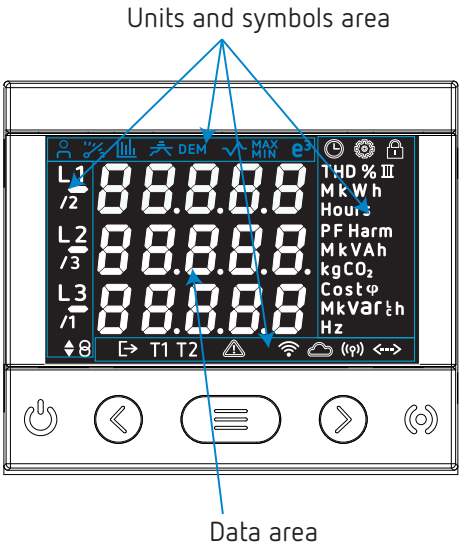


Figure 25: CVM-D50 Display areas.

✓ The **data** area displays the values measured or calculated by the device.

✓The **units** and **symbols** area where the different states, profiles and equipment information are displayed (**Table 13**).

Table 13: Icons in the display.

Icon	Description	Icon	Description
▲▼ 8	Installation status: ▼ Installation consuming. ▲ Installation generating.		Instantaneous value
	Energy Value.		User Profile.
T1 T2	Tariff: **T1** Tariff 1, **T2** Tariff 2	DEM	Maximum demand value
MIN	Minimum value.		Programming menu locked by password.
MAX	Maximum value.		Communications activated.

4.4.- LED INDICATORS

The **CVM-D50** device has 2 LEDs:

- **CPU**, indicates that the device is on, flashing each second.

- **ALARM / ENERGY PULSES;** if this is on, it indicates that an alarm or an energy pulses output has been activated. In the case of the energy pulses, the LED will be lit and flash with the rate of these pulses.
The configuration of the Alarm/Energy Pulses is performed through the configuration menu ("*6.17.- ALARM / ENERGY PULSES CONFIGURATION*"), via communications ("*7.5.11.7.- Alarm/Energy Pulses*") or through the Web page ("*8.3.4.- ALARM/PULSES*").

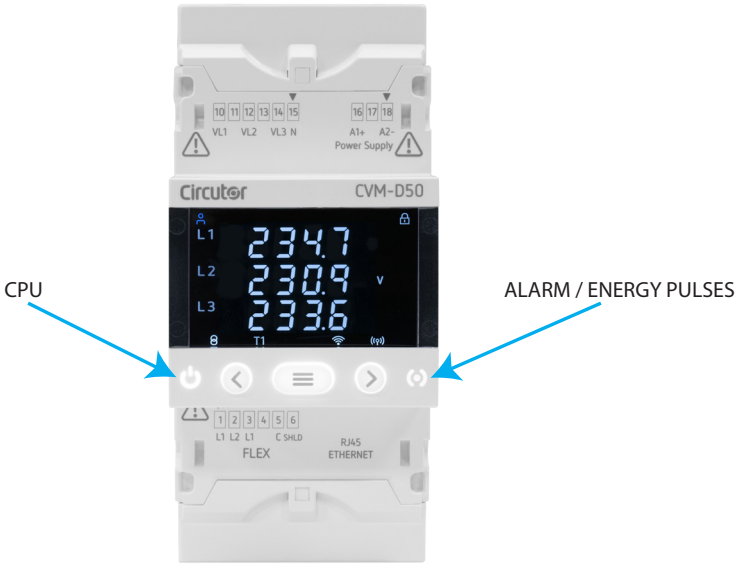


Figure 26: LED indicators of the CVM-D50.

5.- DISPLAY

The **CVM-D50** features 3 display menus; see **Figure 27**.

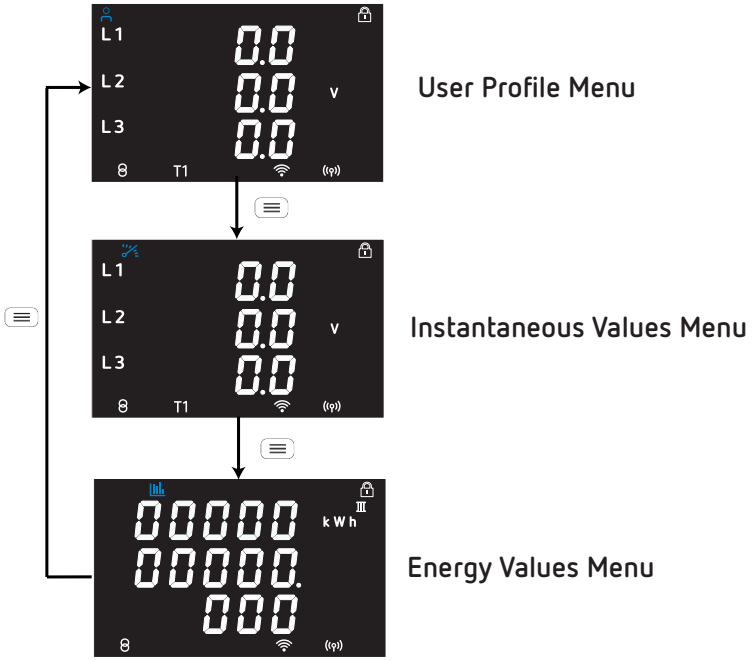


Figure 27:Display menu.

To switch between the different display menus, press the ☰ key.

5.1.- USER PROFILE MENU

The display of the **User Profile** menu is configured in section ***"6.20.- USER PROFILE DISPLAY"***.

Within the **User Profile** menu, the screens that were selected in the programming menu (***"6.21.- USER PROFILE SCREENS"***) are shown.

Note: *If no screens have been selected for display, the device will show all screens from the instantaneous values and energy values menus.*

Use keys < and > to browse the different screens.

The 👤 symbol at the top of the screen indicates that the values being displayed are from the User Profile.

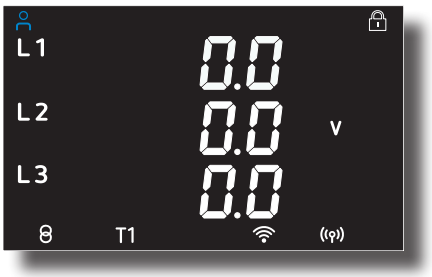


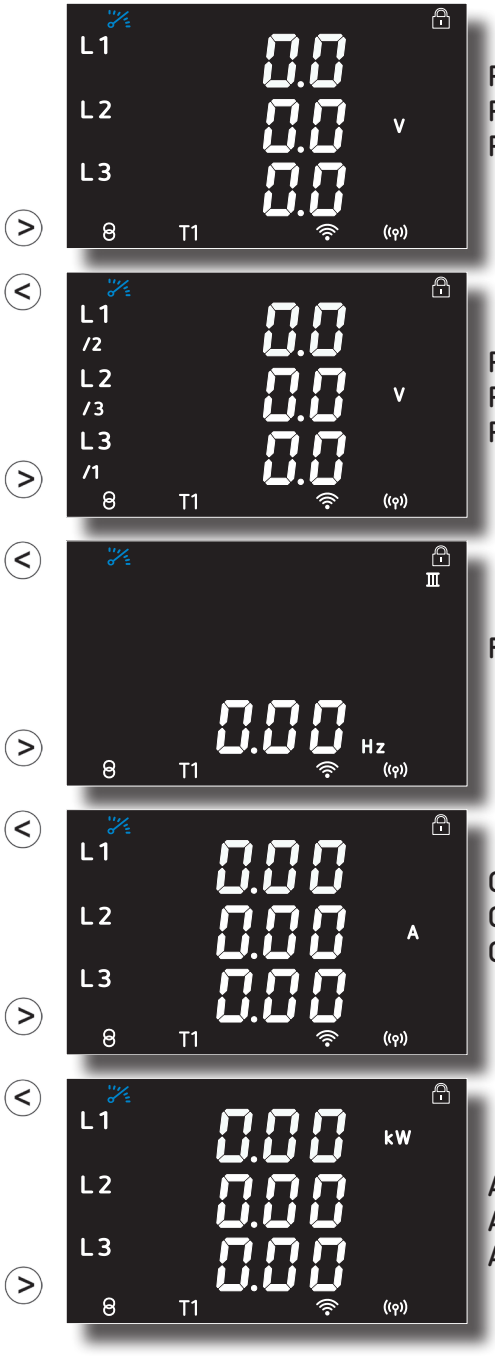
Figure 28: User Menu Screen.

5.2.- INSTANTANEOUS VALUES MENU

In the **Instantaneous Values menu** of the device, 15 different screens are displayed along with the voltage and current harmonics, up to the 31st harmonic, for each of the lines: L1, L2, and L3 (***"5.2.4.- HARMONICS"***).

Use keys < and > to browse the different screens.

The symbol at the top of the screen indicates that the values being displayed are instantaneous values.



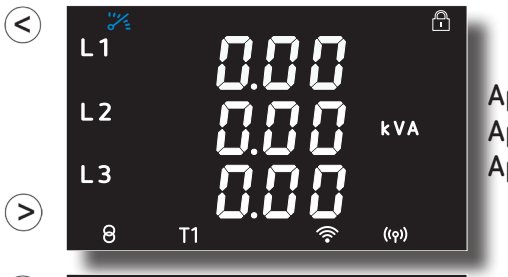
Phase-Neutral voltage L1 (V)
Phase-Neutral voltage L2 (V)
Phase-Neutral voltage L3 (V)

Phase-Phase voltage L1-L2 (V)
Phase-Phase voltage L2-L3 (V)
Phase-Phase voltage L3-L1 (V)

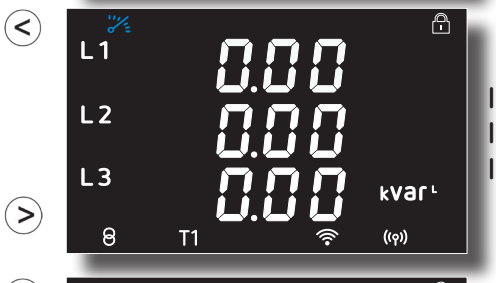
Frequency (Hz)

Current L1 (A)
Current L2 (A)
Current L3 (A)

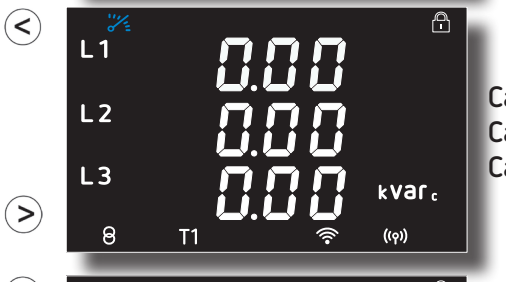
Active Power L1 (kW)
Active Power L2 (kW)
Active Power L3 (kW)



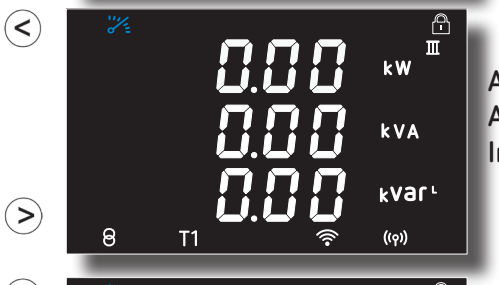
Apparent Power L1 (kVA)
Apparent Power L2 (kVA)
Apparent Power L3 (kVA)



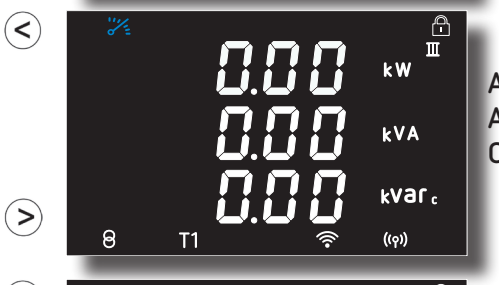
Inductive Reactive Power L1 ($kvar^L$)
Inductive Reactive Power L2 ($kvar^L$)
Inductive Reactive Power L3 (var^L)



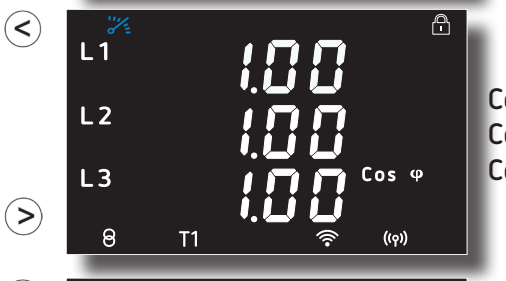
Capacitive Reactive Power L1 ($kvar_C$)
Capacitive Reactive Power L2 ($kvar_C$)
Capacitive Reactive Power L3 ($kvar_C$)



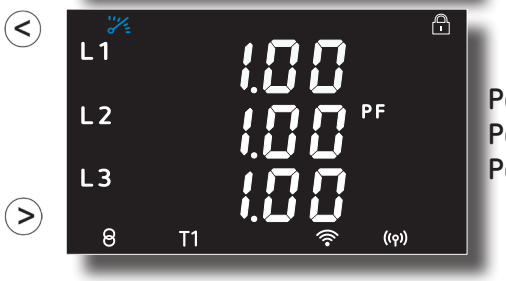
Active Power III (kW)
Apparent Power III (kVA)
Inductive Reactive Power III ($kvar^L$)



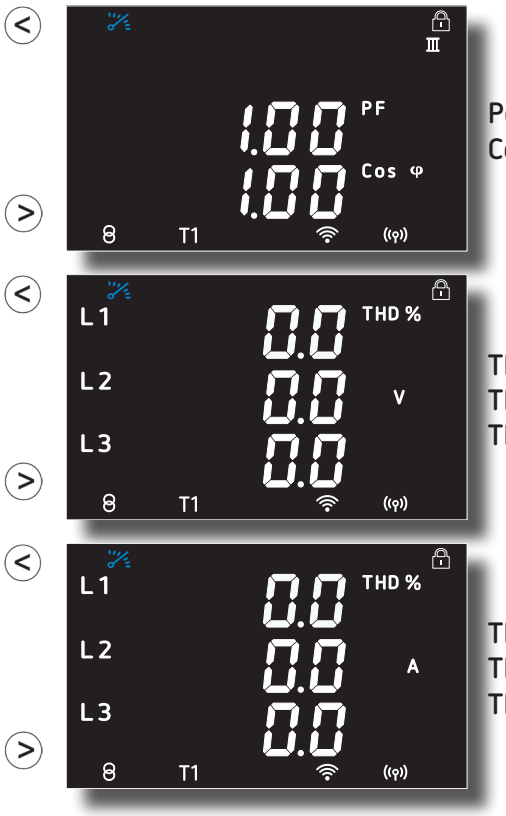
Active Power III (kW)
Apparent Power III (kVA)
Capacitive Reactive Power III ($kvar_C$)



Cos φ L1 (cos φ)
Cos φ L2 (cos φ)
Cos φ L3 (cos φ)



Power factor L1 (PF)
Power factor L2 (PF)
Power factor L3 (PF)



Power factor III (PF)
Cos φ III (cos φ)

THD Voltage L1 (%)
THD Voltage L2 (%)
THD Voltage L3 (%)

THD Current L1 (%)
THD Current L2 (%)
THD Current L3 (%)

Also displayed on these screens are:

- ✓ **Maximum values**
- ✓ **Minimum values**
- ✓ **Maximum Demand**
- ✓ **Harmonics**

5.2.1.- MAXIMUM VALUES

To see the maximum values of the screen being displayed, press the (>) key for 2 seconds. These are displayed for 10 seconds.
Press the (<) and (>) keys to display all other maximum values.

The MAX symbol is shown on the display.

The maximum and minimum values are reset on the programming menu (*"6.10.- DELETING MAXIMUM AND MINIMUM VALUES"*) or via communications ("*7.5.5.- DELETING PARAMETERS*").

5.2.2.- MINIMUM VALUES

To see the minimum values of the screen being displayed, press the (<) key for 2 seconds. These are displayed for 10 seconds.
Press the (<) and (>) keys to display all other minimum values.

The MIN symbol is shown on the display.

The maximum and minimum values are reset on the programming menu (*"6.10.- DELETING MAXIMUM AND MINIMUM VALUES"*) or via communications ("*7.5.5.- DELETING PARAMETERS*").

5.2.3.- MAXIMUM DEMAND

The device calculates the maximum demand of the following:

- ✓The Current of each phase.
- ✓Three-Phase Active Power.
- ✓Three-Phase Apparent Power.
- ✓Three-Phase inductive Power.
- ✓ Three-Phase capacitive Power.

This value can be displayed on the display screen of the parameter by pressing the ☰ and > keys at the same time.

The DEM symbol appears on the display.
Press keys < or > to stop displaying the maximum demand values.

The maximum demand values are reset on the programming menu (*" 6.9.- DELETING MAXIMUM DEMAND"*) or via communications ("*7.5.5.- DELETING PARAMETERS*").

5.2.4.- HARMONICS

The device can display the voltage and current harmonics, up to the 31st order harmonic, for each one of the lines, L1, L2 and L3.

Harmonics display is disabled by defect; see *"6.12.-ENABLE HARMONICS DISPLAY SCREEN"* or *"7.5.11.- CONFIGURATION VARIABLES"* to enable display.

A minimum signal level is required to measure harmonics correctly, i.e., a signal level of at least 20 V is required to measure the voltage harmonics and of at least 200 mA to measure the current harmonics. If the levels are lower, the unit will not calculate them and will display a value of 0.

The harmonics display screens can be displayed by pressing the > key shown after the last profile screen.

Harmonics are represented as shown in **Figure 29**. The figure shows the 15th voltage harmonic (H15).

Figure 29: 15th voltage harmonic.

The > key jumps to the next harmonics screen.

Press the ☰ key to jump from the voltage harmonics to the current harmonics, and from the current harmonics to the home screen of the instantaneous values.

5.2.5.- DETECTION OF INCORRECT CONNECTION AND INCORRECT DIRECTION OF ROTATION

✓ **Incorrect connection or disconnection**

The device has a system for detecting the incorrect connection or disconnection of the voltage lines. If this error occurs, the device displays **0** on the lines with a voltage value of less than 50% of the line with the highest voltage value.

✓ **Incorrect direction of rotation**

The device has a system for detecting the incorrect direction of rotation of the voltages. In other words, if each of the voltages has been correctly connected to the appropriate terminal, L1 to terminal 10, L2 to terminal 11 and L3 to terminal 12.

If there is an error in the direction of rotation, the icons **L1**, **L2** and **L3** flash on the display.

The device has a RS-485 communications parameter, which indicates whether an incorrect direction of rotation has been detected (*"7.5.8.- CONNECTION FAILURES"*).
It is also possible to verify and correct an incorrect connection via the device's website. See *"8.3.1.2.- Autowired"*.

Note: *The detection of the direction of rotation is only enabled for measurement systems: Three-phase network measurement* (4-3Ph, 3-3Ph y 3-ArOn) *and two-phase network measurement with 3-wire connection* (3-2Ph).

5.3.- ENERGY VALUES MENU

In the **Energy Values Menu**, the consumed and generated energy values of the installation are displayed.
The installation status is also displayed:

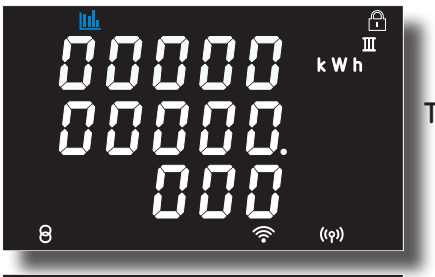
Installation is consuming energy.
Installation is generating energy.

Long press (3 sec.) the > or < keys to jump from the generated values to the consumed values displayed.
The generation values are identified with the negative sign on the screen, which appears in front of each parameter.

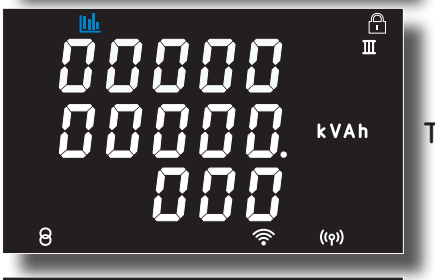
Note: *If the 2 quadrant option has been configured, only the consumed values can be displayed.*

The symbol at the top of the screen indicates that the values being displayed are energy values.

Use keys < and > to browse the different screens (short keystroke).

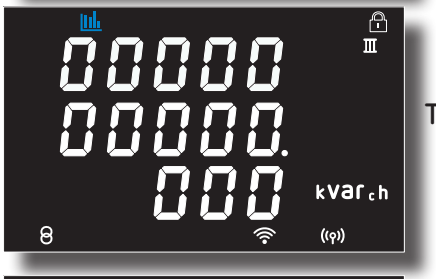


Total three-phase active Energy [4][5] (kWh)

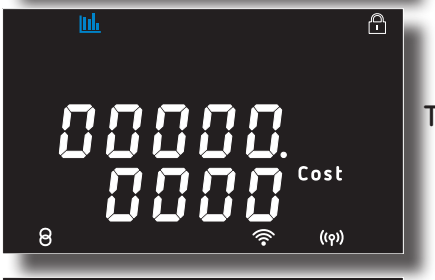


Total three-phase Apparent Energy [4][5] (kVAh)

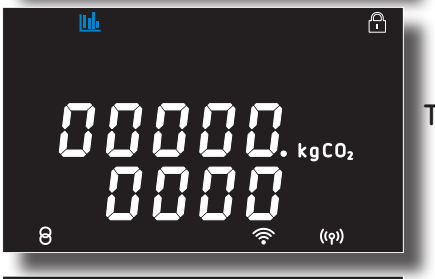
Total three-phase Inductive Reactive Energy [4][5] ($kvar_Lh$)



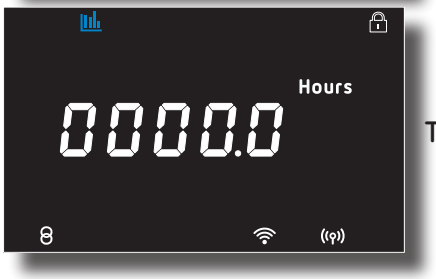
Total three-phase Capacitive Reactive Energy [4][5] ($kvar_ch$)



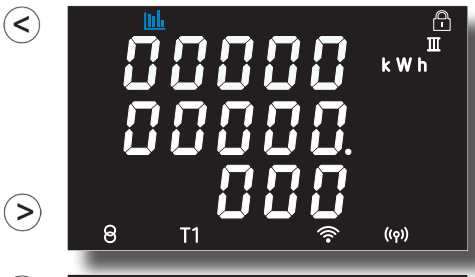
Total Cost [4] (cost)



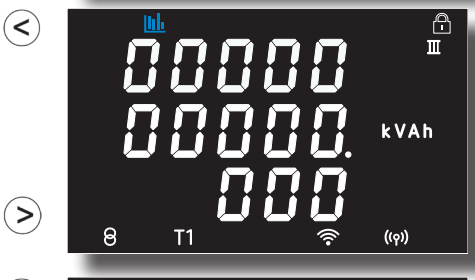
Total CO_2 Emissions [4] ($kgCO_2$)



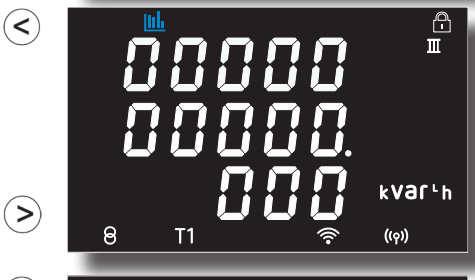
Total No. of hours [4] (hours)



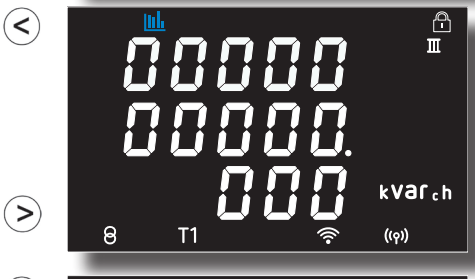
Three-phase Active Energy Tariff 1 [5] (kWh)



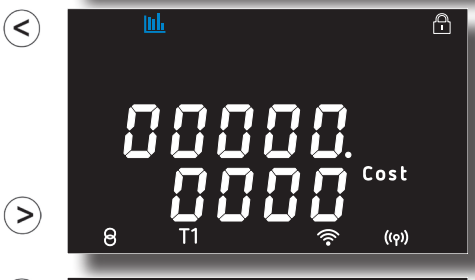
Three-phase Apparent Energy Tariff 1 [5] (kVAh)



Three-phase Inductive Reactive Energy Tariff 1 [5] (kvar^{L}h)



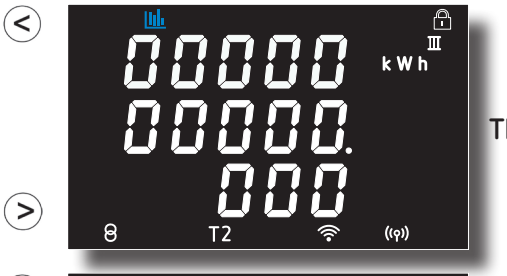
Three-phase Capacitive Reactive Energy Tariff 1 [5] (kvar$_{C}$h)



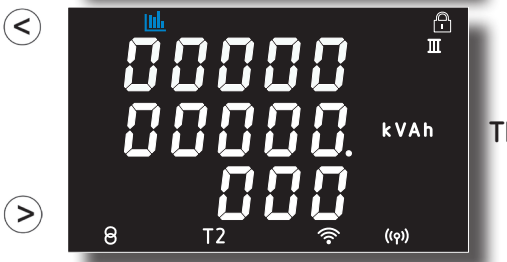
Cost Tariff 1 (cost)

CO_2 Emissions Tariff 1 (kgCO_2)

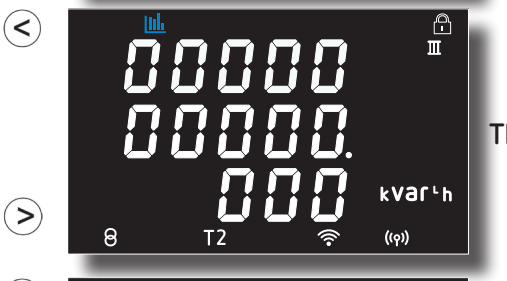
No. of hours Tariff 1 (hours)



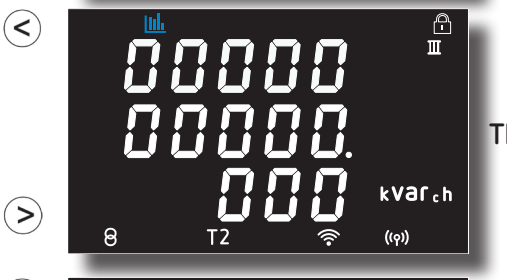
Three-phase Active Energy Tariff 2 [5] (kWh)



Three-phase Apparent Energy Tariff 2 [5] (kVAh)



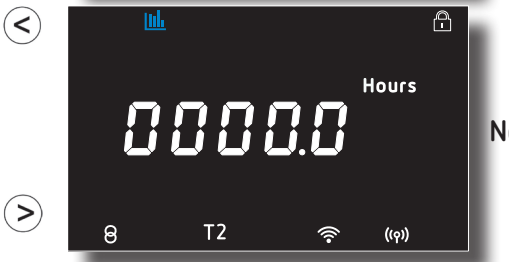
Three-phase Inductive Reactive Energy Tariff 2 [5] (kvar^{L}h)



Three-phase Capacitive Reactive Energy Tariff 2 [5] (kvar$_{c}$h)

Cost Tariff 2 (cost)

Emisiones CO_2 Tarifa 2 ($kgCO_2$)



No. of hours Tariff 2 (hours)

[4] Total = Tariff 1 + Tariff 2.

[5] The maximum displayed energy value is 999999999.999 k.

Symbols **T1** and **T2** on the display indicate the two tariffs available on the device.
The symbol will flash if the current tariff is displayed.
If the Total tariff is displayed (= Tariff 1 + Tariff 2), symbols **T1** and **T2** will remain disabled.

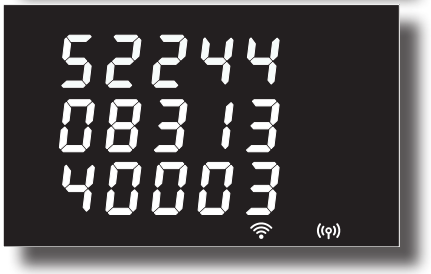
5.4.- DEVICE INFORMATION SCREENS

By pressing keys  simultaneously for more than 2 seconds from any display screen, the device will show the Device Information Screens.

Measurement Firmware Version

Communications Firmware Version

Device Version



Device Serial Number

5.5.- ETHERNET - Wi-Fi COMMUNICATIONS SCREENS

***Note:** "ANNEX A - CONFIGURATION MENUS" shows the full settings tree structure.*

Press the < and ☰ keys simultaneously from any display screen to show the settings and display screens for Ethernet and Wi-Fi communications.

Press the < and ☰ keys again simultaneously to exit the Ethernet - Wi-Fi communication screens.

5.5.1.- ETHERNET COMMUNICATIONS: DHCP CONFIGURATION

You can enable or disable DHCP on this screen. If DHCP is enabled (default configuration), the IP address is assigned dynamically via a central server. No other parameters need to be set up.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
The ☰ key is used to browse the different options.

✓ **Configuration values**

Table 14:Configuration values: DHCP Configuration.

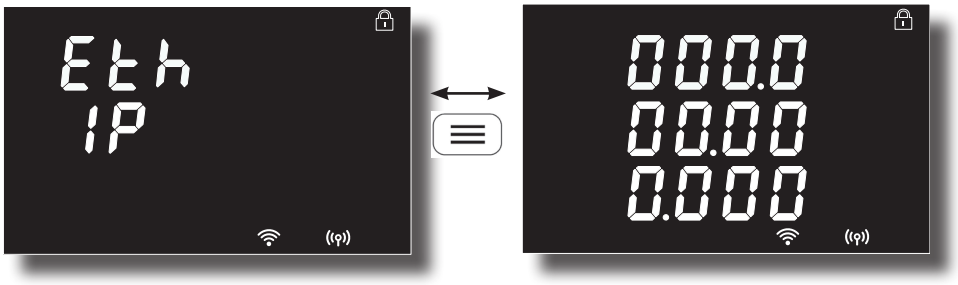
DHCP Configuration		
Possible values	no	DHCP is not enabled.
	YES	DHCP is enabled

To validate the option and exit edit mode, press ☰ > 3 seconds.

To access the next communication screen, press the key >.

5.5.2-. ETHERNET COMMUNICATIONS: IP ADRESS

You can set up (DHCP disabled) or view the IP address on this screen.



Press the key ☰ to display the value.

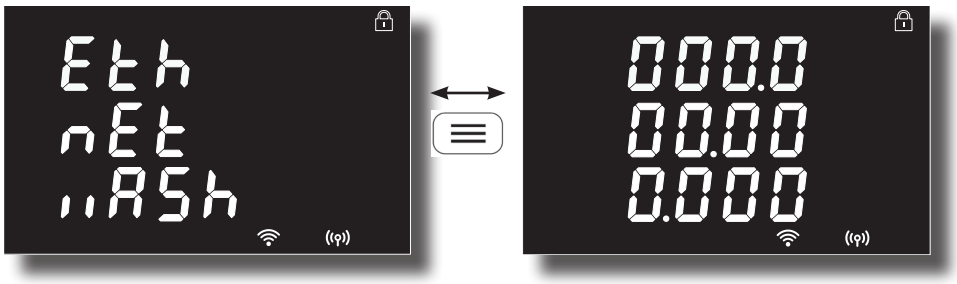
Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press the ☰ key to return to the initial IP address screen.

To access the following communications screen press the key >.

5.5.3.- ETHERNET COMMUNICATIONS: IP MASK

You can set up (DHCP disabled) or view the IP mask on this screen.



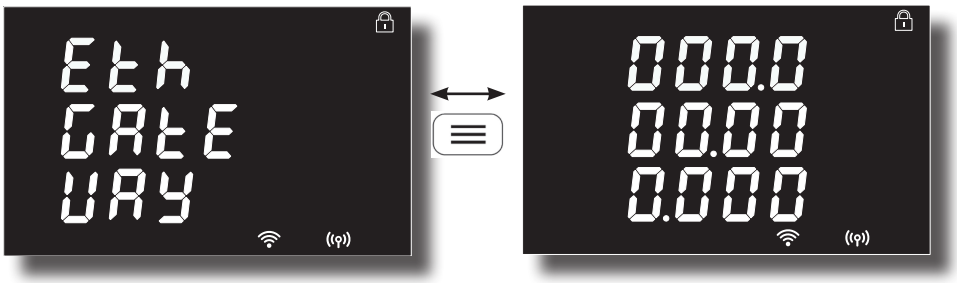
Press the key ☰ to display the value.
Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.
To validate the value and exit edit mode, press ☰ > 3 seconds.
Press the ☰ key to return to the initial IP mask screen.

To access the following communications screen press the key >.

5.5.4-. ETHERNET COMMUNICATIONS: GATEWAY

You can set up (DHCP disabled) or view the gateway for Ethernet communications on this screen.



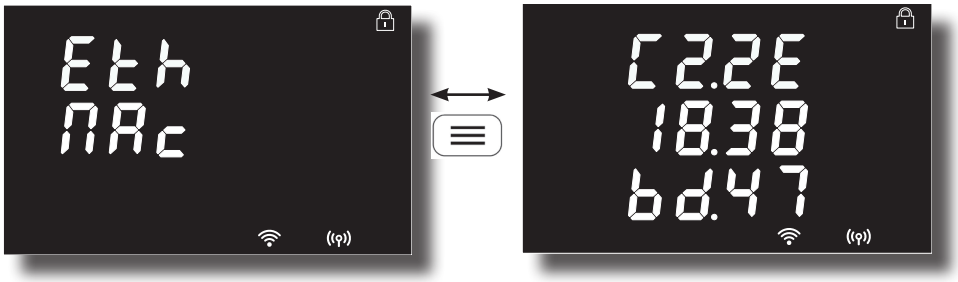
Press the key ☰ to display the value.
Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the key to modify the value of the flashing digit.
Use keys > and < to move between digits.
To validate the value and exit edit mode, press > 3 seconds.
Press the key to return to the initial gateway screen.

To access the following communications screen press the key >.

5.5.5.- ETHERNET COMMUNICATIONS: MAC ADDRESS

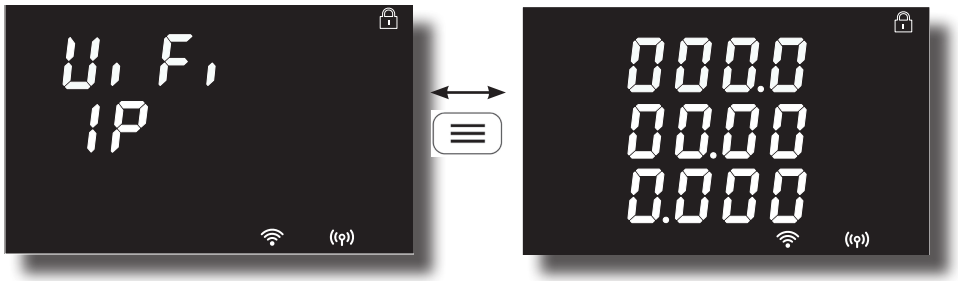
This screen shows the device's MAC address.



Press the key to display the value.
To access the following communications screen press the key >.

5.5.6.- WI-FI COMMUNICATIONS: IP ADDRESS

This screen shows the IP address for Wi-Fi communications.

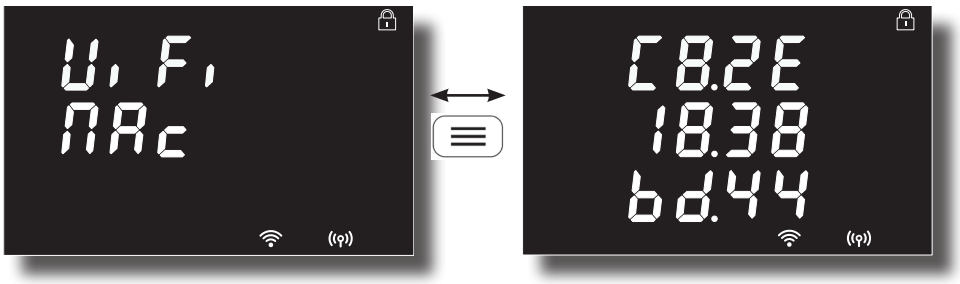


Press the key to display the value.
To access the following communications screen press the key >.

Note: *Wi-Fi communications work only in DHCP mode.*

5.5.7.- WI-FI COMMUNICATIONS: MAC ADDRESS

This screen shows the MAC address for Wi-Fi communications.

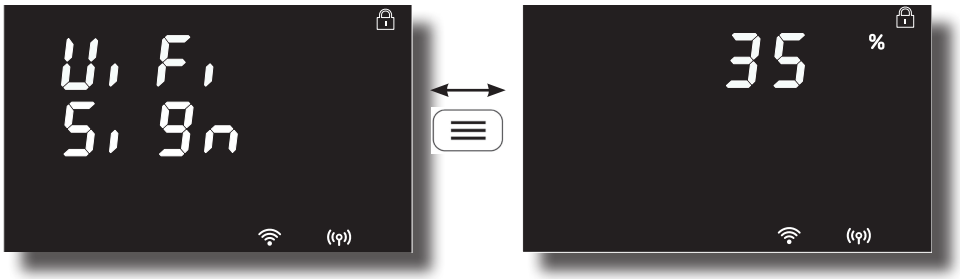


Press the key ☰ to display the value.

To access the following communications screen press the key >.

5.5.8-. WI-FI COMMUNICATIONS: SIGNAL LEVEL

This screen shows the strength of the Wi-Fi signal.



Press the key ☰ to display the value.

To access the following communications screen press the key >.

Note: *If Wi-Fi communication is disabled, the text* OFF appears on the display.
Note: *If the signal level is <25%, it is recommended to use Ethernet communications to avoid any incidence in the data recording.*

6.- CONFIGURATION

To enter the configuration menu press the ☰ key for 3 seconds.

If the icon 🔒 appears on the configuration screen, it means that the device is password-protected (*"6.22.- LOCKING THE PROGRAMMING"*). When attempting to edit a value by pressing the key for more than 3 seconds, the ☰ screen shown in **Figure 30** will appear, prompting the user to enter the unlock password.

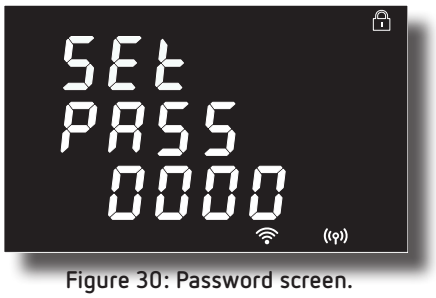


Figure 30: Password screen.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the password, press the > key if you are on the last digit or the < key if you are on the first digit.

Default password: 1234.

If the entered password value is correct, the configuration parameters can be modified.

Note: *The password value can only be changed via communications. See section* ***"7.5.11.10.- Password".***

Note: *The complete configuration tree can be viewed in* ***"ANNEX A - CONFIGURATION MENUS".***

6.1.- PRIMARY VOLTAGE

On this screen the voltage transformer primary is programmed.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.
To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 15: Configuration values: Primary voltage.

Primary voltage	
Minimum value	1 V
Maximum value	99999 V

Voltage ratio ≤ 1000.
Voltage ratio x Current ratio ≤ 300000.

Note: *The ratio is the relation between the primary and the secondary.*

Press key (>) to access the next programming step.

6.2.- SECONDARY VOLTAGE

On this screen the voltage transformer secondary is programmed.

Press the (≡) key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the (≡) key to modify the value of the flashing digit.
Use keys (>) and (<) to move between digits.

To validate the value and exit edit mode, press (≡) > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 16: Configuration values: Secondary voltage.

Secondary voltage	
Minimum value	1 V
Maximum value	999 V

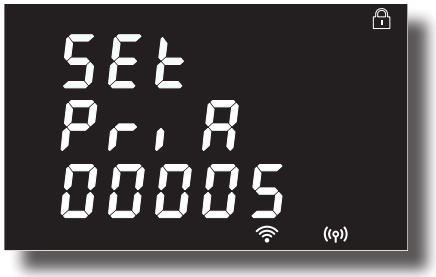
Voltage ratio ≤ 1000.
Voltage ratio x Current ratio ≤ 300000.

Press key (>) to access the next programming step.

6.3.- PRIMARY CURRENT

Note: *Display visible on models* ***CVM-D50-ITF*** *and* ***CVM-D50-MC****.*

The current transformer primary is programmed on this screen.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 17: Configuration values: Primary current.

Primary current	
Minimum value	1 A
Maximum value	10000 A

Voltage ratio x Current ratio ≤ 300000.

Note: *The ratio is the relation between the primary and the secondary.*
Press key > to access the next programming step.

6.4.- SECONDARY CURRENT

Note: *Display visible on model* ***CVM-D50-ITF****.*

On this screen the current transformer secondary is selected.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 18: Configuration values: Secondary current.

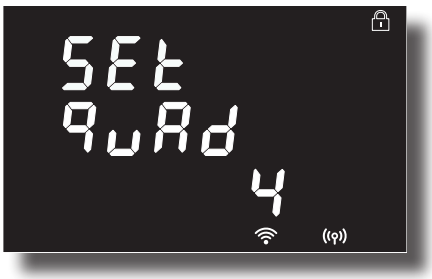
Secondary current		
Possible values	1 A	5 A

Voltage ratio x Current ratio ≤ 300000.

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press key > to access the next programming step.

6.5.- NUMBER OF QUADRANTS

The quadrant number on which the device takes the measurement is selected on this screen.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

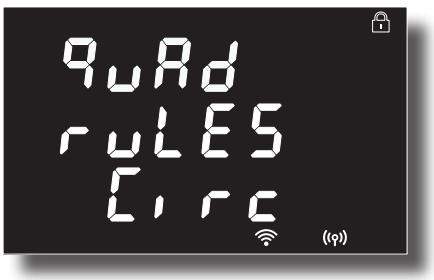
Table 19: Configuration values: Number of quadrants.

Number of quadrants		
Possible values	2	4

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press key > to access the next programming step.

6.6.- MEASUREMENT CONVENTION

You can select the measurement convention of the device from this screen.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 20: Configuration values: Measurement convention.

Measurement convention		
Possible values	C irc	Circutor measurement convention.
	I EC	IEC measurement convention
	I EEE	IEEE measurement convention

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press key > to access the next programming step.

6.7.- MEASUREMENT SYSTEM

The measurement system is selected on this screen.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 21: Configuration values: Measurement system.

Measurement system		
Possible values	4-3Ph	Three-phase network measurement with a 4-wire connection.
	3-3Ph	Three-phase network measurement with a 3-wire connection
	3ArOn	Three-phase network measurement with a 3-wire connection and transformers with an ARON connection.(6)
	3-2Ph	Two-phase network measurement with a 3-wire connection.
	2-2Ph	Single-phase network measurement, phase to phase, with a 2-wire connection.
	2- 1Ph	Single-phase network measurement, phase to neutral, with a 2-wire connection.

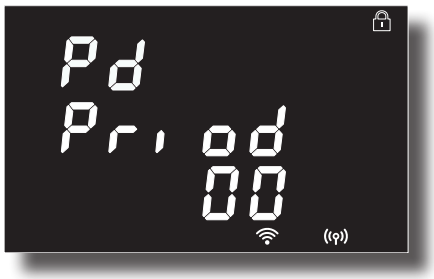
(6) Option not available for the models: **CVM-D50-FLEX**.

To validate the value and exit edit mode, press ☰ > 3 seconds.

Press key > to access the next programming step.

6.8.- MAXIMUM DEMAND INTEGRATION PERIOD

The maximum demand integration period is programmed in minutes on this screen.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 22: Configuration values: Integration period.

Integration period	
Minimum value	0 minutes
Maximum value	60 minutes

Note: *Programming the value **0** disables the calculation of the maximum demand.*
Press key > to access the next programming step.

6.9.- DELETING MAXIMUM DEMAND

On this screen you select whether or not to delete the maximum demand.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 23: Configuration values: Deleting Maximum demand.

Deleting maximum demand		
Possible values	Yes	No

To validate the value and exit edit mode, press ☰ > 3 seconds.

Select **Yes** to force the device to automatically delete all maximum demand data; the **No** option will be displayed again on the screen.

Press key > to access the next programming step.

6.10.- DELETING MAXIMUM AND MINIMUM VALUES

On this screen you select whether or not to delete the maximum and minimum values.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 24: Configuration values: Deleting Maximum and minimum.

Deleting maximum and minimum		
Possible values	Yes	No

To validate the value and exit edit mode, press ☰ > 3 seconds.

Select **Yes** to force the device to automatically delete all maximum and minimum values; the **No** option will be displayed again on the screen.

Press key > to access the next programming step.

6.11.- DELETING ENERGY VALUES

On this screen you select whether or not to delete the energy, cost, CO_2 emissions and No. of hours values

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 25: Configuration values: Deleting Energy.

Deleting Energy		
Possible values	Yes	No

To validate the value and exit edit mode, press ☰ > 3 seconds.

Select **Yes** to force the device to automatically delete all values; the **No** option will be displayed again on the screen..

Press key > to access the next programming step.

6.12.- ENABLE HARMONICS DISPLAY SCREEN

This screen is used to select whether harmonics are displayed or not.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 26: Configuration values: Harmonics display.

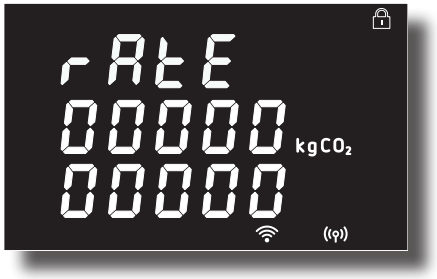
Harmonics display		
Possible values	Yes	No

To validate the value and exit edit mode, press ☰ > 3 seconds.

Press key > to access the next programming step.

6.13.- $kgCO_2$ CARBON EMISSION RATIO OF CONSUMED ENERGY

The carbon emissions ratio is the amount of emissions released into the atmosphere to produce a unit of electricity (1 kWh).
The ratio for the European mix is approximately 0.65 $kgCO_2$ per kWh.



This screen is used to programme the carbon emissions ratio for consumed energy, using the 2 tariffs configured for the device: **T1** on the top line and **T2** on the bottom line.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 27: Configuration values: Carbon emissions ratio (Consumed energy).

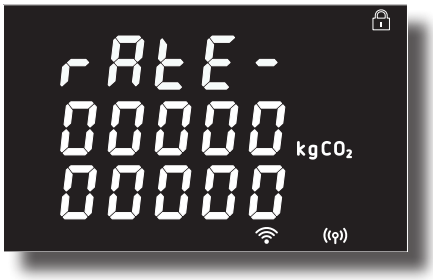
Carbon emissions ratio (Consumed energy)	
Minimum value	0
Maximum value	1.9999

Note: *The decimal point is not shown on the display.*

Press key > to access the next programming step.

6.14.- $kgCO_2$ CARBON EMISSION RATIO OF GENERATED ENERGY

The carbon emissions ratio is the amount of emissions released into the atmosphere to produce a unit of electricity (1 kWh).
The ratio for the European mix is approximately 0.65 $kgCO_2$ per kWh.



This screen is used to programme the carbon emissions ratio for generated energy, using the 2 tariffs configured for the device: **T1** on the top line and **T2** on the bottom line.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

Table 28: Configuration values: Carbon emissions ratio (Generated energy).

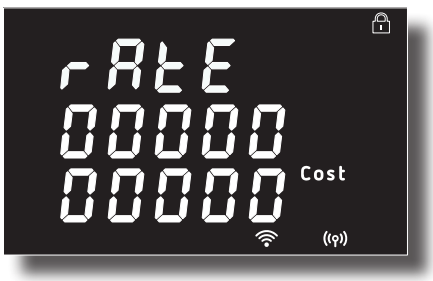
Carbon emissions ratio (Generated energy)	
Minimum value	0
Maximum value	1.9999

Note: *The decimal point is not shown on the display.*

Press key > to access the next programming step.

6.15.- COST RATIO OF CONSUMED ENERGY

This screen is used to programme the cost per kWh of electricity for consumed energy, using the 2 tariffs configured for the device: **T1** on the top line and **T2** on the bottom line.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

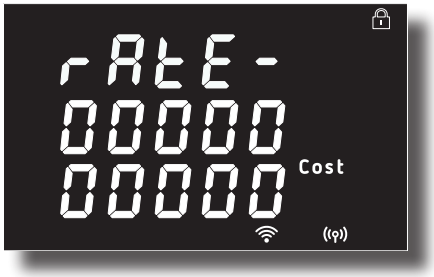
Table 29: Configuration values: Cost ratio (Consumed energy).

Cost ratio (Consumed energy)	
Minimum value	0
Maximum value	1.9999

Note: *The decimal point is not shown on the display.*
Press key > to access the next programming step.

6.16.- COST RATIO OF GENERATED ENERGY

This screen is used to programme the cost per kWh of electricity for generated energy, using the 2 tariffs configured for the device: **T1** on the top line and **T2** on the bottom line.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

✓ **Configuration values**

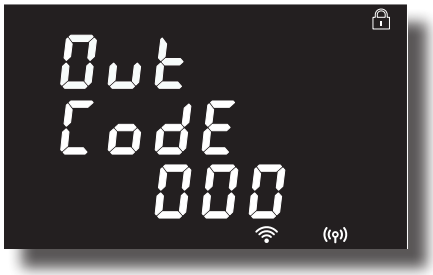
Table 30: Configuration values: Cost ratio (Generated energy).

Cost ratio (Generated energy)	
Minimum value	0
Maximum value	1.9999

Note: *The decimal point is not shown on the display.*
Press key > to access the next programming step.

6.17.- ALARM / ENERGY PULSES CONFIGURATION

In this step, all the values corresponding to the alarm/energy pulse are programmed.



On this screen, the variable code is selected based on **Table 31, Table 32** and **Table 33,** which will control the alarm.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Set the value to **00** if you do not wish to program a variable.

Use keys > and < to move between digits.

If an incorrect code has been entered, the value will be deleted and the device will restore the last value saved.

To validate the value and exit edit mode, press ☰ > 3 seconds.

Table 31: Parameter codes used to program the alarm (Table 1).

Parameter	Phase	Code	Phase	Code	Phase	Code	Phase	Code
Phase-Neutral voltage	L1	01	L2	09	L3	17	-	-
Current	L1	02	L2	10	L3	18	-	-
Active Power	L1	03	L2	11	L3	19	III	25
Inductive Reactive Power	L1	04	L2	12	L3	20	III	26
Capacitive Reactive Power	L1	05	L2	13	L3	21	III	27
Apparent Power	L1	06	L2	14	L3	22	III	28
Power factor	L1	07	L2	15	L3	23	III	29
Cosine φ	L1	08	L2	16	L3	24	III	30
% THD V	L1	36	L2	37	L3	38	-	-
% THD A	L1	39	L2	40	L3	41	-	-
Phase-Phase voltage	L1/2	32	L2/3	33	L3/1	34	-	-
Frequency	-	31	-	-	-	-	-	-
Maximum current demand	L1	45	L2	46	L3	47	-	-
Active Power Maximum Demand	-	-	-	-	-	-	III	42
Apparent Power Maximum Demand	-	-	-	-	-	-	III	43
Inductive Power Maximum Demand	-	-	-	-	-	-	III	132
Capacitive Power Maximum Demand	-	-	-	-	-	-	III	133

In addition, there are some parameters (**Table 32**) that refer to the three phases at the same time (OR function). If you have selected one of these variables, the alarm will be activated when any of the three phases meets the programmed conditions.

Table 32:Parameter codes used to program the alarm (Table 2).

Types of parameters	Code
Phase-Neutral voltage	200
Current	201
Active Power	202
Inductive Reactive Power	203
Capacitive Reactive Power	204
Power factor	205
Phase-Phase voltage	206
% THD V	207
% THD A	208
Apparent Power	209

Table 33: Parameter codes used to program the alarm (energy pulses) (Table 3).

Parameter	Tariff	Code	Tariff	Code	Tariff	Code
Consumed active energy	T1	49	T2	70	total	112
Generated active energy	T1	59	T2	80	total	122
Consumed inductive reactive energy	T1	51	T2	72	total	114
Generated inductive reactive energy	T1	61	T2	82	total	124
Consumed capacitive reactive energy	T1	53	T2	74	total	116
Generated capacitive reactive energy	T1	63	T2	84	total	126
Consumed apparent energy	T1	55	T2	76	total	118
Generated apparent energy	T1	65	T2	86	total	128

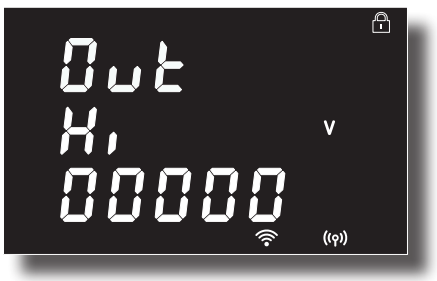
Press key (>) to access the next programming step.

If a parameter has been selected from **Table 31** or **Table 32** the next setup screen will be shown in section ***"6.17.1.- UPPER THRESHOLD"***.

If a parameter has been selected from **Table 33** the next setup screen will be shown in section ***"6.17.8.- KILOWATTS PER PULSE"***.

6.17.1.- UPPER THRESHOLD

This screen is used to programme the upper threshold, i.e., the value above which the alarm will be activated.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Note: *The device allows the user to configure negative values. To do so, increase the first digit to a value higher than 9.*

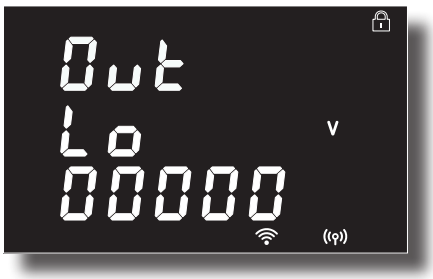
Use keys > and < to move between digits.

Note: *Pay* ***special attention*** *when programming the Generation Power (displayed with negative values).*
Example: *If you wish to enter a generation power alarm with limits between 2 kW and 1 kW, program the following as the* ***upper threshold*** *: - 1 kW and the following as the* ***lower threshold*** *: - 2 kW.*

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press key > to access the next programming step.

6.17.2.- LOWER THRESHOLD

This screen is used to programme the lower threshold, i.e., the value under which the alarm will be activated.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Note: *The device allows the user to configure negative values. To do so, increase the first digit to a value higher than 9.*

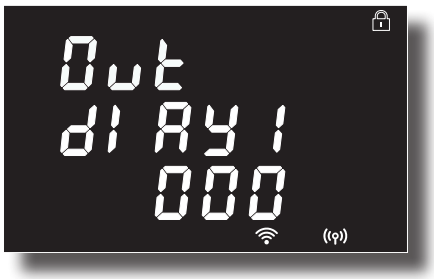
Use keys > and < to move between digits.

Note: *Pay* ***special attention*** *when programming the Generation Power (displayed with negative values).*
Example: *If you wish to enter a generation power alarm with limits between 2 kW and 1 kW, program the following as the* ***upper threshold*** *: - 1 kW and the following as the* ***lower threshold*** *: - 2 kW.*

To validate the value and exit edit mode, press ☰ > 3 seconds.
Press key > to access the next programming step.

6.17.3.- CONNECTION TIME DELAY

The alarm connection delay is programmed on this screen in seconds.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.
To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

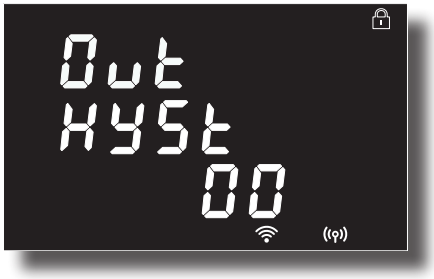
Table 34: Configuration values: Connection time delay.

	Connection time delay
Minimum value	0
Maximum value	999

Press key > to access the next programming step.

6.17.4.- HYSTERESIS VALUE

The hysteresis value, i.e., difference between the alarm connection and disconnection value, in %, is programmed on this screen.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.
To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

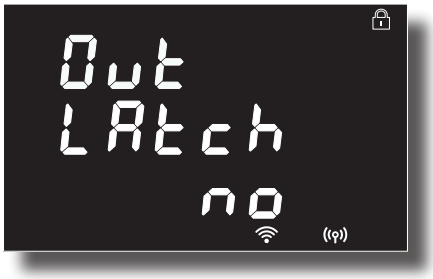
Table 35: Configuration values: Hysteresis.

	Hysteresis
Minimum value	0 %
Maximum value	99 %

Press key > to access the next programming step.

6.17.5.- LATCH

The interlocking is selected on this screen, i.e., if the alarm is interlocked after it has been tripped, even when the condition that triggered it has disappeared.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

Table 36: Configuration values: Latch.

	Latch	
Possible values	Yes	No

Press key > to access the next programming step.

Note: *If the device is reset, the status of alarms is deleted and all alarms will return to the programmed standby status, provided that the condition that triggered them has been resolved.*

6.17.6.- LATCH TIME

Note: *Screen visible if the latch has been enabled, see* ***"6.17.5.- LATCH"****.*

This screen is used to program the latch time, meaning the time in seconds when the alarm will be latched. After this time, if the alarm condition has cleared, the disconnection delay is activated

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.

Use keys > and < to move between digits.
To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ Configuration values

Table 37: Configuration values: Latch time.

	Latch time
Minimum value	0 s
Maximum value	600 s

Note: *If a* ***0*** *is programmed, the alarm remains latched and can only be unlatched manually.*

Press key (>) to access the next programming step.

6.17.7.- DISCONNECTION TIME DELAY

The alarm disconnection delay is programmed on this screen in seconds.

Press the (≡) key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the (≡) key to modify the value of the flashing digit.
Use keys (>) and (<) to move between digits.

To validate the value and exit edit mode, press (≡) > 3 seconds.

✓ Configuration values

Table 38: Configuration values: Disconnection time delay.

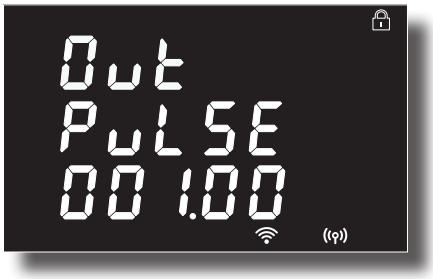
	Disconnection time delay
Minimum value	0 s
Maximum value	999 s.

Press key (>) to access the next programming step.

6.17.8.- KILOWATTS PER PULSE

Note: *This screen is displayed if the alarm parameter has been selected from an energy value, see **Table 33**.*

This screen is used to programme the kilowatts per pulse.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

Table 39: Configuration values: Kilowatts per pulse.

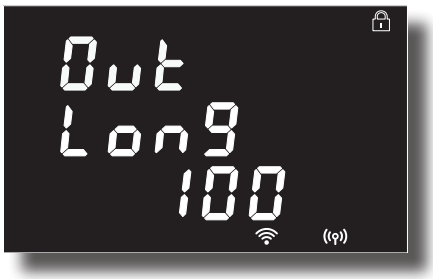
	Kilowatts per pulse
Minimum value	000.01 kWh
Maximum value	999.99 kWh

Press key > to access the next programming step.

6.17.9.- PULSE WIDTH

Note: *This screen is displayed if the alarm parameter has been selected from an energy value, see **Table 33**.*

The width of the pulse is selected on this screen in ms.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

Table 40: Configuration values: Pulse width.

	Pulse width
Minimum value	30 ms
Maximum value	500 ms

Press key > to access the next programming step.

6.18.- TARIFF SELECTION

You can select the operating tariff on this screen.

Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ☰ key to scroll through the available options.

To validate the value and exit edit mode, press ☰ > 3 seconds.

✓ **Configuration values**

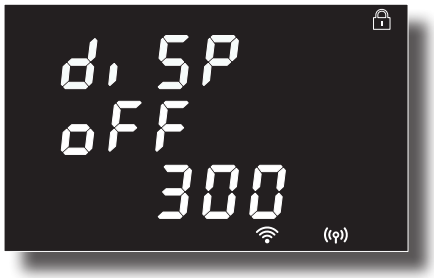
Table 41: Configuration values: tariff.

Tariff		
Possible values	t 1	Tariff 1.
	t2	Tariff 2.

Press key > to access the next programming step.

6.19.- BACKLIGHT

This screen is used to programme the maximum brightness time of the display since the device was last used with the keypad. After this time, the display will reduce the brightness level.



Press the ≡ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Press the ≡ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the value and exit edit mode, press ≡ > 3 seconds.

✓ **Configuration values**

Table 42: Configuration values: Backlight.

Backlight	
Minimum value	1 second.
Maximum value	999 seconds.

If the value entered by the user is out of the range of programming values, the programmed value will be deleted and the system will restore it to the last saved value.

Press key > to access the next programming step.

6.20.- USER PROFILE DISPLAY

On this screen, you can select whether the **User Profile** will be displayed .

Press the ≡ key for 3 seconds to enter the edit mode, the value to be modified flashes.
Use the ≡ key to scroll through the available options.

To validate the value and exit edit mode, press ≡ > 3 seconds.

✓ Configuration values

Table 43: Configuration values: User profile display.

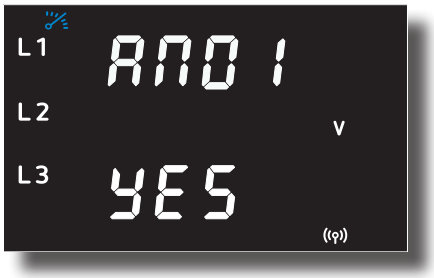
User profile display		
Possible values	YES	User Profile is displayed.
	no	User Profile is not displayed.
	EHI t	Exit the screen without making any changes.

Press key (>) to access the next programming step.

6.21.- USER PROFILE SCREENS

In this section, the screens to be displayed in the **User Profile** are selected.

Press the (≡) key for 3 seconds to display the first screen of the Instantaneous Values menu. Select whether the screen should be displayed in the **User Profile** or not.



Use the (≡) key to scroll through the available options.

✓ Configuration values

Table 44: Configuration values: User Profile screens.

	User Profile screens	
Possible values	YES	The screen will be displayed in the User Profile.
	no	The screen will not be displayed in the User Profile

Press key (>) to access the next programming step.

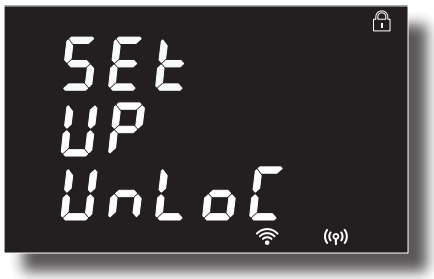
This programming step is repeated for each of the 57 screens available in the device.

To validate the screen configuration and exit the edit mode, press (≡) > 3 seconds.

Press key (>) to access the next programming step.

6.22.- LOCKING THE PROGRAMMING

This screen is for protecting the data configured in the programming menu.



Press the ☰ key for 3 seconds to enter the edit mode, the value to be modified flashes.

Figure 31: Pantalla de password.

Press the ☰ key to modify the value of the flashing digit.
Use keys > and < to move between digits.

To validate the password value, press the > key if on the last digit, or press the < key if on the first digit.

Password value: 1234

Note: *The password value can only be modified via communications. See* ***"7.5.11.- CONFIGURATION VARIABLES"****.*

If the entered password value is correct, the programming lock can then be modified.
Use the ☰ key to scroll through the available options.

✓ **Configuration values**

Table 45: Configuration values: Locking the programming.

	Locking the programming	
Possible values	UnLoC	When entering the programming menu, it is possible to view and modify the configuration.
	LoC	Upon entering the programming menu, the configuration can be viewed but not modified. The icon 🔒 indicates the locked status. To modify the configuration, a password must be entered.

To validate the value and exit edit mode, press ☰ > 3 seconds.

7.- Wi-Fi AND ETHERNET COMMUNICATIONS

CVM-D50 devices include Ethernet and Wi-Fi communications.

Communications can be set up via the device's settings web page *("8.3.5.- COMMUNICATION")* or via the device's display, see *("5.5.- ETHERNET - Wi-Fi COMMUNICATIONS SCREENS")*.

The Modbus map in section ***"7.5.- MODBUS COMMANDS"*** uses the Modbus TCP protocol.

7.1.- USAGE ENVIRONMENT AND HEALTH

Wireless communications emit radio frequency electromagnetic energy, like other radio devices.

Because wireless communications operate under the guidelines found in radio frequency standards and recommendations, they are safe for users to use.

In some settings and situations the use of wireless communications may be restricted by the building's owner of representatives of the organisation.
These may include:

✓Use of wireless connections on board aircraft, in hospitals or near service stations, blasting areas, medical implants or electronic medical devices implanted in the human body (pacemakers, etc.).

✓ In any other setting where the risk of interference with other devices or services is a hazard.

If you are not sure of the applicable usage policy for wireless devices in a specific organisation (airport, hospital, etc.) we recommend requesting permission to use wireless communications.

7.2.- CYBERSECURITY BEST PRACTICES FOR INDUSTRIAL ENVIRONMENTS

This device features Ethernet and Wi-Fi communication interfaces and has been designed and manufactured in accordance with the following regulations:

✓ **Directive 2014/53/UE (RED)**:

- Electrical safety.
- Electromagnetic compatibility.
- Efficient use of the radio spectrum.

✓**Delegated Regulation (EU) 2022/30 (RED-DA) in accordance with requirement 3.3(d), as per standard EN 18031-1:**

- Protection against unauthorised access.
- Preservation of network integrity.
- Protection of the user's personal data.

To ensure secure operation, the following cybersecurity best practices must be applied during configuration and deployment:

✓**Minimum secure network requirements:**

• Install the device on private industrial networks (not on public or open networks).
• Segment the network using **VLANs** (Virtual Local Area Networks) or dedicated subnets.
• Use firewalls or perimeter devices to filter traffic.
• Enable only the ports and protocols required for the operation of the device.
• If not strictly necessary, block or restrict the device's access to the Internet.
• Restrict physical network access to authorised personnel only.

✓**Wi-Fi network security:**

• Connect the device only to Wi-Fi networks using **WPA2** or **WPA3** authentication.
• Avoid open networks, **WEP** (Wired Equivalent Privacy), or other obsolete and insecure protocols.
• If the Wi-Fi interface is not required for the installation, disable it from the device's communication menu to reduce risk.

✓**Password and authentication management:**

• All default passwords **must be** changed upon initial commissioning.
• Use passwords with the following characteristics (according to **NIST SP 800-63B**):
  - Minimum length of 15 characters.
  - Combination of uppercase, lowercase, numbers, and symbols.

These measures help prevent unauthorised access through brute force or dictionary attacks.

✓**Cryptography:**

• All interfaces of the device (Ethernet, Wi-Fi, REST API, Web interface) use secure cryptographic protocols:

  - **WPA2** or **WPA3** for Wi-Fi.
  - **TLS 1.2** or higher for encrypted communications.
  - Algorithms validated by **NIST** (National Institute of Standards and Technology).

• Obsolete technologies are not used, including: **WEP**, **SSL**, **Telnet**, and unencrypted **HTTP**.

✓**Updates and maintenance:**

• Firmware updates must be carried out exclusively from verified and trusted sources, thereby ensuring the integrity and authenticity of the software loaded onto the device.
• Prior to applying a new version, the system shall verify the validity of the digital signature associated with the firmware, ensuring it has not been tampered with.

• It is recommended to:

  - Establish preventive maintenance procedures.
  - Implement a periodic update plan as part of the cybersecurity policy.
  - Document updates as part of the device lifecycle management.

7.3.- Wi-Fi COMMUNICATIONS

Wi-Fi is one of the most widely-used wireless technologies today, used to connect electronic devices and exchange information between them without a physical connection.

The **CVM-D50** models has Wi-Fi communications over the 2.4 GHz band, in accordance with the IEEE 802.11b, IEEE 802.11g and IEEE 802.11n standards.

7.4.- Circutor MyConfig MOBILE APPLICATION

The **Circutor MyConfig** mobile application, which allows for device configuration, can be downloaded free of charge from Google Play and the iOS App Store.

The steps to connect the device to the app are as follows:

1.- Once the device's Wi-Fi is enabled, open the **Circutor MyConfig** app, tap the **+** button, and select the **CVM-D50**.

2.- Perform a device scan; a device named **CVM-D50-XXXX** will appear in the list, where **XXXX** are the last 4 digits of the **CVM-D50**'s serial number.

3.- Connect the device via Wi-Fi.
The PIN code corresponds to the last 6 digits of the serial number (S/N).

4.- Once the device is connected, you can proceed with its configuration.

7.5.- MODBUS COMMANDS

Two different memory maps have been implemented for the Measurement, Energy and Voltage and Current harmonics variables. However, they have the same functions:

- ✓ **Map 1**, uses the addresses of the **CVM-MINI** device, entering the addresses of the new parameters measured by this new device.

- ✓ **Map 2**, uses the addresses of the **CVM-C10** device (adding 0x1000 to all addresses). Except for 3 parameters, the **CVM-C10** and the **CVM-D50** use the same parameters.

Map 2 should be used if a Modbus map is going to be implemented from scratch. However, if the map is already being used in another device, use **Map 1** for **CVM-MINI** and **Map 2** for **CVM-C10**.

All the addresses of **Modbus** memory are in Hexadecimal.

7.5.1.- MEASUREMENT VARIABLES

For these variables is implemented the **Function 0x04.**

Table 46: Modbus memory Map 1 (Measurement variables - Instantaneous values).

Map 1			
Instantaneous values			
Parameter	**Type**	**Address**	**Units**
Phase-Neutral voltage L1	Unit32	00-01	V x 10
Current L1	Unit32	02-03	A x 1000
Active Power L1	Unit32	04-05	W
Reactive Power L1	Unit32	06-07	var
Inductive Reactive Power L1	Unit32	12C-12D	var
Capacitive Reactive Power L1	Unit32	12E-12F	var
Apparent Power L1	Unit32	4A-4B	VA
Power factor L1	Unit32	08-09	x 100
Cos φ L1	Unit32	130-131	x 100
Phase-Neutral voltage L2	Unit32	0A-0B	V x 10
Current L2	Unit32	0C-0D	A x 1000
Active Power L2	Unit32	0E-0F	W
Reactive Power L2	Unit32	10-11	var
Inductive Reactive Power L2	Unit32	132-133	var
Capacitive Reactive Power L2	Unit32	134-135	var
Apparent Power L2	Unit32	4C-4D	VA
Power factor L2	Unit32	12-13	x 100
Cos φ L2	Unit32	136-137	x 100
Phase-Neutral voltage L3	Unit32	14-15	V x 10
Current L3	Unit32	16-17	A x 1000
Active Power L3	Unit32	18-19	W
Reactive Power L3	Unit32	1A-1B	var
Inductive Reactive Power L3	Unit32	138-139	var
Capacitive Reactive Power L3	Unit32	13A-13B	var
Apparent Power L3	Unit32	4E-4F	VA
Power factor L3	Unit32	1C-1D	x 100
Cos φ L3	Unit32	13C-13D	x 100
Active Power III	Unit32	1E-1F	W
Inductive Reactive Power III	Unit32	20-21	var
Capacitive Reactive Power III	Unit32	22-23	var
Apparent Power III	Unit32	42-43	VA
Power factor III	Unit32	26-27	x100
Cos φ III	Unit32	24-25	x100
Frequency L1	Unit32	28-29	Hz x10
Phase-Phase voltage L1-L2	Unit32	2A-2B	V x 10
Phase-Phase voltage L2-L3	Unit32	2C-2D	V x 10
Phase-Phase voltage L3-L1	Unit32	2E-2F	V x 10
% THD Voltage L1	Unit32	30-31	% x 10
% THD Voltage L2	Unit32	32-33	% x 10

Table 46 (Continuation): Modbus memory Map 1 (Measurement variables - Instantaneous values).

Map 1			
Instantaneous values			
Parameter	Type	Address	Units
% THD Voltage L3	Unit32	34-35	% x 10
% THD Current L1	Unit32	36-37	% x 10
% THD Current L2	Unit32	38-39	% x 10
% THD Current L3	Unit32	3A-3B	% x 10
Maximum Demand of Total Imported Active Power	Unit32	162-163	W
Maximum Demand of Total Imported Apparent Power	Unit32	164-165	VA
Maximum Demand of Total Imported Inductive Reactive Power	Unit32	166-167	var
Maximum Demand of Total Imported Capacitive Reactive Power	Unit32	168-169	var
Maximum Current Demand L1	Unit32	44-45	A x 1000
Maximum Current Demand L2	Unit32	52-53	A x 1000
Maximum Current Demand L3	Unit32	54-55	A x 1000
Three-Phase Current (Average)	Unit32	46-47	A x 1000
Neutral Current	Unit32	48-49	A x 1000
Temperature	Unit32	50-51	°C

Table 47: Modbus memory Map 1 (Measurement variables - Maximum values).

Map 1						
Maximum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Phase-Neutral voltage L1	60-61	Unit32	V x 10	1B58-1B59	Unit32	s
Current L1	62-63	Unit32	A x 1000	1B5A-1B5B	Unit32	s
Active Power L1	64-65	Unit32	W	1B5C-1B5D	Unit32	s
Reactive Power L1	66-67	Unit32	var	1B5E-1B5F	Unit32	s
Inductive Reactive Power L1	13E-13F	Unit32	var	1C2C-1C2D	Unit32	s
Capacitive Reactive Power L1	140-141	Unit32	var	1C2E-1C2F	Unit32	s
Apparent Power L1	AA-AB	Unit32	VA	1BA2-1BA3	Unit32	s
Power factor L1	68-69	Unit32	x 100	1B60-1B61	Unit32	s
Cos φ L1	142-143	Unit32	x 100	1C30-1C31	Unit32	s
Phase-Neutral voltage L2	6A-6B	Unit32	V x 10	1B62-1B63	Unit32	s
Current L2	6C-6D	Unit32	A x 1000	1B64-1B65	Unit32	s
Active Power L2	6E-6F	Unit32	W	1B66-1B67	Unit32	s
Reactive Power L2	70-71	Unit32	var	1B68-1B69	Unit32	s
Inductive Reactive Power L2	144-145	Unit32	var	1C32-1C33	Unit32	s
Capacitive Reactive Power L2	146-147	Unit32	var	1C34-1C35	Unit32	s
Apparent Power L2	AC-AD	Unit32	VA	1BA4-1BA5	Unit32	s
Power factor L2	72-73	Unit32	x 100	1B6A-1B6B	Unit32	s
Cos φ L2	148-149	Unit32	x 100	1C36-1C37	Unit32	s
Phase-Neutral voltage L3	74-75	Unit32	V x 10	1B6C-1B6D	Unit32	s
Current L3	76-77	Unit32	A x 1000	1B6E-1B6F	Unit32	s
Active Power L3	78-79	Unit32	W	1B70-1B71	Unit32	s
Reactive Power L3	7A-7B	Unit32	var	1B72-1B73	Unit32	s
Inductive Reactive Power L3	14A-14B	Unit32	var	1C38-1C39	Unit32	s

Table 47 (Continuation): Modbus memory Map 1 (Measurement variables - Maximum values).

Map 1						
Maximum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Capacitive Reactive Power L3	14C-14D	Unit32	var	1C3A-1C3B	Unit32	s
Apparent Power L3	AE-AF	Unit32	VA	1BA6-1BA7	Unit32	s
Power factor L3	7C-7D	Unit32	x 100	1B74-1B75	Unit32	s
Cos φ L3	14E-14F	Unit32	x 100	1C3C-1C3D	Unit32	s
Active Power III	7E-7F	Unit32	W	1B76-1B77	Unit32	s
Inductive Reactive Power III	80-81	Unit32	var	1B78-1B79	Unit32	s
Capacitive Reactive Power III	82-83	Unit32	var	1B7A-1B7B	Unit32	s
Apparent Power III	A2-A3	Unit32	VA	1B9A-1B9B	Unit32	s
Power factor III	86-87	Unit32	x100	1B7E-1B7F	Unit32	s
Cos φ III	84-85	Unit32	x100	1B7C-1B7D	Unit32	s
Frequency L1	88-89	Unit32	Hz x10	1B80-1B81	Unit32	s
Phase-Phase voltage L1-L2	8A-8B	Unit32	V x 10	1B82-1B83	Unit32	s
Phase-Phase voltage L2-L3	8C-8D	Unit32	V x 10	1B84-1B85	Unit32	s
Phase-Phase voltage L3-L1	8E-8F	Unit32	V x 10	1B86-1B87	Unit32	s
% THD Voltage L1	90-91	Unit32	% x 10	1B88-1B89	Unit32	s
% THD Voltage L2	92-93	Unit32	% x 10	1B8A-1B8B	Unit32	s
% THD Voltage L3	94-95	Unit32	% x 10	1B8C-1B8D	Unit32	s
% THD Current L1	96-97	Unit32	% x 10	1B8E-1B8F	Unit32	s
% THD Current L2	98-99	Unit32	% x 10	1B90-1B91	Unit32	s
% THD Current L3	9A-9B	Unit32	% x 10	1B92-1B93	Unit32	s
Maximum Demand of Total Imported Active Power	16A-16B	Unit32	W	1C20-1C21	Unit32	s
Maximum Demand of Total Imported Apparent Power	16C-16D	Unit32	VA	1C22-1C23	Unit32	s
Maximum Demand of Total Imported Inductive Reactive Power	16E-16F	Unit32	var	1C3E-1C3F	Unit32	s
Maximum Demand of Total Imported Capacitive Reactive Power	170-171	Unit32	var	1C40-1C41	Unit32	s
Maximum Current Demand L1	A4-A5	Unit32	A x 1000	1B9C-1B9D	Unit32	s
Maximum Current Demand L2	B2-B3	Unit32	A x 1000	1BAA-1BAB	Unit32	s
Maximum Current Demand L3	B4-B5	Unit32	A x 1000	1BAC-1BAD	Unit32	s
Three-Phase Current (Average)	A6-A7	Unit32	A x 1000	1B9E-1B9F	Unit32	s
Neutral Current	A8-A9	Unit32	A x 1000	1BA0-1BA1	Unit32	s
Temperature	B0-B1	Unit32	°C	1BA8-1BA9	Unit32	s

Table 48: Modbus memory Map 1 (Measurement variables - Minimum values).

Map 1						
Minimum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Phase-Neutral voltage L1	C0-C1	Unit32	V x 10	1BB8-1BB9	Unit32	s
Current L1	C2-C3	Unit32	A x 1000	1BBA-1BBB	Unit32	s
Active Power L1	C4-C5	Unit32	W	1BBC-1BBD	Unit32	s

Table 48 (Continuation): Modbus memory Map 1 (Measurement variables - Minimum values).

Map 1						
Minimum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Reactive Power L1	C6-C7	Unit32	var	1BBE-1BBF	Unit32	s
Inductive Reactive Power L1	150-151	Unit32	var	1C42-1C43	Unit32	s
Capacitive Reactive Power L1	152-153	Unit32	var	1C44-1C45	Unit32	s
Apparent Power L1	10A-10B	Unit32	VA	1C02-1C03	Unit32	s
Power factor L1	C8-C9	Unit32	x 100	1BC0-1BC1	Unit32	s
Cos φ L1	154-155	Unit32	x 100	1C46-1C47	Unit32	s
Phase-Neutral voltage L2	CA-CB	Unit32	V x 10	1BC2-1BC3	Unit32	s
Current L2	CC-CD	Unit32	A x 1000	1BC4-1BC5	Unit32	s
Active Power L2	CE-CF	Unit32	W	1BC6-1BC7	Unit32	s
Reactive Power L2	D0-D1	Unit32	var	1BC8-1BC9	Unit32	s
Inductive Reactive Power L2	156-157	Unit32	var	1C48-1C49	Unit32	s
Capacitive Reactive Power L2	158-159	Unit32	var	1C4A-1C4B	Unit32	s
Apparent Power L2	10C-10D	Unit32	VA	1C04-1C05	Unit32	s
Power factor L2	D2-D3	Unit32	x 100	1BCA-1BCB	Unit32	s
Cos φ L2	15A-15B	Unit32	x 100	1C4C-1C4D	Unit32	s
Phase-Neutral voltage L3	D4-D5	Unit32	V x 10	1BCC-1BCD	Unit32	s
Current L3	D6-D7	Unit32	A x 1000	1BCE-1BCF	Unit32	s
Active Power L3	D8-D9	Unit32	W	1BD0-1BD1	Unit32	s
Reactive Power L3	DA-DB	Unit32	var	1BD2-1BD3	Unit32	s
Inductive Reactive Power L3	15C-15D	Unit32	var	1C4E-1C4F	Unit32	s
Capacitive Reactive Power L3	15E-15F	Unit32	var	1C50-1C51	Unit32	s
Apparent Power L3	10E-10F	Unit32	VA	1C06-1C07	Unit32	s
Power factor L3	DC-DD	Unit32	x 100	1BD4-1BD5	Unit32	s
Cos φ L3	160-161	Unit32	x 100	1C52-1C53	Unit32	s
Active Power III	DE-DF	Unit32	W	1BD6-1BD7	Unit32	s
Inductive Reactive Power III	E0-E1	Unit32	var	1BD8-1BD9	Unit32	s
Capacitive Reactive Power III	E2-E3	Unit32	var	1BDA-1BDB	Unit32	s
Apparent Power III	102-103	Unit32	VA	1BFA-1BFB	Unit32	s
Power factor III	E6-E7	Unit32	x100	1BDE-1BDF	Unit32	s
Cos φ III	E4-E5	Unit32	x100	1BDC-1BDD	Unit32	s
Frequency L1	E8-E9	Unit32	Hz x10	1BE0-1BE1	Unit32	s
Phase-Phase voltage L1-L2	EA-EB	Unit32	V x 10	1BE2-1BE3	Unit32	s
Phase-Phase voltage L2-L3	EC-ED	Unit32	V x 10	1BE4-1BE5	Unit32	s
Phase-Phase voltage L3-L1	EE-EF	Unit32	V x 10	1BE6-1BE7	Unit32	s
% THD Voltage L1	F0-F1	Unit32	% x 10	1BE8-1BE9	Unit32	s
% THD Voltage L2	F2-F3	Unit32	% x 10	1BEA-1BEB	Unit32	s
% THD Voltage L3	F4-F5	Unit32	% x 10	1BEC-1BED	Unit32	s
% THD Current L1	F6-F7	Unit32	% x 10	1BEE-1BEF	Unit32	s
% THD Current L2	F8-F9	Unit32	% x 10	1BF0-1BF1	Unit32	s
% THD Current L3	FA-FB	Unit32	% x 10	1BF2-1BF3	Unit32	s
Three-Phase Current (Average)	106-107	Unit32	A x 1000	1BFE-1BFF	Unit32	s
Neutral Current	108-109	Unit32	A x 1000	1C00-1C01	Unit32	s

Table 48 (Continuation): Modbus memory Map 1 (Measurement variables - Minimum values).

Map 1						
Minimum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Temperature	110-111	Unit32	°C	1C08-1C09	Unit32	s

Table 49: Modbus memory Map 2 (Measurement variables - Instantaneous values).

Map 2			
Instantaneous values			
Parameter	Type	Address	Units
Phase-Neutral voltage L1	Unit32	1000-1001	V x 10
Current L1	Unit32	1002-1003	A x 1000
Active Power L1	Int32	1004-1005	W
Inductive Reactive Power L1	Int32	1006-1007	var
Capacitive Reactive Power L1	Int32	1008-1009	var
Apparent Power L1	Unit32	100A-100B	VA
Power factor L1	Int32	100C-100D	x 100
Cos φ L1	Int32	100E-100F	x 100
Phase-Neutral voltage L2	Unit32	1010-1011	V x 10
Current L2	Unit32	1012-1013	A x 1000
Active Power L2	Int32	1014-1015	W
Inductive Reactive Power L2	Int32	1016-1017	var
Capacitive Reactive Power L2	Int32	1018-1019	var
Apparent Power L2	Unit32	101A-101B	VA
Power factor L2	Int32	101C-101D	x 100
Cos φ L2	Int32	101E-101F	x 100
Phase-Neutral voltage L3	Unit32	1020-1021	V x 10
Current L3	Unit32	1022-1023	A x 1000
Active Power L3	Int32	1024-1025	W
Inductive Reactive Power L3	Int32	1026-1027	var
Capacitive Reactive Power L3	Int32	1028-1029	var
Apparent Power L3	Unit32	102A-102B	VA
Power factor L3	Int32	102C-102D	x 100
Cos φ L3	Int32	102E-102F	x 100
Active Power III	Int32	1030-1031	W
Inductive Reactive Power III	Int32	1032-1033	var
Capacitive Reactive Power III	Int32	1034-1035	var
Apparent Power III	Unit32	1036-1037	VA
Power factor III	Int32	1038-1039	x 100
Cos φ III	Int32	103A-103B	x 100
Frequency L1	Unit32	103C-103D	Hz x 100
Phase-Phase voltage L1-L2	Unit32	103E-103F	V x 10
Phase-Phase voltage L2-L3	Unit32	1040-1041	V x 10
Phase-Phase voltage L3-L1	Unit32	1042-1043	V x 10
Neutral Current	Unit32	1044-1045	A x 1000
% THD Voltage L1	Unit32	1046-1047	% x 10
% THD Voltage L2	Unit32	1048-1049	% x 10

Table 49 (Continuation) : Modbus memory Map 2 (Measurement variables - Instantaneous values).

Map 2			
Instantaneous values			
Parameter	Type	Address	Units
% THD Voltage L3	Unit32	104A-104B	% x 10
% THD Current L1	Unit32	104C-104D	% x 10
% THD Current L2	Unit32	104E-104F	% x 10
% THD Current L3	Unit32	1050-1051	% x 10
Maximum Demand of Total Imported Active Power	Unit32	1052-1053	W
Maximum Demand of Total Imported Apparent Power	Unit32	1054-1055	VA
Maximum Demand of Total Imported Inductive Reactive Power	Unit32	1200-1201	var
Maximum Demand of Total Imported Capacitive Reactive Power	Unit32	1202-1203	var
Maximum Current Demand L1	Unit32	1058-1059	A x 1000
Maximum Current Demand L2	Unit32	105A-105B	A x 1000
Maximum Current Demand L3	Unit32	105C-105D	A x 1000

Table 50: Modbus memory Map 2 (Measurement variables - Maximum values).

Map 2						
Maximum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Phase-Neutral voltage L1	1106-1107	Unit32	V x 10	1B58-1B59	Unit32	s
Current L1	1108-1109	Unit32	A x 1000	1B5A-1B5B	Unit32	s
Active Power L1	110A-110B	Int32	W	1B5C-1B5D	Unit32	s
Inductive Reactive Power L1	110C-110D	Int32	var	1C2C-1C2D	Unit32	s
Capacitive Reactive Power L1	110E-110F	Int32	var	1C2E-1C2F	Unit32	s
Apparent Power L1	1110-1111	Unit32	VA	1BA2-1BA3	Unit32	s
Power factor L1	1112-1113	Int32	x 100	1B60-1B61	Unit32	s
Cos φ L1	1114-1115	Int32	x 100	1C30-1C31	Unit32	s
Phase-Neutral voltage L2	1116-1117	Unit32	V x 10	1B62-1B63	Unit32	s
Current L2	1118-1119	Unit32	A x 1000	1B64-1B65	Unit32	s
Active Power L2	111A-111B	Int32	W	1B66-1B67	Unit32	s
Inductive Reactive Power L2	111C-111D	Int32	var	1C32-1C33	Unit32	s
Capacitive Reactive Power L2	111E-111F	Int32	var	1C34-1C35	Unit32	s
Apparent Power L2	1120-1121	Unit32	VA	1BA4-1BA5	Unit32	s
Power factor L2	1122-1123	Int32	x 100	1B6A-1B6B	Unit32	s
Cos φ L2	1124-1125	Int32	x 100	1C36-1C37	Unit32	s
Phase-Neutral voltage L3	1126-1127	Unit32	V x 10	1B6C-1B6D	Unit32	s
Current L3	1128-1129	Unit32	A x 1000	1B6E-1B6F	Unit32	s
Active Power L3	112A-112B	Int32	W	1B70-1B71	Unit32	s
Inductive Reactive Power L3	112C-112D	Int32	var	1C38-1C39	Unit32	s
Capacitive Reactive Power L3	112E-112F	Int32	var	1C3A-1C3B	Unit32	s
Apparent Power L3	1130-1131	Unit32	VA	1BA6-1BA7	Unit32	s
Power factor L3	1132-1133	Int32	x 100	1B74-1B75	Unit32	s
Cos φ L3	1134-1135	Int32	x 100	1C3C-1C3D	Unit32	s
Active Power III	1136-1137	Int32	W	1B76-1B77	Unit32	s
Inductive Reactive Power III	1138-1139	Int32	var	1B78-1B79	Unit32	s

Table 50 (Continuation): Modbus memory Map 2 (Measurement variables - Maximum values).

Map 2						
Maximum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Capacitive Reactive Power III	113A-113B	Int32	var	1B7A-1B7B	Unit32	s
Apparent Power III	113C-113D	Unit32	VA	1B9A-1B9B	Unit32	s
Power factor III	113E-113F	Int32	x 100	1B7E-1B7F	Unit32	s
Cos φ III	1140-1141	Int32	x 100	1B7C-1B7D	Unit32	s
Frequency L1	1142-1143	Unit32	Hz x 100	1B80-1B81	Unit32	s
Phase-Phase voltage L1-L2	1144-1145	Unit32	V x 10	1B82-1B83	Unit32	s
Phase-Phase voltage L2-L3	1146-1147	Unit32	V x 10	1B84-1B85	Unit32	s
Phase-Phase voltage L3-L1	1148-1149	Unit32	V x 10	1B86-1B87	Unit32	s
Neutral Current	114A-114B	Unit32	A x 1000	1BA0-1BA1	Unit32	s
% THD Voltage L1	114C-114D	Unit32	% x 10	1B88-1B89	Unit32	s
% THD Voltage L2	114E-114F	Unit32	% x 10	1B8A-1B8B	Unit32	s
% THD Voltage L3	1150-1151	Unit32	% x 10	1B8C-1B8D	Unit32	s
% THD Current L1	1152-1153	Unit32	% x 10	1B8E-1B8F	Unit32	s
% THD Current L2	1154-1155	Unit32	% x 10	1B90-1B91	Unit32	s
% THD Current L3	1156-1157	Unit32	% x 10	1B92-1B93	Unit32	s
Maximum Demand of Total Imported Active Power	1158-1159	Unit32	W	1C20-1C21	Unit32	s
Maximum Demand of Total Imported Apparent Power	115A-115B	Unit32	VA	1C22-1C23	Unit32	s
Maximum Demand of Total Imported Inductive Reactive Power	1204-1205	Unit32	var	1C3E-1C3F	Unit32	s
Maximum Demand of Total Imported Capacitive Reactive Power	1206-1207	Unit32	var	1C40-1C41	Unit32	s
Maximum Current Demand L1	115E-115F	Unit32	A x 1000	1B9C-1B9D	Unit32	s
Maximum Current Demand L2	1160-1161	Unit32	A x 1000	1BAA-1BAB	Unit32	s
Maximum Current Demand L3	1162-1163	Unit32	A x 1000	1BAC-1BAD	Unit32	s

Table 51: Modbus memory Map 2 (Measurement variables - Minimum values).

Map 2						
Minimum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Phase-Neutral voltage L1	1164-1165	Unit32	V x 10	1BB8-1BB9	Unit32	s
Current L1	1166-1167	Unit32	A x 1000	1BBA-1BBB	Unit32	s
Active Power L1	1168-1169	Int32	W	1BBC-1BBD	Unit32	s
Inductive Reactive Power L1	116A-116B	Int32	var	1C42-1C43	Unit32	s
Capacitive Reactive Power L1	116C-116D	Int32	var	1C44-1C45	Unit32	s
Apparent Power L1	116E-116F	Unit32	VA	1C02-1C03	Unit32	s
Power factor L1	1170-1171	Int32	x 100	1BC0-1BC1	Unit32	s
Cos φ L1	1172-1173	Int32	x 100	1C46-1C47	Unit32	s
Phase-Neutral voltage L2	1174-1175	Unit32	V x 10	1BC2-1BC3	Unit32	s
Current L2	1176-1177	Unit32	A x 1000	1BC4-1BC5	Unit32	s
Active Power L2	1178-1179	Int32	W	1BC6-1BC7	Unit32	s

Table 51 (Continuation): Modbus memory Map 2 (Measurement variables - Minimum values).

Map 2						
Minimum values						
Parameter	Address	Type	Units	Address Date	Type	Units
Inductive Reactive Power L2	117A-117B	Int32	var	1C48-1C49	Unit32	s
Capacitive Reactive Power L2	117C-117D	Int32	var	1C4A-1C4B	Unit32	s
Apparent Power L2	117E-117F	Unit32	VA	1C04-1C05	Unit32	s
Power factor L2	1180-1181	Int32	x 100	1BCA-1BCB	Unit32	s
Cos φ L2	1182-1183	Int32	x 100	1C4C-1C4D	Unit32	s
Phase-Neutral voltage L3	1184-1185	Unit32	V x 10	1BCC-1BCD	Unit32	s
Current L3	1186-1187	Unit32	A x 1000	1BCE-1BCF	Unit32	s
Active Power L3	1188-1189	Int32	W	1BD0-1BD1	Unit32	s
Inductive Reactive Power L3	118A-118B	Int32	var	1C4E-1C4F	Unit32	s
Capacitive Reactive Power L3	118C-118D	Int32	var	1C50-1C51	Unit32	s
Apparent Power L3	118E-118F	Unit32	VA	1BFA-1BFB	Unit32	s
Power factor L3	1190-1191	Int32	x 100	1BD4-1BD5	Unit32	s
Cos φ L3	1192-1193	Int32	x 100	1C52-1C53	Unit32	s
Active Power III	1194-1195	Int32	W	1BD6-1BD7	Unit32	s
Inductive Reactive Power III	1196-1197	Int32	var	1BD8-1BD9	Unit32	s
Capacitive Reactive Power III	1198-1199	Int32	var	1BDA-1BDB	Unit32	s
Apparent Power III	119A-119B	Unit32	VA	1C06-1C07	Unit32	s
Power factor III	119C-119D	Int32	x 100	1BDE-1BDF	Unit32	s
Cos φ III	119E-119F	Int32	x 100	1BDC-1BDD	Unit32	s
Frequency L1	11A0-11A1	Unit32	Hz x 100	1BE0-1BE1	Unit32	s
Phase-Phase voltage L1-L2	11A2-11A3	Unit32	V x 10	1BE2-1BE3	Unit32	s
Phase-Phase voltage L2-L3	11A4-11A5	Unit32	V x 10	1BE4-1BE5	Unit32	s
Phase-Phase voltage L3-L1	11A6-11A7	Unit32	V x 10	1BE6-1BE7	Unit32	s
Neutral Current	11A8-11A9	Unit32	A x 1000	1C00-1C01	Unit32	s
% THD Voltage L1	11AA-11AB	Unit32	% x 10	1BE8-1BE9	Unit32	s
% THD Voltage L2	11AC-11AD	Unit32	% x 10	1BEA-1BEB	Unit32	s
% THD Voltage L3	11AE-11AF	Unit32	% x 10	1BEC-1BED	Unit32	s
% THD Current L1	11B0-11B1	Unit32	% x 10	1BEE-1BEF	Unit32	s
% THD Current L2	11B2-11B3	Unit32	% x 10	1BF0-1BF1	Unit32	s
% THD Current L3	11B4-11B5	Unit32	% x 10	1BF2-1BF3	Unit32	s

7.5.2.- ENERGY VARIABLES

For these variables is implemented the **Function 0x03** and **0x04.**

Table 52: Modbus memory Map 1 (Instantaneous energy variables).

Map 1			
Parameter	Address	Type	Units
Total Imported Active Energy	3C-3D	Uint32	Wh
Total Imported Inductive Reactive Energy	3E-3F	Uint32	varh
Total Imported Capacitive Reactive Energy	40-41	Uint32	varh
Total Imported Apparent Energy	56-57	Uint32	VAh
Total Exported Active Energy	58-59	Uint32	Wh

Table 52 (Continuation): Modbus memory Map 1 (Instantaneous energy variables).

Parameter	Address	Type	Units
Total Exported Inductive Reactive Energy	5A-5B	Uint32	varh
Total Exported Capacitive Reactive Energy	5C-5D	Uint32	varh
Total Exported Apparent Energy	5E-5F	Uint32	VAh

Table 53: Modbus memory Map 1 (Energy variables Tariffs).

Map 1					
Parameter	Total Tarif	Tariff 1	Tariff 2	Type	Units
Total Imported Active Energy (kWh)	1E0-1E1	18C-18D	1B6-1B7	Uint32	kWh
Total Imported Active Energy (Wh)	172-173	18E-18F	1B8-1B9	Uint32	Wh
Total Imported Inductive Reactive Energy (kvarh)	1E2-1E3	190-191	1BA-1BB	Uint32	kvarh
Total Imported Inductive Reactive Energy (varh)	174-175	192-193	1BC-1BD	Uint32	varh
Total Imported Capacitive Reactive Energy (kvarh)	1E4-1E5	194-195	1BE-1BF	Uint32	kvarh
Total Imported Capacitive Reactive Energy (varh)	176-177	196-197	1C0-1C1	Uint32	varh
Total Imported Apparent Energy (kVAh)	1E6-1E7	198-199	1C2-1C3	Uint32	kVAh
Total Imported Apparent Energy (VAh)	178-179	19A-19B	1C4-1C5	Uint32	VAh
Total Exported Active Energy (kWh)	1E8-1E9	19C-19D	1C6-1C7	Uint32	kWh
Total Exported Active Energy (Wh)	17A-17B	19E-19F	1C8-1C9	Uint32	Wh
Total Exported Inductive Reactive Energy (kvarh)	1EA-1EB	1A0-1A1	1CA-1CB	Uint32	kvarh
Total Exported Inductive Reactive Energy (varh)	17C-17D	1A2-1A3	1CC-1CD	Uint32	varh
Total Exported Capacitive Reactive Energy (kvarh)	1EC-1ED	1A4-1A5	1CE-1CF	Uint32	kvarh
Total Exported Capacitive Reactive Energy (varh)	17E-17F	1A6-1A7	1D0-1D1	Uint32	varh
Total Exported Apparent Energy (kVAh)	1EE-1EF	1A8-1A9	1D2-1D3	Uint32	kVAh
Total Exported Apparent Energy (VAh)	180-181	1AA-1AB	1D4-1D5	Uint32	VAh
Imported Energy Emissions	182-183	1AC-1AD	1D6-1D7	Uint32	$kgCO_2$ x 10
Imported Energy Cost	184-185	1AE-1AF	1D8-1D9	Uint32	x 10
Exported Energy Emissions	186-187	1B0-1B1	1DA-1DB	Uint32	$kgCO_2$ x 10
Exported Energy Cost	188-189	1B2-1B3	1DC-1DD	Uint32	x 10
Operating Seconds	18A-18B	1B4-1B5	1DE-1DF	Uint32	s

Table 54: Modbus memory Map 2 (Energy variables Tariffs).

Map 2					
Parameter	Type	Tariff 1	Tariff 2	Total	Units
Total Imported Active Energy (kWh)	Uint32	105E-105F	1088-1089	10DC-10DD	kWh
Total Imported Active Energy (Wh)	Uint32	1060-1061	108A-108B	10DE-10DF	Wh
Total Imported Inductive Reactive Energy (kvarh)	Uint32	1062-1063	108C-108D	10E0-10E1	kvarh
Total Imported Inductive Reactive Energy (varh)	Uint32	1064-1065	108E-108F	10E2-10E3	varh
Total Imported Capacitive Reactive Energy (kvarh)	Uint32	1066-1067	1090-1091	10E4-10E5	kvarh
Total Imported Capacitive Reactive Energy (varh)	Uint32	1068-1069	1092-1093	10E6-10E7	varh
Total Imported Apparent Energy (kVAh)	Uint32	106A-106B	1094-1095	10E8-10E9	kVAh
Total Imported Apparent Energy (VAh)	Uint32	106C-106D	1096-1097	10EA-10EB	VAh
Imported Energy Emissions	Uint32	106E-106F	1098-1099	10EC-10ED	$kgCO_2$ x 10
Imported Energy Cost	Uint32	1070-1071	109A-109B	10EE-10EF	x 10
Total Exported Active Energy (kWh)	Uint32	1072-1073	109C-109D	10F0-10F1	kWh
Total Exported Active Energy (Wh)	Uint32	1074-1075	109E-109F	10F2-10F3	Wh
Total Exported Inductive Reactive Energy (kvarh)	Uint32	1076-1077	10A0-10A1	10F4-10F5	kvarh

Table 54 (Continuation): Modbus memory Map 2 (Energy variables Tariffs).

Map 2					
Parameter	Type	Tariff 1	Tariff 2	Total	Units
Total Exported Inductive Reactive Energy (varh)	Uint32	1078-1079	10A2-10A3	10F6-10F7	varh
Total Exported Capacitive Reactive Energy (kvarh)	Uint32	107A-107B	10A4-10A5	10F8-10F9	kvarh
Total Exported Capacitive Reactive Energy (varh)	Uint32	107C-107D	10A6-10A7	10FA-10FB	varh
Total Exported Apparent Energy (kVAh)	Uint32	107E-107F	10A8-10A9	10FC-10FD	kVAh
Total Exported Apparent Energy (VAh)	Uint32	1080-1081	10AA-10AB	10FE-10EF	VAh
Exported Energy Emissions	Uint32	1082-1083	10AC-10AD	1100-1101	x 10
Exported Energy Cost	Uint32	1084-1085	10AE-10AF	1102-1103	x 10
Operating Seconds	Uint32	1086-1087	10B0-10B1	1104-1105	seg

Table 55: Modbus memory Map 1 and Map 2 (Energy variables per phase).

Map 1 and Map 2					
Parameter	Type	L1	L2	L3	Units
Imported Active Energy T1 (kWh)	Uint32	1400-1401	1460-1461	14C0-14C1	kWh
Imported Active Energy T1 (Wh)	Uint32	1402-1403	1462-1463	14C2-14C3	Wh
Imported Inductive Reactive Energy T1 (kvarh)	Uint32	1404-1405	1464-1465	14C4-14C5	kvarh
Imported Inductive Reactive Energy T1 (varh)	Uint32	1406-1407	1466-1467	14C6-14C7	varh
Imported Capacitive Reactive Energy T1 (kvarh)	Uint32	1408-1409	1468-1469	14C8-14C9	kvarh
Imported Capacitive Reactive Energy T1 (varh)	Uint32	140A-140B	146A-146B	14CA-14CB	varh
Imported Apparent Energy T1 (kVAh)	Uint32	140C-140D	146C-146D	14CC-14CD	kVAh
Imported Apparent Energy T1 (VAh)	Uint32	140E-140F	146E-146F	14CE-14CF	VAh
Exported Active Energy T1 (kWh)	Uint32	1410-1411	1470-1471	14D0-14D1	kWh
Exported Active Energy T1 (Wh)	Uint32	1412-1413	1472-1473	14D2-14D3	Wh
Exported Inductive Reactive Energy T1 (kvarh)	Uint32	1414-1415	1474-1475	14D4-14D5	kvarh
Exported Inductive Reactive Energy T1 (varh)	Uint32	1416-1417	1476-1477	14D6-14D7	varh
Exported Capacitive Reactive Energy T1 (kvarh)	Uint32	1418-1419	1478-1479	14D8-14D9	kvarh
Exported Capacitive Reactive Energy T1 (varh)	Uint32	141A-141B	147A-147B	14DA-14DB	varh
Exported Apparent Energy T1 (kVAh)	Uint32	141C-141D	147C-147D	14DC-14DD	kVAh
Exported Apparent Energy T1 (VAh)	Uint32	141E-141F	147E-147F	14DE-14DF	VAh
Imported Active Energy T2 (kWh)	Uint32	1420-1421	1480-1481	14E0-14E1	kWh
Imported Active Energy T2 (Wh)	Uint32	1422-1423	1482-1483	14E2-14E3	Wh
Imported Inductive Reactive Energy T2 (kvarh)	Uint32	1424-1425	1484-1485	14E4-14E5	kvarh
Imported Inductive Reactive Energy T2 (varh)	Uint32	1426-1427	1486-1487	14E6-14E7	varh
Imported Capacitive Reactive Energy T2 (kvarh)	Uint32	1428-1429	1488-1489	14E8-14E9	kvarh
Imported Capacitive Reactive Energy T2 (varh)	Uint32	142A-142B	148A-148B	14EA-14EB	varh
Imported Apparent Energy T2 (kVAh)	Uint32	142C-142D	148C-148D	14EC-14ED	kVAh
Imported Apparent Energy T2 (VAh)	Uint32	142E-142F	148E-148F	14EE-14EF	VAh
Exported Active Energy T2 (kWh)	Uint32	1430-1431	1490-1491	14F0-14F1	kWh
Exported Active Energy T2 (Wh)	Uint32	1432-1433	1492-1493	14F2-14F3	Wh
Exported Inductive Reactive Energy T2 (kvarh)	Uint32	1434-1435	1494-1495	14F4-14F5	kvarh
Exported Inductive Reactive Energy T2 (varh)	Uint32	1436-1437	1496-1497	14F6-14F7	varh
Exported Capacitive Reactive Energy T2 (kvarh)	Uint32	1438-1439	1498-1499	14F8-14F9	kvarh
Exported Capacitive Reactive Energy T2 (varh)	Uint32	143A-143B	149A-149B	14FA-14FB	varh
Exported Apparent Energy T2 (kVAh)	Uint32	143C-143D	149C-149D	14FC-14FD	kVAh

Table 55 (Continuation): Modbus memory Map 1 and Map 2 (Energy variables per phase).

Map 1 and Map 2					
Parameter	Type	L1	L2	L3	Units
Exported Apparent Energy T2 (VAh)	Uint32	143E-143F	149E-149F	14FE-14FF	VAh
Imported Active Energy (Total Tariffs) (kWh)	Uint32	1440-1441	14A0-14A1	1500-1501	kWh
Imported Active Energy (Total Tariffs) (Wh)	Uint32	1442-1443	14A2-14A3	1502-1503	Wh
Imported Inductive Reactive Energy (Total Tariffs) (kvarh)	Uint32	1444-1445	14A4-14A5	1504-1505	kvarh
Imported Inductive Reactive Energy (Total Tariffs) (varh)	Uint32	1446-1447	14A6-14A7	1506-1507	varh
Imported Capacitive Reactive Energy (Total Tariffs) (kvarh)	Uint32	1448-1449	14A8-14A9	1508-1509	kvarh
Imported Capacitive Reactive Energy (Total Tariffs) (varh)	Uint32	144A-144B	14AA-14AB	150A-150B	varh
Imported Apparent Energy (Total Tariffs) (kVAh)	Uint32	144C-144D	14AC-14AD	150C-150D	kVAh
Imported Apparent Energy (Total Tariffs) (VAh)	Uint32	144E-144F	14AE-14AF	150E-150F	VAh
Exported Active Energy (Total Tariffs) (kWh)	Uint32	1450-1451	14B0-14B1	1510-1511	kWh
Exported Active Energy (Total Tariffs) (Wh)	Uint32	1452-1453	14B2-14B3	1512-1513	Wh
Exported Inductive Reactive Energy (Total Tariffs) (kvarh)	Uint32	1454-1455	14B4-14B5	1514-1515	kvarh
Exported Inductive Reactive Energy (Total Tariffs) (varh)	Uint32	1456-1457	14B6-14B7	1516-1517	varh
Exported Capacitive Reactive Energy (Total Tariffs) (kvarh)	Uint32	1458-1459	14B8-14B9	1518-1519	kvarh
Exported Capacitive Reactive Energy (Total Tariffs) (varh)	Uint32	145A-145B	14BA-14BB	151A-151B	varh
Exported Apparent Energy Total Tarifas (kVAh)	Uint32	145C-145D	14BC-14BD	151C-151D	kVAh
Exported Apparent Energy Total Tarifas (VAh)	Uint32	145E-145F	14BE-14BF	151E-151F	VAh

7.5.3.- VOLTAGE AND CURRENT HARMONICS

For these variables is implemented the **Function 0x03** and **0x04.**

Table 56: Modbus memory Map 1 (Voltage Harmonics).

Map 1					
Parameter	L1	L2	L3	Type	Units
Fundamental of Voltage Harmonics	2AE-2AF	2CC-2CD	2EA-2EB	Uint32	V x 10
2nd Voltage Harmonic	2B0-2B1	2CE-2CF	2EC-2ED	Uint32	% x 10
3rd Voltage Harmonic	2B2-2B3	2D0-2D1	2EE-2EF	Uint32	% x 10
4th Voltage Harmonic	2B4-2B5	2D2-2D3	2F0-2F1	Uint32	% x 10
5th Voltage Harmonic	2B6-2B7	2D4-2D5	2F2-2F3	Uint32	% x 10
6th Voltage Harmonic	2B8-2B9	2D6-2D7	2F4-2F5	Uint32	% x 10
7th Voltage Harmonic	2BA-2BB	2D8-2D9	2F6-2F7	Uint32	% x 10
8th Voltage Harmonic	2BC-2BD	2DA-2DB	2F8-2F9	Uint32	% x 10
9th Voltage Harmonic	2BE-2BF	2DC-2DD	2FA-2FB	Uint32	% x 10
10th Voltage Harmonic	2C0-2C1	2DE-2DF	2FC-2FD	Uint32	% x 10
11th Voltage Harmonic	2C2-2C3	2E0-2E1	2FE-2FF	Uint32	% x 10
12th Voltage Harmonic	2C4-2C5	2E2-2E3	300-301	Uint32	% x 10
13th Voltage Harmonic	2C6-2C7	2E4-2E5	302-303	Uint32	% x 10

Table 56 (Continuation): Modbus memory Map 1 (Voltage Harmonics).

Map 1					
Parameter	L1	L2	L3	Type	Units
14th Voltage Harmonic	2C8-2C9	2E6-2E7	304-305	Uint32	% x 10
15th Voltage Harmonic	2CA-2CB	2E8-2E9	306-307	Uint32	% x 10
16th Voltage Harmonic	308-309	328-329	348-349	Uint32	% x 10
17th Voltage Harmonic	30A-30B	32A-32B	34A-34B	Uint32	% x 10
18th Voltage Harmonic	30C-30D	32C-32D	34C-34D	Uint32	% x 10
19th Voltage Harmonic	30E-30F	32E-32F	34E-34F	Uint32	% x 10
20th Voltage Harmonic	310-311	330-331	350-351	Uint32	% x 10
21st Voltage Harmonic	312-313	332-333	352-353	Uint32	% x 10
22nd Voltage Harmonic	314-315	334-335	354-355	Uint32	% x 10
23rd Voltage Harmonic	316-317	336-337	356-357	Uint32	% x 10
24th Voltage Harmonic	318-319	338-339	358-359	Uint32	% x 10
25th Voltage Harmonic	31A-31B	33A-33B	35A-35B	Uint32	% x 10
26th Voltage Harmonic	31C-31D	33C-33D	35C-35D	Uint32	% x 10
27th Voltage Harmonic	31E-31F	33E-33F	35E-35F	Uint32	% x 10
28th Voltage Harmonic	320-321	340-341	360-361	Uint32	% x 10
29th Voltage Harmonic	322-323	342-343	362-363	Uint32	% x 10
30th Voltage Harmonic	324-325	344-345	364-365	Uint32	% x 10
31st Voltage Harmonic	326-327	346-347	366-367	Uint32	% x 10

Table 57: Modbus memory Map 2 (Voltage Harmonics).

Map 2					
Parameter	L1	L2	L3	Type	Units
Fundamental of Voltage Harmonics	1A28-1A29	1A48-1A49	1A68-1A69	Uint32	V x 10
2nd Voltage Harmonic	1A2A	1A4A	1A6A	Uint16	% x 10
3rd Voltage Harmonic	1A2B	1A4B	1A6B	Uint16	% x 10
4th Voltage Harmonic	1A2C	1A4C	1A6C	Uint16	% x 10
5th Voltage Harmonic	1A2D	1A4D	1A6D	Uint16	% x 10
6th Voltage Harmonic	1A2E	1A4E	1A6E	Uint16	% x 10
7th Voltage Harmonic	1A2F	1A4F	1A6F	Uint16	% x 10
8th Voltage Harmonic	1A30	1A50	1A70	Uint16	% x 10
9th Voltage Harmonic	1A31	1A51	1A71	Uint16	% x 10
10th Voltage Harmonic	1A32	1A52	1A72	Uint16	% x 10
11th Voltage Harmonic	1A33	1A53	1A73	Uint16	% x 10
12th Voltage Harmonic	1A34	1A54	1A74	Uint16	% x 10
13th Voltage Harmonic	1A35	1A55	1A75	Uint16	% x 10
14th Voltage Harmonic	1A36	1A56	1A76	Uint16	% x 10
15th Voltage Harmonic	1A37	1A57	1A77	Uint16	% x 10
16th Voltage Harmonic	1A38	1A58	1A78	Uint16	% x 10
17th Voltage Harmonic	1A39	1A59	1A79	Uint16	% x 10
18th Voltage Harmonic	1A3A	1A5A	1A7A	Uint16	% x 10
19th Voltage Harmonic	1A3B	1A5B	1A7B	Uint16	% x 10
20th Voltage Harmonic	1A3C	1A5C	1A7C	Uint16	% x 10
21st Voltage Harmonic	1A3D	1A5D	1A7D	Uint16	% x 10

Table 57 (Continuation): Modbus memory Map 2 (Voltage Harmonics).

Map 2					
Parameter	L1	L2	L3	Type	Units
22nd Voltage Harmonic	1A3E	1A5E	1A7E	Uint16	% x 10
23rd Voltage Harmonic	1A3F	1A5F	1A7F	Uint16	% x 10
24th Voltage Harmonic	1A40	1A60	1A80	Uint16	% x 10
25th Voltage Harmonic	1A41	1A61	1A81	Uint16	% x 10
26th Voltage Harmonic	1A42	1A62	1A82	Uint16	% x 10
27th Voltage Harmonic	1A43	1A63	1A83	Uint16	% x 10
28th Voltage Harmonic	1A44	1A64	1A84	Uint16	% x 10
29th Voltage Harmonic	1A45	1A65	1A85	Uint16	% x 10
30th Voltage Harmonic	1A46	1A66	1A86	Uint16	% x 10
31st Voltage Harmonic	1A47	1A67	1A87	Uint16	% x 10

Table 58: Modbus memory Map 1 (Current Harmonics).

Map 1					
Parameter	L1	L2	L3	Type	Units
Fundamental of Current Harmonics	1F4-1F5	212-213	230-231	Uint32	A x 10000
2nd Current Harmonic	1F6-1F7	214-215	232-233	Uint32	% x 10
3rd Current Harmonic	1F8-1F9	216-217	234-235	Uint32	% x 10
4th Current Harmonic	1FA-1FB	218-219	236-237	Uint32	% x 10
5th Current Harmonic	1FC-1FD	21A-21B	238-239	Uint32	% x 10
6th Current Harmonic	1FE-1FF	21C-21D	23A-23B	Uint32	% x 10
7th Current Harmonic	200-201	21E-21F	23C-23D	Uint32	% x 10
8th Current Harmonic	202-203	220-221	23E-23F	Uint32	% x 10
9th Current Harmonic	204-205	222-223	240-241	Uint32	% x 10
10th Current Harmonic	206-207	224-225	242-243	Uint32	% x 10
11th Current Harmonic	208-209	226-227	244-245	Uint32	% x 10
12th Current Harmonic	20A-20B	228-229	246-247	Uint32	% x 10
13th Current Harmonic	20C-20D	22A-22B	248-249	Uint32	% x 10
14th Current Harmonic	20E-20F	22C-22D	24A-24B	Uint32	% x 10
15th Current Harmonic	210-211	22E-22F	24C-24D	Uint32	% x 10
16th Current Harmonic	24E-24F	26E-26F	28E-28F	Uint32	% x 10
17th Current Harmonic	250-251	270-271	290-291	Uint32	% x 10
18th Current Harmonic	252-253	272-273	292-293	Uint32	% x 10
19th Current Harmonic	254-255	274-275	294-295	Uint32	% x 10
20th Current Harmonic	256-257	276-277	296-297	Uint32	% x 10
21st Current Harmonic	258-259	278-279	298-299	Uint32	% x 10
22nd Current Harmonic	25A-25B	27A-27B	29A-29B	Uint32	% x 10
23rd Current Harmonic	25C-25D	27C-27D	29C-29D	Uint32	% x 10
24th Current Harmonic	25E-25F	27E-27F	29E-29F	Uint32	% x 10
25th Current Harmonic	260-261	280-281	2A0-2A1	Uint32	% x 10
26th Current Harmonic	262-263	282-283	2A2-2A3	Uint32	% x 10
27th Current Harmonic	264-265	284-285	2A4-2A5	Uint32	% x 10
28th Current Harmonic	266-267	286-287	2A6-2A7	Uint32	% x 10
29th Current Harmonic	268-269	288-289	2A8-2A9	Uint32	% x 10

Table 58 (Continuation): Modbus memory Map 1 (Current Harmonics).

Map 1					
Parameter	L1	L2	L3	Type	Units
30th Current Harmonic	26A-26B	28A-28B	2AA-2AB	Uint32	% x 10
31st Current Harmonic	26C-26D	28C-28D	2AC-2AD	Uint32	% x 10

Table 59: Modbus memory Map 2 (Current Harmonics).

Map 2					
Parameter	L1	L2	L3	Type	Units
Fundamental of Current Harmonics	1A88-1A89	1AA8-1AA9	1AC8-1AC9	Uint32	A x 1000
2nd Current Harmonic	1A8A	1AAA	1ACA	Uint16	% x 10
3rd Current Harmonic	1A8B	1AAB	1ACB	Uint16	% x 10
4th Current Harmonic	1A8C	1AAC	1ACC	Uint16	% x 10
5th Current Harmonic	1A8D	1AAD	1ACD	Uint16	% x 10
6th Current Harmonic	1A8E	1AAE	1ACE	Uint16	% x 10
7th Current Harmonic	1A8F	1AAF	1ACF	Uint16	% x 10
8th Current Harmonic	1A90	1AB0	1AD0	Uint16	% x 10
9th Current Harmonic	1A91	1AB1	1AD1	Uint16	% x 10
10th Current Harmonic	1A92	1AB2	1AD2	Uint16	% x 10
11th Current Harmonic	1A93	1AB3	1AD3	Uint16	% x 10
12th Current Harmonic	1A94	1AB4	1AD4	Uint16	% x 10
13th Current Harmonic	1A95	1AB5	1AD5	Uint16	% x 10
14th Current Harmonic	1A96	1AB6	1AD6	Uint16	% x 10
15th Current Harmonic	1A97	1AB7	1AD7	Uint16	% x 10
16th Current Harmonic	1A98	1AB8	1AD8	Uint16	% x 10
17th Current Harmonic	1A99	1AB9	1AD9	Uint16	% x 10
18th Current Harmonic	1A9A	1ABA	1ADA	Uint16	% x 10
19th Current Harmonic	1A9B	1ABB	1ADB	Uint16	% x 10
20th Current Harmonic	1A9C	1ABC	1ADC	Uint16	% x 10
21st Current Harmonic	1A9D	1ABD	1ADD	Uint16	% x 10
22nd Current Harmonic	1A9E	1ABE	1ADE	Uint16	% x 10
23rd Current Harmonic	1A9F	1ABF	1ADF	Uint16	% x 10
24th Current Harmonic	1AA0	1AC0	1AE0	Uint16	% x 10
25th Current Harmonic	1AA1	1AC1	1AE1	Uint16	% x 10
26th Current Harmonic	1AA2	1AC2	1AE2	Uint16	% x 10
27th Current Harmonic	1AA3	1AC3	1AE3	Uint16	% x 10
28th Current Harmonic	1AA4	1AC4	1AE4	Uint16	% x 10
29th Current Harmonic	1AA5	1AC5	1AE4	Uint16	% x 10
30th Current Harmonic	1AA6	1AC6	1AE6	Uint16	% x 10
31st Current Harmonic	1AA7	1AC7	1AE7	Uint16	% x 10

7.5.4.- RECORDS OF VARIABLES

Functions 0x03 and 0x10 are implemented for these variables.

The device saves the records for:

✓ Standard Events.
✓ Quality Events.
✓ The energy closing.
✓ The average measurement profiles.
✓ The maximum measurement profiles.
✓ The minimum measurement profiles.

Records can be read in two ways:

- Reading a specific file.
- Reading all the files generated between certain dates.

7.5.4.1.- Reading a specific file

To read a specific file, the **Table 60, Table 62, Table 64, Tabla 61, Table 66** and **Table 67** have to be read, depending on the records desired, and the following procedure must be used:

1.- Read the parameter **No. of files saved** to find out the number of files saved.

2.-Write the file number you want to read in the **File to read** parameter.

3.- Read all the parameters at once:
- 3 parameters for standard events.
- 17 parameters for quality events.
- 27 parameters for energy closure.
- 73 parameters for the Average Measurement, Maximum Measurement, and Minimum Measurement profiles.

Table 60: Modbus memory map: Standard Events (Table 1).

Standard Events (Table 1)			
Parameters	**Address**	**Type**	**Value / Units**
No. of files saved	1F40	Uint16	0 ... 99
File to read	1F41	Uint16	0 ... 99
Date	1F42-1F43	Uint32	s
Event Code	1F43	Uint16	See **Table 61**

Table 61: Modbus memory map: Standard Event Code.

Standard Event Code	
Events	**Code**
Start	1
Configuration Change	2
Reset of All Configuration and Factory Parameters	3
Energy Profile Deleted	4
Measurement Profile Deleted	5
Standard Events Profile Deleted	6
Quality Events Profile Deleted	7
Clock Change	8
ESP32 Configuration Change	9
Connection	10
Disconnection	11

Table 62: Modbus memory map: Quality Events (Table 1).

Quality Events (Table 1)			
Parameters	Address	Type	Value / Units
No. of files saved in the profile	1F4C	Uint16	0 ... 299
File to read	1F4B	Uint16	0 ... 299
Date	1F4C-1F4D	Uint32	s
Event Code	1F4E	Uint16	See **Table 63**
Activation Date	1F4F-1F50	Uint32	epoch
Average Value L1	1F51-1F52	Float32	V
Average ValueL2	1F53-1F54	Float32	V
Average Value L2	1F55-1F56	Float32	V
Maximum / Minimum Value L1	1F57-1F58	Float32	V
Maximum / Minimum Value L2	1F59-1F5A	Float32	V
Maximum / Minimum Value L3	1F5B-1F5C	Float32	V

Table 63: Modbus memory map: Quality Event Code.

Quality Event Code	
Events	Code
Overvoltage Activation on L1	1
Overvoltage Deactivation on L1	2
Overvoltage Activation on L2	3
Overvoltage Deactivation on L2	4
Overvoltage Activation on L3	5
Overvoltage Deactivation on L3	6
Undervoltage Activation on L1	7
Undervoltage Deactivation on L1	8
Undervoltage Activation on L2	9
Undervoltage Deactivation on L2	10
Undervoltage Activation on L3	11
Undervoltage Deactivation on L3	12

Table 64: Modbus memory map: Energy Closures (Table 1).

Energy Closures (Table 1)			
Parameters	Address	Type	Value / Units
No. of files saved in the profile	1FA4-1FA5	Uint32	0 ... 3839
File to read	1FA6-1FA7	Uint32	0 ... 3839
Date	1FA8-1FA9	Uint32	s
Status	1FAA	Uint16	See **Table 68**
Total Imported Active Energy (kWh)	1FAB-1FAC	Uint32	kWh
Total Imported Active Energy (Wh)	1FAD	Uint16	Wh
Total Exported Active Energy (kWh)	1FAE-1FAF	Uint32	kWh
Total Exported Active Energy (Wh)	1FB0	Uint16	Wh
Total Imported Inductive Reactive Energy(kvarh)	1FB1-1FB2	Uint32	kvarh
Total Imported Inductive Reactive Energy(varh)	1FB3	Uint16	varh
Total Exported Inductive Reactive Energy (kvarh)	1FB4-1FB5	Uint32	kvarh
Total Exported Inductive Reactive Energy (varh)	1FB6	Uint16	varh
Total Imported Capacitive Reactive Energy (kvarh)	1FB7-1FB8	Uint32	kvarh

Tabla 64 (Continuation): Modbus memory map: Energy Closures (Table 1).

Energy Closures (Table 1)			
Parameters	Address	Type	Value / Units
Total Imported Capacitive Reactive Energy (varh)	1FB9	Uint16	varh
Total Exported Capacitive Reactive Energy (kvarh)	1FBA-1FBB	Uint32	kvarh
Total Exported Capacitive Reactive Energy (varh)	1FBC	Uint16	varh
Total Imported Apparent Energy(kVAh)	1FBD-1FBE	Uint32	kVAh
Total Imported Apparent Energy(VAh)	1FBF	Uint16	VAh
Total Exported Apparent Energy (kVAh)	1FC0-1FC1	Uint32	kVAh
Total Exported Apparent Energy (VAh)	1FC2	Uint16	VAh

Table 65: Modbus memory map: Average Measurement Profiles (Table 1).

Average Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
No. of files saved in the profile	2008-2009	Uint32	0 ... 5759
File to read	200A-200B	Uint32	0 ... 5759
Date	200C-200D	Uint32	s
Status	200E	Uint16	See **Table 68**
Phase-Neutral voltage L1	200F-2010	Float32	V
Phase-Neutral voltage L2	2011-2012	Float32	V
Phase-Neutral voltage L3	2013-2014	Float32	V
Current L1	2015-2016	Float32	A
Current L2	2017-2018	Float32	A
Current L3	2019-201A	Float32	A
Three-Phase Current (Average)	201B-201C	Float32	A
Neutral Current	201D-201E	Float32	A
Active Power L1	201F-2020	Float32	W
Active Power L2	2021-2022	Float32	W
Active Power L3	2023-2024	Float32	W
Active Power III	2025-2026	Float32	W
Reactive Power L1	2027-2028	Float32	var
Reactive Power L2	2029-202A	Float32	var
Reactive Power L2	202B-202C	Float32	var
Reactive Power III	202D-202E	Float32	var
Apparent Power III	202F-2030	Float32	VA
Power factor L1	2031-2032	Float32	-
Power factor L2	2033-2034	Float32	-
Power factor L3	2035-2036	Float32	-
Power factor III	2037-2038	Float32	-
Cos φ L1	2039-203A	Float32	-
Cos φ L2	203B-203C	Float32	-
Cos φ L3	203D-203E	Float32	-
Cos φ III	203F-2040	Float32	-
Frequency	2041-2042	Float32	Hz
Phase-Phase voltage L1-L2	2043-2044	Float32	V
Phase-Phase voltage L2-L3	2045-2046	Float32	V

Table 65 (Continuation): Modbus memory map: Average Measurement Profiles (Table 1).

Average Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
Phase-Phase voltage L3-L1	2047-2048	Float32	V
% THD Voltage L1	2049-204A	Float32	%
% THD Voltage L2	204B-204C	Float32	%
% THD Voltage L3	204D-204E	Float32	%
% THD Current L1	204F-2050	Float32	%
% THD Current L2	2051-2052	Float32	%
% THD Current L3	2053-2054	Float32	%

Table 66: Modbus memory map: Maximum Measurement Profiles (Table 1).

Maximum Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
No. of files saved in the profile	206C-206D	Uint32	0 ... 5759
File to read	206E-206F	Uint32	0 ... 5759
Date	2070-2071	Uint32	s
Status	2072	Uint16	See **Table 68**
Phase-Neutral voltage L1	2073-2074	Float32	V
Phase-Neutral voltage L2	2075-2076	Float32	V
Phase-Neutral voltage L3	2077-2078	Float32	V
Current L1	2079-207A	Float32	A
Current L2	207B-207C	Float32	A
Current L3	207D-207E	Float32	A
Three-Phase Current (Average)	207F-2080	Float32	A
Neutral Current	2081-2082	Float32	A
Active Power L1	2083-2084	Float32	W
Active Power L2	2085-2086	Float32	W
Active Power L3	2087-2088	Float32	W
Active Power III	2089-208A	Float32	W
Reactive Power L1	208B-208C	Float32	var
Reactive Power L2	208D-208E	Float32	var
Reactive Power L2	208F-2090	Float32	var
Reactive Power III	2091-2092	Float32	var
Apparent Power III	2093-2094	Float32	VA
Power factor L1	2095-2096	Float32	-
Power factor L2	2097-2098	Float32	-
Power factor L3	2099-209A	Float32	-
Power factor III	209B-209C	Float32	-
Cos φ L1	209D-209E	Float32	-
Cos φ L2	209F-20A0	Float32	-
Cos φ L3	20A1-20A2	Float32	-
Cos φ III	20A3-20A4	Float32	-
Frequency	20A5-20A6	Float32	Hz
Phase-Phase voltage L1-L2	20A7-20A8	Float32	V
Phase-Phase voltage L2-L3	20A9-20AA	Float32	V
Phase-Phase voltage L3-L1	20AB-20AC	Float32	V

Table 66 (Continuation): Modbus memory map: Maximum Measurement Profiles (Table 1).

Maximum Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
% THD Voltage L1	20AD-20AE	Float32	%
% THD Voltage L2	20AF-20B0	Float32	%
% THD Voltage L3	20B1-20B2	Float32	%
% THD Current L1	20B3-20B4	Float32	%
% THD Current L2	20B5-20B6	Float32	%
% THD Current L3	20B7-20B8	Float32	%

Table 67: Modbus memory map: Minimum Measurement Profiles (Table 1).

Minimum Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
No. of files saved in the profile	20D0-20D1	Uint32	0 ... 5759
File to read	20D2-20D3	Uint32	0 ... 5759
Date	20D4-20D5	Uint32	s
Status	20D6	Uint16	See **Table 68**
Phase-Neutral voltage L1	20D7-20D8	Float32	V
Phase-Neutral voltage L2	20D9-20DA	Float32	V
Phase-Neutral voltage L3	20DB-20DC	Float32	V
Current L1	20DD-20DE	Float32	A
Current L2	20DF-20E0	Float32	A
Current L3	20E1-20E2	Float32	A
Three-Phase Current (Average)	20E3-20E4	Float32	A
Neutral Current	20E5-20E6	Float32	A
Active Power L1	20E7-20E8	Float32	W
Active Power L2	20E9-20EA	Float32	W
Active Power L3	20EB-20EC	Float32	W
Active Power III	20ED-20EE	Float32	W
Reactive Power L1	20EF-20F0	Float32	var
Reactive Power L2	20F1-20F2	Float32	var
Reactive Power L2	20F3-20F4	Float32	var
Reactive Power III	20F5-20F6	Float32	var
Apparent Power III	20F7-20F8	Float32	VA
Power factor L1	20F9-20FA	Float32	-
Power factor L2	20FB-20FC	Float32	-
Power factor L3	20FD-20FE	Float32	-
Power factor III	20FF-2100	Float32	-
Cos φ L1	2101-2102	Float32	-
Cos φ L2	2103-2104	Float32	-
Cos φ L3	2105-2106	Float32	-
Cos φ III	2107-2108	Float32	-
Frequency	2109-210A	Float32	Hz
Phase-Phase voltage L1-L2	210B-210C	Float32	V
Phase-Phase voltage L2-L3	210D-210E	Float32	V
Phase-Phase voltage L3-L1	210F-2110	Float32	V
% THD Voltage L1	2111-2112	Float32	%

Tabla 67 (Continuation): Modbus memory map: Minimum Measurement Profiles (Table 1).

Minimum Measurement Profiles (Table 1)			
Parameters	Address	Type	Value / Units
% THD Voltage L2	2113-2114	Float32	%
% THD Voltage L3	2115-2116	Float32	%
% THD Current L1	2117-2118	Float32	%
% THD Current L2	2119-211A	Float32	%
% THD Current L3	211B-211C	Float32	%

The format of the **Status** parameter is shown in **Table 68.**

Table 68: Format of the Status parameter.

Format of the Status parameter	
Bit 1	**1:** During the saved period, the device has been turned off.
Bit 3	**1:** During the saved period, the device configuration has been modified.
Bit 7	**1:** There are values that may not be valid.

7.5.4.2.- Reading the files generated between specific dates

In order to read the files generated between specific dates, **Table 69, Table 70, Table 71, Table 72, Table 73** and **Table 74** have to be read, depending on the records desired, and the following procedure must be used:

1.- Write the dates of the files you wish to read in the parameter **Start and end date**.

2.- Read the parameter **No. of files saved** to find out the number of files saved between the specified dates.

3.- Read all the parameters at once:

- 4 parameters for standard events.
- 18 parameters for quality events.
- 29 parameters for energy closure.
- 75 parameters for the Average Measurement, Maximum Measurement, and Minimum Measurement profiles.

Table 69: Modbus memory map: Standard Events (Table 2).

Standard Events (Table 2)			
Parameters	Address	Type	Value / Units
Start and end date	1F72 ... 1F75	Uint32	epoch
No. of files saved	1F76	Uint16	0 ... 99
Index	1F77	Uint16	0 ... 99
Date	1F78-1F79	Uint32	epoch
Event Code	1F7A	Uint16	See **Table 61**

Table 70: Modbus memory map: Quality Events (Table 2).

Quality Events (Tabla 1)			
Parameters	Address	Type	Value / Units
Start and end date	1F7C 1F7F	Uint32	epoch
No. of files saved	1F80	Uint16	0 ... 299
Index	1F81	Uint16	0 ... 299
Date	1F82-1F83	Uint32	epoch
Event Code	1F84	Uint16	See **Table 63**
Activation Date	1F85-1F86	Uint32	epoch
Average Value L1	1F87-1F88	Float32	V
Average ValueL2	1F89-1F8A	Float32	V
Average Value L2	1F8B-1F8C	Float32	V
Maximum / Minimum Value L1	1F8D-1F8E	Float32	V
Maximum / Minimum Value L2	1F8F-1F90	Float32	V
Maximum / Minimum Value L3	1F91-1F92	Float32	V

Table 71: Modbus memory map: Energy Closures (Table 2).

Energy Closures (Table 2)			
Parameters	Address	Type	Value / Units
Start and end date	2134 ... 2137	Uint32	epoch
No. of files saved	2138-2139	Uint32	0 ... 3839
Index	213A-213B	Uint32	0 ... 3839
Date	213C-213D	Uint32	epoch
Status	213E	Uint16	See **Table 68**
Total Imported Active Energy (kWh)	213F-2140	Uint32	kWh
Total Imported Active Energy (Wh)	2141	Uint16	Wh
Total Exported Active Energy (kWh)	2142-2143	Uint32	kWh
Total Exported Active Energy (Wh)	2144	Uint16	Wh
Total Imported Inductive Reactive Energy (kvarh)	2145-2146	Uint32	kvarh
Total Imported Inductive Reactive Energy (varh)	2147	Uint16	varh
Total Exported Inductive Reactive Energy (kvarh)	2148-2149	Uint32	kvarh
Total Exported Inductive Reactive Energy (varh)	214A	Uint16	varh
Total Imported Capacitive Reactive Energy (kvarh)	214B-214C	Uint32	kvarh
Total Imported Capacitive Reactive Energy (varh)	214D	Uint16	varh
Total Exported Capacitive Reactive Energy(kvarh)	214E-214F	Uint32	kvarh
Total Exported Capacitive Reactive Energy(varh)	2150	Uint16	varh
Total Imported Apparent Energy (kVAh)	2151-2152	Uint32	kVAh
Total Imported Apparent Energy (VAh)	2153	Uint16	VAh
Total Exported Apparent Energy (kVAh)	2154-2155	Uint32	kVAh
Total Exported Apparent Energy (VAh)	2156	Uint16	VAh

Table 72: Modbus memory map: Average Measurement Profiles (Table 2).

Average Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Start and end date	2198 ... 219B	Uint32	epoch
No. of files saved	219C-219D	Uint32	0 ... 5759
Index	219E-219F	Uint32	0 ... 5759

Table 72 (Continuation): Modbus memory map: Average Measurement Profiles (Table 2).

Average Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Date	21A0-21A1	Uint32	s
Status	21A2	Uint16	See **Table 68**
Phase-Neutral voltage L1	21A3-21A4	Float32	V
Phase-Neutral voltage L2	21A5-21A6	Float32	V
Phase-Neutral voltage L3	21A7-21A8	Float32	V
Current L1	21A9-21AA	Float32	A
Current L2	21AB-21AC	Float32	A
Current L3	21AD-21AE	Float32	A
Three-Phase Current (Average)	21AF-21B0	Float32	A
Neutral Current	21B1-21B2	Float32	A
Active Power L1	21B3-21B4	Float32	W
Active Power L2	21B5-21B6	Float32	W
Active Power L3	21B7-21B8	Float32	W
Active Power III	21B9-21BA	Float32	W
Reactive Power L1	21BB-21BC	Float32	var
Reactive Power L2	21BD-21BE	Float32	var
Reactive Power L3	21BF-21C0	Float32	var
Reactive Power III	21C1-21C2	Float32	var
Apparent Power III	21C3-21C4	Float32	VA
Power factor L1	21C5-21C6	Float32	-
Power factor L2	21C7-21C8	Float32	-
Power factor L3	21C9-21CA	Float32	-
Power factor III	21CB-21CC	Float32	-
Cos φ L1	21CD-21CE	Float32	-
Cos φ L2	21CF-21D0	Float32	-
Cos φ L3	21D1-21D2	Float32	-
Cos φ III	21D3-21D4	Float32	-
Frequency	21D5-21D6	Float32	Hz
Phase-Phase voltage L1-L2	21D7-21D8	Float32	V
Phase-Phase voltage L2-L3	21D9-21DA	Float32	V
Phase-Phase voltage L3-L1	21DB-21DC	Float32	V
% THD Voltage L1	21DD-21DE	Float32	%
% THD Voltage L2	21DF-21E0	Float32	%
% THD Voltage L3	21E1-21E2	Float32	%
% THD Current L1	21E3-21E4	Float32	%
% THD Current L2	21E5-21E6	Float32	%
% THD Current L3	21E7-21E8	Float32	%

Table 73: Modbus memory map: Maximum Measurement Profiles (Table 2).

Maximum Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Start and end date	21FC ... 21FF	Uint32	epoch
No. of files saved	2200-2201	Uint32	0 ... 5759
Index	2202-2203	Uint32	0 ... 5759

Table 73 (Continuation): Modbus memory map: Maximum Measurement Profiles (Table 2).

Maximum Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Date	2204-2205	Uint32	s
Status	2206	Uint16	See **Table 68**
Phase-Neutral voltage L1	2207-2208	Float32	V
Phase-Neutral voltage L2	2209-220A	Float32	V
Phase-Neutral voltage L3	220B-220C	Float32	V
Current L1	220D-220E	Float32	A
Current L2	220F-2210	Float32	A
Current L3	2211-2212	Float32	A
Three-Phase Current (Average)	2213-2214	Float32	A
Neutral Current	2215-2216	Float32	A
Active Power L1	2217-2218	Float32	W
Active Power L2	2219-221A	Float32	W
Active Power L3	221B-221C	Float32	W
Active Power III	221D-221E	Float32	W
Reactive Power L1	221F-2220	Float32	var
Reactive Power L2	2221-2222	Float32	var
Reactive Power L3	2223-2224	Float32	var
Reactive Power III	2225-2226	Float32	var
Apparent Power III	2227-2228	Float32	VA
Power factor L1	2229-222A	Float32	-
Power factor L2	222B-222C	Float32	-
Power factor L3	222D-222E	Float32	-
Power factor III	222F-2230	Float32	-
Cos φ L1	2231-2232	Float32	-
Cos φ L2	2233-2234	Float32	-
Cos φ L3	2235-2236	Float32	-
Cos φ III	2237-2238	Float32	-
Frequency	2239-223A	Float32	Hz
Phase-Phase voltage L1-L2	223B-223C	Float32	V
Phase-Phase voltage L2-L3	223D-223E	Float32	V
Phase-Phase voltage L3-L1	223F-2240	Float32	V
% THD Voltage L1	2241-2242	Float32	%
% THD Voltage L2	2243-2244	Float32	%
% THD Voltage L3	2245-2246	Float32	%
% THD Current L1	2247-2248	Float32	%
% THD Current L2	2249-224A	Float32	%
% THD Current L3	224B-224C	Float32	%

Table 74: Modbus memory map: Minimum Measurement Profiles (Table 2).

Minimum Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Start and end date	2260 ... 2263	Uint32	epoch
No. of files saved	2264-2265	Uint32	0 ... 5759
Index	2266-2267	Uint32	0 ... 5759

Tabla 74 (Continuation): Modbus memory map: Minimum Measurement Profiles (Table 2).

Minimum Measurement Profiles (Table 2)			
Parameters	Address	Type	Value / Units
Date	2268-2269	Uint32	epoch
Status	226A	Uint16	See **Table 68**
Phase-Neutral voltage L1	226B-226C	Float32	V
Phase-Neutral voltage L2	226D-226E	Float32	V
Phase-Neutral voltage L3	226F-2270	Float32	V
Current L1	2271-2272	Float32	A
Current L2	2273-2274	Float32	A
Current L3	2275-2276	Float32	A
Three-Phase Current (Average)	2277-2278	Float32	A
Neutral Current	2279-227A	Float32	A
Active Power L1	227B-227C	Float32	W
Active Power L2	227D-227E	Float32	W
Active Power L3	227F-2280	Float32	W
Active Power III	2281-2282	Float32	W
Reactive Power L1	2283-2284	Float32	var
Reactive Power L2	2285-2286	Float32	var
Reactive Power L3	2287-2288	Float32	var
Reactive Power III	2289-228A	Float32	var
Apparent Power III	228B-228C	Float32	VA
Power factor L1	228D-228E	Float32	-
Power factor L2	228F-2290	Float32	-
Power factor L3	2291-2292	Float32	-
Power factor III	2293-2294	Float32	-
Cos φ L1	2295-2296	Float32	-
Cos φ L2	2297-2298	Float32	-
Cos φ L3	2299-229A	Float32	-
Cos φ III	229B-229C	Float32	-
Frequency	229D-229E	Float32	Hz
Phase-Phase voltage L1-L2	229F-22A0	Float32	V
Phase-Phase voltage L2-L3	22A1-22A2	Float32	V
Phase-Phase voltage L3-L1	22A3-22A4	Float32	V
% THD Voltage L1	22A5-22A6	Float32	%
% THD Voltage L2	22A7-22A8	Float32	%
% THD Voltage L3	22A9-22AA	Float32	%
% THD Current L1	22AB-22AC	Float32	%
% THD Current L2	22AD-22AE	Float32	%
% THD Current L3	22AF-22B0	Float32	%

7.5.5.- DELETING PARAMETERS

For these variables is implemented the **Function 0x05** and **0x01.**

Table 75: Modbus memory map: Deleting parameters (Table 1).

Parameters	Address	Type	Value
Device reset	7D0	Bool	**FF00:** Reset
Clear Energy, Max/Min Values, and Maximum Demand	898	Bool	**FF00:** Clear
Maximum and Minimum Values			
Clear Maximum and Minimum Values	848	Bool	**FF00:** Clear
Clear Maximum Values	849	Bool	
Clear Minimum Values	84A	Bool	
Maximum Demand			
Clear Maximum Demand	852	Bool	**FF00:** Clear
Clear Maximum Values of the Maximum Demand	853	Bool	
Hour Counter			
Clear Hour Counter (Tariff 1)	837	Bool	**FF00:** Clear
Clear Hour Counter (Tariff 2)	83A	Bool	

Table 76: Modbus memory map: Deleting parameters (Table 2).

Energies					
Parameters	L1	L2	L3	Type	Value
Imported Energy Reset Tariff 1	85C	862	868	Bool	**FF00:** Clear
Exported Energy Reset Tariff 1	85D	863	869	Bool	
Imported Energy Reset Tariff 2	85E	864	86A	Bool	
Exported Energy Reset Tariff 2	85F	865	86B	Bool	
Imported Energy Reset Total Tariffs	860	866	86C	Bool	
Exported Energy Reset Total Tariffs	861	867	86D	Bool	
Energy Reset	870	871	872	Bool	
Energy Reset L1 + L2 + L3	873			Bool	
Reset All Energies	874			Bool	
Parameters	**Tariff 1**	**Tariff 2**	**Total T.**	**Type**	**Value**
Three-Phase Energy Reset	-	-	834	Bool	**FF00:** Clear
Imported Three-Phase Energy Reset	835	838	83B	Bool	
Exported Three-Phase Energy Reset	836	839	83C	Bool	

Table 77: Modbus memory map: Deleting parameters (Table 3).

Parameters	Address	Type	Value
Standard Events Reset	3E8	Bool	**FF00:** Clear
Quality Events Reset	3E9	Bool	
Energy Closure Reset	3EA	Bool	
Average Measurement Profile Reset	3EB	Bool	
Maximum Measurement Profile Reset	3EC	Bool	
Minimum Measurement Profile Reset	3ED	Bool	

7.5.6.- POWER STATUS

The **function 0x04** is implemented for this variable.
This variable indicates the quadrant in which the device is operating.

Table 78: Modbus memory map: Power status.

Power status			
Variable	Address	Type	Default value
Power status	7D1	Unit16	-

The variable format is shown in **Table 79:**

Table 79: Variable format: Power status.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	**1:** Capacitive	**1:** Inductive	**1:** Generated	**1:** Consumed

7.5.7.- ALARM STATUS

For these variables is implemented the **Function 0x04.**

Table 80: Modbus memory map: Alarm status.

Alarm status			
Parameters	Address	Type	Value
Alarm Status	4E21	Uint16	**0:** Deactivated **1:** Activated
Alarm Latching	4E28	Uint16	**0:** Unlatched **1:** Latched
Alarm Activation Date	4E29-4E2A	Uint32	s (epoch format)

7.5.8.- CONNECTION FAILURES

For these variables is implemented the **Function 0x04.**

Table 81: Modbus memory map: Connection Failures

Connection Failures			
Parameters	Address	Type	Value
Voltage connection failure	7D5	Uint16	**0:** Unknown **1:** No failures **2:** Failure
Current connection failure L1	7D6	Uint16	
Current connection failure L2	7D7	Uint16	
Current connection failure L3	7D8	Uint16	

7.5.9.- DEVICE INFORMATION

For these variables is implemented the **Function 0x04.**

Table 82: Modbus memory map: device information.

Device information			
Parameters	Address	Type	Value
Device Name	514 ... 51D	Uint16	**Circutor**

Tabla 82 (Continuation): Modbus memory map: device information.

Device information			
Parameters	Address	Type	Value
Identifier	578-579	Uint32	879
Product Number	57A-57B	Uint32	0
Serial Number	5AA ... 5B0	Array	-
Version	5DC ... 5DE	Uint16	-
New Firmware Version	C2EC ... C2EE	Uint16	-

7.5.10.- DEFAULT VALUES

For these variables is implemented the **Function 0x05.**

Table 83: Modbus memory map: Default values.

Default values			
Parameters	Address	Type	Value
Fix Connection	8FC	bool	**1:** Fix
Default Configuration	BB8	bool	**1:** Enable
Default Channels	BB9	bool	**1:** Enable
Start Device Update	9C3E	bool	**1:** Enable
Active Update	9C3F	bool	**1:** Enabled

7.5.11.- CONFIGURATION VARIABLES

For these variables is implemented the **Function 0x03** and **0x10.**

7.5.11.1.- Transformation ratios

Table 84:Modbus configuration parameters: Voltage.

Voltage				
Description	Address	Type	Valid data margin	Default value
Voltage primary	2710-2711	Uint32	1 ... 99999 V	1 V
Voltage secondary	2712	Uint16	1 ... 999 V	1 V
Minimum Voltage	9D08-9D09	Float32	-	20 V

Table 85:Modbus configuration parameters: Current.

Current				
Description	Address	Type	Valid data margin	Default value
Current primary [7]	2713	Uint16	1 ... 1000 A	5 A
Current secondary [8]	2714	Uint16	**0:** 1A **1:** 5A	**1**
Minimum Current	9D0A-9D0B		-	0.008 A

[7] Configurable parameter in the models: **CVM-D50-ITF** and **CVM-D50-MC**.
[8] Configurable parameter in the model: **CVM-D50-ITF**.

7.5.11.2.- Measurement

Table 86:Modbus configuration parameters: Measurement.

Measurement				
Description	Address	Type	Valid data margin	Default value
Number of quadrants	2B64	Uint16	**0:** 4 quadrants **1:** 2 quadrants	**0**
Measurement convention	2B86	Uint16	**0:** Circutor, **1:** IEC, **2:** IEEE	**0**
Measurement system	2B5C	Uint16	**0:** 4-3Ph, **1:** 3-3Ph, **2:** 3Aron [9], **3:** 3-2Ph, **4:** 2-2Ph, **5:** 2-1Ph	**0**

[9] Option not available for the **CVM-D50-FLEX** model.

7.5.11.3.- Maximum demand

Table 87:Modbus configuration parameters: Maximum demand.

Maximum demand				
Description	Address	Type	Valid data margin	Default value
Integration period	274C	Uint16	0 ... 60 min.	0
Calculation Method	274D	Uint16	**0:** Sliding Window, **1:** Fixed Window	**0**

7.5.11.4.- Activating the harmonics display screen

Table 88:Modbus configuration parameters: Display of harmonics.

Display of harmonics				
Description	Address	Type	Valid data margin	Default value
Display of harmonics	2B62	Bool	**0:** Harmonic screens are not displayed **1:** Harmonic screens are displayed	0

7.5.11.5.- CO_2 Emissions and Energy Cost

Table 89:Modbus configuration parameters: CO_2 Emissions and Energy Cost.

CO_2 Emissions and Energy Cost						
Description	Tariff 1	Tariff 2	Type	Valid data margin	Default value	Units
Carbon Emission Rate, Consumed Energy	2724	2725	Unit16	0 ... 19999 $kgCO_2$	0	x 10000
Carbon Emission Rate, Generated Energy	2728	2729	Unit16	0 ... 19999 $kgCO_2$	0	x 10000
Cost Rate, Consumed Energy	272C	272D	Unit16	0 ... 19999	0	x 10000
Cost Rate, Generated Energy	2730	2731	Unit16	0 ... 19999	0	x 10000

7.5.11.6.- Quality

Table 90:Modbus configuration parameters: Quality.

Quality					
Description	Address	Type	Valid data margin	Default value	Units
Reference Voltage	36B0-36B1	Float32	-	230	V
Overvoltage Threshold	36B2-36B3	Float32	110 ... 300 %	100%	%

Table 90 (Continuation): Modbus configuration parameters: Quality.

Description	Address	Type	Valid data margin	Default value	Units
Overvoltage Activation	36B4	Unit16	60 ... 600 s	0	s
Overvoltage Deactivation	36B5	Unit16	60 ... 600 s	0	s
Undervoltage Threshold	36B6-36B7	Float32	85 ... 100 %	1	%
Undervoltage Activation	36B8	Unit16	60 ... 600 s	0	s
Undervoltage Deactivation	36B9	Unit16	60 ... 600 s	0	s

7.5.11.7.- Alarm/Energy Pulses

Table 91:Modbus configuration parameters: Alarm.

Alarm				
Description	**Address**	**Type**	**Valid data margin**	**Default value**
Variable code	2AFC	Unit16	see **Table 31 and Table 32**	0
Upper Threshold	2AF8-2AF9	Int32	Depending on the variable	-
Lower Threshold	2AFA-2AFB	Int32	Depending on the variable	-
Connection delay	2AFD	Uint16	0 ... 999 s	0 s
Hysteresis	2AFE	Uint16	0 ... 99 %	0 %
Latch	2AFF	Bool	**0:** Latch Disabled **1:** Latch Enabled	**0**
Latch time	2B02-2B03	Uint32	0 ... 600 s	0 s
Disconnection delay	2B00	Uint16	0 ... 999 s	0 s

Table 92:Modbus configuration parameters: Energy Pulses.

Energy Pulses				
Description	**Address**	**Type**	**Valid data margin**	**Default value**
Variable code	2AFC	Unit16	See **Table 33**	0
Kilowatts per Pulse[11]	2B20-2B21	Unit32	000.01 ... 999.99 kWh	100 kwh
Pulse width	2B22	Unit16	30 ... 500 ms	**100 ms**

[11] The variable is read and written with a factor of x100. A value of 1 corresponds to 0.01 kWh.

7.5.11.8.- Tariff selection

Table 93:Modbus configuration parameters: Tariff selection.

Tariff selection				
Description	**Address**	**Type**	**Valid data margin**	**Default value**
Tariff selection	2B66	Unit16	**0:** Tariff 1, **1:** Tariff 2	**0**

7.5.11.9.- Display and Clock

Table 94:Modbus configuration parameters: Display and Clock.

Display and Clock				
Description	**Address**	**Type**	**Valid data margin**	**Default value**
Backlight	2B5E	Uint16	1 ... 999 s	300
Clock	283C-283D	Uint32	epoch	-

Table 94 (Continuation): Modbus configuration parameters: Display and Clock.

Descripción	Dirección	Tamaño	Margen valido de datos	Valor por defecto
Time Zone	3FAC ... 3FCB	Array	-	-

7.5.11.10.- Password

Table 95:Modbus configuration parameters: Password.

Password				
Description	Address	Type	Valid data margin	Default value
Programming Lock	2B71	Bool	**0:** Unlocked **1:** Locked	**0**
Password	2B70	Uint16	1 ... 9999	1234

7.5.11.11.- Profiles

Table 96:Modbus configuration parameters: Profiles.

Profiles				
Description	Address	Type	Valid data margin	Default value
Parameter Logging Interval	32C8-32C9	Uint32	600 ... 3600 s	**600**

8.- WEBSITE

The configuration and display webpage for the device is accessed via the IP address of the **CVM-D50**. The device's IP address can be checked in section ***"5.5.- ETHERNET - Wi-Fi COMMUNICATIONS SCREENS"***.

To access the configuration website, open the screen shown in **Figure 32** and enter the Username and Password. The default values are shown in **Table 97**.

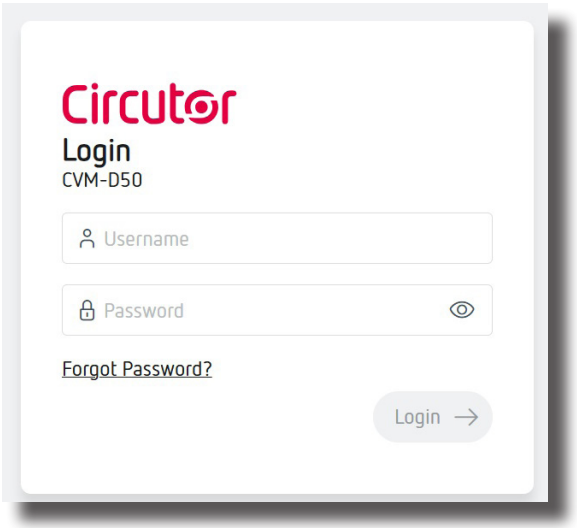


Figure 32: Accessing the configuration website.

Table 97:Accessing the configuration website.

Accessing the configuration website	
Users	admin
Password	circutor

If you forgot your password, click the **Forgot Password?** option to change it using the serial number of the device.

Note: *You can change the language of the website at the top right.*

Once validated, the main screen can be accessed, **Figure 33**.

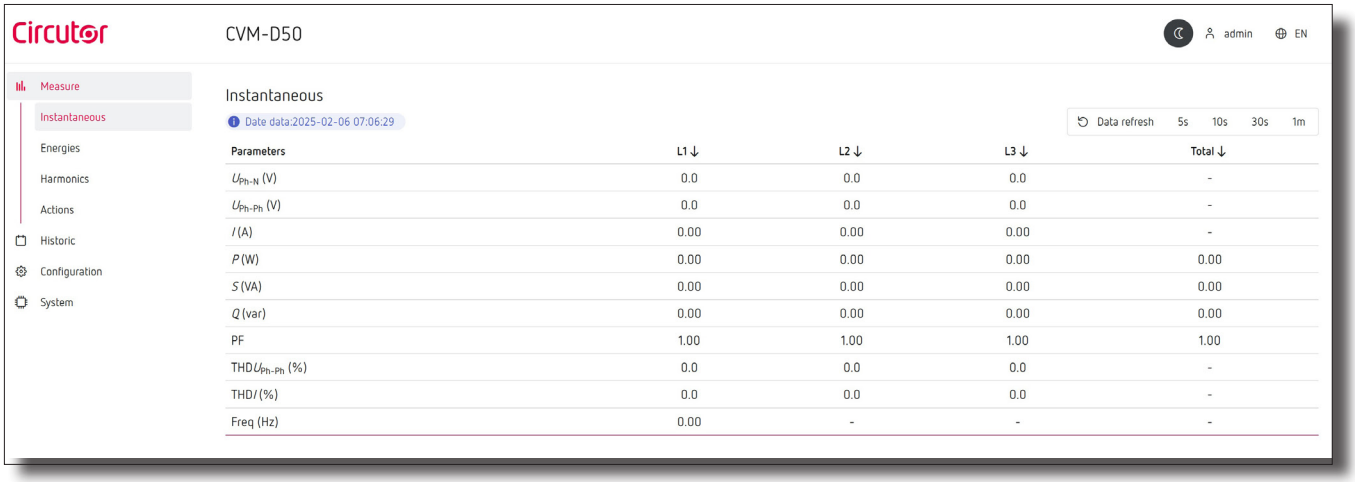


Figure 33: Home screen.

From this screen you can access the menu of the configuration website, **Figure 34.**

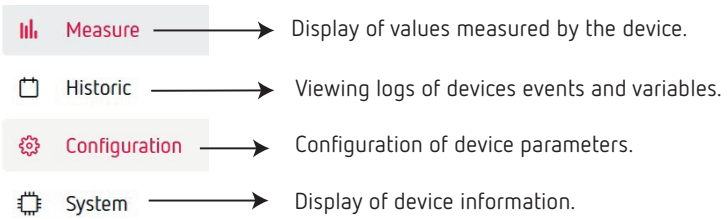


Figure 34: Configuration website.

At the top right of the website you can:

tap to log out.
change the language of the website.
change the website to night mode.

8.1.- MEASURE

The **Measure** section displays the most important values measured by the device.

8.1.1.- INSTANTANEOUS

This section shows the instantaneous values of the device's main parameters.

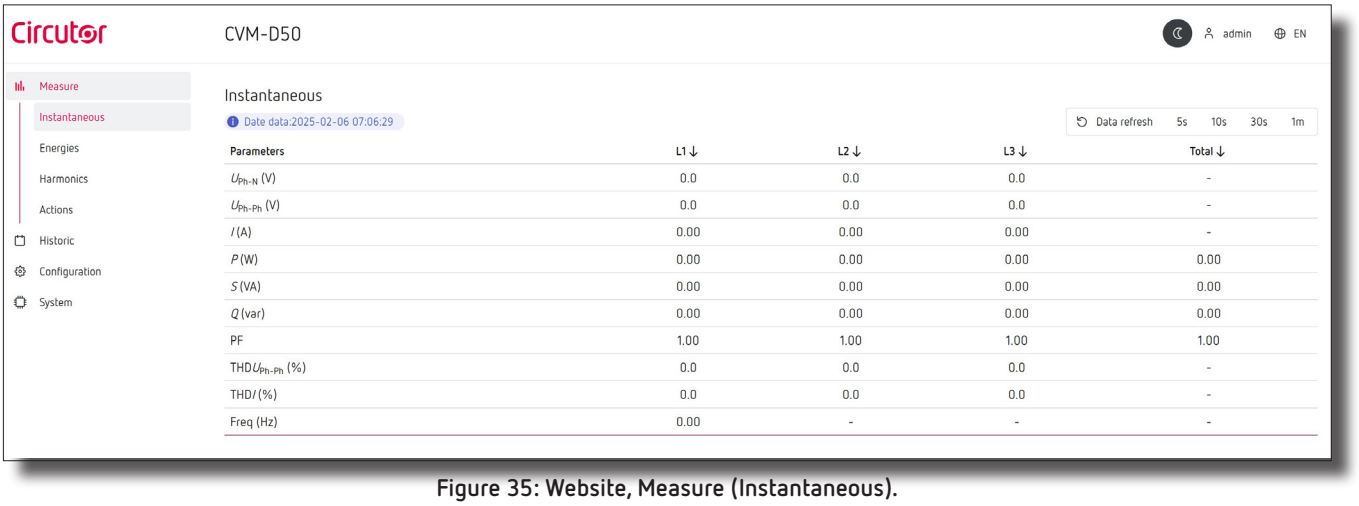


Figure 35: Website, Measure (Instantaneous).

8.1.2.- ENERGIES

This section displays the energies measured by the device.

Figure 36: Website, Measure (Energies).

8.1.3.- HARMONICS

This section displays the Voltage and Current Harmonics of the device.

Figure 37: Website, Measure (Harmonics).

✓**Type:** Select the harmonics to be displayed: **Voltage Harmonics** or **Current Harmonics.**

8.1.4.- ACTIONS

In this section, you can select the action to be executed by the device.

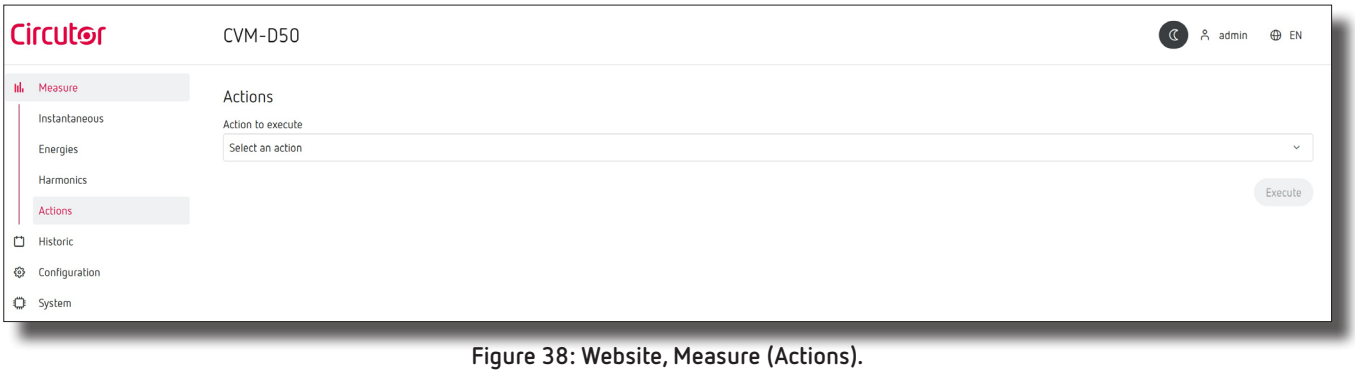


Figure 38: Website, Measure (Actions).

The possible actions to be executed are:

- Delete maximum and minimum values.
- Delete demand log.
- Delete three-phase energies.
- Delete single-phase energy L1, L2, L3.
- Delete all energy.
- Reset hour counter for tariff 1 and 2.

8.2.- HISTORIC

In the **Historic** section, the records generated by the device can be viewed and downloaded.

8.2.1.- GENERAL EVENT LOG

In this section, the general events of the device can be viewed and downloaded.

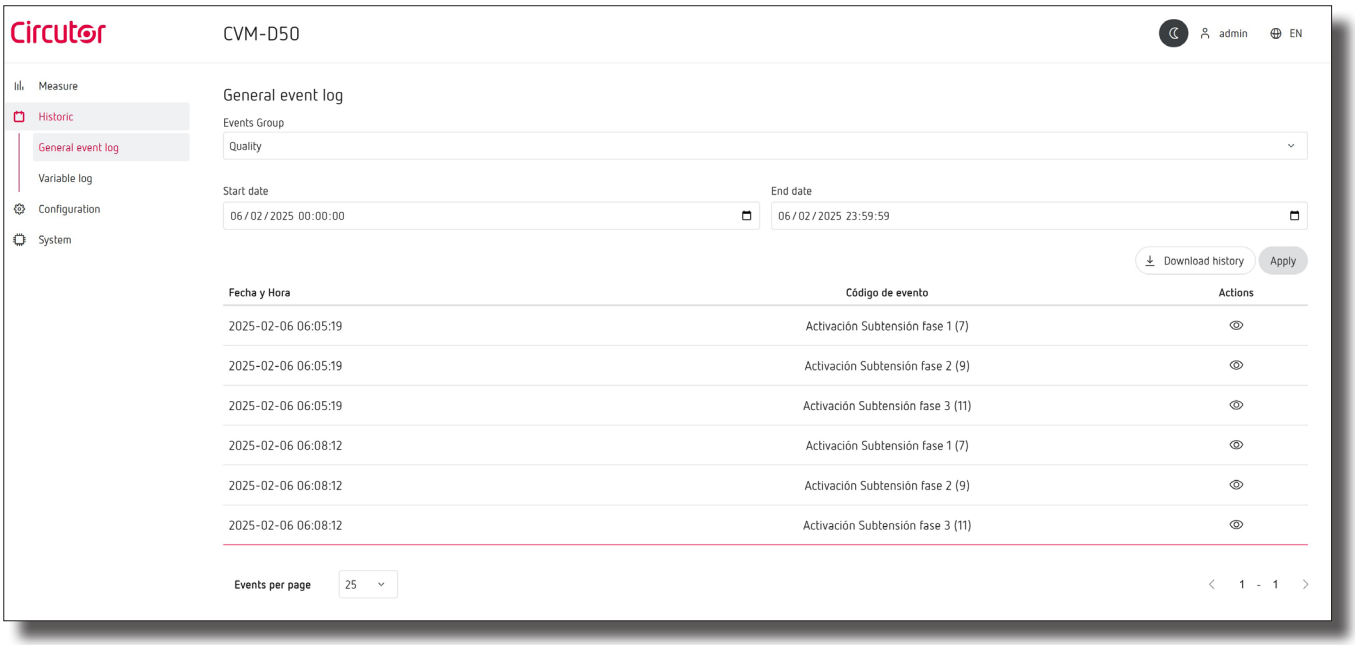


Figure 39: Website, Historic (General event log).

✓**Events Group:** Select the event group: **Standard** or **Quality.**

✓**Start date:** Select the start date of the event log.
✓**End date:** Select the end date of the event log.

Press Apply to display the records.

By pressing the action, the event details are displayed. **Figure 40**.

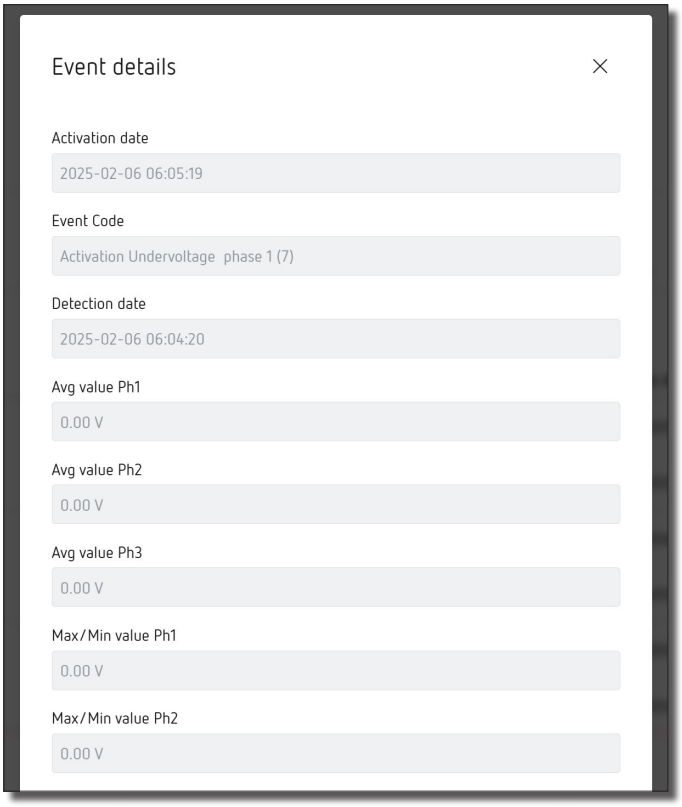


Figure 40: Website, Historic (Event details).

Press Download history to download the history of records.

8.2.2.- VARIABLE LOG

In this section, the device's variable log can be downloaded.

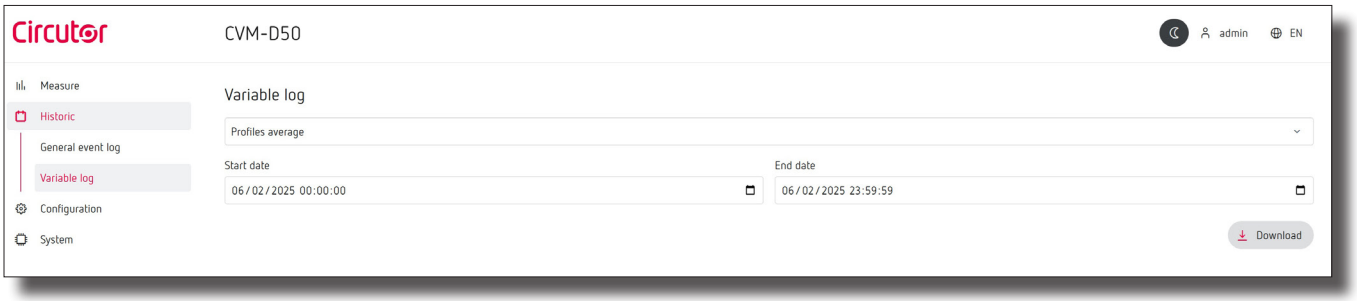


Figure 41: Website, Historic (Variable log).

✓**Variable log:** Select the group of variables to download: **Profiles average, Maximum Profiles, Minimum Profiles** or **Energy Closures.**
✓**Start date:** Select the start date of the variable log.
✓**End date:** Select the end date of the variable log.

Press Download to download the history of records..

8.3.- CONFIGURATION

The device's various configuration parameters can be set up in the **Configuration** section.

8.3.1.- INSTALLATION

On this screen, the installation parameters of the **CVM-D50** are configured.

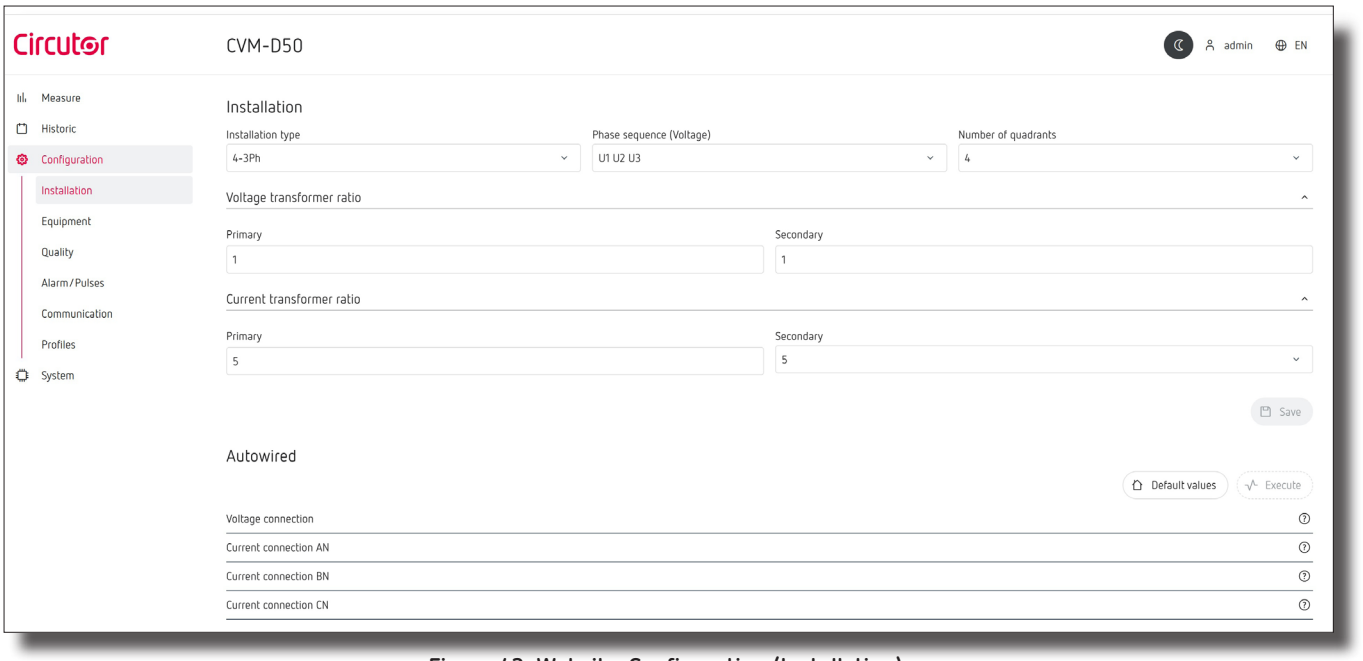


Figure 42: Website, Configuration (Installation).

8.3.1.1.- Installation

In the **Installation** section, the following parameters are configured:

✓**Installation Type:** Select the type of installation:

4-3Ph, Three-phase network measurement with 4-wire connection.
3-3Ph, Three-phase network measurement with 3-wire connection.
3Aron, Three-phase network measurement with 3-wire connection and transformers in ARON configuration.(12)
3-2Ph, Two-phase network measurement with 3-wire connection.
2-2Ph, Single-phase phase-to-phase network measurement with 2-wire connection.
2-1Ph, Single-phase phase-to-neutral network measurement with 2-wire connection.

(12) Option not available for **CVM-D50-FLEX** models.

✓**Phase Sequence (Voltage):** Select the voltage phase sequence: **U1 U2 U3**, **U1 U3 U2**, **U2 U1 U3**, **U2 U3 U1**, **U3 U2 U1** or **U3 U1 U2**.

✓**Number of Quadrants:** Select the number of quadrants in which the device performs measurements: **2** or **4** quadrants.

In the **Voltage Transformer Ratio** section:

✓**Primary:** Primary of the voltage transformer.

✓**Secondary:** Secondary of the voltage transformer.

In the **Current Transformer Ratio** section:

Note: *Parameters not visible on the **CVM-D50-FLEX** model.*
Note: *The **"Secondary"** parameter is not visible on the **CVM-D50-MC** model.*

✓**Primary:** Primary of the current transformer.
✓**Secondary:** Secondary of the current transformer.

Press **Save** to store the configuration.

8.3.1.2.- Autowired

The device checks the configuration set up in the section ***"8.3.1.1.- INSTALLATION"*** and compares it with the actual physical connection. Showing the table in **Figure 43**, indicating the status of the installation.

Note: *The configuration is only checked when the channels are configured in three-phase mode.*

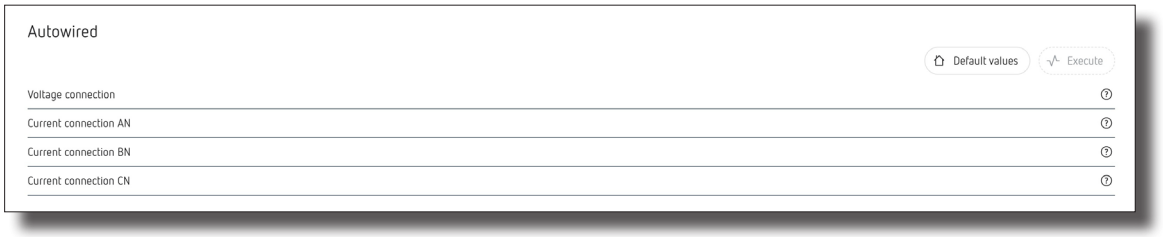


Figure 43: Website, Configuration (Autowired).

Table 98 shows the meaning of the icons.

Table 98: Connection status.

Status	Description
✓	The device has detected that the configuration is correct.
⚠	The device has detected that the configuration is incorrect.
?	The device has no information and cannot determine if the configuration is correct or not.

Press Default values to assign each channel its default value (V1 and I1 to L1, V2 and I2 to L2, V3 and I3 to L3).

If the device detects that the configuration is incorrect, the phase sequence must be reconfigured and the button must be pressed for the device to correctly set the voltages and current.

8.3.2.- EQUIPMENT

This screen is used to configure the parameters of the **CVM-D50**.

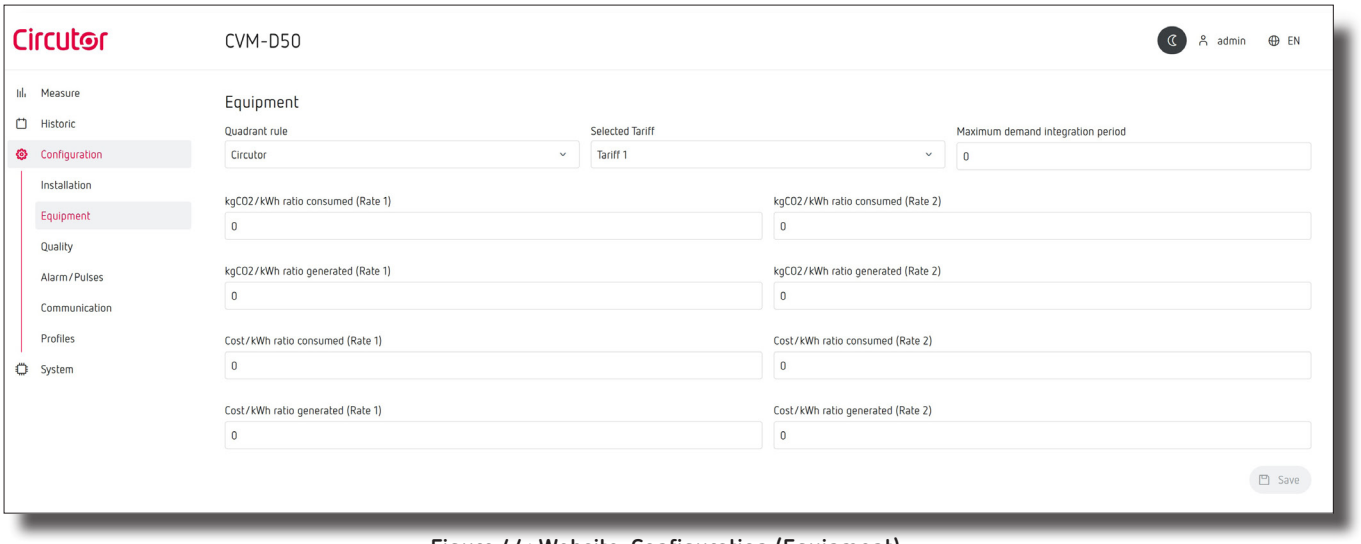


Figure 44: Website, Configuration (Equipment).

✓**Quadrant rule:** Select the measurement convention used by the device:
Circutor, Circutor measurement convention.
IEC, IEC measurement convention.
IEEE, IEEE measurement convention.

✓**Selected tariff:** Select the tariff in use: **Tariff 1** or **Tariff 2.**

✓**Maximum demand integration period:** Integration period for maximum demand in minutes.

✓**kgCO2/kWh ratio consumed (Rate 1):** Carbon emission ratio for energy consumed under Tariff 1 (T1).

✓**kgCO2/kWh ratio generated (Rate 1):** Carbon emission ratio for energy generated under Tariff 1 (T1).

✓**Coste/kWh ratio consumed (Rate 1):** Cost per kWh of electricity for energy consumed under Tariff 1 (T1).

✓**Coste/kWh ratio generated (Rate 1):** Cost per kWh of electricity for energy generated under Tariff 1 (T1).

✓**kgCO2/kWh ratio consumed (Rate 2):** Carbon emission ratio for energy consumed under Tariff 2 (T2).

✓**kgCO2/kWh ratio generated (Rate 2):** Carbon emission ratio for energy generated under Tariff 2 (T2).

✓**Coste/kWh ratio consumed (Rate 2):** Cost per kWh of electricity for energy consumed under Tariff 2 (T2).

✓**Coste/kWh ratio generated (Rate 2):** Cost per kWh of electricity for energy generated under Tariff 2 (T2).

Press **Save** to store the configuration.

8.3.3.- QUALITY

On this screen, the quality parameters of the **CVM-D50** are configured.

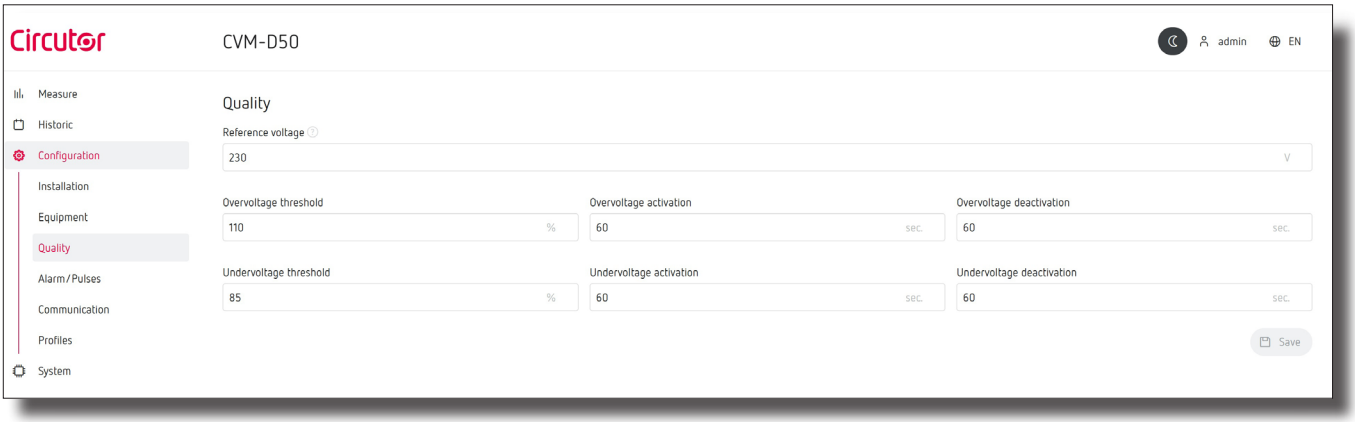


Figure 45: Website, Configuration (Quality).

✓**Reference voltage:** Reference voltage for the overvoltage and undervoltage thresholds. If set to 0, the thresholds are disabled.

✓**Overvoltage threshold:** An overvoltage is considered to occur when the RMS voltage exceeds the programmed threshold. The value is configured as a percentage of the **Reference Voltage**.

✓**Overvoltage activation**: Time in seconds required to activate the overvoltage condition.

✓**Overvoltage deactivation:** Time in seconds required to deactivate the overvoltage condition.

✓**Undervoltage threshold:** An undervoltage is considered to occur when the RMS voltage drops below the programmed threshold. The value is configured as a percentage of the Reference Voltage.

✓**Undervoltage activation:** Time in seconds required to activate the undervoltage condition.

✓**Undervoltage deactivation:** Time in seconds required to deactivate the undervoltage condition.

Press 🖫 **Save** to store the configuration.

8.3.4.- ALARM/PULSES

On this screen, the alarm or energy pulse parameters of the **CVM-D50** are configured.

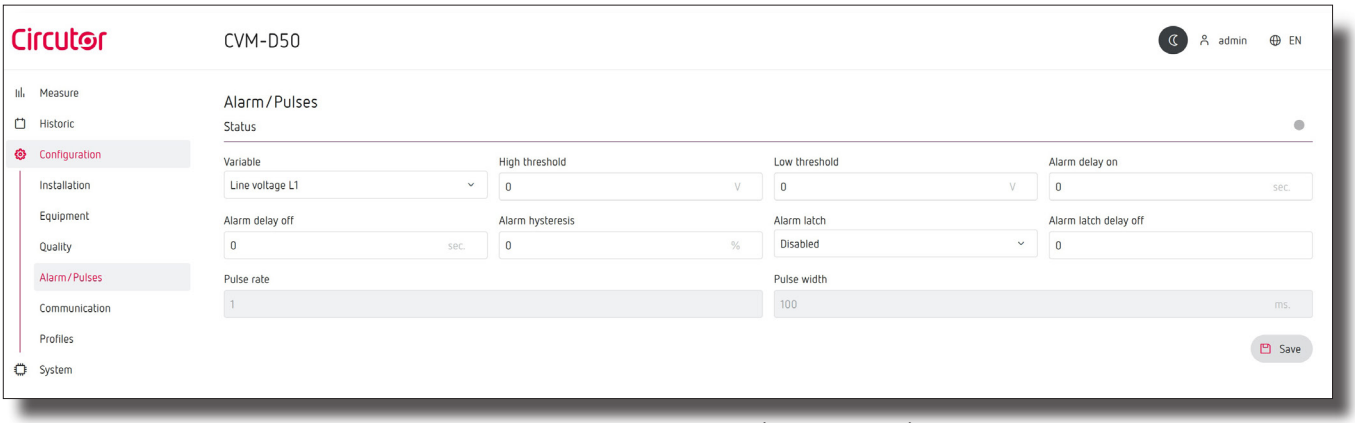


Figure 46: Website, Configuration (Alarm/Pulses).

✓**Status:** Indicates whether the alarm is enabled 🔴 or not ⚫.

✓**Variable:** Select the variable that controls the alarm or energy pulses.

✓**High threshold:** Value above which the alarm is activated.

✓**Low threshold:** Value below which the alarm is activated.

✓**Alarm delay on:** delay in seconds in the activation of the alarm.

✓**Alarm delay off:** Delay in seconds before the alarm is deactivated.

✓**Alarm hysteresis:** Difference between the alarm activation and deactivation values, expressed as a %.

✓**Alarm latch:** Enables latch mode, once the alarm is triggered, it remains active even if the triggering condition disappears.

✓**Alarm latch delay off**: Latch time in seconds. After this time, if the alarm condition is no longer maintained, the delay off is activated.

When an **energy variable** is selected, the configuration parameters are:

✓**Pulse rate:** Value in kilowatts per pulse.

✓**Pulse width:** Pulse duration in milliseconds (ms).

Press 🖫 **Save** to store the configuration.

8.3.5.- COMMUNICATION

This section is used to configure the communication parameters of the **CVM-D50**.

8.3.5.1.- DNS/NTP

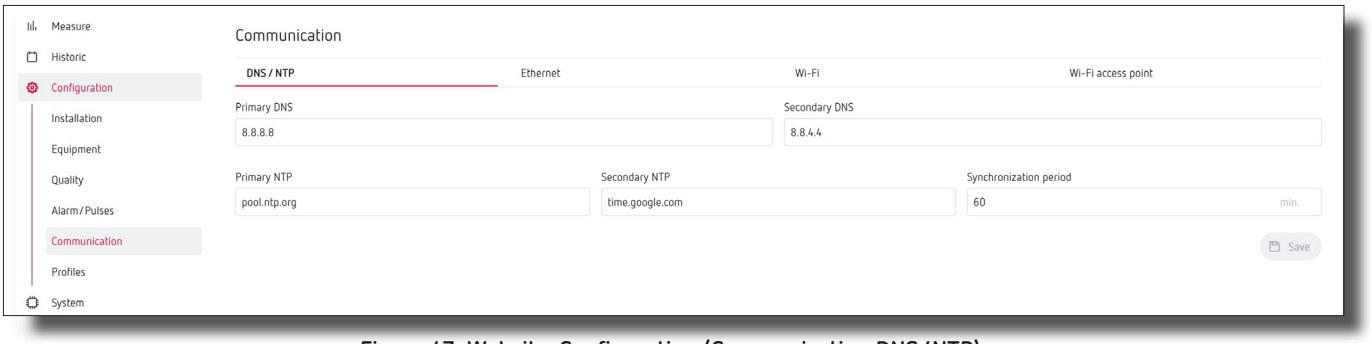


Figure 47: Website, Configuration (Communication DNS/NTP).

✓**Primary DNS:** address of the primary DNS server.

✓**Secondary DNS:** address of the secondary DNS server.

✓**Primary NTP:** address of the clock synchronization protocol, Network Time Provider.

✓**Secondary NTP:** secondary address of the Network Time Provider, in case the primary NTP fails.

✓**Synchronization period:** synchronization period in minutes.

Press 🖫 **Save** to store the configuration and send it to the device.

8.3.5.2.- ETHERNET

Configuring Ethernet communications.

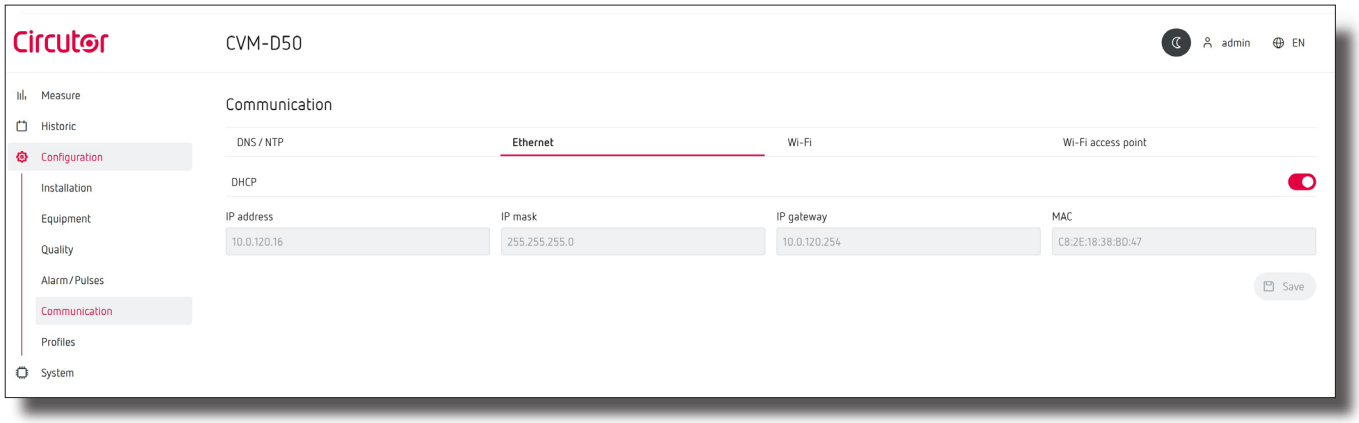


Figure 48: Website, Configuration (Communication Ethernet).

✓**DHCP** : If DHCP is enabled, the IP address is dynamically assigned by a central server and no further parameters need to be configured.
If this option is disabled, the IP address is fixed and the following parameters need to be configured:

✓**IP Address**: IP address.

✓**IP mask**: IP mask.

✓**IP gateway**:gateway.

✓**MAC:** MAC address of the device, non-configurable parameter.

Press **Save** to store the configuration and send it to the device.

8.3.5.3.- Wi-Fi

Configuring Wi-Fi communications.

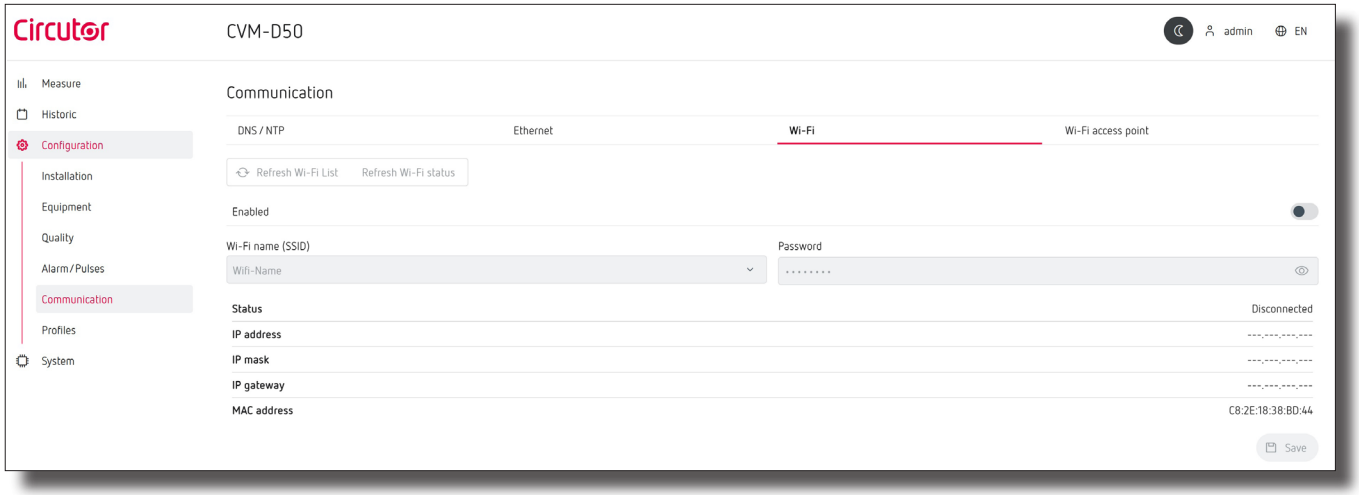


Figure 49: Website, Configuration (Communication Wi-Fi).

Press Refresh Wi-Fi List to refresh the list of Wi-Fi networks and Refresh Wi-Fi status refresh the Wi-Fi status.

✓**Enabled** : Select to enable Wi-Fi communications or not. If enabled, the following parameters need to be configured:

✓**Wi-Fi name (SSID)**:Name of Wi-Fi network.

✓**Password**: Network login password.

✓**Status**: Indicates whether the interface is connected to the internet or not.

✓**IP Address**: IP address of the device, non-configurable parameter.

✓**IP mask**: IP mask, non-configurable parameter.

✓**IP Gateway**: non-configurable parameter.

✓**MAC Address**: MAC address of the device, non-configurable parameter.

Press **Save** to store the configuration and send it to the device.

8.3.5.4.- Wi-Fi access point

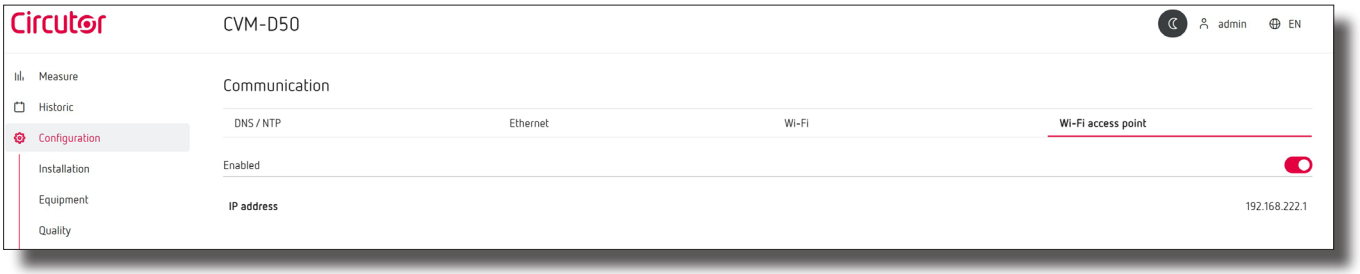


Figure 50: Website, Configuration (Wi-Fi access point).

✓**Enabled** : The device is selected as a Wi-Fi access point or not.

The IP address of the device when operating as an Access Point is **192.168.222.1.**

8.3.6.- PROFILES

The parameters to record in the database are selected on this screen.

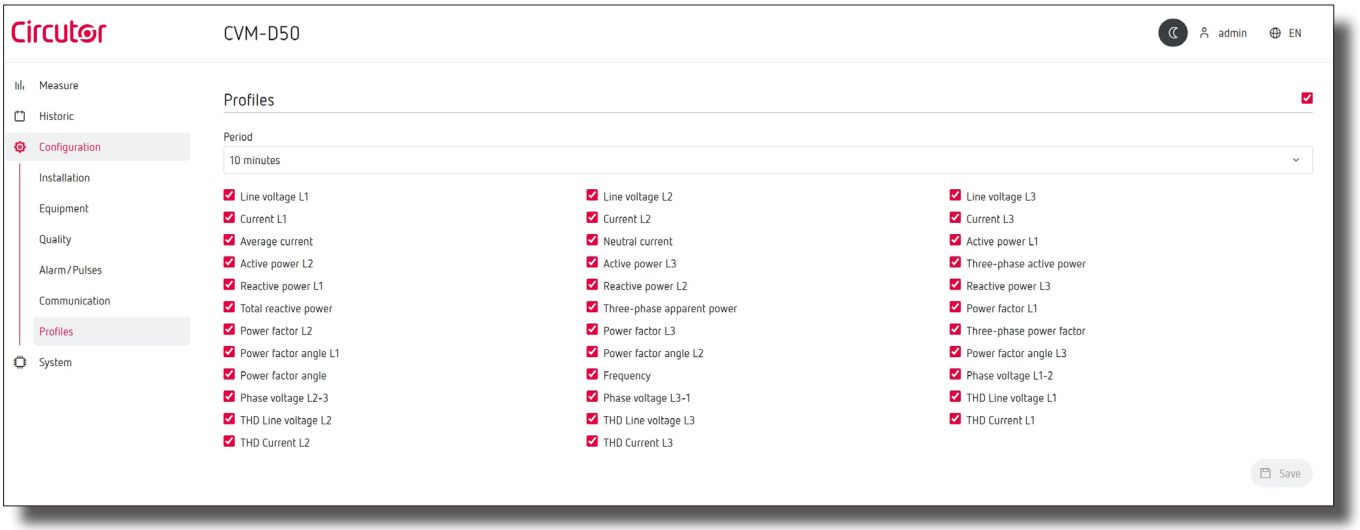


Figure 51: Website, Configuration (Profiles).

✓**Profiles:** Click ☑ to select all parameters or ☐ to deselect them.

✓**Period:** Select the recording period: **10 min, 15 min, 20 min, 30 min or 1 h.**

☑ Select each of the parameters to be recorded.

Press 🖫 **Save** to store the configuration and send it to the device.

8.4.- SYSTEM

The **System** section shows the information on the device, and it can be updated and rebooted.

8.4.1.- DEVICE INFORMATION

In this section, the device information can be viewed or modified.

Figure 52: Website, System (Device information).

✓**Serial number:** device serial number.

✓**Model:** Device model.

✓**Production date:** Device production date.

8.4.2.- FIRMWARE UPDATE

The device's firmware can be updated in this section.

Figure 53: Website, System (Firmware update).

✓**Measurement Firmware version:** firmware version.

✓**Communications Firmware version:** firmware version.

Press Update to start updating the device's software.

8.4.3.- CONFIGURE TIME ZONE

This section is used to set the time zone of the device.

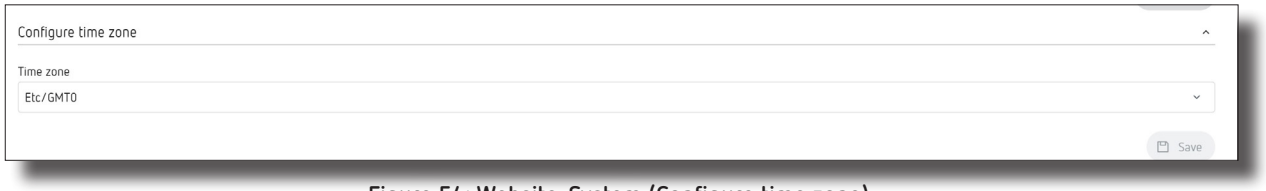


Figure 54: Website, System (Configure time zone).

✓**Time zone:** time zone where the device is located.

Press 🖫 **Save** to store the configuration and send it to the device.

8.4.4.- CONFIGURE DATE

This menu is used to set the date on the device.

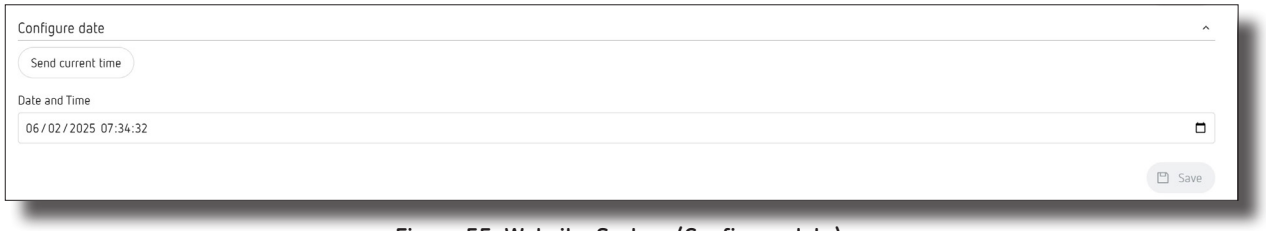


Figure 55: Website, System (Configure date).

Press Send current time to send the current time to the device.

✓**Date and Time:** date and time of the device.

Press 🖫 **Save** to store the configuration and send it to the device.

9.- TECHNICAL FEATURES

AC power supply	
Rated voltage	100 ... 240 V ~ ± 10%
Frequency	50 ... 60 Hz
Consumption	2.7 ... 4 VA
Installation category	CAT III 300 V

DC Power supply	
Rated voltage	100 ... 240 V ⎓ ± 10%
Consumption	1.8 ... 2 W
Installation category	CAT III 300 V

Voltage measurement circuit	
Rated voltage (Un)	230 V Ph-N, 400 V Ph-Ph
Max. voltage measurement	300 V Ph-N
Min. voltage measurement (Vstart)	11.5 V Ph-N
Frequency measurement margin	45 ... 65 Hz
Input impedance	400 kΩ
Installation category	CAT III 300 V

Current measurement circuit		
CVM-D50-FLEX	Measurement using Rogowski sensors.	
Rated current (In)	CVM-D50-ITF	.../5A o .../1 A
	CVM-D50-MC	.../0.250 A
	CVM-D50-FLEX	1000 A / 100 mV
Max. current measurement	CVM-D50-ITF	6 A
	CVM-D50-MC	300 mA
	CVM-D50-FLEX	1200 A / 120 mV
Min. current measurement (Istart)	CVM-D50-ITF	10 mA
	CVM-D50-MC	1% In
	CVM-D50-FLEX	20 A / 2 mV
Consumption	0.9 VA	
Installation category	CAT III 300 V	

Measurement accuracy		
Voltage measurement	CVM-D50-ITF	0.5% ± 1 digit (5 ... 120% Un)
	CVM-D50-MC	
	CVM-D50-FLEX (13)	
Current measurement	CVM-D50-ITF	0.5% ± 1 digit (2 ... 120% In)
	CVM-D50-MC	0.5% ± 1 digit (10% ≤ I ≤ 120% In)
	CVM-D50-FLEX (13)	0.5% ± 1 digit (10 ... 120% In)
Frequency measurement	CVM-D50-ITF	0.5%
	CVM-D50-MC	
	CVM-D50-FLEX (13)	
Active power measurement	CVM-D50-ITF	0.5% ± 2 digits
	CVM-D50-MC	1% ± 2 digits
	CVM-D50-FLEX (13)	

(Continuation) Measurement accuracy			
Reactive power measurement	CVM-D50-ITF	1% ± 2 digits	
	CVM-D50-MC	2% ± 2 digits	
	CVM-D50-FLEX[13]		
Apparent power measurement	CVM-D50-ITF	0.5% ± 2 digits	
	CVM-D50-MC	1% ± 2 digits	
	CVM-D50-FLEX [13]		
Active energy measurement	CVM-D50-ITF	I < 0.1In	I > 0.1In
		Class 1	Class 0.5 (.../1 A) Class 0.5s (.../5 A)
	CVM-D50-MC	Class 1	
	CVM-D50-FLEX [13]	Class 2	
Reactive energy measurement	CVM-D50-ITF	Class 2	
	CVM-D50-MC		
	CVM-D50-FLEX [13]	Class 3	

[13] Measurement accuracy without sensors.

Ethernet communication	
Type	Ethernet 10BaseT - 100BaseTX self-detectable
Connector	RJ45
Protocol	Modbus TCP - Web server
Connection mode to Network	DHCP ON/OFF (ON by default)

Wi-Fi communication	
Band	2.4 GHz (Range: 2.4 ... 2.5 GHz)
Standard	IEEE 802.11 b / g, IEEE 802.11 n (up to 150 Mbps)
Max. Output power	**IEEE 802.11 b** : 20 dBm **IEEE 802.11 n** : 14 dBm

User interface	
Display	LCD Custom COG high contrast
Keyboard	3 keys
LED	2 LED

Environmental features	
Operating temperature	-10°C ... +50°C
Storage temperature	-30°C ... +80°C
Relative humidity (non-condensing)	5 ... 95%
Maximum altitude	2000 m
Protection degree IP	IP30, **Front:** IP40
Protection degree IK	IK08
Pollution degree	2
Use	Indoor

Mechanical features			
Terminals			
1 ... 6, 10, 12, 14 ... 16, 18	2.5 mm^2	≤ 0.4 Nm	M2.5
Dimensions (Figure 56)	52.5 x 118 x 74 mm		

(Continuation) Mechanical features		
Weight	CVM-D50-ITF	224 g.
	CVM-D50-MC	223 g.
	CVM-D50-FLEX	209 g.
Enclosure	Self-extinguishing V0 plastic	
Mounting [14]	DIN rail	

[14] Minimum recommended distance between DIN rails: 150 mm.

Standars	
Safety requirements for electrical equipment for measurement, control and laboratory use -- Part 1: General requirements	IEC/EN 61010-1
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits	IEC/EN 61010-2-030
Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements	UNE-EN 55016-2-1
Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	UNE-EN 61000-4-2
Electromagnetic compatibility (EMC) - Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides	UNE-EN 61000-4-20
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	UNE-EN 61000-4-4
Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	UNE-EN 61000-4-5
Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	UNE-EN 61000-4-6
Electromagnetic compatibility (EMC) -- Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	UNE-EN 61000-4-8
Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase	UNE-EN IEC 61000-4-11
Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	UNE-EN 61000-4-3
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU	ETSI-EN 301 489-1 Ver. 2.1.1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU	ETSI-EN 301 489-17 Ver. 3.1.1
Environmental testing -- Part 2-1: Tests - Test A: Cold	UNE-EN 60068-2-1
Environmental testing -- Part 2-2: Tests - Tests B: Dry heat.	UNE-EN 60068-2-2
Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	UNE-EN 60068-2-78
Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC - Equipment for testing, measuring or monitoring of protective measures - Part 12: Power metering and monitoring devices (PMD)	IEC 61557-12
Common security requirements for radio equipment - Part 1: Internet connected radio equipment	EN 18031-1:2024
Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum	ETSI EN 300 328 v2.2.2

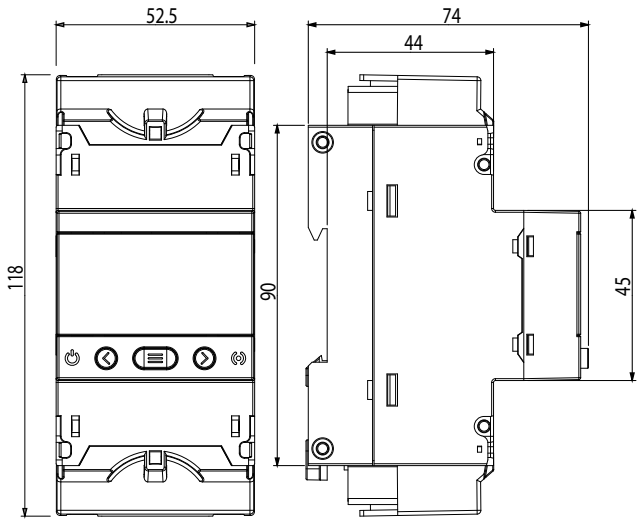


Figure 56: Dimensions of the CVM-D50.

10.- MAINTENANCE AND TECHNICAL SERVICE

In the case of any query in relation to device operation or malfunction, please contact the **CIRCUTOR S.A.U.** Technical Support Service.

Technical Assistance Service
Vial Sant Jordi, s/n, 08232 - Viladecavalls (Barcelona)
Tel: 902 449 459 (Spain) / +34 937 452 919 (outside of Spain)
email: sat@circutor.com

11.- GUARANTEE

CIRCUTOR guarantees its products against any manufacturing defect for two years after the delivery of the units.

CIRCUTOR will repair or replace any defective factory product returned during the guarantee period.

- No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
- The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. "Improper usage" is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
- **CIRCUTOR** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or "improper usage" of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
  - Overvoltages and/or electrical disturbances in the supply;
  - Water, if the product does not have the appropriate IP classification;
  - Poor ventilation and/or excessive temperatures;
  - Improper installation and/or lack of maintenance;
  - Buyer repairs or modifications without the manufacturer's authorisation.

CIRCUTOR, S.A.U. – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(ES) DECLARACIÓN UE DE CONFORMIDAD

La presente declaración de conformidad se expide bajo la exclusiva responsabilidad de CIRCUTOR con dirección en **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) España**

Producto:

Analizadores de redes trifásicos, carril DIN

Serie:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

Marca:

CIRCUTOR

EL objeto de la declaración es conforme con la legislación de armonización pertinente en la UE, siempre que sea instalado, mantenido y usado en la aplicación para la que ha sido fabricado, de acuerdo con las normas de instalación aplicables y las instrucciones del fabricante

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativos(s):

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

El organismo notificado ALTER TECHNOLOGY TÜV NORD S.A.U., con el número de organismo notificado 2031, ha realizado el Módulo B y ha emitido el certificado de examen UE de tipo: ATN-CER-1929-0262-2025 Ed.01, de acuerdo con el artículo 3.3d de la Directiva 2014/53/UE: Directiva de Equipos Radioeléctricos.

(EN) EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of CIRCUTOR with registered address at **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spain**

Product:

Power analyzer, three-phase DIN rail

Series:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

Brand:

CIRCUTOR

The object of the declaration is in conformity with the relevant EU harmonisation legislation, provided that it is installed, maintained and used for the application for which it was manufactured, in accordance with the applicable installation standards and the manufacturer's instructions

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

It is in conformity with the following standard(s) or other regulatory document(s):

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

The notified body ALTER TECHNOLOGY TÜV NORD S.A.U., with notified body number 2031, performed Module B and issued the EU type-examination certificate: ATN-CER-1929-0262-2025 Ed.01, in accordance with Article 3.3d of Directive 2014/53/EU: Radio Equipment Directive.

(FR) DÉCLARATION UE DE CONFORMITÉ

La présente déclaration de conformité est délivrée sous la responsabilité exclusive de CIRCUTOR dont l'adresse postale est **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelone) Espagne**

Produit:

analyseurs de réseaux triphasés, rail DIN

Série:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

Marque:

CIRCUTOR

L'objet de la déclaration est conforme à la législation d'harmonisation pertinente dans l'UE, à condition d'avoir été installé, entretenu et utilisé dans l'application pour laquelle il a été fabriqué, conformément aux normes d'installation applicables et aux instructions du fabricant

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

Il est en conformité avec la(les) suivante (s) norme(s) ou autre(s) document(s) réglementaire (s):

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

L'organisme notifié ALTER TECHNOLOGY TÜV NORD S.A.U., sous le numéro d'organisme notifié 2031, a réalisé le module B et délivré le certificat d'examen UE de type : ATN-CER-1929-0262-2025 Ed.01, conformément à l'article 3.3d de la directive 2014/53/UE : directive relative aux équipements radioélectriques.

Viladecavalls (Spain), 27/11/2025
Chief Executive Officer: Joan Comellas Cabeza

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(DE)

KONFORMITÄTSERKLÄRUNG UE

Vorliegende Konformitätserklärung wird unter alleiniger Verantwortung von CIRCUTOR mit der Anschrift, Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spanien, ausgestellt

Produkt:

Dreiphasen-Leistungsanalyser, DIN-Schiene

Serie:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

Marke:

CIRCUTOR

Der Gegenstand der Konformitätserklärung ist konform mit der geltenden Gesetzgebung zur Harmonisierung der EU, sofern die Installation, Wartung undVerwendung der Anwendung seinem Verwendungszweck entsprechend gemäß den geltenden Installationsstandards und der Vorgaben des Herstellers erfolgt.

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

Es besteht Konformität mit der/den folgender/folgenden Norm/Normen oder sonstigem/sonstiger Regelwerk/Regelwerken

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

Die benannte Stelle ALTER TECHNOLOGY TÜV NORD S.A.U. mit der Nummer 2031 hat Modul B durchgeführt und die EU-Baumusterprüfbescheinigung ATN-CER-1929-0262-2025 Ed.01 gemäß Artikel 3.3d der Richtlinie 2014/53/EU: Funkanlagenrichtlinie ausgestellt.

(PT)

DECLARAÇÃO DA UE DE CONFORMIDADE

A presente declaração de conformidade é expedida sob a exclusiva responsabilidade da CIRCUTOR com morada em **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Espanha**

Producto:

Analisadores de redes trifásicos, Calha DIN

Série:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

Marca:

CIRCUTOR

O objeto da declaração está conforme a legislação de harmonização pertinente na UE, sempre que seja instalado, mantido e utilizado na aplicação para a qual foi fabricado, de acordo com as normas de instalação aplicáveis e as instruções do fabricante.

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

Está em conformidade com a(s) seguinte(s) norma(s) ou outro(s) documento(s) normativo(s):

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

O organismo notificado ALTER TECHNOLOGY TÜV NORD S.A.U., com o número de organismo notificado 2031, realizou o Módulo B e emitiu o certificado de exame de tipo da UE: ATN-CER-1929-0262-2025 Ed.01, de acordo com o Artigo 3.3d da Diretiva 2014/53/UE: Diretiva de Equipamento de Rádio.

(IT)

DICHIARAZIONE DI CONFORMITÀ UE

La presente dichiarazione di conformità viene rilasciata sotto la responsabilità esclusiva di CIRCUTOR, con sede in **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcellona) Spagna**

prodotto:

Analizzatori di reti trifase, binario DIN

Serie:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

MARCHIO:

CIRCUTOR

L'oggetto della dichiarazione è conforme alla pertinente normativa di armonizzazione dell'Unione Europea, a condizione che venga installato, mantenuto e utilizzato nell'ambito dell'applicazione per cui è stato prodotto, secondo le norme di installazione applicabili e le istruzioni del produttore.

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

È conforme alle seguenti normative o altri documenti normativi:

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

L'organismo notificato ALTER TECHNOLOGY TÜV NORD S.A.U., con numero di organismo notificato 2031, ha eseguito il Modulo B e rilasciato il certificato di esame UE del tipo: ATN-CER-1929-0262-2025 Ed.01, in conformità all'articolo 3.3d della direttiva 2014/53/UE: direttiva sulle apparecchiature radio.

Viladecavalls (Spain), 27/11/2025
Chief Executive Officer: Joan Comellas Cabeza

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08232 Viladecavalls (Barcelona) Spain
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(PL)

DEKLARACJA ZGODNOŚCI UE

Niniejsza deklaracja zgodności zostaje wydana na wyłączną odpowiedzialność firmy CIRCUTOR z siedzibą pod adresem: **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Hiszpania**

produk:

Trójfazowe analizatory sieci, szyna DIN

Seria:

CVM-D50-ITF, CVM-D50-MC, CVM-D50-FLEX

marka:

CIRCUTOR

Przedmiot deklaracji jest zgodny z odnośnymi wymaganiami prawodawstwa harmonizacyjnego w Unii Europejskiej pod warunkiem, że będzie instalowany, konserwowany i użytkowany zgodnie z przeznaczeniem, dla którego został wyprodukowany, zgodnie z mającymi zastosowanie normami dotyczącymi instalacji oraz instrukcjami producenta

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2014/53/EU: Radio Equipment Directive	2011/65/EU + 2015/863/EU: RoHS Directive

Jest zgodny z następującą(ymi) normą(ami) lub innym(i) dokumentem(ami) normatywnym(i):

IEC 61010-1:2010+AMD1:2016	IEC 61010-2-030:2023
IEC 61326-1:2020	ETSI EN 301 489-1 v2.2.3
ETSI EN 301 489-17 v3.2.6	ETSI EN 300 328 V2.2.2
EN 18031-1:2024	IEC 63000:2016+AMD1:2022

Jednostka notyfikowana ALTER TECHNOLOGY TÜV NORD S.A.U. o numerze jednostki notyfikowanej 2031 przeprowadziła moduł B i wydała certyfikat badania typu UE: ATN-CER-1929-0262-2025 Ed.01, zgodnie z artykułem 3.3d dyrektywy 2014/53/UE: Dyrektywa w sprawie urządzeń radiowych.

Viladecavalls (Spain), 27/11/2025
Chief Executive Officer: Joan Comellas Cabeza

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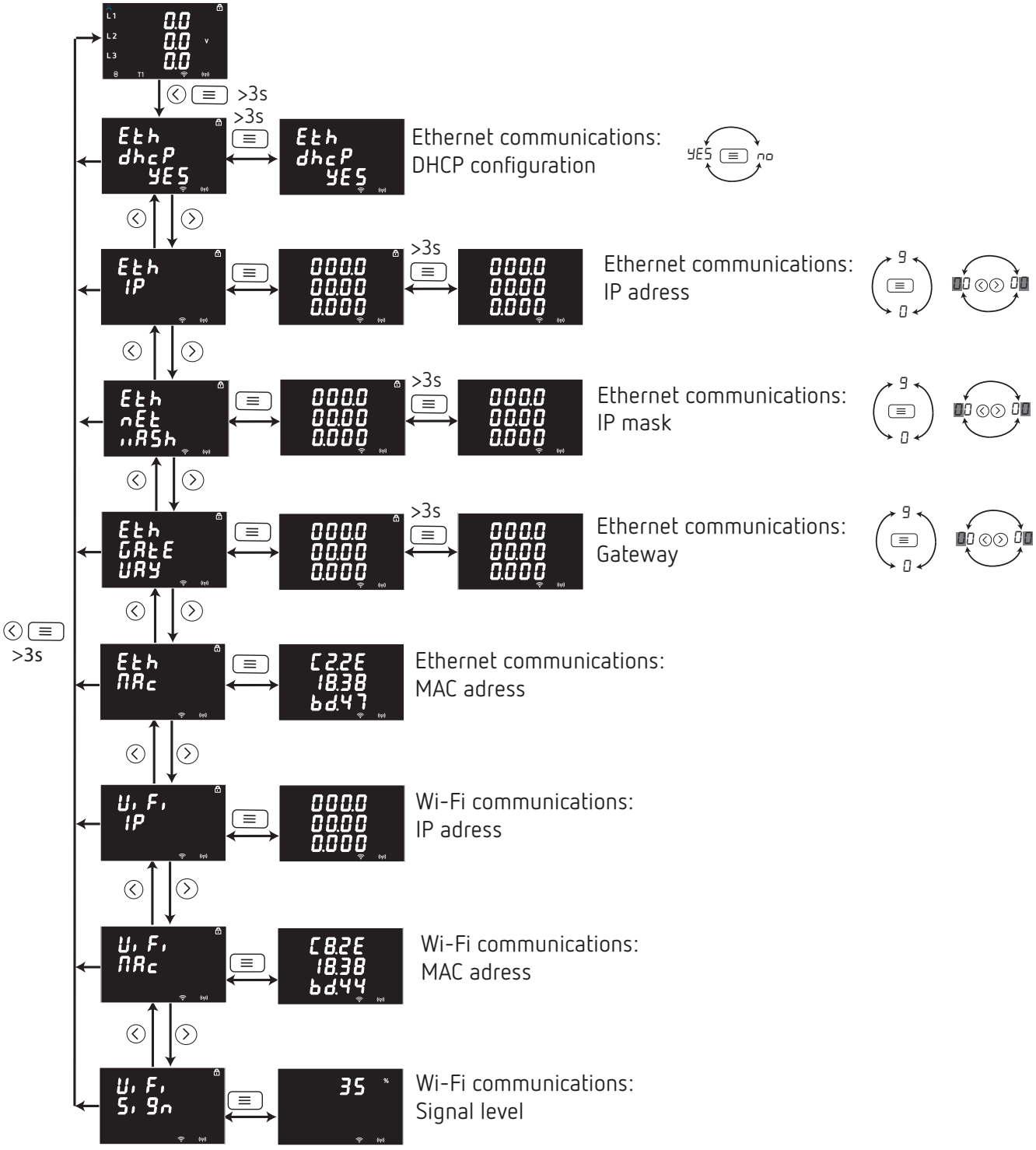
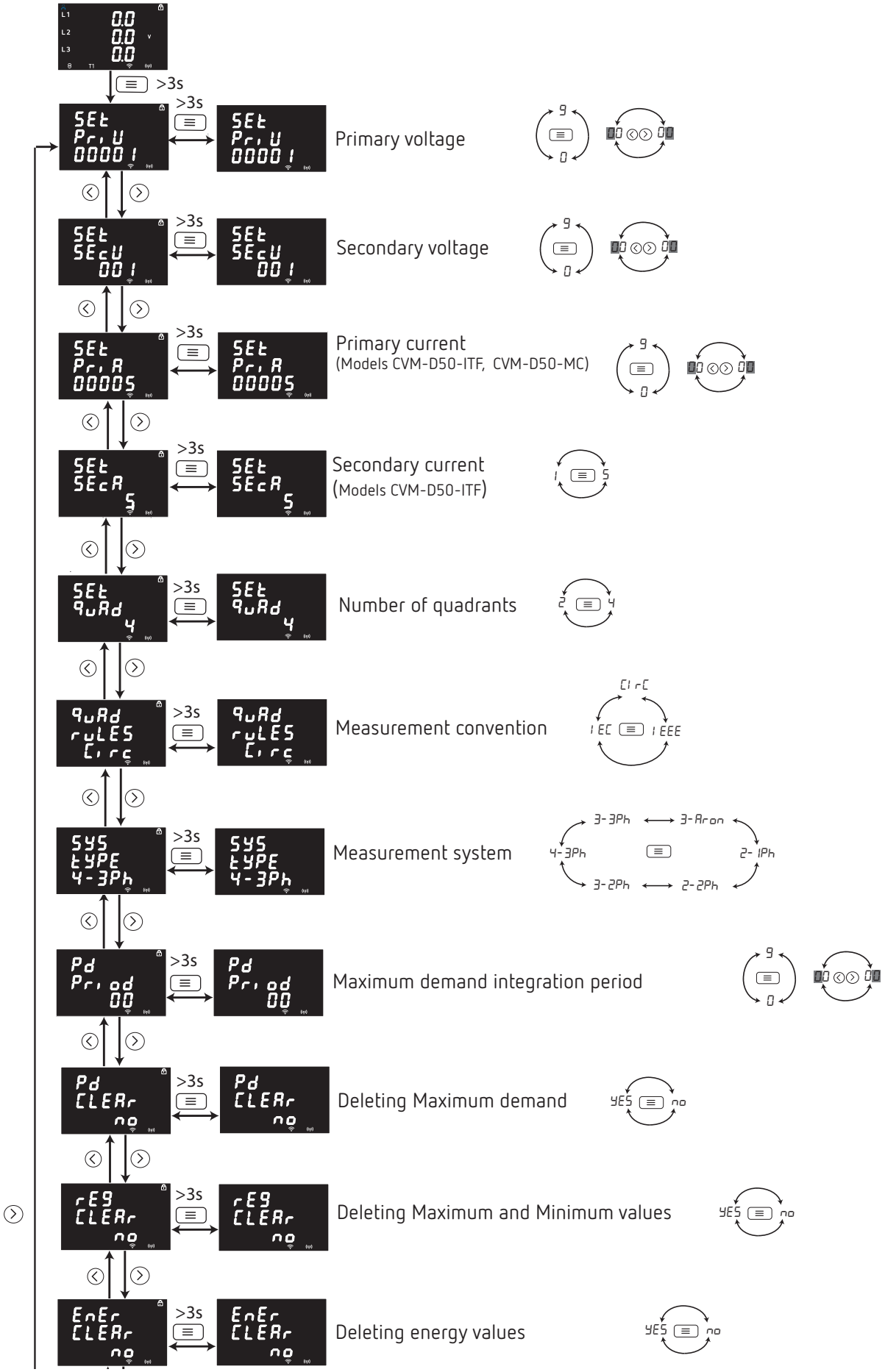
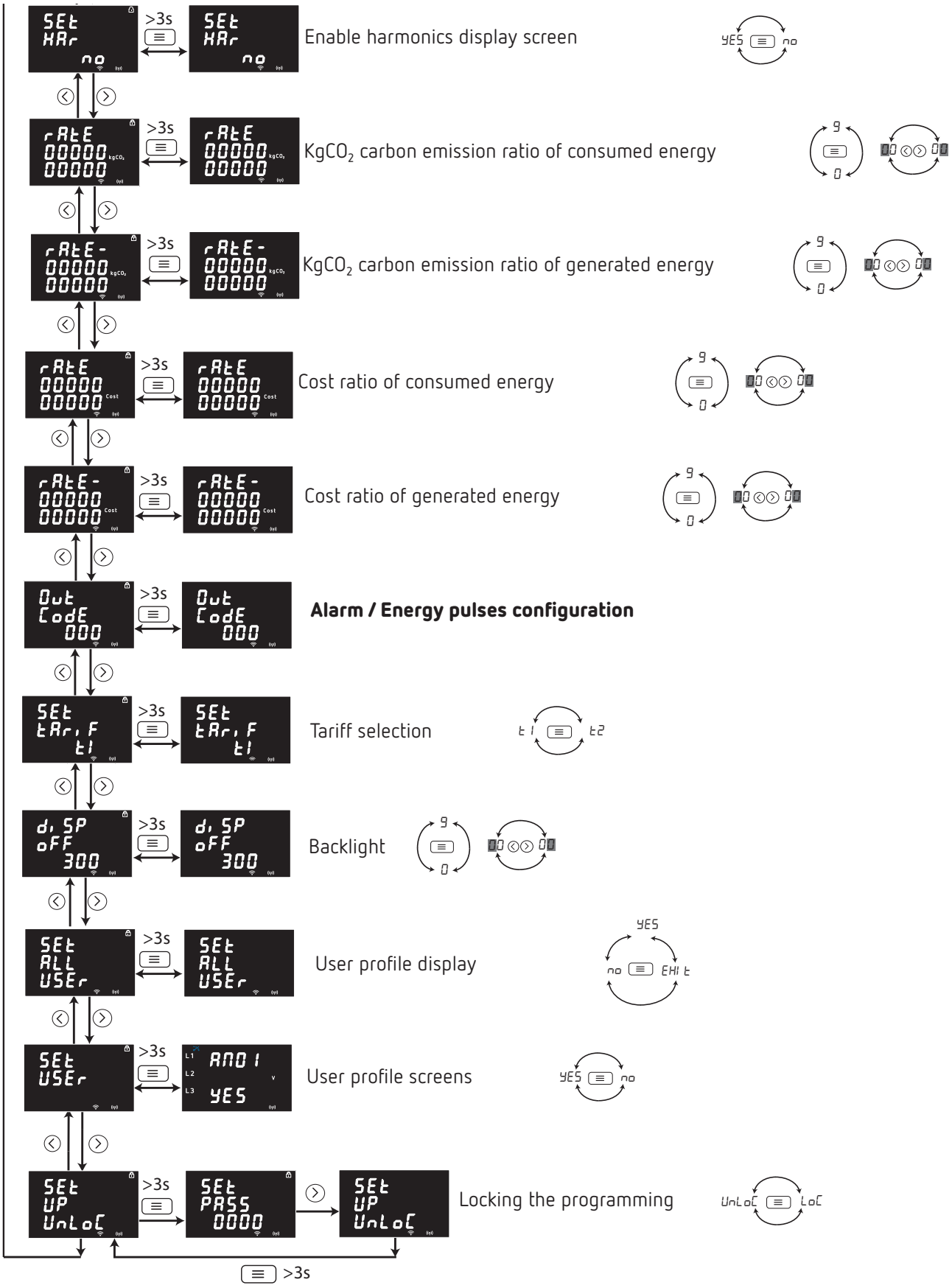
ANNEX A.- CONFIGURATION MENUS

Communications Ethernet and Wi-Fi

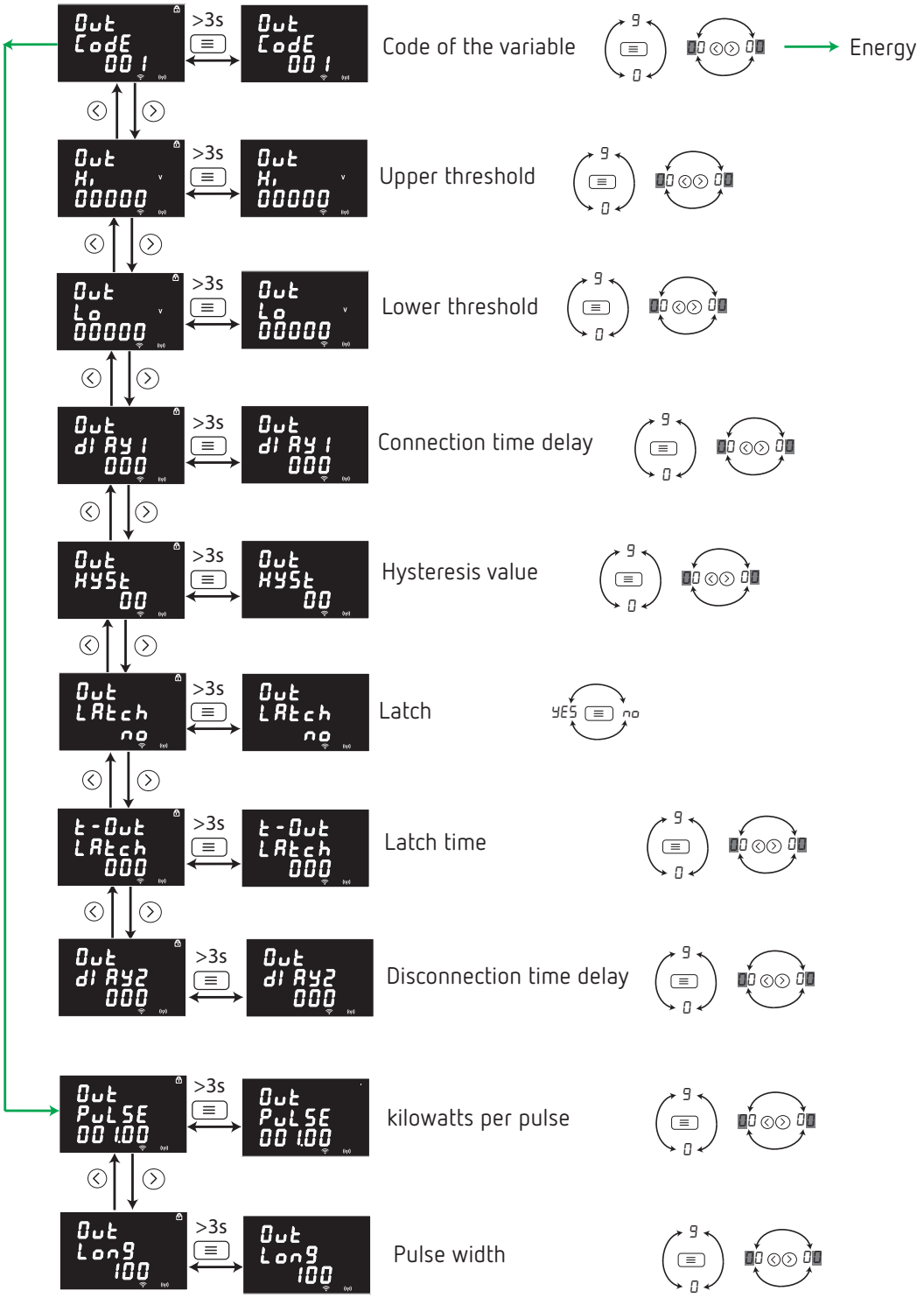


Configuration menu




SEt HAr no
>3s
Enable harmonics display screen
YES no
rAtE 00000 00000
KgCO2 carbon emission ratio of consumed energy
rAtE- 00000 00000
KgCO2 carbon emission ratio of generated energy
Cost ratio of consumed energy
Cost ratio of generated energy
Out CodE 000
Alarm / Energy pulses configuration
SEt tAr, F t1
Tariff selection
t1 t2
d, SP oFF 300
Backlight
SEt ALL USEr
User profile display
no EHI t
SEt USEr
AND 1
YES
User profile screens
SEt UP UnLoC
SEt PASS 0000
Locking the programming
UnLoC LoC

Alarm / Energy pulses configuration



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