Power analyzer

CVM-B50

INSTRUCTION MANUAL

(M487B01-03-25A)

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.

COMMITMENT TO TRANSPARENCY AND DATA ACCESS (Data Act)

Commitment to Transparency and Data Access (Data Act)

CIRCUTOR maintains a firm commitment to transparency and equitable access to the data generated by its connected electronic devices and related services. In compliance with **Regulation (EU) 2023/2854 (Data Act)**, the company makes available to its customers the relevant information regarding the data generated through the use of such products and services, under the terms established by the applicable regulations.

What data are generated?

CIRCUTOR's connected devices may collect and generate technical and operational data, such as:

- Operating and measurement parameters of the devices, including electrical quantities (energy, power, voltage, current, among others) and thermal variables;
- Device operating states;
- System events, including electrical events and power quality events;
- Device operation logs;
- Number of switching operations and device operating time.

These data do not generally include personal information, which is processed in accordance with the **General Data Protection Regulation** (**GDPR**) and **CIRCUTOR**'s Privacy Policy.

How to access and share these data?

Customers may directly access the generated data or request their download, provision, or transfer to authorised third parties through the following channels:

- Email: **data-act@circutor.com**
- Standard communication interfaces (such as REST APIs in different formats, industrial protocols, or messaging services);
- Download mechanisms via web platforms or interfaces integrated into the device itself;
- Remote communications through protocols such as OCPP, MQTT, or IEC 60870-5-102.

The available access and communication options will depend on the product. For detailed information on the supported protocols, interfaces, and access methods, please refer to the communications section of this manual.

For further information on formats, security measures, access conditions, and procedures, please consult:

https://circutor.com/en/company/commitment/eu-data-act/

CONTENTS

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
04/26	M487B01-03-25A	Initial Version

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	In accordance with the relevant European directive.
	Device safety category: Class II
	Device covered by European Directive 2012/19/EC. At the end of its useful life, do not leave the device in a household refuse bin. Follow local regulations on electronic equipment recycling.
⎓	Direct current.
~	Alternating current.

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

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,

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

2.- PRODUCT DESCRIPTION

The **CVM-B50** device measures, calculates and displays the main electrical parameters of the following networks: single-phase, two-phase, with and without neutral, balanced three-phase, with ARON measurements or unbalanced. The measurement will be taken in RMS with the three AC voltage inputs and four current inputs.

There are 3 versions of the device, depending on the type of current input:

✓**CVM-B50-ITF:** model measures current through /5A or /1A transformers.
✓**CVM-B50-FLEX:** current measurement through Rogowski sensors.
✓**CVM-B50-MC:** current measurement through efficient MC1 and MC3 series transformers.

The device features:

- **3 keys** that allow you to browse between the various screens and program the device.
- **2** indicator **LEDs.**
- **LCD display**, displays all parameters.
- **4 digital inputs**, used to select the tariff, detect the logic state of external signals or to generate a synchronism pulse to calculate the maximum demand.
- **2 digital outputs**, fully programmable.
- **2 alarm relays**, fully programmable.
- **Ethernet** communications with **Modbus TCP** and **BACnet** protocol.
- **Wi-Fi** communications.

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-B50** 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 will be installed on a panel ($92^{+0.8}$ x $92^{+0.8}$ mm panel drill hole, in compliance with IEC 61554). All connections are located inside the electric panel.

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 type gL (IEC 60269) or class M 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.

3.3.- CVM-B50-FLEX: ROGOWSKI SENSORS

The **CVM-B50-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 one Rogowski sensor model that can be used with the **CVM-B50-FLEX: MFC-FLEX.**

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

Table 3: Probe cable terminal connections.

Terminals
MFC-FLEX
 **White** (OUT+): Measuring channel (L1, L2, L3, N) **Blue** (OUT-): Common (C) **Grey:** Shield (SHLD)

3.4.- DEVICE TERMINALS

3.4.1.- CVM-B50-ITF AND CVM-B50-MC MODELS

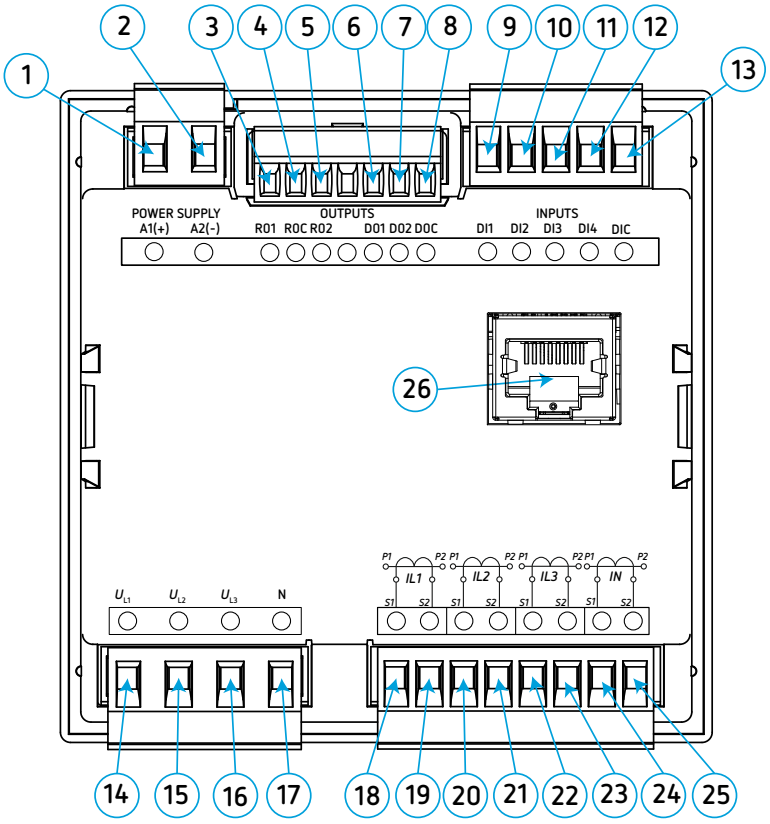


Figure 1: CVM-B50-ITF and CVM-B50-MC terminals.

Table 4: List of terminals of the CVM-B50-ITF and CVM-B50-MC.

Device terminals	
1 : **A1(+),** Power supply	14 : $U_{L1,}$ Voltage input L1
2 : **A2(-),** Power supply	15 : $U_{L2,}$ Voltage input L2
3 : **RO1**, Relay output 1	16 : $U_{L3,}$ Voltage input L3
4 : **ROC**, Common relay output	17 : **N,** Neutral
5 : **RO2**, Relay output 2	18 : **S1 IL1,** current input L1
6 : **DO1**, Digital output 1	19 : **S2 IL1,** current input L1
7 : **DO2**, Digital output 2	20 : **S1 IL2,** current input L2
8 : **DOC**, Common digital output	21 : **S2 IL2,** current input L2
9 : **DI1**, Digital input 1	22 : **S1 IL3,** current input L3
10 : **DI2**, Digital input 2	23 : **S2 IL3,** current input L3
11 : **DI3**, Digital input 3	24 : **S1 IN,** current input N
12 : **DI4**, Digital input 4	25 : **S2 IN,** current input N
13 : **DIC**, Common digital input	26 : Ethernet connector

3.4.2.- CVM-B50-FLEX MODEL

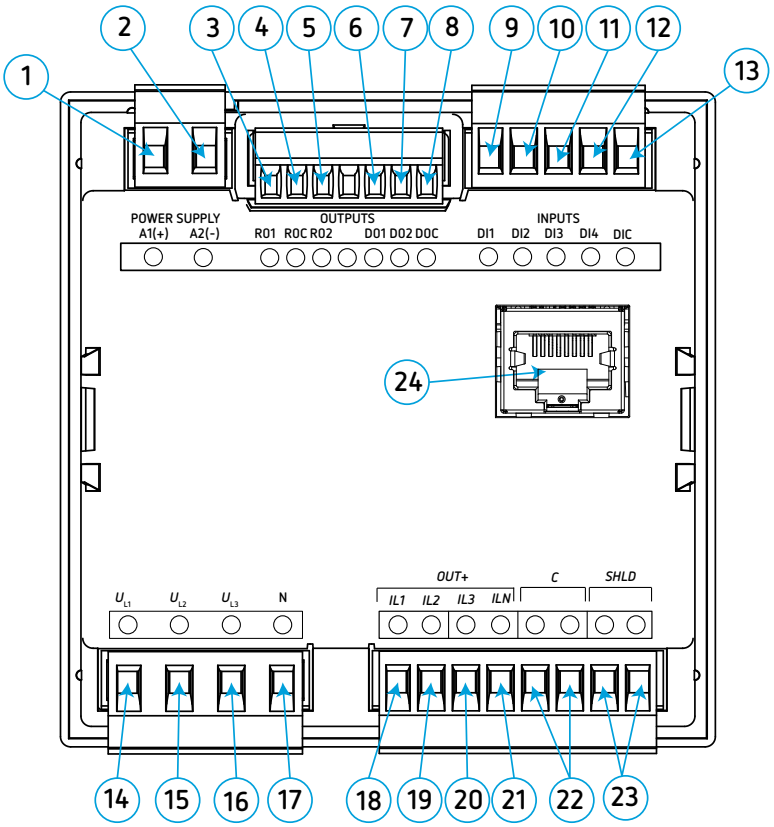


Figure 2: CVM-B50-FLEX terminals.

Table 5: List of terminals of the CVM-B50-FLEX.

Device terminals	
1 : **A1(+),** Power supply	13 : **DIC**, Common digital input
2 : **A2(-),** Power supply	14 : U_{L1}, Voltage input L1
3 : **RO1**, Relay output 1	15 : U_{L2}, Voltage input L2
4 : **ROC**, Common relay output	16 : U_{L3}, Voltage input L3
5 : **RO2**, Relay output 2	17 : **N,** Neutral
6 : **DO1**, Digital output 1	18 : **IL1 (OUT+),** current input L1
7 : **DO2**, Digital output 2	19 : **IL2 (OUT+),** current input L2
8 : **DOC**, Common digital output	20 : **IL3 (OUT+),** current input L3
9 : **DI1**, Digital input 1	21 : **ILN (OUT+),** current inpute N
10 : **DI2**, Digital input 2	22 : **C,** common for the current inputs
11 : **DI3**, Digital input 3	23 : **SHLD,** GND for the current inputs
12 : **DI4**, Digital input 4	24 : Ethernet connector

3.5.- WIRING DIAGRAMS

3.5.1.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION, **CVM-B50-ITF** MODEL

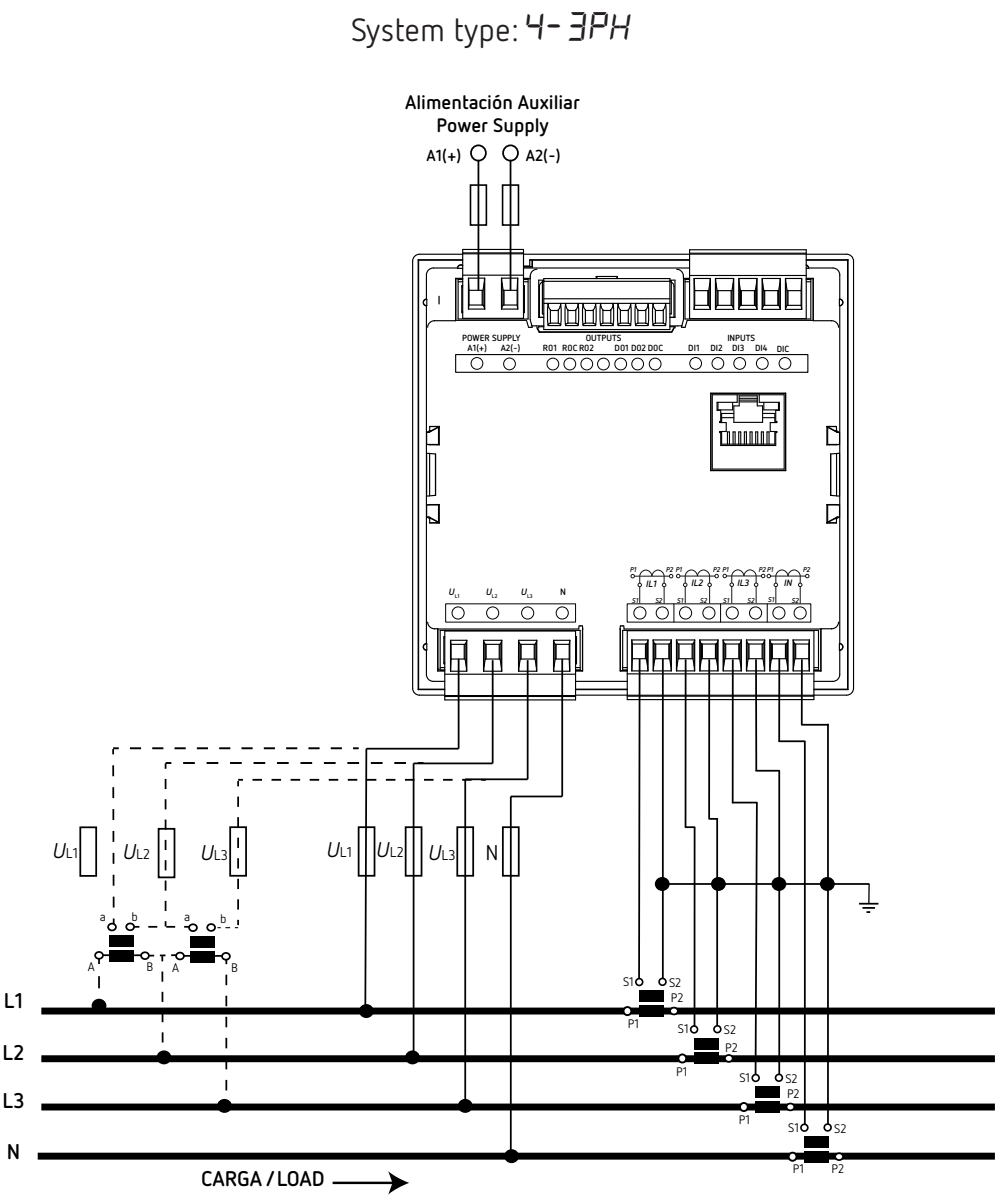


Figure 3: Three-Phase measuring with a 4-wire connection (CVM-B50-ITF).

3.5.2.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION, **CVM-B50-MC** MODEL

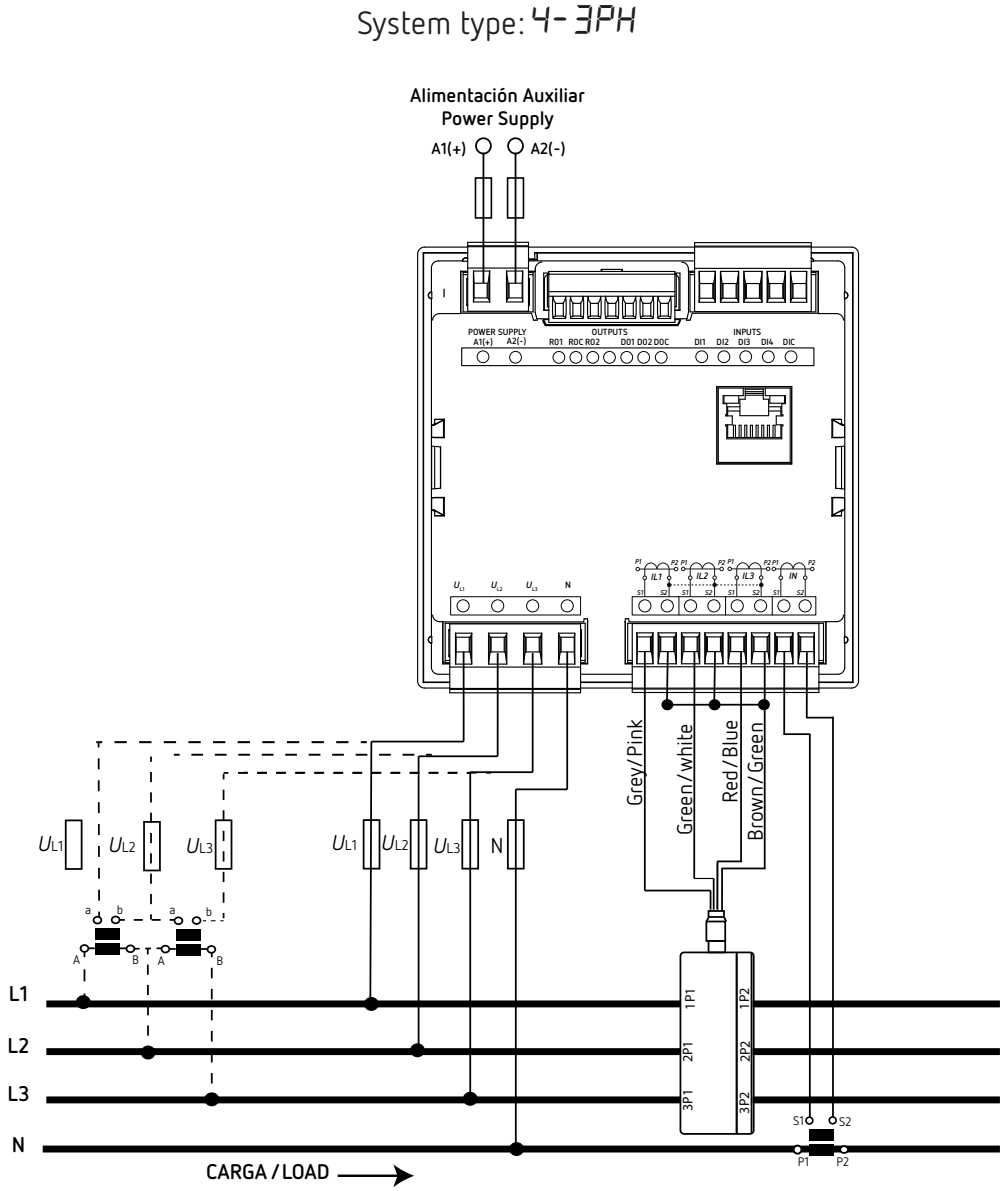


Figure 4: Three-Phase measuring with a 4-wire connection (CVM-B50-MC).

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

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

3.5.3.- MEASURING THREE-PHASE NETWORKS WITH A 4-WIRE CONNECTION, **CVM-B50-FLEX** MODEL

System type: 4-3PH

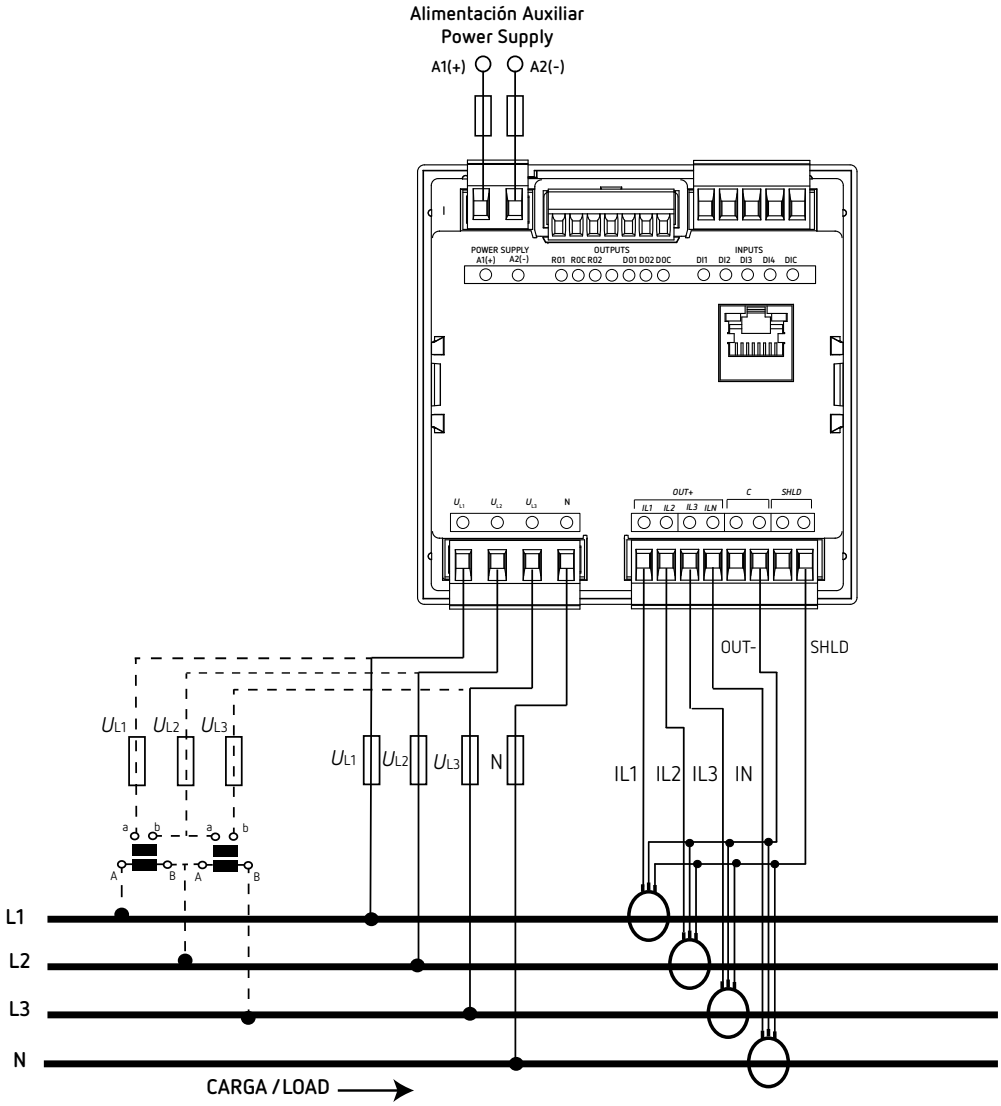


Figure 5: Three-Phase measuring with a 4-wire connection (CVM-B50-FLEX).

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

3.5.4.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION,**CVM-B50-ITF** MODEL

System type: 3- 3PH

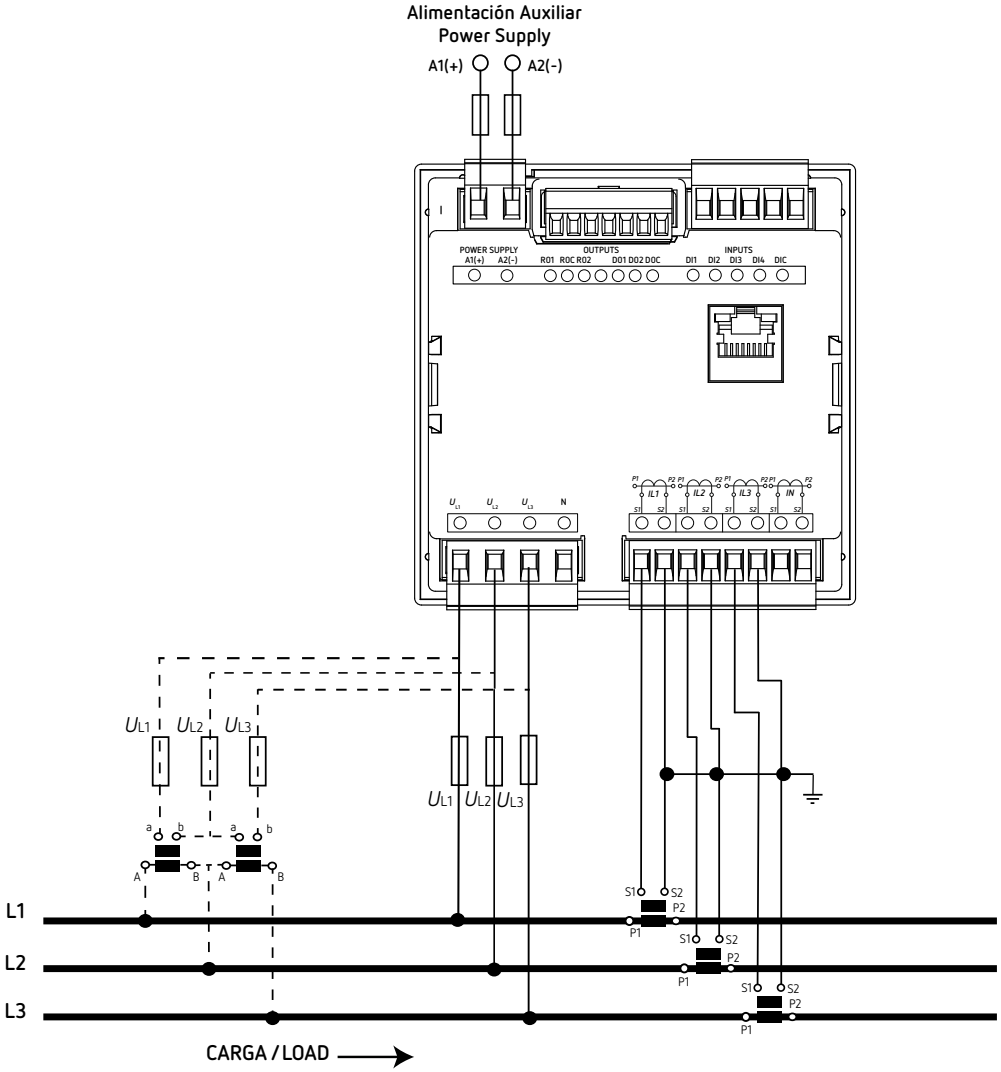


Figure 6: Three-Phase measuring with a 3-wire connection (CVM-B50-ITF).

3.5.5.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION, **CVM-B50-MC** MODEL

System type: 3- 3PH

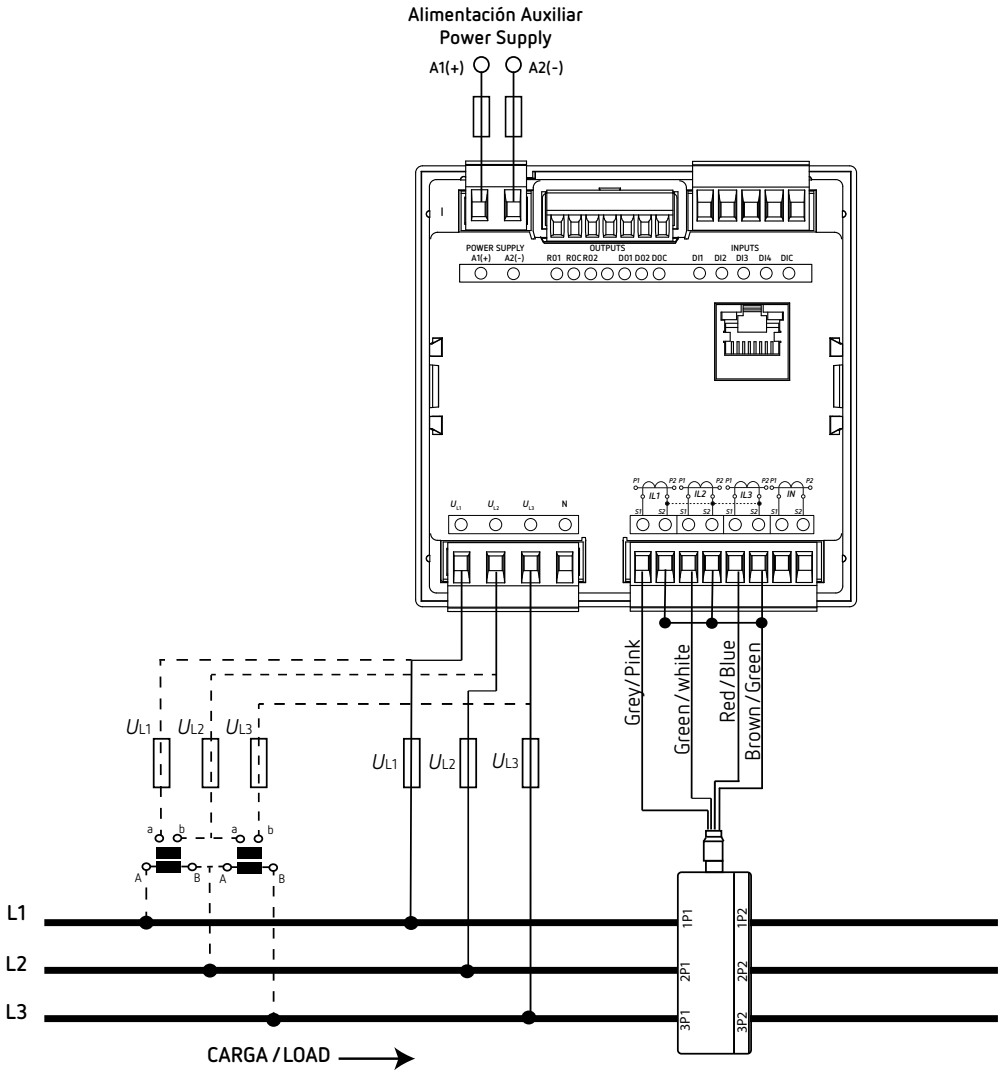


Figure 7: Three-Phase measuring with a 3-wire connection (CVM-B50-MC).

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

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

3.5.6.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION, **CVM-B50-FLEX** MODEL

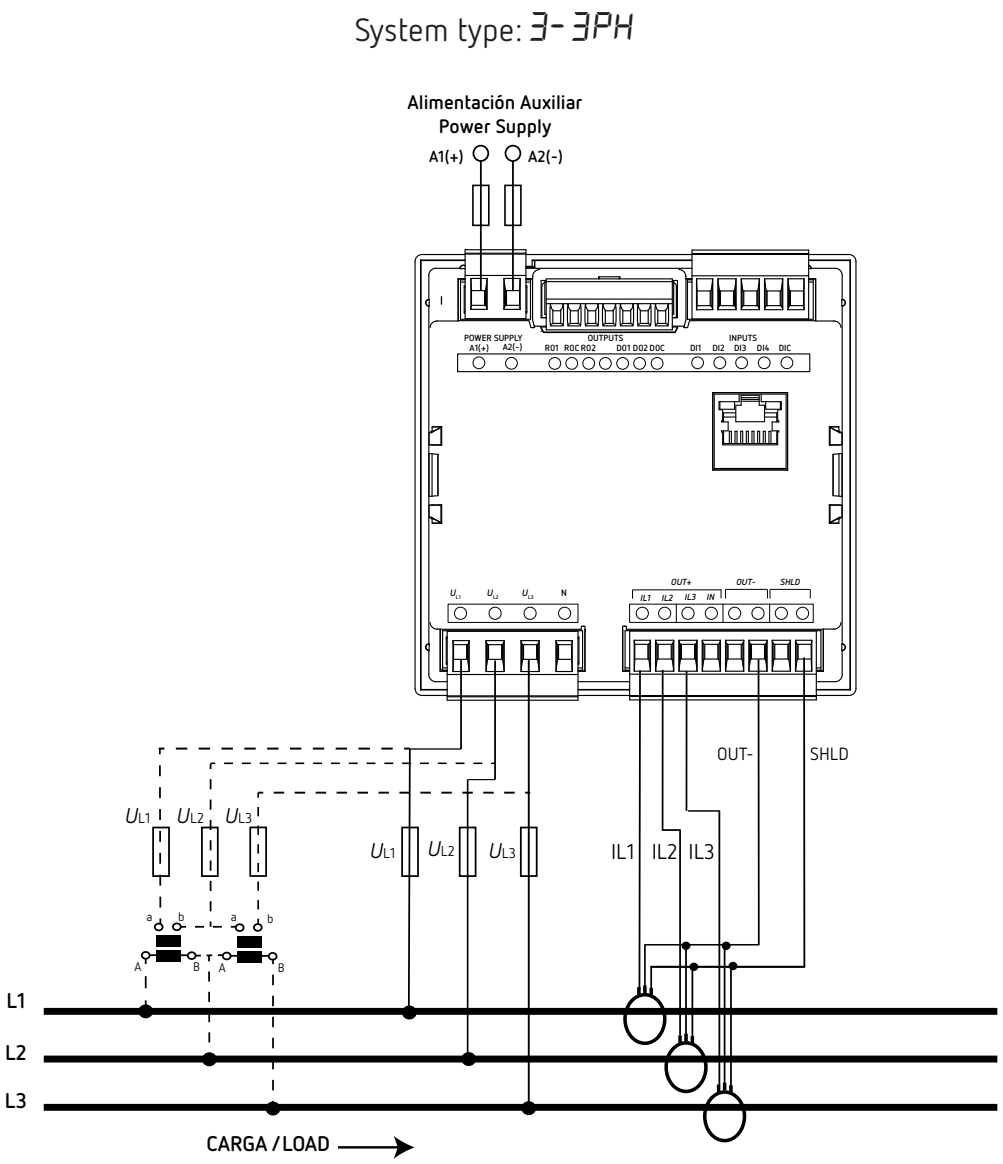


Figure 8: Three-Phase measuring with a 3-wire connection (CVM-B50-FLEX).

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

3.5.7.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION AND TRANSFORMERS WITH AN ARON CONNECTION, **CVM-B50-ITF** MODEL

System type: 3ARON

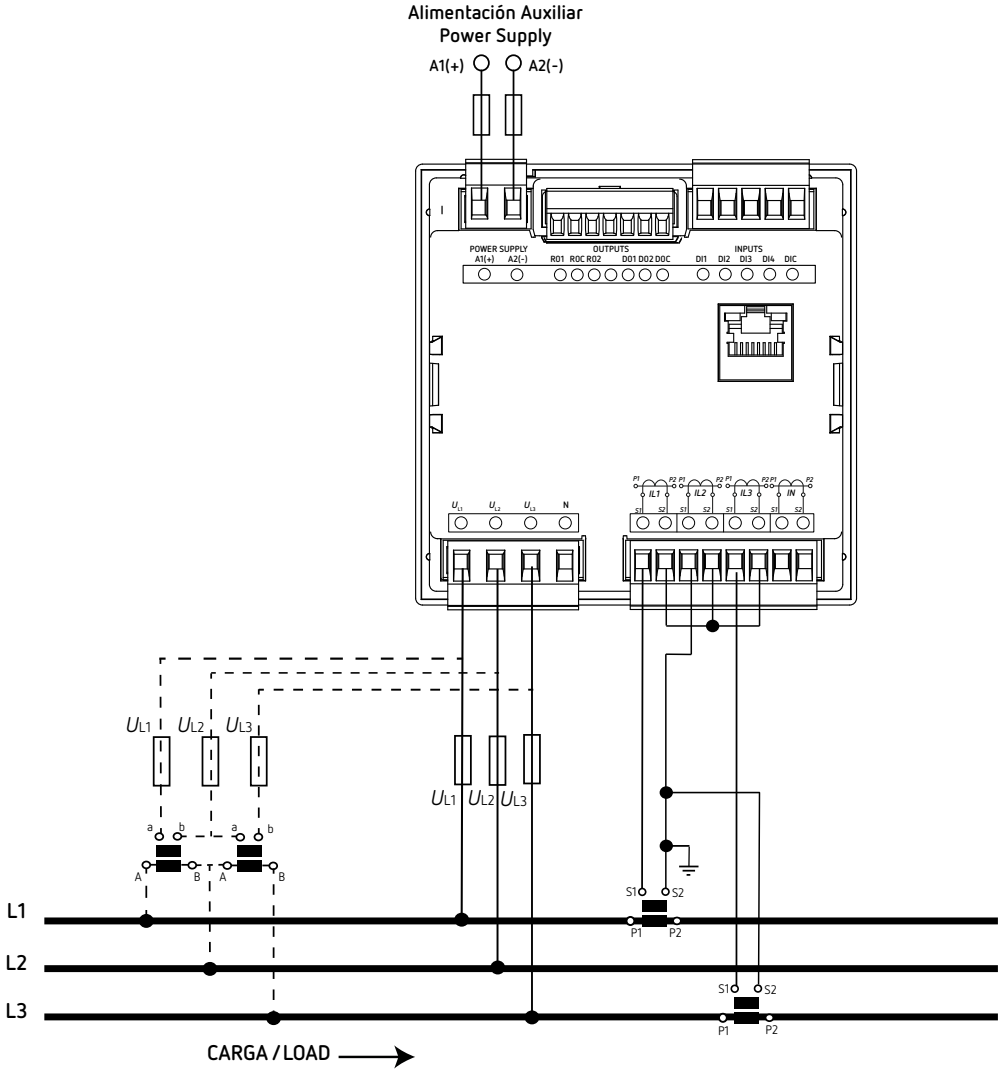


Figure 9: Three-Phase measuring with a 3-wire connection and transformers with an ARON connection (CVM-B50-ITF).

3.5.8.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION AND TRANSFORMERS WITH AN ARON CONNECTION, **CVM-B50-MC** MODEL

System type: 3ARON

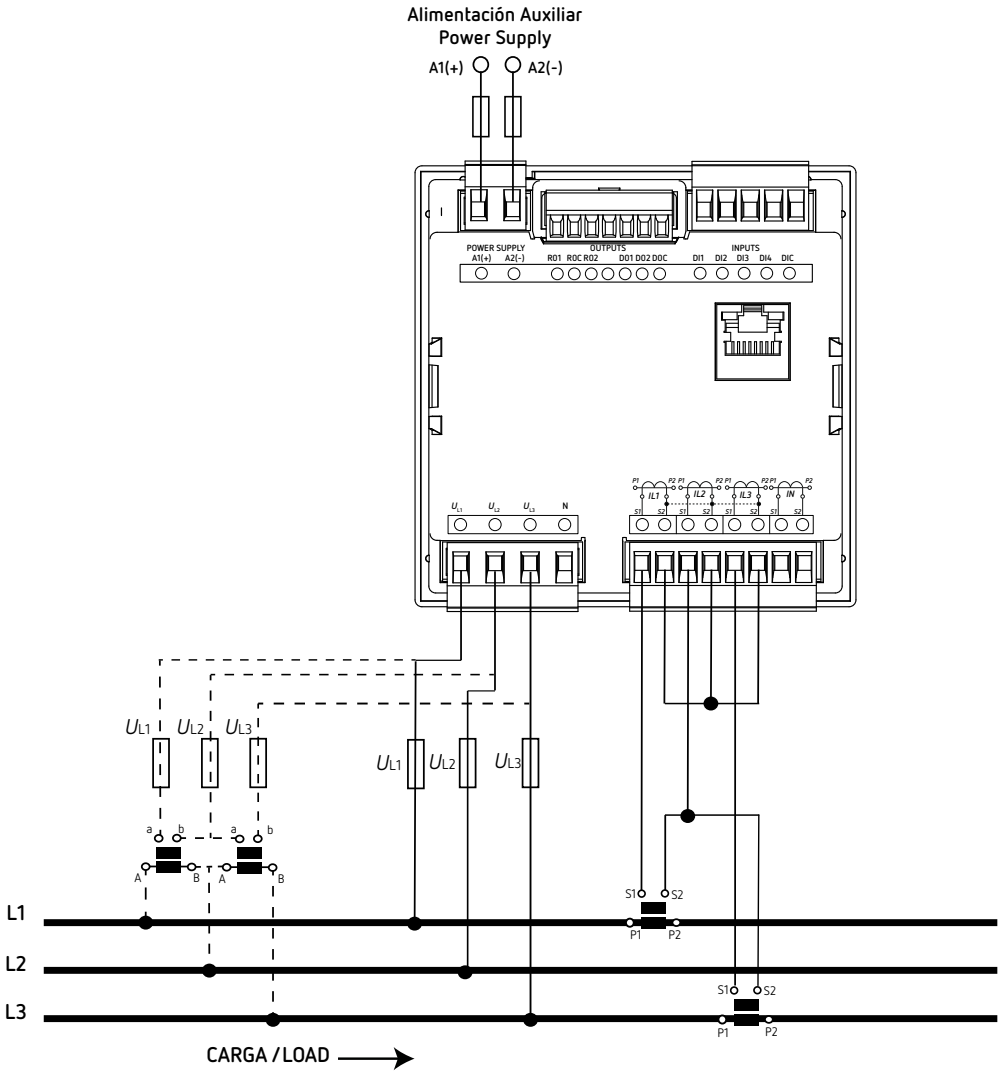


Figure 10: Three-Phase measuring with a 3-wire connection and transformers with an ARON connection (CVM-B50-MC).

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

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

3.5.9.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE CONNECTION AND TRANSFORMERS WITH AN ARON CONNECTION, **CVM-B50-FLEX** MODEL

System type: 3ARON

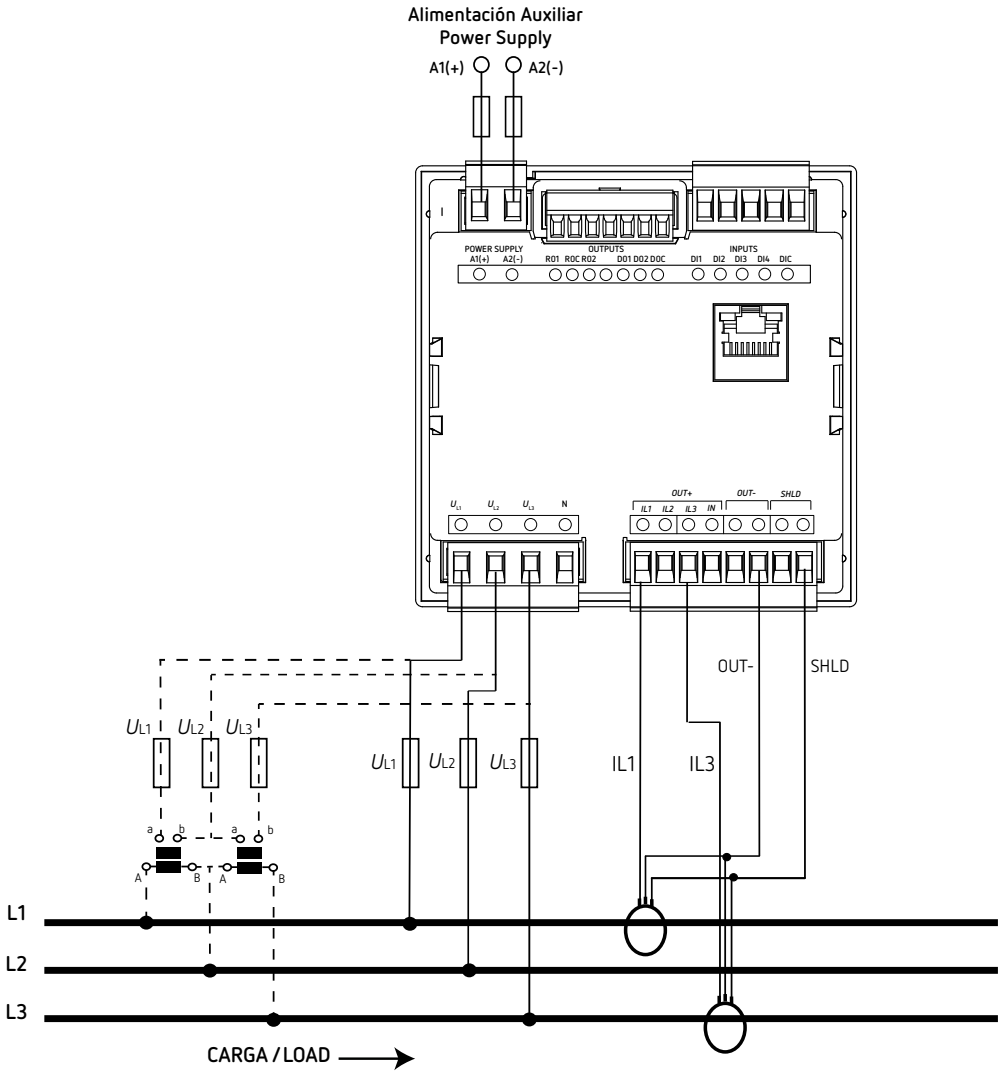


Figure 11: Three-Phase measuring with a 3-wire connection and transformers with an ARON connection (CVM-B50-FLEX).

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

3.5.10.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION, **CVM-B50-ITF** MODEL

System typen: 3-2PH

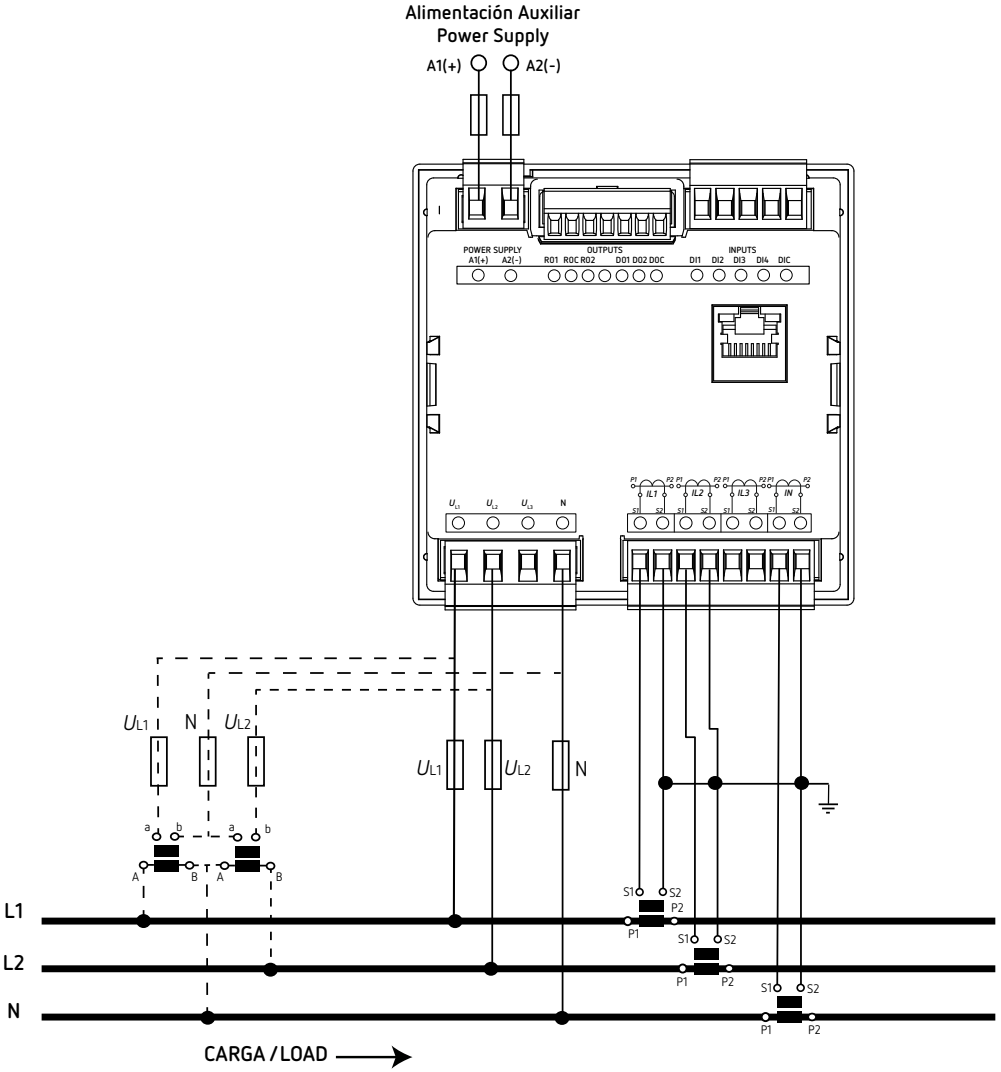


Figure 12: Measuring Two-Phase Networks with a 3-wire connection (CVM-B50-ITF).

3.5.11.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION, **CVM-B50-MC** MODEL

System type: 3-2PH

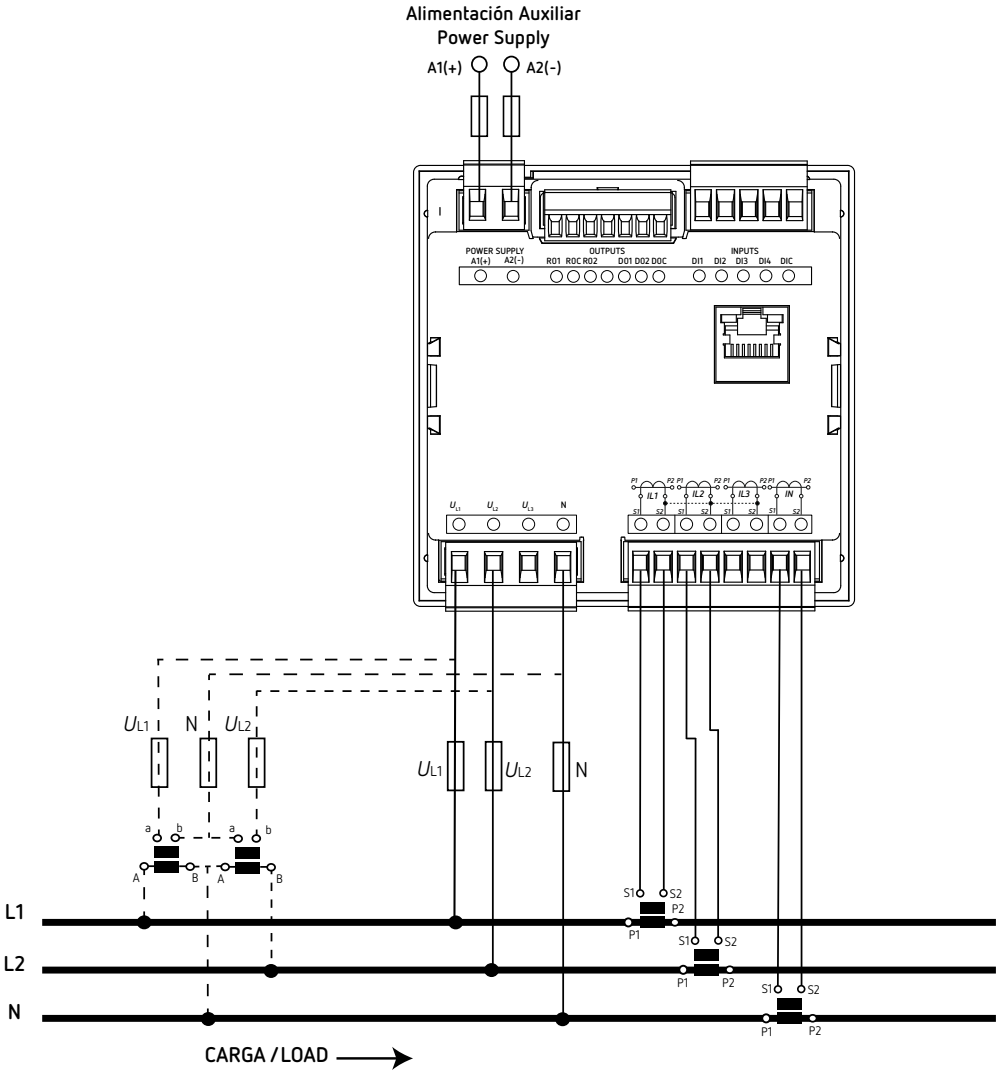


Figure 13: Measuring Two-Phase Networks with a 3-wire connection (CVM-B50-MC).

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

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

3.5.12.- MEASURING TWO-PHASE NETWORKS WITH A 3-WIRE CONNECTION, **CVM-B50-FLEX** MODEL

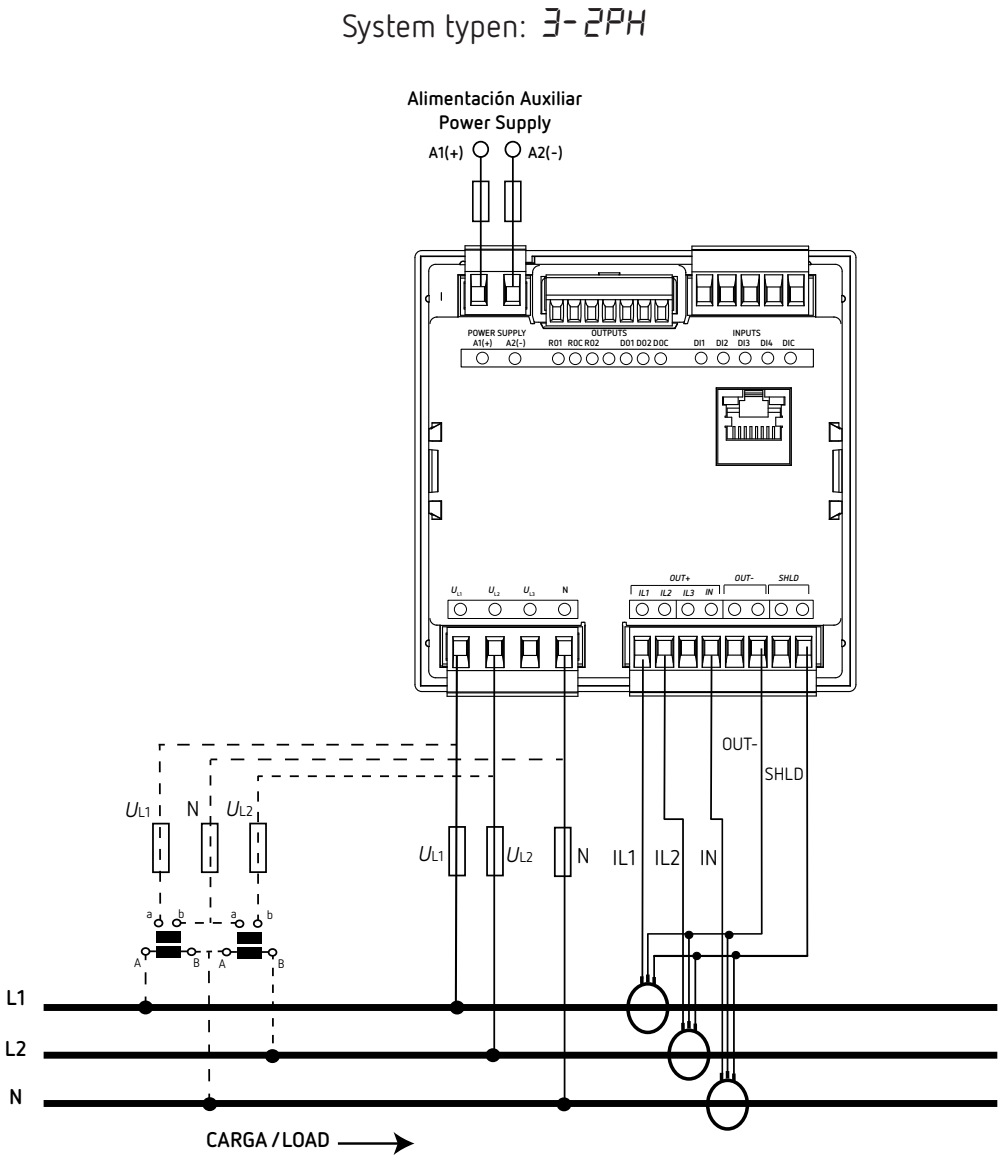


Figure 14: Measuring Two-Phase Networks with a 3-wire connection (CVM-B50-FLEX).

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

3.5.13.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION, **CVM-B50-ITF** MODEL

System type: 2-2PH

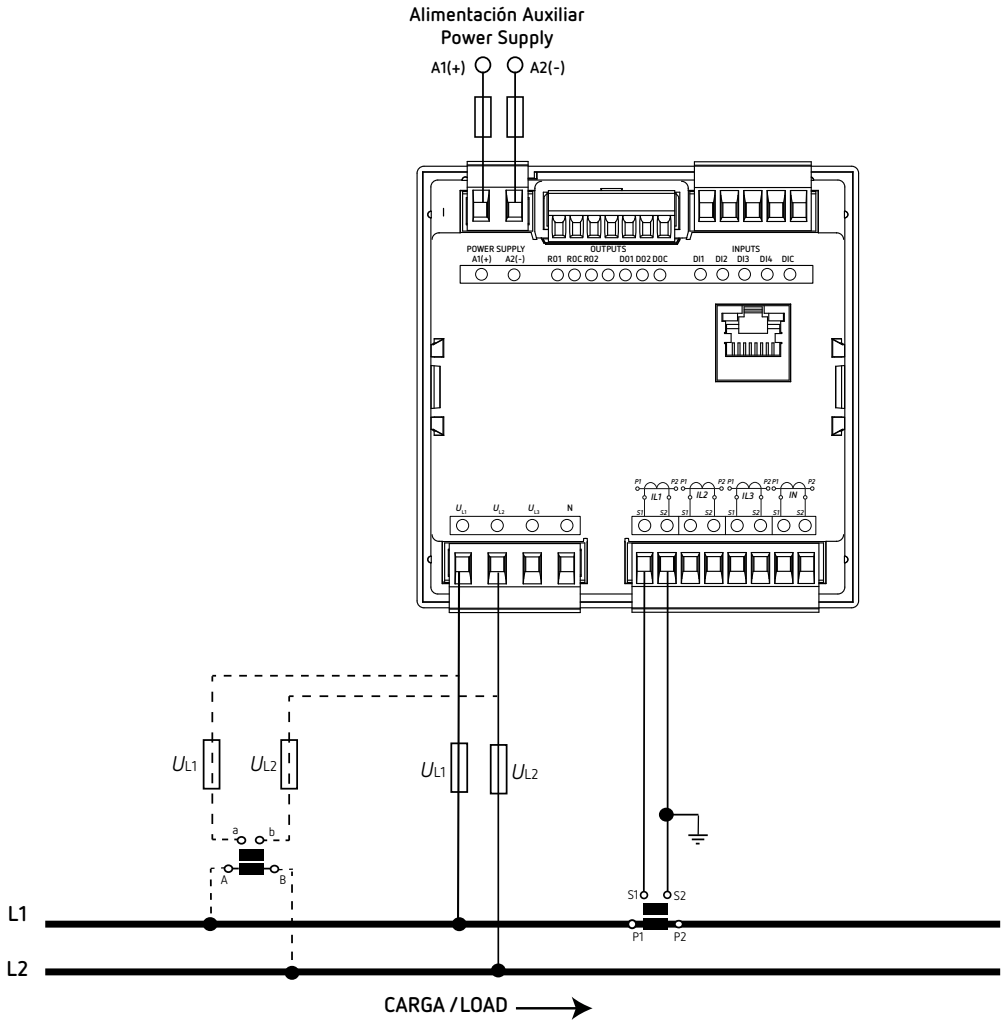


Figure 15: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection (CVM-B50-ITF).

3.5.14.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION, **CVM-B50-MC** MODEL

System type: 2-2PH

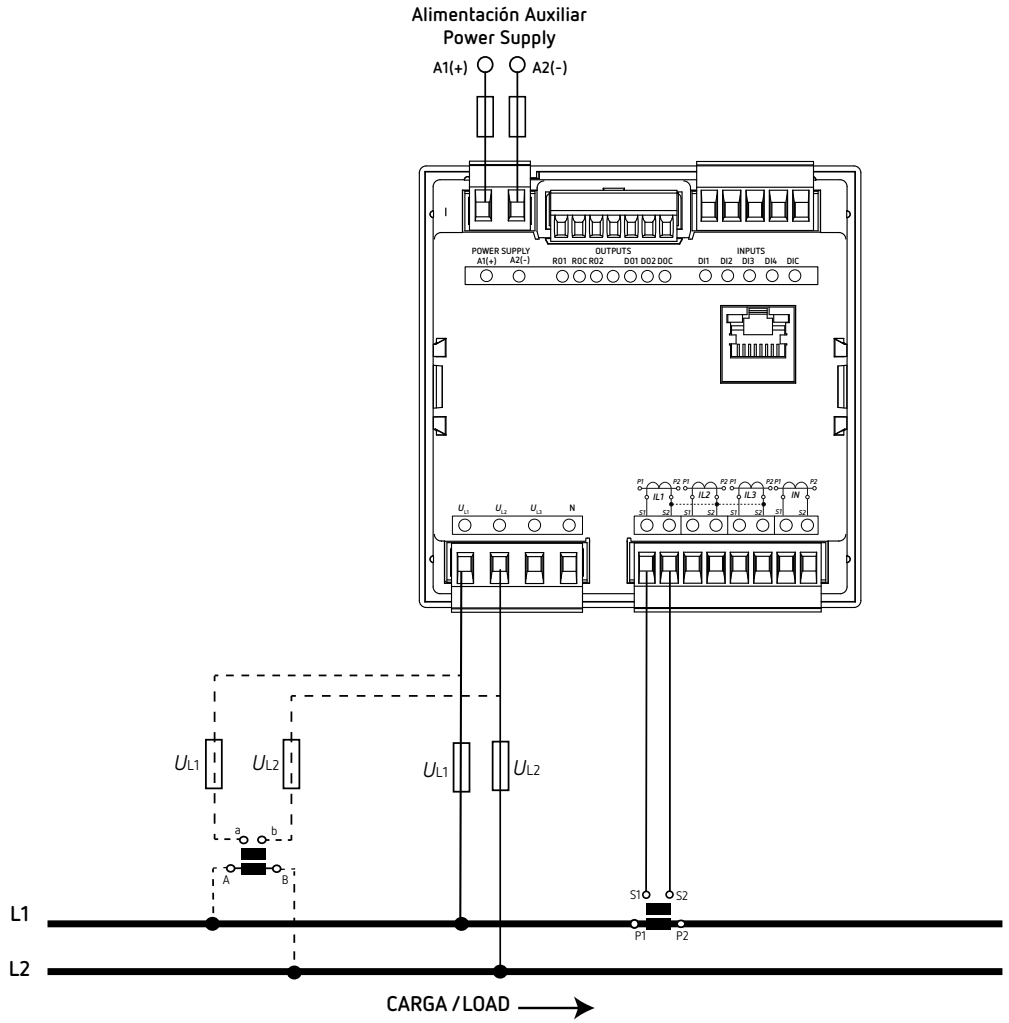


Figure 16: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection (CVM-B0-MC).

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

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

3.5.15.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO PHASE, WITH A 2-WIRE CONNECTION, **CVM-B50-FLEX** MODEL

System type: 2-2PH

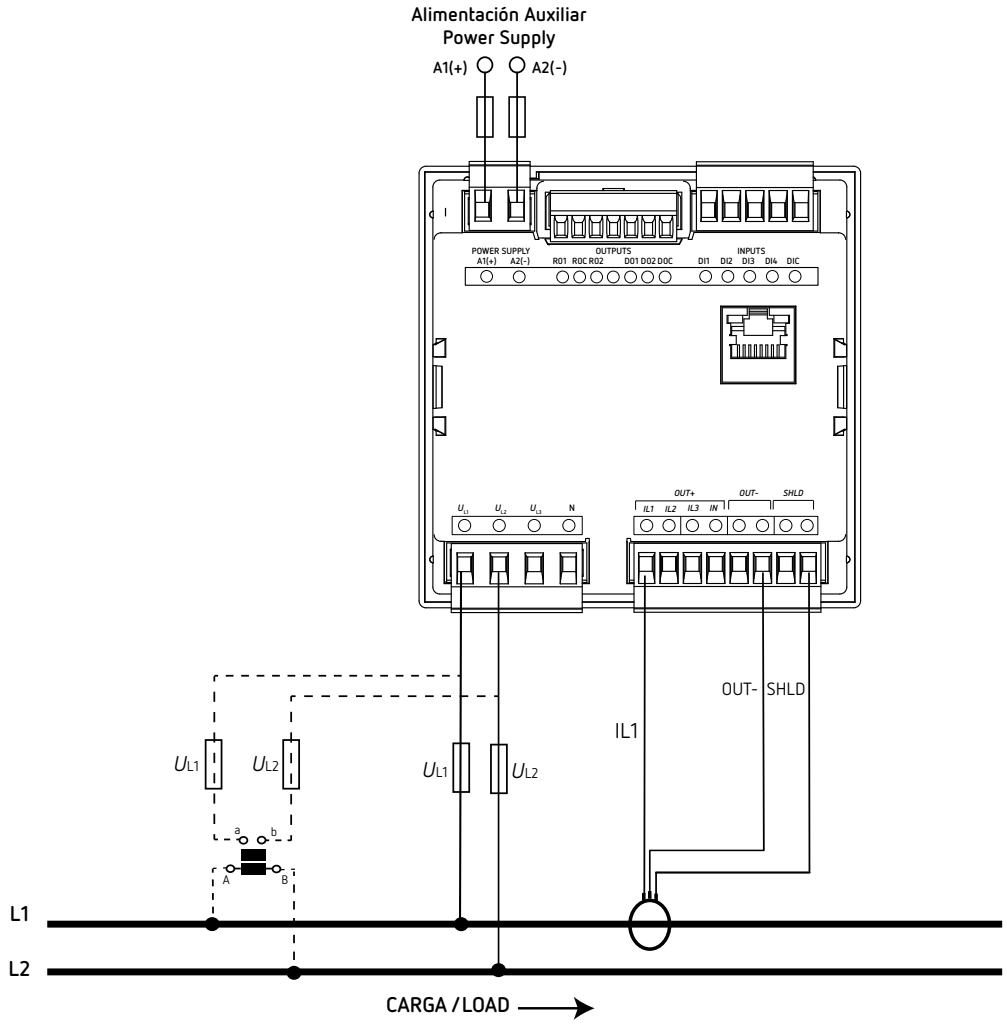


Figure 17: Measuring Single-Phase Networks, phase to phase, with a 2-wire connection (CVM-B50-FLEX).

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

3.5.16.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION, **CVM-B50-ITF** MODEL

System type: 2- 1PH

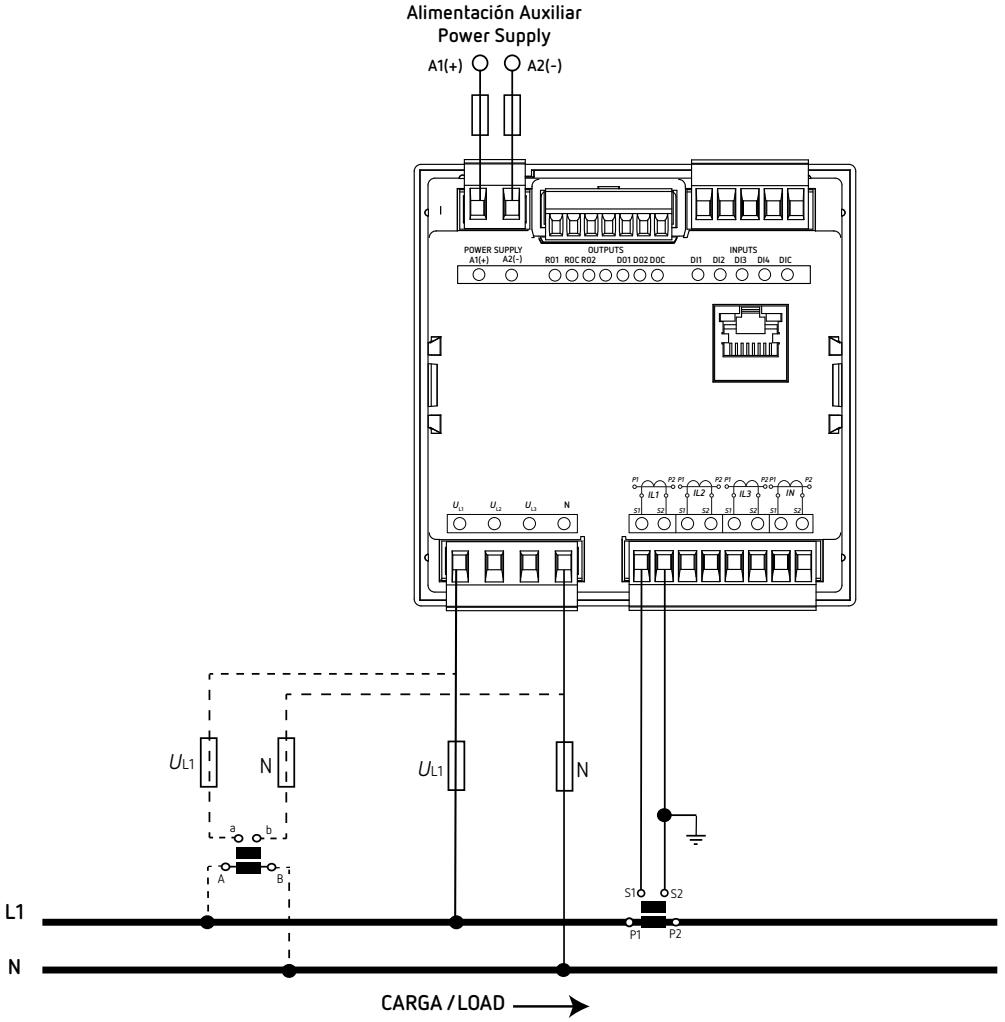


Figure 18: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection (CVM-B50-ITF).

3.5.17.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION, **CVM-B50-MC** MODEL

System type: 2- 1PH

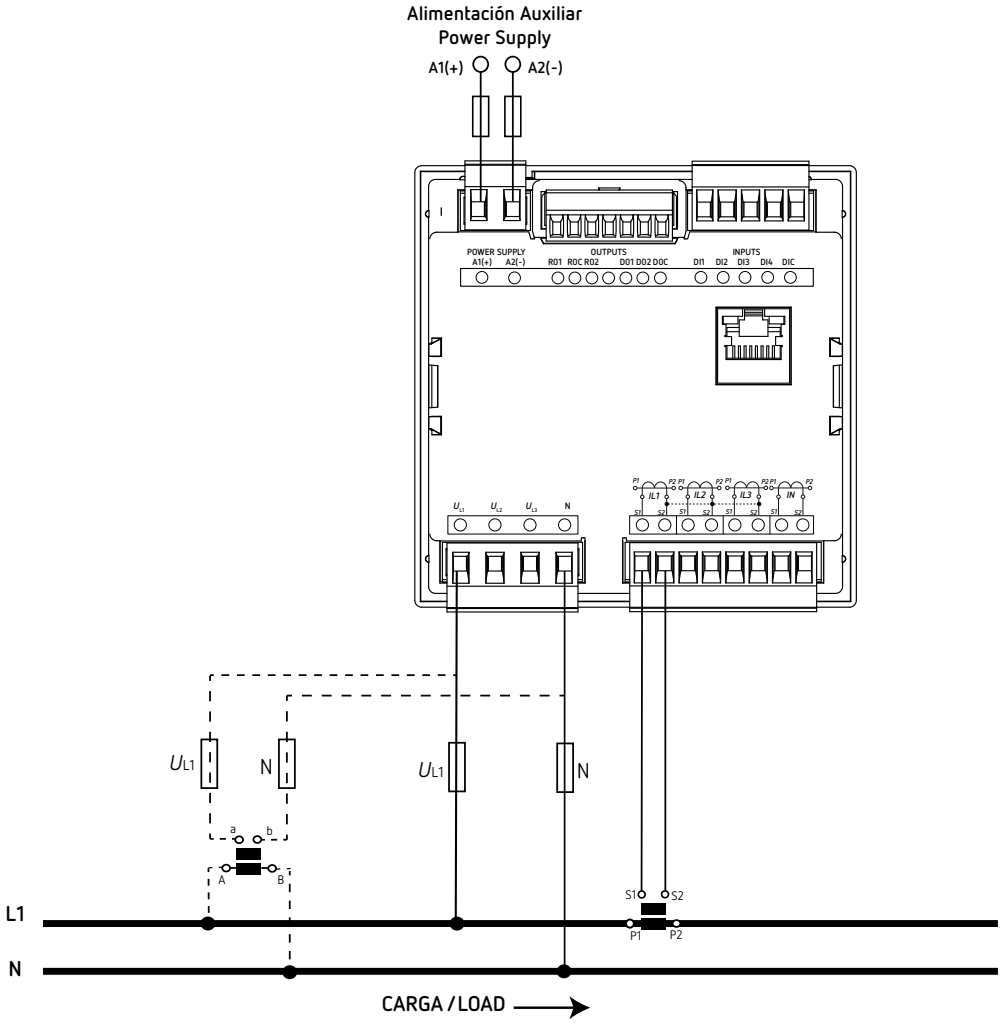


Figure 19: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection (CVM-B50-MC).

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

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

3.5.18.- MEASURING SINGLE-PHASE NETWORKS, PHASE TO NEUTRAL, WITH A 2-WIRE CONNECTION, **CVM-B50-FLEX** MODEL

TSystem type: 2- 1PH

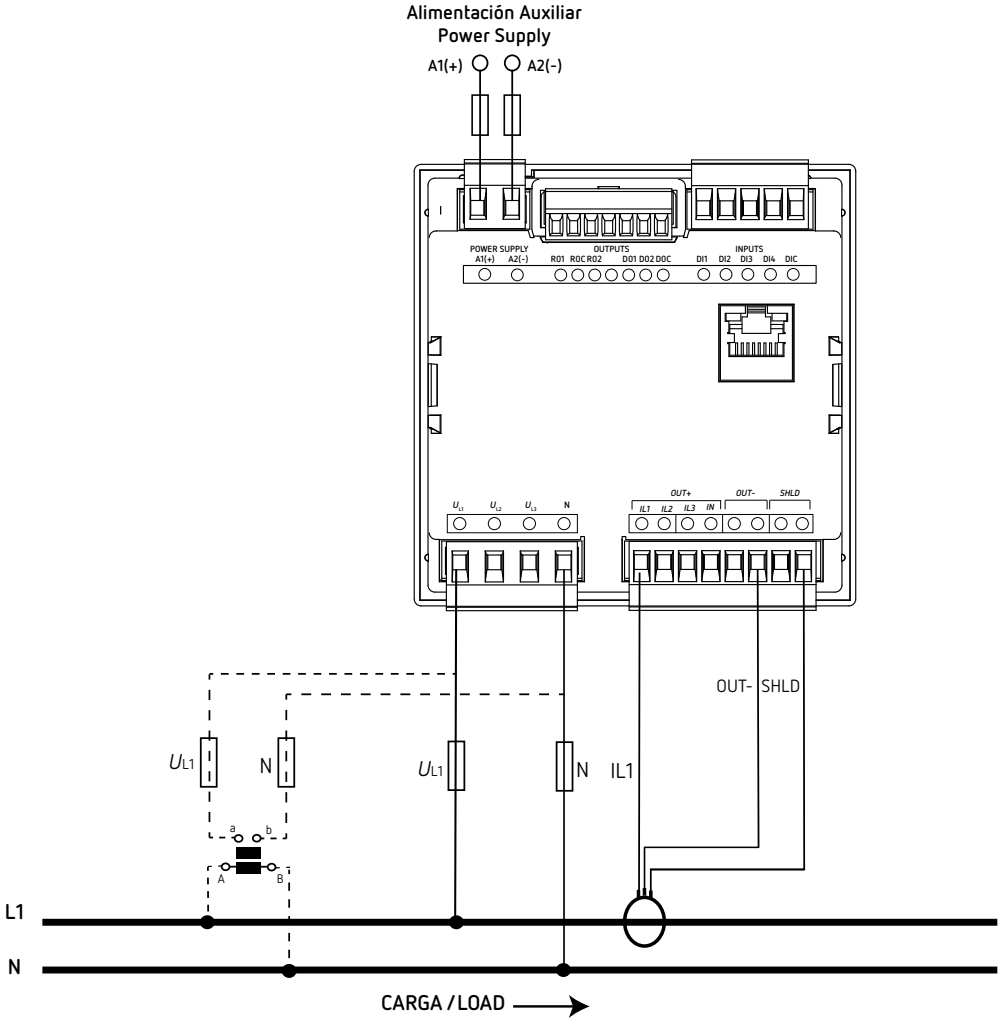


Figure 20: Measuring Single-Phase Networks, phase to neutral, with a 2-wire connection (CVM-B50-FLEX).

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

3.5.19.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE AND EARTH CONNECTION, **CVM-B50-ITF** MODEL

System type: 3-3I T

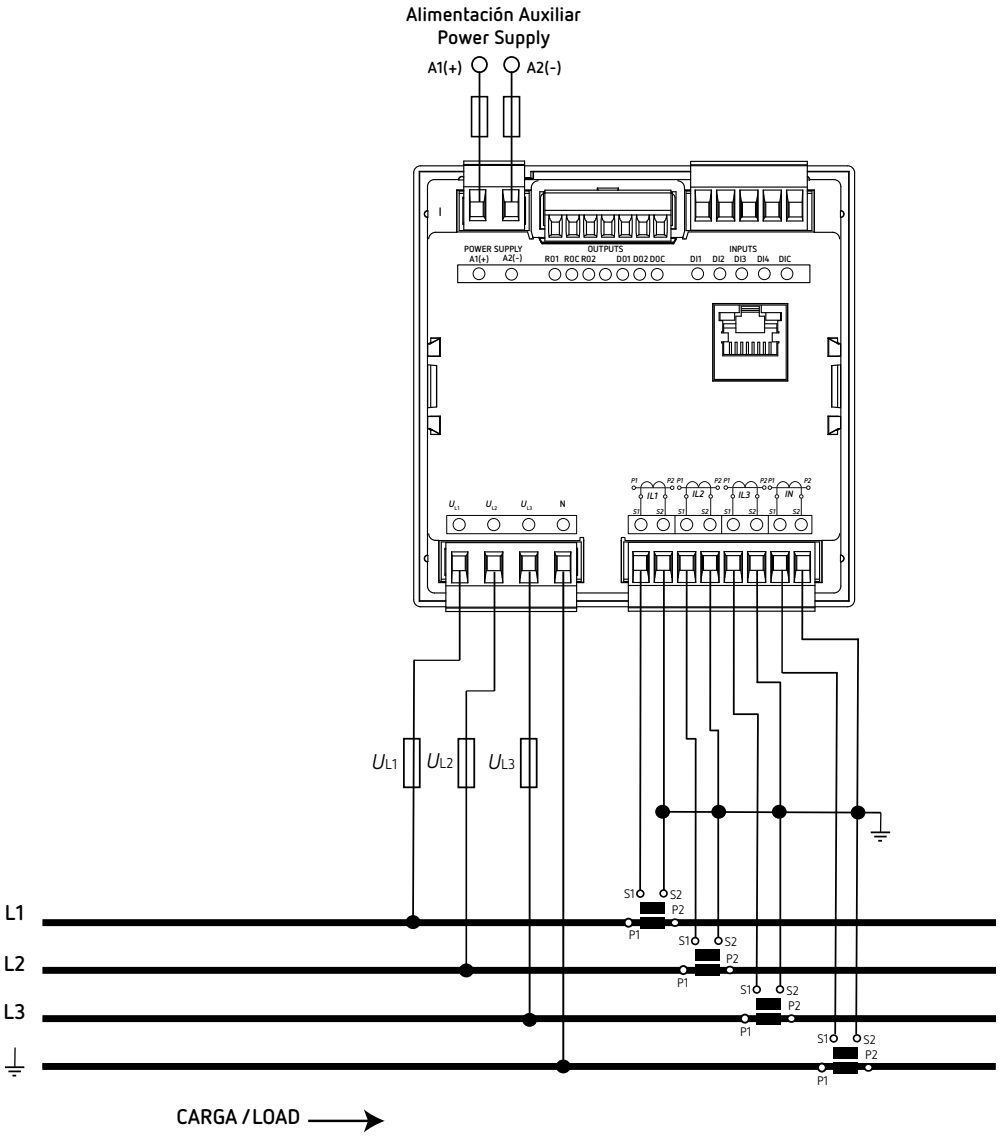


Figure 21: Measuring three-phase networks with a 3-wire and earth connection (CVM-B50-ITF).

3.5.20.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE AND EARTH CONNECTION, **CVM-B50-MC** MODEL

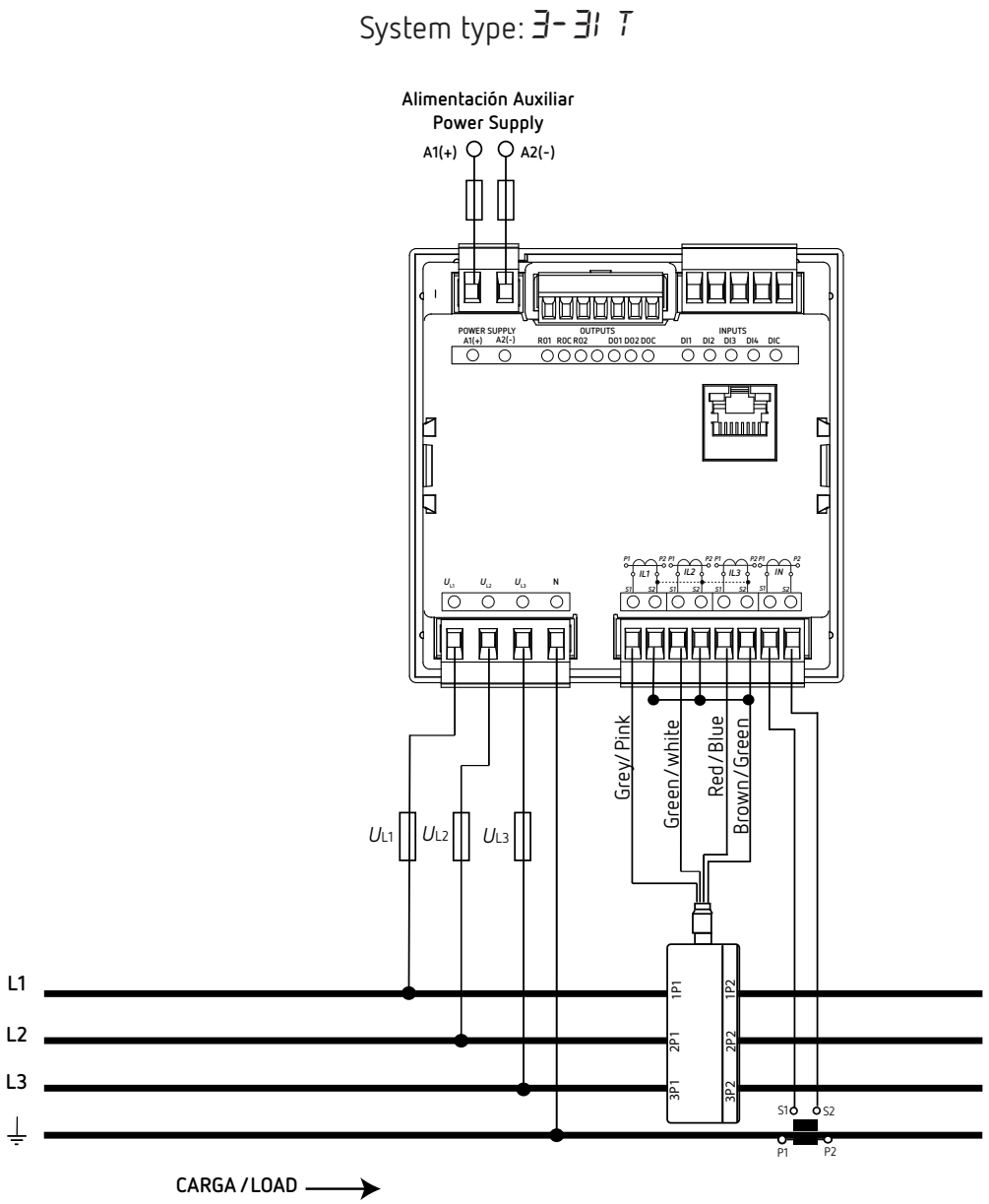


Figure 22: Measuring three-phase networks with a 3-wire and earth connection (CVM-B50-MC).

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

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

3.5.21.- MEASURING THREE-PHASE NETWORKS WITH A 3-WIRE AND EARTH CONNECTION, **CVM-B50-FLEX** MODEL

System type: 3-3I T

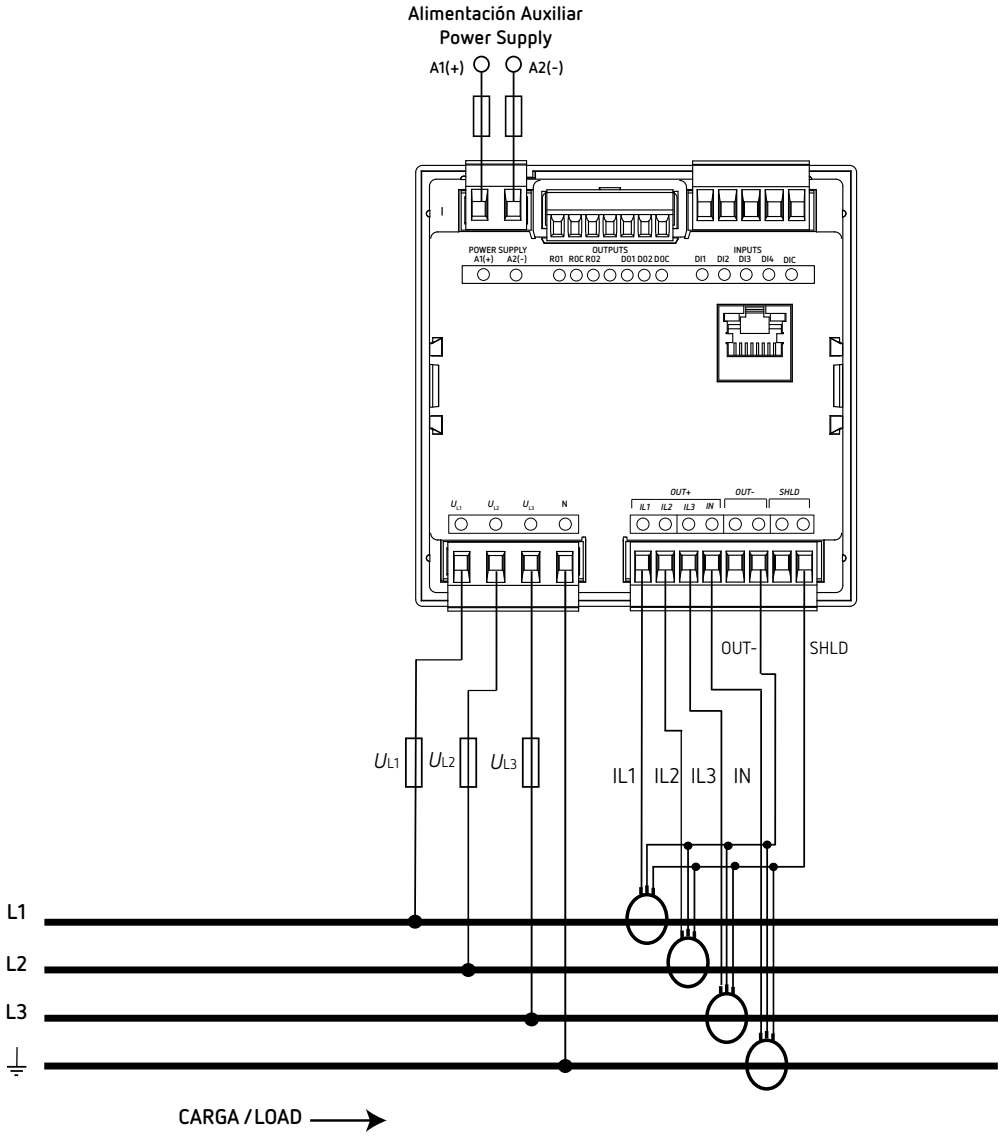


Figure 23: Measuring three-phase networks with a 3-wire and earth connection (CVM-B50-FLEX).

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

4.- OPERATION

4.1.- OPERATING PRINCIPLE

The **CVM-B50** is a four-quadrant power analyzer (consumption and generation).

The device can operate according to three different measurement conventions:

- ✓ **CIRCUTOR** measurement convention.
- ✓ **IEC 61557-12** measurement convention.
- ✓ **IEEE 1459** measurement convention.

The measurement convention is configured in the setup menu, see *"6.10.- QUADRANT RULE"*.

✓ **CIRCUTOR** measurement convention:

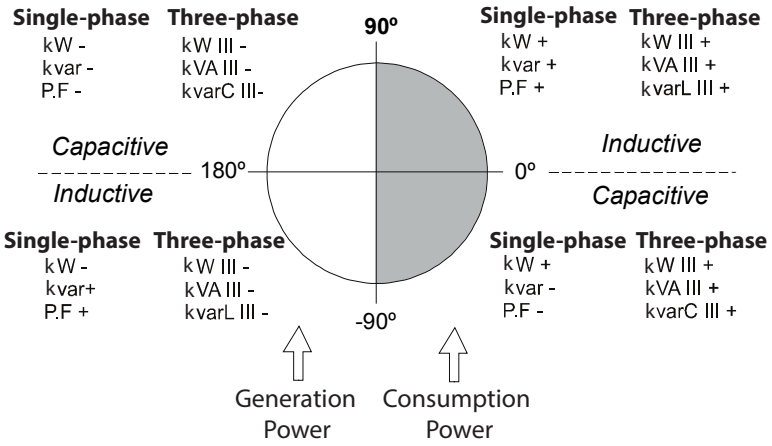
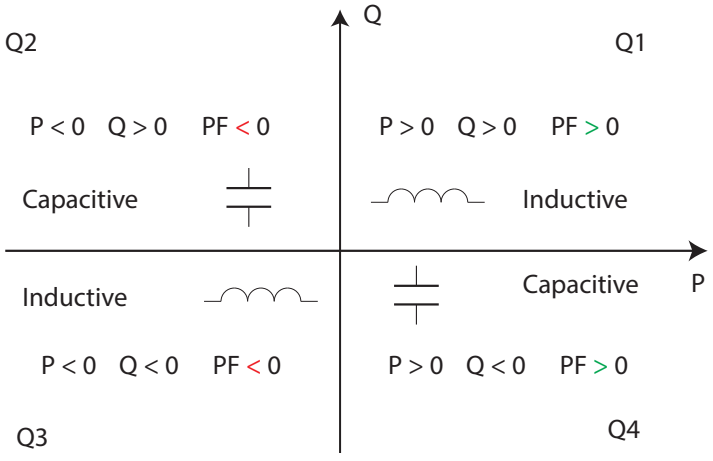


Figure 24: CIRCUTOR measurement convention.

✓ **IEC 61557-12** measurement convention:

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



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

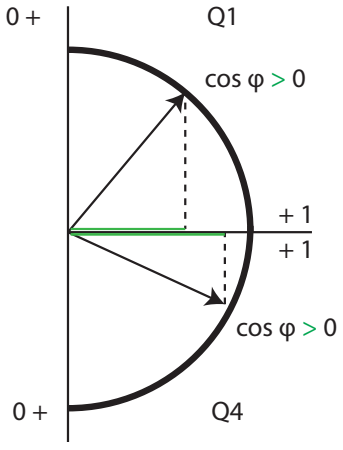
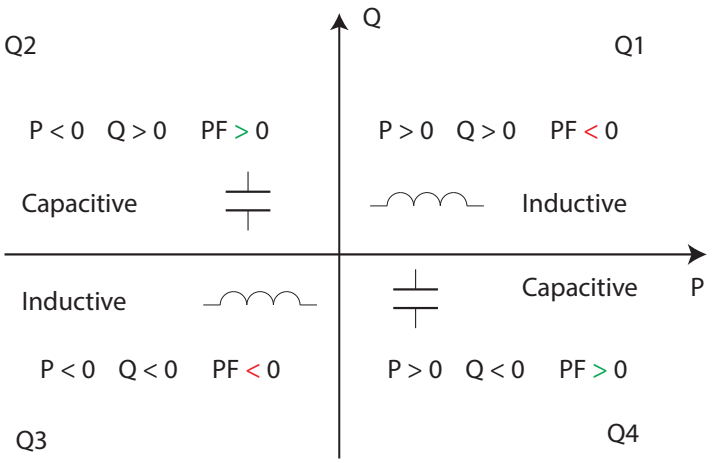


Figure 25: IEC 61557-12 measurement convention.

✓ **IEEE 1459** measurement convention:

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



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

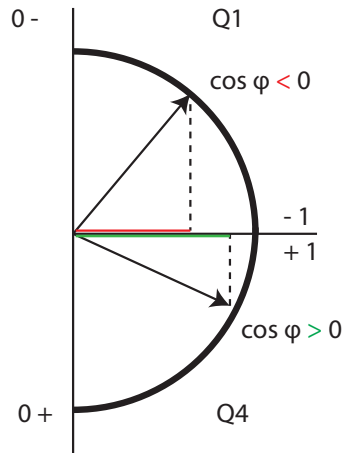


Figure 26: IEEE 1459 measurement convention.

4.2.- MEASURING PARAMETERS

The device displays the electrical parameters shown in the following tables.
Where: **III** = Three-phase, **∑ =** Total, **MAX =** Maximum value, **MIN =** Minimum value.

Table 6: Measuring parameters of the CVM-B50 (4-3PH installation).

Parameter	4-3PH									
	L1	L2	L3	N	L12	L23	L31	III	MAX	MIN
Voltage	✓	✓	✓	-	✓	✓	✓	✓	✓	✓
THD Voltage	✓	✓	✓	-	-	-	-	-	✓	✓
Voltage harmonics	✓	✓	✓	-	-	-	-	-	✓	✓
Current	✓	✓	✓	✓	-	-	-	✓	✓	✓
THD Current	✓	✓	✓	-	-	-	-	-	✓	✓
Current harmonics	✓	✓	✓	-	-	-	-	-	✓	✓
Frequency	✓	-	-	-	-	-	-	-	✓	✓
Active power	✓	✓	✓	-	-	-	-	✓	✓	✓
Apparent power	✓	✓	✓	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Consumption)	✓	✓	✓	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Generation)	✓	✓	✓	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Consumption)	✓	✓	✓	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Generation)	✓	✓	✓	-	-	-	-	✓	✓	✓
Cos φ	✓	✓	✓	-	-	-	-	✓	✓	✓
Power factor	✓	✓	✓	-	-	-	-	✓	✓	✓
Maximum Current Demand	✓	✓	✓	-	-	-	-	✓	✓	-
Maximum Demand of Active power	-	-	-	-	-	-	-	✓	✓	-
Maximum Demand of Apparent Power	-	-	-	-	-	-	-	✓	✓	-
Maximum Demand of inductive Reactive Power	-	-	-	-	-	-	-	✓	✓	-
Maximum Demand of capacitive Reactive Power	-	-	-	-	-	-	-	✓	✓	-

Table 7: Measuring parameters of the CVM-B50 (3-3PH installation).

Parameter	3-3PH								
	L1	L2	L3	L12	L23	L31	III	MAX	MIN
Voltage	-	-	-	✓	✓	✓	✓	✓	✓
Current	✓	✓	✓	-	-	-	✓	✓	✓
Frequency	✓	-	-	-	-	-	-	✓	✓
Active power	-	-	-	-	-	-	✓	✓	✓
Apparent power	-	-	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Consumption)	-	-	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Generation)	-	-	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Consumption)	-	-	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Generation)	-	-	-	-	-	-	✓	✓	✓
Maximum Current Demand	✓	✓	✓	-	-	-	✓	✓	-
Maximum Demand of Active power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of Apparent Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of inductive Reactive Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of capacitive Reactive Power	-	-	-	-	-	-	✓	✓	-

Table 8: Measuring parameters of the CVM-B50 (3ARON installation).

Parameter	3ARON								
	L1	L2	L3	L12	L23	L31	III	MAX	MIN
Voltage	-	-	-	✓	✓	✓	✓	✓	✓
Current	✓	✓	✓	-	-	-	✓	✓	✓
Frequency	✓	-	-	-	-	-	-	✓	✓
Active power	-	-	-	-	-	-	✓	✓	✓
Apparent power	-	-	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Consumption)	-	-	-	-	-	-	✓	✓	✓
Inductive Reactive Power (Generation)	-	-	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Consumption)	-	-	-	-	-	-	✓	✓	✓
Capacitive Reactive Power (Generation)	-	-	-	-	-	-	✓	✓	✓
Maximum Current Demand	✓	✓	✓	-	-	-	✓	✓	-
Maximum Demand of Active power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of Apparent Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of inductive Reactive Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of capacitive Reactive Power	-	-	-	-	-	-	✓	✓	-

Table 9: Measuring parameters of the CVM-B50 (3-2PH installation).

Parameter	3-2PH						
	L1	L2	N	L12	III	MAX	MIN
Voltage	✓	✓	-	✓	-	✓	✓
THD Voltage	✓	✓	-	-	-	-	-
Voltage harmonics	✓	✓	-	-	-	-	-
Current	✓	✓	✓	-	✓	✓	✓
THD Current	✓	✓	-	-	-	-	-

Table 9 (Continued): Measuring parameters of the CVM-B50 (3-2PH installation).

Parameter	3-2PH						
	L1	L2	N	L12	III	MAX	MIN
Current harmonics	✓	✓	-	-	-	-	-
Frequency	✓	✓	-	-	-	✓	✓
Active power	✓	✓	-	-	✓	✓	✓
Apparent power	✓	✓	-	-	✓	✓	✓
Inductive Reactive Power (Consumption)	✓	✓	-	-	✓	✓	✓
Inductive Reactive Power (Generation)	✓	✓	-	-	✓	✓	✓
Capacitive Reactive Power (Consumption)	✓	✓	-	-	✓	✓	✓
Capacitive Reactive Power (Generation)	✓	✓	-	-	✓	✓	✓
Cos φ	✓	✓	-	-	✓	✓	✓
Power factor	✓	✓	-	-	✓	✓	✓
Maximum Current Demand	✓	✓	-	-	✓	✓	-
Maximum Demand of Active power	-	-	-	-	✓	✓	-
Maximum Demand of Apparent Power	-	-	-	-	✓	✓	-
Maximum Demand of inductive Reactive Power	-	-	-	-	✓	✓	-
Maximum Demand of capacitive Reactive Power	-	-	-	-	✓	✓	-

Table 10: Measuring parameters of the CVM-B50 (2-2PH installation).

Parameter	2-2PH			
	L1	L12	MAX	MIN
Voltage	-	✓	✓	✓
THD Voltage	✓	-	-	-
Voltage harmonics	✓	-	-	-
Current	✓	-	✓	✓
THD Current	✓	-	-	-
Current harmonics	✓	-	-	-
Frequency	✓	-	✓	✓
Active power	✓	-	✓	✓
Apparent power	✓	-	✓	✓
Inductive Reactive Power (Consumption)	✓	-	✓	✓
Inductive Reactive Power (Generation)	✓	-	✓	✓
Capacitive Reactive Power (Consumption)	✓	-	✓	✓
Capacitive Reactive Power (Generation)	✓	-	✓	✓
Cos φ	✓	-	✓	✓
Power factor	✓	-	✓	✓
Maximum Current Demand	✓	-	✓	-

Table 11: Measuring parameters of the CVM-B50 (2-1PH installation).

Parameter	2-1PH			
	L1	N	MAX	MIN
Voltage	✓	-	✓	✓
THD Voltage	✓	-	-	-
Voltage harmonics	✓	-	-	-
Current	✓	✓	✓	✓
THD Current	✓	-	-	-
Current harmonics	✓	-	-	-
Frequency	✓	-	✓	✓
Active power	✓	-	✓	✓
Apparent power	✓	-	✓	✓
Inductive Reactive Power (Consumption)	✓	-	✓	✓
Inductive Reactive Power (Generation)	✓	-	✓	✓
Capacitive Reactive Power (Consumption)	✓	-	✓	✓
Capacitive Reactive Power (Generation)	✓	-	✓	✓
Cos φ	✓	-	✓	✓
Power factor	✓	-	✓	✓
Maximum Current Demand	✓	-	✓	-

Table 12: Measuring parameters of the CVM-B50 (3-3IT installation).

Parameter	3-3IT								
	L1	L2	L3	L12	L23	L31	III	MAX	MIN
Voltage	✓	✓	✓	✓	✓	✓	✓	✓	✓
THD Voltage	✓	✓	✓	-	-	-	-	-	-
Voltage harmonics	✓	✓	✓	-	-	-	-	-	-
Current	✓	✓	✓	-	-	-	✓	✓	✓
THD Current	✓	✓	✓	-	-	-	-	-	-
Current harmonics	✓	✓	✓	-	-	-	-	-	-
Frequency	✓	-	-	-	-	-	-	✓	✓
Active power	✓	✓	✓	-	-	-	✓	✓	✓
Apparent power	✓	✓	✓	-	-	-	✓	✓	✓
Inductive Reactive Power (Consumption)	✓	✓	✓	-	-	-	✓	✓	✓
Inductive Reactive Power (Generation)	✓	✓	✓	-	-	-	✓	✓	✓
Capacitive Reactive Power (Consumption)	✓	✓	✓	-	-	-	✓	✓	✓
Capacitive Reactive Power (Generation)	✓	✓	✓	-	-	-	✓	✓	✓
Cos φ	-	-	-	-	-	-	✓	✓	✓
Power factor	-	-	-	-	-	-	✓	✓	✓
Maximum Current Demand	✓	✓	✓	-	-	-	-	✓	-
Maximum Demand of Active power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of Apparent Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of inductive Reactive Power	-	-	-	-	-	-	✓	✓	-
Maximum Demand of capacitive Reactive Power	-	-	-	-	-	-	✓	✓	-

Table 13: Measuring parameters of the CVM-B50 (Global).

Parameter	T1	T2	T3	∑
Active Energy (Consumption)	✓	✓	✓	✓
Active Energy (Generation)	✓	✓	✓	✓
Apparent Energy (Consumption)	✓	✓	✓	✓
Apparent Energy (Generation)	✓	✓	✓	✓
Inductive Reactive Energy (Consumption)	✓	✓	✓	✓
Inductive Reactive Energy (Generation)	✓	✓	✓	✓
Capacitive Reactive Energy (Consumption)	✓	✓	✓	✓
Capacitive Reactive Energy (Generation)	✓	✓	✓	✓
Cost (Consumption)	✓	✓	✓	✓
Cost (Generation)	✓	✓	✓	✓
CO_2 Emissions (Consumption)	✓	✓	✓	✓
CO_2 Emissions (Generation)	✓	✓	✓	✓
No. of hours	✓	✓	✓	✓

4.2.1.- THD CALCULATION

The device can calculate the Total Harmonic Distortion (**THD**) using the fundamental component of the signal (**THD**) or the effective component (RMS) (**thd**).

The equations for the calculation of the Total Harmonic Distortion of Voltage are:

$$THD = \sqrt{\sum_{n=2}^{32}\left(\frac{V_n}{V_1}\right)^2}$$

Where $\mathbf{V_1}$ **=** is the fundamental component.

$$thd = \sqrt{\sum_{n=2}^{32}\left(\frac{V_n}{V_{RMS}}\right)^2}$$

Where $\mathbf{V_{RMS}}$ **=** is the effective component (RMS).

The calculation method to be used by the device is selected in the configuration menu, see ***"6.15.- THD CALCULATION"*** or ***"8.3.2.1.- Connection".***

4.2.2.- MAXIMUM DEMAND

The maximum demand is the average instantaneous measurement over a specific time interval, usually 15 minutes. There are several ways to calculate this parameter:

Fixed Window (by block)

This is the calculation of maximum demand in a specific interval (normally the integration period = 15 minutes). Once the number is calculated, the value is saved and a new calculation for the next 15 minutes begins. The result would be 4 values per hour, **Figure 27**.

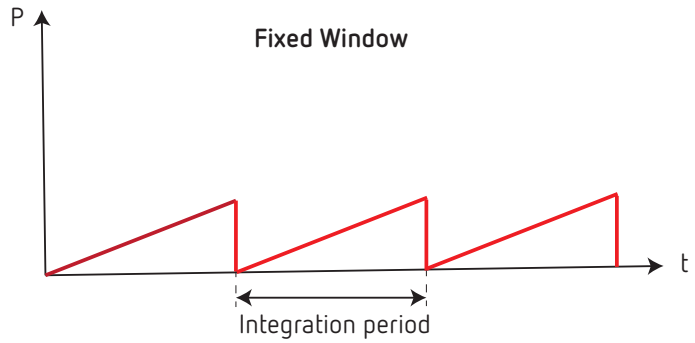


Figure 27:Fixed window.

Sliding window

This is the calculation of maximum demand in a specific interval (usually the integration period = 15 minutes). Once the number is calculated, it is refreshed every minute with the values from the last 15 minutes. In other words, every minute (this time can be variable) we will have a maximum demand number for the last 15 minutes, **Figure 28**.

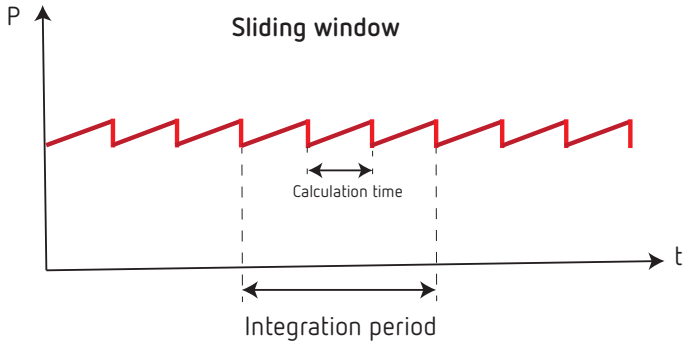


Figure 28:Sliding window.

The **CVM-B50** calculates the maximum demand of the following:

- ✓ Current of the L1, L2, L3 and three-phase.
- ✓ Three-phase Active Power consumed.
- ✓ Three-phase Apparent Power consumed.
- ✓ Three-phase Inductive Reactive Power consumed.
- ✓ Three-phase Capacitive Reactive Power consumed.

In the configuration menu, the type of integration is selected, ***"6.12.- MAXIMUM DEMAND INTEGRATION WINDOW"*** and the integration period of the maximum demand ***"6.13.- MAXIMUM DEMAND INTEGRATION PERIOD"***.
It can also be configured on the website, see ***"8.3.2.1.- Connection"***.

4.3.- DISPLAY

The device has a backlit LCD display showing all the parameters listed in **Table 6** ... **Table 13**.

The display is divided into two (**Figure 29**):

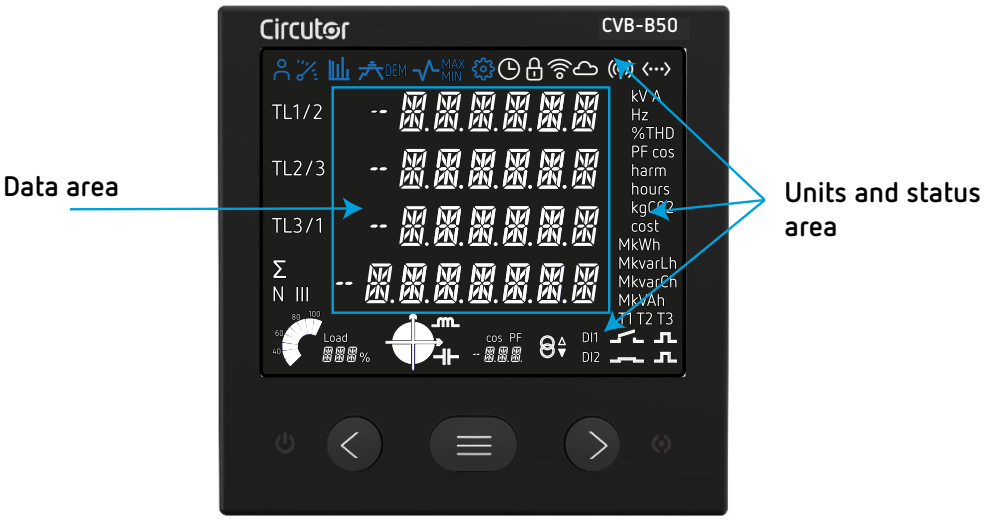


Figure 29: CVM-B50 C11 Display.

✓ The **data** area, which displays all the values measured by the device.
✓The **units and status** area, which displays the different statuses, units and device information (**Tabla 14**).

Table 14:Display icons.

Icon	Description	Icon	Description
	User profile.		Instantaneous value
	Energy value.	DEM	Maximum demand value
MAX	Maximum value.	MIN	Minimum value.
	Configuration menu.		Device connected to the Wi-Fi network. **Flashing:** IP not assigned. **Steady**: IP assigned.
	Password-protected configuration menu.		
	Device connected to **Scout**. **Flashing:** Data transmission.		Access Point enabled. **Flashing:** Devices connected. **Steady:** No devices connected.
	Ethernet connection. **Flashing**: Device connecting. **Steady**: Device connected.	**T1, T2, T3**	Active tariff.
	Digital output connected.		Relay disconnected.
	Relay connected		Consumption.
	Generation.	cos PF	cos φ or Power Factor (PF) of the installation.
	Quadrant in which the device is working.	Load %	Analogue bar showing the % of the current power of the installation.

4.3.1.- cos φ - PF (POWER FACTOR)

Figure 30: Cos φ - PF

This icon displays, in real time, the **cos φ** or **Power Factor (PF)** value of the installation.
The parameter to be displayed is selected through the programming menu (*"6.19.- DISPLAY SELECTION cos φ - PF"*).

4.3.2.- ANALOGUE BAR

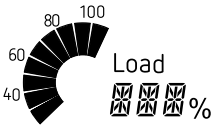


Figure 31: Analogue Bar.

The **current power of the installation** in % is displayed on the analog bar. When the value exceeds 110% the analog bar flashes. And if the value exceeds 999% *-HI* is displayed.

The device calculates the current power of the installation using the formula:

$$P = V*I*\cos(\varphi)$$

Where the **voltage** and the **cos(φ)** are the installation's current values.
The **current** is referenced in its full scale. (100% is the full scale of the device and a value above 100% indicates that it is out of range).

4.4.- KEYBOARD FUNCTIONS

The **CVM-B50** has 3 keys that allow you to browse between the various screens and program the device, **Figure 32**.

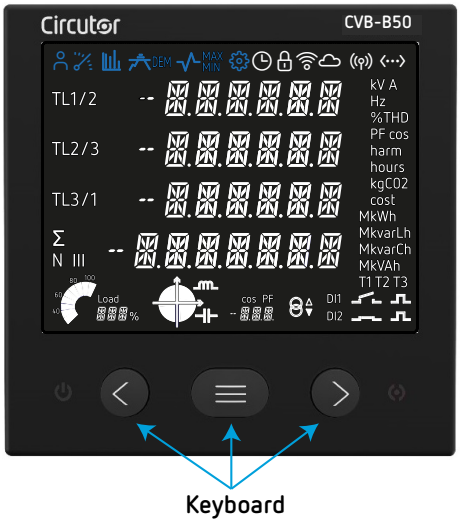


Figure 32: CVM-B50 keyboard.

Key functions on measuring screens (**Table 15**):

Table 15: Key functions on measuring screens.

Key	Short keystroke	Long keystroke (3 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.
	-	Enter/Exit the Ethernet communications configuration menu.

Key functions on harmonics screens (**Table 16**):

Table 16: Key functions on harmonics screens.

Key	Short keystroke	Long keystroke (3 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 17**):

Table 17: Key functions on the programming menu, query mode.

Key	Short keystroke	Long keystroke (3 s)
	Previous screen.	Exit the configuration menu.
	Next screen.	Exit the configuration menu.
	Configuration menu shortcut	Enter the configuration menu in edit mode.

Key functions on the programming menu, edit mode (**Table 18**):

Table 18: Key functions on the programming menu, edit mode.

Key	Keystroke
	Moves an editable digit (flashing).
	Increments the digits (0-9) or cyclically switches between the different options.
	Moves an editable digit (flashing).

4.5.- LED INDICATORS

The **CVM-B50** device has 2 LEDs, **Figure 33**:

- **ON**, white color, indicates that the device is on, flashing each second.
- **ALARM**, Red colour, if illuminated, it indicates an internal error in the device.

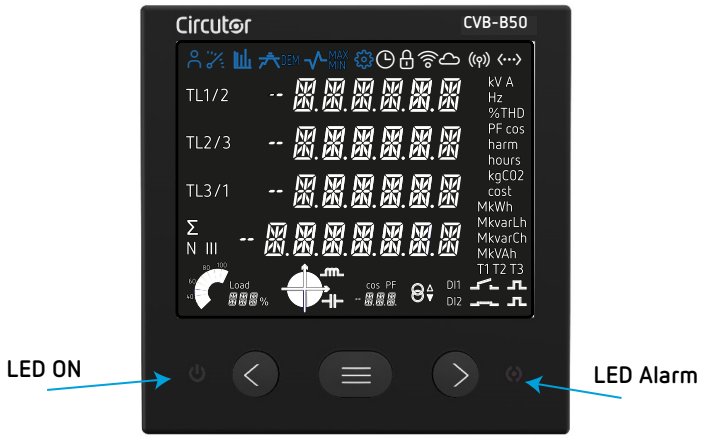


Figure 33: LED Indicators of the CVM-B50.

4.6.- RO1 AND RO2 RELAY OUTPUTS

The **CVM-B50** features 2 relay outputs, **RO1** and **RO2** (terminals 3, 4 and 5 in **Figure 1**) fully programmable via the display (***"6.27.- RELAY OUTPUT 1 PROGRAMMING"*** and ***"6.28.- RELAY OUTPUT 2 PROGRAMMING"***) or via the website (***"8.2.2.- DIGITAL OUTPUTS"***) (**Figure 34**).

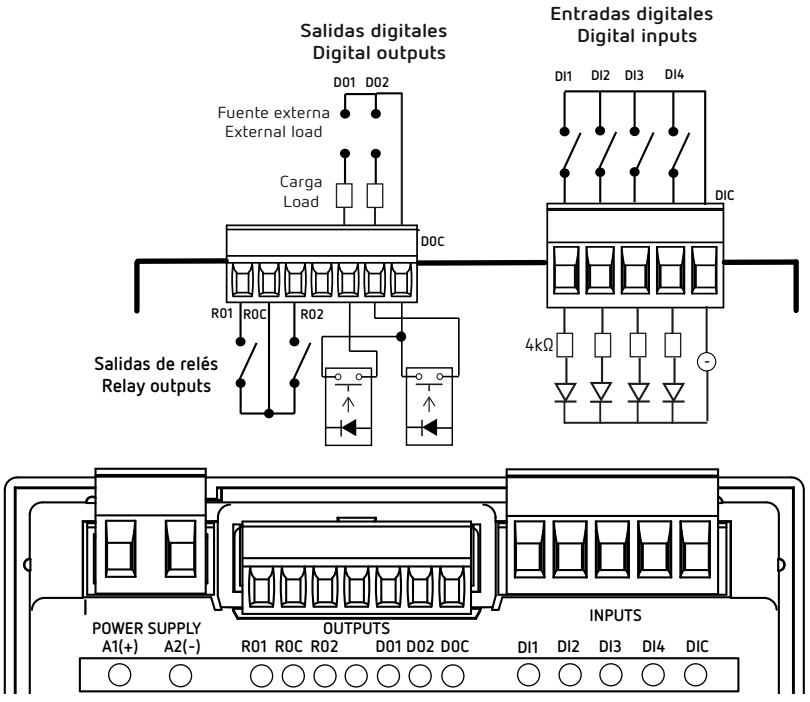


Figure 34:Relay outputs, Digital outputs and Digital inputs.

4.7.- DIGITAL INPUTS DI1, DI2, DI3 AND DI4

The **CVM-B50** features 4 digital inputs, **DI1**, **DI2**, **DI3** and **DI4** (terminals 9 ... 13 in **Figure 1**) programmable to operate as a logic input, pulse counter, tariff selection input (**Figure 34**) or to generate a synchronisation pulse for maximum demand calculation.

The operating mode of the inputs is configured on the display (***"6.31.- DIGITAL INPUT 1 OPERATING MODE", "6.32.- DIGITAL INPUT 2 OPERATING MODE", "6.33.- DIGITAL INPUT 3 OPERATING MODE"*** and ***"6.34.- DIGITAL INPUT 4 OPERATING MODE"***) or via the website (***"8.2.1.- DIGITAL INPUTS"***).

Depending on the status of the inputs, the selected tariff can be determined according to **Table 19**.

Table 19: Selecting the tariff in accordance with the input status.

DI1			DI2			Tariff
Pulse counter	Logic input	Tariff selection	Pulse counter	Logic input	Tariff selection	
x			x			T1
x				x		T1
	x		x			T1
	x			x		T1
x					0	T1
	x				0	T1
x					1	T3
	x				1	T3
		0		x		T1
		0	x			T1
		1		x		T2
		1	x			T2
		0			0	T1
		0			1	T3
		1			0	T2
		1			1	T1

4.8.-DIGITAL OUTPUTS DO1 AND DO2

The **CVM-B50** features 2 NPN transistor outputs (terminals 6, 7 and 8 in **Figure 1**) fully programmable via the display (***"6.29.-DIGITAL OUTPUT 1 PROGRAMMING"*** and ***"6.30.- DIGITAL OUTPUT 2 PROGRAMMING"***) or via the website (***"8.2.2.- DIGITAL OUTPUT"***) (**Figure 34**).

5.- DISPLAY

The **CVM-B50** features three display menus, see **Figure 35**.

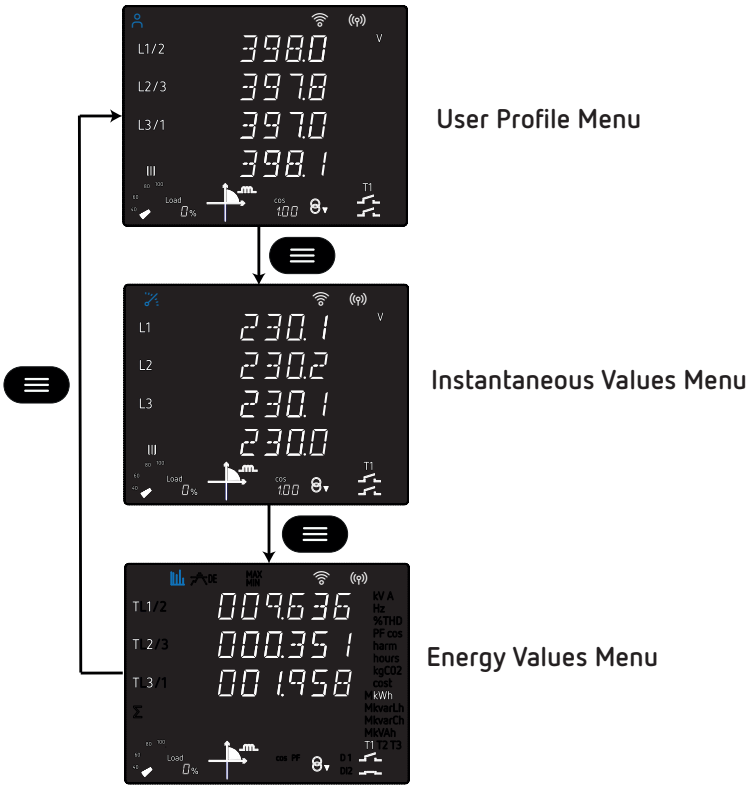


Figure 35:Display menu.

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 ***"6.16.- USER PROFILE DISPLAY"*.**

The screens selected in the programming menu (***"6.17.- USER PROFILE SCREENS"***) are displayed in the **User profile** menu.

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

To move through the different screens, use the and keys.

The symbol at the top of the screen indicates that the values being displayed correspond to the user profile.

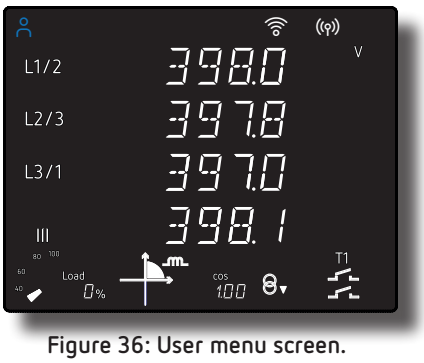


Figure 36: User menu screen.

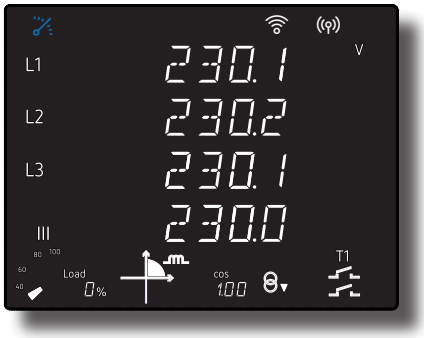
5.2.- INSTANTANEOUS VALUES MENU

The **Instantaneous Values** menu of the device displays 13 different screens and the voltage and current harmonics, up to the 31st harmonic, for each of the lines L1, L2 and L3 (***"5.4.- HARMONICS"***).

To move through the different screens, use the ◀ and ▶ keys.

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

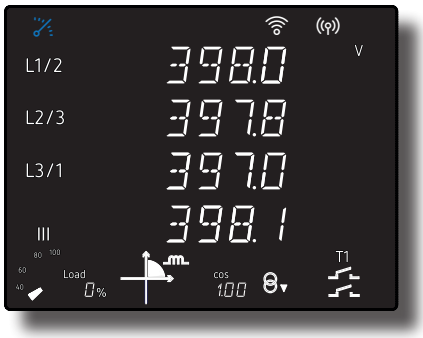
Note: *Some variables are not available depending on the installation type.*



Phase-neutral Voltage L1
Phase-neutral Voltage L2
Phase-neutral Voltage L3
Phase-neutral Voltage III

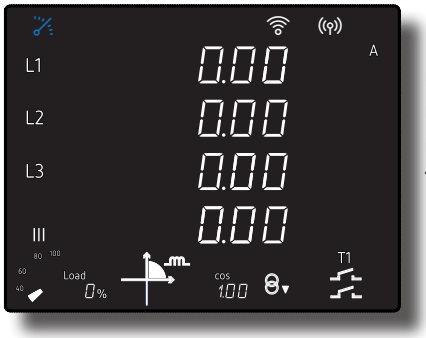
Note: *Screen not visible for installation types 3-3PH ,3ARON and 2-2Ph*

Note: *For the 3-3I T installation, the phase-earth voltage is displayed.*



Phase-phase Voltage L1-L2
Phase-phase Voltage L2-L3
Phase-phase Voltage L3-L1
Phase-phase Voltage III

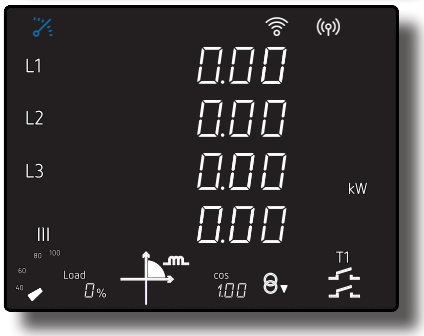
Note: *Screen not visible for 2-1PH installation types.*



Current L1
Current L2
Current L3
Three-phase current III

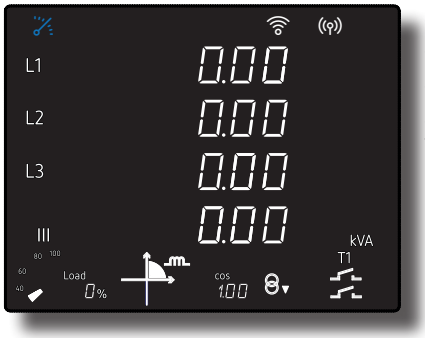
Neutral current N

Note: *Screen not visible for 3-3PH, 3ARON, 2-2Ph and 3-3I T installation types.*



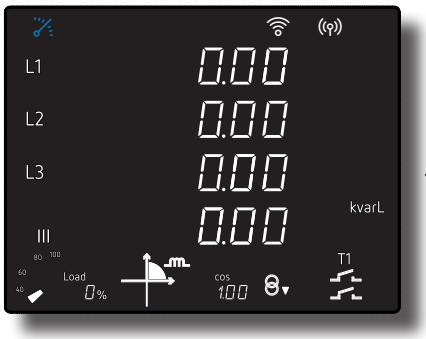
Active Power L1
Active Power L2
Active Power L3
Three-phase Active Power, III

The generation values are not measured when the 2 quadrant option is selected.

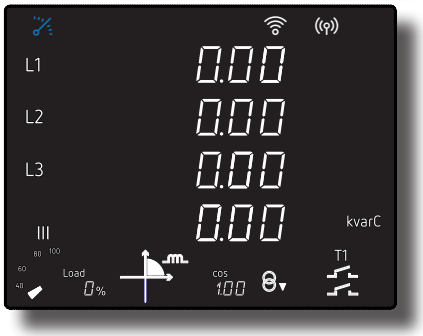


Apparent Power L1
Apparent Power L2
Apparent Power L3
Three-phase Apparent Power, III

The generation values are not measured when the 2 quadrant option is selected.



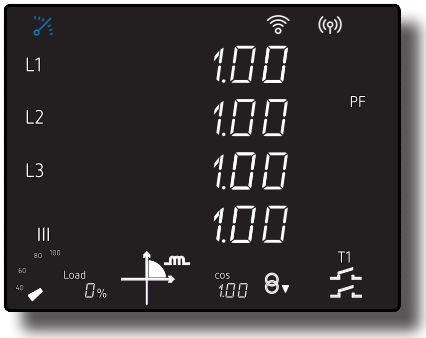
Inductive Reactive Power L1
Inductive Reactive Power L2
Inductive Reactive Power L3
Three-phase Inductive Reactive Power, III



Capacitive Reactive Power L1
Capacitive Reactive Power L2
Capacitive Reactive Power L3
Three-phase Capacitive Reactive Power, III

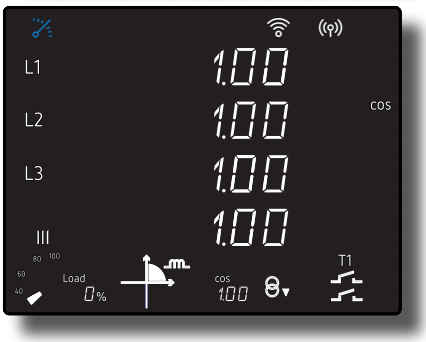
Frequency

Digital Input 1 status
Digital Input 2 status
Digital Input 3 status
Digital Input 4 status



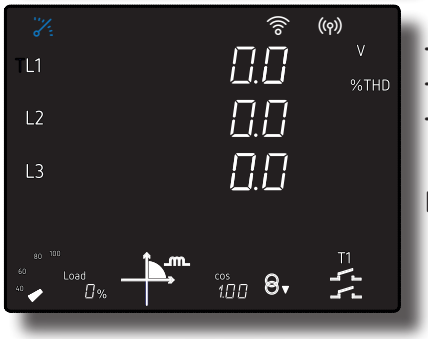
Power factor L1
Power factor L2
Power factor L3
Power factor III

Note: *Screen not visible for 3- 3PH and 3ARON installation types.*



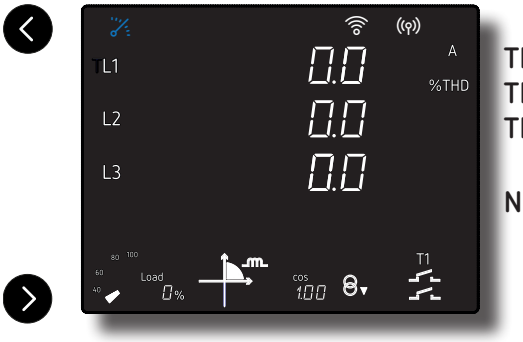
Cos φ L1
Cos φ L2
Cos φ L3
Cos φ III

Note: *Screen not visible for 3- 3PH and 3ARON installation types.*



THD Voltage L1
THD Voltage L2
THD Voltage L3

Note: *Screen not visible for 3- 3PH and 3ARON installation types.*



THD Current L1
THD Current L2
THD Current L3

Note: *Screen not visible for 3- 3PH and 3ARON installation types.*

5.2.1.- MAXIMUM AND MINIMUM VALUES

To see the maximum values of the screen being displayed, press the key for 3 seconds. These are displayed for 30 seconds. The MAX symbol is shown on the display (**Figure 37**).

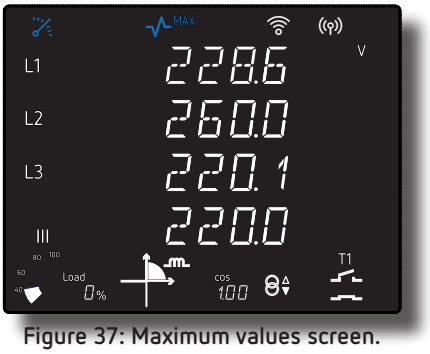


Figure 37: Maximum values screen.

To see the minimum values of the screen being displayed, press the key for 3 seconds. These are displayed for 30 seconds. The MIN symbol will be displayed.

The maximum and minimum values are reset on the programming menu (***"6.20.- DELETING MAXIMUM AND MINIMUM VALUES"***).

5.2.2.- MAXIMUM DEMAND

The device calculates the maximum demand of the following:

- ✓ L1, L2, L3 and three-phase current.
- ✓ Three-phase Active Power consumed.
- ✓ Three-phase Apparent Power consumed.
- ✓ Three-phase Inductive Reactive Power consumed.
- ✓ Three-phase Capacitive Reactive Power consumed.

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 (**Figure 38**).

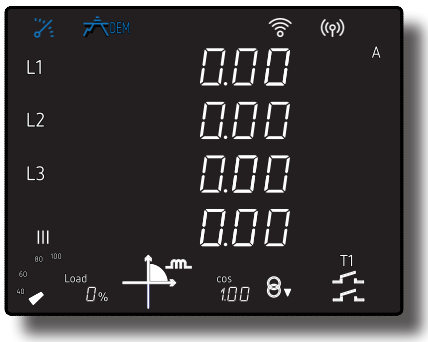


Figure 38: Maximum demand values.

To move through the different maximum demand screens, use the and keys.

The maximum demand is configured on the device display (***"6.12.- MAXIMUM DEMAND INTEGRATION WINDOW "*** and ***"6.13.- MAXIMUM DEMAND INTEGRATION PERIOD"***) or via the website (***"8.3.2.1.- Connection"***).

The maximum demand values are reset through the display configuration menu (***"6.14.- DELETING MAXIMUM DEMAND"***) or via the website (***"8.1.6.- ACTIONS"***).

5.2.3.- INCORRECT CONNECTION AND INCORRECT PHASE SEQUENCE DETECTION

✓ **Incorrect connection or disconnection**

The device features a system for detecting incorrect connection or disconnection of the voltage lines. If this error occurs, the device displays a value of 0 on those lines whose voltage is below 10 V.

Note: *For the correct operation of the incorrect connection or disconnection detection system for the voltage lines, it is essential that the L1 voltage is correctly connected. Otherwise, voltage detection may be incorrect.*

✓ **Incorrect phase sequence**

The device features a system for detecting an incorrect voltage phase sequence, i.e. it verifies that each phase is connected to the corresponding terminal: L1 to terminal 14, L2 to terminal 15 and L3 to terminal 16.

In the event of a phase sequence error, the **L1**, **L2** and **L3** icons on the display flash.

Note: *Incorrect current connection detection is based on the angle between each current and its associated voltage. An error is considered to exist when this angle is greater than 30º (cos φ < 0.86). For this reason, the use of this system is not recommended in installations where the loads present phase shifts greater than this value.*

The device also features a communications parameter indicating the detection of an incorrect phase sequence (***"7.5.7.- VOLTAGE AND CURRENT CONNECTION"***).
It is also possible to check and correct an incorrect connection through the device website, see "***8.3.1.5.- Autowired***".

Note: *Phase sequence detection is only available for the following measurement systems: three-phase network measurement (4-3PH, 3-3PH, 3ARON* ***and*** *3-3IT) .*

5.3.- ENERGY VALUES MENU

In the **Energy Values** menu, the consumed and generated energies of the installation are displayed, together with their status:

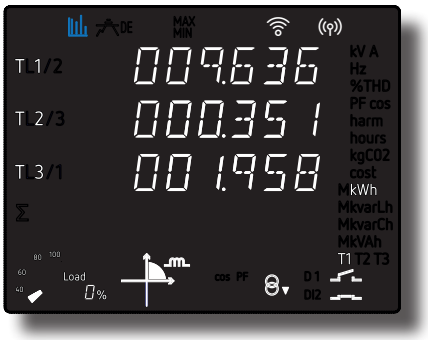
- Installation consuming.
- Installation generating.

By pressing and holding key for ≥ 3 seconds, the generated values are displayed. These values are identified by the negative sign in front of each parameter.

By pressing and holding key for ≥ 3 seconds, the consumed values are displayed.

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

To move through the different screens, use the and keys.



Active Energy Tariff 1
Active Energy Tariff 2
Active Energy Tariff 3

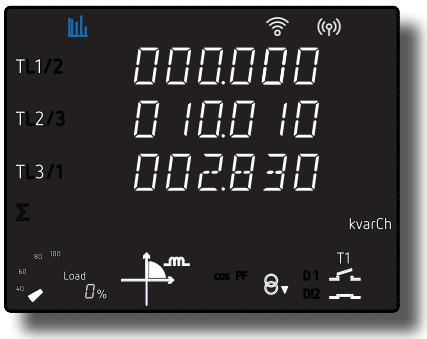
Consumption and generation values only available for the 4 quadrant option.

Apparent Energy Tariff 1
Apparent Energy Tariff 2
Apparent Energy Tariff 3

Consumption and generation values only available for the 4 quadrant option.

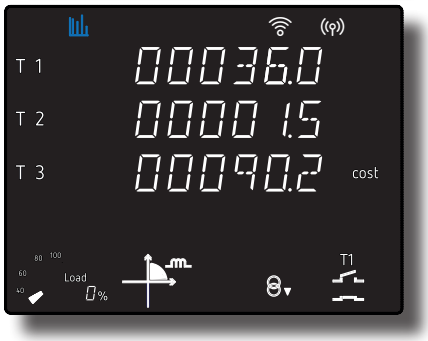
Inductive Reactive Energy Tariff 1
Inductive Reactive Energy Tariff 2
Inductive Reactive Energy Tariff 3

Consumption and generation values only available for the 4 quadrant option.



Capacitive Reactive Energy Tariff 1
Capacitive Reactive Energy Tariff 2
Capacitive Reactive Energy Tariff 3

Consumption and generation values only available for the 4 quadrant option.



Cost Tariff 1
Cost Tariff 2
Cost Tariff 3

Consumption and generation values

CO_2 Emissions Tariff 1
CO_2 Emissions Tariff 2
CO_2 Emissions Tariff 3

Consumption and generation values

No. of hours Tariff 1
No. of hours Tariff 2
No. of hours Tariff 3

The **T1**, **T2** and **T3** symbols on the display indicate the tariffs available on the device.
The active tariff is shown at the bottom right of the display.

Note: *When displaying Costs and Emissions, the message HI GH may appear if the value to be displayed exceeds the maximum value representable on the display.*

5.4.- HARMONICS

Note: *Screens not visible for 3-3PH and 3ARON installation types.*

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

Their display can be disabled through the configuration menu (***"6.22.- ACTIVATING THE HARMONICS DISPLAY SCREEN."***).

The harmonic display screens are shown in the **User profile** and **Instantaneous values** display menus by pressing the key after the last profile screen.

The harmonics are represented as shown in **Figure 39**.

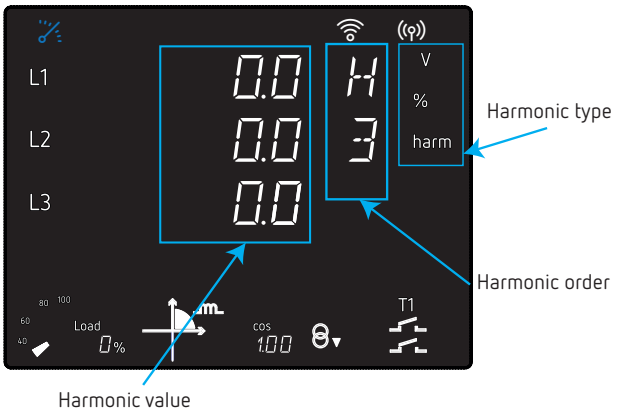


Figure 39: CVM-B50 harmonics screen.

The key moves to the next harmonic screen.
Using the key the different harmonic types are displayed:

- Voltage harmonics L1, L2, L3.
- Current harmonics L1, L2, L3.

To exit the harmonic display screens, press the key .

6.- CONFIGURATION

To enter the configuration menu press the key for 3 seconds. The ⚙ symbol is displayed on the configuration screens.

If the 🔒 icon appears on the configuration screens, the device configuration is password-protected ("*6.37.- CONFIGURATION LOCK*") and, when attempting to edit the value by pressing the key for > 3 s, the screen , shown in **Figure 40** appears to enter the unlock password.

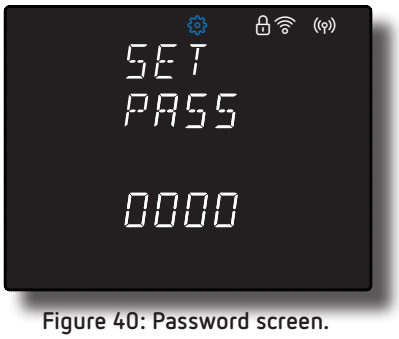


Figure 40: Password screen.

Use the key to modify the value of the flashing digit.
Use the and keys to move between digits.

To confirm the password value, press the key when positioned on the last digit or the key when positioned on the first digit.

Password value: 1234

If the entered password value is correct, the configuration parameters can then be modified.
Note: *The password value can only be modified via communications, see* ***"7.5.12.19.- Password configuration".***

Note: *In* ***"ANNEX B.- CONFIGURATION MENU"*** *the complete device configuration tree can be viewed.*

Press the or keys for 3 seconds to exit the configuration menu.

6.1.-PRIMARY VOLTAGE

On this screen the voltage transformer primary is programmed.

To edit the transformer primary value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 20:Configuration values: Primary voltage.

Primary voltage	
Minimum value	1
Maximum value	600000

To access the next configuration step, press the key.

6.2.- SECONDARY VOLTAGE

On this screen the voltage transformer secondary is programmed.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 21:Configuration values: Secondary voltage.

Secondary voltage	
Minimum value	1
Maximum value	999

To access the next configuration step, press the key .

6.3.- PRIMARY CURRENT

The current transformer primary is programmed on this screen.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 22:Configuration values: Primary current.

Primary current	
Minimum value	1
Maximum value	20000

To access the next configuration step, press the key .

6.4.- SECONDARY CURRENT

Note: *Parameter not available in **CVM-B50-FLEX** and **CVM-B50-MC** models.*

On this screen the current transformer secondary is selected.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 23:Configuration values: Secondary current.

Secondary current	
Possible values	1 A
	5 A

To access the next configuration step, press the key .

6.5.- PRIMARY NEUTRAL CURRENT

The neutral current transformer primary is programmed on this screen.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.
When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 24:Configuration values: Primary neutral current.

Primary neutral current	
Minimum value	1
Maximum value	20000

To access the next configuration step, press the key .

6.6.- SECONDARY NEUTRAL CURRENT

Note: *Parameter not available in **CVM-B50-FLEX** and **CVM-B50-MC** models.*

The neutral current transformer secondary is programmed on this screen.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

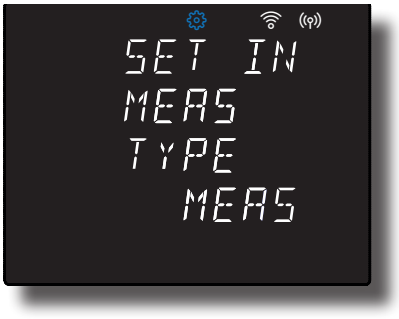
Table 25:Configuration values: Secondary neutral current.

Secondary neutral current	
Possible values	1 A
	5 A

To access the next configuration step, press the key .

6.7.- NEUTRAL CURRENT MEASUREMENT

This screen is used to select whether the neutral current is measured or calculated by the device.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 26:Configuration values: Neutral current measurement.

Neutral current measurement		
Possible values	MEAS	The device measures the Neutral current.
	CALC	The device calculates the Neutral current.

To access the next configuration step, press the key .

6.8.- NOMINAL FREQUENCY

This screen is used to select the nominal operating frequency of the device.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 27:Configuration values: Nominal frequency.

Nominal frequency	
Possible values	50 Hz
	60 Hz

To access the next configuration step, press the key .

6.9.- NUMBER OF QUADRANTS

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

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 28:Configuration values: Number of quadrants.

Number of quadrants		
Possible values	2	Consumption
	4	Consumption and Generation

To access the next configuration step, press the key .

6.10.- QUADRANT RULE

This screen is used to select the measurement convention to be used by the device.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 29:Configuration values: Quadrant rule.

Quadrant rule		
Possible values	C ırc	**Circutor** measurement convention.
	IEC	IEC 61557-12 measurement convention.
	IEEE	IEEE 1459 measurement convention.

To access the next configuration step, press the key .

6.11.- SYSTEM TYPE

The type of installation is selected on this screen.

To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓Configuration values

Table 30:Configuration values: System type.

System type		
Possible values	4-3PH	Three-phase network measurement with a 4-wire connection.
	3-3I T	Measuring Three-Phase Networks with a 3-wire and earth 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.
	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.

To access the next configuration step, press the key .

6.12.- MAXIMUM DEMAND INTEGRATION WINDOW

In this screen, the type of integration to be used for the calculation of the maximum demand is selected. See ***"4.2.2.- MAXIMUM DEMAND"***.

To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓**Configuration values**

Table 31:Configuration values: Type of integration of the maximum demand.

Type of integration of the maximum demand		
Possible values	SLIDE	Sliding window
	TIMED	Fixed window

Note: *When modifying the type of integration, the device restarts the calculation of the maximum demand.*

To access the next configuration step, press the key .

6.13.- MAXIMUM DEMAND INTEGRATION PERIOD

The maximum demand integration period is programmed in minutes on this screen. See ***"4.2.2.- MAXIMUM DEMAND"***.

To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓Configuration values

Table 32:Configuration values: Maximum demand integration period.

Maximum demand integration period	
Minimum value	0
Maximum value	60

Note: *Programming the value* ***0*** *disables the calculation of the maximum demand.*
Note: *When modifying the integration period, the device restarts the calculation of the maximum demand.*

To access the next configuration step, press the key .

6.14.- DELETING MAXIMUM DEMAND

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

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 33:Configuration values: Deleting maximum demand.

Deleting maximum demand	
Possible values	YES
	NO

To access the next configuration step, press the key .

6.15.- THD CALCULATION

In this screen the calculation method of the Total Harmonic Distortion (THD) is selected. See ***"4.2.1.- THD CALCULATION"***.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 34:Configuration values: THD calculation.

THD calculation		
Possible values	THD RMS	Calculation using the effective value (RMS).
	THD FUN	Calculation using the fundamental value.

To access the next configuration step, press the key .

6.16.- USER PROFILE DISPLAY

This screen is used to enable or disable the **User profile** display.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 35: Configuration values: User profile display.

User profile display		
Possible values	YES	The User profile is displayed.
	NO	The User profile is not displayed.
	EXIT	Exit the screen without making any changes.

To access the next configuration step, press the key .

6.17.- USER PROFILE SCREENS

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

Press key for 3 seconds to display the fourth screen of the Instantaneous Values menu, .
Select whether the screen is to be displayed in the **User profile**.

Use the key to move between the available options.

✓Configuration values

Table 36: Configuration values: User profile display.

	User profile display	
Possible values	YES	The screen will be displayed in the User profile.
	NO	The screen will not be displayed in the User profile.

To move to the next screen, press key .

This programming step is repeated for each of the 26 screens available on the device..

To confirm the value, press for 3 seconds. The icon stops flashing.

To access the next configuration step, press the key .

6.18.- BACKLIGHT

This screen is used to configure the time that the display backlight remains on since the last key press.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 37:Configuration values: Backlight.

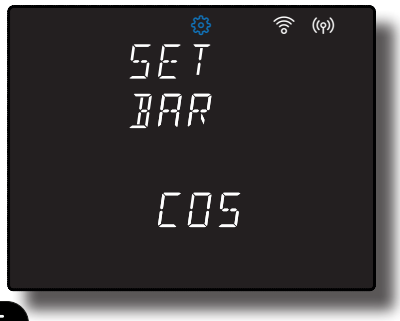
Backlight	
Minimum value	0 s
Maximum value	99 s

Note: *A value of* ***00*** *indicates that the backlight will remain permanently on.*

To access the next configuration step, press the key.

6.19.- DISPLAY SELECTION Cos φ - PF

In this screen it is selected what is going to be visualized in the icon, cos PF, the **Cos φ** or the **PF**, power factor.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 38:Configuration values: Display selection cos φ - PF.

Display selection cos φ - PF		
Possible values	COS	Displaying the Cos φ.
	PF	Displaying the Power Factor

To access the next configuration step, press the key .

6.20.- DELETING MAXIMUM AND MINIMUM VALUES

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

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

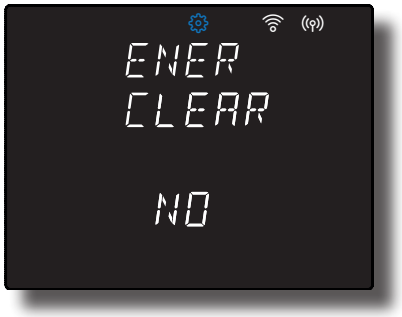
Table 39:Configuration values: Deleting maximum and minimum values.

Deleting maximum and minimum values	
Possible values	YES
	NO

To access the next configuration step, press the key .

6.21.- DELETING ENERGY VALUES

On this screen you select whether or not to delete the energy values.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 40:Configuration values: Deleting energy values.

Deleting energy values	
Possible values	YES
	NO

To access the next configuration step, press the key .

6.22.- ACTIVATING THE HARMONICS DISPLAY SCREEN

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

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

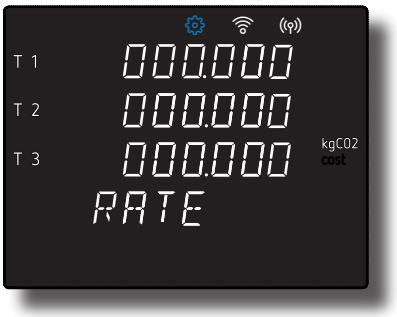
Table 41:Configuration values: Harmonics display.

Harmonics display	
Possible values	YES
	NO

To access the next configuration step, press the key .

6.23.- $kgCO_2$ 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 kgCO2 per kWh.
The emission ratio of the 3 tariffs of the device, **T1**, **T2** and **T3**, is programmed on this screen.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 42:Configuration values: emission ratio, consumed energy.

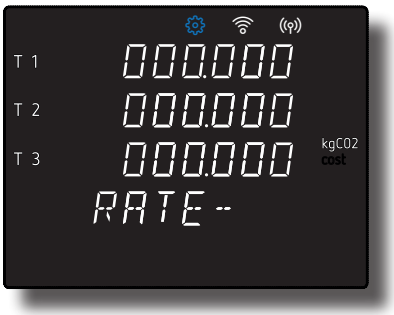
Emission ratio, consumed energy	
Minimum value	000.000
Maximum value	999.999

Note: *To configure values with a greater number of decimal places or values higher than those indicated, the device website or Modbus TCP communications must be used. Due to the display resolution, the programmed value may not be displayed correctly on this screen.*

To access the next configuration step, press the key .

6.24.- $kgCO_2$ 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 kgCO2 per kWh.
The emission ratio of the 3 tariffs of the device, **T1**, **T2** and **T3**, is programmed on this screen.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 43:Configuration values: emission ratio, generated energy.

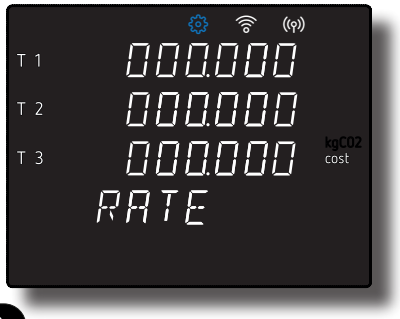
Emission ratio, generated energy	
Minimum value	000.000
Maximum value	999.999

Note: *To configure values with a greater number of decimal places or values higher than those indicated, the device website or Modbus TCP communications must be used. Due to the display resolution, the programmed value may not be displayed correctly on this screen.*

To access the next configuration step, press the key.

6.25.- COST RATIO OF CONSUMED ENERGY

The cost per kWh of electricity of the three tariffs of the device is calculated on this screen.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 44:Configuration values: Cost ratio, consumed energy.

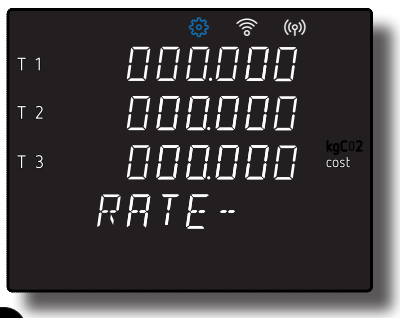
Cost ratio, consumed energy	
Minimum value	000.000
Maximum value	999.999

Note: *To configure values with a greater number of decimal places or values higher than those indicated, the device website or Modbus TCP communications must be used. Due to the display resolution, the programmed value may not be displayed correctly on this screen.*

To access the next configuration step, press the key.

6.26.- COST RATIO OF GENERATED ENERGY

The cost per kWh of electricity of the three tariffs of the device is calculated on this screen.



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 45:Configuration values: cost ratio, generated energy.

Cost ratio, generated energy	
Minimum value	000.000
Maximum value	999.999

Note: *To configure values with a greater number of decimal places or values higher than those indicated, the device website or Modbus TCP communications must be used. Due to the display resolution, the programmed value may not be displayed correctly on this screen.*

To access the next configuration step, press the key .

6.27.- RELAY OUTPUT 1 PROGRAMMING

In this section, all values corresponding to Relay Output 1 (**RO1**) are configured.
The variable code is selected on this screen, depending on **Table 46** and **Table 47,** that will control relay output 1.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Note: *If Relay Output 1 is not to be configured, set the value to* **000**.

Table 46: Parameter codes used to program the outputs.

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
Cos 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	-	-	-	-	-	-
Neutral current	-	35	-	-	-	-	-	-
Maximum current demand	L1	45	L2	46	L3	47	III	44
Active Power Maximum Demand	-	-	-	-	-	-	III	42
Apparent Power Maximum Demand	-	-	-	-	-	-	III	43
Inductive Reactive Power Maximum Demand	-	-	-	-	-	-	III	132
Capacitive Reactive Power Maximum Demand	-	-	-	-	-	-	III	133

In addition, there are some parameters (**Table 47**) 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 47: Multiple parameter codes for alarm programming.

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

To access the next configuration step, press the key  .

6.27.1.- HIGH THRESHOLD

This screen is used to configure the value above which Relay Output 1 is activated.

To edit the value, press the key ☰ for 3 seconds. The value to be modified and the ⚙ icon flash.

To enter or modify the value, repeatedly press the key ☰, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key ›, allowing the remaining values to be modified.

Note: *Pay* ***special attention*** *when programming the Generation Power (displayed with negative values).*
Example: *If a generation power alarm with limits between 2 kW and 1 kW is to be configured, set the* **maximum value** *to: -1 kW and the* ***minimum value*** *to: -2 kW*

To confirm the value, press ☰ for 3 seconds. The ⚙ icon stops flashing.

✓**Configuration values**

Table 48: Configuration values: High threshold and Low threshold.

High threshold and Low threshold				
	Voltage	Current	Power Power factor Cosine φ	Frequency THD
Minimum value	000000.0	000000.0	-9999999	00000.00
Maximum value	999999.9	999999.9	9999999	99999.99

To access the next configuration step, press the key ›.

6.27.2.- LOW THRESHOLD

This screen is used to configure the value below which Relay Output 1 is activated.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

Note: *Pay* ***special attention*** *when programming the Generation Power (displayed with negative values).*
Example: *If a generation power alarm with limits between 2 kW and 1 kW is to be configured, set the* **maximum value** *to: -1 kW and the* ***minimum value*** *to: -2 kW*

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

See **Table 48**.

To access the next configuration step, press the key.

6.27.3.- ALARM ACTIVATION DELAY

At this point, the delay in seconds for the activation of Relay Output 1 is configured.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 49:Configuration values: Alarm activation delay.

Alarm activation delay	
Minimum value	0 s
Maximum value	999 s

To access the next configuration step, press the key .

6.27.4.- ALARM HYSTERESIS

At this point, the hysteresis value, i.e. the difference between the activation and deactivation values of Relay Output 1, is configured in %.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 50:Configuration values: Alarm hysteresis.

Alarm hysteresis	
Minimum value	0 %
Maximum value	99 %

To access the next configuration step, press the key .

6.27.5.- LATCH

The latch 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.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 51:Configuration values: Latch.

Latch	
Possible values	YES
	NO

Note: *If the device is reset, the status of relay output 1 is cleared and returns to the programmed idle state, provided that the condition for its activation is no longer maintained.*

To access the next configuration step, press the key .

6.27.6.- ALARM LATCH DEACTIVATION DELAY

This screen is used to configure the latching time, i.e. the time in seconds during which Relay Output 1 remains latched. Once this time has elapsed, if the activation condition is no longer maintained, the disconnection delay is activated.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 52:Configuration values: Alarm latch deactivation delay.

Alarm latch deactivation delay	
Minimum value	0 s
Maximum value	600 s

To access the next configuration step, press the key .

6.27.7.- ALARM DEACTIVATION DELAY

At this point, the delay in seconds for the deactivation of Relay Output 1 is configured.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 53:Configuration values: Alarm deactivation delay.

Alarm deactivation delay	
Minimum value	0 s
Maximum value	999 s

To access the next configuration step, press the key .

6.27.8.- CONTACT STATUS

This screen is used to select the contact status of Relay Output 1.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 54:Configuration values: Contact status.

Contact status		
Possible values	NOPEN	Normally open contact.
	NCLOSE	Normally closed contact.

To access the next configuration step, press the key .

6.28.- RELAY OUTPUT 2 PROGRAMMING

In this section, all values corresponding to Relay Output 2 (**RO2**) are configured.

The programming procedure is the same as for Relay Output 1, see ***"6.27.- RELAY OUTPUT 1 PROGRAMMING"***.

To access the next configuration step, press the key .

6.29.- DIGITAL OUTPUT 1 PROGRAMMING

In this section, all values corresponding to Digital Output 1 (**DO1**) are configured.
This screen is used to select the variable code, according to **Table 46, Table 47** and **Table 55,** that will control digital output 1.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Note: *If Digital Output 1 is not to be configured, set the value to* ***000****.*

Table 55: Parameter codes for digital output programming.

Parameter	Tariff	Code	Tariff	Code	Tariff	Code	Tariff	Code
Consumed Active Energy	T1	49	T2	70	T3	91	Total	112
Generated Active Energy	T1	59	T2	80	T3	101	Total	122
Consumed Inductive Reactive Energy	T1	51	T2	72	T3	93	Total	114
Generated Inductive Reactive Energy	T1	61	T2	82	T3	103	Total	124
Consumed Capacitive Reactive Energy	T1	53	T2	74	T3	95	Total	116
Generated Capacitive Reactive Energy	T1	63	T2	84	T3	105	Total	126
Consumed Apparent Energy	T1	55	T2	76	T3	97	Total	118
Generated Apparent Energy	T1	65	T2	86	T3	107	Total	128
Consumed CO_2 Emissions	T1	56	T2	77	T3	98	Total	119
Emisiones CO_2 Emissions	T1	66	T2	87	T3	108	Total	129
Consumption Cost	T1	57	T2	78	T3	99	Total	120
Coste Generada	T1	67	T2	88	T3	109	Total	130
Nº de horas	T1	68	T2	89	T3	110	Total	131

If a parameter from **Table 46** or **Table 47** has been selected, the following configuration steps are the same as for Relay Output 1, seer *"6.27.- RELAY OUTPUT 1 PROGRAMMING"*.
If a parameter from **Table 55**, has been selected, the following configuration steps are:

6.29.1.- PULSE RATE

In this section, the kilowatts per pulse for Digital Output 1 are configured.

To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓**Configuration values**

Table 56:Configuration values: Pulse rate.

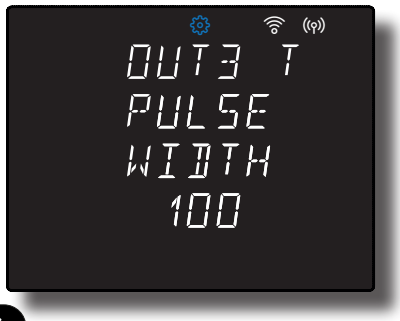
	Energy	CO_2 emissions	Cost	No. of hours
Minimum value	000.000 kWh	000.000 kgCO_2	0000.00 € / $	000 h
Maximum value	999.999 kWh	999.999 kgCO_2	9999.99 € /$	999 h

Example: *To configure 500 Wh per pulse : 000.500*
To configure 1.5 kWh per pulse : 00 1.500

To access the next configuration step, press the key.

6.29.2.- PULSE WIDTH

At this point, the pulse width in ms is selected.



To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 57:Configuration values: Pulse width.

Pulse width	
Minimum value	30 ms
Maximum value	500 ms

To access the next configuration step, press the key .

6.30.- DIGITAL OUTPUT 2 PROGRAMMING

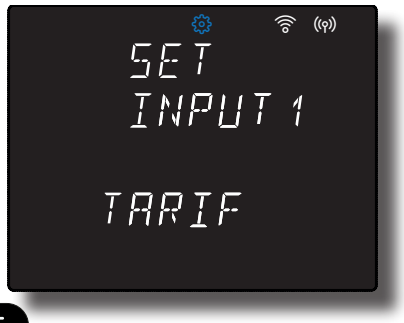
In this section, all values corresponding to Digital Output 2 (**DO2**) are configured.

The programming procedure is the same as for Digital Output 1, see ***"6.29.- DIGITAL OUPUT 1 PROGRAMMING".***

To access the next configuration step, press the key .

6.31.- DIGITAL INPUT 1 OPERATING MODE

This screen is used to select the function of Digital Input 1 (**DI1**)



To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 58:Configuration values: Digital Input 1 operating mode.

Digital Input 1 operating mode		
Possible values	TARIF	Tariff selection.
	LOGIC	Logic status.
	PULSE	Pulse counter.

Note: *When the Maximum Demand synchronisation pulse is generated, the device restarts the maximum demand calculation.*

To access the next configuration step, press the key .

6.32.- DIGITAL INPUT 2 OPERATING MODE

This screen is used to select the function of Digital Input 2 (**DI2**)

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 59:Configuration values: Digital Input 2 operating mode.

Digital Input 2 operating mode		
Possible values	TARIF	Tariff selection.
	LOGIC	Logic status.
	PULSE	Pulse counter.

Note: *When the Maximum Demand synchronisation pulse is generated, the device restarts the maximum demand calculation.*

To access the next configuration step, press the key .

6.33.- DIGITAL INPUT 3 OPERATING MODE

This screen is used to select the function of Digital Input 3 (**DI3**)

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 60:Configuration values: Digital Input 3 operating mode.

Digital Input 3 operating mode		
Possible values	LOGIC	Logic status.
	PULSE	Pulse counter.

Note: *When the Maximum Demand synchronisation pulse is generated, the device restarts the maximum demand calculation.*

To access the next configuration step, press the key .

6.34.- DIGITAL INPUT 4 OPERATING MODE

This screen is used to select the function of Digital Input 4 (**DI4**).

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.
Key switches between the available options.
To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 61:Configuration values: Digital Input 4 operating mode.

Digital Input 4 operating mode		
Possible values	LOGIC	Logic status.
	PULSE	Pulse counter.
	PD	Maximum Demand synchronisation pulse

Note: *When the Maximum Demand synchronisation pulse is generated, the device restarts the maximum demand calculation.*

To access the next configuration step, press the key .

6.35.- BACnet COMMUNICATIONS: ID

This screen is used to configure the device identifier, Device ID, for BACnet communications.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓Configuration values

Table 62:Configuration values: BACnet communications: ID.

BACnet communications: ID	
Possible values	00000
	4194303

To access the next configuration step, press the key .

6.36.- BACnet COMMUNICATIONS: PORT

This screen is used to configure the port number used for BACnet communications.

To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

To enter or modify the value, repeatedly press the key , increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key , allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓Configuration values

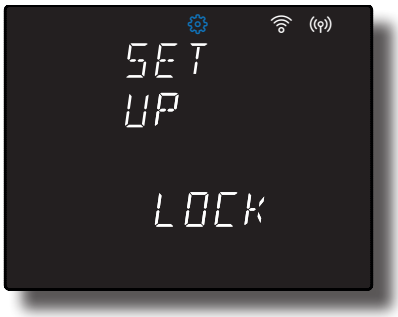
Table 63:Configuration values: BACnet communications: Port.

BACnet communications: Port	
Possible values	1024
	65535

To access the next configuration step, press the key .

6.37.- CONFIGURATION LOCK

This screen is intended to protect the programmed data in the configuration menu.



To edit the value, press the key for 3 seconds. The value to be modified and the ⚙ icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The ⚙ icon stops flashing.

✓Configuration values

Table 64:Configuration values: Configuration lock.

Configuration lock		
Possible values	UNLOCK	When accessing a configuration screen, the programming can be viewed and modified.
	LOCK	When accessing a configuration screen, the value can only be edited by entering the unlock password. The 🔒 icon on the screen indicates the lock status of the device.

To access the next configuration step, press the key  .

7.- ETHERNET AND WI-FI COMMUNICATIONS

The **CVM-B50** devices feature Ethernet and Wi-Fi communications.

The communications configuration can be carried out through the device configuration website (***"8.4.- COMMUNICATION"***) or through the device display (***"7.4.- ETHERNET AND WI-FI COMMUNICATIONS CONFIGURATION"***).

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 for connecting and exchanging information between electronic devices without the need for physical connections.

The **CVM-B50** features Wi-Fi communications in the 2.4 GHz band, in accordance with IEEE 802.11b, IEEE 802.11g and IEEE 802.11n standards.

7.4.- ETHERNET AND WI-FI COMMUNICATIONS CONFIGURATION

To enter and exit the configuration menu, press key  for 3 seconds.
The ⚙ symbol is displayed on the configuration screens.

If the 🔒 icon appears on the configuration screens, the device configuration is password-protected ("***6.37.- CONFIGURATION LOCK***") and, when attempting to edit the value by pressing key  for > 3 s, the screen shown in **Figure 40** appears to enter the unlock password, see "***6.- CONFIGURACIÓN".***

Note: *In **"ANNEX C.- ETHERNET AND Wi-Fi COMMUNICATIONS MENU"** the complete configuration tree can be viewed.*

7.4.1.- ETHERNET: DHCP

On this screen you select whether or not to enable DHCP. If DHCP enable is selected (default setting), the IP address is assigned dynamically through a central server and no further parameters need to be configured.

To edit the value, press the key  for 3 seconds. The value to be modified and the ⚙ icon flash.
Key  switches between the available options.
To confirm the value, press  for 3 seconds. The ⚙ icon stops flashing.

✓Configuration values

Table 65:Configuration values: Ethernet: DHCP.

Ethernet: DHCP		
Possible values	YES	DHCP enabled
	NO	DHCP not enabled

To access the next configuration step, press the key  .

7.4.2.- ETHERNET: IP ADRESS

This screen configures (DHCP not enabled) or displays the IP address.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

To access the next configuration step, press the key.

7.4.3.- ETHERNET: MASK

On this screen the IP mask is configured (DHCP not enabled) or displayed.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

To access the next configuration step, press the key.

7.4.4.- ETHERNET: GATEWAY

This screen configures (DHCP not enabled) or displays the gateway for Ethernet communications.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

To access the next configuration step, press the key.

7.4.5.- ETHERNET: MAC ADRESS

This screen displays the MAC address of the device.

Note: *This parameter cannot be modified.*

To access the next configuration step, press the key.

7.4.6.- Wi-Fi: IP ADRESS

This screen configures (DHCP not enabled) or displays the IP address.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

To enter or modify the value, repeatedly press the key, increasing the value of the digit currently flashing.

When the desired value is shown on the display, move to the next digit by pressing the key, allowing the remaining values to be modified.

To confirm the value, press for 3 seconds. The icon stops flashing.

To access the next configuration step, press the key.

7.4.7.- Wi-Fi: MAC ADRESS

This screen displays the MAC address of the device for Wi-Fi communications.

Note: *This parameter cannot be modified.*

To access the next configuration step, press the key.

7.4.8.- Wi-Fi: SIGNAL

This screen displays the Wi-Fi communications signal quality.

Note: *This parameter cannot be modified.*

To access the next configuration step, press the key .

7.4.9.- Wi-Fi: AP

This screen is used to select whether the device operates as an Access Point. If enabled, the device creates its own Wi-Fi network to which other wireless devices can connect for configuration or communication purposes.

To edit the value, press the key for 3 seconds. The value to be modified and the icon flash.

Key switches between the available options.

To confirm the value, press for 3 seconds. The icon stops flashing.

✓**Configuration values**

Table 66:Configuration values: Wi-Fi: AP.

Wi-Fi: AP		
Possible values	YES	The device operates as an Access Point.
	NO	The device does not operate as an Access Point.

Note: *Device IP address for operation as an Access Point:* ***192.168.222.1***

To access the next configuration step, press the key .

7.5.- MODBUS COMMANDS

All the addresses of Modbus memory are in Hexadecimal.

Note: *During file download, Modbus TCP communications are temporarily interrupted.*

7.5.1.- MEASUREMENT VARIABLES

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

Table 67: Modbus memory map (Measurement variable).

Parameter	Type	Instantaneous	Maximum	Minimum	Units
L1 Phase voltage	Float 32	00-01	112-113	17C-17D	V
L1 Current	Float 32	02-03	114-115	17E-17F	A
L1 Active Power	Float 32	04-05	116-117	180-181	W
L1 Reactive Power	Float 32	06-07	118-119	182-183	var
L1 Inductive Power	Float 32	08-09	11A-11B	184-185	var
L1 Capacitive Power	Float 32	0A-0B	11C-11D	186-187	var
L1 Apparent Power	Float 32	0C-0D	11E-11F	188-189	VA
L1 Power Factor	Float 32	0E-0F	120-121	18A-18B	-
L1 Cos φ	Float 32	10-11	122-123	18C-18D	-
L2 Phase voltage	Float 32	12-13	124-125	18E-18F	V
L2 Current	Float 32	14-15	126-127	190-191	A
L2 Active Power	Float 32	16-17	128-129	192-193	W
L2 Reactive Power	Float 32	18-19	12A-12B	194-195	var
L2 Inductive Power	Float 32	1A-1B	12C-12D	196-197	var
L2 Capacitive Power	Float 32	1C-1D	12E-12F	198-199	var
L2 Apparent Power	Float 32	1E-1F	130-131	19A-19B	VA
L2 Power Factor	Float 32	20-21	132-133	19C-19D	-
L2 Cos φ	Float 32	22-23	134-135	19E-19F	-
L3 Phase voltage	Float 32	24-25	136-137	1A0-1A1	V
L3 Current	Float 32	26-27	138-139	1A2-1A3	A
L3 Active Power	Float 32	28-29	13A-13B	1A4-1A5	W
L3 Reactive Power	Float 32	2A-2B	13C-13D	1A6-1A7	var
L3 Inductive Power	Float 32	2C-2D	13E-13F	1A8-1A9	var
L3 Capacitive Power	Float 32	2E-2F	140-141	1AA-1AB	var
L3 Apparent Power	Float 32	30-31	142-143	1AC-1AD	VA
L3 Power Factor	Float 32	32-33	144-145	1AE-1AF	-
L3 Cos φ	Float 32	34-35	146-147	1B0-1B1	-
Three-phase Active Power	Float 32	36-37	148-149	1B2-1B3	W
Three-phase Reactive Power	Float 32	38-39	14A-14B	1B4-1B5	var
Three-phase Inductive Power	Float 32	3A-3B	14C-14D	1B6-1B7	var
Three-phase Capacitive Power	Float 32	3C-3D	14E-14F	1B8-1B9	var
Three-phase Apparent Power	Float 32	3E-3F	150-151	1BA-1BB	VA
Three-phase Power Factor	Float 32	40-41	152-153	1BC-1BD	-
Three-phase Cos φ	Float 32	42-43	154-155	1BE-1BF	-
L1 Frequency	Float 32	44-45	156-157	1C0-1C1	Hz

Table 67 (Continued): Modbus memory map (Measurement variable).

Parameter	Type	Instantaneous	Maximum	Minimum	Units
L1-L2 Voltage	Float 32	46-47	158-159	1C2-1C3	V
L2-L3 Voltage	Float 32	48-49	15A-15B	1C4-1C5	V
L3-L1 Voltage	Float 32	4A-4B	15C-15D	1C6-1C7	V
Neutral Current	Float 32	4C-4D	15E-15F	1C8-1C9	A
L1 voltage THD %	Float 32	4E-4F	160-161	1CA-1CB	%
L2 voltage THD %	Float 32	50-51	162-163	1CC-1CD	%
L3 voltage THD %	Float 32	52-53	164-165	1CE-1CF	%
L1 current THD %	Float 32	54-55	166-167	1D0-1D1	%
L2 current THD %	Float 32	56-57	168-169	1D2-1D3	%
L3 current THD %	Float 32	58-59	16A-16B	1D4-1D5	%
Maximum demand of total consumed Active Power	Float 32	5A-5B	16C-16D	-	W
Maximum demand of total consumed Inductive Power	Float 32	5C-5D	16E-16F	-	var
Maximum demand of total consumed Capacitive Power	Float 32	5E-5F	170-171	-	var
Maximum demand of total consumed Apparent Power	Float 32	60-61	172-173	-	VA
Maximum demand of three-phase current	Float 32	62-63	174-175	-	A
Maximum demand of L1 current	Float 32	64-65	176-177	-	A
Maximum demand of L2 current	Float 32	66-67	178-179	-	A
Maximum demand of L3 current	Float 32	68-69	17A-17B	-	A

7.5.1.1.- Neutral current calculation

Functions 0x05 and **0x01** are implemented for these variables.

Table 68: Modbus memory map (Neutral current calculation).

Neutral current calculation			
Parameter	Type	Address	Value
Neutral current	bool	64	**0:** Measured **1:** Calculated

7.5.2.- ENERGY VARIABLES

For the correct reading of the energy values, both the energy value (**Table 69**) and the associated carry (overflow counter) (**Table 70**) must be read.

The carry indicates the number of times the energy value has exceeded its maximum representable value due to register size limitations.

The actual energy value must be calculated using the following expression:

Energy = Read energy (**Table 69**) + (carry (**Table 70**) × Maximum Energy)

The **Maximum Energy** is **1 Tera** for tariffs 1, 2 and 3, and **3 Tera** for the Total tariff.

Function 0x04 is implemented for these variables.

Table 69: Modbus memory map (Energy variables).

Parameter	Type	Tariff 1	Tariff 2	Tariff 3	Total	Units
Total consumed Active Energy	Uint 64	6A...6D	8A...8D	AA...AD	CA...CD	Wh
Total consumed Inductive Reactive Energy	Uint 64	6E...71	8E...91	AE...B1	CE...D1	varh
Total consumed Capacitive Reactive Energy	Uint 64	72...75	92...95	B2...B5	D2...D5	varh
Total consumed Apparent Energy	Uint 64	76...79	96...99	B6...B9	D6...D9	VAh
Total generated Active Energy	Uint 64	7A...7D	9A...9D	BA...BD	DA...DD	Wh
Total generated Inductive Reactive Energy	Uint 64	7E...81	9E...A1	BE...C1	DE...E1	varh
Total generated Capacitive Reactive Energy	Uint 64	82...85	A2...A5	C2...C5	E2...E5	varh
Total generated Apparent Energy	Uint 64	86...89	A6...A9	C6...C9	E6...E9	VAh
Consumed CO_2 emissions	Float 32	EA-EB	EE-EF	F2-F3	F6-F7	$kgCO_2$
Generated CO_2 emissions	Float 32	EC-ED	F0-F1	F4-F5	F8-F9	$kgCO_2$
Consumed energy cost	Float 32	FA-FB	FE-FF	102-103	106-107	-
Generated energy cost	Float 32	FC-FD	100-101	104-105	108-109	-
Hours per tariff	Uint 32	10A-10B	10C-10D	10E-10F	110-111	s

Table 70: Modbus memory map (Energy variables - Carry).

Parameter	Type	Tariff 1	Tariff 2	Tariff 3	Total
Carry for Total consumed Active Energy	Uint 16	3E8	3F0	3F8	400
Carry for Total consumed Inductive Reactive Energy	Uint 16	3E9	3F1	3F9	401
Carry for Total consumed Capacitive Reactive Energy	Uint 16	3EA	3F2	3FA	402
Carry for Total consumed Apparent Energy	Uint 16	3EB	3F3	3FB	403
Carry for Total generated Active Energy	Uint 16	3EC	3F4	3FC	404
Carry for Total generated Inductive Reactive Energy	Uint 16	3ED	3F5	3FD	405
Carry for Total generated Capacitive Reactive Energy	Uint 16	3EE	3F6	3FE	406
Carry for Total generated Apparent Energy	Uint 16	3EF	3F7	3FF	407

7.5.3.- VOLTAGE AND CURRENT HARMONICS

Function 0x04 is implemented for these variables.

Table 71: Modbus memory map (Voltage harmonics).

Parameter	Type	Voltage L1	Voltage L2	Voltage L3	Units
Fundamental Harm.	Float 32	A28-A29	A66-A67	AA4-AA5	V
2nd Order harmonic	Float 32	A2A-A2B	A68-A69	AA6-AA7	%
3rd Order harmonic	Float 32	A2C-A2D	A6A-A6B	AA8-AA9	%
4th Order harmonic	Float 32	A2E-A2F	A6C-A6D	AAA-AAB	%
5th Order harmonic	Float 32	A30-A31	A6E-A6F	AAC-AAD	%
6th Order harmonic	Float 32	A32-A33	A70-A71	AAE-AAF	%
7th Order harmonic	Float 32	A34-A35	A72-A73	AB0-AB1	%
8th Order harmonic	Float 32	A36-A37	A74-A75	AB2-AB3	%
9th Order harmonic	Float 32	A38-A39	A76-A77	AB4-AB5	%
10th Order harmonic	Float 32	A3A-A3B	A78-A79	AB6-AB7	%
11th Order harmonic	Float 32	A3C-A3D	A7A-A7B	AB8-AB9	%
12th Order harmonic	Float 32	A3E-A3F	A7C-A7D	ABA-ABB	%

Table 71 (Continued): Modbus memory map (Voltage harmonics).

Parameter	Type	Voltage L1	Voltage L2	Voltage L3	Units
13th Order harmonic	Float 32	A40-A41	A7E-A7F	ABC-ABD	%
14th Order harmonic	Float 32	A42-A43	A80-A81	ABE-ABF	%
15th Order harmonic	Float 32	A44-A45	A82-A83	AC0-AC1	%
16th Order harmonic	Float 32	A46-A47	A84-A85	AC2-AC3	%
17th Order harmonic	Float 32	A48-A49	A86-A87	AC4-AC5	%
18th Order harmonic	Float 32	A4A-A4B	A88-A89	AC6-AC7	%
19th Order harmonic	Float 32	A4C-A4D	A8A-A8B	AC8-AC9	%
20th Order harmonic	Float 32	A4E-A4F	A8C-A8D	ACA-ACB	%
21st Order harmonic	Float 32	A50-A51	A8E-A8F	ACC-ACD	%
22nd Order harmonic	Float 32	A52-A53	A90-A91	ACE-ACF	%
23rd Order harmonic	Float 32	A54-A55	A92-A93	AD0-AD1	%
24th Order harmonic	Float 32	A56-A57	A94-A95	AD2-AD3	%
25th Order harmonic	Float 32	A58-A59	A96-A97	AD4-AD5	%
26th Order harmonic	Float 32	A5A-A5B	A98-A99	AD6-AD7	%
27th Order harmonic	Float 32	A5C-A5D	A9A-A9B	AD8-AD9	%
28th Order harmonic	Float 32	A5E-A5F	A9C-A9D	ADA-ADB	%
29th Order harmonic	Float 32	A60-A61	A9E-A9F	ADC-ADD	%
30th Order harmonic	Float 32	A62-A63	AA0-AA1	ADE-ADF	%
31st Order harmonic	Float 32	A64-A65	AA2-AA3	AE0-AE1	%

Table 72: Modbus memory map (Current harmonics).

Parameter	Type	Current L1	Current L2	Current L3	Units
Fundamental Harm.	Float 32	AE2-AE3	B20-B21	B5E-B5F	A
2nd Order harmonic	Float 32	AE4-AE5	B22-B23	B60-B61	%
3rd Order harmonic	Float 32	AE6-AE7	B24-B25	B62-B63	%
4th Order harmonic	Float 32	AE8-AE9	B26-B27	B64-B65	%
5th Order harmonic	Float 32	AEA-AEB	B28-B29	B66-B67	%
6th Order harmonic	Float 32	AEC-AED	B2A-B2B	B68-B69	%
7th Order harmonic	Float 32	AEE-AEF	B2C-B2D	B6A-B6B	%
8th Order harmonic	Float 32	AF0-AF1	B2E-B2F	B6C-B6D	%
9th Order harmonic	Float 32	AF2-AF3	B30-B31	B6E-B6F	%
10th Order harmonic	Float 32	AF4-AF5	B32-B33	B70-B71	%
11th Order harmonic	Float 32	AF6-AF7	B34-B35	B72-B73	%
12th Order harmonic	Float 32	AF8-AF9	B36-B37	B74-B75	%
13th Order harmonic	Float 32	AFA-AFB	B38-B39	B76-B77	%
14th Order harmonic	Float 32	AFC-AFD	B3A-B3B	B78-B79	%
15th Order harmonic	Float 32	AFE-AFF	B3C-B3D	B7A-B7B	%
16th Order harmonic	Float 32	B00-B01	B3E-B3F	B7C-B7D	%
17th Order harmonic	Float 32	B02-B03	B40-B41	B7E-B7F	%
18th Order harmonic	Float 32	B04-B05	B42-B43	B80-B81	%
19th Order harmonic	Float 32	B06-B07	B44-B45	B82-B83	%
20th Order harmonic	Float 32	B08-B09	B46-B47	B84-B85	%
21st Order harmonic	Float 32	B0A-B0B	B48-B49	B86-B87	%
22nd Order harmonic	Float 32	B0C-B0D	B4A-B4B	B88-B89	%

Table 72 (Continued): Modbus memory map (Current harmonics).

Parameter	Type	Current L1	Current L2	Current L3	Units
23rd Order harmonic	Float 32	B0E-B0F	B4C-B4D	B8A-B8B	%
24th Order harmonic	Float 32	B10-B11	B4E-B4F	B8C-B8D	%
25th Order harmonic	Float 32	B12-B13	B50-B51	B8E-B8F	%
26th Order harmonic	Float 32	B14-B15	B52-B53	B90-B91	%
27th Order harmonic	Float 32	B16-B17	B54-B55	B92-B93	%
28th Order harmonic	Float 32	B18-B19	B56-B57	B94-B95	%
29th Order harmonic	Float 32	B1A-B1B	B58-B59	B96-B97	%
30th Order harmonic	Float 32	B1C-B1D	B5A-B5B	B98-B99	%
31st Order harmonic	Float 32	B1E-B1F	B5C-B5D	B9A-B9B	%

7.5.4.- DELETING PARAMETERS

Functions 0x05 and **0x01** are implemented for these variables.

Table 73: Modbus memory map (Deleting parameters).

Deleting parameters			
Parameter	Address	Type	Value
Device reset	7D0	bool	**1:** Reset
Energy deletion	834	bool	**1:** Delete
Deletion of maximum and minimum values	838	bool	
Maximum Demand deletion	839	bool	
Hours deletion	83D	bool	
Deletion of the Maximum Maximum Demand value	83F	bool	
Deletion of Energies, Maximum Values, Minimum Values, Maximum Demand and Maximum Maximum Demand Value	848	bool	
Deletion of all pulse counters	884	bool	
Deletion of the DI1 pulse counter	885	bool	
Deletion of the DI2 pulse counter	886	bool	
Deletion of the DI3 pulse counter	887	bool	
Deletion of the DI4 pulse counter	888	bool	
Deletion of standard events	3E8	bool	
Deletion of quality events	3E9	bool	**1:** Delete
Energy profile deletion	3EA	bool	
Deletion of average measurement profiles	3EB	bool	
Deletion of maximum measurement profiles	3EC	bool	
Deletion of minimum measurement profiles	3ED	bool	

7.5.5.- POWER STATUS

Function 0x04 is implemented for these variables.
This variable indicates the quadrant in which the device is operating.

Table 74: Modbus memory map (Power status).

Power status			
Variable	Type	Address	Default value
Power status	Uint 16	7D1	-

The variable format is shown in **Table 75:**

Table 75: 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

7.5.6.- DEVICE INFORMATION

Function 0x04 is implemented for these variables.

Table 76: Modbus memory map (Device information).

Device information			
Variable	Type	Address	Default value
Device name	Uint 16	514 ... 51D	"Cir cutor"
Serial number	Array	5AA ... 5B0	-
Modbus ID identifier	Uint 32	578-579	890
Device model	Uint 16	640	**0: CVM-B50-ITF** **1: CVM-B50-MC** **2: CVM-B50-FLEX**
Measurement Firmware version	Uint 16	C2EC ... C2EE	-
Communications Firmware version	Uint 16	C2EF ... C2F1	-

Functions 0x05 and **0x01** are implemented for these variables.

Table 77: Modbus memory map (Default values).

Default values			
Parameter	Address	Type	Value
Default configuration	BB8	bool	**1:** Enable
Default channels	BB9	bool	**1:** Enable
Start device update	9C3E	bool	**1:** Enable
Update active	9C3F	bool	**1:** Enabled

7.5.7.- VOLTAGE AND CURRENT CONNECTION

Function 0x04 is implemented for these variables.
These variables indicate whether the voltage and current connections have been carried out correctly or not.

Table 78: Modbus memory map (Voltage and current connection).

Voltage and current connection			
Variable	Type	Address	Value
Voltage connection	Uint 16	7D5	**0:** Unknown status **1:** OK **2:** Not OK
L1 current connection	Uint 16	7D6	
L2 current connection	Uint 16	7D7	
L3 current connection	Uint 16	7D8	

Functions 0x05 and **0x01** are implemented for these variables.

Table 79: Modbus memory map (Current connection).

Current connection			
Variable	Type	Address	Value
Correct current connection	Bool	8FC	**1:** Correct

7.5.8.- RO1 AND RO2 RELAY OUTPUTS

Functions 0x05 and **0x01** are implemented for these variables.

Table 80: Modbus memory map (RO1 and RO2 relay output status (Table 1)).

RO1 and RO2 relay output status (Table 1)			
Variable	Type	Address	Value
RO1 Relay Output status	Bool	F	**0:** Deactivated- **1:** Activated
RO2 Relay Output status	Bool	10	

Function 0x04 is implemented for these variables.

Table 81: Modbus memory map (RO1 and RO2 relay output status (Table 2)).

RO1 and RO2 relay output status (Table 2)			
Variable	Type	Address	Value
RO1 Relay Output latch	Uint 16	4E32	**0:** Unlatched - **1:** Latched
RO2 Relay Output latch	Uint 16	4E33	
RO1 Relay Output activation date	Uint 32	4E36 - 4E37	s (epoch)
RO2 Relay Output activation date	Uint 32	4E38 - 4E39	s (epoch)

7.5.9.- DO1 AND DO2 DIGITAL OUTPUTS

Functions 0x05 and **0x01** are implemented for these variables.

Table 82: Modbus memory map (DO1 and DO2 digital output status (Table 1)).

DO1 and DO2 digital output status (Table 1)			
Variable	Type	Address	Value
DO1 Digital Output status	Bool	11	**0:** Deactivated- **1:** Activated
DO2 Digital Output status	Bool	12	

Function 0x04 is implemented for these variables.

Table 83: Modbus memory map (Relay and digital output status).

Relay and digital output status			
Variable	Type	Address	Default value
Relay and digital output status	Uint 16	4E21	-

The variable format is shown in **Table 84:**

Table 84: Variable format (Digital output status).

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	DO2 **0:** Deactivated **1:** Activated	DO1 **0:** Deactivated **1:** Activated	RO2 **0:** Deactivated **1:** Activated	RO1 **0:** Deactivated **1:** Activated

Table 85: Modbus memory map (DO1 and DO2 Digital Output status (Table 2)).

DO1 and DO2 Digital Output status (Table 2)			
Variable	Type	Address	Value
DO1 Digital Output latch	Uint 16	4E34	**0:** Unlatched - **1:** Latched
DO2 Digital Output latch	Uint 16	4E35	
DO1 Digital Output activation date	Uint 32	4E3A - 4E3B	s (epoch)
DO2 Digital Output activation date	Uint 32	4E3C - 4E3D	s (epoch)

7.5.10.- DI1, DI2, DI3 AND DI4 DIGITAL INPUTS

Function 0x02 is implemented for these variables.

Table 86: Modbus memory map (DI1, DI2, DI3 and DI4 Digital Input status).

DI1, DI2, DI3 and DI4 Digital Input status			
Variable	Type	Address	Value
DI1 Digital Input	Bool	0	**0:** Deactivated- **1:** Activated
DI2 Digital Input	Bool	1	
DI3 Digital Input	Bool	2	
DI4 Digital Input	Bool	3	

The Digital Input status can also be read when operating in logic mode:

Function 0x04 is implemented for these variables.

Table 87: Modbus memory map (DI1, DI2, DI3 and DI4 Digital Input status (Logic status mode)).

Digital Input status			
Variable	Type	Address	Default value
Digital Input status	Uint 16	4E20	-

The variable format is shown in **Table 88:**

Table 88: Variable format (DI1, DI2, DI3 and DI4 Digital Input status).

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	**DI4** **0:** Deactivated **1:** Activated	**DI3** **0:** Deactivated **1:** Activated	**DI2** **0:** Deactivated **1:** Activated	**DI1** **0:** Deactivated **1:** Activated

7.5.11.- VARIABLE RECORDS

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

The device stores records of:

- ✓ Standard events.
- ✓ Quality events.
- ✓ Energy profiles.
- ✓ Average measurement profiles
- ✓ Maximum measurement profiles.
- ✓ Minimum measurement profiles.

The records can be read in two ways:

- Reading a specific file.
- Reading all files generated between two specific dates.

7.5.11.1.- Reading a specific file

To read a specific file **Table 89**, **Table 91**, **Table 93**, **Table 94**, **Table 95** and **Table 96** must be used depending on the records to be read, following the procedure below:

1.- Read the parameter **Number of files stored in the profile** in order to determine the total number of files stored.

2.-Write the number corresponding to the file to be consulted in the parameter **File to read**.

3.- Perform the block reading of the variable sets corresponding to **Standard Events**, **Quality Events**, **Energy Profiles**, as well as **Average Measurement Profiles**, **Maximum Measurement Profiles** and **Minimum Measurement Profiles**.
From the **Date** parameter up to the last parameter of the corresponding table.

Note: *Once the parameters have been read, the sequence must be repeated from point 1 in order to access a new file.*

Table 89: Modbus memory map: Standard events (Table 1).

Standard events (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	1F40	Uint16	0 ... 100
File to read	1F41	Uint16	0 ... 100
Date	1F42-1F43	Uint32	s (epoch)
Event code	1F44	Uint16	See **Table 90**

Table 90: Modbus memory map: Standard event codes.

Standard event codes.	
Event	Code
Start-up	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
Communications firmware update error	12
Communications firmware update successful	13

Table 91: Modbus memory map: Quality events (Table 1).

Quality events (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	1F4A	Uint16	0 ... 300
File to read	1F4B	Uint16	0 ... 300
Date	1F4C-1F4D	Uint32	s (epoch)
Event code	1F4E	Uint16	See **Table 92**
Activation date	1F4F-1F50	Uint32	s (epoch)
Average value of L1 voltage	1F51-1F52	Float32	V
Average value of L2 voltage	1F53-1F54	Float32	V
Average value of L3 voltage	1F55-1F56	Float32	V
Maximum or minimum value of L1 voltage	1F57-1F58	Float32	V
Maximum or minimum value of L2 voltage	1F59-1F5A	Float32	V
Maximum or minimum value of L3 voltage	1F5B-1F5C	Float32	V

Table 92: Modbus memory map: Quality event codes.

Quality event codes	
Event	Code
L1 overvoltage activation	1
L1 overvoltage deactivation	2
L2 overvoltage activation	3
L2 overvoltage deactivation	4

Table 92 (Continued): Modbus memory map: Quality event codes.

Event	Code
L3 overvoltage activation	5
L3 overvoltage deactivation	6
L1 undervoltage activation	7
L1 undervoltage deactivation	8
L2 undervoltage activation	9
L2 undervoltage deactivation	10
L3 undervoltage activation	11
L3 undervoltage deactivation	12

Table 93: Modbus memory map: Energy profiles (Table 1).

Energy profiles (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	1FA4-1FA5	Uint32	0 ... 3840
File to read	1FA6-1FA7	Uint32	0 ... 3840
Date	1FA8-1FA9	Uint32	s (epoch)
Status	1FAA	Uint16	See **Table 97**
Total consumed Active Energy (kWh)	1FAB-1FAC	Uint32	kWh
Total consumed Active Energy (Wh)	1FAD	Uint16	Wh
Total generated Active Energy (kWh)	1FAE-1FAF	Uint32	kWh
Total generated Active Energy (Wh)	1FB0	Uint16	Wh
Total consumed Inductive Reactive Energy (kvarh)	1FB1-1FB2	Uint32	kvarh
Total consumed Inductive Reactive Energy (varh)	1FB3	Uint16	varh
Total generated Inductive Reactive Energy (kvarh)	1FB4-1FB5	Uint32	kvarh
Total generated Inductive Reactive Energy (varh)	1FB6	Uint16	varh
Total consumed Capacitive Reactive Energy (kvarh)	1FB7-1FB8	Uint32	kvarh
Total consumed Capacitive Reactive Energy (varh)	4FB9	Uint16	varh
Total generated Capacitive Reactive Energy (kvarh)	4FBA-4FBB	Uint32	kvarh
Total generated Capacitive Reactive Energy (varh)	4FBC	Uint16	varh
Total consumed Apparent Energy (kVAh)	4FBD-4FBE	Uint32	kVAh
Total consumed Apparent Energy (VAh)	4FBF	Uint16	VAh
Total generated Apparent Energy (kVAh)	4FC0-4FC1	Uint32	kVAh
Total generated Apparent Energy (VAh)	4FC2	Uint16	VAh

Table 94: Modbus memory map: Average Measurement Profile (Table 1).

Average Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	2008-2009	Uint32	0 ... 5760
File to read	200A-200B	Uint32	0 ... 5760
Date	200C-200D	Uint32	s (epoch)
Status	200E	Uint16	See **Table 97**
L1 Phase-Neutral voltage	200F-2010	Float32	V
L2 Phase-Neutral voltage	2011-2012	Float32	V
L3 Phase-Neutral voltage	2013-2014	Float32	V
L1 current	2015-2016	Float32	A

Table 94 (Continued): Modbus memory map: Average Measurement Profile (Table 1).

Average Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
L2 current	2017-2018	Float32	A
L3 current	2019-201A	Float32	A
Three-phase current	201B-201C	Float32	A
Neutral current	201D-201E	Float32	A
L1 Active Power	201F-2020	Float32	W
L2 Active Power	2021-2022	Float32	W
L3 Active Power	2023-2024	Float32	W
III Active Power	2025-2026	Float32	W
L1 Reactive Power	2027-2028	Float32	var
L2 Reactive Power	2029-202A	Float32	var
L3 Reactive Power	202B-202C	Float32	var
III Reactive Power	202D-202E	Float32	var
III Apparent Power	202F-2030	Float32	VA
L1 Power Factor	2031-2032	Float32	-
L2 Power Factor	2033-2034	Float32	-
L3 Power Factor	2035-2036	Float32	-
III Power Factor	2037-2038	Float32	-
L1 cos Φ	2039-203A	Float32	-
L2 cos Φ	203B-203C	Float32	-
L3 cos Φ	203D-203E	Float32	-
III cos Φ	203F-2040	Float32	-
Frequency	2041-2042	Float32	Hz
L1-L2 Phase-Phase voltage	2043-2044	Float32	V
L2-L3 Phase-Phase voltage	2045-2046	Float32	V
L3-L1 Phase-Phase voltage	2047-2048	Float32	V
L1 voltage THD	2049-204A	Float32	%
L2 voltage THD	204B-204C	Float32	%
L3 voltage THD	204D-204E	Float32	%
L1 current THD	204F-2050	Float32	%
L2 current THD	2051-2052	Float32	%
L3 current THD	2053-2054	Float32	%

Table 95: Modbus memory map: Maximum Measurement Profile (Table 1).

Maximum Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	206C-206D	Uint32	0 ... 5760
File to read	206E-206F	Uint32	0 ... 5760
Date	2070-2071	Uint32	s
Status	2072	Uint16	See **Table 97**
L1 Phase-Neutral voltage	2073-2074	Float32	V
L2 Phase-Neutral voltage	2075-2076	Float32	V
L3 Phase-Neutral voltage	2077-2078	Float32	V
L1 current	2079-207A	Float32	A

Tabla 95 (Continued): Modbus memory map: Maximum Measurement Profile (Table 1).

Maximum Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
L2 current	207B-207C	Float32	A
L3 current	207D-207E	Float32	A
Three-phase current	207F-2080	Float32	A
Neutral current	2081-2082	Float32	A
L1 Active Power	2083-2084	Float32	W
L2 Active Power	2085-2086	Float32	W
L3 Active Power	2087-2088	Float32	W
III Active Power	2089-208A	Float32	W
L1 Reactive Power	208B-208C	Float32	var
L2 Reactive Power	208D-208E	Float32	var
L3 Reactive Power	208F-2090	Float32	var
III Reactive Power	2091-2092	Float32	var
III Apparent Power	2093-2094	Float32	VA
L1 Power Factor	2095-2096	Float32	-
L2 Power Factor	2097-2098	Float32	-
L3 Power Factor	2099-209A	Float32	-
III Power Factor	209B-209C	Float32	-
L1 cos Φ	209D-209E	Float32	-
L2 cos Φ	209F-20A0	Float32	-
L3 cos Φ	20A1-20A2	Float32	-
III cos Φ	20A3-20A4	Float32	-
Frequency	20A5-20A6	Float32	Hz
L1-L2 Phase-Phase voltage	20A7-20A8	Float32	V
L2-L3 Phase-Phase voltage	20A9-20AA	Float32	V
L3-L1 Phase-Phase voltage	20AB-20AC	Float32	V
L1 voltage THD	20AD-20AE	Float32	%
L2 voltage THD	20AF-20B0	Float32	%
L3 voltage THD	20B1-20B2	Float32	%
L1 current THD	20B3-20B4	Float32	%
L2 current THD	20B5-20B6	Float32	%
L3 current THD	20B7-20B8	Float32	%

Table 96: Modbus memory map: Minimum Measurement Profile (Table 1).

Minimum Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
Number of files stored in the profile	20D0-20D1	Uint32	0 ... 5760
File to read	20D2-20D3	Uint32	0 ... 5760
Date	20D4-20D5	Uint32	s
Status	20D6	Uint16	See **Table 97**
L1 Phase-Neutral voltage	20D7-20D8	Float32	V
L2 Phase-Neutral voltage	20D9-20DA	Float32	V
L3 Phase-Neutral voltage	20DB-20DC	Float32	V
L1 current	20DD-20DE	Float32	A
L2 current	20DF-20E0	Float32	A

Table 96 (Continued): Modbus memory map: Minimum Measurement Profile (Table 1).

Minimum Measurement Profile (Table 1)			
Parameter	Address	Type	Value / Units
L3 current	20E1-20E2	Float32	A
Three-phase current	20E3-20E4	Float32	A
Neutral current	20E5-20E6	Float32	A
L1 Active Power	20E7-20E8	Float32	W
L2 Active Power	20E9-20EA	Float32	W
L3 Active Power	20EB-20EC	Float32	W
III Active Power	20ED-20EE	Float32	W
L1 Reactive Power	20EF-20F0	Float32	var
L2 Reactive Power	20F1-20F2	Float32	var
L3 Reactive Power	20F3-20F4	Float32	var
III Reactive Power	20F5-20F6	Float32	var
III Apparent Power	20F7-20F8	Float32	VA
L1 Power Factor	20F9-20FA	Float32	-
L2 Power Factor	20FB-20FC	Float32	-
L3 Power Factor	20FD-20FE	Float32	-
III Power Factor	20FF-2100	Float32	-
L1 cos Φ	2101-2102	Float32	-
L2 cos Φ	2103-2104	Float32	-
L3 cos Φ	2105-2106	Float32	-
III cos Φ	2107-2108	Float32	-
Frequency	2109-210A	Float32	Hz
L1-L2 Phase-Phase voltage	210B-210C	Float32	V
L2-L3 Phase-Phase voltage	210D-210E	Float32	V
L3-L1 Phase-Phase voltage	210F-2110	Float32	V
L1 voltage THD	2111-2112	Float32	%
L2 voltage THD	2113-2114	Float32	%
L3 voltage THD	2115-2116	Float32	%
L1 current THD	2117-2118	Float32	%
L2 current THD	2119-211A	Float32	%
L3 current THD	211B-211C	Float32	%

The format of the **Status** parameter is shown in **Table 97.**

Table 97: Status parameter format.

Status parameter format	
Bit 1	**1:** During the stored period, the device has been powered off.
Bit 3	**1:** During the stored period, the device configuration has been modified.
Bit 5	**1:** During the stored period, an out-of-range value has been detected.
Bit 6	**1:** During the stored period, the clock has been adjusted.
Bit 7	**1:** Invalid value, bits **1**, **3**, **5** and **6** indicate the reason.

7.5.11.2.- Reading files generated between specific dates

To read the files generated between specific dates,**Table 98, Table 99, Table 100, Table 101, Table 102 and Table 103** must be used depending on the records to be read, following the procedure below:

1.- Write the dates of the files to be read in the **Initial and final date** parameter.

2.- Read the parameter **Number of stored files** in order to determine the number of files stored between the specified dates.

3.- Perform the block reading of the variable sets corresponding to **Standard Events**, **Quality Events**, **Energy Profiles**, as well as **Average Measurement Profiles**, **Maximum Measurement Profiles** and **Minimum Measurement Profiles**.
From the **Index** parameter up to the last parameter of the corresponding table.

Note: *Once the parameters have been read, the sequence must be repeated from point 1 in order to access a new file.*

Table 98: Modbus memory map: Standard events (Table 2).

Standard events (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	1F72 ... 1F75	Uint32	epoch
Number of stored files	1F76	Uint16	0 ... 100
Index	1F77	Uint16	0 ... 100
Date	1F78-1F79	Uint32	s (epoch)
Event code	1F7A	Uint16	See **Table 90**

Table 99: Modbus memory map: Quality events (Table 2).

Quality events (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	1F7C ... 1F7F	Uint32	epoch
Number of stored files	1F80	Uint16	0 ... 300
Index	1F81	Uint16	0 ... 300
Date	1F82-1F83	Uint32	s (epoch)
Event code	1F84	Uint16	See **Table 92**
Activation date	1F85-1F86	Uint32	s (epoch)
Average value of L1 voltage	1F87-1F88	Float32	V
Average value of L2 voltage	1F89-1F8A	Float32	V
Average value of L3 voltage	1F8B-1F8C	Float32	V
Maximum or minimum value of L1 voltage	1F8D-1F8E	Float32	V
Maximum or minimum value of L2 voltage	1F8F-1F90	Float32	V
Maximum or minimum value of L3 voltage	1F91-1F92	Float32	V

Table 100: Modbus memory map: Energy profiles (Table 2).

Energy profiles (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	2134 ... 2137	Uint32	s (epoch)
Number of stored files	2138-2139	Uint32	0 ... 3840
Index	213A-213B	Uint32	0 ... 3840
Date	213C-213D	Uint32	s (epoch)

Table 100 (Continued): Modbus memory map: Energy profiles (Table 2).

Energy profiles (Table 2)			
Parameter	Address	Type	Value / Units
Status	213E	Uint16	See **Table 97**
Total consumed Active Energy (kWh)	213F-2140	Uint32	kWh
Total consumed Active Energy (Wh)	2141	Uint16	Wh
Total generated Active Energy (kWh)	2142-2143	Uint32	kWh
Total generated Active Energy (Wh)	2144	Uint16	Wh
Total consumed Inductive Reactive Energy (kvarh)	2145-2146	Uint32	kvarh
Total consumed Inductive Reactive Energy (varh)	2147	Uint16	varh
Total generated Inductive Reactive Energy (kvarh)	2148-2149	Uint32	kvarh
Total generated Inductive Reactive Energy (varh)	214A	Uint16	varh
Total consumed Capacitive Reactive Energy (kvarh)	214B-214C	Uint32	kvarh
Total consumed Capacitive Reactive Energy (varh)	214D	Uint16	varh
Total generated Capacitive Reactive Energy (kvarh)	214E-214F	Uint32	kvarh
Total generated Capacitive Reactive Energy (varh)	2150	Uint16	varh
Total consumed Apparent Energy (kVAh)	2151-2152	Uint32	kVAh
Total consumed Apparent Energy (VAh)	2153	Uint16	VAh
Total generated Apparent Energy (kVAh)	2154-2155	Uint32	kVAh
Total generated Apparent Energy (VAh)	2156	Uint16	VAh

Table 101: Modbus memory map: Average Measurement Profile (Table 2).

Average Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	2198 ... 219B	Uint32	s (epoch)
Number of stored files	219C-219D	Uint32	0 ... 5760
Index	219E-219F	Uint32	0 ... 5760
Date	21A0-21A1	Uint32	s (epoch)
Status	21A2	Uint16	See **Table 97**
L1 Phase-Neutral voltage	21A3-21A4	Float32	V
L2 Phase-Neutral voltage	21A5-21A6	Float32	V
L3 Phase-Neutral voltage	21A7-21A8	Float32	V
L1 current	21A9-21AA	Float32	A
L2 current	21AB-21AC	Float32	A
L3 current	21AD-21AE	Float32	A
Three-phase current	21AF-21B0	Float32	A
Neutral current	21B1-21B2	Float32	A
L1 Active Power	21B3-21B4	Float32	W
L2 Active Power	21B5-21B6	Float32	W
L3 Active Power	21B7-21B8	Float32	W
III Active Power	21B9-21BA	Float32	W
L1 Reactive Power	21BB-21BC	Float32	var
L2 Reactive Power	21BD-21BE	Float32	var
L3 Reactive Power	21BF-21C0	Float32	var
III Reactive Power	21C1-21C2	Float32	var
III Apparent Power	21C3-21C4	Float32	VA
L1 Power Factor	21C5-21C6	Float32	-

Table 101 (Continued): Modbus memory map: Average Measurement Profile (Table 2).

Average Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
L2 Power Factor	21C7-21C8	Float32	-
L3 Power Factor	21C9-21CA	Float32	-
III Power Factor	21CB-21CC	Float32	-
L1 cos Φ	21CD-21CE	Float32	-
L2 cos Φ	21CF-21D0	Float32	-
L3 cos Φ	21D1-21D2	Float32	-
III cos Φ	21D3-21D4	Float32	-
Frequency	21D5-21D6	Float32	Hz
L1-L2 Phase-Phase voltage	21D7-21D8	Float32	V
L2-L3 Phase-Phase voltage	21D9-21DA	Float32	V
L3-L1 Phase-Phase voltage	21DB-21DC	Float32	V
L1 voltage THD	21DD-21DE	Float32	%
L2 voltage THD	21DF-21E0	Float32	%
L3 voltage THD	21E1-21E2	Float32	%
L1 current THD	21E3-21E4	Float32	%
L2 current THD	21E5-21E6	Float32	%
L3 current THD	21E7-21E8	Float32	%

Table 102: Modbus memory map: Maximum Measurement Profile (Table 2).

Maximum Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	21FC...21FF	Uint32	s (epoch)
Number of stored files	2200-2201	Uint32	0 ... 5760
Index	2202-2203	Uint32	0 ... 5760
Date	2204-2205	Uint32	s (epoch)
Status	2206	Uint16	See **Table 97**
L1 Phase-Neutral voltage	2207-2208	Float32	V
L2 Phase-Neutral voltage	2209-220A	Float32	V
L3 Phase-Neutral voltage	220B-220C	Float32	V
L1 current	220D-220E	Float32	A
L2 current	220F-2210	Float32	A
L3 current	2211-2212	Float32	A
Three-phase current	2213-2214	Float32	A
Neutral current	2215-2216	Float32	A
L1 Active Power	2217-2218	Float32	W
L2 Active Power	2219-221A	Float32	W
L3 Active Power	221B-221C	Float32	W
III Active Power	221D-221E	Float32	W
L1 Reactive Power	221F-2220	Float32	var
L2 Reactive Power	2221-2222	Float32	var
L3 Reactive Power	2223-2224	Float32	var
III Reactive Power	2225-2226	Float32	var
III Apparent Power	2227-2228	Float32	VA
L1 Power Factor	2229-222A	Float32	-

Table 102 (Continued): Modbus memory map: Maximum Measurement Profile (Table 2).

Maximum Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
L2 Power Factor	222B-222C	Float32	-
L3 Power Factor	222D-222E	Float32	-
III Power Factor	222F-2230	Float32	-
L1 cos Φ	2231-2232	Float32	-
L2 cos Φ	2233-2234	Float32	-
L3 cos Φ	2235-2236	Float32	-
III cos Φ	2237-2238	Float32	-
Frequency	2239-223A	Float32	Hz
L1-L2 Phase-Phase voltage	223B-223C	Float32	V
L2-L3 Phase-Phase voltage	223D-223E	Float32	V
L3-L1 Phase-Phase voltage	223F-2240	Float32	V
L1 voltage THD	2241-2242	Float32	%
L2 voltage THD	2243-2244	Float32	%
L3 voltage THD	2245-2246	Float32	%
L1 current THD	2247-2248	Float32	%
L2 current THD	2249-224A	Float32	%
L3 current THD	224B-224C	Float32	%

Table 103: Modbus memory map: Minimum Measurement Profile (Table 2).

Minimum Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
Initial and final date	2260...2263	Uint32	s (epoch)
Number of stored files	2264-2265	Uint32	0 ... 5760
Index	2266-2267	Uint32	0 ... 5760
Date	2268-2269	Uint32	s (epoch)
Status	226A	Uint16	See **Table 97**
L1 Phase-Neutral voltage	226B-226C	Float32	V
L2 Phase-Neutral voltage	226D-226E	Float32	V
L3 Phase-Neutral voltage	226F-2270	Float32	V
L1 current	2271-2272	Float32	A
L2 current	2273-2274	Float32	A
L3 current	2275-2276	Float32	A
Three-phase current	2277-2278	Float32	A
Neutral current	2279-227A	Float32	A
L1 Active Power	227B-227C	Float32	W
L2 Active Power	227D-227E	Float32	W
L3 Active Power	227F-2280	Float32	W
III Active Power	2281-2282	Float32	W
L1 Reactive Power	2283-2284	Float32	var
L2 Reactive Power	2285-2286	Float32	var
L3 Reactive Power	2287-2288	Float32	var
III Reactive Power	2289-228A	Float32	var
III Apparent Power	228B-228C	Float32	VA

Table 103 (Continued): Modbus memory map: Minimum Measurement Profile (Table 2).

Minimum Measurement Profile (Table 2)			
Parameter	Address	Type	Value / Units
L1 Power Factor	228D-228E	Float32	-
L2 Power Factor	228F-2290	Float32	-
L3 Power Factor	2291-2292	Float32	-
III Power Factor	2293-2294	Float32	-
L1 cos Φ	2295-2296	Float32	-
L2 cos Φ	2297-2298	Float32	-
L3 cos Φ	2299-229A	Float32	-
III cos Φ	229B-229C	Float32	-
Frequency	229D-229E	Float32	Hz
L1-L2 Phase-Phase voltage	229F-22A0	Float32	V
L2-L3 Phase-Phase voltage	22A1-22A2	Float32	V
L3-L1 Phase-Phase voltage	22A3-22A4	Float32	V
L1 voltage THD	22A5-22A6	Float32	%
L2 voltage THD	22A7-22A8	Float32	%
L3 voltage THD	22A9-22AA	Float32	%
L1 current THD	22AB-22AC	Float32	%
L2 current THD	22AD-22AE	Float32	%
L3 current THD	22AF-22B0	Float32	%

7.5.12.- DEVICE CONFIGURATION VARIABLES

7.5.12.1.- Transformation ratios

Table 104: Modbus memory map: Transformation ratios.

Transformation ratios				
Configuration variable	Type	Address	Valid data range	Default value
Primary voltage	Uint 32	2710-2711	1 ... 600000	1
Secondary voltage	Uint 32	2712-2713	1 ... 999	1
Primary current	Uint 32	2714-2715	1 ... 20000	5 A (**CVM-B50-ITF**) 63 A (**CVM-B50-MC**) 1000 V (**CVM-B50-FLEX**)
Secondary current	Float 32	2716-2717	1 ... 5 A (**CVM-B50-ITF**) 250 mA (**CVM-B50-MC**) 100 mV (**CVM-B50-FLEX**)	5 A (**CVM-B50-ITF**) 250 mA (**CVM-B50-MC**) 100 mV (**CVM-B50-FLEX**)

7. 5.12.2.- Neutral current transformation ratios

Table 105: Modbus memory map: Neutral current transformation ratios.

Transformation ratios				
Configuration variable	Type	Address	Valid data range	Default value
Neutral current primary	Uint 32	2718-2719	1 ... 20000	5 A (**CVM-B50-ITF**) 63 A (**CVM-B50-MC**) 1000 V (**CVM-B50-FLEX**)
Neutral current secondary	Float 32	271A-271B	1 ... 5 A (**CVM-B50-ITF**) 250 mA (**CVM-B50-MC**) 100 mV (**CVM-B50-FLEX**)	5 A (**CVM-B50-ITF**) 250 mA (**CVM-B50-MC**) 100 mV (**CVM-B50-FLEX**)

7. 5.12.3.- Nominal frequencyl

Table 106: Modbus memory map: Nominal frequency.

Nominal frequency				
Configuration variable	Type	Address	Valid data range	Default value
Nominal frequency	Uint 16	271E	50 Hz - 60 Hz	50 Hz

7.5.12.4.- Minimum voltage and current

Table 107: Modbus memory map: Minimum voltage and current.

Minimum voltage and current			
Configuration variable	Type	Address	Default value
Minimum voltage	Float 32	9D08-9D09	10 V
Minimum current	Float 32	9D0A-9D0B	0.01 (**CVM-B50-ITF**) 0.0015 (**CVM-B50-MC**) 0.0015 (**CVM-B50-FLEX**)

7.5.12.5.- Number of quadrants

Table 108: Modbus memory map: Number of quadrants.

Number of quadrants				
Configuration variable	Type	Address	Valid data range	Default value
Number of quadrants	Uint 16	2B64	**0:** 4 (consumption and generation) **1:** 2 (consumption)	**0**

7.5.12.6.- Quadrant rule

Table 109: Modbus memory map: Quadrant rule.

Quadrant rule				
Configuration variable	Type	Address	Valid data range	Default value
Quadrant rule	Uint 16	2B86	**0:** Circutor **1:** IEC 61557-12 **2:** IEEE 1459	**0**

7.5.12.7.- Installation type

Table 110: Modbus memory map: Installation type.

Installation type				
Configuration variable	Type	Address	Valid data range	Default value
Installation type	Uint 16	2B5C	**0:** 4-3PH 4-wire three-phase network. **1:** 3-3PH 3-wire three-phase network. **2:** 3ARON 3-wire three-phase Aron network. **3:** 3-2PH 3-wire two-phase network. **4:** 2-2PH 2-wire phase-to-phase single-phase network. **5:** 2-1PH 2-wire phase-to-neutral single-phase network. **6:** 3-3I T 3-wire three-phase network with earth.	**0**

7.5.12.8.- Maximum Demand

Table 111:Modbus memory map: Maximum Demand.

Maximum Demand				
Configuration variable	Type	Address	Valid data range	Default value
Integration period	Uint 16	274C	0[1] - 60 minutes	15 min
Integration window	Uint 16	274D	**0:** Sliding window **1:** Fixed window	**0**

[1] Setting the value 0 disables the Maximum Demand calculation.

Note: *When modifying the Maximum Demand configuration variables, the device restarts the Maximum Demand calculation.*

7.5.12.9.- THD/TDD calculation

Table 112:Modbus memory map: THD/TDD calculation.

THD/TDD calculation				
Configuration variable	Type	Address	Valid data range	Default value
THD/TDD calculation	Uint 16	2774	**0:** THD, calculation using the RMS value. **1:** TDD, calculation using the fundamental value.	**0**

7.5.12.10.- Backlight

Table 113: Modbus memory map: Backlight

Backlight				
Configuration variable	Type	Address	Valid data range	Default value
Backlight	Uint 16	2B5E	0 ... 99 seconds **0:** Always on	0 s

7.5.12.11.- Enable harmonic display screen

Table 114: Modbus memory map: Harmonic display

Harmonic display				
Configuration variable	Type	Address	Valid data range	Default value
Harmonic display	Bool	2B62	**0:** No **1:** Yes	**1**

7.5.12.12.- CO_2 emissions in consumption and generation

Table 115: Modbus memory map: CO_2 emissions in consumption and generation.

CO_2 emissions				
Configuration variable	Type	Address	Valid data range	Default value
Consumption tariff 1 emissions ratio	Float 32	2724-2725	≥ 0 (no upper limit)	0
Consumption tariff 2 emissions ratio	Float 32	2726-2727	≥ 0 (no upper limit)	0
Consumption tariff 3 emissions ratio	Float 32	2728-2729	≥ 0 (no upper limit)	0

Table 115 (Continued): Modbus memory map: CO_2 emissions in consumption and generation.

CO_2 emissions				
Configuration variable	Type	Address	Valid data range	Default value
Generation tariff 1 emissions ratio	Float 32	272A-272B	≥ 0 (no upper limit)	0
Generation tariff 2 emissions ratio	Float 32	272C-272D	≥ 0 (no upper limit)	0
Generation tariff 3 emissions ratio	Float 32	272E-272F	≥ 0 (no upper limit)	0

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

7.5.12.13.- Energy cost in consumption and generation

Table 116: Modbus memory map: Energy cost in consumption and generation.

Cost per kWh				
Configuration variable	Type	Address	Valid data range	Default value
Consumption tariff 1 cost per kWh	Float 32	2730-2731	≥ 0 (no upper limit)	0
Consumption tariff 2 cost per kWh	Float 32	2732-2733	≥ 0 (no upper limit)	0
Consumption tariff 3 cost per kWh	Float 32	2734-2735	≥ 0 (no upper limit)	0
Generation tariff 1 cost per kWh	Float 32	2736-2737	≥ 0 (no upper limit)	0
Generation tariff 2 cost per kWh	Float 32	2738-2739	≥ 0 (no upper limit)	0
Generation tariff 3 cost per kWh	Float 32	273A-273B	≥ 0 (no upper limit)	0

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

7.5.12.14.- RO1 and RO2 Relay Output programming

Table 117: Modbus memory map: RO1 and RO2 Relay Output programming.

RO1 and RO2 Relay Output programming					
Configuration variable	Type	Address		Valid data range	Default value
		RO1	RO2		
High threshold	Float 32	2AF8-2AF9	2B0C-2B0D	According to variable	0
Low threshold	Float 32	2AFA-2AFB	2B0E-2B0F	According to variable	0
Variable code	Uint 16	2AFC	2B10	**Table 46 and Table 47**	0
Alarm activation delay	Uint 16	2AFD	2B11	0 ... 999 seconds	0
Alarm hysteresis	Uint 16	2AFE	2B12	0 ... 99 %	0
Latch	Bool	2AFF	2B13	**0:** No **1:** Yes	**0**
Alarm deactivation delay	Uint 16	2B00	2B14	0 ... 999 seconds	0
Contact status	Uint 16	2B01	2B15	**0:** Normally open **1:** Normally closed	**0**
Alarm latch deactivation delay	Uint 32	2B02-2B03	2B16-2B17	0 ... 600 seconds	0

7.5.12.15.- DO1 and DO2 Digital Output programming

Table 118: Modbus memory map: DO1 and DO2 Digital Output programming.

DO1 and DO2 Digital Output programming					
Configuration variable	Type	Address		Valid data range	Default value
		DO1	DO2		
Digital Outputs programmed as alarm					
High threshold	Float 32	2B20-2B21	2B34-2B35	According to variable	0
Low threshold	Float 32	2B22-2B23	2B36-2B37	According to variable	0
Variable code	Uint 16	2B24	2B38	**Table 46 and Table 47**	0
Alarm activation delay	Uint 16	2B25	2B39	0 ... 999 seconds	0
Alarm hysteresis	Uint 16	2B26	2B3A	0 ... 99 %	0
Latch	Bool	2B27	2B3B	**0 :** No **1:** Yes	**0**
Alarm deactivation delay	Uint 16	2B28	2B3C	0 ... 999 seconds	0
Contact status	Uint 16	2B29	2B3D	**0:** Normally open **1:** Normally closed	**0**
Alarm latch deactivation delay	Uint 32	2B2A-2B2B	2B3E-2B3F	0 ... 600 seconds	0
Digital Outputs programmed as pulse					
Variable code	Uint 16	2B2C	2B40	**Table 55**	0
Pulse rate	Float 32	2B2D-2B2E	2B41-2B42	0 ... 999.999 kWh 0 ... 999.999 $kgCO_2$ 0 ... 9999.99 Coin 0 ... 999 Hour	1000 Wh 1000 gCO_2 1 Coin 1 Hour
Pulse width	Uint 16	2B2F	2B43	30 ... 500 ms	100 ms

7.5.12.16.- DI1, DI2, DI3 and DI4 Digital Input programming

Table 119: Modbus memory map: DI1, DI2, DI3 and DI4 Digital Input programming.

DI1, DI2, DI3 and DI4 Digital Input programming							
Configuration variable	Type	Address				Valid data range	Default value
		DI1	DI2	DI3	DI4		
Operating mode [2]	Uint 16	2B66	2B69	2B6C	2B6F	**0**: Tariff [3] **1**: Status **2**: Pulse **3:** Maximum Demand synchronisation pulse[4]	**0** (DI1) **0** (DI2) **1** (DI3) **1** (DI4)
Pulse weight	Uint 16	2B67	2B6A	2B6D	2B70	1 ... 0xFFFF	1
Pulse width	Uint 16	2B68	2B6B	2B6E	2B71	10 ... 10000 ms	30 ms

[2] If Input 1 is configured as tariff and Input 2 as logic status (or vice versa), only 2 tariffs will be available.
[3] Option available for **DI1** and **DI2** Digital Inputs.
[4] Option available for **DI4** Digital Input.

Table 120: Modbus memory map: DI1, DI2, DI3 and DI4 pulse counter.

DI1, DI2, DI3 and DI4 pulse counter			
Variable	Type	Address	Value
DI1 pulse counter	Uint 64	4E2A ... 4E2D	-
DI2 pulse counter	Uint 64	4E2E ... 4E31	
DI3 pulse counter	Uint 64	4E32 ... 4E35	
DI4 pulse counter	Uint 64	4E36 ... 4E39	

7.5.12.17.- Clock

Table 121:Modbus memory map: Clock.

Clock				
Configuration variable	Type	Address	Valid data range	Default value
Clock	Uint 32	283C	s (epoch)	-

7.5.12.18.- Tariff

Table 122:Modbus memory map: Tariff.

Tariff				
Configuration variable	Type	Address	Valid data range	Default value
Current tariff	Uint 16	2B75	**1**: Tariff 1, **2**: Tariff 2, **3**: Tariff 3	**1**

7.5.12.19.- Password configuration

These variables allow locking or unlocking access to the editing of configuration parameters and also allow changing the password value. The only way to change the password value is through this command.

Note: *The device does not require the old password to save the new one; the new password is saved directly without any verification.*

Table 123: Modbus memory map: Password configuration.

Password configuration				
Configuration variable	Type	Address	Valid data range	Default value
Password value	Uint 16	2B7A	0000 ... 9999	1234
Configuration lock	Bool	2B7B	**0**: Unlock **1**: Lock	**0**

7.5.12.20.- Voltage quality

Table 124: Modbus memory map: Voltage quality.

Voltage quality				
Configuration variable	Type	Address	Valid data range	Default value
Reference voltage	Float 32	36B0-36B1	-	230 V
Overvoltage threshold	Float 32	36B2-36B3	100.00 ... 300.00 %	110.00 %
Overvoltage activation	Uint 16	36B4	1 ... 600 s	60 s
Overvoltage deactivation	Uint 16	36B5	1 ... 600 s	60 s
Undervoltage threshold	Float 32	36B6-36B7	5 ... 100 %	85.00 %
Undervoltage activation	Uint 16	36B8	1 ... 600 s	60 s
Undervoltage deactivation	Uint 16	36B9	1 ... 600 s	60 s

7.5.12.21.- Logging period

The logging period can be configured for Average Measurement, Maximum Measurement and Minimum Measurement profiles. For energy profiles, the period is fixed at 900 s.

Table 125:Modbus memory map: Logging period.

Logging period				
Configuration variable	Type	Address	Valid data range	Default value
Logging period	Uint 32	32C8-32C9	600 s - 900 s - 1200 s - 1800 s - 3600 s	600 s

7.5.12.22.- BACnet communications

Table 126:Mapa de memoria Modbus: BACnet communications.

BACnet communications				
Configuration variable	Type	Address	Valid data range	Default value
ID	Uint 32	2CEC-2CED	00000 ... 4194303	1
Port	Uint 16	2CEE	1024 ... 65535	47808

7.6.- BACnet PROTOCOL

BACnet is a communication protocol for Building Automation and Control Networks. This protocol replaces the proprietary communications of each device with a common set of communication rules, allowing the complete integration of building control and automation systems from different manufacturers.

The device incorporates **BACnet/IP** communication in accordance with ANSI/ASHRAE 135 (ISO 16484-5).

Through an Ethernet connection, the device can be integrated into a **BACnet/IP** network, making available all the objects and services defined in the corresponding **PICS** (*Protocol Implementation Conformance Statement*) document (see ***"ANNEX A.- PICS MAP"***).

Communication is carried out via UDP, using port 47808 (0xBAC0) by default. This parameter can be modified from the configuration screen if required by the network architecture.

The device identifier (Device_ID) can be modified from the configuration screen or by writing the corresponding property of the Device object. This identifier must be unique within the **BACnet** system.

For more information about the **BACnet** protocol, visit: **www.bacnet.org**

8.- WEB PAGE

Access to the device configuration and display Web page is carried out through its IP address.
It is also possible to access it using the device name followed by the "**.local**" domain, provided that access is made from a device connected to the same network (same IP range) or connected to the device Wi-Fi access point.

By default, the device name is composed of the model and the last four digits of the serial number. For example, if the device name is **CVM-B50-1234**, it can be accessed through the following URL:

https://cvm-b50-1234.local (case insensitive).

This is the default device name, but it can be modified in section ***"8.5.1.-DEVICE INFORMATION".***

To access the Web page, the screen shown in **Figure 41**, is displayed, where the Username and Password must be entered. The default values are shown in **Table 127**.

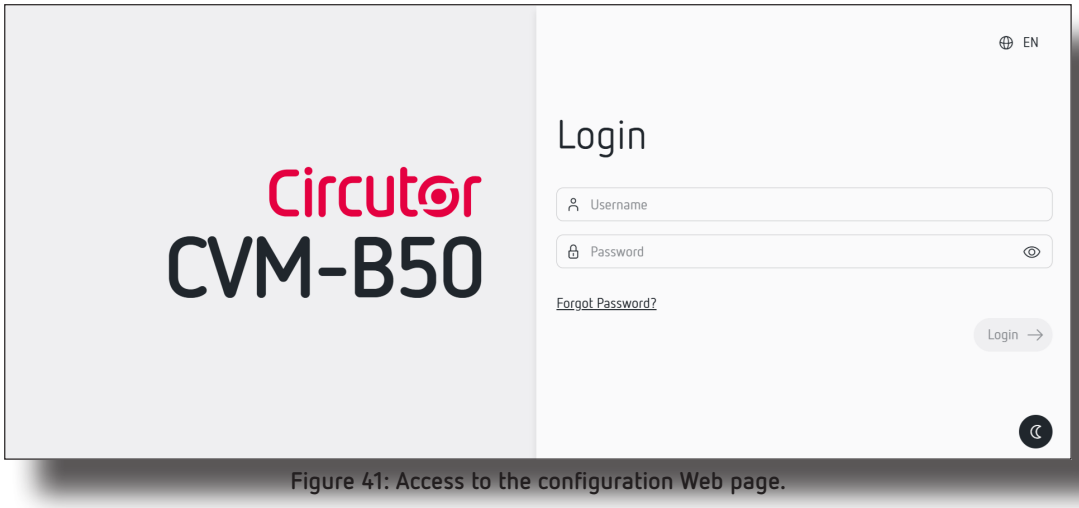


Figure 41: Access to the configuration Web page.

Table 127: Access to the configuration Web page.

Access to the configuration Web page	
Username	admin
Password	circutor

If the access password has been forgotten, click on the **Forgot Password?** option in order to change the password using the device serial number.

Note: *In the upper right corner, ⊕, it is possible to change the Web page language.*

Once access has been validated, the main screen shown in **Figure 42** is displayed.

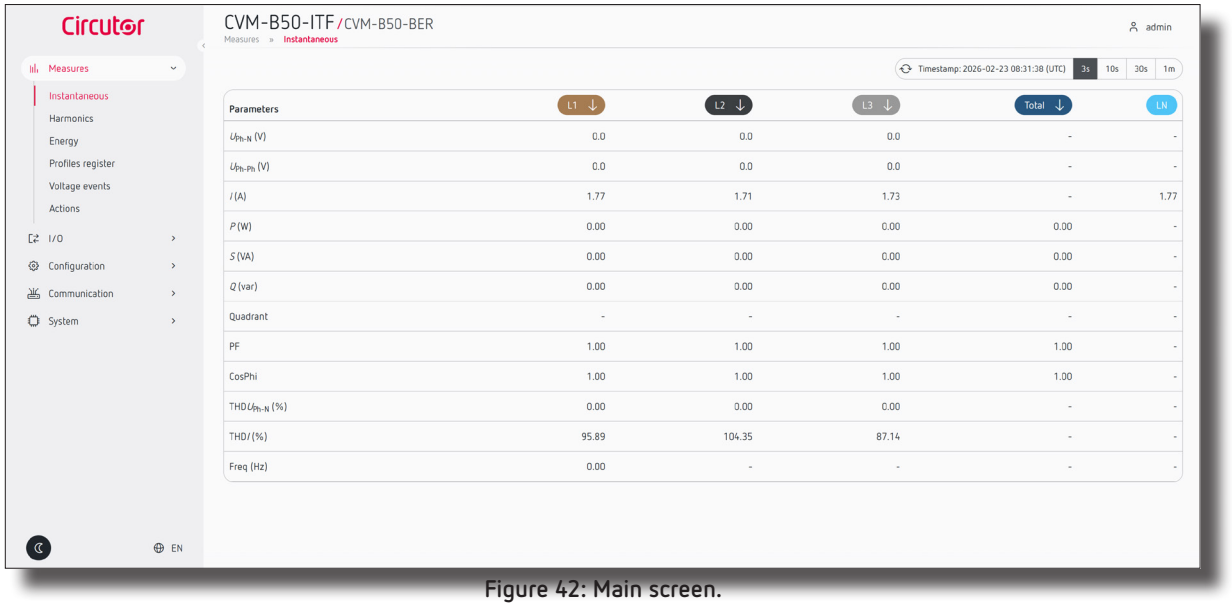


Figure 42: Main screen.

From this screen it is possible to access the configuration Web page menu:

- **Measures** → display of the values measured by the device
- **I/O** → display and configuration of the device Inputs and Outputs.
- **Configuration** → configuration of the device parameters.
- **Communication** → configuration of the device communication parameters.
- **System** → display of system information.

The following actions can also be performed from the Web page:

Press to log out.
Change the Web page language.
Switch the Web page to night mode.

8.1.- MEASURES

In the **Mesures** section, the most important values measured by the device are displayed.

8.1.1.- INSTANTANEOUS

This section displays the instantaneous values of the parameters measured by the **CVM-B50**, **Figure 43.**

Figure 43:Web page, Measurements (Instantaneous).

8.1.2.- HARMONICS

This section displays the voltage and current harmonics, **Figure 44.**

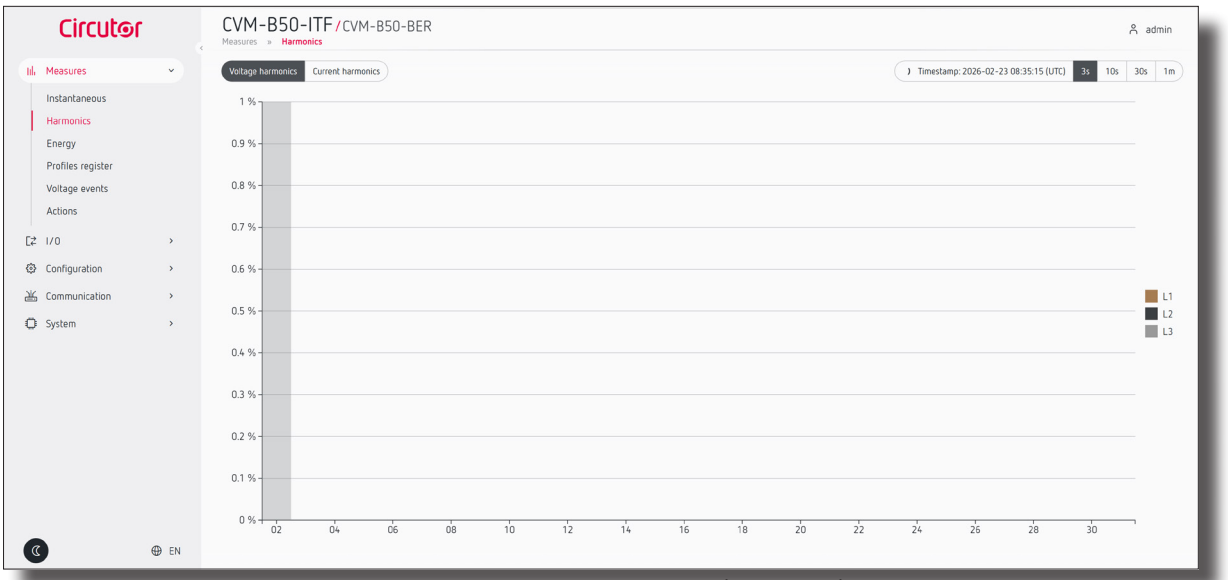


Figure 44:Web page, Measurements (Harmonics).

8.1.3.- ENERGY

This section displays the energies measured by the **CVM-B50, Figure 45**.

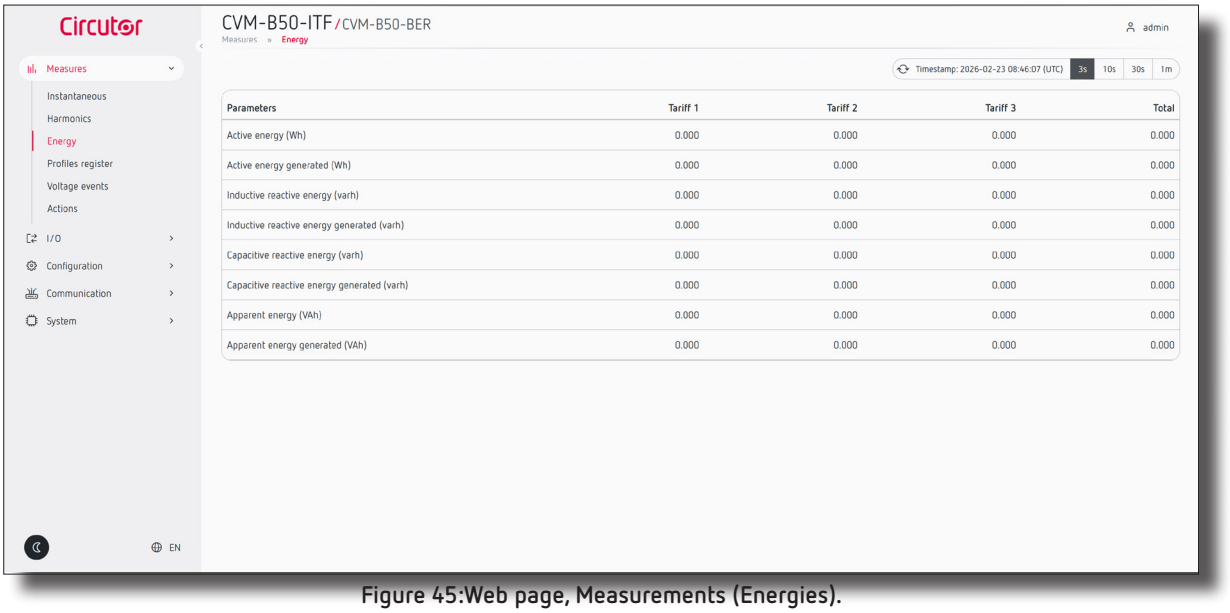


Figure 45:Web page, Measurements (Energies).

Note: *The energy counters reset the accumulated record upon reaching the maximum values of 1 TWh (Active Energy), 1 Tvarh (Reactive Energy) and 1 TVAh (Apparent Energy). The total variables reset the accumulated record upon reaching values of 3 Teras.*

8.1.4.- PROFILES REGISTER

This section allows downloading the history of the records stored by the device, **Figure 46**.

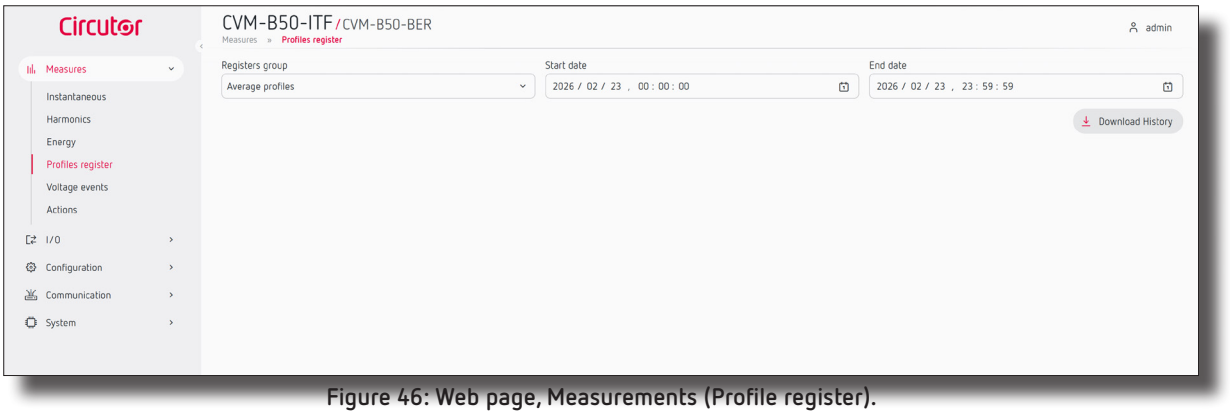


Figure 46: Web page, Measurements (Profile register).

The records available for download are:

- ✓ Average measurement profiles.
- ✓ Maximum measurement profiles.
- ✓ Minimum measurement profiles.
- ✓ Energy bill.

Select the **Register group**, the start and end date, and press **Download History.**

8.1.5.- VOLTAGE EVENTS

This section displays the voltage events generated in the **CVM-B50** by selecting the start and end date, **Figure 47**.

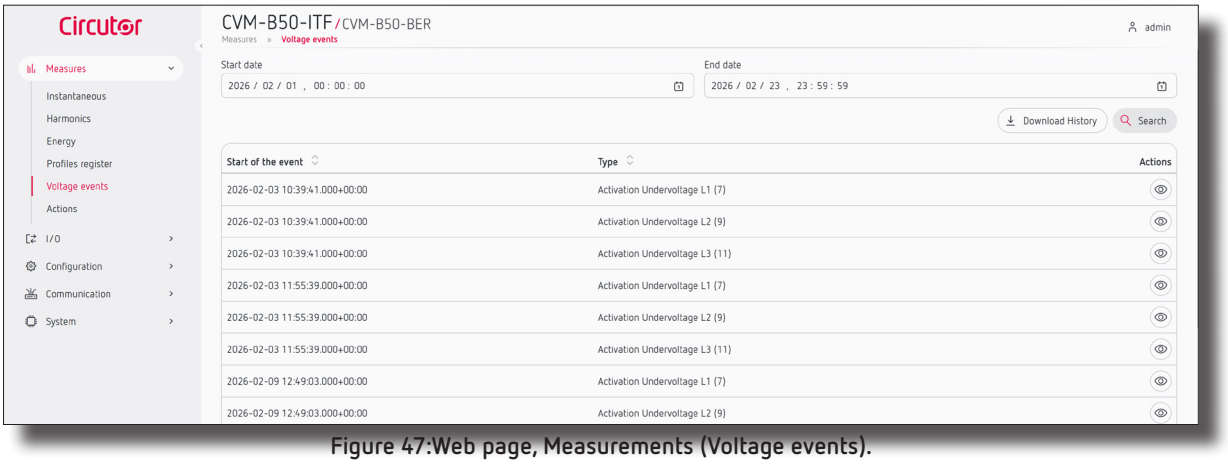


Figure 47:Web page, Measurements (Voltage events).

Press **Search** to display the parameters once a period has been selected.
The searched events can be saved using *Download History*.

8.1.6.- ACTIONS

This section allows deleting different parameters by pressing **Execute** , **Figure 48**.

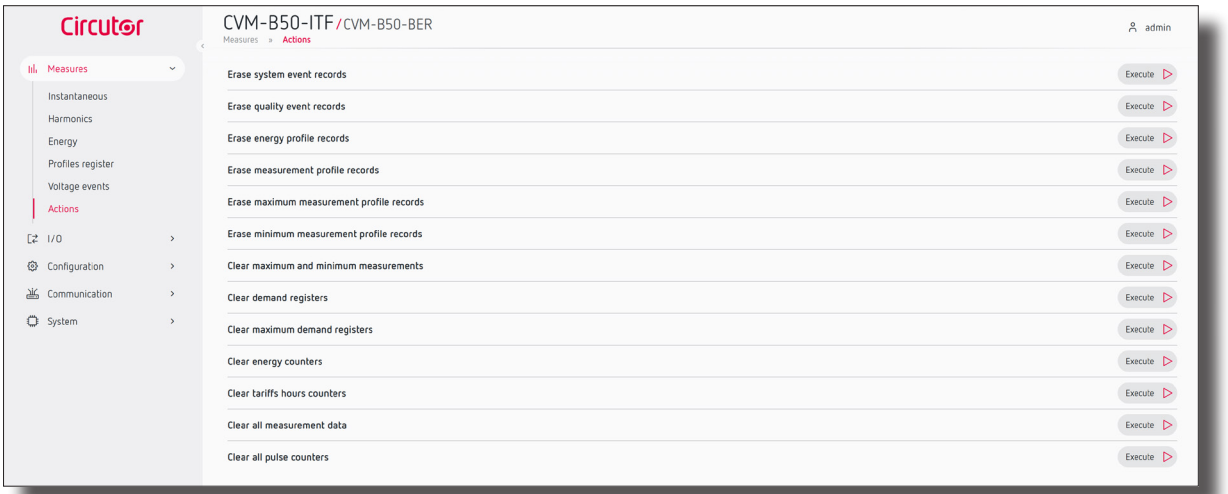


Figure 48:Web page, Measurements (Actions).

8.2.- I/O

In the **I/O** section, the device Inputs and Outputs are displayed and configured.

8.2.1.- DIGITAL INPUTS

This section displays the status and configuration of the device Digital Inputs.
The **CVM-B50** model has 4 digital inputs, **Figure 49**.

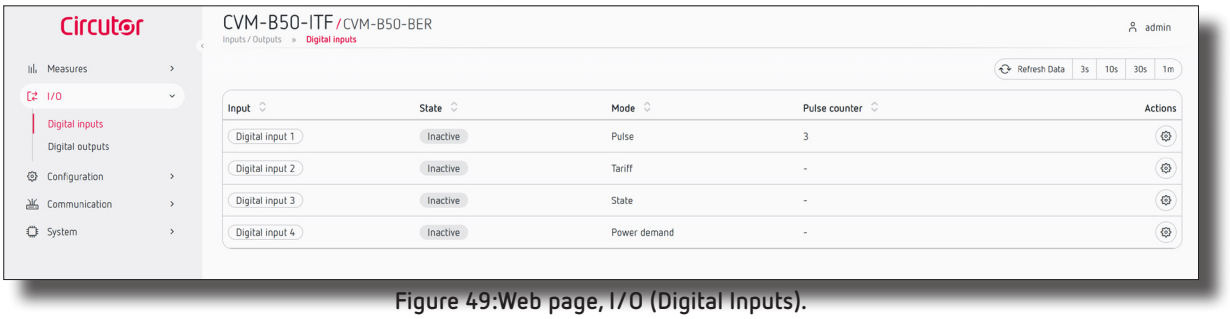


Figure 49:Web page, I/O (Digital Inputs).

Press ⚙ to access the Digital Input configuration screen. The screen shown in **Figure 50** is displayed.

Figure 50: Edit Digital Input.

✓**Mode**: Select the operating mode of the Digital Input:
Status: Logic input.
Pulse: Pulse counter.
Tariff: Tariff selection. Option available for Digital Inputs 1 and 2.
Maximum Demand: Maximum Demand synchronisation pulse. Option available for Digital Input 4.

✓**Pulse width**: Digital Input pulse width, in ms.

✓**Pulse weight:** Pulse weight.

Note: *Variable available in **Pulse** Mode.*

Press 🖫 **Save** to save the changes made.

If **Mode: Pulse** has been selected, the following is also displayed:

✓**Pulse counter**, indicating the pulses received by the device.
It is also possible to **Reset the pulse counter** by pressing **Execute**.

8.2.2.- DIGITAL OUTPUTS

This section displays the status and configuration of the device Digital Outputs.
The **CVM-B50** model has 2 digital outputs (**DO1** and **DO2**) and 2 relay outputs (**RO1** and **RO2**), **Figure 51**.

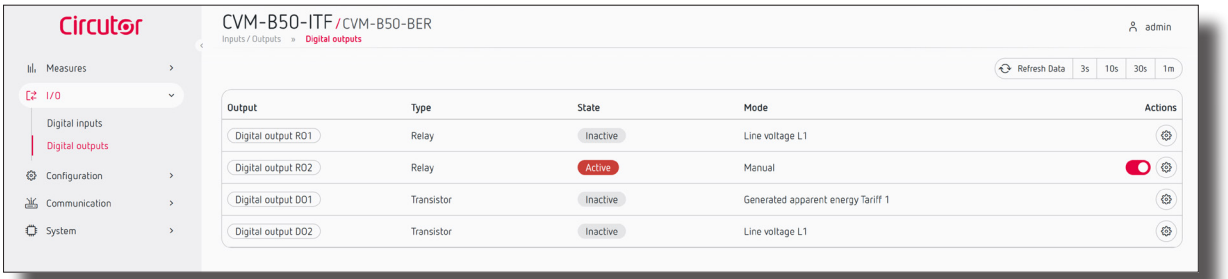


Figure 51:Web page, I/O (Digital Outputs).

8.2.2.1.- Digital Output RO1 and Digital Output RO2

Press ⚙ to access the Relay Output configuration screen. The screen shown in **Figure 52** is displayed.

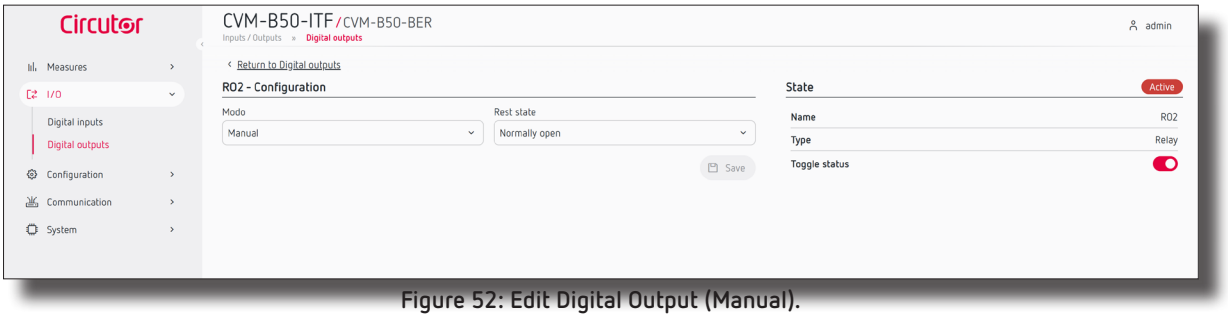


Figure 52: Edit Digital Output (Manual).

Configuration

✓**Mode**: Select the operating mode of the Relay Output, see **Table 128**.

Table 128: Operating modes of the Relay Outputs and Digital Outputs.

Mode		
General	Manual	
Frequency	Frequency	
Voltage	L1 line voltage	L2 line voltage
	L3 line voltage	L1-L2 line voltage
	L2-L3 line voltage	L3-L1 line voltage
	Voltage on any line	Voltage on any phase
Current	L1 current	L1 current demand register
	L2 current	L2 current demand register
	L3 current	L3 current demand register
	Neutral current	Average current demand register
	Current on any line	
Active Power	L1 Active Power	L2 Active Power
	L3 Active Power	Three-phase Active Power
	Three-phase Active Power demand register	Active Power on any line

Table 128 (Continued): Operating modes of the Relay Outputs and Digital Outputs.

Mode		
Reactive Power	L1 inductive Reactive Power	L1 capacitive Reactive Power
	L2 inductive Reactive Power	L2 capacitive Reactive Power
	L3 inductive Reactive Power	L3 capacitive Reactive Power
	Three-phase inductive Reactive Power	Three-phase capacitive Reactive Power
	Three-phase inductive Reactive Power demand register	Three-phase capacitive Reactive Power demand register
	Inductive Reactive Power on any line	Capacitive Reactive Power on any line
Apparent Power	L1 Apparent Power	L2 Apparent Power
	L3 Apparent Power	Three-phase Apparent Power
	Three-phase Apparent Power demand register	Apparent Power on any line
Power Factor	L1 Power Factor	L2 Power Factor
	L3 Power Factor	Three-phase Power Factor
	Power Factor on any line	
Cos Phi	L1 cos phi	L2 cos phi
	L3 cos phi	Cos phi
Harmonics	L1 voltage THD	L2 voltage THD
	L3 voltage THD	L1 current THD
	L2 current THD	L3 current THD
	Voltage THD on any line	Current THD on any line

If **Mode: Manual** has been selected, **Figure 52**, the following is also configured:

✓**Rest state**: Select the relay idle state: **Normally open** or **Normally closed**.

Press **Save** to save the changes made.

State

In **Toggle status**, the relay is manually activated or deactivated.

If any of the other variables from **Table 128** has been selected in **Mode, Figure 53** is displayed, and the following parameters must also be configured:

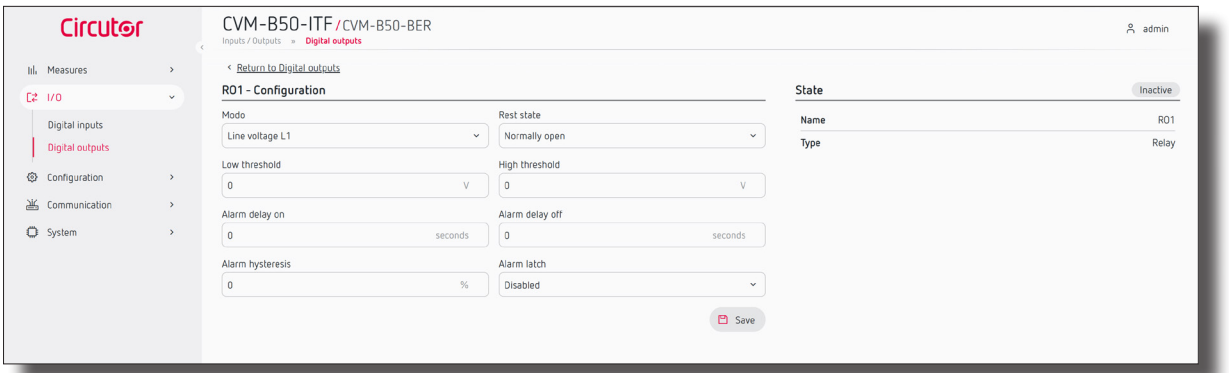


Figure 53: Edit Digital Output (Measurement variable).

✓**Rest state**: Select the relay idle state: **Normally open** or **Normally closed**.
✓**Low threshold:** Value below which the Relay Output is activated.
✓**High threshold:** Value above which the Relay Output is activated.
✓**Alarm delay on:** Delay in seconds before activation of the Relay Output.

Table 129:Configuration values: Alarm delay on.

Alarm delay on	
Minimum value	0 s
Maximum value	999 s

✓**Alarm delay off:** Delay in seconds before deactivation of the Relay Output.

Table 130:Configuration values: Alarm delay off.

Alarm delay off	
Minimum value	0 s
Maximum value	999 s

✓**Alarm hysteresis:** Difference between the activation and deactivation value of the Relay Output, in %.

Table 131:Configuration values: Alarm hysteresis.

Alarm hysteresis	
Minimum value	0 %
Maximum value	99 %

✓**Alarm latch:** Select whether latching is enabled or not, meaning that after the relay is triggered it remains latched even if the condition that caused the trigger disappears.

If alarm latching has been enabled, the following must also be configured:

✓**Alarm latch deactivation delay**: Time in seconds during which the Relay Output remains latched. Once this time has elapsed, if the activation condition is no longer present, the deactivation delay is activated.

Table 132:Configuration values: Alarm latch deactivation delay.

Alarm latch deactivation delay	
Minimum value	0 s
Maximum value	600 s

Press **Save** to save the changes made.

8.2.2.2.- Digital Output DO1 and Digital Output DO2

Press to access the Digital Output configuration screen. The screen shown in **Figura 52** is displayed.

The configuration parameters are:

✓**Mode**: Select the operating mode of the Digital Output, see **Table 128** and **Table 133**.

Table 133: Operating modes of the Digital Output (Table 2).

Mode		
Active Energy	Consumed Active Energy	Generated Active Energy
	Consumed Active Energy Tariff 1	Generated Active Energy Tariff 1
	Consumed Active Energy Tariff 2	Generated Active Energy Tariff 2
	Consumed Active Energy Tariff 3	Generated Active Energy Tariff 3
Reactive Energy	Consumed inductive Reactive Energy	Generated inductive Reactive Energy
	Consumed capacitive Reactive Energy	Generated capacitive Reactive Energy
	Consumed inductive Reactive Energy Tariff 1	Generated inductive Reactive Energy Tariff 1
	Consumed capacitive Reactive Energy Tariff 1	Generated capacitive Reactive Energy Tariff 1
	Consumed inductive Reactive Energy Tariff 2	Generated inductive Reactive Energy Tariff 2
	Consumed capacitive Reactive Energy Tariff 2	Generated capacitive Reactive Energy Tariff 2
	Consumed inductive Reactive Energy Tariff 3	Generated inductive Reactive Energy Tariff 3
	Consumed capacitive Reactive Energy Tariff 3	Generated capacitive Reactive Energy Tariff 3
Apparent Energy	Consumed Apparent Energy	Generated Apparent Energy
	Consumed Apparent Energy Tariff 1	Generated Apparent Energy Tariff 1
	Consumed Apparent Energy Tariff 2	Generated Apparent Energy Tariff 2
	Consumed Apparent Energy Tariff 3	Generated Apparent Energy Tariff 3
Energy CO_2	Consumed energy CO_2	Generated energy CO_2
	Consumed energy CO_2 Tariff 1	Generated energy CO_2 Tariff 1
	Consumed energy CO_2 Tariff 2	Generated energy CO_2 Tariff 2
	Consumed energy CO_2 Tariff 3	Generated energy CO_2 Tariff 3
Energy cost	Consumed energy cost	Generated energy cost
	Consumed energy cost Tariff 1	Generated energy cost Tariff 1
	Consumed energy cost Tariff 2	Generated energy cost Tariff 2
	Consumed energy cost Tariff 3	Generated energy cost Tariff 3
Energy hours	Total energy hours	Total energy hours Tariff 1
	Total energy hours Tariff 2	Total energy hours Tariff 3

If a variable from **Table 128** has been selected in **Mode**, the configuration parameters are the same as those described in section ***"8.2.2.1.- Digital Output RO1 and Digital Output RO2".***

If a variable from **Table 133** has been selected in **Mode**, the configuration parameters are as follows, **Figure 54**:

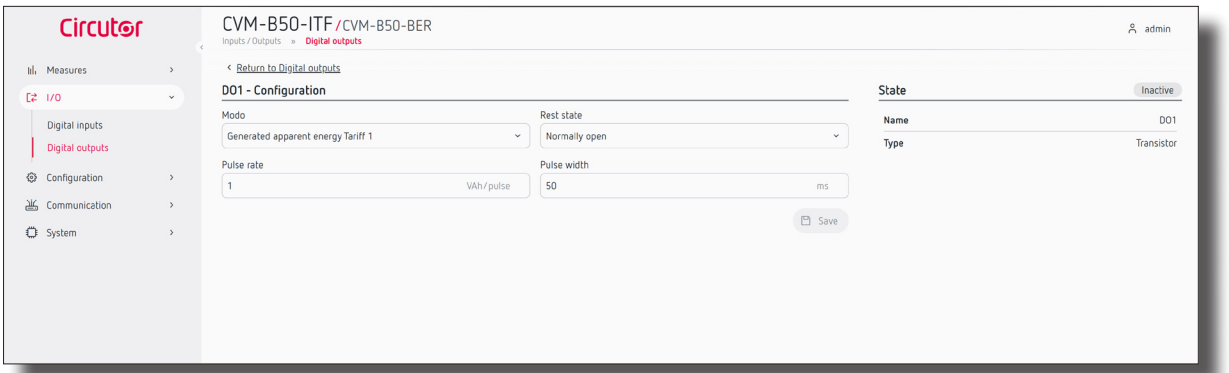


Figure 54: Edit Digital Output (Energy variable).

✓**Rest state:** Select the transistor idle state: **Normally open** or **Normally closed.**

✓**Pulse rate:** kilowatts per pulse of the Digital Output.

Table 134: Configuration values: Pulse rate.

	Active Energy	Reactive Energy	Apparent Energy
Minimum value	000.000 kWh/pulse	000.000 kvarh/pulse	000.000 kVAh/pulse
Maximum value	999.999 kWh/pulse	999.999 kvarh/pulse	999.999 kVAh/pulse
	CO_2 emissions	**Cost**	**Number of hours**
Minimum value	000.000 $kgCO_2$/pulse	0000.00 Cost/pulse	000 h/pulse
Maximum value	999.999 $kgCO_2$/pulse	9999.99 Cost/pulse	999 h/pulse

✓**Pulse width:** Pulse width in ms.

Table 135:Configuration values: Pulse width.

Pulse width	
Minimum value	30 ms
Maximum value	500 ms

Press **Save** to save the changes made.

8.3.- ⚙ CONFIGURATION

In the ⚙ **Configuration** section, the different device parameters are configured.

8.3.1.- INSTALLATION

This section configures the installation parameters of the **CVM-B50, Figure 55**.

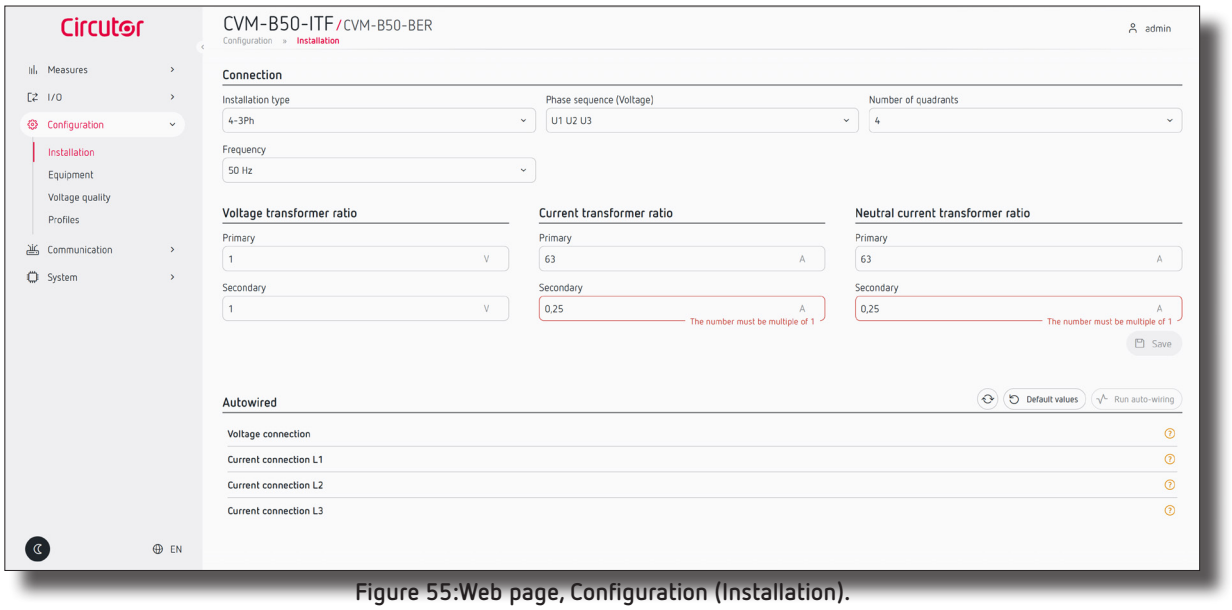


Figure 55:Web page, Configuration (Installation).

8.3.1.1.- Connection

Figure 56: Web page, Configuration (Installation - Connection).

✓**Installation type:** Configuration of the installation type, **Table 136.**

Table 136: Configuration values: Installation type.

Installation type		
Possible values	4-3PH	Three-phase network measurement with a 4-wire connection.
	3-3I T	Measuring Three-Phase Networks with a 3-wire and earth 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.
	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.

Note: *When the installation type is changed, the database is automatically deleted.*

✓**Phase sequence (Voltage):** Select the voltage phase sequence, **Table 137**.

Table 137:Configuration values: Phase sequence.

Phase sequence			
Possible values	U1 U2 U3	U1 U3 U2	U2 U1 U3
	U2 U3 U1	U3 U2 U1	U3 U1 U2

✓**Number of quadrants:** Select the number of quadrants in which the device performs the measurement, **Table 138**.

Table 138:Configuration values: Number of quadrants.

Number of quadrants		
Possible values	2	Consumption
	4	Consumption and Generation

✓**Frequency:** Select the nominal frequency of the device, **Table 139**.

Table 139:Configuration values: Frequency.

Frequency	
Possible values	50 Hz
	60 Hz

8.3.1.2.- Voltage transformer ratio

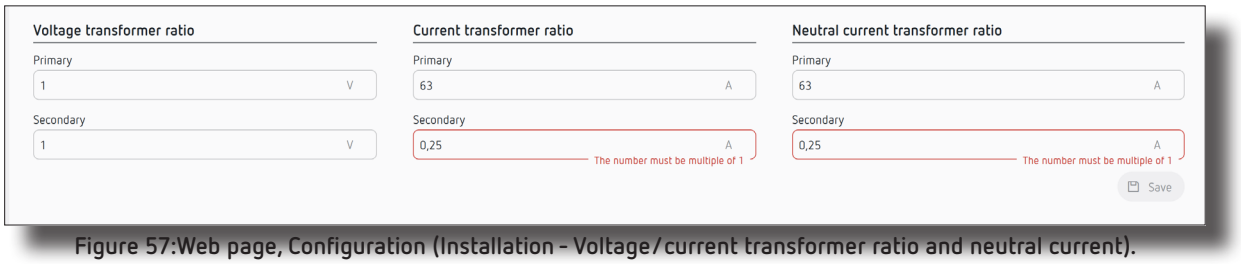


Figure 57:Web page, Configuration (Installation - Voltage/current transformer ratio and neutral current).

✓**Primary:** Voltage primary, **Table 140**.

Table 140:Configuration values: Voltage primary.

Voltage primary	
Minimum value	1
Maximum value	600000

✓**Secondary:** Voltage secondary, **Table 141**.

Table 141:Configuration values: Voltage secondary.

Voltage secondary	
Minimum value	1
Maximum value	999

8.3.1.3.- Current transformer ratio

Figure 57 shows the configuration values of the current transformer:

✓**Primary:** Current primary, **Table 142**.

Table 142:Configuration values: Current primary.

Current primary	
Minimum value	1
Maximum value	20000

✓**Secondary:** Current secondary, **Table 143**. Parameter not available in **CVM-B50-FLEX** and **CVM-B50-MC** models.

Table 143:Configuration values: Current secondary.

Current secondary	
Possible values	1 A
	5 A

8.3.1.4.- Neutral current transformer ratio

Figure 57 shows the configuration values of the neutral current transformer:

✓**Primary:** Neutral current transformer primary, **Table 144**.

Table 144:Configuration values: Neutral current primary.

Neutral current primary	
Minimum value	1
Maximum value	20000

✓**Secondary:** Neutral current transformer secondary, **Table 145**. Parameter not available in **CVM-B50-FLEX and CVM-B50-MC** models.

Table 145:Configuration values: Neutral current secondary.

Neutral current secondary	
Possible values	1 A
	5 A

Press **Save** to save the changes made.

8.3.1.5.- Autowired

By pressing the ⟳, key, the device checks the configuration carried out in sections *"8.3.1.1.- Connection"*, "8.3.1.2.- Voltage transformer ratio", *"8.3.1.3.- Current transformer ratio"* and *"8.3.1.4.- Neutral current transformer ratio"* and compares it with the actual physical connection, displaying the table shown in **Figure 58**, indicating the installation status.

Note: *The configuration check is only effectively carried out when the channels are configured as three-phase.*

Figure 58:Web page, Configuration (Installation - Autowired).

Table 146 shows the meaning of the icons.

Table 146: Connection status.

Status	Description
✓	The device has detected that the configuration is correct.
⚠	The device has detected that the configuration is not correct.
?	The device does not have information and cannot determine whether the configuration is correct or not.

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

If the device detects that the configuration is not correct, the phase sequence must be reconfigured and the **Run auto-wiring** button pressed so that the device correctly configures the voltages and currents.

Note: *For correct operation of the auto-wiring function, it is essential that the L1 voltage is correctly connected. Otherwise, voltage detection may be incorrect.*

Note: *Incorrect current connection detection is based on the angle between each current and its associated voltage. An error is considered to exist when this angle exceeds 30º (cos φ < 0.86). For this reason, the use of the auto-wiring function is not recommended in installations where the loads have phase shifts greater than this value.*

8.3.2.- EQUIPMENT

This section allows selecting the configuration parameters of the **CVM-B50, Figure 59**.

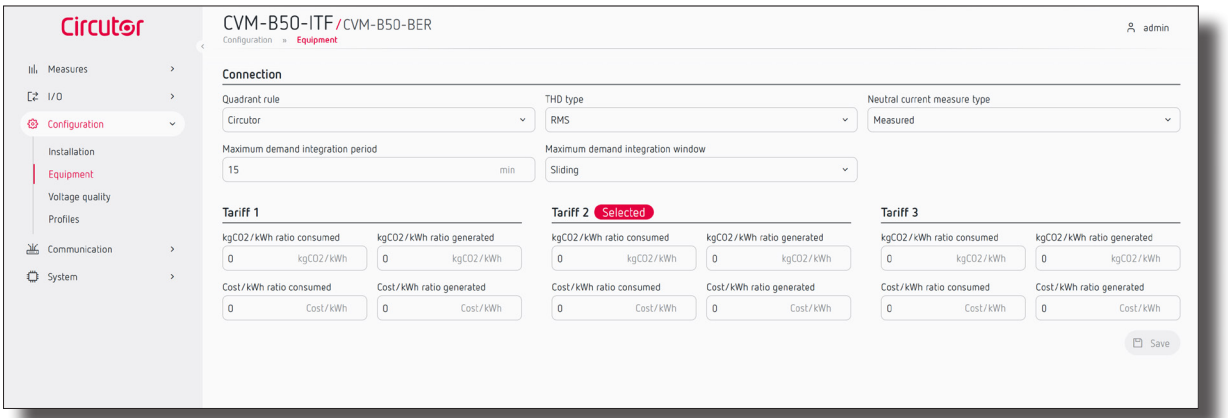


Figure 59:Web page, Configuration (Equipment).

8.3.2.1.- Connection

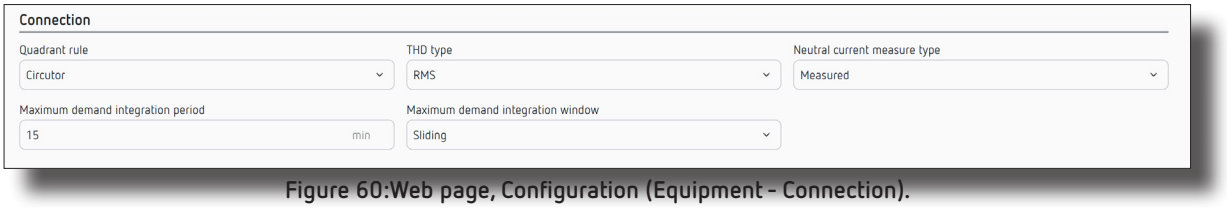


Figure 60:Web page, Configuration (Equipment - Connection).

✓**Quadrant rule:** This section selects the measurement convention to be used by the device, **Table 147.**

Table 147:Configuration values: Quadrant rule.

Quadrant rule		
Possible values	Circ	**Circutor** measurement convention.
	IEC	IEC 61557-12 measurement convention.
	IEEE	IEEE 1459 measurement convention.

✓**THD type:** Select the THD calculation, **Table 148**.

Table 148:Configuration values: THD calculation.

THD calculation		
Possible values	**RMS**	Calculation using the effective value (RMS).
	Fundamental	Calculation using the fundamental value.

✓**Neutral current measurement type:** Select whether it will be measured or calculated by the device, **Table 149**.

Table 149:Configuration values: Neutral current measurement type.

Neutral current measurement type		
Possible values	**Measured**	The device measures the neutral current.
	Calculated	The device calculates the neutral current.

✓**Maximum Demand integration period:** Maximum Demand integration period in minutes, **Table 150**.

Table 150:Configuration values: Maximum Demand integration period.

Maximum Demand integration period	
Minimum value	0 min
Maximum value	60 min

Note: *Setting the value* ***0*** *disables the Maximum Demand calculation.*
Note: *When the integration period is modified, the device restarts the Maximum Demand calculation.*

✓**Maximum Demand integration window:** Select the type of integration to be used for the Maximum Demand calculation, **Table 151**:

Table 151:Configuration values: Maximum Demand integration type.

Maximum Demand integration type		
Possible values	**Sliding**	Sliding window
	Fixed	Fixed window

8.3.2.2.- TARIFF 1, TARIFF 2 AND TARIFF 3

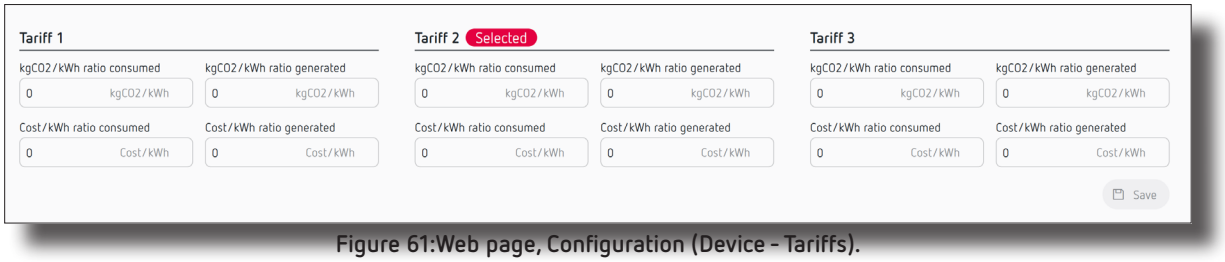


Figure 61:Web page, Configuration (Device - Tariffs).

For each device tariff, the following can be selected:

✓**kgCO2/kWh ratio consumed:** The carbon emissions ratio is the amount of emissions released into the atmosphere to produce one unit of electricity (1 kWh), **Table 152**.

Table 152:Configuration values: Emissions ratio, consumed energy.

Emissions ratio, consumed energy	
Minimum value	≥ 0 (no upper limit)
Maximum value	

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

✓**kgCO2/kWh ratio generated:** The carbon emissions ratio is the amount of emissions released into the atmosphere to produce one unit of electricity (1 kWh), **Table 153**.

Table 153:Configuration values: Emissions ratio, generated energy.

Emissions ratio, generated energy	
Minimum value	≥ 0 (no upper limit)
Maximum value	

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

✓**Cost/kWh ratio consumed:** Cost per kWh of electricity for consumed energy, **Table 154**.

Table 154:Configuration values: Cost ratio, consumed energy.

Cost ratio, consumed energy	
Minimum value	≥ 0 (no upper limit)
Maximum value	

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

✓**Cost/kWh ratio generated:** Cost per kWh of electricity for generated energy, **Table 155**.

Table 155:Configuration values: Cost ratio, generated energy.

Cost ratio, generated energy	
Minimum value	≥ 0 (no upper limit)
Maximum value	

Note: *Due to the display resolution, the programmed value may not be displayed correctly on the screen.*

Press **Save** to save the changes made.

8.3.3.- VOLTAGE QUALITY

This section configures the quality parameters of the **CVM-B50, Figure 62**.

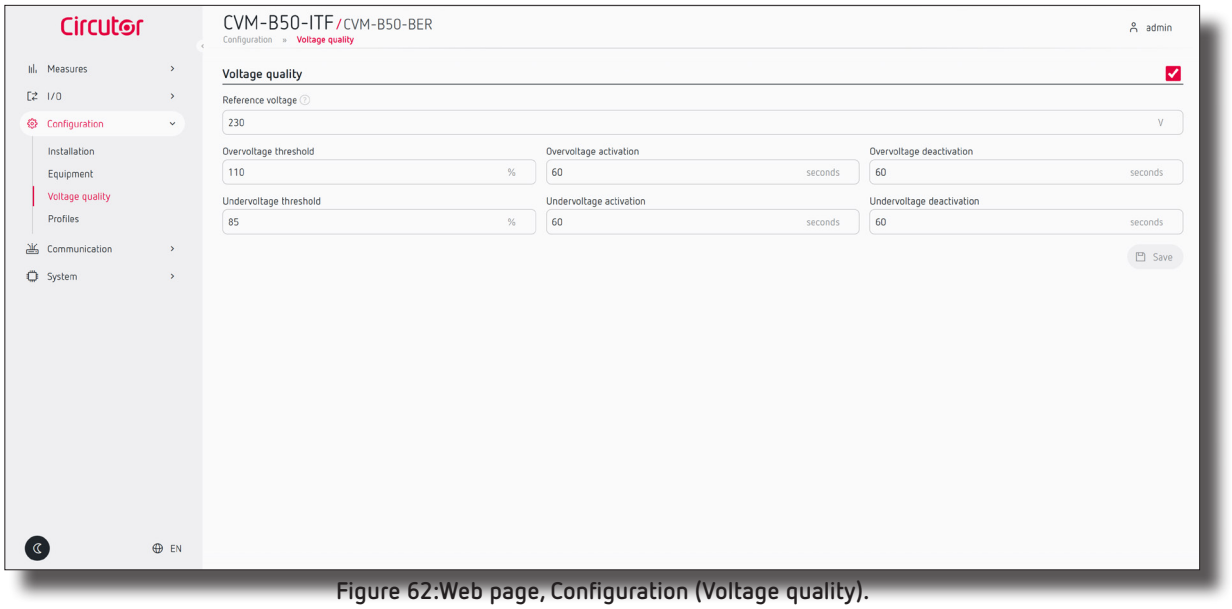


Figure 62:Web page, Configuration (Voltage quality).

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

✓**Overvoltage threshold:** An overvoltage condition is considered to exist if the RMS voltage value exceeds the threshold configured in this parameter. The value is configured as a percentage of the **Reference voltage** value, **Table 156**.

Table 156:Configuration values: Overvoltage threshold.

Overvoltage threshold	
Minimum value	100 %
Maximum value	300 %

✓**Overvoltage activation:** Overvoltage activation time in seconds, **Table 157**.

Table 157:Configuration values: Overvoltage activation.

Overvoltage activation	
Minimum value	1 s
Maximum value	600 s

✓**Overvoltage deactivation:** Overvoltage deactivation time in seconds, **Table 158**.

Table 158:Configuration values: Overvoltage deactivation.

Overvoltage deactivation	
Minimum value	1 s
Maximum value	600 s

✓**Undervoltage threshold:** An undervoltage condition is considered to exist if the RMS voltage value falls below the threshold configured in this parameter. The value is configured as a percentage of the **Reference voltage** value, **Table 159**.

Table 159:Configuration values: Undervoltage threshold.

Undervoltage threshold	
Minimum value	1 %
Maximum value	100 %

✓**Undervoltage activation:** Undervoltage activation time in seconds, **Table 160**.

Table 160:Configuration values: Undervoltage activation.

Undervoltage activation	
Minimum value	1 s
Maximum value	600 s

✓**Undervoltage deactivation:** Undervoltage deactivation time in seconds, **Table 161**.

Table 161:Configuration values: Undervoltage deactivation.

Undervoltage deactivation	
Minimum value	1 s
Maximum value	600 s

Press **Save** to save the configuration.

8.3.4.- PROFILES

This screen allows selecting the parameters to be recorded in the database, **Figure 63**.

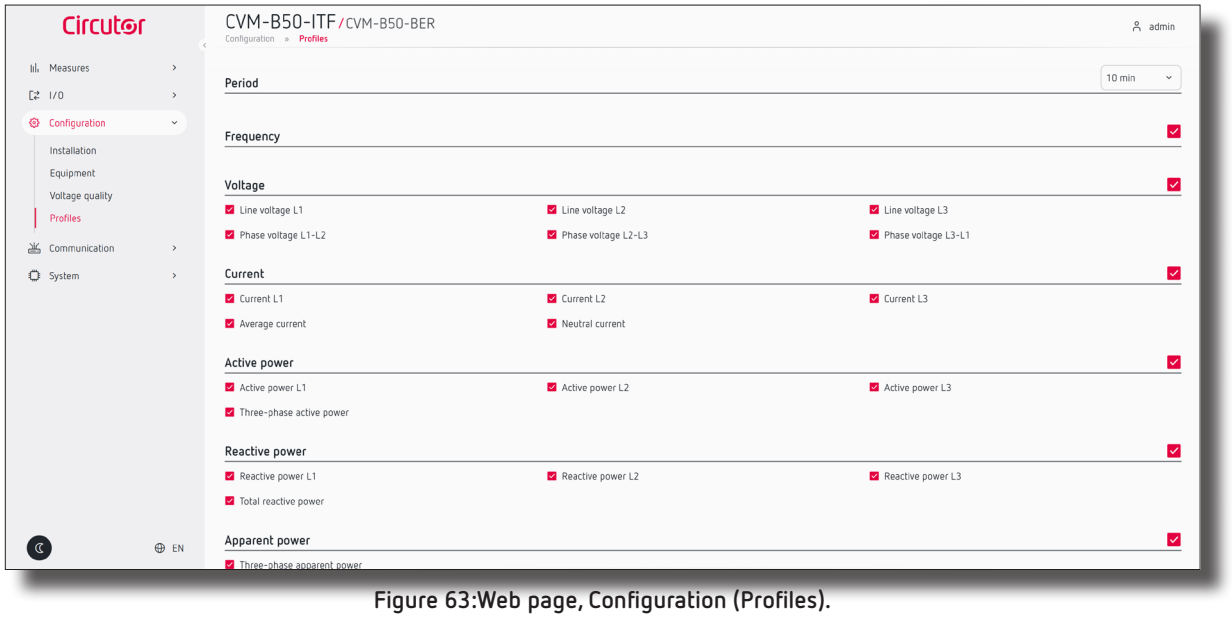


Figure 63:Web page, Configuration (Profiles).

✓**Period:** Select the logging period: **10 min, 15 min, 20 min, 30 min or 60 min.**

☑ Select each of the parameters to be recorded.

Note: *When the configuration is changed, the database is reset.*

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

8.4.- COMMUNICATION

In the **Communication** section, the device communication parameters are configured.

8.4.1.- Wi-Fi

Configuration of the Wi-Fi communications, **Figure 64**.

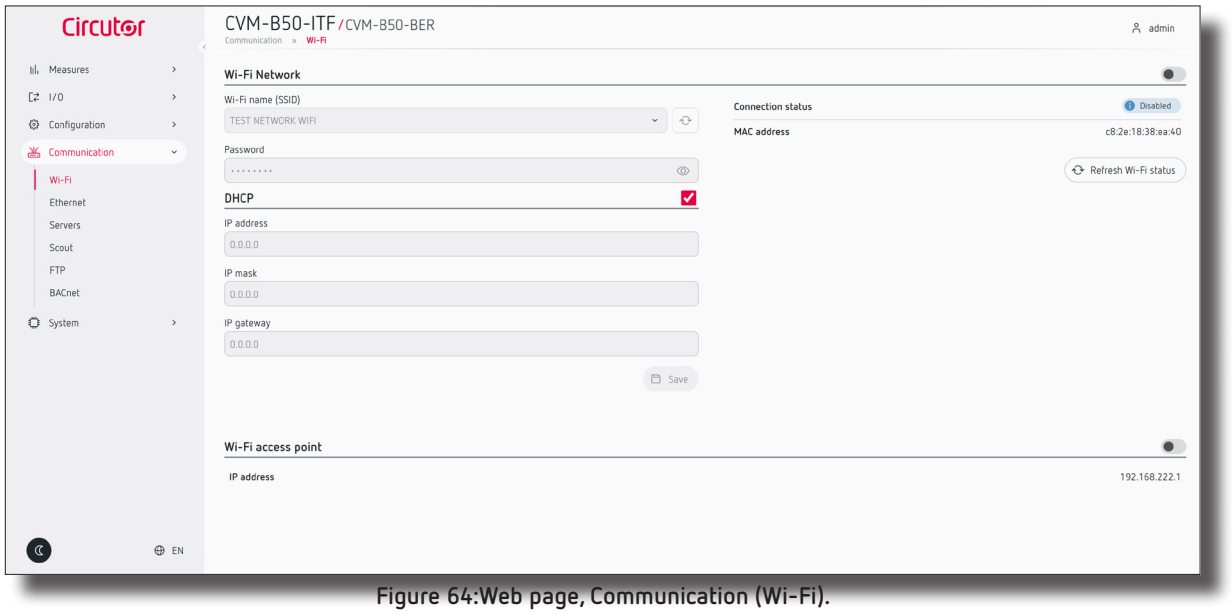


Figure 64:Web page, Communication (Wi-Fi).

8.4.1.1.- Wi-Fi Network

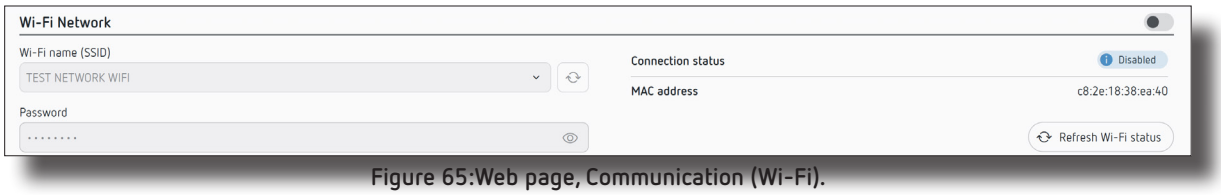


Figure 65:Web page, Communication (Wi-Fi).

: Select whether Wi-Fi communications are enabled or disabled. If enabled, the following parameters must be configured:

✓**Wi-Fi name (SSID):** Name of the Wi-Fi network.
✓**Password:** Network access password.

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

✓**Connection status:** Indicates the Wi-Fi connection status.
✓**MAC address:** Device MAC address, non-configurable parameter.

Press **Refresh Wi-Fi status** to refresh the Wi-Fi status.

8.4.1.2.- DHCP

Figure 66:Web page, Communication (DHCP).

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

✓**IP address:** IP address.
✓**IP mask:** IP mask.
✓**IP Gateway:** Gateway IP address.

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

8.4.1.3.- Wi-Fi access point

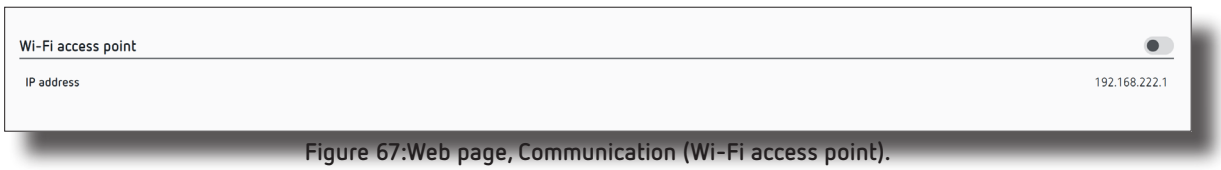


Figure 67:Web page, Communication (Wi-Fi access point).

: Select whether the device is enabled or disabled as a Wi-Fi access point.

✓**IP address:** Device IP address, non-configurable parameter

8.4.2.- ETHERNET

Configuration of the Ethernet communications, **Figure 68**.

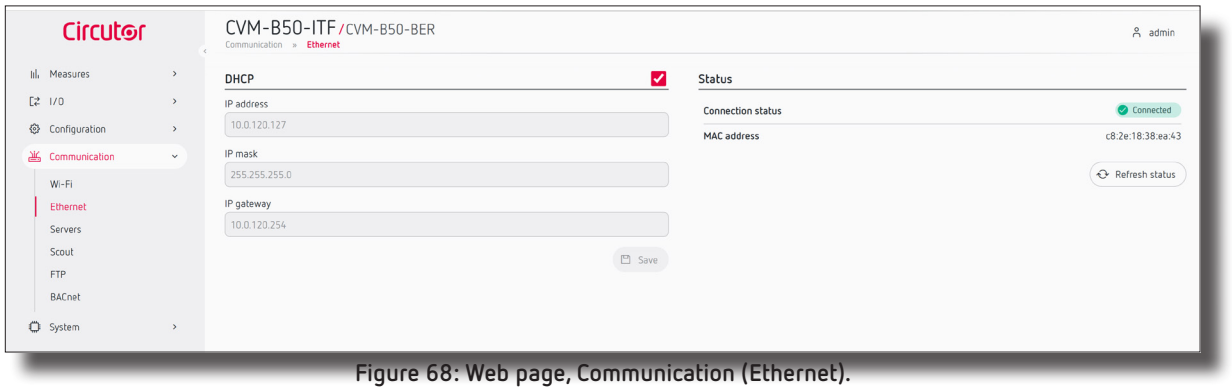


Figure 68: Web page, Communication (Ethernet).

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

✓**IP address:** IP address.
✓**IP mask:** IP mask.
✓**IP gateway:** Gateway IP address.

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

✓**Connection status:** Indicates the Ethernet connection status.
✓**MAC address:** Device MAC address, non-configurable parameter.

Press ⟳ **Refresh status** to refresh the Ethernet connection status.

8.4.3.- SERVERS

Configuration of the **DNS** (*Domain Name System*) and **NTP** (*Network Time Protocol*), **Figure 69**.

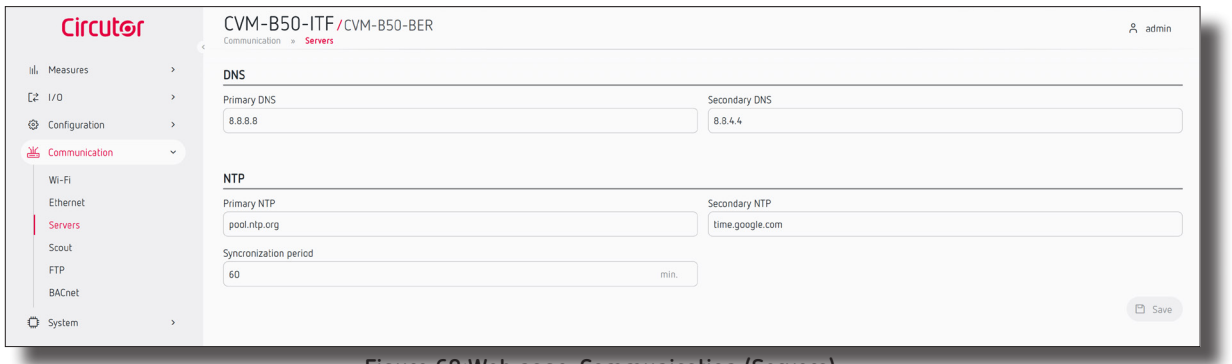


Figure 69:Web page, Communication (Servers).

8.4.3.1.- DNS

✓**Primary DNS:** Primary DNS server address.
✓**Secondary DNS:** Secondary DNS server address.

8.4.3.2.- NTP

✓**Primary NTP:** Address of the clock synchronisation protocol, Network Time Provider.
✓**Secondary NTP:** Secondary Network Time Provider address, in case the primary NTP fails.
✓**Synchronisation period:** Select the synchronisation period with the server in minutes.

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

8.4.4.- SCOUT

Scout is a **CIRCUTOR** electrical monitoring platform that allows the **CVM-B50** to be connected in order to provide centralised monitoring of electrical parameters, display events and alarms in real time, analyse supply quality and generate automatic reports on the installation behaviour.
On the Scout screen, **Figure 70**, the connection of the device to the Scout platform can be configured.

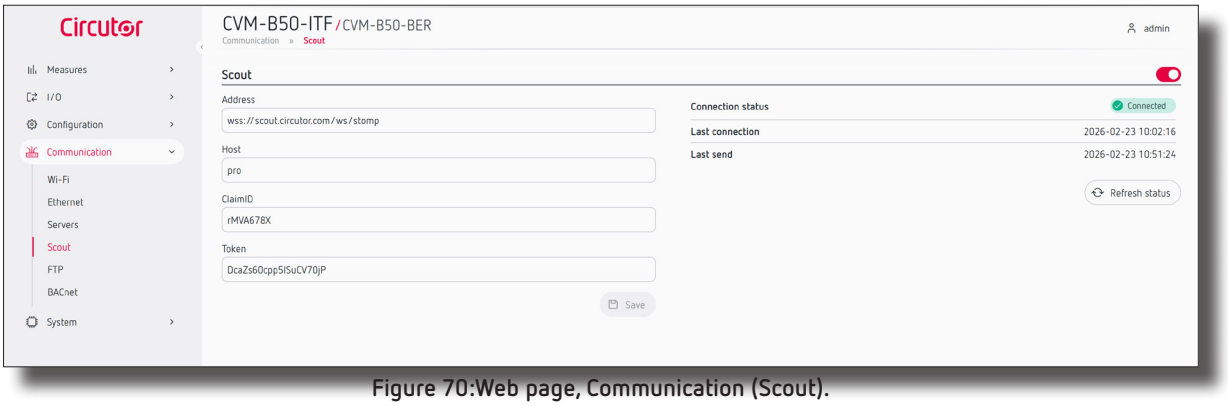


Figure 70:Web page, Communication (Scout).

: Select whether the device connection to the **Scout** platform is enabled or disabled. If enabled, the following parameters must be configured:

✓**Address:** Platform URL.
✓**Host**: Domain of the server managing the communication.
✓**ClaimID**: Unique device identifier on the platform.
✓**Token**: Communication authorisation key for the platform.

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

✓**Connection status:** Indicates the connection status with the **Scout** platform.
✓**Last connection:** Time of the last connection.
✓**Last send:** Date of the last transmission.

Press **Refresh status** to refresh the connection status with the **Scout** platform.

8.4.5.- FTP

Configuration of the automatic transmission of device information to one or two FTP servers through an Ethernet connection, **Figure 71**.

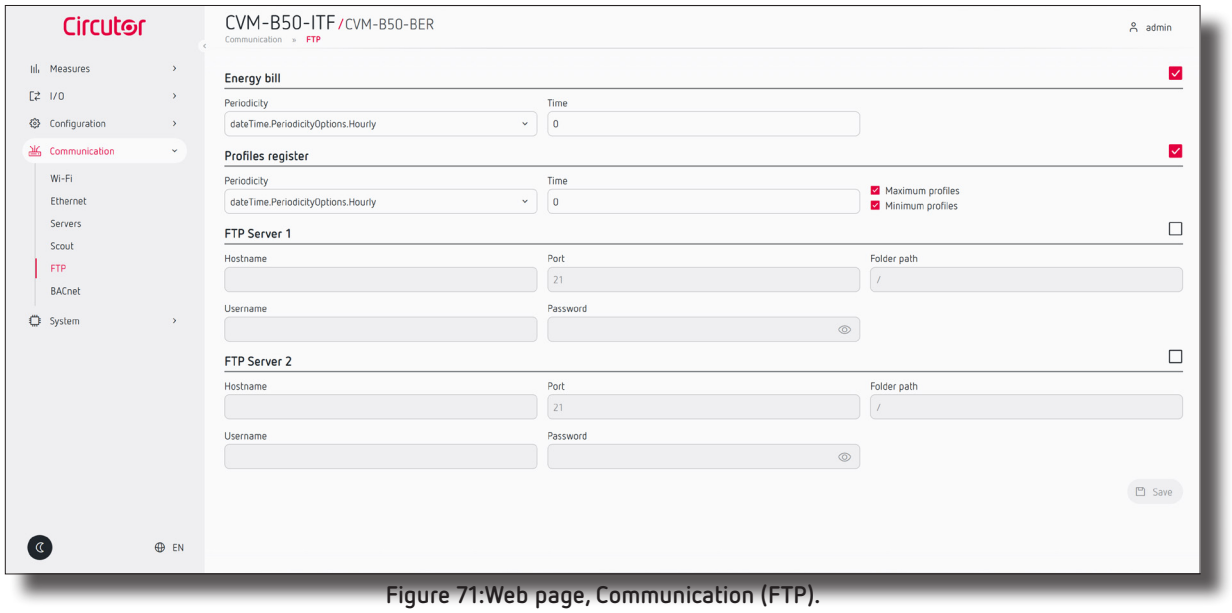


Figure 71:Web page, Communication (FTP).

8.4.5.1.- Energy bill

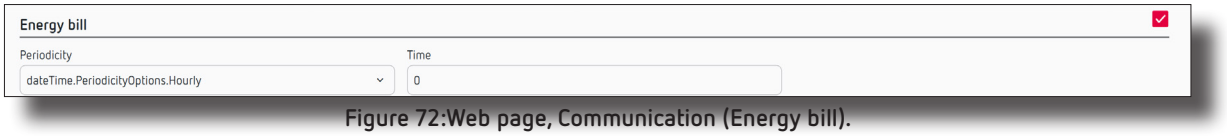


Figure 72:Web page, Communication (Energy bill).

Energy bill ☑ **:** Allows scheduling the periodic export of accumulated energy data for use in billing or energy analysis processes. If enabled, the following parameters must be configured:

✓**Periodicity:** Select the data transmission frequency: **Hourly**, **Daily**, **Weekly** or **Monthly**.
✓**Time:** Transmission time.

8.4.5.2.- Profiles register

Figure 73:Web page, Communication (Profiles register).

Profiles register ☑ **:** Allows configuring the automatic export of the profiles recorded by the device. If enabled, the following parameters must be configured:

✓**Periodicity:** Select the data transmission frequency: **Hourly**, **Daily**, **Weekly** or **Monthly**.
✓**Time:** Transmission time.

☑ **Maximum profiles:** Select to export the maximum profile values.
☑ **Minimum profiles:** Select to export the minimum profile values.

8.4.5.3.- FTP Server 1 and FTP Server 2

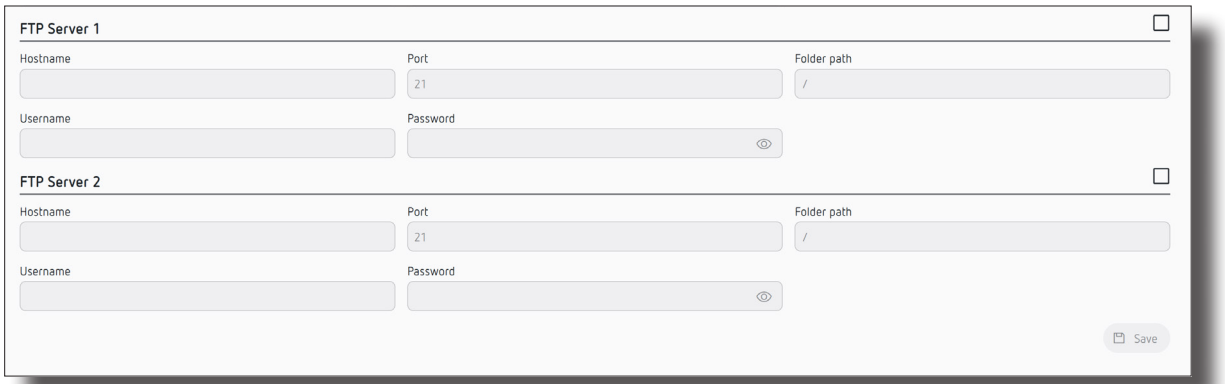


Figure 74:Web page, Communication (FTP Server 1 and FTP Server 2).

For FTP Server 1 and **FTP Server 2**, the following can be configured:

FTP Server 1 / FTP Server 2 ☑ **:** Enables the configuration of **FTP Server 1 / FTP Server 2**. If enabled, the following parameters must be configured:

✓**Hostname:** IP address or domain name of the **FTP** server.
✓**Port: FTP** server communication port (Default: 21).
✓**Folder path**: Server directory where the generated files will be stored.
✓**Username:** Name of the user authorised to access the **FTP** server.
✓**Password:** User password.

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

8.4.6.- BACnet

Configuration of the BACnet communications, **Figure 75**.

Figure 75:Web page, Communication (BACnet).

✓**Device ID:** Device identifier, Device ID, for BACnet communications.
✓**Port:** Port used for BACnet communications.

8.5.- SYSTEM

In the **System** section, the device information is displayed and the device can be updated and re-started.

8.5.1.- DEVICE INFORMATION

This section allows displaying or modifying the device information, **Figure 76**.

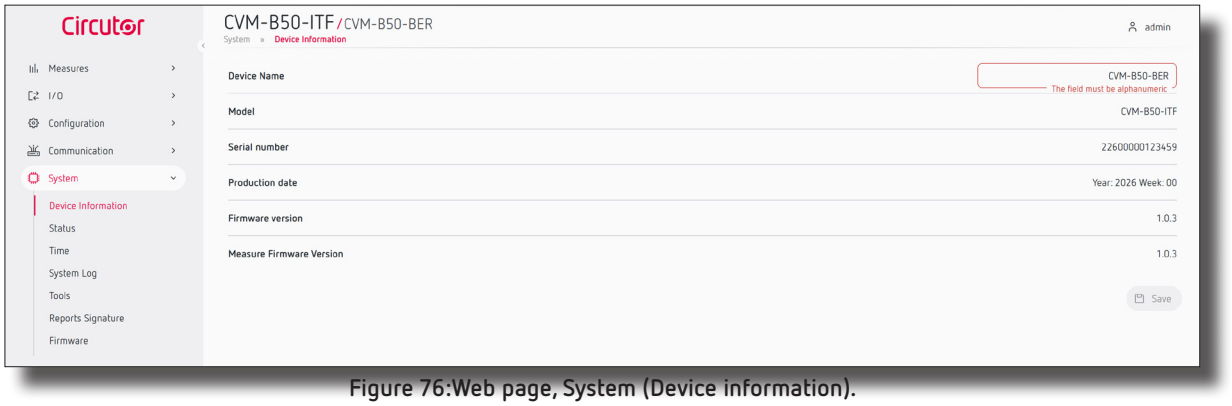


Figure 76:Web page, System (Device information).

✓**Device name:** device name. This name is used to access the device Web page.
✓**Model:** device model.
✓**Serial number:** Device serial number.
✓**Production date:** Device production date.
✓**Firmware version:** Device firmware version.
✓**Measure Firmware version:** Measurement firmware version.

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

8.5.2.- STATUS

This section displays the device communication information, **Figure 77**.

Figure 77:Web page, System (Status).

8.5.3.- TIME

This section configures the device time zone, date and time, **Figure 78**.

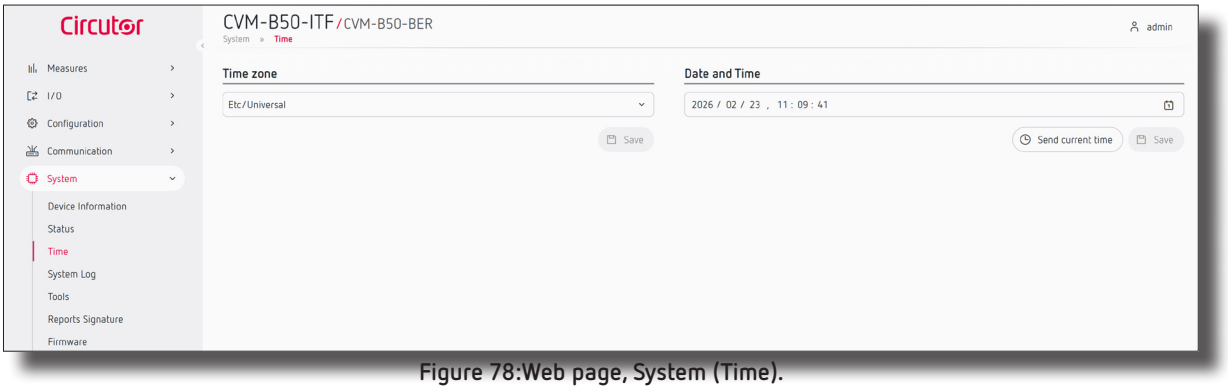


Figure 78:Web page, System (Time).

✓**Time zone:** Time zone where the device is located.
✓**Date and Time:** Device date and time.

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

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

8.5.4.- SYSTEM LOG

This section allows displaying and downloading the events recorded in the device, **Figure 79**. To do this, select the **Start Date** and **End Date** of the events to be displayed, and press the **Search** key.

Figure 79:Web page, System (System log).

The event log can be downloaded by pressing **Download History.**

8.5.5.- TOOLS

This section allows entering an IP address or a Web address to check the device connection with the Web or IP address, **Figure 80**.

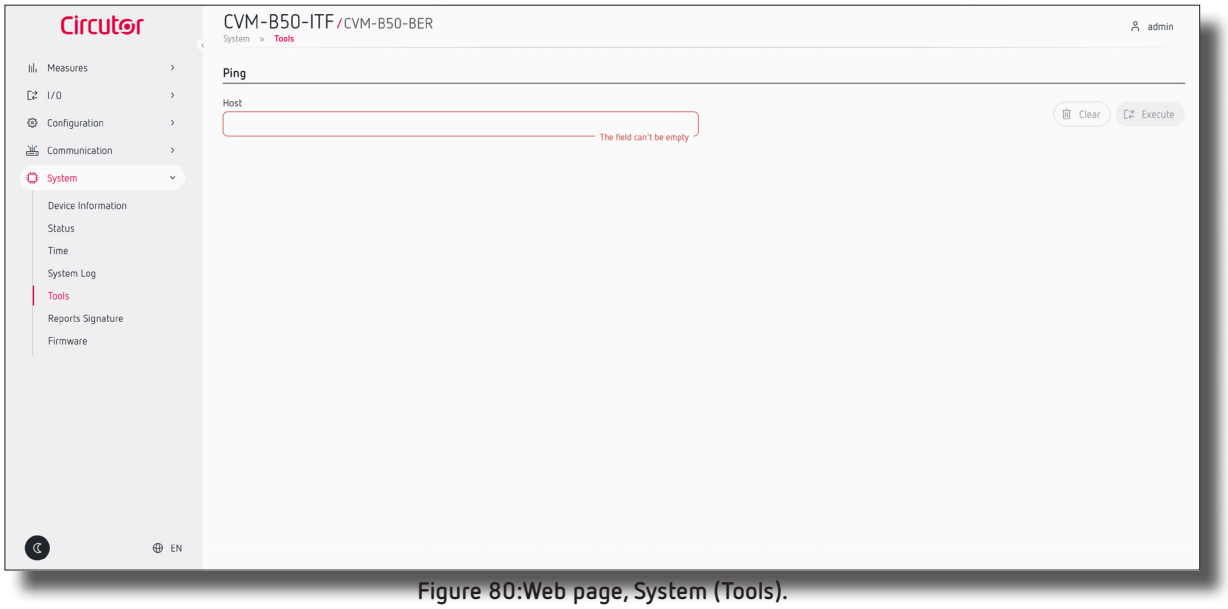


Figure 80:Web page, System (Tools).

✓**Host:** Identifier of the remote device with which the IP connectivity is to be checked using the ping command, either the IP address or the domain name.

Press **Execute** to start the check.

This tool is useful for checking the device connection with the **Scout** platform.

8.5.6.- REPORTS SIGNATURE

This section allows managing the digital signature of the reports generated by the device, guaranteeing their authenticity and integrity through public key cryptography. The reports are signed using an **ECDSA secp256r1** algorithm, **Figure 81**.

Figure 81:Web page, System (Reports signature).

For **Reports signing**, it is possible to:

- Manually enter the PEM private key.

Send private key file, allowing a (.pem) file to be uploaded from the local device.

Send key to apply the configured private key to the system.

Download public key, allowing the public key associated with the private key installed in the device to be downloaded.

The device is provided with a unique default private key. However, the user may replace it with another private key of the same type.
The device will use the private key to automatically generate the corresponding public key. This public key will be included in the downloaded reports so that recipients can verify the signature.
If it is required to generate a custom key pair, the following points must be considered:

• Key generation

A private key can be generated using tools such as **OpenSSL** with the following command:

openssl ecparam -genkey -name prime256v1 -noout -out PrivateKey.pem

The private key is used to sign the reports, while the public key can be shared with third parties to verify the signatures.
It is important to keep the private key in a secure location and not share it with anyone.

• Signature verification

When generating a report, a digital signature is created using the device private key. This signature is included in the report together with the corresponding public key.

To verify the signature of a report, the public key included in the report can be used together with tools such as **OpenSSL** with the following command:

openssl dgst -sha256 -verify PublicKey.pem -signature Report.sig Report.csv

This command checks whether the signature is valid and whether the report has been modified since its creation.

8.5.7.- FIRMWARE

This section allows updating the device firmware, **Figure 82**.

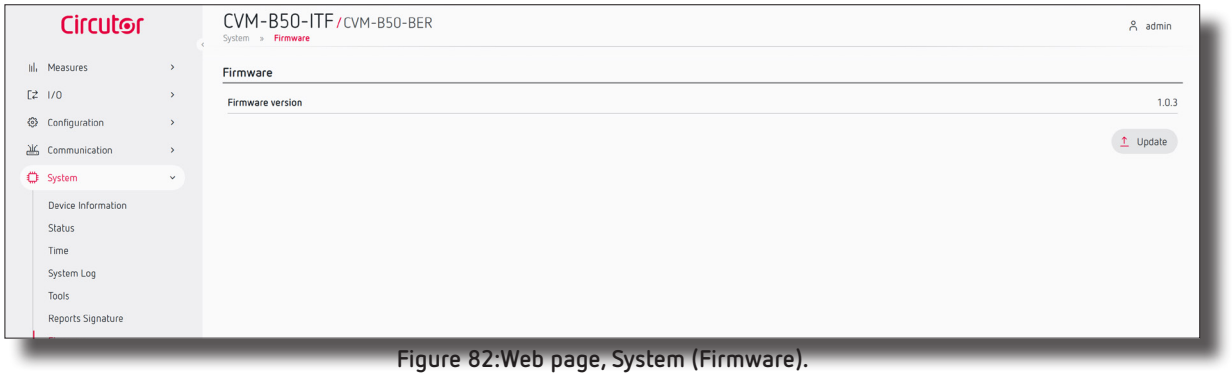


Figure 82:Web page, System (Firmware).

✓**Firmware version:** Firmware version.

Press **Update** to start the device software update.

9.- TECHNICAL SPECIFICATIONS

Power supply AC - DC [5]			
Power supply AC			
Rated voltage	100 ... 240 V ~ ± 10%		
Frequency	50 ... 60 Hz		
Consumption	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	5 ... 8 VA	5 ... 8 VA	5 ... 8 VA
Installation category	CAT III 300 V		
Power supply DC			
Rated voltage	100 ... 240 V ⎓ ± 10%		
Consumption	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	2.7 ... 3 W	2.7 ... 3 W	2.7 ... 3 W
Installation category	CAT III 300 V		

Power supply AC - DC [5]			
Power supply AC			
Rated voltage	85 ... 300 V ~		
Frequency	50 ... 60 Hz		
Consumption	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	5 ... 9.5 VA	5 ... 9.5 VA	5 ... 9.5 VA
Installation category	CAT III 300 V		
Power supply DC			
Rated voltage	100 ... 300 V ⎓		
Consumption	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	2.8 ... 3 W	2.8 ... 3 W	2.8 ... 3 W
Installation category	CAT III 300 V		

[5] According to model.

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	50 ... 60 Hz (V > 50 V~)
Input impedance	400 kΩ
Installation category	CAT III 300 V

Current measurement circuit			
CVM-B50-FLEX	Measure through Rogowsky sensors		
Rated current (In)	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	5 A	.../250 mA	1000 A/100 mV
Scales	.../1A o .../5A	-	-
Max. current measurement	6 A	300 mA	1200 A/120 mV
Min. current measurement (Istart)	10 mA	0.5 mA	5 A/ 0.5 mV
Consumption	0.9 VA	0.9 VA	0.9 VA
Installation category	CAT III 300 V	CAT III 300 V	CAT III 300 V

Measurement accuracy (UNE-EN 61557-12)[6]	
CVM-B50-ITF	
Voltage measurement	0.2% (20 ... 120% Un)
Current measurement	0.2% (10% In ≤ I ≤ 120 %In)
Frequency measurement	0.5% (45 ... 65 Hz)
Active power measurement	0.5% ± 2 digits (1% In ≤ I ≤ 120 %In)
Reactive power measurement	1 % ± 2 digits (2% In ≤ I ≤ 120 %In)
Apparent power measurement	0.5% ± 2 digits (2% In ≤ I ≤ 120 %In)
Active Energy measurement	Class 0.5s (According to EN IEC 62053-22)
Reactive Energy measurement	Class 1 (According to IEC 62053-24)
cos φ	0.5 %
Power factor	0.5 % (10 ... 120% In)
CVM-B50-FLEX (without sensors MFC-FLEX)	
Voltage measurement	0.2 % (20 ... 120% Un)
Current measurement	0.5 % (10% In ≤ I ≤ 120 %In)
Frequency measurement	0.5% (45 ... 65 Hz)
Active power measurement	1% (5% In ≤ I ≤ 120%In)
Reactive power measurement	2 % (5% In ≤ I ≤ 120%In)
Apparent power measurement	1 % (5% In ≤ I ≤ 120%In)
cos φ	0.5 %
Power factor	0.5 % (10 ... 120% In)
CVM-B50-MC (without MC transformers)	
Voltage measurement	0.2% (20 ... 120% Un)
Current measurement	0.5 % (10% In ≤ I ≤ 120 %In)
Frequency measurement	0.5% (45 ... 65 Hz)
Active power measurement	0.5% ± 2 digits (1% In ≤ I ≤ 120 %In)
Reactive power measurement	1 % ± 2 digits (2% In ≤ I ≤ 120 %In)
Apparent power measurement	0.5% ± 2 digits (5% In ≤ I ≤ 120 %In)
Active Energy measurement	Class 0.5s (According to EN IEC 62053-22)
Reactive Energy measurement	Class 1 (According to IEC 62053-24)
cos φ	0.5 %
Power factor	0.5 % (10 ... 120% In)

[6] Accuracy values for installation type: 4-3Ph.

Relays outputs	
Quantity	2 (**R01, R02**)
Max. voltage open contacts	250 V ~ / 30 V ⎓
Maximum current	2.5 A
Maximum switching power	625 VA / 75 W (AC1)
Electrical life (250V AC / 5A)	60 x 10^3 cycles
Mechanical life	10 x 10^6 cycles

Digital input	
Quantity	4 (**DI1, DI2, DI3, DI4**)
Type	NPN
Max. current in short circuit	4 mA ⎓
Max. voltage in open circuit	17 V ⎓

Digital output	
Quantity	2 (**DO1, DO2**)
Type	NPN
Maximum voltage	24V ⎓
Maximum current	50 mA
Maximum frequency	16 imp / s
Pulse widht	30 ms - 400 ms

Wi-Fi Communications	
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

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

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

Environmental features	
Operating temperature	-10°C ... +50°C
Storage temperature	-25°C ... +75°C
Relative humidity (non-condensing)	5 ... 95%
Maximum altitude	2000 m
Protection degree IP	IP20, **Front:** IP54
Protection degree IK	IK08
Pollution degree	2
Use	Indoor

Mechanical features			
Terminals			
1, 2, 14 ... 17, 9 ... 13, 18 ... 25	0.2 ... 2.5 mm²	0.5 ... 0.6 Nm	⌀ M3.5
3 ... 8	0.2 ... 1.5 mm²	0.2 ... 0.3 Nm	⌀ M2.5
Dimensions (Figure 83)	96 x 96 x 67.2 mm		
Weight	CVM-B50-ITF	CVM-B50-MC	CVM-B50-FLEX
	370 g.	370 g.	326 g.
Surround	Self-extinguishing UL 94 V0 plastic		
Attachment	Panel		

Standard	
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements	UNE-EN 61010-1
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	IEC 613626-1
Specification for radio disturbance and immunity measuring apparatus and methods – 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 IEC 61000-4-20
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) – 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.	UNE-EN IEC 61000-4-11
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring circuits	UNE-EN 61010-2-030
Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for measuring and monitoring power consumption and power quality parameters.	EN IEC 61557-12
Environmental testing – Part 2-2: Tests – Test B: Dry heat	UNE-EN 60068-2-2
Environmental testing – Part 2-1: Tests – Test A: Cold	UNE-EN 60068-2-1
Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state.	UNE-EN 60068-2-78
Common security requirements for radio equipment – Part 1: Internet-connected radio equipment.	EN 18031-1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility	ETSI-EN 301 489-1 Ver. 2.2.3
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility	ETSI-EN 301 489-17 Ver. 3.3.1

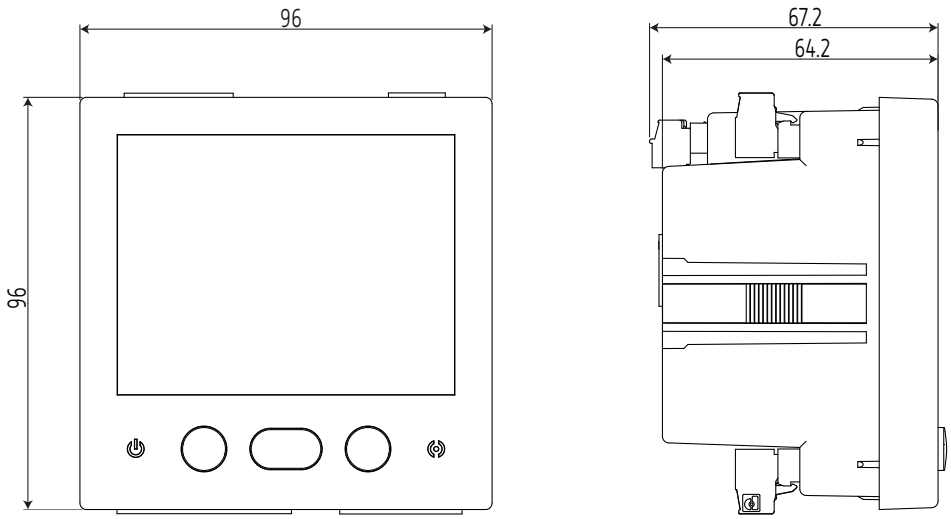


Figure 83: Dimensions of the CVM-B50.

10.- MAINTENANCE AND TECHNICAL SERVICE

The device does not require maintenance.
Clean the display only with soapy water and dry it using a soft, dry cloth.

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: +34 937 452 919
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.

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(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

Serie:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

(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

Series:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

(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

Série:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

Viladecavalls (Spain), 9/9/2025
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

Serie:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

(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

Série:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

(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

Serie:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

Viladecavalls (Spain), 9/9/2025
Chief Executive Officer: Joan Comellas Cabeza

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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

Seria:

CVM-B50

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 v3.3.1	EN 18031-1:2024
IEC 63000:2016+AMD1:2022	

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ANNEX A.- PICS MAP

BACnet Protocol Implementation Conformance Statement

Date: 20/02/2026

Vendor Name: **CIRCUTOR**
Vendor ID: **525**
Product Name: **CVM-B50**
Product Model Number: **890**

Applications Software Version: **1.0.3**
Firmware Revision: **0.8.5**
BACnet Protocol Version: **1.12**

Product Description:
Electrical energy meter

BACnet Standardized Device Profiles Supported (Annex L):

☐ BACnet Advanced Operator Workstation (B-AWS)
☐ BACnet Operator Workstation (B-OWS)
☐ BACnet Operator Display (B-OD)
☐ BACnet Building Controller (B-BC)
☐ BACnet Advanced Application Controller (B-AAC)
☒ BACnet Application Specific Controller (B-ASC)
☐ BACnet Smart Sensor (B-SS)
☐ BACnet Smart Actuator (B-SA)

BACnet Interoperability Building Blocks Supported (Annex K):

- Data Sharing-ReadProperty-B (DS-RP-B)
- Data Sharing - ReadProperty Multiple - B (DS-RPM-B)
- Device Management-Dynamic Device Binding-B (DM-DDB-B)
- Device Management-Dynamic Object Binding-B (DM-DOB-B)
- Device Management-DeviceCommunicationControl-B (DM-DCC-B)

Which of the following device binding methods does the product support?
☒ Receive Who-Is, send I-Am (BIBB DM-DDB-B)
☒ Receive Who-Has, send I-Have (BIBB DM-DOB-B)

Segmentation Capability:

☐ Able to transmit segmented messages Window Size:
☐ Able to receive segmented messages Window Size:

Standard Object Types Supported:

- Device Object
- Analog Input Object

Device Object Type

1. Dynamically creatable using BACnet's CreateObject service?	No
2. Dynamically erasable using BACnet's DeleteObject service?	No
3. List of optional properties supported	
4. List of all properties that are writable where not otherwise is a required by this standard	
5. List of proprietary properties:	
Max_Apdu_Length_Accepted	1476
Apdu_Timeout	3000
Number_Of_Apdu_Retries	3
6. List of any property value range restrictions	

Analog Input Object Type

1. Dynamically creatable using BACnet's CreateObject service?	No	
2. Dynamically erasable using BACnet's DeleteObject service?	No	
3. List of optional properties supported	max_pres_value	min_pres_value
4. List of all properties that are writable where not otherwise is a required by this standard		
5. List of proprietary properties		
6. List of any property value range restrictions:		

Properly Identifier

Object_Name		max 32 characters			
DESCRIPTION		SYMBOL	ID_OBJECTS	OBJECTS_NAME	UNITS
Tensión fase-neutro	Voltage phase to neutral	V1	AI0	Ph2NU1	V
Corriente	Current	A1	AI1	Ph1Current	A
Potencia activa	Active power	kW1	AI2	ActPwrPh1	kW
Potencia reactiva	Reactive power	kvar1	AI3	ReactPwrPh1	kvar
Factor de potencia	Power factor	PF1	AI4	PwrFactPh1	PF
Tensión fase-neutro	Voltage phase to neutral	V1	AI5	Ph2NU2	V
Corriente	Current	A2	AI6	Ph2Current	A
Potencia activa	Active power	kW2	AI7	ActPwrPh2	kW

Potencia reactiva	Reactive power	kvar2	AI8	ReactPwrPh2	kvar
Factor de potencia	Power factor	PF2	AI9	PwrFactPh2	PF
Tensión fase-neutro	Voltage phase to neutral	V3	AI10	Ph2NU3	V
Corriente	Current	A3	AI11	Ph3Current	A
Potencia activa	Active power	kW3	AI12	ActPwrPh3	kW
Potencia reactiva	Reactive power	kvar3	AI13	ReactPwrPh3	kvar
Factor de potencia	Power factor	PF3	AI14	PwrFactPh3	PF
Potencia activa trifásica	Three phase active power	kWIII	AI15	ActPwOn3Ph	kW
Potencia inductiva trifásica	Three phase reactive inductive power	kvarLIII	AI16	InductPwOn3Ph	kvarL
Potencia capacitiva trifásica	Three phase capacitive inductive power	kvarCIII	AI17	CapPwOn3Ph	kvarC
Cos φ trifásic	Three phase cos φ	CosφIII	AI18	Cosphi	Cos φ
Factor de potencia trifásico	Three phase power factor	PFIII	AI19	PwFactOn3Ph	PF
Frecuencia	Frequency	Hz	AI20	Frequency	Hz
Tensión fase-fase	Voltage phase to phase	V12	AI21	Ph2PhU12	V
Tensión fase-fase	Voltage phase to phase	V23	AI22	Ph2PhU23	V
Tensión fase-fase	Voltage phase to phase	V31	AI23	Ph2PhU31	V
%THD V	%THD V	%THD V1	AI24	THDVal_U1	%THD
%THD V	%THD V	%THD V2	AI25	THDVal_U2	%THD
%THD V	%THD V	%THD V3	AI26	THDVal_U3	%THD
%THD A	%THD A	%THD A1	AI27	THDVal_I1	%THD
%THD A	%THD A	%THD A2	AI28	THDVal_I2	%THD
%THD A	%THD A	%THD A3	AI29	THDVal_I3	%THD
Energía activa consumida	Active energy	kWh III (+)	AI30	ActEnergy	kWh
Energía reactiva inductiva consumida	Reactive inductive energy	kvarLh III (+)	AI31	InductEnergy	kvarLh
Energía reactiva capacitiva consumida	Reactive capacitive energy	kvarCh III (+)	AI32	CapEnergy	kvarCh
Energía Aparente consumida	Three phase apparent energy	kVAh III (+)	AI33	AppEnergy	kVAh
Energía activa generada	Three phases generated active energy	kWh III (-)	AI34	ActEnergy_exp	kWh
Energía inductiva generada	Three phases generated reactive inductive energy	kvarLh III (-)	AI35	IndEnergy_exp	kvarLh
Energía capacitiva generada	Three phase generated reactive capacitive energy	kvarCh III (-)	AI36	CapEnergy_exp	kvarCh
Energía aparente generada	Three phases generated aparent energy	kVAh III (-)	AI37	AppEnergy_exp	kVAh
Corriente	Current	AN	AI38	NeutralCurrent	A
Potencia aparente L1	Apparent power L1	kVA	AI39	AppPwrPh1	kVA
Potencia aparente L2	Apparent power L2	kVA	AI40	AppPwrPh2	kVA
Potencia aparente L3	Apparent power L3	kVA	AI41	AppPwrPh3	kVA
Potencia aparente trifásica	Three phase apparent power	kVA	AI42	AppPw3Ph	kVA
Máxima demanda I1	Power demand I1	Md (A1)	AI43	MaxDemand_A1	A
Máxima demanda I2	Power demand I2	Md (A2)	AI44	MaxDemand_A2	A

Máxima demanda I3	Power demand I3	Md (A3)	AI45	MaxDemand_A3	A
Máxima demanda kvarL	Power demand kvarL	kvarL III	AI46	MaxDemand_kvarL	kvarL
Máxima demanda kvarC	Power demand kvarC	kvarC III	AI47	MaxDemand_kvarC	kvarC
Máxima demanda kW	Power demand kW	kW III	AI48	MaxDemand_kW	kW
Máxima demanda kVA	Power demand kVA	kVA III	AI49	MaxDemand_kVA	kVA

BACnet Data Link Layer Options:

☒ BACnet IP, (Annex J)
☒ BACnet IP (Annex J), Foreign Device
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s): ___
☐ MS/TP master (Clause 9), baud rate(s): ___
☐ MS/TP slave (Clause 9), baud rate(s): ___
☐ LonTalk, (Clause 11), medium: ___
☐ BACnet/ZigBee (Annex O)
☐ Other: ___

Device Address Binding:

Is static device binding supported? ☐ Yes ☒ No

Networking Options:

☐ Router (Clause 6) - All routing configurations: ___
☐ BACnet Tunneling Router over IP (Annex H)
☒ BACnet/IP Broadcast Management Device (BBMD)
BBMD supports registrations by Foreign Devices: ☒ Yes ☐ No
BDT size: max. 128 FDT size: max. 128

Network Security Options:

☒ Non-secure Device - is capable of operating without BACnet Network Security
☐ Secure Device - is capable of using BACnet Network Security (NS-SD BIBB)
☐ Multiple Application-Specific Keys:
☐ Supports encryption (NS-ED BIBB)
☐ Key Server (NS-KS BIBB)

Character Sets Supported:

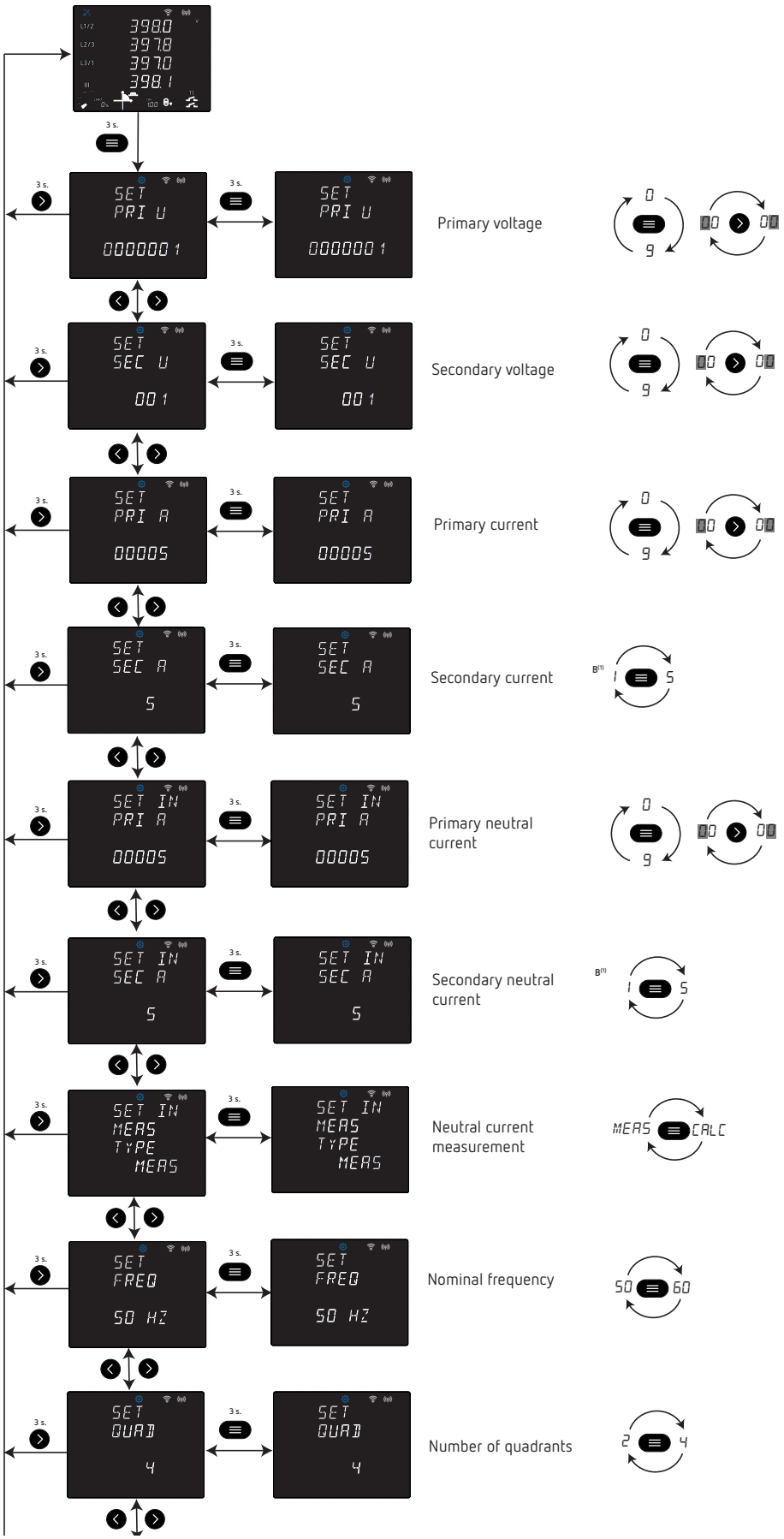
Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

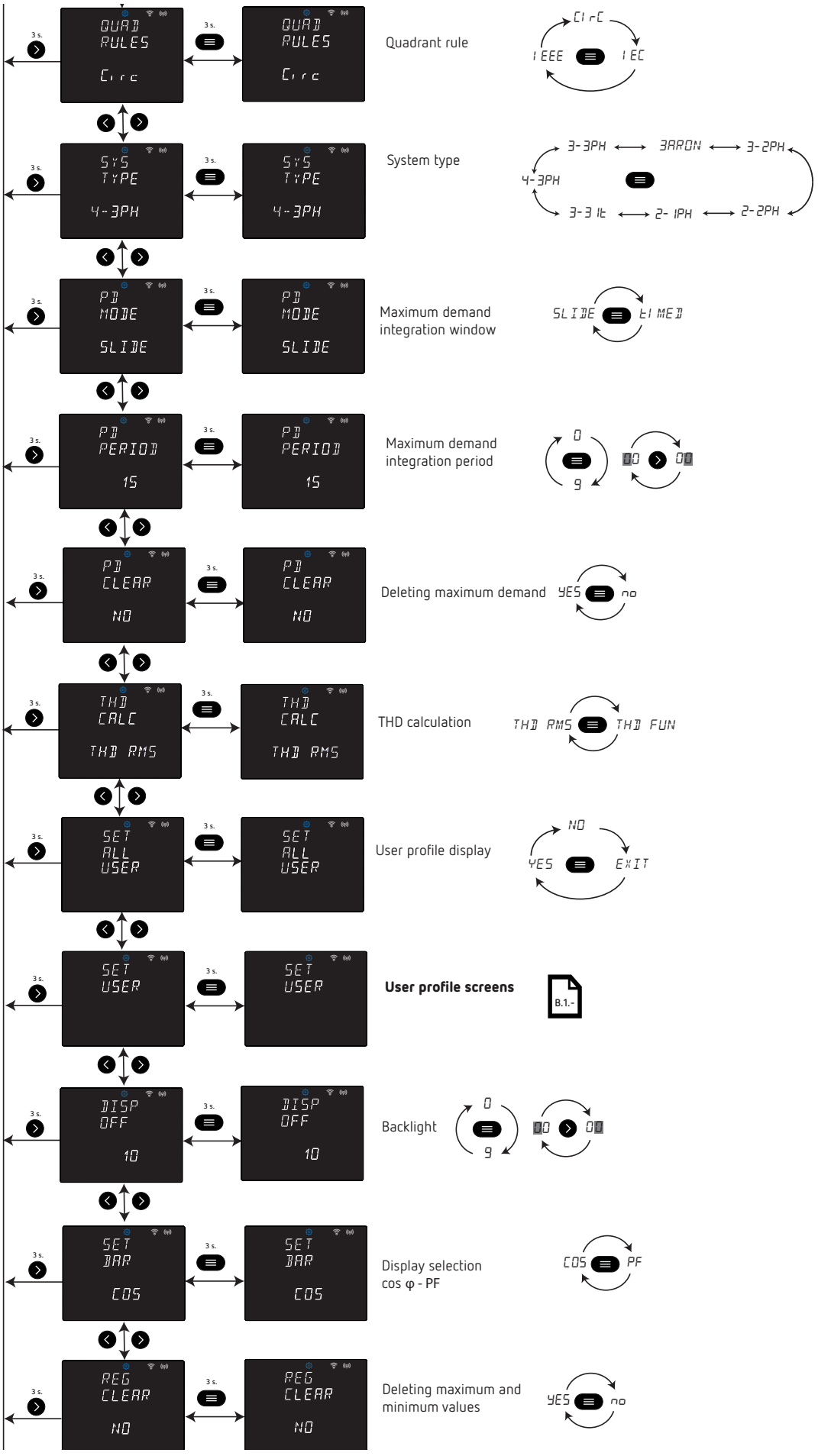
☒ ANSI X3.4	☐ IBM™/Microsoft™ DBCS	☐ ISO 8859-1
☐ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS X 0208

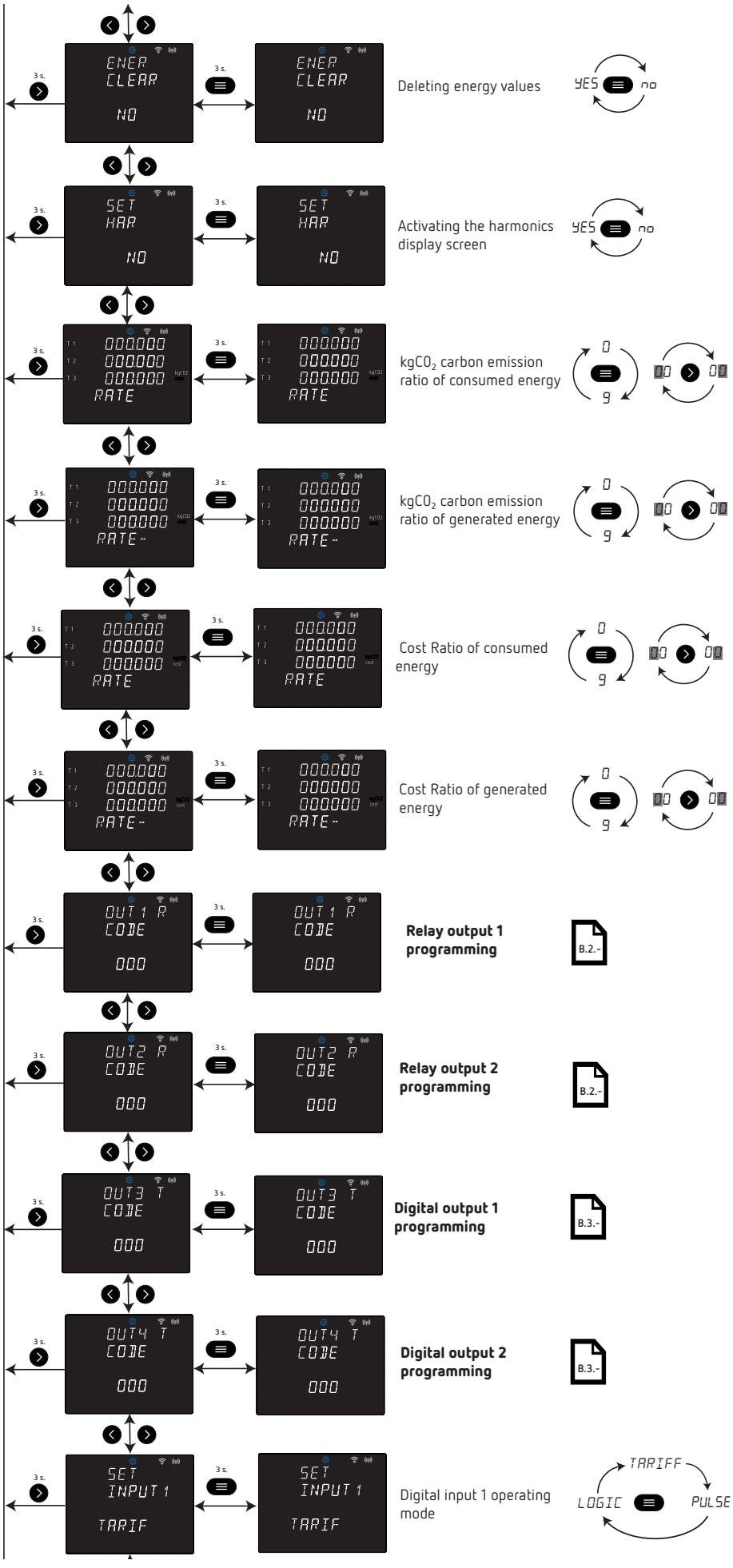
If this product is a communication gateway which presents a network of virtual BACnet devices, a separate PICS shall be provided that describes the functionality of the virtual BACnet devices. That PICS shall describe a superset of the functionality of all types of virtual BACnet devices that can be presented by the gateway.

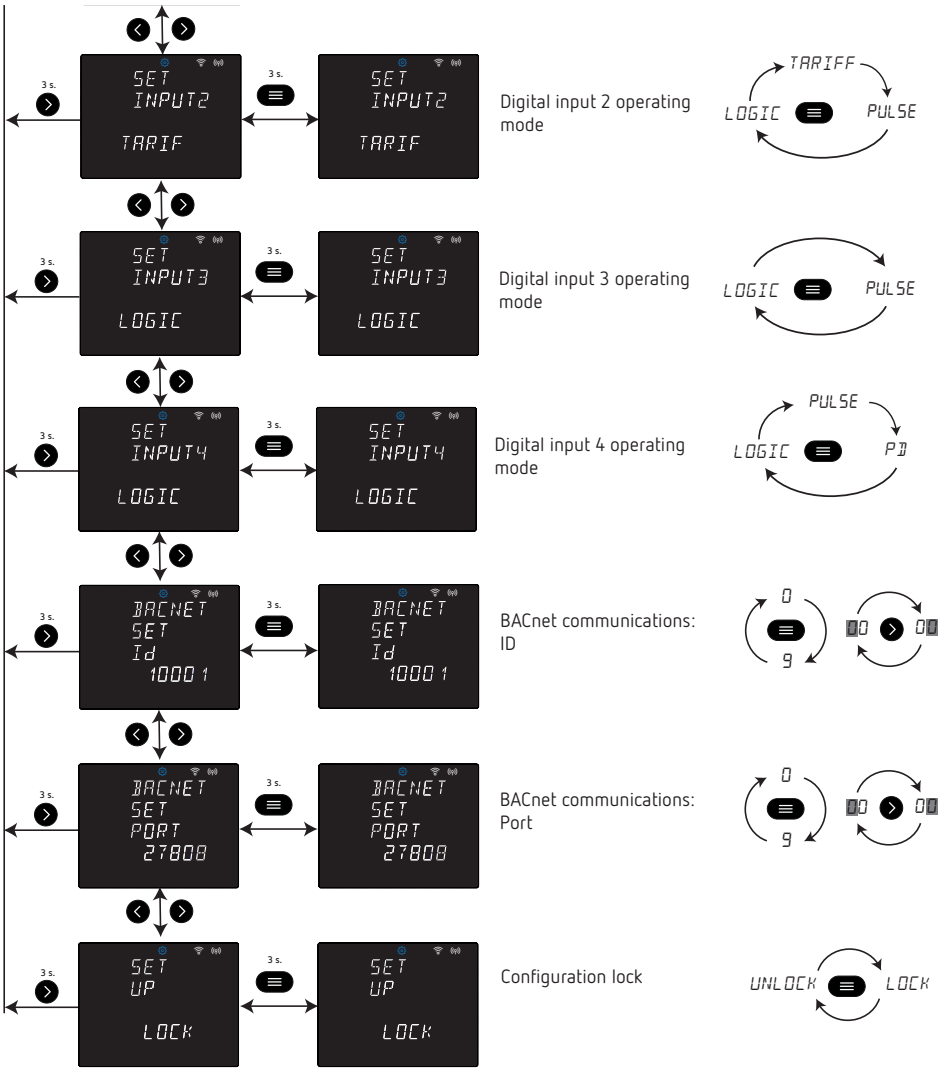
ANNEX B.- CONFIGURATION MENU

Configuration menu




QUAD
RULES
Circ
3 s.
Quadrant rule
CIrC
IEEE
IEC
SYS
TYPE
4-3PH
System type
3-3PH
3ARON
3-2PH
4-3PH
3-3 IE
2- 1PH
2-2PH
PD
MODE
SLIDE
Maximum demand
integration window
SLIDE
tIMEd
PD
PERIOD
15
Maximum demand
integration period
0
9
00
PD
CLEAR
NO
Deleting maximum demand
YES
no
THD
CALC
THD RMS
THD calculation
THD RMS
THD FUN
SET
ALL
USER
User profile display
NO
YES
EXIT
SET
USER
User profile screens
B.1.-
DISP
OFF
10
Backlight
SET
BAR
COS
Display selection
cos φ - PF
COS
PF
REG
CLEAR
NO
Deleting maximum and
minimum values
YES
no

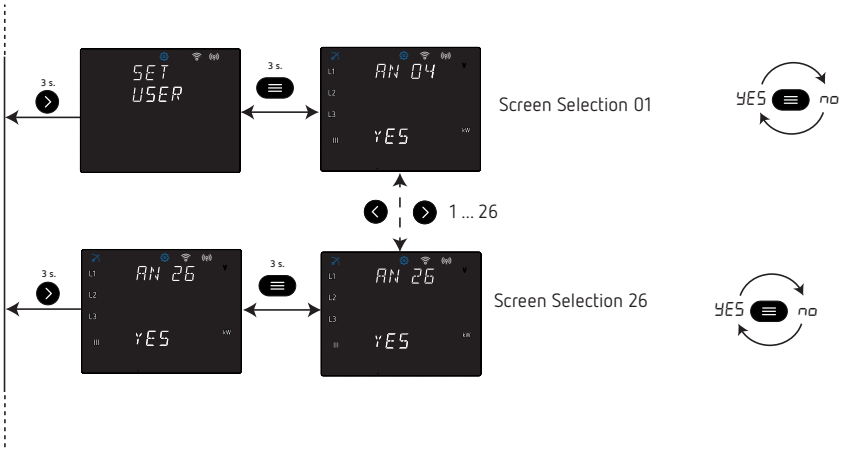

ENER
CLEAR
NO
3 s.
Deleting energy values
YES
no
SET
HAR
Activating the harmonics display screen
RATE
kgCO2 carbon emission ratio of consumed energy
RATE-
kgCO2 carbon emission ratio of generated energy
Cost Ratio of consumed energy
Cost Ratio of generated energy
OUT1 R
CODE
000
Relay output 1 programming
B.2.-
OUT2 R
Relay output 2 programming
OUT3 T
Digital output 1 programming
B.3.-
OUT4 T
Digital output 2 programming
SET
INPUT 1
TARIF
Digital input 1 operating mode
LOGIC
PULSE



B[1] Parameter not available in **CVM-B50-FLEX** and **CVM-B50-MC** models.

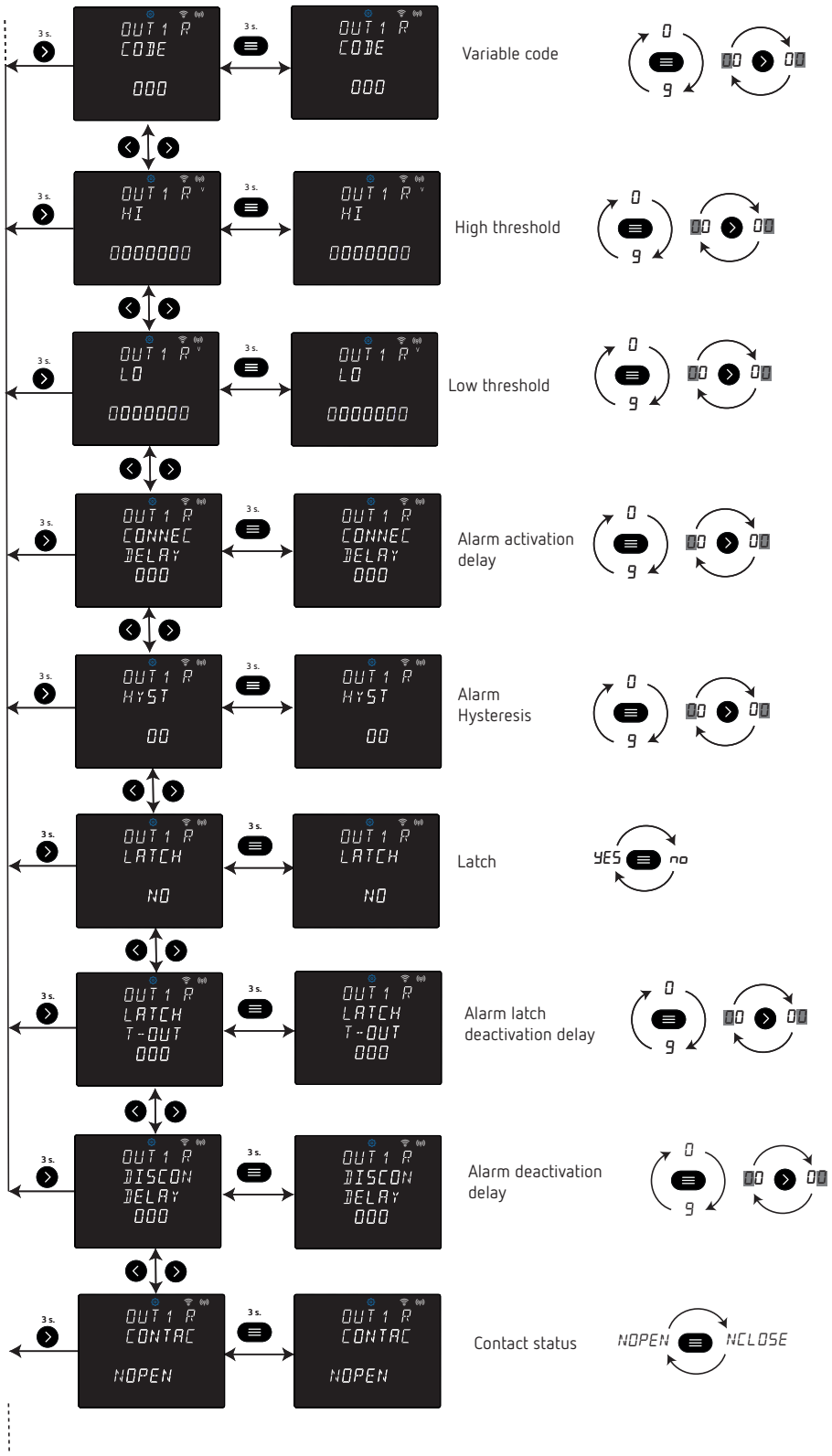
B.1.- USER PROFILE SCREENS

User profile screens



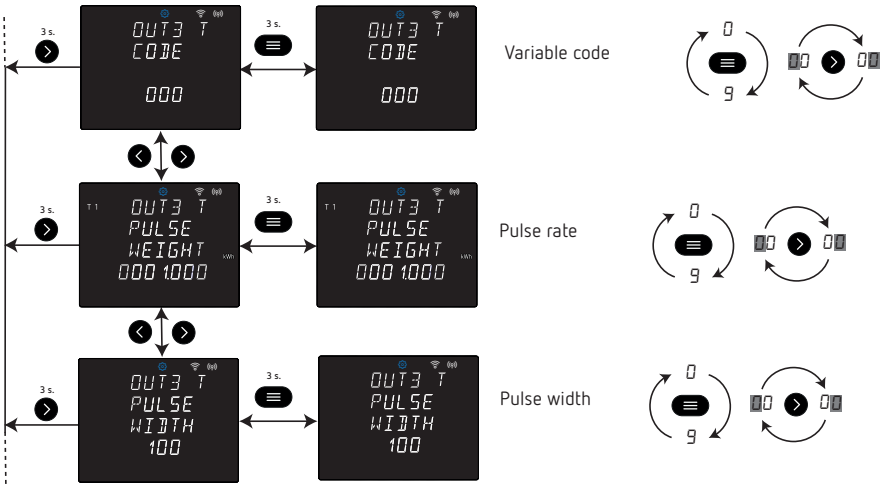
B.2.- RELAY OUTPUT 1 AND 2 CONFIGURATION

Programming the relay output 1 and 2



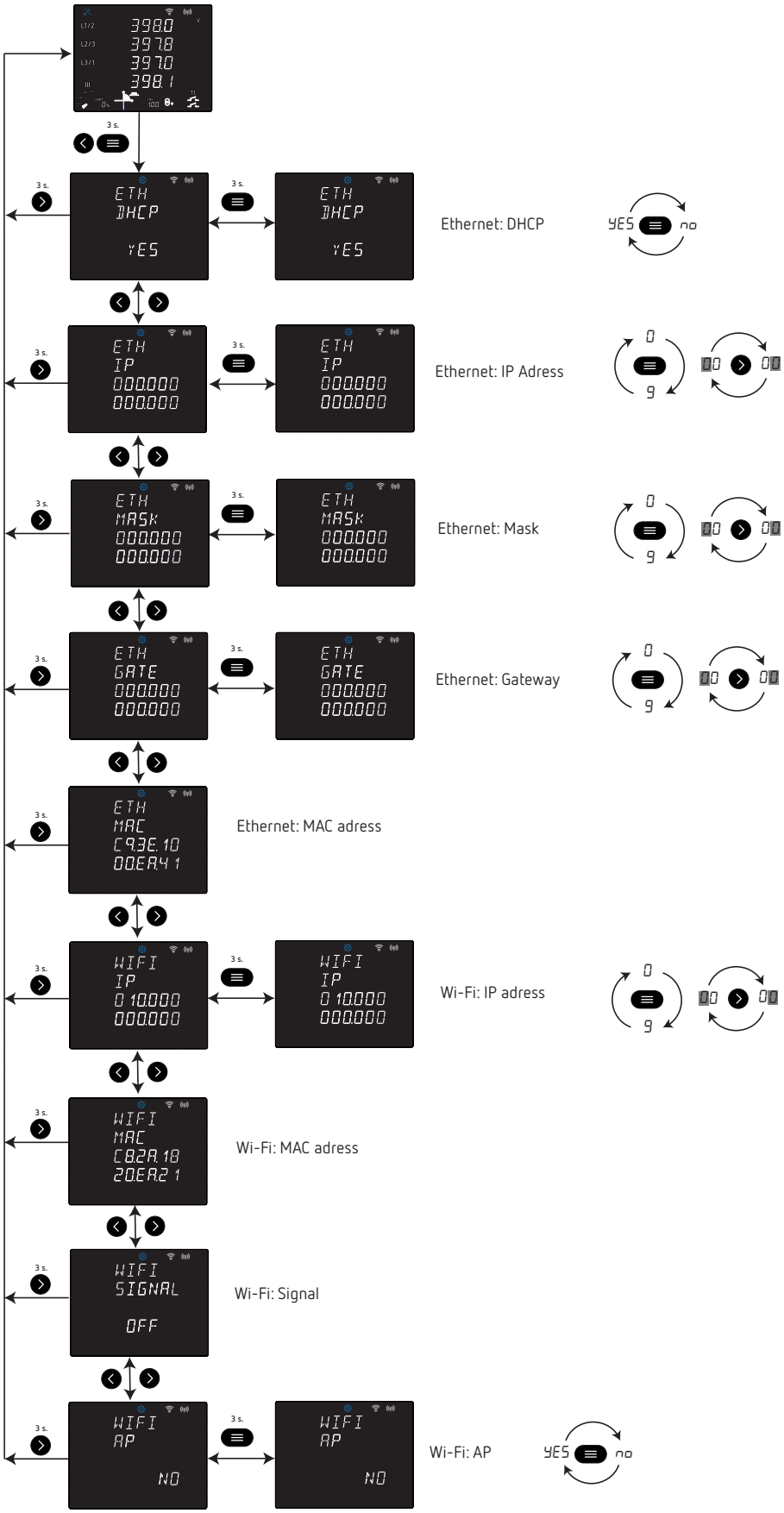
B.3.- DIGITAL OUTPUT 1 AND 2 CONFIGURATION

Programming Digital output 1 and Digital output 2



ANNEX C.- ETHERNET AND WI-FI COMMUNICATIONS CONFIGURATION MENU

Ethernet and Wi-Fi communications configuration menu



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