Power analyzer

CVM-B100 CVM-B150

INSTRUCTION MANUAL

(M010B01-03-16B)

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 unit may result in injury to personnel as well as damage to the unit. 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 unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.
	Refer to the instruction manual before using the unit 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 unit and /or installations.

CIRCUTOR, SA reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

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

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

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REVISION LOG

Table 1: Revision log.

Date	Revision	Description
06/14	M010B01-03-14A	Initial Version
05/15	M010B01-03-15A	Introduction of expansion modules: M-CVM-AB-Modbus TCP (Bridge), M-CVM-AB-LON M-CVM-AB-Profibus M-CVM-AB-MBus M-CVM-AB-Datalogger Changes in the following sections: 3.5. - 4.4.1.- 5.1. - 5.3. - 5.4.- 5.5.3.3. - 5.6.- 6.3. - 6.4. - 7.5.4. - 7.5.5. - 7.8. - 9
07/15	M010B01-03-15B	Changes in the following sections: 7.3.1. - 9.
12/15	M010B01-03-15C	Changes in the following sections: 3.3.2.- 3.4.- 9.
12/15	M010B01-03-15D	Changes in the following sections: 3.2. - 3.5. - 5.6.3. - 5.6.20. - 6.3.7.3. - 6.3.7.16. - 6.5. - 9
07/16	M010B01-03-16A	Changes in the following sections: 2.- 5.5.3.8. - 7.10. - 8.2. - 10.9. - 13.
08/16	M010B01-03-16B	Changes in the following sections: 7.9.4 1. - 7.9.4.2.

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

1.- VERIFICATION UPON RECEPTION

Check the following points upon receiving the unit:

a) The unit meets the specifications described in your order.
b) The unit has not suffered any damage during transport.
c) Perform an external visual inspection of the unit prior to switching it on.
d) Check that it has been delivered with the following:
- An installation guide,
- 4 Retainers used to attach the unit,
- 5 plug-in connectors with screws,
- 1 seal,

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

2.- PRODUCT DESCRIPTION

The **CVM-B** unit measures, calculates and displays the main electrical parameters in single-phase networks, with and without neutral two-phase networks, balanced three-phase networks, with ARON measurement or unbalanced networks. The measurement is taken in RMS, via four AC voltage inputs and four current inputs.
The current measurement is taken indirectly with transformers /5, /1 or with efficient transformers from the MC1 and MC3 series.

It is a modular unit that can be expanded using expansion modules with different functions.

There are 2 unit models:

✓ **CVM-B100,** with a 3.5'' display.
✓ **CVM-B150,** with a 5.6'' display.

The unit features:

- 3 keys that allow you to browse between the various screens and program the unit.
- 3 indicator LEDs: CPU, ALARM and on the navigation keys.
- LCD Display, for displaying all parameters.

- 2 digital inputs, to select the tariff, detect the logic state of external signals or as act as an impulse input.
- 2 transistor digital outputs, fully programmable.
- 2 relay digital outputs, fully programmable.
- RS-485 communications, with two serial protocols: **MODBUS RTU** ® and **BACnet**.

The **CVM-B** can be expanded with the following expansion modules:

✓ **M-CVM-AB-8I-8OTR,** expansion module with 8 transistor digital inputs and 8 transistor digital outputs.

✓ **M-CVM-AB-8I-8OR,** expansion module with 8 relay digital inputs and 8 relay digital outputs.

✓ **M-CVM-AB-4AI-8AO,** expansion module with 4 analogue inputs and 8 analogue out puts.

✓ **M-CVM-AB-Modbus/TCP(Bridge),** expansion module for connecting the unit to a Modbus/TCP network and as an Ethernet to RS-485 gateway.

✓ **M-CVM-AB-LON,** expansion module for connecting the unit to a LonWorks network.

✓ **M-CVM-AB-Profibus,** expansion module for connecting the unit to a Profibus network.

✓ **M-CVM-AB-MBus,** expansion module for connecting the unit to a M-Bus network.

✓ **M-CVM-AB-Datalogger,** expansion module that can be used to store data in the embedded PowerStudio platform integrated in the module.

✓ **M-CVM-AB-Modbus/TCP(Switch),** expansion module for connecting the unit to a Modbus/TCP network and as an Ethernet to Ethernet gateway.

3.- UNIT INSTALLATION

3.1.- PRIOR RECOMMENDATIONS

In order to use the unit 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-B** unit 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 unit. It is dangerous to handle the unit 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 unit is not responsible for any damage resulting from failure by the user or installer to observe 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 unit, 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 unit from the power supply (unit and measuring system power supply) before maintaining, repairing or handling the unit's connections.
Please contact the after-sales service if you suspect that there is an operational fault in the unit.

3.2.- INSTALLATION

The unit is installed on a panel. All connections are located inside the electric panel.

Table 2: Panel drill holes for installation.

Model	**Panel drill hole** (according to DIN 43700)
CVM-B100	$92^{+0.8}$ x $92^{+0.8}$ mm
CVM-B150	$138^{+0.8}$ x $138^{+0.8}$ mm

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

The unit must be connected to a power circuit that is protected with gL fuses (IEC 269) or M fuses, with a rating of 1 to 2 A. It must be fitted with a circuit breaker or equivalent device for disconnecting the unit from the power supply mains.
The power and voltage measuring circuit must be connected with cables that have a minimum cross-section of 1mm^2 and the wires must to endure a temperature at least 77 degrees.

The secondary line of the current transformer will have a minimum cross-section of 2.5 mm^2.

Current needs to be measured via external current transformers providing reinforced insulation.

3.3.- UNIT TERMINALS

The **CVM-B** terminals are distributed between the upper and lower face of the unit.

3.3.1.- Terminals on the upper face

Table 3:List of terminals on the upper face of the CVM-B.

Terminals of the top side of the unit	
1: V_{REF}, Reference voltage input	**10: T_1**, Digital output of transistor 1
2: N_{REF}, Reference voltage neutral	**11: T_2**, Digital output of transistor 2
3: N, Voltage input neutral	**12: T_C**, Common digital output of transistor
4: V_{L3},Voltage input L3	**13: A(+)**, RS485
5: V_{L2}, Voltage input L2	**14: B(-)**, RS485
6: V_{L1}, Voltage input L1	**15: S**, GND for RS-485
7: I_1, Digital input 1	**16, 17: R_1**, Relay digital output 1
8: I_2, Digital input 2	**18, 19: R_2**, Relay digital output 2
9: I_c, for digital inputs	

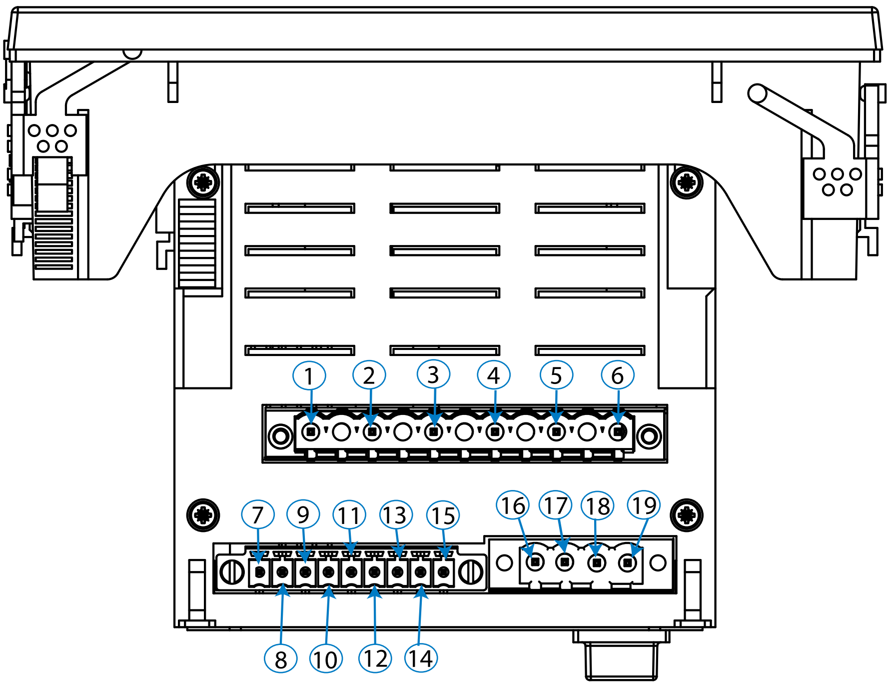


Figure 1: CVM-Bx terminals, upper face.

3.3.2.- Terminals on the lower face

Table 4:List of terminals on the lower face of the CVM-B.

Unit terminals	
20 : Auxiliary power supply. **~ +**, **CVM-Bxxx-ITF** **-**, **CVM-Bxxx-ITF-SDC**	**25: S2,** Current input L2
21: Auxiliary power supply. **~ -**, **CVM-Bxxx-ITF** **+**, **CVM-Bxxx-ITF-SDC**	**26: S1**, Current input L3
22: S1, Current input L1	**27: S2,** Current input L3
23: S2, Current input L1	**28: S1**, Neutral current input, LN
24: S1, Current input L2	**29: S2**, Neutral current input, LN

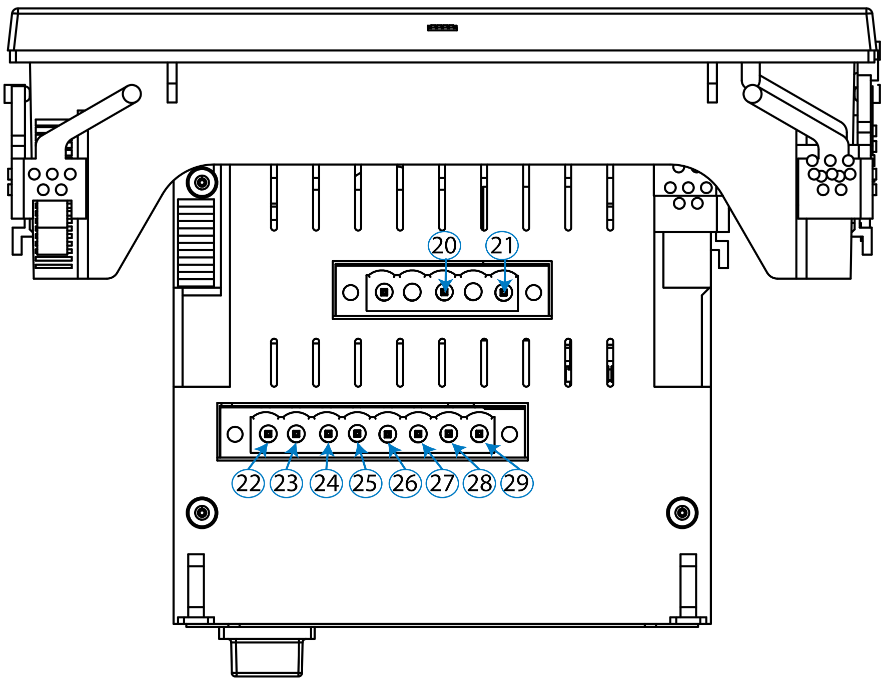


Figure 2:CVM-B terminals, lower face.

3.4.- CONNECTION DIAGRAMS

3.4.1.- Three-phase network measurement with a 4-wire connection.

Measurement system: 4W 3Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

Secondary winding of the neutral current transformer: 1 5

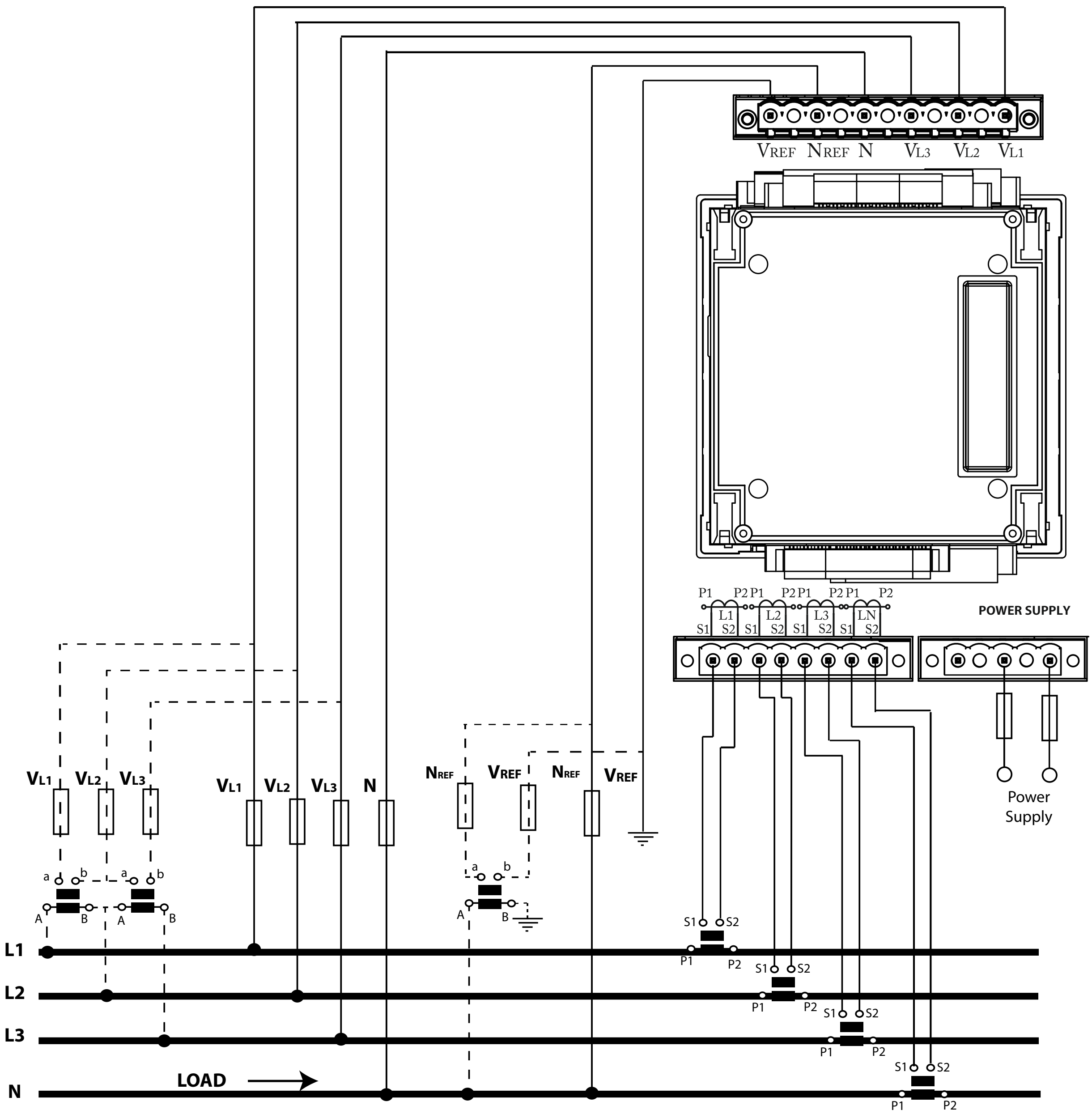


Figure 3: Three-phase measuring with a 4-wire connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

Note: The unit can calculate the neutral current without having to measure it, option: Calculated current .../A.

The MC1 transformer secondary value is set to 0.250 A
The transformer for measuring the LN neutral current cannot be MC type.

Measurement system: 4W 3Ph

Secondary winding of the current transformer: MC (MC3 type transformer)

Secondary winding of the neutral current transformer: 1 5

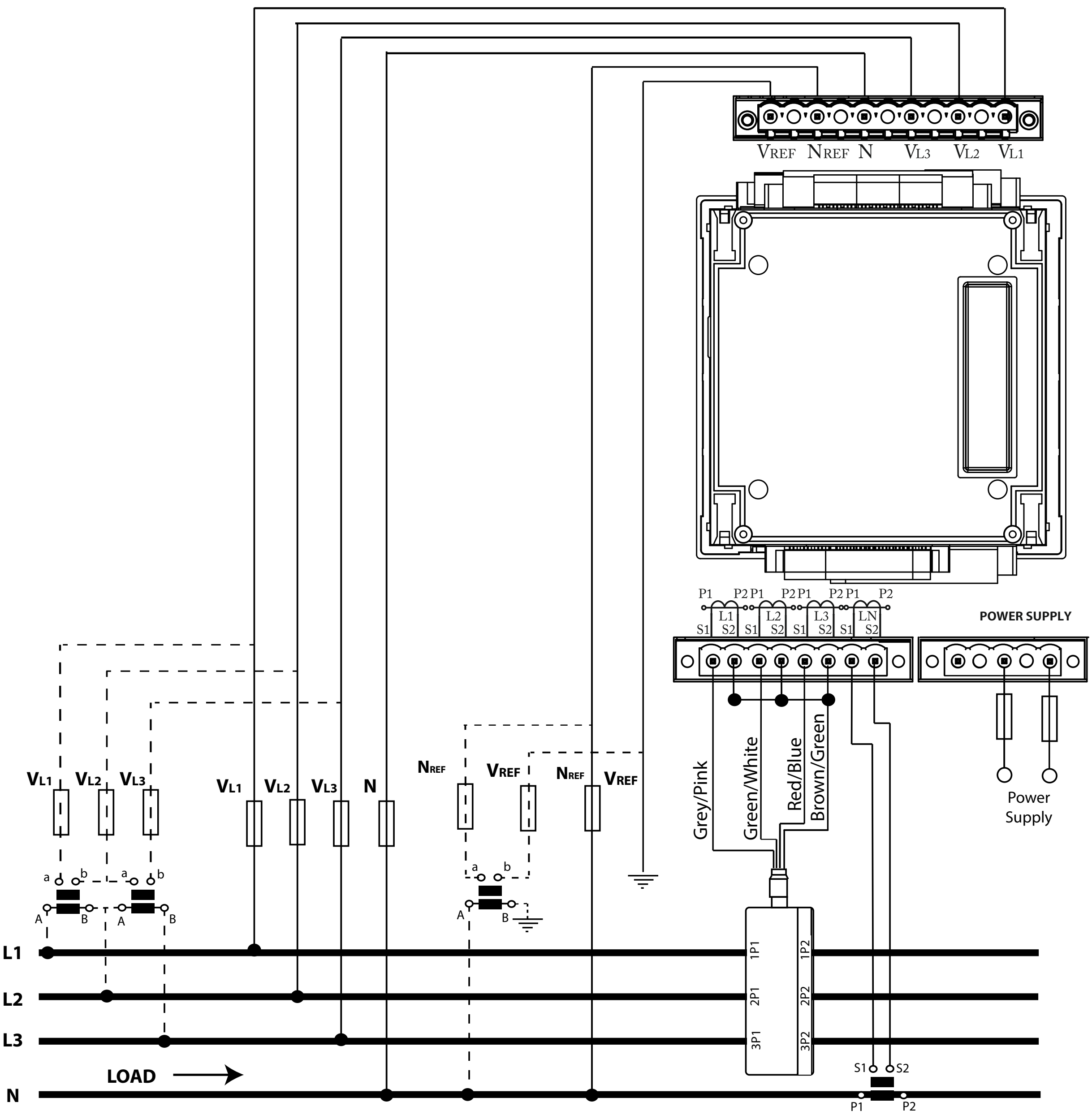


Figure 4: Three-phase measuring with a 4-wire connection (MC3 type transformer (/0.250)).

Note: The unit can calculate the neutral current without having to measure it, option: Calculated current .../A.

⚠	The MC3 transformer secondary value is set to 0.250 A. The transformer for measuring the LN neutral current cannot be MC type.

3.4.2.- Three-phase network measurement with a 3-wire connection.

Measurement system: 3W 3Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

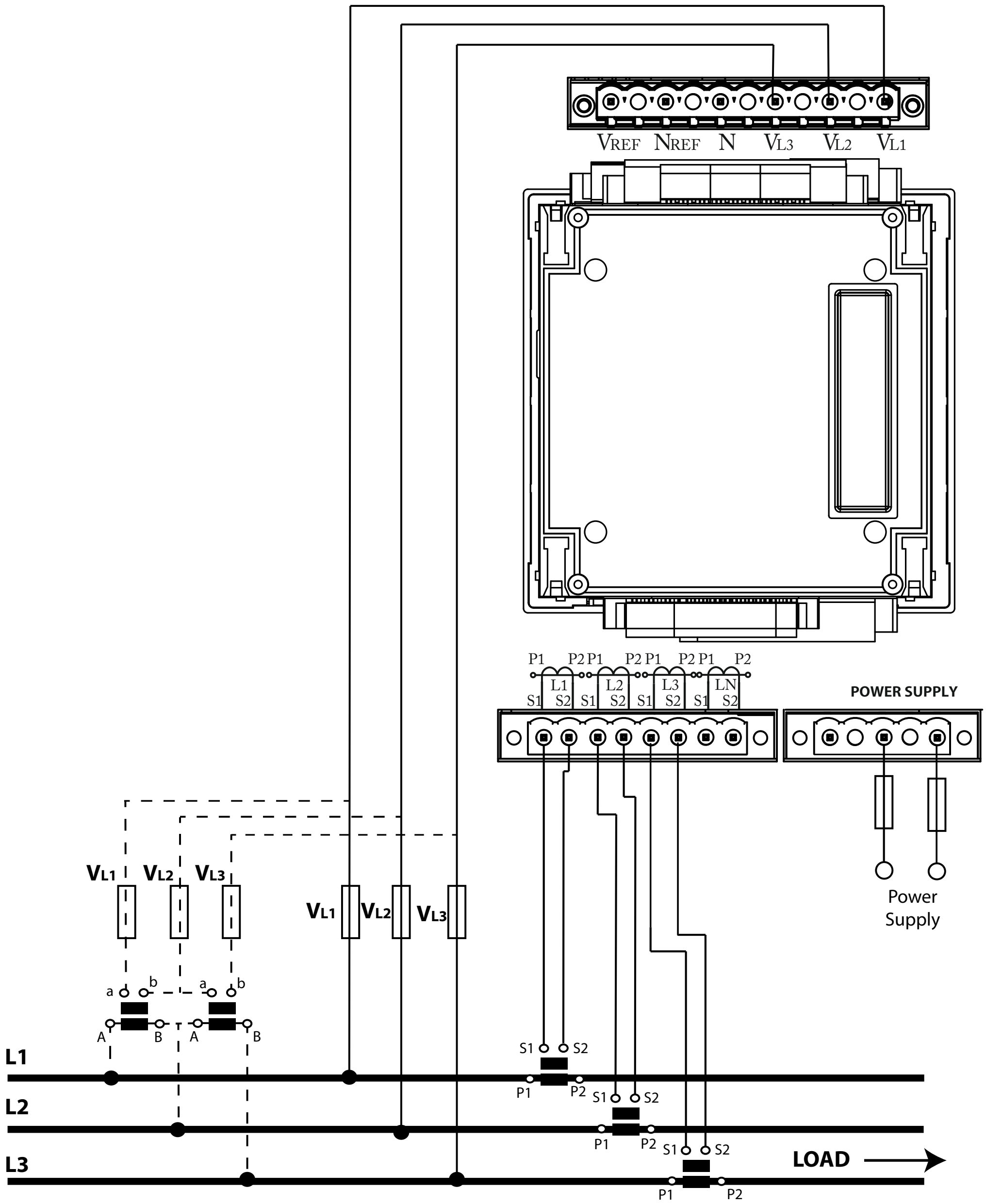


Figure 5: Three-phase measuring with a 3-wire connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

	The MC1 transformer secondary value is set to 0.250 A

Measurement system: 3W 3Ph

Secondary winding of the current transformer: MC (MC3 type transformer)

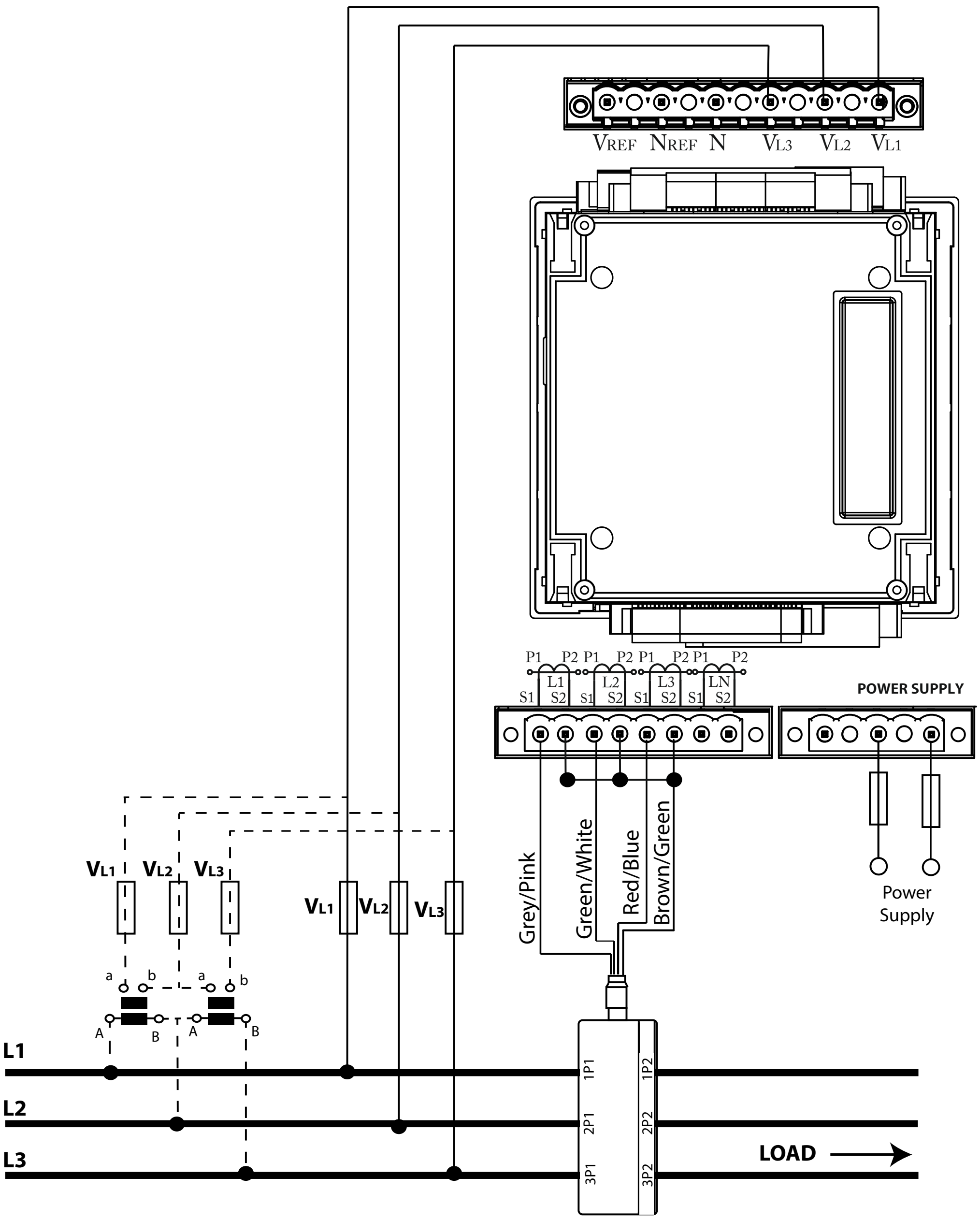


Figure 6: Three-phase measuring with a 3-wire connection (MC3 type transformer (/0.250)).

⚠	The MC3 transformer secondary value is set to 0.250 A

3.4.3.- Three-phase network measurement with a 3-wire connection and transformers with an ARON connection.

Measurement system: Aron 3Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

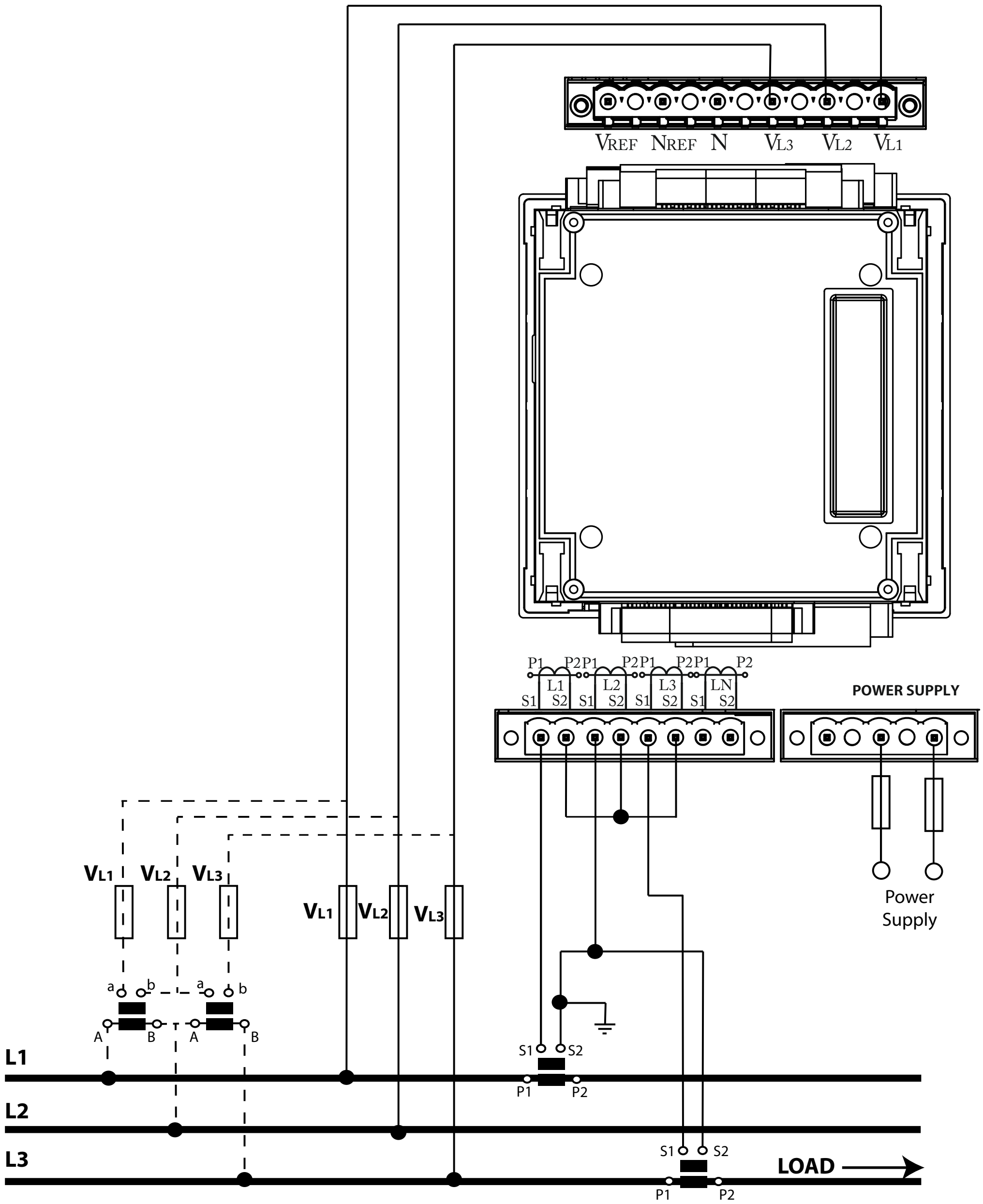


Figure 7: Three-phase measuring with a 3-wire connection and transformers in an ARON connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

⚠	The MC1 transformer secondary value is set to 0.250 A

3.4.4.- Two-phase network measurement with a 3-wire connection.

Measurement system: 3W 2Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

Secondary winding of the neutral current transformer: 1 5

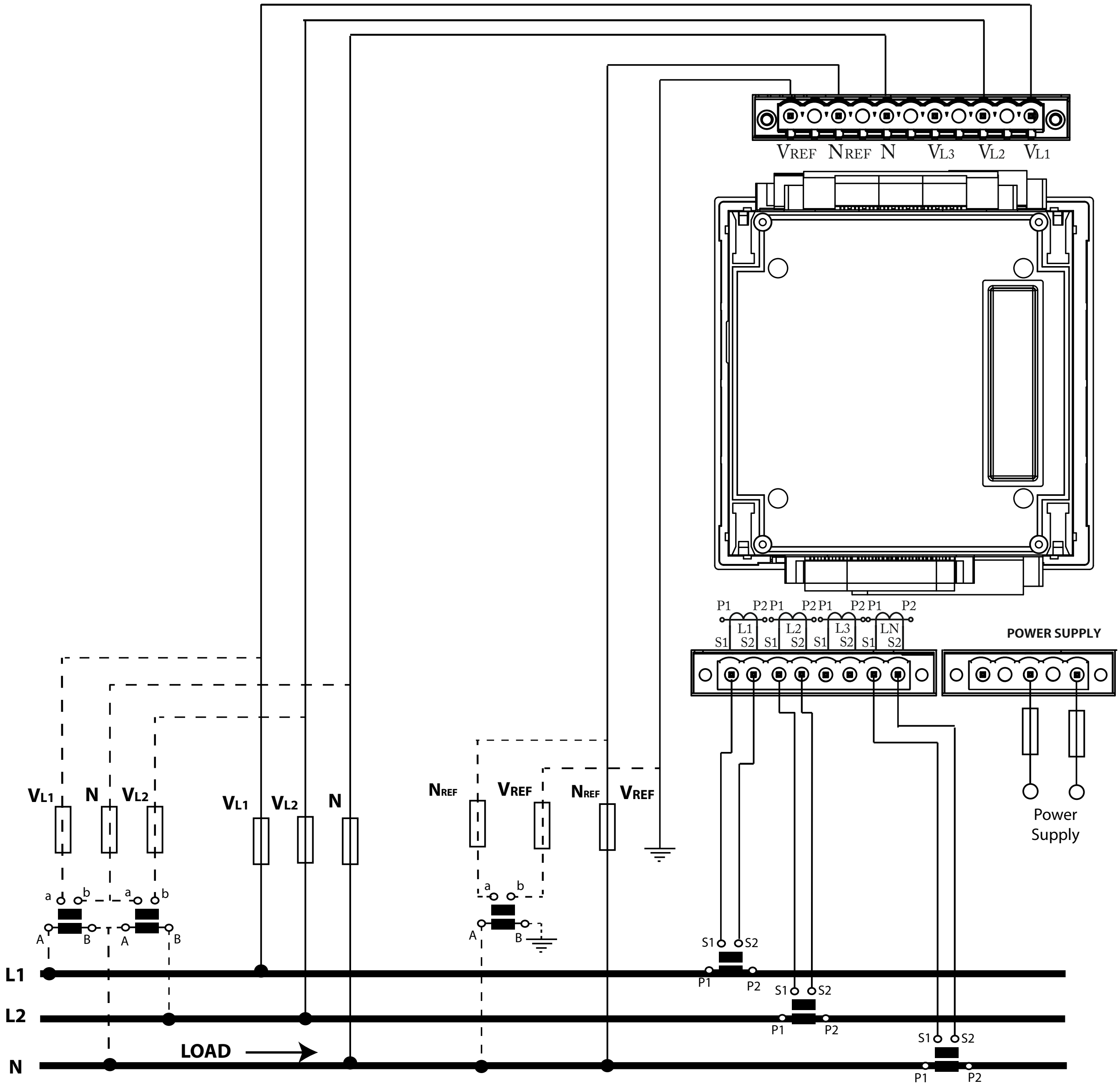


Figure 8: Two-phase measuring with a 3-wire connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

Note: The unit can calculate the neutral current without having to measure it, option: Calculated current .../A.

⚠	The MC1 transformer secondary value is set to 0.250 A The transformer for measuring the LN neutral current cannot be MC type.

3.4.5.- Single-phase network measurement, phase to phase, with a 2-wire connection.

Measurement system: 2W 2Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

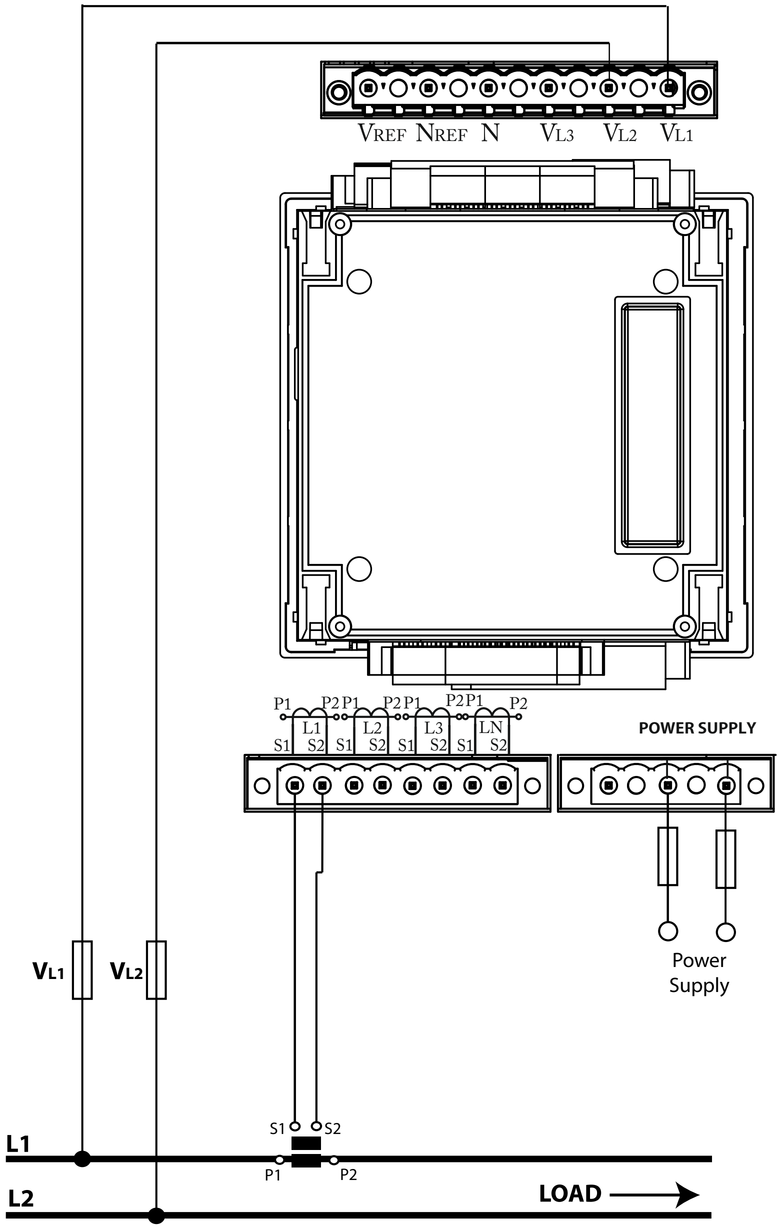


Figure 9: Phase to phase single-phase measuring with a 2-wire connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

⚠	The MC1 transformer secondary value is set to 0.250 A

3.4.6.- Single-phase network measurement, phase to neutral, with a 2-wire connection.

Measurement system: 2W 1Ph

Secondary winding of the current transformer: 1 5 MC (MC1 type transformer)

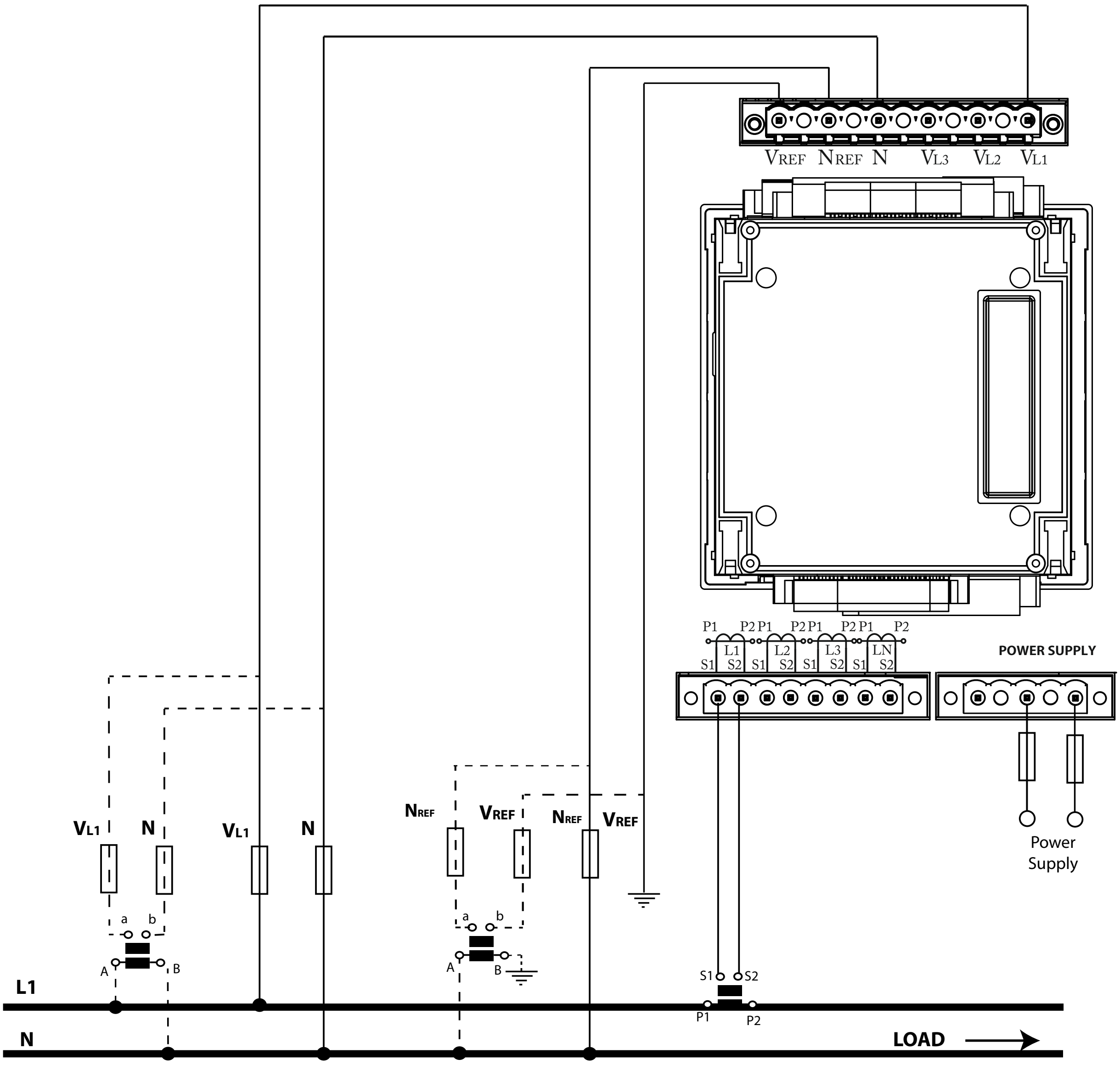


Figure 10: Phase to neutral single-phase measuring with a 2-wire connection (transformer secondary: /1A, /5A or MC1 (/0.250)).

	The MC1 transformer secondary value is set to 0.250 A

3.5.- STARTING UP THE UNIT

Once the **CVM-B** is connected to the power supply, the following screen, **Figure 11**, appears on the display and checks the integrity of the unit and detects the expansion modules.

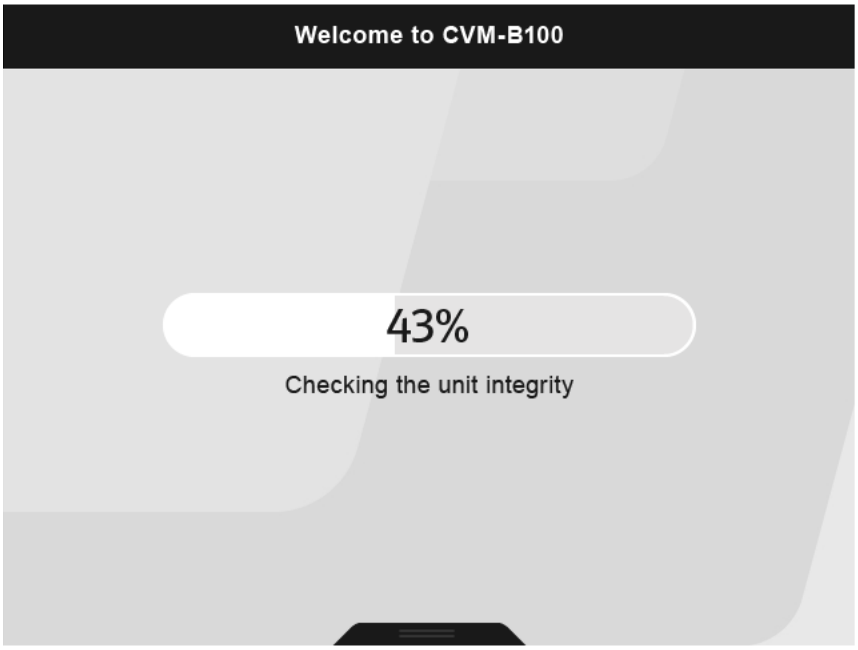


Figure 11: Initial check screen of the CVM-B.

When the checking process has finished, the welcome screen is displayed (**Figure 12**) until the key is pressed to continue with the start-up.
Note: *If 20 seconds elapse without pressing the key, the unit moves directly to the measurement screen by default.*

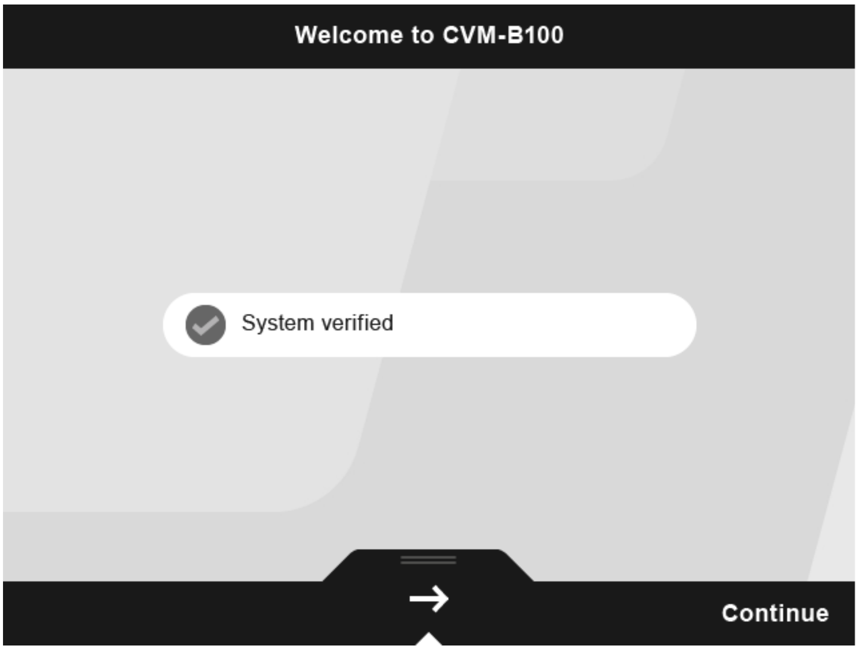


Figure 12: CVM-B welcome screen.

If this is the first time the unit is switched on, the screen in **Figure 13** appears to select the language.

Figure 13: Language selection screen.

The following options appear in the lower area:

ES, EN, DE, FR, 中文, 한국어 the possible languages of the unit: Spanish, English, German, French, Chinese and Korean.

Confirm, confirms and saves in the memory the language displayed on the screen**.**

Use the keys and to select the required language; once selected, confirm the language by choosing the option and pressing the key .

After selecting the language, select the current date (Format: dd/mm/yyyy) and time (**Figure 14**).

Figure 14: Current date and time selection screen.

The digit selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program.

Previous, selects the previous digit.

Next, selects the next digit.

Confirm date and time, confirms and saves in the memory the value programmed on the screen.

Use the keys and to select the current date and time; once selected, confirm by choosing the option and pressing the key .

Finally, select the corresponding time zone for the unit, **Figure 15**.

Figure 15: Time zone selection screen.

The following options appear in the lower area:

- When programming the **time zone**:

0, +1 ... -1 all possible time zones.

- When selecting **summer/winter time**:

Enable summer time.

Disable summer time.

- For all parameters:

Confirm, confirms and saves in the memory the time zone displayed on the screen.

Previous, selects the previous parameter.

Next, selects the next parameter.

Use the keys and to select the different options; once selected, confirm by choosing the option and pressing the key .

The screen shown in **Figure 16** will then be displayed for a few seconds,

Figure 16: Start-up screen, CVM-B.

the unit completes its start-up and the main screen is shown on the display, **Figure 17**.

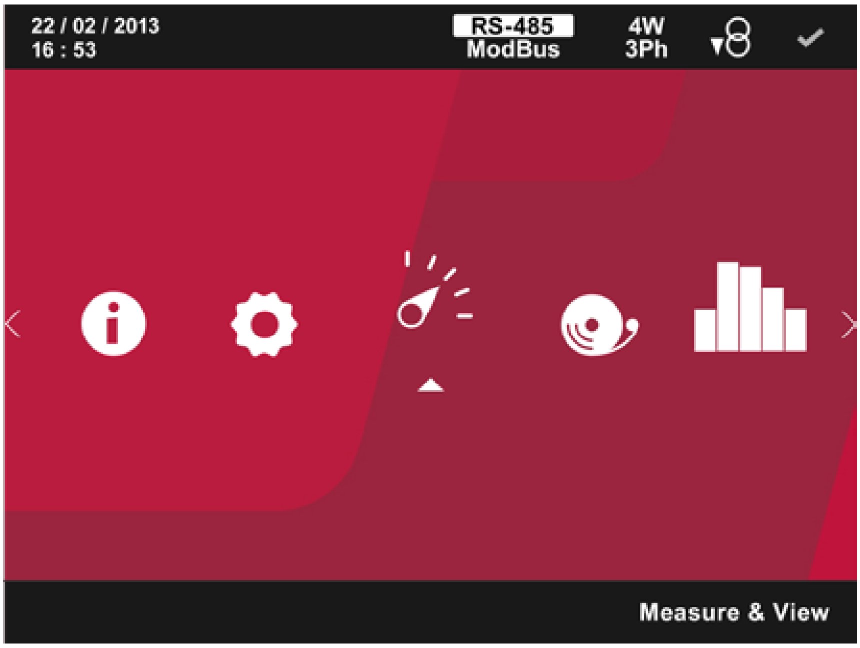


Figure 17: Main screen, CVM-B.

4.- OPERATION

4.1.- OPERATING PRINCIPLE

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

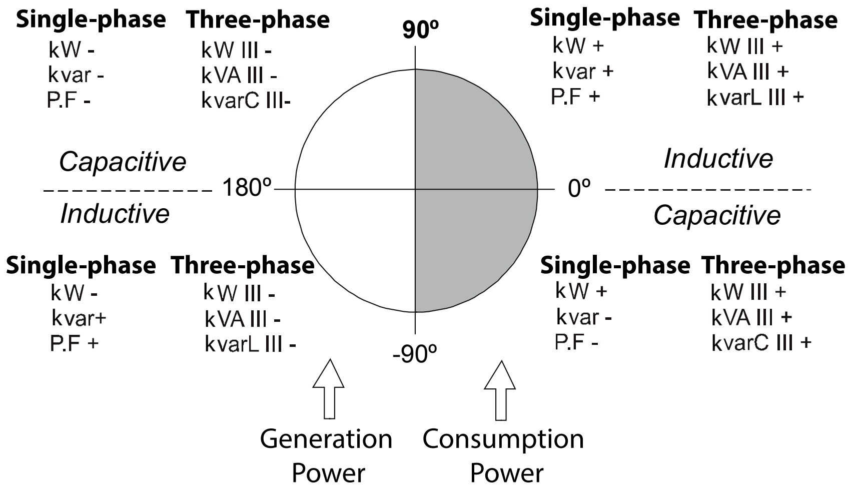


Figure 18: Four quadrants of CVM-B.

Apart from the basic functions of any analyzer, the **CVM-B**:

✓ Has, for each instantaneous variable, a bar chart that shows the current instantaneous value, maximum and minimum values and the pre-alarm and alarm zones programmed.

✓ Has three display modes, in order to display 1, 3 or 4 variables at the same time on each display. The display of the variables is fully configurable.

✓It includes as standard the **BACnet** communications protocol.

✓ It is 100% modular and expandable with different expansion modules which can be included in the unit.

✓ It can be easily updated through the microSD card supplied with the unit.

4.2.- MEASUREMENT PARAMETERS

The unit displays the electrical parameters shown in **Table 5**.

Table 5: CVM-Bx measurement parameters.

Parameter	Units	Phases L1-L2-L3	N	Total III
Phase-neutral voltage	Vph-N	✓	✓	✓
Phase-phase voltage	Vph-ph	✓		✓
Current	A	✓	✓	✓
Frequency	Hz	✓(L1)		
Active Power	kW	✓		✓
Apparent Power	kVA	✓		✓
Total Reactive Power	kvar	✓		✓
Inductive Reactive Power	kvarL	✓		✓
Capacitive Reactive Power	kvarC	✓		✓
Power factor	PF	✓		✓
Cos φ	φ	✓		✓
Voltage THD %	% THD V	✓	✓	
Current THD %	% THD A	✓	✓	
Harmonic Breakdown - Voltage (up to the 50th order harmonic)	harm V	✓	✓	
Harmonic Breakdown - Current (up to the 50th order harmonic)	harm V	✓	✓	
Total Active Energy	kWh	✓		✓
Total Inductive Reactive Energy	kvarLh	✓		✓
Total Capacitive Reactive Energy	kvarCh	✓		✓
Total Reactive Energy	kvarh	✓		✓
Total Apparent Energy	kVAh	✓		✓
Active Energy Tariff 1	kWh	✓		✓
Inductive Reactive Energy Tariff 1	kvarLh	✓		✓
Capacitive Reactive Energy Tariff 1	kvarCh	✓		✓
Total Reactive Energy Tariff 1	kvarh	✓		✓
Apparent Energy Tariff 1	kVAh	✓		✓
Active Energy Tariff 2	kWh	✓		✓
Inductive Reactive Energy Tariff 2	kvarLh	✓		✓
Capacitive Reactive Energy Tariff 2	kvarCh	✓		✓
Total Reactive Energy Tariff 2	kvarh	✓		✓
Apparent Energy Tariff 2	kVAh	✓		✓
Active Energy Tariff 3	kWh	✓		✓
Inductive Reactive Energy Tariff 3	kvarLh	✓		✓
Capacitive Reactive Energy Tariff 3	kvarCh	✓		✓
Total Reactive Energy Tariff 3	kvarh	✓		✓
Apparent Energy Tariff 3	kVAh	✓		✓
Maximum Current Demand, Tariff 1	A	✓		✓
Maximum Active Power Demand, Tariff 1	kW	✓		✓

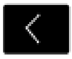
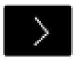
Table 5 (Continuation): CVM-Bx measurement parameters.

Parameter	Units	Phases L1-L2-L3	N	Total III
Maximum Apparent Power Demand, Tariff 1	kVA	✓		✓
Maximum Current Demand, Tariff 2	A	✓		✓
Maximum Active Power Demand, Tariff 2	kW	✓		✓
Maximum Apparent Power Demand, Tariff 2	kVA	✓		✓
Maximum Current Demand, Tariff 3	A	✓		✓
Maximum Active Power Demand, Tariff 3	kW	✓		✓
Maximum Apparent Power Demand, Tariff 3	kVA	✓		✓
Phase sequence		✓		
Parameter	**Units**	**Tariff: T1-T2-T3**	**Total Tariff**	
No. of hours of active tariff	hours	✓	✓	
Cost	COST	✓	✓	
CO_2 Emissions	$kgCO_2$	✓	✓	

4.3.- KEYPAD FUNCTIONS

The **CVM-B** has 3 keys that allow you to browse the various screens and program the unit.

Table 6: Function of keys.

Key	Keystroke
	Shifting to the left
	Shifting to the right
	Select parameter / Enter programming menu

4.4.- DISPLAY

The unit has a colour TFT display which displays all the parameters indicated in **Table 5**.
The display is divided into three areas (**Figure 19**):

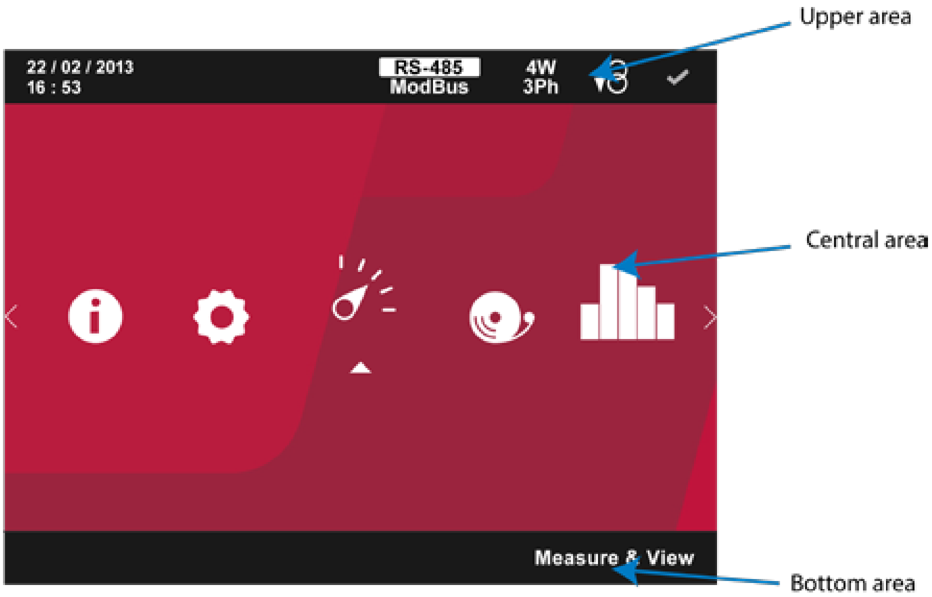


Figure 19: CVM-B display areas.

4.4.1.- UPPER AREA

Figure 20: Upper area of display.

The current date and time are displayed in real time in this area.
The following are also displayed:

✓ **Communications expansion module**

If a communications expansion module has been installed, one of the following messages will be displayed according to the purpose of the module:

LonWorks Module

Modbus/TCP Module.

Profibus Module.

MBus Module**.**

Datalogger Module.

✓ Type of communications

The **CVM-B** units have one RS-485 communications port.
The unit has as standard two communications protocols: **MODBUS RTU** ® and **BACnet**.
See ***"6.- INTEGRATED COMMUNICATIONS"***

Depending on the protocol selected you will view:

RS-485 ModBus **MODBUS RTU** protocol.
RS-485 BACnet **BACnet** protocol.

✓ Type of installation

Use the setup menu to select the type of installation to which the unit is connected, (***"5.6.5.- Measurement connection mode."***).
Depending on the installation selected, you will view:

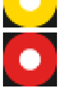
2W 1Ph Single-phase installation.
2W 2Ph Two-phase installation.
3W 2Ph Two-phase installation with neutral.
3W 3Ph Three-phase installation.
4W 3Ph Three-phase installation with neutral.
Aron 3Ph Aron installation.

If the position of the input channels is changed to allow communications (***"6.3.7.17.- Position of input channels"***), the installation type will be shown in red.

✓ Consumption or Generation

The icon  indicates that the installation is generating.
The icon  indicates that the installation is consuming.

✓ Alarm status

The icon  indicates that no alarm has been generated.
The icon  indicates that the unit has a pre-alarm activated.
The icon  indicates that the unit has an alarm activated.

4.4.2.- LOWER AREA

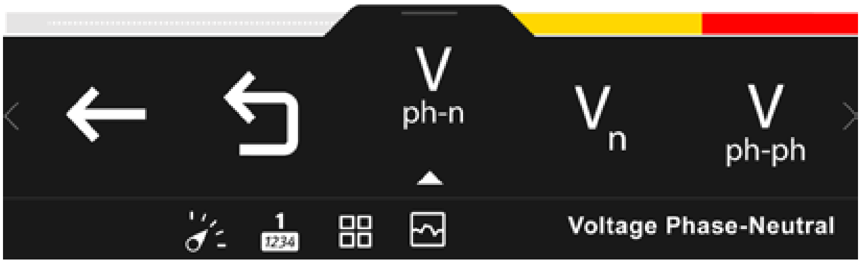


Figure 21: Lower area of display.

The various options on the display and setup menus and an explanatory text for the option selected are shown in the lower area.
On the display screens the lower area disappears after 3 seconds without pressing any key.
It reappears by pressing the key .

4.4.3.- CENTRAL AREA

The different display and setup menus for the unit are accessed from the central area.
All instantaneous, incremental and demand parameters in various formats are also displayed:

- ✓ Numeric representation of one, three and up to four parameters at the same time.
- ✓ Analogue representation.
- ✓ Graphical representation.
- ✓ Representation on a bar chart.

A bar chart is displayed for instantaneous and demand parameters, **Figure 22**, which shows the current instantaneous value, maximum and minimum values and pre-alarm and alarm zones programmed.

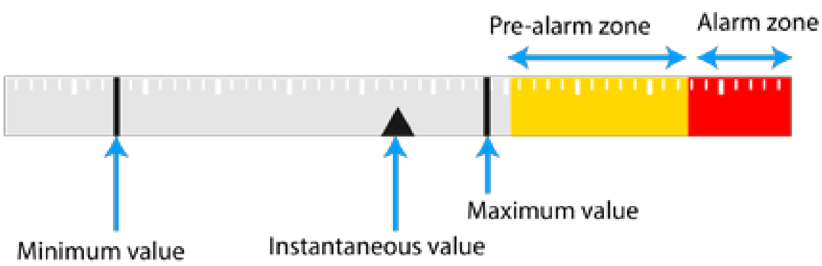


Figure 22: Description of the bar chart.

If an alarm has not been programmed for the parameter, the pre-alarm and alarm zones shown in the bar chart are calculated.

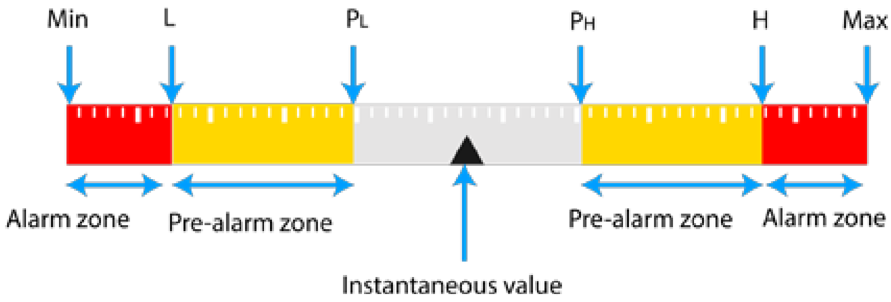


Figure 23: Calculation of the bar chart.

The calculation formulas are:

✓ **Neutral-phase voltage and neutral voltage**

L = Primary rated voltage* 0.9
Min = **L** * 0.8
PL = **L** + ((**H** - **L**) * 0.1)

H= Primary rated voltage * 1.1
Max = **H** * 1.2
PH = **H** - ((**H** - **L**) * 0.1)

✓ **Phase-phase voltage**

L = Primary rated voltage* 0.9 * √3
Min = **L** * 0.8
PL = **L** + ((**H** - **L**) * 0.1)

H = Primary rated voltage * 1.1 * √3
Max = **H** * 1.2
PH = **H** - ((**H** - **L**) * 0.1)

✓ **Current**

L = 0
Min = 0
PL = 0

H = Primary current
Max = **H** * 1.2
PH = **H** - ((**H** - **L**) * 0.1)

The alarm and pre-alarm zones L are not displayed.

✓ **Power ratings**

L = 0
Min = 0
PL = 0

H = Primary rated voltage * Primary current
Max = **H** * 1.2
PH = **H** - ((**H** - **L**) * 0.1)

The alarm and pre-alarm zones L are not displayed.

✓ **Frequency 50 Hz**

L = 45
Min = **L** * 0.95
PL = **L** + ((**H** - **L**) * 0.25)

H = 55
Max = **H** * 1.05
PH = **H** - ((**H** - **L**) * 0.25)

✓ **Frequency 60 Hz**

L = 55	**H** = 65
Min = **L** * 0.95	**Max** = **H** * 1.05
PL = **L** + ((**H** - **L**) * 0.25)	**P**H = **H** - ((**H** - **L**) * 0.25)

✓ **Voltage THD**

L = 0	**H** = 5
Min =0	**Max** = **H** * 2
PL = **L** + ((**H** - **L**) * 0.25)	**P**H = **H** - ((**H** - **L**) * 0.25)

The alarm and pre-alarm zones L are not displayed.

✓ **Current THD**

L = 0	**H** = 20
Min =0	**Max** = **H** * 2
PL = **L** + ((**H** - **L**) * 0.25)	**P**H = **H** - ((**H** - **L**) * 0.25)

The alarm and pre-alarm zones L are not displayed.

✓ **Cosine phi and Power factor**

L = -0.9	**H** = 0.9
Min = -**Max**	**Max** = minor(**L** or **H**) * 1.2
PL = **L** + ((**L** - **H+2**) * 0.25)	**P**H = **H** + ((**L** - **H+2**) * 0.25)

4.5.- LED INDICATORS

The **CVM-B** unit features:

- A **CPU** LED, which indicates that the unit is working correctly with a 1 second flashing. A flashing of 0.5 seconds indicates that an error has occurred.

- An **ALARM** LED, which indicates that an alarm has been activated with the LED flashing. If there is no alarm it remains switched off.

-3 LED on the **navigation keys**, which stay switched on with low current; when any of the 3 keys are pressed they all come on at maximum current.

Figure 24:LED indicators of the CVM-B.

4.6.- INPUTS

The **CVM-B** has two programmable digital inputs (terminals 7 and 8 in **Figure 1**) for working as:

- ✓ Logic input.
- ✓ Impulse input.
- ✓ Tariff selection.

See ***"5.6.17.- Digital inputs."*** to configure the inputs.

In ***"5.1.7.- Integrated functions."*** and in ***"5.5.2 Integrated functions."*** you can see the status and configuration of the programmed digital inputs.

The selected tariff can be determined in accordance with the status of the inputs, as shown in **Table 7**.

Table 7: Selecting the tariff according to the inputs.

I1	I2	Tariff
Tariff selection	Tariff selection	
0	0	Tariff 1
0	1	Tariff 2
1	0	Tariff 3

4.7.- OUTPUTS

The unit features:

- ✓ Two relay digital outputs (terminals 16, 17, 18 and 19 in **Figure 1**) programmable as alarms, see ***"5.6.15.-Relay digital outputs."***

- ✓ Two transistor digital outputs, optoisolated NPNs (terminals 10, 11 and 12 in **Figure 1**) programmable as an impulse output or alarms, see ***"5.6.16.- Transistor digital outputs."***

5.- DISPLAY AND CONFIGURATION

On the main screen, **Figure 25**, you can access the various menus of the unit:

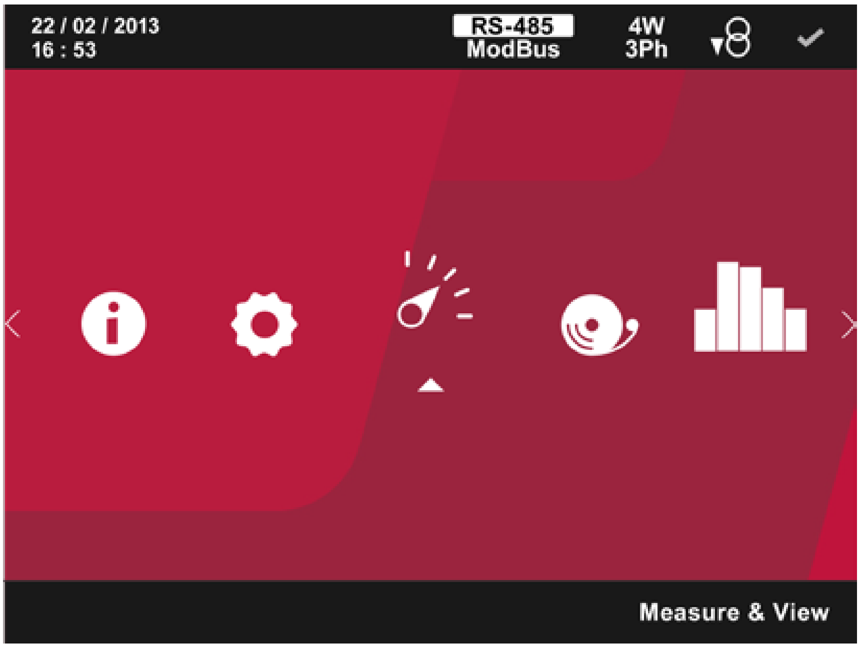


Figure 25:Main screen.

Measurement display menu, see ***"5.1.-MEASUREMENT DISPLAY MENU "***

Alarm menu, see ***"5.2.- ALARM MENU ".***

Energy closes menu, see **"5.3.- ENERGY CLOSES MENU "**

Log menu, see **"5.4.- LOG MENU "**

Information menu, see ***"5.5.- INFORMATION MENU ".***

Setup menu, see ***"5.6.- SETUP MENU ".***

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.-MEASUREMENT DISPLAY MENU

The screen in **Figure 26** is the home screen for the measurement display menu.

Figure 26: Main screen of the measurement display menu.

The display options appear in the lower area:

Display 1 parameter.

Display 3 parameters.

Display 4 parameters.

Phasors.

Standardised phasors.If the configured connection mode is single-phase or two-phase without neutral, the normalised phasors icon is not displayed.

Harmonics

Integrated functions.

Expansion modules. This option only appears when the unit is connected to an an expansion module of **Transistor Digital Inputs/Outputs** (**M-CVM-AB-8I-8OTR**), **Relay Digital Inputs/Outputs** (**M-CVM-AB-8I-8OR**) or **Analogue Inputs/Outputs** (**M-CVM-AB-4AI-8AO**).

Main menu, return to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.1.- Display 1 parameter.

By selecting this option, you want to view a single parameter on the display.

Figure 27: 1 parameter display screen.

The following options appear in the lower area:

Default parameters.
Customise parameters.
Back, returns to the home screen of the measurement display menu, **Figure 26**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.1.1.- Default parameters.

This menu allows you to view the following types of parameters:

Figure 28:Default parameters display screen (display 1 parameter).

Instantaneous parameters.

Incremental parameters.

Demand parameters.

Back, returns to the home screen of the 1 parameter display menu, **Figure 27.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.1.1.1.- Instantaneous parameters.

On this screen, **Figure 29,** you can view all the parameters indicated in **Tabla 8**.

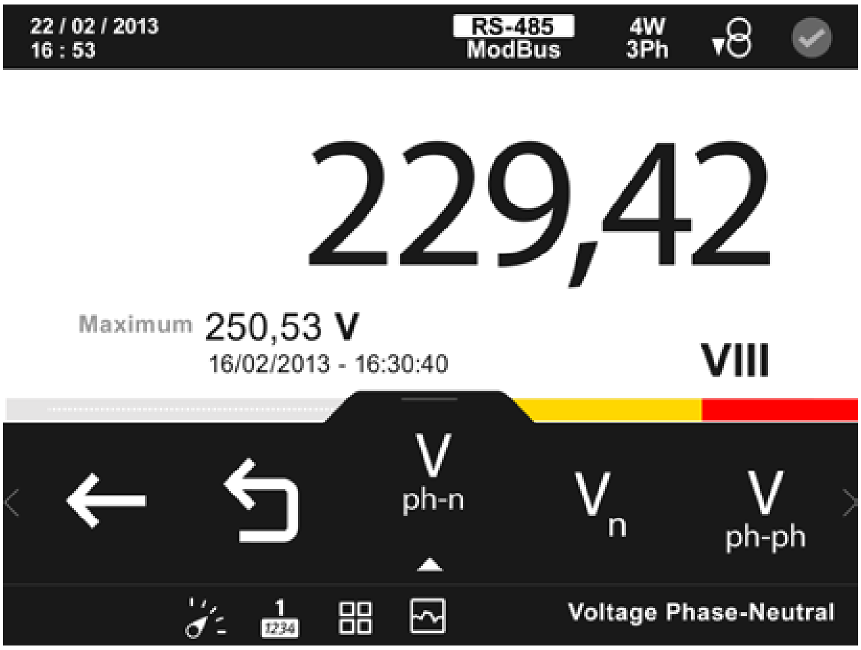


Figure 29: Instantaneous parameters (display 1 parameter).

For each of the instantaneous parameters you can view:

- ✓ The maximum and minimum value, with the date and time when it occurred.
- ✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see ***"4.4.3. CENTRAL AREA".***
- ✓ Graphical representation of the parameter.
- ✓ The analogue representation of the parameter.

Table 8: Instantaneous parameters.

Icon	Display 1 parameter Instantaneous parameters
V ph-n	Phase-Neutral Voltage
Vn	Neutral voltage
V ph-ph	Phase-Phase Voltage
A	Current
An	Neutral Current
Hz	Frequency
W	Active power (1)
varL	Inductive reactive power (1)
varC	Capacitive reactive power (1)

Table 8 (Continuation) : Instantaneous parameters.

Icon	Display 1 parameter Instantaneous parameters
var	Total reactive power (1)
VA	Apparent power (1)
PF	Power factor (1)
cos φ	Cosine phi III (1)
THD V	Voltage THD (1)
THD A	Current THD (1)

(1) The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to inductive or capacitive energy.

Indicating that the parameter refers to consumed or generated energy.

If the 2 icons light up at the same time, it means the installation is not properly connected.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The menu in the lower area disappears after 3 seconds (**Figure 30**).

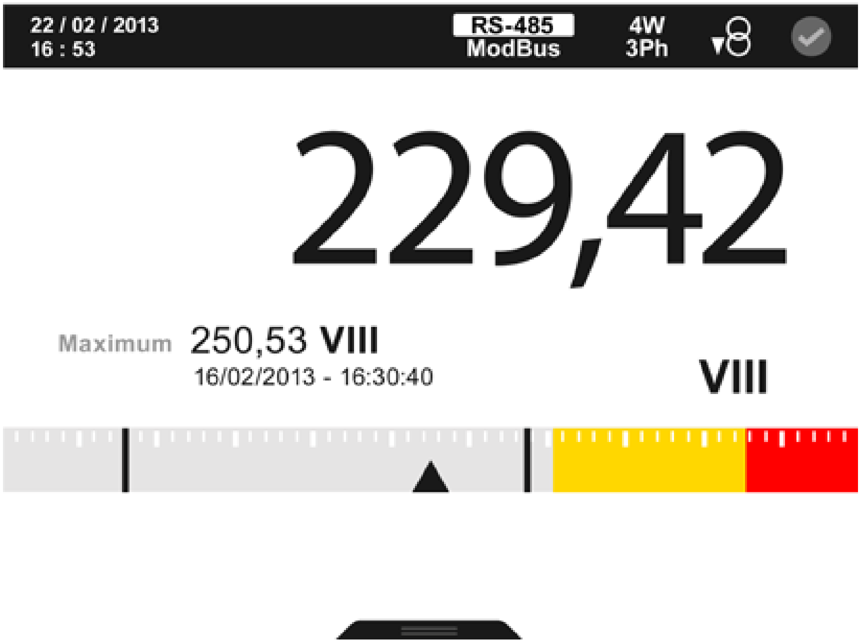


Figure 30: Instantaneous parameters without lower area (display 1 parameter).

Press the key to display the lower area again.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 28.**

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.1.1.1.1.- Instantaneous parameters display menu.

For each instantaneous parameter, this menu enables (**Figure 31**):

Figure 31:Instantaneous parameters, display menu (display 1 parameter).

Graphic view. ***(“5.1.1.1.1.1.1.Graphic view.”)***

Analog view. **(** ***“5.1.1.1.1.1.2. Analog view.”*)**

Display of 3 parameters, moves to the 3 parameters display screen. (***“5.1.2.- Display 3 parameters.”***)

Display of 4 parameters, moves to the 4 parameters display screen. (***“5.1.3.- Display 4 parameters.”)***

Back, returns to the instantaneous parameters display screen, **Figure 29**.

Main Menu, back to the main menu, **Figure 25**.

5.1.1.1.1.1.1.- Graphic view

Figure 32 shows the graphical display screen.

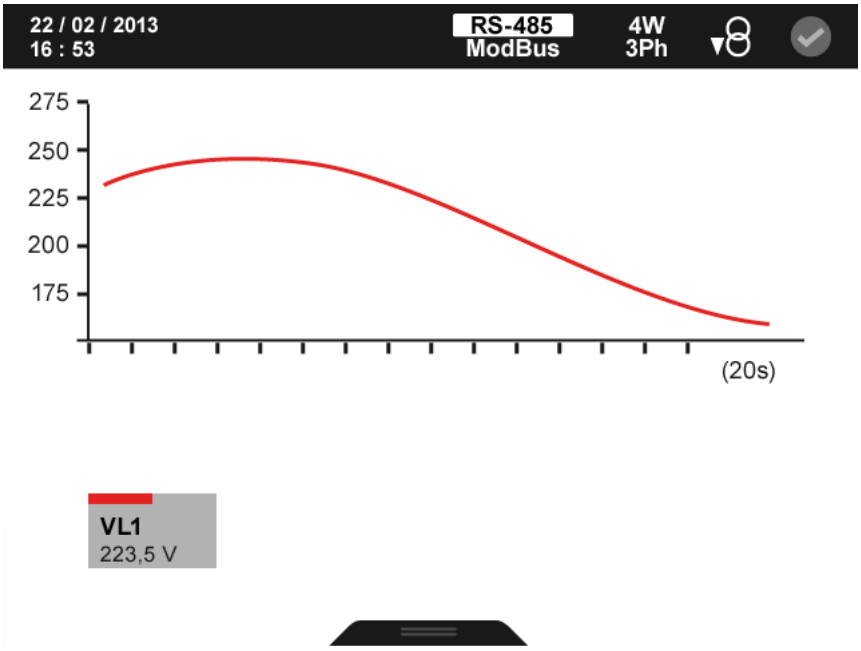


Figure 32: Instantaneous parameters, graphic view (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.
The lower area menu options are:

20s, 60s, 300s Selecting the graph display time (X-axis). The time can be set to 20, 60 or 300 seconds
Note: *The option selected is not displayed on the menu.*

Back, returns to the instantaneous parameters display menu screen, **Figure 31**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.1.1.1.2.- Analog view.

The analogue display screen is shown in **Figure 33**.

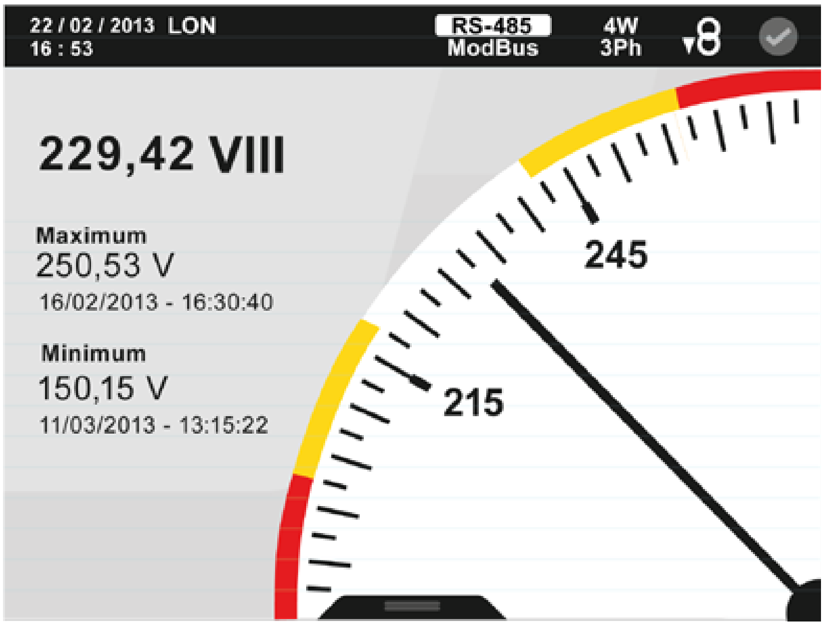


Figure 33:Instantaneous parameters, analog view(display 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

- Back, returns to the instantaneous parameters display menu screen, **Figure 31**.
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

If you view the current, active power or apparent power, a second red coloured needle will appear indicating the value of the maximum demand of the parameter being displayed.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.
T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

5.1.1.1.2.- Incremental parameters.

On this screen, **Figure 34**, you can view all the parameters indicated in **Tabla 9**.
For each of the incremental parameters you can view:

- ✓ The value generated and consumed,
- ✓The value for each tariff, T1, T2 and T3 and the total value of the 3 tariffs.
- ✓ The graphical representation of the parameter.
- ✓ Graphical representation of the energy closes.

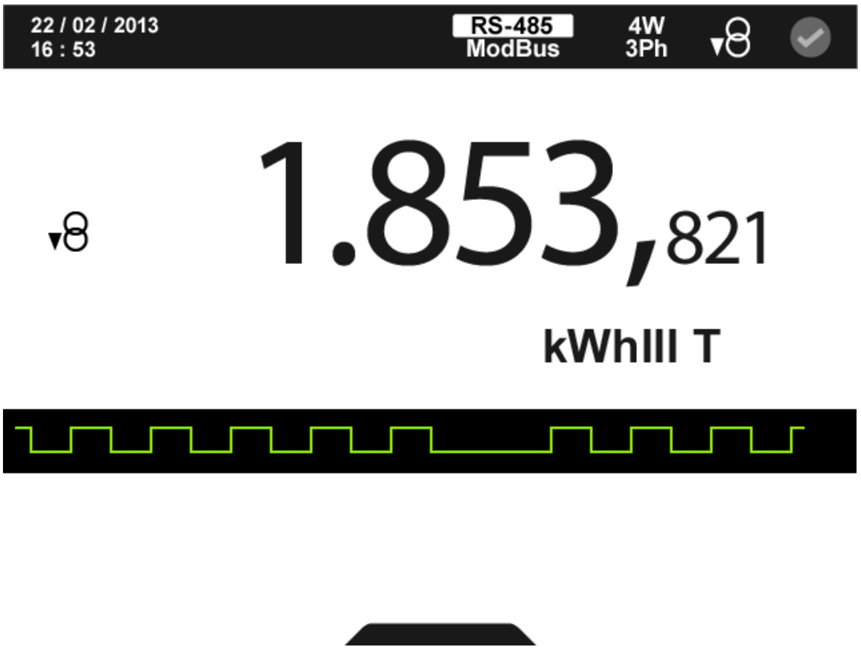


Figure 34: Incremental parameters (display 1 parameter).

Table 9:Incremental parameters (display 1 parameter).

Icon	Display 1 parameter Incremental parameters
Wh	Active energy (1) (2)(3)
varLh	Inductive reactive energy (1) (2) (3)
varCh	Capacitive reactive energy (1) (2) (3)
varh	Total reactive energy (1) (2) (3)
VAh	Apparent energy (1) (2) (3)
h(T)	Active tariff hours
CO_2	CO_2 Emissions
	Cost

(1) There is a graphical representation for all these parameters on the screen, **Figure 35**, which indicates the energy increase: a flat line indicates that there is no energy increase and the pulses indicate an increase in it.

Figure 35: Graphical representation of the energy increase.

Note: This representation is not real, it is only significant to give the user an idea of the energy increase.

(2) The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

(3) The value of the energy parameters is saved in the non-volatile memory every minute.

Press the key to display the lower area.
Use the keys and to browse the various parameters.
The menu in the lower area disappears after a few seconds.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 28.**

Main Menu, back to the main menu, **Figure 25**.

If there is a transistor digital output or input, programmed in impulse mode, associated with the variable being displayed, the following will appear:

The icon that indicates that an impulse input or output has been programmed
M0 The module with which the alarm is associated.
T2 The associated output in the module.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.1.1.2.1.- Incremental parameters display menu.

For each incremental parameter, this menu enables the following (**Figure 36**):

Figure 36: Incremental parameters, display menu (display 1 parameter).

Display the generation or consumption value of the selected parameter.

Note: *The option selected is not displayed on the menu.*

Tariff selection (***"5.1.1.1.2.1.1. Tariff selection***)

Graphic view of the incremental energy parameters. (***"5.1.1.1.2.1.2.* Graphic view*"***)

Back, returns to the incremental parameters display screen, **Figure 34.**

Main Menu, back to the main menu, **Figure 25**.

5.1.1.1.2.1.1.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 37**.

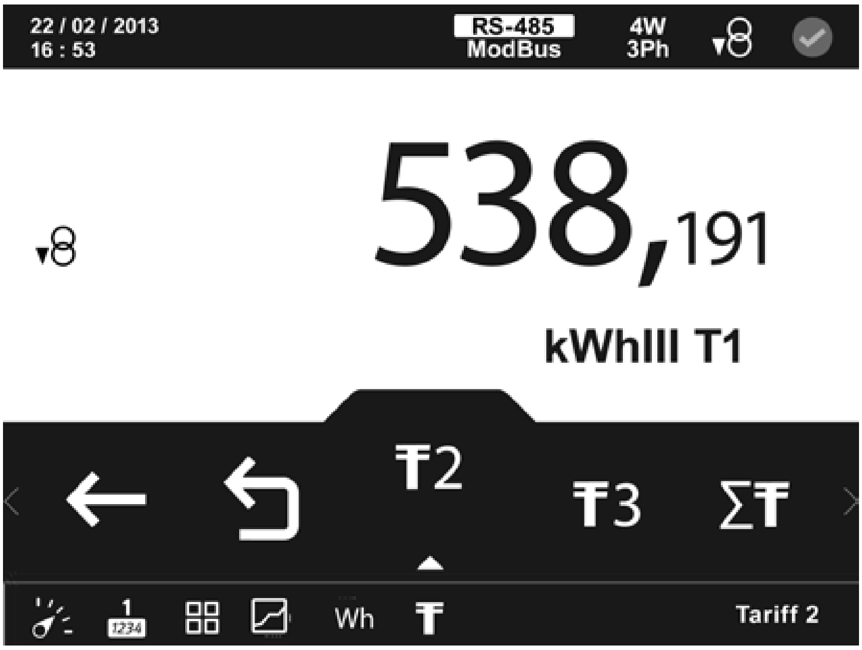


Figure 37:Incremental parameters, tariff selection (display 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, , , Select the tariff to display: Tariff 1, Tariff 2, Tariff 3 or the total value of the three tariffs.
Note: *The option selected is not displayed on the menu.*
Back, returns to the incremental parameters display menu, **Figure 36**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.1.2.1.2.- Graphic view

The graphical representation of the energy closes is shown for all the incremental energy parameters, **Figure 38**.

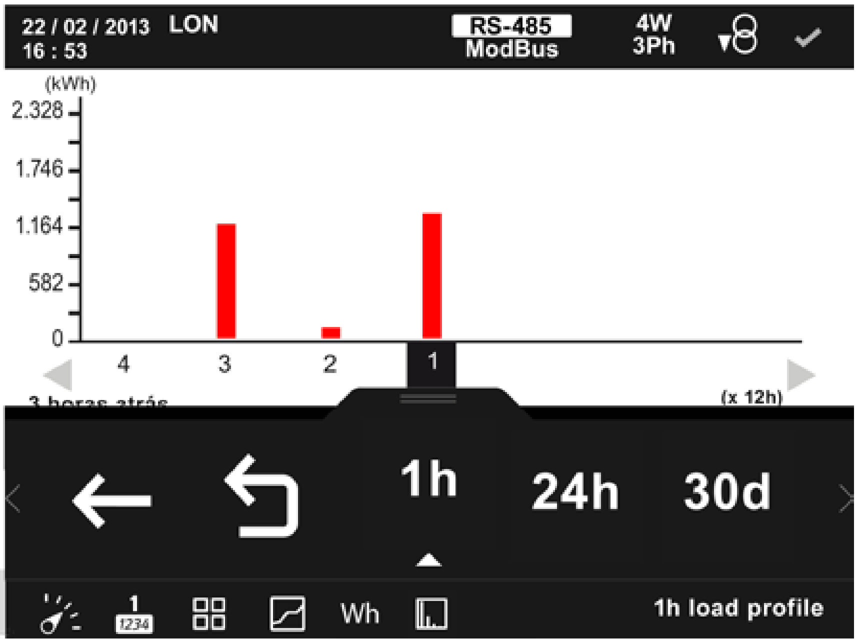


Figure 38:Incremental parameters, graphic view (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

1h, 12h, 24h, 30d Selecting the energy close time periods: Closes of 1 hour, 12 hours 24 hours or 30 days.
Note: *The option selected is not displayed on the menu.*
Previous, scrolls through the energy closes in ascending order.
Next, scrolls through the energy closes in descending order.
Back, returns to the incremental parameters display menu, **Figure 36**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

The unit shows 59 energy closes for each display period.
The energy close values are reset when the unit is disconnected from the auxiliary power supply.

5.1.1.1.3.- Demand parameters.

On this screen, **Figure 39**, you can view all the maximum demand parameters indicated in **Tabla 10**.
For each of the demand parameters you can view:

- ✓ Graphical representation of the parameter.
- ✓ The analogue representation of the parameter.
- ✓The value for each tariff, T1, T2 and T3.
- ✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see ***"4.4.3. CENTRAL AREA"***.

Figure 39: Demand parameters (display 1 parameter).

Table 10:Demand parameters (displays 1 parameter).

Icon	Display 1 parameter Demand parameters.
A	Current
W	Active power
VA	Apparent power

The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The menu in the lower area disappears after 3 seconds.

Press the key to display the lower area again.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 28.**

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.1.1.3.1.- Demand parameters display menu.

For each demand parameter, this menu enables (**Figure 40**):

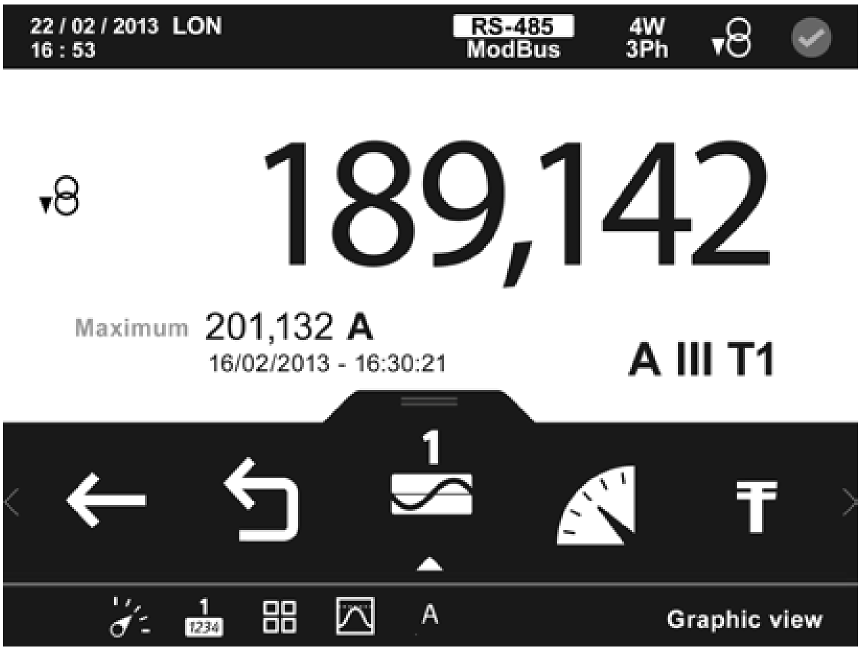


Figure 40:Demand parameters display menu (display 1 parameter).

Graphic view ***("5.1.1.1.3.1.1.Graphic view.")***

Analogue display.***("5.1.1.1.3.1.2. Analogue display.")***

Tariff selection ***("5.1.1.1.3.1.3. Tariff selection.")***

Back, returns to the demand parameters display screen, **Figure 39**.

Main Menu, back to the main menu, **Figure 25**.

5.1.1.1.3.1.1.- Graphic view.

Figure 41 shows the graphical display screen.

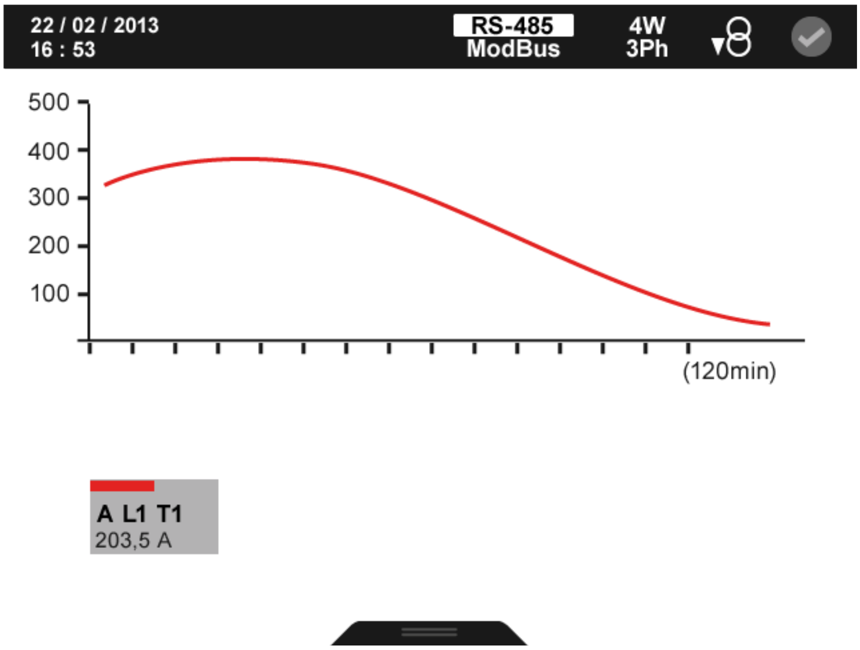


Figure 41:Demand parameters, graphic view (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

120m, 48h, Select the integration time (X-axis) on the graph. The time can be set to 120 minutes or 48 hours.
Note: *The option selected is not displayed on the menu.*

Back, returns to the demand parameters display menu screen, **Figure 40.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.1.3.1.2.- Analogue view.

The analogue display screen is shown in **Figure 42**.

Figure 42:Demand parameters, analog view (display 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

Back, returns to the demand parameters display menu screen, **Figure 40.**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

The second red coloured needle indicates the instantaneous value of the parameter being displayed.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.
T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

5.1.1.1.3.1.3.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 43**.

Figure 43: Demand parameters, tariff selection (display 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, , Select the tariff to display: Tariff 1, Tariff 2 or Tariff 3.
Note: *The option selected is not displayed on the menu.*
Back, returns to the demand parameters display menu screen, **Figure 40.**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.- Customise parameters

On this screen, **Figure 44**, you can view the five custom screens with 1 parameter.

Figure 44: Custom parameters screen (display 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

- , ... Select one of the 5 programmed custom screens.
- Back, returns to the home screen of the 1 parameter display menu, **Figure 27.**
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.1.- , ... Customisation screens

Figure 45 shows the screen used to customise 1 parameter.
These screens can also be configured for communications.
See ***"6.- INTEGRATED COMMUNICATIONS".***

Figure 45: Custom parameters screen (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

Select the parameter that will be displayed on the customisation screen. (***"5.1.1.2.1.1. Parameter selection"***)

Back, returns to the home screen of the parameter customisation menu, **Figure 44.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.1.1.- Parameter selection

Figure 46 shows the screen for selecting the parameter for display.

Figure 46: Custom parameters screen, parameter selection (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

Selects an instantaneous parameter (***"5.1.1.2.1.1.1. Selecting an instantaneous parameter."***)

Selecting an incremental parameter. (***"5.1.1.2.1.1.2. Selecting an incremental parameter."***)

Selecting a demand parameter.(***"5.1.1.2.1.1.3. Selecting a demand parameter."***)

Delete parameter, deletes the parameter displayed on the screen**.**

When this option is selected the icon appears with the option to save the deleted parameter.

Back, returns to the customisation screen, **Figure 45.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.1.1.1.- Selecting an instantaneous parameter.

Figure 47 shows the screen for selecting the Instantaneous parameters.

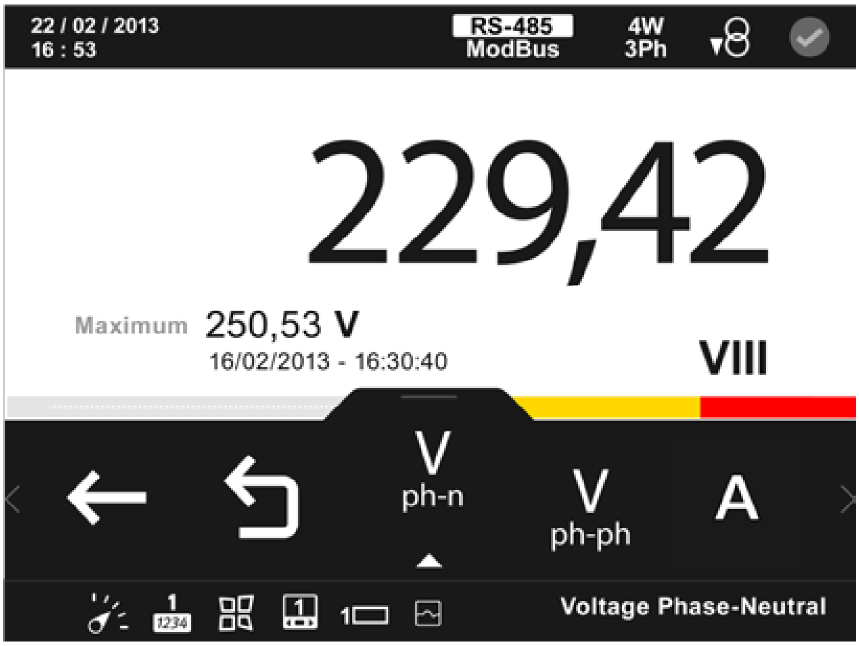


Figure 47: Custom parameters screen, selecting an instantaneous parameter (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The menu at the bottom displays all the available instantaneous parameters (**Table 11**).

Table 11: Instantaneous parameters that can be selected on the customisation screens.

Customisation screen			
Icon	**Instantaneous parameter**	**Icon**	**Instantaneous parameter**
V ph-n	Phase-Neutral Voltage	var	Total reactive power
V ph-ph	Phase-Phase Voltage	VA	Apparent power
A	Current	PF	Power factor
Hz	Frequency	cos φ	Cosine phi
W	Active power	THD V	Voltage THD
varL	Inductive reactive power	THD A	Current THD
varC	Capacitive reactive power		

To select a parameter, press the button to open the menu at the bottom for selecting the phase:

- For the **Neutral-Phase** and **Voltage** parameters:

  L1 Phase L1, L2 Phase L2, L3 Phase L3, III Three-phase, LN Neutral.

- For the **Phase-Phase Voltage** parameter:

  L12 Phase L1-L2, L23 Phase L2-L3, L31 Phase L1-L3, L123 Phase L1-L2-L3.

- For the **Frequency** parameter:

  L1 Phase L1.

- For the **Active power, Inductive reactive power**, **Capacitive reactive power**, **Total reactive power**, **Apparent power**, **Power factor** and **Cosine phi** parameters:

  L1 Phase L1, L2 Phase L2, L3 Phase L3, III Three-phase.

- For the **Voltage THD** and **Current THD** parameters:

  L1 Phase L1, L2 Phase L2, L3 Phase L3, LN Neutral.

The option appears after selecting the phase to save the selection.

The following options are also shown on the bottom at all times

Back, returns to the previous customisation screen.
Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.1.1.2.- Selecting an incremental parameter.

Figure 48 shows the screen for selecting an incremental parameter.

Figure 48: Custom parameters screen, selecting an incremental parameter (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The menu at the bottom displays all the available instantaneous parameters (**Table 12**).

Table 12: Incremental parameters that can be selected on the customisation screens.

Customisation screen			
Icon	**Incremental parameter**	**Icon**	**Incremental parameter**
Wh	Active energy	VAh	Apparent energy
varLh	Inductive reactive energy	h(T)	Active tariff hours
varCh	Capacitive reactive energy	CO_2	CO_2 Emissions
varh	Total reactive energy		Cost

To select a parameter, press the button to open the menu at the bottom for selecting the phase:

- For the **Active energy, Inductive reactive energy**, **Capacitive reactive energy**, **Total reactive energy** and **Apparent energy** parameters:

L1 Phase L1, L2 Phase L2, L3 Phase L3, III Three-phase.

- For the **Active tariff time**, **CO_2 Emissions** and **Cost** parameters:

  L1 Phase L1.

The tariff must be selected after selecting the phase:

T1 Tariff 1, T2 Tariff 2, T3 Tariff 3, ΣT Total tariff.

And to select the consumption or generation value:

Consumption, Generation.

Finally, the option appears for saving the selection.

The following options are also shown on the bottom at all times

Back, returns to the previous customisation screen.
Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.1.2.1.1.3.- Selecting a demand parameter.

Figure 49 shows the screen for selecting a demand parameter.

Figure 49: Custom parameters screen, selecting a demand parameter (displays 1 parameter).

The menu in the lower area disappears after 3 seconds.

Press the ☰ key to display the lower area again.

The menu at the bottom displays all the available demand parameters (**Table 13**).

Table 13: Demand parameters that can be selected on the customisation screens.

Customisation screen	
Icon	**Demand parameter**
A	Current
W	Active power
VA	Apparent power

To select a parameter, press the ☰ button to open the menu at the bottom for selecting the phase:

L1 Phase L1, L2 Phase L2, L3 Phase L3, III Three-phase.

The tariff must be selected after selecting the phase:

T1 Tariff 1, T2 Tariff 2, T3 Tariff 3.

Finally, the option appears for saving the selection.

The following options are also shown on the bottom at all times

← Back, returns to the previous customisation screen.

Main Menu, back to the main menu, **Figure 25**.

Use the keys > and < to browse the different options.
To access the option selected press the key ☰.

5.1.2.- Display 3 parameters.

By selecting this option, you can view the three parameters at the same time on the display.

Figure 50: 3 parameter display screen.

The following options appear in the lower area:

Default parameters.

Customise parameters.

Back, returns to the home screen of the measurement display menu, **Figure 26.**

Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.2.1.- Default parameters.

This menu allows you to view the following types of parameters:

Figure 51:Default parameters display screen (display 3 parameters).

Instantaneous parameters.
Incremental parameters.
Demand parameters.
Back, returns to the home screen of the 3 parameter display menu, **Figure 50**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.2.1.1.- Instantaneous parameters.

On this screen, **Figure 52,** you can view all the parameters indicated in **Table 14.**

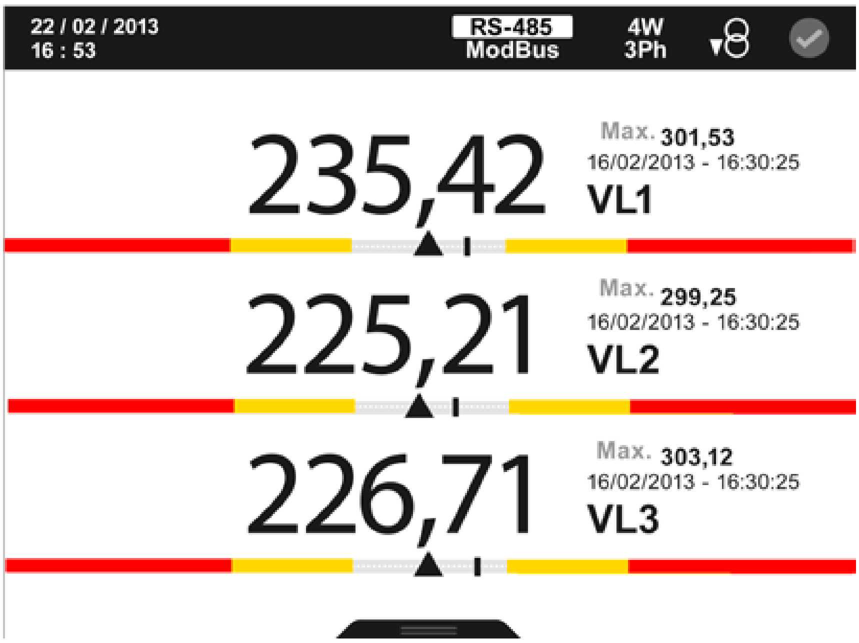


Figure 52: Instantaneous parameters (display 3 parameters).

For each of the instantaneous parameters you can view:

✓ The maximum and minimum value, with the date and time when it occurred.

✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see **"4.4.3. CENTRAL AREA".**

Table 14:Instantaneous parameters (display 3 parameters).

Icon	Display 3 parameters Instantaneous parameters
V ph-n	Phase-Neutral Voltage L1 Phase-Neutral Voltage L2 Phase-Neutral Voltage L3
V_n	Neutral voltage
V ph-ph	Phase-Phase Voltage L1-L2 Phase-Phase Voltage L2-L3 Phase-Phase Voltage L3-L1
A	Current L1 Current L2 Current L3
Hz	Frequency
W	Active power L1 (1) Active power L2 (1) Active power L3 (1)
varL	Inductive reactive power L1 (1) Inductive reactive power L2 (1) Inductive reactive power L3 (1)

Table 14 (Continuation) : Instantaneous parameters (display 3 parameters).

Icon	Display 3 parameters Instantaneous parameters
varC	Capacitive reactive power L1 (1) Capacitive reactive power L2 (1) Capacitive reactive power L3 (1)
var	Total reactive power L1 (1) Total reactive power L2 (1) Total reactive power L3 (1)
VA	Apparent power L1 (1) Apparent power L2 (1) Apparent power L3 (1)
PF	Power Factor L1 (1) Power Factor L2 (1) Power Factor L3 (1)
cos φ	Cosine phi L1 (1) Cosine phi L2 (1) Cosine phi L3 (1)
THD V	Voltage THD L1 (1) Voltage THD L2 (1) Voltage THD L3 (1)
THD A	Current THD L1 (1) Current THD L2 (1) Current THD L3 (1)

(1) The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to inductive or capacitive energy.

Indicating that the parameter refers to consumed or generated energy.

If the 2 icons light up at the same time, it means the installation is not properly connected.

Press the key to display the lower area.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The menu in the lower area disappears after 3 seconds.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.2.1.1.1.- Instantaneous parameters display menu.

For each instantaneous parameter, this menu allows (**Figure 53**):

Figure 53: Instantaneous parameters, display menu (displays 3 parameters).

 Graphic view.(***"5.1.2.1.1.1.1. Graphic view."***)

 Back, returns to the instantaneous parameters display screen, **Figure 52**.

 Main Menu, back to the main menu, **Figure 25**.

5.1.2.1.1.1.1.-  Graphic view.

Figure 54 shows the graphical display screen.

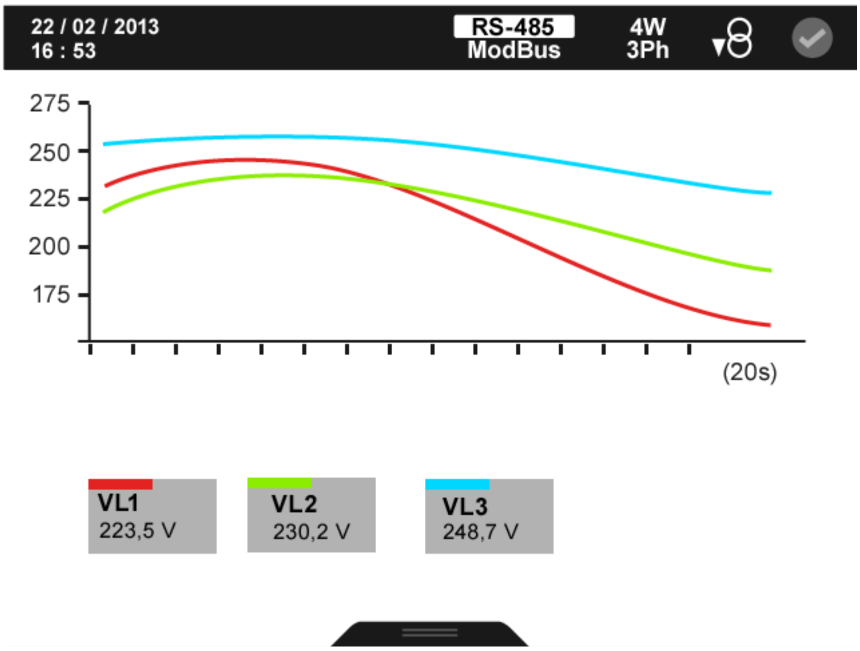


Figure 54: Instantaneous parameters, graphical representation (displays 3 parameters).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

20s, 60s, 300s Selecting the graph display time (X-axis). The time can be set to 20, 60 or 300 seconds
Note: *The option selected is not displayed on the menu.*
Back, returns to the instantaneous parameters display menu screen, **Figure 53**.
Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.2.1.2.- Incremental parameters.

On this screen, **Figure 55**, you can view all the parameters indicated in **Table 15**.
For each of the incremental parameters you can view:

✓The value generated and consumed,
✓The value for each tariff, T1, T2 and T3 and the total value of the 3 tariffs.
✓Graphical representation of the energy closes.

Figure 55: Incremental parameters (display 3 parameters).

Table 15: Instantaneous parameters (display 3 parameters).

Icon	Display 3 parameters Incremental parameters
Wh	Active energy L1 [1] [2] Active energy L2 [1] [2] Active energy L3 [1] [2]
varLh	Inductive reactive energy L1 [1] [2] Inductive reactive energy L2 [1] [2] Inductive reactive energy L3 [1] [2]
varCh	Capacitive reactive energy L1 [1] [2] Capacitive reactive energy L2 [1] [2] Capacitive reactive energy L3 [1] [2]
varh	Total reactive energy L1 [1] [2] Total reactive energy L2 [1] [2] Total reactive energy L3 [1] [2]
VAh	Apparent energy L1 [1] [2] Apparent energy L2 [1] [2] Apparent energy L3 [1] [2]
h(T)	Active tariff hours
CO_2	Active tariff CO_2 emissions
	Cost of active tariff

[1] The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

[2] The value of the energy parameters is saved in the non-volatile memory every minute.

If there is a transistor digital output or input, programmed in impulse mode, associated with the variable being displayed, the following will appear:

The icon that indicates that an impulse input or output has been programmed
M0 The module with which the alarm is associated.
T2 The associated output in the module.

The lower area menu disappears when selecting the parameter to display.
Press the key to display the lower area again.
Use the keys and to browse the various parameters.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 50**.
Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.2.1.2.1.- Incremental parameters display menu.

For each incremental parameter, this menu enables the following (**Figure 56**):

Figure 56: Incremental parameters, display menu (display 3 parameters).

Display the generation or consumption value of the selected parameter.
Note: *The option selected is not displayed on the menu.*

Tariff selection (**“*5.1.2.1.2.1.1.- Tariff selection.*”*)***

Graphical representation of the incremental energy parameters.
(***“5.1.2.1.2.1.2. Graphic view.”***)

Back, returns to the incremental parameters display screen, **Figure 55.**

Main Menu, back to the main menu, **Figure 25**.

5.1.2.1.2.1.1.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 57**.

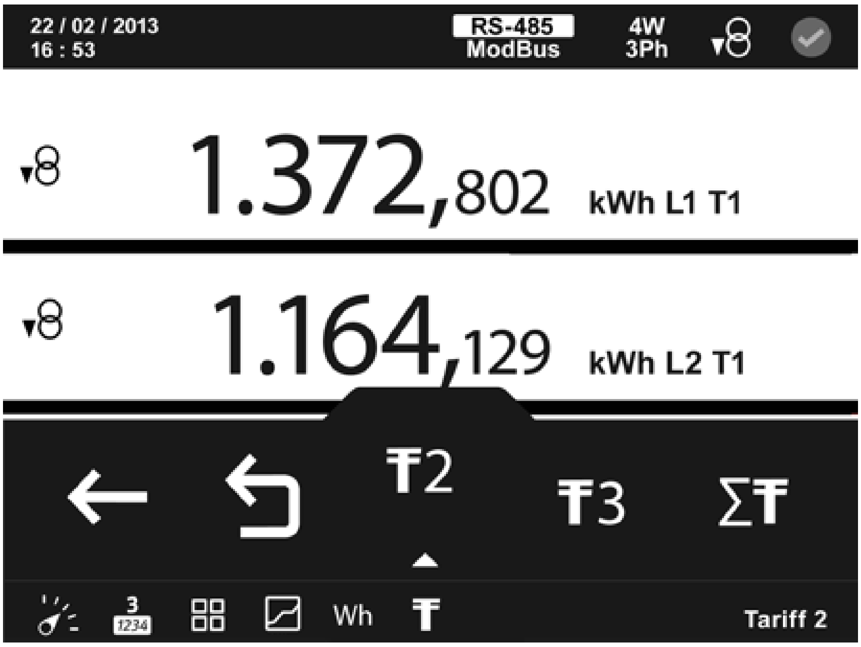


Figure 57:Incremental parameters, tariff selection (display 3 parameters).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, , , Select the tariff to display: Tariff 1, Tariff 2, Tariff 3 or the total value of the three tariffs.
Note: *The option selected is not displayed on the menu.*
Back, returns to the incremental parameters display menu screen, **Figure 56**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.2.1.2.1.2.- Graphic view.

The graphical representation of the energy closes is shown for all the incremental energy parameters, **Figure 58**.

Figure 58:Incremental parameters, graphic view (displays 3 parameters).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

1h, 12h, 24h, 30d Selecting the energy close time periods: Closes of 1 hour, 12 hours 24 hours or 30 days.
Note: *The option selected is not displayed on the menu.*
Previous, scrolls through the energy closes in ascending order.
Next, scrolls through the energy closes in descending order.
Back, returns to the incremental parameters display menu screen, **Figure 56**.
Main Menu, back to the main menu, **Figure 25**

Use the keys and to browse the different options.
To access the option selected press the key .

The unit shows 59 energy closes for each display period.
The energy close values are reset when the unit is disconnected from the auxiliary power supply.

5.1.2.1.3.- Demand parameters.

On this screen, **Figure 59**, you can view all the maximum demand parameters indicated in **Table 16**.

For each of the demand parameters you can view:

✓The value for each tariff, T1, T2 and T3.

✓ The maximum value, with the date and time when it occurred.

✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see **"*4.4.3. CENTRAL AREA*".**

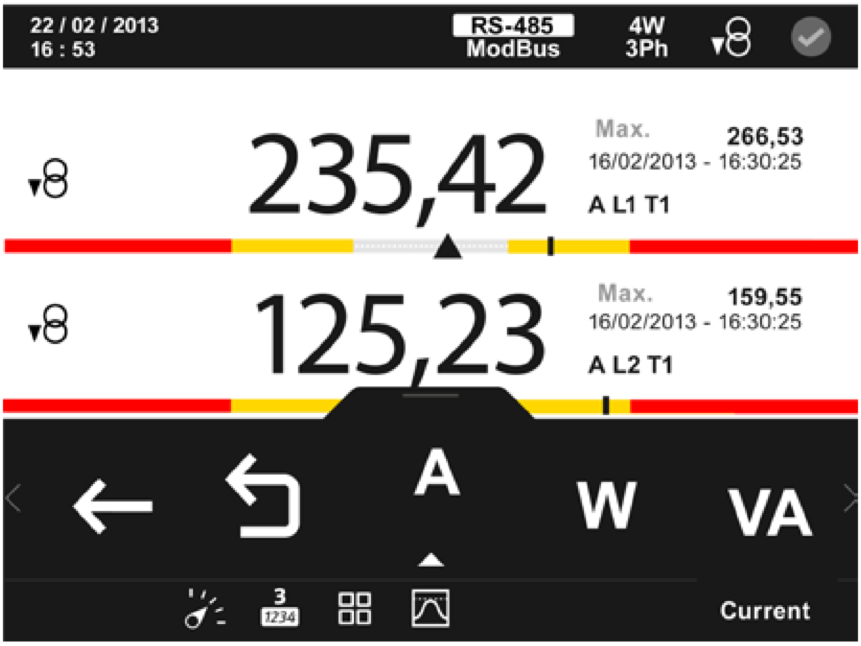


Figure 59: Demand parameters (display 3 parameters).

Table 16:Demand parameters (display 3 parameters).

Icon	Display 3 parameters Demand parameters.
A	Current L1 Current L2 Current L3
W	Active power L1 Active power L2 Active power L3
VA	Apparent power L1 Apparent power L2 Apparent power L3

Use the keys and to browse the various parameters.

The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

The following icons also appear in the active power maximum demand parameters:

Indicating that the parameter refers to inductive or capacitive energy.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The lower area menu disappears when selecting the parameter to display.

Press the key to display the lower area again.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 50.**

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.2.1.3.1.- Demand parameters display menu.

For each demand parameter, this menu enables (**Figure 60**):

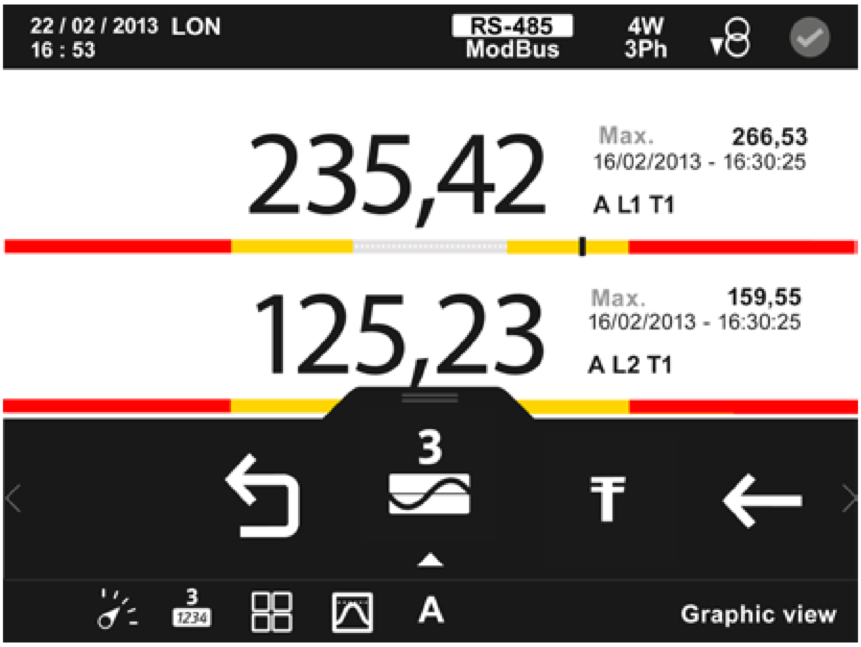


Figure 60:Demand parameters, display menu (display 3 parameters).

Graphic view .*(“5.1.2.1.3.1.1. Graphic view”)*
Tariff selection ***(“5.1.2.1.3.1.2. Tariff selection.”)***
Back, returns to the demand parameters display screen, **Figure 59**.
Main Menu, back to the main menu, **Figure 25**.

5.1.2.1.3.1.1.- Graphic view.

Figure 61 shows the graphical display screen.

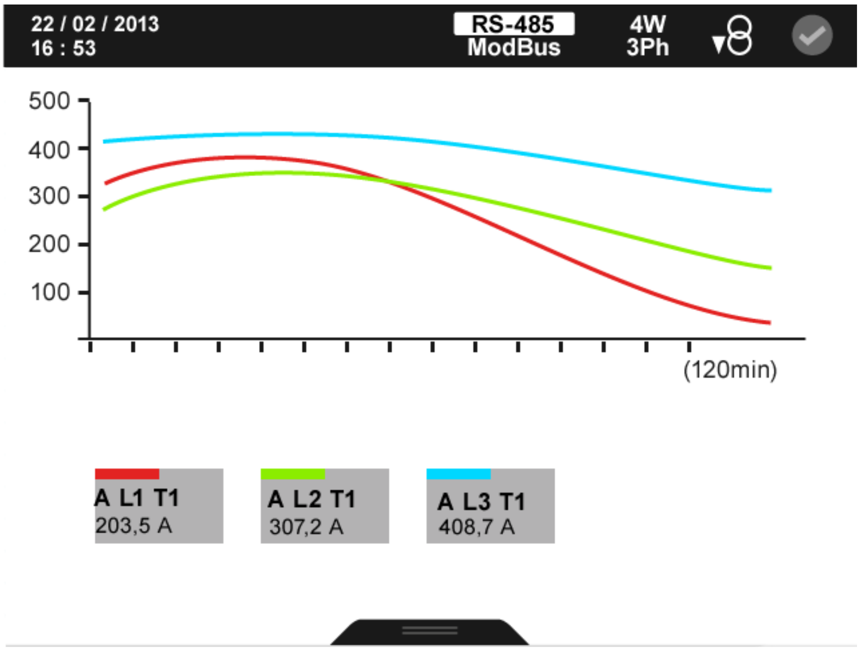


Figure 61: Demand parameters, graphical representation (displays 3 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

120m, 48h, Select the integration time (X-axis) on the graph. The time can be set to 120 minutes or 48 hours.
Note: *The option selected is not displayed on the menu.*
Back, returns to the demand parameters display menu screen, **Figure 60**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.2.1.3.1.2.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 62**.

Figure 62:Demand parameters, tariff selection (display 3 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

T1, T2, T3 Select the tariff to display: Tariff 1, Tariff 2 or Tariff 3.
Note: *The option selected is not displayed on the menu.*
Back, returns to the demand parameters display menu screen, **Figure 60**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.2.2.- Customise parameters

On this screen, **Figure 63**, you can view the five custom screens with 3 parameters.

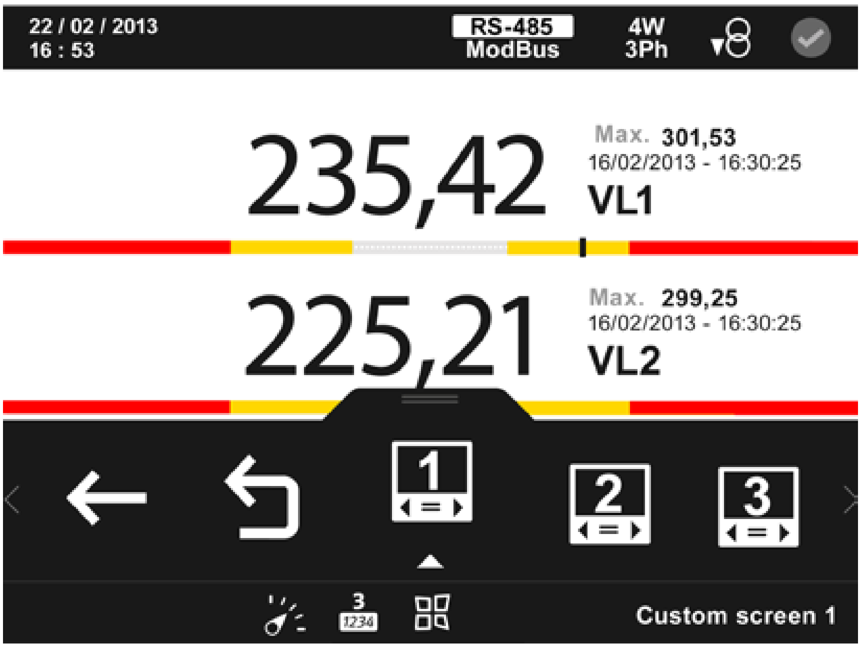


Figure 63: Custom parameters screen (display 3 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

- , ... Select one of the 5 programmed custom screens.
- Back, returns to the home screen of the 3 parameter display menu, **Figure 50.**
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.2.2.1.- , ... Customisation screens

Figure 64 shows the screen used to customise 3 parameters.
These screens can also be configured for communications. See ***"6.- INTEGRATED COMMUNICATIONS"***

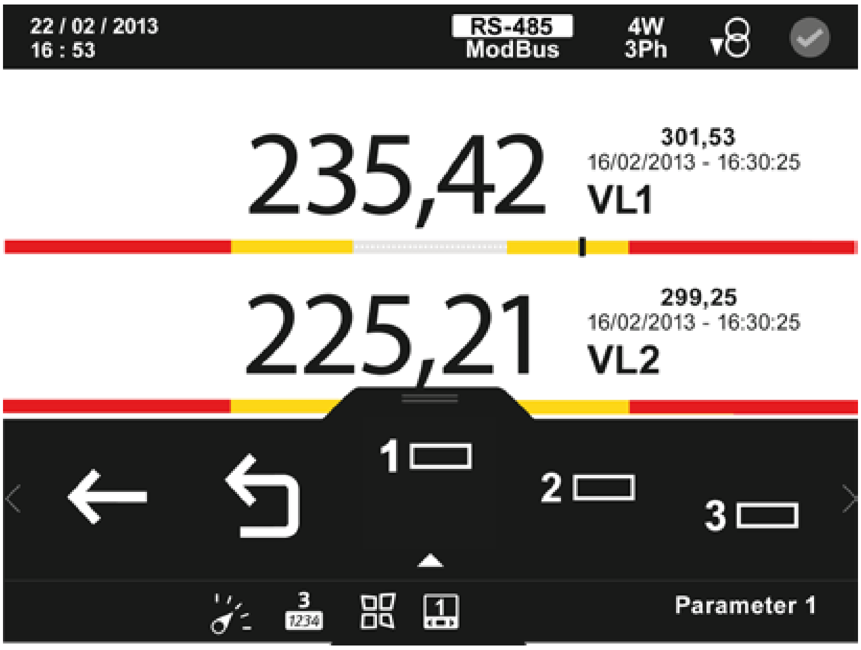


Figure 64: Custom parameters screen (displays 3 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, Select the parameter 1 that you wish to display on the customisation screen. (See ***"5.1.1.2.1.1. Parameter selection"***)

, Select the parameter 2 that you wish to display on the customisation screen. (See ***"5.1.1.2.1.1. Parameter selection"***)

, Select the parameter 3 that you wish to display on the customisation screen. (See ***"5.1.1.2.1.1. Parameter selection"***)

Back, returns to the home screen of the parameter customisation menu, **Figure 63.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.- Display 4 parameters.

By selecting this option, you can view the four parameters at the same time on the display.

Figure 65: 4 parameter display screen.

The following options appear in the lower area:

Default parameters.
Customise parameters.
Back, returns to the home screen of the measurement display menu, **Figure 26.**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.3.1.- Default parameters.

This menu allows you to view the following types of parameters:

Figure 66:Default parameters display screen (display 4 parameters).

- Instantaneous parameters.
- Incremental parameters.
- Demand parameters.
- Back, returns to the home screen of the 3 parameter display menu, **Figure 65.**
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.1.3.1.1.- Instantaneous parameters.

On this screen, **Figure 67,** you can view all the parameters indicated in **Table 17**.

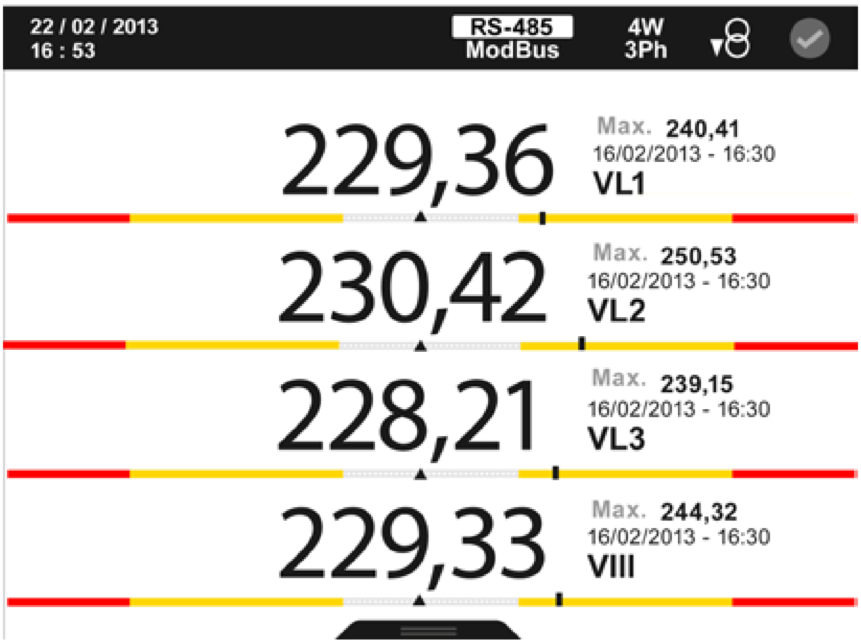


Figure 67: Instantaneous parameters (display 4 parameters).

For each of the instantaneous parameters you can view:

✓ The maximum and minimum value, with the date and time when it occurred.

✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see ***"4.4.3. CENTRAL AREA"*.**

✓ The graphic view.

Table 17:Instantaneous parameters (display 4 parameters).

Icon	Display 4 parameters Instantaneous parameters
V ph-n	Phase-Neutral Voltage L1 Phase-Neutral Voltage L2 Phase-Neutral Voltage L3 Phase-Neutral Voltage III
V_n	Neutral voltage
V ph-ph	Phase-Phase Voltage L1-L2 Phase-Phase Voltage L2-L3 Phase-Phase Voltage L3-L1 Phase-Phase Voltage III
A	Current L1 Current L2 Current L3 Current III
A_n	Neutral current
Hz	Frequency

Table 17 (Continuation) :Instantaneous parameters (display 4 parameters).

Icon	Display 4 parameters Instantaneous parameters
W	Active power L1 [2] Active power L2 [2] Active power L3 [2] Active power III [2]
varL	Inductive reactive power L1 [2] Inductive reactive power L2 [2] Inductive reactive power L3 [2] Inductive reactive power III [2]
varC	Capacitive reactive power L1 [2] Capacitive reactive power L2 [2] Capacitive reactive power L3 [2] Capacitive reactive power III [2]
var	Total reactive power L1 [1][2] Total reactive power L2 [1][2] Total reactive power L3 [1][2] Total reactive power III [1][2]
VA	Apparent power L1 [2] Apparent power L2 [2] Apparent power L3 [2] Apparent power III [2]
PF	Power Factor L1 [1][2] Power Factor L2 [1][2] Power Factor L3 [1][2] Power Factor III [1][2]
cos φ	Cosine phi L1 [1][2] Cosine phi L2 [1][2] Cosine phi L3 [1][2] Cosine phi III [1][2]
THD V	Voltage THD L1 [2] Voltage THD L2 [2] Voltage THD L3 [2] Voltage THD LN [2]
THD A	Current THD L1 [2] Current THD L2 [2] Current THD L3 [2] Current THD LN [2]

[1] The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to inductive or capacitive energy.

[2] The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

Press the key to display the lower area.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The menu in the lower area disappears after 3 seconds.
The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 66**.

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.3.1.1.1.- Instantaneous parameters display menu.

For each instantaneous parameter, this menu allows (**Figure 68**):

Figure 68: Instantaneous parameters, display menu (display 4 parameters).

Graphic view.

Back, returns to the instantaneous parameters display screen, **Figure 67**

Main Menu, back to the main menu, **Figure 25**.

5.1.3.1.1.1.1.- Graphic view.

Figure 69 shows the graphical display screen .

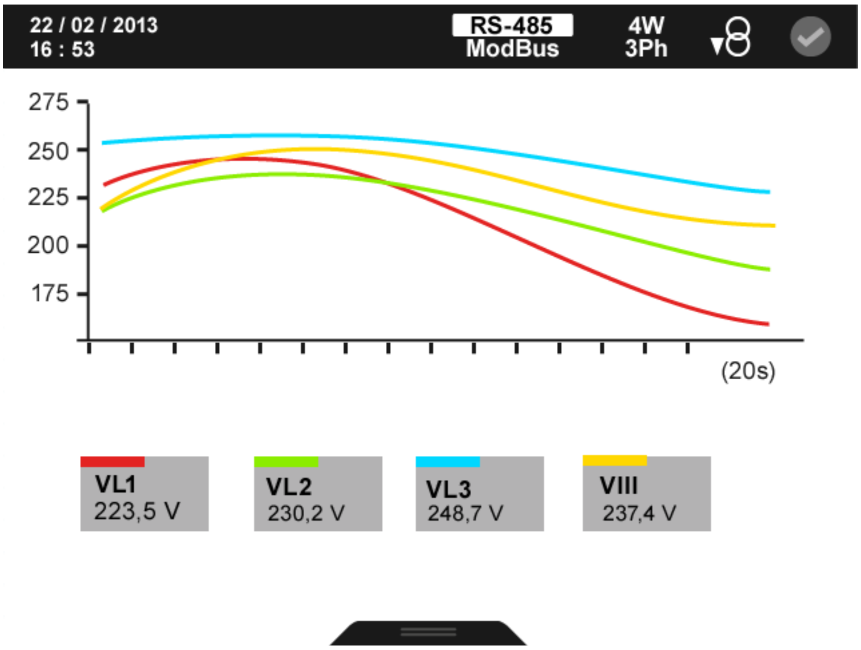


Figure 69: Instantaneous parameters, graphical representation (displays 4 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

20s, 60s, 300s Selecting the graph display time (X-axis). The time can be set to 20, 60 or 300 seconds
Note: *The option selected is not displayed on the menu.*
Back, returns to the instantaneous parameters display screen, **Figure 68**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various parameters.
Press the key to display the lower area.

5.1.3.1.2.- Incremental parameters.

On this screen, **Figure 70**, you can view all the parameters indicated in **Table 18**.
For each of the incremental parameters you can view:

- ✓ The value generated and consumed.
- ✓The value for each tariff, T1, T2 and T3 and the total value of the 3 tariffs.
- ✓ Graphical representation of the energy closes.

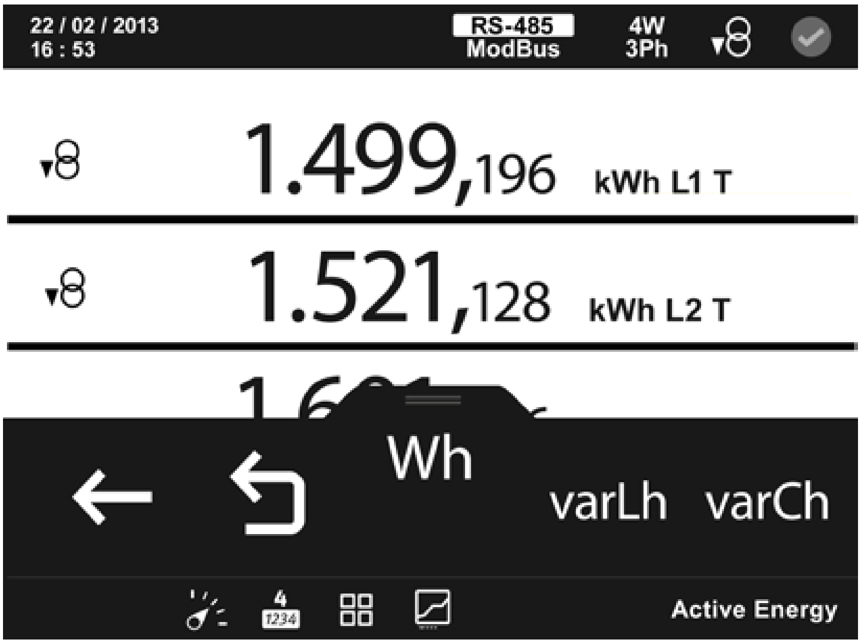


Figure 70: Incremental parameters (display 4 parameters).

Table 18: Incremental parameters (display 4 parameters).

Icon	Display 4 parameters Incremental parameters
Wh	Active energy L1 (1) (2) Active energy L2 (1) (2) Active energy L3 (1) (2) Active energy III (1) (2)
varLh	Inductive reactive energy L1 (1) (2) Inductive reactive energy L2 (1) (2) Inductive reactive energy L3 (1) (2) Inductive reactive energy III (1) (2)
varCh	Capacitive reactive energy L1 (1) (2) Capacitive reactive energy L2 (1) (2) Capacitive reactive energy L3 (1) (2) Capacitive reactive energy III (1) (2)
varh	Total reactive energy L1 (1) (2) Total reactive energy L2 (1) (2) Total reactive energy L3 (1) (2) Total reactive energy III (1) (2)
VAh	Apparent energy L1 (1) (2) Apparent energy L2 (1) (2) Apparent energy L3 (1) (2) Apparent energy III (1) (2)

Table 18 (Continuation): Incremental parameters (display 4 parameters).

Icon	Display 4 parameters Incremental parameters
h(T)	Active tariff hours
CO_2	Active tariff CO_2 emissions
	Cost of active tariff

(1) The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

(2) The value of the energy parameters is saved in the non-volatile memory every minute.

If there is a transistor digital output or input, programmed in impulse mode, associated with the variable being displayed, the following will appear:

The icon that indicates that an impulse input or output has been programmed

M0 The module with which the alarm is associated.

T2 The associated output in the module.

Use the keys and to browse the various parameters.
The lower area menu disappears when selecting the parameter to display.
Press the key to display the lower area again.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 66**.

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.3.1.2.1.- Incremental parameters display menu.

For each incremental parameter, this menu enables the following (**Figure 71**):

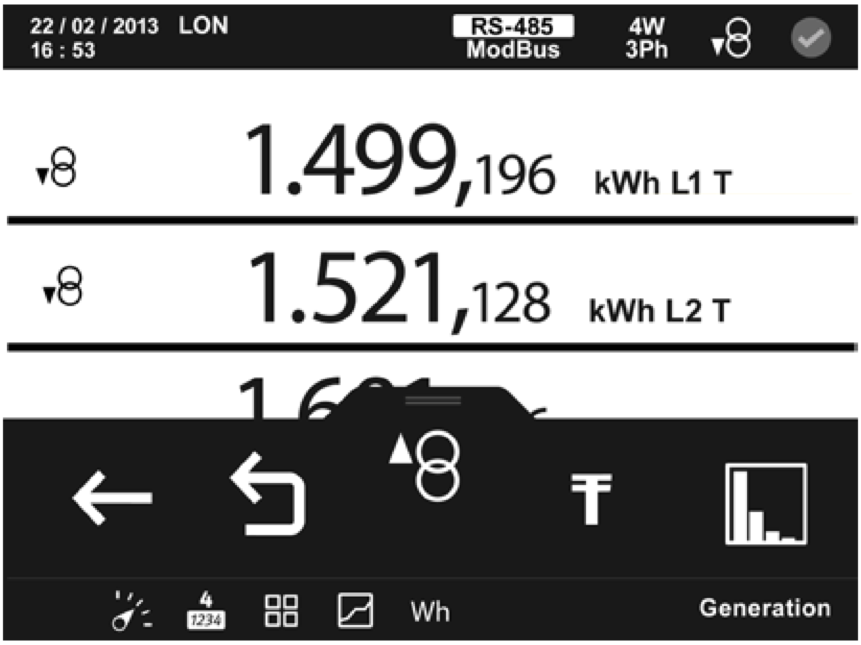


Figure 71: Incremental parameters, display menu (display 4 parameters).

Display the generation or consumption value of the selected parameter.
Note: *The option selected is not displayed on the menu.*

Tariff selection (***"5.1.3.1.2.1.1.- Tariff selection."***)

Graphical representation of the incremental energy parameters. (***"5.1.3.1.2.1.2. Graphic view."***)

Back, returns to the incremental parameters display screen, **Figure 70.**

Main Menu, back to the main menu, **Figure 25**.

5.1.3.1.2.1.1.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 72**.

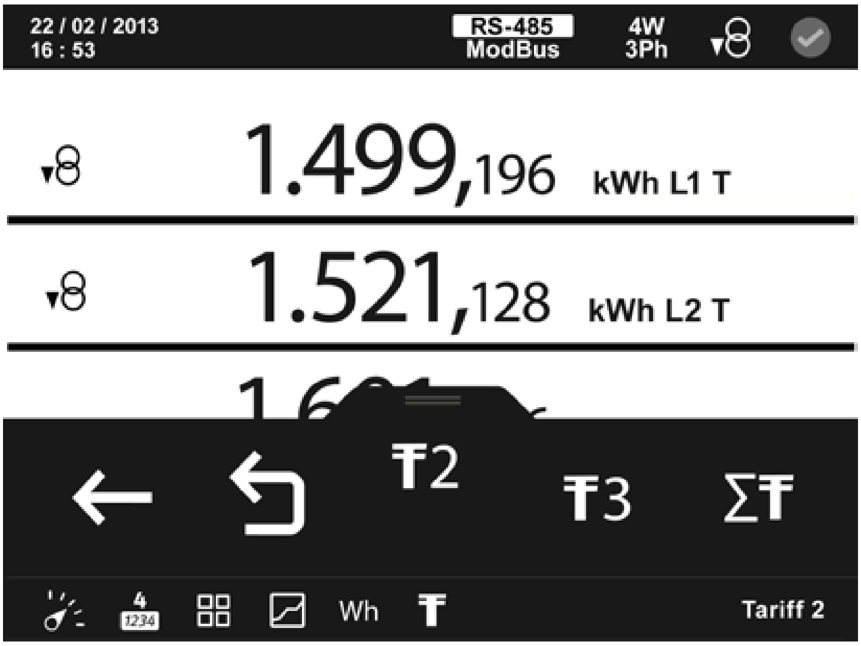


Figure 72:Incremental parameters, tariff selection (display 4 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

, , , Select the tariff to display: Tariff 1, Tariff 2, Tariff 3 or the total value of the three tariffs.
Note: *The option selected is not displayed on the menu.*
Back, returns to the incremental parameters display menu screen, **Figure 71**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.1.2.1.2.- Graphic view.

The graphical representation of the energy closes is shown for all the incremental energy parameters, **Figure 73**.

Figure 73: Incremental parameters, graphic view (displays 4 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

1h, 12h, 24h, 30d Selecting the energy close time periods: Closes of 1 hour, 12 hours 24 hours or 30 days.
Note: *The option selected is not displayed on the menu.*
Previous, scrolls through the energy closes in ascending order.
Next, scrolls through the energy closes in descending order.
Back, returns to the incremental parameters display menu screen, **Figure 71**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

The unit shows 59 energy closes for each display period.
The energy close values are reset when the unit is disconnected from the auxiliary power supply.

5.1.3.1.3.- Demand parameters.

On this screen, **Figure 74**, you can view all the maximum demand parameters indicated in **Table 19**.

For each of the demand parameters you can view:

- ✓The value for each tariff, T1, T2 and T3.
- ✓ The maximum value, with the date and time when it occurred.
- ✓ A bar chart with the indications of the instantaneous value, maximum and minimum values and alarms, see **"4.4.3. CENTRAL AREA".**

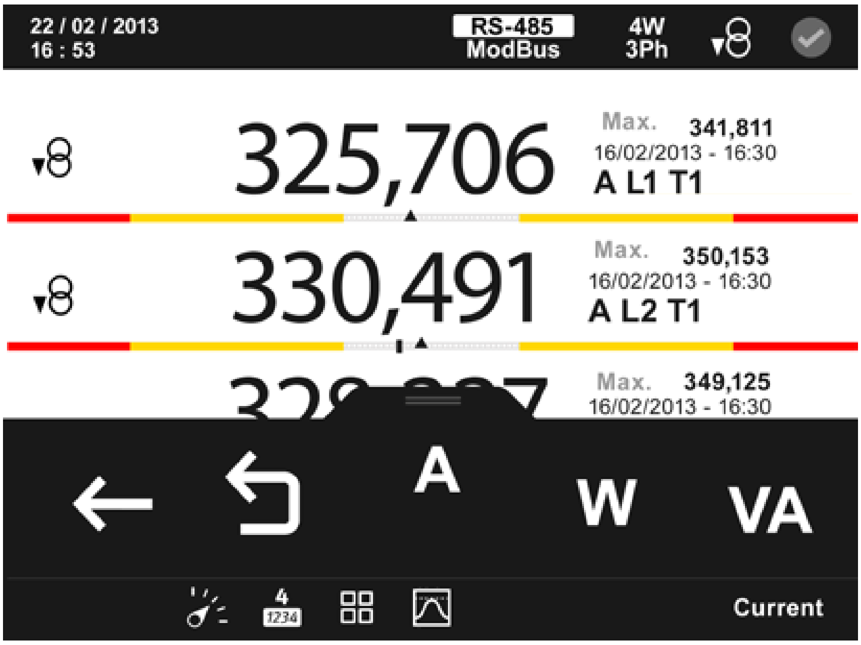


Figure 74:Demand parameters (display 4 parameters).

Table 19:Demand parameters (display 4 parameters).

Icon	Display 4 parameters Demand parameters
A	Current L1 Current L2 Current L3 Current III
W	Active power L1 Active power L2 Active power L3 Active power III
VA	Apparent power L1 Apparent power L2 Apparent power L3 Apparent power III

The following icons appear for all these parameters on the screen:

Indicating that the parameter refers to consumed or generated energy.
If the 2 icons light up at the same time, it means the installation is not properly connected.

Use the keys and to browse the various parameters.

If there is an alarm associated with the variable being displayed, the following will be shown:

M0 The module with which the alarm is associated.

T2 The associated output in the module.

The alarm status: not activated, pre-alarm activated, alarm activated.

The icon flashes during the delay time in the alarm connection (ON) and disconnection (OFF).

The menu in the lower area disappears after a few seconds.

Press the key to display the lower area again.

The following icons also appear in the lower area:

Back, returns to the default parameters display screen, **Figure 65.**

Main Menu, back to the main menu, **Figure 25.**

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.3.1.3.1.- Demand parameters display menu.

For each demand parameter, this menu enables (**Figure 75**):

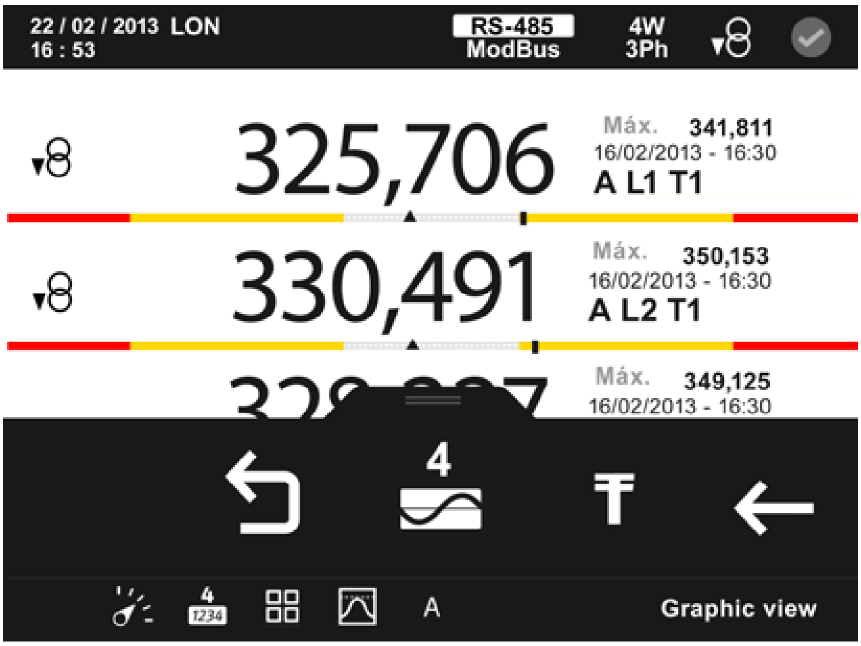


Figure 75: Demand parameters, display menu (display 4 parameters).

Graphic view.(***"5.1.3.1.3.1.1. Graphic view."***)

Tariff selection ***("5.1.3.1.3.1.2. Tariff selection.")***

Back, returns to the demand parameters display screen, **Figure 74**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.1.3.1.1.- Graphic view.

Figure 76 shows the graphical display screen .

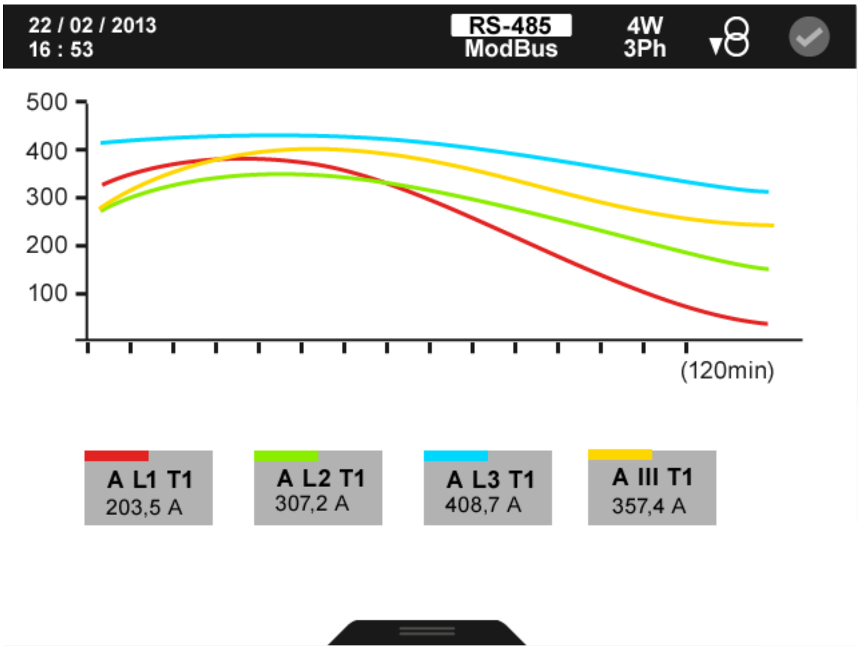


Figure 76: Demand parameters, graphic view (displays 4 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

120m, 48h, Select the integration time (X-axis) on the graph. The time can be set to 120 minutes or 48 hours.
Note: *The option selected is not displayed on the menu.*
Back, returns to the demand parameters display menu screen, **Figure 75**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.1.3.1.2.- Tariff selection.

The screen for selecting the tariff to be displayed is shown in **Figure 77**.

Figure 77:Demand parameters, tariff selection (display 4 parameters).

The menu in the lower area disappears after a few seconds.
Press the key to display the lower area again.

The lower area menu options are:

T1, T2, T3 Select the tariff to display: Tariff 1, Tariff 2 or Tariff 3.
Note: *The option selected is not displayed on the menu.*
Back, returns to the demand parameters display menu screen, **Figure 75**.
Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.2.- Customise parameters

On this screen, **Figure 78**, you can view the five custom screens with 4 parameters.

Figure 78: Custom parameters screen (display 4 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, ... Select one of the 5 programmed custom screens.
Note: *The option selected is not displayed on the menu.*
Back, returns to the home screen of the 4 parameter display menu, **Figure 65.**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.3.2.1.- , ... Customisation screens

Figure 79 shows the screen used to customise 4 parameters.
These screens can also be configured for communications. See ***"6.- INTEGRATED COMMUNICATIONS"***

Figure 79: Custom parameters screen (displays 4 parameter).

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

, Select the parameter 1 that you wish to display on the customisation screen. (See ***"5.1.1.2.1.1. Parameter selection"***)

, Select the parameter 2 that you wish to display on the customisation screen. (See "***5.1.1.2.1.1. Parameter selection"***)

, Select the parameter 3 that you wish to display on the customisation screen. (See "***5.1.1.2.1.1. Parameter selection"***)

, Select the parameter 4 that you wish to display on the customisation screen. (See "***5.1.1.2.1.1. Parameter selection"***)

Back, returns to the home screen of the parameter customisation menu, **Figure 78.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the different options.
To access the option selected press the key .

5.1.4.- Phasors.

By selecting this option, you can view the phase sequence (**Figure 80**).

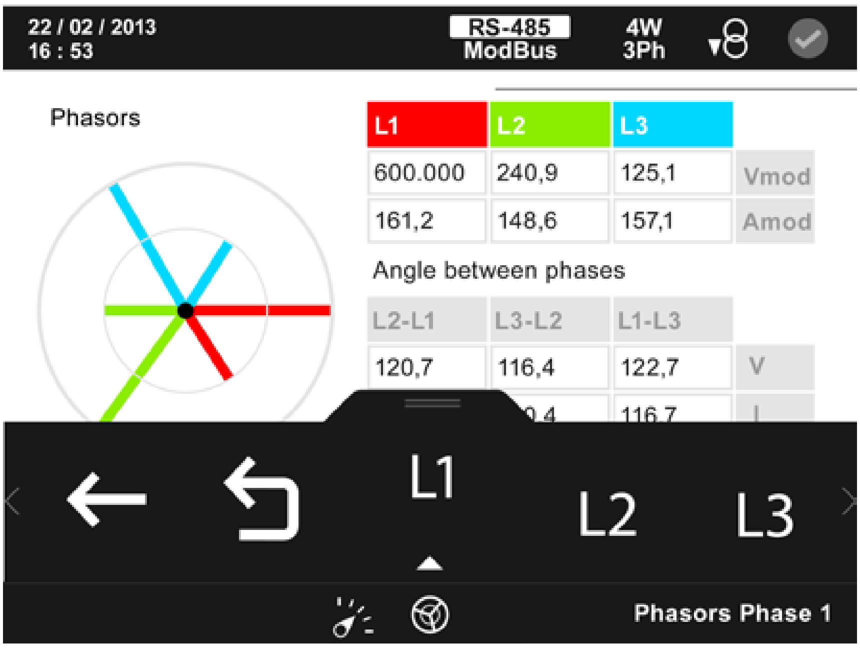


Figure 80: Phasor display screen.

The following options appear in the lower area:

L1, L2, L3, III Select the line of phasors that you are going to display: L1, L2 , L3 or all the phasors.
Note: *The option selected is not displayed on the menu.*

Back, returns to the home screen of the measurement display menu, **Figure 26.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The menu in the lower area disappears after a few seconds.

5.1.5.- Standard phasors.

By selecting this option, you can view the phase sequence with the standard values (**Figure 81**).

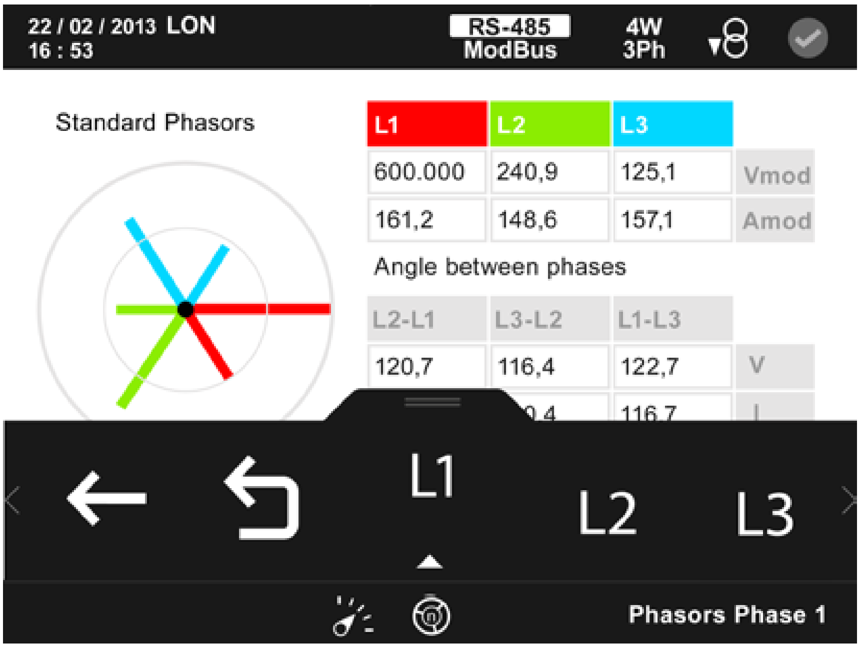


Figure 81: Standardised phasor display screen.

The following options appear in the lower area:

L1, L2, L3, III Select the line of phasors that you are going to display: L1, L2 , L3 or all the phasors.

Note: *The option selected is not displayed on the menu.*

Back, returns to the home screen of the measurement display menu, **Figure 26.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The menu in the lower area disappears after a few seconds.

5.1.6.- Harmonics.

On this screen, **Figure 82**, you can view the harmonics of the parameters indicated in **Table 20**.

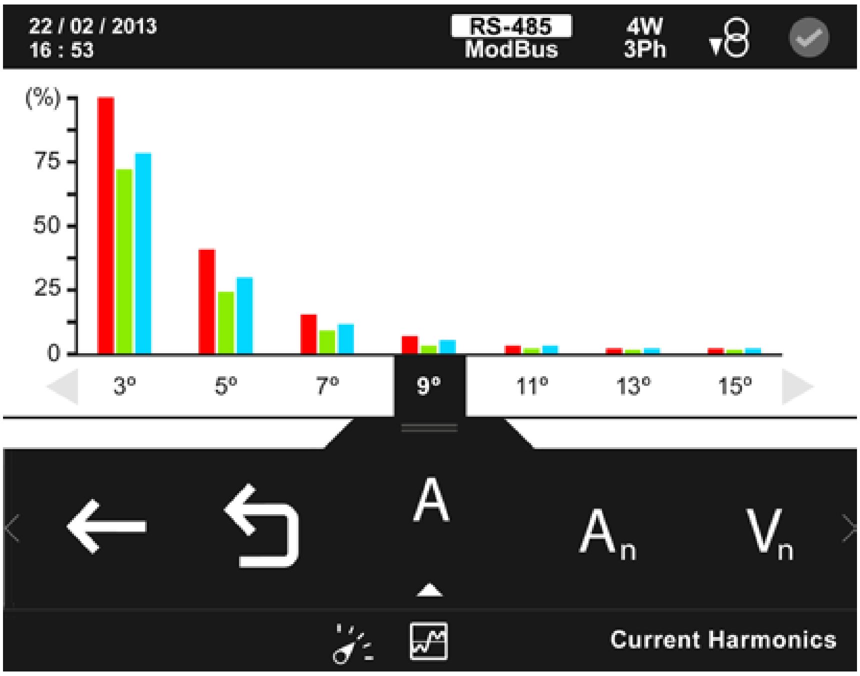


Figure 82: Harmonics screen.

Table 20:Harmonics.

Icon	Harmonics
A	Current harmonics L1 Current harmonics L2 Current harmonics L3
A_n	Neutral current harmonics
V_{ph-n}	Harmonics of phase-neutral voltage L1 Harmonics of phase-neutral voltage L2 Harmonics of phase-neutral voltage L3
V_n	Neutral voltage harmonics

Use the keys > and < to browse the various parameters.

The menu in the lower area disappears after a few seconds.

Press the ≡ key to display the lower area again.

In the lower area you can:

A, A_n, V_{ph-n}, V_n Select the types of harmonics to display: current, neutral current, phase-neutral voltage or neutral voltage.
Note: *The option selected is not displayed on the menu.*

, Select the display of the even or odd harmonics .

Previous, you move through the harmonics in descending order.

Next, you move through the harmonics in ascending order.

Table display, (see ***“5.1.6.1.Table display.”***)

Back, returns to the home screen of the measurement display menu, **Figure 26.**

Main Menu, back to the main menu, **Figure 25**.

If you press the key while selecting a display parameter, you will enter the parameter display menu.

5.1.6.1.- Table display.

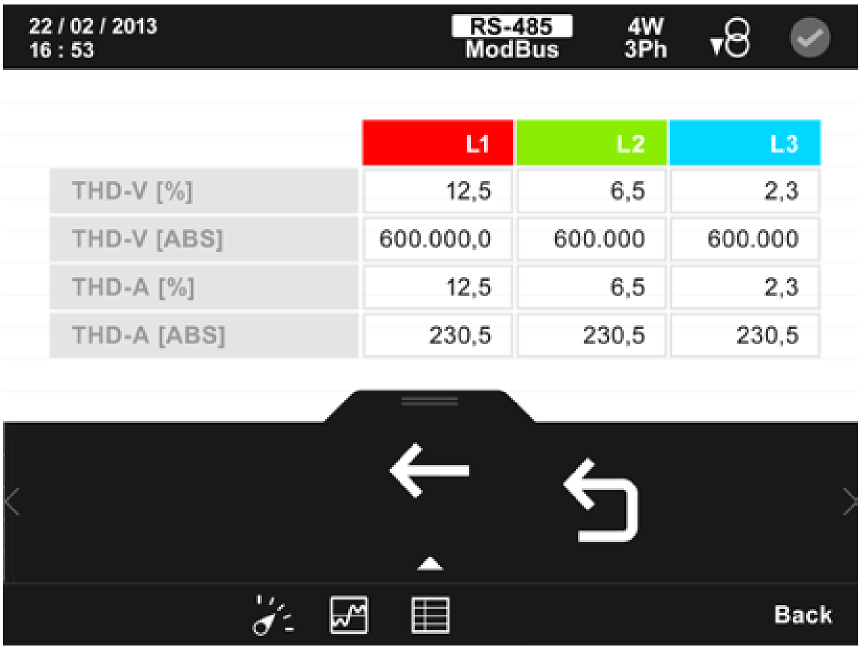


Figure 83: Harmonics screen, table display.

The menu in the lower area disappears after a few seconds.

Press the key to display the lower area again.

In the lower area you can:

Back, returns to the Harmonics screen, **Figure 82.**

Main Menu, back to the main menu, **Figure 25.**

Use the keys and to select the different options.
To confirm the selection, press the key .

5.1.7.- Integrated functions.

On this screen, **Figure 84**, you can view the status of the digital inputs integrated in the unit.

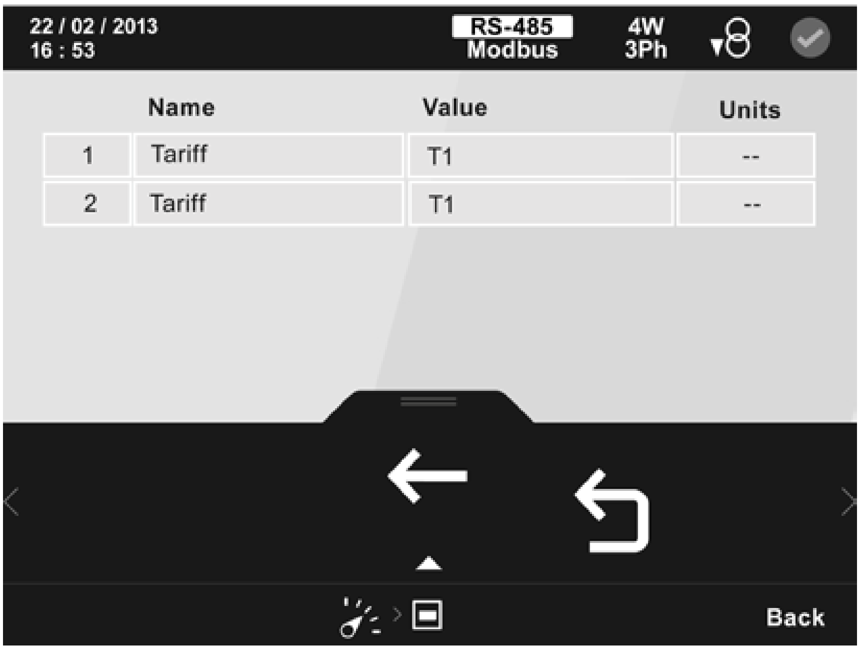


Figure 84: Display screen of digital inputs integrated in the unit.

The following options appear in the lower area:

Back, returns to the home screen of the measurement display menu, **Figure 26.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The menu in the lower area disappears after a few seconds.

5.1.8.- Expansion modules.

Note: *This option only appears when the unit is connected to an expansion module of* **Transistor Digital Inputs/Outputs** (**M-CVM-AB-8I-8OTR**), **Relay Digital Inputs/Outputs** (**M-CVM-AB-8I-8OR**) *or* **Analogue Inputs/Outputs (M-CVM-AB-4AI-8AO**).

On the main screen, **Figure 85**, of this option, select the expansion module for which you want to display the status of the inputs.

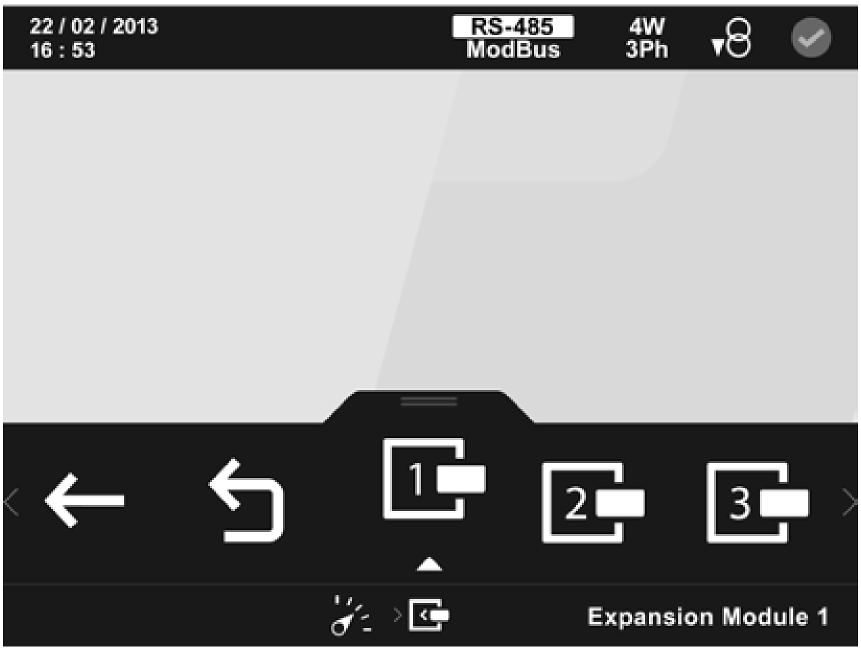


Figure 85: Expansion modules information screen.

The following options appear in the lower area:

, , , Select from the different expansion modules provided by the unit.
Back, returns to the home screen of the measurement display menu, **Figure 26**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

When selecting an expansion module, you will view a screen like that in **Figure 86**, where you can view the status of the module inputs.

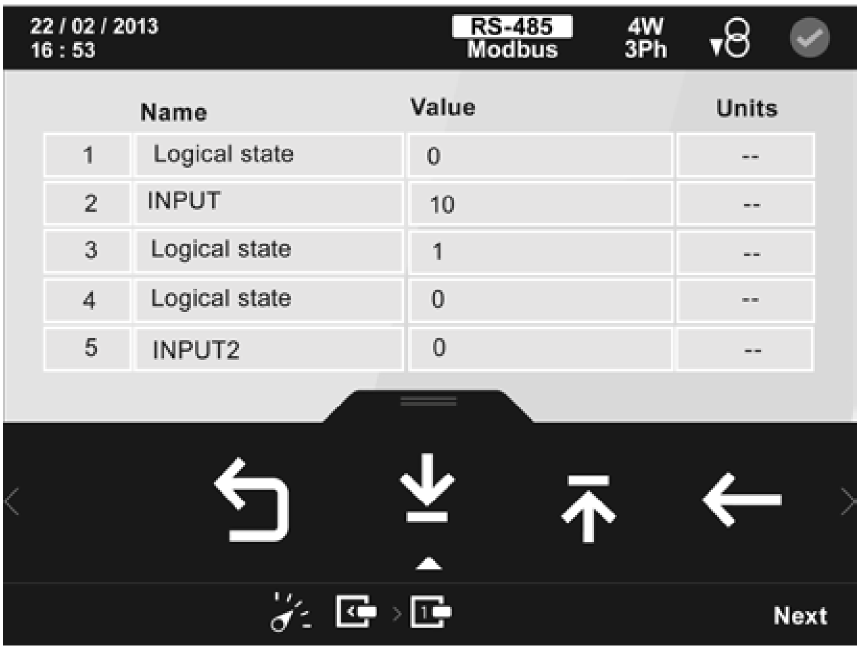


Figure 86: Display screen of digital inputs of an expansion module.

The following options appear in the lower area:

Previous, moves up the list of alarms.

Next, moves down the list of alarms.

Back, returns to the expansion modules information screen, **Figure 85.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The menu in the lower area disappears after a few seconds.

5.2.- ALARM MENU

The screen in **Figure 87** is the alarm display menu screen. Where all the alarms programmed in the unit and in the connected expansion modules are displayed, indicating a brief description and the date and time of the alarm activation.

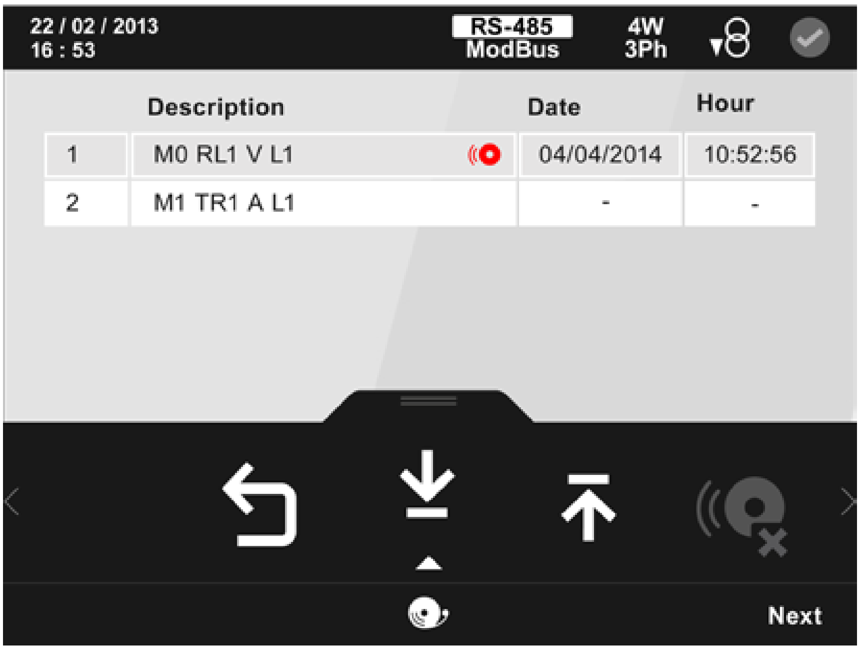


Figure 87: Main screen of alarm menu.

The alarm selected is indicated in white.

The display options appear in the lower area:

Previous, moves up the list of alarms.

Next, moves down the list of alarms.

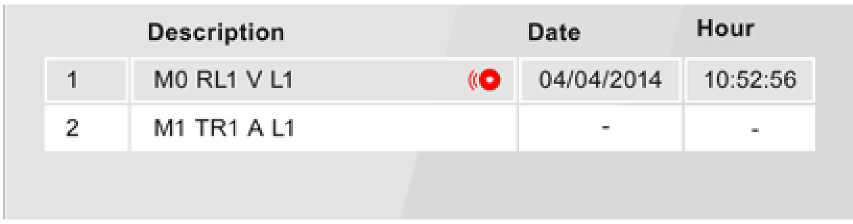
.Disabled latch, displayed when the alarm selected does not have the latch option enabled.

Unlock alarm, if the latch option has been programmed in an alarm and it has been activated, the alarm will be unlocked with this option.

Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.



	Description	Date	Hour
1	M0 RL1 V L1	04/04/2014	10:52:56
2	M1 TR1 A L1	-	-

Figure 88: Alarm menu description table.

The programmed alarms description table , **Figure 88**, is made up of 4 columns:

Cd. : Indicates the code of the variable that controls the programmed alarm, **Table 21**.

Description : Description of alarm that you have programmed.

Example: **M0 RL1 V L1**
M0, Indicates that an alarm is integrated in the unit.
RL1, Indicates that it is output 1 of the relay digital outputs.
V L1, The variable that controls the alarm is Phase-Neutral Voltage of phase 1.

The icon indicates that the alarm has been activated.

Date : If the alarm has been activated, the date when this occurred will be displayed.
Time : If the alarm has been activated, the time when this occurred will be displayed.

5.3.- ENERGY CLOSES MENU

The screen in **Figure 89** is the home screen for the energy close menu.

Figure 89: Main screen of the energy closes menu.

In the information menu you can view:

The active energy closes III of the total tariff.
(***"5.3.1*** **Active energy closes III of the total tariff and of reactive energy III of the total tariff.**)

The reactive energy closes III of the total tariff.
(***"5.3.1*** **Active energy closes III of the total tariff and of reactive energy III of the total tariff.**)

Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.3.1.- Wh varh Active energy closes III of the total tariff and of reactive energy III of the total tariff.

This screen displays the graphical representation of the closes of consumed active energy III of the total tariff (the sum of the three tariffs) after selecting the Wh option.
Or the consumed reactive energy III closes of the total tariff (the sum of the three tariffs) after selecting the varh option.

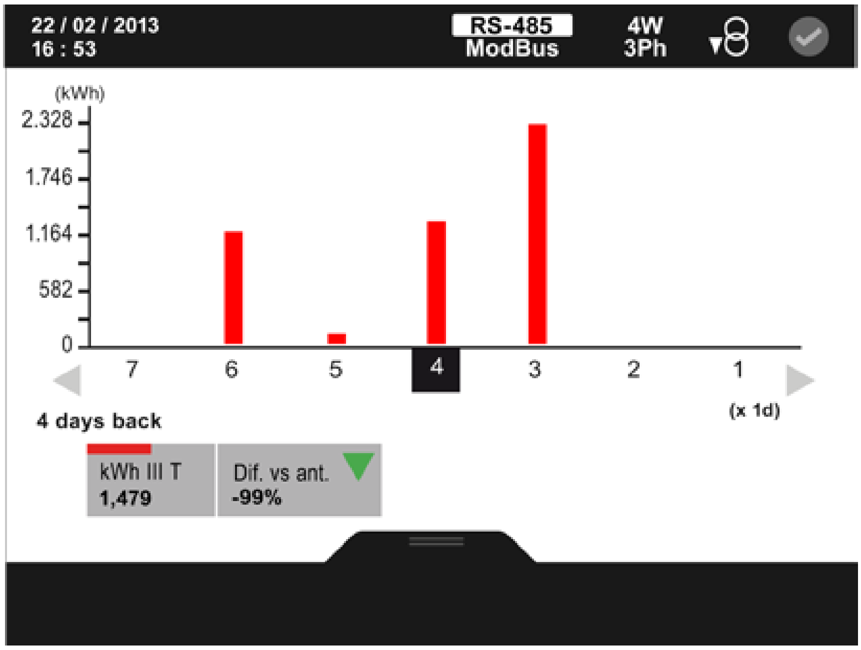


Figure 90:Active energy closes.

The menu in the lower area disappears after 3 seconds.
Press the key to display the lower area again.

The lower area menu options are:

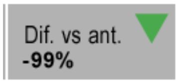
1d, 7d, 30d, 365d Selecting the energy close time periods: Closes of day 1, week 1, 1 month or 1 year.
Note: *The option selected is not displayed on the menu.*
Previous, scrolls through the energy closes in ascending order.
Next, scrolls through the energy closes in descending order.
Back, returns to the energy closes menu main screen, **Figure 89**.
Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The unit shows 29 energy closes for each display period.

When a given close is selected the display shows:

The value of the selected energy close.



The difference, in %, between the most recent energy close with respect of the previous close.
A green arrow indicates a lower consumption than the previous close and a red arrow indicates a higher consumption.

5.4.- LOG MENU log

The screen in **Figure 91** is the home screen of the menu log, which shows the log of the alarms and events that have occurred in the unit.

Figure 91: Main screen log menu.

The log menu can show:

- Alarm log ***(“5.4.1. Alarm log”)***
- Event log. (***“5.4.2. Event log”)***
- Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.4.1.- Alarm log

This screen shows the log of the last 50 alarms occurring in the unit and installed expansion modules, including a brief description and the date and time of the last alarm activation.

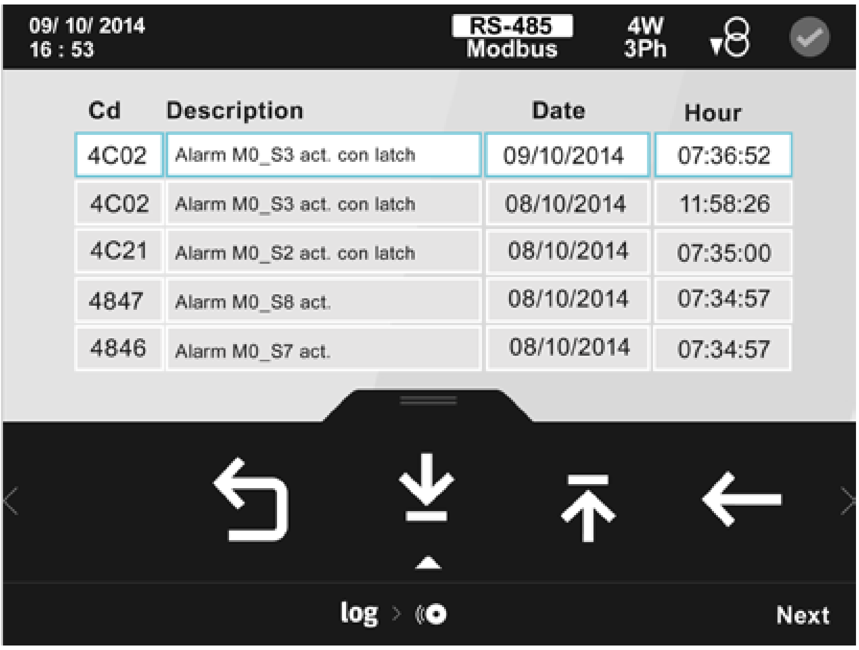


Figure 92:Alarm log

The lower area menu options are:

- Previous, scrolls up the alarm log.
- Next, scrolls down the alarm log.
- Back, returns to the main screen of the log menu, **Figure 91**.
- Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Figure 93: Details of the alarm log.

The alarm log,**Figure 93**, has 4 columns:

Cd. : indicates the code of the alarm that occurred (in hexadecimal)

Description: Description of the alarm.

Example: **Alarm M0_S3 act with latch**

M0, Indicates the module where the alarm was activated:
M0, is an alarm triggered in the unit.
M1 ...M4, is an alarm in the expansion module 1...4.

S3, Indicates the module output that has activated the alarm.
In the event of alarms installed in the unit, M0:
- S1, is the digital output of transistor 1.
- S2, is the digital output of transistor 2.
- S3, is the digital output of relay 1.
- S4, is the digital output of relay 2.

Date : Date of the alarm.
Hour: Time of the alarm.

The alarm log can be deleted on the ***Parameter reset*** screen of the setup menu (“***5.6.19* Parameter reset.**”)

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

5.4.2.-  Event log

This screen shows the log of the last 50 events occurring in the unit and the installed expansion modules, including a brief description and the date and time of the event.

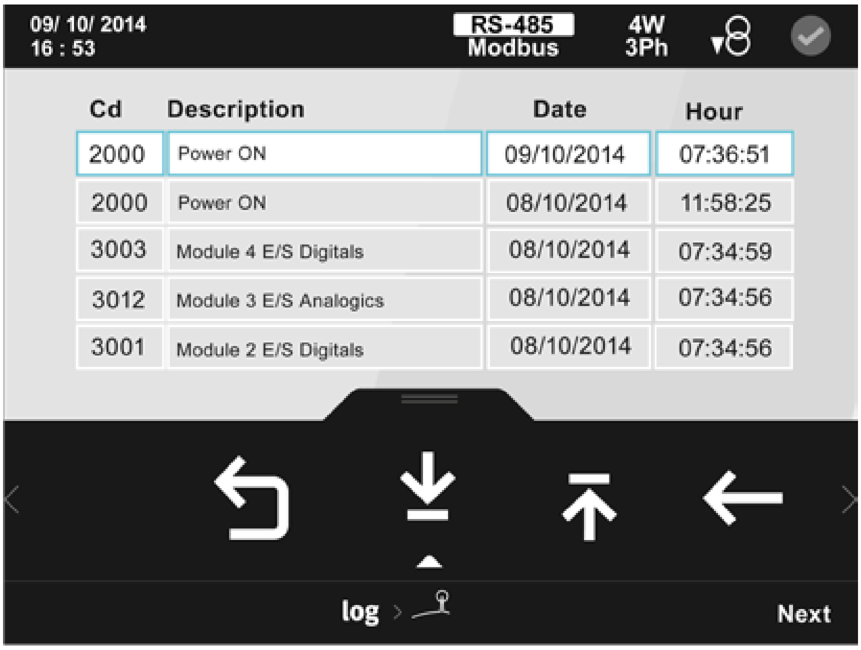
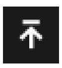


Figure 94:Event log.

The lower area menu options are:

 Previous, scrolls up the event log.

Next, scrolls down the event log..
Back, returns to the main screen of the log menu, **Figure 91**.
Main menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

The event log can be deleted on the ***Parameter reset*** screen of the setup menu ("***5.6.19* Parameter reset.**")

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

5.5.- INFORMATION MENU

The screen in **Figure 95**, is the home screen of the information menu.

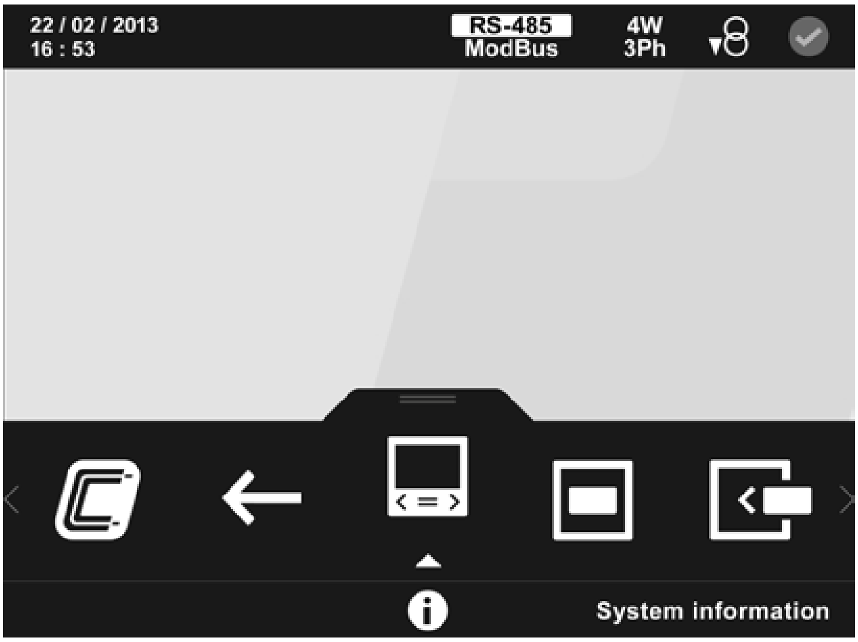


Figure 95: Main screen of information menu.

In the information menu you can view:

System information.
Integrated functions.
Expansion modules.
CIRCUTOR S.A.
Main menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.5.1.- System information.

On the system information screen, **Figure 96**, you will view the model, serial number and firmware version of the unit.

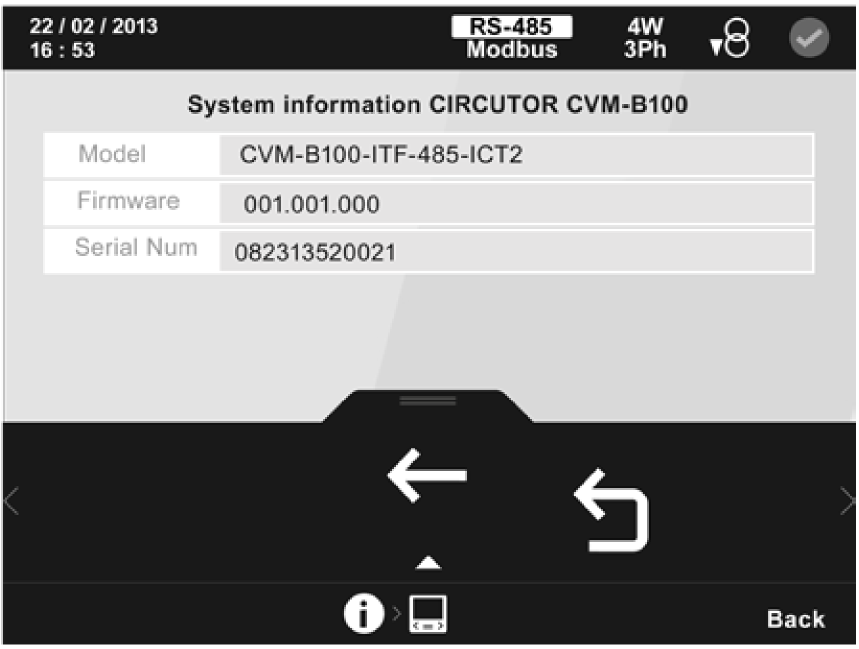


Figure 96: System information screen.

The following options appear in the lower area:

Back, returns to the home screen of the information menu, **Figure 95.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.5.2.- Integrated functions.

On the integrated functions screen, **Figure 97**, you will view the configuration of the communications and digital inputs and outputs.

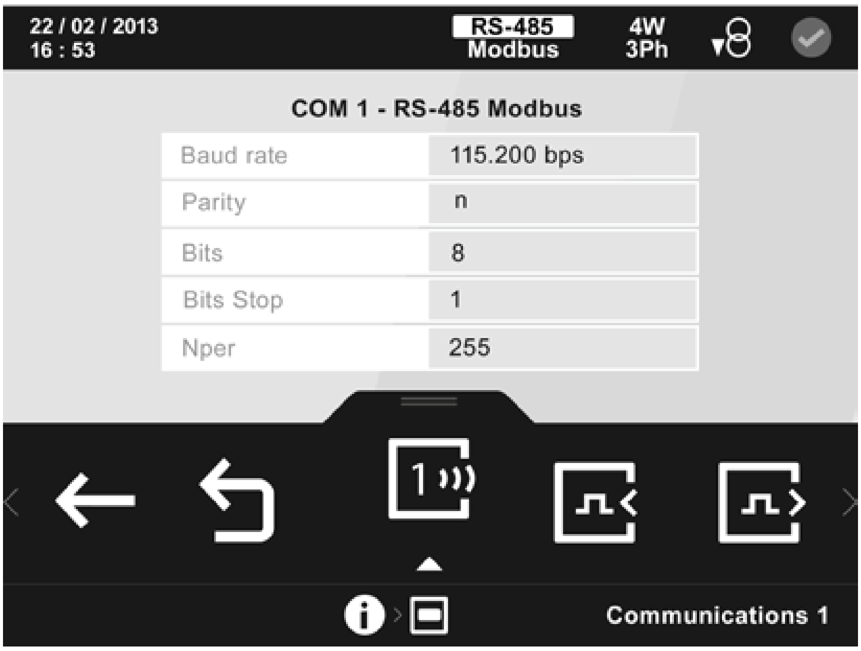


Figure 97: Integrated functions screen.

The following options appear in the lower area:

Communications, display of COM1 port communication parameters
Digital inputs, display of the configuration of the digital inputs integrated in the unit.
Digital outputs, display of the configuration of the digital outputs integrated in the unit.
Back, returns to the home screen of the information menu, **Figure 95.**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.5.3.- Expansion modules.

On the expansion modules screen, **Figure 98**, you will view the model, serial number and firmware version of each of the expansion modules.

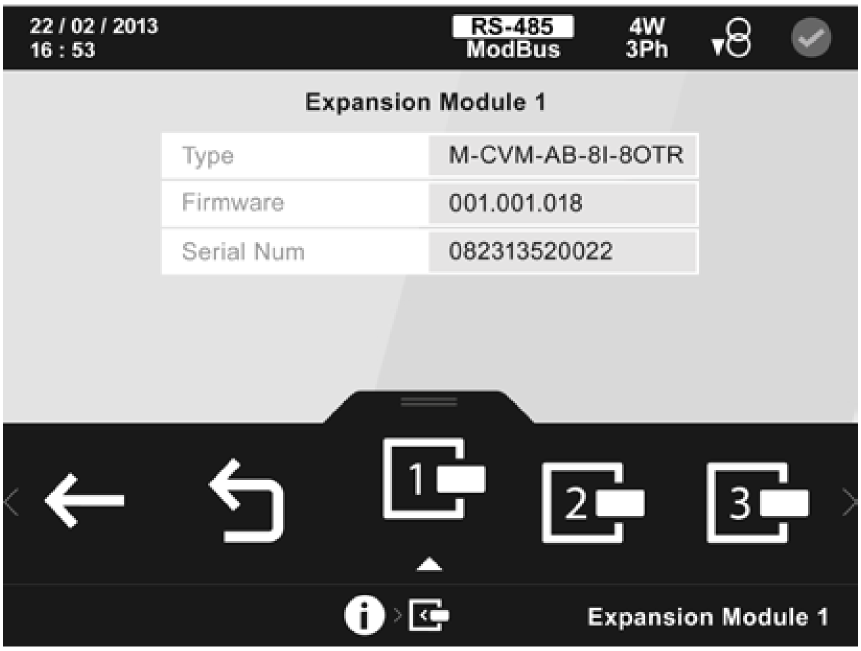


Figure 98: Expansion modules information screen.

The following options appear in the lower area:

, , , Select from the different expansion modules provided by the unit.

Back, returns to the home screen of the information menu, **Figure 95.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to browse the various menus.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

If you press the key while selecting an expansion module, you will enter the module display menu.

5.5.3.1.- Expansion modules of Transistor and Relay digital inputs/outputs

The screen in **Figure 99**, is one of the information display screens for the expansion module.

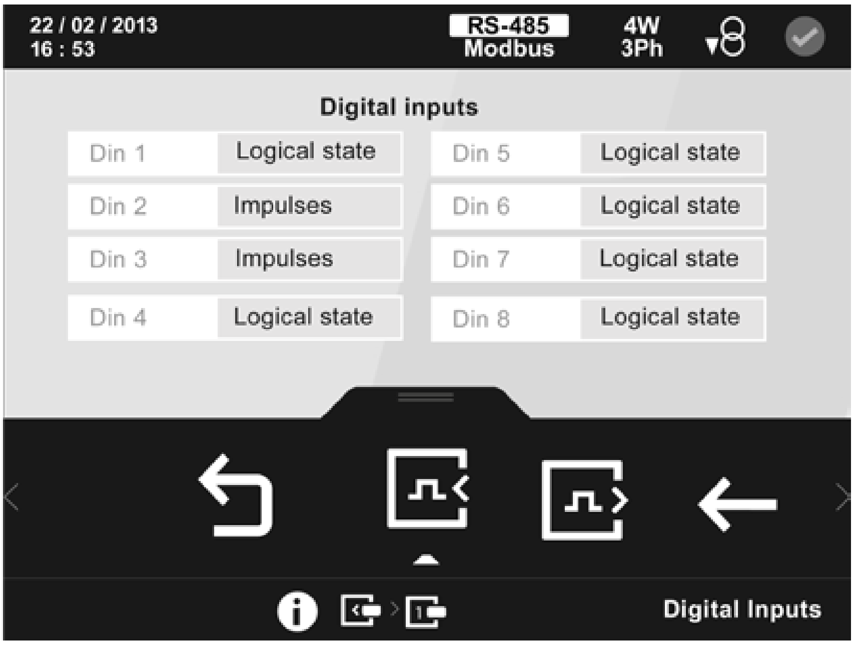


Figure 99: Digital inputs information screen (Transistor Digital Inputs/Outputs Module).

This screen displays the configuration of the digital inputs of the module.
The following options appear in the lower area:

Digital inputs, to display how the inputs have been configured.
Digital outputs, to display how the outputs have been configured.
Back, returns to the expansion modules information screen, **Figure 98**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

When selecting the digital outputs option, , you will view the screen in **Figure 100**, with the configuration information for the digital outputs.

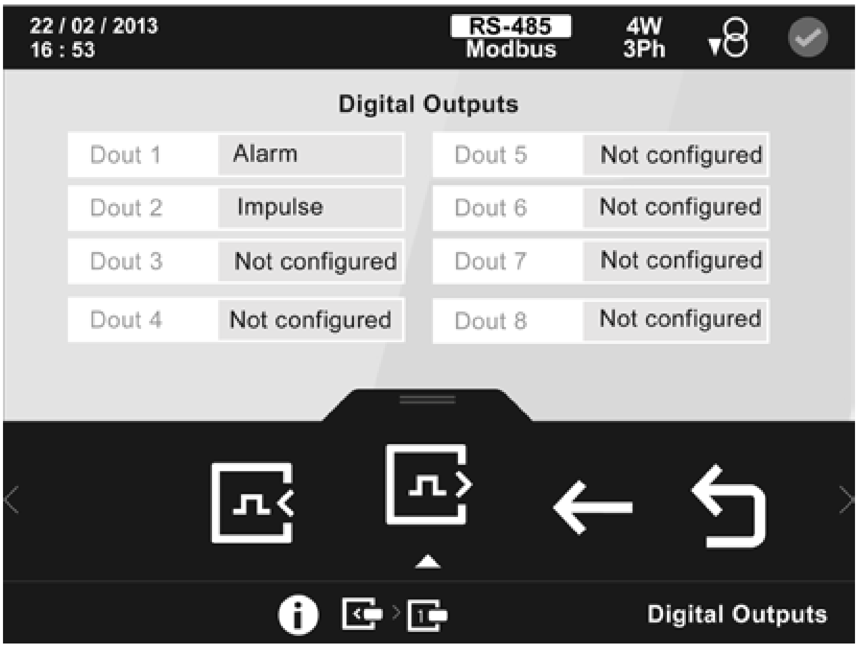


Figure 100: Digital outputs information screen (Transistor Digital Inputs/Outputs Module)

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.5.3.2.- Analogue Inputs/Outputs expansion modules

The screen in **Figure 101**, is one of the information display screens for the expansion module.

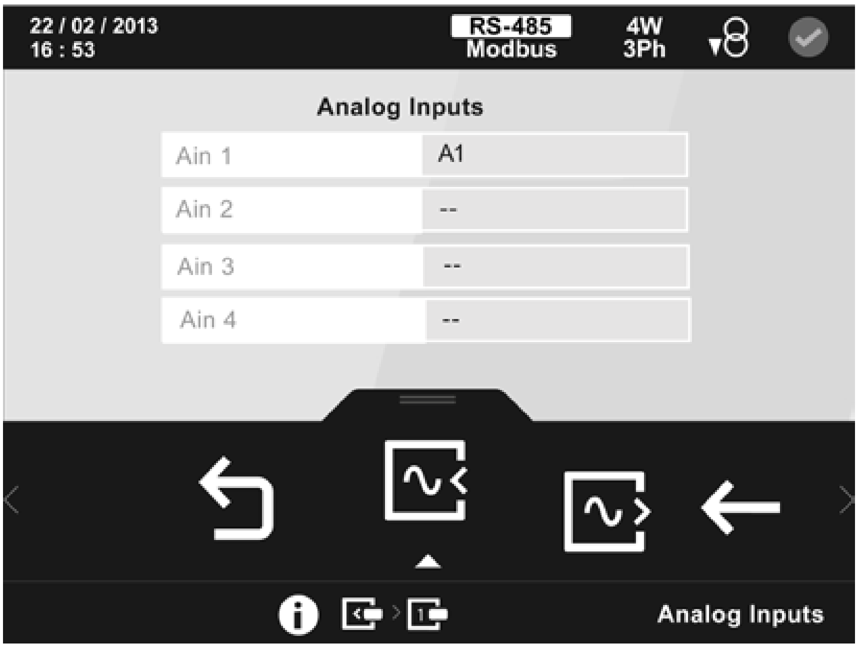
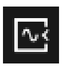
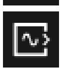


Figure 101: Analogue outputs information screen (Analogue Inputs/Outputs Module).

This screen displays the configuration of the analogue inputs of the module.
The following options appear in the lower area:

 Analogue inputs, to display how the inputs have been configured.

 Analogue outputs, to display how the outputs have been configured.

Back, returns to the expansion modules information screen, **Figure 98**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

When selecting the analogue outputs option, , you will view the screen in **Figure 102**, with the configuration information for the outputs.

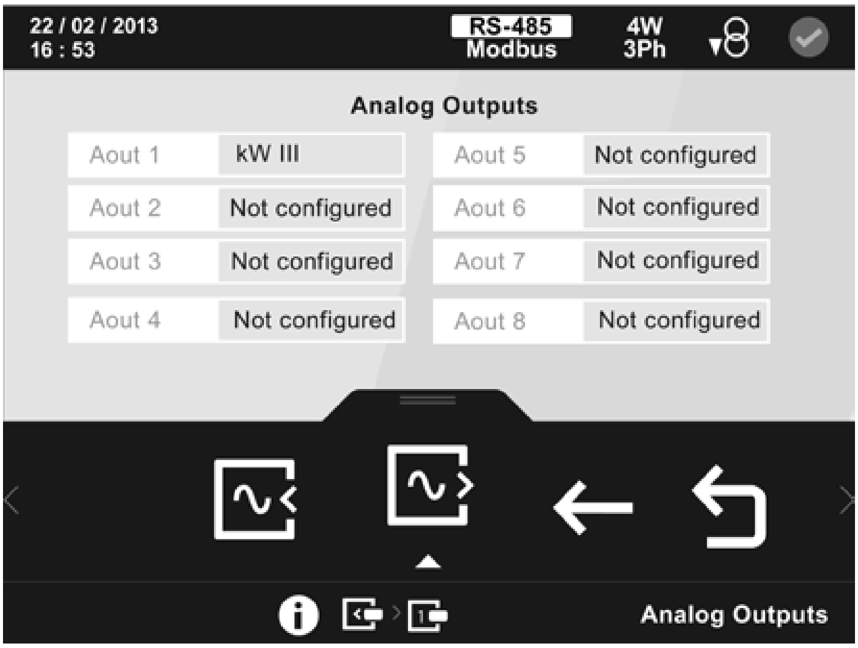


Figure 102: Analogue outputs information screen (Analogue Inputs/Outputs Module).

5.5.3.3.- Modbus TCP (Bridge) communications expansion modules

The screen in **Figure 103**, is a screen that displays the information of the Modbus TCP communications module.

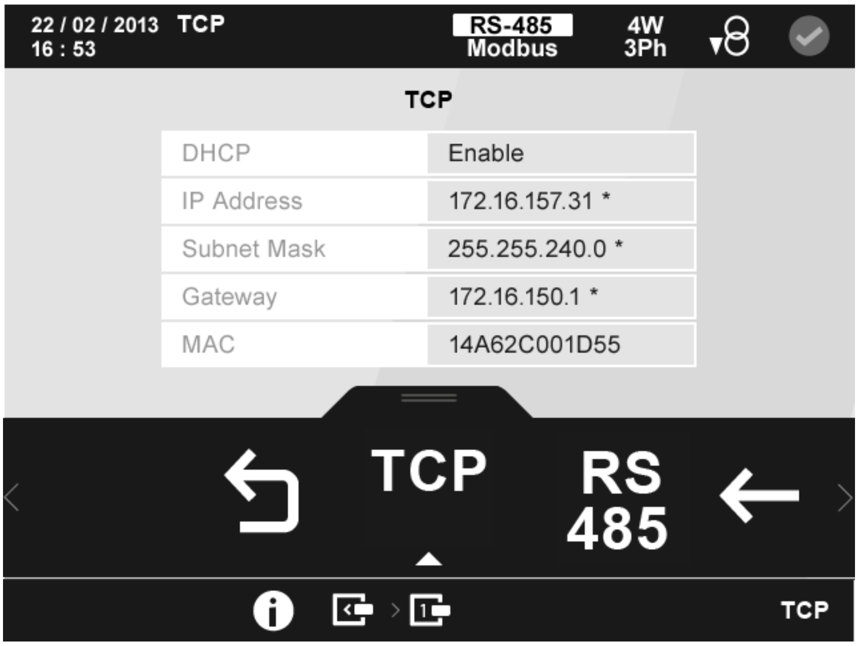


Figure 103: Information screen of the Modbus TCP (Bridge) module (TCP communications).

This screen shows how the TCP communications of the module are configured.
The following options appear in the lower area:

TCP, for viewing how the TCP communications have been configured.
RS-485, for viewing how the RS-485 gateway is configured.
Back, returns to the expansion module information screen, **Figure 98**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

On selecting the **RS-485** option, , the screen in **Figure 104**, appears with information on the configuration of the RS-485 gateway.

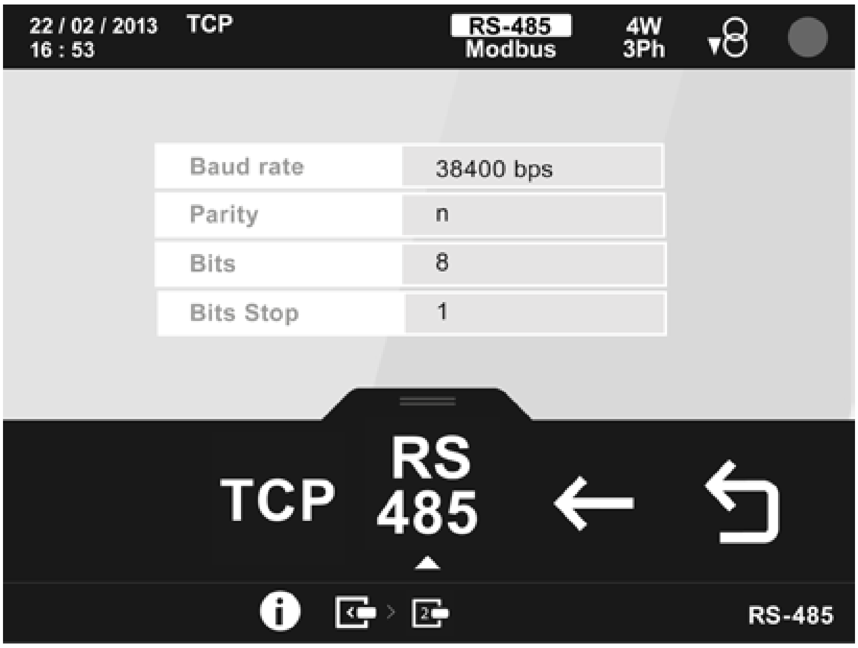


Figure 104: Information screen of the Modbus/TCP (Bridge) module (RS-485 Gateway).

5.5.3.4.- LonWorks communications expansion modules

The screen in **Figure 105** display screen, is a screen that displays the information of the LonWorks communications module.

Figure 105: LonWorks module information screen.

This screen displays the unit's Neuron ID, a single 48-bit identifier of each Neuron Chip.

The following options appear in the lower area:

Back, returns to the expansion module information screen, **Figure 98**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

5.5.3.5.- Profibus communications expansion modules

The screen in **Figure 106** display screen, is a screen that displays the information of the Profibus communications module.

Figure 106: Profibus module information screen.

This screen shows the unit's Profibus identifier.
The following options appear in the lower area:

Back, returns to the expansion module information screen, **Figure 98**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

5.5.3.6.- MBus communications expansion modules

The screen in **Figure 107** display screen, is a screen that displays the information of the MBus communications module.

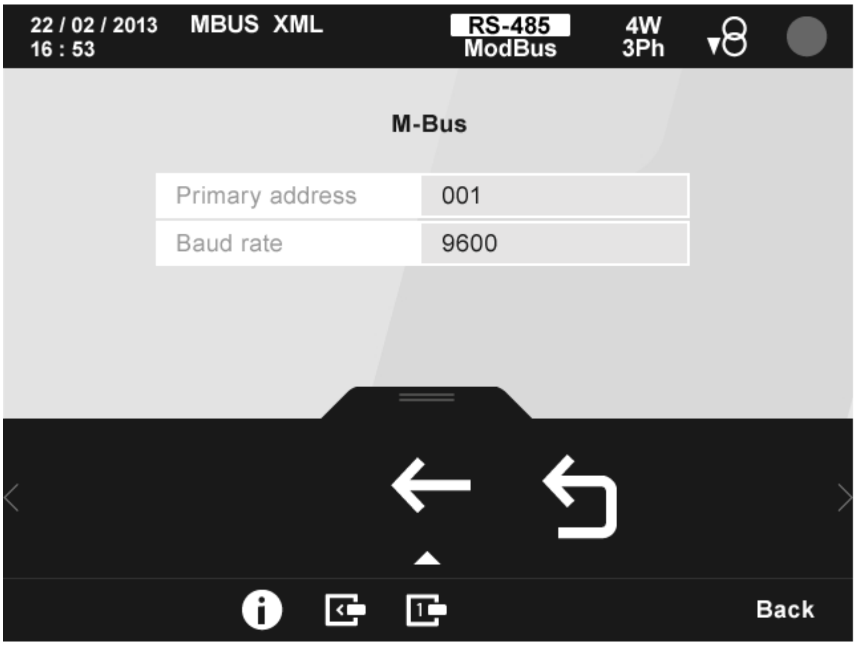


Figure 107: MBus module information screen.

This screen shows how the M-Bus communications of the module are configured.
The following options appear in the lower area:

Back, returns to the expansion module information screen, **Figure 98**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

5.5.3.7.- Datalogger expansion modules

The screen in **Figure 108** display screen, is a screen that displays the information of the Datalogger communications module.

Figure 108: Datalogger (TCP) module information screen.

This screen shows how the TCP communications of the module are configured.

The following options appear in the lower area:

TCP, for viewing how the TCP communications have been configured.
Port, for viewing how the port have been configured..
Back, returns to the expansion module information screen, **Figure 98**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

On selecting the **Port** option, , the screen in **Figure 109**, appears with information on the port number, Embedded version and Power Studio version.

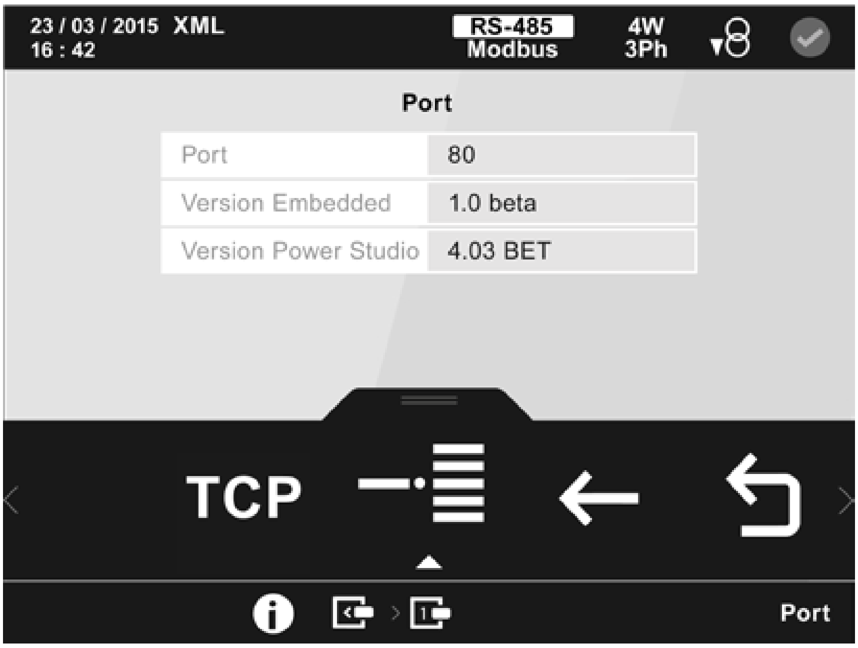


Figure 109: Datalogger (Port) module information screen.

5.5.3.8.- Modbus TCP (Switch) communications expansion modules

The screen in **Figure 103**, is a screen that displays the information of the Modbus TCP (Switch) communications module.

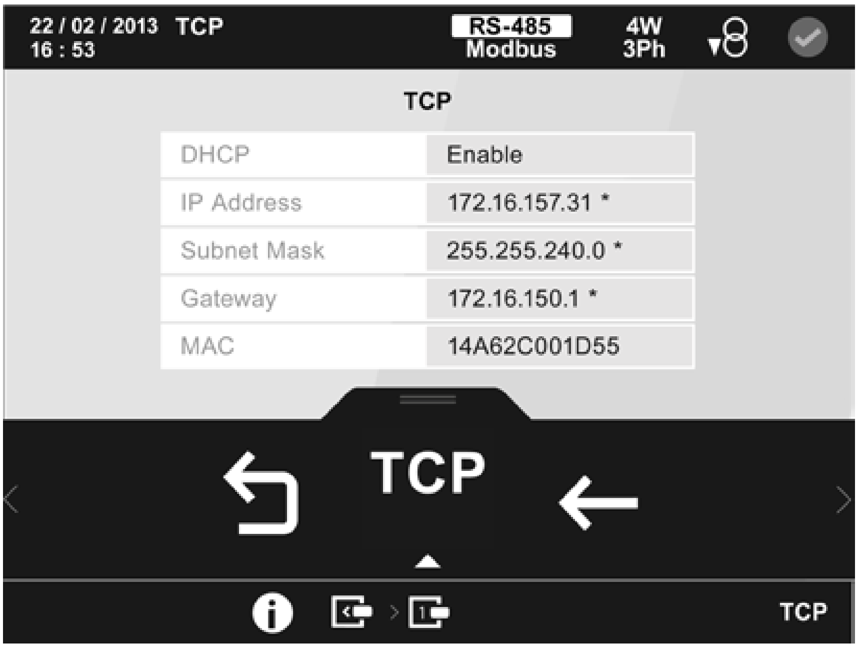
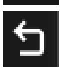


Figure 110: Information screen of the Modbus TCP (Switch) module (TCP communications).

This screen shows how the TCP communications of the module are configured.
The following options appear in the lower area:

TCP, for viewing how the TCP communications have been configured.


Back, returns to the expansion module information screen, **Figure 98**.


Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.5.4.- CIRCUTOR S.A.

This screen, **Figure 111**, shows all the Circutor contact information.

Figure 111: Circutor screen.

The following options appear in the lower area:

Back, returns to the home screen of the information menu, **Figure 95.**
Main Menu, back to the main menu, **Figure 25.**

Use the keys and to browse the various menus.
To access the selected menu press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.- SETUP MENU

If the setup menu is protected by an access password there is an icon on the main menu screen, see **Figure 112**.

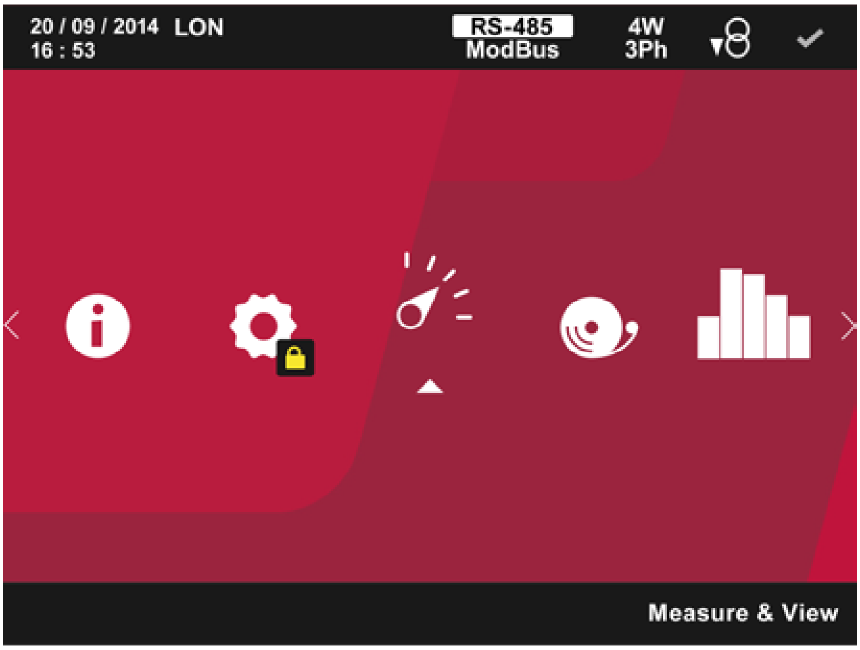


Figure 112:Protected setup menu.

A screen will appear when accessing the menu to enter the access password (**Figure 113**). Password enablement is selected in section ***"5.6.4. Access key."***

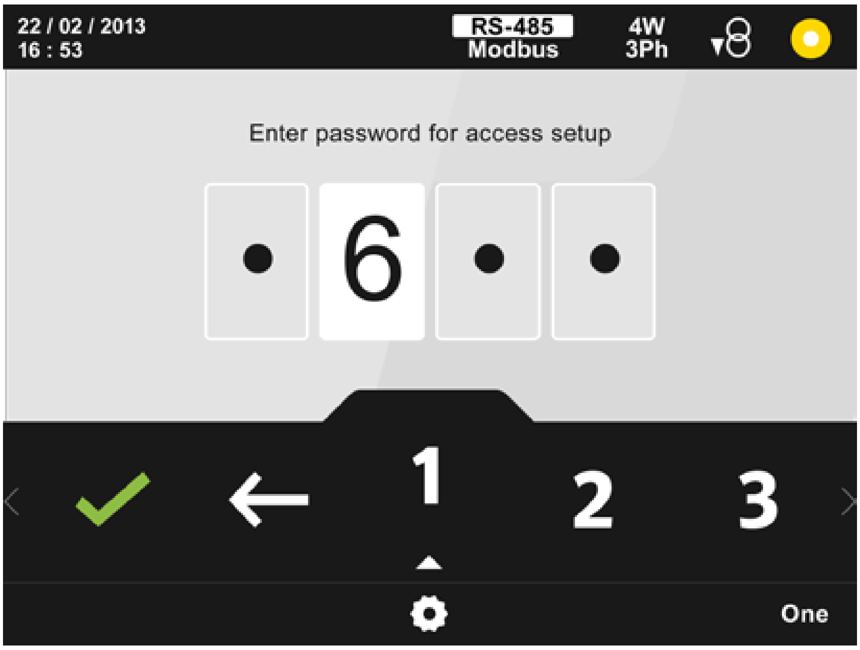


Figure 113: Access password screen.

The digit selected is indicated in white.

The following options appear in the lower area:

0, 1 ... 9 The ten possible digits to program.

Previous, selects the previous digit.

Next, selects the next digit.

Confirm, to confirm the access password programmed and enter the home screen of the setup menu, **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

The screen in **Figure 114**, is the home screen of the setup menu.

Figure 114: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area.

Use the keys and to browse the various parameters.
To access the selected menu press the key .

When selecting:

Main Menu, returns to the main menu, **Figure 25**.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.1.- Date and time.

The current date and time are selected on this screen, **Figure 115**.

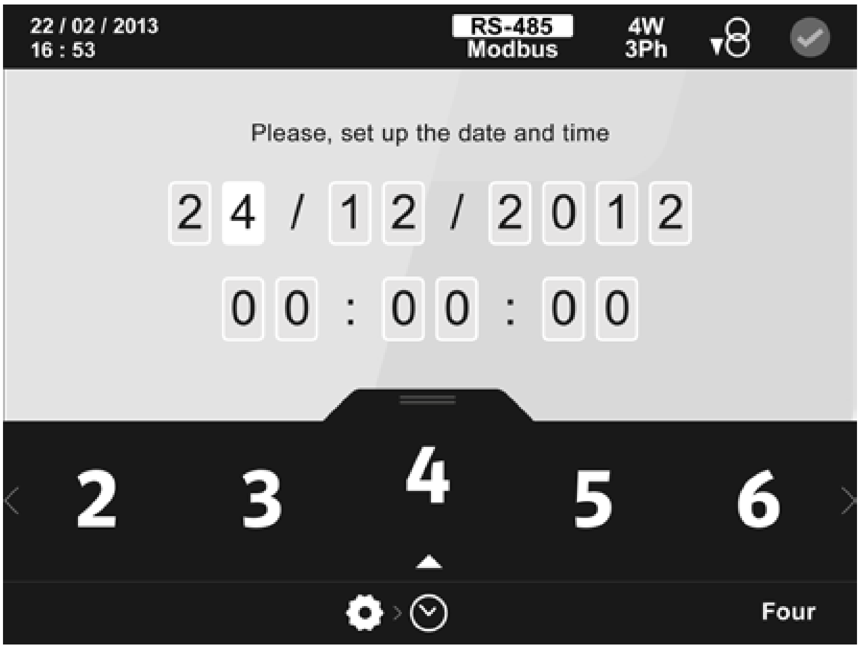


Figure 115: Date and time configuration screen.

The digit selected is indicated in white.

The following options appear in the lower area:

0, 1 ... 9 The ten possible digits to program.

Previous, selects the previous digit.

Next, selects the next digit.

Confirm date and time, confirms and saves in the memory the value programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.2.- Time zone.

The time zone is selected on this screen **Figure 116**.

Figure 116: Time zone configuration screen.

The following options appear in the lower area:

- When programming the **time zone**:

0, +1 ... -1 All possible time zones.

- When selecting **summer/winter time**:

Enable summer time,

Disable summer time,

- For all parameters:

Confirm, confirms and saves in the memory the time zone displayed on the screen.

Previous, selects the previous parameter.

Next, selects the next parameter.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.3.- Language.

The unit language is selected on this screen **Figure 117**.

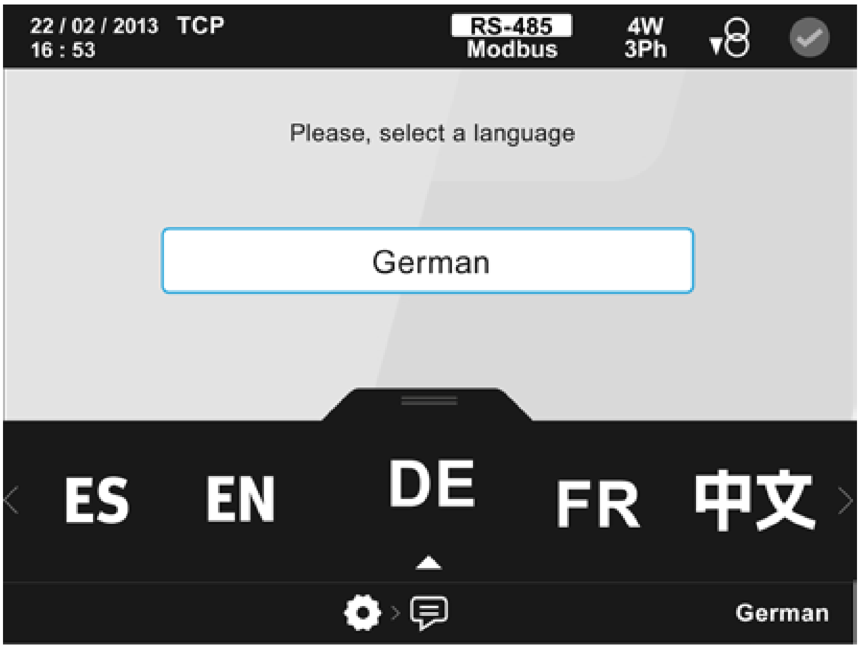


Figure 117: Unit language configuration screen.

The following options appear in the lower area:

ES, EN ,DE, FR , 中文, 한국어 The possible languages of the unit: Spanish, English, German, French, Chinese and Korean.

Confirm, confirms and saves in the memory the language displayed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.4.- Access key.

The access key to the unit setup menu is selected on this screen **Figure 118**.

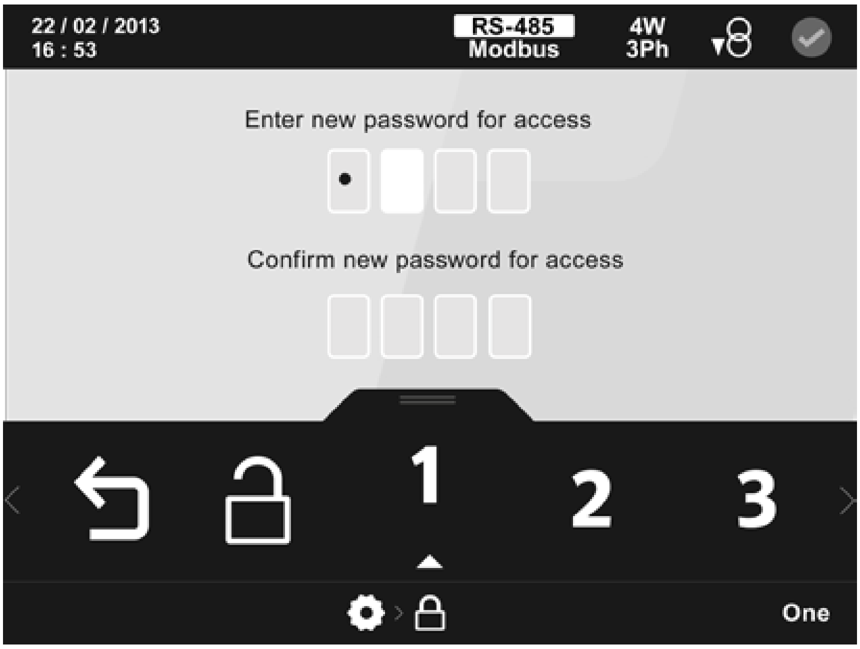


Figure 118: Access key configuration screen.

The digit selected is indicated in white.

The following options appear in the lower area:

0, 1 ... 9 The ten possible digits to program.

Previous, selects the previous digit.

Next, selects the next digit.

Confirm, confirms and saves in the memory the value programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Unlock, removes setup menu protection by means of a password.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If the unit is protected with a password and you want to remove that protection, select the unlock option and an information screen will appear indicating that you are about to unlock the unit, and then finally select the confirmation option .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.5.- Measurement connection mode.

This screen, **Figure 119**, is for selecting the measurement connection mode.

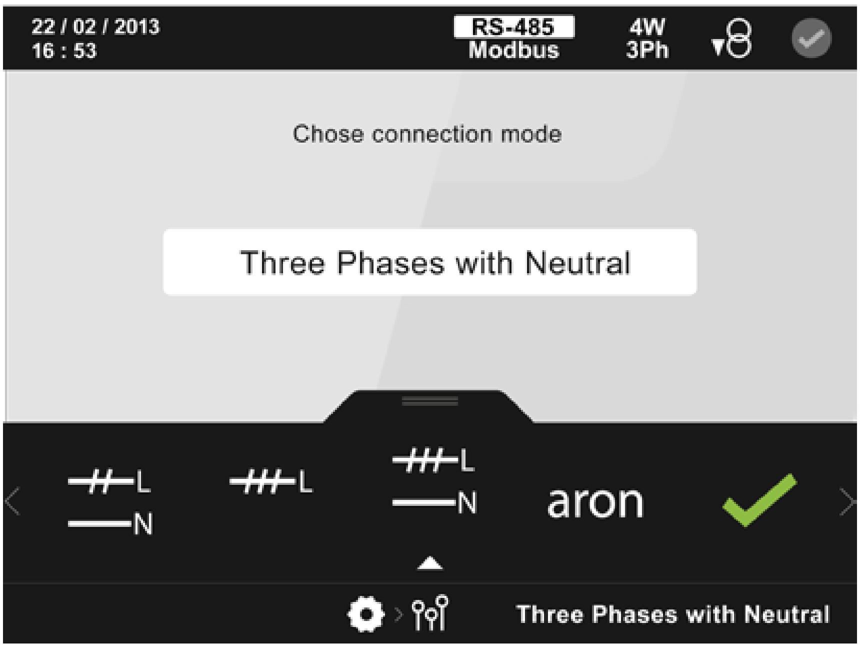


Figure 119: Measurement connection mode configuration screen.

The following options appear in the lower area:

- Single-phase.
- Two-phase.
- Two-phase with neutral.
- Three-phase.
- Three-phase with neutral.
- Aron.
- Confirm, confirms and saves in the memory the value programmed on the screen**.**
- Back, returns to the home screen of the setup menu **Figure 114**.
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.6.- Ratio of voltage transformers.

The voltage transformer ratio is selected on this screen, **Figure 120**.
The following is programmed:

- ✓ The value of the primary voltage
- ✓ The value of the secondary voltage.
- ✓ The value of the rated phase-neutral voltage.

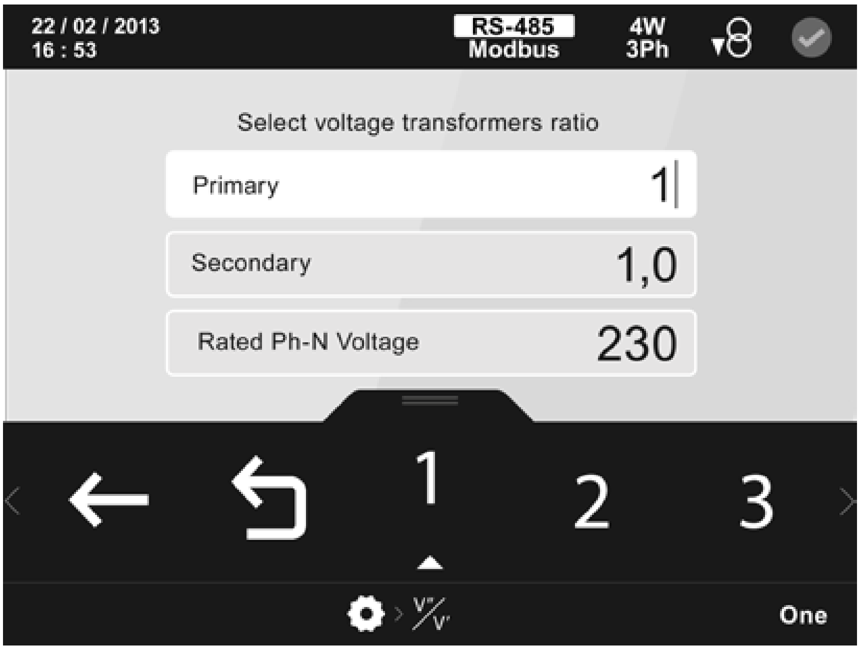


Figure 120: Voltage transformer ratio configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

- **0**, **1** ... **9** The ten possible digits to program.
- **,** Comma, when programming the secondary voltage.
- Previous, selects the previous parameter.
- Next, selects the next parameter.
- Confirm, confirms and saves in the memory the value programmed on the screen.
- Delete character, deletes the selected character.
- Delete parameter, deletes the characters of the selected parameter.
- Back, returns to the home screen of the setup menu **Figure 114**.
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

Primary voltage:

Maximum value: 500000.
Minimum value: 1.

Secondary voltage:

Maximum value: 999,9
Minimum value: 10.

Rated Phase-Neutral Voltage:

Maximum value: (Rated Phase-Neutral Voltage / Voltage Ratio) ≤ 1000
Minimum value: (Rated Phase-Neutral Voltage / Voltage Ratio) ≥ 50

Maximum possible voltage ratio: 9999.

Note: The voltage ratio is the ratio between the primary and secondary voltage.

5.6.7.- Ratio of current transformers.

The current transformer ratio is selected on this screen, **Figure 121**.
The following is programmed:

✓ The value of the primary current
✓ The value of the secondary current.
✓ The value of the primary neutral current.
✓ The value of the secondary neutral current.

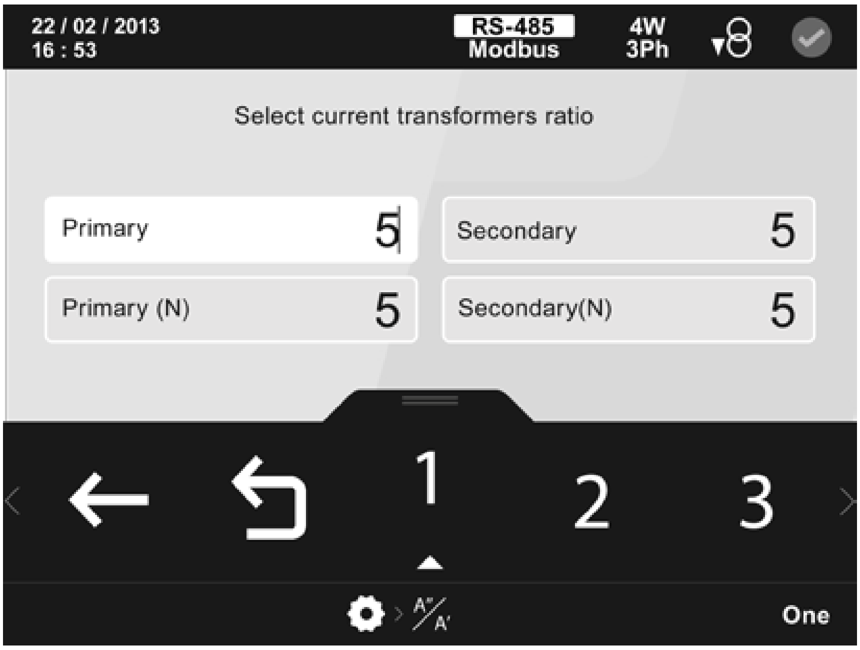


Figure 121: Current transformer ratio configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **Primary current** and **the Primary neutral current**:

0, **1** ... **9** The ten possible digits to program.

- When programming the **Secondary current**:

1 To select a 1A secondary.
5 To select a 5A secondary.
MC To select an efficient MC type transformer (/0.250 A)

- When programming **the secondary neutral current**:

1 To select a 1A secondary.
5 To select a 5A secondary.

...IA Calculated current, to select a software-based calculation by the unit of the neutral current.

- For all parameters:

Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the value programmed on the screen.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

Primary current:

For /5A and /1A secondary current: **Maximum value:** 10000.
For MC type secondary current: **Maximum value:** 1500.
Minimum value: 1.

Primary neutral current:

Maximum value: 10000.
Minimum value: 1.

The primary voltage x primary current value must be less than **60MW**.

5.6.8.- Display of variables.

The parameters to be displayed for each type of instantaneous, incremental and demand value are selected on this screen, **Figure 122**:

Figure 122: Variable display configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

Enable display of the parameter.

Disable display of the parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.9.- Demand.

The maximum demand configuration parameters are selected on this screen **Figure 123**:

- ✓ The type of integration of the demand.
- ✓ The integration time in minutes.

Figure 123: The maximum demand parameters configuration screen.

The parameter selected is indicated in white.
The following options appear in the lower area:

- When programming the **type of integration**:

Sliding window.
Fixed window.

- When programming the **integration time**:

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.

- For all parameters:

Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Integration time:

Maximum value: 60 minutes.
Minimum value: 1 minute.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.10.- Installation data.

The following installation features are selected on this screen **Figure 124**:

✓ Rated frequency.
✓ Number of quadrants.

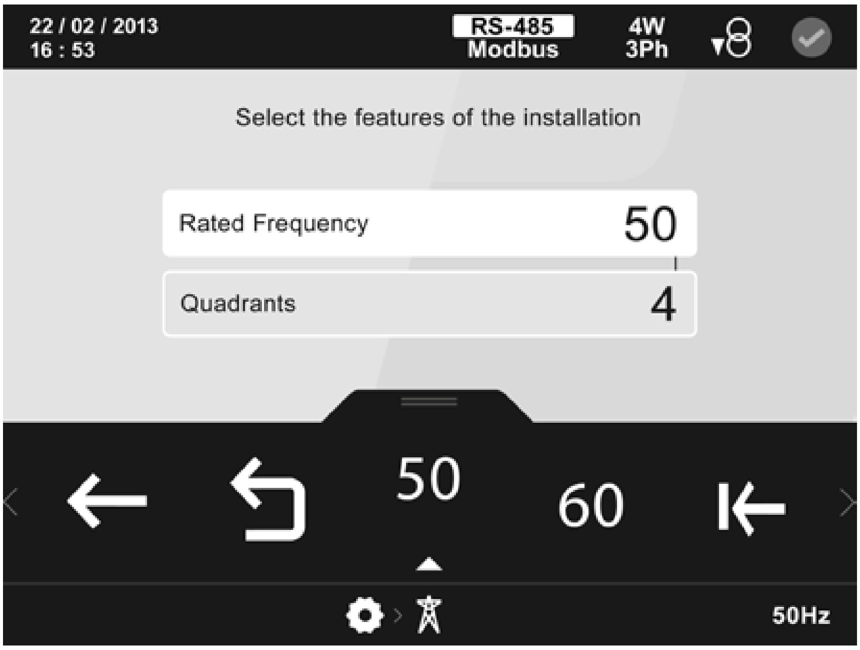


Figure 124: Installation features configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **Rated frequency**:

50, 60 Possible nominal frequency values: 50Hz or 60Hz.

- When programming the **number of quadrants**:

Consumption, installation that works with 2 quadrants.
Consumption and generation, installation that works with 4 quadrants.

- For all parameters:

Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.11.- Energy consumption costs.

The energy consumption costs are selected on this screen **Figure 125**:

- ✓ The cost per kWh of electricity of tariff 1 consumption.
- ✓ The cost per kWh of electricity of tariff 2 consumption.
- ✓ The cost per kWh of electricity of tariff 3 consumption.
- ✓ The currency.

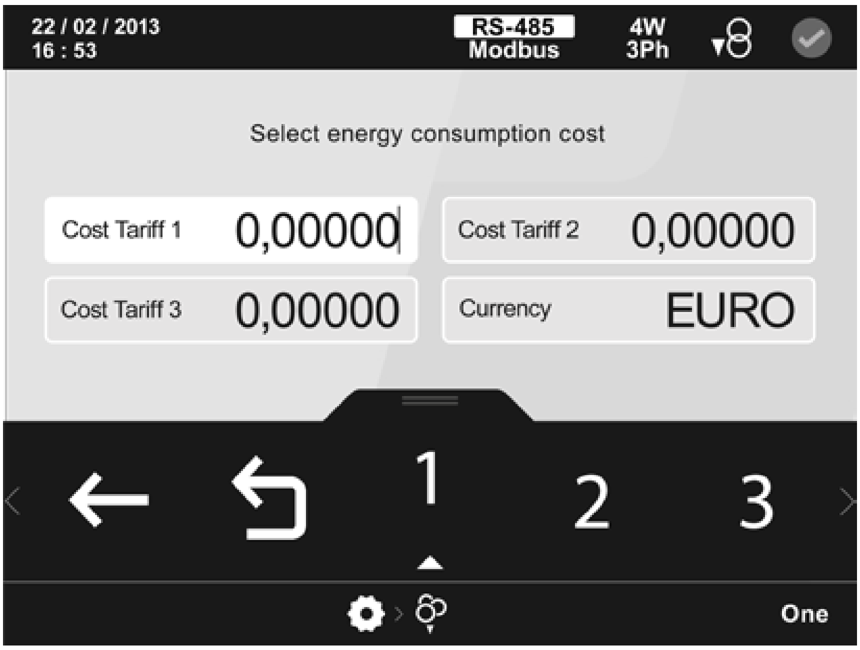


Figure 125: Energy consumption costs configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **cost of the tariffs**:

0, 1 ... 9 The ten possible digits to program.
, , Comma.

- When programming the **Currency**:

A, B ... Z The possible letters to program.

- For all parameters:

Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Cost of the tariffs:

Maximum value: 100.000
Minimum value: 0.00000

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.12.- Energy generation costs.

The energy generation costs are selected on this screen **Figure 126**:

- ✓ The cost per kWh of electricity of tariff 1 generation.
- ✓ The cost per kWh of electricity of tariff 2 generation.
- ✓ The cost per kWh of electricity of tariff 3 generation.
- ✓ The currency.

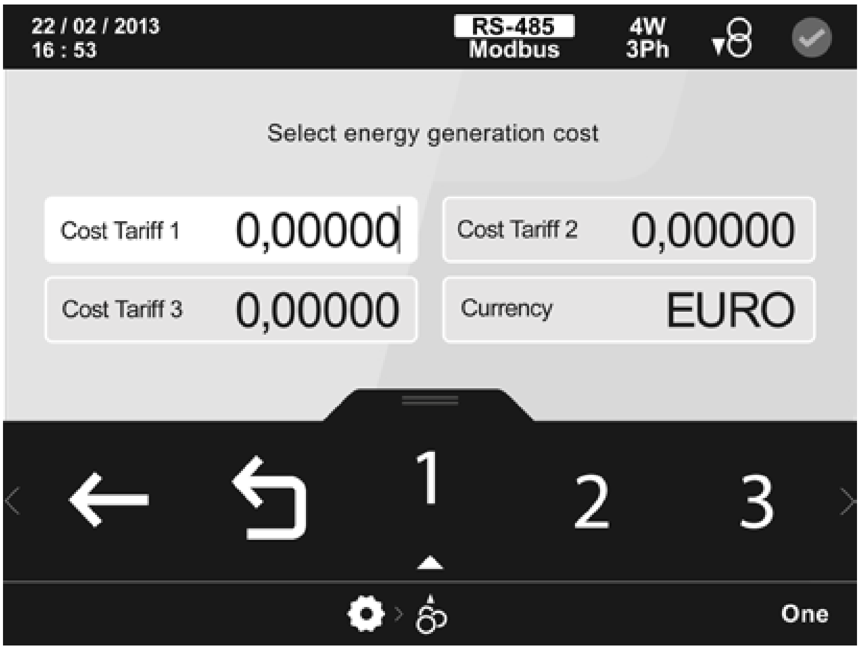


Figure 126: Energy generation costs configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **cost of the tariffs**:

0, 1 ... 9 The ten possible digits to program.

, Comma.

- When programming the **Currency**:

A, B ... Z The possible letters to program.

- For all parameters:

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Cost of the tariffs:

Maximum value*:* 100.000
Minimum value: 0.00000

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.13.- CO_2 consumption emissions.

The carbon consumption emission ratios are selected on this screen **Figure 127**.

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

The following are configured:

- ✓ The tariff 1 consumption emissions ratio.
- ✓ The tariff 2 consumption emissions ratio.
- ✓ The tariff 3 consumption emissions ratio.

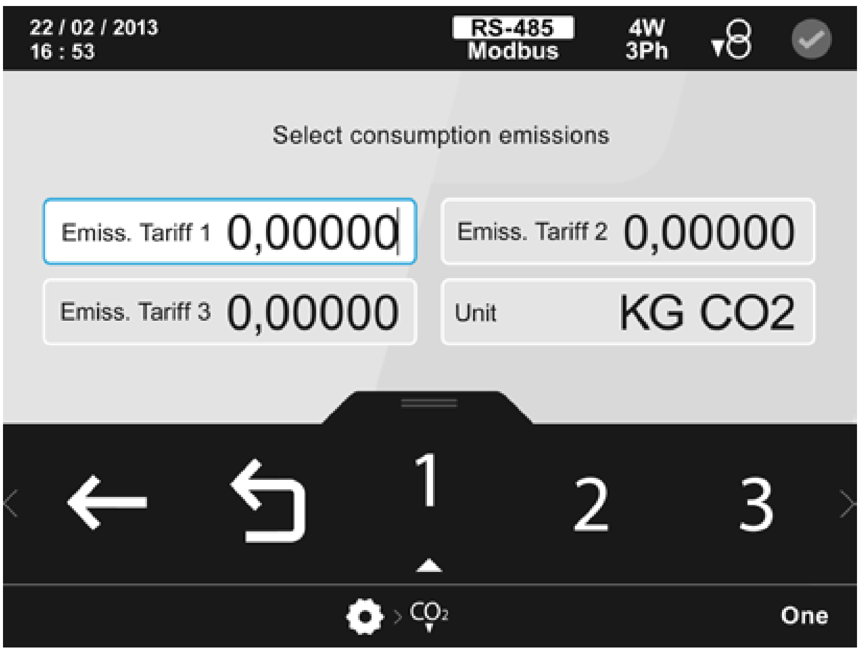


Figure 127: The $C0_2$ consumption emissions configuration screen.

The parameter selected is indicated in white.

The following options appear in the lower area:

0, 1 ... 9 The ten possible digits to program.
, Comma.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

CO_2 consumption emissions ratio:

Maximum value*:* 100.000
Minimum value: 0.00000

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.14.- CO_2 generation emissions.

The carbon generation emission ratios are selected on this screen **Figure 128**.

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

The following are configured:

- ✓ The tariff 1 generation emissions ratio.
- ✓ The tariff 2 generation emissions ratio.
- ✓ The tariff 3 generation emissions ratio.

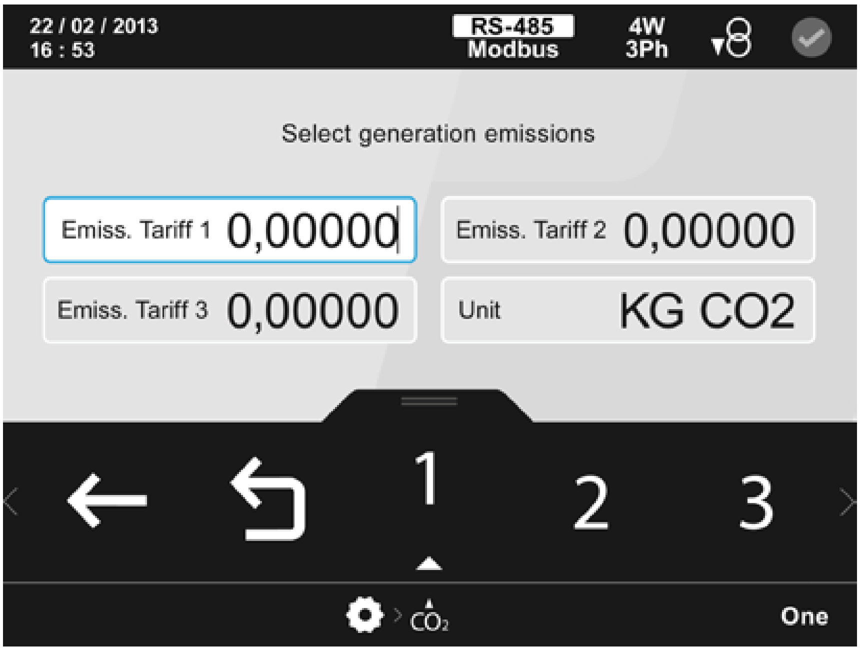


Figure 128: The C0$_2$ generation emissions configuration screen.

The parameter selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 The ten possible digits to program.

, Comma.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

CO_2 generation emissions ratio:

Maximum value: 100.000
Minimum value: 0.00000

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.15.- Relay digital outputs.

Select the output to configure on the main configuration screen of the relay digital outputs, **Figure 129**.

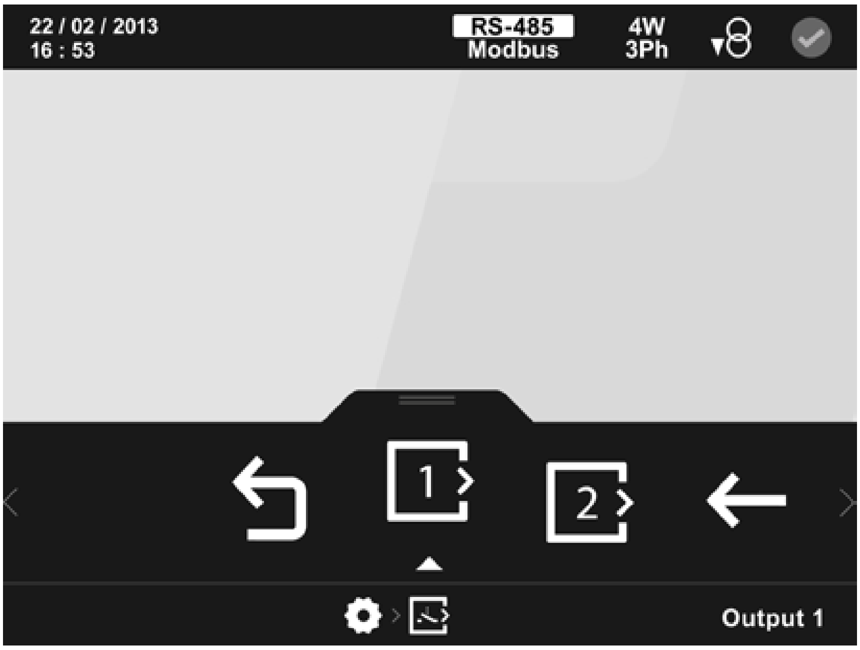


Figure 129: Main configuration screen of relay digital outputs.

The following options appear in the lower area:

Output 1, to select the configuration of the **digital output of relay 1**.
Output 2, to select the configuration of the **digital output of relay 2**.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

After selecting the output to configure, **Figure 130**, the following parameters can be configured:

- ✓ The variable code that controls the relay.
- ✓ The Pre-alarm value.
- ✓ The minimum value below which the relay is activated.
- ✓ The maximum value above which the relay is activated.
- ✓ The delay in connecting and disconnecting the relay.
- ✓ The status of the outputs.
- ✓ The latch.

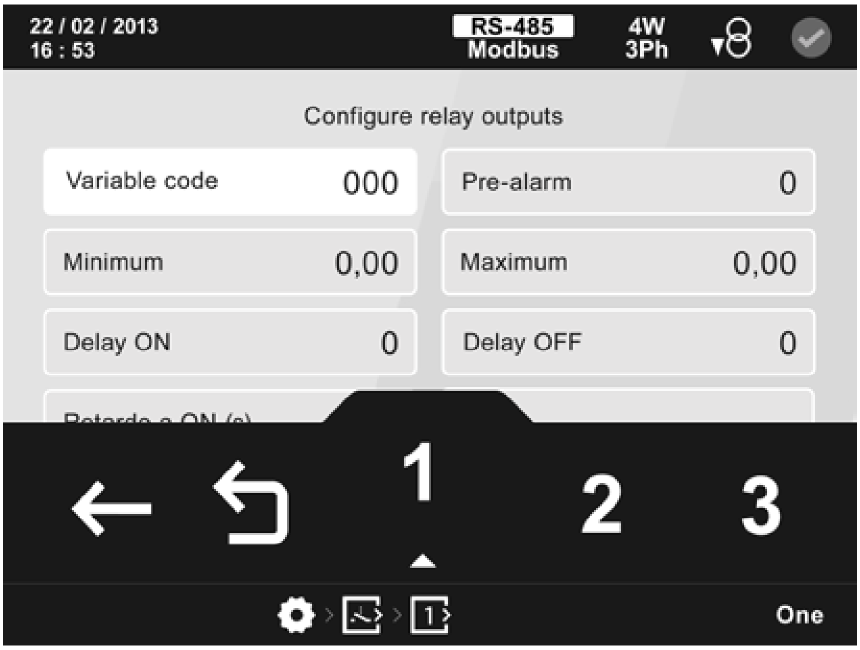


Figure 130: Configuration screen of relay digital outputs.

The parameter selected is indicated in white.
The following options appear in the lower area:

- When programming the **variable code** which controls the relay digital output (**Table 21**):

0, 1 ... 9 The ten possible digits to program.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Note: To cancel the operation of a digital output, the **0** code must be programmed.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

Table 21: Code of variables for programming the digital outputs and transistor.

Variable	Phase	Code	Phase	Code	Phase	Code	Phase	Code
Phase-Neutral Voltage	L1	1	L2	9	L3	17	III	31
Current	L1	2	L2	10	L3	18	III	33
Active power	L1	3	L2	11	L3	19	III	34
Inductive Reactive Power	L1	4	L2	12	L3	20	III	35
Capacitive Reactive Power	L1	5	L2	13	L3	21	III	36
Total Reactive Power	L1	69	L2	70	L2	71	III	72
Apparent Power	L1	6	L2	14	L3	22	III	37
Power factor	L1	7	L2	15	L3	23	III	38
Cosine φ	L1	8	L2	16	L3	24	III	39
% THD V	L1	40	L2	41	L3	42	LN	43
% THD A	L1	44	L2	45	L3	46	LN	47
Phase-Phase Voltage	L1/2	28	L2/3	29	L3/1	30	III	32
Neutral voltage	-	25	-		-		-	
Neutral current	-	26	-		-		-	
Frequency	-	27	-		-		-	
Variable	**L1**		**L2**		**L3**		**III**	
Active Energy Generated (4)	T1	149	T1	154	T1	159	T1	164
	T2	189	T2	194	T2	199	T2	204
	T3	229	T3	234	T3	239	T3	244
	Total	509	Total	514	Total	519	Total	524
Active Energy Consumed (4)	T1	129	T1	134	T1	139	T1	14
	T2	169	T2	174	T2	179	T2	184
	T3	209	T3	214	T3	219	T3	224
	Total	489	Total	494	Total	499	Total	504
Inductive Reactive Energy Generated (4)	T1	150	T1	155	T1	160	T1	165
	T2	190	T2	195	T2	200	T2	205
	T3	230	T3	235	T3	240	T3	245
	Total	510	Total	515	Total	520	Total	525
Inductive Reactive Energy Consumed (4)	T1	130	T1	135	T1	140	T1	145
	T2	170	T2	175	T2	180	T2	185
	T3	210	T3	215	T3	220	T3	225
	Total	490	Total	495	Total	500	Total	505
Capacitive Reactive Energy Generated (4)	T1	151	T1	156	T1	161	T1	166
	T2	191	T2	196	T2	201	T2	206
	T3	231	T3	236	T3	241	T3	246
	Total	511	Total	516	Total	521	Total	526
Capacitive Reactive Energy Consumed (4)	T1	131	T1	136	T1	141	T1	146
	T2	171	T2	176	T2	181	T2	186
	T3	211	T3	216	T3	221	T3	226
	Total	491	Total	496	Total	501	Total	506

Table 21 (Continuation): Code of variables for programming the digital outputs and transistor.

Variable	L1		L2		L3		III	
Total Reactive Energy Generated (4)	T1	152	T1	157	T1	162	T1	167
	T2	192	T2	197	T2	202	T2	207
	T3	232	T3	237	T3	242	T3	247
	Total	512	Total	517	Total	522	Total	527
Total Reactive Energy Consumed (4)	T1	132	T1	137	T1	142	T1	147
	T2	172	T2	177	T2	182	T2	187
	T3	212	T3	217	T3	222	T3	227
	Total	492	Total	497	Total	502	Total	507
Apparent Energy Generated (4)	T1	153	T1	158	T1	163	T1	168
	T2	193	T2	198	T2	203	T2	208
	T3	233	T3	238	T3	243	T3	248
	Total	513	Total	518	Total	523	Total	528
Apparent Energy Consumed (4)	T1	133	T1	138	T1	143	T1	148
	T2	173	T2	178	T2	183	T2	188
	T3	213	T3	218	T3	223	T3	228
	Total	493	Total	498	Total	503	Total	508
Maximum current demand	T1	600	T1	601	T1	602	T1	603
	T2	612	T2	613	T2	614	T2	615
	T3	624	T3	625	T3	626	T3	627
	Total	828	Total	829	Total	830	Total	831
Active Power Maximum Demand	T1	604	T1	605	T1	606	T1	607
	T2	616	T2	617	T2	618	T2	619
	T3	628	T3	629	T3	630	T3	631
	Total	832	Total	833	Total	834	Total	835
Apparent Power Maximum Demand	T1	608	T1	609	T1	610	T1	611
	T2	620	T2	621	T2	622	T2	623
	T3	632	T3	633	T3	634	T3	635
	Total	836	Total	837	Total	838	Total	839
Variable	**Integrated(1)**							
Digital input I1 (3) (5)	900		-		-		-	
Digital input I2 (3) (5)	901		-		-		-	
Variable	**Module 1(2)**		**Module 2 (2)**		**Module 3 (2)**		**Module 4 (2)**	
Digital input I1 (3) (5)	902		910		918		926	
Digital input I2 (3) (5)	903		911		919		927	
Digital input I3 (3) (5)	904		912		920		928	
Digital input I4 (3) (5)	905		913		921		929	
Digital input I5 (3) (5)	906		914		922		930	
Digital input I6 (3) (5)	907		915		923		931	
Digital input I7 (3) (5)	908		916		924		932	
Digital input I8 (3) (5)	909		917		925		933	
Analogue input I1	934		942		950		958	
Analogue input I2	935		943		951		959	
Analogue input I3	936		944		952		960	
Analogue input I4	937		945		953		961	

[1] The integrated variables are those that the unit has as standard.
[2] If in the unit there is more than one module connected with the same type of inputs, the module with the lowest number is the one with the lowest serial number.
[3] When programming as an alarm a digital input programmed as logic state if:

- You program the maximum value = minimum value = 0 the output will show an alarm when the input has a value of 1.
- You program the maximum value = minimum value = 1 the output will show an alarm when the input has a value of 0.

Any other combination of values will cause erroneous behaviour of the alarm.
The pre-alarm value is not considered.

[4] Codes valid only for programming the digital outputs of the transistor in impulse mode.
[5] Codes not valid for programming analogue outputs.

- When programming the **pre-alarm value**:

If the unit exceeds the programmed pre-alarm value, the icon is activated on the display, and the icon that indicates the alarm status changes colour: .
The value is programmed in %.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **minimum value** below which the relay is activated:

The units and maximum and minimum values of the variables to program are shown in **Table 22**.

0, 1 ... 9, ,, - The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

● When programming the **maximum value** above which the relay is activated:

The units and maximum and minimum values of the variables to program are shown in **Table 22**.

Note: *The maximum value must be greater than the minimum value programmed.*

0, 1 ... 9, ,, – The ten possible digits to program.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

Table 22: Units and maximum and minimum values of the programming variables of the digital outputs.

Variable	Units	Maximum	Minimum
Phase-Neutral Voltage	V	1000.00 * voltage ratio(1)	0
Phase-Phase Voltage	V		
Neutral Voltage	V		
Current	A	10.000 *current ratio (2)	0
Neutral Current	A		
Frequency	Hz	70.00	40.00

Table 22(Continuation):Units and maximum and minimum values of the programming variables of the digital outputs.

Variable	Units	Maximum	Minimum
Active Power [3]	kW		-180000
Apparent Power [3]	kVA		0
Total Reactive Power [3]	kvar	180000	-180000
Inductive Reactive Power [3]	kvar		0
Capacitive Reactive Power [3]	kvar		0
Power factor	-	1.00	-1.00
Cos φ	º	1.00	-1.00
Voltage THD %	%	100.0	0
Current THD %	%	100.0	0
Maximum Demand of Current	A	10.000 *current ratio [2]	0
Maximum Demand of Active power	kW	180000	0
Maximum Demand of Apparent Power	kVA		

[1] The voltage ratio is the ratio between the primary and secondary voltage.
[2] The current ratio is the ratio between the primary and secondary current.
[3] The three-phase powers accept up to 540000kW.

● When programming the **connection delay (ON)** of the relay digital output:

The connection delay is programmed in seconds.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Connection delay (ON):

Maximum value: 999 s.
Minimum value: 0 s.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **disconnection delay (OFF)** of the relay digital output:

The disconnection delay is programmed in seconds.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Disconnection delay (OFF):

Maximum value: 999 s.
Minimum value: 0 s.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **output status** of the relay:

Here you program the output status of the relay as normally closed or normally open.

N/O Normally open.
N/C Normally closed.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **latch**:

The latch is selected in this parameter, i.e., if the relay digital output is locked after it has been tripped, even when the condition that triggered it has disappeared.

Note: *If the unit loses its power supply, the latch disappears.*

Enable the latch.
Disable the latch.
Previous, selects the previous parameter**.**
Next, selects the next parameter**.**
Confirm, confirms and saves in the memory the values programmed on the screen**.**
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.16.- Transistor digital outputs.

Select the output to configure on the main configuration screen of the transistor digital outputs,**Figure 131**.

Figure 131: Main configuration screen of transistor digital outputs.

The following options appear in the lower area:

Output 1, to select the configuration of the **digital output of transistor 1**.

Output 2, to select the configuration of the **digital output of transistor 2**.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

After selecting the output to configure, you can configure the transistor output mode, **Alarm** or **Impulse output**, and the parameters for each mode.

Alarm, to select the alarm mode of the transistor digital output.

Impulses, to select the impulse mode of the transistor digital output.

5.6.16.1.- Alarm mode of transistor digital output

When selecting the alarm mode, **Figure 132**, the configuration parameters are:

- ✓ The variable code that controls the transistor.
- ✓ The pre-alarm value.
- ✓ The minimum value below which the transistor is activated.
- ✓ The maximum value above which the transistor is activated.
- ✓ The delay in the connection and disconnection of the transistor.
- ✓ The status of the outputs.
- ✓ The latch.

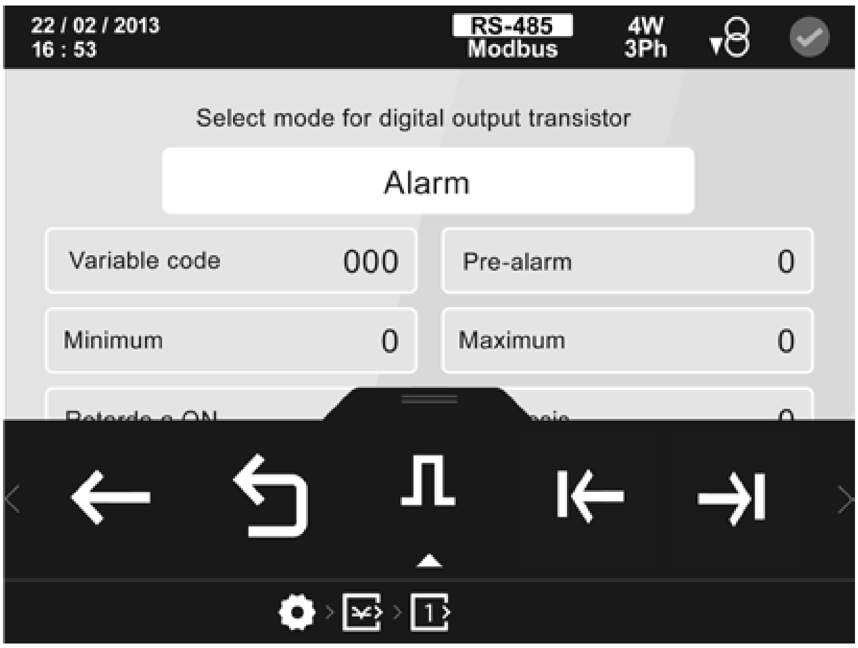


Figure 132: Configuration screen of transistor digital outputs (alarm mode).

The parameter selected is indicated in white.
The following options appear in the lower area:

- When programming the **variable code** which controls the transistor digital output (**Table 21**):

  0, 1 ... 9 The ten possible digits to program.
  Delete character, deletes the selected character.
  Delete parameter, deletes the characters of the selected parameter.
  Previous, selects the previous parameter.
  Next, selects the next parameter.
  Confirm, confirms and saves in the memory the values programmed on the screen.
  Back, returns to the home screen of the setup menu **Figure 114**.
  Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

To cancel the operation of a digital output, the **00** code must be programmed.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **pre-alarm value**:

If the unit exceeds the programmed pre-alarm value, the icon is activated on the display, and the icon that indicates the alarm status changes colour ,
The value is programmed in %.

  0, 1 ... 9 The ten possible digits to program.
  Delete character, deletes the selected character.
  Delete parameter, deletes the characters of the selected parameter.
  Previous, selects the previous parameter.
  Next, selects the next parameter.
  Confirm, confirms and saves in the memory the values programmed on the screen.
  Back, returns to the home screen of the setup menu **Figure 114**.
  Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **minimum value** below which the transistor is activated:

The units and maximum and minimum values of the variables to program are shown in **Table 22**.

0, 1 ... 9 The ten possible digits to program.
,, − Comma and minus sign.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **maximum value** above which the transistor is activated:

The units and maximum and minimum values of the variables to program are shown in **Table 22**.

Note: *The maximum value must be greater than the minimum value programmed.*

0, 1 ... 9 The ten possible digits to program.
,, − Comma and minus sign.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **connection delay (ON)** of the transistor digital output:

The connection delay is programmed in seconds.

0, 1 ... 9 the ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Connection delay (ON):

Maximum value: 999s.
Minimum value: 0s.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **disconnection delay (OFF)** of the transistor digital output:

The disconnection delay is programmed in seconds.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Disconnection delay (OFF):

Maximum value: 999s.
Minimum value: 0s.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

● When programming the **latch**:

Note: *If the unit loses its power supply, the latch disappears.*

The latch is selected in this parameter, i.e., the transistor digital output will be locked after it has been tripped, even when the condition that triggered it has disappeared.

Enable the latch.
Disable the latch.
Previous, selects the previous parameter**.**
Next, selects the next parameter**.**
Confirm, confirms and saves in the memory the values programmed on the screen**.**
Back, returns to the home screen of the setup menu **Figura 113**,
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.16.2.- Impulse mode of transistor digital output

When selecting the impulse mode, **Figure 133**, the configuration parameters are:

- ✓ The variable code that controls the transistor.
- ✓ The energy meter factor.
- ✓ The high and low impulse period.

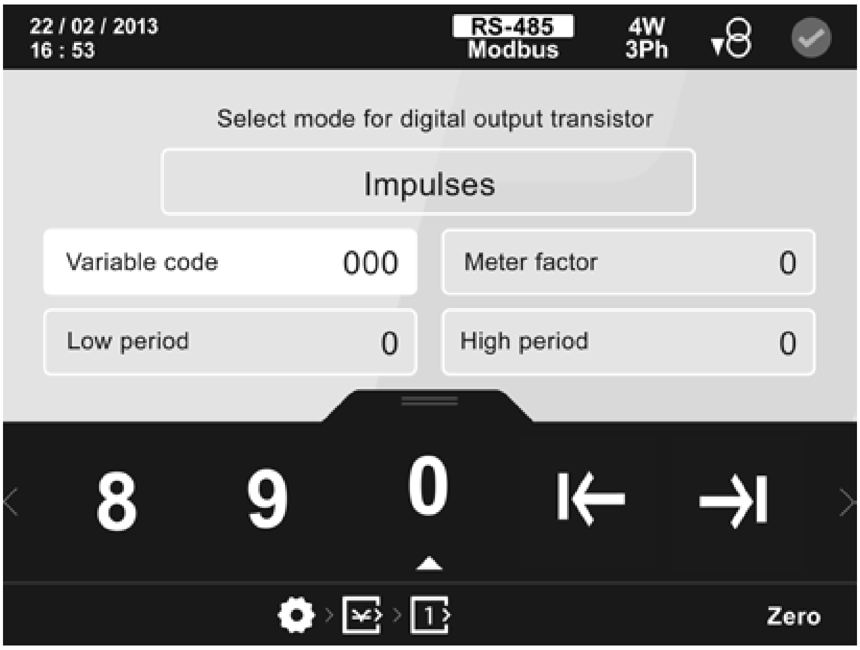


Figure 133: Configuration screen of transistor digital outputs (impulse mode).

The parameter selected is indicated in white.

⚠	It is possible that the unit may measure energy exceeding its configuration. Make sure the energy pulses correspond to the maximum energy level admitted by the installation.

To program the transistor digital output, after configuring the **variable code** and the pulse time (with the **low period** and **high period** parameters), the following formula provides a method for calculating the number of output pulses according to the generated energy so that the pulses do not accumulate.

$$3600 * \mathbf{PE} / \mathbf{PT} > \mathbf{MP} \quad \rightarrow \quad \mathbf{PE} = \mathbf{MP} * \mathbf{TP} / 3600$$

Where:

MP : Maximum power of the installation in W.
PE: Pulse energy in Wh (**Energy meter factor**)
TP : **low period** + **high period**, in seconds.

For example: If the installation can consume 100kW, a suitable configuration could be pulses of 10W (**Energy meter factor**) with a **high** and **low period** of 50 ms.

The following options appear in the lower area:

- When programming the **variable code** which controls the transistor digital output (**Table 21**):

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

To cancel the operation of a digital output, the **00** code must be programmed.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **energy meter factor**:

The factor of the energy meter is the amount of energy per hour needed for generating a pulse, in Wh.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **low period:**

The low period is the time that the pulse is at its minimum value.
The programmed value is a multiple of 10 ms, i.e. when programming 1 the impulse will be at its minimum value of 10 ms.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Low period:

Maximum value*:* 65536.
Minimum value: 1.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **high period**:

The high period is the time that the pulse is at its maximum value.
The programmed value is a multiple of 10 ms, i.e., when programming 1 the impulse will be at its maximum value of 10 ms.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figura 113**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.

To confirm the selection, press the key .

High period:

Maximum value: 65536.
Minimum value: 1.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.17.- Digital inputs.

The operating mode for digital inputs and the parameters for each mode are selected in the main configuration screen for digital inputs, **Figure 134**.

The possible operating modes are:

Tariff, the various tariffs are selected with the digital inputs.
Impulses, to select the inputs as impulse inputs.
Logic state, to select the inputs as a logic input.

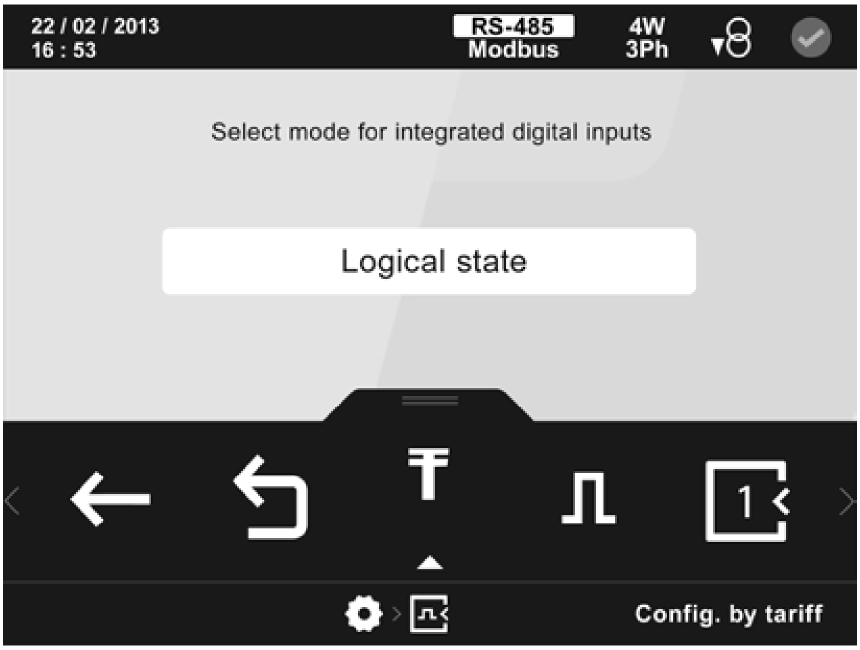


Figure 134: Main configuration screen for digital inputs.

Using the keys and firstly select the operating mode.
To confirm the selection, press the key .

The configuration parameters of digital inputs 1 and 2 change according to the operating modes.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.17.1.- Configuration of digital inputs, Tariff mode.

When selecting the tariff mode the two inputs operate in the same mode; they cannot be programmed independently (**Figure 135**).

Table 7 shows the selection of the tariff according to the digital inputs.

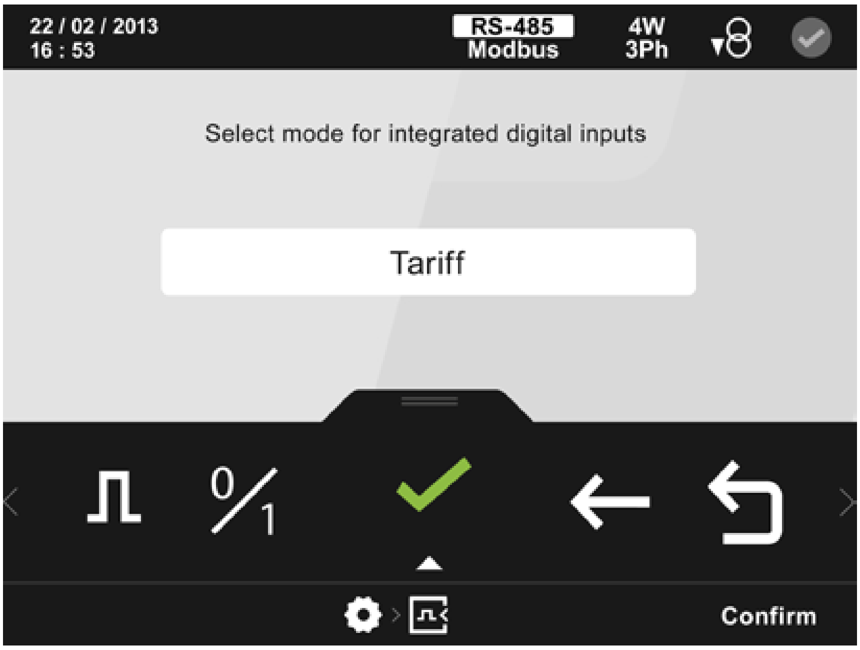


Figure 135: Digital inputs configuration screen (tariff mode).

Impulses, to select the inputs as impulse inputs.

Logic state, to select the inputs as a logic input.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figura 113**.

Main Menu, back to the main menu, **Figure 25**.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.17.2.- Configuration of digital inputs, impulse mode.

After selecting the configuration of an input in impulse mode, you must select the input that you want to configure in this mode:

Digital input 1.

Digital input 2.

When selecting the input to configure with the key (**Figure 136**), you can programme the following parameters:

- ✓ The input name.
- ✓ The units.
- ✓ The decimals.
- ✓ The energy meter factor.

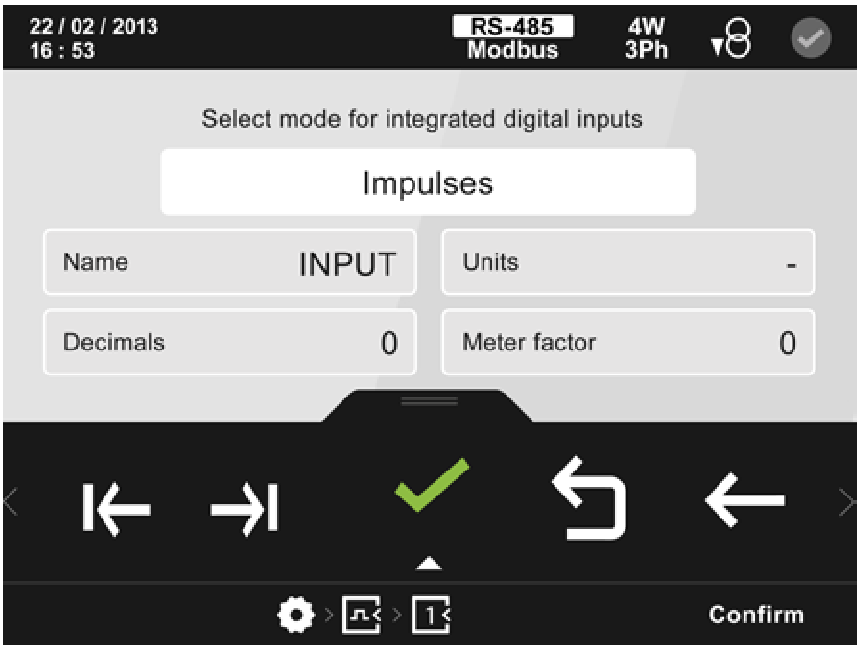


Figure 136: Digital inputs configuration screen (impulse mode).

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **input name**:

Here you will enter the name for recognising the digital input (maximum of 8 characters).

A, B ... 0 The possible letters and numbers to program**.**

Delete character, deletes the selected character**.**

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter**.**

Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for digital inputs **Figure 134**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **units**:

Here you enter the units that the digital input will have.

A, B ... Z The possible letters to program.
0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for digital inputs **Figure 134**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming **the decimals**:

Here you program the number of decimals that the digital input will have.

0, 1 ... 5 The number of possible decimals to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for digital inputs **Figure 134**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming **the meter factor**:

The energy meter factor is the number of times the value of the digital input will be increased for each impulse detected by said input.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for digital inputs **Figure 134**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.17.3.- Configuration of digital inputs, logic state mode.

After selecting the configuration of an input in logic mode, you must select the input that you want to configure in this mode:

- Digital input 1.
- Digital input 2.

When selecting the input to configure with the key (**Figure 137**), you can program the input logic.

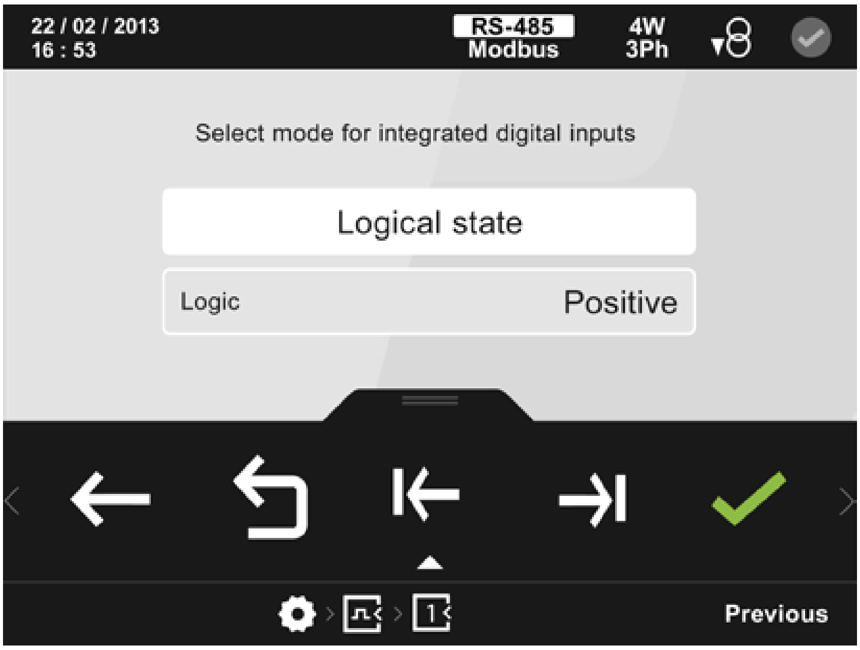


Figure 137: Digital inputs configuration screen (logic state mode).

The parameter selected is indicated in white.
The following options appear in the lower area:

- Positive, the digital input logic is positive.
- Negative, the digital input logic is negative.
- Previous, selects the previous parameter.
- Next, selects the next parameter.
- Confirm, confirms and saves in the memory the values programmed on the screen.
- Back, returns to the main configuration screen for digital inputs **Figure 134**.
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.18.- Integrated communications.

Select the RS-485 communications protocol and configuration parameters on the integrated communications configuration screen, **Figure 138**.

The possible communications protocols are:

MB Modbus.
BN BACnet.

Using the keys and firstly select the communications protocol.
To confirm the selection, press the key .

Integrated communications configuration parameters change according to the communications protocol.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.18.1.- MB Configuration parameters, Modbus protocol.

When selecting the Modbus communications protocol, **Figure 138**, you can program the following parameters:

- ✓ The peripheral number.
- ✓ The transmission speed, Baud Rate.
- ✓ The parity.
- ✓ The number of stop bits.

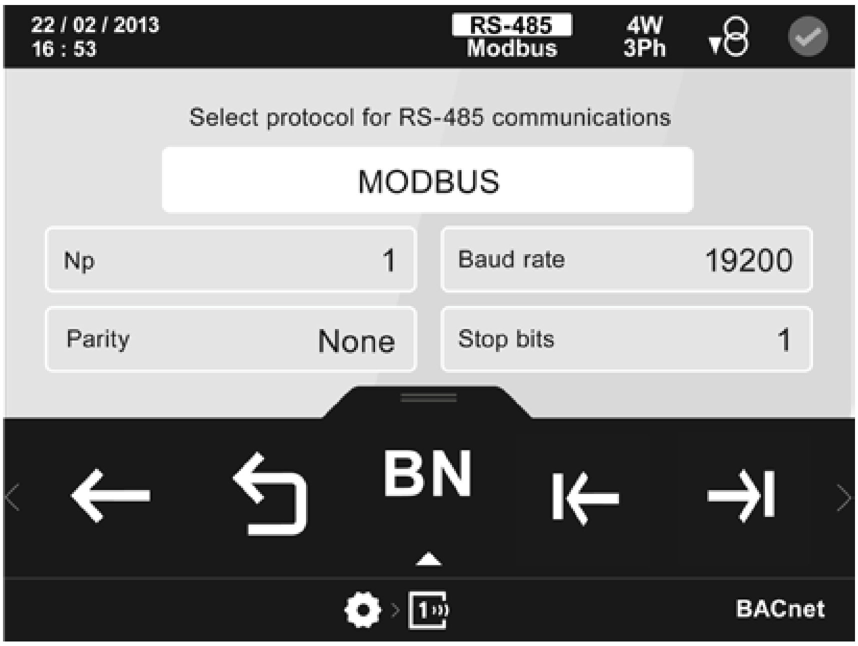


Figure 138: Integrated communications configuration screen (Modbus protocol).

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **Np**:

The Np is the peripheral number assigned to the unit in the Modbus network.

0, 1 ... 9 The ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Np:

Maximum value*:* 255.
Minimum value: 0.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **transmission speed**, **Baud rate**:

9600, 19200 ... 115200 The possible transmission speeds**: 9600, 19200, 38400, 57600, 76800** or **115200.**
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **parity**:

Even parity.
Odd parity.
No parity.
Previous, selects the previous parameter**.**
Next, selects the next parameter**.**
Confirm, confirms and saves in the memory the values programmed on the screen**.**
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **number of stop bits**:

, Possible numbers of stop bits**: 1** or **2.**
Previous, selects the previous parameter**.**
Next, selects the next parameter**.**
Confirm, confirms and saves in the memory the values programmed on the screen**.**
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.18.2.- BN Configuration parameters, BACnet protocol.

When selecting the BACnet communications protocol, **Figure 139**, you can program the following parameters:

- ✓ The transmission speed, Baud Rate.
- ✓ The MAC.
- ✓ The Device ID.

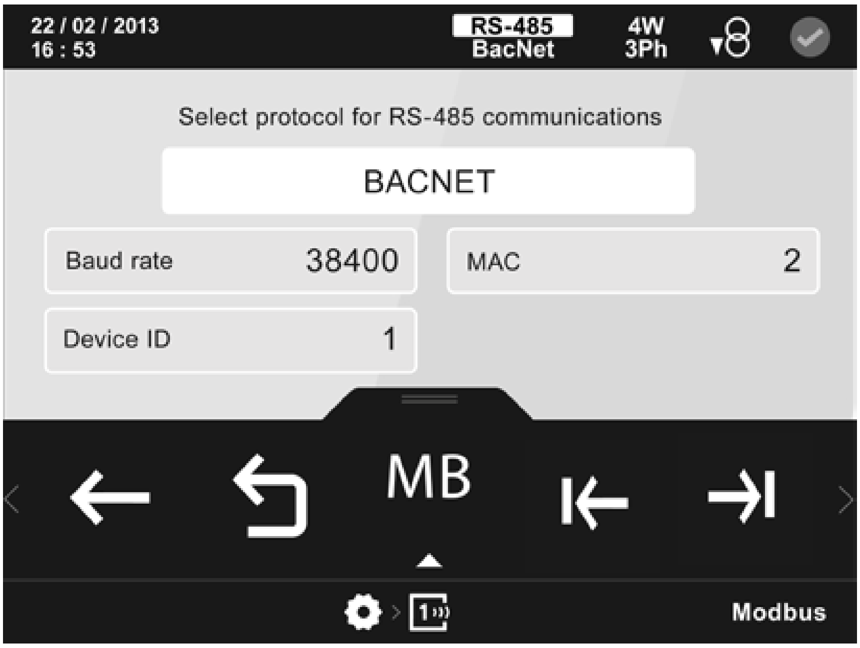


Figure 139: Integrated communications configuration screen (BACnet protocol).

The parameter selected is indicated in white.

The following options appear in the lower area:

- When programming the **transmission speed**, **Baud Rate**:

9600, 19200 ... 115200 The possible transmission speeds**: 9600, 19200, 38400, 57600, 76800** or **115200.**

Previous, selects the previous parameter**.**

Next, selects the next parameter**.**

Confirm, confirms and saves in the memory the values programmed on the screen**.**

Back, returns to the main configuration screen for integrated communications.

Main Menu, back to the main menu, **Figure 25.**

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **MAC**:

Here you have to program the MAC address.

0, 1 ... 9 The ten possible digits to program.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Maximum value: 127.
Minimum value: 0.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **Device ID**:

0, 1 ... 9 The ten possible digits to program.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Back, returns to the main configuration screen for integrated communications.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Maximum value: 4194303.
Minimum value: 0.

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.19.- Parameter reset.

The parameters to be reset are selected on the parameter reset screen, **Figure 140**.
In the **CVM-B** you can reset:

- ✓ The maximum and minimum values.
- ✓ The energies.
- ✓ The demand values.
- ✓ The maximum demand maximum values.
- ✓ The energy closes.
- ✓ The event and energy logs.

Figure 140: Parameter reset screen.

The following options appear in the lower area:

Enable reset, enable reset of selected parameter.
Disable reset, disable reset of selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the home screen of the setup menu **Figure 114**.
Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.20.- User interface

Select the time to off back for the display, keyboard sensitivity, display decimal and date format on the user interface screen, **Figure 141**.

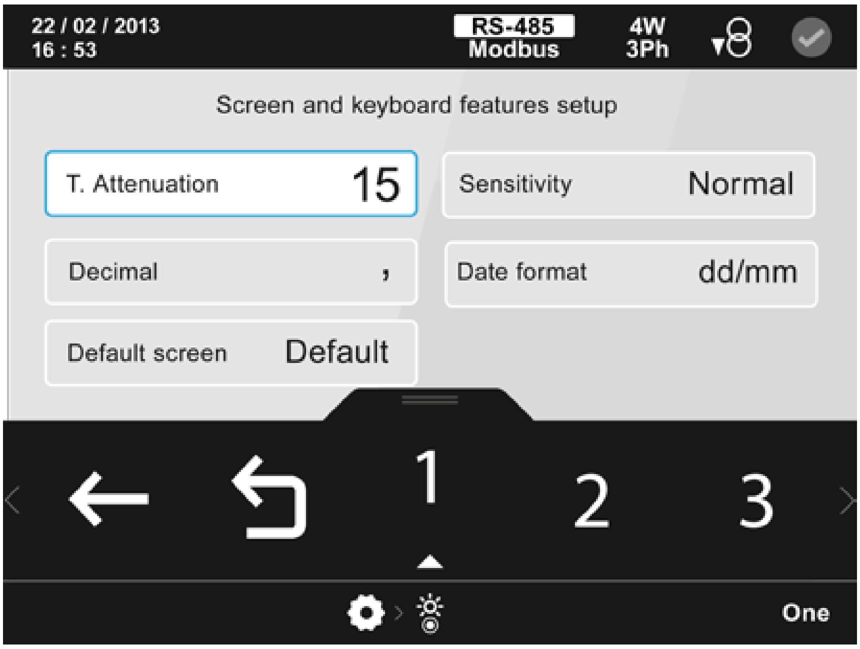


Figure 141:User interface screen.

The following options appear in the lower area:

- When programming the **Time to off back** on the display:

0, 1 ... 9 The ten possible digits to program.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

Time to off back:

Maximum value: 99 minutes.
Minimum value: 1 minute

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **sensitivity** of the keyboard:

  Low.
  Normal.
  High.
  Previous, selects the previous parameter.
  Next, selects the next parameter.
  Confirm, confirms and saves in the memory the values programmed on the screen.
  Back, returns to the home screen of the setup menu **Figure 114**.
  Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the display **decimal**:

  Coma.
  Point.
  Previous, selects the previous parameter.
  Next, selects the next parameter.
  Confirm, confirms and saves in the memory the values programmed on the screen.
  Back, returns to the home screen of the setup menu **Figure 114**.
  Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- When programming the **date format**:

  D/M Format dd/mm/yyyy
  M/D Format dd/mm/yyyy.
  Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

- To program the **default screen** :

Default, select the screen with the 4-parameter voltage measurement.

Customised 1 parameter, select the first 1-parameter customisable screen.

Customised 3 parameter, select the first 3-parameter customisable screen.

Customised 4 parameter, select the first 4-parameter customisable screen.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the home screen of the setup menu **Figure 114**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

5.6.21.- Expansion modules.

If expansion modules have been connected in the unit, the programming of the various modules can be accessed via this menu. See ***"7.- EXPANSION MODULES".***

6.- INTEGRATED COMMUNICATIONS

The **CVM-B** units have one RS-485 communications port.
The unit has as standard two communications protocols: **MODBUS RTU** ® and **BACnet**.

The protocol and configuration parameters are selected on the setup menu. (*"5.6.18.- In-tegrated communications."*).
The unit is factory configured with the **MODBUS** protocol.

6.1.- CONNECTIONS

The RS-485 cable should be wired with a twisted pair cable with mesh shield (minimum 3 wires), with a maximum distance between the **CVM-B** and the master unit of 1200 metres.
A maximum of 32 **CVM-B** units can be connected to this bus.

Use an intelligent converter to establish communications with the master unit.

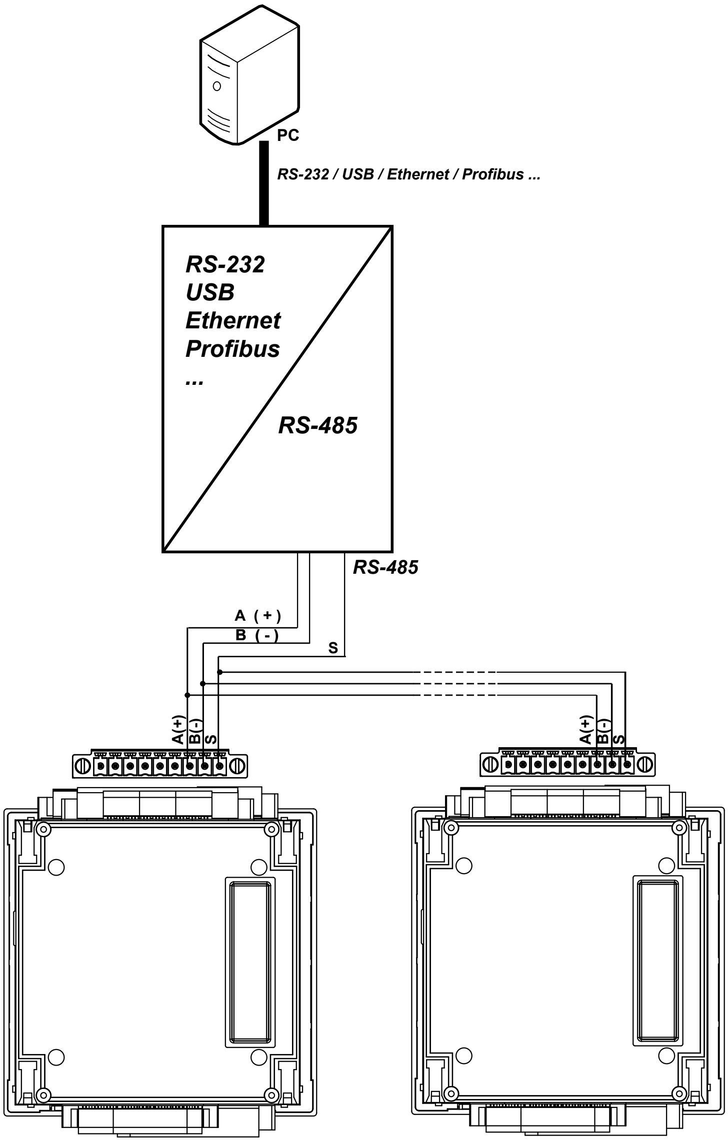


Figure 142: RS-485 Connection diagram.

6.2.- MODBUS PROTOCOL

The **MODBUS** protocol is a communication standard in the industry that enables the network connection of multiple units, where there is a master and multiple slaves. It allows individual master-slave dialogue and also enables commands in broadcast format.
In the **MODBUS** protocol, the **CVM-B** unit uses the RTU (Remote Terminal Unit) mode.

In the RTU mode, the message start and end are detected with silences of at least 3.5 characters, and the 16-bit CRC error-detection method is used.

The **MODBUS** functions implemented in the unit are:

Function 0x04. Reading registers.
Function 0x05. Writing a relay.
Function 0x10. Writing multiple registers.

Exception codes

If the bit with greatest weight of the byte corresponding to the function in the reply of the unit is 1, this indicates that the next byte is an exception code.

Address	Function	Exception code	CRC
0A	84	01	XXXX

Address: 0A, Peripheral number: 10 in decimal.
Function: 84, Reading function 04 with bit no. 7 at 1.
Exception code: 01, see **Table 23**.
CRC: 16-bit CRC.

Table 23: Exception code.

Exception code	Description
01	Incorrect function. The function number is not implemented.
02	Incorrect address or number of registers out of limits
03	Function not permitted
04	Peripheral error. An error occurred when accessing a peripheral (EEPROM, card, etc.)
05	Test dependent function
06	Slave busy. The card is processing the response, the query must be repeated.

6.2.1.- Example of MODBUS query

Query: Instantaneous value of the L1 phase voltage

Address	Function	Initial register	No. of registers	CRC
0A	04	0000	0002	70B0

Address: 0A, Peripheral number: 10 in decimal.
Function: 04, Read function.
Initial Register: 0000, register from which to start reading.
No. of registers: 0002, number of registers to be read.
CRC: 70B0, CRC character.

Response:

Address	Function	No. of Bytes	Register no. 1	Register no. 2	CRC
0A	04	04	0000	084D	8621

Address: 0A, Responding peripheral number: 10 in decimal.
Function: 04, Read function.
No. of bytes: 04, No. of bytes received.
Register: 0000084D, value of the L1 phase voltage: VL1 x 10: 212.5 V
CRC: 8621, CRC character.

6.3.- MODBUS MEMORY MAP

All **MODBUS** map addresses are hexadecimal.

6.3.1.- Measurement Variables

For these variables **Function 0x04** is implemented: reading registers.
Each instantaneous value occupies 2 registers.
The maximum and minimum values occupy 4 registers, 2 for the variable value while the next two indicate the date and time when the maximum or minimum value was read, in compact format (U32).

The short format of the register date and time is:

Bit 32	Bits 31 ... 27	Bits 26...23	Bits 22...18	Bits 17...13	Bits 12...7	Bits 6...1
x	Year	Month	Day	Hour	Minutes	seconds

The year is calculated with the offset = 2013, that is the
Real Year : 2013 + Year (bits 31 ...27) .

Each unit occupies a separate register.

Table 24: Modbus memory map: measurement variables

Parameter	Symbol	Instantaneous	Maximum	Minimum	Units [1]
Phase voltage L1	V1	00-01	100-103	300-303	157C
Current L1	A1	02-03	104-107	304-307	157D
Active Power L1	kW1	04-05	108-10B	308-30B	1580
Inductive Reactive Power L1	kvarL1	06-07	10C-10F	30C-30F	1580
Capacitive Reactive Power L1	kvarC1	08-09	110-113	310-313	1580
Apparent Power L1	kVA1	0A-0B	114-117	314-317	1580
Power Factor L1	PF1	0C-0D	118-11B	318-31B	1583
Cos φ L1	Cos φ1	0E-0F	11C-11F	31C-31F	x 100
Phase voltage L2	V2	10-11	120-123	320-323	157C
Current L2	A2	12-13	124-127	324-327	157D
Active Power L2	kW2	14-15	128-12B	328-32B	1580
Inductive Reactive Power L2	kvarL2	16-17	12C-12F	32C-32F	1580
Capacitive Reactive Power L2	kvarC2	18-19	130-133	330-333	1580
Apparent Power L2	kVA2	1A-1B	134-137	334-337	1580
Power Factor L2	PF2	1C-1D	138-13B	338-33B	1583
Cos φ L2	Cos φ2	1E-1F	13C-13F	33C-33F	x 100
Phase voltage L3	V3	20-21	140-143	340-343	157C
Current L3	A3	22-23	144-147	344-347	157D
Active Power L3	kW3	24-25	148-14B	348-34B	1580
Inductive Reactive Power L3	kvarL3	26-27	14C-14F	34C-34F	1580
Capacitive Reactive Power L3	kvarC3	28-29	150-153	350-353	1580
Apparent Power L3	kVA3	2A-2B	154-157	354-357	1580
Power Factor L3	PF3	2C-2D	158-15B	358-35B	1583
Cos φ L3	Cos φ3	2E-2F	15C-15F	35C-35F	x 100
Neutral Voltage	Vn	30-31	160-163	360-363	157C
Neutral Current	In	32-33	164-167	364-367	157E
Frequency L1	Hz	34-35	168-16B	368-36B	157F
Voltage L1-L2	V12	36-37	16C-16F	36C-36F	157C
Voltage L2-L3	V23	38-39	170-173	370-373	157C
Voltage L3-L1	V31	3A-3B	174-177	374-377	157C
Line III voltage	Vc III	3C-3D	178-17B	378-37B	157C
Three-phase voltage	Vn III	3E-3F	17C-17F	37C-37F	157C
Three-phase current	I III	40-41	180-183	380-383	157D
Active three-phase power	kW III	42-43	184-187	384-387	1580
Three-phase inductive power	kvarL III	44-45	188-18B	388-38B	1580
Three-phase capacitive power	kvarC III	46-47	18C-18F	38C-38F	1580
Three-phase apparent power	kVA III	48-49	190-193	390-393	1580
Three-phase Power Factor	PF III	4A-4B	194-197	394-397	1583
Three-phase Cos φ	Cos φ III	4C-4D	198-19B	398-39B	x100
Voltage THD % L1	THDV1	4E-4F	19C-19F	39C-39F	1582
Voltage THD % L2	THDV2	50-51	1A0-1A3	3A0-3A3	1582
Voltage THD % L3	THDV3	52-53	1A4-1A7	3A4-3A7	1582
Voltage THD % Vn	THDVN	54-55	1A8-1AB	3A8-3AB	1582
Current THD % L1	THDI1	56-57	1AC-1AF	3AC-3AF	1582
Current THD % L2	THDI2	58-59	1B0-1B3	3B0-3B3	1582
Current THD % L3	THDI3	5A-5B	1B4-1B7	3B4-3B7	1582

Table 24 (Continuation) : Modbus memory map: measurement variables

Parameter	Symbol	Instantaneous	Maximum	Minimum	Units [(1)]
Current THD % In	THDIN	5C-5D	1B8-1BB	3B8-3BB	1582
Reactive Power L1	kvar	5E-5F	1BC-1BF	3BC-3BF	1580
Reactive Power L2	kvar	60-61	1C0-1C3	3C0-3C3	1580
Reactive Power L3	kvar	62-63	1C4-1C7	3C4-3C7	1580
Three-phase reactive power	kvar	64-65	1C8-1CB	3C8-3CB	1580
Reactive Power Consumed L1	kvarC	66-67	1CC-1CF	3CC-3CF	1580
Reactive Power Consumed L2	kvarC	68-69	1D0-1D3	3D0-3D3	1580
Reactive Power Consumed L3	kvarC	6A-6B	1D4-1D7	3D4-3D7	1580
Three-phase reactive power consumed	kvarC	6C-6D	1D8-1DB	3D8-3DB	1580
Reactive Power Generated L1	kvarG	6E-6F	1DC-1DF	3DC-3DF	1580
Reactive Power Generated L2	kvarG	70-71	1E0-1E3	3E0-3E3	1580
Reactive Power Generated L3	kvarG	72-73	1E4-1E7	3E4-3E7	1580
Three-phase reactive power generated	kvarG	74-75	1E8-1EB	3E8-3EB	1580
Phase 1 Quadrant	-	76-77	-	-	-
Phase 2 Quadrant	-	78-79	-	-	-
Phase 3 Quadrant	-	7A-7B	-	-	-
Neutral Quadrant	-	7C-7D	-	-	-

[(1)] Format of the units: Power of 10 (with sign).

Example : *L1 Voltage phase instantaneous value*: 523. *Units*: - 2. *Real value* : 523x10^{-2}= 52.3V

6.3.2.- Current Energy Variables

For these variables **Function 0x04** is implemented: reading registers.
3 registers must be read for each one, the first two are the whole part and the third the decimal part.

Table 25: Modbus memory map: current energy variables.

Parameter	Symbol	Address	
		1 [(1)]	2 [(1)]
Tariff 1			
Active energy consumed L1	kWh L1	514-515	516
Active energy consumed L2	kWh L2	517-518	519
Active energy consumed L3	kWh L3	51A-51B	51C
Active energy consumed LIII	kWh LIII	51D-51E	51F
Inductive reactive energy consumed L1	kvarhL L1	520-521	522
Inductive reactive energy consumed L2	kvarhL L2	523-524	525
Inductive reactive energy consumed L3	kvarhL L3	526-527	528
Inductive reactive energy consumed LIII	kvarhL LIII	529-52A	52B
Capacitive reactive energy consumed L1	kvarhC L1	52C-52D	52E
Capacitive reactive energy consumed L2	kvarhC L2	52F-530	531
Capacitive reactive energy consumed L3	kvarhC L3	532-533	534
Capacitive reactive energy consumed LIII	kvarhC LIII	535-536	537
Reactive energy consumed L1	kvarh L1	538-539	53A
Reactive energy consumed L2	kvarh L2	53B -53C	53D
Reactive energy consumed L3	kvarh L3	53E-53F	540
Reactive energy consumed LIII	kvarh LIII	541-542	543

Table 25 (Continuation) : Modbus memory map: current energy variables.

Parameter	Symbol	Address	
		1 (1)	2 (1)
Apparent energy consumed L1	kVAh L1	544-545	546
Apparent energy consumed L2	kVAh L2	547-548	549
Apparent energy consumed L3	kVAh L3	54A-54B	54C
Apparent energy consumed LIII	kVAh LIII	54D-54E	54F
Active energy generated L1	kWh L1 (-)	550-551	552
Active energy generated L2	kWh L2 (-)	553-554	555
Active energy generated L3	kWh L3 (-)	556-557	558
Active energy generated LIII	kWh LIII (-)	559-55A	55B
Inductive reactive energy generated L1	kvarhL L1 (-)	55C-55D	55E
Inductive reactive energy generated L2	kvarhL L2 (-)	55F-560	561
Inductive reactive energy generated L3	kvarhL L3 (-)	562-563	564
Inductive reactive energy generated LIII	kvarhL LIII (-)	565-566	567
Capacitive reactive energy generated L1	kvarhC L1 (-)	568-569	56A
Capacitive reactive energy generated L2	kvarhC L2 (-)	56B -56C	56D
Capacitive reactive energy generated L3	kvarhC L3 (-)	56E-56F	570
Capacitive reactive energy generated LIII	kvarhC LIII (-)	571-572	573
Reactive energy generated L1	kvarh L1 (-)	574-575	576
Reactive energy generated L2	kvarh L2 (-)	577-578	579
Reactive energy generated L3	kvarh L3 (-)	57A-57B	57C
Reactive energy generated LIII	kvarh LIII (-)	57D-57E	57F
Apparent energy generated L1	kVAh L1 (-)	580-581	582
Apparent energy generated L2	kVAh L2 (-)	583-584	585
Apparent energy generated L3	kVAh L3 (-)	586-587	588
Apparent energy generated LIII	kVAh LIII (-)	589-58A	58B
Tariff 2			
Active energy consumed L1	kWh L1	58C-58D	58E
Active energy consumed L2	kWh L2	58F-590	591
Active energy consumed L3	kWh L3	592-593	594
Active energy consumed LIII	kWh LIII	595-596	597
Inductive reactive energy consumed L1	kvarhL L1	598-599	59A
Inductive reactive energy consumed L2	kvarhL L2	59B -59C	59D
Inductive reactive energy consumed L3	kvarhL L3	59E-59F	5A0
Inductive reactive energy consumed LIII	kvarhL LIII	5A1-5A2	5A3
Capacitive reactive energy consumed L1	kvarhC L1	5A4-5A5	5A6
Capacitive reactive energy consumed L2	kvarhC L2	5A7-5A8	5A9
Capacitive reactive energy consumed L3	kvarhC L3	5AA-5AB	5AC
Capacitive reactive energy consumed LIII	kvarhC LIII	5AD-5AE	5AF
Reactive energy consumed L1	kvarh L1	5B0-5B1	5B2
Reactive energy consumed L2	kvarh L2	5B3-5B4	5B5
Reactive energy consumed L3	kvarh L3	5B6-5B7	5B8
Reactive energy consumed LIII	kvarh LIII	5B9-5BA	5BB
Apparent energy consumed L1	kVAh L1	5BC-5BD	5BE
Apparent energy consumed L2	kVAh L2	5BF-5C0	5C1
Apparent energy consumed L3	kVAh L3	5C2-5C3	5C4
Apparent energy consumed LIII	kVAh LIII	5C5-5C6	5C7

Table 25 (Continuation) : Modbus memory map: current energy variables.

Parameter	Symbol	Address	
		1 (1)	2 (1)
Active energy generated L1	kWh L1 (-)	5C8-5C9	5CA
Active energy generated L2	kWh L2 (-)	5CB-5CC	5CD
Active energy generated L3	kWh L3 (-)	5CE-5CF	5D0
Active energy generated LIII	kWh LIII (-)	5D1-5D2	5D3
Inductive reactive energy generated L1	kvarhL L1 (-)	5D4-5D5	5D6
Inductive reactive energy generated L2	kvarhL L2 (-)	5D7-5D8	5D9
Inductive reactive energy generated L3	kvarhL L3 (-)	5DA-5DB	5DC
Inductive reactive energy generated LIII	kvarhL LIII (-)	5DD-5DE	5DF
Capacitive reactive energy generated L1	kvarhC L1 (-)	5E0-5E1	5E2
Capacitive reactive energy generated L2	kvarhC L2 (-)	5E3-5E4	5E5
Capacitive reactive energy generated L3	kvarhC L3 (-)	5E6-5E7	5E8
Capacitive reactive energy generated LIII	kvarhC LIII (-)	5E9-5EA	5EB
Reactive energy generated L1	kvarh L1 (-)	5EC-5ED	5EE
Reactive energy generated L2	kvarh L2 (-)	5EF-5F0	5F1
Reactive energy generated L3	kvarh L3 (-)	5F2-5F3	5F4
Reactive energy generated LIII	kvarh LIII (-)	5F5-5F6	5F7
Apparent energy generated L1	kVAh L1 (-)	5F8-5F9	5FA
Apparent energy generated L2	kVAh L2 (-)	5FB-5FC	5FD
Apparent energy generated L3	kVAh L3 (-)	5FE-5FF	600
Apparent energy generated LIII	kVAh LIII (-)	601-602	603
Tariff 3			
Active energy consumed L1	kWh L1	604-605	606
Active energy consumed L2	kWh L2	607-608	609
Active energy consumed L3	kWh L3	60A-60B	60C
Active energy consumed LIII	kWh LIII	60D-60E	60F
Inductive reactive energy consumed L1	kvarhL L1	610-611	612
Inductive reactive energy consumed L2	kvarhL L2	613-614	615
Inductive reactive energy consumed L3	kvarhL L3	616-617	618
Inductive reactive energy consumed LIII	kvarhL LIII	619-61A	61B
Capacitive reactive energy consumed L1	kvarhC L1	61C-61D	61E
Capacitive reactive energy consumed L2	kvarhC L2	61F-620	621
Capacitive reactive energy consumed L3	kvarhC L3	622-623	624
Capacitive reactive energy consumed LIII	kvarhC LIII	625-626	627
Reactive energy consumed L1	kvarh L1	628-629	62A
Reactive energy consumed L2	kvarh L2	62B -62C	62D
Reactive energy consumed L3	kvarh L3	62E-62F	630
Reactive energy consumed LIII	kvarh LIII	631-632	633
Apparent energy consumed L1	kVAh L1	634-635	636
Apparent energy consumed L2	kVAh L2	637-638	639
Apparent energy consumed L3	kVAh L3	63A-63B	63C
Apparent energy consumed LIII	kVAh LIII	63D-63E	63F
Active energy generated L1	kWh L1 (-)	640-641	642
Active energy generated L2	kWh L2 (-)	643-644	645
Active energy generated L3	kWh L3 (-)	646-647	648
Active energy generated LIII	kWh LIII (-)	649-64A	64B

Table 25 (Continuation) : Modbus memory map: current energy variables.

Parameter	Symbol	Address	
		1 (1)	2 (1)
Inductive reactive energy generated L1	kvarhL L1 (-)	64C-64D	64E
Inductive reactive energy generated L2	kvarhL L2 (-)	64F-650	651
Inductive reactive energy generated L3	kvarhL L3 (-)	652-653	654
Inductive reactive energy generated LIII	kvarhL LIII (-)	655-656	657
Capacitive reactive energy generated L1	kvarhC L1 (-)	658-659	65A
Capacitive reactive energy generated L2	kvarhC L2 (-)	65B -65C	65D
Capacitive reactive energy generated L3	kvarhC L3 (-)	65E-65F	660
Capacitive reactive energy generated LIII	kvarhC LIII (-)	661-662	663
Reactive energy generated L1	kvarh L1 (-)	664-665	666
Reactive energy generated L2	kvarh L2 (-)	667-668	669
Reactive energy generated L3	kvarh L3 (-)	66A-66B	66C
Reactive energy generated LIII	kvarh LIII (-)	66D-66E	66F
Apparent energy generated L1	kVAh L1 (-)	670-671	672
Apparent energy generated L2	kVAh L2 (-)	673-674	675
Apparent energy generated L3	kVAh L3 (-)	676-677	678
Apparent energy generated LIII	kVAh LIII (-)	679-67A	67B
Total			
Active energy consumed L1	kWh L1	67C-67D	67E
Active energy consumed L2	kWh L2	67F-680	681
Active energy consumed L3	kWh L3	682-683	684
Active energy consumed LIII	kWh LIII	685-686	687
Inductive reactive energy consumed L1	kvarhL L1	688-689	68A
Inductive reactive energy consumed L2	kvarhL L2	68B -68C	68D
Inductive reactive energy consumed L3	kvarhL L3	68E-68F	690
Inductive reactive energy consumed LIII	kvarhL LIII	691-692	693
Capacitive reactive energy consumed L1	kvarhC L1	694-695	696
Capacitive reactive energy consumed L2	kvarhC L2	697-698	699
Capacitive reactive energy consumed L3	kvarhC L3	69A-69B	69C
Capacitive reactive energy consumed LIII	kvarhC LIII	69D-69E	69F
Reactive energy consumed L1	kvarh L1	6A0-6A1	6A2
Reactive energy consumed L2	kvarh L2	6A3-6A4	6A5
Reactive energy consumed L3	kvarh L3	6A6-6A7	6A8
Reactive energy consumed LIII	kvarh LIII	6A9-6AA	6AB
Apparent energy consumed L1	kVAh L1	6AC-6AD	6AE
Apparent energy consumed L2	kVAh L2	6AF-6B0	6B1
Apparent energy consumed L3	kVAh L3	6B2-6B3	6B4
Apparent energy consumed LIII	kVAh LIII	6B5-6B6	6B7
Active energy generated L1	kWh L1 (-)	6B8-6B9	6BA
Active energy generated L2	kWh L2 (-)	6BB-6BC	6BD
Active energy generated L3	kWh L3 (-)	6BE-6BF	6C0
Active energy generated LIII	kWh LIII (-)	6C1-6C2	6C3
Inductive reactive energy generated L1	kvarhL L1 (-)	6C4-6C5	6C6
Inductive reactive energy generated L2	kvarhL L2 (-)	6C7-6C8	6C9
Inductive reactive energy generated L3	kvarhL L3 (-)	6CA-6CB	6CC
Inductive reactive energy generated LIII	kvarhL LIII (-)	6CD-6CE	6CF

Table 25 (Continuation) : Modbus memory map: current energy variables.

Parameter	Symbol	Address	
		1 (1)	2 (1)
Capacitive reactive energy generated L1	kvarhC L1 (-)	6D0-6D1	6D2
Capacitive reactive energy generated L2	kvarhC L2 (-)	6D3-6D4	6D5
Capacitive reactive energy generated L3	kvarhC L3 (-)	6D6-6D7	6D8
Capacitive reactive energy generated LIII	kvarhC LIII (-)	6D9-6DA	6DB
Reactive energy generated L1	kvarh L1 (-)	6DC-6DD	6DE
Reactive energy generated L2	kvarh L2 (-)	6DF-6E0	6E1
Reactive energy generated L3	kvarh L3 (-)	6E2-6E3	6E4
Reactive energy generated LIII	kvarh LIII (-)	6E5-6E6	6E7
Apparent energy generated L1	kVAh L1 (-)	6E8-6E9	6EA
Apparent energy generated L2	kVAh L2 (-)	6EB-6EC	6ED
Apparent energy generated L3	kVAh L3 (-)	6EE-6EF	6F0
Apparent energy generated LIII	kVAh LIII (-)	6F1-6F2	6F3

(1)***Note :***The energy units are at address 0x1580.
Format of the units: Power of 10 (with sign).
Unit (Register 0x1580) = 0 → Address 1: kW and Address 2: W
Unit (Register 0x1580) = -3 → Address 1: W and Address 2: mW

6.3.3.- Maximum Demand Variables

For these variables **Function 0x04** is implemented: reading registers.
Each instantaneous value occupies 2 registers.
The maximum values occupy 4 registers, 2 for the variable value while the next two indicate the date and time when the maximum occurred, in compact format.

Table 26: Modbus memory map: Maximum Demand variables

Parameter	Tariff 1		Tariff 2		Tariff 3	
	Instantaneous	Maximum	Instantaneous	Maximum	Instantaneous	Maximum
Current L1	A8C-A8D	D48-D4B	AA4-AA5	D78-D7B	ABC-ABD	DA8-DAB
Current L2	A8E-A8F	D4C-D4F	AA6-AA7	D7C-D7F	ABE-ABF	DAC-DAF
Current L3	A90-A91	D50-D53	AA8-AA9	D80-D83	AC0-AC1	DB0-DB3
Three-phase current	A92-A93	D54-D57	AAA-AAB	D84-D87	AC2-AC3	DB4-DB7
Active Power L1	A94-A95	D58-D5B	AAC-AAD	D88-D8B	AC4-AC5	DB8-DBB
Active Power L2	A96-A97	D5C-D5F	AAE-AAF	D8C-D8F	AC6-AC7	DBC-DBF
Active Power L3	A98-A99	D60-D63	AB0-AB1	D90-D93	AC8-AC9	DC0-DC3
Active three-phase power	A9A-A9B	D64-D67	AB2-AB3	D94-D97	ACA-ACB	DC4-DC7
ApparentPower L1	A9C-A9D	D68-D6B	AB4-AB5	D98-D9B	ADC-ACD	DC8-DCB
Apparent Power L2	A9E-A9F	D6C-D6F	AB6-AB7	D9C-D9F	ACE-ACF	DCC-DCF
Apparent Power L3	AA0-AA1	D70-D73	AB8-AB9	DA0-DA3	AD0-AD1	DD0-DD3
Three-phase Apparent Power	AA2-AA3	D74-D77	ABA-ABB	DA4-DA7	AD2-AD3	DD4-DD7

Note : *The voltage units are at address 0x157D and the power units at address 0x1580. Format of the units: Power of 10 (with sign).*

6.3.4.- Voltage and current harmonics.

The first two registers are the RMS value of the fundamental harmonic, followed by the 50 harmonics, each one of 1 register size.
For these variables **Function 0x04** is implemented: reading registers.

Table 27:Modbus memory map: Voltage and current harmonics.

Parameter	Voltage L1	Voltage L2	Voltage L3	Neutral Voltage	Units (1)
Fundamental Harm.	125C-125D	1290 – 1291	12C4 -12C5	12F8 – 12F9	V x 100
2nd Order harmonic	125E	1292	12C6	12FA	1581
3rd Order harmonic	125F	1293	12C7	12FB	1581
4th Order harmonic	1260	1294	12C8	12FC	1581
5th Order harmonic	1261	1295	12C9	12FD	1581
6th Order harmonic	1262	1296	12CA	12FE	1581
7th Order harmonic	1263	1297	12CB	12FF	1581
8th Order harmonic	1264	1298	12CC	1300	1581
9th Order harmonic	1265	1299	12CD	1301	1581
10th Order harmonic	1266	129A	12CE	1302	1581
11th Order harmonic	1267	129B	12CF	1303	1581
12th Order harmonic	1268	129C	12D0	1304	1581
13th Order harmonic	1269	129D	12D1	1305	1581
14th Order harmonic	126A	129E	12D2	1306	1581
15th Order harmonic	126B	129F	12D3	1307	1581
16th Order harmonic	126C	12A0	12D4	1308	1581
17th Order harmonic	126D	12A1	12D5	1309	1581
18th Order harmonic	126E	12A2	12D6	130A	1581
19th Order harmonic	126F	12A3	12D7	130B	1581
20th Order harmonic	1270	12A4	12D8	130C	1581
21st Order harmonic	1271	12A5	12D9	130D	1581
22nd Order harmonic	1272	12A6	12DA	130E	1581
23rd Order harmonic	1273	12A7	12DB	130F	1581
24th Order harmonic	1274	12A8	12DC	1310	1581
25th Order harmonic	1275	12A9	12DD	1311	1581
26th Order harmonic	1276	12AA	12DE	1312	1581
27th Order harmonic	1277	12AB	12DF	1313	1581
28th Order harmonic	1278	12AC	12E0	1314	1581
29th Order harmonic	1279	12AD	12E1	1315	1581
30th Order harmonic	127A	12AE	12E2	1316	1581
31st Order harmonic	127B	12AF	12E3	1317	1581
32nd Order harmonic	127C	12B0	12E4	1318	1581
33rd Order harmonic	127D	12B1	12E5	1319	1581
34th Order harmonic	127E	12B2	12E6	131A	1581
35th Order harmonic	127F	12B3	12E7	131B	1581
36th Order harmonic	1280	12B4	12E8	131C	1581
37th Order harmonic	1281	12B5	12E9	131D	1581
38th Order harmonic	1282	12B6	12EA	131E	1581
39th Order harmonic	1283	12B7	12EB	131F	1581
40th Order harmonic	1284	12B8	12EC	1320	1581

Table 27 (Continuation) : Modbus memory map: Voltage and current harmonics.

Parameter	Voltage L1	Voltage L2	Voltage L3	Neutral Voltage	Units (1)
41st Order harmonic	1285	12B9	12ED	1321	1581
42nd Order harmonic	1286	12BA	12EE	1322	1581
43rd Order harmonic	1287	12BB	12EF	1323	1581
44th Order harmonic	1288	12BC	12F0	1324	1581
45th Order harmonic	1289	12BD	12F1	1325	1581
46th Order harmonic	128A	12BE	12F2	1326	1581
47th Order harmonic	128B	12BF	12F3	1327	1581
48th Order harmonic	128C	12C0	12F4	1328	1581
49th Order harmonic	128D	12C1	12F5	1329	1581
50th Order harmonic	128E	12C2	12F6	132A	1581
Parameter	**Current L1**	**Current L2**	**Current L3**	**Neutral Current**	**Units (1)**
Fundamental Harm.	132E – 132F	1362 – 1363	1396 – 1397	13CA – 13CB	A x 1000
2nd Order harmonic	1330	1364	1398	13CC	1581
3rd Order harmonic	1331	1365	1399	13CD	1581
4th Order harmonic	1332	1366	139A	13CE	1581
5th Order harmonic	1333	1367	139B	13CF	1581
6th Order harmonic	1334	1368	139C	13D0	1581
7th Order harmonic	1335	1369	139D	13D1	1581
8th Order harmonic	1336	136A	139E	13D2	1581
9th Order harmonic	1337	136B	139F	13D3	1581
10th Order harmonic	1338	136C	13A0	13D4	1581
11th Order harmonic	1339	136D	13A1	13D5	1581
12th Order harmonic	133A	136E	13A2	13D6	1581
13th Order harmonic	133B	136F	13A3	13D7	1581
14th Order harmonic	133C	1370	13A4	13D8	1581
15th Order harmonic	133D	1371	13A5	13D9	1581
16th Order harmonic	133E	1372	13A6	13DA	1581
17th Order harmonic	133F	1373	13A7	13DB	1581
18th Order harmonic	1340	1374	13A8	13DC	1581
19th Order harmonic	1341	1375	13A9	13DD	1581
20th Order harmonic	1342	1376	13AA	13DE	1581
21st Order harmonic	1343	1377	13AB	13DF	1581
22nd Order harmonic	1344	1378	13AC	13E0	1581
23rd Order harmonic	1345	1379	13AD	13E1	1581
24th Order harmonic	1346	137A	13AE	13E2	1581
25th Order harmonic	1347	137B	13AF	13E3	1581
26th Order harmonic	1348	137C	13B0	13E4	1581
27th Order harmonic	1349	137D	13B1	13E5	1581
28th Order harmonic	134A	137E	13B2	13E6	1581
29th Order harmonic	134B	137F	13B3	13E7	1581
30th Order harmonic	134C	1380	13B4	13E8	1581
31st Order harmonic	134D	1381	13B5	13E9	1581
32nd Order harmonic	134E	1382	13B6	13EA	1581
33rd Order harmonic	134F	1383	13B7	13EB	1581
34th Order harmonic	1350	1384	13B8	13EC	1581
35th Order harmonic	1351	1385	13B9	13ED	1581

Table 27 (Continuation) : Modbus memory map: Voltage and current harmonics.

Parameter	Voltage L1	Voltage L2	Voltage L3	Neutral Voltage	Units (1)
36th Order harmonic	1352	1386	13BA	13EE	1581
37th Order harmonic	1353	1387	13BB	13EF	1581
38th Order harmonic	1354	1388	13BC	13F0	1581
39th Order harmonic	1355	1389	13BD	13F1	1581
40th Order harmonic	1356	138A	13BE	13F2	1581
41st Order harmonic	1357	138B	13BF	13F3	1581
42nd Order harmonic	1358	138C	13C0	13F4	1581
43rd Order harmonic	1359	138D	13C1	13F5	1581
44th Order harmonic	135A	138E	13C2	13F6	1581
45th Order harmonic	135B	138F	13C3	13F7	1581
46th Order harmonic	135C	1390	13C4	13F8	1581
47th Order harmonic	135D	1391	13C5	13F9	1581
48th Order harmonic	135E	1392	13C6	13FA	1581
49th Order harmonic	135F	1393	13C7	13FB	1581
50th Order harmonic	1360	1394	13C8	13FC	1581

(1) Format of the units: Power of 10 (with sign).

6.3.5.- Cost variables

These parameters occupy 2 registers each.
Each unit occupies a separate register.
For these variables **Function 0x04** is implemented: reading registers.

Table 28: Modbus memory map: cost variables

Parameter	Tariff 1	Tariff 2	Tariff 3	Total	Units (1)
No. of active energy hours consumed LIII	15E0-15E1	15EC-15ED	15F8-15F9	1604-1605	1584
Cost of active energy consumed LIII	15E2-15E3	15EE-15EF	15FA-15FB	1606-1607	1586
Consumed CO_2 emissions	15E4-15E5	15F0-15F1	15FC-15FD	1608-1609	1585
No. of active energy hours generated LIII	15E6-15E7	15F2-15F3	15FE-15FF	160A-160B	1584
Cost of active energy generated LIII	15E8-15E9	15F4-15F5	1600-1601	160C-160D	1586
Generated CO_2 emissions	15EA-15EB	15F6-15F7	1602-1603	160E-160F	1585

(1) Format of the units: Power of 10 (with sign).

6.3.6.- Angle variables

These parameters occupy 2 registers each.
For these variables **Function 0x04** is implemented: reading registers.

Table 29:Modbus memory map: Angle variables.

Parameter	Address	Units
V1-V2 angle	1770-1771	Degrees x 1000 (with sign)
V2-V3 angle	1772-1773	Degrees x 1000 (with sign)
V3-V1 angle	1774-1775	Degrees x 1000 (with sign)
V1-I1 angle	1776-1777	Degrees x 1000 (with sign)
V2-I2 angle	1778-1779	Degrees x 1000 (with sign)
V3-I3 angle	177A-177B	Degrees x 1000 (with sign)

6.3.7.- Unit configuration variables

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Note: *The programming values must be written in hexadecimal.*

⚠	It is necessary to change the screen when a setup change is made for communications in order for the changes take effect in the display.

6.3.7.1.- Date and time

These parameters occupy 1 register each.

Table 30:Modbus memory map: Configuration variables (Date and Time).

Date and Time			
Configuration variable	**Address**	**Valid data window**	**Default value**
Year	283C	**2013** to **2076**	-
Month	283D	**1** to **12**	-
Day	283E	**1** to **31**	-
Time	283F	**0** to **23**	-
Minutes	2840	**0** to **59**	-
Seconds	2841	**0** to **59**	-

Note: *The 6 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.2.- Time zone

These parameters occupy 1 register each.

Table 31:Modbus memory map: Configuration variables (time zone).

Local time configuration			
Configuration variable	**Address**	**Valid data window**	**Default value**
Configuration of local time	2A9E	**Table 32**	0
Time	2A9F	**0**: Winter **1**:Summer	0

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 32: Configuration of local time

Local time parameter			
Local time	**Value**	**Local time**	**Value**
UTC+1	0x0000	UTC-11	0x000C
UTC+2	0x0001	UTC-10	0x000D
UTC+3	0x0002	UTC-9	0x000E
UTC+4	0x0003	UTC-8	0x000F
UTC+5	0x0004	UTC-7	0x0010
UTC+6	0x0005	UTC-6	0x0011
UTC+7	0x0006	UTC-5	0x0012
UTC+8	0x0007	UTC-4	0x0013
UTC+9	0x0008	UTC-3	0x0014
UTC+10	0x0009	UTC-2	0x0015
UTC+11	0x000A	UTC-1	0x0016
UTC+12	0x000B	UTC	0x0017

6.3.7.3.- Language

This parameter occupies 1 register.

Table 33:Modbus memory map: Configuration variables (language).

Language			
Configuration variable	**Address**	**Valid data window**	**Default value**
Unit language	2A9C	**0**: Spanish **1**: English **2**: German **3**: French **4**: Chinese **5**: Korean	1

6.3.7.4.- Access key

The ***Enable*** configuration variable occupies 1 register.
The ***Value*** configuration variable occupies 4 registers.

Table 34: Modbus memory map: Configuration variables (Access key).

Access key			
Configuration variable	**Address**	**Valid data window**	**Default value**
Enabled	2A97	**0**: Enabled **1**: Disabled	1
Value	2A98-2A9B	**0- 9**	0x0001 0x0009 0x0007 0x0003

Note: *The 5 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.5.- Measurement connection mode

This parameter occupies 1 register.

Table 35: Modbus memory map: Configuration variables (Measurement connection mode).

Measurement connection mode			
Configuration variable	**Address**	**Valid data window**	**Default value**
Measurement connection mode	2A9D	**0**: Single-phase **1**: Two-phase **2**: Two-phase with Neutral **3**: Three-phase **4**: Three-phase with Neutral **5**: Aron	4

6.3.7.6.- Ratio of voltage and current transformers

These parameters occupy 2 registers each.

Table 36:Modbus memory map: Configuration variables (transformation ratios)

Transformation ratios			
Configuration variable	**Address**	**Valid data window**	**Default value**
Primary voltage [(1)] [(2)]	2710-2711	**1 - 500000**	1
Secondary voltage [(1)][(4)]	2712-2713	**1 - 9999**	10
Primary current [(2)]	2714-2715	*Minimum value:* **1** *Maximum value:* ../1A y ../5 A: **10000** ../ 0.250 A: **1500**	5
Secondary current	2716-2717	**1** : ../1A **5** : ../5 A **250** : ../ 0.250 A	5
Primary neutral current	2718-2719	**1 - 10000**	5
Secondary neutral current	271A-271B	**0**: Calculated current **1** : ../1A **5** : ../5 A	5
Rated voltage [(3)]	271C-271D	*Minimum value:* (Rated Voltage / Voltage ratio[(5)]) ≥ **50** *Maximum value:* (Rated Voltage / Voltage ratio[(5)]) ≤ **1000**	230.00

[(1)] Primary voltage/Secondary voltage must not exceed the value 9999.
[(2)] Primary voltage * Primary current must not exceed the value 60MW.
[(3)] It has 2 decimals.
[(4)] The secondary voltage has 1 decimal.
[(5)] The voltage ratio is the ratio between the primary and secondary voltage.

Note: *The 14 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.7.- Display of variables

This parameter occupies 1 register.

Table 37:Modbus memory map: Configuration variables (Display of variables).

Selection of variables to be displayed			
Configuration variable	**Address**	**Valid data window**	**Default value**
Selection of variables to be displayed	2A94 – 2A95	0x00FF FFFF(1)	0x00FF 0xFFFF

(1) Each variable bit indicates the display (1) or not (0) of a parameter, see **Table 38**, where Bit 0 is the lowest bit and bit 32 the highest.
The variable can never have a value of 0x0000 0000; one parameter must at least be displayed. The unit will return a frame error if this happens.

Table 38: Display of variables (List of parameters)

Bit	Description	Address	Valid data window
0	Phase-Neutral Voltage	**12**	Current THD
1	Phase-Phase Voltage	**13**	Active Energy
2	Current	**14**	Inductive Reactive Energy
3	Frequency	**15**	Capacitive Reactive Energy
4	Active power	**16**	Total Reactive Energy
5	Inductive Reactive Power	**17**	Apparent Energy
6	Capacitive Reactive Power	**18**	No. hours of active tariff
7	Total Reactive Power	**19**	CO_2 Emissions
8	Apparent Power	**20**	Cost
9	Power Factor	**21**	Maximum current demand
10	Cosine φ	**22**	Maximum active power Demand
11	Voltage THD	**23**	Maximum apparent power demand

6.3.7.8.- Demand

These parameters occupy 1 register each.

Table 39:Modbus memory map: Configuration variables (Maximum Demand)

Maximum Demand			
Configuration variable	**Address**	**Valid data window**	**Default value**
Integration time (in minutes)	274C	**1** – **60**	15
Type of integration	274D	**0** : Scrolling window **1** : Fixed Window	0
Synchronisation	274E	**0** : Internal	0
Input	274F	**0** : Input 1	0

Note: *The 4 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.9.- Installation data

These parameters occupy 1 register each.

Table 40: Modbus memory map: Configuration variables (Installation data)

Installation data			
Configuration variable	**Address**	**Valid data window**	**Default value**
Nominal Frequency(1)	2720	**5000** or **6000**	5000
Number of quadrants	2722	**2** or **4**	4

(1) The units of the frequency are at address 0x157F. Format of the units: Power of 10 (with sign).

6.3.7.10.- Cost of energy consumption and generation

The ***Cost*** configuration variables occupy 2 registers each.
The ***Currency*** configuration variables occupy 4 registers.

Table 41:Modbus memory map: Configuration variables (Energy cost)

Energy cost			
Configuration variable	**Address**	**Valid data window**	**Default value**
Cost per kWh of tariff 1 consumption	27D8-27D9	**0** to **100** (1)	0
Cost per kWh of tariff 2 consumption	27DA-27DB	**0** to **100** (1)	0
Cost per kWh of tariff 3 consumption	27DC-27DD	**0** to **100** (1)	0
Cost per kWh of tariff 1 generation	27DE-27DF	**0** to **100** (1)	0
Cost per kWh of tariff 2 generation	27E0-27E1	**0** to **100** (1)	0
Cost per kWh of tariff 3 generation	27E2-27E3	**0** to **100** (1)	0
Currency	27E4-27E7	7 ascii characters	EURO

(1) The number of decimals are indicated at address **0x1586**. Format of the units: Power of 10 (with sign).

Note: *The 16 registers must be written and read at once (as a group), otherwise it will respond with an error.*

6.3.7.11.- CO_2 consumption and generation emissions

These parameters occupy 2 registers each.

Table 42:Modbus memory map: Configuration variables (CO_2 emissions)

$C0_2$ emissions			
Configuration variable	**Address**	**Valid data window**	**Default value**
Tariff 1 consumption emissions ratio	2774-2775	**0** to **100** (1)	0
Tariff 2 consumption emissions ratio	2776-2777	**0** to **100** (1)	0
Tariff 3 consumption emissions ratio	2778-2779	**0** to **100** (1)	0
Tariff 1 generation emissions ratio	277A-277B	**0** to **100** (1)	0
Tariff 2 generation emissions ratio	277C-277D	**0** to **100** (1)	0
Tariff 3 generation emissions ratio	277E-277F	**0** to **100** (1)	0

(1) The number of decimals are indicated at address **0x1585**. Format of the units: Power of 10 (with sign).

Note: *The 12 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.12.- Relay digital outputs

The ***Maximum Value*** and ***Minimum Value*** configuration variables occupy 2 registers each. All other variables occupy 1 register each.

Table 43:Modbus memory map: Relay digital outputs.

Configuration of the digital outputs of the relay				
Configuration variable	**Address**		**Valid data margin**	**Default value**
	Output 1	**Output 2**		
Maximum value [(1)]	4E48-4E49	4E5C-4E5D	**Table 44**	0
Minimum value[(1)]	4E4A-4E4B	4E5E-4E5F	**Table 44**	0
Connection delay (ON)	4E4C	4E60	**0** to **999** seconds	0
Disconnection delay (OFF)	4E4D	4E61	**0** to **999** seconds	0
Pre-alarm value	4E4E	4E62	**0** to **100** %	0
Output status	4E4F	4E63	**0** : Normally open **1**: Normally closed	0
Interlocking (latch)	4E50	4E64	**0** : Unlocked **1**: Locked	0
Not used	4E51	4E65	0	0
Variable code	4E52	4E66	**Table 21**	0
Module no.	4E53	4E67	0	0

(1) The decimal for the selected variable must be included when programming the maximum and minimum values.

Note: *The 12 registers of each output must be written and read at once (as a group), otherwise it will respond with an error.*

Table 44: Units and maximum and minimum values of the programming variables of the digital outputs.

Variable	Units	Maximum	Minimum
Phase-neutral voltage [(4)]	V	10000 * voltage ratio[(1)]	0
Phase-phase voltage[(4)]	V		
Neutral voltage[(4)]	V		
Current	mA	10000 *current ratio [(2)]	0
Neutral current	mA		
Frequency [(4)]	Hz	7000	4000
Active power [(3)]	W	180 000 000	-180 000 000
Apparent power [(3)]	VA		0
Total reactive power [(3)]	var		-180 000 000
Inductive reactive power [(3)]	var		0
Capacitive reactive power [(3)]	var		0
Power factor	-	100	-100
Cos φ	º	100	-100
Voltage THD %	%	1000	0
Current THD %	%	1000	0
Maximum Demand of Current	mA	10000 *current ratio [(2)]	0

Table 44 (Continuation): Units and maximum and minimum values of the programming variables of the digital outputs.

Variable	Units	Maximum	Minimum
Maximum Demand of Active Power	W	180 000 000	0
Maximum Demand of Apparent Power	VA		

(1) The voltage ratio is the ratio between the primary and secondary voltage.
(2) The current ratio is the ratio between the primary and secondary current.
(3) The three-phase powers accept up to 540 000 000 W.
(4) Variables with 2 decimals.

6.3.7.13.- Transistor digital outputs

The ***Maximum Value*** and ***Minimum Value*** configuration variables occupy 2 registers each. All other variables occupy 1 register each.

Table 45: Modbus memory map: Configuration variables (Transistor digital outputs).

Configuration of Transistor Digital Outputs						
Configuration variable		**Address**		**Valid data margin**		**Default value**
Alarm	**Impulse output**	**Output 1**	**Output 2**			
Maximum value (1)	Energy meter factor	4E20-4E21	4E34-4E35	**Table 44**		0
Min. value(1)	-	4E22-4E23	4E36-4E37	**Table 44**		0
Delay in the connection (ON)	High period	4E24	4E38	**Alarm** **0** a **999** s.	**Impulse output** **1** a **65536** (2)	0
Delay in the disconnection (OFF)	Low period	4E25	4E39	**0** a **999** s.	**1** a **65536** (2)	0
Pre-alarm value	-	4E26	4E3A	**0** al **100** %		0
Output status	-	4E27	4E3B	**0** : Normally open **1**: Normally closed		0
Interlocking (latch)	-	4E28	4E3C	**0** : Unlocked **1**: Locked		0
Not used	Not used	4E29	4E3D	0		0
Variable code		4E2A	4E3E	**Table 21**		0
Module no.		4E2B	4E3F	0		0

(1) When programming the maximum and minimum values, the decimals for the variable selected must be included.
(2) The programmed value is a multiple of 10 ms, i.e. when programming 1 the impulse will be at its minimum value of 10 ms.

Note: *The 12 registers of each output must be written and read at once (as a group), otherwise it will respond with an error.*

6.3.7.14.- Digital inputs

The ***Input Name*** configuration variable occupies 4 registers.
The ***Units*** configuration variable occupies 3 registers.
All other variables occupy 1 register each.

Table 46:Modbus memory map: Configuration variables (Digital Inputs).

Configuration of Digital Inputs				
Configuration variable	**Address**		**Valid data window**	**Default value**
	Input 1	**Input 2**		
Mode	4FB0	4FBC	**-1**: Tariff **0**: Logic state **> 0**:Impulses(1)	0
Logic (Logic state)	4FB1	4FBD	**0**: positive **1**: Negative	0
No. of decimals (Impulses)	4FB2	4FBE	**0** to **5**	0
Not used	4FB3	4FBF	0	0
Input name (impulses) (2)	4FB4 - 4FB7	4FC0 - 4FC3	**8** characters	"INPUT"
Units (Impulses) (2)	4FB8 - 4FBA	4FC4 - 4FC6	**6** characters	-

(1) When programming a value of more than 1, programme the impulse operating mode and energy meter factor for this mode simultaneously.

(2) the characters must be sent in hexadecimal.

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

6.3.7.15.- Integrated communications

These parameters occupy 1 register each.

Table 47:Modbus memory map: Configuration variables (Communications)

Communications			
Configuration variable	**Address**	**Valid data window**	**Default value**
Protocol	2738	**0** : Modbus , **1**: BACnet	0
Peripheral number	2739	**0** to **255**	1
Speed	273A	**0**: 1200 - **1**: 2400 - **2**: 4800 **3**: 9600 - **4**: 19200 - **5**: 38400 - **6**: 57600 - **7**: 76800 - **8**: 115200	4
Parity	273B	**0** : No parity **1**: Odd parity **2**: Even parity	0
Length	273C	**1**: 8 bits	1
Stop bits	273D	**0**: 1 stop bit **1**: 2 stop bits	0

Note: *The 6 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.7.16.- User interface

These parameters occupy 1 register each.

Table 48:Modbus memory map: Configuration variables (user interface)

User interface			
Configuration variable	**Address**	**Valid data window**	**Default value**
Sensitivity	280C	**0**: low, **1**: medium, **2**: high	1
Fade-off time	280D	**1-99** (minutes)	15
Decimal display	280E	**0:** Decimal mark: comma. **1:** Decimal mark: period	0
Date format	280F	**0:** dd/mm/yyyy. **1:** dd/mm/yyyy.	1
Default screen	2810	**0:** Default **1:** Customised 1 parameter **2:** Customised 3 parameter **3:** Customised 4 parameter	0

6.3.7.17.- Position of input channels

This parameter occupies 1 register.

Table 49:Modbus memory map: Configuration variables (Position of input channels).

Position of input channels		
Configuration variable	**Address**	**Default value**
Position of input channels	2850	0x0924

This variable allows you to switch the voltage and current channels and reverse the current direction, enabling the correction of an incorrect installation.
The variable format is shown in **Table 50**:

Table 50:Variable format: Position of input channels.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
I3	**I2**	**I1**	**0**	**Channel 3 I**		**Channel 2 I**		**Channel 1 I**		**Channel 3 V**		**Channel 2 V**		**Channel 1 V**	

Where:

Table 51:Variable format: Position of input channels (description)

Bit	Description	Address	Valid data window
I3	Direction of the current of L3	Bit 15	**0**: The direction does not change **1**: Changes the direction of the current
I2	Direction of the current of L2	Bit 14	**0**: The direction does not change **1**: Changes the direction of the current
I1	Direction of the current of L1	Bit 13	**0**: The direction does not change **1**: Changes the direction of the current
Channel 3 I	Current channel 3	Bit 11 and 10	**00**: L1 , **01**:L2 , **10**: L3
Channel 2 I	Current channel 2	Bit 9 and 8	**00**: L1 , **01**:L2 , **10**: L3
Channel 1 I	Current channel 1	Bit 7 and 6	**00**: L1 , **01**:L2 , **10**: L3
Channel 3 V	Voltage channel 3	Bit 5 and 4	**00**: L1 , **01**:L2 , **10**: L3
Channel 2 V	Voltage channel 2	Bit 3 and 2	**00**: L1 , **01**:L2 , **10**: L3
Channel 1 V	Voltage channel 1	Bit 1 and 0	**00**: L1 , **01**:L2 , **10**: L3

Example:

Query: Reading the position of input channels.

Address	Function	Initial register	No. of registers	CRC
0A	04	2850	0001	XXXX

Address: 0A, Peripheral number: 10 in decimal.
Function: 04, Read function.
Initial Register: 2850, register address.
No. of registers: 0001, number of registers to be read.
CRC: XXXX, CRC character.

Response:

Address	Function	No. of Bytes	Register	CRC
0A	04	02	0924	XXXX

Address: 0A, Responding peripheral number: 10 in decimal.
Function: 04, Read function.
No. of bytes: 02, No. of bytes received.
Register: 0924 (0000100100100100bin) Indicates:
- (**000**0100100100100bin) The direction of the currents does not change,
- (0000**10**0100100100bin) Current channel 3 is assigned to L3,
- (000010**01**00100100bin) Current channel 2 is assigned to L2,
- (00001001**00**100100bin) Current channel 1 is assigned to L1,
- (0000100100**10**0100bin) Voltage channel 3 is assigned to L3,
- (000010010010**01**00bin) Voltage channel 2 is assigned to L2,
- (00001001001001**00**bin) Voltage channel 1 is assigned to L1,

CRC: XXXX, CRC character.

6.3.7.18.- Configuration of custom screens

These parameters occupy 1 register each.

Table 52: Modbus memory map: Configuration variables (Configuration of the parameter customisation screens)

Configuration of the parameter customisation screens						
Configuration variable	**Address**					**Valid data margin**
1 parameter screens	**Screen 1**	**Screen 2**	**Screen 3**	**Screen 4**	**Screen 5**	
Variable	2968	2978	2988	2998	29A8	**Table 55**
Not used	2969	2979	2989	2999	29A9	0
Not used	296A	297A	298A	299A	29AA	0
Not used	296B	297B	298B	299B	29AB	0
Phase	296C	297C	298C	299C	29AC	**Table 56**
Not used	296D	297D	298D	299D	29AD	0
Not used	296E	297E	298E	299E	29AE	0
Not used	296F	297F	298F	299F	29AF	0
Consumption or Generation (1)	2970	2980	2990	29A0	29B0	**0**: Consumption **1**: Generation

Table 52 (Continuation): Modbus memory map: Configuration variables (Configuration of the parameter customisation screens)

Configuration of the parameter customisation screens						
Configuration variable	**Address**					**Valid data margin**
Not used	2971	2981	2991	29A1	29B1	**0**
Not used	2972	2982	2992	29A2	29B2	**0**
Not used	2973	2983	2993	29A3	29B3	0
Tariff	2974	2984	2994	29A4	29B4	**Table 57**
Not used	2975	2985	2995	29A5	29B5	**0**
Not used	2976	2986	2996	29A6	29B6	**0**
Not used	2977	2987	2997	29A7	29B7	0

(1) A 0 must be sent in the energy parameters where the consumption or generation option does not exist.

Note: *The 80 registers must be written at once (as a group), otherwise it will respond with an error. They can be read separately.*

Table 53:Modbus memory map: Configuration variables (Configuration of the parameter customisation screens).

Configuration of the parameter customisation screens						
Configuration variable	**Address**					**Valid data margin**
3 parameter screens	**Screen 1**	**Screen 2**	**Screen 3**	**Screen 4**	**Screen 5**	
Parameter 1: Variable	29CC	29DC	29EC	29FC	2A0C	**Table 55**
Parameter 2: Variable	29CD	29DD	29ED	29FD	2A0D	**Table 55**
Parameter 3: Variable	29CE	29DE	29EE	29FE	2A0E	**Table 55**
Not used	29CF	29DF	29EF	29FF	2A0F	**0**
Parameter 1: Phase	29D0	29E0	29F0	2A00	2A10	**Table 56**
Parameter 2: Phase	29D1	29E1	29F1	2A01	2A11	**Table 56**
Parameter 3: Phase	29D2	29E2	29F2	2A02	2A12	**Table 56**
Not used	29D3	29E3	29F3	2A03	2A13	**0**
Parameter 1: (1) Consumption or Generation	29D4	29E4	29F4	2A04	2A14	**0**: Consumption **1**: Generation
Parameter 2: (1) Consumption or Generation	29D5	29E5	29F5	2A05	2A15	**0**: Consumption **1**: Generation
Parameter 3:(1) Consumption or Generation	29D6	29E6	29F6	2A06	2A16	**0**: Consumption **1**: Generation
Not used	29D7	29E7	29F7	2A07	2A17	**0**
Parameter 1: Tariff	29D8	29E8	29F8	2A08	2A18	**Table 57**
Parameter 2: Tariff	29D9	29E9	29F9	2A09	2A19	**Table 57**
Parameter 3: Tariff	29DA	29EA	29FA	2A0A	2A1A	**Table 57**
Not used	29DB	29EB	29FB	2A0B	2A1B	**0**

(1) A 0 must be sent in the energy parameters where the consumption or generation option does not exist.

Note: *The 80 registers must be written at once (as a group), otherwise it will respond with an error. They can be read separately.*

Table 54: Modbus memory map: Configuration variables (Configuration of the parameter customisation screens)

Configuration of the parameter customisation screens						
Configuration variable	**Address**					**Valid data margin**
4 parameter screens	**Screen 1**	**Screen 2**	**Screen 3**	**Screen 4**	**Screen 5**	
Parameter 1: Variable	2A30	2A40	2A50	2A60	2A70	**Table 55**
Parameter 2: Variable	2A31	2A41	2A51	2A61	2A71	**Table 55**
Parameter 3: Variable	2A32	2A42	2A52	2A62	2A72	**Table 55**
Parameter 4: Variable	2A33	2A43	2A53	2A63	2A73	**Table 55**
Parameter 1: Phase	2A34	2A44	2A54	2A64	2A74	**Table 56**
Parameter 2: Phase	2A35	2A45	2A55	2A65	2A75	**Table 56**
Parameter 3: Phase	2A36	2A46	2A56	2A66	2A76	**Table 56**
Parameter 4: Phase	2A37	2A47	2A57	2A67	2A77	**Table 56**
Parameter 1: [(1)] Consumption or Generation	2A38	2A48	2A58	2A68	2A78	**0**: Consumption **1**: Generation
Parameter 2: [(1)] Consumption or Generation	2A39	2A49	2A59	2A69	2A79	**0**: Consumption **1**: Generation
Parameter 3: [(1)] Consumption or Generation	2A3A	2A4A	2A5A	2A6A	2A7A	**0**: Consumption **1**: Generation
Parameter 4: [(1)] Consumption or Generation	2A3B	2A4B	2A5B	2A6B	2A7B	**0**: Consumption **1**: Generation
Parameter 1: Tariff	2A3C	2A4C	2A5C	2A6C	2A7C	**Table 57**
Parameter 2: Tariff	2A3D	2A4D	2A5D	2A6D	2A7D	**Table 57**
Parameter 3: Tariff	2A3E	2A4E	2A5E	2A6E	2A7E	**Table 57**
Parameter 4: Tariff	2A3F	2A4F	2A5F	2A6F	2A7F	**Table 57**

[(1)] A 0 must be sent in the energy parameters where the consumption or generation option does not exist.

Note: *The 80 registers must be written at once (as a group), otherwise it will respond with an error. They can be read separately.*

The unit has 3 types of screens to customise:

1 parameter displayed on screen.
3 parameters displayed on screen.
4 parameters displayed on screen.

Each of these types of screen has 5 different screens to customise.

Table 55: Configuration of custom screens: Variables.

Variables parameter			
Variable	**Value**	**Variable**	**Value**
Phase-Neutral Voltage	0x0000	Current THD	0x000E
Neutral Voltage	0x0001	Maximum Current Demand	0x000F
Phase-Phase Voltage	0x0002	Maximum Active Power Demand	0x0010
Current	0x0003	Maximum Apparent Power Demand	0x0011
Neutral Current	0x0004	Active Energy	0x0012
Frequency	0x0005	Inductive Reactive Energy	0x0013
Active power	0x0006	Capacitive Reactive Energy	0x0014
Inductive Reactive Power	0x0007	Total Reactive Energy	0x0015
Capacitive Reactive Power	0x0008	Apparent Energy	0x0016
Total Reactive Power	0x0009	No. of hours of active tariff	0x0017

Table 55 (Continuation) : Configuration of custom screens: Variables.

Variables parameter			
Variable	**Value**	**Variable**	**Value**
Apparent Power	0x000A	CO_2 Emissions	0x0018
Power Factor	0x000B	Cost	0x0019
Cosine φ	0x000C	Empty (no parameters)	0x001A
Voltage THD	0x000D		

Table 56: Configuration of custom screens: Phases.

Phases Parameter			
Phase	**Value**	**Phase**	**Value**
L1	0x0000	L1-L2	0x0000
L2	0x0001	L2-L3	0x0001
L3	0x0002	L3-L1	0x0002
Total III	0x0003	L1-L2-L3	0x0003
LN	0x0004		

Table 57:Configuration of custom screens: Tariffs

Tariffs Parameter[7]			
Tariff	**Value**	**Tariff**	**Value**
Tariff 1	0x0000	Tariff 3	0x0002
Tariff 2	0x0001	Total value of 3 tariffs	0x0003

[7]If the variable has no tariff option, 00 will be sent.

6.3.7.19.- Manual programming of alarms

These parameters occupy 1 register each.

Table 58: Modbus memory map: Configuration variables (manual programming of alarms).

Manual programming of alarms						
Configuration variable	**Address**				**Valid data window**	**Default value**
	Output 1 Relay	**Output 2 Relay**	**Output 1 Transistor**	**Output 1 Transistor**		
Programming status[1]	4F20	4F34	4EF8	4F0C	**0**: Automatic **1**:Manual	0
Value	4F21	4F35	4EF9	4F0D	**0**: Open **1**:Closed	0

[1] When programming the ***Programming status*** manually , set the output for the relays and transistors manually, using the ***Value*** parameter. The configuration of the relay and transistor digital outputs programmed in the unit no longer works.
The relays and transistors work in automatic mode according to the configuration programmed in the unit.

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

6.3.8.- Other unit variables

6.3.8.1.- Firmware version

These parameters occupy 6 registers.

Table 59: Modbus memory map: Firmware version.

Firmware version[(1)]		
Configuration variable	**Address**	**Example**
Version	2AF8 – 2AFD	“010102”

[(1)]For this variable only **Function 0x04** is implemented: reading registers.

The firmware version is provided in an ASCII 6 character string.

6.3.8.2.- Date of last calibration

These parameters occupy 1 register each.

Table 60:Modbus memory map: Date of last calibration.

Date of last calibration[(1)]		
Configuration variable	**Address**	**Valid data window**
Day	2844	**1** to **31**
Month	2845	**1** to **12**
Year	2846	**2013** to **2076**
Time	2847	**0** to **23**
Minutes	2848	**0** to **59**
Seconds	2849	**0** to **59**

[(1)]For these variables only **Function 0x04** is implemented: reading registers.

6.3.8.3.- Internal temperature

These parameters occupy 2 registers.

Table 61:Modbus memory map: Internal temperature.

Internal temperature [(1)]		
Configuration variable	**Address**	**Valid data window**
Internal temperature	2852-2853	ºC with 2 decimals

[(1)]For this variable only **Function 0x04** is implemented: reading registers.

6.3.8.4.- Status of digital inputs

The ***Input Status 1*** and ***Input Status 2*** variables occupy 2 registers.
The ***Current tariff*** variable occupies 1 register.

Table 62: Modbus memory map: Status of digital inputs.

Status of digital inputs, mode: Logic state[(1)]		
Configuration variable	**Address**	**Valid data window**
Input Status 1	59D8 – 59D9	**0** to **1**
Input Status 2	59DA – 59DB	**0** to **1**
Status of digital inputs, mode: Logic state[(1)]		
Current tariff	59DC	**0:** Tariff 1 **1:**Tariff 2 **2:** Tariff 3

[(1)]For these variables only **Function 0x04** is implemented: reading registers.

6.3.8.5.- Alarm status

6.3.8.5.1.- Relay digital outputs

The ***Latch*** variable occupies 2 registers.
All other variables occupy 1 register each.

Table 63: Modbus memory map: Alarm status: Relay digital outputs:

Alarm status Relay digital outputs			
Configuration variable	**Address**		**Valid data window**
	Output 1	**Output 2**	
Latch(1)	7558-7559	756C-756D	**0:** unlock alarm **1:** locked alarm
Connection delay(2)	755A	756E	Energy meter which indicates the value of the connection delay variable (ON)
Disconnection delay(2)	755B	756F	Energy meter which indicates the value of the disconnection delay variable (OFF)
Alarm activation date: Year(2)	755C	7570	**2013** to **2076**
Alarm activation date: Month(2)	755D	7571	**1** to **12**
Alarm activation date: Day(2)	755E	7572	**1** to **31**
Alarm activation time: Hour(2)	755F	7573	**0** to **23**
Alarm activation time: Minutes(2)	7560	7574	**0** to **59**
Alarm activation time: Seconds(2)	7561	7575	**0** to **59**
Not used	7562	7576	**-**
Not used	7563	7577	**-**
Status (2)	7564	7578	**0**: No alarm, **1**: Active alarm
Alarm status(2)	7564	7578	**0**: No alarm, **1**: Pre-alarm, **2**: Connection or disconnection delay, **3**: Alarm, **4**: Impulses,

(1) If the latch option has been programmed in an alarm and it has been activated, the alarm will be unlocked with this option.

(2)For these variables only **Function 0x04** is implemented: reading registers.

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

6.3.8.5.2.- Transistor digital outputs

The ***Latch*** variable occupies 2 registers.
All other variables occupy 1 register each.

Table 64: Modbus memory map: Alarm status: Transistor digital outputs.

Alarm status: Transistor digital outputs					
Configuration variable		**Address**		**Valid data window**	
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Alarm**	**Impulse output**
Latch [1]	kWh or Wh	7530-7531	7544-7545	**0:** unlock alarm **1:** locked alarm	kWh or Wh energy meter
Delay in the connection[2]	Wh or mWh	7532	7546	Energy meter which indicates the value of the connection delay variable (ON)	Wh or mWh energy meter
Delay in the disconnection[2]	Energy meter factor	7533	7547	Energy meter which indicates the value of the disconnection delay variable (OFF)	Energy meter factor meter
Alarm activation date: Year[2]	-	7534	7548	**2013** to **2076**	**-**
Alarm activation date: Month[2]	-	7535	7549	**1** to **12**	-
Alarm activation date: Day[2]	-	7536	754A	**1** to **31**	-
Alarm activation time: Hour[2]	-	7537	754B	**0** to **23**	-
Alarm activation time: Minutes[2]	-	7538	754C	**0** to **59**	-
Alarm activation time: Seconds[2]	-	7539	754D	**0** to **59**	-
Not used	Not used	753A	754E	**-**	-
Not used	Not used	753B	754F	**-**	-
Status [2]		753C	7550	**0**: No alarm, **1**: Active alarm	
Alarm status[2]		753A	754E	**0**: No alarm, **1**: Pre-alarm, **2**: Connection or disconnection delay, **3**: Alarm, **4**: Impulses,	

[1] If the latch option has been programmed in an alarm and it has been activated, the alarm will be unlocked with this option.

[2]For these variables only **Function 0x04** is implemented: reading registers.

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

6.3.8.6. Energy closes

The ***Energy*** variables occupy 90 registers.
All other variables occupy 1 register each.

Energy closes	
Variable[1]	**Address**
1 day active energy close	2BC0 - 2C19
1 day reactive energy close total	2C24 - 2C7D
Index of the sample from the close of the day[2]	2C7E
1 week active energy close	2C88 - 2CE1
1 week reactive energy close total	2CEC - 2D45
Index of the sample from the close of the week[2]	2D46
1 month active energy close	2D50-2DA9
1 month reactive energy close total	2DB4 - 2E0D
Index of the sample from the close of the month[2]	2E0E
Active energy at 1 year close	2E18 - 2E71
Total reactive energy at 1 year close	2E7C - 2ED5
Index of the sample of the following year close [2]	2ED6

[1]For these variables the **Function 0x04** is implemented: reading registers.
[2] The information in the index of the sample of the following year close is provided in order to know in what position the registers are currently at, bearing in mind that this position is still empty and will be the next to be filled in when the next close is made.

The registers have information on the energy at the moment of the close.
The close is calculated as the difference between the most recent energy value and the energy logged in the previous period.

Note: *The 90 registers must be read at once (as a group), otherwise it will respond with an error.*

6.3.9.- Deleting parameters

These parameters occupy 1 register each.
Parameters can be deleted using **Function 0x05**: writing a relay.

Table 65:Modbus memory map: Deleting parameters

Deleting parameters	Address	Value to be sent
System reset	07D0	0x00FF
Deleting energies	0834	0x00FF
Deleting maximum and minimum values	0837	0x00FF
Deleting of partial meter of tariff 1 energy consumed	0838	0x00FF
Deleting of partial meter of tariff 2 energy consumed	0839	0x00FF
Deleting of partial meter of tariff 3 energy consumed	083A	0x00FF
Deleting of partial meter of tariff 1 energy generated	083B	0x00FF
Deleting of partial meter of tariff 2 energy generated	083C	0x00FF
Deleting of partial meter of tariff 3 energy generated	083D	0x00FF
Initialises Maximum Demand	083E	0x00FF
Deleting of Maximum Demand maximum and minimum values	083F	0x00FF

Table 65 (Continuation) : Modbus memory map: Deleting parameters

Deleting parameters	Address	Value to be sent
Deleting the alarm logs	0840	0x00FF
Deleting the event logs	0841	0x00FF
Deleting the energy closes	0842	0x00FF
Full deletion	0848	0x00FF
Default setup (50Hz)	0BBC	0x00FF
Default setup (50Hz)	0BBD	0x00FF
Test	2AF8	0x00FF
Expansion module 1 test	2AF9	0x00FF
Expansion module 2 test	2AFA	0x00FF
Expansion module 3 test	2AFB	0x00FF
Expansion module 4 test	2AFC	0x00FF

6.4.- BACnet PROTOCOL

BACnet is a communications protocol for Building Automation and Control NETworks. This protocol replaces the proprietary communications of each device, making it a set of common communication rules that enables the complete integration of the building automation and control devices of different manufacturers.

The unit incorporates **BACNet** MS/TP communication, following the specifications of ANSI/ ASHRAE 135 (ISO 16484-5).
Using a RS485 connection, the analyzer can connect to a BACnet and include all of the objects and services defined in the attached PICS map (Protocol Implementation Conformance Statement). ("***6.5.- PICS MAP***")

The default speed is 38400 bps and the MAC is 2 (node number), and can be changed on the configuration screen or by entering the BaudRate and MAC_Address variables. The identifier (Device_ID) can be changed on the configuration screen using the writing property over the variable or through the Device_ID variable.

Another option is to overwrite the Object_Name in the Device object:
a) #Baud x – where x can be: 9600, 19200, 38400, 57600, 76800, 115200
b) #MAC x – where x can be: 0 ... 127
c) #ID x – where x can be: 0 ... 4194303

For further information on the protocol: www.bacnet.org

6.5.- PICS MAP

PICS
Vendor Name: CIRCUTOR
Product Name: CVM-B100 | CVM-B150
Product Model Number: 0823
Application Software Version: 1
Firmware Revision: 1.0
BACnet Protocol Revision: 10

Product Description:

Electrical energy meter

BACnet Standardised Device Profile (Annex L)

x	BACnet Application Specific Controller (B-ASC)

List all BACnet Interoperability Building supported (see Annex K in BACnet Addendum 135d):

DS-RP-B Read Property DS-WP-B Write Property DS-RPM-B Read Property Multiple DM-DDB-B Dynamic Device Binding DM-DOB-B Dynamic Object Binding DM-DCC-B Device Communication Control DM-RD-B Reinitialize Device

Which of the following device binding methods does the product support? (check one or more)

x	Receive Who-Is, send I-Am (BIBB DM-DDB-B)
x	Receive Who-Has, send I-Have (BIBB DM-DOB-B)

Standard Object Types Supported:

Analogue Input Object Type

1. Dynamically creatable using BACnet's CreateObject service?	No	
2. Dynamically deletable 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 writeable where not otherwise required by this standard		
5. List of proprietary properties:		
6. List of any property value range restrictions:		

Property Identifier

Object_Name	max 6 characters

DESCRIPTION		SYMBOL	ID OBJECTS	OBJECT NAME	UNITS
Tensión fase-neutro	Voltage phase to neutral	V 1	AI0	Ph2NU1	V
Corriente	Current	A 1	AI1	Ph1Current	A
Potencia activa	Active power	kW 1	AI2	ActPwrPh1	kW
Potencia reactiva	Reactive power	kvar 1	AI3	ReactPwrPh1	kvar
Factor de potencia	Power factor	PF 1	AI4	PwrFactPh1	PF
Tensión fase-neutro	Voltage phase to neutral	V 2	AI5	Ph2NU2	V
Corriente	Current	A 2	AI6	Ph2Current	A
Potencia activa	Active power	kW 2	AI7	ActPwrPh2	kW

DESCRIPTION		SYMBOL	ID OBJECTS	OBJECT NAME	UNITS
Potencia reactiva	Reactive power	kvar 2	AI8	ReactPwrPh2	kvar
Factor de potencia	Power factor	PF 2	AI9	PwrFactPh2	PF
Tensión fase-neutro	Voltage phase to neutral	V 3	AI10	Ph2NU3	V
Corriente	Current	A 3	AI11	Ph3Current	A
Potencia activa	Active power	kW 3	AI12	ActPwrPh3	kW
Potencia reactiva	Reactive power	kvar 3	AI13	ReactPwrPh3	kvar
Factor de potencia	Power factor	PF 3	AI14	PwrFactPh3	PF
Potencia activa trifási-ca	Three phase active power	kW III	AI15	ActPwOn3Ph	kW
Potencia inductiva trifásica	Three phase reactive inductive power	kvarL III	AI16	InductPwOn3Ph	kvarL
Potencia capacitiva trifásica	Three phase capacitive inductive power	kvarC III	AI17	CapPwOn3Ph	kvarC
Cos φ trifásico	Three phase cos φ	Cos φ III	AI18	Cosphi	Cos φ
Factor de potencia trifásico	Three phase power factor	PFIII	AI19	PwFactOn3Ph	PF
Frecuencia (L2)	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	Active energy	kW•h III	AI30	ActEnergy	kW•h
Energía reactiva in-ductiva	Reactive inductive energy	kvarL•h III	AI31	InductEnergy	kvarL•h
Energía reactiva ca-pacitiva	Reactive capacitive energy	kvarC•h III	AI32	CapEnergy	kvarC•h
Energía Aparente trifásica	Three phase aparent energy	kVA•h III	AI33	AppEnergy	kVA•h
Energía activa gene-rada	Three phase generated active energy	kW•h III (-)	AI34	ActEnergy_exp	kW•h
Energía inductiva generada	Three phase generat-ed reactive inductive energy	kvarL•h III (-)	AI35	IndEnergy_exp	kvarL•h
Energía capacitiva generada	Three phase generat-ed reactive capacitive energy	kvarC•h III(-)	AI36	CapEnergy_exp	kvarC•h
Energía aparente generada	Three phase generated aparent energy	kVA•h III (-)	AI37	AppEnergy_exp	kVA•h
Corriente trifásica (media)	Three phase average current	I_AVG	AI38	AvgValCurr3Ph	I_AVG
Corriente de neutro	Neutral current	In	AI39	NeutralCurrent	In
Potencia aparente L1	Aparent power L1	kVA	AI40	AppPwrPh1	kVA
Potencia aparente L2	Aparent power L2	kVA	AI41	AppPwrPh2	kVA
Potencia aparente L3	Aparent power L3	kVA	AI42	AppPwrPh3	kVA

DESCRIPTION		SYMBOL	ID OBJECTS	OBJECT NAME	UNITS
Potencia aparente trifásica	Three phase aparent power	kVAIII	AI43	AppPw3Ph	kVA
Máxima demanda I1	Maximum demand I1	Md (A1)	AI44	MaxDemand_A1	A
Máxima demanda I2	Maximum demand I2	Md(A2)	AI45	MaxDemand_A2	A
Máxima demanda I3	Maximum demand I3	Md(A3)	AI46	MaxDemand_A3	A
Máxima demanda A	Maximum demand A	A III	AI47	MaxDemand_A	A
Máxima demanda kW	Maximum demand kW	kW III	AI48	MaxDemand_kW	kW
Máxima demanda kVA	Maximum demand kVA	kVA III	AI49	MaxDemand_ kVA	kVA

Analogue Value Object Type

1. Dynamically creatable using BACnet's CreateObject service?		No
2. Dynamically deletable using BACnet's DeleteObject service?		No
3. List of optional properties supported:		
4. List of all properties that are writeable where not otherwise required by this standard		
5. List of proprietary properties:		
Property Identifier	**Property Datatype**	**Meaning**
5. List of object identifiers and their meaning in this device		
Object ID	**Object Name**	**Description**
AV1	MAC_Address	MAC
AV2	BaudRate	BAUD RATE
AV3	Device_ID	DEVICE ID

Device Object Type

1. Dynamically creatable using BACnet's CreateObject service?	No
2. Dynamically deletable using BACnet's DeleteObject service?	No
3. List of optional properties supported:	Description, Protocol_Conformance_Class
4. List of all properties that are writeable where not otherwise required by this standard	
Object_Name Max_Master Max_Info_Frames Object_Identifier	
5. List of proprietary properties:	
5. List of any property value range restrictions	
Property Identifier	**Restrictions**
Object_Name	< 32 bytes
Object_Identifier	Device Type only
Number_Of_APDU_Retries	0-255
APDU_Timeout	0-65535 milliseconds
Vendor_Identifier	0-65535

Data Link Layer Options (check all that supported):

X	MS/TP master (Clause 9), baud rate(s): 9.6, 19.2, 38.4, 57.6, 76.8kB/s

Character Sets Supported (check all that apply):

Indicating support for multiple character set does not imply that they can all be supported simultaneously.

X	ANSI X3.4

7.- EXPANSION MODULES

The unit has following expansion modules that can be connected to it.
The modules are:

- ✓ **Transistor Digital Inputs/Outputs** (**M-CVM-AB-8I-8OTR**),
- ✓ **Relay Digital Inputs/Outputs** (**M-CVM-AB-8I-8OR**)
- ✓ **Analogue Inputs/Outputs (M-CVM-AB-4AI-8AO**)
- ✓ **Modbus TCP Bridge communications module (M-CVM-AB-Modbus-TCP(Bridge)**)
- ✓ **LonWorks communications module (M-CVM-AB-LON**)
- ✓ **Profibus communications module (M-CVM-AB-Profibus**)
- ✓ **MBus communications module (M-CVM-AB-MBus**)
- ✓ **Data storage module (M-CVM-AB-Datalogger**)
- ✓ **Modbus TCP Switch communications module (M-CVM-AB-Modbus-TCP(Switch)**)

The unit accepts a maximum of 4 expansion modules.
Depending on the modules connected, total consumption will not exceed 15W.

The unit only accepts one communications module of each type.

7.1.- INSTALLATION

Before installing the expansion module the device must be unplugged from all power supplies, both the unit's and the measurement system's internal power supply.

If more than one expansion module is installed, they must be ordered by serial number, i.e., the module with the lowest serial number must be the first installed in the unit.

A.- Protective cove version 1

To install, firstly remove the protective cover of the expansion connector located at the rear of the unit, **Figure 143.**

Figure 143: Remove the expansion connector cap.

connect the expansion module to the unit, **Figure 144**,

Figure 144: Connect the expansion module.

and secure it by inserting the 4 fastening pins into the corresponding slots, **Figure 145**.

Figure 145: Insert the fastening pins into the corresponding slots.

B- Protective cove version 2

To install, firstly remove the protective cover of the expansion connector located at the rear of the unit. To do so:

a.- Remove the two fastening pins that secure the protective cover with a flat tip screwdriver, **Figure 146**.

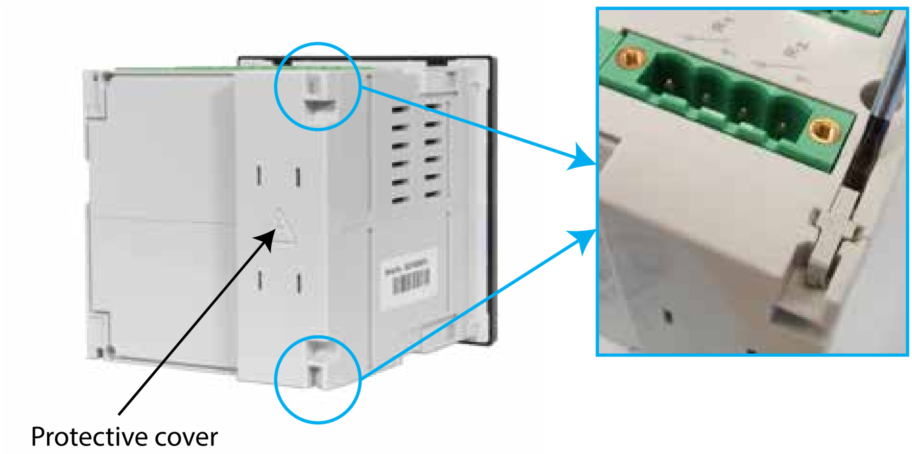


Figure 146: Remove the two fastening pins.

b.- Remove the protective cover by inserting a flat tip screwdriver into the fixing slot and press the cover upwards.(**Figure 147**)

Figure 147: Remove the protective cover.

Connect the expansion module to the unit, **Figure 148**.

Figure 148: Connect the expansion module.

and secure it by inserting the 4 fastening pins into the corresponding slots,

Figure 149: Insert the fastening pins into the corresponding slots.

7.2.- RELAY DIGITAL INPUTS/OUTPUTS

This expansion module features 8 relay digital inputs and 8 relay digital outputs.

7.2.1.- CONNECTION TERMINALS

A.- Terminals on the upper face

Table 66: List of terminals on the upper face, Relay digital inputs/outputs module.

Unit terminals	
1: R1, Digital output of relay 1	**6: R5**, Digital output of relay 5
2: R2, Digital output of relay 2	**7: R6**, Digital output of relay 6
3: R3, Digital output of relay 3	**8: R7**, Digital output of relay 7
4: R4, Digital output of relay 4	**9: R8**, Digital output of relay 8
5: COM , Common digital outputs of relay **R1**, **R2**, **R3** and **R4**	**10: COM,** Common digital outputs of relay **R5**, **R6**, **R7** and **R8**

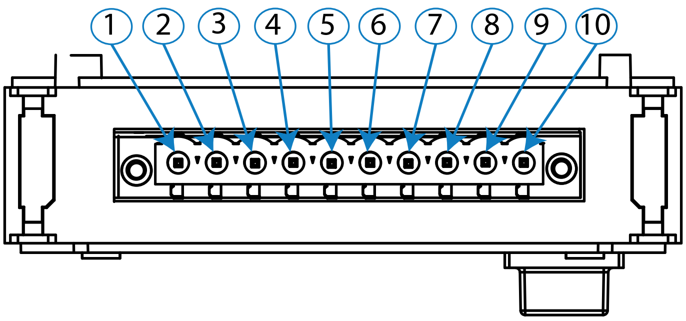


Figure 150: Terminals of Relay Digital Inputs/Outputs, upper face.

B.- Terminals on the lower face

Table 67: List of terminals on the lower face, Relay digital inputs/outputs module.

Unit terminals	
11: COM, for digital inputs	**16: I5**, Digital input 5
12: I1, Digital input 1	**17: I6**, Digital input 6
13: I2, Digital input 2	**18: I7**, Digital input 7
14: I3, Digital input 3	**19: I8**, Digital input 8
15: I4 , Digital input 4	

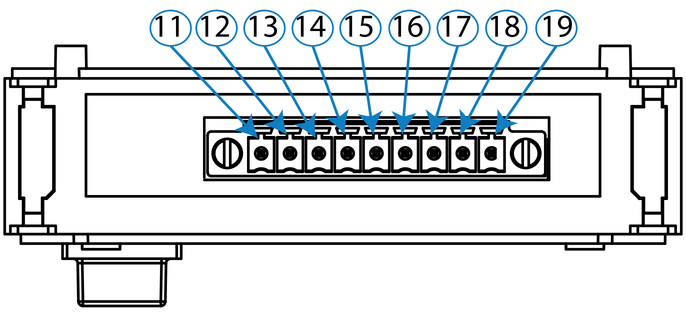


Figure 151:Terminals of Relay Digital Inputs/Outputs, lower face.

7.2.2.- CONNECTION DIAGRAMS

A.- Relay digital outputs

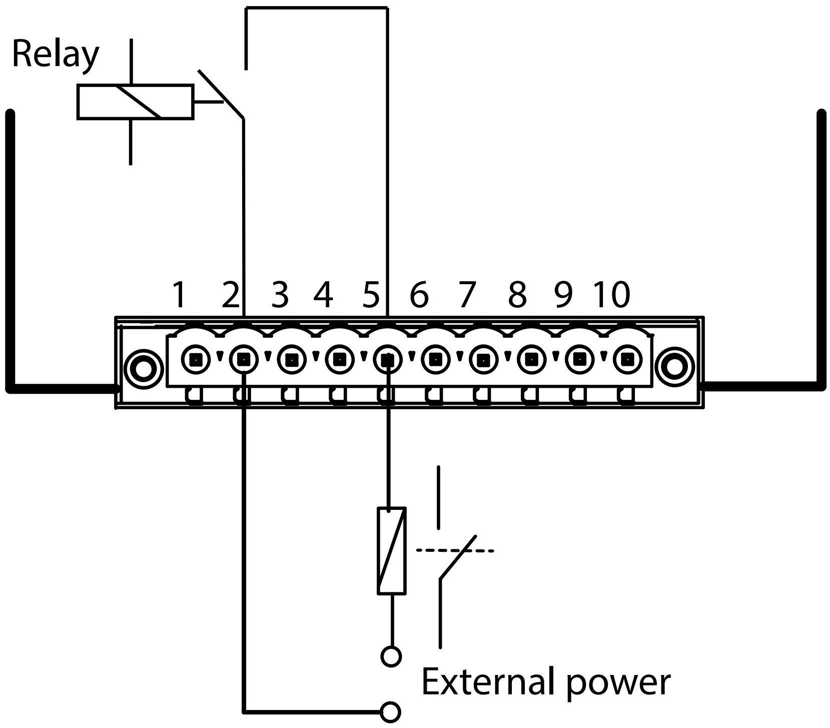


Figure 152: Connection diagram, relay digital outputs.

B.- Digital inputs

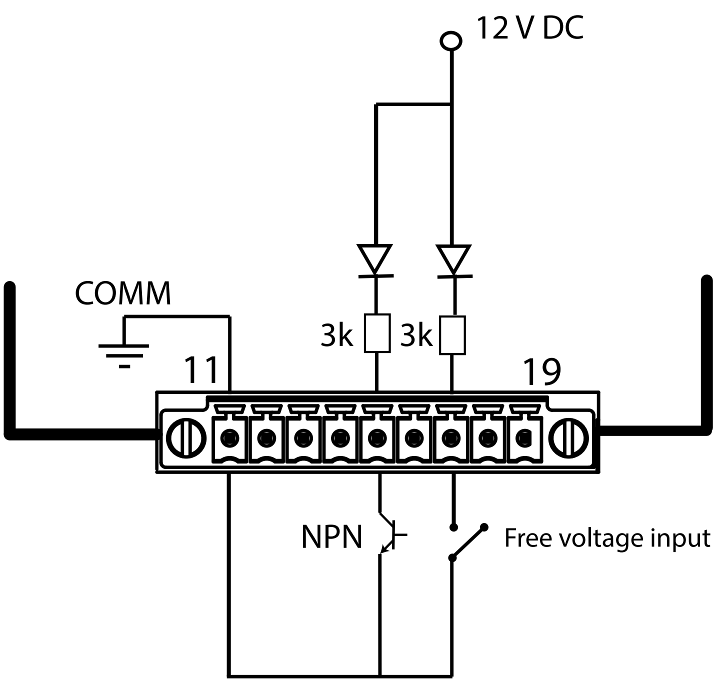


Figure 153: Connection diagram, digital inputs.

7.2.3.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 154,** is the home screen of the setup menu.

Figure 154: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 155**.

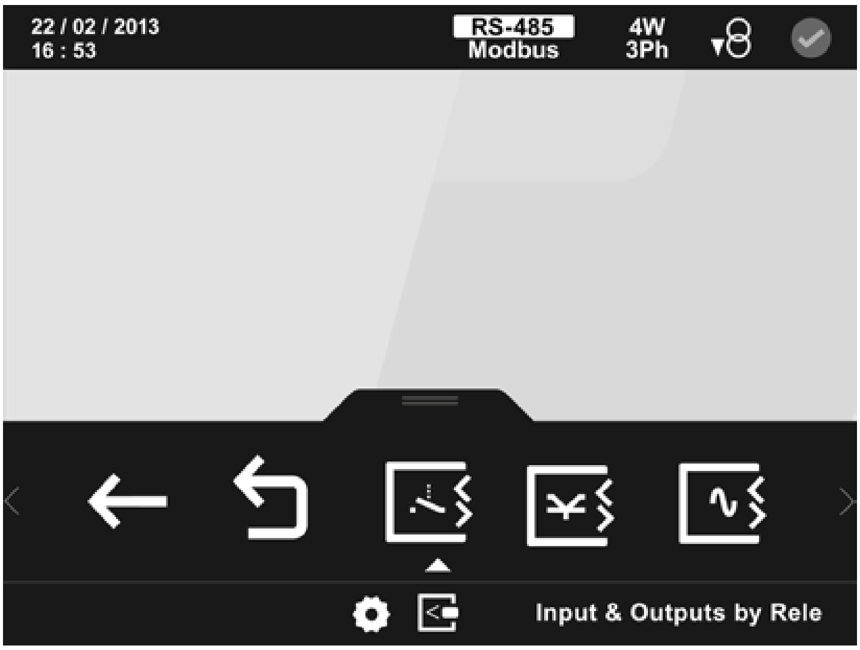


Figure 155: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.

If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **Relay digital Inputs/Outputs** icon .

Press the button to open the main configuration screen of the relay digital Inputs/Outputs module, **Figure 156.**

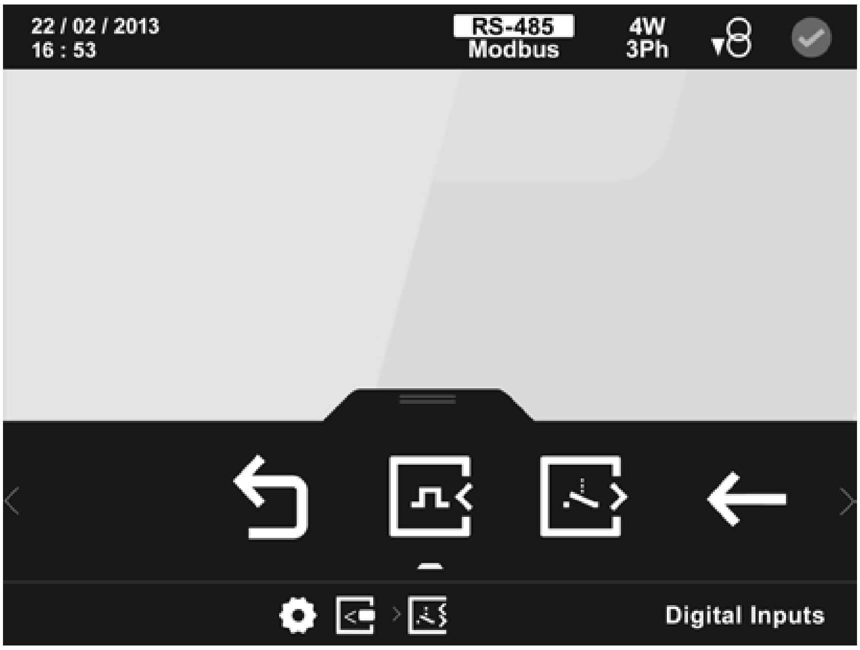


Figure 156: Main configuration screen of relay digital inputs/outputs.

The following options appear in the lower area:

Digital inputs[1], to select the configuration of the digital inputs.
Digital outputs [1], to select the configuration of the relay digital outputs.
Back, returns to the home screen of the expansion modules menu, **Figure 155**.
Main Menu, back to the main menu, **Figure 25**.

[1] If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them; the module with the lowest number has the lowest serial number.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.2.3.1.- Digital inputs.

The operating mode for 8 digital inputs and the parameters for each mode are selected in the main configuration screen for digital inputs, **Figure 157**.
The 8 inputs can be configured separately as:

- Impulses.
- Logic state.

The order for configuring an input is:
1.- Select the operating mode: impulses or logic state.
2.- Select the digital input and configure the appropriate parameters.

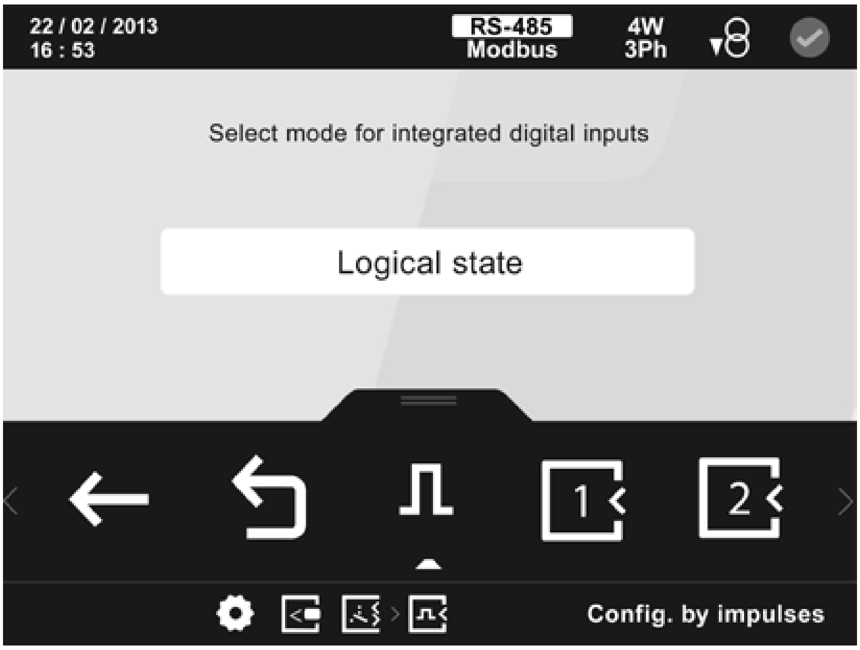


Figure 157: Main configuration screen for relay digital inputs.

The following options appear in the lower area:

- Impulses, to select the input as impulses.
- Logic state, to select the input as a logic state.
- ... Digital input, 1 to 8, to select the configuration of each of the 8 digital inputs.
- Confirm, confirms and saves in the memory the values programmed on the screen.
- Back, returns to the main screen for relay digital inputs/outputs,**Figure 156**.
- Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.2.3.1.1.- Configuration of a digital input, impulse mode.

When selecting the configuration of digital inputs in impulse mode, you can program the following parameters:

- ✓ The input name.
- ✓ The units.
- ✓ The decimals.
- ✓ The energy meter factor.

The configuration of a digital input in impulse mode in the expansion modules is the same as the configuration of the digital inputs in impulse mode integrated in the unit, see ***"5.6.17.2.- Configuration of digital inputs, impulse mode."***

7.2.3.1.2.- Configuration of a digital input, logic state mode.

When selecting the configuration of digital inputs in logic state mode, you can program the input logic as positive or negative.

The configuration of a digital input in logic state mode in the expansion modules is the same as the configuration of the digital inputs in logic state mode integrated in the unit, see ***"5.6.17.3.- Configuration of digital inputs, logic state mode."***

7.2.3.2.- Relay digital outputs.

Select the output to configure on the main configuration screen of the relay digital outputs, **Figure 158**.

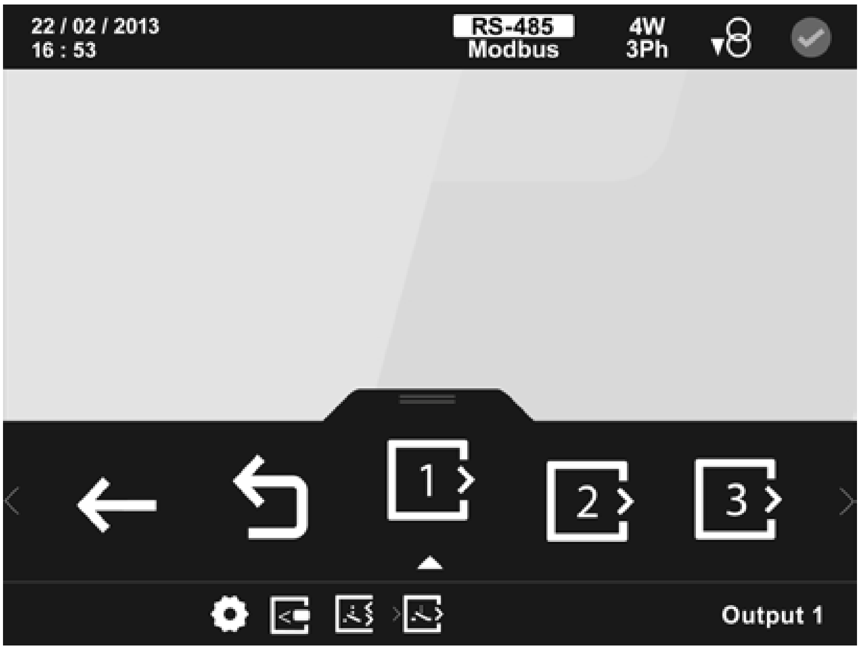


Figure 158: Main configuration screen of relay digital outputs.

The following options appear in the lower area:

... Digital outputs of 1 to 8, to select the configuration of each of the 8 relay digital outputs.

Back, returns to the main screen for relay digital inputs/outputs, **Figure 156**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

After selecting the output to configure, you can configure the following parameters:

- ✓ The variable code that controls the relay.
- ✓ The pre-alarm value.
- ✓ The minimum value below which the relay is activated.
- ✓ The maximum value above which the relay is activated.
- ✓ The delay in connecting (ON) and disconnecting (OFF) the relay.
- ✓ The status of the outputs.
- ✓ The latch.

The configuration of the relay digital outputs in the expansion modules is the same as the configuration of the relay digital outputs integrated in the unit, see ***"5.6.15.- Relay digital outputs."***.

7.2.4.- MODBUS COMMUNICATIONS

The address of the Modbus memory map depends on the position of the expansion module in the unit.
Slot 1 will be the position of the expansion module installed just behind the standard unit, and Slot 2 the next position...
As the maximum number of expansion modules that can be connected to the unit is 4, there will only be 4 slots.

7.2.4.1.- Programming of relay digital outputs

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 68: Modbus memory map: Relay digital outputs, expansion modules (Table 1).

Configuration of relay digital outputs		
Configuration variable	**Valid data window**	**Default value**
Variable code	**Table 21**	0
Pre-alarm value	**0** to **100**%	0
Minimum value(1)	**Table 44**	0
Maximum value (1)	**Table 44**	0
Connection delay (ON)	**0** to **999** s.	0
Disconnection delay (OFF)	**0** to **999** s.	0
Latch	**0** : Unlocked **1**: Locked	0
Output status	**0** : Normally open **1**: Normally closed	0
Module no.	0	0

(1) When programming the maximum and minimum values, the decimals for the variable selected must be included.

Table 69: Modbus memory map: Relay digital outputs, expansion modules (Table 2).

Configuration of relay digital outputs: Slot 1								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Maximum value	C350	C364	C378	C38C	C3A0	C3B4	C3C8	C3DC
Minimum value	C352	C366	C37A	C38E	C3A2	C3B6	C3CA	C3DE
Delay connection (ON)	CE54	C368	C37C	C390	C3A4	C3B8	C3CC	C3E0
Disconnection delay (OFF)	C355	C369	C37D	C391	C3A5	C3B9	C3CD	C3E1
Pre-alarm value	C356	C36A	C37E	C392	C3A6	C3BA	C3CE	C3E2
Output status	C357	C36B	C37F	C393	C3A7	C3BB	C3CF	C3E3
Latch	C358	C36C	C380	C394	C3A8	C3BC	C3D0	C3E4
Not used	C359	C36D	C381	C395	C3A9	C3BD	C3D1	C3E5
Variable code	C35A	C36E	C382	C396	C3AA	C3BE	C3D2	C3E6
Module no.	C35B	C36F	C383	C397	C3AB	C3BF	C3D3	C3E7

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 70: Modbus memory map: Relay digital outputs, expansion modules (Table 3).

Configuration of the relay digital outputs : Slot 2								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Maximum value	C738	C74C	C760	C774	C788	C79C	C7B0	C7C4
Minimum value	C73A	C74E	C762	C776	C78A	C79E	C7B2	C7C6
Delay connection (ON)	C73C	C750	C764	C778	C78C	C7A0	C7B4	C7C8
Disconnection delay (OFF)	C73D	C751	C765	C779	C78D	C7A1	C7B5	C7C9
Pre-alarm value	C73E	C752	C766	C77A	C78E	C7A2	C7B6	C7CA
Output status	C73F	C753	C767	C77B	C78F	C7A3	C7B7	C7CB
Latch	C740	C754	C768	C77C	C790	C7A4	C7B8	C7CC
Not used	C741	C755	C769	C77D	C791	C7A5	C7B9	C7CD
Variable code	C742	C756	C76A	C77E	C792	C7A6	C7BA	C7CE
Module no.	C743	C757	C76B	C77F	C793	C7A7	C7BB	C7CF

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 71:Modbus memory map: Relay digital outputs, expansion modules (Table 4).

Configuration of the relay digital outputs: Slot 3								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Maximum value	CB20	CB34	CB48	CB5C	CB70	CB84	CB98	CBAC
Minimum value	CB22	CB36	CB4A	CB5E	CB72	CB86	CB9A	CBAE
Delay connection (ON)	CB24	CB38	CB4C	CB60	CB74	CB88	CB9C	CBB0
Disconnection delay (OFF)	CB25	CB39	CB4D	CB61	CB75	CB89	CB9D	CBB1
Pre-alarm value	CB26	CB3A	CB4E	CB62	CB76	CB8A	CB9E	CBB2
Output status	CB27	CB3B	CB4F	CB63	CB77	CB8B	CB9F	CBB3
Latch	CB28	CB3C	CB50	CB64	CB78	CB8C	CBA0	CBB4
Not used	CB29	CB3D	CB51	CB65	CB79	CB8D	CBA1	CBB5
Variable code	CB2A	CB3E	CB52	CB66	CB7A	CB8E	CBA2	CBB6
Module no.	CB2B	CB3F	CB53	CB67	CB7B	CB8F	CBA3	CBB7

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 72:Modbus memory map: Relay digital outputs, expansion modules (Table 5).

Configuration of relay digital outputs: Slot 4								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Maximum value	CF08	CF1C	CF30	CF44	CF58	CF6C	CF80	CF94
Minimum value	CF0A	CF1E	CF32	CF46	CF5A	CF6E	CF82	CF96
Delay connection (ON)	CF0C	CF20	CF34	CF48	CF5C	CF70	CF84	CF98
Disconnection delay (OFF)	CF0D	CF21	CF35	CF49	CF5D	CF71	CF85	CF99
Pre-alarm value	CF0E	CF22	CF36	CF4A	CF5E	CF72	CF86	CF9A
Output status	CF0F	CF23	CF37	CF4B	CF5F	CF73	CF87	CF9B
Latch	CF10	CF24	CF38	CF4C	CF60	CF74	CF88	CF9C
Not used	CF11	CF25	CF39	CF4D	CF61	CF75	CF89	CF9D
Variable code	CF12	CF26	CF3A	CF4E	CF62	CF76	CF8A	CF9E
Module no.	CF13	CF27	CF3B	CF4F	CF63	CF77	CF8B	CF9F

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

7.2.4.2.- Manual programming of relay digital outputs

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 73: Modbus memory map: Manual programming of outputs, expansion modules (Table 1).

Manual programming of relay digital outputs		
Configuration variable	Valid data window	Default value
Programming status(1)	**0**: Automatic **1**:Manual	0
Value	**0**: Open **1**:Closed	0

(1) When programming the ***Programming status*** manually set the output for the relays manually, using the ***Value*** parameter. The configuration of the relay digital outputs programmed in the unit no longer works.
The relays work in automatic mode according to the configuration programmed in the unit.

Table 74: Modbus memory map: Manual programming of outputs, expansion modules (Table 2).

Manual programming of relay digital outputs: Slot 1								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Programming status	C428	C43C	C450	C464	C478	C48C	C4A0	C4B4
Value	C429	C43D	C451	C465	C479	C48D	C4A1	C4B5

Note: The 2 registers must be written at once (as a group), otherwise it will respond with an error.

Table 75: Modbus memory map: Manual programming of outputs, expansion modules (Table 3).

Manual programming of relay digital outputs: Slot 2								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Programming status	C810	C824	C838	C84C	C874	C874	C888	C89C
Value	C811	C825	C839	C84D	C875	C875	C889	C89D

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 76: Modbus memory map: Manual programming of outputs, expansion modules (Table 4).

Manual programming of relay digital outputs: Slot 3								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Programming status	CBF8	CC0C	CC20	CC34	CC48	CC5C	CC70	CC84
Value	CBF9	CC0d	CC21	CC35	CC49	CC5D	CC71	CC85

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 77: Modbus memory map: Manual programming of outputs, expansion modules (Table 5).

Manual programming of relay digital outputs: Slot 4								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Programming status	CFE0	CFF4	D008	D01C	D030	D044	D058	D06C
Value	CFE1	CFF5	D009	D01D	D031	D045	D059	D06D

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

7.2.4.3.- Programming the digital inputs

The Modbus memory map for the digital inputs of the relay digital inputs/outputs module is the same as the transistor digital inputs/outputs module, see ***"7.3.4.3.- Programming the digital inputs"***

7.2.4.4.- Status of digital inputs

The Modbus memory map for the status of the digital inputs of the relay digital inputs/outputs module is the same as the transistor digital inputs/outputs module, see ***"7.3.4.4.- Status of digital inputs"***

7.2.4.5.- Status of relay digital outputs

The following functions are implemented for these variables:

Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 78:Modbus memory map: Status of relay digital outputs (Table 1).

Status of relay digital outputs	
Configuration variable	**Valid data window**
Alarm	**Alarm**
Latch [(1)]	**0:** unlock alarm **1:** locked alarm
Connection delay[(2)]	Energy meter which indicates the value of the connection delay variable (ON)
Disconnection delay[(2)]	Energy meter which indicates the value of the disconnection delay variable (OFF)
Alarm activation date: Year[(2)]	**2013** to **2076**
Alarm activation date: Month[(2)]	**1** to **12**
Alarm activation date: Day[(2)]	**1** to **31**
Alarm activation time: Hour[(2)]	**0** to **23**
Alarm activation time: Minutes[(2)]	**0** to **59**
Alarm activation time: Seconds[(2)]	**0** to **59**
Status [(2)]	**0**: No alarm, **1**: Active alarm,
Alarm status[(2)]	**0**: No alarm, **1**: Pre-alarm, **2**: Connection or disconnection delay, **3**: Alarm, **4**: Impulses.

[(1)] If the latch option has been programmed in an alarm and it has been activated, the alarm will be unlocked with this option.

[(2)]For these variables only **Function 0x04** is implemented: reading registers.

Table 79: Modbus memory map: Status of relay digital outputs (Table 2).

Status of relay digital outputs: Slot 1								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Latch	C670	C684	C698	C6AC	C6C0	C6D4	C6E8	C6FC
Connection delay	C672	C686	C69A	C6AE	C6C2	C6D6	C6EA	C6FE
Disconnection delay	C673	C687	C69B	C6AF	C6C3	C6D7	C6EB	C6FF
Alarm activation date: Year	C674	C688	C69C	C6B0	C6C4	C6D8	C6EC	C700
Alarm activation date: Month	C675	C689	C69D	C6B1	C6C5	C6D9	C6ED	C701
Alarm activation date: Day	C676	C68A	C69E	C6B2	C6C6	C6DA	C6EE	C702
Alarm activation time: Time	C677	C68B	C69F	C6B3	C6C7	C6DB	C6EF	C703
Alarm activation time: Minutes	C678	C68C	C6A0	C6B4	C6C8	C6DC	C6F0	C704
Alarm activation time: Seconds	C679	C68D	C6A1	C6B5	C6C9	C6DD	C6F1	C705
Not used	C67A	C68E	C6A2	C6B6	C6CA	C6DE	C6F2	C706
Not used	C67B	C68F	C6A3	C6B7	C6CB	C6DF	C6F3	C707
Status	C67C	C690	C6A4	C6B8	C6CC	C6E0	C6F4	C708
Alarm status	C67D	C691	C6A5	C6B9	C6CD	C6E1	C6F5	C709

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 80: Modbus memory map: Status of relay digital outputs (Table 3).

Status of relay digital outputs: Slot 2								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Latch	CA58	CA6C	CA80	CA94	CAA8	CABC	CAD0	CAE4
Connection delay	CA5A	CA6E	CA82	CA96	CAAA	CABE	CAD2	CAE6
Disconnection delay	CA5B	CA6F	CA83	CA97	CAAB	CABF	CAD3	CAE7
Alarm activation date: Year	CA5C	CA70	CA84	CA98	CAAC	CAC0	CAD4	CAE8
Alarm activation date: Month	CA5D	CA71	CA85	CA99	CAAD	CAC1	CAD5	CAE9
Alarm activation date: Day	CA5E	CA72	CA86	CA9A	CAAE	CAC2	CAD6	CAEA
Alarm activation time: Time	CA5F	CA73	CA87	CA9B	CAAF	CAC3	CAD7	CAEB
Alarm activation time: Minutes	CA60	CA74	CA88	CA9C	CAB0	CAC4	CAD8	CAEC
Alarm activation time: Seconds	CA61	CA75	CA89	CA9D	CAB1	CAC5	CAD9	CAED
Not used	CA62	CA76	CA8A	CA9E	CAB2	CAC6	CADA	CAEE
Not used	CA63	CA77	CA8B	CA9F	CAB3	CAC7	CADB	CAEF
Status	CA64	CA78	CA8C	CAA0	CAB4	CAC8	CADC	CAF0
Alarm status	CA65	CA79	CA8D	CAA1	CAB5	CAC9	CADD	CAF1

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 81: Modbus memory map: Status of relay digital outputs (Table 4).

Status of relay digital outputs: Slot 3								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Latch	CE40	CE54	CE68	CE7C	CE90	CEA4	CEB8	CECC
Connection delay	CE42	CE56	CE6A	CE7E	CE92	CEA6	CEBA	CECE
Disconnection delay	CE43	CE57	CE6B	CE7F	CE93	CEA7	CEBB	CECF
Alarm activation date: Year	CE44	CE58	CE6C	CE80	CE94	CEA8	CEBC	CED0
Alarm activation date: Month	CE45	CE59	CE6D	CE81	CE95	CEA9	CEBD	CED1
Alarm activation date: Day	CE46	CE5A	CE6E	CE82	CE96	CEAA	CEBE	CED2
Alarm activation time: Time	CE47	CE5B	CE6F	CE83	CE97	CEAB	CEBF	CED3
Alarm activation time: Minutes	CE48	CE5C	CE70	CE84	CE98	CEAC	CEC0	CED4
Alarm activation time: Seconds	CE49	CE5D	CE71	CE85	CE99	CEAD	CEC1	CED5
Not used	CE4A	CE5E	CE72	CE86	CE9A	CEAE	CEC2	CED6
Not used	CE4B	CE5F	CE73	CE87	CE9B	CEAF	CEC3	CED7
Status	CE4C	CE60	CE74	CE86	CE9C	CEB0	CEC4	CED8
Alarm status	CE4D	CE61	CE75	CE89	CE9D	CEB1	CEC5	CED9

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 82: Modbus memory map: Status of relay digital outputs (Table 5).

Status of relay digital outputs: Slot 4								
Configuration variable	Address							
	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output 8
Latch	D228	D23C	D250	D264	D278	D28C	D2A0	D2B4
Connection delay	D22A	D23E	D252	D266	D27A	D28E	D2A2	D2B6
Disconnection delay	D22B	D23F	D253	D267	D27B	D28F	D2A3	D2B7
Alarm activation date: Year	D22C	D240	D254	D268	D27C	D290	D2A4	D2B8
Alarm activation date: Month	D22D	D241	D255	D269	D27D	D291	D2A5	D2B9
Alarm activation date: Day	D22E	D242	D256	D26A	D27E	D292	D2A6	D2BA
Alarm activation time: Time	D22F	D243	D257	D26B	D27F	D293	D2A7	D2BB
Alarm activation time: Minutes	D230	D244	D258	D26C	D280	D294	D2A8	D2BC
Alarm activation time: Seconds	D231	D245	D259	D26D	D281	D295	D2A9	D2BD
Not used	D232	D246	D25A	D26E	D282	D296	D2AA	D2BE
Not used	D233	D247	D25B	D26F	D283	D297	D2AB	D2BF
Status	D234	D248	D25C	D270	D284	D298	D2AC	D2C0
Alarm status	D235	D249	D25D	D271	D285	D299	D2AD	D2C1

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

7.3.- TRANSISTOR DIGITAL INPUTS/OUTPUTS

This expansion module contains 8 transistor digital inputs and 8 transistor digital outputs.

7.3.1.- CONNECTION TERMINALS

A.- Terminals on the upper face

Table 83:List of terminals on the upper face, Transistor digital inputs/outputs module.

Unit terminals	
1: T1, Digital output of transistor 1	**6: T5**, Digital output of transistor 5
2: T2, Digital output of transistor 2	**7: T6**, Digital output of transistor 6
3: T3, Digital output of transistor 3	**8: T7**, Digital output of transistor 7
4: T4, Digital output of transistor 4	**9: T8**, Digital output of transistor 8
5: COM, Common digital outputs of transistor **T1, T2, T3** and **T4**	**10: COM ,** Common digital outputs of transistor **T5, T6, T7** and **T8**

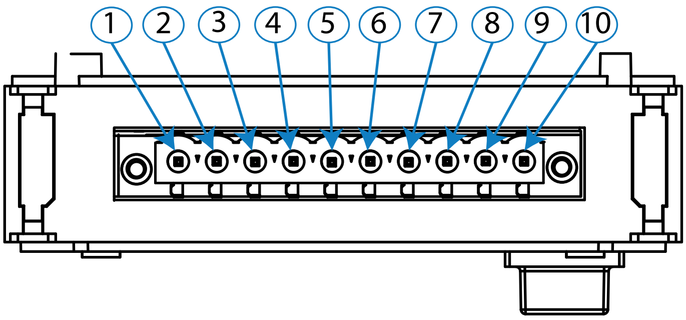


Figure 159: Terminals of Transistor Digital Inputs/Outputs, upper face.

B.- Terminals on the lower face

Table 84:List of terminals on the lower face, Transistor digital inputs/outputs module.

Unit terminals	
11: COM, for digital inputs	**16: I5**, Digital input 5
12: I1, Digital input 1	**17: I6**, Digital input 6
13: I2, Digital input 2	**18: I7**, Digital input 7
14: I3, Digital input 3	**19: I8**, Digital input 8
15: I4 , Digital input 4	

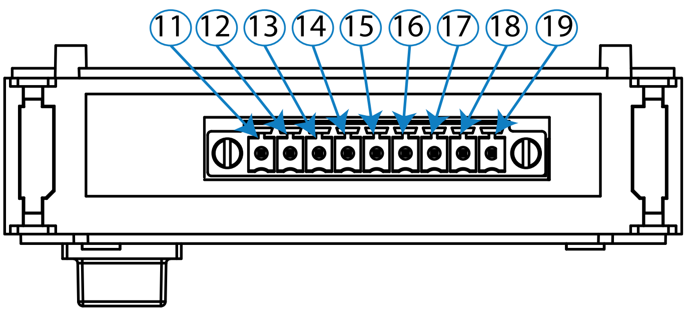


Figure 160:Terminals of Transistor Digital Inputs/Outputs, lower face.

7.3.2.- CONNECTION DIAGRAMS

A.- Transistor digital outputs

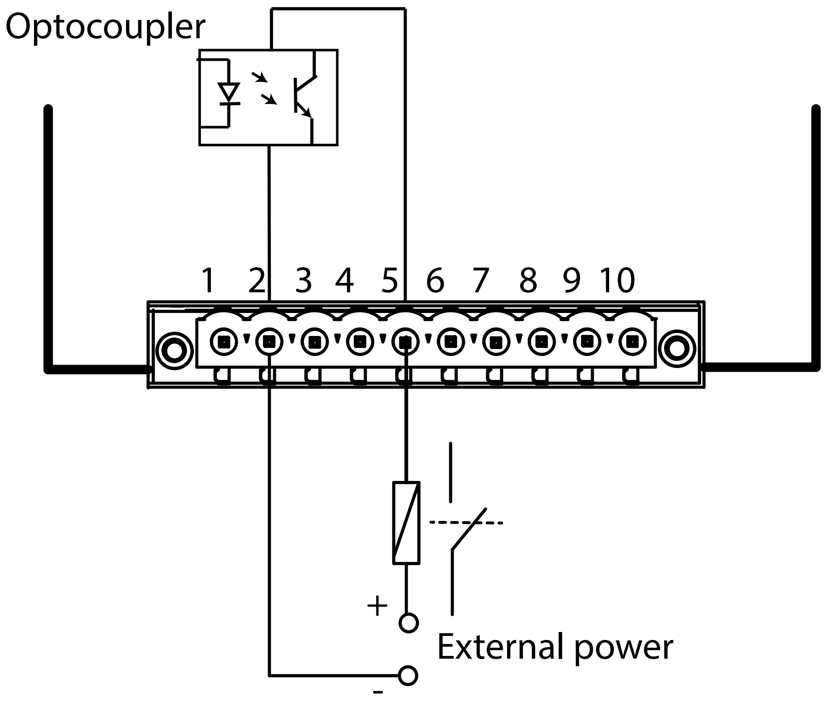


Figure 161:Connection diagram, transistor digital outputs.

B.- Digital inputs

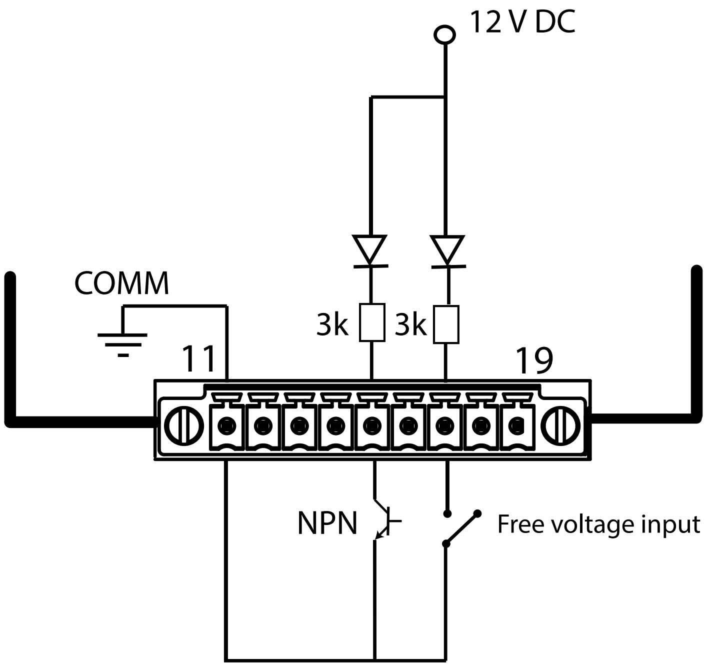


Figure 162:Connection diagram, digital inputs.

7.3.3.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 163,** is the home screen of the setup menu.

Figure 163: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 164**.

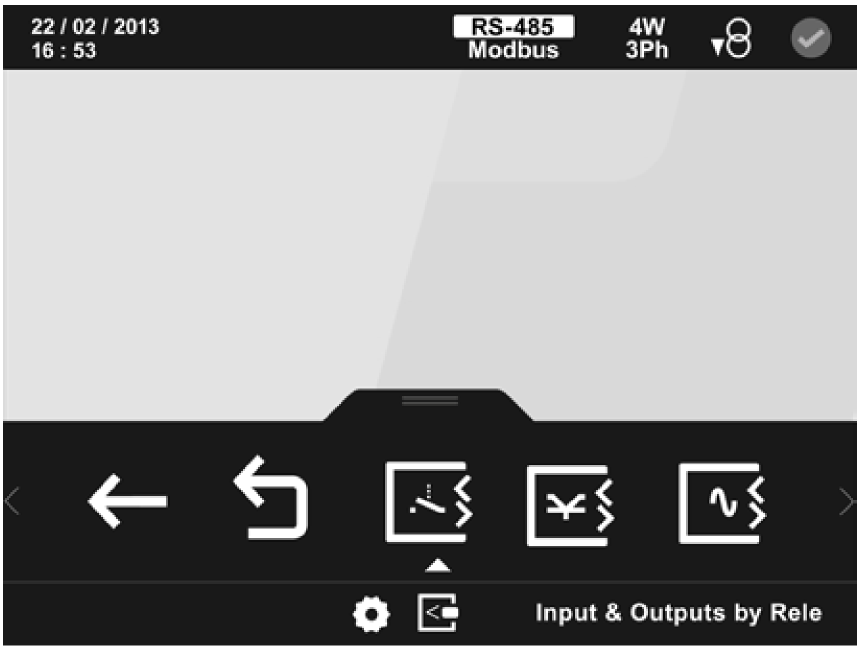


Figure 164: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.

If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **Transistor digital Inputs/Outputs** icon .

Press the button to open the main configuration screen of the transistor digital Inputs/ Ouputs module, **Figure 165.**

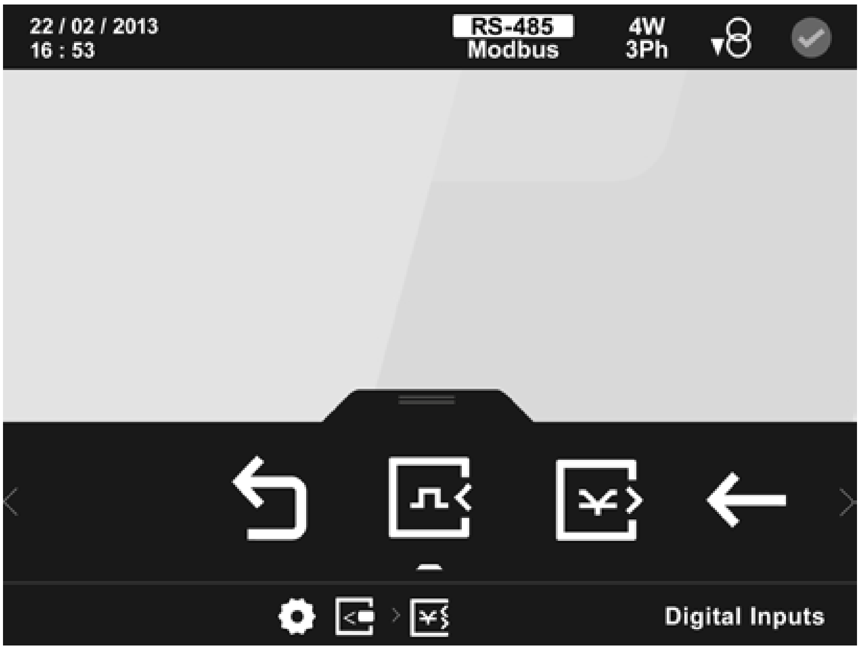


Figure 165: Main configuration screen of transistor digital inputs/outputs.

The following options appear in the lower area:

Digital inputs[1], to select the configuration of the digital inputs.
Digital outputs[1], to select the configuration of the transistor digital outputs.
Back, returns to the home screen of the expansion modules menu, **Figure 164**
Main Menu, back to the main menu, **Figure 25.**

[1] If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them; the module with the lowest number has the lowest serial number.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.3.3.1.- Digital inputs.

The configuration of the digital inputs is the same as the configuration of the digital inputs in the relay digital inputs/outputs module, see ***"7.2.3.1.- Digital inputs."***

7.3.3.2.- Transistor digital outputs.

Select the output to configure on the main configuration screen for transistor digital outputs, **Figure 166**.

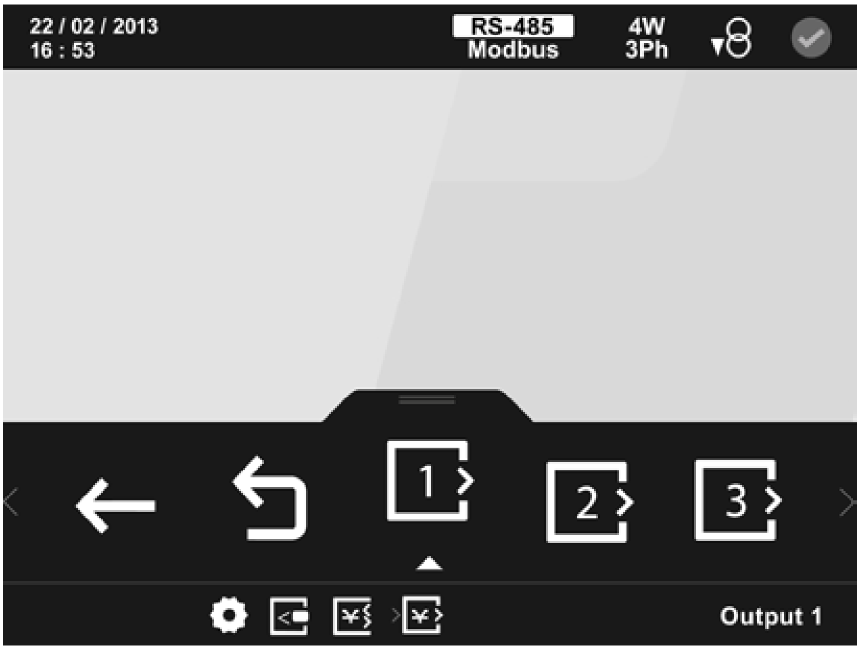


Figure 166: Main configuration screen of transistor digital outputs.

The following options appear in the lower area:

... Digital outputs, 1 to 8, to select the configuration of each of the 8 transistor digital outputs.

Back, returns to the main screen for transistor digital inputs/outputs, **Figure 165**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

The configuration of the transistor digital outputs in the expansion modules is the same as the configuration of the transistor digital outputs integrated in the unit, see ***"5.6.16.- Transistor digital outputs."***

7.3.4.- COMUNICACIONES MODBUS

The address of the Modbus memory map depends on the position of the expansion module in the unit.
Slot 1 will be the position of the expansion module installed just behind the standard unit, and Slot 2 the next position...
As the maximum number of expansion modules that can be connected to the unit is 4, there will only be 4 slots.

7.3.4.1. - Programming of transistor digital outputs

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 85: Modbus memory map: Transistor digital outputs, expansion modules (Table 1).

<table>
<tr><th colspan="5">Configuration of Transistor Digital Outputs</th></tr>
<tr><th colspan="2">Configuration variable</th><th colspan="2">Valid data window</th><th>Default value</th></tr>
<tr><td colspan="2">Variable code</td><td colspan="2">Table 21</td><td>0</td></tr>
<tr><td>Alarm</td><td>Impulse output</td><td colspan="2" rowspan="2">0 to 100%</td><td rowspan="2">0</td></tr>
<tr><td>Pre-alarm value</td><td>-</td></tr>
<tr><td>Minimum value(1)</td><td>-</td><td colspan="2">Table 44</td><td>0</td></tr>
<tr><td>Maximum value (1)</td><td>Energy meter factor</td><td colspan="2">Table 44</td><td>0</td></tr>
<tr><td rowspan="2">Connection delay (ON)</td><td rowspan="2">High period (2)</td><td>Alarm</td><td>Impulse output</td><td rowspan="2">0</td></tr>
<tr><td>0 to 999 s.</td><td>1 to 65536</td></tr>
<tr><td>Disconnection delay (OFF)</td><td>Low period (2)</td><td>0 to 999 s.</td><td>1 to 65536</td><td>0</td></tr>
<tr><td>Latch</td><td>-</td><td colspan="2">0 : Unlocked
1: Locked</td><td>0</td></tr>
<tr><td>Output status</td><td>-</td><td colspan="2">0 : Normally open
1: Normally closed</td><td>0</td></tr>
<tr><td colspan="2">Module no.</td><td colspan="2">0</td><td>0</td></tr>
</table>

(1) When programming the maximum and minimum values, the decimals for the variable selected must be included.
(2) The programmed value is a multiple of 10 ms, when programming 1 the impulse will be at its minimum value of 10 ms.

Table 86: Modbus memory map: Transistor digital outputs, expansion modules (Table 2).

Transistor Digital Outputs configuration: Slot 1									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Maximum value	Energy meter factor	C350	C364	C378	C38C	C3A0	C3B4	C3C8	C3DC
Minimum value	-	C352	C366	C37A	C38E	C3A2	C3B6	C3CA	C3DE
Delay in the Connection (ON)	High period	CE54	C368	C37C	C390	C3A4	C3B8	C3CC	C3E0
Delay in the Disconnection (OFF)	Low period	C355	C369	C37D	C391	C3A5	C3B9	C3CD	C3E1
Value of Pre-alarm	-	C356	C36A	C37E	C392	C3A6	C3BA	C3CE	C3E2
Status of The output	-	C357	C36B	C37F	C393	C3A7	C3BB	C3CF	C3E3
Latch	-	C358	C36C	C380	C394	C3A8	C3BC	C3D0	C3E4
Not used		C359	C36D	C381	C395	C3A9	C3BD	C3D1	C3E5
Variable code		C35A	C36E	C382	C396	C3AA	C3BE	C3D2	C3E6
Module no.		C35B	C36F	C383	C397	C3AB	C3BF	C3D3	C3E7

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 87: Modbus memory: Transistor digital outputs, expansion modules (Table 3).

Transistor Digital Outputs configuration: Slot 2									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Maximum value	Energy meter factor	C738	C74C	C760	C774	C788	C79C	C7B0	C7C4
Minimum value	-	C73A	C74E	C762	C776	C78A	C79E	C7B2	C7C6
Delay in the Connection (ON)	High period	C73C	C750	C764	C778	C78C	C7A0	C7B4	C7C8
Delay in the Disconnection (OFF)	Low period	C73D	C751	C765	C779	C78D	C7A1	C7B5	C7C9
Value of Pre-alarm	-	C73E	C752	C766	C77A	C78E	C7A2	C7B6	C7CA
Status of The output	-	C73F	C753	C767	C77B	C78F	C7A3	C7B7	C7CB
Latch	-	C740	C754	C768	C77C	C790	C7A4	C7B8	C7CC
Not used		C741	C755	C769	C77D	C791	C7A5	C7B9	C7CD
Variable code		C742	C756	C76A	C77E	C792	C7A6	C7BA	C7CE
Module no.		C743	C757	C76B	C77F	C793	C7A7	C7BB	C7CF

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 88: Modbus memory map: Transistor digital outputs, expansion modules (Table 4).

Transistor Digital Outputs configuration: Slot 3									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Maximum value	Energy meter factor	CB20	CB34	CB48	CB5C	CB70	CB84	CB98	CBAC
Minimum value	-	CB22	CB36	CB4A	CB5E	CB72	CB86	CB9A	CBAE
Delay in the Connection (ON)	High period	CB24	CB38	CB4C	CB60	CB74	CB88	CB9C	CBB0
Delay in the Disconnection (OFF)	Low period	CB25	CB39	CB4D	CB61	CB75	CB89	CB9D	CBB1
Value of Pre-alarm	-	CB26	CB3A	CB4E	CB62	CB76	CB8A	CB9E	CBB2
Status of The output	-	CB27	CB3B	CB4F	CB63	CB77	CB8B	CB9F	CBB3
Latch	-	CB28	CB3C	CB50	CB64	CB78	CB8C	CBA0	CBB4
Not used		CB29	CB3D	CB51	CB65	CB79	CB8D	CBA1	CBB5
Variable code		CB2A	CB3E	CB52	CB66	CB7A	CB8E	CBA2	CBB6
Module no.		CB2B	CB3F	CB53	CB67	CB7B	CB8F	CBA3	CBB7

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 89: Modbus memory map: Transistor digital outputs, expansion modules (Table 5).

Transistor Digital Outputs configuration: Slot 4									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Maximum value	Energy meter factor	CF08	CF1C	CF30	CF44	CF58	CF6C	CF80	CF94
Minimum value	-	CF0A	CF1E	CF32	CF46	CF5A	CF6E	CF82	CF96
Delay in the Connection (ON)	High period	CF0C	CF20	CF34	CF48	CF5C	CF70	CF84	CF98
Delay in the Disconnection (OFF)	Low period	CF0D	CF21	CF35	CF49	CF5D	CF71	CF85	CF99
Value of Pre-alarm	-	CF0E	CF22	CF36	CF4A	CF5E	CF72	CF86	CF9A
Status of The output	-	CF0F	CF23	CF37	CF4B	CF5F	CF73	CF87	CF9B
Latch	-	CF10	CF24	CF38	CF4C	CF60	CF74	CF88	CF9C
Not used		CF11	CF25	CF39	CF4D	CF61	CF75	CF89	CF9D
Variable code		CF12	CF26	CF3A	CF4E	CF62	CF76	CF8A	CF9E
Module no.		CF13	CF27	CF3B	CF4F	CF63	CF77	CF8B	CF9F

Note: *The 12 registers must be written and read at once (as a group), otherwise it will respond with an error.*

7.3.4.2.- Manual programming of transistor digital outputs

The following functions are implemented for these variables:
Function 0x04:reading registers.
Function 0x10: Writing multiple registers.

Table 90: Modbus memory map: Manual programming of outputs, expansion modules (Table 1).

Manual programming of transistor digital outputs		
Configuration variable	**Valid data window**	**Default value**
Programming status[(1)]	**0**: Automatic **1**:Manual	0
Value	**0**: Open **1**:Closed	0

[(1)] When programming the ***Programming status*** manually set the output for the transistors manually, using the ***Value*** parameter. The configuration of the transistor digital outputs programmed in the unit no longer works.
The transistors work in automatic mode according to the configuration programmed in the unit.

Table 91: Modbus memory map: Manual programming of outputs, expansion modules (Table 2).

Manual programming of transistor digital outputs: Slot 1								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Programming status	C428	C43C	C450	C464	C478	C48C	C4A0	C4B4
Value	C429	C43D	C451	C465	C479	C48D	C4A1	C4B5

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 92: Modbus memory map: Manual programming of outputs, expansion modules (Table 3).

Manual programming of transistor digital outputs: Slot 2								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Programming status	C810	C824	C838	C84C	C874	C874	C888	C89C
Value	C811	C825	C839	C84D	C875	C875	C889	C89D

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 93: Modbus memory map: Manual programming of outputs, expansion modules (Table 4).

Manual programming of transistor digital outputs: Slot 3								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Programming status	CBF8	CC0C	CC20	CC34	CC48	CC5C	CC70	CC84
Value	CBF9	CC0d	CC21	CC35	CC49	CC5D	CC71	CC85

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

Table 94: Modbus memory map: Manual programming of outputs, expansion modules (Table 5).

Manual programming of transistor digital outputs: Slot 4								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Programming status	CFE0	CFF4	D008	D01C	D030	D044	D058	D06C
Value	CFE1	CFF5	D009	D01D	D031	D045	D059	D06D

Note: *The 2 registers must be written at once (as a group), otherwise it will respond with an error.*

7.3.4.3.- Programming the digital inputs

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 95:Modbus memory map: Digital inputs, expansion modules (Table 1).

Configuration of Digital Inputs		
Configuration variable	**Valid data window**	**Default value**
Mode	**0**: Logic state **> 0**:Impulses(1)	0
Logic (Logic state)	**0**: positive **1**: Negative	0
Input name (impulses) (2)	**8** characters	"INPUT"
Units (Impulses) (2)	**6** characters	-
No. of decimals (Impulses)	**0** to **5**	0

(1) When programming a value of more than 1, program the impulse operating mode and energy meter factor for this mode simultaneously.

(2) the characters must be sent in hexadecimal.

Table 96: Modbus memory map: Digital inputs, expansion modules (Table 2).

Configuration of digital inputs: Slot 1								
Configuration variable	**Address**							
	Input 1	**Input 2**	**Input 3**	**Input 4**	**Input 5**	**Input 6**	**Input 7**	**Input 8**
Mode	C4E0	C4EC	C4F8	C504	C510	C51C	C528	C534
Logic (Logic state)	C4E1	C4ED	C4F9	C505	C511	C51D	C529	C535
No. of decimals (Impulses)	C4E2	C4EE	C4FA	C506	C512	C51E	C52A	C536
Not used	C4E3	C4EF	C4FB	C507	C513	C51F	C52B	C537
Input name (impulses)	C4E4 - C4E7	C4F0- C4F3	C4FC- C4FF	C508- C50B	C514- C517	C520- C523	C52C- C52F	C538- C53B
Units (Impulses)	C4E8 - C4EA	C4F4- C4F6	C500- C502	C50C- C50E	C518- C51A	C524- C526	C530 C532	C53C C53E

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 97:Modbus memory map: Digital inputs, expansion modules (Table 3).

Configuration of digital inputs: Slot 2								
Configuration variable	**Address**							
	Input 1	**Input 2**	**Input 3**	**Input 4**	**Input 5**	**Input 6**	**Input 7**	**Input 8**
Mode	C8C8	C8D4	C8E0	C8EC	C8F8	C904	C910	C91C
Logic (Logic state)	C8C9	C8D5	C8E1	C8ED	C8F9	C905	C911	C91D
No. of decimals (Impulses)	C8CA	C8D6	C8E2	C8EE	C8FA	C906	C912	C91E
Not used	C8CB	C8D7	C8E3	C8EF	C8FB	C907	C913	C91F
Input name (impulses)	C8CC-C8CF	C8D8-C8DB	C8E4-C8E7	C8F0-C8F3	C8FC-C8FF	C908-C90B	C914-C917	C920-C923
Units (Impulses)	C8D0-C8D2	C8DC-C8DE	C8E8-C8EA	C8F4-C8F6	C900-C902	C90C-C90E	C918-C91A	C924-C926

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 98:Modbus memory map: Digital inputs, expansion modules (Table 4).

Configuration of digital inputs: Slot 3								
Configuration variable	**Address**							
	Input 1	**Input 2**	**Input 3**	**Input 4**	**Input 5**	**Input 6**	**Input 7**	**Input 8**
Mode	CCB0	CCBC	CCC8	CCD4	CCE0	CCEC	CCF8	CD04
Logic (Logic state)	CCB1	CCBD	CCC9	CCD5	CCE1	CCED	CCF9	CD05
No. of decimals (Impulses)	CCB2	CCBE	CCCA	CCD6	CCE2	CCEE	CCFA	CD06
Not used	CCB3	CCBF	CCCB	CCD7	CCE3	CCEF	CCFB	CD07
Input name (impulses)	CCB4 - CCB7	CCC0 - CCC3	CCCC - CCCF	CCD8-CCDB	CCE4-CCE7	CCF0-CCF3	CCFC-CCFF	CD08-CD0B
Units (Impulses)	CCB8 - CCBA	CCC4 - CCC6	CCD0 - CCD2	CCDC-CCDE	CCE8-CCEA	CCF4-CCF6	CD00-CD02	CD0C-CD0E

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 99:Modbus memory map: Digital inputs, expansion modules (Table 5).

Configuration of digital inputs: Slot 4								
Configuration variable	**Address**							
	Input 1	**Input 2**	**Input 3**	**Input 4**	**Input 5**	**Input 6**	**Input 7**	**Input 8**
Mode	D098	D0A4	D0B0	D0BC	D0C8	D0D4	D0E0	D0EC
Logic (Logic state)	D099	D0A5	D0B1	D0BD	D0C9	D0D5	D0E1	D0ED
No. of decimals (Impulses)	D09A	D0A6	D0B2	D0BE	D0CA	D0D6	D0E2	D0EE
Not used	D09B	D0A7	D0B3	D0BF	D0CB	D0D7	D0E3	D0EF
Input name (impulses)	D09C-D09F	D0A8-D0AB	D0B4-D0B7	D0C0-D0C3	D0CC-D0CF	D0D8-D0DB	D0E4-D0E7	D0F0-D0F3
Units (Impulses)	D0A0-D0A2	D0AC-D0AD	D0B8-D0BA	D0C4-D0C6	D0D0-D0D2	D0DC-D0DE	D0E8-D0EA	D0F4-D0F6

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

7.3.4.4.- Status of digital inputs

The following functions are implemented for these variables:
Function 0x04: reading registers.

Table 100: Modbus memory map: Status of digital inputs (Table 1).

Status of digital inputs: Slot 1		
Configuration variable	**Address**	**Valid data window**
Input Status 1	C5A8 – C5A9	**0** to **1**
Input Status 2	C5AA – C5AB	**0** to **1**
Input Status 3	C5AC – C5AD	**0** to **1**
Input Status 4	C5AE – C5AF	**0** to **1**
Input Status 5	C5B0 – C5B1	**0** to **1**
Input Status 6	C5B2 – C5B3	**0** to **1**
Input Status 7	C5B4 – C5B5	**0** to **1**
Input Status 8	C5B6 – C5B7	**0** to **1**

Table 101: Modbus memory map: Status of digital inputs (Table 2).

Status of digital inputs: Slot 2		
Configuration variable	**Address**	**Valid data window**
Input Status 1	C990 – C991	**0** to **1**
Input Status 2	C992 – C993	**0** to **1**
Input Status 3	C994 – C995	**0** to **1**
Input Status 4	C996 – C997	**0** to **1**
Input Status 5	C998 – C999	**0** to **1**
Input Status 6	C99A – C99B	**0** to **1**
Input Status 7	C99C – C99D	**0** to **1**
Input Status 8	C99E – C99F	**0** to **1**

Table 102: Modbus memory map: Status of digital inputs (Table 3).

Status of digital inputs: Slot 3		
Configuration variable	**Address**	**Valid data window**
Input Status 1	CD78 - CD79	**0** to **1**
Input Status 2	CD7A - CD7B	**0** to **1**
Input Status 3	CD7C - CD7D	**0** to **1**
Input Status 4	CD7E - CD7F	**0** to **1**
Input Status 5	CD80 - CD81	**0** to **1**
Input Status 6	CD82 - CD83	**0** to **1**
Input Status 7	CD84 - CD85	**0** to **1**
Input Status 8	CD86 - CD87	**0** to **1**

Table 103: Modbus memory map: Status of digital inputs (Table 4).

Status of digital inputs: Slot 4		
Configuration variable	**Address**	**Valid data window**
Input Status 1	D160 - D161	**0** to **1**
Input Status 2	D162 - D163	**0** to **1**
Input Status 3	D164 - D165	**0** to **1**
Input Status 4	D166 - D167	**0** to **1**
Input Status 5	D168 - D169	**0** to **1**
Input Status 6	D16A - D16B	**0** to **1**
Input Status 7	D16C - D16D	**0** to **1**
Input Status 8	D16E - D16F	**0** to **1**

7.3.4.5.- Status of transistor digital outputs

The following functions are implemented for these variables:
Function 0x04: reading registers.

Table 104:Modbus memory map: Status of transistor digital outputs (Table 1).

Status of transistor digital outputs			
Configuration variable		**Valid data window**	
Alarm	**Impulse output**	**Alarm**	**Impulse output**
Latch [1]	kWh or Wh	**0:** unlock alarm **1:** locked alarm	kWh or Wh energy meter
Delay in the connection[2]	Wh or mWh	Energy meter which indicates the value of the connection delay variable (ON)	Wh or mWh energy meter
Delay in the disconnection[2]	Energy meter factor	Energy meter which indicates the value of the disconnection delay variable (OFF)	Energy meter factor meter
Alarm activation date: Year[2]	-	**2013** to **2076**	**-**
Alarm activation date: Month[2]	-	**1** to **12**	-
Alarm activation date: Day[2]	-	**1** to **31**	-
Alarm activation time: Hour[2]	-	**0** to **23**	-
Alarm activation time: Minutes[2]	-	**0** to **59**	-
Alarm activation time: Seconds[2]	-	**0** to **59**	-
Not used		**-**	-
Not used		**-**	-
Status [2]		**0**: No alarm, **1**: Active alarm,	
Alarm status[2]		**0**: No alarm, **1**: Pre-alarm, **2**: Connection or disconnection delay, **3**: Alarm, **4**: Impulses.	

[1] If the latch option has been programmed in an alarm and it has been activated, the alarm will be unlocked with this option.

[2]For these variables only **Function 0x04** is implemented: reading registers.

Table 105: Modbus memory map: Status of transistor digital outputs (Table 2).

Transistor digital outputs: Slot1									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Latch	kWh o Wh	C670	C684	C698	C6AC	C6C0	C6D4	C6E8	C6FC
Delay in the Connection	Wh o mWh	C672	C686	C69A	C6AE	C6C2	C6D6	C6EA	C6FE
Delay in the Disconnection	Factor Energy meter	C673	C687	C69B	C6AF	C6C3	C6D7	C6EB	C6FF
Alarm activation date: Year	-	C674	C688	C69C	C6B0	C6C4	C6D8	C6EC	C700
Alarm activation date: Month	-	C675	C689	C69D	C6B1	C6C5	C6D9	C6ED	C701
Alarm activation date: Day	-	C676	C68A	C69E	C6B2	C6C6	C6DA	C6EE	C702
Alarm activation time: Hour	-	C677	C68B	C69F	C6B3	C6C7	C6DB	C6EF	C703
Alarm activation time: Minutes	-	C678	C68C	C6A0	C6B4	C6C8	C6DC	C6F0	C704
Alarm activation time: Seconds	-	C679	C68D	C6A1	C6B5	C6C9	C6DD	C6F1	C705
Not used		C67A	C68E	C6A2	C6B6	C6CA	C6DE	C6F2	C706
Not used		C67B	C68F	C6A3	C6B7	C6CB	C6DF	C6F3	C707
Status		C67C	C690	C6A4	C6B8	C6CC	C6E0	C6F4	C708
Alarm Status		C67D	C691	C6A5	C6B9	C6CD	C6E1	C6F5	C709

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 106: Modbus memory map: Status of transistor digital outputs (Table 3).

Transistor digital outputs: Slot2									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Latch	kWh o Wh	CA58	CA6C	CA80	CA94	CAA8	CABC	CAD0	CAE4
Delay in the Connection	Wh o mWh	CA5A	CA6E	CA82	CA96	CAAA	CABE	CAD2	CAE6
Delay in the Disconnection	Factor Energy meter	CA5B	CA6F	CA83	CA97	CAAB	CABF	CAD3	CAE7
Alarm activation date: Year	-	CA5C	CA70	CA84	CA98	CAAC	CAC0	CAD4	CAE8
Alarm activation date: Month	-	CA5D	CA71	CA85	CA99	CAAD	CAC1	CAD5	CAE9
Alarm activation date: Day	-	CA5E	CA72	CA86	CA9A	CAAE	CAC2	CAD6	CAEA
Alarm activation time: Hour	-	CA5F	CA73	CA87	CA9B	CAAF	CAC3	CAD7	CAEB
Alarm activation time: Minutes	-	CA60	CA74	CA88	CA9C	CAB0	CAC4	CAD8	CAEC
Alarm activation time: Seconds	-	CA61	CA75	CA89	CA9D	CAB1	CAC5	CAD9	CAED

Table 106 (Continuation): Modbus memory map: Status of transistor digital outputs (Table 3).

Estado de las Salidas Digitales de Transistor : Slot 2								
Variable de configuración	**Dirección**							
Not used	CA62	CA76	CA8A	CA9E	CAB2	CAC6	CADA	CAEE
Not used	CA63	CA77	CA8B	CA9F	CAB3	CAC7	CADB	CAEF
Status	CA64	CA78	CA8C	CAA0	CAB4	CAC8	CADC	CAF0
Alarm Status	CA65	CA79	CA8D	CAA1	CAB5	CAC9	CADD	CAF1

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 107: Modbus memory map: Status of transistor digital outputs (Table 4).

Transistor digital outputs: Slot3									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Latch	kWh o Wh	CE40	CE54	CE68	CE7C	CE90	CEA4	CEB8	CECC
Delay in the Connection	Wh o mWh	CE42	CE56	CE6A	CE7E	CE92	CEA6	CEBA	CECE
Delay in the Disconnection	Factor Energy meter	CE43	CE57	CE6B	CE7F	CE93	CEA7	CEBB	CECF
Alarm activation date: Year	-	CE44	CE58	CE6C	CE80	CE94	CEA8	CEBC	CED0
Alarm activation date: Month	-	CE45	CE59	CE6D	CE81	CE95	CEA9	CEBD	CED1
Alarm activation date: Day	-	CE46	CE5A	CE6E	CE82	CE96	CEAA	CEBE	CED2
Alarm activation time: Hour	-	CE47	CE5B	CE6F	CE83	CE97	CEAB	CEBF	CED3
Alarm activation time: Minutes	-	CE48	CE5C	CE70	CE84	CE98	CEAC	CEC0	CED4
Alarm activation time: Seconds	-	CE49	CE5D	CE71	CE85	CE99	CEAD	CEC1	CED5
Not used		CE4A	CE5E	CE72	CE86	CE9A	CEAE	CEC2	CED6
Not used		CE4B	CE5F	CE73	CE87	CE9B	CEAF	CEC3	CED7
Status		CE4C	CE60	CE74	CE88	CE9C	CEB0	CEC4	CED8
Alarm Status		CE4D	CE61	CE75	CE89	CE9D	CEB1	CEC5	CED9

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

Table 108: Modbus memory map: Status of transistor digital outputs (Table 5).

Transistor digital outputs: Slot4									
Configuration variable		**Address**							
Alarm	**Impulse output**	**Output 1**	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Latch	kWh o Wh	D228	D23C	D250	D264	D278	D28C	D2A0	D2B4
Delay in the Connection	Wh o mWh	D22A	D23E	D252	D266	D27A	D28E	D2A2	D2B6
Delay in the Disconnection	Factor Energy meter	D22B	D23F	D253	D267	D27B	D28F	D2A3	D2B7
Alarm activation date: Year	-	D22C	D240	D254	D268	D27C	D290	D2A4	D2B8
Alarm activation date: Month	-	D22D	D241	D255	D269	D27D	D291	D2A5	D2B9
Alarm activation date: Day	-	D22E	D242	D256	D26A	D27E	D292	D2A6	D2BA
Alarm activation time: Hour	-	D22F	D243	D257	D26B	D27F	D293	D2A7	D2BB
Alarm activation time: Minutes	-	D230	D244	D258	D26C	D280	D294	D2A8	D2BC
Alarm activation time: Seconds	-	D231	D245	D259	D26D	D281	D295	D2A9	D2BD
Not used		D232	D246	D25A	D26E	D282	D296	D2AA	D2BE
Not used		D233	D247	D25B	D26F	D283	D297	D2AB	D2BF
Status		D234	D248	D25C	D270	D284	D298	D2AC	D2C0
Alarm Status		D235	D249	D25D	D271	D285	D299	D2AD	D2C1

Note: *The 14 registers must be read at once (as a group), otherwise it will respond with an error.*

7.4.- ANALOGUE INPUTS/OUTPUTS

This expansion module contains 8 analogue outputs and 4 analogue inputs.

7.4.1.- CONNECTION TERMINALS

A.- Terminals on the upper face

Table 109: List of terminals on the upper face, Analogue inputs/outputs module.

Unit terminals	
1: O1, Analogue output 1	**6: O6**, Analogue output 6
2: O2, Analogue output 2	**7: O7**, Analogue output 7
3: O3, Analogue output 3	**8: O8**, Analogue output 8
4: O4, Analogue output 4	**9: COM**, Common analogue outputs
5: O5, Analogue output 5	

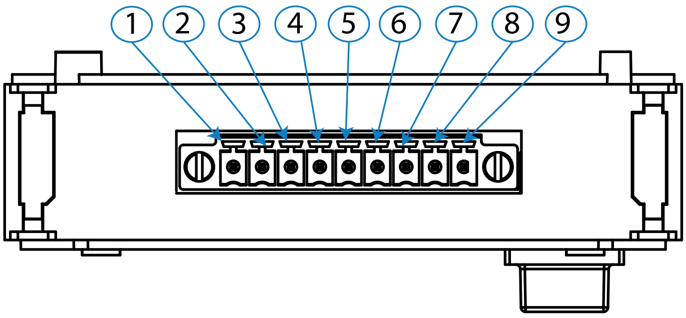


Figure 167:Analogue Input/Output Terminals, upper face.

⚠	The analogue outputs are active; they do not need an external power supply for generating 20 mA or 10 V.

⚠	The operating mode of each output (Voltage or Current) is configured on the unit's screen or by communications. Make sure the output is configured according to your needs before connecting a unit to it. Your unit could be damaged.

B.- Terminals on the lower face

Table 110: List of terminals on the lower face, Analogue inputs/outputs module.

Unit terminals	
10: I1+, Analogue input 1	**14: I3+,** Analogue input 3
11: I1-, Analogue input 1	**15: I3-,** Analogue input 3
12: I2+, Analogue input 2	**16: I4+,** Analogue input 4
13: I2-, Analogue input 2	**17: I4-,** Analogue input 4

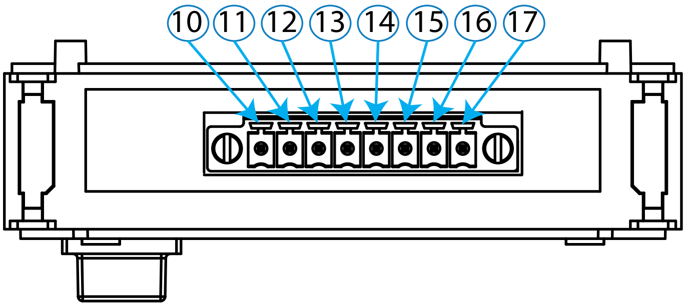


Figure 168:Analogue Input/Output Terminals, lower face.

⚠	Respect the input polarities for the unit to work properly.

⚠	Do not connect the inputs in series so that the same current passes through all of them. The unit will not measure correctly. The inputs must work independently.

7.4.2.- CONNECTION DIAGRAMS

A.- Analogue outputs

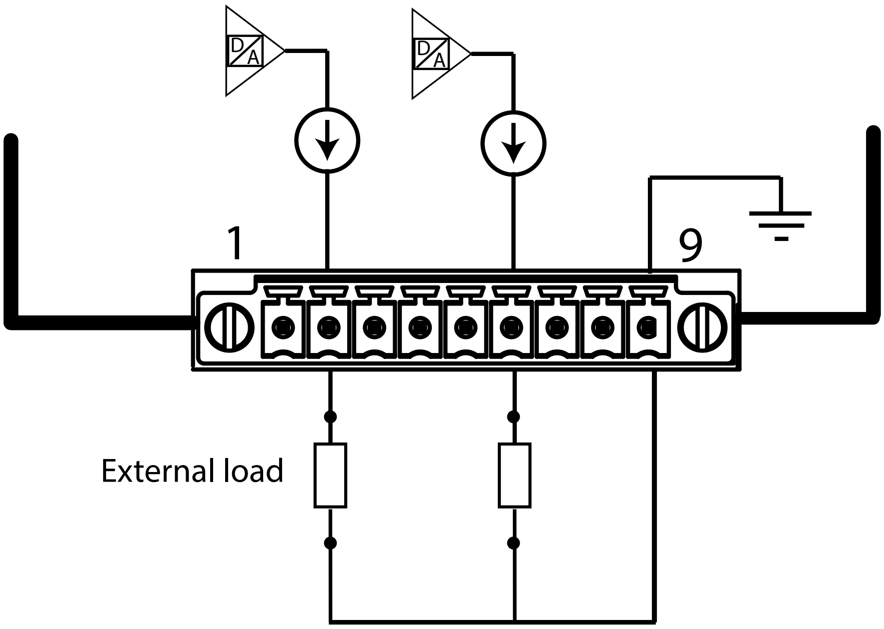


Figure 169:Connection diagram, analogue outputs.

B.- Analogue inputs

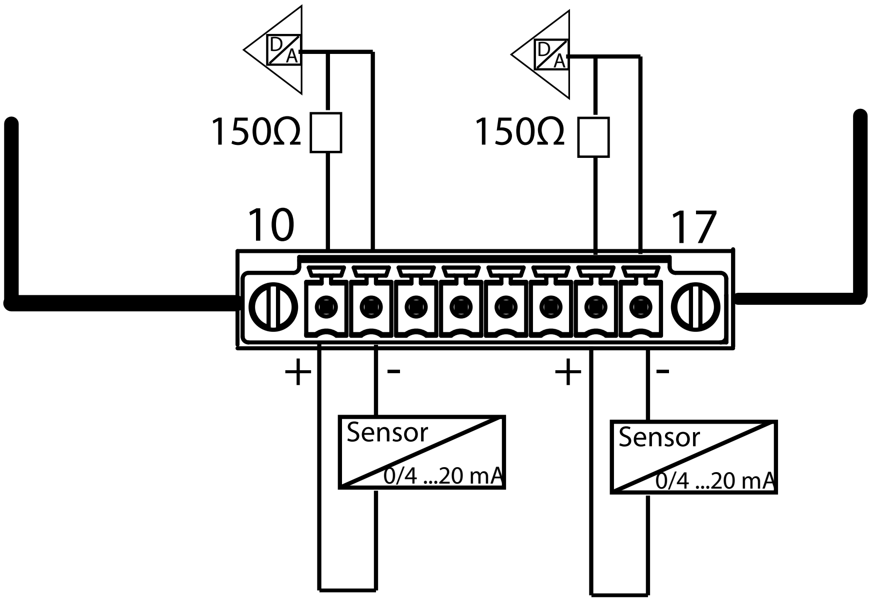


Figure 170: Connection diagram, analogue inputs.

7.4.3.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 171,** is the home screen of the setup menu.

Figure 171: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 172**.

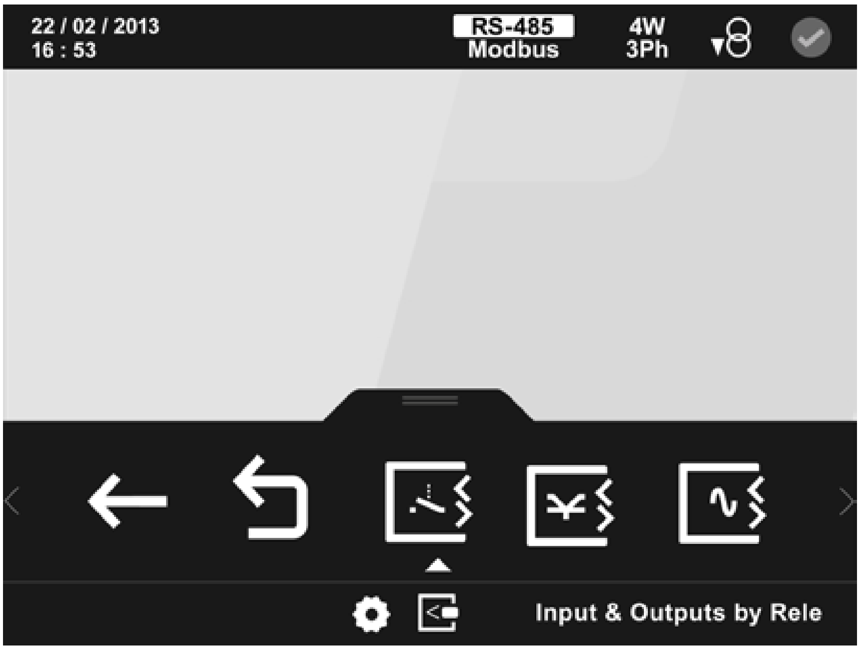


Figure 172: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.
If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **analogue Inputs/ Outputs** icon .

Press the button to open the main configuration screen of the module of analogue digital inputs/outputs, **Figure 173.**

Figure 173: Main configuration screen for analogue inputs/outputs.

The following options appear in the lower area:

Analogue inputs(1), to select the configuration of analogue inputs.
Analogue outputs(1), to select the configuration of analogue outputs.
Back, returns to the home screen of the expansion modules menu, **Figure 172**.
Main Menu, back to the main menu, **Figure 25**.

(1) If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them; the module with the lowest number has the lowest serial number.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.4.3.1.- Analogue inputs.

Select the input to configure on the main configuration screen for the analogue inputs, **Figure 174**.

Figure 174: Main configuration screen for analogue inputs.

The following options appear in the lower area:

... Analogue inputs from 1 to 4, to select the configuration of each of the 4 analogue inputs.

Back, returns to the main configuration screen for analogue inputs/outputs, **Figure 173**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

When selecting the input to configure, **Figure 175,** the configuration parameters are:

- ✓ The analogue input scale.
- ✓ The zero.
- ✓ The full scale.
- ✓ The decimal position.
- ✓ The analogue input name.
- ✓ The units.

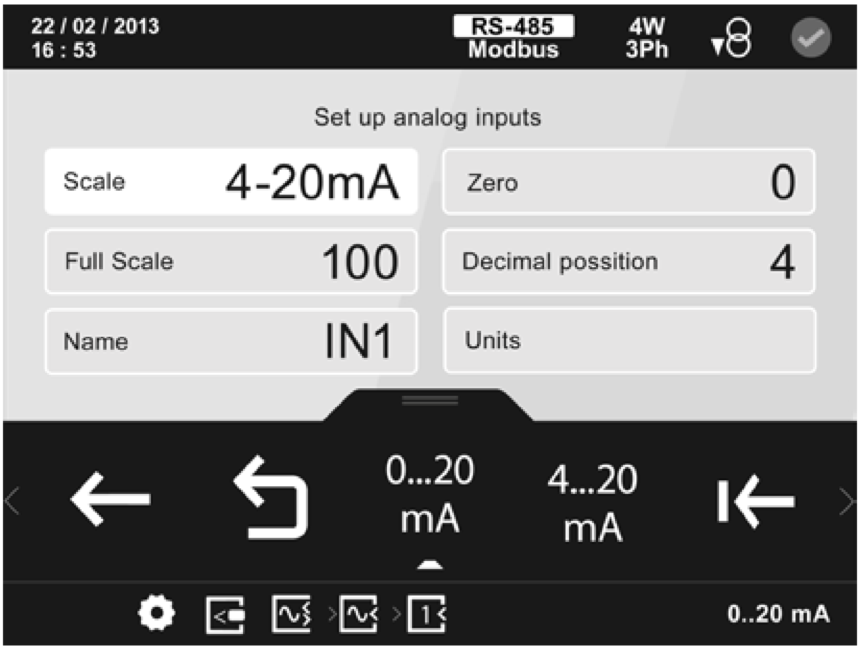


Figure 175: Analogue inputs configuration screen.

The parameter selected is indicated in white.
The following options appear in the lower area:

- When programming the **scale**:

0... 20 mA, to select the scale from 0 to 20 mA.
4... 20 mA, to select the scale from 4 to 20 mA.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves in the memory the values programmed on the screen.
Back, returns to the main configuration screen for analogue inputs, **Figure 174.**
Main Menu, back to the main menu, **Figure 25**.

- When programming the **Zero** and the **Full-scale** value:

Zero is the value for which you have the start of the analogue input, 0 or 4 mA.
The **Full-scale** is the value for which you have the end of the analogue input, 20 mA.

0, 1 ... 9 the ten possible digits to program.
Negative, the minus sign.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the main configuration screen for analogue inputs, **Figure 174.**

Main Menu, back to the main menu, **Figure 25**.

Zero Value:

Maximum value: 32000.
Minimum value: -32000.

Full-scale:

Maximum value: 32000.
Minimum value: -32000.

● When programming the **Decimal position**:

Here you program the number of decimals that the digital input will have.

0, 1 ... 5 The number of possible decimals to program.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the main configuration screen for analogue inputs,**Figure 174.**

Main Menu, back to the main menu, **Figure 25**.

Decimal position:

Maximum value: 5.
Minimum value: 0.

● When programming **the analogue input name** and the **units**:

Here you enter the name for recognising the analogue input (maximum of 8 characters) and the units it will have.

A, B ... Z the possible letters to program.

0, 1 ... 9 the ten possible digits to program.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the main configuration screen for analogue inputs, **Figure 174.**

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.4.3.2.- Analogue outputs.

Select the output to configure on the main configuration screen for the analogue outputs, **Figure 176**.

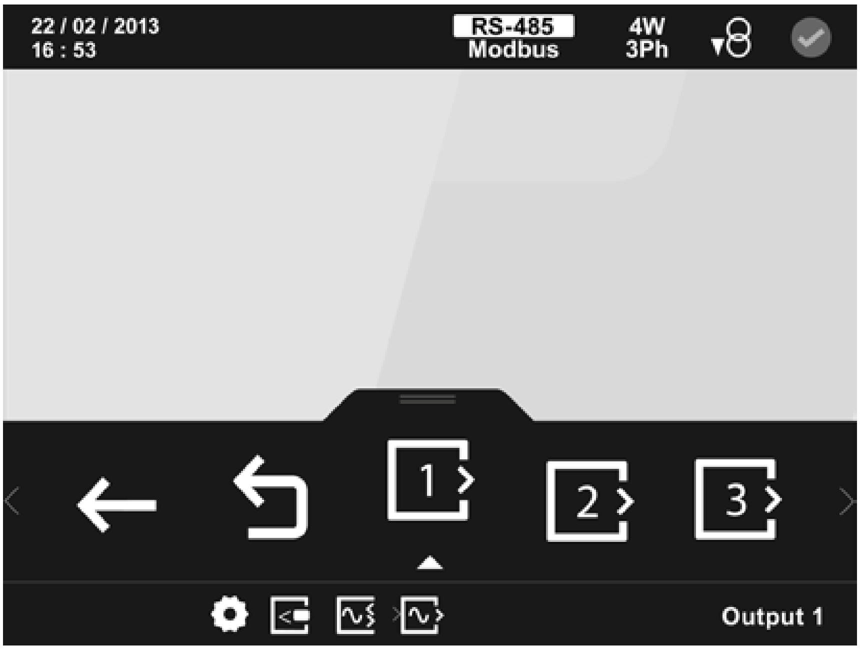


Figure 176: Main configuration screen for analogue outputs.

The following options appear in the lower area:

... Analogue outputs, 1 to 8, to select the configuration of each of the 8 analogue outputs.

Back, returns to the main configuration screen for analogue inputs/outputs, **Figure 173**.

Main Menu, back to the main menu, **Figure 25**.

Use the keys and to select the different options.
To confirm the selection, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

When selecting the output to configure, **Figure 177**, the configuration parameters are:

- ✓ Variable code.
- ✓ The scale.
- ✓ The zero
- ✓ The full scale.

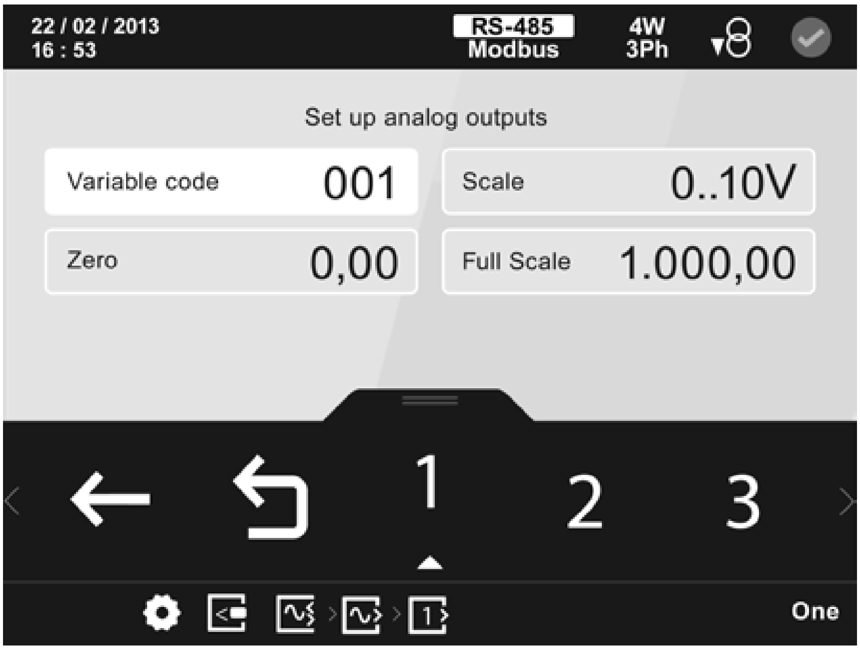


Figure 177: Analogue outputs configuration screen.

The parameter selected is indicated in white.
The following options appear in the lower area:

- When programming the **variable code** which controls the analogue output (**Table 21**):

  0, 1 ... 9 the ten possible digits to program.
  Delete character, deletes the selected character.
  Delete parameter, deletes the characters of the selected parameter.
  Previous, selects the previous parameter.
  Next, selects the next parameter.
  Confirm, confirms and saves in the memory the values programmed on the screen.
  Back, returns to the main configuration screen for analogue outputs, **Figure 176.**
  Main Menu, back to the main menu, **Figure 25**.

- When programming the **scale**:

  0... 20mA, to select the scale from 0 to 20mA.

  4... 20mA, to select the scale from 4 to 20mA.

  0... 10V, to select the scale from 0 to 10V.

  Previous, selects the previous parameter.

  Next, selects the next parameter.

  Confirm, confirms and saves in the memory the values programmed on the screen.

  Back, returns to the home screen of the analogue inputs menu **Figure 176.**

  Main Menu, back to the main menu, **Figure 25**.

- When programming the **Zero** and the **Full-scale** value:

Zero is the value for which you have the start of the analogue output, 0 or 4mA.
The **Full-scale** is the value for which you have the end of the analogue output, 20mA.

  0, 1 ... 9 the ten possible digits to program.

  Negative, the minus sign.

  Comma, the comma.

  Delete character, deletes the selected character.

  Delete parameter, deletes the characters of the selected parameter.

  Previous, selects the previous parameter.

  Next, selects the next parameter.

  Confirm, confirms and saves in the memory the values programmed on the screen.

  Back, returns to the home screen of the analogue inputs menu **Figure 176.**

  Main Menu, back to the main menu, **Figure 25**.

Zero Value:

Maximum and Minimum value: **Table 22**

Full-scale:

Maximum and Minimum value: **Table 22**

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

7.4.4.- MODBUS COMMUNICATIONS

The address of the Modbus memory map depends on the position of the expansion module in the unit.
Slot 1 will be the position of the expansion module installed just behind the standard unit, and Slot 2 the next position...
As the maximum number of expansion modules that can be connected to the unit is 4, there will only be 4 slots.

7.4.4.1.- Programming analogue outputs

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

Table 111: Modbus memory map: Analogue outputs, expansion modules (Table 1).

Configuration of analogue outputs		
Configuration variable	**Valid data window**	**Default value**
Variable code	**Table 21**	0
Scale	**0:** 0 to 20 mA **1:** 4 to 20 mA **2:** 0 to 10 V	0
Zero	**Table 44**	0
Full-scale	**Table 44**	-
Module no.	**0**	0

Table 112: Modbus memory map: Analogue outputs, expansion modules (Table 2).

Configuration of analogue outputs: Slot 1								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Zero	D340 - D341	D34A - D34B	D354 - D355	D35E - D35F	D368 - D369	D372 - D373	D37C - D37D	D386 - D387
Full-scale	D342 - D343	D34C - D34D	D356 - D357	D360 - D361	D36A - D36B	D374 - D375	D37E - D37F	D388 - D389
Scale	D344	D34E	D358	D362	D36C	D376	D380	D38A
Variable code	D345	D34F	D359	D363	D36D	D377	D381	D38B
Nº de modulo	D346	D350	D35A	D364	D36E	D378	D382	D38C

Note: *The 7 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 113: Modbus memory map: Analogue outputs, expansion modules (Table 3).

Configuration of analogue outputs: Slot 2								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Zero	D728 - D729	D732- D733	D73C - D73D	D746 - D747	D750 - D751	D75A - D75B	D764 - D765	D76E - D76F
Full-scale	D72A - D72B	D734- D735	D73E - D73F	D748 - D749	D752 - D753	D75C - D75D	D766 - D767	D770 - D771
Scale	D72C	D736	D740	D74A	D754	D75E	D768	D772
Variable code	D72D	D737	D741	D74B	D755	D75F	D769	D773
Nº de modulo	D72E	D738	D742	D74C	D756	D760	D76A	D774

Note: *The 7 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 114: Modbus memory map: Analogue outputs, expansion modules (Table 4).

Configuration of analogue outputs: Slot 3								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Zero	DB10 - DB11	DB1A - DB1B	DB24- DB25	DB2E- DB2F	DB38 - DB39	DB42 - DB43	DB4C - DB4D	DB56 - DB57
Full-scale	DB12 - DB13	DB1C - DB1D	DB26- DB27	DB30- DB31	DB3A - DB3B	DB44 - DB45	DB4E - DB4F	DB58 - DB59
Scale	DB14	DB1E	DB28	DB32	DB3C	DB46	DB50	DB5A
Variable code	DB15	DB1F	DB29	DB33	DB3D	DB47	DB51	DB5B
Nº de modulo	DB16	DB20	DB2A	DB34	DB3E	DB48	DB52	DB5C

Note: *The 7 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 115: Modbus memory map: Analogue outputs, expansion modules (Table 5).

Configuration of analogue outputs: Slot 4								
Configuration variable	**Address**							
	Output 1	**Output 2**	**Output 3**	**Output 4**	**Output 5**	**Output 6**	**Output 7**	**Output 8**
Zero	DEF8 - DEF9	DF02 - DF03	DF0C - DF0D	DF16 - DF17	DF20 - DF21	DF2A - DF2B	DF34 - DF35	DF3E - DF3F
Full-scale	DEFA - DEFB	DF04 - DF05	DF0E - DF0F	DF18 - DF19	DF22 - DF23	DF2C - DF2D	DF36 - DF37	DF40 - DF41
Scale	DEFC	DF06	DF10	DF1A	DF24	DF2E	DF38	DF42
Variable code	DEFD	DF07	DF11	DF1B	DF25	DF2F	DF39	DF43
Nº de modulo	DEFE	DF08	DF12	DF1C	DF26	DF30	DF3A	DF44

Note: *The 7 registers must be written and read at once (as a group), otherwise it will respond with an error.*

7.4.4.2.- Programming analogue inputs

The following functions are implemented for these variables:
 Function 0x04: reading registers.
 Function 0x10: Writing multiple registers.

Table 116:Modbus memory map: Analogue inputs, expansion modules (Table 1).

Configuration of analogue inputs		
Configuration variable	**Valid data window**	**Default value**
Scale	**0:** 0 to 20 mA **1:** 4 to 20 mA	0
Zero	**-32000** to **32000**	0
Full-scale	**-32000** to **32000**	20000
No. of decimals	**0** to **5**	0
Input name [1]	**8** characters	“--”
Units [1]	**5** characters	“--”

[1] the characters must be sent in hexadecimal.

Table 117: Modbus memory map: Analogue inputs, expansion modules (Table 2).

Configuration of analogue inputs: Slot 1				
Configuration variable	**Address**			
	Input 1	**Input 2**	**Input 3**	**Input 4**
Zero	D2F0	D304	D318	D32C
Full-scale	D2F1	D305	D319	D32D
Scale	D2F2	D306	D31A	D32E
No. of decimals	D2F3	D307	D31B	D32F
Input name	D2F4 - D2F7	D308 - D30B	D31C - D31F	D330 - D333
Units	D2F8 - D2FA	D30C - D30E	D320 - D322	D334 - D336

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 118: Modbus memory map: Analogue inputs, expansion modules (Table 3).

Configuration of analogue inputs: Slot 2				
Configuration variable	**Address**			
	Input 1	**Input 2**	**Input 3**	**Input 4**
Zero	D6D8	D6EC	D700	D714
Full-scale	D6D9	D6ED	D701	D715
Scale	D6DA	D6EE	D702	D716
No. of decimals	D6DB	D6EF	D703	D717
Input name	D6DC - D6DF	D6F0 - D6F3	D704 - D707	D718 - D71B
Units	D6E0 - D6E2	D6F4 - D6F6	D708 - D70A	D71C - D71E

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 119: Modbus memory map: Analogue inputs, expansion modules (Table 4).

Configuration of analogue inputs: Slot 3				
Configuration variable	Address			
	Input 1	Input 2	Input 3	Input 4
Zero	DAC0	DAD4	DAE8	DAFC
Full-scale	DAC1	DAD5	DAE9	DAFD
Scale	DAC2	DAD6	DAEA	DAFE
No. of decimals	DAC3	DAD7	DAEB	DAFF
Input name	DAC4 - DAC7	DAD8 - DADB	DAEC - DAEF	DB00 - DB03
Units	DAC8 - DACA	DADC - DADE	DAF0 - DAF2	DB04 - DB06

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

Table 120: Modbus memory map: Analogue inputs, expansion modules (Table 5).

Configuration of analogue inputs: Slot 4				
Configuration variable	Address			
	Input 1	Input 2	Input 3	Input 4
Zero	DEA8	DEBC	DED0	DEE4
Full-scale	DEA9	DEBD	DED1	DEE5
Scale	DEAA	DEBE	DED2	DEE6
No. of decimals	DEAB	DEBF	DED3	DEE7
Input name	DEAC - DEAF	DEC0 - DEC3	DED4 - DED7	DEE8 - DEEB
Units	DEB0 - DEB2	DEC4 - DEC6	DED8 - DEDA	DEEC - DEEE

Note: *The 11 registers must be written and read at once (as a group), otherwise it will respond with an error.*

7.4.4.3.- Status of the analogue inputs

The following functions are implemented for these variables:
Function 0x04: reading registers.

Table 121: Modbus memory map: Analogue inputs, expansion modules (Table 6).

Status of the analogue inputs: Slot 1		
Configuration variable	Address	Valid data margin
Status Input 1	D390 – D391	-
Status Input 2	D392 – D393	-
Status Input 3	D394 – D395	-
Status Input 4	D396 – D397	-

Table 122: Modbus memory map: Analogue inputs, expansion modules (Table 7).

Status of the analogue inputs: Slot 2		
Configuration variable	Address	Valid data margin
Status Input 1	D778 - D779	-
Status Input 2	D77A - D77B	-
Status Input 3	D77C - D77D	-
Status Input 4	D77E - D77F	-

Table 123: Modbus memory map: Analogue inputs, expansion modules (Table 8).

Status of the analogue inputs: Slot 3		
Configuration variable	**Address**	**Valid data margin**
Status Input 1	DB60 - DB61	-
Status Input 2	DB62 - DB63	-
Status Input 3	DB64 - DB65	-
Status Input 4	DB66 - DB67	-

Table 124: Modbus memory map: Analogue inputs, expansion modules (Table 9).

Status of the analogue inputs: Slot 4		
Configuration variable	**Address**	**Valid data margin**
Status Input 1	DF48 - DF49	-
Status Input 2	DF4A - DF4B	-
Status Input 3	DF4C - DF4D	-
Status Input 4	DF4E - DF4F	-

7.5.- MODBUS/TCP BRIDGE COMMUNICATIONS MODULE

The **M-CVM-AB-Modbus TCP (Bridge)** is a communications module for connecting the **CVM-B** units to a **Modbus/TCP** network and as an Ethernet to RS-485 gateway.
Modbus/TCP is a communications protocol designed for enabling industrial units to communicate with each other on Ethernet networks using TCP/IP protocols.
Basically, **Modbus/TCP** encapsulates a Modbus frame within a TCP frame, making it possible to configure and monitor a unit via the Internet.

The communications module is also equipped with an RS-485 gateway.

7.5.1.- CONNECTION TERMINALS

Table 125:List of terminals, Modbus TCP (Bridge) communications module.

Terminals in the unit	
1: Ethernet	**3: B(-)**, RS-485
2: A(+), RS-485	**4: S**, GND for RS-485

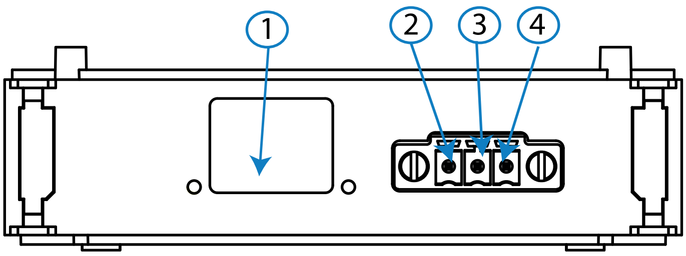


Figure 178: Modbus TCP (Bridge) communications module terminals

7.5.2.- LEDs

Table 126: List of LEDs, Modbus TCP (Bridge) communications module.

LED	Status	Function
LINK / ACT	On	Unit connected to the network
	Off	Unit disconnected from the network
	Blinking light	Activity on the bus
SPEED	On	100 BT
	Off	10 BT

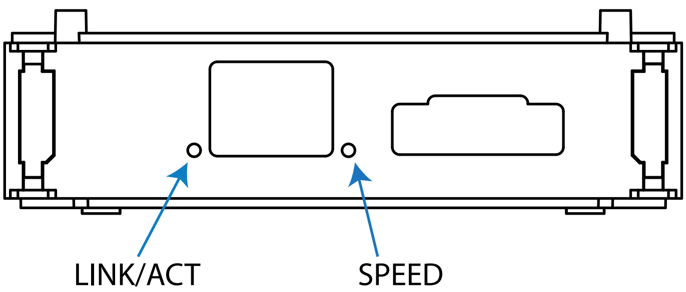


Figure 179: LEDs Modbus TCP. (Bridge)

7.5.3.- CONNECTION DIAGRAM

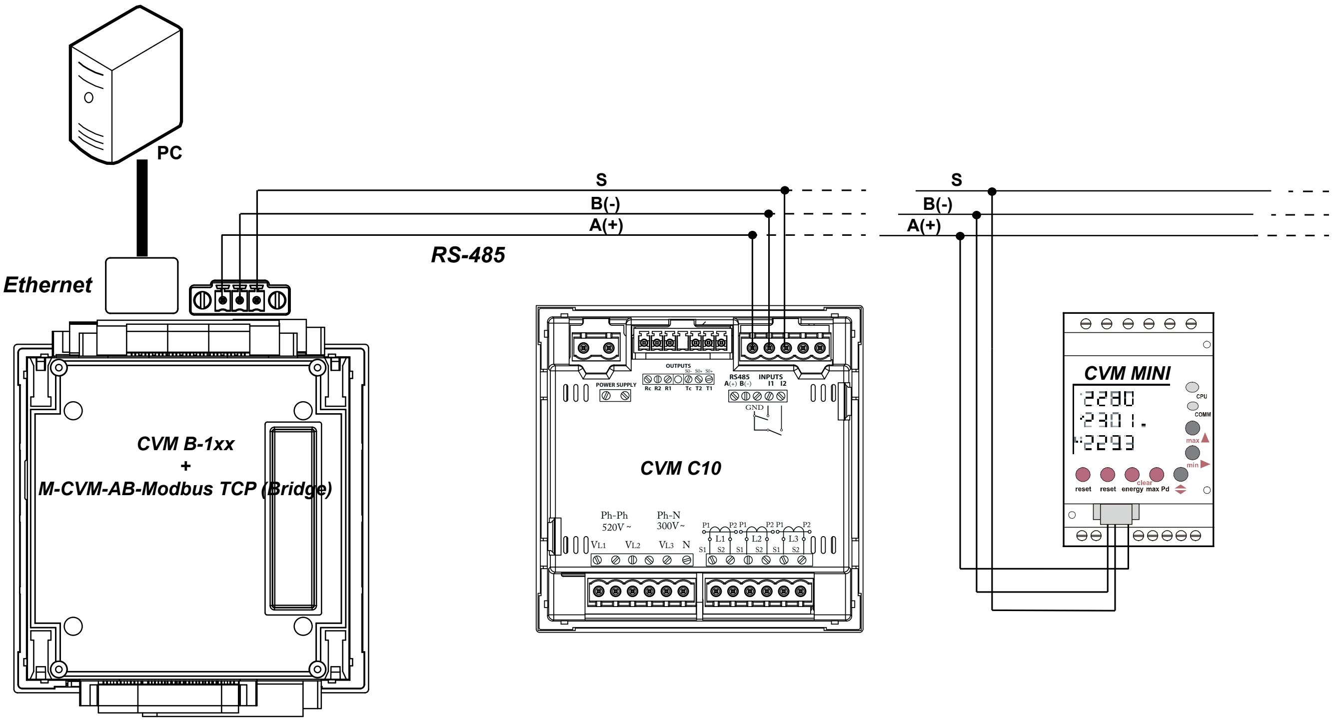


Figure 180:Modbus TCP (Bridge) connection diagram.

7.5.4.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 181,** is the home screen of the setup menu.

Figure 181: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 182**.

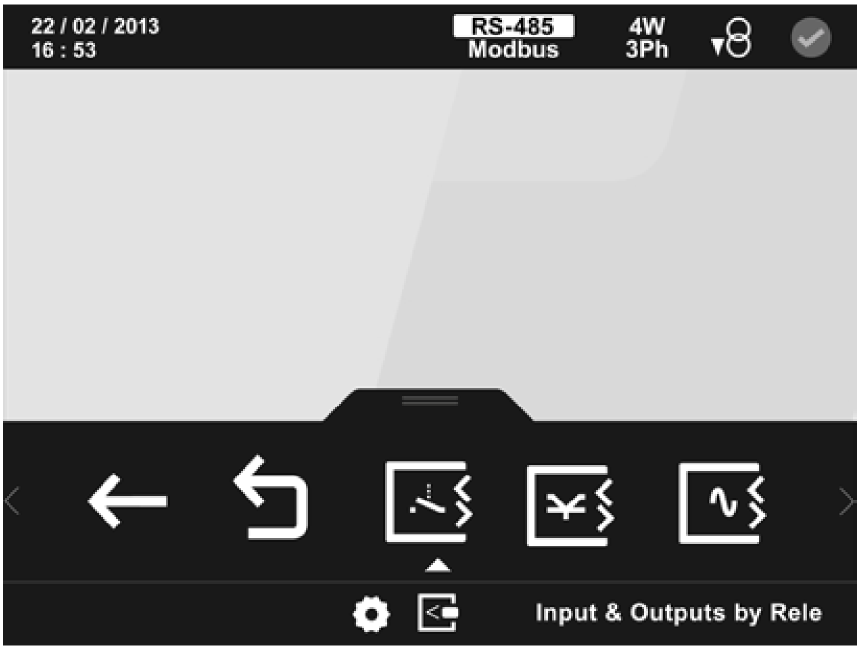


Figure 182: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.
If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **Modbus TCP (Bridge) communications** icon.

Press the button to open the main configuration screen of the Modbus TCP communications module, **Figure 183.**

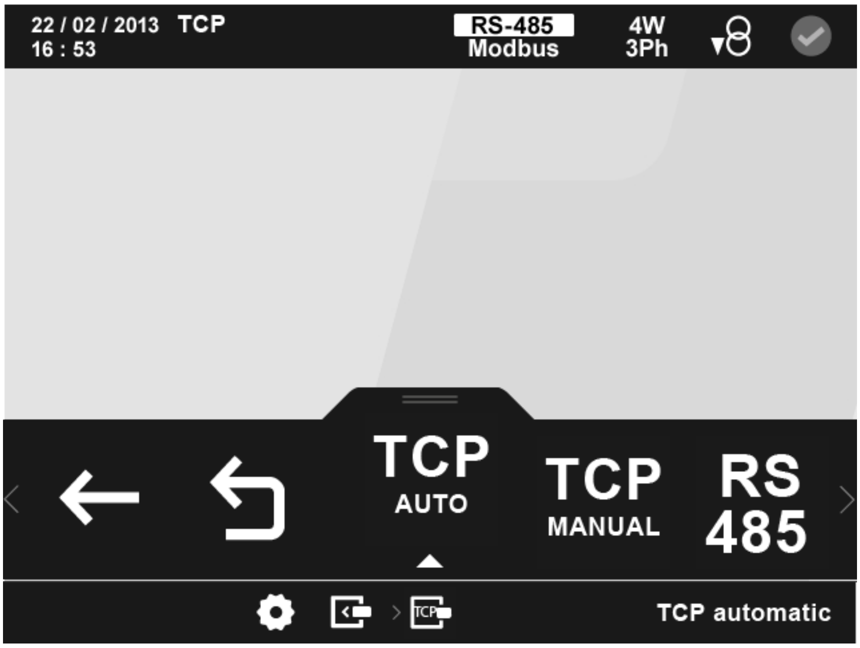


Figure 183: Main configuration screen of the Modbus TCP communications module.

The following options appear in the lower area:

Configuration of DHCP activation/deactivation.
(*"7.5.4.1.- Configuration of DHCP activation/deactivation")*

Configuration of the TCP parameters.
("7.5.4.2.- Configuration of the TCP parameters manually.")

Configuration of the RS-485 gateway parameters.
(*"7.5.4.3.- Configuration of the RS-485 gateway parameters"*)

Back, returns to the home screen of the expansion modules menu, **Figure 182**.

Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.5.4.1.- Configuration of DHCP activation/deactivation

On this screen you select whether or not the IP is automatically assigned. **Figure 184**.

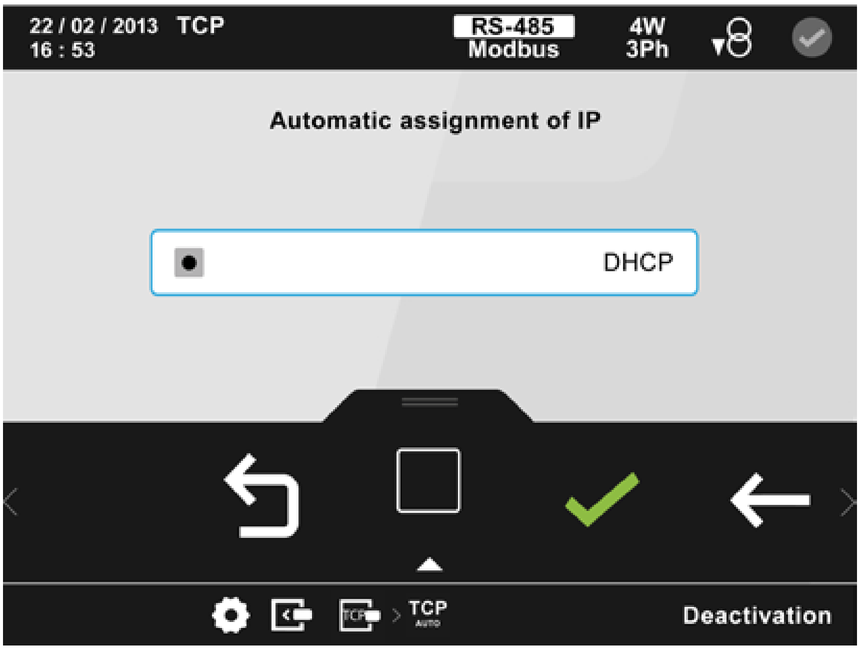


Figure 184: Configuration screen of the Modbus TCP (Bridge) module (TCP Auto)

The following options appear in the lower area:

DHCP activation, the IP is automatically assigned.

DHCP deactivation, the TCP parameters are configured manually in option TCP MANUAL.

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the main configuration screen of the Modbus TCP module, **Figure 183.**

Main Menu, returns to the main menu, **Figure 25**.

7.5.4.2.- Configuration of the TCP parameters manually.

Note: *If DHCP is activated, you will not be able to modify the parameters on this screen. This is indicated by a * next to each value.*

The configuration parameters of the TCP communication are, **Figure 185**:

- ✓ IP address.
- ✓ Subnet mask.
- ✓ Gateway.

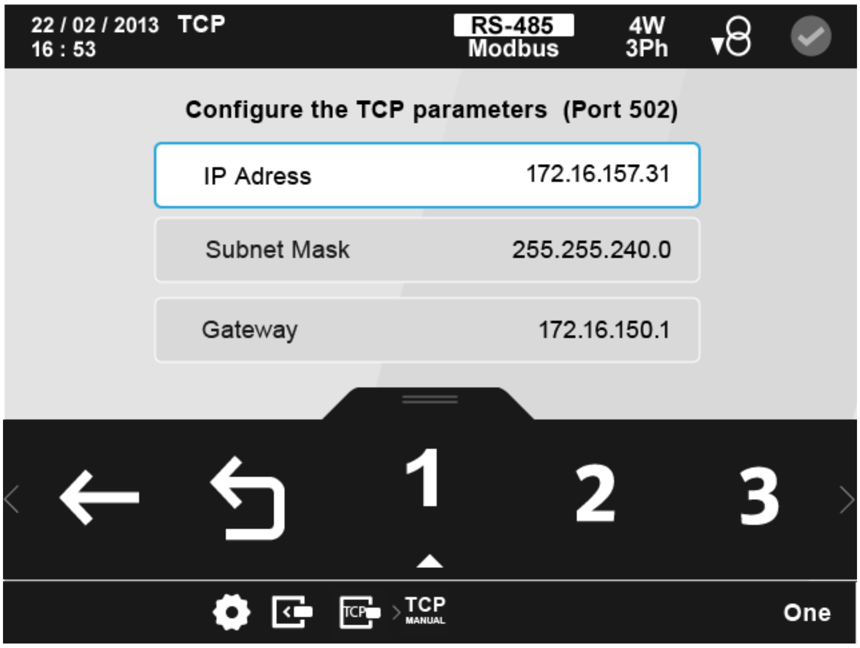


Figure 185: Configuration screen of the Modbus TCP (Bridge) module (TCP manual)

The parameter selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program.

. Point.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves the values programmed on the screen in the memory.

Back, returns to the main configuration screen of the Modbus TCP module, **Figure 183.**

Main Menu, returns to the main menu, **Figure 25**.

7.5.4.3.- RS 485 Configuration of the RS-485 gateway parameters

The configuration parameters of the RS-485 gateway are, **Figure 186**:

- ✓ The transmission speed, Baud rate.
- ✓ The parity.
- ✓ The number of stop bits.

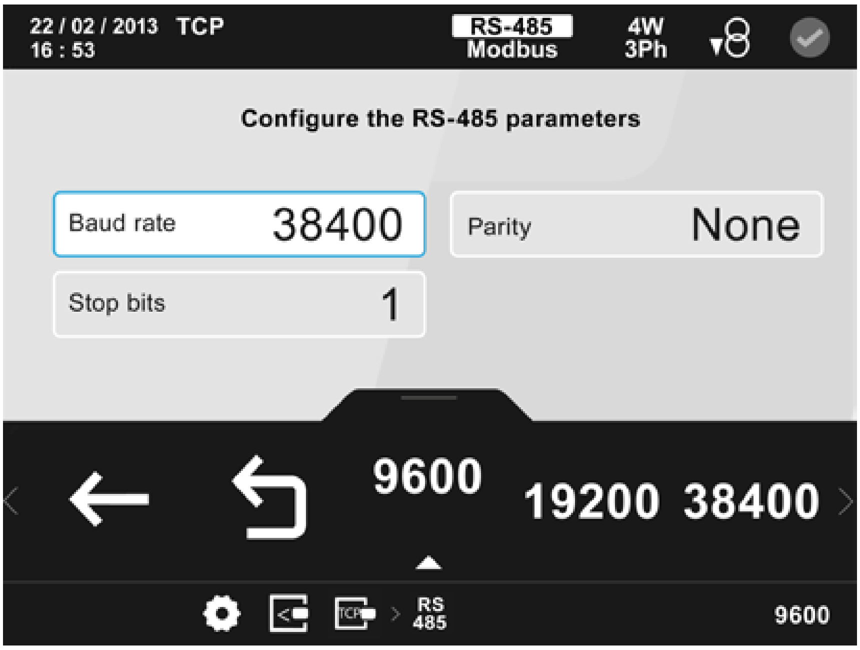


Figure 186: Configuration screen of the Modbus TCP (Bridge) module (RS-485 Gateway)

- When programming the **transmission speed**, **Baud rate**:

9600, 19200 ... 115200 Possible transmission speeds**: 9600, 19200, 38400, 57600, 76800** or **115200.**

Previous, selects the previous parameter**.**

Next, selects the next parameter**.**

Confirm, confirms and saves the values programmed on the screen in the memory**.**

Back, returns to the main configuration screen of the Modbus TCP module, **Figure 183.**

Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

- When programming the **parity**:

Even parity.
Odd parity.
No parity.
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves the values programmed on the screen in the memory.
Back, returns to the main configuration screen of the Modbus TCP module, **Figure 183.**
Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

- When programming the **number of stop bits**:

, Possible numbers of stop bits**: 1** or **2.**
Previous, selects the previous parameter.
Next, selects the next parameter.
Confirm, confirms and saves the values programmed on the screen in the memory.
Back, returns to the main configuration screen of the Modbus TCP module, **Figure 183.**
Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.5.5.- MODBUS COMMUNICATIONS

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

7.5.5.1.- Configuration of DHCP activation/deactivation

Table 127:Modbus memory map: Modbus TCP (Bridge) communications module (Table 1)

Configuration of DHCP activation/deactivation			
Configuration variable	**Address**	**Valid data margin**	**Default value**
DHCP Flag	F23A	**0** : Deactivation **1**: Activation	1

7.5.5.2.- Configuration of the TCP parameters

Table 128:Modbus memory map: Modbus TCP (Bridge) communications module (Table 2)

Configuration of the Modbus TCP parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
IP Address	F230 - F231	1 long : 4 characters	-
Subnet Mask	F232 - F233	1 long : 4 characters	-
Gateway	F234 - F235	1 long : 4 characters	-

Note: *The module resets to activate the configuration.*
Note: *The 6 registers must be written at once (as a group), otherwise it will respond with an error.*

7.5.5.3.- Configuration of the RS-485 gateway parameters

Table 129:Modbus memory map: Modbus TCP (Bridge) communications module (Table 3)

Configuration of the Modbus TCP parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
Baud rate	F500	**0**: 1200 - **1**: 2400 - **2**: 4800 - **3**: 9600 - **4**: 19200 - **5**: 38400 - **6**: 57600 - **7**: 76800 - **8**: 115200	4
Parity	F501	**0** : No parity **1**: Odd parity **2**: Even parity	0
Length	F502	**1**: 8-bit	1
Stop Bits	F503	**0**: 1 stop bit **1**: 2 stop bits	0

Note: *The 4 registers must be written at once (as a group), otherwise it will respond with an error.*

7.5.5.4.- MAC address of the Modbus TCP module

The function implemented for this variable is:
Function 0x04: reading registers.

Table 130:Modbus memory map: Modbus TCP (Bridge) communications module (Table 4)

MAC address of the Modbus TCP module		
Configuration variable	**Address**	**Valid data margin**
MAC address	F236 - F238	3 integers : 6 characters

7.6.- LONWORKS COMMUNICATIONS MODULE

The LonWorks communications module, **M-CVM-AB-LON**, enables communicating the **CVM-B** on a LonWorks network.

7.6.1.- CONNECTION TERMINALS

Table 131: List of terminals, LonWorks communications module.

Terminals in the unit	
1, 4: A, Bus connection (without polarity)	**3:** Not used
2, 5: B, Bus connection (without polarity)	

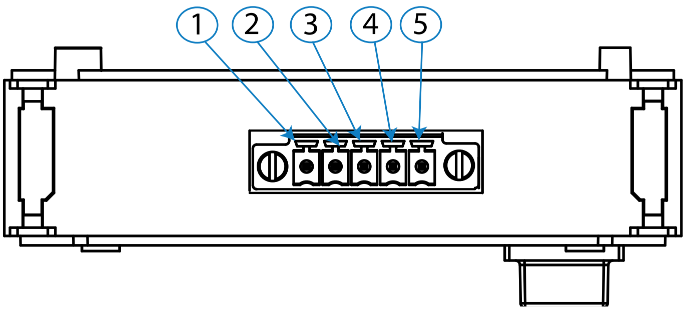


Figure 187: Modbus LonWorks communications module terminals.

7.6.2.- CONNECTION DIAGRAM

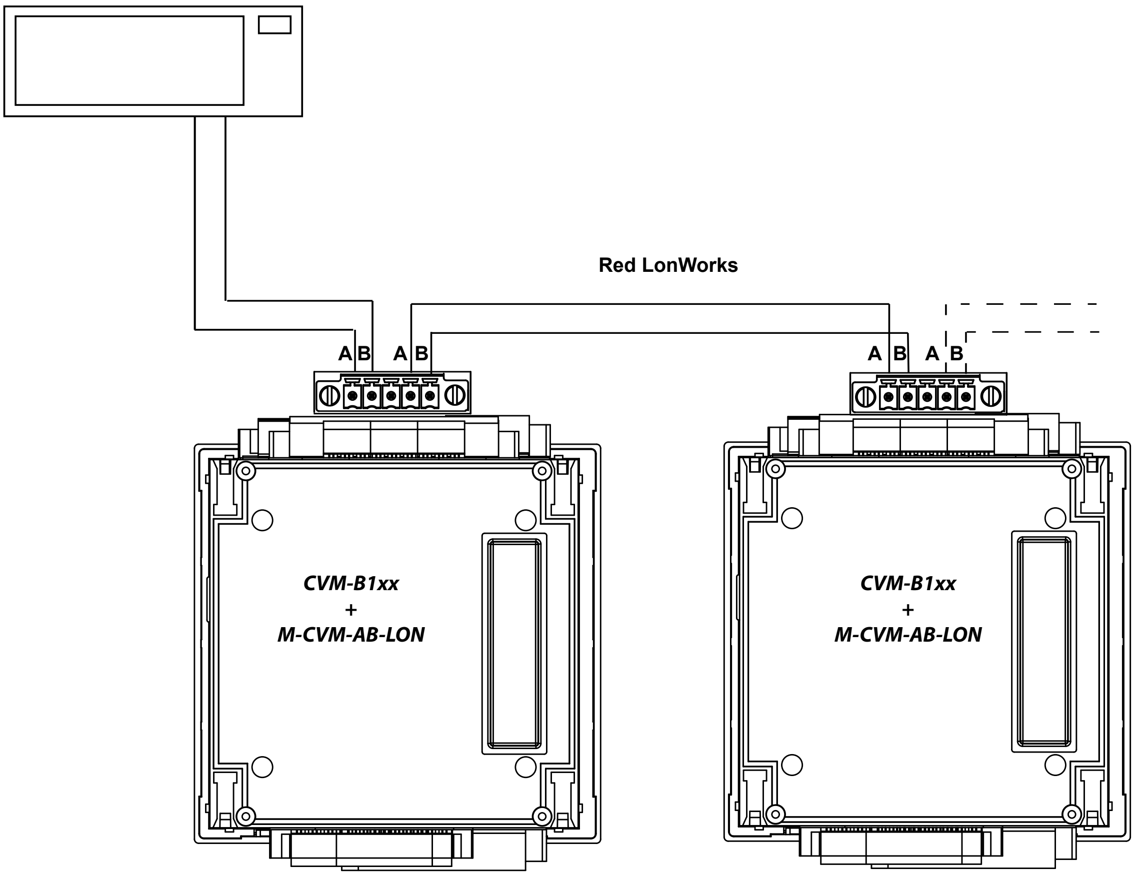


Figure 188:Connection diagram, LonWorks.

7.6.3.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 189,** is the home screen of the setup menu.

Figure 189: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 190**.

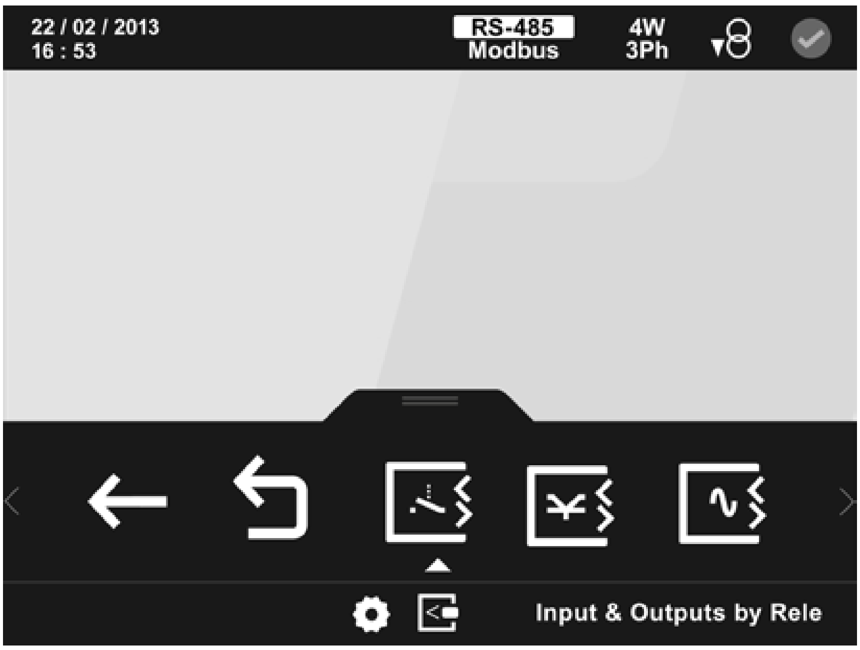


Figure 190: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.
If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **LonWorks communications** icon.

Press the button to open the configuration screen of the LonWorks communications module, **Figure 191**.

Figure 191: Main configuration screen of the LonWorks module

This screen can be used for connecting the unit to a LonWorks network. To do so, select the confirm option . The unit will then send to the network all the information needed to establish the connection.

When the information has been sent correctly the following message appears on the screen, **Figure 192**.

Figure 192: Main configuration screen of the LonWorks module (Message)

The following options also appear at the bottom:

Confirm, for deleting the message and to continue browsing the menu.

Back, returns to the home screen of the expansion modules menu, **Figure 190**.

Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.6.4.- MODBUS COMMUNICATIONS

Table 132:Modbus memory map: LonWorks communications module

Configuration of the LonWorks parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
Flag Service Pin(1)	E678	**0 - 1** (Function 0x10) **1** (Function 0x04)	-
Neuron ID (2)	E67A - E67C	Decimal value	-

(1) The following functions are implemented for this variable:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

(2) For this variable **Function 0x04** is implemented.

7.6.5.- LIST OF LONWORKS LOGS

***Note:** The binary files and setup file can be downloaded from **Circutor's** website.*

Variable	Name	Variable type	Unit
Current L1	nvo_Ph1Current	SNVT_amp_ac (139)	A 1
	Code	**Resolution**	**Values**
	02	1	0..65,534
Current L2	**Name**	**Variable type**	**Unit**
	nvo_Ph2Current	SNVT_amp_ac (139)	A 2
	Code	**Resolution**	**Values**
	07	1	0..65,534
Current L3	**Name**	**Variable type**	**Unit**
	nvo_Ph3Current	SNVT_amp_ac (139)	A 3
	Code	**Resolution**	**Values**
	12	1	0..65,534
Phase-Phase Voltage V12	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU12	SNVT_volt_ac (138)	V 12
	Code	**Resolution**	**Values**
	22	1	0..65,534
Phase-Phase Voltage V23	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU23	SNVT_volt_ac (138)	V 23
	Code	**Resolution**	**Values**
	23	1	0..65,534
Phase-Phase Voltage V31	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU31	SNVT_volt_ac (138)	V 31
	Code	**Resolution**	**Values**
	24	1	0..65,534
Phase-Neutral Voltage L1	**Name**	**Variable type**	**Unit**
	nvo_Ph2NU1	SNVT_volt_ac (138)	V 1
	Code	**Resolution**	**Values**
	01	1	0..65,534
Phase-Neutral Voltage L2	**Name**	**Variable type**	**Unit**
	nvo_Ph2NU2	SNVT_volt_ac (138)	V 2
	Code	**Resolution**	**Values**
	06	1	0..65,534
Phase-Neutral Voltage L3	**Name**	**Variable type**	**Unit**
	nvo_Ph2NU3	SNVT_volt_ac (138)	V 3
	Code	**Resolution**	**Values**
	11	1	0..65,534
Frequency	**Name**	**Variable type**	**Unit**
	nvo_Frequency	SNVT_freq_hz (76)	Hz
	Code	**Resolution**	**Values**
	21	0.1	0..6553.5
Active Power L1	**Name**	**Variable type**	**Unit**
	nvo_ActPwrPh1	SNVT_power_kilo (28)	kW L1
	Code	**Resolution**	**Values**
	03	0.1	0..6553.5

Variable	Name	Variable type	Unit
Active power L2	nvo_ActPwrPh2	SNVT_power_kilo (28)	kW L2
	Code	**Resolution**	**Values**
	08	0.1	0..6553.5
Active power L3	**Name**	**Variable type**	**Unit**
	nvo_ActPwrPh3	SNVT_power_kilo (28)	kW L3
	Code	**Resolution**	**Values**
	13	0.1	0..6553.5
Reactive power L1	**Name**	**Variable type**	**Unit**
	nvo_ReactPwrPh1	SNVT_power_kilo (28)	kVAr L1
	Code	**Resolution**	**Values**
	04	0.1	0..6553.5
Reactive power L2	**Name**	**Variable type**	**Unit**
	nvo_ReactPwrPh2	SNVT_power_kilo (28)	kVAr L2
	Code	**Resolution**	**Values**
	09	0.1	0..6553.5
Reactive power L3	**Name**	**Variable type**	**Unit**
	nvo_ReactPwrPh3	SNVT_power_kilo (28)	kVAr L3
	Code	**Resolution**	**Values**
	14	0.1	0..6553.5
Apparent power L1	**Name**	**Variable type**	**Unit**
	nvo_AppPwrPh1	SNVT_power_kilo (28)	kVA L1
	Code	**Resolution**	**Values**
	33	0.1	0..6553.5
Apparent power L2	**Name**	**Variable type**	**Unit**
	nvo_AppPwrPh2	SNVT_power_kilo (28)	kVA L2
	Code	**Resolution**	**Values**
	34	0.1	0..6553.5
Apparent power L3	**Name**	**Variable type**	**Unit**
	nvo_AppPwrPh3	SNVT_power_kilo (28)	kVA L3
	Code	**Resolution**	**Values**
	35	0.1	0..6553.5
Power factor L1	**Name**	**Variable type**	**Unit**
	nvo_PwrFactPh1	SNVT_pwr_fact (98)	PF L1
	Code	**Resolution**	**Values**
	05	0.00005	-1.00000..1.00000
Power factor L2	**Name**	**Variable type**	**Unit**
	nvo_PwrFactPh2	SNVT_pwr_fact (98)	PF L2
	Code	**Resolution**	**Values**
	10	0.00005	-1.00000..1.00000
Power factor L3	**Name**	**Variable type**	**Unit**
	nvo_PwrFactPh3	SNVT_pwr_fact (98)	PF L3
	Code	**Resolution**	**Values**
	15	0.00005	-1.00000..1.00000
Current THD L1	**Name**	**Variable type**	**Unit**
	nvo_THDVal_I1	SNVT_lev_percent (81)	THD A% L1
	Code	**Resolution**	**Values**
	28	0.005	-163.840..163.830

Variable	Name	Variable type	Unit
Current THD L2	nvo_THDVal_I2	SNVT_lev_percent (81)	THD A% L2
	Code	**Resolution**	**Values**
	29	0.005	-163.840..163.830
Current THD L3	**Name**	**Variable type**	**Unit**
	nvo_THDVal_I3	SNVT_lev_percent (81)	THD A% L3
	Code	**Resolution**	**Values**
	30	0.005	-163.840..163.830
Voltage THD L1	**Name**	**Variable type**	**Unit**
	nvo_THDVal_U1	SNVT_lev_percent (81)	THD V% L1
	Code	**Resolution**	**Values**
	25	0.005	-163.840..163.830
Voltage THD L2	**Name**	**Variable type**	**Unit**
	nvo_THDVal_U2	SNVT_lev_percent (81)	THD V% L2
	Code	**Resolution**	**Values**
	26	0.005	-163.840..163.830
Voltage THD L3	**Name**	**Variable type**	**Unit**
	nvo_THDVal_U3	SNVT_lev_percent (81)	THD V% L3
	Code	**Resolution**	**Values**
	27	0.005	-163.840..163.830
Neutral current	**Name**	**Variable type**	**Unit**
	nvo_neutralCurrent	SNVT_amp_ac (139)	In
	Code	**Resolution**	**Values**
	32	1	0..65,534
Active power III	**Name**	**Variable type**	**Unit**
	nvo_ActPwOn3Ph	SNVT_power_kilo (28)	kW III
	Code	**Resolution**	**Values**
	16	0.1	0..6553.5
Inductive Reactive Power III	**Name**	**Variable type**	**Unit**
	nvoInductPwOn3Ph	SNVT_power_kilo (28)	kVArL III
	Code	**Resolution**	**Values**
	17	0.1	0..6553.5
Capacitive Reactive Power III	**Name**	**Variable type**	**Unit**
	nvo_CapPwOn3Ph	SNVT_power_kilo (28)	kVArC III
	Code	**Resolution**	**Values**
	18	0.1	0..6553.5
Apparent Power III	**Name**	**Variable type**	**Unit**
	nvo_AppPwOn3Ph	SNVT_power_kilo (28)	kVA III
	Code	**Resolution**	**Values**
	36	0.1	0..6553.5
Power Factor III	**Name**	**Variable type**	**Unit**
	nvo_PwFactOn3Ph	SNVT_pwr_fact (98)	PF III
	Code	**Resolution**	**Values**
	20	0.00005	-1.00000..1.00000
Cos φ III	**Name**	**Variable type**	**Unit**
	nvo_Cosphi	SNVT_pwr_fact (98)	cos φ
	Code	**Resolution**	**Values**
	19	0.00005	-1.00000..1.00000

Variable	Name	Variable type	Unit
Three-phase Current	nvoAvgValCurr3Ph	SNVT_amp_ac (139)	I_AVG
	Code	**Resolution**	**Values**
	31	1	0..65,534
Current Maximum Demand L1	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_A1	SNVT_amp_ac (139)	Md(A1)
	Code	**Resolution**	**Values**
	37	1	0..65,534
Current Maximum Demand L2	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_A2	SNVT_amp_ac (139)	Md(A2)
	Code	**Resolution**	**Values**
	38	1	0..65,534
Current Maximum Demand L3	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_A3	SNVT_amp_ac (139)	Md(A3)
	Code	**Resolution**	**Values**
	39	1	0..65,534
Md Current III	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_A	SNVT_amp_ac (139)	Md(A III)
	Code	**Resolution**	**Values**
	40	1	0..65,534
Md Active Power III	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_kw	SNVT_power_kilo (28)	Md(kW III)
	Code	**Resolution**	**Values**
	41	0.1	0..6553.5
Md Apparent Power III	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_kVA	SNVT_power_kilo (28)	Md(kVA III)
	Code	**Resolution**	**Values**
	42	0.1	0..6553.5
Active Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_ActEnergy	SNVT_elec_kwh_l (146)	kW.h(+)
	Code	**Resolution**	**Values**
	43	0.1	-214,748,364.8.. 214,748,364.6
Inductive Reactive Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_InductEnergy	SNVT_elec_kwh_l (146)	kVArL.h(+)
	Code	**Resolution**	**Values**
	44	0.1	-214,748,364.8.. 214,748,364.6
Capacitive Reactive Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_CapEnergy	SNVT_elec_kwh_l (146)	kVArC.h(+)
	Code	**Resolution**	**Values**
	45	0.1	-214,748,364.8.. 214,748,364.6
Apparent Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_AppEnergy	SNVT_elec_kwh_l (146)	kVA.h(+)
	Code	**Resolution**	**Values**
	46	0.1	-214,748,364.8.. 214,748,364.6
Active Energy (-)	**Name**	**Variable type**	**Unit**
	nvoActEnergy_exp	SNVT_elec_kwh_l (146)	kW.h(-)
	Code	**Resolution**	**Values**
	47	0.1	-214,748,364.8.. 214,748,364.6

Variable	Name	Variable type	Unit
Inductive Reactive Energy (-)	nvoIndEnergy_exp	SNVT_elec_kwh_l (146)	kVArL.h(-)
	Code	**Resolution**	**Values**
	48	0.1	-214,748,364.8.. 214,748,364.6
Capacitive Reactive Energy (-)	**Name**	**Variable type**	**Unit**
	nvoCapEnergy_exp	SNVT_elec_kwh_l (146)	kVArC.h(-)
	Code	**Resolution**	**Values**
	49	0.1	-214,748,364.8.. 214,748,364.6
Apparent Energy (-)	**Name**	**Variable type**	**Unit**
	nvoAppEnergy_exp	SNVT_elec_kwh_l (146)	kVA.h(-)
	Code	**Resolution**	**Values**
	50	0.1	-214,748,364.8.. 214,748,364.6

Arrray 1 tipo **NVT** (SNVT_str_int (37)), Unit (N/A), Resolution (1), Values (0...65,565), Bytes (31)

```
typedef struct {
unsigned short char_set ;
unsigned long wide_char [15] ;
} SNTV_str_int;
```

	Name	Variable type	Unit
Current L1	nvo_Ph1Current	SNVT_amp_ac (139)	A 1
	Code	**Resolution**	**Values**
	02	1	0..65,534
Current L2	**Name**	**Variable type**	**Unit**
	nvo_Ph2Current	SNVT_amp_ac (139)	A 2
	Code	**Resolution**	**Values**
	07	1	0..65,534
Current L3	**Name**	**Variable type**	**Unit**
	nvo_Ph3Current	SNVT_amp_ac (139)	A 3
	Code	**Resolution**	**Values**
	12	1	0..65,534
Frequency	**Name**	**Variable type**	**Unit**
	nvo_Frequency	SNVT_freq_hz (76)	Hz
	Code	**Resolution**	**Values**
	21	0.1	0..6553.5
Phase-Phase Voltage V12	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU12	SNVT_volt_ac (138)	V 12
	Code	**Resolution**	**Values**
	22	1	0..65,534
Phase-Phase Voltage V23	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU23	SNVT_volt_ac (138)	V 23
	Code	**Resolution**	**Values**
	23	1	0..65,534
Phase-Phase Voltage V31	**Name**	**Variable type**	**Unit**
	nvo_Ph2PhU31	SNVT_volt_ac (138)	V 31
	Code	**Resolution**	**Values**
	24	1	0..65,534
Active Power L1	**Name**	**Variable type**	**Unit**
	nvo_ActPwrPh1	SNVT_power_kilo (28)	kW L1
	Code	**Resolution**	**Values**
	03	0.1	0..6553.5

Arrray 1 tipo **NVT** (SNVT_str_int (37)), Unit (N/A), Resolution (1), Values (0...65,565), Bytes (31) typedef struct { unsigned short char_set ; unsigned long wide_char [15] ; } SNTV_str_int;			
	Name	**Variable type**	**Unit**
Active Power L2	nvo_ActPwrPh2	SNVT_power_kilo (28)	kW L2
	Code	**Resolution**	**Values**
	08	0.1	0..6553.5
Active Power L3	**Name**	**Variable type**	**Unit**
	nvo_ActPwrPh3	SNVT_power_kilo (28)	kW L3
	Code	**Resolution**	**Values**
	13	0.1	0..6553.5
Cos **φ** III	**Name**	**Variable type**	**Unit**
	nvo_Cosphi	SNVT_pwr_fact (98)	cos **φ**
	Code	**Resolution**	**Values**
	19	0.00005	-1.00000..1.00000
Active Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_ActEnergy	SNVT_elec_kwh_l (146)	kW.h(+)
	Code	**Resolution**	**Values**
	43	0.1	-214,748,364.8.. 214,748,364.6
Inductive Reactive Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_InductEnergy	SNVT_elec_kwh_l (146)	kVArL.h(+)
	Code	**Resolution**	**Values**
	44	0.1	-214,748,364.8.. 214,748,364.6

Arrray 2 tipo **NVT** (SNVT_str_int (37)), Unit (N/A), Resolution (1), Values (0...65,565), Bytes (31) typedef struct { unsigned short char_set ; unsigned long wide_char [15] ; } SNTV_str_int;			
	Name	**Variable type**	**Unit**
Active Energy (+)	nvo_ActEnergy	SNVT_elec_kwh_l (146)	kW.h (+)
	Code	**Resolution**	**Values**
	43	0.1	-214,748,364.8.. 214,748,364.6
Inductive Reactive Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_InductEnergy	SNVT_elec_kwh_l (146)	kVArL.h(+)
	Code	**Resolution**	**Values**
	44	0.1	-214,748,364.8.. 214,748,364.6
Capacitive Reactive Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_CapEnergy	SNVT_elec_kwh_l (146)	kVArC.h(+)
	Code	**Resolution**	**Values**
	45	0.1	-214,748,364.8.. 214,748,364.6
Apparent Energy (+)	**Name**	**Variable type**	**Unit**
	nvo_AppEnergy	SNVT_elec_kwh_l (146)	kVA.h(+)
	Code	**Resolution**	**Values**
	46	0.1	-214,748,364.8.. 214,748,364.6

Arrray 3 tipo **NVT** (SNVT_str_int (37)), Unit (N/A), Resolution (1), Values (0...65,565), Bytes (31)
typedef struct {
unsigned short char_set ;
unsigned long wide_char [15] ;
} SNTV_str_int;

	Name	Variable type	Unit
Phase-Neutral Voltage L1	nvo_Ph2NU1	SNVT_volt_ac (138)	V 1
	Code	**Resolution**	**Values**
	22	1	0..65,534
Phase-Neutral Voltage L2	**Name**	**Variable type**	**Unit**
	nvo_Ph2NU2	SNVT_volt_ac (138)	V 2
	Code	**Resolution**	**Values**
	23	1	0..65,534
Phase-Neutral Voltage L3	**Name**	**Variable type**	**Unit**
	nvo_Ph2NU3	SNVT_volt_ac (138)	V 3
	Code	**Resolution**	**Values**
	24	1	0..65,534
Frequency	**Name**	**Variable type**	**Unit**
	nvo_Frequency	SNVT_freq_hz (76)	Hz
	Code	**Resolution**	**Values**
	21	0.1	0..6553.5
Neutral Current	**Name**	**Variable type**	**Unit**
	nvo_neutralCurrent	SNVT_amp_ac (139)	In
	Code	**Resolution**	**Values**
	37	1	0..65,534
Active Power III	**Name**	**Variable type**	**Unit**
	nvo_ActPwOn3Ph	SNVT_power_kilo (28)	kW III
	Code	**Resolution**	**Values**
	16	0.1	0..6553.5
Inductive Reactive Power III	**Name**	**Variable type**	**Unit**
	nvoInductPwOn3Ph	SNVT_power_kilo (28)	kVArL III
	Code	**Resolution**	**Values**
	17	0.1	0..6553.5
Apparent Power III	**Name**	**Variable type**	**Unit**
	nvo_AppPwOn3Ph	SNVT_power_kilo (28)	kVA III
	Code	**Resolution**	**Values**
	36	0.1	0..6553.5
Power Factor III	**Name**	**Variable type**	**Unit**
	nvo_PwFactOn3Ph	SNVT_pwr_fact (98)	PF III
	Code	**Resolution**	**Values**
	20	0.00005	-1.00000..1.00000
Cos **φ** III	**Name**	**Variable type**	**Unit**
	nvo_Cosphi	SNVT_pwr_fact (98)	cos **φ**
	Code	**Resolution**	**Values**
	19	0.00005	-1.00000..1.00000
Md Apparent/Active Power III	**Name**	**Variable type**	**Unit**
	nvo_MaxDemand_kVA	SNVT_power_kilo (28)	Md(kVA III)
	Code	**Resolution**	**Values**
	42	0.1	0..6553.5

<table>
<tr><td colspan="4">Arrray 3 tipo NVT (SNVT_str_int (37)), Unit (N/A), Resolution (1), Values (0...65,565), Bytes (31)
typedef struct {
unsigned short char_set ;
unsigned long wide_char [15] ;
} SNTV_str_int;</td></tr>
<tr><th></th><th>Name</th><th>Variable type</th><th>Unit</th></tr>
<tr><td rowspan="3">Active Energy (+)</td><td>nvo_ActEnergy</td><td>SNVT_elec_kwh_l (146)</td><td>kW.h(+)</td></tr>
<tr><th>Code</th><th>Resolution</th><th>Values</th></tr>
<tr><td>43</td><td>0.1</td><td>-214,748,364.8.. 214,748,364.6</td></tr>
<tr><td rowspan="4">Inductive Reactive Energy (+)</td><th>Name</th><th>Variable type</th><th>Unit</th></tr>
<tr><td>nvo_InductEnergy</td><td>SNVT_elec_kwh_l (146)</td><td>kVArL.h(+)</td></tr>
<tr><th>Code</th><th>Resolution</th><th>Values</th></tr>
<tr><td>44</td><td>0.1</td><td>-214,748,364.8.. 214,748,364.6</td></tr>
</table>

Notes:

✓ *All the variables declared in the arrays are shown without a sign.*

✓ *All the power variables (SNVT_power_kilo type) are shown without a sign.*

✓ *There is a variable called nvi_UpdatePeriod that indicates the refresh time of the variables linked with bindings. It is a NVT type variable (SNVT_time_sec (107), Units (Seconds), Resolution(0.1s), Values (5.0 ... 3200.0), Bytes (2)).*

✓ *All of the instantaneous variables listed in this section have a maximum value (_M) and minimum (_m) value, adding the displayed structures behind the name of the variable. For example, the maximum value of the L1 current is nvo_Ph1Current_M and minimum value is nvo_Ph1Current_m.*

7.7.- PROFIBUS COMMUNICATIONS MODULE

The Profibus communications module, **M-CVM-AB-Profibus**, enables communicating the **CVM-B** with a Profibus network.

7.7.1.- CONNECTION TERMINALS

Table 133: List of terminals, Profibus communications module.

Connection terminals	
1: Shield	**6: P5**, 5V supply voltage
3: B, No inverting input/output signal from Profibus	**8: A**, Inverting input/output signal from Profibus
5: M5 GND, Data reference potencial	

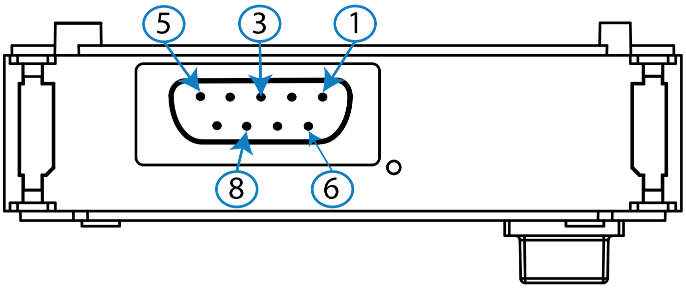


Figure 193: Profibus communications module terminals.

7.7.2.- LEDs

Table 134: List of LEDs, Profibus communications module.

LED	State	Function
BUS ERROR	ON	Communications error
	OFF	Work correctly

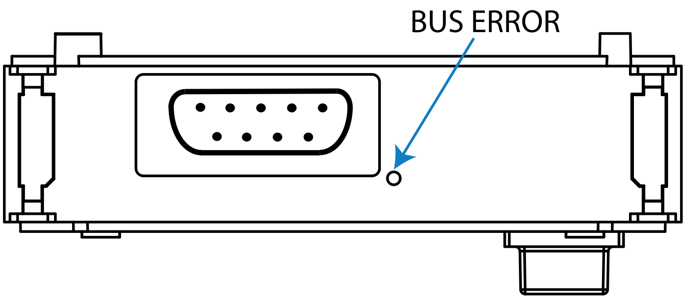


Figure 194: Profibus LED.

7.7.3.- CONNECTION DIAGRAM

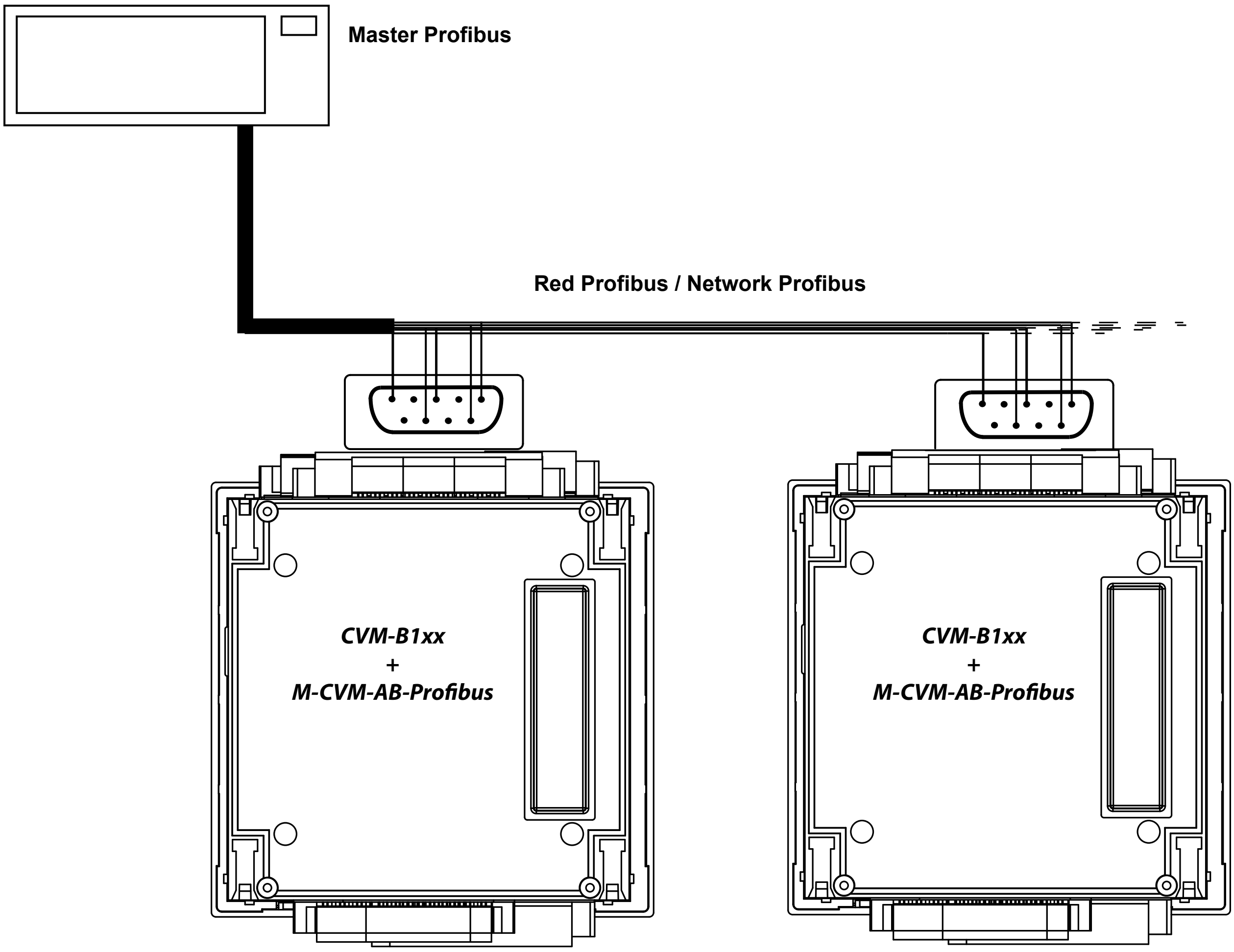


Figure 195:Connection diagram, Profibus.

7.7.4.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 196,** is the home screen of the setup menu.

Figure 196: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

The main screen of the expansion modules is shown in **Figure 197**.

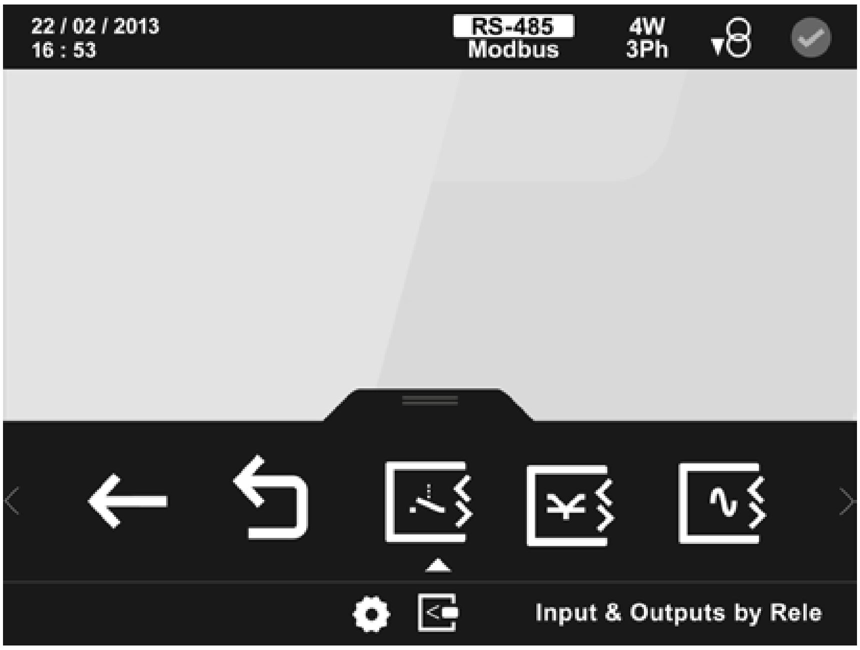


Figure 197: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.

If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.
Use the and buttons to move to the different options and select the **Profibus communications** icon .

Press the button to open the main configuration screen of the Profibus communications module, **Figure 198.**

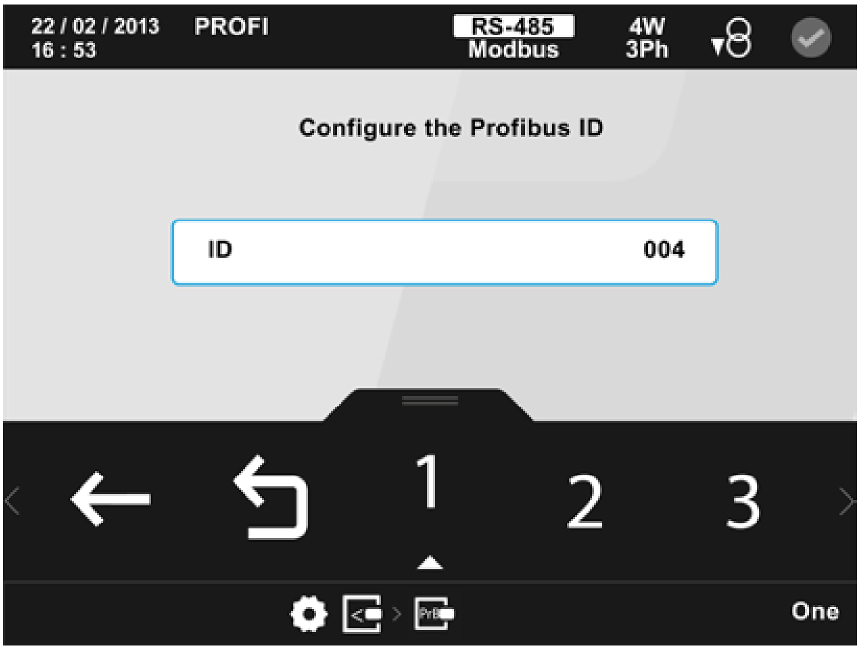


Figure 198: Main configuration screen of the Profibus module

The identifier of the unit in the Profibus network can be selected in this screen.

The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Confirm, confirms and saves the values programmed on the screen in the memory.
Back, returns to the home screen of the expansion modules menu, **Figure 197**.
Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.7.5.- MODBUS COMMUNICATIONS

The following functions are implemented for this variable:
Function 0x04: reading logs.
Function 0x10: Writing multiple logs.

Table 135:Modbus memory map: Profibus communications module

Configuration of the Profibus parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
Peripheral number	EA60	**1 - 255**	-

7.7.6.- VARIABLES PROFIBUS GSD FILE

Note: *Profibus drivers for Scada can be downloaded from **Circutor**'s website.*

The configurations of the GSD modules are given in **Figure 137.**
The table shows the module number, content (variable) and the total size of the module.

Table 136: GSD modules.

Module		Name	Bytes	∑
Mod 1	Mod 1.1	Phase-neutral voltages	12	52
	Mod 1.2	Phase currents	12	
	Mod 1.3	Phase-phase voltage	12	
	Mod 1.4	Power factor	12	
	Mod 1.5	Frequency	4	
Mod 2	Mod 2	Powers	48	48
Mod 3	Mod 3.1	Average values	12	44
	Mod 3.2	Neutral Current	8	
	Mod 3.3	Three-phase values	24	
Mod 4	Mod 4	Present energy without tariffing	48	48
Mod 5	Mod 5	THD V / I	32	32
Mod 6	Mod 6			
Mod 7	Mod 7			
Mod 8	Mod 8	Odd harmonics voltage (15º)	72	72
Mod 9	Mod 9	Odd harmonics current (15º)	72	72
Mod 10	Mod 10			
Mod 11	Mod 11			
Mod 12	Mod 12			
Mod 13	Mod 13	Cos φ	12	12

Module 1

Table 137: GSD modules (Module 1 - Mod 1.1)

Mod 1.1				
Phase-neutral voltage	**Symbol**	**Bytes**	**Address**	**Units**
Voltage phase 1	V 1	4	00-01	Vx100
Voltage phase 2	V 2	4	10-11	Vx100
Voltage phase 3	V 3	4	20-21	Vx100

Table 138: GSD modules (Module 1 - Mod 1.2)

Mod 1.2				
Phase currents	**Symbol**	**Bytes**	**Address**	**Units**
Current	A 1	4	02-03	mA
Current	A 2	4	12-13	mA
Current	A 3	4	22-23	mA

Table 139: GSD modules (Module 1 - Mod 1.3)

Mod 1.3				
Phase-phase voltage	**Symbol**	**Bytes**	**Address**	**Units**
Line voltage L1-L2	V 12	4	36-37	Vx100
Line voltage L2-L3	V 23	4	38-39	Vx100
Line voltage L3-L1	V 31	4	3A-3B	Vx100

Table 140: GSD modules (Module 1 - Mod 1.4)

Mod 1.4				
Power factor	**Symbol**	**Bytes**	**Address**	**Units**
Power factor	PF 1	4	0C-0D	x100
Power factor	PF 2	4	1C-1D	x100
Power factor	PF 3	4	2C-2D	x100

Table 141: GSD modules (Module 1 - Mod 1.5)

Mod 1.5				
Frequency	**Symbol**	**Bytes**	**Address**	**Units**
Frequency (L1)	Hx	4	34-35	Hz x100

Module 2

Table 142: GSD modules (Module 2)

Mod 2				
Powers	**Symbol**	**Bytes**	**Address**	**Units**
Active powers				
Active power	Kw 1	4	04-05	W
Active power	Kw 2	4	14-15	W
Active power	Kw 3	4	24-25	W
Inductive reactive powers				
Inductive reactive power	KvarL 1	4	06-07	var
Inductive reactive power	KvarL 2	4	16-17	var
Inductive reactive power	KvarL 3	4	26-27	var
Capacitive reactive powers				
Capacitive reactive power	KvarC 1	4	08-09	var
Capacitive reactive power	KvarC 2	4	18-19	var
Capacitive reactive power	KvarC 3	4	28-29	var
Apparent power				
Apparent power	kVA1	4	0A-0B	VA
Apparent power	kVA2	4	1A-1B	VA
Apparent power	kVA3	4	2A-2B	VA

Module 3

Table 143: GSD modules (Module 3 - Mod 3.1)

Mod 3.1				
Average values	**Symbol**	**Bytes**	**Address**	**Units**
Average phase voltage	Vn_AVG	4	3C-3D	Vx100
Average line voltage	Vp_AVG	4	3E-3F	Vx100
Average current	I_AVG	4	40-41	mA

Table 144: GSD modules (Module 3 - Mod 3.2)

Mod 3.2				
Neutral values	**Symbol**	**Bytes**	**Address**	**Units**
Neutral voltage	Vn	4	30-31	Vx100
Neutral current	In	4	32-33	mA
Current	A 3	4	22-23	mA

Table 145: GSD modules (Module 3 - Mod 3.3)

Mod 3.3				
Three-phase values	**Symbol**	**Bytes**	**Address**	**Units**
Three-phase active power	Kw III	4	42-43	W
Three-phase inductive power	KvarL III	4	44-45	var
Three-phase capacitive power	KvarC III	4	46-47	var
Three-phase apparent power	KvaIII	4	48-49	VA
Three-phase power factor	PFIII	4	4A-4B	x100
Cos φ three-phase	Cos φ III	4	4C-4D	x100

Module 4

Table 146: GSD modules (Module 4)

Mod 4					
Total tariff	**Symbol**	**Bytes**	**Address kWh**	**Address Wh**	**Units**
Tariff 1					
Active Energy	kwh III	4	500-501		kWh
Active Energy	wh III	2		502	Wh
Inductive Reactive Energy	kvarhL III	4	503-504		kWh
Inductive Reactive Energy	varhL III	2		505	Wh
Capacitive reactive energy	kvarhC III	4	506-507		kWh
Capacitive reactive energy	varhC III	2		508	Wh
Three-phase apparent energy	kVAh III	4	509-50A		kWh
Three-phase apparent energy	VAh III	2		50B	Wh
Generated active energy	kWhIII (-)	4	50C-50D		kWh
Generated active energy	WhIII (-)	2		50E	Wh
Inductive active energy	kvarLhIII (-)	4	50F-510		kWh
Inductive active energy	varLhIII (-)	2		511	Wh
Inductive active energy	kvarChIII (-)	4	512-513		kWh
Inductive active energy	varChIII (-)	2		514	Wh
Generated apparent energy	kVAhIII (-)	4	515-516		kWh
Generated apparent energy	VAhIII (-)	2		517	Wh

Module 5

Table 147: GSD modules (Module 5)

Mod 5				
THD V / I	**Symbol**	**Bytes**	**Address**	**Units**
V 1 THD ratio	THDV1	4	4E-4F	%x100
V 2 THD ratio	THDV2	4	50-51	%x100
V 3 THD ratio	THDV3	4	52-53	%x100
V N THD ratio	THDVN	4	54-55	%x100
I 1 THD ratio	THDI1	4	56-57	%x100
I 2 THD ratio	THDI2	4	58-59	%x100
I 3 THD ratio	THDI3	4	5A-5B	%x100
IN THD ratio	THDIN	4	5C-5D	%x100

Module 8

Table 148: GSD modules (Module 8)

Mod 8				
Odd harmonics voltage	**Symbol**	**Bytes**	**Address**	**Units**
L 1				
Fundamental Harm.	V1_fund	4	0A28-0A29	Vx100
3rd Order Harmonic	v1 H3	2	0A2B	%x100
5th Order Harmonic	v1 H5	2	0A2D	%x100
7th Order Harmonic	v1 H7	2	0A2F	%x100
9th Order Harmonic	v1 H9	2	0A31	%x100
11th Order Harmonic	v1 H11	2	0A33	%x100
13th Order Harmonic	v1 H13	2	0A35	%x100
15th Order Harmonic	v1 H15	2	0A37	%x100
L 2				
Fundamental Harm.	V2_fund	4	0A5B-0A5C	Vx100
3rd Order Harmonic	v2 H3	2	0A5E	%x100
5th Order Harmonic	v2 H5	2	0A60	%x100
7th Order Harmonic	v2 H7	2	0A62	%x100
9th Order Harmonic	v2 H9	2	0A64	%x100
11th Order Harmonic	v2 H11	2	0A66	%x100
13th Order Harmonic	v2 H13	2	0A68	%x100
15th Order Harmonic	v2 H15	2	0A6A	%x100
L3				
Fundamental Harm.	V3_fund	4	0A8E-0A8F	Vx100
3rd Order Harmonic	v3 H3	2	0A91	%x100
5th Order Harmonic	v3 H5	2	0A93	%x100
7th Order Harmonic	v3 H7	2	0A95	%x100
9th Order Harmonic	v3 H9	2	0A97	%x100
11th Order Harmonic	v3 H11	2	0A99	%x100
13th Order Harmonic	v3 H13	2	0A9B	%x100
15th Order Harmonic	v3 H15	2	0A9D	%x100
N				
Fundamental Harm.	Vn_fund	4	0AC1-0AC2	Vx100
3rd Order Harmonic	vn H3	2	0AC4	%x100
5th Order Harmonic	vn H5	2	0AC6	%x100

Table 148 (Continuation) : GSD modules (Module 8)

Mod 8				
Odd harmonics voltage	**Symbol**	**Bytes**	**Address**	**Units**
7th Order Harmonic	vn H7	2	0AC8	%x100
9th Order Harmonic	vn H9	2	0ACA	%x100
11th Order Harmonic	vn H11	2	0ACC	%x100
13th Order Harmonic	vn H13	2	0ACE	%x100
15th Order Harmonic	vn H15	2	0AD0	%x100

Module 9

Table 149: GSD modules (Module 9)

Mod 9				
Odd harmonics current	**Symbol**	**Bytes**	**Address**	**Units**
L 1				
Fundamental Harm.	I1_fund	4	0B54-0B55	mA
I1 3th Order Harmonic	i1 H3	2	0B57	%x100
I1 5th Order Harmonic	i1 H5	2	0B59	%x100
I1 7th Order Harmonic	i1 H7	2	0B5B	%x100
I1 9th Order Harmonic	i1 H9	2	0B5D	%x100
I1 11th Order Harmonic	i1 H11	2	0B5F	%x100
I1 13th Order Harmonic	i1 H13	2	0B61	%x100
I1 15th Order Harmonic	i1 H15	2	0B63	%x100
L 2				
Fundamental Harm.	I2_fund	4	0B87-0B88	mA
I2 3rd Order Harmonic	i2 H3	2	0B8A	%x100
I2 5th Order Harmonic	i2 H5	2	0B8C	%x100
I2 7th Order Harmonic	i2 H7	2	0B8E	%x100
I2 9th Order Harmonic	i2 H9	2	0B90	%x100
I2 11th Order Harmonic	i2 H11	2	0B92	%x100
I2 13th Order Harmonic	i2 H13	2	0B94	%x100
I2 15th Order Harmonic	i2 H15	2	0B96	%x100
L3				
Fundamental Harm.	I3_fund	4	0BBA-0BBB	mA
I3 3rd Order Harmonic	i3 H3	2	0BBD	%x100
I3 5th Order Harmonic	i3 H5	2	0BBF	%x100
I3 7th Order Harmonic	i3 H7	2	0BC1	%x100
I3 9th Order Harmonic	i3 H9	2	0BC3	%x100
I3 11th Order Harmonic	i3 H11	2	0BC5	%x100
I3 13th Order Harmonic	i3 H13	2	0BC7	%x100
I3 15th Order Harmonic	i3 H15	2	0BC9	%x100
N				
Fundamental Harm.	In_fund	4	0BED-0BEE	mA
In 3rd Order Harmonic	in H3	2	0BF0	%x100
In 5th Order Harmonic	in H5	2	0BF2	%x100
In 7th Order Harmonic	in H7	2	0BF4	%x100

Table 149 (Continuation) : GSD modules (Module 9)

Mod 9				
Odd harmonics current	**Symbol**	**Bytes**	**Address**	**Units**
In 9th Order Harmonic	in H9	2	0BF6	%x100
In 11th Order Harmonic	in H11	2	0BF8	%x100
In 13th Order Harmonic	in H13	2	0BFA	%x100
In 15th Order Harmonic	in H15	2	0BFC	%x100

Module 13

Table 150: GSD modules (Module 13)

Mod 13				
Cos φ	**Symbol**	**Bytes**	**Address**	**Units**
cos φ	cos φ 1	4	0E-0F	x100
cos φ	cos φ 2	4	1E-1F	x100
cos φ	cos φ 3	4	2E-2F	x100

7.8.- MBUS COMMUNICATIONS MODULE

The MBus communications module, **M-CVM-AB-MBus**, enables communicating the **CVM-B** with a M-Bus network.

7.8.1.- CONNECTION TERMINALS

Table 151: List of terminals, MBus communications module.

Connection terminals	
1, 4: MBus +	**3:** Not use
2, 5: MBus -	

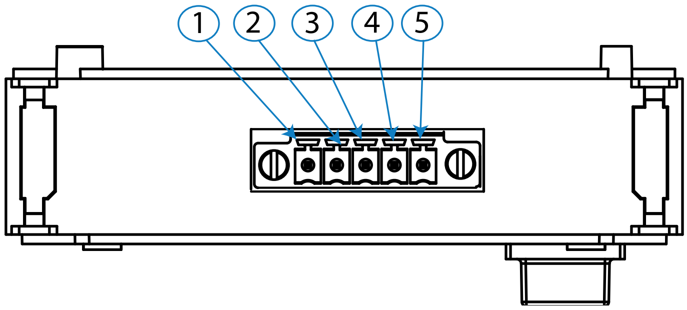


Figure 199: MBus communications module terminals.

7.8.2.- CONNECTION DIAGRAM

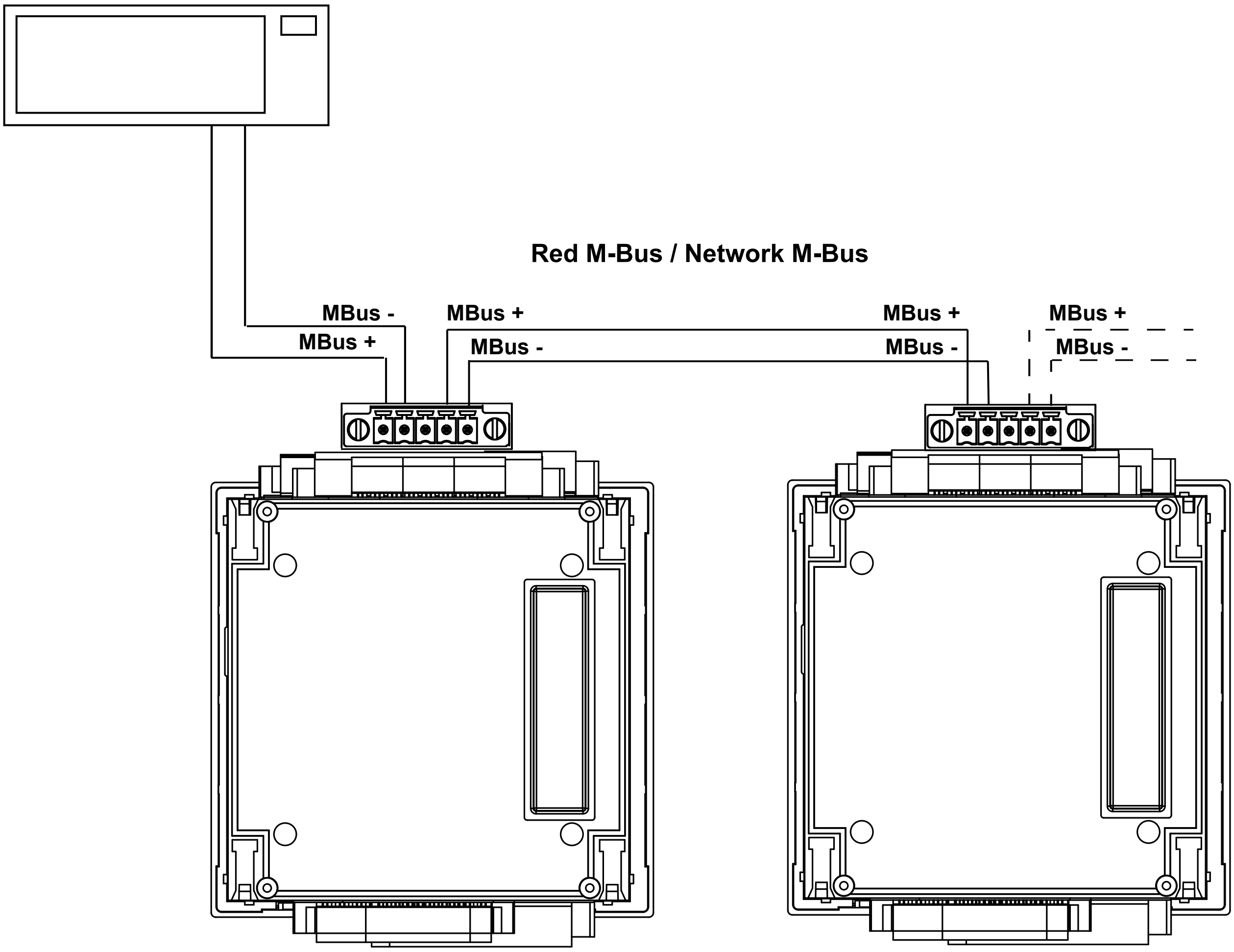


Figure 200:Connection diagram, MBus.

7.8.3.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 201,** is the home screen of the setup menu.

Figure 201: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.

The main screen of the expansion modules is shown in **Figure 202**.

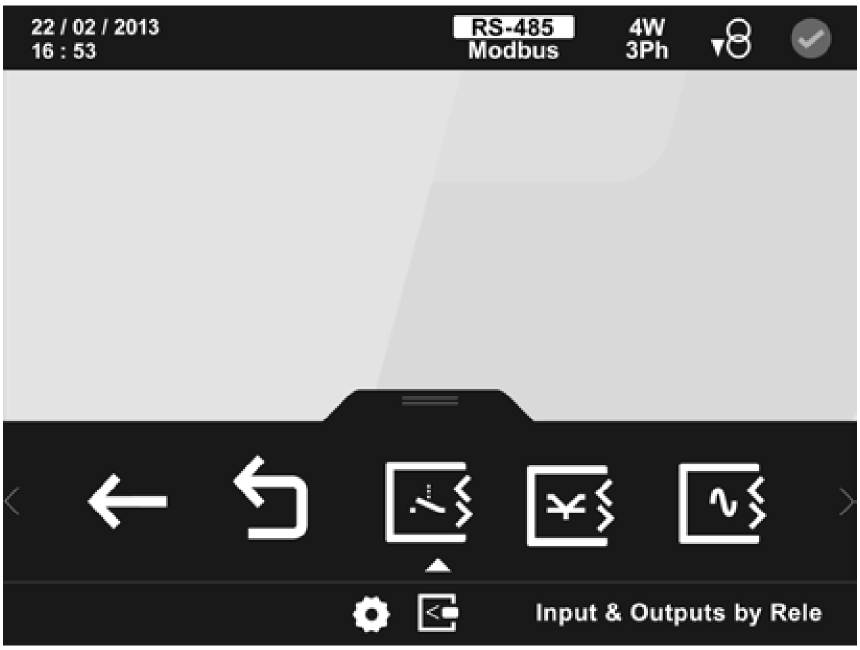


Figure 202: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.

If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.
Use the and buttons to move to the different options and select the **MBus communications** icon .

Press the button to open the main configuration screen of the MBus communications module, **Figure 203.**

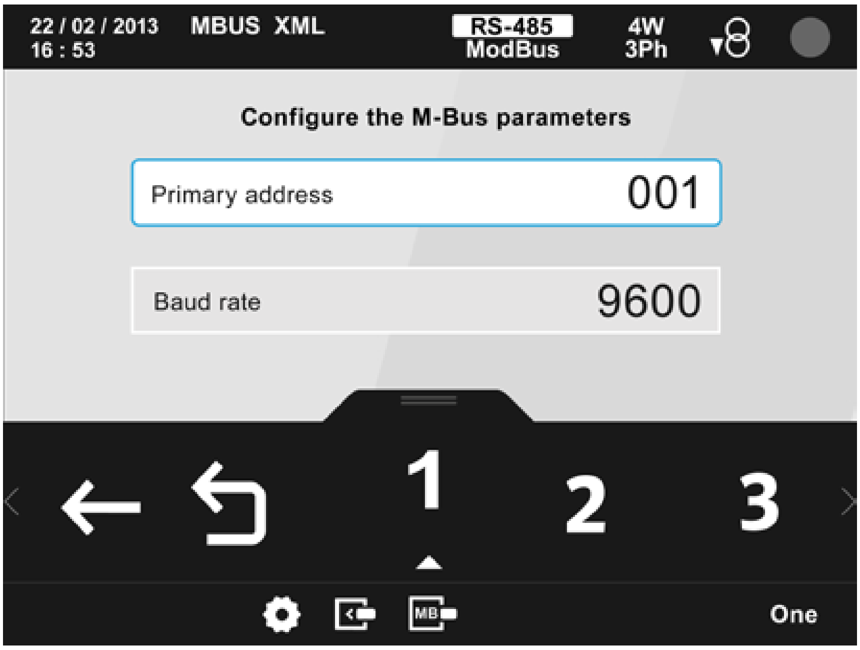


Figure 203: Main configuration screen of the MBus module

The configuration parameters are:

✓ The primary address
✓ The transmission speed, Baud rate.

- When programming the **Primary address:**

0, 1 ... 9 the ten possible digits to program.
Delete character, deletes the selected character.
Delete parameter, deletes the characters of the selected parameter.
Previous, selects the previous parameter.
Siguiente, selecciona el parámetro siguiente.
Confirm, confirms and saves the values programmed on the screen in the memory.
Return, returns to the home screen of the expansion modules menu.
Main Menu, returns to the main menu, **Figure 25**.

Maximum value: 250.
Minimum value: 1.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

- When programming the **transmission speed**, **Baud rate**:

1200, 2400 ... 9600 Possible transmission speeds:**1200, 2400, 4800** o **9600.**
Previous, selects the previous parameter**.**
Next, selects the next parameter**.**
Confirm, confirms and saves the values programmed on the screen in the memory**.**
Back, returns to the main configuration screen of the expansion modules menu.
Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.8.4.- MODBUS COMMUNICATIONS

The following functions are implemented for this variable:
Function 0x04: reading logs.
Function 0x10: Writing multiple logs.

Table 152:Modbus memory map: MBus communications module

Configuration of the MBus parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
Primary address	EE48	1 - 250	1
Baud rate	EE49	**2**: 1200 - **3**: 2400 - **4**: 4800 - **5**: 9600	5

Note: *The 2 logs can be read separately, but they must be written at the same time (as a group). Otherwise, the system will reply with an error.*

7.8.5.- M-BUS COMMUNICATIONS

The **M-Bus** module implements a slave M-Bus interface that is compatible with the EN13757-2 and EN13757-3 standards, enabling the direct reading of up to 38 electrical parameters of the **CVM-B**.
Network access is accomplished with a M-Bus transceiver that is self-powered from the same bus and galvanically isolated from the rest of the circuit.

The data-reading protocol on the M-Bus network is as follows:

1.- The M-Bus network master requests data reading from the slave by sending the "REQ_UD2" telegram (user data request).

2.- The slave responds with the "RSP_UD" telegram (user data response).
The "RSP_UD" telegram has 2 different parts:

A.- A header with a static structure, containing relevant information about the unit:

- **Serial number:** the last 8 digits of the CVM-B serial number.
- **Manufacturer ID: CIR**
- **Device type ID: Electricity.**
- **Version ID:** hardware/firmware version of the unit.

B.- Data blocks with variables:

Each block contains one **CVM-B** variable. To describe the data, the M-Bus protocol specifies that there must be at least:

- one **DIF** field that defines the format of the data being sent.
- one **VIF** field that defines the units in which the data are expressed.

Depending on the data type, format extensions (**DIFE**) and/or unit definition extensions (**VIFE**) may be required.

The maximum length of the "RSP_UD" telegram is 255 bytes.

7.8.5.1.- TABLE OF “RSP_UD” TELEGRAM VARIABLES

Variables arranged by order of appearance in the telegram.

Table 153: Table of “RSP_UD” telegram variables.

Variable	Format	Type	Units	Notes
Date / Time	4 bytes type F	Timestamp		Date/time of the analyzer measurement
L1 - L2 line voltage	2 bytes	Instantaneous	V	1 or 2 decimal places of resolution
L2 - L3 line voltage	2 bytes	Instantaneous	V	
L1 - L3 line voltage	2 bytes	Instantaneous	V	
Line III voltage	2 bytes	Instantaneous	V	
Network frequency	Float 4 bytes	Instantaneous	Hz	2 decimal places of resolution
Phase 1 current	4 bytes	Instantaneous	A	With sign, 0 to 3 decimal places of resolution
Phase 2 current	4 bytes	Instantaneous	A	
Phase 3 current	4 bytes	Instantaneous	A	
Line III current	4 bytes	Instantaneous	A	
Phase 1 active power	4 bytes	Instantaneous	kW	
Phase 2 active power	4 bytes	Instantaneous	kW	
Phase 3 active power	4 bytes	Instantaneous	kW	
Line III active power	4 bytes	Instantaneous	kW	
Phase 1 power factor	1 byte	Instantaneous	-	With sign, 2 decimal places of resolution
Phase 2 power factor	1 byte	Instantaneous	-	
Phase 3 power factor	1 byte	Instantaneous	-	
Line III power factor	1 byte	Instantaneous	-	
Active energy consumed Tariff 1	4 bytes	Incremental	kWh	0 to 3 decimal places of resolution
Active energy generated Tariff 1	4 bytes	Incremental	kWh	
Active energy consumed Tariff 2	4 bytes	Incremental	kWh	
Active energy generated Tariff 2	4 bytes	Incremental	kWh	
Active energy consumed Tariff 3	4 bytes	Incremental	kWh	
Active energy generated Tariff 3	4 bytes	Incremental	kWh	
Total active energy consumed	4 bytes	Incremental	kWh	
Total active energy generated	4 bytes	Incremental	kWh	
Energy meter hours Tariff 1	4 bytes	Incremental	horas	
Energy meter hours Tariff 2	4 bytes	Incremental	horas	
Energy meter hours Tariff 3	4 bytes	Incremental	horas	
Total energy meter hours	4 bytes	Incremental	horas	
Phase 1 maximum current	4 bytes	Máx. Inst.	A	With sign, 0 to 3 decimal places of resolution
Phase 2 maximum current	4 bytes	Máx. Inst.	A	
Phase 3 maximum current	4 bytes	Máx. Inst.	A	
Line III maximum current	4 bytes	Máx. Inst.	A	
Phase 1 maximum active power	4 bytes	Máx. Inst.	kW	
Phase 2 maximum active power	4 bytes	Máx. Inst.	kW	
Phase 3 maximum active power	4 bytes	Máx. Inst.	kW	
Line III maximum active power	4 bytes	Máx. Inst.	kW	

7.9.- DATA STORAGE MODULE, DATALOGGER

The **M-CVM-AB-Datalogger** can be used to store data in the embedded PowerStudio platform integrated in the module.

The information stored in the module can be accessed with a WEB browser compatible with JAVA and/or with HTTP Requests sent to the integrated XML server.
Note: *Refer to the PowerStudio manual for more information about the XML server.*

Once the module has been connected to an Ethernet network and an IP address has been assigned to the module, use the web browser of a computer in the same local network and enter the IP address in the browser's navigation bar. The embedded PowerStudio environment of the module can be used to display the data in real time, as well as the data stored over time.

Refer to the PowerStudio manual and tutorials found on ***CIRCUTOR'****s website for more information about additional configurations, sending emails, generation of additional calculations, etc.*

7.9.1.- CONNECTION TERMINALS

Table 154:List of terminals, Datalogger module.

Connection terminals
1: Ethernet

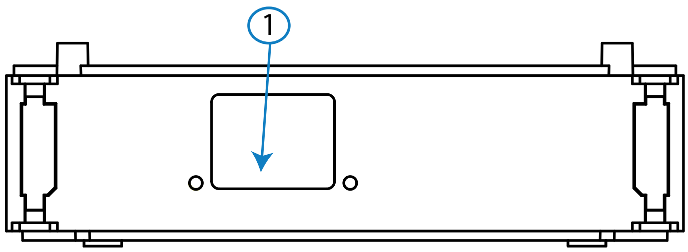


Figure 204: Datalogger module terminals.

7.9.2.- LEDs

Table 155: List of LEDs, Datalogger module.

LED	State	Function
ACT	ON	No bus activity
	Blinking	Bus activity
LINK	ON	Link
	OFF	No link

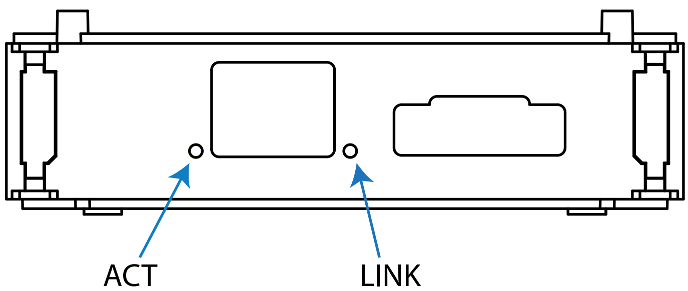


Figure 205: Datalogger LEDs.

7.9.3.- CONNECTION DIAGRAM

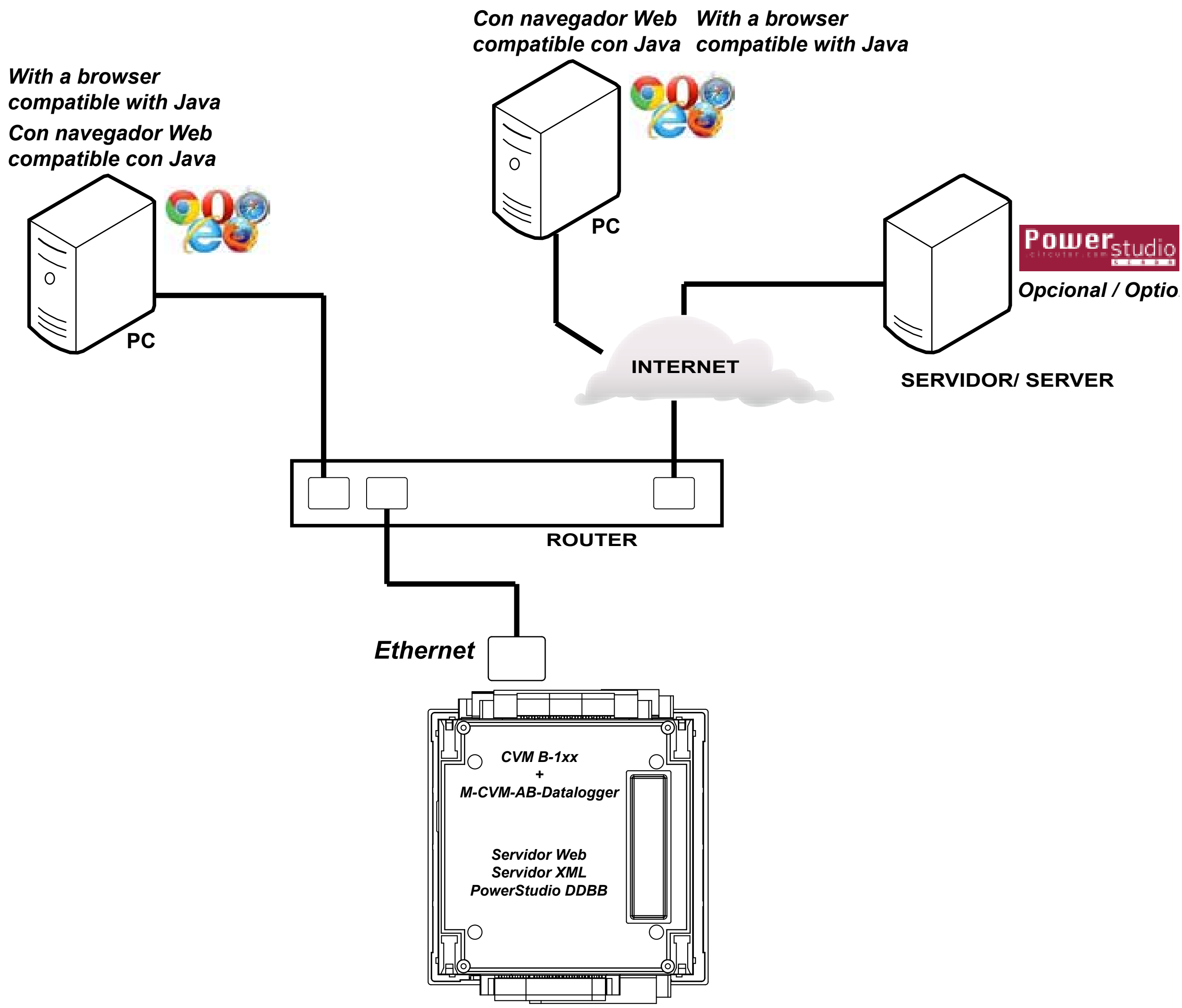


Figure 206:Connection diagram, Datalogger.

7.9.4.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 207,** is the home screen of the setup menu.

Figure 207: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .
If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 208**.

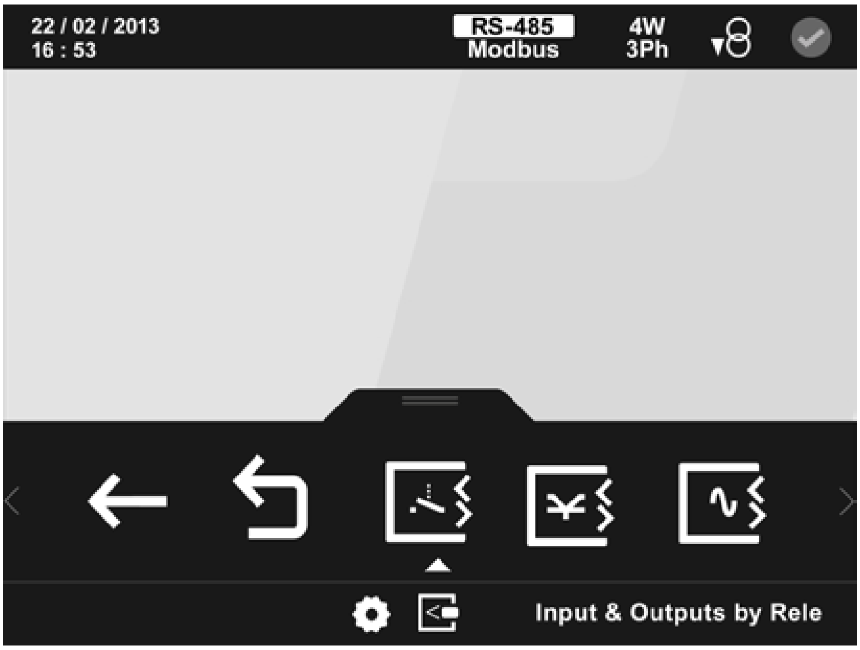


Figure 208: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.

If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **Datalogger module** icon .

Press the button to open the main configuration screen of the Datalogger module, **Figure 209.**

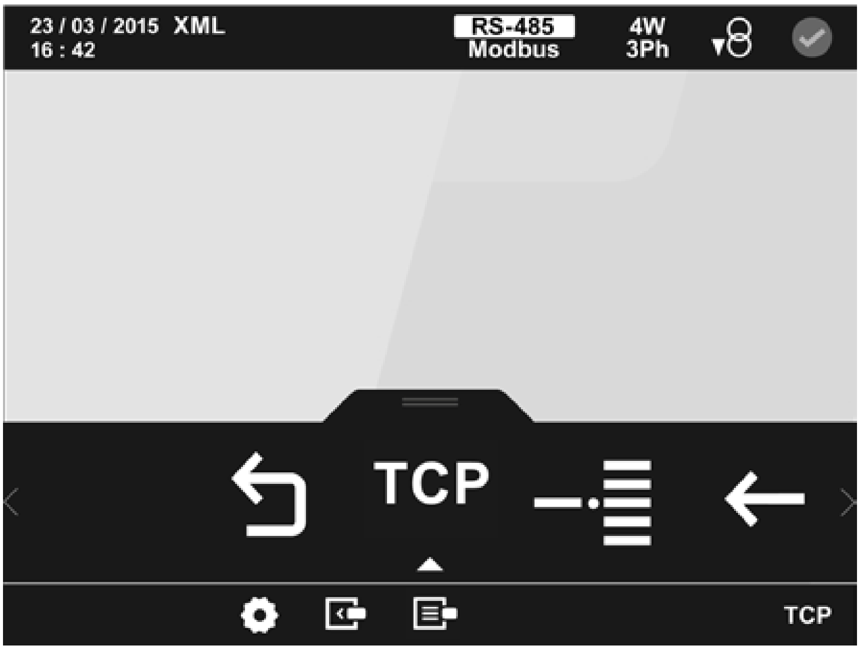


Figure 209: Main configuration screen of the Datalogger module.

The following options appear in the lower area:

TCP Configuration of the TCP parameters.(***"7.9.4.1.- Configuration of the TCP parameters"***)

Port configuration (***"7.9.4.2.- Port configuration"***)

Back, returns to the home screen of the expansion modules menu, **Figure 208**

Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.9.4.1.- TCP Configuration of the TCP parameters

On this screen displays the TCP parameters are configured, **Figure 210.**

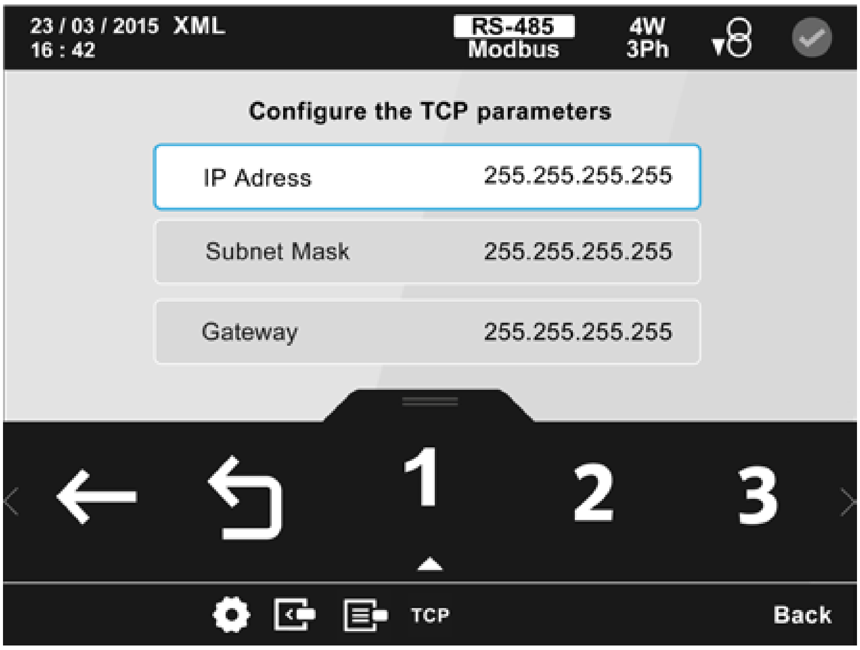


Figure 210: Configuration screen of the TCP parameters.

The parameter selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program.

. Point.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves the values programmed on the screen in the memory.

Back, returns to the main configuration screen of the Datalogger module,**Figure 209.**

Main Menu, returns to the main menu, **Figure 25**.

7.9.4.2.- Port configuration.

On this screen the port address is configured, **Figure 211.**

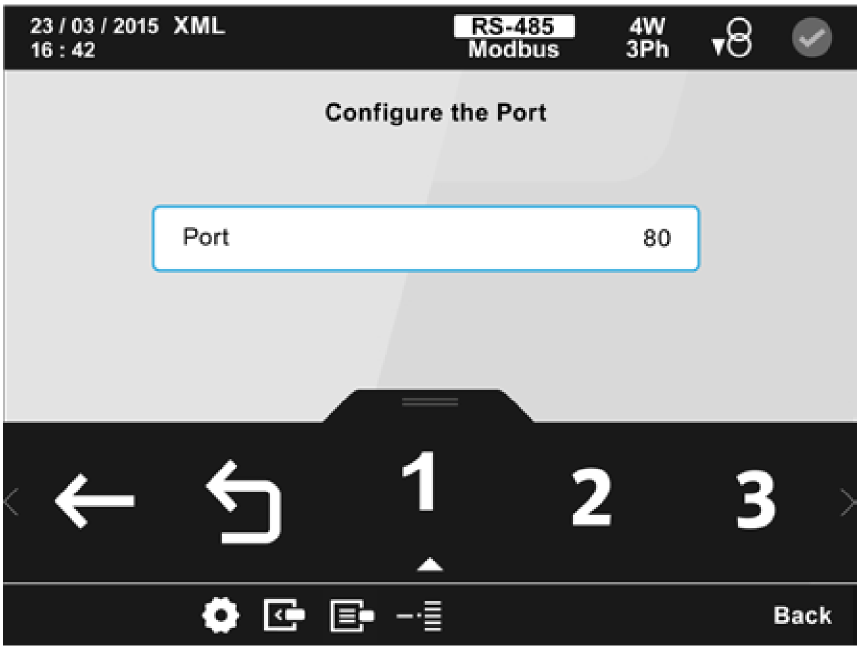


Figure 211:Port configuration screen.

The parameter selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program**.**

Delete character, deletes the selected character**.**

Delete parameter, deletes the characters of the selected parameter.

Confirm, confirms and saves the values programmed on the screen in the memory**.**

Back, returns to the main configuration screen of the Datalogger module,**Figure 209.**

Main Menu, returns to the main menu, **Figure 25**.

7.9.5.- MODBUS COMMUNICATIONS

The following functions are implemented for these variables:
Function 0x04: reading registers.

7.9.5.1.- TCP parameters

Table 156: Modbus memory map: : Datalogger module (Table 1)

TCP parameters			
Configuration variable	**Address**	**Valid data margin**	**Example**
DHCP Flag	E2AE	**0** : Deactivation **1**: Activation	-
IP Address	E290 - E291	1 long : 4 characters	AC109C4B (172.16.156.75)
Subnet Mask	E292 - E293	1 long : 4 characters	FFFFF000 (255.255.240.0)
Gateway	E294 - E295	1 long : 4 characters	AC109601(172.16.150.1)
MAC	E2A0 - E2A2	3 integers : 6 characters	14A62C001D54 (14.A6.2C.00.1D.54)

7.9.5.2.- Port address and versions

Table 157:Modbus memory map: : Datalogger module (Table 2)

Port address and versions		
Configuration variable	**Address**	**Valid data margin**
Port	E296 - E297	1 long
Embedded version	E298 - E29B	4 integers : 8 characters
PowerStudio version	E29C - E29F	4 integers : 8 characters

7.10.- MODBUS/TCP Switch COMMUNICATIONS MODULE

The **M-CVM-AB-Modbus TCP (Switch)** is a communications module for connecting the **CVM-B** units to a **Modbus/TCP** network and as an Ethernet to Ethernet gateway.

Modbus/TCP is a communications protocol designed for enabling industrial units to communicate with each other on Ethernet networks using TCP/IP protocols.
Basically, **Modbus/TCP** encapsulates a Modbus frame within a TCP frame, making it possible to configure and monitor a unit via the Internet.

7.10.1.- CONNECTION TERMINALS

Table 158:List of terminals, Modbus TCP (Switch) communications module.

Terminals in the unit
1: Ethernet
2: Ethernet

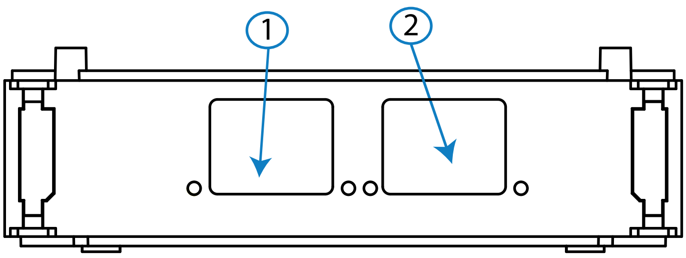


Figure 212: Modbus TCP (Switch) communications module terminals

7.10.2.- LEDs

Table 159: List of LEDs, Modbus TCP (Switch) communications module.

LED	Status	Function
LINK / ACT	On	Unit connected to the network
	Off	Unit disconnected from the network
	Blinking light	Activity on the bus
SPEED	On	100 BT
	Off	10 BT

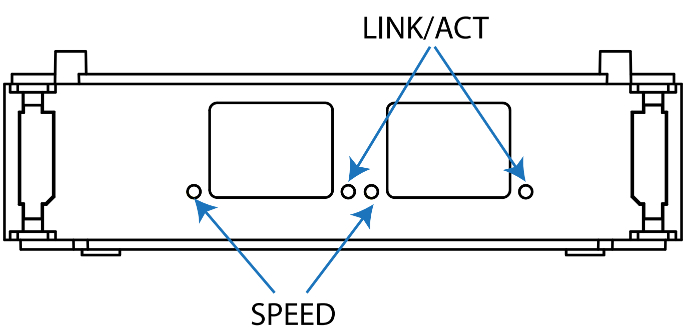


Figure 213: LEDs Modbus TCP. (Switch)

7.10.3.- CONNECTION DIAGRAM

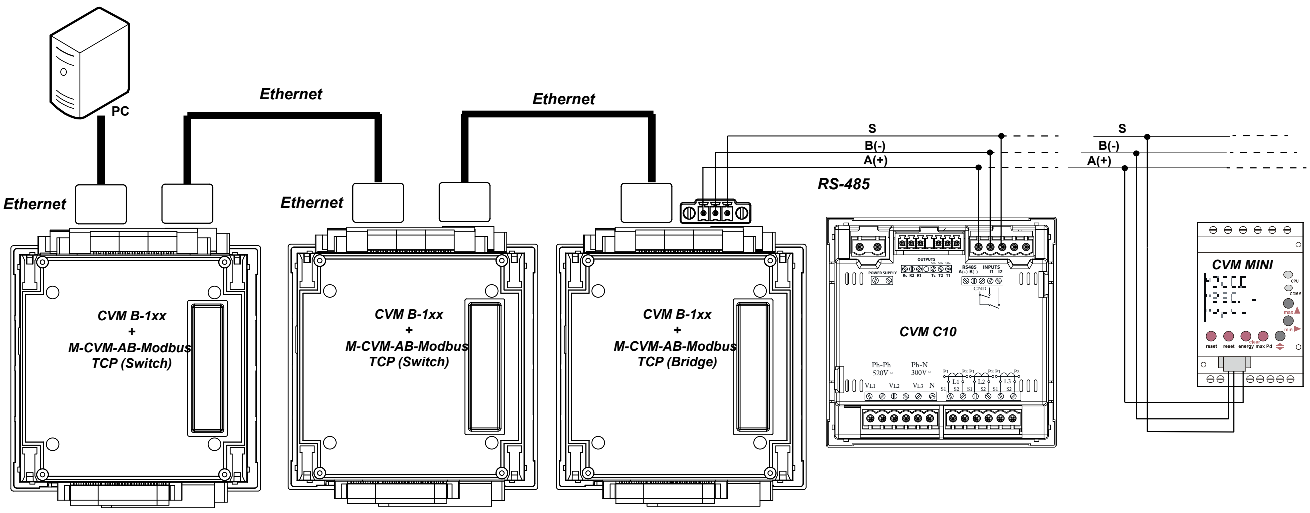


Figure 214:Modbus TCP (Switch) connection diagram.

7.10.4.- CONFIGURATION

You can access the setup menu on the main screen, **Figure 25**.
The screen in **Figure 215,** is the home screen of the setup menu.

Figure 215: Main screen of setup menu.

All the possible programming parameters for the unit appear in the lower area. To configure the expansion modules you need to, using the keys and , browse the various parameters until finding the expansion modules icon, .
To access the selected parameter, press the key .

If no key is pressed for 5 minutes, the display screen changes automatically to the default screen.
The main screen of the expansion modules is shown in **Figure 216**.

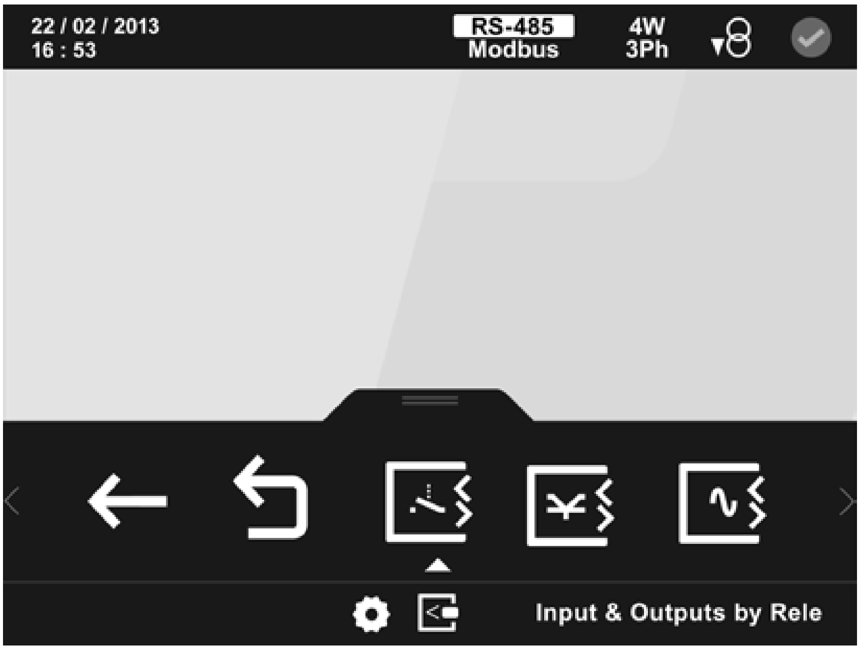


Figure 216: Main screen of expansion modules.

Displayed here are all the expansion modules connected to the unit.
If in the unit there is more than one module of the same type connected, a number will appear in the icon to differentiate them ; the module with the lowest number has the lowest serial number.

Use the and buttons to move to the different options and select the **Modbus TCP (Switch) communications** icon.

Press the button to open the main configuration screen of the Modbus TCP communications module, **Figure 217.**

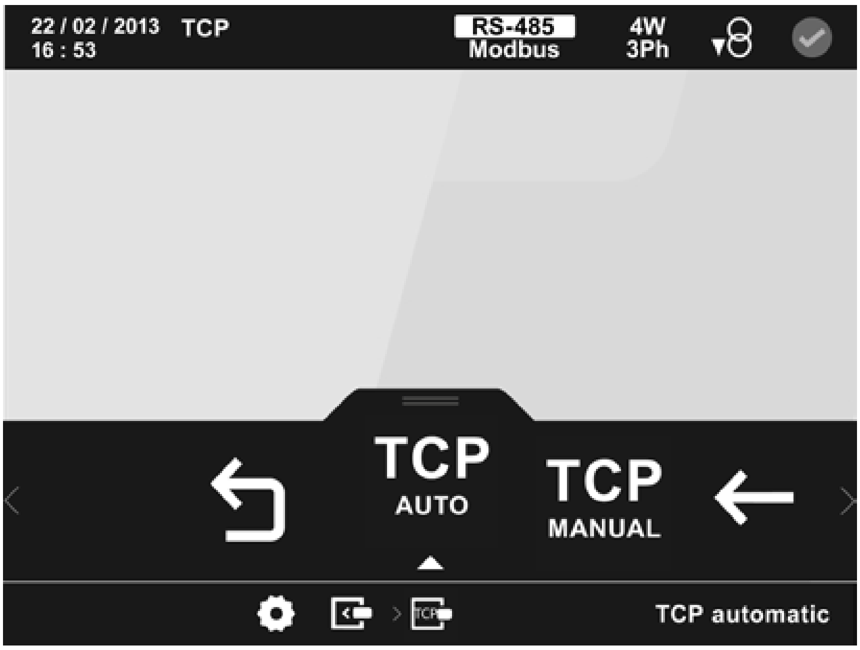


Figure 217: Main configuration screen of the Modbus TCP communications module.

The following options appear in the lower area:

Configuration of DHCP activation/deactivation.
(“7.10.4.1.- Configuration of DHCP activation/deactivation”)

Configuration of the TCP parameters.
(“7.10.4.2.- Configuration of the TCP parameters manually.”)

Back, returns to the home screen of the expansion modules menu, **Figure 216**.

Main Menu, returns to the main menu, **Figure 25**.

Use the and buttons to select the different options.
To confirm the selection, press the button.

If no button is pressed for 5 minutes, the display screen changes automatically to the default screen, which displays the voltage measurement of 4 parameters.

7.10.4.1.- Configuration of DHCP activation/deactivation

On this screen you select whether or not the IP is automatically assigned. **Figure 218**.

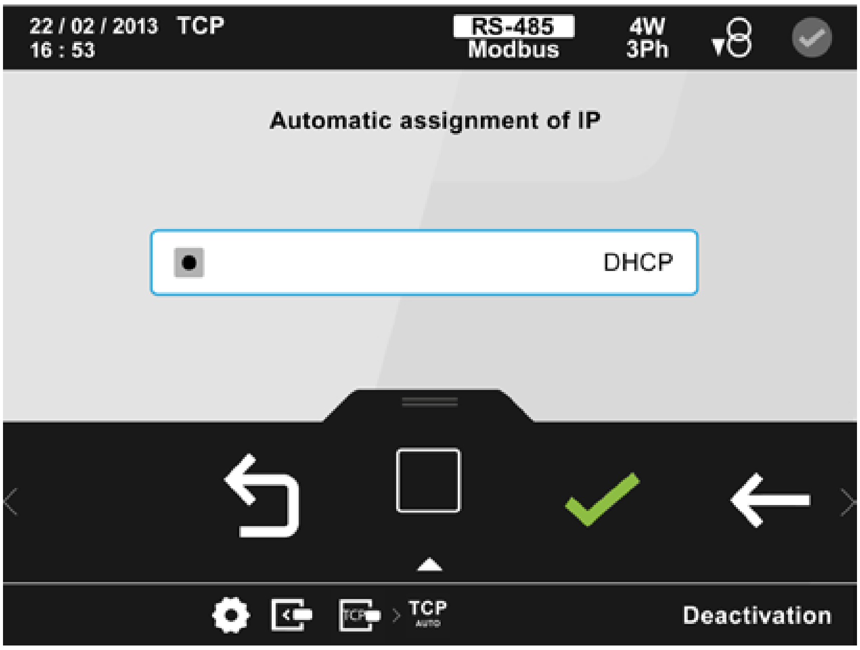


Figure 218: Configuration screen of the Modbus TCP (Switch) module (TCP Auto)

The following options appear in the lower area:

DHCP activation, the IP is automatically assigned.

DHCP deactivation, the TCP parameters are configured manually in option .

Confirm, confirms and saves in the memory the values programmed on the screen.

Back, returns to the main configuration screen of the Modbus TCP module, **Figure 217.**

Main Menu, returns to the main menu, **Figure 25**.

7.10.4.2.- Configuration of the TCP parameters manually.

Note: *If DHCP is activated, you will not be able to modify the parameters on this screen. This is indicated by a * next to each value.*

The configuration parameters of the TCP communication are, **Figure 219**:

✓ IP address.
✓ Subnet mask.
✓ Gateway.

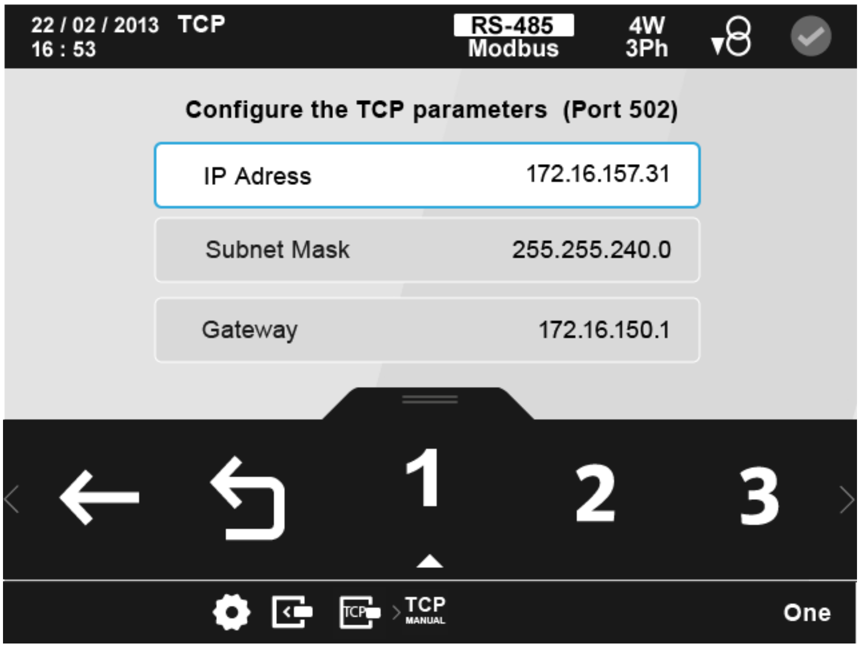


Figure 219: Configuration screen of the Modbus TCP (Switch) module (TCP manual)

The parameter selected is indicated in white.
The following options appear in the lower area:

0, 1 ... 9 the ten possible digits to program.

Point.

Delete character, deletes the selected character.

Delete parameter, deletes the characters of the selected parameter.

Previous, selects the previous parameter.

Next, selects the next parameter.

Confirm, confirms and saves the values programmed on the screen in the memory.

Back, returns to the main configuration screen of the Modbus TCP module, **Figure 217.**

Main Menu, returns to the main menu, **Figure 25**.

7.10.5.- MODBUS COMMUNICATIONS

The following functions are implemented for these variables:
Function 0x04: reading registers.
Function 0x10: Writing multiple registers.

7.10.5.1.- Configuration of DHCP activation/deactivation

Table 160:Modbus memory map: Modbus TCP (Switch) communications module (Table 1)

Configuration of DHCP activation/deactivation			
Configuration variable	**Address**	**Valid data margin**	**Default value**
DHCP Flag	F23A	**0** : Deactivation **1**: Activation	1

7.10.5.2.- Configuration of the TCP parameters

Table 161:Modbus memory map: Modbus TCP (Switch) communications module (Table 2)

Configuration of the Modbus TCP parameters			
Configuration variable	**Address**	**Valid data margin**	**Default value**
IP Address	F230 - F231	1 long : 4 characters	-
Subnet Mask	F232 - F233	1 long : 4 characters	-
Gateway	F234 - F235	1 long : 4 characters	-

Note: *The module resets to activate the configuration.*
Note: *The 6 registers must be written at once (as a group), otherwise it will respond with an error.*

7.10.5.3.- MAC address of the Modbus TCP module

The function implemented for this variable is:
Function 0x04: reading registers.

Table 162:Modbus memory map: Modbus TCP (Switch) communications module (Table 3)

MAC address of the Modbus TCP module		
Configuration variable	**Address**	**Valid data margin**
MAC address	F236 - F238	3 integers : 6 characters

8.- SOFTWARE UPDATE

In the **CVM-B** you can update:

✓ The unit software,
✓ The expansion modules software.

	Before carrying out any updating process, the unit must be unplugged from all power supplies, both the power supply for the unit and measurement.

To update the unit you will need:

✓ The microSD card inserted on one side of the unit.
✓ The update files, which can be found on the Circutor web site.
Select the update files according to the model of the unit, **CVM-B100** or **CVM-B150**.
✓ A PC so as to update the files in the microSD card.

On the side of the unit there is a slot with the microSD card; to access it simply press the microSD card and it will be released from the slot.

Figure 220: Position of slot with the microSD card.

8.1.- UNIT SOFTWARE UPDATE.

The update files depend on the model of the unit:

Table 163:Display software update files.

Model	Display software update file
CVM-B100	firmware_cpu.bin resources_CVM_B100.pbr
CVM-B150	firmware_cpu.bin resources_CVM_B150.pbr

Follow the steps below to update the unit software:

1.- Copy the 2 files, **Table 163**, in the microSD card.
2.- Insert the microSD card in its slot.
3.- Connect the unit to the power supply.
The unit is automatically updated when started.

The updating process may take a few seconds and will be completed once the screen application has started.

Note: *If the expansion modules installed in the unit are not compatible with a new software upgrade, a message will appear on the screen indicating that they need to be upgraded.*

Once the unit has started, the file "firmware_cpu.bim" is deleted automatically from the microSD card.

8.2.- EXPANSION MODULES UPDATE

The update files are:

Table 164:Expansion modules update file.

Model	Expansion modules update file
Transistor digital inputs/outputs **Relay Digital Inputs/Outputs**	firmware_digi.bin
Analogue Inputs/Outputs	firmware_analog.bin
Modbus TCP (Bridge) communications	firmware_modbus_ip.bin
Modbus TCP (Switch) communications	firmware_mtcp_switch.bin
LonWorks communications	firmware_lonworks.bin
Profibus communications	firmware_profibus.bin
MBus communications	firmware_mbus.bin
Datalogger	firmware_embedded.bin

Follow the steps below to update the unit software:

1.- Replace the new file, **Table 164,** with the file in the microSD card.
2.- Insert the microSD card in its slot.
3.- Connect the unit to the power supply.
The unit scans the modules connected to it and looks to see whether there is a new update for each of them.
If there is, the updating process may take around 7 minutes.

The updated information on the modules is displayed in the expansion modules section of the information menu, ***"5.5.3.- Expansion modules."***

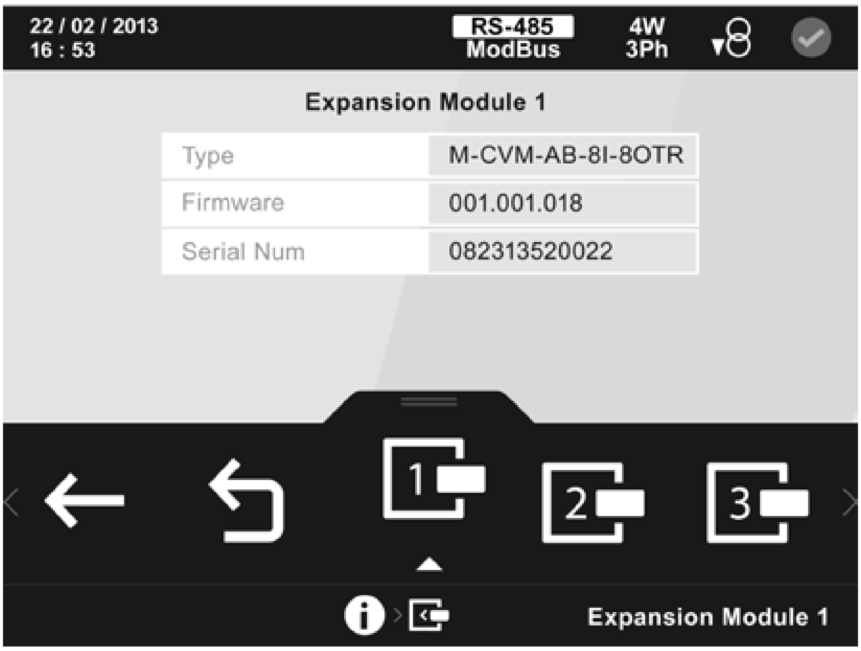


Figure 221:Expansion modules information screen.

The update files are not deleted automatically from the microSD card. This is in case you want to add a new module afterwards and want it to be updated with the same version of the modules already installed.

9.- TECHNICAL FEATURES

AC power supply (CVM-B100-ITF, CVM-B150-ITF)		
Rated voltage	100 ... 240 V ~	
Frequency	50 ... 60Hz	
Consumption	**CVM-B100**	**CVM-B150**
	max. 23.9 VA	max. 29.4 VA
Installation category	CAT III 300 V	

DC Power supply				
Rated voltage	**CVM-Bxxx-ITF-SDC**		**CVM-Bxxx-ITF**	
	20 ...120 V ⎓		120 ...300 V ⎓	
Consumption	**CVM-B100**	**CVM-B150**	**CVM-B100**	**CVM-B150**
	max.10.6 W	max.13.8 W	max.12.2 W	max.11.9 W
Installation category	CAT III 300 V			

Voltage measurement circuit	
Voltage measurement margin	20 ... 600 V ~
Frequency measurement margin	40 ... 70 Hz
Input impedance	1.2 MΩ
Minimum measurement voltage (Vstart)	10 V ~
Maximum voltage input consumption	0.15VA
Installation category	CAT III 600 V

Current measurement circuit			
Nominal current (In)	.../5A , .../1A or .../0.250 A		
Phase current measurement margin	**In: .../5A**	**In: .../1A**	**In: .../0.250A**
	0.01...10A	0.01...2A	0.01 ...0.5A
Neutral current measurement margin	**.../5A**	**.../1A**	**.../A** (calculated)
	0.02 ...10A	0.02...2A	0.02 ... 10A (**In: .../5A**) 0.02 ... 2A (**In: .../1A**) 0.02 ... 0.5A (**In: .../0.250A**)
Maximum current, impulse < 1s	100 A		
Minimum measurement current (Istart)	0.01 A	0.01 A	0.01 A
Maximum current input consumption	0.9 VA		
Installation category	CAT III 600 V		

Accuracy of measurements (in accordance with the IEC 61557-12 standard for PMD SD/SS)			
	.../5A	**.../1A**	**.../0.250A**
Voltage measurement	Class 0.2 ± 1 digit (20 ...600 V~)	Class 0.2 ± 1 digit (20 ...600 V~)	Class 0.2 ± 1 digit (20 ...600 V~)
Neutral voltage measurement	Class 0.5 ± 1 digit (50 ...600 V~)	Class 0.5 ± 1 digit (50 ...600 V~)	Class 0.5 ± 1 digit (50 ...600 V~)
Phase current measurement	Class 0.2 ± 1 digit (0.05 ...8A)	Class 0.2 ± 1 digit (0.01 ...1.2 A)	Class 0.2 ± 1 digit (0.01 ...0.3 A)
Neutral current measurement	Class 1 ± 1 digit (0.05 ...6A)	Class 1 ± 1 digit (0.05 ...1.2 A)	Class 1 ± 1 digit (Calculated)
Measurement of active and apparent power (Vn 230/110 V~)	Class 0.5 ± 1 digit (0.05 ...6 A)	Class 0.5 ± 1 digit (0.01 ...1.2 A)	Class 0.5 ± 1 digit (0.01 ...0.3 A)
Reactive power measurement (Vn 230/110 V~)	Class 1 ± 1 digit (0.05 ...6 A)	Class 1 ± 1 digit (0.01 ...1.2 A)	Class 1 ± 1 digit (0.01 ...0.3 A)

(Continuation) Accuracy of measurements (in accordance with the IEC 61557-12 standard for PMD SD/SS)			
	.../5A	**.../1A**	**.../0.250A**
Active energy measurement (IEC 62053-22)	Class 0.5S	Class 1	Class 1
Reactive energy measurement (IEC 62053-23)	Class 1	Class 2	Class 2
Frequency measurement	Class 0.1	Class 0.1	Class 0.1
Power factor measurement	Class 0.5	Class 0.5	Class 0.5
Voltage THD measurement	Class 1	Class 1	Class 1
Voltage harmonics (up to 40th order)	Class 1	Class 1	Class 1
Current THD measurement	Class 1	Class 2	Class 2
Current harmonics (up to 40th order)	Class 1	Class 2	Class 2

Transistor digital outputs [(1)]	
Quantity	2
Type	Transistor
Maximum voltage	48V
Maximum current	130 mA
Maximum frequency	1 KHz
Pulse width	1 ms
Pulse duration (Ton / Toff)	0.3 ms / 0.7 ms

Relay digital outputs [(1)]	
Quantity	2
Maximum voltage, open contacts	250 V ~
Maximum current	3 A
Maximum switching power	1500 W (AC1)
Electrical working life (at full load)	$3x10^4$ cycles
Mechanical working life	$1x10^7$ cycles

Digital inputs [(1)]	
Quantity	2
Type	Potential-free contact
Insulation	4 KV
Maximum short-circuit current	5 mA
Maximum voltage in open circuit	15 V ⎓

[(1)] Must be connected to SELV circuit.

Modbus Communications	
Field bus	RS-485
Communications protocol	Modbus RTU
Speed	9600 - 19200 - 38400-57600-76800-115200
Stop bits	1 - 2
Parity	none - even - odd

BACnet communications	
Field bus	MS/TP
Communications protocol	BACnet
Speed	9600 - 19200 - 38400-57600-76800-115200
Stop bits	1

Parity	no parity

User interface		
Display: Type	TFT colour screen	
Display: Resolution	VGA (640x480)	
Display: Format	4:3	
Display: Visible area size	CVM-B100	CVM-B150
	3.5”	5.6”
Keyboard	3 capacitive keys	
LED	3 LED (CPU-Keys-ALARM)	

Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (2)	IP30 Front panel without seal: IP40 Front panel with seal: IP65

(2) This pollution degree hasn’t been tested by UL.

Mechanical features		
Dimensions	CVM-B100	CVM-B150
	Figure 222 (mm)	Figure 223 (mm)
Weight	500 gr	698 gr
Enclosure	Self-extinguishing V0 plastic	
Attachment (DIN 43700)	92x92 panel	138x138 panel

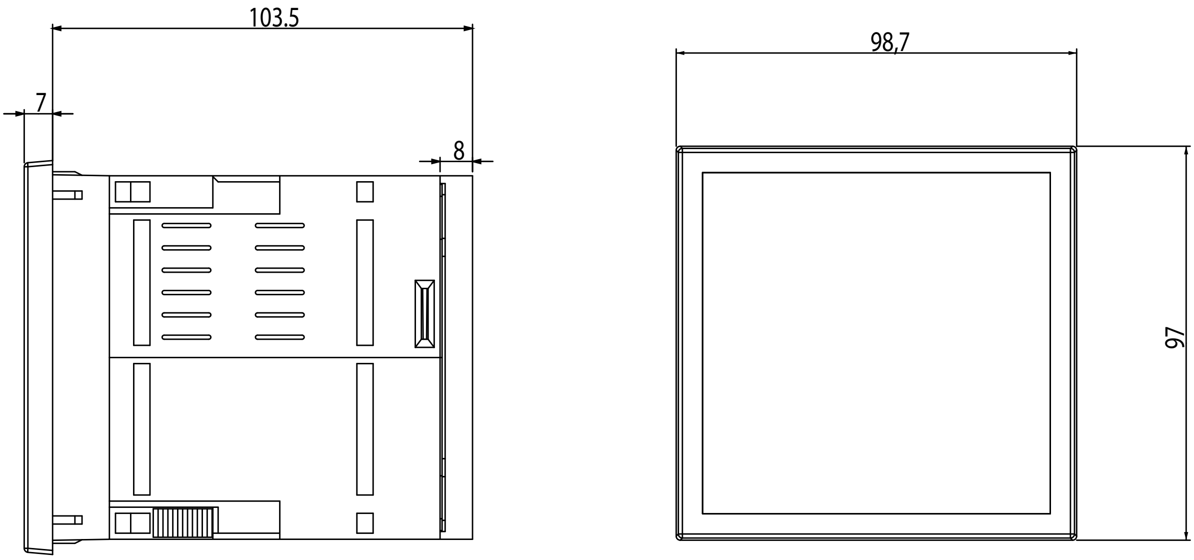


Figure 222: CVM-B100 dimensions.

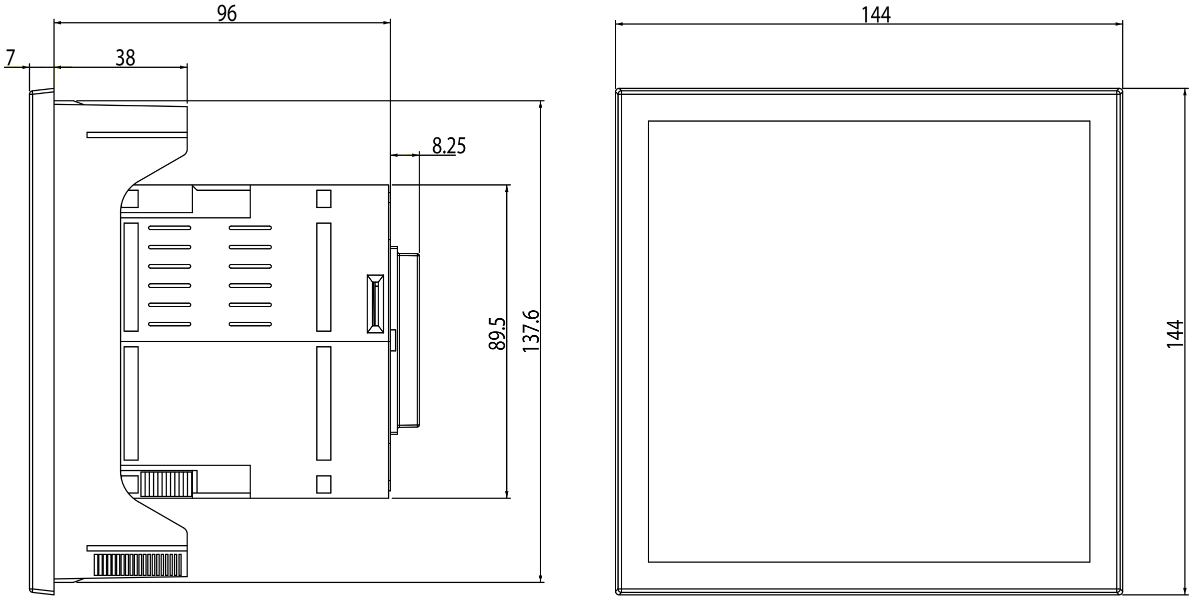


Figure 223:CVM-B150 dimensions.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.- TECHNICAL FEATURES OF EXPANSION MODULES

10.1.- TRANSISTOR DIGITAL INPUTS/OUTPUTS

General features	
Maximum power of the module	3 W
Transistor digital outputs (1)	
Quantity	8
Type	NPN
Maximum voltage	48 V ⎓
Maximum current	130 mA
Maximum frequency	1 MHz
Pulse width	3 ms
Digital inputs (1)	
Quantity	8
Type	Potential-free contact
Insulation	4 kV
Input impedance	3 kΩ
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (2)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) Must be connected to SELV circuit.

(2) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.2.- RELAY DIGITAL INPUTS/OUTPUTS

General features	
Maximum power of the module	3 W
Relay digital outputs [(1)]	
Quantity	8
Maximum voltage, open contacts	250 V~
Maximum current	3 A
Maximum switching power	750 VA
Electrical working life (250 VAC / 3A)	10^5 cycles
Mechanical working life	2 x 10^7 cycles
Digital inputs [(1)]	
Quantity	8
Type	Potential-free contact
Insulation	4 kV
Input impedance	32 kΩ
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree [(2)]	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	105 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

[(1)] Must be connected to SELV circuit.

[(2)] This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.3.- DIGITAL ANALOGUE INPUTS/OUTPUTS

General features	
Maximum power of the module	3W
Analogue outputs [1]	
Quantity	8
Maximum internal voltage	12 V
Linearity	<1%
DAC resolution	4096 dots
Analogue outputs in current mode	
Nominal output range	0-20 mA or 4-20 mA (Programmable)
Maximum load resistor	300 Ω
Analogue outputs in voltage mode	
Nominal output range	0-10 V
Minimum load resistor	5000 Ω
Analogue inputs [1]	
Quantity	4
Type of measurement	Current
Nominal input range	0-20 mA or 4-20 mA (Programmable)
Accuracy	<1%
Input impedance	150 Ω
Maximum acceptable input current	22 mA ⎓
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree [2]	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

[1] Must be connected to SELV circuit.

[2] This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.4.- MODBUS TCP (Bridge) COMMUNICATIONS

General features	
Maximum power of the module	2 W
Communications : Modbus TCP	
Connector	RJ-45
Protocol	Modbus/TCP
Baud rate	Ethernet 10BT / 100BT
Communications: RS-485 gateway	
Bus	RS-485
Protocol	Modbus
Peripheral number	1 ... 255
Baud rate	9600 - 19200 - 38400 - 57600 - 76800 - 115200
Data bits	7- 8
Stop bits	1- 2
Parity	No - even - odd
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (1)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.5.- LONWORKS COMMUNICATIONS

General features	
Maximum power of the module	1.2 W
Communications	
Protocol	LonTalk
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree [(1)]	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

[(1)] This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.6.- PROFIBUS COMMUNICATIONS

General features	
Maximum power of the module	2 W
Communications	
Connector	DB9
Protocol	Profibus
Identifier	4
Baud rate	19,2 kbs - 93,75 kbs - 187,5 kbs - 500 kbs - 1500 kbs - 3000 kbs - 6000 kbs - 12000 kbs
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (1)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.7.- MBUS COMMUNICATIONS

General features	
Maximum power of the module	2 W
Communications	
Bus	Wired M-Bus
Protocol	Slave M-Bus compatible to EN 13757-2 and EN 13757-3
Baud rate	1200 - 2400 - 4800 - 9600
Primary address	1 ... 250
Stop bits	1
Parity	even
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (1)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Communication systems for and remote reading of meters - Part 2: Physical and link layer	UNE-EN 13757-2:2004
Communication systems for and remote reading of meters - Part 3: Dedicated application layer	UNE-EN 13757-3:2004
Heat Meters - Part 3: Data exchange and interfaces	UNE-EN 1434-3:2008
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.8.- DATA STORAGE, DATALOGGER

General features	
Maximum power of the module	2 W
Communications : Modbus TCP	
Connector	RJ-45
Protocol	Modbus/TCP
Baud rate	Ethernet 10BT / 100BT
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (1)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

10.9.- MODBUS TCP (Switch) COMMUNICATIONS

General features	
Maximum power of the module	2 W
Communications : Modbus TCP	
Connector	RJ-45
Protocol	Modbus/TCP
Baud rate	Ethernet 10BT / 100BT
Environmental features	
Operating temperature	-10ºC ... +50ºC
Storage temperature	-20ºC ... +80ºC
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
Protection degree (1)	IP30
Mechanical features	
Dimensions (mm)	**Figure 224** and **Figure 225**
Weight	80 g
Enclosure	V0 self-extinguishing plastic
Assembly	Panel

(1) This pollution degree hasn't been tested by UL.

Standards	
Safety requirements for electrical equipment for measurement, control and laboratory use	IEC 61010: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 6100-6-2:2006
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments.	UNE-EN 6100-6-4:2007
Coordination of the insulation of units installed in low voltage systems (networks)	IEC 664: 2007
Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.	UNE-EN 55022
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	UL/CSA 61010-1 3rd edition

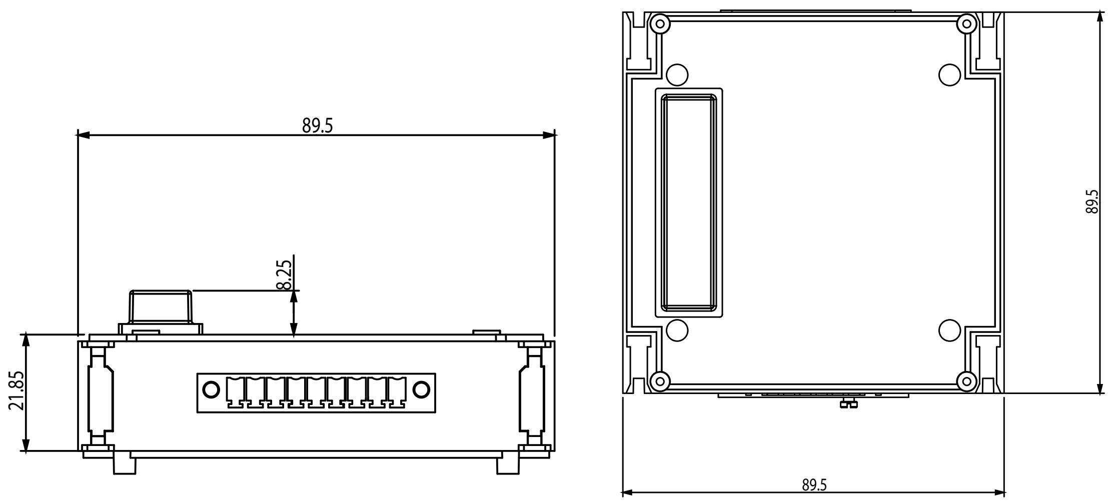


Figure 224: Expansion module dimensions (Protective cove version 1).

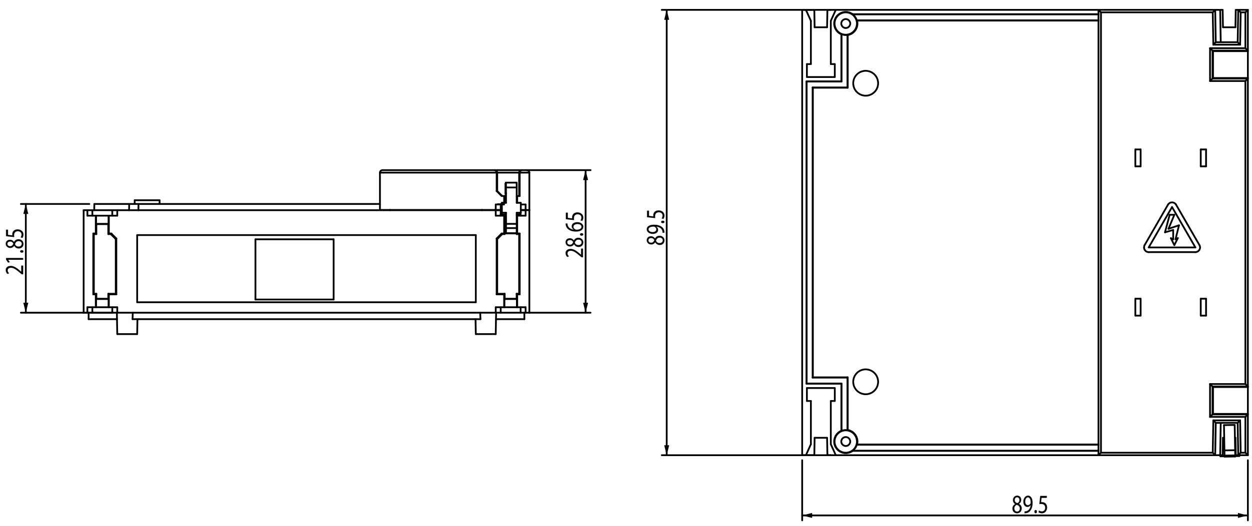


Figure 225: Expansion module dimensions (Protective cove version 2).

11.- MAINTENANCE AND TECHNICAL SERVICE

The unit does not need any maintenance.
Only clean the screen with soapy water and dry with a soft dry cloth.

In the case of any query in relation to unit operation or malfunction, please contact the **CIRCUTOR, SA** Technical Support Service.

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

12.- 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.

13.- CE CERTIFICATE

DECLARACIÓN DE CONFORMIDAD CE
CE DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE CE

Por la presente *We hereby* *Par le présent* — **CIRCUTOR, S.A.**

Con dirección en: *With address in:* *Avec adresse à:* — **Vial Sant Jordi, s/n, 08232 VILADECAVALLS (Barcelona) ESPAÑA**

Declaramos bajo nuestra responsabilidad que el producto:
We declare under our responsibility that the product:
Nous déclarons sous notre responsabilité que le produit:

Analizador de redes eléctricas
Network power analyzer
Analyseur de réseaux électrique

Serie: CVM-B100, CVM-B150

Marca CIRCUTOR
Brand
Marque

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,
Provided that it is installed, maintained and used in application for which it was made, in accordance with relevant installation standards and manufacturer's instructions,
Toujours qu'il soit installé, maintenu et utilisé pour l'application par lequelle il a été fabriqué, d'accord avec les normes d'installation applicables et suivant les instructions du fabricant,

Cumple con las prescripciones de la(s) Directiva(s):
Complies with the provisions of Directive(s):
Accomplie avec les prescriptions de la (les) Directive(s):

2014/35/CE: Low Voltage Directive
2004/108/CE: Electromagnetic Compatibility Directive
2011/65/CE: Rohs Directive

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativo(s) :
It is in conformity with the following standard(s) or other normative document(s) :
Il est en conformité avec la (les) norme(s) suivante(s) ou autre(s) document(s) normatif (ves) :

IEC 61010-1:2010
IEC 61326-1:2012
IEC 61000-6-2:2005
IEC 61000-6-4:2011
UL 61010-1, 3rd Edition, 2012-5

Año de marcado "CE": 2014
Year of affixing "CE" marking:
An de mise en application du marquage "CE":

CIRCUTOR, S.A.
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Revisado en Viladecavalls
Fecha: 11/04/2016
Date:
Date :

Nombre y Firma: *Name and signature :* *Nom et signature :* — **Ferran Gil Torné**, *General Manager*, *Directeur Général*

Sello *Stamp* *Tampon*

CIRCUTOR, SA – Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spain – Tel.(+34) 937 452 900 - central@circutor.es

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