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ÍNDEX

1 INTRODUCTION

The numerical displays of the DN series are industrial devices designed for the presentation of numerical data, available in different digit quantities, digit heights, and control buses.

They can display from **2 to 10 digits** in a single color (red). Versions are available for indoor use and high-brightness outdoor applications.

Control can be performed via serial BUS **RS-232/RS-485 (RS-422 optional)** or via **Ethernet/WiFi** network. Configuration allows the use of different communication protocols (see details in later chapters).

All units can include a **fixed text of up to three characters**.

They are manufactured with **one or two display faces**, allowing multiple installation options. The digit heights — DN-109 (57 mm), DN-119 (100 mm), DN-189 (180 mm) — allow **reading distances from 30 m up to 90 m**.

The field of application for these displays is broad, suitable for industrial processes where it is required to show numeric **values sent from a PLC/PC** via the available communication options of the device.

The configuration of all parameters and protocols is performed through a **web server** at the IP address defined by the user (default IP address: **10.30.90.11**).

2 GENERAL CHARACTERISTICS

2.1 General characteristics of the displays

2.1.1 General characteristics of the displays DN-109

Power supply voltage .....80 to 240 VAC 50/60 Hz. Option 24 VDC.
Power consumption .....See section 2.2.1.
Display .....7-segment digits, 57 mm high + decimal point.
.....Red LED. Reading distance 30 meters.
Text (LED) .....Formed by LEDs of 3 mm diameter.
.....Character height 50 mm
Text (Vinyl) .....White vinyl. Character height 50 mm.
Parameter memory .....Eeprom.
Environmental conditions .....Operating temperature: –20 to +60 °C.
.....Storage temperature: –30 to +70 °C.
.....Humidity: 20–90 % RH non-condensing.
.....Maximum ambient illumination: 1000 lux.
.....Protection: IP41 or IP54/IP65.

2.1.2 General characteristics of the displays DN-119

Power supply voltage .....80 to 240 VAC 50/60 Hz. Option 24 VDC.
Power consumption .....See section 2.2.2.
Display .....7-segment digits, 100 mm high + decimal point.
.....Red LED. Reading distance 50 meters
Text (LED) .....Formed by LEDs of 5 mm diameter.
.....Character height 65 mm.
Text (Vinyl) .....White vinyl. Character height 65 mm.
Parameter memory .....Eeprom.
Environmental conditions .....Operating temperature: –20 to +60 °C.
.....Storage temperature: –30 to +70 °C.
.....Humidity: 20–90 % RH non-condensing.
.....Maximum ambient illumination: 1000 lux.
.....High-brightness option (Monochrome Red, Outdoor).
.....Protection: IP41 or IP54/IP65

2.1.3 General characteristics of the displays DN-189

Power supply voltage .....80 to 240 VAC 50/60 Hz. Option 24 VDC.
Power consumption .....See section 2.2.3.
Display .....7-segment digits, 180 mm high + decimal point.
.....Red LED. Reading distance 90 meters.
Text (Vinyl) .....White vinyl..
Parameter memory .....Eeprom.
Environmental conditions .....Operating temperature: –20 to +60 °C.
.....Storage temperature: –30 to +70 °C
.....Humidity: 20–90 % RH non-condensing.
.....Maximum ambient illumination: 1000 lux.
.....High-brightness option (Monochrome Red, Outdoor)
.....Protection: IP41 or IP54/IP65.

2.2 Estimated Weights and Power Consumptions.

2.2.1 Weight and Power Consumption of the DN-109

Ref.	Weight (kg)	Power C (W)	Ref.	Weight (kg)	Power C (W)	Ref.	Weight (kg)	Power C (W)
DN-109/3S	3,2	9,9	DN-109/3S+TL	3,2	11,9	DN-109/3S+TV	3,2	9,9
DN-109/3D	3,2	14	DN-109/3D+TL	3,2	15,7	DN-109/3D+TV	3,2	14
DN-109/4S	3,2	11,5	DN-109/4S+TL	3,7	13,6	DN-109/4S+TV	3,7	11,5
DN-109/4D	3,7	18,4	DN-109/4D+TL	3,7	19,1	DN-109/4D+TV	3,7	18,4
DN-109/5S	3,2	13,2	DN-109/5S+TL	3,7	15,2	DN-109/5S+TV	3,7	13,2
DN-109/5D	3,7	22	DN-109/5D+TL	4,7	25,7	DN-109/5D+TV	4,2	22
DN-109/6S	3,7	14,7	DN-109/6S+TL	4,2	16,8	DN-109/6S+TV	4,2	14,7
DN-109/6D	4,2	24,9	DN-109/6D+TL	4,7	29	DN-109/6D+TV	4,2	24,9
DN-109/7S	4,2	16,4	DN-109/7S+TL	4,2	18,4	DN-109/7S+TV	4,2	16,4
DN-109/7D	4,7	28,1	DN-109/7D+TL	5,2	32,1	DN-109/7D+TV	5,2	28,1
DN-109/8S	4,2	18	DN-109/8S+TL	4,7	20	DN-109/8S+TV	4,7	18
DN-109/8D	5,2	31,3	DN-109/8D+TL	5,7	35,3	DN-109/8D+TV	5,7	31,3
DN-109/9S	4,7	19,7	DN-109/9S+TL	4,7	21,6	DN-109/9S+TV	4,7	19,7
DN-109/9D	5,2	34,5	DN-109/9D+TL	5,7	38,6	DN-109/9D+TV	5,7	34,5
DN-109/10S	4,7	21,2	DN-109/10S+TL	5,2	23,2	DN-109/10S+TV	5,2	21,2
DN-109/10D	5,7	37,7	DN-109/10D+TL	6,2	41,7	DN-109/10D+TV	6,2	37,7

Table 51: Weight and Power Consumption of the DN-109.

2.2.2 Weight and Power Consumption of the DN-119

Ref.	Weight (kg)	Power C (W)	Ref.	Weight (kg)	Power C (w)	Ref.	Weight (kg)	Power C (W)
DN-119/3S	4,2	14,8	DN-119/3S+TL	4,7	17,4	DN-119/3S+TV	4,7	14,8
DN-119/3D	4,2	22	DN-119/3D+TL	5,2	24	DN-119/3D+TV	5,2	22
DN-119/4S	4,7	18	DN-119/4S+TL	5,7	20,6	DN-119/4S+TV	5,7	18
DN-119/4D	5,2	30,6	DN-119/4D+TL	5,7	35,9	DN-119/4D+TV	5,7	30,6
DN-119/5S	5,2	21	DN-119/5S+TL	5,7	23,7	DN-119/5S+TV	5,7	21
DN-119/5D	5,7	36,9	DN-119/5D+TL	6,2	42,1	DN-119/5D+TV	6,2	36,9
DN-119/6S	5,7	24,2	DN-119/6S+TL	6,2	26,8	DN-119/6S+TV	6,2	24,2
DN-119/6D	6,2	43,2	DN-119/6D+TL	6,7	48,5	DN-119/6D+TV	6,7	43,2
DN-119/7S	6,2	27,3	DN-119/7S+TL	7,2	29,9	DN-119/7S+TV	7,2	27,3
DN-119/7D	3,7	29,5	DN-119/7D+TL	7,7	54,8	DN-119/7D+TV	7,7	29,5
DN-119/8S	6,7	30,4	DN-119/8S+TL	7,7	33	DN-119/8S+TV	7,7	30,4
DN-119/8D	7,2	55,6	DN-119/8D+TL	8,2	60,8	DN-119/8D+TV	8,2	55,6
DN-119/9S	7,2	33,4	DN-119/9S+TL	8,2	36	DN-119/9S+TV	8,2	33,4
DN-119/9D	7,7	61,6	DN-119/9D+TL	8,7	66,9	DN-119/9D+TV	8,7	61,6
DN-119/10S	7,7	36,5	DN-119/10S+TL	8,7	39,2	DN-119/10S+TV	8,7	36,5
DN-119/10D	8,2	68	DN-119/10D+TL	9,2	73	DN-119/10D+TV	9,2	68

Table 52: Weight and Power Consumption of the DN-119.

2.2.3 Weight and Power Consumption of the DN-189

Ref.	Weight (kg)	Power C (W)	Ref.	Weight (kg)	Power C (W)
DN-189/2S	4,2	17,3	DN-189/2S+TV	5,7	17,3
DN-189/2D	4,7	29,8	DN-189/2D+TV	6,7	29,8
DN-189/3S	5,2	23,4	DN-189/3S+TV	6,7	23,4
DN-189/3D	6,2	42,2	DN-189/3D+TV	8,2	42,2
DN-189/4S	6,2	29,7	DN-189/4S+TV	7,7	29,7
DN-189/4D	7,7	54,8	DN-189/4D+TV	9,2	54,8
DN-189/5S	7,2	35,8	DN-189/5S+TV	9,2	35,8
DN-189/5D	8,7	67,2	DN-189/5D+TV	10,7	67,2
DN-189/6S	8,7	41,8	DN-189/6S+TV	10,2	41,8
DN-189/6D	10,2	79,5	DN-189/6D+TV	11,7	79,5
DN-189/7S	9,7	48	DN-189/7S+TV	11,2	48
DN-189/7D	11,2	92,1	DN-189/7D+TV	13,2	92,1
DN-189/8S	10,7	54,3	DN-189/8S+TV	12,2	54,3
DN-189/8D	12,7	104,6	DN-189/8D+TV	14,2	104,6
DN-189/9S	11,2	60,6	DN-189/9S+TV	13,2	60,6
DN-189/9D	13,7	117,2	DN-189/9D+TV	15,7	117,2
DN-189/10S	12,2	66,9	DN-189/10S+TV	14,2	66,9
DN-189/10D	15,2	129,8	DN-189/10D+TV	16,7	129,8

Table 53: Weight and Power Consumption of the DN-189.

2.3 Dimensions and Mounting of the Displays

2.3.1 Dimensions and Mounting of the Displays DN-109 and DN-119

Ref.	A	B	Ref.	A	B
DN-109/3S	288	122	DN-109/3S+T	288	122
DN-109/4S	288	122	DN-109/4S+T	336	122
DN-109/5S	288	122	DN-109/5S+T	382	122
DN-109/6S	336	122	DN-109/6S+T	430	122
DN-109/7S	382	122	DN-109/7S+T	478	122
DN-109/8S	430	122	DN-109/8S+T	526	122
DN-109/9S	478	122	DN-109/9S+T	574	122
DN-109/10S	526	122	DN-109/10S+T	622	122
DN-119/3S	324	177	DN-119/3S+T	504	177
DN-119/4S	414	177	DN-119/4S+T	594	177
DN-119/5S	504	177	DN-119/5S+T	684	177
DN-119/6S	594	177	DN-119/6S+T	774	177
DN-119/7S	684	177	DN-119/7S+T	864	177
DN-119/8S	774	177	DN-119/8S+T	954	177
DN-119/9S	864	177	DN-119/9S+T	1044	177
DN-119/10S	954	177	DN-119/10S+T	1134	177

Table 54: Dimensions and Mounting of the Displays DN-109 and DN-119.

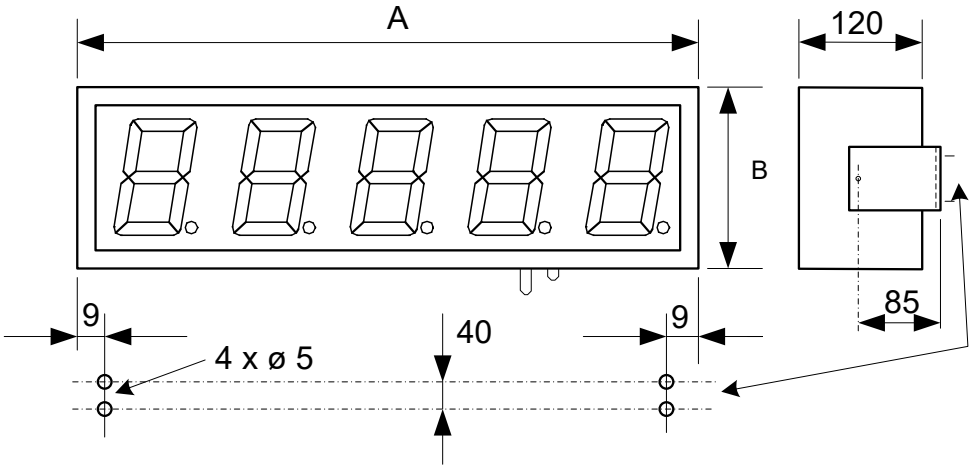


Fig. 59: Dimensional diagram of the DN-109 and DN-119.

All measurements are in millimeters.

2.3.2 Dimensions and Mounting of the DN-189

Ref.	A	B	C	Ref,	A	B	C
DN-189/2S	340	251	67	DN-189/2S+TV	660	251	67
DN-189/3S	500	251	67	DN-189/3S+TV	820	251	67
DN-189/4S	660	251	67	DN-189/4S+TV	980	251	67
DN-189/5S	820	251	67	DN-189/5S+TV	1140	251	67
DN-189/6S	980	251	67	DN-189/6S+TV	1300	251	67
DN-189/7S	1140	251	67	DN-189/7S+TV	1460	251	67
DN-189/8S	1300	251	67	DN-189/8S+TV	1620	251	67
DN-189/9S	1460	251	67	DN-189/9S+TV	1780	251	67
DN-189/10S	1620	251	67	DN-189/10S+TV	1940	251	67

Table 55: Dimensions and Mounting of the Displays DN- 189.

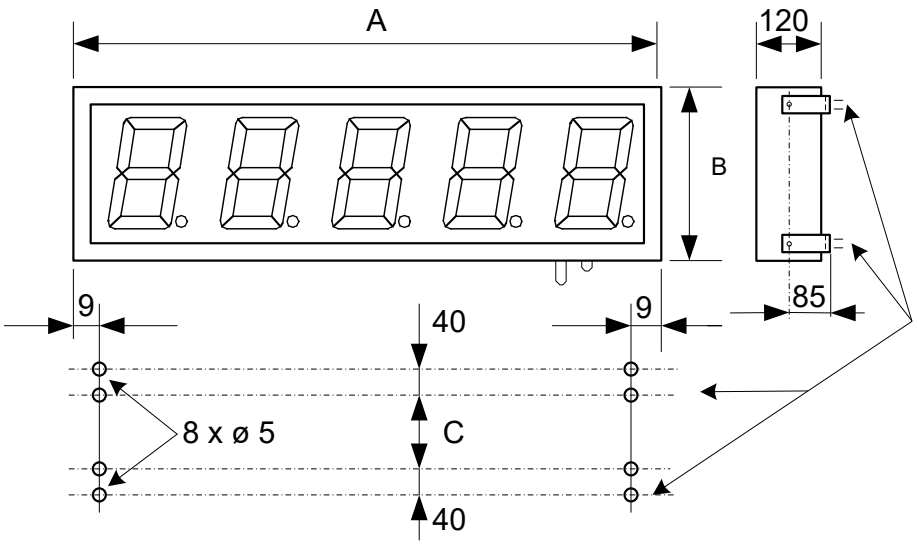


Fig. 60: Esquema de las dimensiones de los visualizadores DN-189.

Todas las medidas están en milímetros

3 INSTALLATION

The installation of the **DN-109**, **DN-119**, and **DN-189** is not particularly delicate, but several important considerations must be taken into account.

They must not be anchored in places subject to vibration, nor in locations that exceed the limits specified in the display's characteristics, in terms of both temperature and humidity.

The degree of protection for the **DN-109**, **DN-119**, and **DN-189** displays is **IP41**. This means that they are protected against the ingress of foreign solid objects larger than 1 mm in diameter and against vertical drops of water.

The degree of protection for the **DN-109e**, **DN-119e**, and **DN-189e** displays is **IP65**, which means that they are completely protected against dust and against water jets.

The installation of displays with protection grade IP65 is detailed in section 3.3.

The **DN-109, DN-119**, and **DN-189** displays should not be installed in places where the illumination level exceeds **1000 lux**. Direct exposure to sunlight on the display surface should also be avoided, as it would reduce visibility.

In the electrical installation, proximity to lines carrying very high current, high-voltage lines, high-frequency generators, or U/F converters for motors must be avoided.

3.1 Location of Equipment Connectors

The connectors of the equipment are located on the lower part of the display.

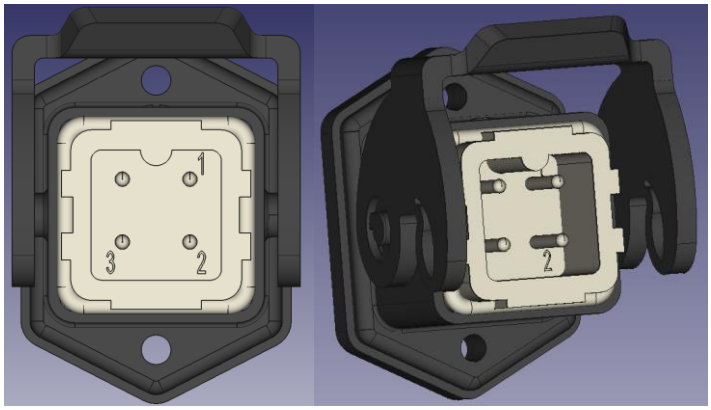


Fig. 61: Power connector of the display.

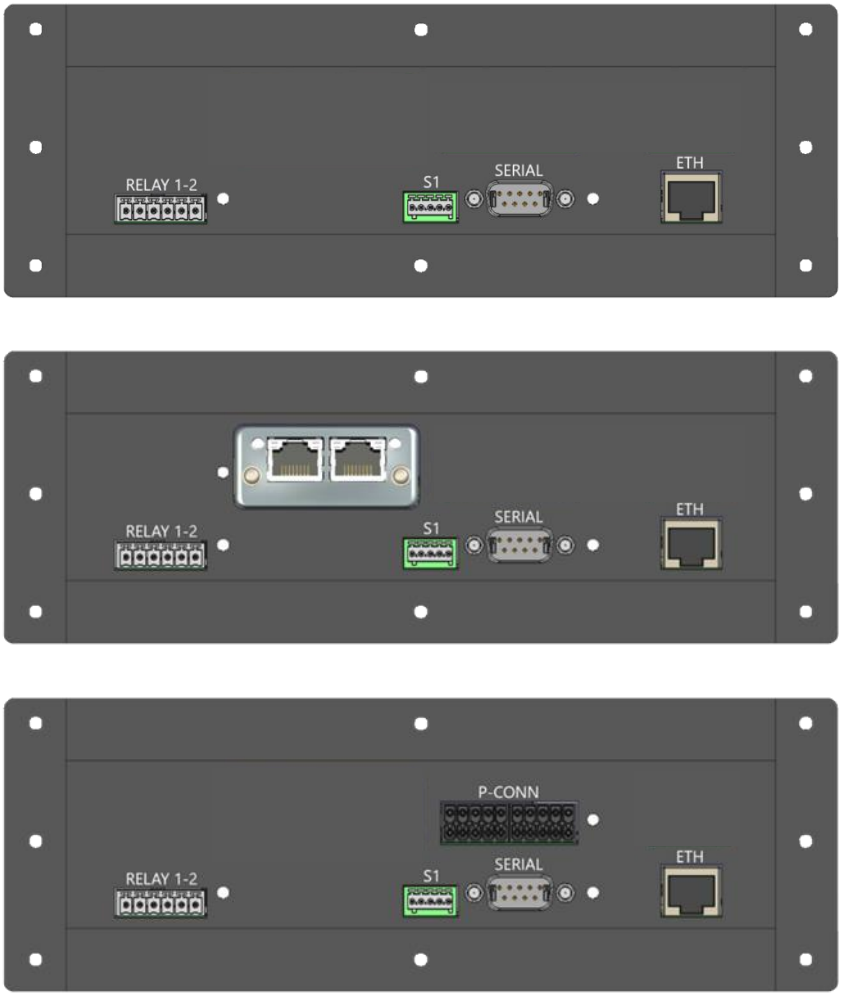
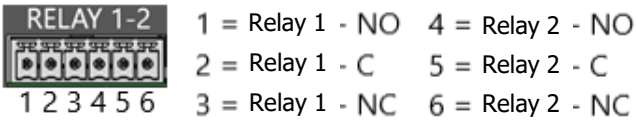


Fig. 62: Data transfer connectors of the display.

Connector layout :

- **ETH.** Ethernet.
- **SERIAL.** DB-9 connector. Connection schemes can be seen in section 3.4.
- **S1.** Connector for digital detection probes (particles, humidity, temperature, etc.) (Not enabled).
- **RELAY 1-2.** Actuator relay outputs.



- **P-CONN.** Parallel multifunction input (equipment options).
- **Profinet.** Industrial Profinet bus connector.

3.2 Power Supply Connection

The power supply must be 80 to 240 VAC, 50/60 Hz or 24 VDC for the 24 V option.

The cross-section of the power conductors shall be appropriate to the consumption, with the grounding conductor having a minimum cross-section of 1.5 mm².

The 220 V power connector has 4 contacts and is located on the lower part of the unit. Connect the power cables following the diagram below.

The 24 V power connector has 5 contacts and is located on the lower part of the unit. Connect the power cables following the diagram below.

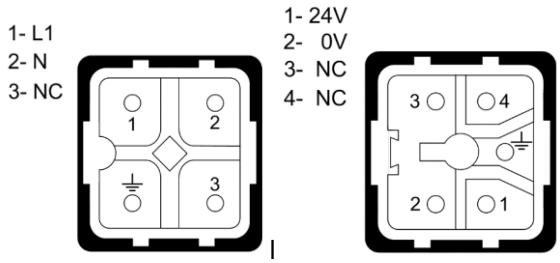


Fig. 63: Left: 220 V, 4-pin power connector diagram. Right: 24 V, 5-pin power connector diagram.

3.3 IP65 Protection Grade

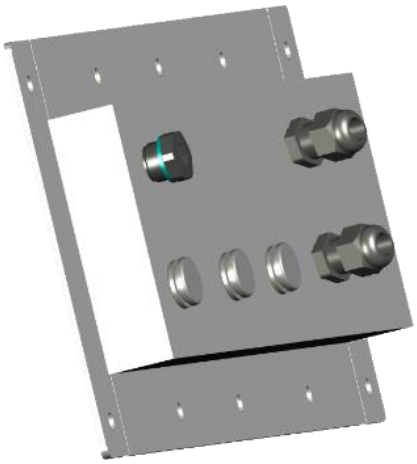
This section applies only when the display is to be mounted in a location requiring **IP65 protection**. The process may be carried out either before or after configuration.

To ensure that the equipment meets the IP65 protection level, the following additional components are supplied:

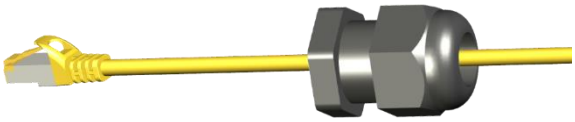
- Outer cover
- Cable glands
- Vent plug
- Rubber caps
- Insulating gasket
- Specific aerial connector (Relays, RJ45, and DB-9)

To install the equipment with IP65 protection, follow these steps:

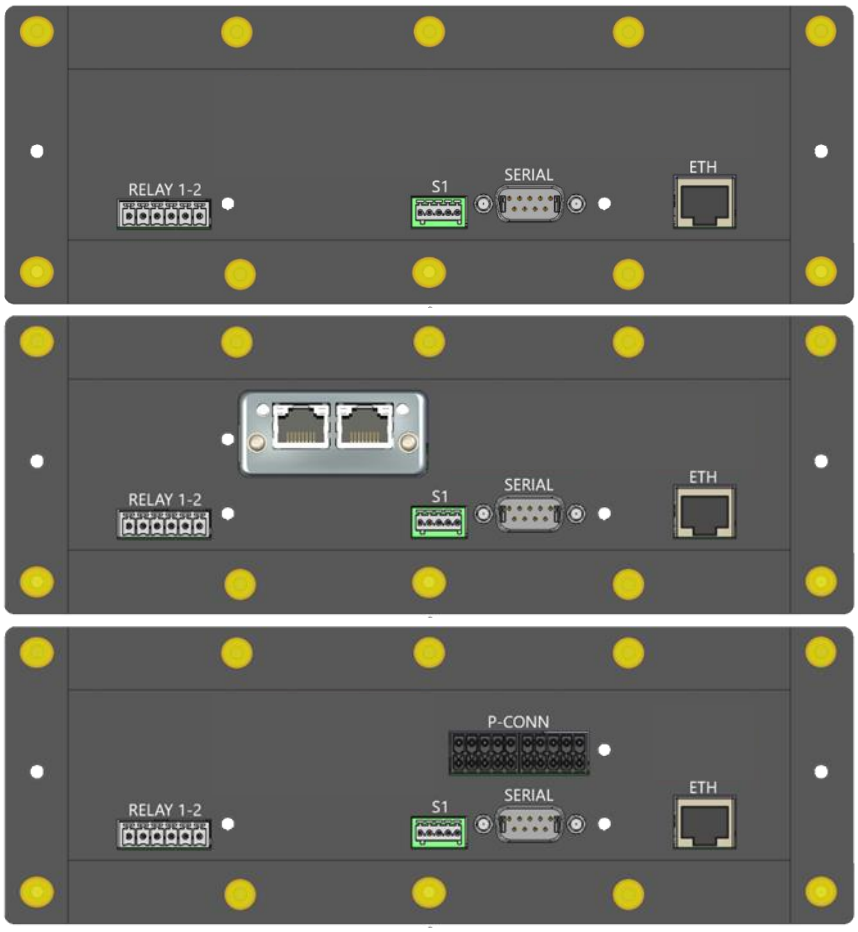
1. Install the **cable glands**, **vent plug**, and **rubber caps** according to the communication/connection to be used



7. Pass the corresponding **cable** (without aerial connector) through the **cable gland** toward the inside of the cover.
8. Wire the provided **aerial connector** and connect it to the display port.



9. Remove the 10 screws marked in yellow (do not remove the flat-head side screws) and set them aside.



DN1X9/NB

DN1X9/NBNN

DN1X9/NBP

10. Place the insulating gasket, position the housing on top ensuring the gasket is correctly positioned between the cover and the display, and reinsert the screws removed in step 4
11. Finally, tighten the cable glands of the connections used.

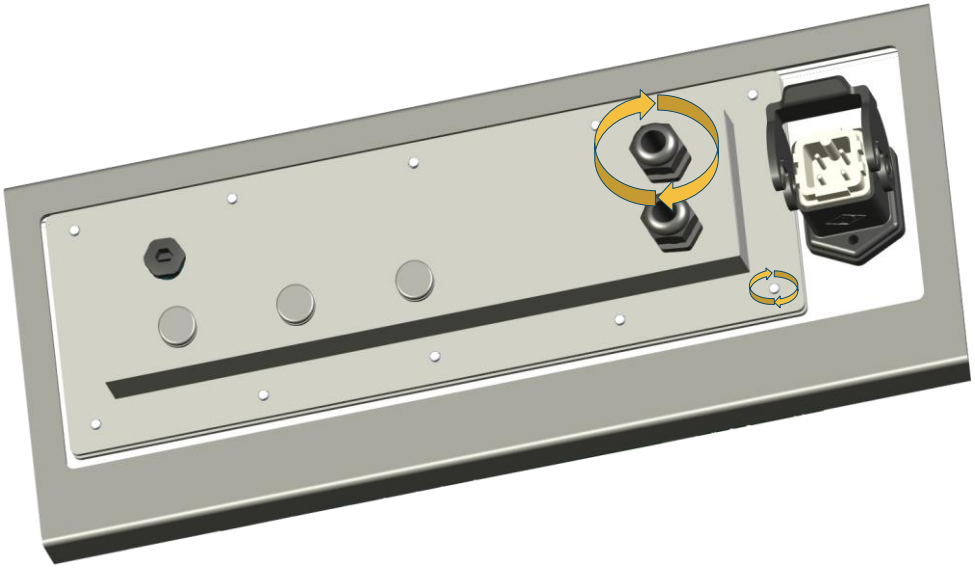


Fig. 64: Screws to be removed are highlighted in yellow.

⚠ A DEFECTIVE INSTALLATION WILL VOID THE DISPLAY WARRANTY.

3.4 Serial Line Connection

The **DN-109**, **DN-119**, and **DN-189** display series support two types of serial line connections: **RS-232** and **RS-485**, or RS-232 and **RS-422** if the equipment has been purchased with the RS-422 option.

The selection of the serial line type is made through the display's web server. See section 4.2.2 .

The connection diagrams are shown below :

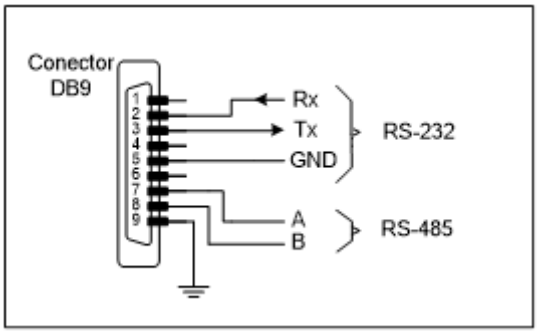


Fig. 65: RS-232/RS-485 wiring diagram.

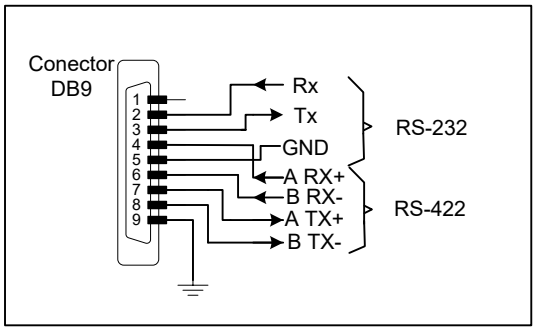


Fig. 66: RS-232/RS-422 wiring diagram.

Both options use the same DB-9 connector located at the bottom of the unit.

3.4.1 Connection Between a PC and a DN-109/119/189 Display

When using the RS-232 line, the total cable length must not exceed 15 meters (at 9600 bps communication speed).

To maintain signal integrity, use shielded cable, connecting the shield to pin 9 of the DB-9 connector.

The data cable must be kept away from high-voltage lines.

The connector shown corresponds to the cable end.

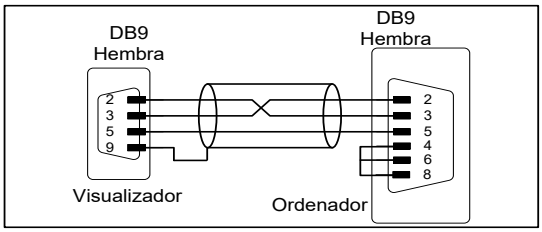


Fig. 67: RS-232 connection diagram between a DN-109/119/189 display and a PC.

3.4.2 Connection Between Three DN-109/119/189 Displays and a PC

When using an RS-485 serial line, the maximum length must not exceed 1000 m without amplifiers.

It is important to use twisted, shielded cable, connecting the shield to pin 9 of the DB-9 connector.

The data cable must be kept away from high-voltage lines.

The connector shown corresponds to the cable end.

A 120 Ω termination resistor must be placed at both ends of the transmission line.

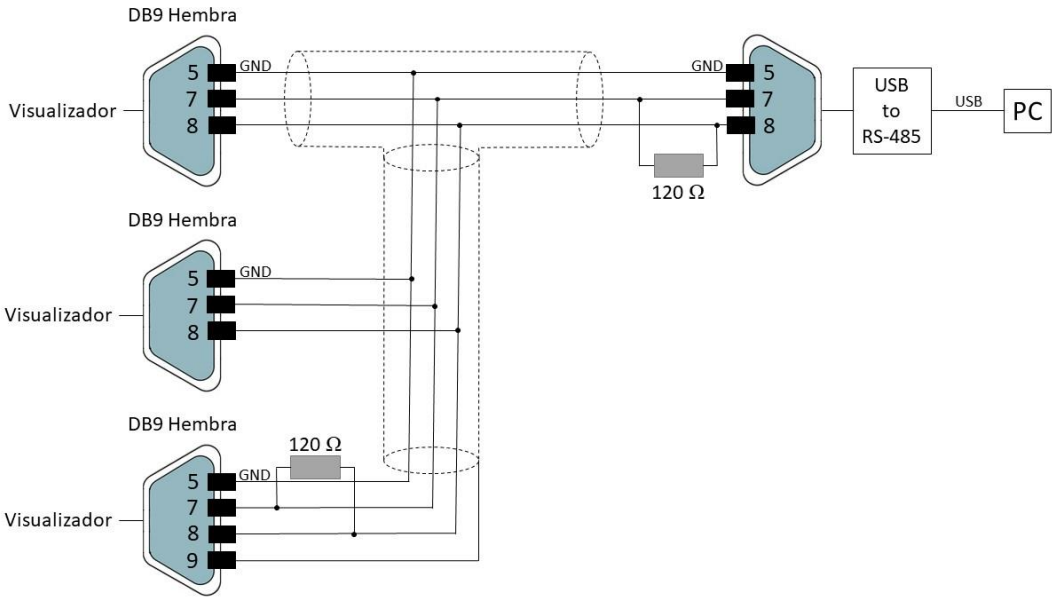


Fig. 68: RS-485 connection diagram between three DN-109/119/189 displays and a PC.

3.5 Ethernet Line Connection

Ethernet line wiring is done using an RJ-45 connector, located at the bottom of the unit.

The connection between a display and a computer using an Ethernet link can be made in two ways:

- Direct connection
- Via a switch or hub using a 100Base-T4 cable (Category 5 recommended).

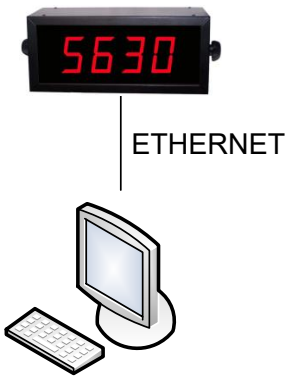


Fig. 69: Ethernet wiring diagram between a DN-109/119/189 display and a PC.

To connect multiple displays, use a switch or hub with one port per unit.

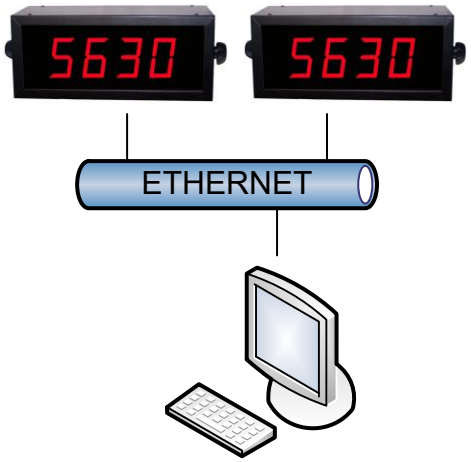


Fig. 70: Ethernet wiring diagram between multiple DN-109/119/189 displays and a PC via switch or hub.

4 INITIALIZATION OF THE DISPLAY

4.1 Initial Startup

Before connecting the display to the power supply, make sure that all connections have been made correctly and that the display is securely mounted.

During the startup process, the display will indicate the different initialization stages in order:

(11)Pr0: To avoid situations where a firmware (FW) update has not finished correctly or an incorrect FW has been loaded that could render the display inoperative.
Each time the unit is powered up and before launching the main program, an access time to the Bootloader (update manager) is established.
This allows retrying the FW update process via the **emergency IP address 192.168.1.100** (not the previously defined IP).
This period is indicated by the message “PR0” and shows when the update can be repeated. (See section 12).

(12)LED Segment Test Sequence: During this stage, all segments of the digits are activated one by one, and then deactivated in reverse order.
This sequence is used to detect segments that stop working over time.

(13)F.XX: Displays the display family. “XX” corresponds to a specific value for your display.

(14)Ux.X: Displays the firmware version loaded. “X.X” corresponds to a specific value for your display.

(15)**Display Initialized:** Shows the value sent from the PC/PLC, or will display dashes if “no data timeout” is active and no data is being sent.
If no device is connected, it will display zero.

To access the display’s web server, download the “Display Discoverer” software from (https://www.ditel.es/descargas).

To configure the display, it must be connected via an **RJ45 cable** to the same network as the PC in use.
Configuration via **Wi-Fi** is also possible.

4.1.1 Configuration with "Display Discoverer"

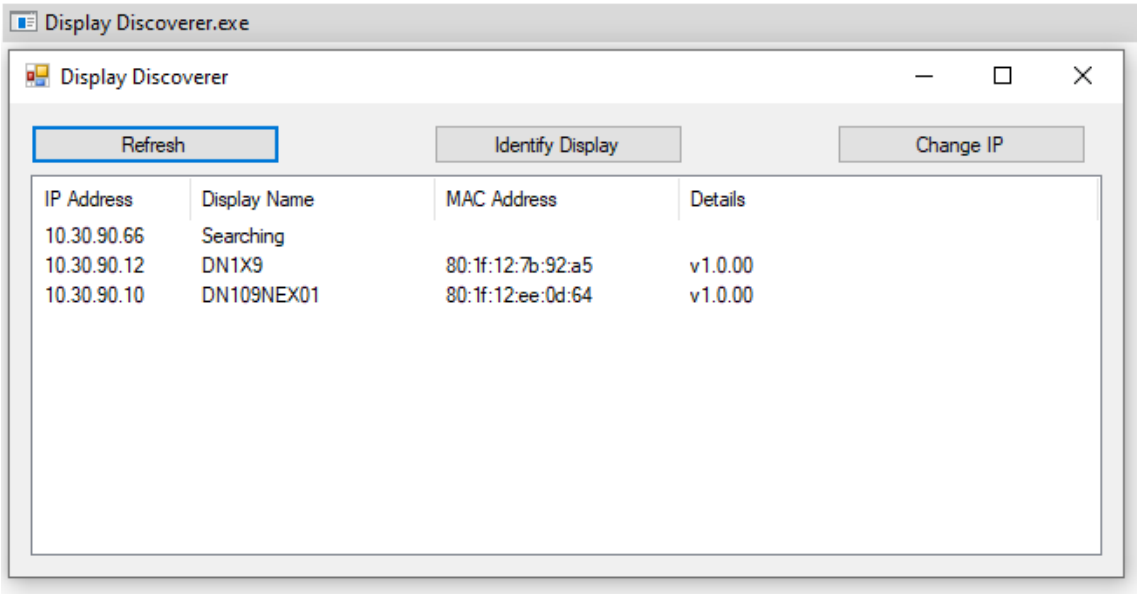


Fig. 71: Running the "Display Discoverer" software.

By default, the factory IP address of the display is **10.30.90.11**.
To change the IP, select it and click **"Change IP."**
Once the new IP is set, click **"Refresh"** to display the device with the updated IP.
The IP can also be modified later during configuration.

If you wish to assign an automatic IP address, click **"Auto-Assign IP."**
This will set the display to **DHCP mode.**
This mode can also be applied later during configuration

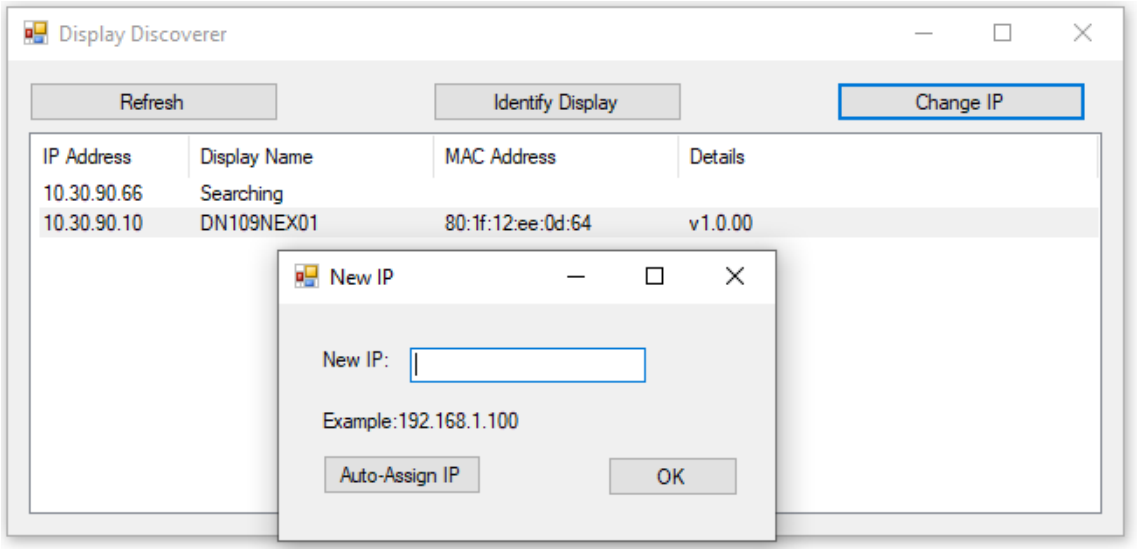


Fig. 72: IP change procedure.

Double-clicking the updated IP address opens the web server page in your browser. You can also access it directly by typing the IP address into the browser.

IMPORTANT:

If you receive several new units for installation, all will come with the same default IP. Therefore, before configuration, you must individually change the IP of each unit to avoid IP conflicts.

When working with multiple displays, it's easy to confuse one unit with another.
To help with this, the **"Identify Display"** function has been added.
Selecting a display from the list and clicking this button makes the chosen device blink three times, allowing easy identification.

4.2 Display Configuration

Configuration is done through the **web server** hosted inside the display at the IP address set via Display Discoverer (See section 4.1.1).

You must connect the display to a computer either directly or via the company's Ethernet network.
If public time servers are to be used, an Internet connection is required.
Configuration and operation via **Wi-Fi** are also possible. The Wi-Fi connection has its own IP address.

Below are the configuration screens, elements, and their functions:

4.2.1 General Overview

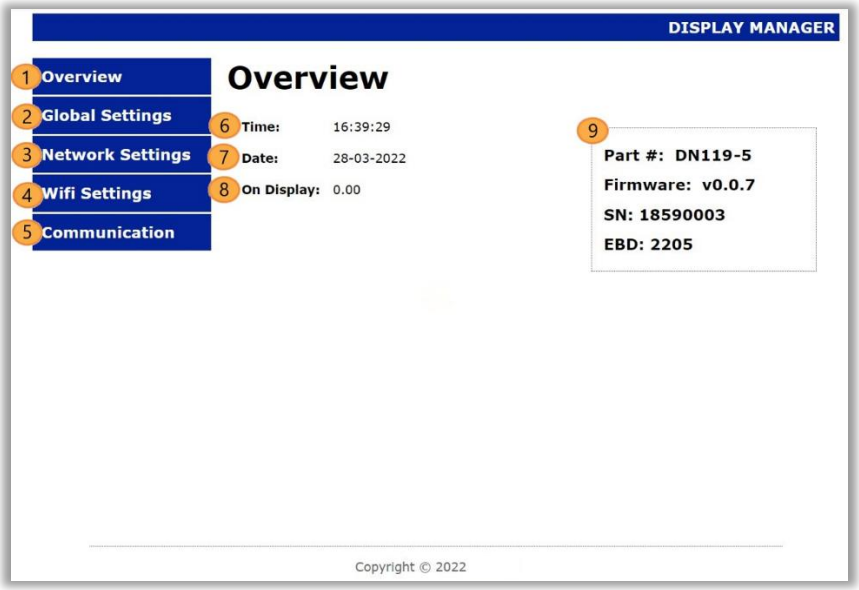


Fig. 73: Initial web server screen. General view of the display.

The home screen shows basic information about the display and navigation buttons for configuration options.

19. Link to the general overview. Shows real-time information.
20. Link to general settings. Select communication interface, data format, time, brightness, etc.
21. Link to network settings. Set LAN communication: IP, subnet mask, gateway, DNS, DHCP.
22. Link to WiFi network settings.
23. Link to **Communication Settings** (Ethernet & serial). Based on the communication established in **2**, it allows the adjustment of the necessary parameters.
24. Displays the current time.
25. Displays the current date.
26. Displays the current value shown on the display.:
   a. **OvH:** Value exceeds the maximum limit.
   b. **OvL:** Value below minimum limit.
   c. **TRIMMED:** More characters than the display can show — only visible characters are displayed; full value shown in parentheses with “TRIMMED” noted.

27. Shows manufacturing information (for technical support purposes only).

4.2.2 General Settings

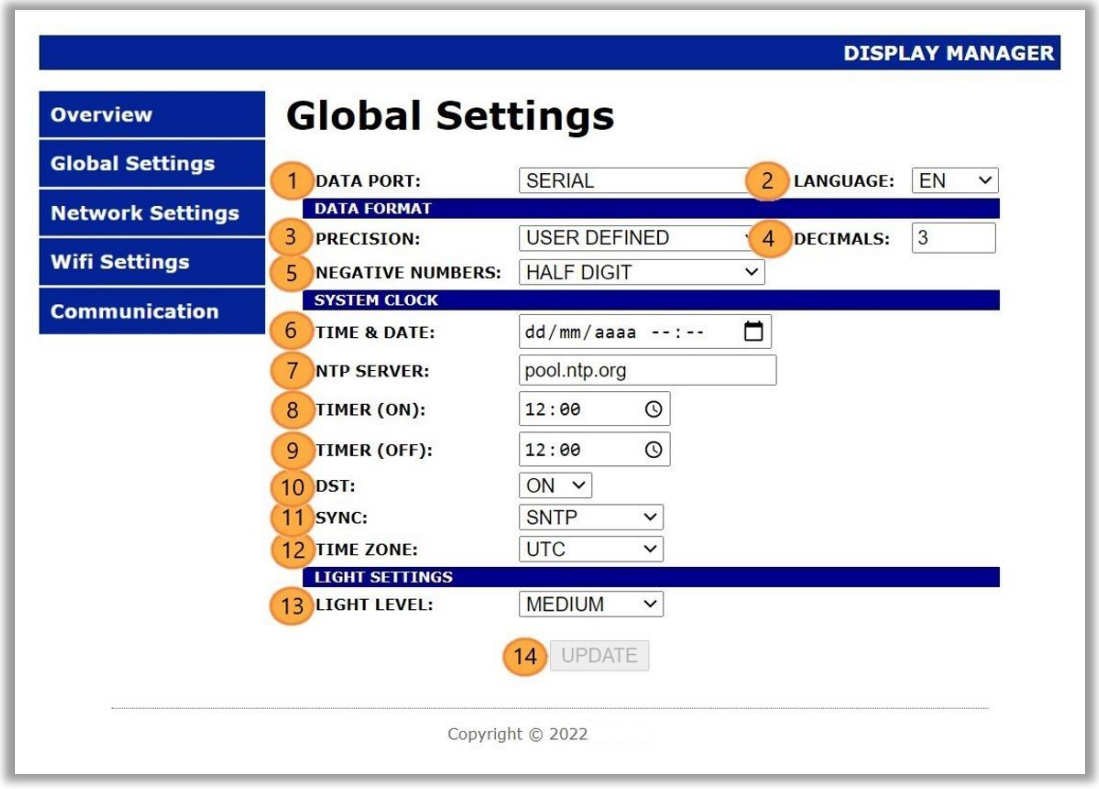


Fig. 74: Web server. General Settings screen.

This page allows modification of various parameters that affect other configuration screens.

15. **Input source selection** — choose the communication port that provides data to the display.
16. **Language selection** — currently only English available.
17. **Display precision**.

    - AUTO: Automatically adjusts decimal places.
    - USER DEFINED: Allows manual selection (parameter 4).

18. **Decimals**: Set number of decimal places.

    Example table (4-digit display):

VALUE TO DISPLAY	PRECISION	DECIMALS	DISPLAYED VALUE
1.23	USER DEFINED	2	1.23
1.23	AUTO	-	1.23
1.234	USER DEFINED	2	1.23
1.234	AUTO	-	1.234
1.235	USER DEFINED	2	1.24
1.235	AUTO	-	1.235
1.23	USER DEFINED	3	1.230
1.2345	USER DEFINED	4	1.235
1.2345	AUTO	-	1.235

Table 56: Examples of "PRECISION" and "DECIMALS."

19. **FULL DIGIT / HALF DIGIT**:
    - *FULL DIGIT:* Leftmost character used only for negative sign.
    - *HALF DIGIT:* Leftmost character can show "–" or "–1," increasing numeric range.

Example: In a 5-digit display:

- **FULL DIGIT:** Minimum value = –9999
- **HALF DIGIT:** Minimum value = –19999

Fig. 75: Left — minimum in FULL DIGIT (–9999); right — HALF DIGIT (–19999).

20. Set **date and time** manually (defaults to PC time).
21. Define **SNTP server address/domain** (default: *pool.ntp.org*).
22. Set display **ON time**.
23. Set display **OFF time**.
    - To disable automatic ON/OFF, set both times equal.
24. Enable **Daylight Saving Time** (DST).
25. Choose **Clock synchronization method**:
    - **NONE:** No sync.
    - **ETH_SNTP:** via Ethernet SNTP server.
    - **WIFI_SNTP:** via Wi-Fi SNTP server (not in Access Point mode).
26. Set **time zone**.
27. Set **brightness level**.
28. Click **UPDATE** to apply changes.

4.2.3 Wired Network Settings

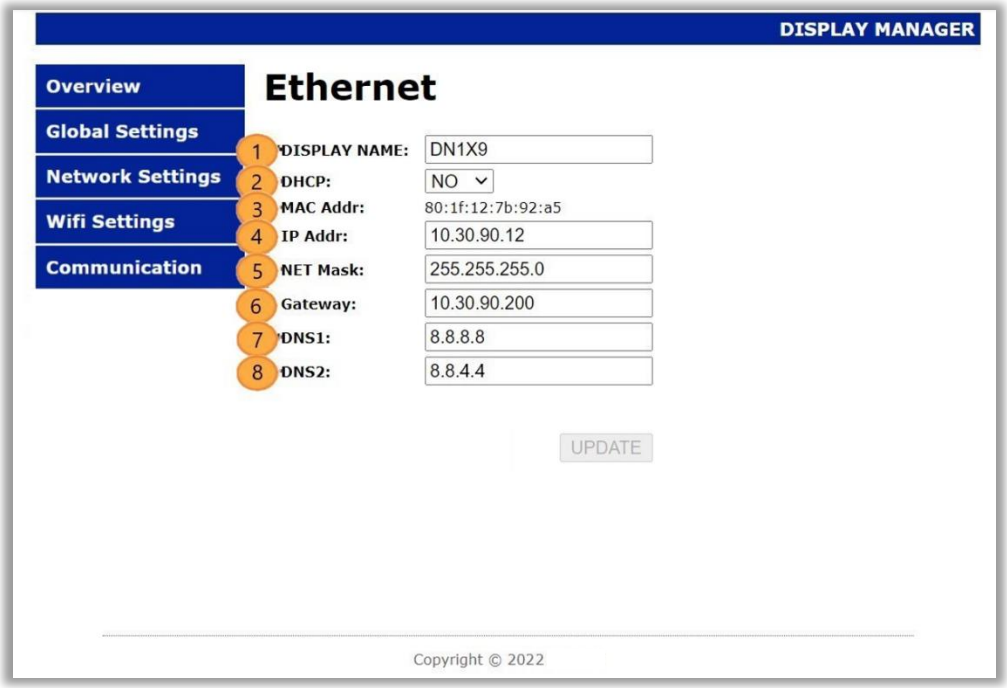


Fig. 76: Web server. Network Settings screen.

Used to configure Ethernet connectivity parameters.

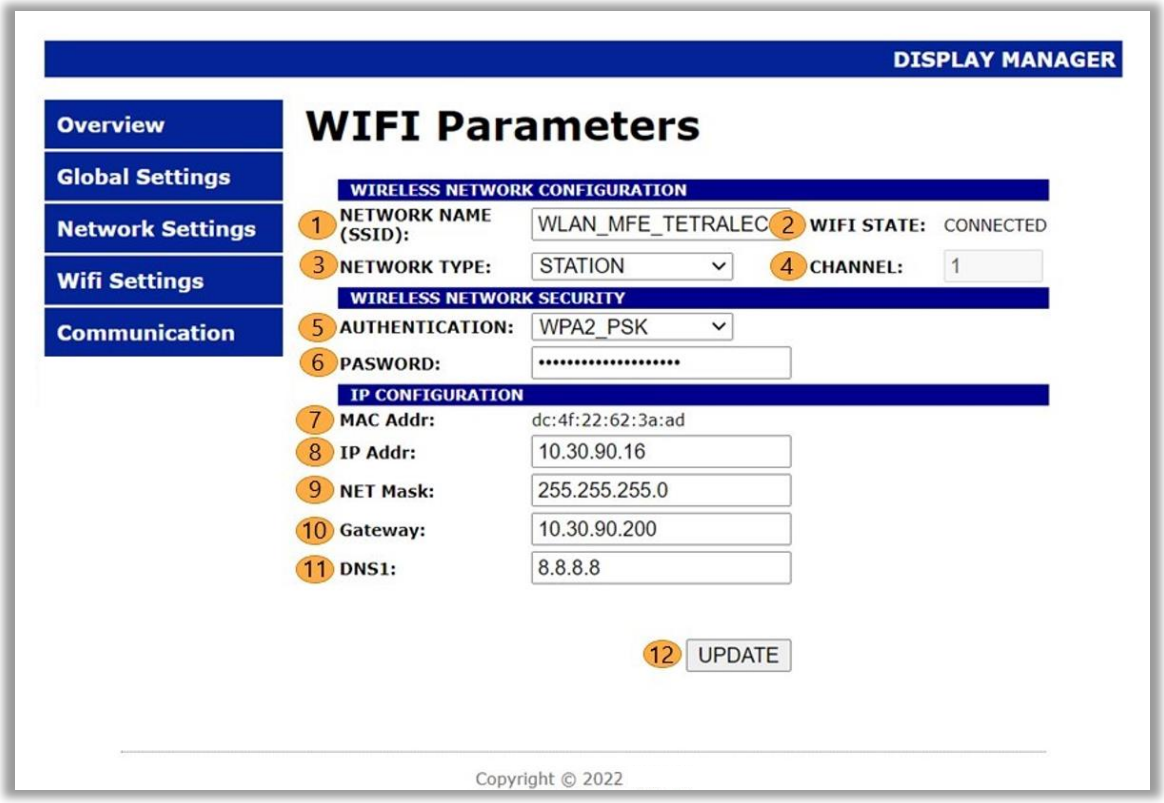
19. Modify the device name.
20. Enable/disable DHCP (auto IP assignment).
21. Displays the MAC address.
22. Modify IP address.
23. Modify Subnet mask.
24. Modify Gateway address.
25. Modify Primary DNS. If the DNS is not selected correctly, the SNTP server must be configured with its IP address and not its domain name.
26. Modify Secondary DNS.
27. Click UPDATE to apply settings.

IMPORTANT:

E. Parameters apply only to wired Ethernet.
Wi-Fi has separate settings. Avoid duplicate IPs — the display does not warn of conflicts.

F. If power is lost during saving or memory becomes corrupted, the display will automatically reset to the emergency IP **192.168.1.100**.

4.2.4 Wi-Fi Network Settings



Used to configure wireless connectivity parameters.

12. **Mode:**
    - **STATION:** Connects to an existing Wi-Fi network.
    - **ACCESS POINT (AP):** Creates a Wi-Fi network hosted by the display
13. Shows **connection status** (“ERROR” if password is incorrect)n.
14. Select **STATION** or **ACCESS POINT** mode.
    - Default AP name: **DIRECT_DN_DISPLAY**
    - Default password: **12345678**
15. In AP mode, select Wi-Fi channel (1–11).
16. Select **security type** WIFI.
17. Enter Wi-Fi **password**.

ATENTION: If forgotten, reconfiguration must be done via wired Ethernet.

18. Displays the **MAC address** (different for STATION/AP).
19. Configure **IP address**. (Ensure it’s not already in use.)
20. Configure **Subnet mask**.
21. Configure **Gateway.**
22. Configure **DNS.** (If incorrect, use IP instead of domain for SNTP.)

When any parameter is modified, a button is enabled to send the new configuration.

The upload process takes about 15 seconds.

If only the IP is changed, it takes about 5 seconds and redirects automatically..

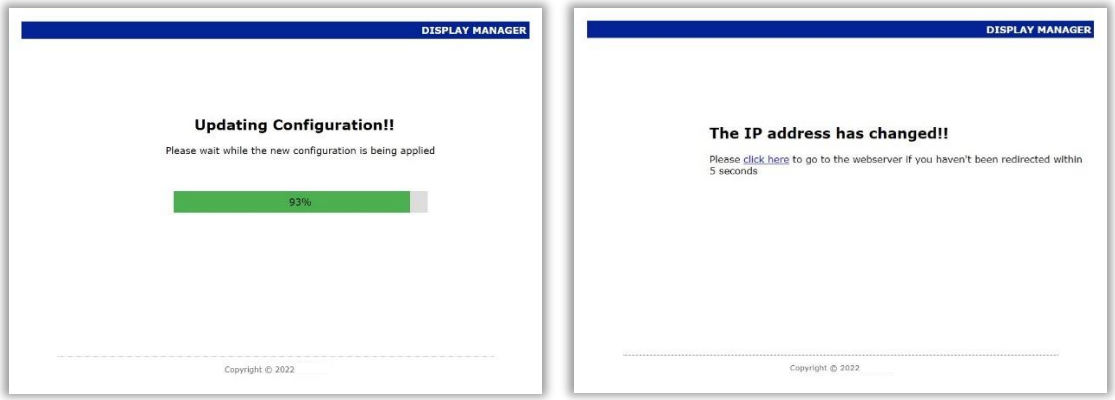


Fig. 77: Left — 15-second progress bar.
Right — automatic redirection after IP change.

Wi-Fi communication specifics: WIFI

Wi-Fi communication is not functionally identical to Ethernet.
The following are factors to consider.:

- Ethernet configuration **cannot** be modified via Wi-Fi.
- Forgotten Wi-Fi password must be reset via Ethernet.
- On Windows, Wi-Fi connection status may take time to update — reopening “Available Networks” speeds this up.
- Avoid sending data via Wi-Fi during configuration.
- Ethernet and Wi-Fi IPs are **independent.**

4.2.5 Communication Settings

See Communication Settings in chapter 6.

5 WORK OPERATION

The notation for numerical values used in this manual is as follows:

- When it is a hexadecimal number, the number is written followed by “h”.
- When it is a decimal number, the number is written followed by “d”.
- When it is a binary number, the number is written followed by “b”.
- When it is an ASCII number, it will be described as such.

For example: the ASCII character *X* can be represented as 58h, 88d or 1011000b, depending on what is needed at any given moment. The ASCII number *15* may be described as 31h 35h, 49d 53d or 110001d 110101d depending on the context.

Definitions of words used in the description of this chapter:

XXX or xxx: Sequences of “X” are used to indicate characters that may vary, such as versions or dates.

.

5.1 Work operation and accepted data types

As previously mentioned, this display can work with numerical data types and text format (ASCII). When working in ASCII, there are specific control commands available that allow a value to be set to blink.

In any communication (EXCEPT MODBUS), the information is sent as an ASCII string. The display is responsible for converting this string into a numerical value in case it contains exclusively numerical information. It will then also perform the necessary actions such as rounding, showing only the defined decimal digits, indicating out-of-range values, etc.

If the transmitted ASCII string contains alphanumeric characters, the display will internally switch to text mode. This means that it does not process decimals nor indicate out-of-range values. Text mode allows non-numerical messages to be represented on 7-segment displays, such as “E 345”, “P-45” or “HOLA”.

In MODBUS communication, the data type to be sent depends on the register being accessed. It will be an ASCII string when register 0 is used, but for the remaining registers the frame must be formed according to the required numerical format (SWORD, UWORD, SDWORD or UDWORD*). All information regarding the formation of MODBUS frames can be found in section 6.2.

* SWORD: signed word (2 bytes with sign)
UWORD: unsigned word (2 bytes without sign)
SDWORD: signed double word (4 bytes with sign)
UDWORD: unsigned double word (4 bytes without sign)

Accepted ASCII character sequences

The display accepts alphanumeric ASCII characters that can be represented on a 7-segment display. The valid characters accepted by the display are the following:

Character	0	1	2	3	4	5	6	7	8	9	A	b
HEX	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h
DEC	48d	49d	50d	51d	52d	53d	54d	55d	56d	57d	65d	66d

Character	C	c	d	E	F	H	h	i	J	L	n	o
HEX	43h	63h	44h	45h	46h	48h	68h	69h	4Ah	4Ch	4Eh (6Eh)	6Fh
DEC	67d	99d	100d	69d	70d	72d	104d	105d	74d	76d	110d	111d

Character	P	r	U	u		.	-
HEX	50h	72h	55h	76h	20h	2Eh	2Dh
DEC	80d	114d	85d	117d	32d	46d	45d

Table 7: Accepted ASCII characters

6 ETHERNET BUS COMMUNICATION

6.1 Ethernet Communication Settings

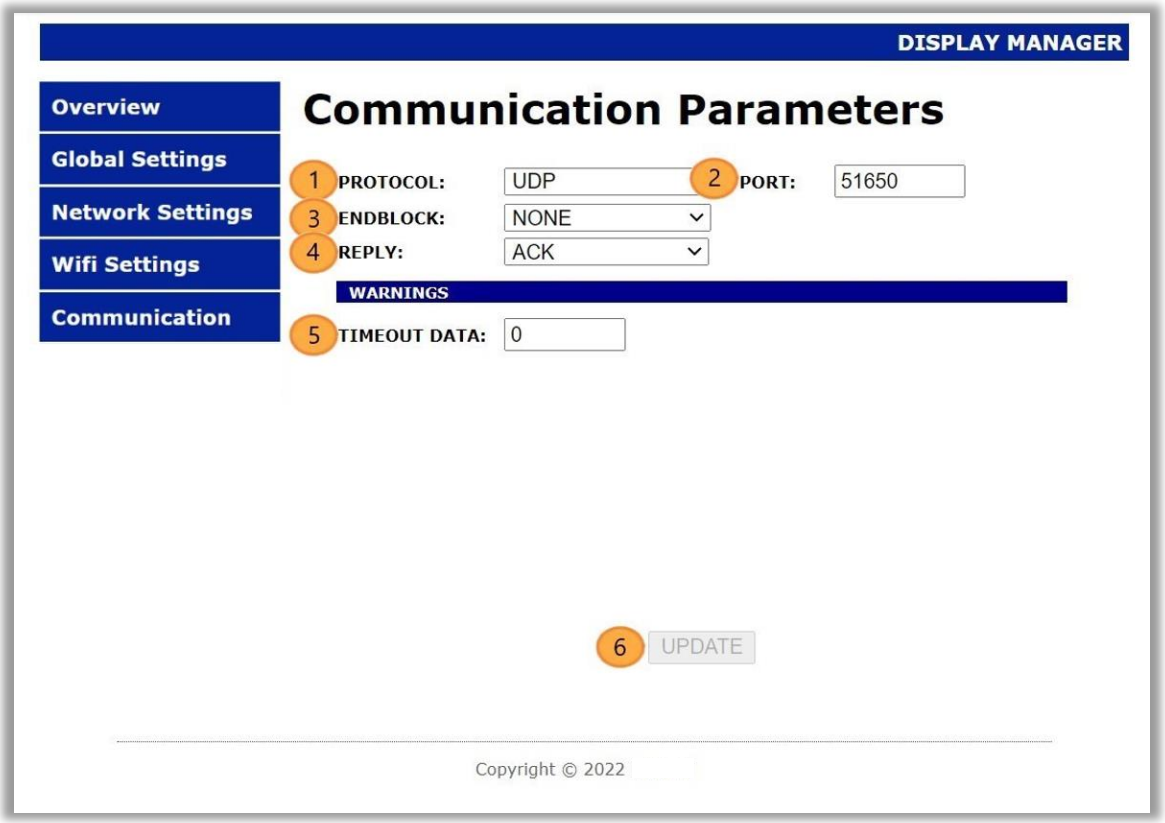


Fig. 78: Communication settings screen of the web server when using Ethernet communication.

7. Dropdown menu to select the protocol that the display will use.
   The available protocols are **TCP**, **UDP**, and **MODBUS/TCP**.
   Extended information about these protocols can be found in sections 6.2, 6.3 and 6.4, respectively.
8. Configures the communication port number. This only applies to TCP and UDP protocols. The selected port must be within the ephemeral port range (49152–65535).

9. Allows selecting a frame terminator. It is used as an enabler: the display will only show data that includes the chosen frame terminator.
Selecting NONE disables the enabling feature.

The available frame terminators are:

Endblock	
NONE	
02h	Value 02h
03h	Value 03h
04h	Value 04h
<CR> 0Dh	0Dh
<LF> 0Ah	0Ah
<CR LF> 0Dh 0Ah	0Dh 0Ah
<LF CR> 0Ah 0Dh	0Ah 0Dh
< * CR> 2Ah 0Dh	Omron Host-Link 2Ah 0Dh

Table 57: Content of ASCII protocol end-of-block values.

10. Allows selecting the display's reply. This reply is sent whenever the display receives data, regardless of whether the data is shown.

The available replies are:

Reply	
NONE	No reply from the display
ACK	Acknowledgment
06h	Value 06h
@ AH AL ED 0 * <CR>	40h Address A Address B 45h 44h 30h 2Ah 0Dh
06h ENDBLOCK	06h Fin de bloque

Table 58: Content of ASCII protocol reply messages.

11. Assigns the timeout (in seconds) of a new request before the display sets "–" on all characters. The value may be any integer multiple of 10 between 0 and 2550 (inclusive). I f the value is 0, the display does not set any timeout — the last received data will be shown indefinitely.

12. When any parameter is modified, the button to send the new information to the display becomes enabled.

6.2 MODBUS/TCP Protocol

No end-of-block terminator is required.
To use the MODBUS/TCP protocol, the communication port must be properly configured (See section 6.1).

6.2.1 MODBUS Functions

The MODBUS functions accepted by the displays are shown in the following table:

Type		Name	Code
Data acces	Access to internal bits and physical *coils*	Read Coils	01h
		Write Single Coil	05h
		Write Multiple Coils	0Fh
	16-bit access to internal registers	Read Holding Registers	03h
		Write Single Register	06h
		Write Multiple Registers	10h

Table 59: Accepted MODBUS functions.

This section details how information is structured at the protocol level in order to troubleshoot communication problems using a MODBUS frame analyzer.

If you are already familiar with this protocol, you may go directly to section 6.2.1 where the encapsulation of information in registers is explained according to the data type to be represented, as well as the available control characters.

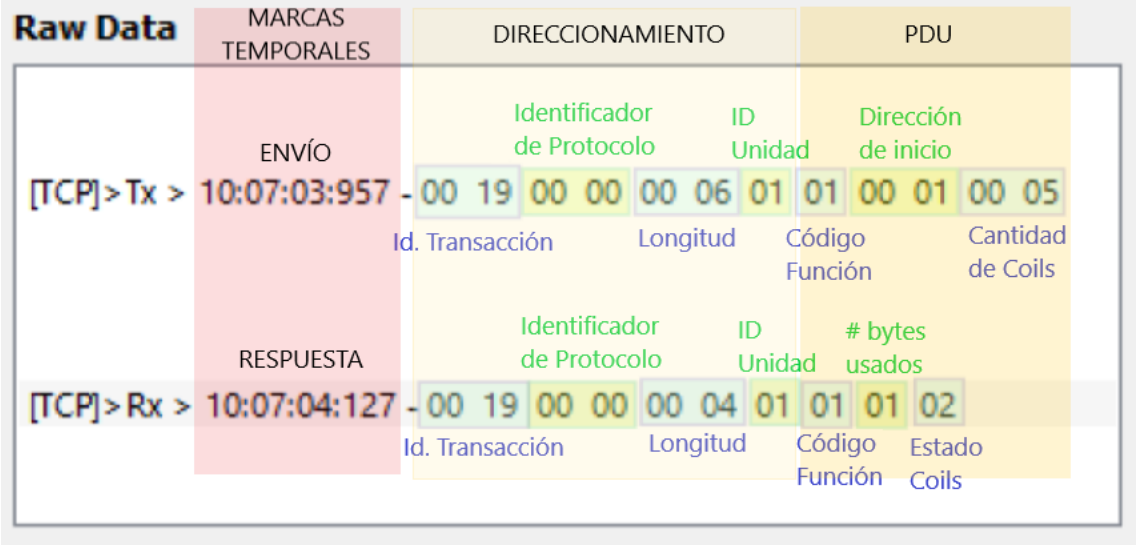
- **Read Coils:** Allows reading the status of internal bits or designated physical *coils*.
  The structure of this function is shown below:

Request		
Function code	1 Byte	01h
Starting address	2 Bytes	0001h to 0005h
Number of coils	2 Bytes	0001h to 0005h
Response		
Function code	1 Byte	01h
Byte count	1 Byte	N (N = # Inputs / 8)
Coil status	n Bytes	n = N or N+1
Error		
Error code	1 Byte	81h
Exception code	1 Byte	01 or 02 or 03 or 04

Table 60: Structure of the "Read Coils" function.

Example:

The display has only the 2nd Coil active. To find out the status of all of them, this function can be used.The following frames are sent and received:



IMPORTANT: When receiving the byte (02h) that indicates the status of the Coils, it must be interpreted as follows:

0				2			
X	X	X	0	0	0	1	0
			Coil #5	Coil #4	Coil #3	Coil #2	Coil #1

Table 61: Reading the status of Coils. "X" indicates that it is not relevant and is not used.

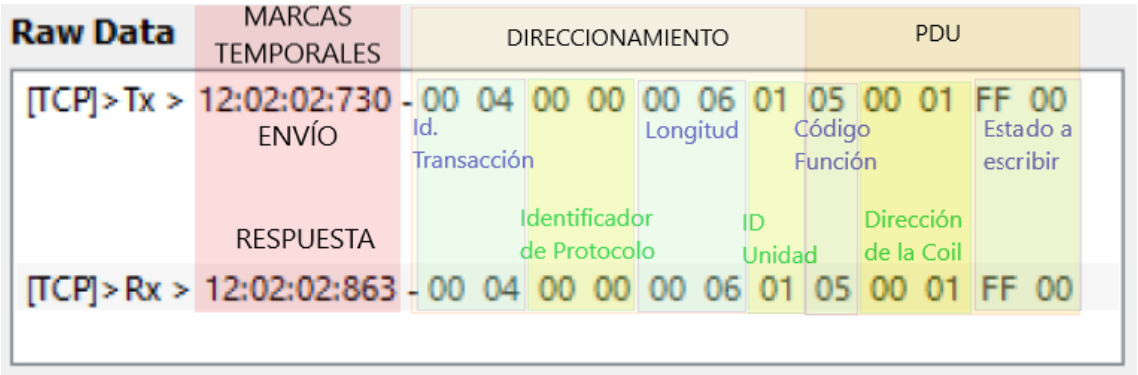
- **Write Single Coil:** Used to assign the ON/OFF state to a Coil.
  The structure of this function is shown below:

Request		
Function code	1 Byte	05h
Coil address	2 Bytes	0001h to 0005h
State of write	2 Bytes	0000h(OFF) or FF00h(ON)
Response		
Function code	1 Byte	05h
Coil address	2 Bytes	0001h to 0005h
State of write	2 Bytes	0000h(OFF) or FF00h(ON)
Error		
Error dode	1 Byte	85h
Exception code	1 Byte	01 or 02 or 03 or 04

Table 62: Structure of the "Write Single Coil" function

Example:

To activate the 1st Coil, the following frames are sent and received:



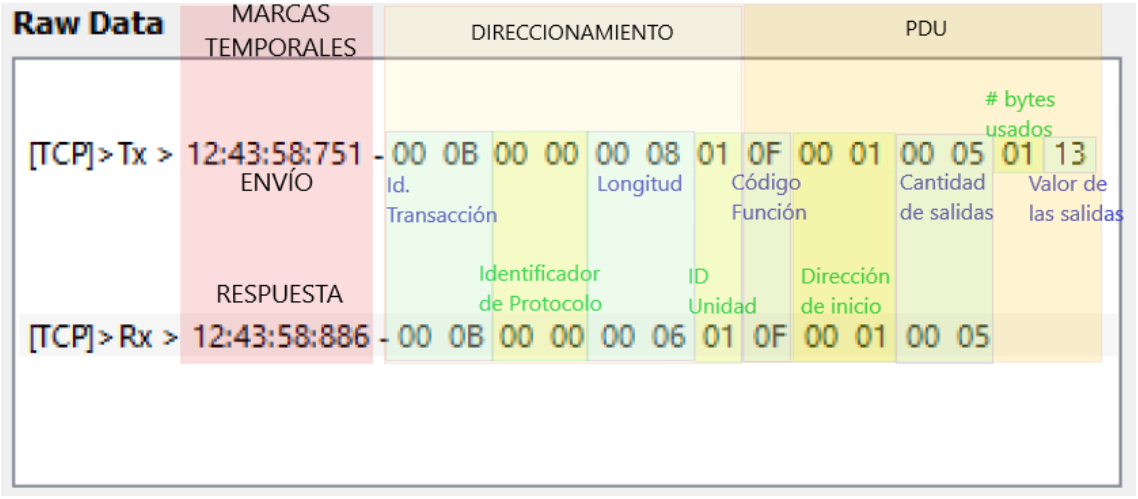
- **Write Multiple Coils:** Used to simultaneously assign the state of several consecutively addressed Coils.
  The structure of this function is shown below:

Request		
Function code	1 Byte	0Fh
Starting address	2 Bytes	0001h to 0005h
Number of outputs	2 Bytes	0001h to 0005h
Byte count	1 Byte	N (N = # Outputs / 8)
Output values	N x 1 Byte	XX…XX
Response		
Function code	1 Byte	0Fh
Starting address	2 Bytes	0001h to 0005h
Number of outputs	2 Bytes	0001h to 0005h
Error		
Error code	1 Byte	8Fh
Exception code	1 Byte	01 or 02 or 03 or 04

Table 63: Structure of the "Write Multiple Coils" function".

Example:

The goal is to activate the 1st, 2nd, and 5th Coils. The following frames are sent and received:



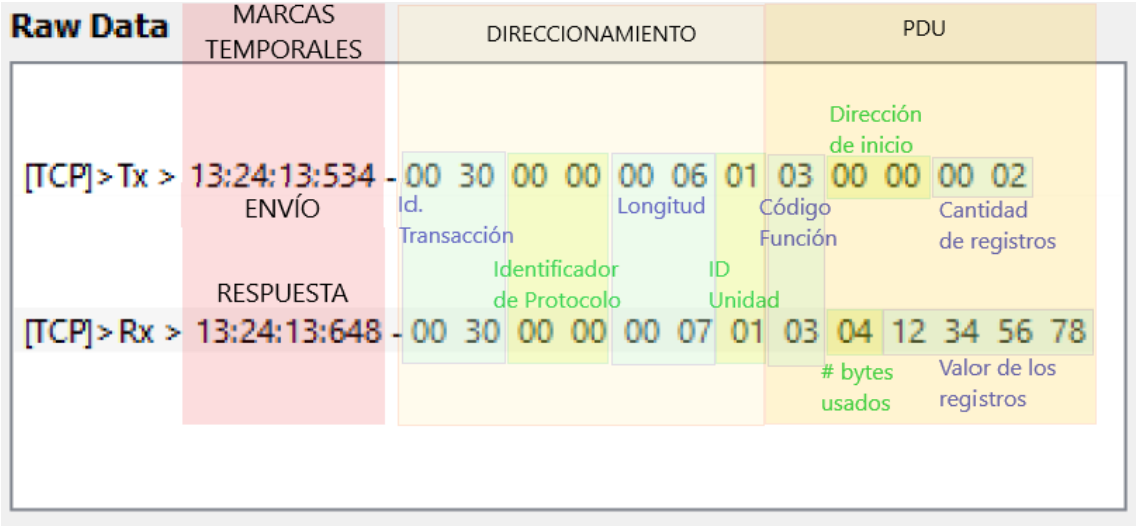
- **Read Holding Registers:** Allows reading the contents of the desired registers. The structure of this function is shown below:

Request		
Function code	1 Byte	03h
Startind address	2 Bytes	0000h to 0011h
Number of registers	2 Bytes	0001h to 0012h
Response		
Function code	1 Byte	01h
Byte count	1 Byte	2 x N (N = # of registers)
Register values	N x 2 Bytes	XX…XX
Error		
Error code	1 Byte	83h
Rxception code	1 Byte	01 or 02 or 03 or 04

Table 64: Structure of the "Read Holding Registers" function".

Example:

Two registers with contents “1234” and “5678” are to be read. They are located at addresses 1 and 2. To do so, the following frames are sent and received:



- **Write Single Register:** Used to assign a value to a single register.
  The structure of this function is shown below:

Request		
Function code	1 Byte	06h
Register address	2 Bytes	0000h to 0011h
Register value	2 Bytes	0000h to FFFFh
Response		
Function code	1 Byte	06h
Byte count	2 Bytes	0001h to 000Ah*
Register value	2 Bytes	0000h to FFFFh
Error		
Error code	1 Byte	86h
Exception code	1 Byte	01 or 02 or 03 or 04

Table 65: Structure of the "Write Single Register" function".

*Depends on the type of data to be written:

2 bytes (0002h): Word value (signed or unsigned).

4 bytes (0004h): Word value and brightness information reading.

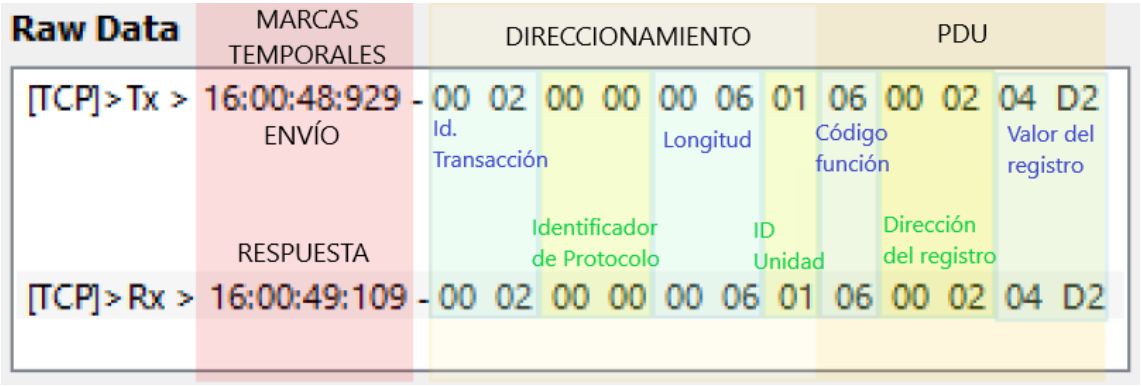
6 bytes (0006h): Double Word value with decimal information.

8 bytes (0008h): Double Word value and brightness information reading.

10 bytes (000Ah): Reading the entire message sent to a 10-digit display.

Example:

To write the value “04D2h” to the register at address “2” in order to display “1234,” the following frames are sent and received:



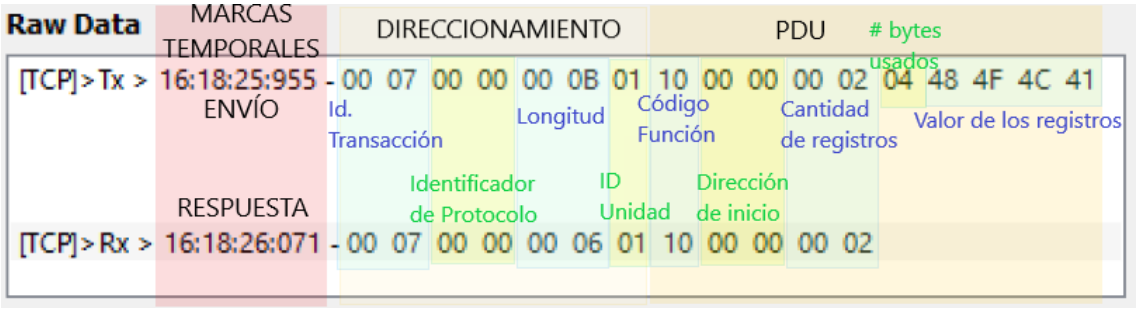
- **Write Multiple Registers:** Used to assign values to multiple registers simultaneously. The structure of this function is shown below:

Request		
Function code	1 Byte	10h
Starting address	2 Bytes	0000h to 0011h
Number of registers	2 Bytes	0001h to 0005h
Byte count	1 Byte	2 x N (N = # of registers)
Register values	N x 2 Byte	XX…XX
Response		
Function code	1 Byte	10h
Starting address	2 Bytes	0000h hasta 0011h
Number of registers	2 Bytes	0001h hasta 0005h
Error		
Error code	1 Byte	90h
Exception code	1 Byte	01 o 02 o 03 o 04

Table 66: Structure of the "Write Multiple Registers" function".

Example:

To write to 2 registers starting at address “0,” so that the display shows the word “HOLA,” the values “48h 4Fh 4Ch 41h” are sent to the registers.
The following frames are sent and received:



6.2.2 Register Writing

The different registers of the display allow interaction in various ways, depending on the address being written to. The registers are distinguished as follows:

- **Register 02**: Send signed WORD numeric values.
- **Register 06**: Send unsigned WORD numeric values
- **Register 10**: Send signed double WORD numeric values.
- **Register 14**: Send unsigned double WORD numeric values.
- **Register 00**: Send ASCII character strings that can be represented on 7-segment digits .

All possibilities are detailed below:

6.2.2.1 Register 02.

Used to send signed WORD numeric values. The value range is from -32768 to 32767 inclusive.

2, 3, or 4 bytes of information must be sent, with the **starting address** being 2.

The first two bytes indicate the value to be displayed (in two's complement).

The third byte can be used to manage blinking: writing 08h starts blinking, 09h stops it.

Finally, brightness is set by writing a value between 30h and 34h in the fourth byte (30h minimum – 34h maximum).

REGISTER 02		REGISTER 03	
Byte 1	Byte 2	Byte 3	Byte 4
<XXh>	<XXh>	<XXh>	<XXh>
Numèric value		Blinking	Brightness*

Table 67: Summary of values for registers 02 and 03.

Example:

To facilitate sending information, the Modbus 10h function is used.

To display the value "**-3270**", the following content must be sent via Modbus:

REGISTER 02		REGISTER 03	
Byte 1	Byte 2	Byte 3	Byte 4
F3h	3Ah	00h	34h
Numeric value		Blinking	Brightness*

Table 68: Example of values to display "-3270".

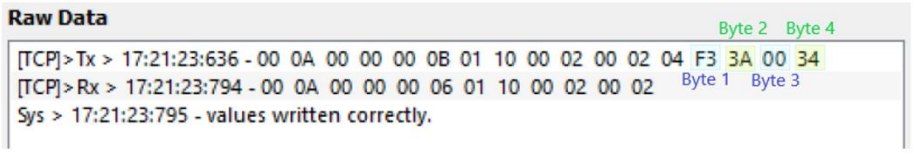


Fig. 79: MODBUS/TCP frame to display the value "-3270".

In these frames, the sending and response are as explained in the previous section.

6.2.2.2 Register 06.

It is important that in this case the **starting address** is 6.This register is used in the same way as the previous one, but it is meant for unsigned WORD numeric values.

The valid range is 0 to 65535.

Brightness is adjusted identically to the previous case.

Table 21 can be used indistinctly for this register.

For example, the same frame used in the Register 02 example is sent, but the starting address is changed to 06.

In this case, the value 62266 is displayed if the display unit has 5 digits or more. Otherwise, the display will show “OvL”.

6.2.2.3 Register 10.

This register is used to send signed double WORD numeric values.

The range goes from –2,147,483,648 to 2,147,483,647, inclusive.

Between 6 and 8 bytes of information must be sent, with **starting address** 10.

The first four bytes indicate the value to be displayed (in two’s complement). The next two bytes modify the decimal point position. The last two (optional) bytes control the blinking and brightness of the display.

Blinking and brightness parameters work identically to the previous cases.

REGISTER 10		REGISTER 11		REGISTER 12		REGISTER 13	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
<XXh>	<XXh>	<XXh>	<XXh>	<XXh>	00h	<XXh>	<XXh>
Numeric value				Decimal position	Not used	Blinking	Brightness*

Table 69: Summary of values for registers 10, 11, 12 and 13.

Example:

To facilitate sending information, the Modbus 10h function is used.

To display the value **“-32.70”**, the following content must be sent via Modbus.

REGISTER 10		REGISTER 11		REGISTER 12		REGISTER 13	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FFh	FFh	F3h	3Ah	02h	00h	00h	34h
Numeric value				Decimal position	Not used	Blinking	Brightness

Table 70: Example of values to display "-32.70".

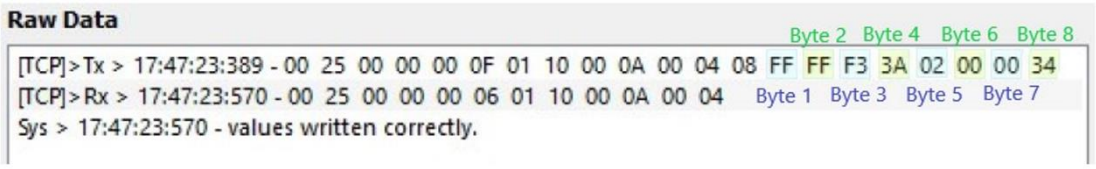


Fig. 80: MODBUS/TCP message to send the value "-32.70".

In these frames, the sending and response follow the rules explained in the previous section.

6.2.2.4 Register 14.

It is important that in this case the **starting address** is 14.

This register is used in the same manner as the previous one, but it is intended for unsigned double WORD numeric values.

The valid range is 0 to 4,294,967,295.

The decimal point and brightness are handled exactly the same way. Tabla 23 can be used interchangeably for this case.

For example, the same frame from the Register 10 example is sent, but the starting address is changed to 14.

In this case, the value 4,294,964,026 is displayed if the unit has 10 digits or more.

Otherwise, the display shows “OvL”

6.2.2.5 Register 00.

It is used to write text to the display (in ASCII characters). Keep in mind that when writing to a 7-segment LED, only certain values can be set. (See section 6.2.1).

For this purpose, 10 registers are available, starting at address 0. Each register can contain two ASCII characters.

REGISTER 0		REGISTER 1		·····	REGISTER N	
Byte 1	Byte 2	Byte 3	Byte 4	·····	Byte 2*N+1	Byte 2*N+2
<XXh>	<XXh>	<XXh>	<XXh>	·····	<XXh>	<XXh>
ASCII 1	ASCII 2	ASCII 3	ASCII 4	·····	ASCII 2*N+1	ASCII 2*N+2

Table 71: Summary of values for Register 00.

Example:

To facilitate sending information, the Modbus 10h function is used.

The text “E 523” must be displayed to indicate an error in an industrial process.

The following content must be sent through Modbus (See tabla de caracteres ASCII).

REGISTER 0		REGISTER 1		REGISTER 2	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
45h	20h	35h	32h	33h	00h
“E”	“ “	“5”	“2”	“3”	

Table 72: Example of values to display “E 523".

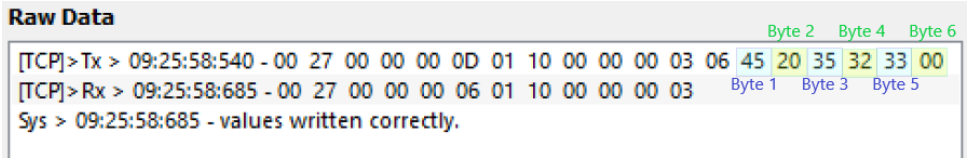


Fig. 81: MODBUS/TCP message used to send the characters “E 523".

As shown, as many registers as needed must be written.

Since the number of characters is 5 (odd), 3 registers are required, and the last byte must be set to 00h.

When using this method, display brightness cannot be modified for compatibility reasons with previous products.

6.2.3 Writing *Coils*

Apart from registers, MODBUS/TCP also allows using función 0Fh "*Write Multiple Coils*" to activate/deactivate relays or control display blinking.

They may also be modified with función 05h "*Write Single Coil*", but the examples use 0Fh for simplicity.

There are 5 coils that can be activated or deactivated, at **STARTING ADDRESS** 1

In order, the coils set the following parameters:

- ***Coil* 1.** Activates or deactivates relay 0.
- ***Coil* 2.** Activates or deactivates relay 1.
- ***Coil* 3.** Activates or deactivates relay 2 (EQUIPMENT OPTIONS)
- ***Coil* 4.** Activates or deactivates relay 3 (EQUIPMENT OPTIONS)
- ***Coil* 5.** Activates or deactivates display blinking.

All coils activate with "1" and deactivate with "0". Your display model may not include coils 3 and 4 - if so, their value will not affect any functionality.

Example:

For a given value, an alarm must be activated and the display should begin blinking.
To do this, one relay and the blinking function must be activated.
Thus, COIL 1 must be enabled to switch RELAY 0, and COIL 5 must be enabled to activate blinking.

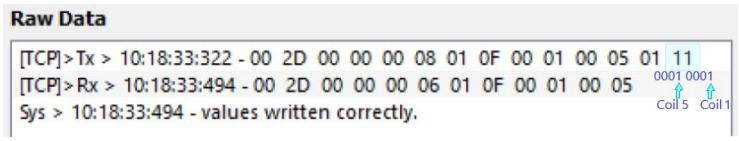


Fig. 82: Example of coil activation for the display.

6.2.4 Reading Registers and *Coils*

This new display version allows reading both registers and *coils*.

The system works exactly the same as writing: the desired registers or *coils* and their addresses are selected to read their status.

Reading can be performed using the functions:

- 01h "Read *Coils*"
- 03h "Read Holding Registers"

The frames needed to perform these functions are described in section 6.2.1, "Read Coils" and "Read Holding Registers", respectively.

6.3 TCP/IP Protocol

To use the TCP/IP protocol, the communication port must be properly configured (See section 6.1).

For the display to show a frame, it must end with a frame terminator recognizable by the display.

The last character sent is shown on the right side of the display.

The communication port is set automatically, but it can be modified at any time.

The display can receive decimal numbers and ASCII characters. After sending the desired values, there are certain control parameters used to adjust brightness and blinking. These parameters must be sent **AFTER** the values to be displayed.

Brightness	
Command	ASCII Code
Minimum	"Y0" or "y0" (7930h or 5930h)
Low	"Y1" or "y1" (7931h or 5931h)
Medium	"Y2" or "y2" (7932h or 5932h)
High	"Y3" or "y3" (7933h or 5933h)
Maximum	"Y4" or "y4" (7934h or 5934h)

Blinking	
Command	ASCII Code
Start	08h
Stop	09h

Examples:

The following table shows some examples combining numerical values in ASCII format and control parameters.

Frame to send								Displayed Value
%QBx	%QBx+1	%QB x+2	%QB x+3	%QB x+4	%QB x+5	%QB x+6	%QB x+7	*
38h	39h	2Eh	35h	37h	32h			89.572(1)
2Dh	36h	37h	2Eh	31h	30h	08h		-67.10(2)
36h	2Eh	34h	36h	32h	33h			6.4623

(3) Value displayed without configuration

(4) Value displayed with blinking

* For PLCs, %QBx corresponds to a specific location in the output address space. Starting from that address, the values must be consecutive.

6.4 UDP Protocol

The functionality of the parameters explained in the previous section (TCP/IP protocol) also applies to the UDP protocol.

7 WIFI COMMUNICATION

The bandwidth of WIFI communication is reduced compared to wired connection. For this reason, the configuration experience will always be smoother when using a cable. This difference will not be noticeable once the device is configured and dedicated exclusively to data visualization.

For these same reasons, it is recommended not to transmit information with the display while configuring it via WIFI.

7.1 WIFI Communication Settings

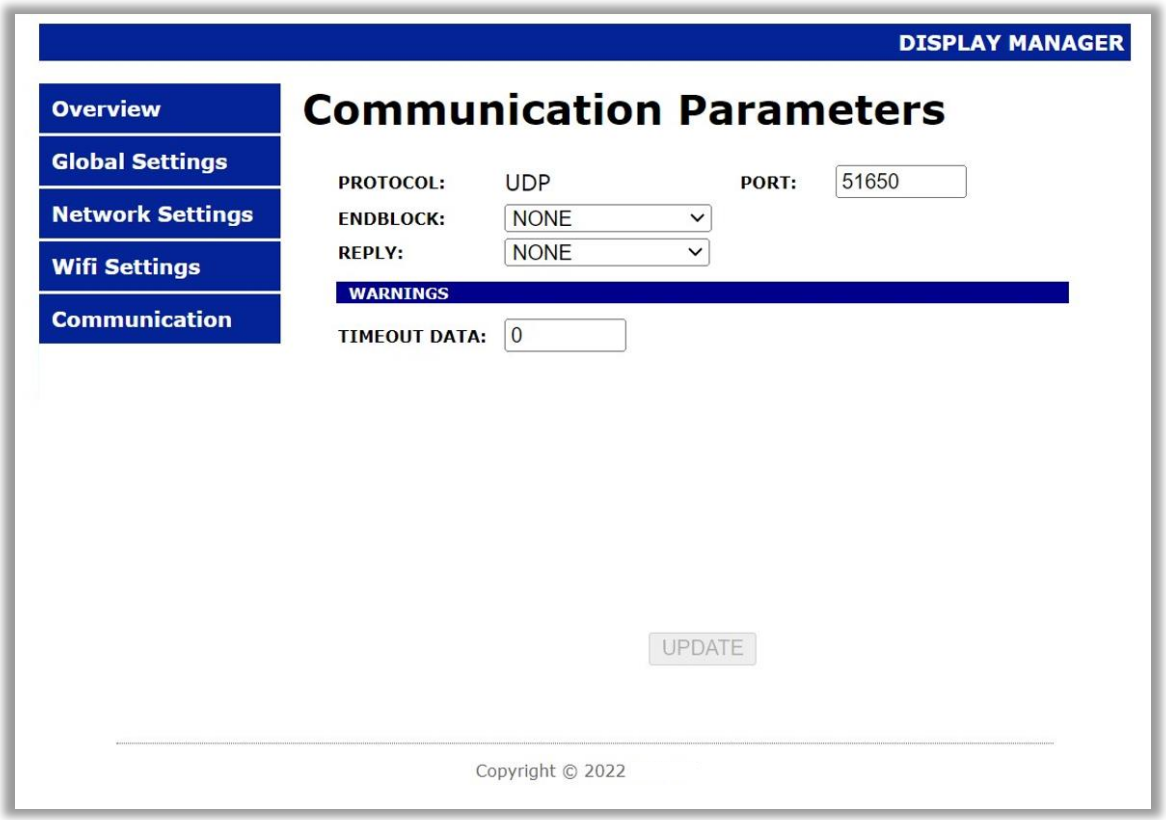


Fig. 83: WIFI communication settings screen.

The WIFI communication settings screen is very similar to that of wired Ethernet. The difference is that there is no protocol option (only UDP communication is available), and an additional type of response is added: the “ECHO” response, which simply returns the same message that was received.

The UDP protocol over WIFI works the same way as over ETHERNET.

8 SERIAL BUS COMMUNICATION

This section includes the web server settings of the display and the operation of the available protocols when communication is carried out through the serial bus.

8.1 Serial Communication Settings

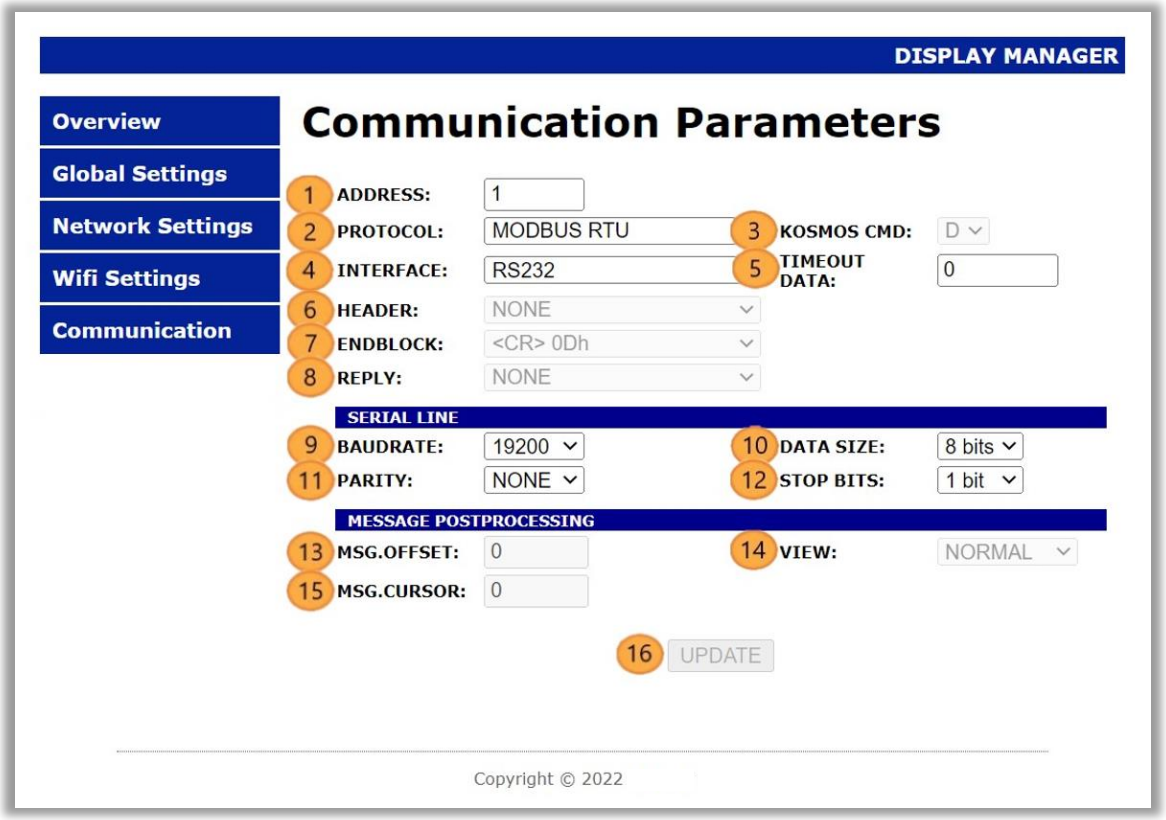


Fig. 84: Communication settings screen of the web server when using serial communication.

In the communication settings screen, the parameters related to the display's communication are configured:

1. **Modifies the internal address assigned to the display.**
2. **Dropdown menu to select the protocol the display will use.**

   The KOSMOS protocols are detailed in the manufacturer's manual.

   Information about the use of MODBUS RTU and ASCII protocols is provided in sections 8.3 and 8.4, respectively.

3. Dropdown menu to select the specific command when a KOSMOS protocol is selected.

Command	Function
D	Transmission of the display value
T	Transmission of the tare value
P	Transmission of the peak value
V	Transmission of the valley value
Y	Transmission of the peak-to-peak value
Z	Transmission of the total value

For more information about the function of these commands, refer to the manufacturer's manual.

4. Selects the type of physical interface of the connector.

By default, RS-232 and RS-485 interfaces can be selected. Devices ordered with the RS-422 option provide RS-232 and RS-422 interfaces, with the connection modification explained in section 3.4.

5. Assigns the timeout (in **seconds**) for a new request before the display shows "–" on all digits. The value can be any integer multiple of 10 between 0 and 2550 (inclusive).
If the value is 0, the display does not apply a timeout; the last data will be shown indefinitely.

6. Allows selection of a message header (ASCII protocol only).
The available headers are listed below:

Header	
NONE	
02h	Value 02h
02h AH AL	Value 02h + display address (High_Byte Low_Byte)
02h AL AH	Value 02h + display address (Low_Byte High_Byte)
@ AH AL E D	Omron Host-Link
AH AL	Display address (High_Byte Low_Byte)
AL AH	Display address (Low_Byte High_Byte)

Table 73: ASCII protocol header contents.

7. Allows selection of the end of message.
The available end-of-block options are:

Endblock	
<CR> 0Dh	0Dh.
<LF> 0Ah	0Ah.
<CR LF> 0Dh 0Ah	0Dh 0Ah.
<LF CR> 0Ah 0Dh	0Ah 0Dh.
03h	Value 03h
< * CR> 2Ah 0Dh	Omron Host-Link 2Ah 0Dh.

Table 74: ASCII protocol end-of-block contents.

8. Allows selection of the display's response.
The response messages are listed below:

Reply	
NONE	No response from the display
@ AH AL ED 0 * <CR>	40h High_Byte_Address Low_Byte_Address 45h 44h 30h 2Ah 0Dh
HEADER 06h ENDBLOCK	Header 06h End of block

Table 75: Contents of the response messages of the ASCII protocol.

9. Selects the transfer rate in bits/s.
10. Selects the number of bits per character.
You can choose 7 or 8 bits.
When using the MODBUS RTU protocol, this cannot be modified; it is set to 8 bits.
11. Sets the parity bit for error control.
The possible modes are: **None**, **Even** Parity, and **Odd** Parity.
12. Selects the number of stop bits, 1 or 2, for data synchronization.
13. Sets the value of the position of the first character to be displayed. This option is intended to avoid displaying headers or labels that other devices may send along with the information.
For example, a scale might send: "Peso (Kg): 203.5".
If applying the value 1, all characters will be ignored until the first number, which is very useful when the label is variable (PESO NETO (Kg), PESO PROMEDIO (Kg), etc.).
Values greater than 1 allow focusing on a specific part of the numerical data—useful in processes where the numerical value does not vary much. In this way, thousands can be ignored in processes where only units or tens change.

Example: The information sent is "PESO 203.5". Depending on the value of this element (13), the following situations occur:
A. 0. As many characters as available on the display are shown. "PESO 203.5" is displayed.
B. 1. Everything is ignored until the first numeric character. "203.5" is displayed.
C. 7. The first 7 characters are ignored. "3.5" is displayed.
14. Dropdown menu that allows reversing the order of the displayed value.
Example: The value "123456" is sent to the display. Depending on the chosen parameter, two situations are possible:
E. **NORMAL.** The value "123456" is displayed.
F. **REVERSED.** The value "654321" is displayed.
15. This parameter complements parameter 13 but applies to the final part of the message. That is, it defines how many values should be displayed starting from MSG.OFFSET.
The effect of this parameter differs depending on the previous element (**14**).

G. **VIEW = NORMAL.** Only shows the beginning of the message up to the designated position.
Example 1: With MSG.CURSOR = 3. If “123456” is sent, “123” is displayed.
Example 2: With MSG.CURSOR = 2. If “123456” is sent, “12” is displayed”.

H. **VISTA VIEW = INVERTED.** Skips the beginning of the message (prior to inversion) up to the designated position.
Example 1: With MSG.CURSOR = 3. If “123456” is sent, “654” is displayed.
Example 2: With MSG.CURSOR = 2. If “123456” is sent, “6543” is displayed”

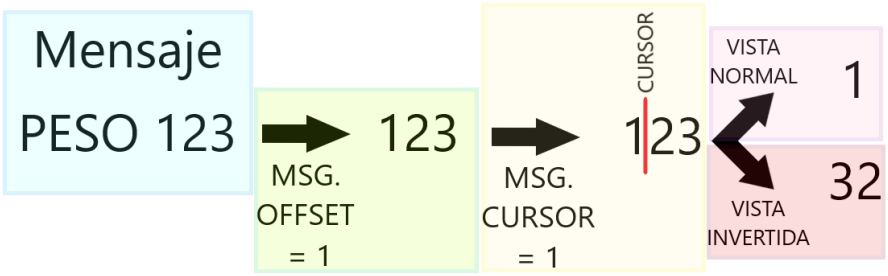


Fig. 85: Diagram showing the use of the MSG.OFFSET and MSG.CURSOR parameters.

16. When any parameter is modified, the button to send the new information to the display is enabled.

8.2 KOSMOS Protocols (ASCII) and KOSMOS (ISO 1745)

The specific information for the KOSMOS protocols must be consulted in the instrument’s manual.

8.3 MODBUS RTU Protocol

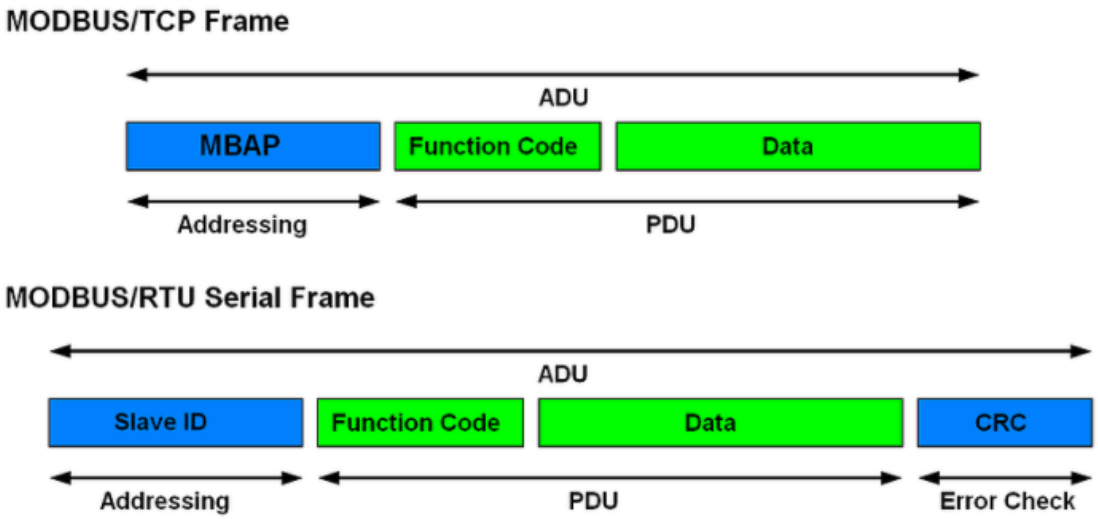


Fig. 86: Differences between Modbus/TCP and Modbus/RTU.

As shown, in RTU frames the addressing is slightly different and a CRC (Cyclic Redundancy Check) is added. The PDU remains unchanged between both protocols. Regarding the use of Modbus functions and the display registers, MODBUS RTU is identical to the Ethernet MODBUS/TCP protocol.

Refer to section 6.2 for any necessary information.

Example: To send “HOLA” (48h 4Fh 4Ch 41h), the following frames are established:

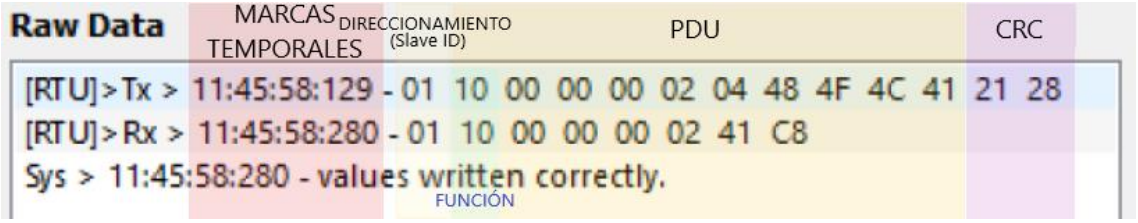


Fig. 87: Frames sent and received to display "HOLA" via MODBUS RTU.

8.4 ASCII Protocol

This protocol allows easy communication with any device that has a serial line and can configure the protocol, such as a computer, a PLC working in RS-232 mode, etc.

Another possibility is connecting multiple displays from the same device over an RS-485 network.

With this protocol the display operates in slave mode; upon receiving data it checks whether the header and block end match the configured values. If so, it displays the content of the data. The frame is configurable to adapt to a wide variety of protocols that use ASCII format.

To understand how the protocol can be configured, the following terms are defined:

Transmission block: Consists of all bytes required to display a value. For each correctly received transmission block, the display will update with a new value. Each block consists of three parts: Header, data, and endblock).

HEADER: Used to identify the beginning of the block. You can choose from 6 formats or none.

Data block: Contains the information to be displayed. It is possible to select the part of the block to be displayed.

ENDBLOCK: Used to identify that the block has been fully received. You can choose among 6 types of endblock.

Additionally, there are control commands that allow starting and stopping blinking of one or more characters.

08h **Start blinking characters**

09h **Stop blinking characters**

Control commands must be placed at the end of the frame.

8.4.1 ASCII Protocol Examples

Example 1: Sending a message from a computer to the display

Configuration for this example:

- **Display address:** 08
- **Header:** 02h AH AL
- **Endblock:** CR
- **MSG. OFFSET:** 0
- **VIEW:** NORMAL
- **Data sent:** 358964

Transmission block sent

Transmission block sent in ASCII		0	8	3	5	8	9	6	4	CR
Transmission block sent in hexadecimal	02h	30h	38h	33h	35h	38h	39h	36h	34h	0Dh
	HEADER			Data sent						ENDBLOCK

Value displayed on a 4-digit device								
						O	u	H
Value displayed on an 8-digit device			3	5	8	9	6	4

On the 4-digit device “OuH” is shown because the value is too large to be represented.

Example 2: Sending a message from a scale to the display.

Configuration for this example:

- **Display address:** 14
- **Header:** 02h AL AH
- **Endblock:** CR LF
- **MSG. OFFSET:** 1 (To display only the numeric value)
- **VIEW:** NORMAL
- **MSG.CURSOR:** 4
- **Data sent:** PESO 15.8kg

Transmission block sent:

Transmission block sent in ASCII		4	1	P	E	S	O		1	5	.	8	k	g	CR	LF
Transmission block sent in hexadecimal	02h	34h	31h	50h	45h	53h	4Fh	20h	31h	35h	2Eh	38h	6Bh	67h	0Dh	0Ah
	HEADER			Data sent											ENDBLOCK	

Value displayed on a 4-digit device				
	1	5.	8

Since **MSG.OFFSET** = 1 was selected, the display ignored all characters prior to the first numeric value, without needing to count them.

In this case it is important to select **MSG.CURSOR** = 4 (since “15.8” is composed of 4 characters, including the decimal point), because after the first number the display will attempt to show everything up to the *endblock*.

If **NOT** selected, the following visualizations would be obtained. Due to the inability to represent some characters (k and g), “-” is displayed.

Value displayed on a 4-digit device								
				1	5.	8	-
Value displayed on a 8-digit device				1	5.	8	-	-

9 PROFINET COMMUNICATION

The display incorporates a Profinet interface to facilitate its integration into industrial networks. This interface is equipped with two RJ45 connectors, allowing direct connectivity to Profinet systems through a wired network.

The GSD configuration file defines the characteristics of the memory space and provides the necessary interfaces for it to be recognized by the Profinet master application or PLC. The interface is shown under the name Profinet payload and consists of 20 characters (uint8_t).

The communication protocol uses a configurable 20-byte buffer, which functions as a memory space available for data reception. The content of this buffer can be interpreted either in numeric or ASCII format, providing flexibility to adapt to various application requirements.

In Profinet mode, the device operates as a slave. Since Profinet is a connection-based protocol, communication requires the device to be previously configured as a Profinet slave. Afterwards, the connection must be initiated and managed by the master.

9.1 PROFINET Communication Settings

From the webserver, in the Global Settings page, the **DATA PORT** must be configured as Profinet. This enables the functionality and allows the connection with the device to be established.

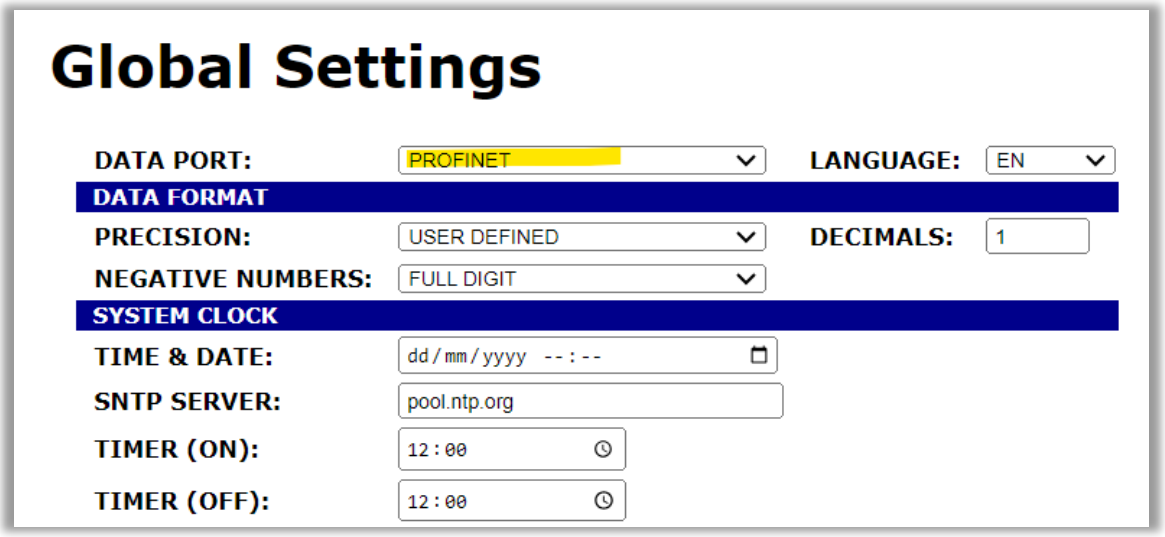


Fig. 88: Global settings screen; configuration of Profinet as the data input port.

Once the Profinet connection is established, the device displays the content of the 20-byte buffer in real time. This ensures dynamic and accurate visualization of the transmitted data, complying with Profinet communication standards.

To assign a valid IP address and Profiname and thereby establish communication with the PLC, it is first necessary to identify the Profinet device connected to the network using Proneta or a similar tool, and then modify its IP address and Profiname.

PRONETA Basic 3.7 - Herramienta de puesta en servicio y diagnóstico para PROFINET - ID: 67460624 - Industry Support Siemens

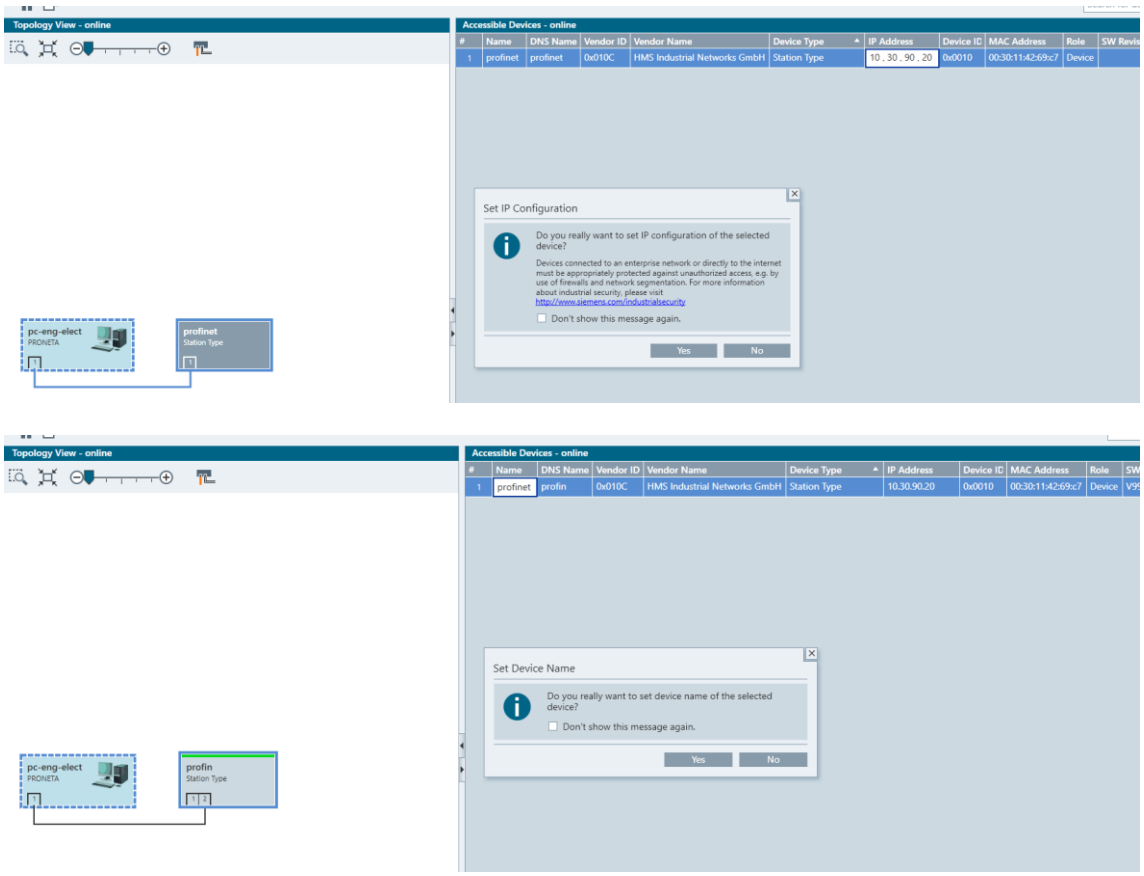


Fig. 89: IP address and Profiname modification of the Profinet module in Proneta

9.2 Types and Data Formats in Profinet Communication

The device supports five different data interpretation formats within the buffer, including signed and unsigned numeric values, and the Float or Word types. Additionally, the data can be represented in ASCII format for enhanced versatility.

The data format configuration can be adjusted from the Communication Parameters screen in the webserver, after selecting the Profinet option in the DATA PORT field of Global Settings.

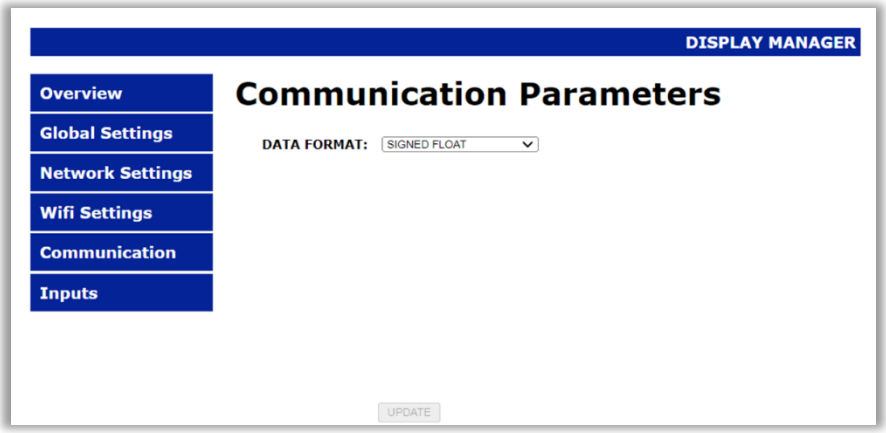


Fig. 90: Data format settings screen in Profinet mode

The update button must be pressed for the changes to take effect.

9.2.1 Float Format

The data block reaches a maximum of 6 bytes when using this format. Byte alignment matches the addresses of the Profinet buffer, with **B0** corresponding to **Profinet payload(1)**, **B1** to **payload(2)**, and so on. The byte assignment is as follows:

- **B0**: Most significant byte of the numeric value (MSB).
- **B1** and **B2**: Middle bytes of the numeric value.
- **B3**: Least significant byte of the numeric value (LSB).
- **B4**: Most significant byte of the decimal point position (MSB).
- **B5**: Least significant byte of the decimal point position (LSB).

B0	B1	B2	B3	B4	B5
MSB num[3]	num[2]	num[1]	LSB num[0]	MSB dp[1]	LSB dp[0]

Table 76: Data format for float type.

The decimal point position is encoded according to the following table:

B4 to B5	Decimal point position
01h	00000000.0
02h	0000000.00
04h	000000.000
08h	00000.0000
10h	0000.00000
11h	000.000000
12h	00.0000000
14h	0.00000000

Table 77: Decimal point position encoding.

9.2.2 Word Format

When using the Word type, only bytes B0 and B1 are used:

- **B0**: Most significant byte of the numeric value (MSB).
- **B1**: Least significant byte of the numeric value (LSB).

This means that the 16-bit (2-byte) number is encoded in big-endian order, i.e., the most significant byte is transmitted first, followed by the least significant byte.

For example, to transmit the value 300 (decimal) in Word format, which corresponds to 0x012C in hexadecimal, we would send 0x01 in B0 and 0x2C in B1.

The maximum value that can be sent is 65535 (0xFFFF in hexadecimal).

9.2.3 ASCII Format

In this mode, numeric values are sent in ASCII code. This format has the additional advantage of allowing control commands, such as enabling blinking with the 0x08 character, or disabling it after sending the 0x09 character.

08h Start blinking function (must be sent at the beginning of the frame)

09h End blinking function (must be sent at the beginning of the frame)

The number of bytes sent in ASCII format depends on the number of digits of the display plus the control commands used, with a maximum limit of 20 bytes, which corresponds to the size of the internal buffer.

Inserting a decimal point character “[.]” or code 0x2E will activate the dot segment for the preceding digit.

The representation of bytes on the display follows a specific sequence:
The first byte of the Profinet buffer corresponds to the rightmost digit of the display.

The byte sequence is represented on the digits from right to left in the following order:

Profinet Frame					Display value
payload(1)	**(2)**	**(3)**	**...**	**(n+1)**	Dn, ..., D2, D1, D0
D0	D1	D2	...	Dn	

9.2.4 Character Encoding in ASCII Format

The numeric value of each digit is encoded in ASCII and sent in the sequence described above.
Among the valid characters, several alphanumeric characters that can be represented in 7-segment displays are included:

Carácter	0	1	2	3	4	5	6	7	8	9	A	b
HEX	30h	31h	32h	33h	34h	35h	36h	37h	38h	39h	41h	42h
DEC	48d	49d	50d	51d	52d	53d	54d	55d	56d	57d	65d	66d

Carácter	C	c	d	E	F	H	h	i	J	L	n	o
HEX	43h	63h	64h	45h	46h	48h	68h	69h	4A h	4C h	6Eh	6Fh
DEC	67d	99d	100 d	69d	70d	72d	104 d	105 d	74d	76d	110 d	111 d

Carácter	P	r	U	u		,	.	-	_	‘	¯	
HEX	50h	72h	55h	75h	20h	2C h	2Eh	2Dh	16h	27h	28h	
DEC	80d	114d	85d	117 d	32d	44d	46d	45d	22d	39d	40d	

Table 78: Subset of characters supported in ASCII mode.

Sending a character that cannot be represented using the previous table will be shown as “–” (2Dh).

9.2.5 Practical Encoding Examples

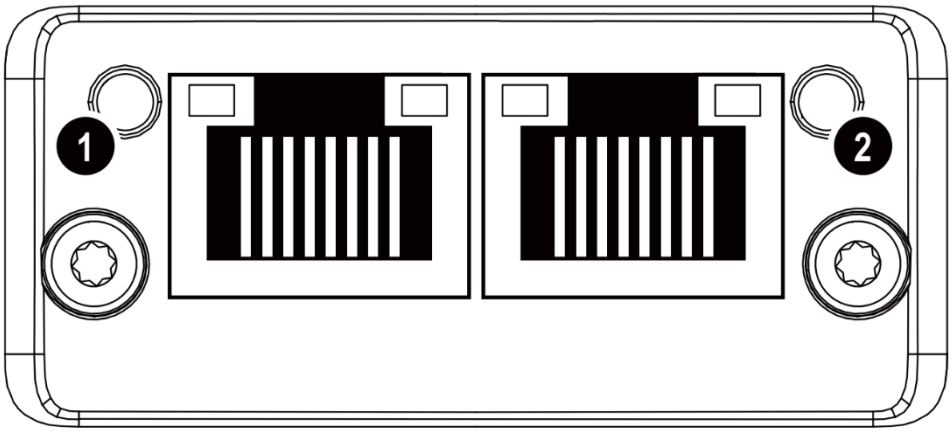
The following table shows seven practical examples of encoding for each case.

Type	Frame to send						Displayed Value
payload	(1)	(2)	(3)	(4)	(5)	(6)	
FLOAT signed	00h	00h	04h	D2h	00h	02h	**12,34**
	FFh	FFh	E9h	D2h	00h	01h	**–567,8**
FLOAT unsigned	00h	00h	B2h	6Eh	00h	00h	**45678**
	00h	01h	86h	9Fh	00h	04h	**99,999**
WORD signed	FDh	A8h					**–600**
	05h	F5h					**1525**
WORD unsigned	F4h	3Dh					**62525**

Table 79: Examples of display results for different formats

9.3 LED Indicators

The Profinet module includes two LEDs on the front panel to indicate Module Status, Network Status and Connection/Activity.



NS LED Status (1)		Description
Off	Offline	No power – No connection with the IO controller
Green	Online (RUN)	Connection with IO controller established, IO controller in RUN state.
Green, 1 blink	Online (STOP)	Connection established, IO controller in STOP or IO data incorrect, IRT sync not completed.
Green, 3 blinks	Identifying	Blinks 3 times (1 Hz) continuously to identify the slave (DCP_Identify).
Green, constant blinking	-	Connection established; IO controller in STOP state.
Red	Fatal event	Major internal error (combined with red module-status LED).
Red, 1 blink	Station name error	Station name not set.
Red, 2 blinks	IP address error	IP address not configured.
Red, 3 blinks	Configuration error	Expected identification differs from actual identification

MS LED Status (2)		Description
Off	Not initialized	No power or module in SETUP or NW_INIT state.
Green	Normal operation	Module has exited NW_INIT state.
Green, 1 blink	Diagnostic event	Diagnostic event(s) present.
Green, constant blinking	-	Blinks at 1 Hz to identify the slave (DCP_Identify).
Red	Exception error	Módulo en estado Excepción.
	Fatal event	Major internal error (combined with red network-status LED).
Red, 1 parpadeo	-	
Red, 2 parpadeos	-	
Red, 3 parpadeos	-	
Red, 4 parpadeos	-	
Red/Green alternating	Firmware update	DO NOT power off the module. Turning it off during this phase may cause permanent damage.

10 DIGITAL INPUTS AND ASSOCIATED FUNCTIONS

As an alternative to displaying values on the display using the previous options, the device can be configured to show information depending on the states of the digital inputs, provided that it has been correctly configured beforehand.
There are 4 functions associated with the digital inputs: counter, chronometer, tachometer, and direct BCD viewer.

If you want to display information from any other port as a repeater (Modbus RTU/TCP, Profinet…), it is imperative that the digital inputs are disabled, since otherwise only the information related to the active digital input function will remain visible.

A continuación, se muestra el esquema de conexión de las entradas digitales, con los dos conectores diseñados a dicho efecto:

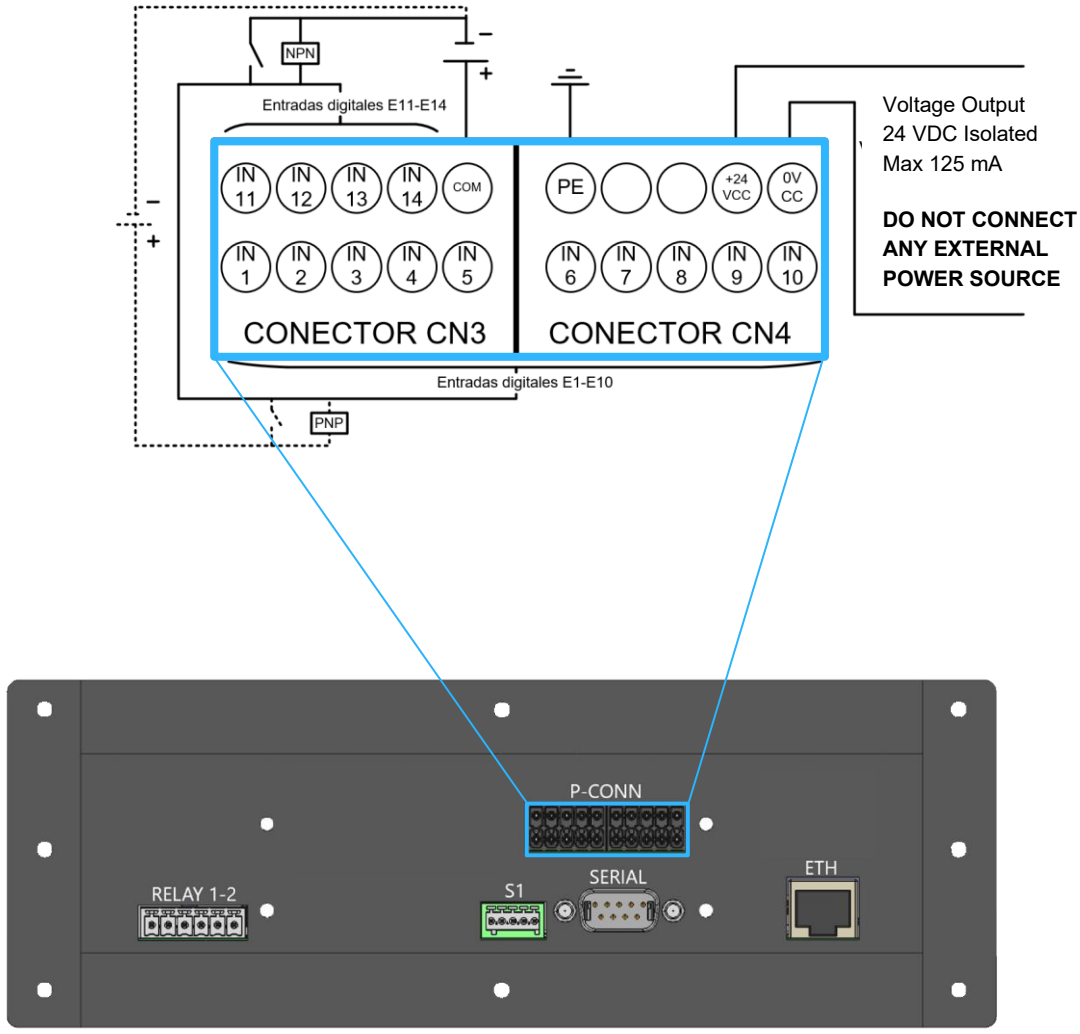


Fig. 91: Digital input connection diagram

10.1 Digital Input Configuration

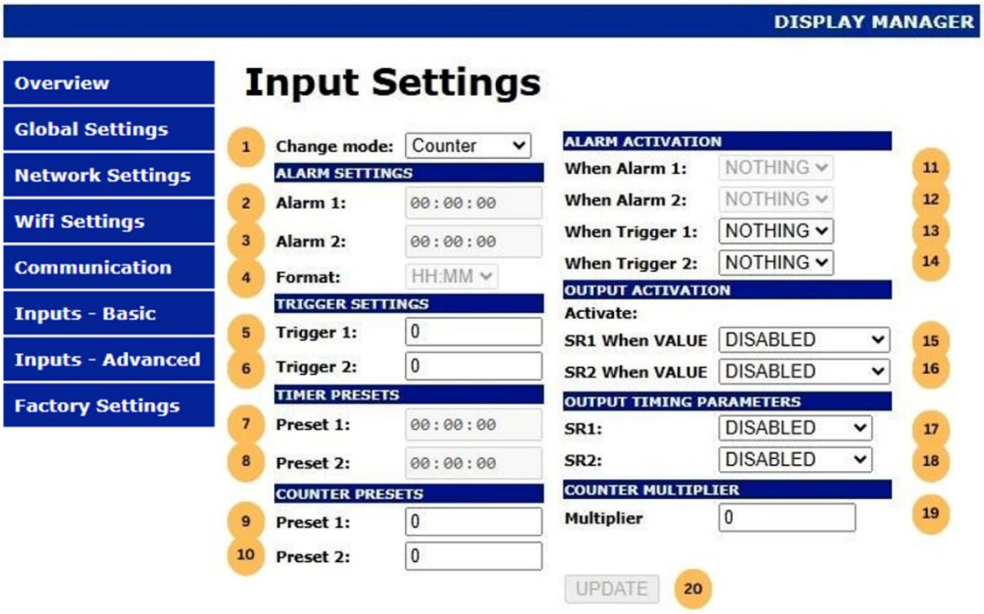


Fig. 92: Input functionality settings screen in the web server

The digital input module can be configured using the dedicated pages in the web server, "**Inputs-Basic**" and "**Inputs-Advanced**".

First, the configuration found in the "Inputs-Basic" page is detailed. The mode selection in (1) enables or disables the relevant controls for each function, as well as allowing the digital inputs to be disabled.

The words "**Alarm**" and "**Trigger**" in the Webserver are equivalent, as both establish a trigger threshold for their respective modes.

41. Selects the operating mode and behavior of the digital inputs. The available modes are: disabled, **counter**, **chronometer**, **tachometer**, and direct **BCD** input.
42. Sets the alarm threshold for ALARM 1 in chronometer mode.
43. Sets the alarm threshold for ALARM 2 in chronometer mode.
44. On displays with 5 digits or fewer, allows the selection of the display format for the chronometer: Hours and minutes (HH:MM) or minutes and seconds (MM:SS).
45. Sets the trigger threshold for TRIGGER 1 in counter mode.
46. Sets the trigger threshold for TRIGGER 2 in counter mode.
47. Sets the preload value (PRESET 1) in chronometer mode.
48. Sets the preload value (PRESET 2) in chronometer mode.
49. Sets the preload value (PRESET 1) in counter mode.
50. Sets the preload value (PRESET 2) in counter mode.
51. Allows the configuration of the action taken when the threshold of ALARM 1 is exceeded in chronometer mode:
   I. **NOTHING:** ALARM 1 is disabled. It remains disabled even if a value is defined in ALARM 2.
   J. **RESET:** The chronometer is immediately (asynchronously) reset to zero.
   K. **PRESET1:** The chronometer is immediately (asynchronously) loaded with the value set in PRESET1.

L. **PRESET2:** The chronometer is immediately (asynchronously) loaded with the value set in PRESET2.

52. Allows the configuration of the action taken when the threshold of ALARM 2 is exceeded in chronometer mode:

I. **NOTHING:** ALARM 2 is disabled. It remains disabled even if a value is defined in ALARM 2.
J. **RESET:** The chronometer is immediately (asynchronously) reset to zero.
K. **PRESET1:** The chronometer is immediately (asynchronously) loaded with the value set in PRESET1.
L. **PRESET2:** The chronometer is immediately (asynchronously) loaded with the value set in PRESET2.

53. Allows configuring the action taken when the threshold of TRIGGER 1 is exceeded in counter mode:

I. **NOTHING:** TRIGGER 1 is disabled. It remains disabled even if a value is defined in TRIGGER 1.
J. **RESET:** The counter is immediately (asynchronously) reset to zero.
K. **PRESET1:** The counter is immediately (asynchronously) loaded with the value set in PRESET1.
L. **PRESET2:** The counter is immediately (asynchronously) loaded with the value set in PRESET2.

54. Allows configuring the action taken when the threshold of TRIGGER 2 is exceeded in counter mode:

I. **NOTHING:** TRIGGER 2 is disabled. It remains disabled even if a value is defined in TRIGGER 2.
J. **RESET: T**he counter is immediately (asynchronously) reset to zero.
K. **PRESET1:** The counter is immediately (asynchronously) loaded with the value set in PRESET1.
L. **PRESET2:** The counter is immediately (asynchronously) loaded with the value set in PRESET2.

55. Defines the activation conditions of relay SR1 .

16. Defines the activation conditions of relay SR2.

The available activation conditions are as follows:

Selection	Activation Conditions
DISABLED	Does not activate
= ALARM 1	Activates relay output if value = ALARM 1
≥ ALARM 1	Activates relay output if value ≥ ALARM 1
= ALARM 2	Activates relay output if value = ALARM 2
≤ ALARM 2	Activates relay output if value ≤ ALARM 2
> ALARM 1	Activates relay output if value > ALARM 1
< ALARM 1	Activates relay output if value < ALARM 1
> ALARM 2	Activates relay output if value > ALARM 2
< ALARM 2	Activates relay output if value < ALARM 2
= 0	Activates relay output if value = 0
≤ AL1 && >= AL2	Activates relay output if value ≤ ALARM 1 and ≥ ALARM 2
≥ AL1 && <= AL2	Activates relay output if value ≥ ALARM 1 and ≤ ALARM 2

Table 80: Relay activation conditions

17. Selects the timing behavior of relay SR1 according to the table.
18. Selects the timing behavior of relay SR2 according to the table.
19. Multiplier value of the counter from 1 to 20; with each rising or falling pulse, the counter will add or subtract the pulse multiplied by this factor.
20. The UPDATE button must be pressed to save the changes.

Selection	Output Timing Conditions
DISABLED	Does not activate
0.5 s	Single pulse of 500 milliseconds
0.8 s	Single pulse of 800 milliseconds
1 s	Single pulse of 1 second
1.5 s	Single pulse of 1,5 second
0.5 Hz	Output repeatedly active for 1 second and inactive for 1 second. The cycle persists until the alarm condition disappears.
2 Hz	Output repeatedly active for 500 ms and inactive for 500 ms. The cycle persists until the alarm condition disappears.
1.25 Hz	Output repeatedly active for 800 ms and inactive for 800 ms. The cycle persists until the alarm condition disappears.
1 Hz	Output repeatedly active for 1000 ms and inactive for 1000 ms. The cycle persists until the alarm condition disappears.
CONTINUOUS	Output active for as long as the alarm condition is met.

Table 81: Relay timing conditions

Now the advanced functionalities related to the digital inputs, found in the "**Inputs-Advanced**" tab of the Webserver, will be described:

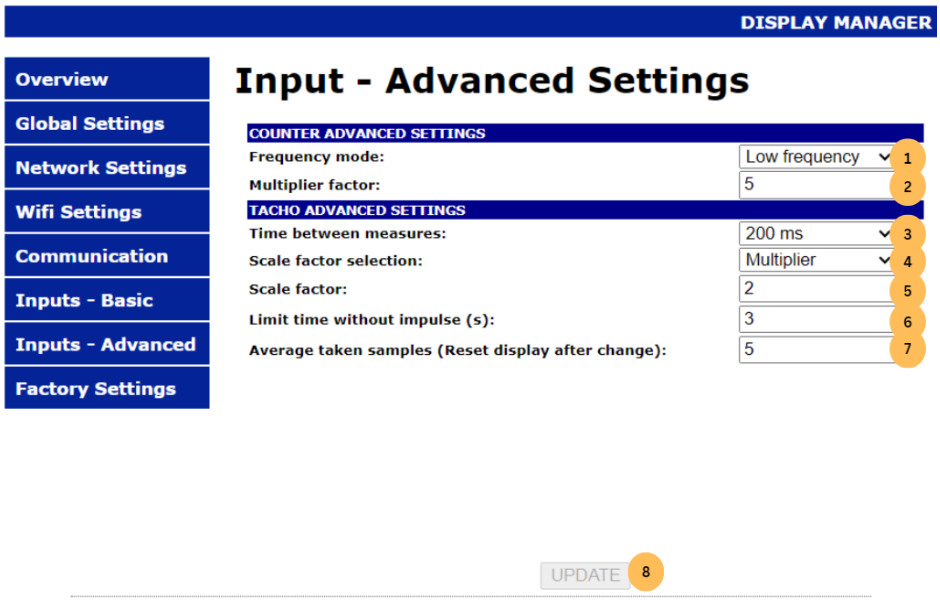


Fig. 93: Advanced digital input functionality settings screen in the web server

17. Selection of the frequency mode for the counter.
18. Multiplier factor for counting.
19. Measurement interval for the tachometer function.
20. Selection of the scaling factor type, either multiplier or divisor.
21. Scaling factor applied to the display output.
22. Time limit without tachometer pulses.
23. Number of measured samples used for averaging.
24. The UPDATE button must be pressed to save the changes.

10.2 Functions Associated With the Digital Inputs

10.2.1 Counter

The counter function allows displaying the number of pulses accumulated since the last reset. It has dedicated inputs for pulse entry, count direction (increment or decrement), as well as a reset input and two preset inputs.

The control inputs used are as follows:

Digital Input	Action Performed When Activated/Deactivated
E1	Increment counter value
E2	Decrement counter value
E3	Reset to zero
E4	Load preset 1
E5	Load preset 2

Table 82: Control inputs used in the counter function.

The counting multiplicity, meaning the number of counts incremented or decremented for each pulse, is configurable through the counter multiplier factor (from 1 to 20).

Additionally, you may select between low-frequency mode (1–100 Hz) or high-frequency mode (100 Hz–10 kHz) depending on the pulse signal frequency.
In low-frequency mode, filtering is applied to prevent contact bounce from corrupting the measurements.

Up to two TRIGGERs can be configured, preset to any value via the web server. Their activation conditions can also be configured according to the following table.

Selection	Activation Condition
DISABLED	Does not activate
= ALARM 1	Activates relay output if value = ALARM 1
≥ ALARM 1	Activates relay output if value ≥ ALARM 1
= ALARM 2	Activates relay output if value = ALARM 2
≤ ALARM 2	Activates relay output if value ≤ ALARM 2
> ALARM 1	Activates relay output if value > ALARM 1
< ALARM 1	Activates relay output if value < ALARM 1
> ALARM 2	Activates relay output if value > ALARM 2
< ALARM 2	Activates relay output if value< ALARM 2
= 0	Activates relay output if value = 0
≤ AL1 && ≥ AL2	Activates relay output if value ≤ ALARM 1 and ≥ ALARM 2
≥ AL1 && ≤ AL2	Activates relay output if value ≥ ALARM 1 and ≤ ALARM 2

Table 83: Activation conditions for the counter function.

If desired, a TRIGGER condition can be linked to either of the two relay outputs.
Timing behavior is also configurable, using single pulses of a specific duration or periodic activation frequencies.
The trigger condition resets via the reset input or when the triggering condition is cleared.

10.2.2 Chronometer

The chronometer function allows time counting in multiple scales and units. The control inputs for this functionality are:

Digital Inputs	Action Performed When Activated/Deactivated
E1	RUN chronometer = ON / STOP Chronometer = OFF
E2	Reset to zero
E3	Load preset 1
E4	Load preset 2
E5	Increase chronometer = ON / Decrease chronometer = OFF

Table 84: Control inputs used in the chronometer function.

Depending on the number of digits configured on the display, the shown format adjusts automatically.

Dígitos disponibles	Display Format
2 Digits	DD
3 Digits	D.DD
4 Digits	DD.DD
5 Digits	DD-DD
6 Digits	DDD-DD
7 Digits	DDDD-DD
8 Digits	HH-MM-SS

Table 85: Display format depending on digit count.

Importante: To use the stopwatch functionality with the colon format (XX:XX), this requirement must be specified in the order.
For displays with 4 or 5 digits, the shown units can be configured in the web server as either HH:MM or MM:SS.
Up to two ALARMs may be configured, preset to any value via the web server.
Their activation conditions follow the table below.

Selection	Activation Condition
DISABLED	Does not activate
= ALARM 1	Activates relay output if value = ALARM 1
≥ ALARM 1	Activates relay output if value ≥ ALARM 1
= ALARM 2	Activates relay output if value = ALARM 2
≤ ALARM 2	Activates relay output if value ≤ ALARM 2
> ALARM 1	Activates relay output if value > ALARM 1
< ALARM 1	Activates relay output if value < ALARM 1
> ALARM 2	Activates relay output if value > ALARM 2
< ALARM 2	Activates relay output if value< ALARM 2
= 0	Activates relay output if value = 0
≤ AL1 && ≥ AL2	Activates relay output if value ≤ ALARM 1 and ≥ ALARM 2
≥ AL1 && ≤ AL2	Activates relay output if value ≥ ALARM 1 and ≤ ALARM 2

Table 86: Activation conditions for the chronometer function.

As with the counter, an ALARM condition may be linked to one of the two relay outputs. The relay timing is also configurable, and the alarm condition resets either via the reset input or when the condition that triggered the alarm clears.

10.2.3 Tachometer

The tachometer function measures the frequency of a signal supplied to a digital input. For proper operation, the tachometer output signal must be connected to digital input E13, and its ground to the pin labeled COM.

The device displays the frequency of the input signal in Hertz. The current measurement range is 1 Hz to 20 kHz, with any waveform that has a single zero crossing.

Additional parameters configurable in the Webserver:

- **Measurement interval**, selectable from 200 ms to 20 s.
  Increasing this interval reduces variations when measuring high frequencies. However, long intervals are not recommended for low-frequency signals due to increased response time.
- **Scaling factor selection**, either multiplier or divisor.
  This determines whether the scaling factor applied to the display output is multiplied or divided.
- **Scaling factor**, applied to the displayed value depending on the input frequency.
  This value must be an integer from 1 to 15000.
- **Tachometer timeout**, in seconds.
  This is the time without receiving pulses after which the display should indicate that no signal is present.
  When exceeding this programmed time, the display shows 0.
  Adjustable from 1 to 10 seconds, with a recommended default of 1 second.
- **Number of averaged samples** shown on the display.
  Adjustable from 1 to 100, used to smooth variations in the input signal.
  Important: After changing this value, the display must be reset for the change to apply.

10.2.4 Direct BCD

The direct BCD function allows displaying a 3-digit number controlled through 14 digital inputs.

Inputs **E1–E4** control digit 1 (rightmost digit).
Inputs **E5–E8** control digit 2 (middle digit).
Inputs **E9–E12** control digit 3 (third digit from the right).
Decimal point position and negative symbol are controlled by **E13** and **E14**.

Digit BCD	Digital Inputs
Units	E4 E3 E2 E1
Tens	E8 E7 E6 E5
Hundreds	E12 E11 E10 E9

Table 87: Input assignment for direct BCD.

Decimal Point Configuration:

Decimal Point	E13 and E14
None	E14 = 0, E13 = 0
Tens	E14 = 0, E13 = 1
Hundreds	E14 = 1, E13 = 0
Minus symbol "–"	E14 = 1, E13 = 1

Table 88: Decimal point configuration for direct BCD.

Example: To display:

8	5.	3

The encoding must be:

Position		8				5				3			
0	1	1	0	0	0	0	1	0	1	0	0	1	1
E14	E13	E12	E11	E10	E9	E8	E7	E6	E5	E4	E3	E2	E1

Table 89: Practical example of direct BCD.

11 RESTORE FACTORY DEFAULT VALUES

In order to restore the entire Ethernet configuration to factory default settings in case the user makes an error during configuration, the Factory Settings tab has been enabled in the Webserver.

By pressing the Reset button, this action is executed.

It is possible to access this tab via WiFi, restoring all Ethernet configuration; however, the display must be restarted for the configuration changes to take effect.

IMPORTANT: Do not restore the Ethernet configuration unless it is absolutely necessary!

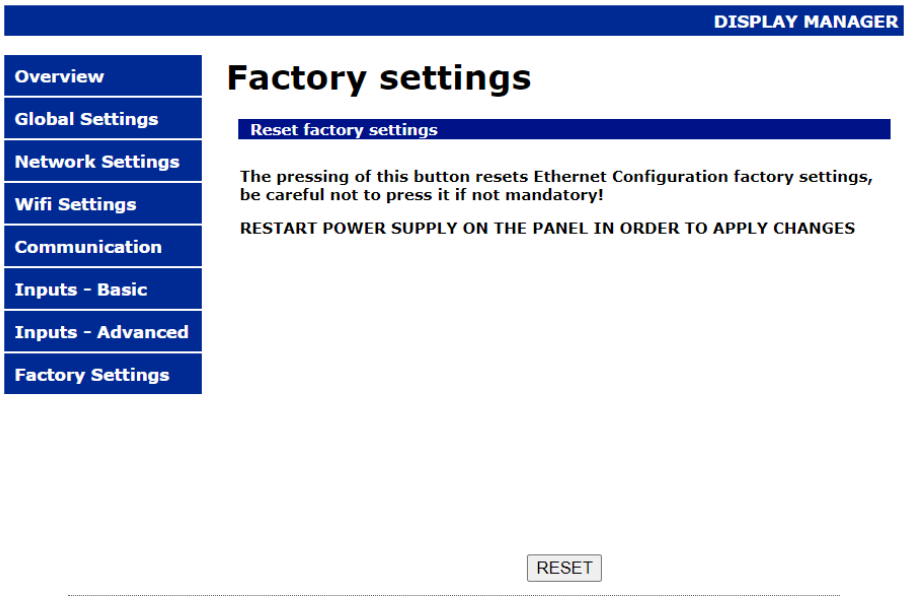


Fig. 94: Screen for advanced input function settings in the web server

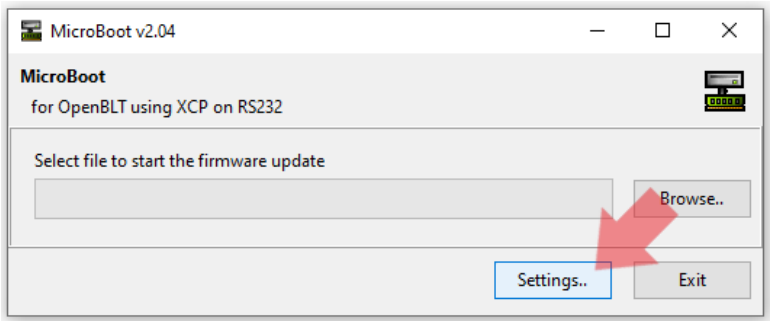
12 UPDATE THE DISPLAY

When it is necessary to update the firmware of the display, the update can be carried out using a PC with the **MicroBoot** program (https://www.ditel.es/descargas).

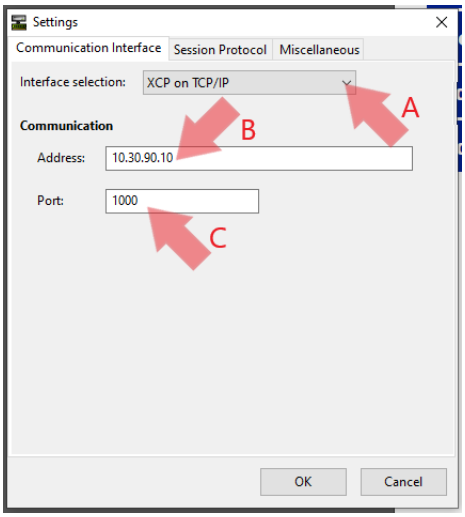
IMPORTANT: The update must be performed using a wired ETHERNET connection.

The steps to update the *firmware* are as follows:

7. Start the program and enter the settings menu.



8. Check the program settings:



   A. Select communication via **TCP/IP**.
   B. Configure the **IP address** assigned to the wired network.
   C. Set port **1000**.

9. Confirm the settings and select the desired firmware.

During the firmware update process, the display will show “Pr1”.

If the update takes too long to start, the process must be canceled. Check the IP address configured in MicroBoot, the Ethernet cable, and the Firewall rules, and then repeat the firmware upload process.

The program itself provides a “timeout” warning if it detects that too much time has passed, but it has no way of knowing whether the process has actually finished, so it does not interrupt the upload. It is only a time warning.

NOTE: If the upload process is interrupted (network drop, cable disconnection, etc.), the update remains incomplete and the display will not have valid firmware. In this situation, the only way to load proper firmware is to power on the device and upload a valid program (using MicroBoot) to the emergency IP address **192.168.1.100** when the display shows “Pr0”.

ANNEX 1: Sending information with “Hercules” for TCP, UDP, and serial communication

When performing communication using the “Hercules” program, it is important to consider certain aspects to avoid mistakes when sending values in decimal or hexadecimal.

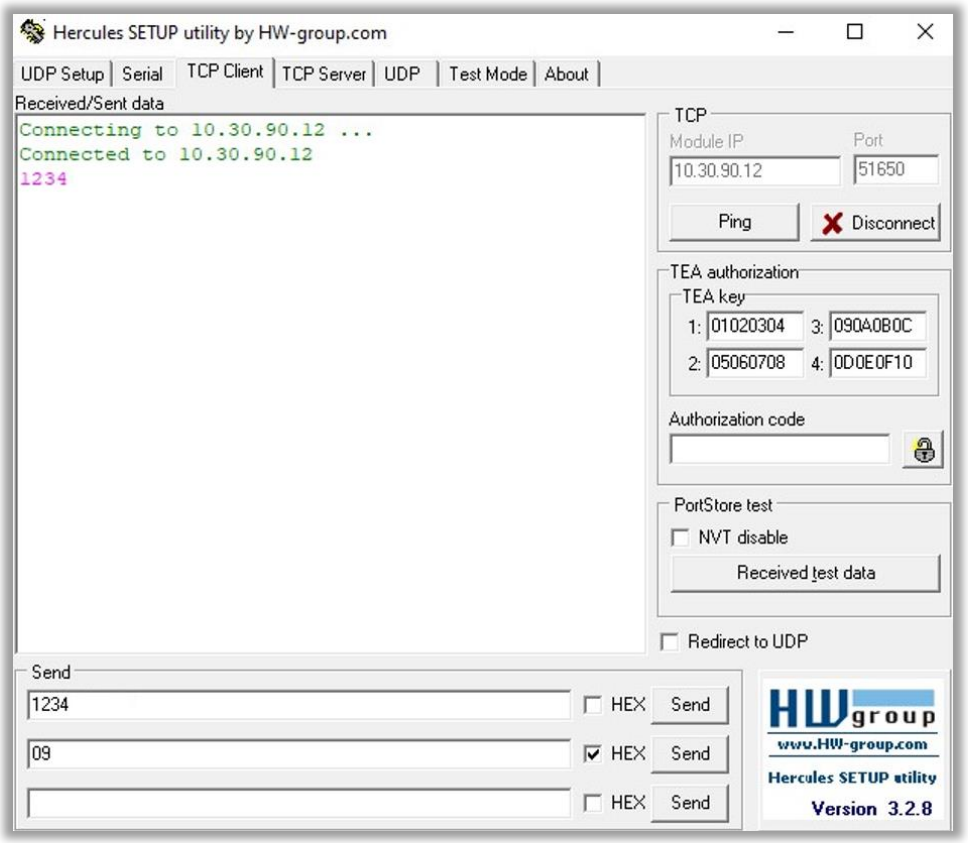


Fig. 95: Example in TCP using the “Hercules” program. “1234” is displayed.

First, it is necessary to set the communication information exactly as defined in the web server, according to the type of communication established.
There are several ways to send information:

- Write the values directly; they will be applied one by one as independent messages.
- Write the commands under “Send”; this allows sending the entire frame simultaneously. The program will automatically interpret numbers as decimals and letters as ASCII characters. To indicate to the program that a hexadecimal number is being entered, a “$” must be placed before the value.
- Write the commands under “Send” while selecting the “HEX” checkbox. This allows the user to write ASCII values directly in hexadecimal, without the need to add symbols.

This method of sending information is common to TCP, UDP, and serial modes.

Ejemplo de configuración del servidor web para TCP:

7. Ventana “Ajustes generales”, **DATA PORT** = ETHERNET.
8. Ventana de “Ajustes de red”, establecer los ajustes de red correctamente, en este caso **IP Addr** = 10.30.90.12 como se ha definido en “Hercules”.
9. Ventana de “Ajustes de comunicación”, **PROTOCOL** = TCP.

En caso de querer habilitar la visualización se puede configurar un “ENDBLOCK”, pero no es necesario para la comunicación.

Example of web server configuration for TCP:

7. In the “General Settings” window, set **DATA PORT** = ETHERNET.
8. In the “Network Settings” window, configure the network settings correctly; in this case, **IP Addr** = 10.30.90.12 as defined in “Hercules”.
9. In the “Communication Settings” window, set **PROTOCOL** = UDP.

If visualization is desired, an “ENDBLOCK” can be configured, but it is not necessary for communication.

Example of web server configuration for RS-232 serial:

5. In the “General Settings” window, set **DATA PORT** = SERIAL.
6. In the “Communication Settings” window:
    - **ADDRESS** = 14.
    - **PROTOCOL** = ASCII.
    - **INTERFACE** = RS232.
    - **HEADER** = 02h AL AH (one has been chosen; the message must be consistent with the established configuration.)
    - **ENDBLOCK** = <CR LF> 0Dh 0Ah
    - **REPLY** = NONE
    - **BAUDRATE** = 19200
    - **PARITY** = NONE
    - **DATA SIZE** = 8 bits
    - **STOP BITS** = 1 bit
    - **MSG.OFFSET** = 0
    - **VIEW** = NORMAL
    - **MSG.CURSOR** = 0

To send the message with “Hercules,” a USB-to-RS232 converter is used. To determine which “COM” port is assigned, it must be checked in the Windows “Device Manager.” The program is configured identically to the server, and the following frame is sent:

02 34 31 31 32 33 34 0D 0A

This frame contains all the parameters necessary to display 1234, including headers and frame ending.

ANNEX 2: Sending information with "QModMaster" for MODBUS TCP and MODBUS RTU communication

When performing MODBUS communication using QModMaster, there are few differences between operating in RTU or TCP mode.

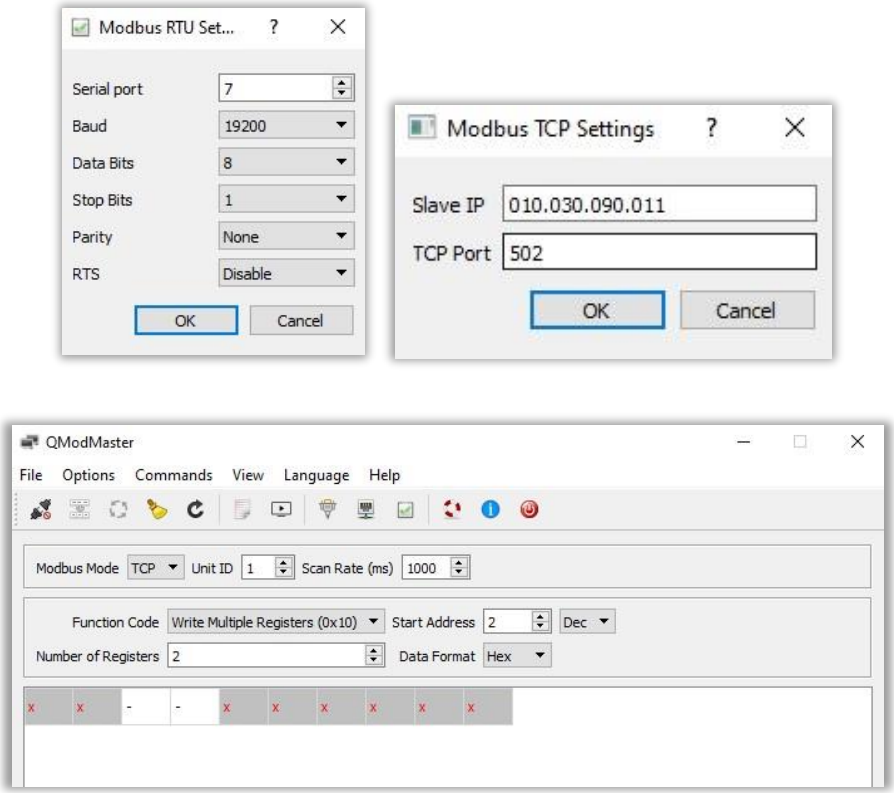


Fig. 96: Operation of the QModMaster program.

First, you must check that the connection settings are correct. These settings differ between RTU and TCP, but in both cases they must match the information configured in the display's web server. In MODBUS TCP, the port is always 502.

Next, you must configure the "Unit ID" and the "Scan Rate." If only one device is connected, an image like the one above will be displayed.

At this point, the type of frame to be sent is configured according to the value you want to display, following the protocols explained in section 6.4.
The parameters to be configured are the following:

- **Function Code:** Select the type of action you want to perform, whether it is reading or writing registers or coils. The dropdown menu specifies all the possibilities, as well as their corresponding function codes.
- **Start Address:** Indicates the first register to read or write. It is recommended to keep this value in decimal.

- **Number of Registers:** Indicates how many registers you want to work with.
- **Data Format:** This dropdown menu allows you to change the register content to the desired format. It is very useful for entering data in the most convenient way possible. If data already exists, the program converts it automatically.

Example 1: Writing “HOLA” to the display using MODBUS TCP.

First, configure the web server as follows:

7. In the “General Settings” window, set **DATA PORT** = ETHERNET.
8. In the “Network Settings” window, configure the network parameters correctly; in this case, **IP Addr** = 10.30.90.11 as defined in QModMaster”.
9. In the “Communication Settings” window, set **PROTOCOL** = MODBUS

Next, use the “Write Multiple Registers” function (10h) to write 2 registers with the content 484Fh 4C41h, starting at address 0.

The configuration in QModMaster would look as follows:

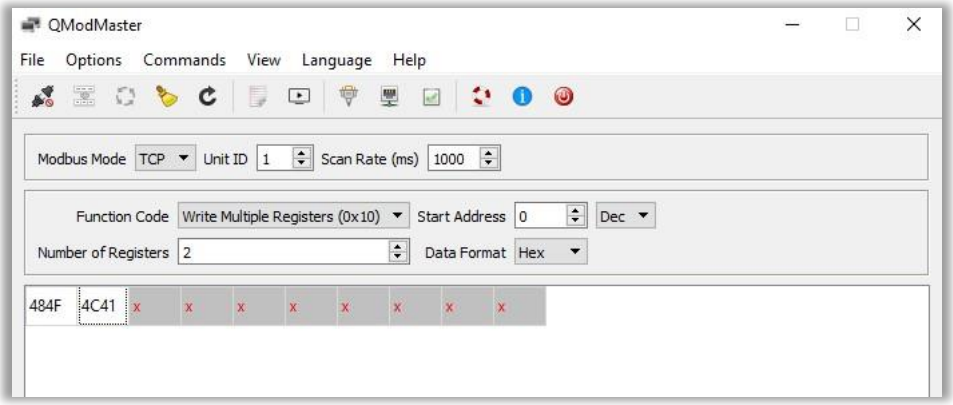


Fig. 97: Example of communication in QModMaster. Sending “HOLA” to the display.

Once everything is configured, click the connector button in the upper left corner of the panel. This starts communication with the display.

Finally, by clicking the button immediately to the right of the connector, the frame will be sent and “HOLA” will appear on the display.

NOTE: It is very useful to open the “Bus Monitor” under the “View” tab. This opens a window showing each frame sent and received during communication.

Example 2: Writing “HOLA” to the display using MODBUS RTU. First, configure the web server as follows:

First, configure the web server as follows:

5. In the “General Settings” window, set **DATA PORT** = SERIAL.
6. In the “Communication Settings” window:
    - **ADDRESS** = 1.
    - **PROTOCOL** = MODBUS RTU.
    - **INTERFACE** = RS232.
    - **BAUDRATE** = 19200
    - **PARITY** = NONE
    - **DATA SIZE** = 8 bits
    - **STOP BITS** = 1 bit

To send the message using QModMaster, a USB-to-RS232 converter is used.
To identify which “COM” port is assigned, check the Windows “Device Manager.”
Configure the program identically to the web server for RTU.

Sending information to the registers is done in the same way as in the previous MODBUS TCP example.

ANNEX 3: Configuring and using function blocks to send information using a PLC.

The examples in this annex were created using a “CPU 1512 SP-1 PN” PLC.

MODBUS_RTU: The following blocks are used to perform communication with the display:

First, the blocks used to configure and establish the connection are shown.

In the “PORT” input, the corresponding communication card is used — in our case, “CM PtP”.

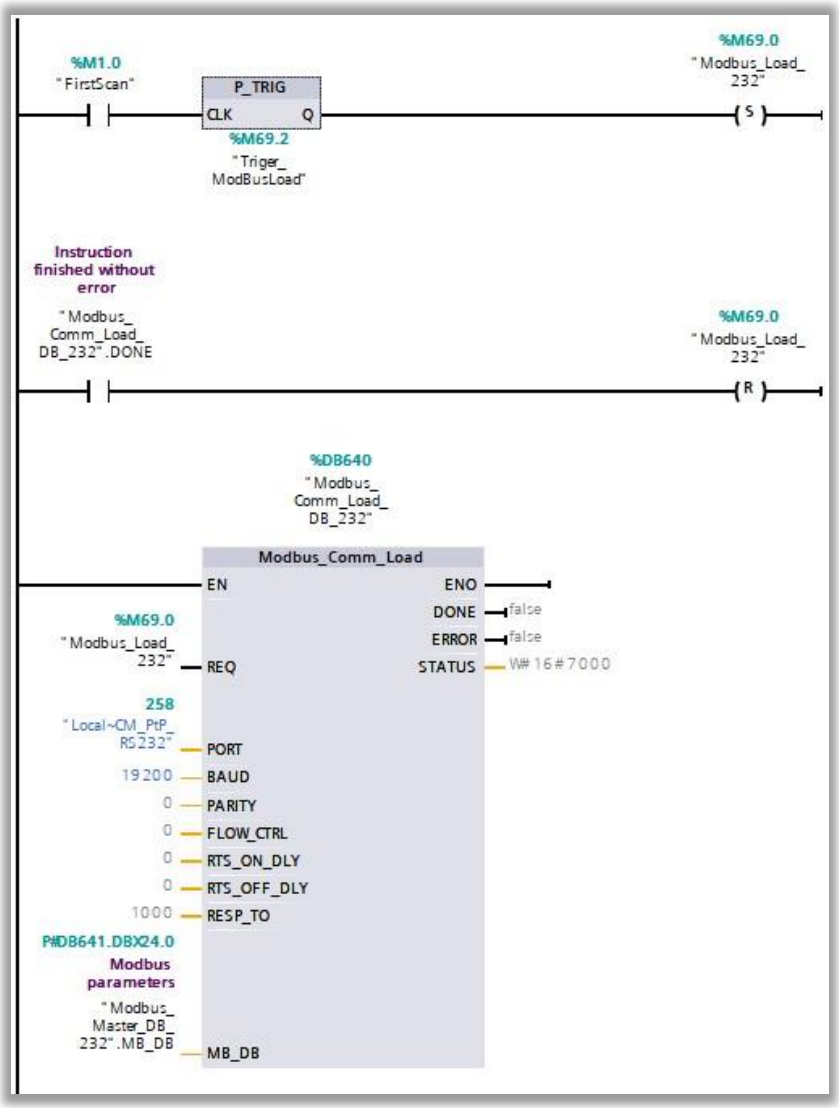
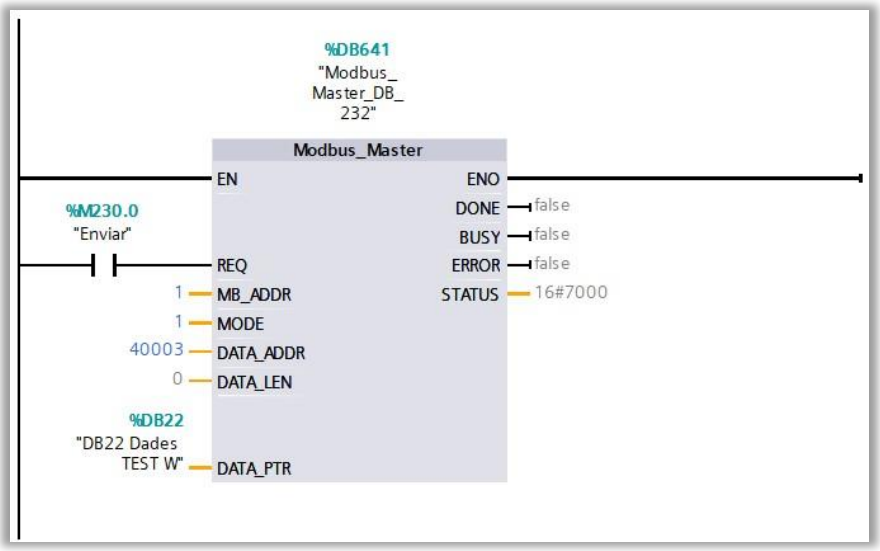
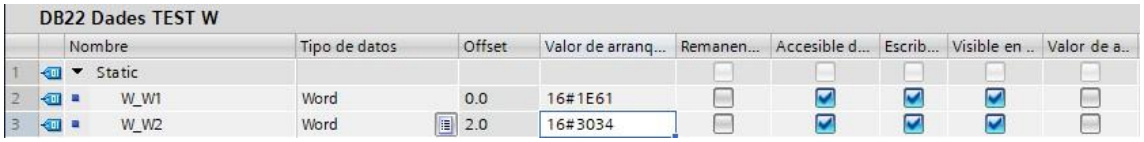


Fig. 98: Communication configuration blocks.

Next, the blocks and variables used to generate and send a register write message are shown.



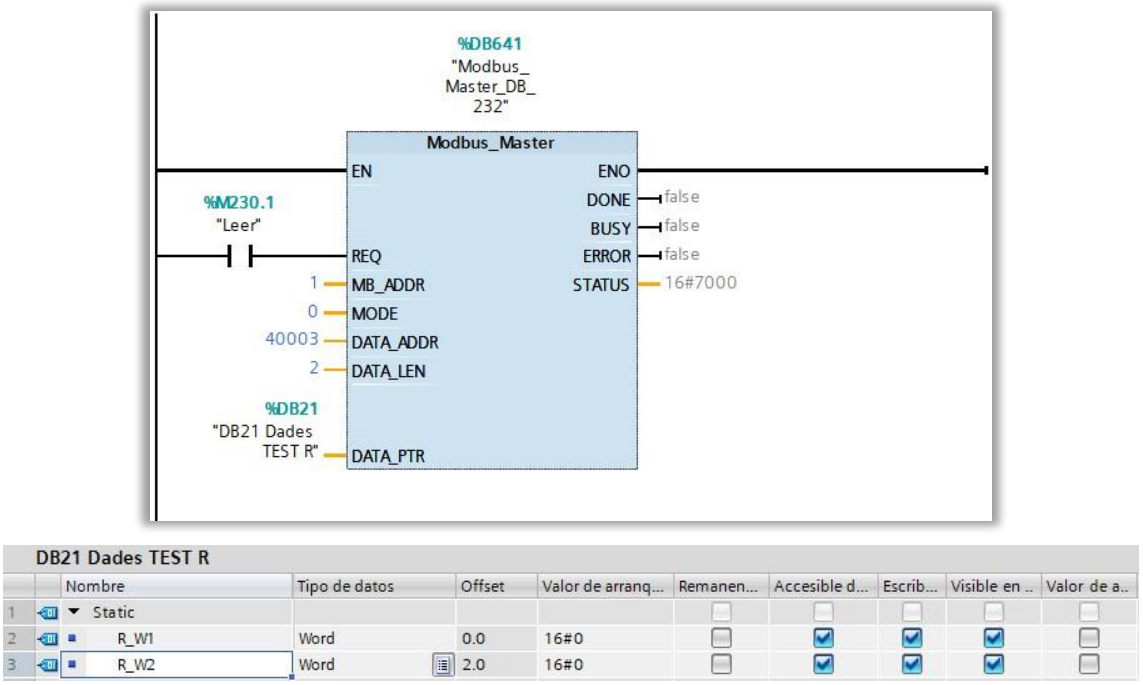


DB22 Dades TEST W

	Nombre	Tipo de datos	Offset	Valor de arranq...	Remanen...	Accesible d...	Escrib...	Visible en ...	Valor de a...
1	Static								
2	W_W1	Word	0.0	16#1E61		☑	☑	☑	
3	W_W2	Word	2.0	16#3034		☑	☑	☑	

Fig. 99: Generation of the content of the registers to be sent.

Finally, the blocks and variables used to generate and send a register read message are shown.



DB21 Dades TEST R

	Nombre	Tipo de datos	Offset	Valor de arranq...	Remanen...	Accesible d...	Escrib...	Visible en ...	Valor de a...
1	Static				☐	☐	☐	☐	☐
2	R_W1	Word	0.0	16#0	☐	☑	☑	☑	☐
3	R_W2	Word	2.0	16#0	☐	☑	☑	☑	☐

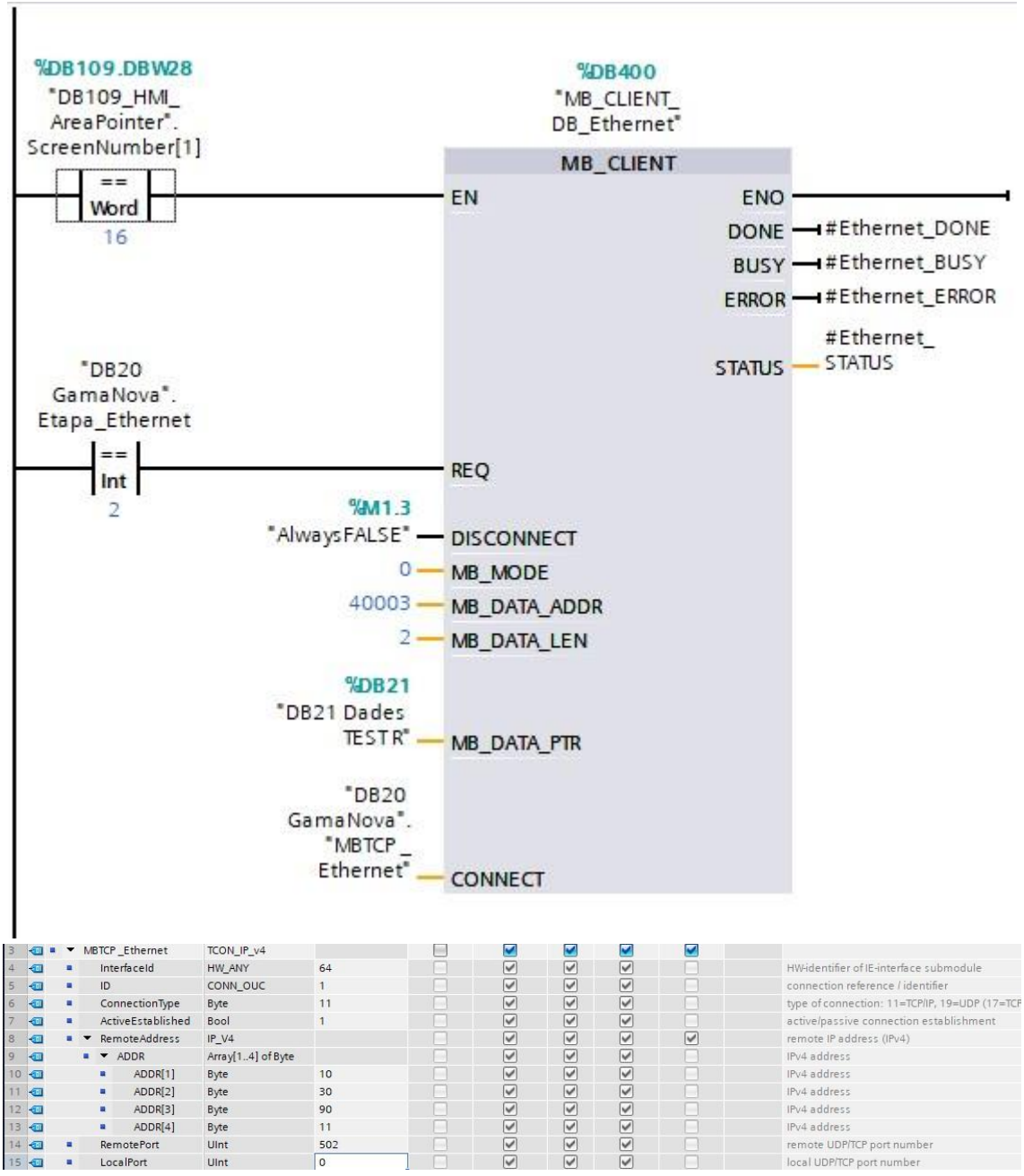
Fig. 100: Reading the registers of the response.

It can be seen that the block is the same (“Modbus_Master”). By changing the input values, the message is configured as either a write or a read, including the number of registers and their location.

IMPORTANT: When configuring the “Modbus_Master,” the corresponding documentation must be consulted to avoid mistakes in any of the block inputs. Depending on the MODBUS function used and its content, the inputs may need to be modified to match the requirements of each information transmission.

MODBUS_TCP: The “Modbus_Master” modules for MODBUS_TCP are the same as for RTU.

These blocks initiate communication via MODBUS_TCP. It is necessary to correctly configure the “MBTCP:Ethernet” variable.



3		MBTCP_Ethernet	TCON_IP_v4		☐	☑	☑	☑	☑	
4		InterfaceId	HW_ANY	64	☐	☑	☑	☑	☐	HW-identifier of IE-interface submodule
5		ID	CONN_OUC	1	☐	☑	☑	☑	☐	connection reference / identifier
6		ConnectionType	Byte	11	☐	☑	☑	☑	☐	type of connection: 11=TCP/IP, 19=UDP (17=TCP
7		ActiveEstablished	Bool	1	☐	☑	☑	☑	☐	active/passive connection establishment
8		RemoteAddress	IP_V4		☐	☑	☑	☑	☑	remote IP address (IPv4)
9		ADDR	Array[1..4] of Byte		☐	☑	☑	☑	☐	IPv4 address
10		ADDR[1]	Byte	10	☐	☑	☑	☑	☐	IPv4 address
11		ADDR[2]	Byte	30	☐	☑	☑	☑	☐	IPv4 address
12		ADDR[3]	Byte	90	☐	☑	☑	☑	☐	IPv4 address
13		ADDR[4]	Byte	11	☐	☑	☑	☑	☐	IPv4 address
14		RemotePort	UInt	502	☐	☑	☑	☑	☐	remote UDP/TCP port number
15		LocalPort	UInt	0	☐	☑	☑	☑	☐	local UDP/TCP port number

Fig. 101: Configuration of communication in MODBUS_TCP.

The IP address must be configured according to the value assigned in the display’s web server. To do this, create the variable “MBTCP_Ethernet” and set its type to TCON_IP_v4—this automatically creates all the required fields.
Remember to set the desired IP and ConnectionType = 11 (TCP/IP).

The “MB_MODE” input (1 or 0) indicates whether the communication is for reading or writing registers.

UDP: To communicate via UDP, Siemens blocks downloaded from their website are used—specifically “S7-1200/S7-1500 (LOpenUserComm_Udp).

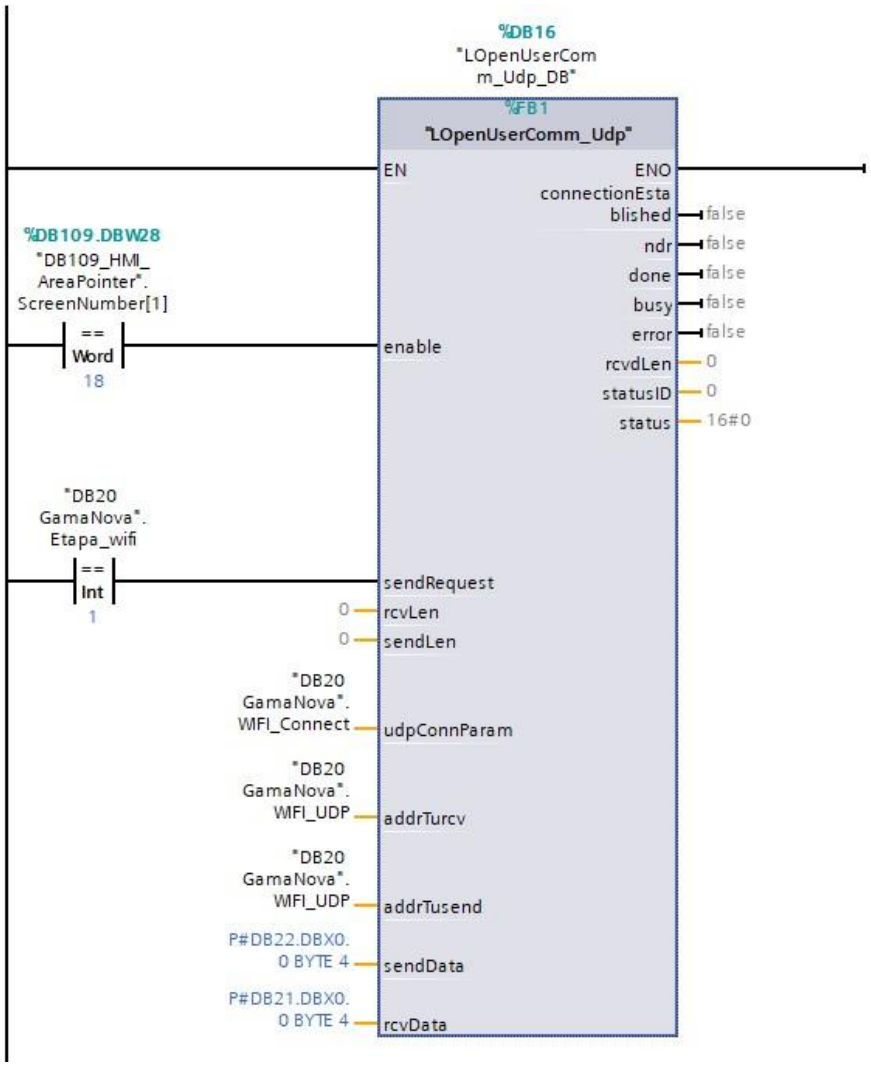
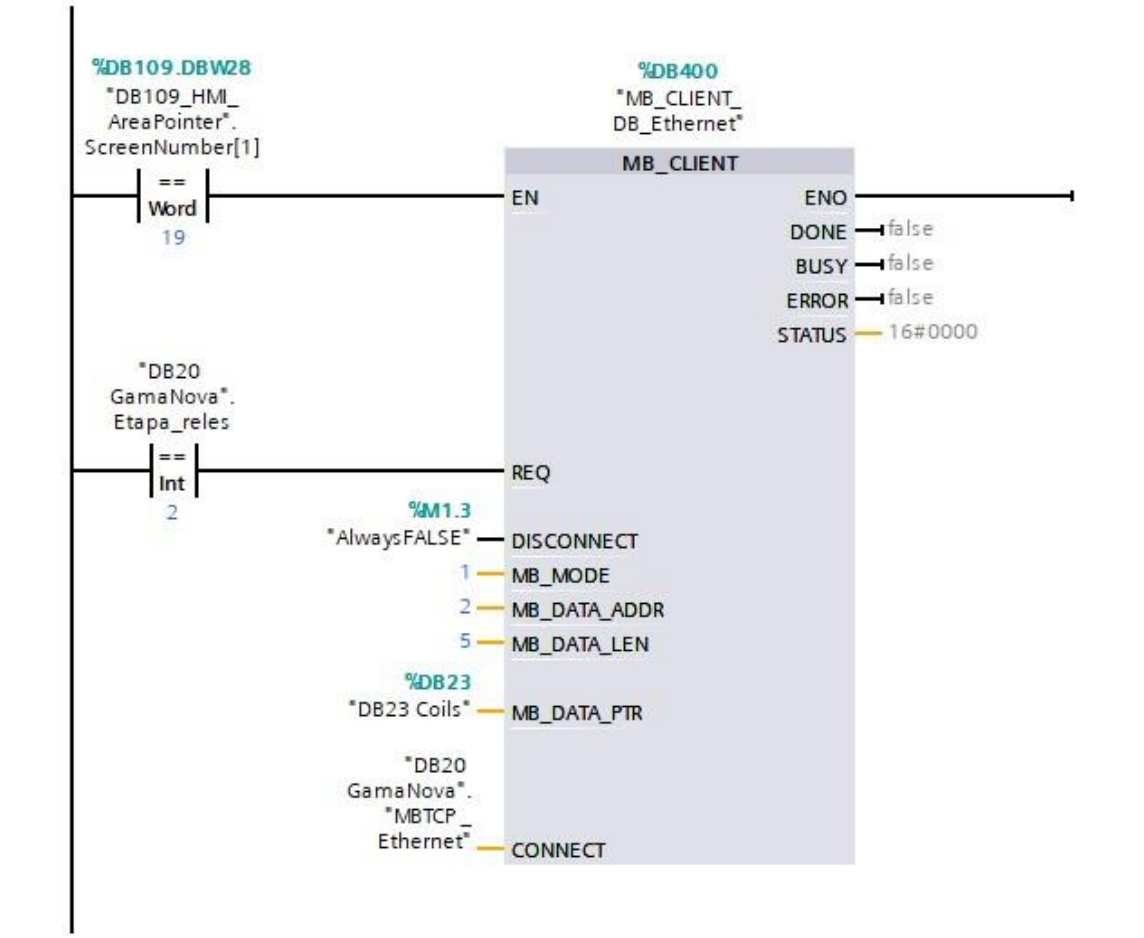


Fig. 102: “LOpenUserComm_Udp” block used to perform UDP communication.

This module automatically manages the configuration once the inputs are set as desired.

WIFI: For WIFI communication, an external module (TPLINK) is used, so the PLC communicates as if it were a wired network.

RELAYS: To activate the relays or blinking function, MODBUS must be used. In our case, we use the previously mentioned MODBUS_TCP module. The difference is clearly visible: in this case, work is done using address “MB_DATA_ADDR = 2” and a data length of “MB_DATA_LEN = 5”, since there are five modifiable elements (4 relays + blinking).



DB23 Coils

	Nombre	Tipo de datos	Offset	Valor de arranq...	Remanen...	Accesible d...	Escrib...	Visible en ..	Valor de a..
1	Static								
2	Rele_1	Bool	0.0	false					
3	Rele_2	Bool	0.1	false					
4	Rele_3	Bool	0.2	false					
5	Rele_4	Bool	0.3	false					
6	Parpadeo	Bool	0.4	false					

Fig. 103: Configuration and generation of the content to be sent to the “Coils.” Relay and blinking management.

In “DB23 Coils,” the desired state is written to activate or deactivate relays (1 to 4) or the blinking function (5).