

OPERATION MANUAL

DISPLAY

DN-1x9-V2

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1 INTRODUCTION

DN series displays are industrial led visualizers presenting numerical relevant data, allowing long distance check. Different number of digits, digit size, control bus and other options can be built on a modular basis:

- 2 to 10 digits.
- Monochrome red leds.
- IP41/IP54/IP65 environmental protection
- High brightness for outdoor use.
- Control Bus: Serial (RS-232/RS-485 (Option RS422)), Ethernet and WIFI. Each one with different protocols.
- A text up to 3 characters can be added, allowing data plus units presentation.
- One or two sides.
- Digit height can be **DN-109: 57 mm, DN-119: 100 mm & DN-189: 180 mm**, so maximum reading distance span from 30, 50 to 90 meters.
- Rugged extruded aluminum box and stainless-steel option.
- 80-240Vac 50/60Hz power supply and +24Vdc option.
- Other options are possible like GPS sync or external probes (T, HR, CO2,)

The range of applications is very wide, in applications where important data in industrial processes must be displayed clearly, securely and remotely. Data are collected from networks or direct equipment, PC or PLC.

Display configuration is easily done by WEBSERVER, all parameters and protocols are available conveniently. Defect IP: **10.30.90.10**.

2 GENERAL CHARACTERISTICS

2.1 Display

2.1.1 DN-109

Power supply	80 a 240 VAC 50/60Hz. Option 24VDC.
Consumption	See 2.2.1 .
Display	7 segments 57 mm + decimal dot
.....	Reading Max. reading distance 30 m
Text (LED)	Red 3 mm
.....	50 mm height
Text (Vinyl)	White Vinyl 50 mm de height.
Parameter internal memory	Eeprom.
Environmental Conditions	Working temperature: -20 a 60°C.
.....	Storage Temperature: -30°C a 70°C
.....	Humidity: 20-90% HR no condensation. See options
.....	Max. Ambient light 1000 lux
.....	Protection: IP41, optionally IP54/IP65

2.1.2 DN-119

Power supply	80 a 240 VAC 50/60Hz. Option 24VDC.
Consumption	See 2.2.2 .
Display	7 segments 100 mm + decimal dot
.....	Red. Max. reading distance 50 m
Text (LED)	Red 3 mm
.....	65 mm height
Text (Vinyl)	White Vinyl 65 mm de height.
Parameter internal memory	Eeprom.
Environmental Conditions	Working temperature: -20 a 60°C.
.....	Storage Temperature: -30°C a 70°C
.....	Humidity: 20-90% HR no condensation. See options
.....	Max. Ambient light 1000 lux. See options
.....	Protection: IP41, optionally IP54/IP65

2.1.3 DN-189

Power supply	80 a 240 VAC 50/60Hz. Option 24VDC.
Consumption	See 2.2.3 .
Display	7 segments 180 mm + decimal dot
.....	Red. Max. reading distance 90 m
Text (Vinyl)	White Vinyl.
Parameter internal memory	Eeprom.
Environmental Conditions	Working temperature: -20 a 60°C.
.....	Storage Temperature: -30°C a 70°C
.....	Humidity: 20-90% HR no condensation. See options
.....	Max. Ambient light 1000 lux. See options
.....	Protection: IP41, optionally IP54/IP65

2.2 Weight and consumption

2.2.1 DN-109

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (w)	Ref.	W (kg)	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 1: Weight and consumption of DN-109 displays.

2.2.2 DN-119

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (W)	Ref.	W (kg)	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 2: Weight and consumption of DN-119 displays.

2.2.3 DN-189

Ref.	W (kg)	C (W)	Ref.	W (kg)	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 3: Weight and consumption of DN-189 displays.

Sizes and dimensions

2.2.4 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 4: Sizes and dimensions of DN-119 and DN-109 displays.

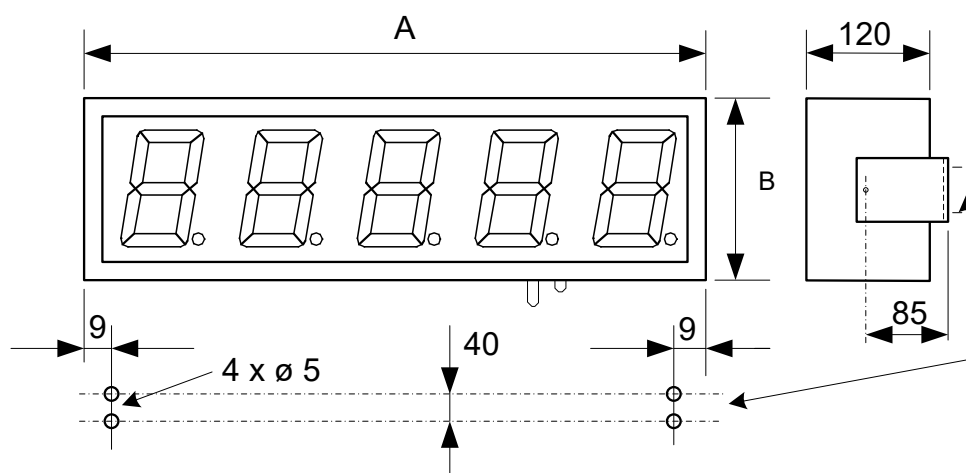


Fig. 1: DN-109 and DN-119 drawing, plus wall fixing

All measures in millimeters

2.2.5 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 5: Sizes and dimensions of DN-189 displays.

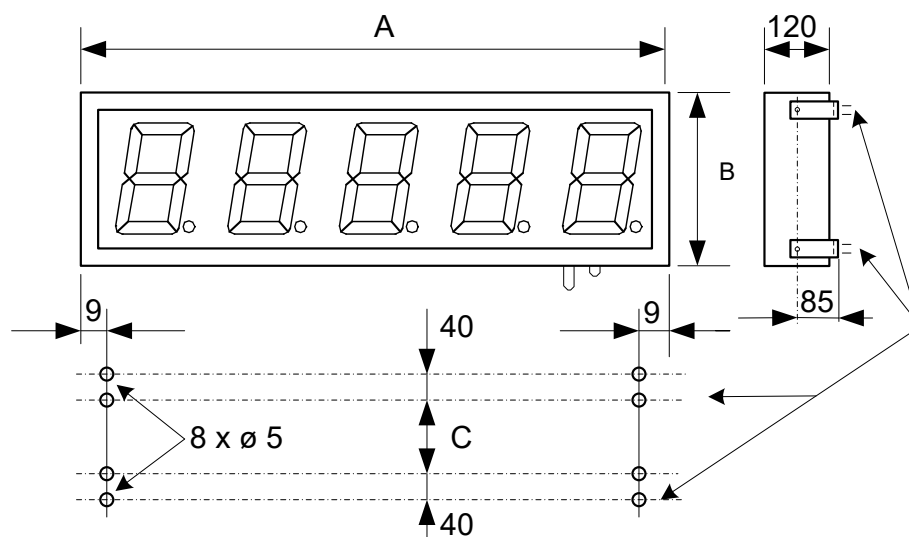


Fig. 2: DN-189 drawing plus wall fixing

All measures in millimeter

3 INSTALLATION

DN-1x9 installation is easy by complying the following rules.

Choose carefully an installation place that complies with environmental requirements and avoid vibration. Choose the display IP level according to place requirements. IP65 installation details can be found at [3.3](#).

DN-1x9 displays must be installed indoors with maximum 1.000 lux ambient light, far from direct sun light. For outdoors or highly illuminated indoors please use models with high brightness option.

Avoid connect the display to disturbed lines or in places with very high EMC levels.

3.1 Connectors

Connectors placement is on the display bottom surface.

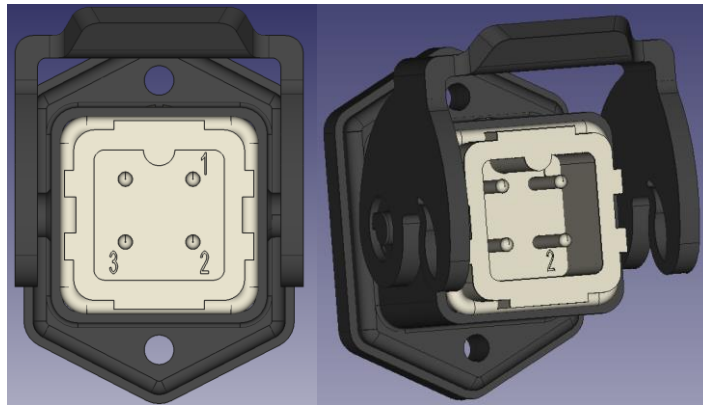


Fig. 3: Power supply connector

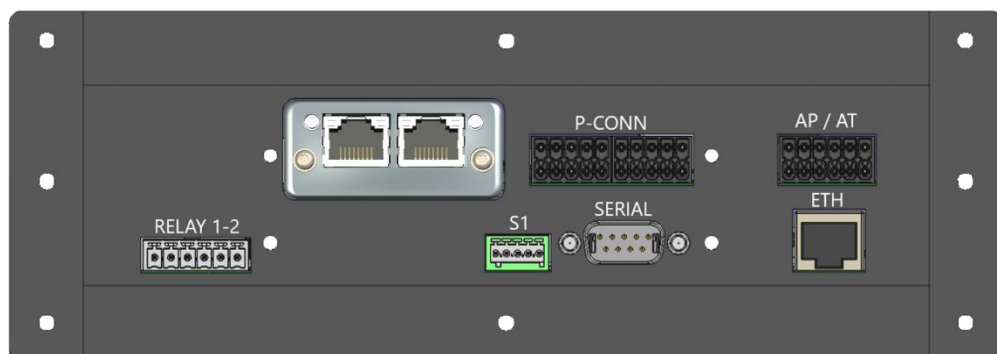


Fig. 4: General connectors

 The image shown does not correspond to reality, it is only an illustrative example.

General connectors:

- **ETH.** RJ45 Ethernet.
- **SERIAL.** DB-9 connector male. See [3.4](#).
- **S1.** Probe connector 1. E.g. for T & HR sensing.
- **RELAY 1-2.**



1 = Relé 1 - NO 4 = Relé 2 - NO
 2 = Relé 1 - C 5 = Relé 2 - C
 3 = Relé 1 - NC 6 = Relé 2 - NC

- **P-CONN.** 14 digital input
- **Industrial BUS.** Profinet

Actual display can present less connectors than appears at the picture.

3.2 Power supply

80 to 240 VAC, 50/60 Hz or 24VDC optionally.

External connection must comply local regulations. A minimum section of 1.5 mm² is recommended.

See pin out at the below picture, depending on AC or DC connection. One aerial connector is provided.

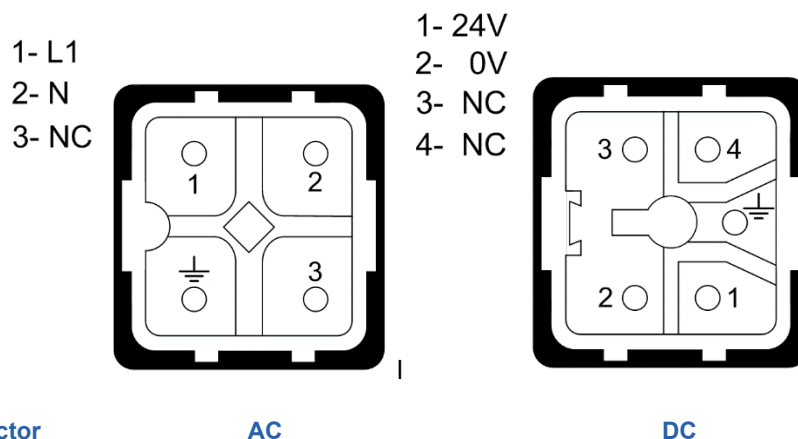


Fig. 5: Connector

3.3 IP65 protection level

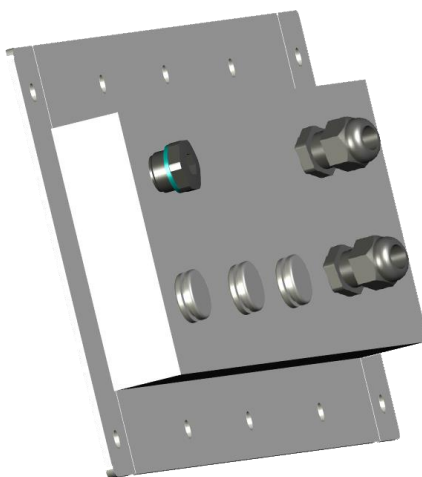
Only for IP54/65 option.

A kit is provided:

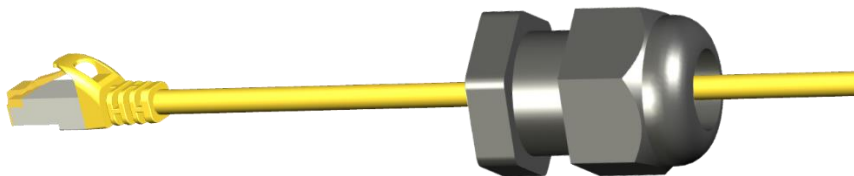
- External cover
- Cable glands
- Vent plug
- Rubber plugs
- Insulating gasket
- Specific cable connector (Relays, RJ45, and DB-9)

Procedure:

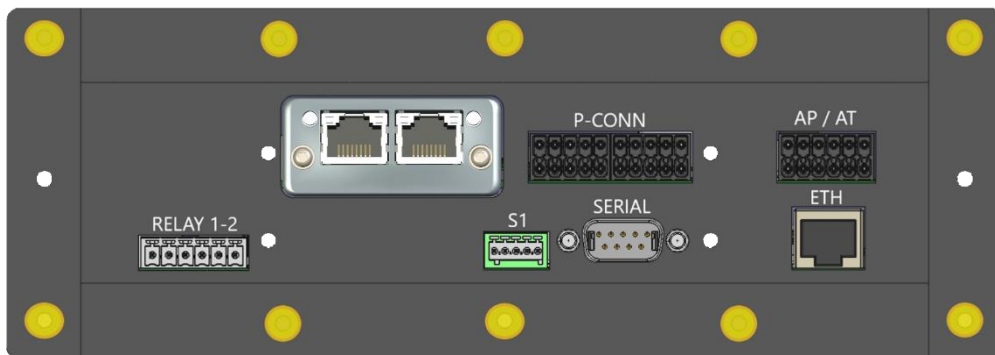
1. Install the cable glands, ventilation plug and rubber plugs according to the communication/connection to be used.



2. Pass the corresponding cable (without the cable connector) through the cable gland, towards the inside of the cover.
3. Wire the provided cable connector and connect it to the display port.

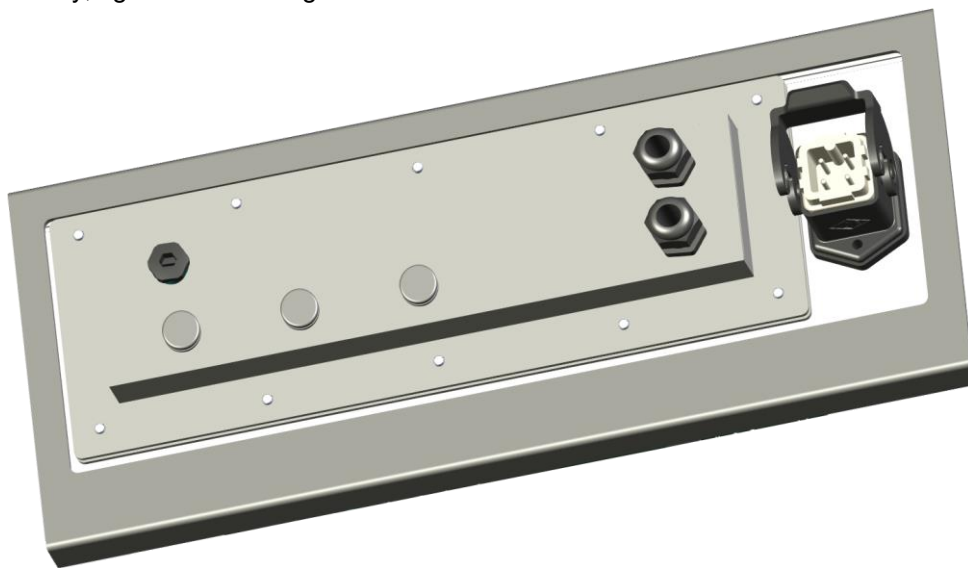


4. Remove the 10 screws marked in yellow (Do not remove the flat head screws on the sides) and set aside.



 **The image shown does not correspond to reality, it is only an illustrative example.**

5. Present the insulating gasket, place the box on top, ensuring that the insulating gasket is correctly positioned between the cover and the display, and retighten the screws removed in point 4.
6. Finally, tighten the cable glands of the connections used.



PLEASE BE CAREFUL. BAD INSTALLATION MAY VOID WARRANTY

3.4 Serial Line connector

DN-1x9 displays are ready to work with RS-232 and RS-485. Optionally it can be configured to work with RS-232 and RS-422. Please select option with order.

Choosing between 232 and 485/422 is done by the customer using the WEB SERVER configurator. See [4.2.2](#).

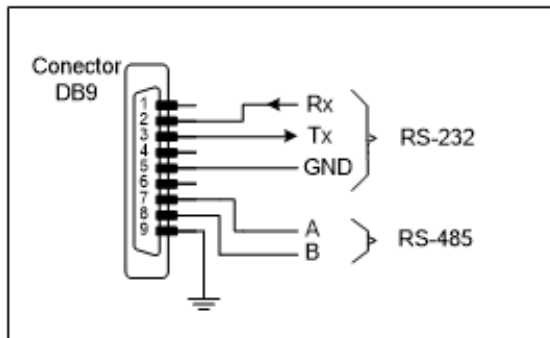


Fig. 6: DB9 pin out RS-232/RS-485

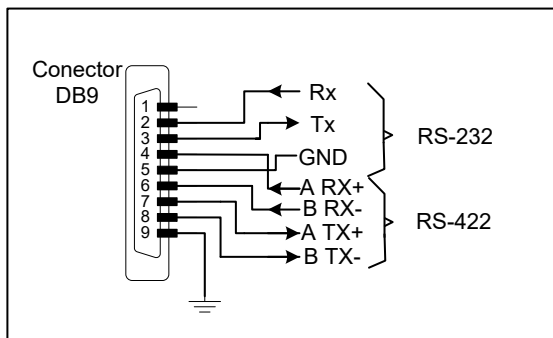


Fig. 7: DB9 pin out RS-232/RS-422.

3.4.1 RS-232 connection between a PC and DN-1x9 display

Use a standard RS-232 line. Maximum recommended length is 15 m (9.600 bps). Use shielded cable and connect shield to pin 9. Please avoid near disturbances.

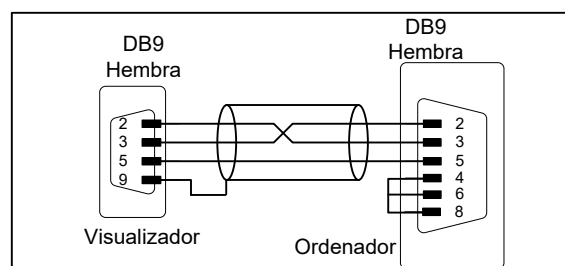


Fig. 8: Aerial cable

3.4.2 RS-485 between DN-1x9 display and a PC

Use a standard RS-485 line. Maximum recommended length 1.000 m. Use braided and shielded cable and connect shield to pin 9. Please avoid near disturbances.

At both ends of RS-485 line a 120 Ω termination must be placed.

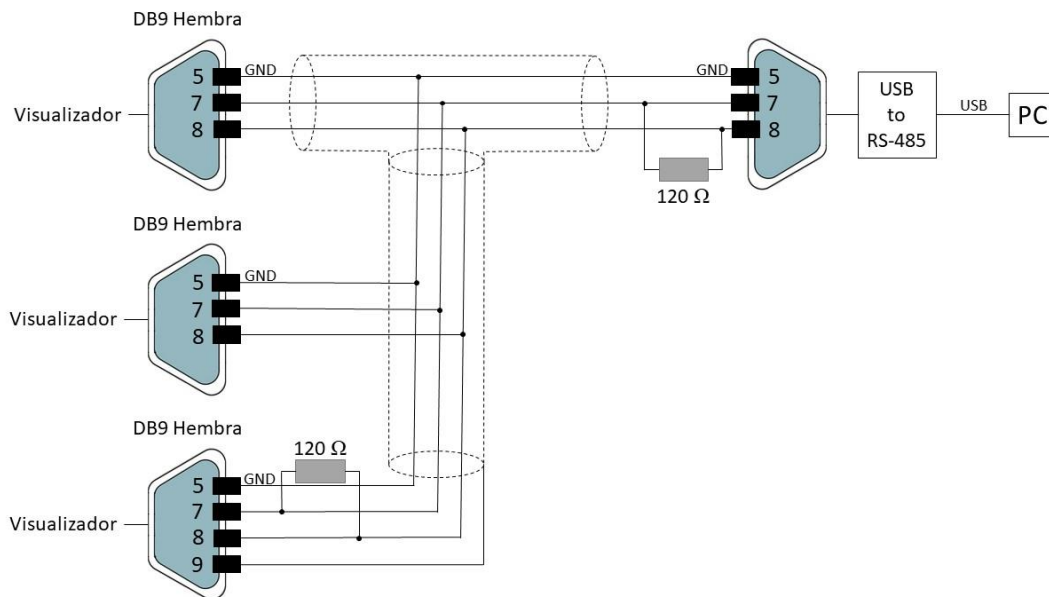


Fig. 9: Aerial cable example.

3.5 Ethernet line connection

Ethernet connection is done by a RJ-45 connector, located at the bottom of the display.

The display can be connected directly to a computer or to a network, usually using a switch or hub module. We recommend at least 100Base-T4, cat5.

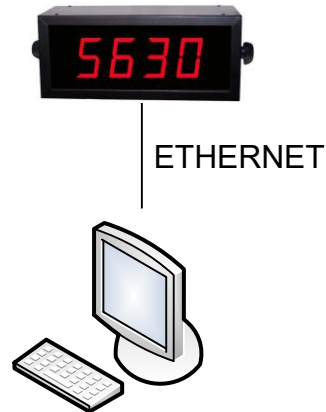


Fig. 10: Direct computer connection diagram.

More than one display can be connected to the same network.

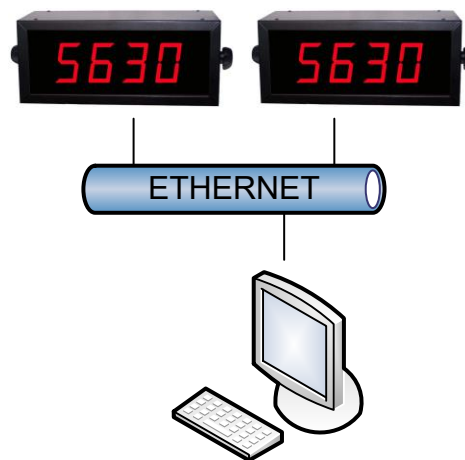


Fig. 11: Example

4 INITIALIZATION

4.1 Start-up

Before connecting to power supply please be sure all the above mentioned advices are done.

During the boot process, the different initialization stages will be indicated on the display, in order:

- (1) **Pr0:** Each time the display is powered up and before starting the main program, an access time is established to enable bootloader. This allows to upgrade display in case of FW corruption. This can be done through the emergency IP address **192.168.1.100**. While this time is on, "PR0" is displayed. Refer to [point 9](#).
- (2) **Test sequence of the led segments:** While this time all display segments are activated one by one, and lately they are deactivated in reverse order, so everyone can check if they all are working properly.
- (3) **F.XX:** Displays the hardware ID. "XX" corresponds to the specific value corresponding to the actual display.
- (4) **uX.X:** Shows the firmware release.
- (5) **Display is ready:** It shows the value send from the PC / PLC, or hyphens if no information is sent (time without data activated), or zero "0" if no device is connected.

Note: To show all the displays connected to network, and allow quick to them please download the "Display discoverer" program (<https://www.lartet.com/en/download-center/>).

To configure the display, it must be connected by ethernet cable (RJ45) to the same network as the PC in use. It is also possible to do it by WIFI.

4.1.1 Configuration with "Display Discoverer"

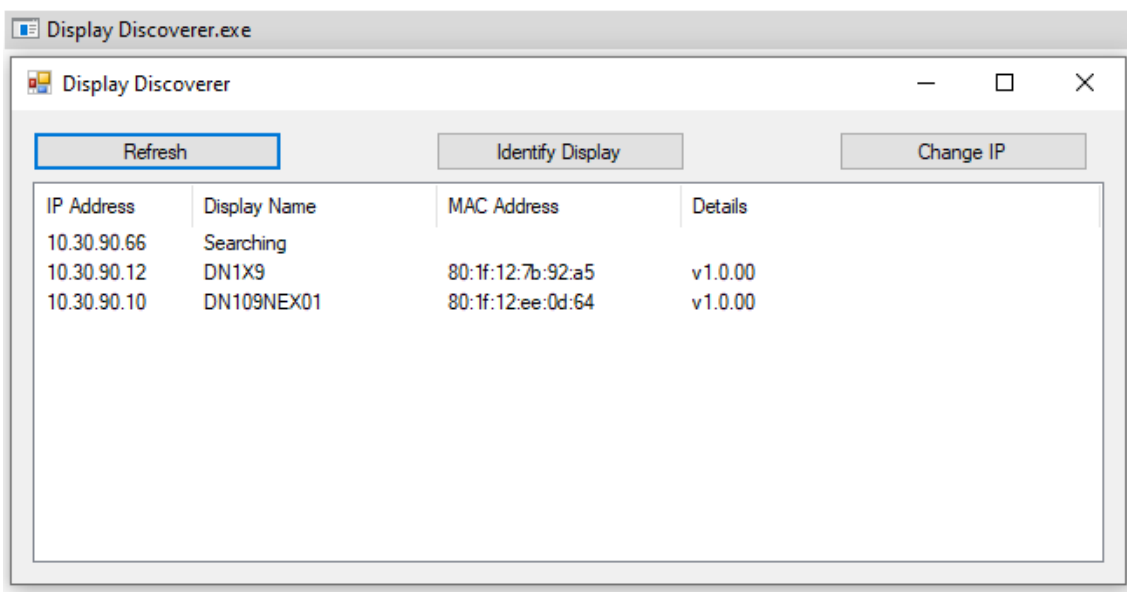


Fig. 12: "Display Discoverer" software window.

By default, the viewer comes from factory with IP address **10.30.90.10**. To change the IP you have to select the default IP and press "Change IP" button. Once done, press "Refresh" to view the new IP. IP address can be changed any time is needed.

If an automatic IP address is desired, press "Auto-Assign IP". This will set display to DHCP mode.

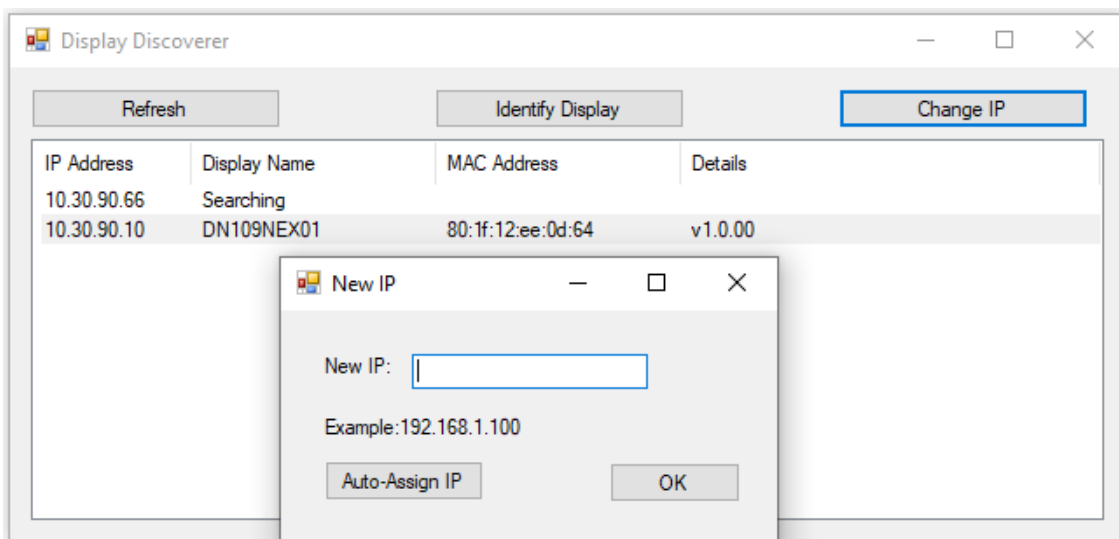


Fig. 13: IP changing window.

Double-clicking on the already modified address will open the browser to the web server page. It can also be accessed by typing the IP directly in the browser.

IMPORTANT:

If several new devices are received for installation, keep in mind that they will all come configured with the same IP address. Therefore, prior to its configuration, the IP of some equipment must be changed individually to avoid duplication of addresses.

When working with several displays it is easy to get confused and configure other than the desired one, from the set of installed equipment. For this reason, the “Identify Display” function has been added. Selecting a display from the list of detected devices and clicking this button will cause it to flash 3 times, allowing you to easily identify which device is going to be configured.

4.2 Display Configuration

To configure the display parameters access to the device WEBSERVER.

To do this, connect the display to your local network (or directly to a PC), and using the “Display Discover” application, select the desired display. By double clicking the selection you go directly to WEB SERVER.

If you already know the display IP address, you can type it on a WEB BROWSER.

If you want to access the public time servers, you must have an Internet connection.

It is also possible to configure and use the display via WIFI connection. The WIFI connection has its own IP address.

Below, the different WEBSERVER pages are shown:

4.2.1 Overview

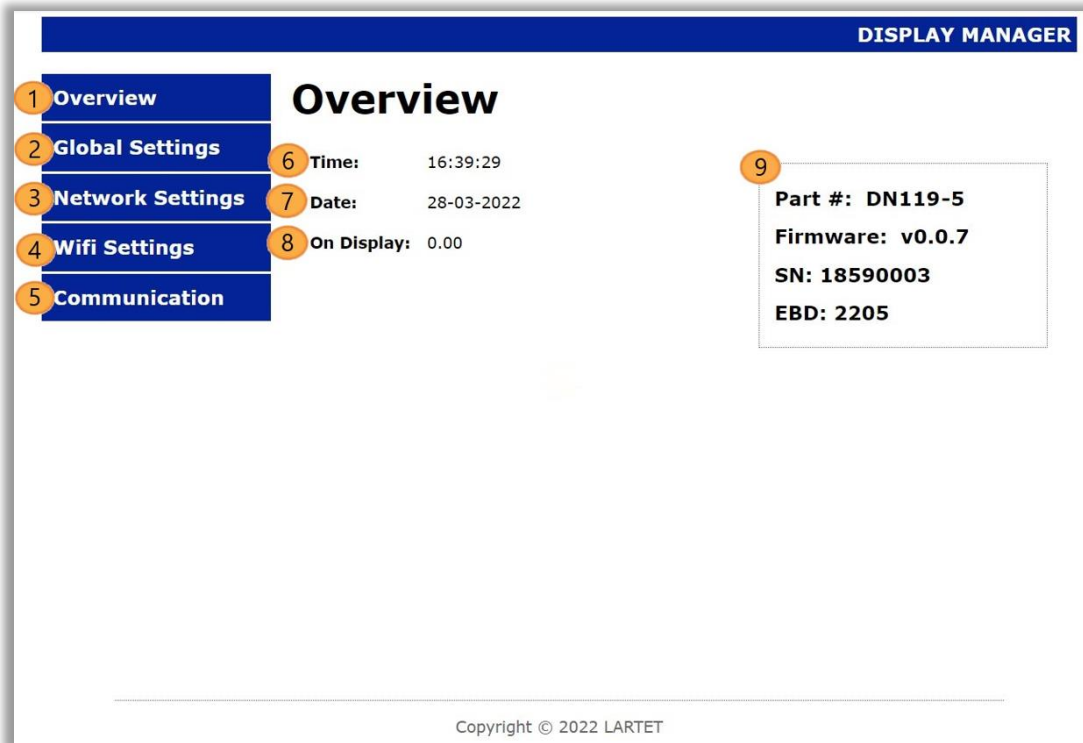


Fig. 14: Initial window.

The initial screen of the server shows us a vision of the basic information of the viewer and the necessary buttons to scroll through the different configuration options.

1. Link to [Overview](#). Information showed in real time.
2. Link to [Global Settings](#). It configures the basic settings: Communication interface, data representation format, brightness, etc
3. Link to [Network Settings](#). Sets LAN communication. It allows the configuration of IPs, network masks, Gateway, DNS and DHCP.
4. Link to [WIFI Settings](#).
5. Link to [Communication Settings](#). Sets the parameters for the communication interface and protocol selected.
6. Shows the current time of the display.
7. Shows the current date of the display.
8. Shows the value displayed or:
 - a. **OvH**: The value exceeds the maximum able to be displayed.
 - b. **OvL**: The value exceeds the minimum able to be displayed.
 - c. **TRIMMED**: The number of digits sent is greater that allowed. The display shows the first ones. The full number is displayed on the web server, with "(TRIMMED)" marked".
9. Shows information related to the manufacturing process. It has no relevance to the user. Technical support may ask for this information to solve device issues.

4.2.2 Global Settings

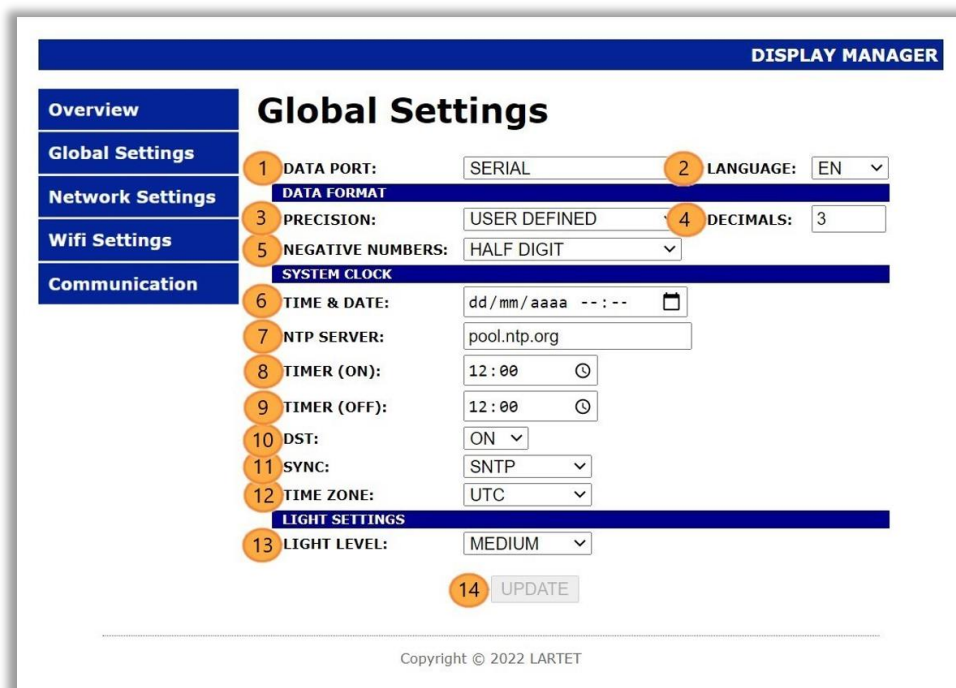


Fig. 15: Global Settings Window.

Various parameters and options are modified on the global settings window. Such modifications will also affect the configurable parameters of the web server and subsequent configuration windows.

1. Selects the data port that will be used for communication.
2. Selects language used. Currently only English version is available.
3. Configures the precision of the values to be shown on the display. “**AUTO**” will set dynamically the number of decimal digits for the value on display according to the digits available on the equipment. If “**USER DEFINED**” is selected, a field appears to enter the desired decimal digits..
4. Decimal digits used for the ON display value.

Below is a table of examples, in this case a 4-character display is considered.

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 6: Example Table

5. Selecting "**FULL DIGIT**" left digit is used only to show negative sign "-". Selecting "**HALF DIGIT**" left digit takes the value "-" or "-1", so the capacity to display negative numbers is increased.

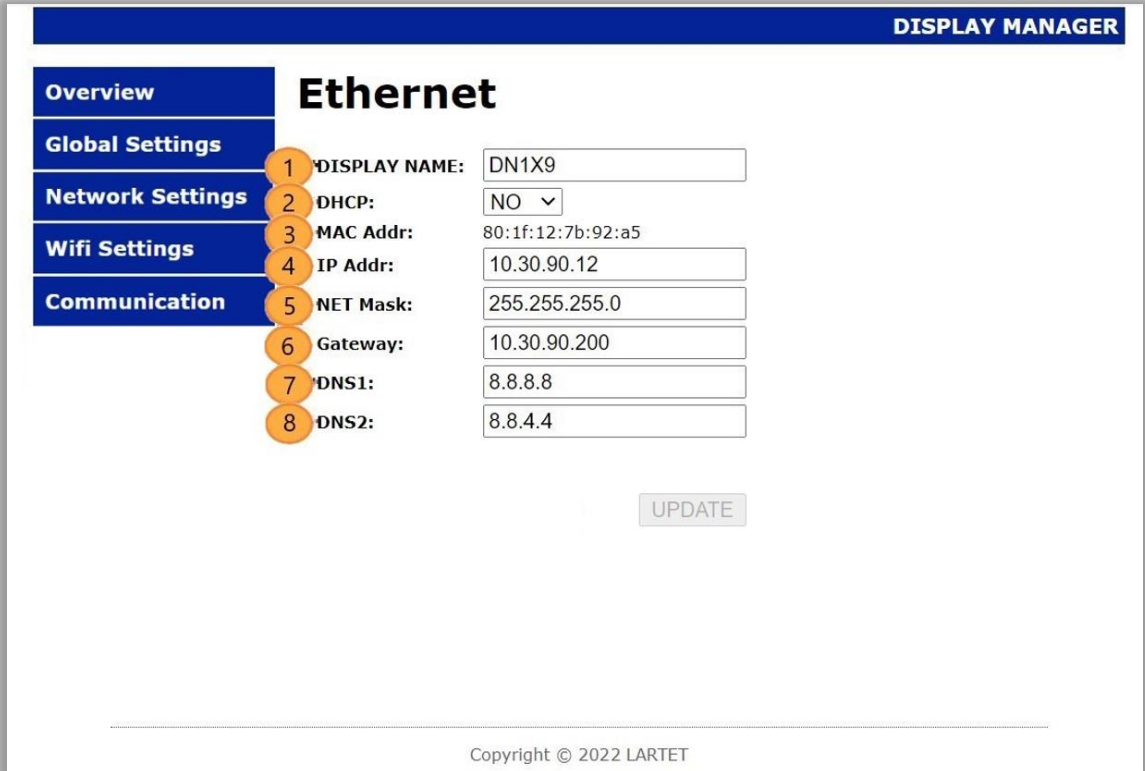
Example: 5 digit display, minimum value in "FULL DIGIT" is -9999, while in "HALF DIGIT" is -19999.



Fig. 16: "FULL DIGIT" and "HALF DIGIT" real example.

6. Manually set the date and time of the viewer. Clicking on the default parameter will show the date and time of the system (PC).
7. SNTP Address/Domain that will be used to obtain the time accurately. By default, the public SNTP server pool.ntp.org is set. It can be configured with an internal company SNTP server or another public access server.
8. Time at which the display will turn on.
9. Time at which the display will turn off. To deactivate the automatic on/off you have to set both (on and off) at the same time.
10. Enable daylight saving time. The time change will be done automatically if you select "ON".
11. Allows to select the desired methods to sync the clock:
 - **NONE:** No sync.
 - **ETH_SNTP:** Uses the server set to 7.
 - **WIFI_SNTP:** The same but using WIFI. Note: Will not work in mode "ACCESS POINT").
12. Set the display time zone.
13. Sets the light intensity level of the display.
14. Clicking "UPDATE" sends the new settings to the display.

4.2.3 Network Settings



DISPLAY MANAGER

Ethernet

Overview

Global Settings

Network Settings

Wifi Settings

Communication

- 1 DISPLAY NAME: DN1X9
- 2 DHCP: NO
- 3 MAC Addr: 80:1f:12:7b:92:a5
- 4 IP Addr: 10.30.90.12
- 5 NET Mask: 255.255.255.0
- 6 Gateway: 10.30.90.200
- 7 DNS1: 8.8.8.8
- 8 DNS2: 8.8.4.4

UPDATE

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Fig. 17: Ethernet network settings.

Parameters related to the connectivity of the display are configured on the network settings screen:

1. Modifies the name assigned to the display.
2. Sets the DHCP protocol or not.
3. Shows the MAC address.
4. Shows the IP address and allows its changing.
5. Shows the Network mask and allows its changing.
6. Shows the “Gateway” address and allows its changing.
7. Primary DNS. In case DNS is not set correctly, you must configure the SNTP server with your IP and not with your domain.
8. Secondary DNS.
9. By clicking “UPDATE” the new information is send to display.

IMPORTANT:

- A. These parameters only apply to wired Ethernet. For WIFI, there is a different configuration available. IPs should not be repeated in order not to have duplication conflicts. The viewer currently does not warn if this happens.
- B. The IP address may be corrupted in case of power loss during storage or if the memory is damaged. In these cases, the display will automatically reconfigure the emergency IP address **192.168.1.100**.

4.2.4 WIFI Settings



DISPLAY MANAGER

WIFI Parameters

WIRELESS NETWORK CONFIGURATION

1 NETWORK NAME (SSID): WLAN_MFE_TETRALEC 2 WIFI STATE: CONNECTED

3 NETWORK TYPE: STATION 4 CHANNEL: 1

WIRELESS NETWORK SECURITY

5 AUTHENTICATION: WPA2_PSK

6 PASSWORD:

IP CONFIGURATION

7 MAC Addr: dc:4f:22:62:3a:ad

8 IP Addr: 10.30.90.16

9 NET Mask: 255.255.255.0

10 Gateway: 10.30.90.200

11 DNS1: 8.8.8.8

12 UPDATE

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Fig. 18: Wifi Settings.

In the WIFI settings, the parameters related to the wireless connectivity of the display are configured.

1. **STATION** Mode: Set the name of the WIFI Network to connect to.
ACCES POINT (AP) Mode: Set the name of the display's WIFI network.
2. Indicates the connection status.
 In **STATION** mode, if the correct password has not been entered, "**ERROR**" will be displayed, since the connection could not be made.
3. Configures the display to connect to an existing WIFI network ("**STATION**") or generate an AP ("**ACCES POINT**").
 By default, the network in AP mode is called **DIRECT_DN_DISPLAY** with password **12345678**.
4. In **AP** mode allows to select the WIFI channel, between 1 and 11.
5. Set the security type of the WIFI network.
6. WIFI password.
 AP mode: Sets the wifi network password.
ATTENTION: If you forget the password, it is necessary to access the display via wired connection to reconfigure it.
7. Shows the MAC address. There are two different addresses, depending on whether the WIFI is configured in STATION or ACCES POINT.
8. Allows you to configure the IP address.

ATTENTION: It is necessary to check that the IP address to be applied is not occupied.

9. Set network mask.
10. Set gateway.
11. Set DNS. In case DNS is not set correctly, you must configure the SNTP server with your IP and not with your domain.

When modifying any parameter, the button is enabled to send the new information to the display. The process of loading the new configuration takes approximately 15 seconds. In case of changing only the IP address, the process takes approximately 5 seconds and an automatic redirection is performed.

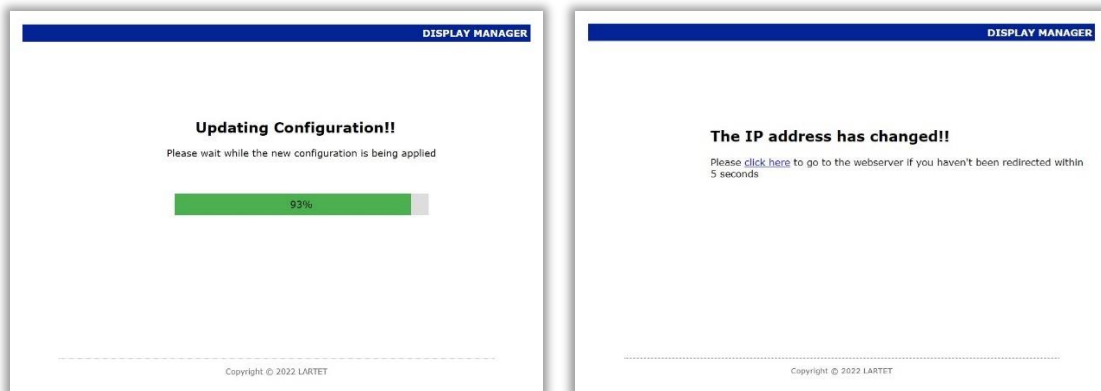


Fig. 19: IP changing windows.

Particularities of WIFI communication

WIFI communication is not identical in functionality to ETHERNET. Here are the points to consider:

- ETHERNET settings cannot be changed via WIFI or vice versa.
- Except: In case of forgetting the WIFI password, it must be reconfigured via wired ETHERNET, regardless of the WIFI configuration mode.
- When making a direct WIFI connection to the display, if a Windows operating system is used, it may take a long time to update the connection status as connected. One way to speed up the process is to close and immediately reopen the option to show “available Wi-Fi networks”.
- For optimal performance, it is not recommended to send data to a viewer over WIFI while setting.
- ETHERNET and WIFI IP addresses are independents.

4.2.5 Communication Settings

See [Communication Settings](#) at chapter 6.

5 WORK OPERATION

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

- **Hexadecimal** numbers: Number followed by “h”.
- **Decimal** numbers: Number followed by “d”.
- **Binary** number: Number followed by “b”.
- **ASCII** number: As is.

Example: ASCII X character, is 58h, 88d or 1011000b.

ASCII 15 number is 31h 35h, 49d 53d o 110001d 110101d.

XXX or **xxx**: Sequences of 'X' are used to indicate characters that can be variables, such as versions or dates.

5.1 Work Operation and accepted data types

As mentioned above, this viewer can work with numeric and text (ASCII) data types. If you work in ASCII, there are specific control commands available that allow you to make a data flash.

In any communication (EXCEPT MODBUS), the information is sent as an ASCII string. The viewer is in charge of converting said string to a numerical value in case it consists exclusively of numerical information. Later it will also carry out the necessary actions such as rounding, showing only the defined decimals, indicating if the value is out of range, etc.

If the ASCII string sent contains alphanumeric characters, the display will go internally to text mode. This implies that it does not treat decimals or signal values out of range. The text mode allows to represent non-numeric messages that can be displayed in 7-segments such as “E 345”, “P-45” or “HELLO”.

In MODBUS communication, the type of data to be sent depends on the register that is to be accessed. It will be an ASCII string if register 0 is used, but for the rest the frame must be formed according to the required numerical format (SWORD, UWORD, SDWORD OR UDWORD*). All the information regarding the formation of MODBUS frames can be found in [section 6.4](#).

*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 in a 7-segment. 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
DEC	80d	114d	85d	117d	32d	46d

Table 7: ASCII characters accepted

6 ETHERNET BUS COMMUNICATION

6.1 Ethernet adjustments

DISPLAY MANAGER

Communication Parameters

1 PROTOCOL: 2 PORT:

3 ENDBLOCK:

4 REPLY:

WARNINGS

5 TIMEOUT DATA:

6

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Fig. 20: Ethernet communications web server window.

- Drop-down menu to select the protocol to be used:
Available protocols **TCP**, **UDP** y **MODBUS/TCP**.
Detailed information to be found at points [6.2](#), [6.3](#) y [6.4](#).
- Set the communication port number. It only affects the TCP and UDP protocols. The port to choose must be in the range of ephemeral ports (49152 - 65535).
- Allows to select an end of frame. It is used as an enabler, the display will only show the data to which the end of the chosen frame is added. Selecting NONE this feature.



The available frame endings are as follows:

End block	
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	Host-Link Omron 2Ah 0Dh

Table 8: ASCII end blocks.

- Allows to select the display response. This response will be sent whenever the viewer receives data, regardless of whether it is actually viewed.

Available answers are:

Reply	
NONE	No answer
ACK	Acknowledgment of receipt
06h	Value 06h
@ AH AL ED 0 * <CR>	40h Direc A Direc.B 45h 44h 30h 2Ah 0Dh
06h ENDBLOCK	06h Block end

Table 9: Answers for ASCII protocol

- Sets the time to wait (in seconds) for a new request before the display sets “-” to all characters. The value can be any integer multiple of 10 between 0 and 2550 (inclusive). In case of value 0, the display does not establish any waiting time, the last data will be shown indefinitely.
- When modifying any parameter, the button is enabled to send the new information to the display.

6.2 MODBUS/TCP Protocol

End block not 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 access	Access to internal bits and Coils	Read Coils	01h
		Write Single Coil	05h
		Write Multiple Coils	0Fh
	16-bits access to internal registers	Read Holding Registers	03h
		Write Single Register	06h
		Write Multiple Registers	10h

Table 10: MODBUS Functions.

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

If you already have knowledge of this protocol, you can go directly to [section 6.4.2](#) where it is explained how the information must be encapsulated in the records according to the type of data that you want to represent, as well as the control characters that are available.

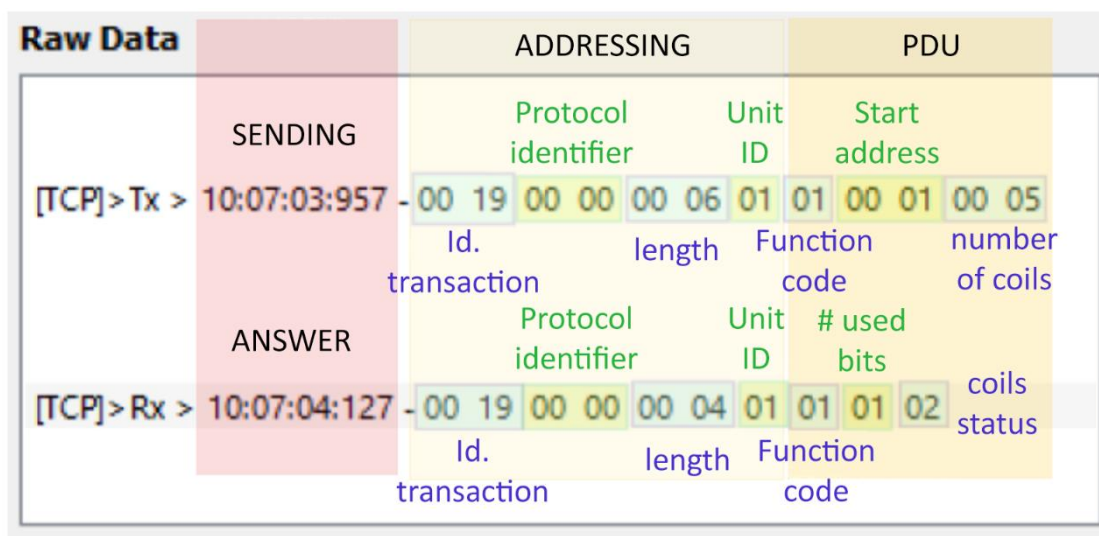
- **Read Coils:** Allows to visualize the state of the internal bits or designated physical Coils. The structure of this function is presented below:

Request		
Function code	1 Byte	01h
Start address	2 Bytes	0001h to 0005h
Number of Coils	2 Bytes	0001h to 0005h
Answer		
Function code	1 Byte	01h
Number of bytes used	1 Byte	N (N = # Inputs / 8)
Coil status	n Bytes	n = N o N+1
Error		
Error code	1 Byte	81h
Exception code	1 Byte	01 or 02 or 03 or 04

Table 11: "Read Coils" function structure.

Example:

The display only has the 2nd Coil active, to know the status of all of them you can use this function. The following frames are sent and received:



IMPORTANT: Upon receiving the byte (02h) that indicates the status of the Coils, it should be read as follows:

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

Table 12: Coil status reading. "X" indicates not used or not relevant.



- **Write Single Coil:** It is used to assign the ON/OFF state to a Coil.

The structure of this function is presented below:

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

Table 13: "Write Single Coil" function structure.

Example:

You want to activate the 1st Coil. The following frames are sent and received:

Raw Data		ADDRESSING				PDU			
[TCP]> Tx > 12:02:02:730	SENDING	00 04	00 00	00 06	01 05	00 01	FF 00		
		Transaction ID.		Length	Function code		Status to write		
	ANSWER		Protocol identifier		Unit ID	Coil address			
[TCP]> Rx > 12:02:02:863		00 04	00 00	00 06	01 05	00 01	FF 00		



- **Write Multiple Coils:** It is used to simultaneously assign the status of several consecutive addressing Coils.

The structure of this function is presented below:

Request		
Function code	1 Byte	0Fh
Start address	2 Bytes	0001h to 0005h
Number of outputs	2 Bytes	0001h to 0005h
Number of bytes used	1 Byte	N (N = # Outputs / 8)
Output value	N x 1 Byte	XX...XX
Answer		
Function code	1 Byte	0Fh
Start 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 14: "Write Multiple Coils" function structure.

Example:

You wish to activate coils 1a, 2a and 5a Coils. The following frames are sent and received:

Raw Data		ADDRESSING				PDU			
						# used bytes			
[TCP]>Tx >	12:43:58:751	- 00 0B	00 00	00 08	01 0F	00 01	00 05	01 13	
	SENDING	Transaction ID.		Length	Function code		Output number	Output value	
	ANSWER		Protocol identifier		Unit ID	Start Address			
[TCP]>Rx >	12:43:58:886	- 00 0B	00 00	00 06	01 0F	00 01	00 05		



- **Read Holding Registers:** Allows you to view the content of the desired registers.
The structure of this function is presented below:

Request		
Function code	1 Byte	03h
Start address	2 Bytes	0000h to 0011h
Number of registers	2 Bytes	0001h to 0012h
Answer		
Function Code	1 Byte	01h
Number of bytes used	1 Byte	2 x N (N = # registers)
Register Value	N x 2 Bytes	XX...XX
Error		
Error Code	1 Byte	83h
Exception Code	1 Byte	01 or 02 or 03 or 04

Table 15: "Read Holding Registers" function structure.

Example:

We want to read two registers with the contents "1234" and "5678", they are located at addresses 1 and 2. To do this, the following frames are sent and received:

Raw Data		ADDRESSING	PDU
[TCP]>Tx >	13:24:13:534	- 00 30 00 00 00 06 01 03 00 00 00 02	Start address
	SENDING	Transaction ID.	Function code
		Protocol identifier	Register number
	ANSWER	Unit ID	
[TCP]>Rx >	13:24:13:648	- 00 30 00 00 00 07 01 03 04 12 34 56 78	# used bytes
			Register value

- **Write Single Register:** It is used to assign the value to only one register.

The structure of this function is presented below:

Request		
Function Code	1 Byte	06h
Register Address	2 Bytes	0000h to 0011h
Register value	2 Bytes	0000h to FFFFh
Answer		
Function Code	1 Byte	06h
Number of bytes used	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 16: "Write Single Register" function structure.

*Depends on the type of data you want to write:

- 2 bytes (0002h): Word type value (with or without sign).
- 4 bytes (0004h): Word type value and reading of information of luminosity.
- 6 bytes (0006h): Double Word type value with decimal.
- 8 bytes (0008h): Double Word type value and reading of information of brightness.
- 10 bytes (000Ah): Full message reading to a 10digits display.

Example:

We want to write in address register "2" the value "04D2h" to display "1234". To do this, the following frames are sent and received:

Raw Data		ADDRESSING						PDU						
[TCP]> Tx >	16:00:48:929	-	00	02	00	00	00	06	01	06	00	02	04	D2
	SENDING	Transaction ID.		Length		Function code		Register value						
	ANSWER			Protocol identifier		Unit ID		Register address						
[TCP]> Rx >	16:00:49:109	-	00	02	00	00	00	06	01	06	00	02	04	D2



- **Write Multiple Registers:** It is used to assign the value to several registers simultaneously.

The structure of this function is presented below:

Request		
Function Code	1 Byte	10h
Start Address	2 Bytes	0000h to 0011h
Number of registers	2 Bytes	0001h to 0005h
Number of bytes used	1 Byte	2 x N (N = # registers)
Register Value	N x 2 Byte	XX...XX
Answer		
Function Code	1 Byte	10h
Start Address	2 Bytes	0000h to 0011h
Number of registers	2 Bytes	0001h to 0005h
Error		
Error Code	1 Byte	90h
Exception Code	1 Byte	01 or 02 or 03 or 04

Table 17: "Write Multiple Registers" function structure.

Example:

You want to write in 2 registers, with initial address "0". For the display to show the word "HELLO", it is sent to the registers "48h 4Fh 4Ch 41h". To do this, the following frames are sent and received:

Raw Data	ADDRESSING	PDU	# used bytes
[TCP]>Tx > 16:18:25:955 -	00 07 00 00 00 0B 01	10 00 00 00 02 04 48 4F 4C 41	
SENDING	Transaction ID	Length	Function code
	Protocol identifier	Unit ID	Start Address
ANSWER			Register number
[TCP]>Rx > 16:18:26:071 -	00 07 00 00 00 06 01	10 00 00 00 02	
			Register value



6.2.2 Register Writing

The different registers of the viewer allow interaction in different ways, depending on the address to which it is written, the following registers are distinguished:

- **Register 02**: Send numerical value *WORD* type with sign.
- **Register 06**: Send numerical value *WORD* type without sign.
- **Register 10**: Send numerical value *double WORD* type with sign.
- **Register 14**: Send numerical value *double WORD* type without sign.
- **Register 00**: Send ASCII character strings, able to be displayed in 7 segments digits.

All possibilities are detailed below:

6.2.2.1 Register 02.

It is used to send numeric values of type WORD with sign. The range of values is from -32768 to 32767, inclusive.

You have to send 2,3 or 4 bytes of information, with the **starting address** being 2.

The first two bytes indicate the value to display (in two's complement). The following modify the brightness of the display.

The third byte can be used to manage flickering. Typing 08h starts the blinking, 09h ends it.

The luminosity is established by writing in the fourth byte a value between 30h and 34h (minimum 30h – maximum 34h).

REGISTER 02		REGISTER 03	
Byte 1	Byte 2	Byte 3	Byte 4
<XXh>	<XXh>	<XXh>	<XXh>
Numerical Value		Blinking	Luminosity*

Table 18: Register 02 and 03 values.

Example:

To easy the sending of information, the [function Modbus 10h](#) 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
Numerical Value		No Blinking	Luminosity*

Table 19: Register 02 and 03 values.

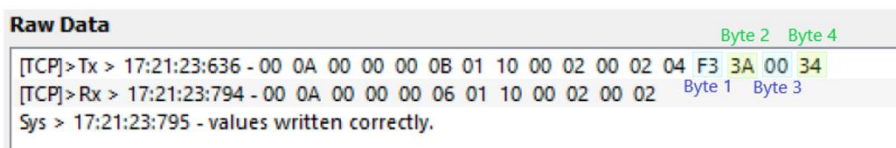


Fig. 21: Example to show "-3270".

6.2.2.2 Register 06.

It is important that in this case the **starting address** is 6.

This register is used identically to the previous one, but it is used for numeric values of type WORD without sign. The range is changed from 0 to 65535. Lightness are handled identically. [Table 21](#) can be used also for this case.

For example, the same frame is sent as in the register 02 example, but the starting address is changed to 06. In this case, 62266 is displayed, if the device has 5 digits or more. Otherwise the display shows "OvL".

6.2.2.3 Register 10.

It is used to send numeric values of type double WORD with sign. The range of values is -2,147,483,648 to 2,147,483,647.

You have to send between 6 and 8 bytes of information, the **starting address** being 10.

The first four bytes indicate the value to display (in A2's complement). The next two modify the position of the decimal point. The last two (optional) the blinking and brightness of the display.

The blinking and luminosity values 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>
Numerical Value				Point Pos.	Not used	Blinking	Luminosity*

Table 20: Register 10, 11, 12 and 13 values.

Example:

To easy the information sending, [function Modbus 10h](#) is used.

To show "**-32.70**" value the following content must be send.

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
Numerical Value				Point Pos.	Not used	No blinking	Luminosity*

Table 21: Register 10, 11, 12 and 13 values.

Raw Data		Byte 2	Byte 4	Byte 6	Byte 8
[TCP]>Tx > 17:47:23:389 - 00 25 00 00 00 0F 01 10 00 0A 00 04 08 FF FF F3 3A 02 00 00 34					
[TCP]>Rx > 17:47:23:570 - 00 25 00 00 00 06 01 10 00 0A 00 04		Byte 1	Byte 3	Byte 5	Byte 7
Sys > 17:47:23:570 - values written correctly.					

Fig. 22: Example to send "**-32.70**" MODBUS/TCP.



6.2.2.4 Register 14.

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

This register is used identically to the previous one, but it is used for numeric values of type double WORD without sign. The range is changed from 0 to 4,294,967,295. Decimal point, blinking, and lightness are handled identically. Table 23 can be used interchangeably for this case.

For example, the same frame is sent as in the register 10 example, but the starting address is changed to 14. In this case, 4.294.964.026 is displayed, if the device has 10 digits or more. Otherwise the display shows "OvL".

6.2.2.5 Register 00.

It is used to write text on the display (in ASCII characters). Keep in mind that when writing to a 7-segment led, only certain values can be set (See [section 5.3.2](#)). For this, 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 22: Register 00 values.

Example:

To facilitate the sending of information, the [function Modbus 10h](#) is used.

You want to display the text "E 523" to indicate an error in an industrial process. The following content must be sent via Modbus (See [table ASCII chars](#)).

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 23: Register 0, 1 & 2 values.

Raw Data		Byte 2	Byte 4	Byte 6
[TCP]>Tx > 09:25:58:540 - 00 27 00 00 00 0D 01 10 00 00 00 03 06 45 20 35 32 33 00				
[TCP]>Rx > 09:25:58:685 - 00 27 00 00 00 06 01 10 00 00 00 03	Byte 1	Byte 3	Byte 5	
Sys > 09:25:58:685 - values written correctly.				

Fig. 23: Example to show "E 523".

As can be seen, as many registers as necessary are written. In this case, since the number of characters is 5 (odd), 3 registers must be used and the last byte must be set to 00h.

If this method is used, the light intensity of the display cannot be modified for reasons of compatibility with previous products.

6.2.3 Coil Writing

In addition to the registers, with MODBUS/TCP it is possible to carry out the [function 0Fh](#) “Write Multiple Coils” function to activate/deactivate the relays or set the flashing of the display.

They can also be modified with [function 05h](#) “Write Single Coil”, but function 0Fh is used in the examples for simplicity.

5 coils are established that can be activated or deactivated, starting from **START ADDRESS 1**. In order, the coils are used to establish the following parameters:

- **Coil 1.** Activates or deactivates relay 0.
- **Coil 2.** Activates or deactivates relay 1.
- **Coil 3.** Activates or deactivates relay 2. (Relay 2 is an option)
- **Coil 4.** Activates or deactivates relay 3. (Relay 3 is an option)
- **Coil 5.** Activates or deactivates blinking.

All the coils are activated at “1” and deactivated at “0”. It is possible that your display model does not have coils 3 and 4, in which case their value will not affect any functionality.

Example:

You want an alarm to be activated for a given value and the display to start flashing the displayed value. For this it is necessary to activate one of the relays and the flashing of the equipment. In this case, COIL1 must be activated to switch RELAY0 and COIL5 to activate the flashing.

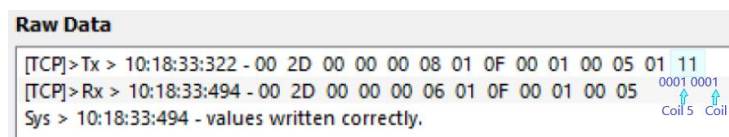


Fig. 24: Example of coil activation.

6.2.4 Reading of registers and coils

The described displays allow the reading of both registers and coils.

The system works identically to writing, the desired registers or coils and their address are selected to read the status.

It can be read with the MODBUS functions [01h](#) “Read Coils” and [03h](#) “Read Holding Registers”.

The frames necessary to carry out these functions are included in section 6.4.1, “[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](#)).

In order for the viewer to display a frame, it must be terminated with an end of frame that is recognizable.

The last character sent is displayed to the right of the display.

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

The display will be able to receive decimal numbers and ASCII characters. Once the desired values are sent, there are certain control parameters to modify the luminosity and the blinking. These parameters must be sent **AFTER** the values to be displayed.

Luminosity		Blinking	
Order	ASCII Code	Order	ASCII Code
Minimal	"Y0" or "y0" (7930h or 5930h)	Start	08h
Low	"Y1" or "y1" (7931h or 5931h)	End	09h
Medium	"Y2" or "y2" (7932h or 5932h)		
High	"Y3" or "y3" (7933h or 5933h)		
Maximum	"Y4" or "y4" (7934h or 5934h)		

Example:

The following table shows some examples combining numeric 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
2Dh	36h	37h	2Eh	31h	30h	08h		-67.10 ⁽¹⁾
36h	2Eh	34h	36h	32h	33h			6.4623

(1) Value displayed without configuration

(2) Value displayed in flashing

*For PLC, %QBx corresponds to a certain position in the output address space, from that address the values must be consecutive.

6.4 UDP Protocol

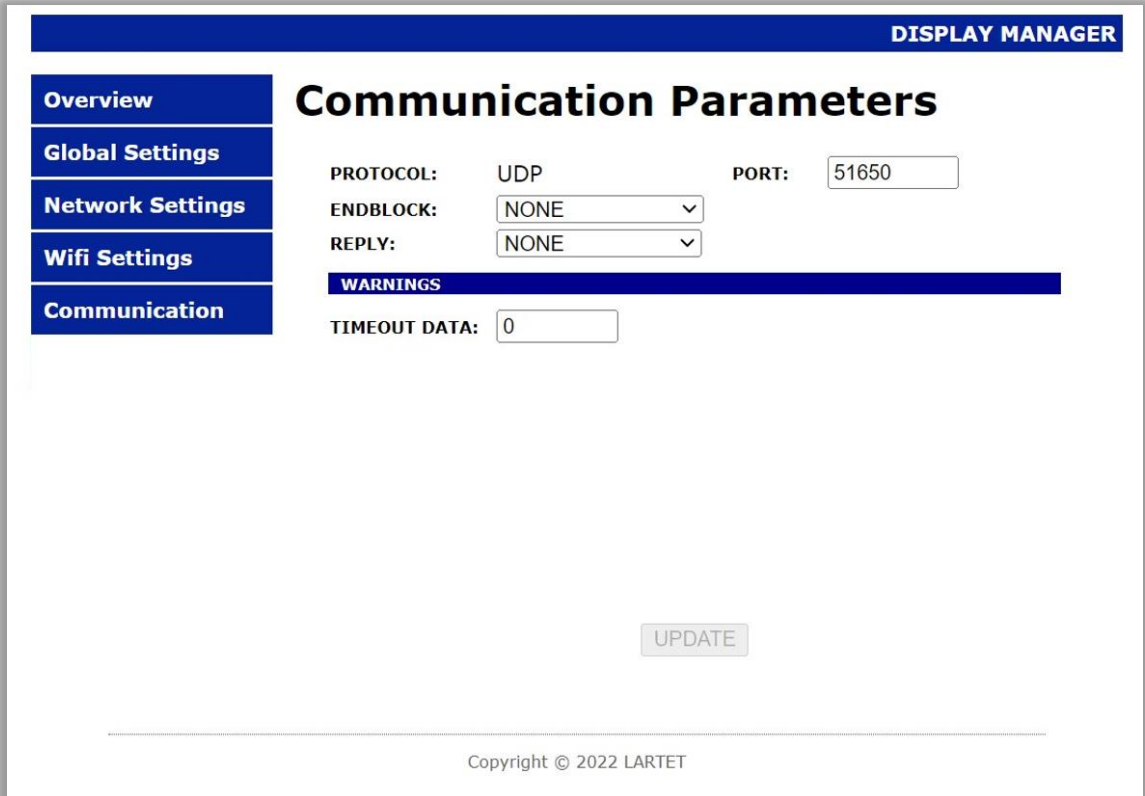
The functionality of the parameters explained in the previous section ([protocol TCP/IP](#)) also applies to the UDP protocol.

7 WIFI COMMUNICATION

The bandwidth of WIFI communication is reduced compared to the wired connection. As a result, the setup experience will always be smoother via 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 it is being configured via WIFI.

7.1 WIFI Communication adjustments



DISPLAY MANAGER

Communication Parameters

PROTOCOL: UDP PORT: 51650

ENDBLOCK: NONE

REPLY: NONE

WARNINGS

TIMEOUT DATA: 0

UPDATE

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Fig. 25: WIFI communication parameters window.

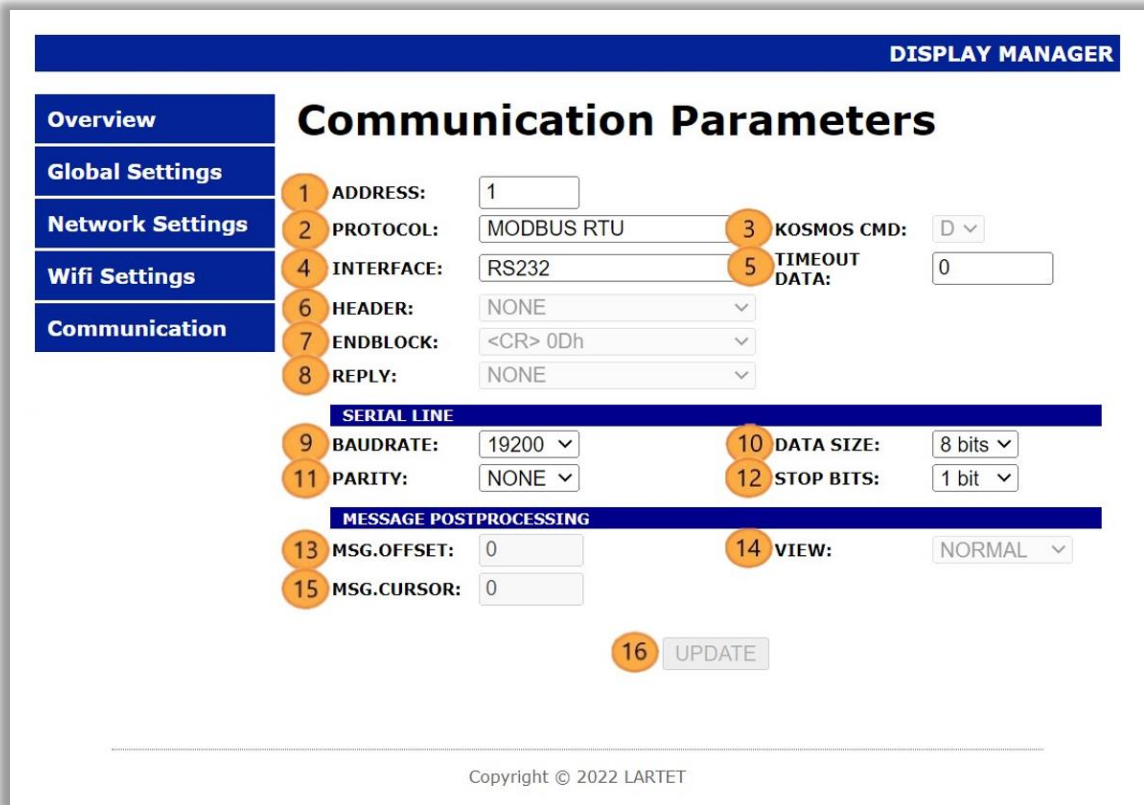
The configuration screen for WIFI communication is very similar to that for wired Ethernet. It differs in that there is no protocol option (there is only communication via UDP) and an additional type of response is added, the "ECHO" response is limited to returning the same message that has been received.

The UDP protocol on WIFI work the same as [ETHERNET](#).

8 SERIAL BUS COMMUNICATION

This section includes the settings of the web server of the viewer and the operation of the available protocols in case of communication through the serial bus.

8.1 Serial Communication adjustments



DISPLAY MANAGER

Communication Parameters

Overview
Global Settings
Network Settings
Wifi Settings
Communication

1 ADDRESS: 1
2 PROTOCOL: MODBUS RTU
3 KOSMOS CMD: D
4 INTERFACE: RS232
5 TIMEOUT DATA: 0
6 HEADER: NONE
7 ENDBLOCK: <CR> 0Dh
8 REPLY: NONE
9 BAUDRATE: 19200
10 DATA SIZE: 8 bits
11 PARITY: NONE
12 STOP BITS: 1 bit
13 MSG.OFFSET: 0
14 VIEW: NORMAL
15 MSG.CURSOR: 0
16 UPDATE

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Fig. 26:Serial communication window.

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

1. Modifies the internal address that is assigned to the display.
2. Protocol selection.

KOSMOS protocol is explained in the manufacturer manual.

MODBUS RTU y **ASCII** protocols are explained in

[7.3 Protocolo MODBUS RTU](#) and [7.4](#) chapters [Protocolos Serie](#).

3. Menu to select the orders for KOSMOS protocol.

Order	Function
D	Display value
T	Tare value
P	High peak value
V	Low peak value
Y	Peak to peak value
Z	Total value

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

4. Select the physical interface type of the serial connector.

Usually, the user can choose between **RS-232** and **RS-485**. If you have a display with **RS-422** option, you can choose between **RS-232** and **RS-422**, see explanation on [3.4](#).

5. Assigns the waiting time (in seconds) for a new request before the display shows “-“ in all digits. The value can be any integer multiple of 10 between 0 and 2550 (inclusive). In case of value 0, the display does not establish any waiting time, the last data will be shown indefinitely.
6. Allows you to select a message header. ASCII protocol only.
The available headers are listed below:

Header	
NONE	
02h	Valor 02h
02h AH AL	02h Value + Display address (H Byte L Byte)
02h AL AH	02h + Display Address (L Byte H Byte)
@ AH AL E D	Host-Link Omron
AH AL	Display address (H Byte L Byte)
AL AH	Display address (L Byte H Byte)

Table 24: ASCII protocol headers.

7. Allows you to select the end of the message

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

Table 25: ASCII protocol end blocks.

8. Allows you to select the display response.

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

Table 26: ASCII protocol reply.

9. Select the transfer rate in bits/s.
10. Select the number of bytes per character:
You can select **7** or **8** bits.
If the MODBUS RTU protocol is used, it cannot be modified, the value is set to 8 bits.
11. Sets the parity bit for error control.
The possible modes are **None**, **Even Parity**, and **Odd Parity**.
12. Select the number of stop bits, 1 or 2 bits for information synchronization.
13. Sets the value of the position of the first character to be displayed.

This option is intended to prevent the display of headers or labels that other devices may send along with the information. For example, a scale could send "Weight (Kg): 203.5".

If the value 1 is applied, all the characters up to the first number will be ignored, very useful if the label is variable (NET WEIGHT (Kg), AVERAGE WEIGHT (Kg), e.g.).

Values greater than 1 allow focusing on a part of the numerical data, useful in processes where the numerical value does not vary much. In this way, for example, the thousands could be ignored in a process where only the units or tens change.

Example: The information "PESO 203.5" is sent. Depending on the value of this element (**13**), the following situations would occur:

- A. **0.** As many characters as the display contains are shown. "PESO 203.5" is displayed.
- B. **1.** Everything up to the first numeric character is skipped. "203.5" is displayed.
- C. **7.** The first 7 characters are skipped. "3.5" is displayed.

14. Allows to invert the order of the value displayed:

Example: The value "123456" is sent to the display, depending on the chosen parameter two situations can be displayed:

- A. **NORMAL.** Shows "123456".
- B. **INVERTED.** Shows "654321".

15. This parameter complements parameter **13**, but for the final part of the message. That is, you choose how many values to display counting from MSG.OFFSET.

The value of this parameter has different effects depending on the previous element (**14**).

- A. **NORMAL.** Shows only the beginning of the message up to the designated position.

Example: With MSG.CURSOR = 3. If "123456" is sent, "123" is displayed.

Example 2: With MSG.CURSOR = 2. If "123456" is sent, "12" is displayed.

- B. **INVERTED.** Skips the start of the message (pre-reversal) 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.

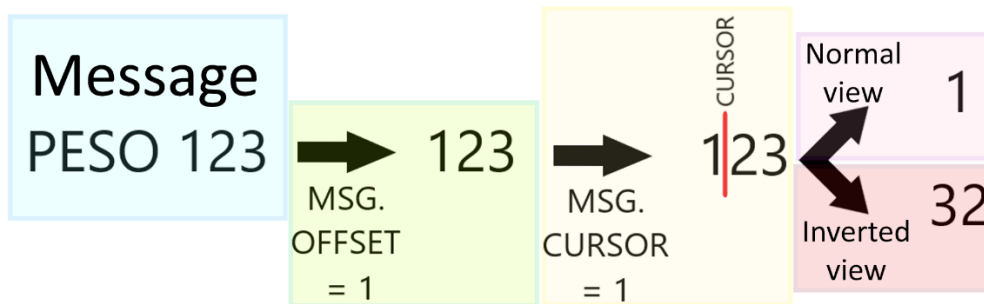


Fig. 27: MSG.OFFSET and MSG.CURSOR use graphic.

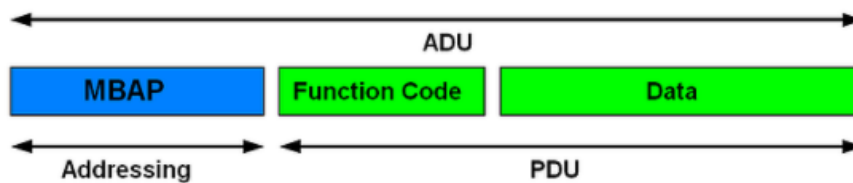
16. When modifying any parameter, the button is enabled to send the new information to the display.

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

The specific information of the KOSMOS protocols must be consulted in the manufacturer's manual of the equipment in use.

8.3 MODBUS RTU Protocol

MODBUS/TCP Frame



MODBUS/RTU Serial Frame

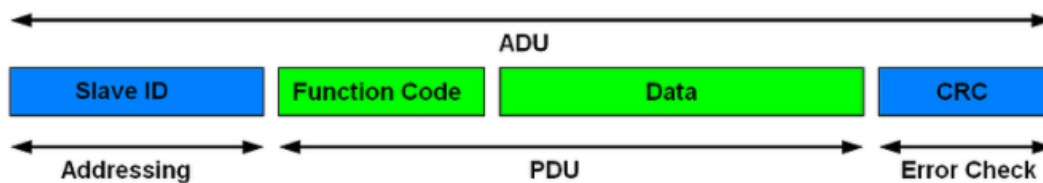


Fig. 28: Modbus/TCP and Modbus/RTU differences.

As can be seen, in the frames the addressing in the RTU 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 display registers, MODBUS RTU is identical to the MODBUS/TCP Ethernet protocol.

See [section 6.4](#) for any necessary information.

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

Raw Data	MARCAS TEMPORALES	DIRECCIONAMIENTO (Slave ID)	PDU	CRC
[RTU]>Tx >	11:45:58:129	- 01	10 00 00 00 02 04 48 4F 4C 41	21 28
[RTU]>Rx >	11:45:58:280	- 01	10 00 00 00 02 41 C8	
Sys >	11:45:58:280	- values written correctly.		

Fig. 29: Sent and received frames to show "HOLA" via Modbus RTU

8.4 ASCII Protocol

This protocol allows easy communication with any device that has a serial line and the protocol can be configured, such as a computer, a PLC working in RS-232 mode, etc. Another possibility is to connect several displays to the same RS-485 network.

With this protocol, the display works in slave mode, when receiving data it checks if the header and the end of the block correspond to those configured. If so, it displays the content of the data. The frame is configurable to be able to adapt to many protocols that use the ASCII format.

To understand how the protocol can be configured, the terms used are described below:

Transmission BLOCK: It is made up of all the bytes necessary to display a value. For each successfully received transmission block the display will be updated with a new value. Each block consists of three parts: The header (Header), the data and the end of the block (End block).

HEADER: It is used to identify the beginning of the block. You can choose between 6 formats or without header.

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

END BLOCK: It is used to identify the complete arrival of the block. You can choose between 6 types of end block.

In addition, there are control commands that allow you to start and end the blinking of one or more characters.

08h Start of blinking characters

09h End of blinking characters

The mentioned control commands should be placed at the end of the frame.

8.4.1 ASCII Protocol examples

Example 1: Send a message from a computer to the viewer

The configuration for this example is as follows:

- **Display address:** 08
- **Header:** 02h AH AL
- **End block:** CR
- **MSG. OFFSET:** 0
- **VIEW:** NORMAL
- **Send data:** 358964

Transmission block

ASCII Block		0	8	3	5	8	9	6	4	CR
HEX Block	02h	30h	38h	33h	35h	38h	39h	36h	34h	0Dh
	HEADER			Sent data						ENDBLOCK

Send value 4 digits						O	u	H
Send Value 8 digits			3	5	8	9	6	4

On 4-digit equipment, "OuH" is displayed because the value is too large to be displayed.

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

The configuration for this example is as follows:

- **Display address:** 14
- **Header:** 02h AL AH
- **End block:** CR LF
- **MSG. OFFSET:** 1 (To display only the numerical value)
- **VIEW:** NORMAL
- **MSG.CURSOR:** 4
- **Send data:** PESO 15.8kg

Transmission block

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

Send value 4 digits		1	5.	8
---------------------	--	---	----	---

Choosing **MSG.OFFSET = 1** the display has ignored all the characters prior to the first numerical value, without the need to count them.

It is important to choose **MSG.CURSOR = 4** ("15.8" is made up of 4 characters "." included), since after the first number the viewer will try to display everything up to the end block.

If **NOT** selected, the following displays would be obtained. Since display cannot present some chars like (*k* and *g*), it displays "-".

Send value 4 digits				1	5.	8	-
Send value 8 digits				1	5.	8	-

9 PROFINET COMMUNICATION

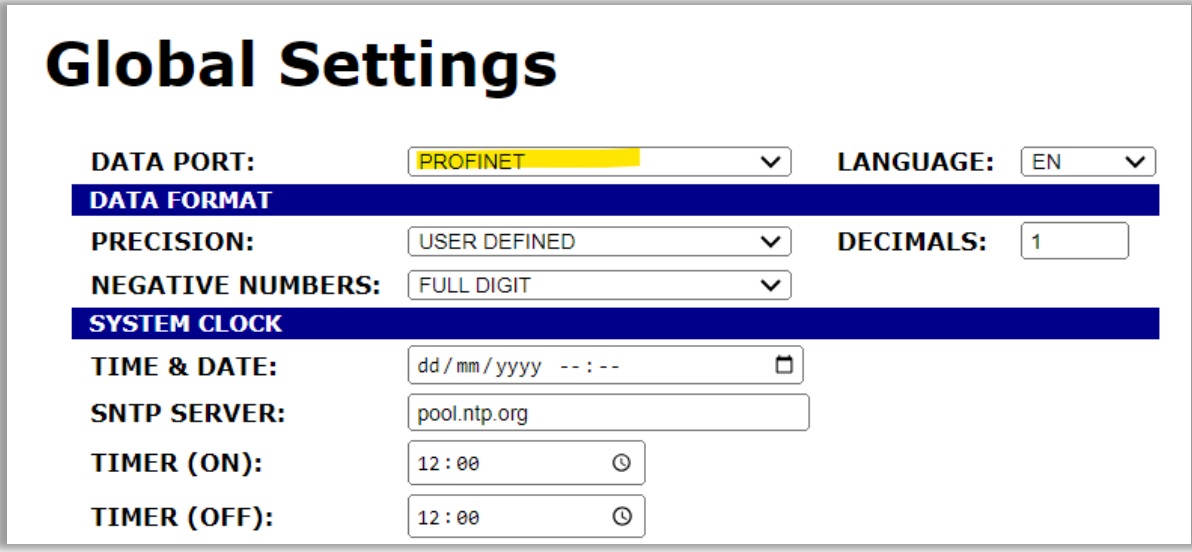
The display includes a Profinet interface to facilitate integration into industrial networks. This interface is equipped with two RJ45 connectors, allowing direct connectivity to Profinet systems via a wired network.

The GSD configuration file defines the memory space characteristics and presents the necessary interfaces for it to be recognized by the application or Profinet master PLC. The interface appears under the name "Profinet payload" and consists of 20 characters (uint8_t). The communication protocol employs a configurable 20-byte buffer that acts as a memory space available for receiving data. The buffer content can be interpreted either as numeric or ASCII format, providing flexibility to meet different application requirements.

In Profinet mode, the device operates as a slave. Since Profinet is a connection-based protocol, communication must be established by configuring the device as a Profinet slave. Subsequently, the connection must be initiated and managed by the master.

9.1 Profinet communication settings

From the webserver, on the "Global Settings" page, the DATA PORT must be configured as Profinet. This enables functionality and allows the device connection.



Global Settings

DATA PORT: PROFINET ▼
LANGUAGE: EN ▼

DATA FORMAT

PRECISION: USER DEFINED ▼
DECIMALS: 1

NEGATIVE NUMBERS: FULL DIGIT ▼

SYSTEM CLOCK

TIME & DATE: dd/mm/yyyy --:-- 📅

SNTP SERVER: pool.ntp.org

TIMER (ON): 12:00 🕒

TIMER (OFF): 12:00 🕒

Fig. 30: Global settings screen; Profinet configured as data input port.

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

To assign a valid IP address and Profiname for communication with the PLC, it is first necessary to identify the connected Profinet device on the network using Proneta or similar software and then change the IP address and Profiname accordingly.

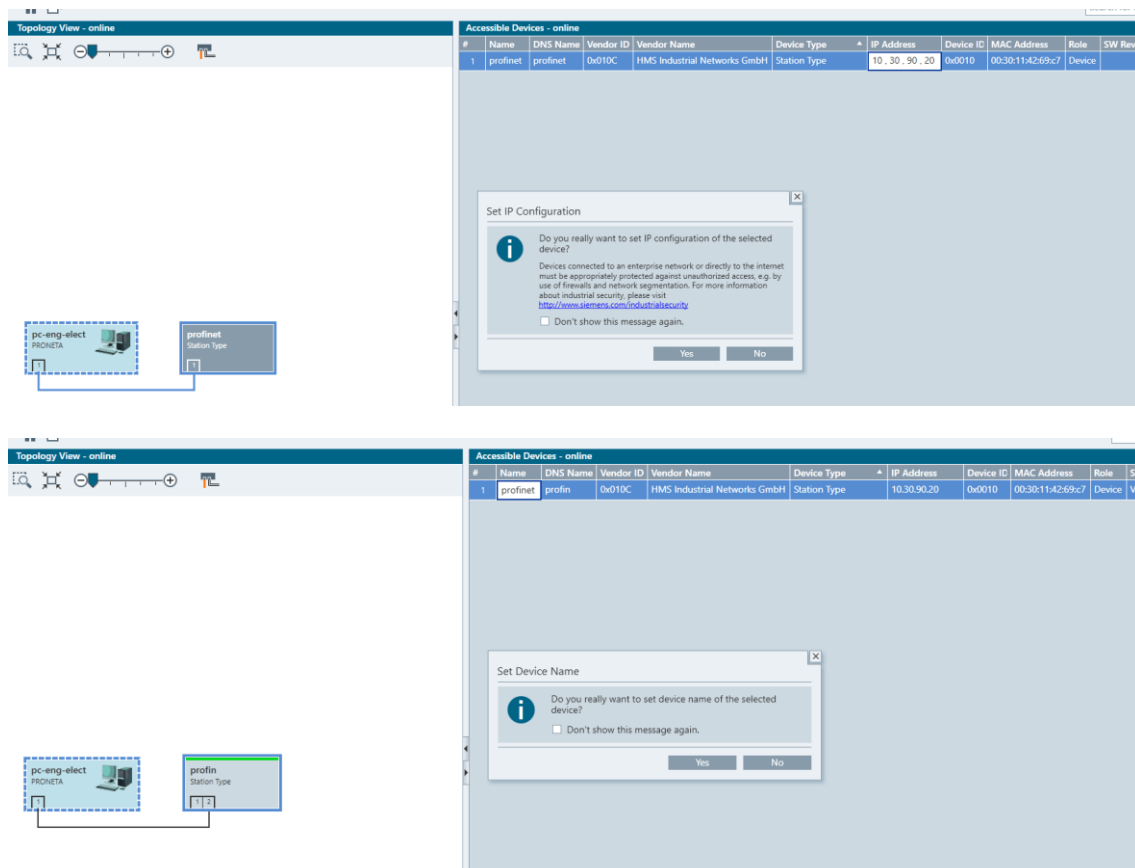


Fig. 31: Changing IP address and Profiname of the Profinet module with the use of Proneta app.

9.2 Type and data formats in Profinet communication

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

Data format configuration can be adjusted on the "Communication Parameters" page of the webserver, after selecting the Profinet option in the DATA PORT setting under Global Settings.

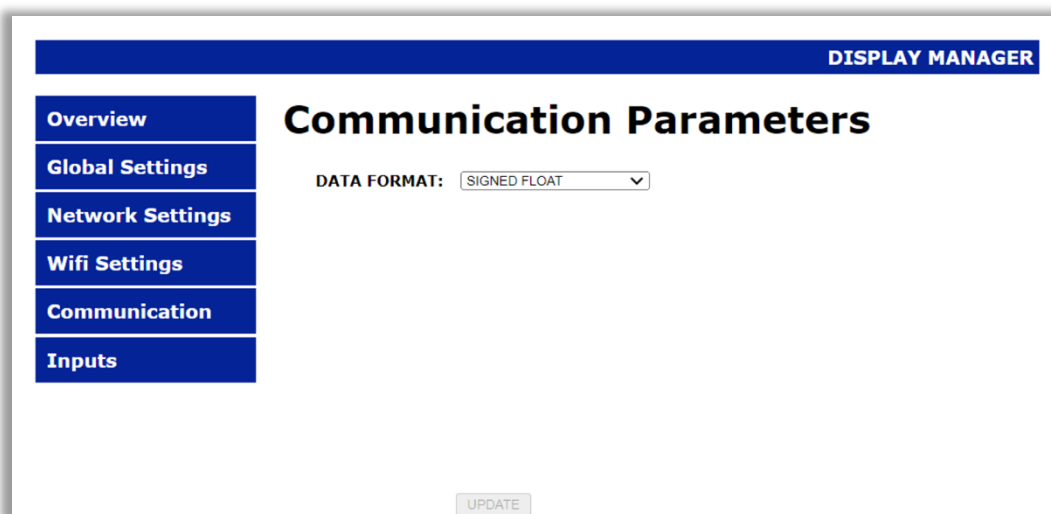


Fig. 32: Data format settings screen in Profinet mode

The Update button must be pressed in order for changes to be applied.

9.2.1 Float format

The data block can be up to 6 bytes in this format. Byte alignment matches the Profinet buffer addresses: B0 corresponds to Profinet **payload(1)**, B1 to **payload(2)**, etc. Byte assignment is as follows:

- **B0**: Most Significant Byte (MSB) of the numeric value
- **B1 and B2**: Remaining bytes of the numeric value
- **B3**: Least Significant Byte (LSB) of the numeric value
- **B4**: MSB of the decimal point position
- **B5**: LSB of the decimal point position

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

Table 27: Float data format

Decimal point position is encoded as follows:

B4 a B5	Decimal point positioning
01h	00000000.0
02h	00000000.00
04h	000000.000
08h	00000.0000
10h	0000.00000
11h	000.000000
12h	00.0000000
14h	0.00000000

Table 28: Decimal point position encoding

9.2.2 Word format

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

- **B0**: Most Significant Byte (MSB)
- **B1**: Least Significant Byte (LSB)

This means the 16-bit (2-byte) number is encoded in big-endian order, i.e., MSB is sent first. For example, to send the value 300 (decimal), corresponding to 0x012C in hexadecimal, send 0x01 in B0 and 0x2C in B1.

The maximum value is 65535 (0xFFFF).

9.2.3 ASCII format

In this mode, numeric values are sent in ASCII code. This format also supports control commands, such as activating or deactivating blinking:

- 08h** Start blinking function (must be sent at the beginning of the frame)
- 09h** Stop blinking function (must be sent at the beginning of the frame)

The number of bytes sent in ASCII format depends on the number of display digits and control commands used, up to a maximum of 20 bytes (buffer size).

Including ASCII code 0x2E between characters (decimal point character) lights the decimal point segment for the previous digit.

The first byte of the Profinet buffer corresponds to the rightmost digit on the display. The byte sequence is displayed right to left as follows:

Profinet frame					Shown value
payload(1)	(2)	(3)	...	(n+1)	Dn, ..., D2, D1, D0
D0	D1	D2	...	Dn	

9.2.4 ASCII character encoding

Each digit is encoded in ASCII and sent in the previously mentioned order. Valid alphanumeric characters are limited to those that can be displayed on 7-segment digits.

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	2C h	2Eh	2Dh	16h	27h	28h	
DEC	80d	114d	85d	117 d	32d	44d	46d	45d	22d	39d	40d

Table 29: Supported characters in ASCII mode

Unrepresentable characters as per this table will be shown as "-" (0x2D).

9.2.5 Practical encoding examples

The next table shows seven practical examples of encoding characters for all modes:

Type	Sent frame						Shown 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 30: Practical examples for all modes



10 DIGITAL ENTRIES AND ASSOCIATED FUNCTIONS

As an alternative to displaying values on the screen through the before mentioned options, the device can be configured to show information based on the status of the digital inputs, provided they are correctly configured beforehand. There are four functions associated with the digital inputs: **counter**, **stopwatch**, **tachometer**, and **direct BCD display**.

If information from any other port is desired to be displayed (e.g., Modbus RTU/TCP, Profinet...), it is imperative to disable the digital inputs. Otherwise, only information related to the active digital input function will remain visible.

The following diagram shows the connection scheme of the digital inputs using the two designated connectors:

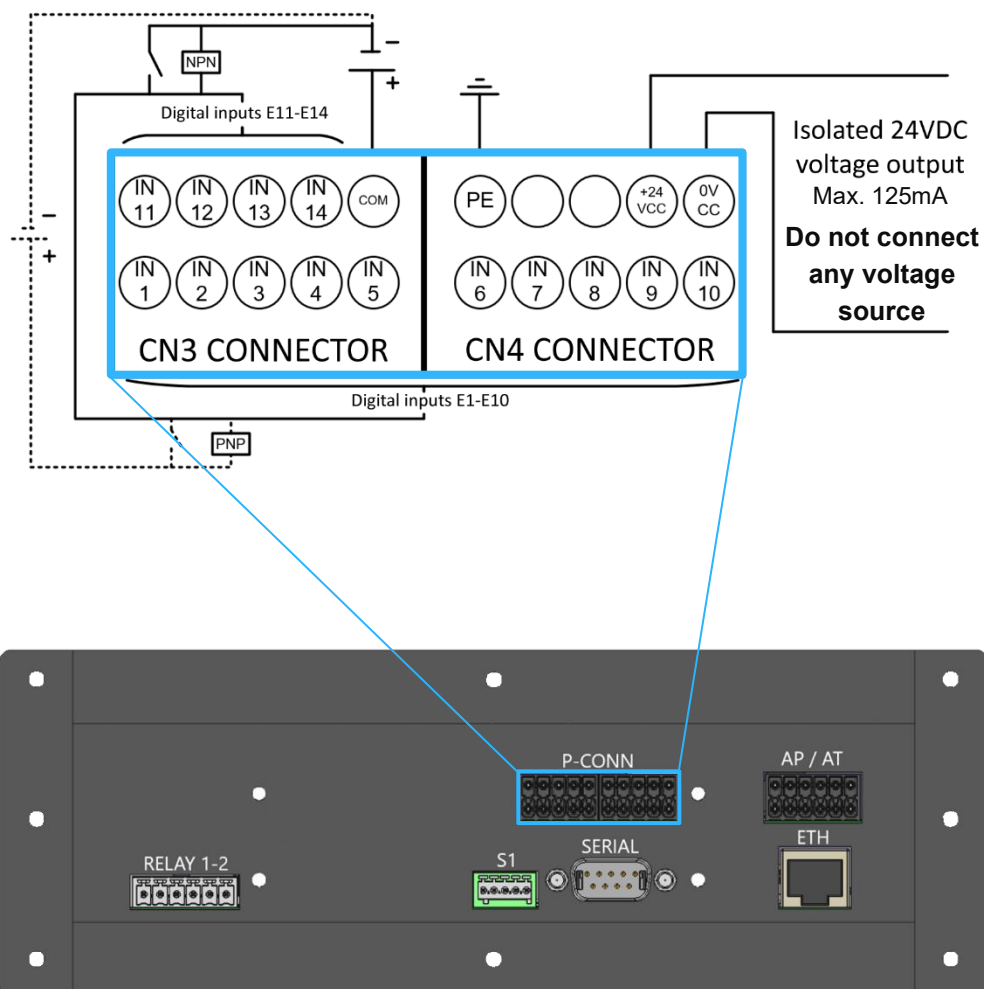


Fig. 33: Digital inputs connection diagram

10.1 Digital inputs configuration

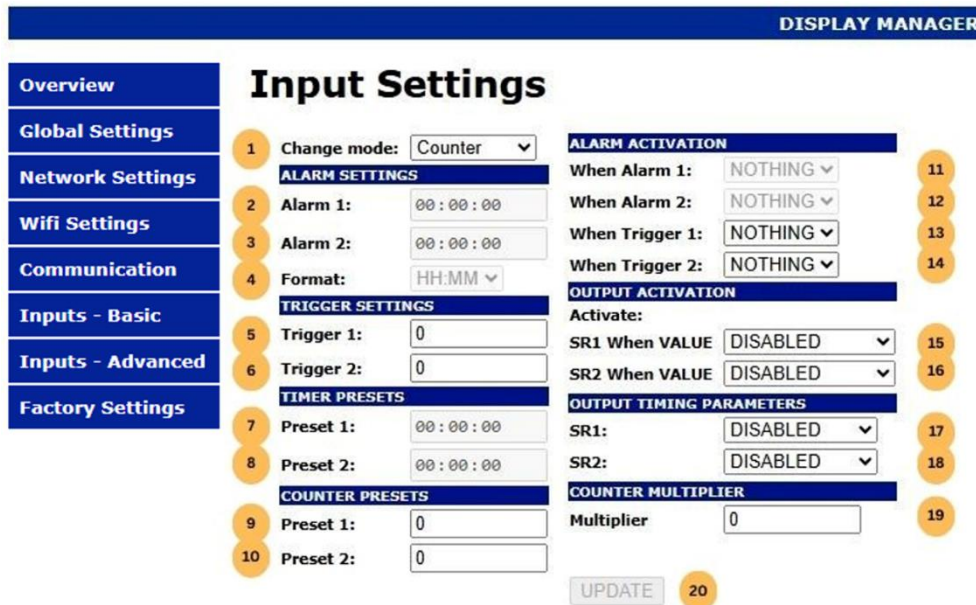


Fig. 34: Digital inputs configuration screen on Webserver

The digital input module is configurable through the "Inputs-Basic" and "Inputs-Advanced" pages on the webserver.

Firstly "Inputs-Basic" related functionalities will be detailed. Selecting a mode (1) enables or disables the relevant controls for each functionality. The words "Alarm" and "Trigger" on the webserver are equivalent, as both set a threshold for their respective modes.

1. Select the operating mode and behavior of the digital inputs: counter, stopwatch, tachometer, or direct BCD input.
2. Set the alarm threshold for ALARM 1 in stopwatch mode.
3. Set the alarm threshold for ALARM 2 in stopwatch mode.
4. For displays with 5 digits or fewer, choose the format shown on the stopwatch: Hours and Minutes (HH:MM) or Minutes and Seconds (MM:SS).
5. Set the trigger threshold for TRIGGER 1 in counter mode.
6. Set the trigger threshold for TRIGGER 2 in counter mode.
7. Set the preload value (PRESET 1) in stopwatch mode.
8. Set the preload value (PRESET 2) in stopwatch mode.
9. Set the preload value (PRESET 1) in counter mode.
10. Set the preload value (PRESET 2) in counter mode.
11. Configure the action when ALARM 1 is exceeded in stopwatch mode:
 - NOTHING: ALARM 1 remains disabled regardless of its value.
 - RESET: Stopwatch is reset immediately (asynchronously) to zero.
 - PRESET1: Stopwatch is loaded with PRESET1 value (asynchronously).
 - PRESET2: Stopwatch is loaded with PRESET2 value (asynchronously).
12. Configure the action when ALARM 2 is exceeded in stopwatch mode:
 - NOTHING: ALARM 2 remains disabled regardless of its value.
 - RESET: Stopwatch is reset immediately (asynchronously) to zero.
 - PRESET1: Stopwatch is loaded with PRESET1 value (asynchronously).
 - PRESET2: Stopwatch is loaded with PRESET2 value (asynchronously).

13. Configure the action when TRIGGER 1 is exceeded in counter mode:
 - NOTHING: TRIGGER1 remains disabled regardless of its value.
 - RESET: Counter is reset immediately (asynchronously) to zero.
 - PRESET1: Counter is loaded with PRESET1 value (asynchronously).
 - PRESET2: Counter is loaded with PRESET2 value (asynchronously).
14. Configure the action when TRIGGER 2 is exceeded in counter mode:
 - NOTHING: TRIGGER2 remains disabled regardless of its value.
 - RESET: Counter is reset immediately (asynchronously) to zero.
 - PRESET1: Counter is loaded with PRESET1 value (asynchronously).
 - PRESET2: Counter is loaded with PRESET2 value (asynchronously).
15. Define the activation conditions for relay output SR1.
16. Define the activation conditions for relay output SR2.

The available activation conditions are the following:

Selection	Activation conditions
DISABLED	Not active
= 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 31: Relay activation conditions

17. Select the timing mode for relay output SR1.
18. Select the timing mode for relay output SR2.
19. Set the counter multiplier value from 1 to 20. Each increment/decrement pulse will count as multiplier × 1.
20. Press the "UPDATE" button to save changes.

Selection	Output timing conditions
DISABLED	Not active
0.5 s	Single pulse of 500 milliseconds
0.8 s	Single pulse of 800 milliseconds
1 s	Single pulse of 1000 milliseconds
1.5 s	Single pulse of 1500 milliseconds
0.5 Hz	Output periodically active for 2 seconds and deactivated for another 2 seconds. The activation cycle persists until the alarm condition disappears.
2 Hz	Output periodically active for 500 milliseconds and deactivated for another 500 milliseconds. The activation cycle persists until the alarm condition disappears.
1.25 Hz	Output periodically active for 800 milliseconds and deactivated for another 800 milliseconds. The activation cycle persists until the alarm condition disappears.
1 Hz	Output periodically active for 1 second and deactivated for another 1 second. The activation cycle persists until the alarm condition disappears.
CONTINUOUS	Output remains active as long as the alarm condition persists

Table 32: Relay timing conditions

The advanced functionalities related to digital entries, which can be found in "Inputs-Advanced" tab in Webserver have the following specifications:

DISPLAY MANAGER

Overview

Global Settings

Network Settings

Wifi Settings

Communication

Inputs - Basic

Inputs - Advanced

Factory Settings

Input - Advanced Settings

COUNTER ADVANCED SETTINGS

Frequency mode:

Low frequency ▼

1

Multiplier factor:

5

2

TACHO ADVANCED SETTINGS

Time between measures:

200 ms ▼

3

Scale factor selection:

Multiplier ▼

4

Scale factor:

2

5

Limit time without impulse (s):

3

6

Average taken samples (Reset display after change):

5

7

UPDATE

8

Fig. 35: Advanced Inputs functionalities in Webserver

1. Frequency mode selection for counter mode.
2. Counter multiplier factor.
3. Tachometer time between measures.
4. Scale factor selection, between multiplier or divisor.
5. Scale factor applied to the display output.
6. Limit time without tachometer impulse.
7. Average taken samples.
8. Press the "UPDATE" button to save changes.

10.2 Digital entries associated functions

10.2.1 Counter

The counter function displays the number of pulses accumulated since the last reset. It has specific inputs for pulse input, counting direction (increment or decrement), reset, and two preset inputs. The used control inputs are the following:

Digital entry	Action upon Activation/Deactivation
E1	Increment counter value
E2	Decrement counter value
E3	Reset counter
E4	Preset 1 load
E5	Preset 2 load

Table 33: Control inputs used for counter function

The counting multiplicity, which is the number of counts incremented or decremented per pulse, is configurable using the counter multiplier factor.

It is possible to configure up to two TRIGGERS, which can be preset to any value via the web server. The conditions under which the TRIGGERS will be activated can also be configured according to the following table.

Selection	Activation conditions
DISABLED	Not active
= 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 34: Activation conditions for counter function

Likewise, if desired, a TRIGGER condition can be linked to one of the two relay outputs. The activation timing is also configurable, either as single pulses of a specific duration or as periodic activation frequencies. The trigger condition is reset either through the reset input or when the condition that initially caused the TRIGGER is no longer present.

10.2.2 Chronometer

The chronometer function measures time in various scales and units. Control inputs used for this function are:

Digital entry	Action done upon Activation/Deactivation
E1	RUN chrono = ON/ STOP chrono = OFF
E2	Reset chronometer
E3	Preset 1 load
E4	Preset 2 load
E5	Increment chronometer = ON/ Decrement chronometer = OFF

Table 35: Control inputs used in chronometer function

The displayed format adjusts automatically based on the configured number of digits:

Available digits	Shown 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 36: Display format based on number of digits

Warning: in case of wanting the chronometer function with the two-point clock format (XX: XX), this shall be specified when ordering.

For 4 or 5-digit options, format can be configured via webserver as HH:MM or MM: SS.

Alarm conditions can be linked to relay outputs with configurable timing. The alarm condition resets via the reset input or when the condition ceases.

Selection	Activation conditions
DISABLED	Not active
= 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 37: Activation conditions for the chronometer function

Likewise, if desired, an ALARM condition can be linked to one of the two relay outputs. The activation timing is also configurable, either as single pulses of a specific duration or as periodic activation frequencies. The trigger condition is reset either through the reset input or when the condition that initially caused the ALARM is no longer present.

10.2.3 Tachometer

The tachometer function allows for measuring the frequency of a signal supplied to a digital input. For proper operation, the tachometer's output signal must be connected to digital input 13 (E13), and its ground must be connected to the pin labeled COM.

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

On the other hand, various parameters related to this functionality can be adjusted in the Webserver:

- Time between measurements for the tachometer function, selectable between 200 ms and 20 s. Increasing this time reduces variations in the displayed signal if it is high-frequency. However, it is not recommended to set a very long time between measurements if the signal to be measured is low-frequency, as the response time will be longer.
- Scale factor selection, between multiplier or divisor. This option allows you to choose whether the scale factor applied later to the display output will be multiplied or divided.
- Scale factor applied to the display output, with the purpose of scaling the value shown depending on the input frequency. The scale factor must be an integer from 1 to 15000.
- Tachometer no-impulse time limit in seconds. This is the time elapsed since no frequency pulse is applied to the tachometer pins until the display shows that no pulse is present. Once the programmed time is exceeded, the display shows a value of 0. This value can range from 1 to 10 seconds, and a default of 1 second is recommended.
- Number of samples measured for averaging displayed on the screen. The number of samples can be programmed from 1 to 100 and helps smooth fluctuations in the input signal when it varies significantly. Important: after changing the sampling value, the display must be reset for the changes to take effect.

10.2.4 Direct BCD

The direct BCD function allows the display of a 3-digit number, controllable through 14 digital inputs.

Inputs E1–E4 control digit 1, which is the rightmost digit on the display.

Inputs E5–E8 control digit 2, the center digit.

Inputs E9–E12 control digit 3, the third digit from the right.

The position of the decimal point and the negative sign (–) is controlled by two additional digital inputs, E13 and E14.

BCD digit	Digital inputs states
Units	E4 E3 E2 E1
Tens	E8 E7 E6 E5
Hundreds	E12 E11 E10 E9

Table 38: Digital inputs in use for direct BCD control

Decimal point	E13 and E14 digital inputs states
None	E14 = 0, E13 = 0
Tens	E14 = 0, E13 = 1
Hundreds	E14 = 1, E13 = 0
Symbol -	E14 = 1, E13 = 1

Table 39: Decimal point configuration for BCD control

For example, in order to show

8 5. 3

It shall be encoded:

Decimal point 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 40: Practical example of direct BCD

11 FACTORY RESET

With the aim of resetting all Ethernet settings to their factory defaults in case the user makes an error in the configuration, the Factory Settings tab on the Webserver has been enabled. By pressing the Reset button, this action will be executed.

It is possible to access this tab via WiFi to reset all Ethernet settings, but it is necessary to reset the display for the configuration changes to take effect.

IMPORTANT: Do not reset the Ethernet configuration unless absolutely necessary!

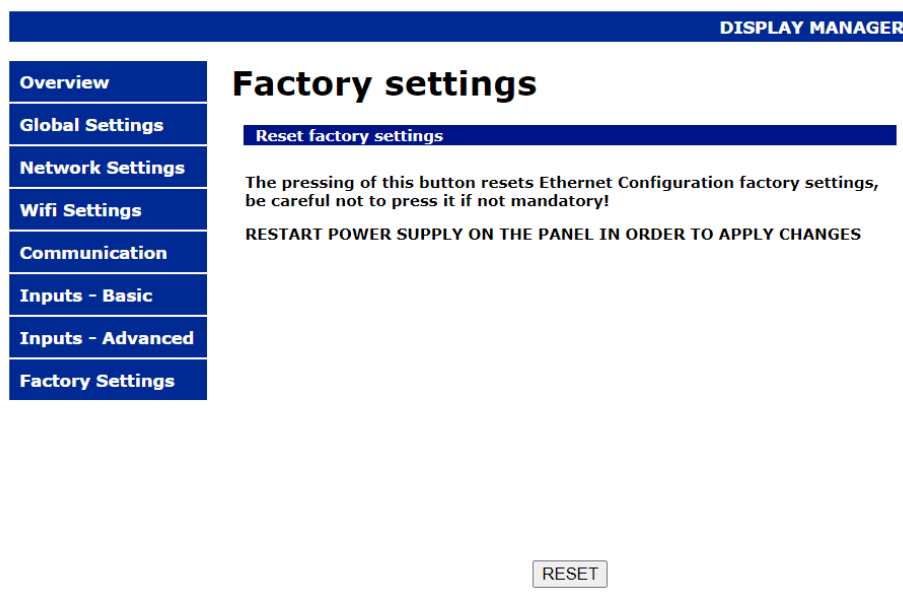


Fig. 36: Advanced inputs screen in Webserver

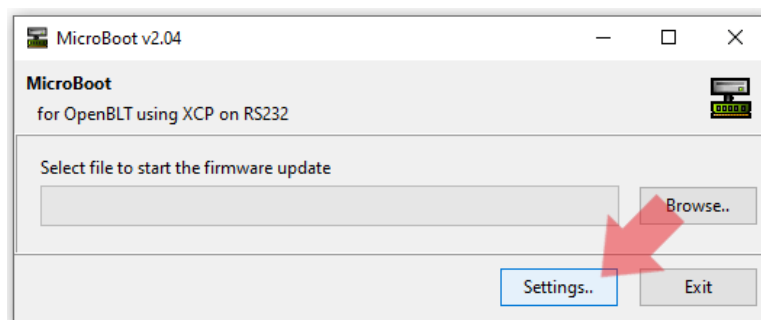
12 UPDATE

Should you need to update the *firmware*, please download **MicroBoot** program form (<https://www.lartet.com/en/download-center/>) and proceed as follows .

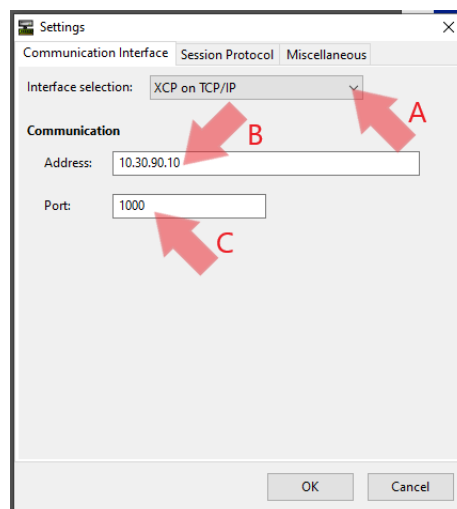
IMPORTANT: The update must be done through a wired ETHERNET

Steps to do the *firmware* upload:

1. Start the program and go into settings.



2. Check program settings:



- A. Establish TCP/IP communication-
 - B. Configure the IP address that has been defined for the wired network.
 - C. Configure 1000 port.
3. Accept 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, cancel the process, check the IP configured in the MicroBoot, the Ethernet cable and the Firewall rules and repeat the *firmware*.

The program itself has a "timeout" notice if it detects that too much time has passed, but it has no way of knowing if the process has finished and it does not interrupt its loading. It is only a time notice.

NOTE: If the loading process is interrupted (power failure, cable disconnection...) the update remains incomplete and the display does not have a valid program. Under these circumstances, the only way to load proper firmware is to power on the unit and load a valid program (via MicroBoot) to the emergency IP address **192.168.1.100** when the display shows “Pr0”.

ANNEX 1: Send information with "Hercules" for TCP, UDP and serial communication

When carrying out the communication using the "Hercules" program, certain aspects must be taken into account so as not to make mistakes when sending values in decimal or hexadecimal.

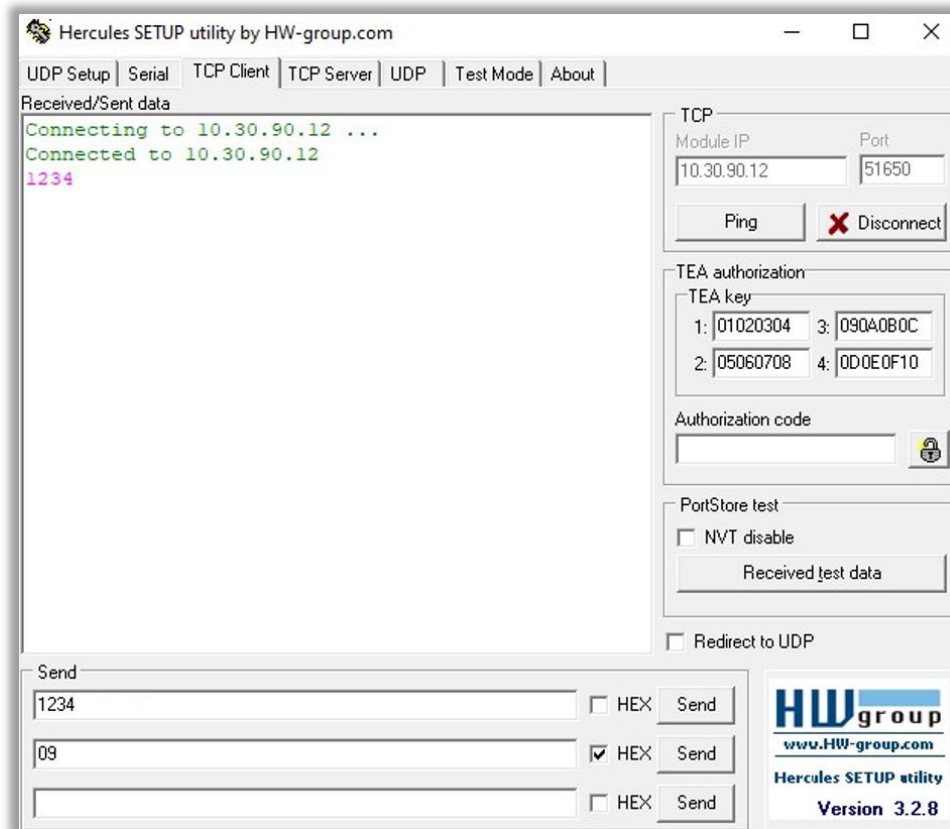


Fig. 37: Example TCP. "1234".

First, it is necessary to establish the communication information as it has been 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 you to send the entire frame simultaneously. The program will automatically read numbers as decimals and letters as ASCII characters. To indicate to the program that we want to enter a hexadecimal number, a "\$" must be applied before the value.
- Write the commands under "Send" by selecting the "HEX" box. This allows the user to directly type ASCII values in hexadecimal form, without the need to add symbols.

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

ANNEX I

Example web server configuration for TCP:

1. "Global Settings" Window., **DATA PORT** = ETHERNET.
2. "Network Settings" window, place right network parameters, **IP Addr** = 10.30.90.12 like in "Hercules".
3. "Communication Settings" window, **PROTOCOL** = TCP.

If you want to enable the display, you can configure an "ENDBLOCK", but it is not necessary for communication.

Example web server configuration for UDP:

Same as above but with **PROTOCOL** = UDP

Example web server configuration for RS-232:

1. "Global settings" window, **DATA PORT** = SERIAL.
2. "Communication settings" window:
 - **ADDRESS** = 14.
 - **PROTOCOL** = ASCII.
 - **INTERFACE** = RS232.
 - **HEADER** = 02h AL AH (for example, message must agree)
 - **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 RS-232 converter is used. To find out which "COM" port it is set to, consult it 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

In this case, said frame contemplates all the necessary parameters to display **1234**, including the headers and end of the frame.

ANNEX 2: Send information with “QModMaster” for MODBUS TCP and MODBUS RTU

When communicating over MODBUS using QModMaster there are few differences to work over RTU or TCP.

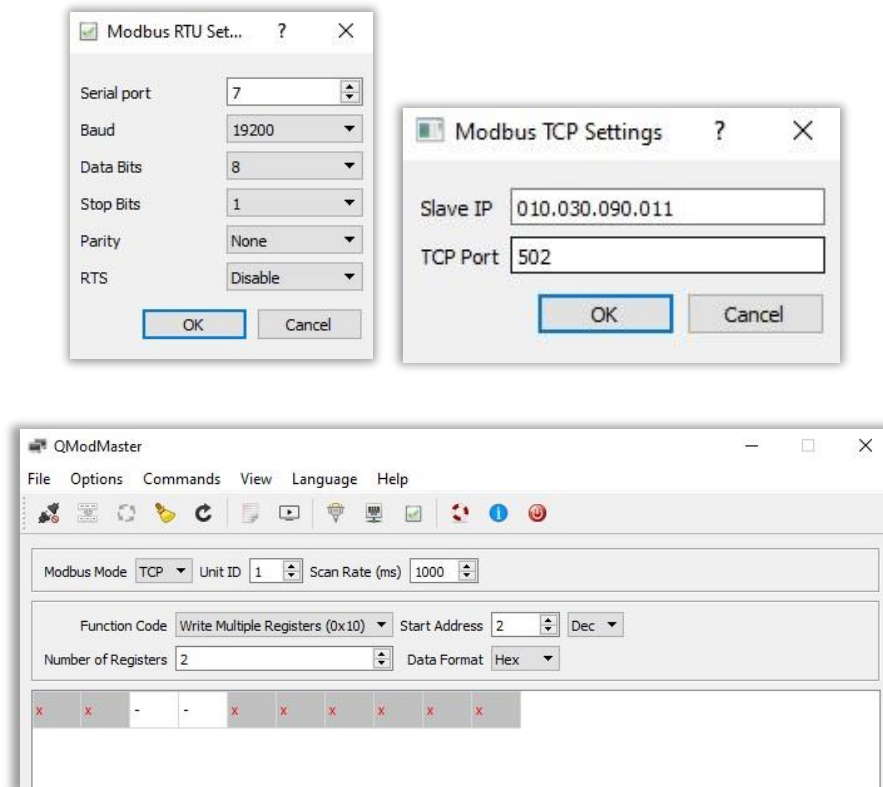


Fig. 38: QModMaster.

First of all, check that the connection settings are correct. These settings vary between RTU or TCP, but in both cases they must be related to the information established in the viewer's web server. In MODBUS TCP the port is always 502.

Next, you have to configure the “Unit ID” and the “Scan Rate”, if there is only one device connected, an image like the previous one will be displayed.

At this point, the type of frame to be sent will be configured according to the value to be displayed, following the protocols explained in [section 6.4](#). The parameters to configure are the following:

- **Function Code:** You must select the type of action you want. Either read or write to registers or Coils. All the possibilities are specified in the drop-down menu, as well as the function number that corresponds to them.
- **Start Address:** Indicates the first register to be read from or written to. It is advised to keep its value in decimal.
- **Number of Registers:** You must indicate how many records you want to work with.

 ANNEX II

- **Data Format:** This drop-down menu allows you to change the contents of the registers to the desired system. It is very useful to enter data in the most comfortable way possible, if there is already data written, the program converts it automatically.

Example 1: You wish to write "HOLA" by MODBUS TCP.

First, the configuration on the web server is configured as follows:

1. "Global Settings", **DATA PORT** = ETHERNET.
2. "Network Settings", place the right adjustments, in this case **IP Addr** = 10.30.90.11 like in "QModMaster".
3. "Communication Settings", **PROTOCOL** = MODBUS

Second, the "Write Multiple Registers" (10h) function is used to write 2 registers with the content "484Fh 4C41h" starting at address 0.

QModMaster configuration:

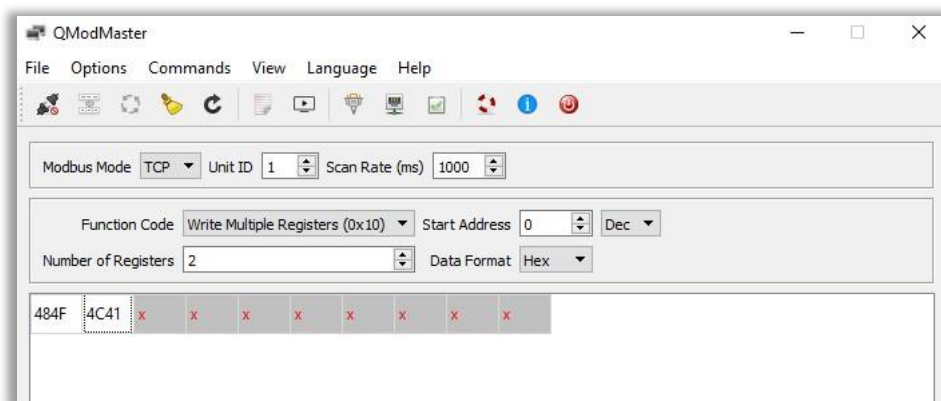


Fig. 39: Example QModMaster. Send "HOLA".

Once the configuration is done, click on the connector button at the top left of the panel. This will initiate communication with the display.

Finally, clicking the button immediately to the right of the connector will send the frame and show "HELLO" on the display.

NOTE: It is very useful to open the "Bus Monitor", in the "View" tab. Doing so opens a window showing each of the frames that are sent and received during the communication.

Example 2: Send "HOLA" by MODBUS RTU.

Adjust configuration like:

1. "Global Settings", **DATA PORT** = SERIAL.

ANNEX II

2. "Communication Settings":

- **ADDRESS** = 1.
- **PROTOCOL** = MODBUS RTU.
- **INTERFACE** = RS232.
- **BAUDRATE** = 19200
- **PARITY** = NONE
- **DATA SIZE** = 8 bits
- **STOP BITS** = 1 bit

To send the message with "QModMaster" a USB to RS-232 converter is used. To find out which "COM" port it is set to, consult it in the Windows "Device Manager". The program is configured identically to the server in RTU.

To send the register information, it is done in an identical way to the previous example in MODBUS TCP.

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

The following examples has been done using a Siemens PLC "CPU 1512 SP-1 PN".

MODBUS_RTU: The following blocks are used to communicate with the display:

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

The corresponding communications card is used in the "PORT" input. In our case, "CM PtP".

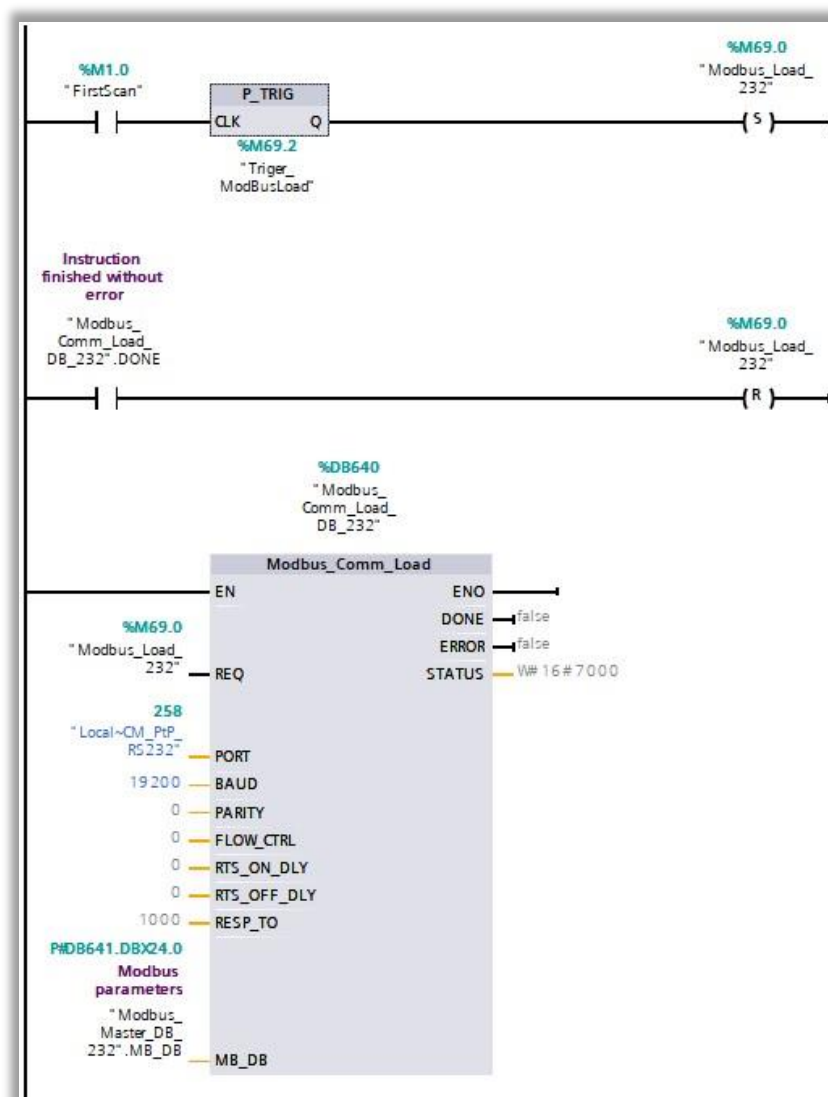


Fig. 40: Comm configuration ports .

Second, the blocks and variables used to generate and send a record write message are shown.

ANNEX III

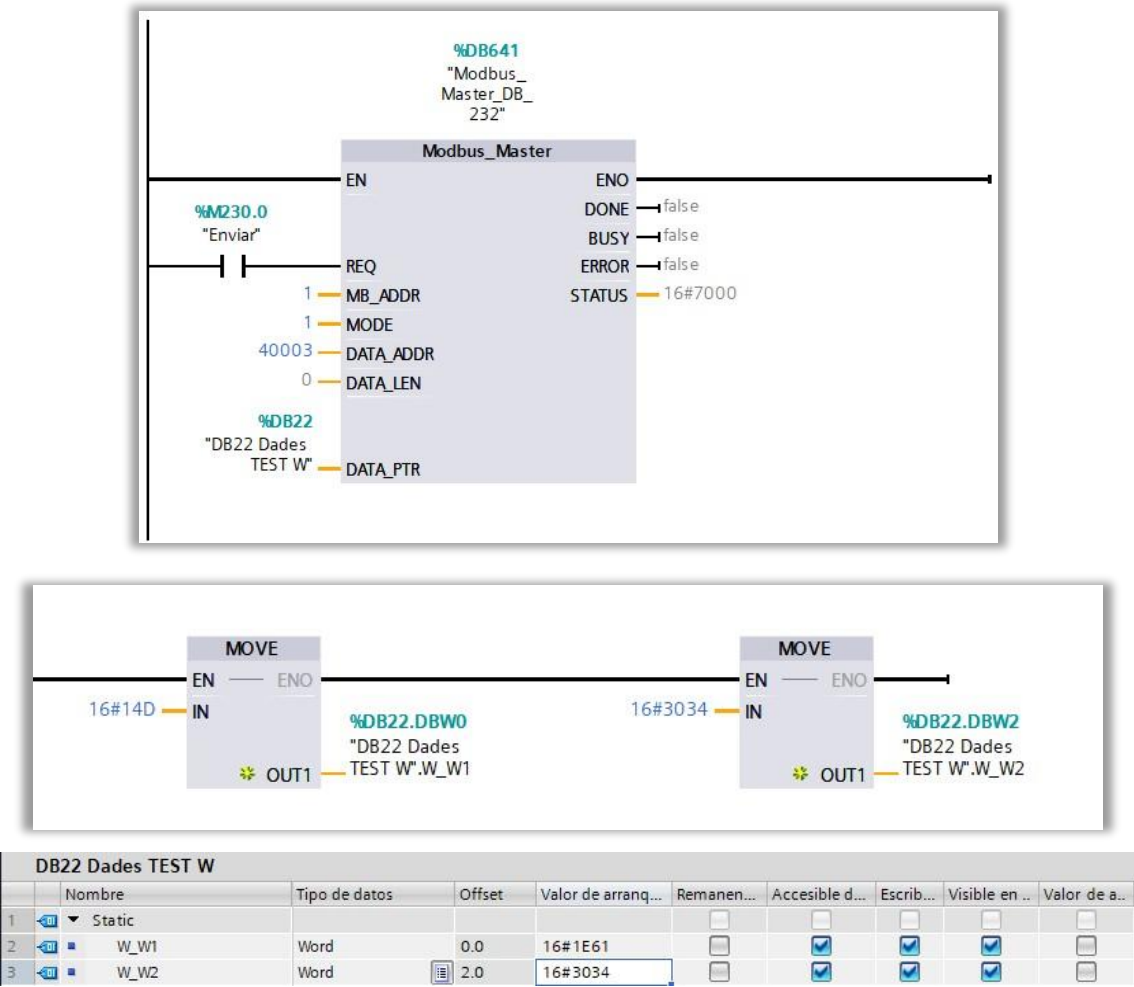


Fig. 41: Register to send.

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



ANNEX III

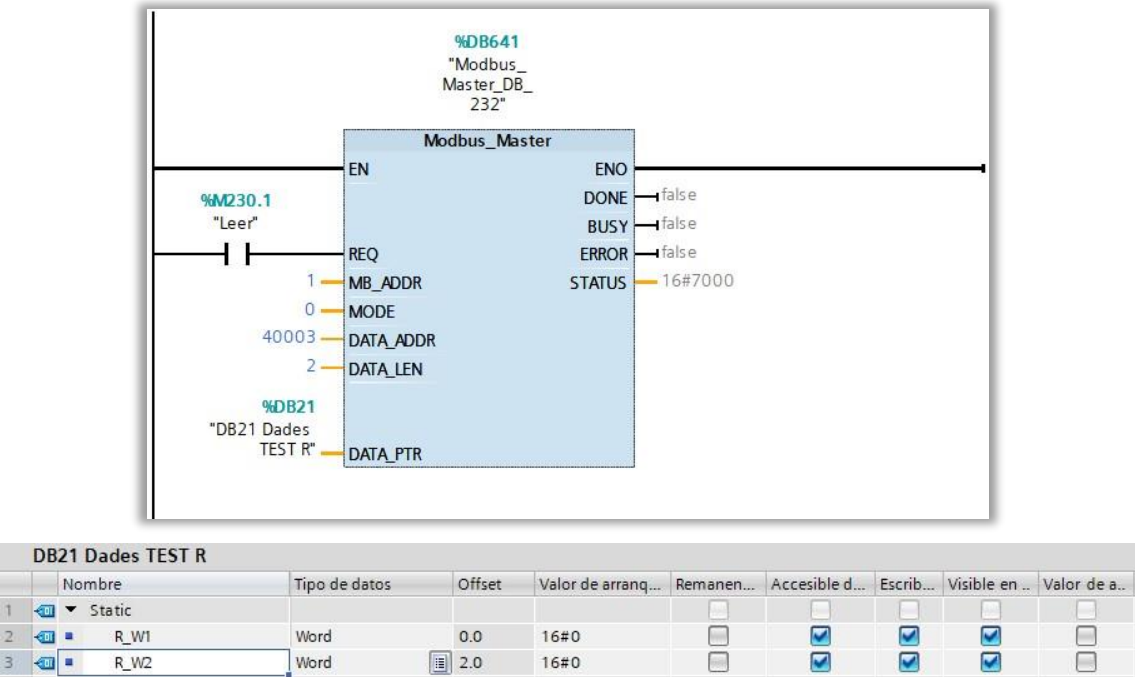


Fig. 42: Answer registers.

It is appreciated that the block is the same “Modbus_Master”. By changing the input values, it is configured to be a write or read message, as well as the number of registers or their location.

IMPORTANT: When configuring the “Modbus_Master” you must consult its documents so as not to make mistakes in any of the block inputs. Depending on the MODBUS function used and its content, it will be necessary to modify the inputs so that they adapt to the needs of each information transmission.

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

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



ANNEX III

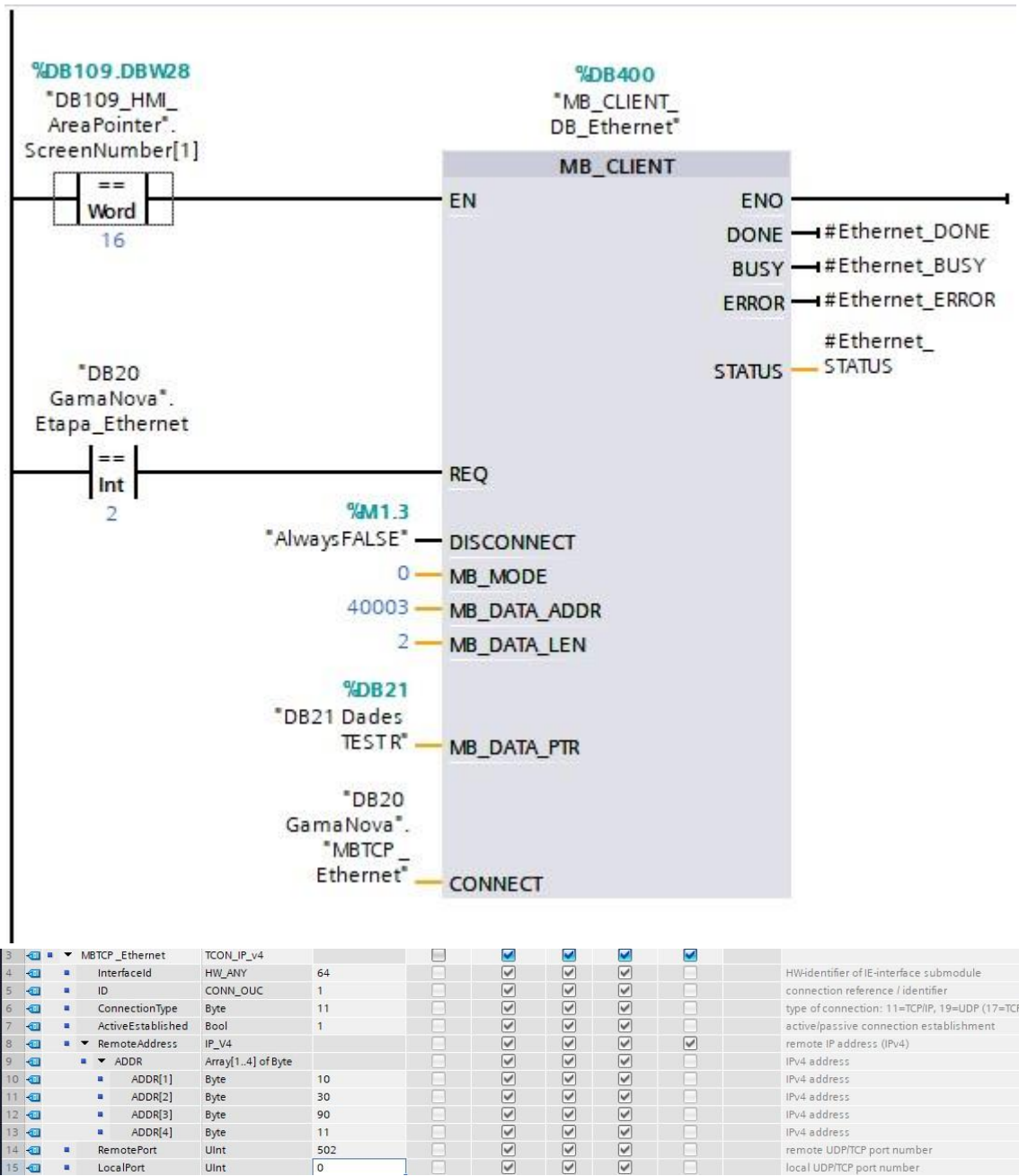


Fig. 43: MODBUS_TCP communication configuration.

The IP must be configured according to the value assigned in the viewer's web server. To do this, generate the variable "MBTCP_Ethernet" and write in its type "TCON_IP_v4", in this way all the fields are developed automatically. Remember to set the desired IP and "ConnectionType" = 11 (TCP/IP).

The "MB_MODE" input (1 or 0) indicates whether the communication is to read or write registers.

UDP: Blocks downloaded from the Siemens website are used to communicate in UDP. Specifically "S7-1200/S7-1500" (LOpenUserComm_Udp).



ANNEX III

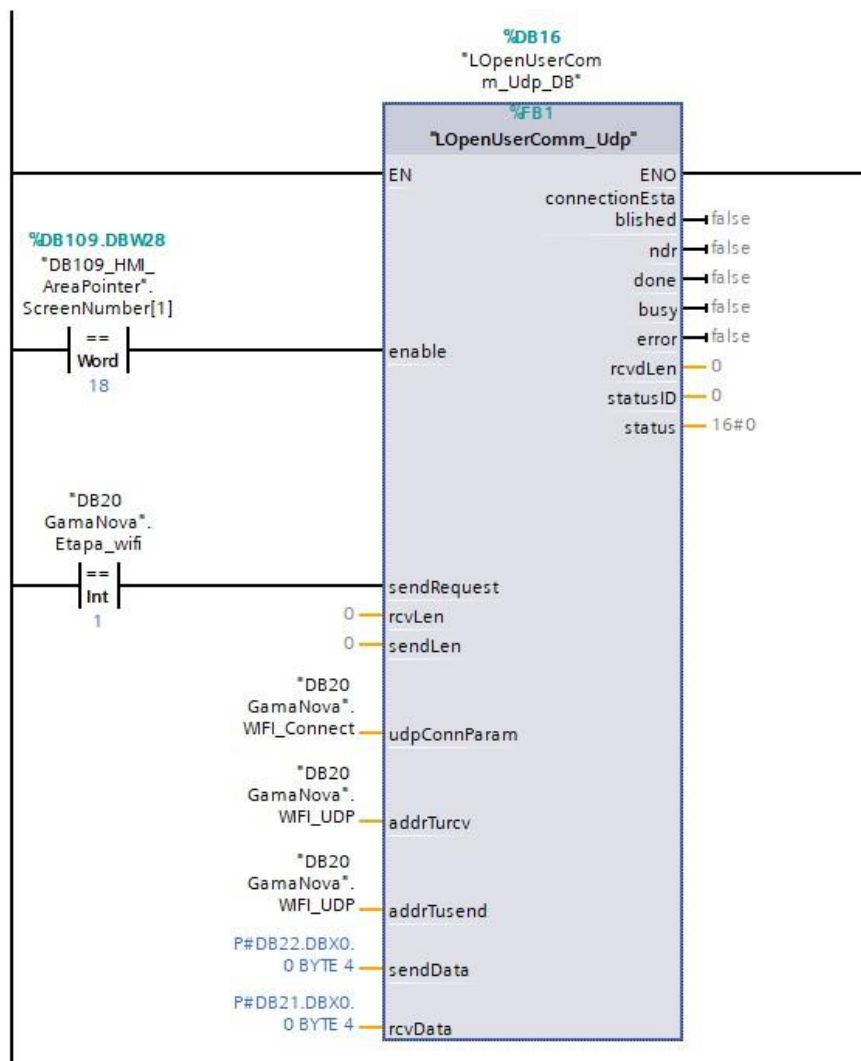


Fig. 44: "LOpenUserComm_Udp" block.

The commented module is in charge of carrying out the configuration automatically, once the inputs have been established in the desired way.

WIFI: An external module (TPLINK) is used for WIFI communication, so the PLC performs communication as if it were a wired network.

RELAY: To activate the relays or the flashing, Modbus must be used. In our case we use the module shown above for Modbus_TCP. The difference is clearly visible, since in this case we work on the address "MB_DATA_ADDR" = 2 and the length of the data is "MB_DATA_LEN" = 5, since there are 5 modifiable elements (4 relays + flashing).

ANNEX III

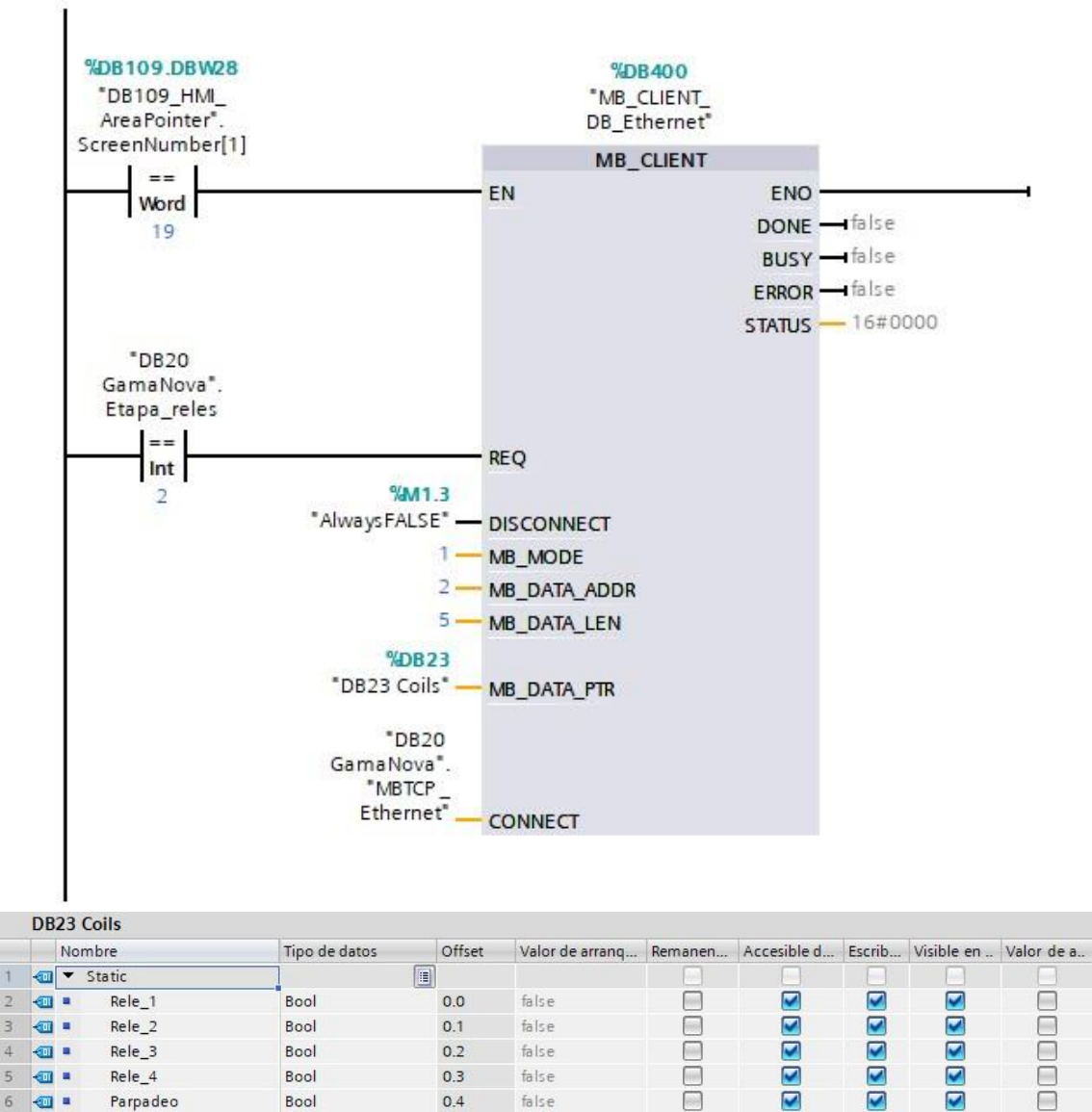


Fig. 45: Relays and Blinking.

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



DECLARACIÓN DE CONFORMIDAD

CONFORMITY DECLARATION



Tetralec Electronica Industrial S.L.
c/ Severo Ochoa, 80
Polígono Industrial Font del Radium
08403 Granollers

As constructor of the equipment's **LARTET**:

Model: DN-109.V2 all versions.
Model: DN-119.V2 all versions.
Model: DN-189.V2 all versions.

We declare under our sole responsibility than the aforementioned products comply with the following European directives:

2014/35/UE LVD.
UNE-EN 60204-1:2019 Safety of machinery

EMC 2014/30 UE Electromagnetic compatibility directive
UNE-EN 61000-6-2:2019 Immunity standard industrial environments
UNE-EN 61000-4-4:2013 Electrical fast transient/burst immunity test
UNE-EN 61000-4-2:2010 Electrostatic discharge immunity test

2011/65/UE: Restrictions of the use of certain hazardous substances in electrical and electronic equipment

Granollers, 28 de April de 2022