TECHNICAL MANUAL

LARGE DISPLAYS

DN109/NB - DN119/NB - DN189/NB - DN129/NB

19 INTRODUCTION

DN/NB series displays are industrial led visualizers presenting relevant numerical data, allowing long distance viewing. Main features depending on chosen model are:

- 2 to 10 digits.
- Monochrome red leds or 4 colors leds.
- IP41/IP54/IP65 environmental protection
- High brightness for outdoor use.
- Programmable 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 engineering unit presentation.
- One or two sides.
- Digit height can be **DN109: 57 mm, DN119: 100 mm, DN189: 180 mm & DN129: 250 mm**, so maximum reading distance span from 30, 50, 90 to 125 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 application 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**.

20 GENERAL CHARACTERISTICS

20.1 Display

20.1.1 DN109

Power supply ....80 a 240 VAC   50/60Hz. Option 24VDC.
Consumption ....See 20.2.1.
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 60ºC.
....Storage Temperature: -30ºC a 70ºC
....Humidity: 20-90% HR no condensation. See options
....Max. Ambient light 1000 lux
....Protection: IP41, optionally IP54/IP65

20.1.2 DN119

Power supply ....80 a 240 VAC   50/60Hz. Option 24VDC.
Consumption ....See 20.2.2.
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 60ºC.
....Storage Temperature: -30ºC a 70ºC
....Humidity: 20-90% HR no condensation. See options
....Max. Ambient light 1000 lux. See options
....Protection: IP41, optionally IP54/IP65

20.1.3 DN189

Power supply ....80 a 240 VAC   50/60Hz. Option 24VDC.
Consumption ....See 20.2.3.
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 60ºC.
....Storage Temperature: -30ºC a 70ºC
....Humidity: 20-90% HR no condensation. See options
....Max. Ambient light 1000 lux. See options
....Protection: IP41, optionally IP54/IP65

20.1.4 **DN129**

Power supply ....80 a 240 VAC   50/60Hz. Option 24VDC.
Consumption ....See 20.2.4.
Display ....7 segments 250 mm + decimal dot
....Red. Max reading distance 120 m
Text (Vinyl) ....White Vinyl
Parameter internal memory ....Eeprom.
Environmental conditions ....Working Temperature -20 a 60ºC.
....Storage Temperature: -30ºC a 70ºC
....Humidity: 20-90% HR no condensation. See options
....Max. ambient light: Full outdoor
....Protection: IP41 option IP54.

20.2 Weight and consumption

20.2.1 DN109

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (w)	Ref.	W (kg)	C (W)
DN109/3S	3,2	9,9	DN109/3S+TL	3,2	11,9	DN109/3S+TV	3,2	9,9
DN109/3D	3,2	14	DN109/3D+TL	3,2	15,7	DN109/3D+TV	3,2	14
DN109/4S	3,2	11,5	DN109/4S+TL	3,7	13,6	DN109/4S+TV	3,7	11,5
DN109/4D	3,7	18,4	DN109/4D+TL	3,7	19,1	DN109/4D+TV	3,7	18,4
DN109/5S	3,2	13,2	DN109/5S+TL	3,7	15,2	DN109/5S+TV	3,7	13,2
DN109/5D	3,7	22	DN109/5D+TL	4,7	25,7	DN109/5D+TV	4,2	22
DN109/6S	3,7	14,7	DN109/6S+TL	4,2	16,8	DN109/6S+TV	4,2	14,7
DN109/6D	4,2	24,9	DN109/6D+TL	4,7	29	DN109/6D+TV	4,2	24,9
DN109/7S	4,2	16,4	DN109/7S+TL	4,2	18,4	DN109/7S+TV	4,2	16,4
DN109/7D	4,7	28,1	DN109/7D+TL	5,2	32,1	DN109/7D+TV	5,2	28,1
DN109/8S	4,2	18	DN109/8S+TL	4,7	20	DN109/8S+TV	4,7	18
DN109/8D	5,2	31,3	DN109/8D+TL	5,7	35,3	DN109/8D+TV	5,7	31,3
DN109/9S	4,7	19,7	DN109/9S+TL	4,7	21,6	DN109/9S+TV	4,7	19,7
DN109/9D	5,2	34,5	DN109/9D+TL	5,7	38,6	DN109/9D+TV	5,7	34,5
DN109/10S	4,7	21,2	DN109/10S+TL	5,2	23,2	DN109/10S+TV	5,2	21,2
DN109/10D	5,7	37,7	DN109/10D+TL	6,2	41,7	DN109/10D+TV	6,2	37,7

20.2.2 DN119

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (W)	Ref.	W (kg)	C (W)
DN119/3S	4,2	14,8	DN119/3S+TL	4,7	17,4	DN119/3S+TV	4,7	14,8
DN119/3D	4,2	22	DN119/3D+TL	5,2	24	DN119/3D+TV	5,2	22
DN119/4S	4,7	18	DN119/4S+TL	5,7	20,6	DN119/4S+TV	5,7	18
DN119/4D	5,2	30,6	DN119/4D+TL	5,7	35,9	DN119/4D+TV	5,7	30,6
DN119/5S	5,2	21	DN119/5S+TL	5,7	23,7	DN119/5S+TV	5,7	21
DN119/5D	5,7	36,9	DN119/5D+TL	6,2	42,1	DN119/5D+TV	6,2	36,9
DN119/6S	5,7	24,2	DN119/6S+TL	6,2	26,8	DN119/6S+TV	6,2	24,2
DN119/6D	6,2	43,2	DN119/6D+TL	6,7	48,5	DN119/6D+TV	6,7	43,2
DN119/7S	6,2	27,3	DN119/7S+TL	7,2	29,9	DN119/7S+TV	7,2	27,3
DN119/7D	3,7	29,5	DN119/7D+TL	7,7	54,8	DN119/7D+TV	7,7	29,5
DN119/8S	6,7	30,4	DN119/8S+TL	7,7	33	DN119/8S+TV	7,7	30,4
DN119/8D	7,2	55,6	DN119/8D+TL	8,2	60,8	DN119/8D+TV	8,2	55,6
DN119/9S	7,2	33,4	DN119/9S+TL	8,2	36	DN119/9S+TV	8,2	33,4
DN119/9D	7,7	61,6	DN119/9D+TL	8,7	66,9	DN119/9D+TV	8,7	61,6
DN119/10S	7,7	36,5	DN119/10S+TL	8,7	39,2	DN119/10S+TV	8,7	36,5
DN119/10D	8,2	68	DN119/10D+TL	9,2	73	DN119/10D+TV	9,2	68

20.2.3 DN189

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (W)
DN189/2S	4,2	17,3	DN189/2S+TV	5,7	17,3
DN189/2D	4,7	29,8	DN189/2D+TV	6,7	29,8
DN189/3S	5,2	23,4	DN189/3S+TV	6,7	23,4
DN189/3D	6,2	42,2	DN189/3D+TV	8,2	42,2
DN189/4S	6,2	29,7	DN189/4S+TV	7,7	29,7
DN189/4D	7,7	54,8	DN189/4D+TV	9,2	54,8
DN189/5S	7,2	35,8	DN189/5S+TV	9,2	35,8
DN189/5D	8,7	67,2	DN189/5D+TV	10,7	67,2
DN189/6S	8,7	41,8	DN189/6S+TV	10,2	41,8
DN189/6D	10,2	79,5	DN189/6D+TV	11,7	79,5
DN189/7S	9,7	48	DN189/7S+TV	11,2	48
DN189/7D	11,2	92,1	DN189/7D+TV	13,2	92,1
DN189/8S	10,7	54,3	DN189/8S+TV	12,2	54,3
DN189/8D	12,7	104,6	DN189/8D+TV	14,2	104,6
DN189/9S	11,2	60,6	DN189/9S+TV	13,2	60,6
DN189/9D	13,7	117,2	DN189/9D+TV	15,7	117,2
DN189/10S	12,2	66,9	DN189/10S+TV	14,2	66,9
DN189/10D	15,2	129,8	DN189/10D+TV	16,7	129,8

20.2.4 DN129

Ref.	W (kg)	C (W)	Ref.	W (kg)	C (W)
DN129/2S	6,7	17	DN129/2S+TV	9,7	17
DN129/2D	8,2	30	DN129/2D+TV	11,7	30
DN129/3S	8,7	24	DN129/3S+TV	11,7	24
DN129/3D	10,7	44	DN129/3D+TV	13,7	44
DN129/4S	10,7	30	DN129/4S+TV	13,2	30
DN129/4D	13,2	56	DN129/4D+TV	16,2	56
DN129/5S	12,2	36	DN129/5S+TV	15,2	36
DN129/5D	15,7	68	DN129/5D+TV	18,7	68
DN129/6S	14,2	44	DN129/6S+TV	17,2	44
DN129/6D	18,2	81	DN129/6D+TV	21,2	81
DN129/7S	16,2	49	DN129/7S+TV	18,7	49
DN129/7D	20,2	94	DN129/7D+TV	23,7	94
DN129/8S	17,7	55	DN129/8S+TV	20,7	55
DN129/8D	23,2	106	DN129/8D+TV	26,2	106
DN129/9S	19,7	62	DN129/9S+TV	22,7	62
DN129/9D	25,7	119	DN129/9D+TV	28,7	119
DN129/10S	21,7	68	DN129/10S+TV	24,2	68
DN129/10D	28,2	132	DN129/10D+TV	31,2	132

20.3 Sizes and dimensions

20.3.1 DN109 and DN119

Ref.	A	B	Ref.	A	B
DN109/3S	288	122	DN109/3S+T	288	122
DN109/4S	288	122	DN109/4S+T	336	122
DN109/5S	288	122	DN109/5S+T	382	122
DN109/6S	336	122	DN109/6S+T	430	122
DN109/7S	382	122	DN109/7S+T	478	122
DN109/8S	430	122	DN109/8S+T	526	122
DN109/9S	478	122	DN109/9S+T	574	122
DN109/10S	526	122	DN109/10S+T	622	122
DN119/3S	324	177	DN119/3S+T	504	177
DN119/4S	414	177	DN119/4S+T	594	177
DN119/5S	504	177	DN119/5S+T	684	177
DN119/6S	594	177	DN119/6S+T	774	177
DN119/7S	684	177	DN119/7S+T	864	177
DN119/8S	774	177	DN119/8S+T	954	177
DN119/9S	864	177	DN119/9S+T	1044	177
DN119/10S	954	177	DN119/10S+T	1134	177
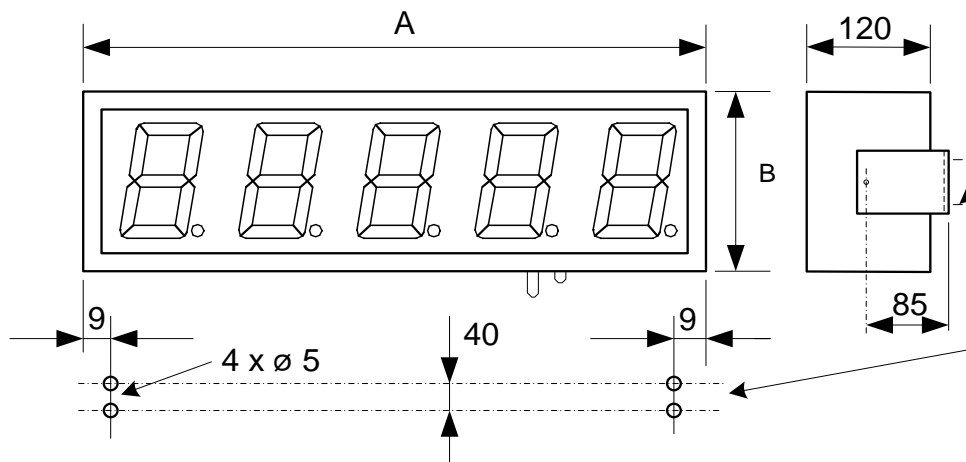
Fig. 81: DN109 and DN119 drawing, plus wall fixing

All measures in millimeters

20.3.2 DN129 and DN189

Ref.	A	B	C	Ref.	A	B	C
DN189/2S	340	251	67	DN189/2S+TV	660	251	67
DN189/3S	500	251	67	DN189/3S+TV	820	251	67
DN189/4S	660	251	67	DN189/4S+TV	980	251	67
DN189/5S	820	251	67	DN189/5S+TV	1140	251	67
DN189/6S	980	251	67	DN189/6S+TV	1300	251	67
DN189/7S	1140	251	67	DN189/7S+TV	1460	251	67
DN189/8S	1300	251	67	DN189/8S+TV	1620	251	67
DN189/9S	1460	251	67	DN189/9S+TV	1780	251	67
DN189/10S	1620	251	67	DN189/10S+TV	1940	251	67
DN129/2S	515	366	186	DN129/2S+TV	985	366	186
DN129/3S	750	366	186	DN129/3S+TV	1220	366	186
DN129/4S	985	366	186	DN129/4S+TV	1455	366	186
DN129/5S	1220	366	186	DN129/5S+TV	1690	366	186
DN129/6S	1455	366	186	DN129/6S+TV	1925	366	186
DN129/7S	1690	366	186	DN129/7S+TV	2160	366	186
DN129/8S	1925	366	186	DN129/8S+TV	2395	366	186
DN129/9S	2160	366	186	DN129/9S+TV	2630	366	186
DN129/10S	2395	366	186	DN129/10S+TV	2865	366	186
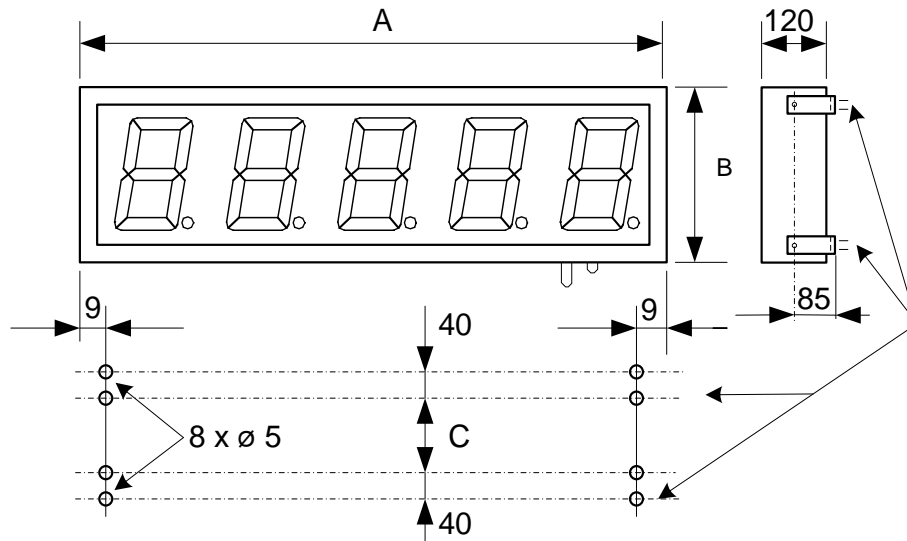
Fig. 82: DN129 and DN189 drawing plus wall fixing

All measures in millimeter

21 INSTALLATION

DN1x9 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 21.3.

DN1x9 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.

21.1 Connectors

Connectors location is on the display bottom surface.
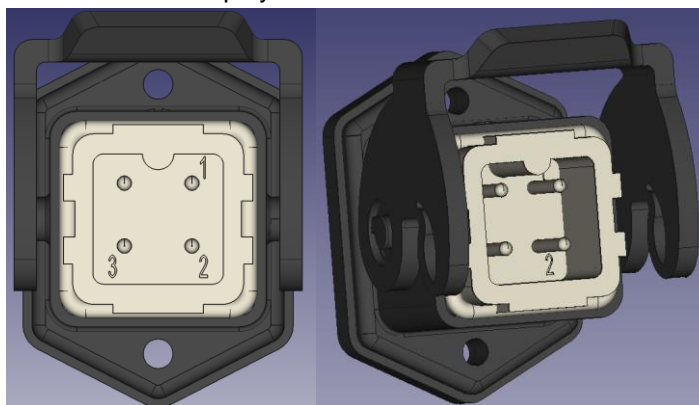
Fig. 83: Power supply connector
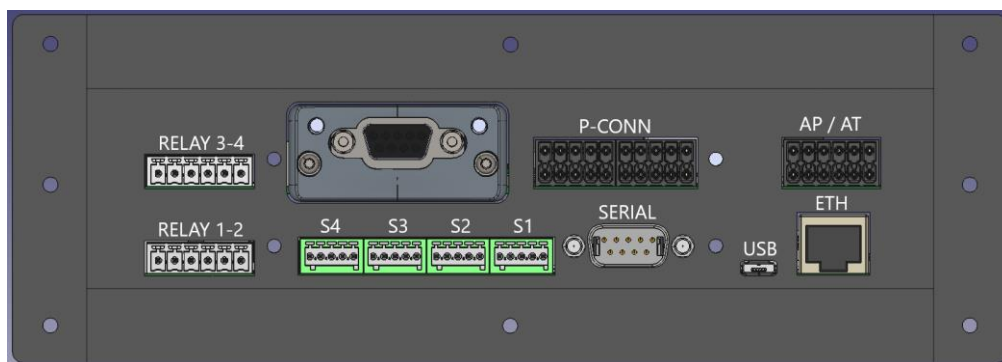
Fig. 84: General connectors

General connectors:

- **ETH.** RJ45 Ethernet.
- **USB.** Micro USB-A.
- **SERIAL.** DB-9 connector male. See 21.4.
- **S1-4.** Probe connectors 1 to 4. E.g. for T & HR sensing.
- **RELAY 1-2.**

RELAY 1-2
1 2 3 4 5 6

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

- **AP / AT.** Analog in. 4-20mA or 0-10V or temperature PT100/PT1000/thermocouple J
- **P-CONN. 14 digital input**
- **Industrial BUS. Profinet/Profibus/Ethercat…**
- **RELAY 3-4**

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

21.2 Power supply wiring

Power supply has to be 80 to 240 VAC, 50/60 Hz or 24VDC (displays with the option 24V).

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.

The 24V power connector has 5 pins and is located at the bottom of the unit. Connect the power cables following the diagram below.

1- L1
2- N
3- NC

1- 24V
2- 0V
3- NC
4- NC
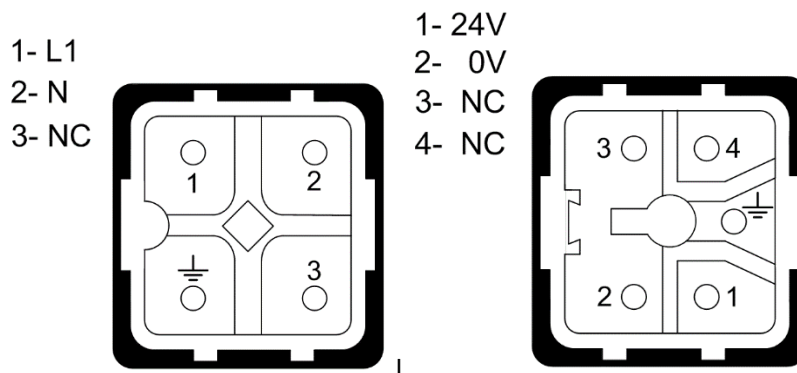
Fig. 85: On the left, diagram of the 220V power connector with 4 contacts. On the right, diagram of the 24V power supply connector with 5 contacts.

21.3 IP65 protection level

Only for displays with IP54/65 option.

A kit is provided:

- External cover
- Overall grommet.
- Cable glands.
- Aerial connector (RJ45 and/or DB-9)

Procedure:

17. Withdraw the 6 yellow highlighted screws from display. Save it. See below picture.
18. On the cover, pass cables to be connected through glands provided.
19. Place and connect aerial connectors.
20. Connect aerials to display base connectors.
21. Place grommet and cover. Be sure that all are well placed to assure IP.
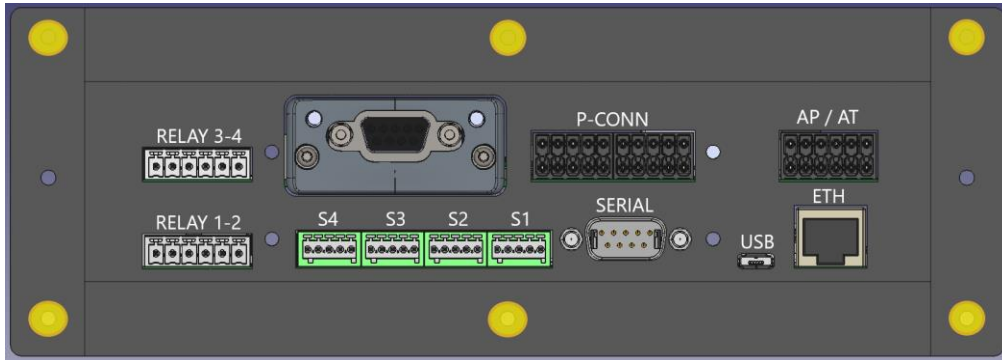
22. Place and screw again the 6 highlighted screws
23. Tight the glands.

PLEASE BE CAREFUL. BAD INSTALLATION MAY VOID WARRANTY

21.4 Serial Line connection

DN-1x9 displays are ready to work with RS-232 and RS-485. Optionally 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.
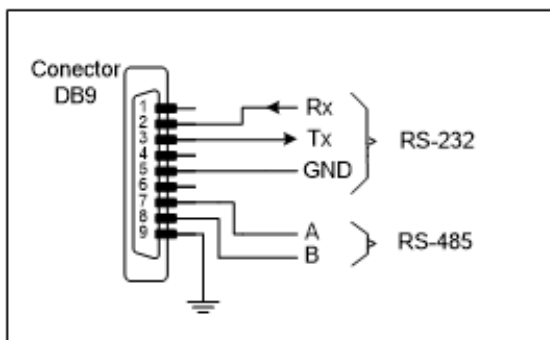
Fig. 86: DB9 pin out RS-232/RS-485
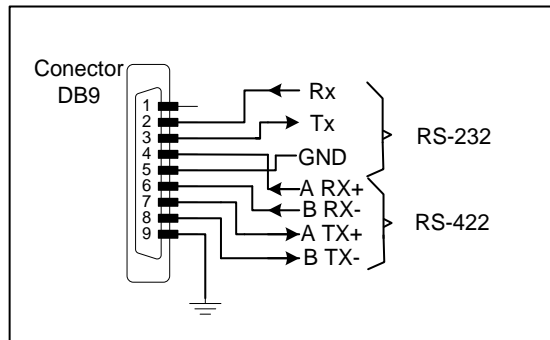
Fig. 87: DB9 pin out RS-232/RS-422.

21.4.1 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.
.
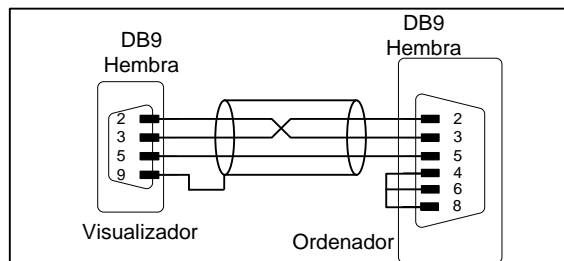
Fig. 88: Aerial cable

21.4.2 RS-485 between DN1x9 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 or RS-485 line a 120 Ω termination must be placed.
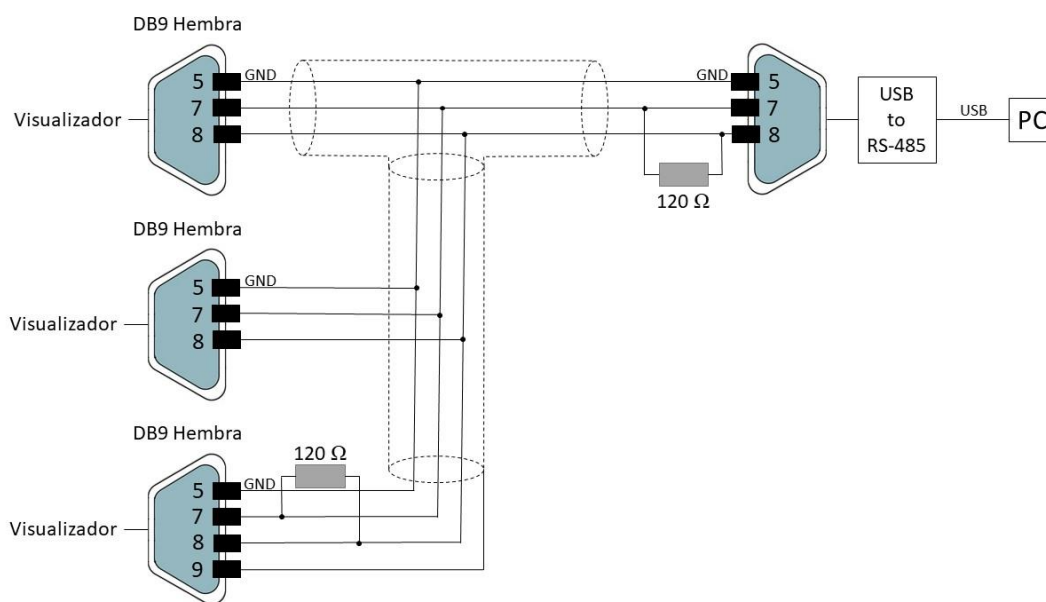
Fig. 89: Aerial cable example.

21.5 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.
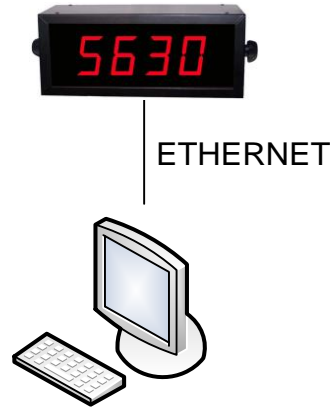
Fig. 90: Direct computer connection diagram.

More than one display can be connected to the same network.
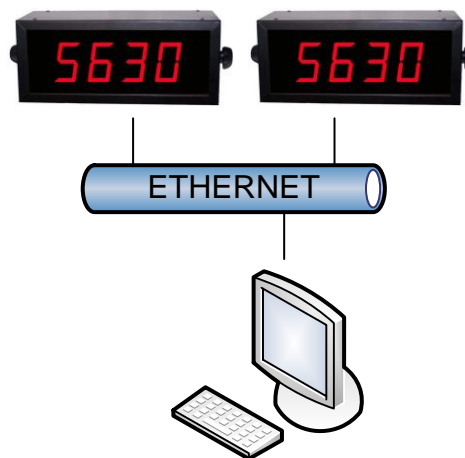
Fig. 91: Example

22 INITIALIZATION

22.1 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:

(11) **Pr0:** Each time the display is powered up and before starting the main program, an access time is stablished 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 27.

(12) **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.

(13) **F.XX:** Displays the hardware ID. "XX" corresponds to the specific value corresponding to the actual display. If the unit has the color option, the digits will light up changing color.

(14) **uX.X:** Shows the firmware release. "XX" corresponds to the specific value corresponding to the actual display. If the unit has the color option, the digits will light up changing color.

(15) **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.ditel.es/descargas).

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.

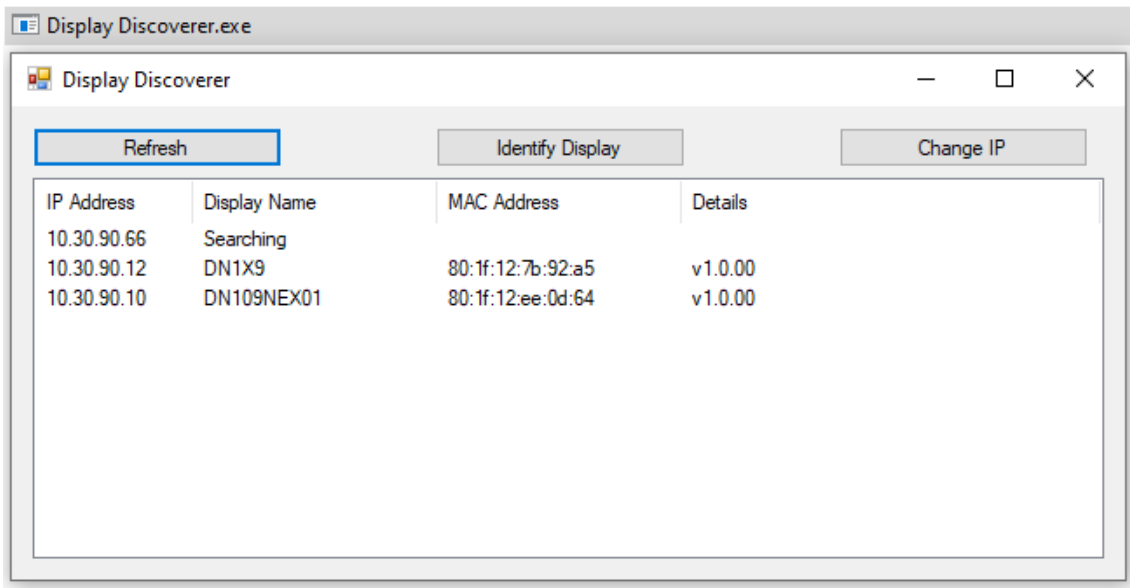## 22.1.1 Configuration with "Display Discoverer"

Fig. 92: "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.

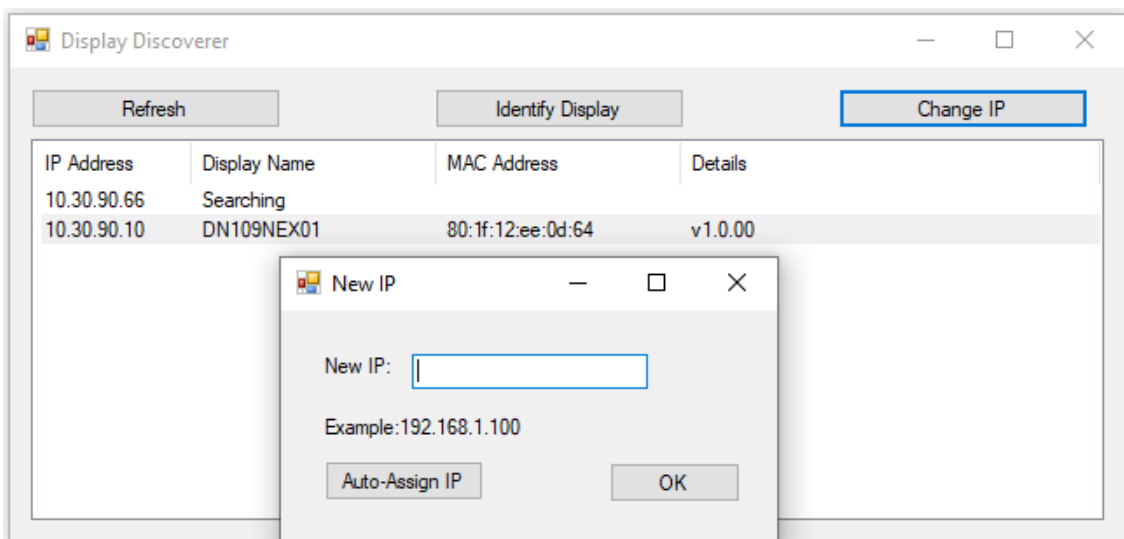If an automatic IP address is desired, press "Auto-Assign IP". This will set display to DHCP mode.

Fig. 93: 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.

22.2 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.

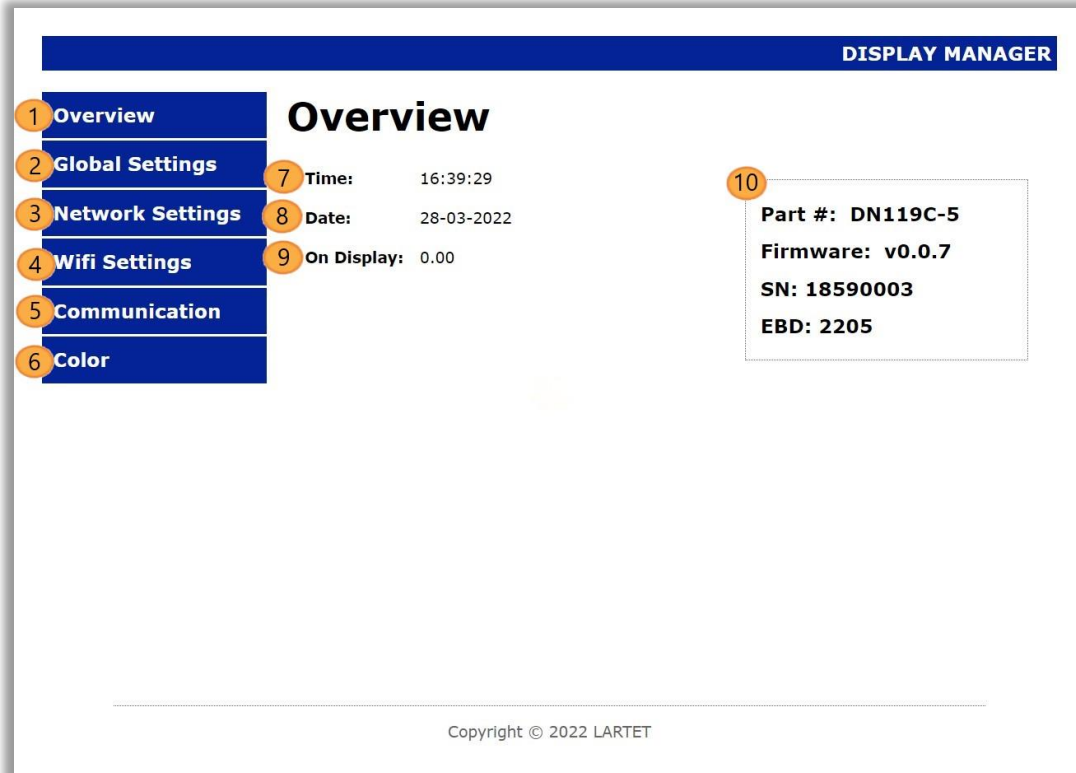Below, the different WEBSERVER pages are shown:

22.2.1 Overview

Fig. 94: 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.

21. Link to Overview. Information showed in real time.
22. Link to Global Settings. It configures the basic settings: Communication interface, data representation format, brightness, etc
23. Link to Network Settings. Sets LAN communication. It allows the configuration of IPs, network masks, Gateway, DNS and DHCP.
24. Link to WIFI Settings.
25. Link to Communication Settings. Sets the parameters for the communication interface and protocol selected.
26. Link to Color Settings. It allows configuring the color and related parameters in equipment with a color option.
27. Shows the current time of the display.
28. Shows the current date of the display.
29. 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".
30. 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.
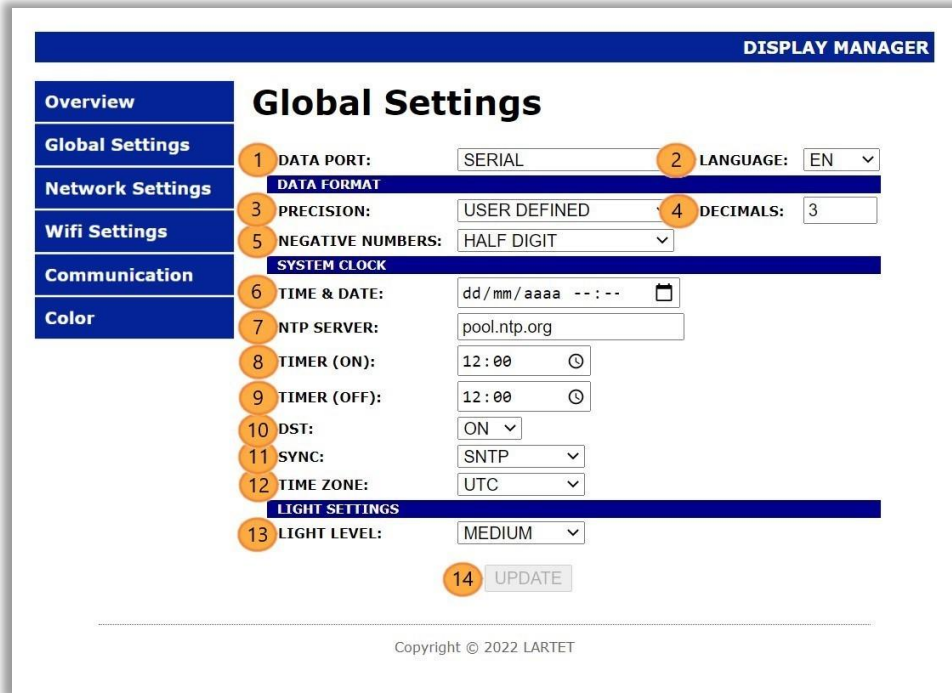
22.2.2 Global Settings

Fig. 95: 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.

29. Selects the data port that will be used for communication.
30. Selects language used. Currently only English version is available.
31. 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.
32. 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 55: Example Table

33. 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. 96: "FULL DIGIT" and "HALF DIGIT" real example.

34. Manually set the date and time of the viewer. Clicking on the default parameter will show the date and time of the system (PC).
35. 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.
36. Time at which the display will turn on.
37. 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.
38. Enable daylight saving time. The time change will be done automatically if you select "ON".
39. 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 "ACCES POINT").
40. Set the display time zone.
41. Sets the light intensity level of the display.
42. Clicking "UPDATE" sends the new settings to the display.

22.2.3 Network Settings

Fig. 97: Ethernet network settings.

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

19. Modifies the name assigned to the display.

20. Sets the DHCP protocol or not.

21. Shows the MAC address.

22. Shows the IP address and allows its changing.

23. Shows the Network mask and allows its changing.

24. Shows the "*Gateway*" address and allows its changing.

25. Primary DNS. In case DNS is not set correctly, you must configure the SNTP server with your IP and not with your domain.

26. Secondary DNS.

27. By clicking "UPDATE" the new information is send to display.

IMPORTANT:

E. 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.

F. 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**.

22.2.4 WIFI Settings

Fig. 98: Wifi Settings.

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

23. **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.
24. 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.
25. 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**.
26. In **AP** mode allows to select the WIFI channel, between 1 and 11.
27. Set the security type of the WIFI network.
28. 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.
29. Shows the MAC address. There are two different addresses, depending on whether the WIFI is configured in STATION or ACCES POINT.
30. Allows you to configure the IP address.

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

31. Set network mask.

32. Set gateway.

33. 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.
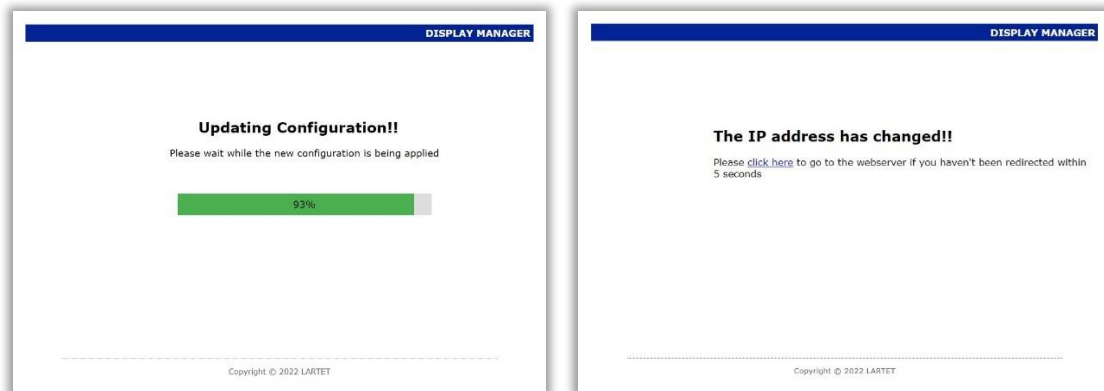
Fig. 99: IP changing windows.

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.

22.2.5 Communication Settings

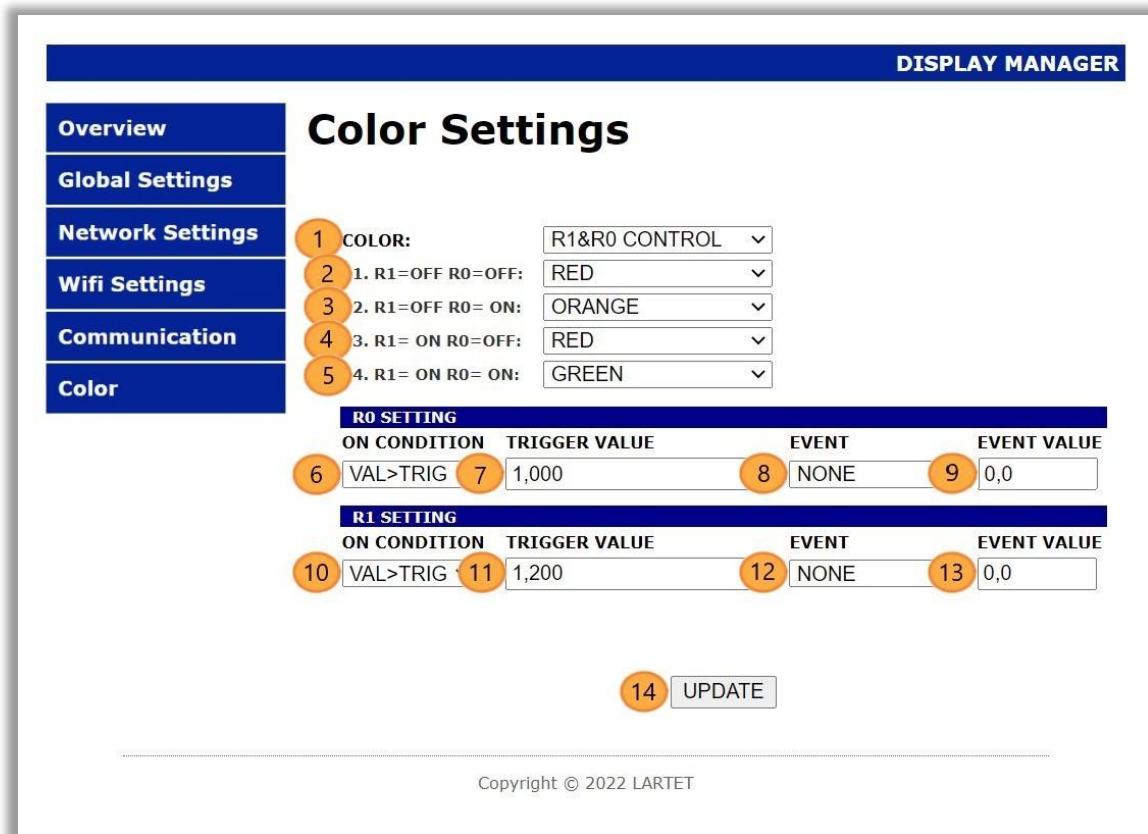See Communication Settings at chapter 22.

22.2.6 COLOR Settings

Fig. 100: Web server color settings window.

In the color settings screen, the parameters related to the color shown by the display are configured. Note: Only applies in units with color option.

R0 and R1 are activation bits that depend on the configuration of parameters 6 and 10, explained below:

23. Selects whether the display color is fixed (Red, Orange, Yellow or Green) or dynamic. Depending on the selection between fixed or dynamic, a greater or lesser number of configuration parameters will be displayed.
24. Set the desired color for the case R1 = OFF and R0 = OFF. In 3, 4 and 5 the color is established for each case of activation of bits R0 and R1.
25. Select the activation condition of R0.
    G. **VAL>TRIG:** It activates bit R0 when the value sent to the display is greater than the value established in parameter 7.
    H. **VAL≤TRIG:** It activates bit R0 when the value sent to the display is less than or equal to the value established in parameter 7.
    I. **OFF:** The R0 bit will always be inactive.

26. Set the activation value of R0.
27. Select the desired event for R0:
   G. **NONE:** The event is activated strictly following what is defined in the activation condition.
   H. **DELAY:** The event is triggered a fixed number of seconds after the condition is met.
   I. **HYSTERESIS:** A hysteresis of the desired value is added to the event.
28. Set the event value for R0.
   G. **NONE:** Without effect.
   H. **DELAY:** Set the desired delay value in seconds.
   I. **HYSTERESIS:** Sets the width of the hysteresis window. Its operation can be easily understood in figure 22.
   Example:
   If you want to program bit R0 with the following activation conditions:
      v. Starting from the condition R0 = OFF, activate bit R0 when the displayed value is > 3.1.
      vi. Starting from the condition R0 = ON, deactivate bit R0 when the displayed value is ≤ 3.

   The following parameters must be defined:

   Parameter 6: VAL>TRIG
   Parameter 7: 3
   Parameter 8: HYSTERESIS
   Parameter 9: 0.1

29. Select the activation condition of R1. Conditions explained in 3.
30. Set the activation value of R1.
31. Select the desired event for R1. Conditions explained in 5.
32. Set the event value for R1. Conditions explained in 6.
33. When modifying any parameter, the "UPDATE" button is enabled to send the new information to the display.

IMPORTANT! In case of selecting a dynamic color and establishing its color based on the value sent, its color cannot be modified through PC/PLC commands. If you want to send the color information by command from the PC/PLC, you must deactivate the activation conditions or select a fixed color.

Selecting a fixed color will always start the display in that color.
In case of visualizing the hyphens when the established time without data expires, they will maintain the previous color.
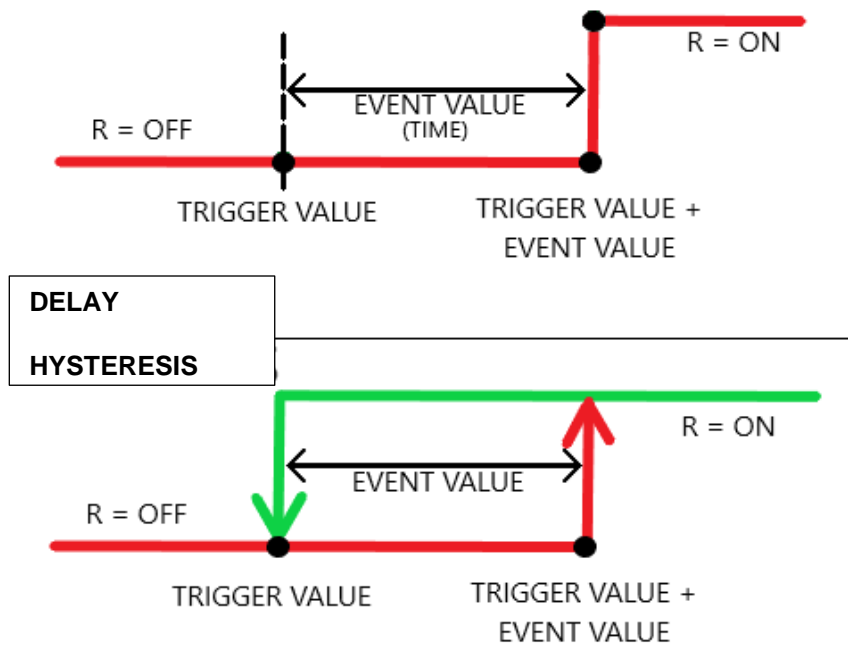
Fig. 101: Graphic explanation of delay and hysteresis

23 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.

23.1 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 and change the color of the digit in displays with color option.

In any communication (EXCEPT MODBUS), the information is sent as an ASCII string. The display is in charge of converting the aforesaid 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 24.2.4.

*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:

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	44h	45h	46h	48h	68h	69h	4Ah	4Ch	4Eh (6Eh)	6Fh
DEC	67d	99d	100d	69d	70d	72d	104d	105d	74d	76d	110d	111d

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

Table 56: ASCII characters accepted

24 ETHERNET BUS COMMUNICATION

24.1 Ethernet adjustments
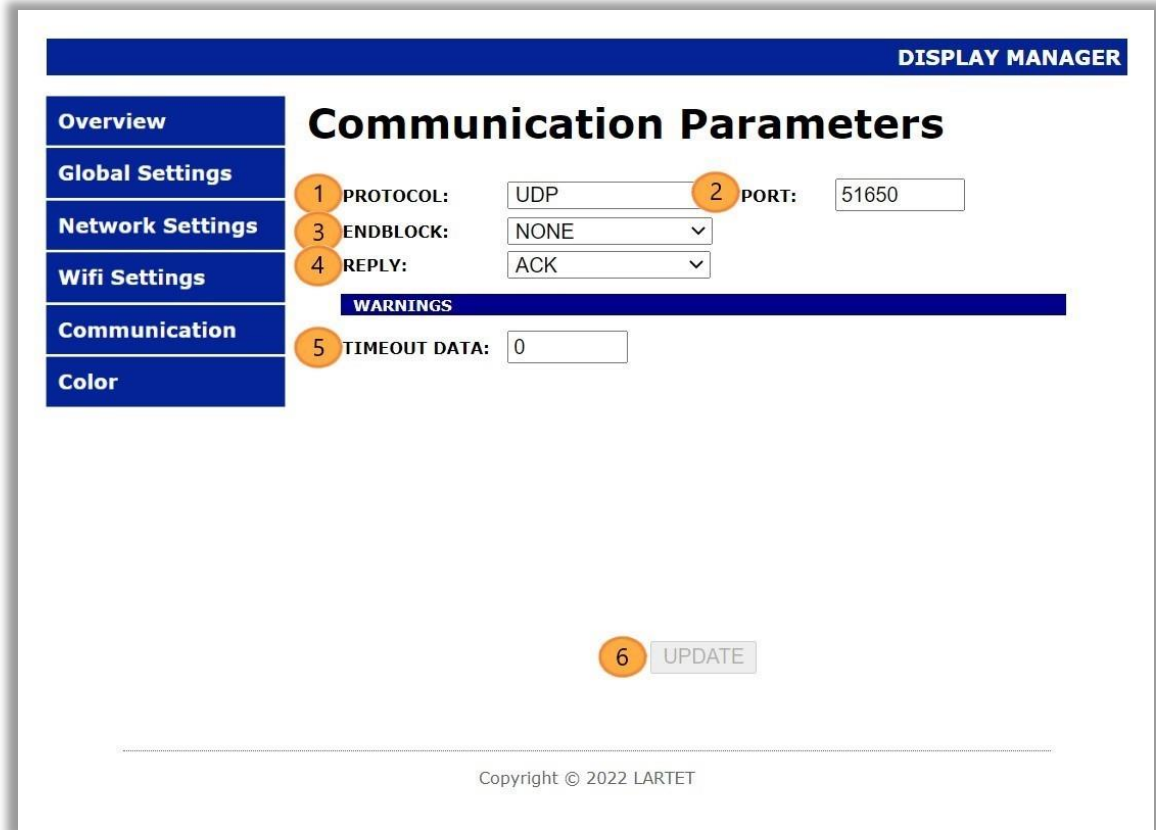
Fig. 102: Ethernet communications web server winndow.

13. Drop-down menu to select the protocol to be used:
   Available protocols **TCP**, **UDP** y **MODBUS/TCP**.
   Detailed information to be found at sections 24.2, 24.3 y 24.4.
14. 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).

15. 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 disables 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 57: ASCII end blocks.

16. Allows to select the display response. This response will be sent whenever the display receives data, regardless of whether it is 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 58: Answers for ASCII protocol

17. 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.

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

24.2 MODBUS/TCP Protocol

End block not required.
To use the MODBUS/TCP protocol, the communication port must be properly configured (See section 24.1).

24.2.1 MODBUS Functions

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

Tipe		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 59: MODBUS Functions accepted.

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 24.2.2 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 adress	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 60: "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 61: Coils status reading. "X" indicates that it is 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 62: "Write Single Coil" function structure.

Example:

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

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

  The structure of this function is presented below:

Reques		
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 63: "Write Multiple Coils" function structure.

Example:

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

- **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 64: "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:
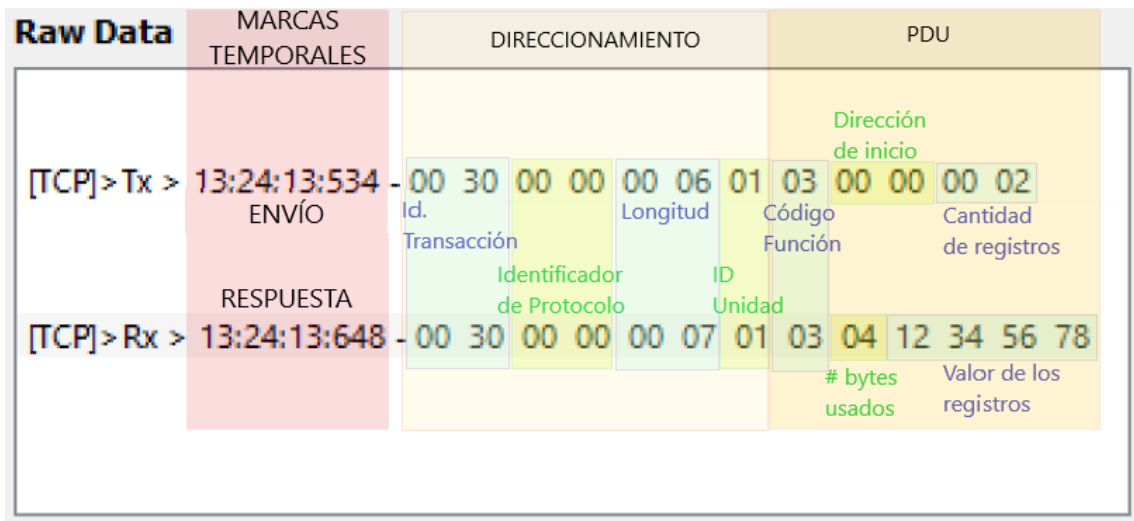
- **Write Single Register:** It is used to assign the value to only one register.

  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 65: "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 color and luminosity information.

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

- 8 bytes (0008h): Double Word type value and reading of color and luminosity information.

-10 bytes (000Ah): Full message reading to a 10 digits display.

Example:

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

- **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 66: "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:

24.2.2 Register Writing

The different registers of the display 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:

24.2.2.1 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 color and/or brightness of the display.

Color values:

- **Red**: Third byte 30h.
- **Green**: Third byte 31h.
- **Yellow**: Third byte 32h.
- **Orange**: Third byte 33h.

Finally, 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		Color	Luminosity*

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

* For monochrome displays the color selection byte can be used to manage flicker. Typing 08h starts the flashing, 09h ends it.

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	30h	34h
Numerical Value		Color	Luminosity*

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

Raw Data

```
                                                           Byte 2    Byte 4
[TCP]>Tx > 17:21:23:636 - 00 0A 00 00 00 0B 01 10 00 02 00 02 04 F3 3A 30 34
[TCP]>Rx > 17:21:23:794 - 00 0A 00 00 00 06 01 10 00 02 00 02    Byte 1    Byte 3
Sys > 17:21:23:795 - values written correctly.
```

Fig. 103: Frame in MODBUS/TCP to display the value "-3270".

These frames show the sending and response explained in the previous section.

24.2.2.2 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 from 0 to 65535. Color and lightness are handled identically.

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".

24.2.2.3 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 two's complement). The next two modify the position of the decimal point. The last two (optional) the color and brightness of the display.

The color 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	Color	Luminosity*

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

* * For monochrome displays the color selection byte can be used to manage flicker. Typing 08h starts the flashing, 09h ends it.

Example:
To easy the information sending, function Modbus 10h is used.
To show "-32.70" value the following content must be sent.

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	31h	34h
Numerical Value				Point Pos.	Not used	Color	Luminosity*

Table 70: Example of the values to display "3270".

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 31 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. 104: Message in MODBUS/TCP to send the value "-3270".

These frames show the sending and response explained in the previous section.

24.2.2.4 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 from 0 to 4,294,967,295. Decimal point, color, 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".

24.2.2.5 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 23). 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 71: Summary of values to use register 00.

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.

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

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

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. 105: Message in MODBUS/TCP to send the characters "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 color or light intensity of the display cannot be modified for reasons of compatibility with previous products. It is possible to change the color by adding a previous step to the message, first writing to any register associated with numerical values (modifying the color) and then writing the message to register 00.

24.2.3 *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 available as an option)
- *Coil 4.* Activates or deactivates relay 3. (Relay 3 is available as 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.

Raw Data

```
[TCP]>Tx > 10:18:33:322 - 00 2D 00 00 00 08 01 0F 00 01 00 05 01 11
[TCP]>Rx > 10:18:33:494 - 00 2D 00 00 00 06 01 0F 00 01 00 05   0001 0001
Sys > 10:18:33:494 - values written correctly.                  Coil 5  Coil 1
```

Fig. 106: Example of display coils activation.

24.2.4 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 24.2.1, "Read Coils" and "Read Holding Registers", respectively.

24.3 TCP/IP Protocol

To use the TCP/IP protocol, the communication port must be properly configured (See section 24.1).

In order for the device to display a frame, this frame 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 color, the luminosity, and the blinking. These parameters must be sent **AFTER** the values to be displayed.

Color	
Order	ASCII Code
Red	"X0" or "x0" (7830h o 5830h)
Green	"X1" or "x1" (7831h o 5831h)
Yellow	"X2" or "x2" (7832h o 5832h)
Orange	"X3" or "x3" (7833h o 5833h)

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

Blinking	
Order	ASCII Code
Start	08h
End	09h

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[1]
2Dh	36h	37h	2Eh	31h	30h	08h		-67.10[2]
36h	2Eh	34h	36h	32h	33h			6.4623
36h	2Eh	34h	36h	32h	33h	58h	31h	6.4623[3]

(7) In monochrome or color equipment set to red by default

(8) Blinking value

(9) Setting the color of the digits with the control command.

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

24.4 UDP Protocol

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

25 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.

25.1 WIFI Communication settings

Fig. 107: 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.

26 SERIAL BUS COMMUNICATION

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

26.1 Serial Communication adjustments

Fig. 108:Serial communication window.

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

33. Modifies the internal address that is assigned to the display.
34. Protocol selection.

KOSMOS protocol is explained in the manufacturer manual.
MODBUS RTU y **ASCII** protocols are explained in chapters
26.3 MODBUS RTU Protocol and 26.4 ASCII Protocol .

35. 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 RS outputs manual for KOSMOS indicators.

36. 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 <u>21.4</u>.

37. Assigns the timeout (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 timeout, the last data will be shown indefinitely.

38. 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 73: ASCII protocol headers.

39. 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 74: ASCII protocol end blocks.

40. 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 75: ASCII protocol reply.

41. Select the transfer rate in bits/s.
42. 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.

43. Sets the parity bit for error control.

> The possible modes are **None**, **Even Parity**, and **Odd Parity**.

44. Select the number of stop bits, 1 or 2 bits for information synchronization.
45. 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), etc…).
> 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:
>> G. **0.** As many characters as the display has, are shown. "PESO 203.5" is displayed.
>> H. **1.** Everything up to the first numeric character is skipped. "203.5" is displayed.
>> I. **7.** The first 7 characters are skipped. "3.5" is displayed.

46. 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:
>> E. **NORMAL.** Shows "123456".
>> F. **INVERTED.** Shows "654321".

47. 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**).
>> E. **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 send, "12" is displayed.
>> F. **INVERTED.** Skips the start of the message (pre-reversal) to the designated position.
>> **Example 1:** With MSG.CURSOR = 3. If "123456" is send, "654" is displayed.
>> **Example 2:** With MSG.CURSOR = 2. If "123456" is send, "6543" is displayed.
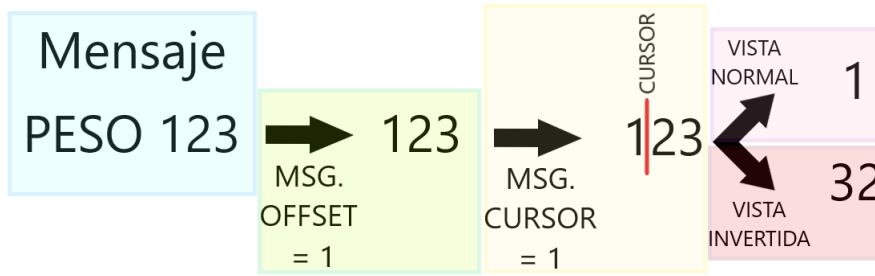
Fig. 109: Diagram of use of the MSG.OFFSET and MSG.CURSOR parameters.

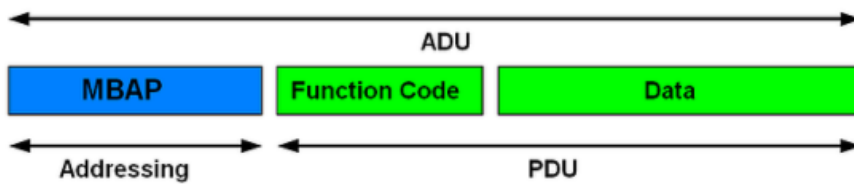**48.** When modifying any parameter, the button is enabled to send the new information to the display.

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

The specific information of the KOSMOS protocols must be consulted in the RS outputs manual for KOSMOS indicators.

26.3 MODBUS RTU Protocol

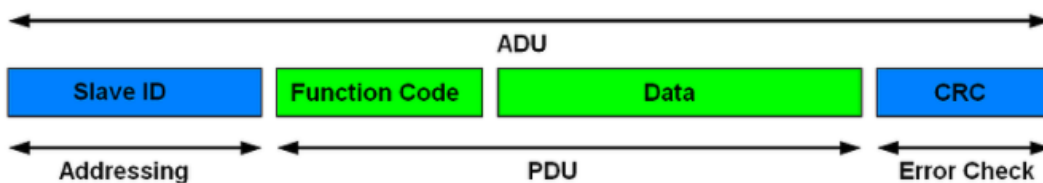**MODBUS/TCP Frame**

MODBUS/RTU Serial Frame

Fig. 110: 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 24.2 for any necessary information.

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

Fig. 111: Frames sent and received to display "HELLO" by MODBUS RTU

26.4 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, as well as in displays with the color option, to set the color of the display (as long as it does not have automatic color conditions).

08h   **Start of blinking characters**

09h   **End of blinking characters**

Displays with the color option

58h (o 78h) + 30h   **Red digits**
58h (o 78h) + 31h   **Green digits**
58h (o 78h) + 32h   **Yellow digits**
58h (o 78h) + 33h   **Orange digits**

The mentioned control commands (blink and color) should be placed at the end of the frame.

26.4.1 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			Datos enviados						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	

Displayed value on a 4 digits device		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 characters (like *k* and *g*), it displays "-".

Displayed value on a 4 digits device				1	5.	8	-
Displayed value on a 8 digits device				1	5.	8	-	-

27 DISPLAY UPDATE

Should you need to update the *firmware*, please download **MicroBoot** program form (https://www.ditel.es/descargas) and proceed as follows .

IMPORTANT: The update must be done through a wired ETHERNET connection

Steps to do the *firmware* upload:

7. Start the program and go into settings.
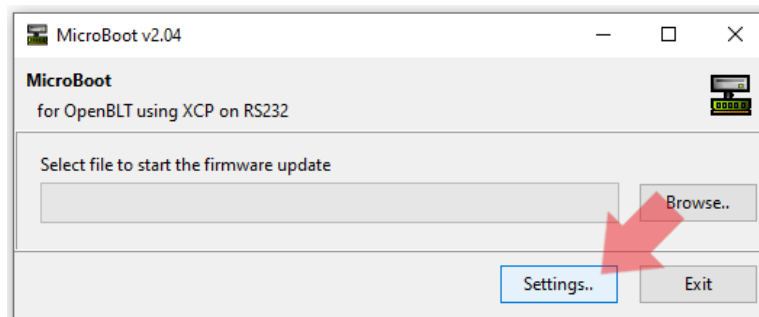
8. Check program settings:
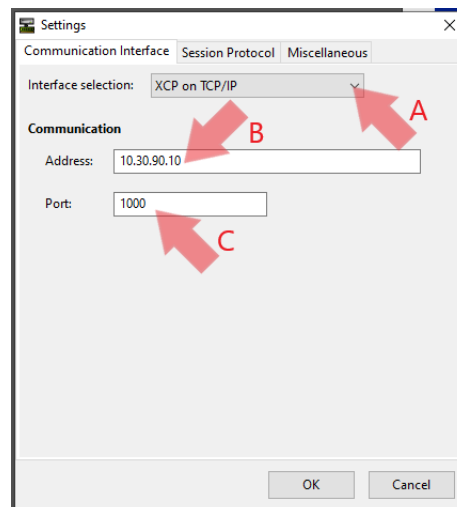
A.   Set TCP/IP communication-
B.   Set the IP address that has been defined for the wired network.
C.   Set 1000 port.

9. 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* update process.

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 I

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.
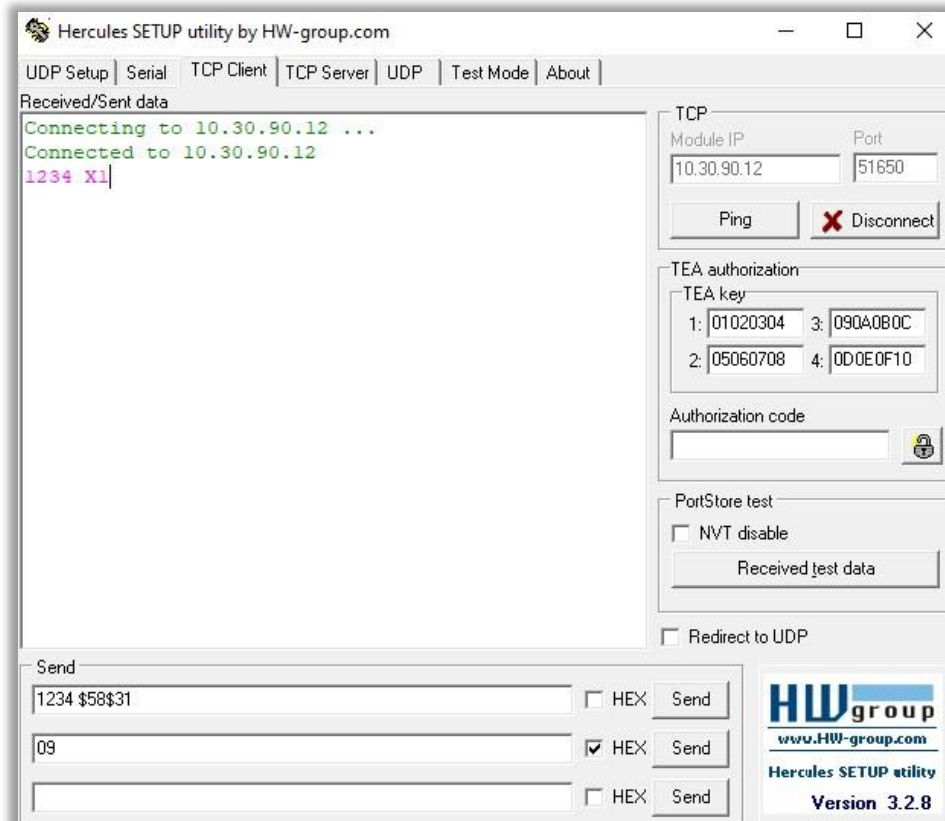
Fig. 112: Example in TCP using the "Hercules" program. "1234" is displayed in green.

First, it is necessary to set 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 of web server configuration for TCP:

7. "Global Settings" Window., **DATA PORT** = ETHERNET.
8. "Network Settings" window, set the right network parameters, in this case **IP Addr** = 10.30.90.12 like in "Hercules".
9. "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 of web server configuration for UDP:

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

Example of web server configuration for RS-232:

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

To send the message with "Hercules" a USB to 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 58 31 0D 0A

In this case, said frame contemplates all the necessary parameters to display **1234** in green, including the headers and ends of 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.
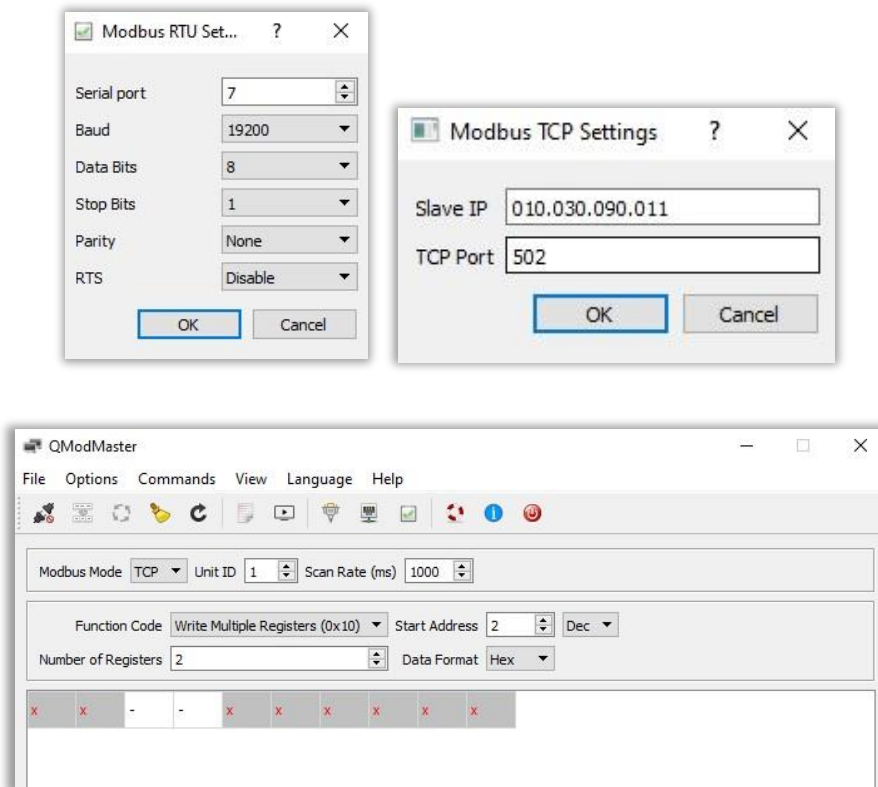
Fig. 113: QModMaster.

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 device'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 set according to the value to be displayed, following the protocols explained in section 24.2. 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 recommended to keep its value in decimal.
- **Number of Registers:** You must indicate how many registers you want to work with.

- **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 "HELLO" by MODBUS TCP.

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

7. "Global Settings", **DATA PORT** = ETHERNET.
8. "Network Settings", place the right adjustments, in this case **IP Addr** = 10.30.90.11 like in "QModMaster".
9. "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:
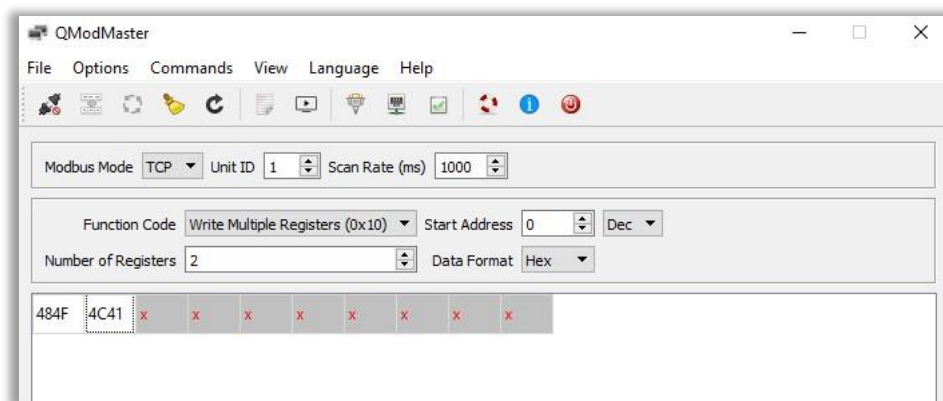
Fig. 114: Communication example in QModMaster. Send "HELLO" to the display.

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: You wish to write "HELLO" by MODBUS RTU.

Adjust settings like:

5. "Global Settings" windows, **DATA PORT** = SERIAL.

6. "Communication Settings" windows :
   - **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 has to be 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".
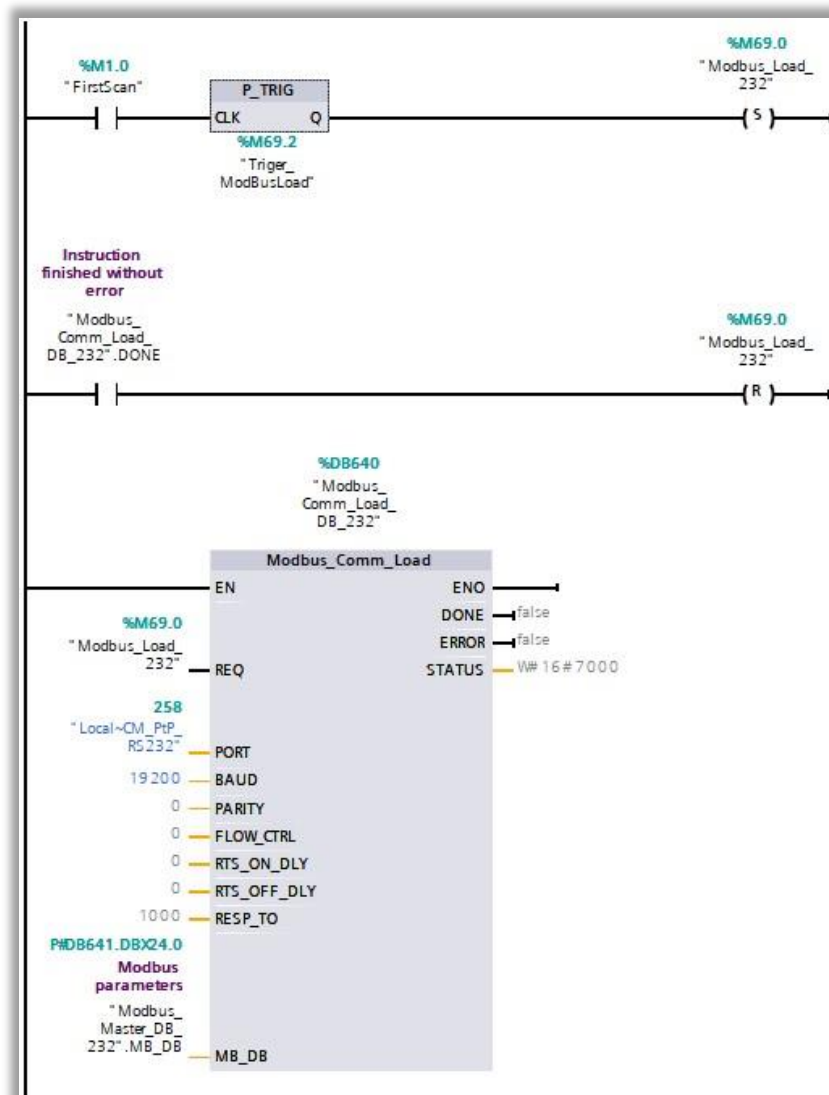
Fig. 115: Communication configuration blocks.

Second, the blocks and variables, used to generate and send a registers writing message, are shown.

Fig. 116: Generation of the content of the registers to be sent

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

Fig. 117: Reading of response registers.

It is noticed that the block is the same "Modbus_Master". By changing the input values, you configure it to be a write or read message, as well as you can configure 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.

ANNEX III

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.
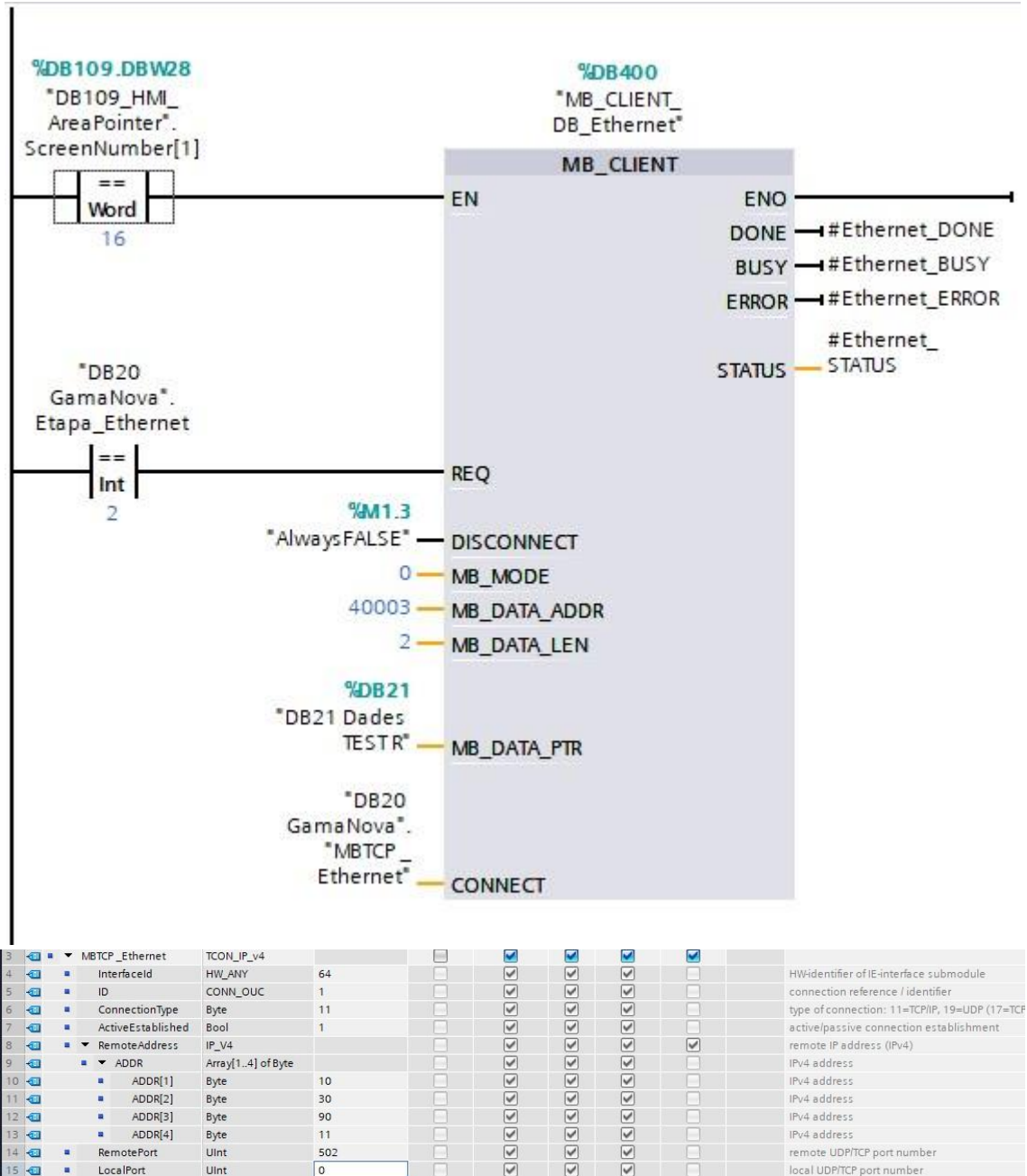

Fig. 118: MODBUS_TCP communication configuration.

The IP must be configured according to the value assigned in the device'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.

ANNEX III

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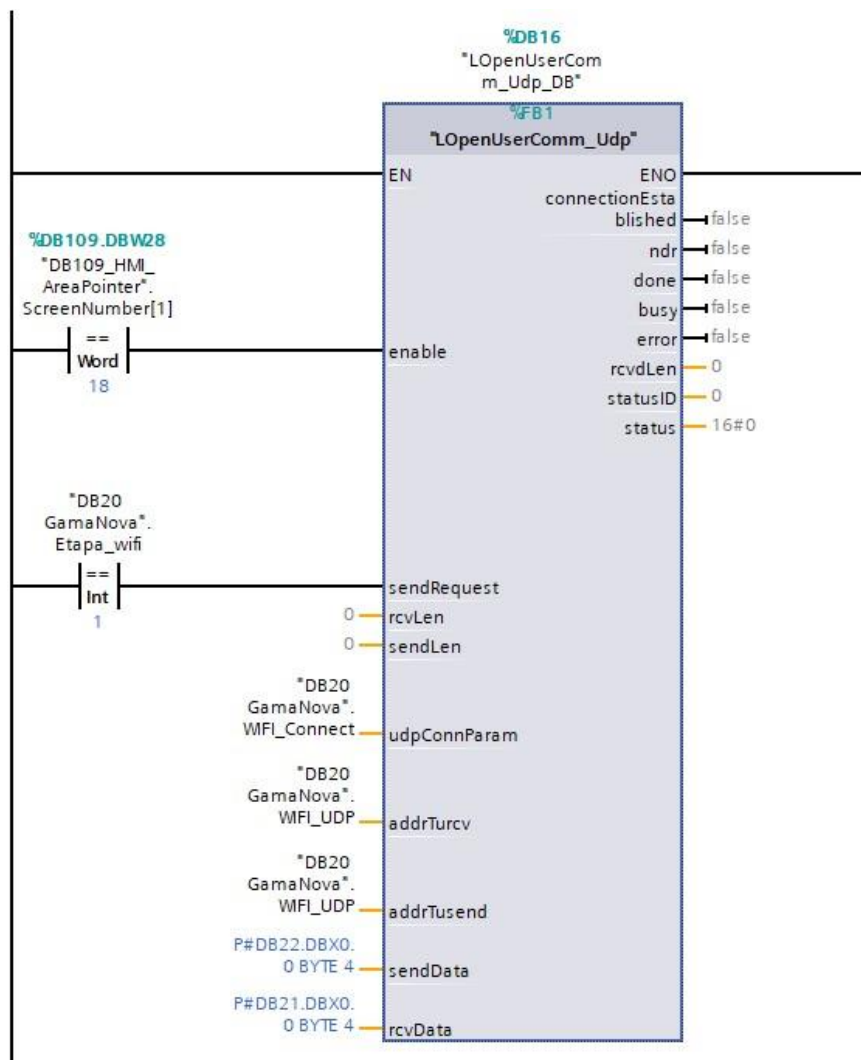

Fig. 119: "LOpenUserComm_Udp" block udsed for UDP communication.

The mentioned module is in charge of carrying out the configuration automatically once the inputs have been set the desired way.

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

ANNEX III

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).
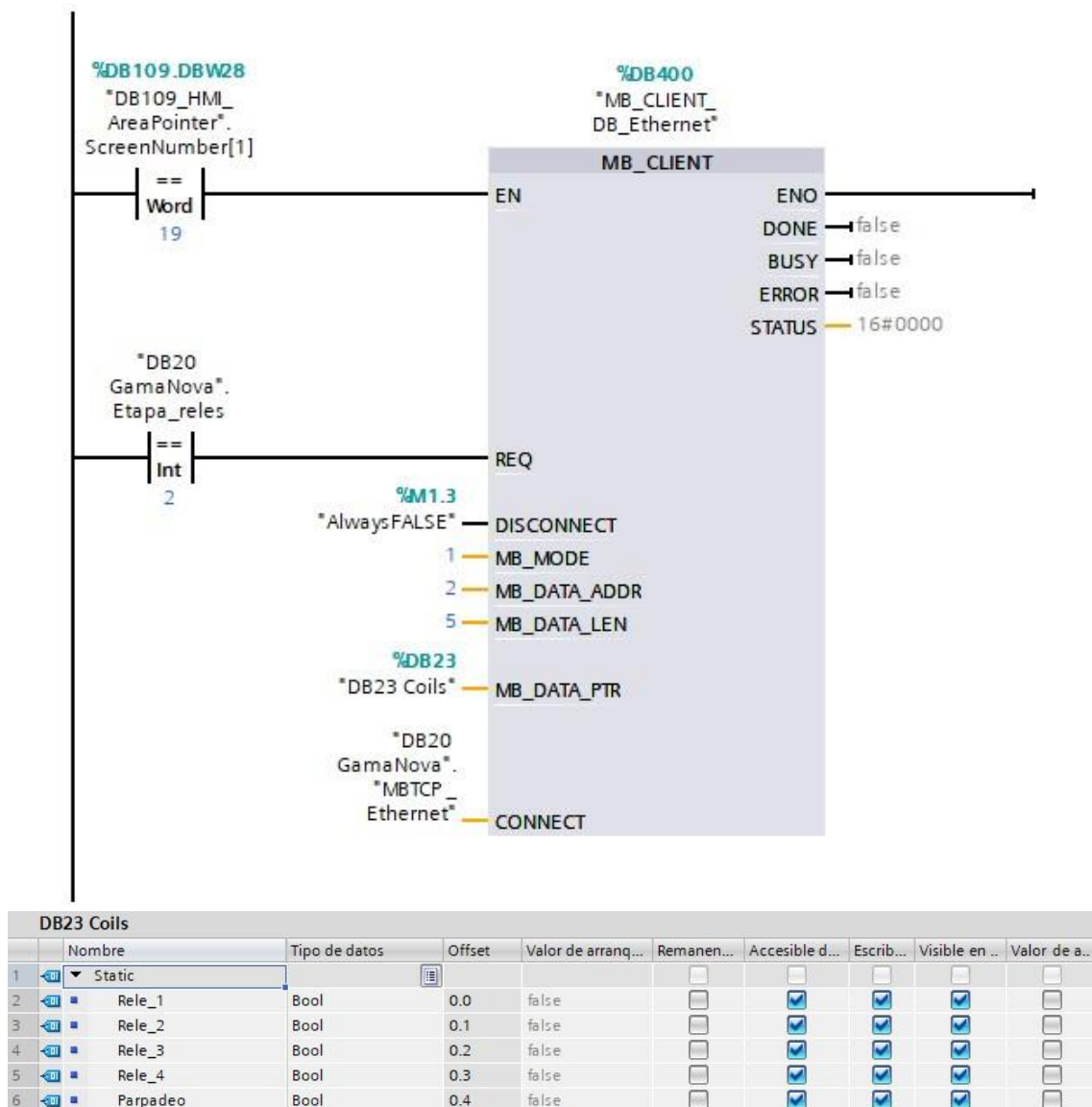

Fig. 120: Configuration and generation of the content to send to the "Coils". Relays and flashing management

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

$C\epsilon$

Diseños y Tecnología S.A.
Xarol, 6B P.I. Les Guixeres
08915 Badalona España

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

Model: DN109.NB all versions.
Model: DN119.NB all versions.
Model: DN129.NB all versions.
Model: DN189.NB 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

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Position : Partner

Badalona, 28 April 2022