OPERATION MANUAL

FOR PROFINET DISPLAY

SERIES

DN-109NN, DN-119NN,

DN-129NN & DN-189NN

Index

1   INTRODUCTION

The numeric displays for series **DN-109NN, DT-119NN, DN-129NN and DN-189NN** are industrial displays controlled by PROFINET network that display numbers as well as a reduced set of characters.

They can have one or two display faces, allowing many solutions and installation possibilities. The digit sizes are: **DN-109NN 57 mm, DN-119NN 100 mm, DN-129NN of 250 mm and DN-189NN 180 mm**, at reading distances ranging from 30 m to 120 m.

The application field of these displays is very wide in applications where it is required to visualize numerical values resulting of industrial processes sent from a PLC/PC through a PROFINET network.

Other options:

- 3 static characters can be added using vinyl letters or led letters.
- DN-129hNN. High luminous intensity
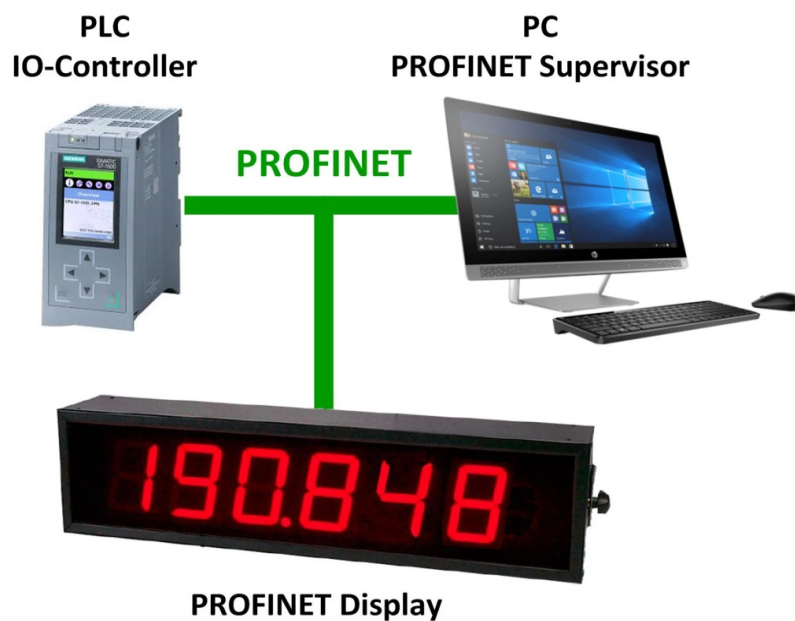- 24Vdc power supply.

Fig. 1 Profinet comunication

2   GENERAL CHARACTERISTICS

2.1   Electrical characteristics

2.1.1   Electrical characteristics of the DN-109 displays.

Supply Voltage..100 to 240 VAC 50/60Hz or 24VDC option.
Consumption ....See section 2.2.
Display ....7 segments of 57 mm height + decimal point.
....Red LED color. Reading distance 30 meters.
Text (LED) ....Formed by LEDs of 5 mm diameter.
....Size 50 mm.
Text (Vinyl) ....White vinyl. (size 50 mm).
Parameter memory ....Eeprom.
Environmental Conditions.......................Operation temperature: -20 to 60ºC.
....Storage temperature: -30ºC to 70ºC
....Humidity: 20-90% HR without condensing.
....Maximum environmental illumination : 1000 lux.
....IP Rating: IP41.

2.1.2   Electrical characteristics of the DN-119 displays.

Supply Voltage..100 to 240 VAC   50/60Hz or 24VDC option.
Consumption ....See section 2.2.
Display ....7 segments of 100 mm height + decimal point.
....Red LED color. Reading distance 50 meters.
Text (LED) ....Formed by LEDs de 5 mm diameter.
....Size 65 mm.
Text (Vinyl) ....White vinyl. (size 65 mm).
Parameter memory ....Eeprom.
Environmental Conditions.......................Operation temperature: -20 to 60ºC.
....Storage temperature: -30ºC to 70ºC.
....Humidity: 20-90% HR without condensing.
....Maximum environmental illumination: 1000 lux.
....IP Rating: IP41.

2.1.3   Electrical characteristics of the DN-189 displays.

Supply Voltage..100 a 240 VAC   50/60Hz. Option 24VDC.
Consumption ....See section 2.2.
Display ....7 segments of 180 mm height + decimal point.
....Red LED color. Reading distance 90 meters.
Text (Vinyl) ....White vinyl.
Parameter memory...................................Eeprom.
Environmental Conditions.......................Operation temperature: -20 to 60ºC.
....Storage temperature: -30ºC to 70ºC.
....Humidity: 20-90% HR without condensing.
....Maximum environmental illumination: 1000 lux.
....IP Rating: IP41.

2.1.4　Electrical characteristics of the DN-129 displays.

Supply Voltage..100 a 240 VAC　50/60Hz. Option 24VDC.
Consumption ....See section 2.2.
Display ....7 segments of 250 mm height + decimal point.
....Red LED color. Reading distance 120 meters.
Text (Vinyl) ....White vinyl.
Parameter memory....................................Eeprom.
Environmental Conditions.......................Operation temperature: -20 to 60ºC.
....Storage temperature: -30ºC to 70ºC.
....Humidity: 20-90% HR without condensing.
....Maximum environmental illumination: 1000 lux.
....Sealing: IP41.

2.2　Display weight and power consumption.

2.2.1　DN-109 weight and power consumption.

Ref.	Weight (kg)	Power (W)	Ref.	Weight (kg)	Power (w)	Ref.	Weight (kg)	Power (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

2.2.2　DN-119 weight and power consumption.

Ref.	Weight (kg)	Power (W)	Ref.	Weight (kg)	Power (w)	Ref.	Weight (kg)	Power (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

2.2.3   DN-189 weight and power consumption.

Ref.	Weight (kg)	Power (W)	Ref.	Weight (kg)	Power (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

2.2.4   DN-129 weight and power consumption.

Ref.	Weight (kg)	Power (W)	Ref.	Weight (kg)	Power (W)
DN-129/2S	6,7	17	DN-129/2S+TV	9,7	17
DN-129/2D	8,2	30	DN-129/2D+TV	11,7	30
DN-129/3S	8,7	24	DN-129/3S+TV	11,7	24
DN-129/3D	10,7	44	DN-129/3D+TV	13,7	44
DN-129/4S	10,7	30	DN-129/4S+TV	13,2	30
DN-129/4D	13,2	56	DN-129/4D+TV	16,2	56
DN-129/5S	12,2	36	DN-129/5S+TV	15,2	36
DN-129/5D	15,7	68	DN-129/5D+TV	18,7	68
DN-129/6S	14,2	44	DN-129/6S+TV	17,2	44
DN-129/6D	18,2	81	DN-129/6D+TV	21,2	81
DN-129/7S	16,2	49	DN-129/7S+TV	18,7	49
DN-129/7D	20,2	94	DN-129/7D+TV	23,7	94
DN-129/8S	17,7	55	DN-129/8S+TV	20,7	55
DN-129/8D	23,2	106	DN-129/8D+TV	26,2	106
DN-129/9S	19,7	62	DN-129/9S+TV	22,7	62
DN-129/9D	25,7	119	DN-129/9D+TV	28,7	119
DN-129/10S	21,7	68	DN-129/10S+TV	24,2	68
DN-129/10D	28,2	132	DN-129/10D+TV	31,2	132

2.3   Dimensions and mounting of the displays

### 2.3.1   Dimensions and mounting of the DN-109 and DN-119

Reference	A	B	Reference	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
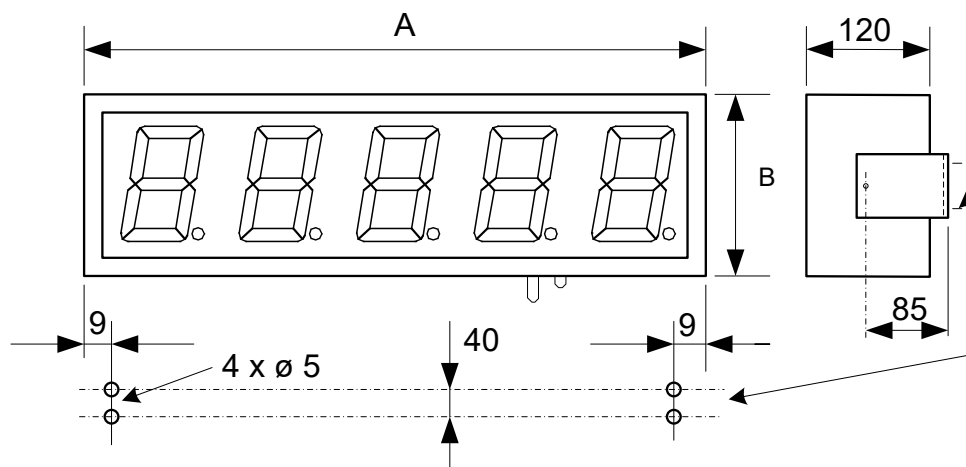
All the measures are in millimeters.

2.3.2   Dimensions and mounting of the DN-129 and DN-189

Reference	A	B	C	Reference	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
DN-129/2S	515	366	186	DN-129/2S+TV	985	366	186
DN-129/3S	750	366	186	DN-129/3S+TV	1220	366	186
DN-129/4S	985	366	186	DN-129/4S+TV	1455	366	186
DN-129/5S	1220	366	186	DN-129/5S+TV	1690	366	186
DN-129/6S	1455	366	186	DN-129/6S+TV	1925	366	186
DN-129/7S	1690	366	186	DN-129/7S+TV	2160	366	186
DN-129/8S	1925	366	186	DN-129/8S+TV	2395	366	186
DN-129/9S	2160	366	186	DN-129/9S+TV	2630	366	186
DN-129/10S	2395	366	186	DN-129/10S+TV	2865	366	186
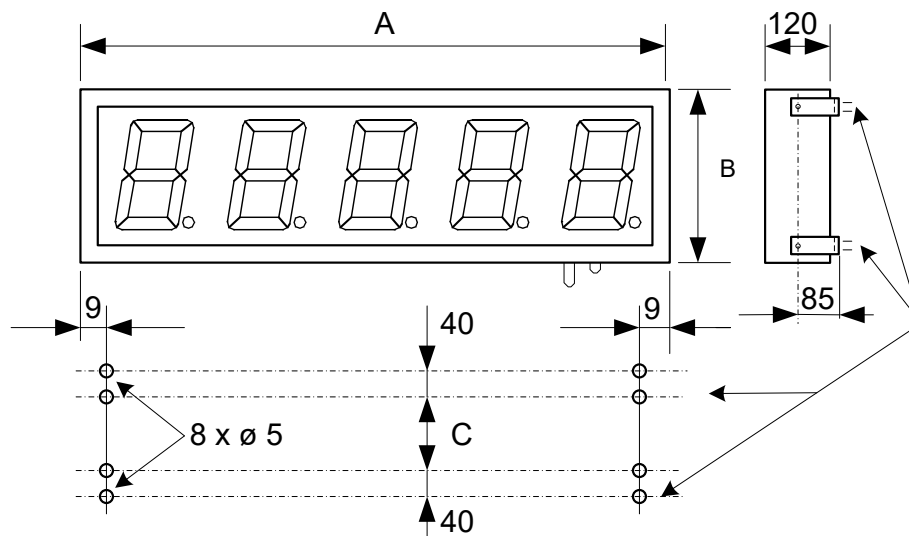
All the measurements are in millimeters.

3 INSTALLATION

The installation of the **DN-109, DN-119, DN-129 and DN-189**, is not particularly difficult but some important considerations must be taken into account.

The display must not be anchored to places subject to vibrations, nor should it be installed in places which generally surpass the limits specified in the display characteristics, both in terms of temperature and humidity

The degree of protection of displays **DN-109, DN-119, DN-129 and DN-189** is IP41, it means that are protected against the penetration of strange solid objects greater than 1 mm, and against the vertical rain drops. **DN-129f** is IP54, which mean that is protected against the rain water. The degree of protection of displays **DN-109e, DN-119e and DN-189e** are IP65, it means that are completely protected against the dust, and water jets.

The displays **DN-109, DN-119, DN-129 and DN-189**, should not be installed in places with an illumination level in excess of 1000 lux. Consequently, do not place the display in direct sunlight because the visibility could be difficult or null.

Displays **DN-119h, DN-129h and DN-189h,** are high luminous intensity units allowing the installation in places where light level excess 1000 lux.

Proximity to high voltage and high current lines must be avoided in electrical installations, as well as proximity to high frequency generators and V/F converters for motors.

3.1 Equipment interfaces
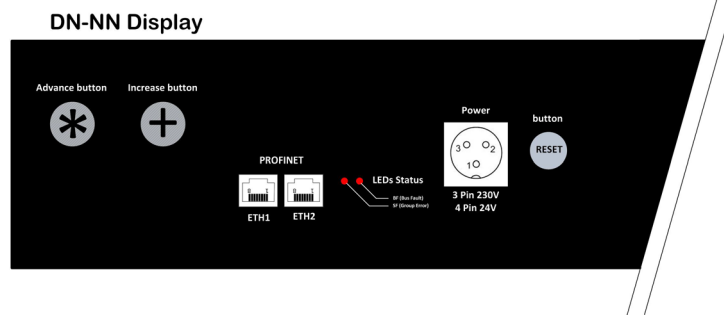
Fig. 2 Connectors and push buttons

3.2   Power supply.

The power supply must be from 100 to 240 VAC, 50/60 Hz or 24VDC (18-36) with 24V option.

The external power supply conductor section must be selected according to the consumption and the ground conductor must have a minimum section of 1.5 mm².

The power supply connector for 220VAC has 3 contacts and is placed in the lower part of the unit. Connect the power wires following the schema below
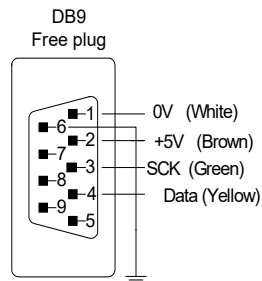
The power supply connector for 24VDC has 4 contacts and is placed in the lower part of the unit. Connect the power wires following the schema below
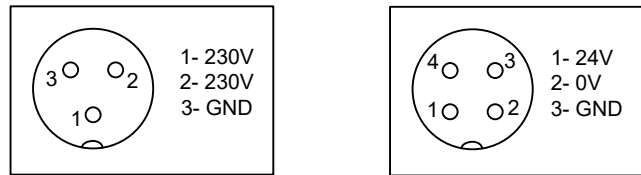
3.3   Wiring of temperature & humidity probe (Option)

The temperature & humidity probe is delivered with 5m cable and a Sub-D9 connector ready to use.

The wiring of connector probe is shown in the diagram (cable connector).

3.4   IP65 Profinet connector installation.

3.4.1   IP65 Profinet connection

The installation of Profinet Bus connector is very simple, it is not necessary to use special tools, but the instruction must be followed carefully.

In the accessories bag, next to the fixing of the equipment, we will find the following:

IP case grey color	Cable gland polyamide	RJ45 Cat6 Connector

We start screwing cable gland in to the grey case, squeezing it strongly with some tool help as an adjustable spanner.

After, we pass the ethernet cable (not supplied) through the cable gland and start the IP65 connector mounting. Together with the connector there is the manual explaining in detail its installation.

Once mounted, we connect the cable to the display (to maintain IP65 seal, only one cable is admitted, connected to one of two connectors available) and we proceed to fix the case in to the display. Highest part of the grey case at the left anchorage of the display (blue circle) and the lowest part to the right anchorage (red circle) (see the image below).
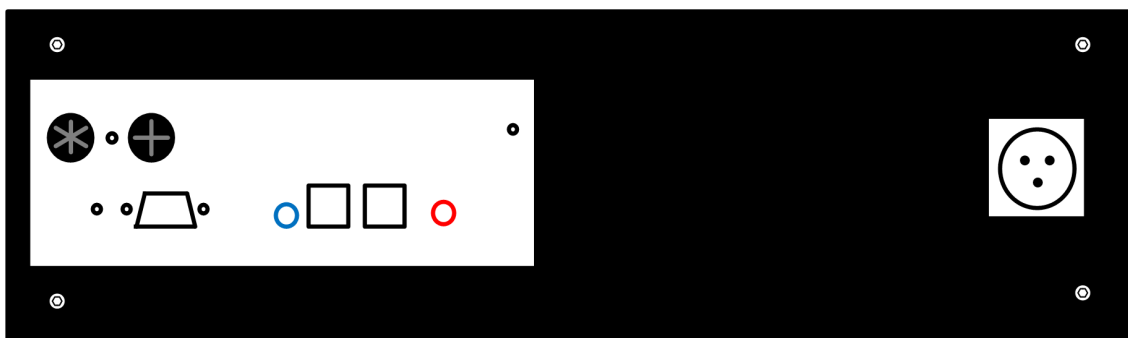
⚠️ **Improper installation cancels the protection IP65 and the warranty.**

Once placed, with the help of a flat screwdriver, turn the locking screws until it is tight enough.

To finish we only have to close the cable glad as strong as possible to avoid that the dust or water can enter.
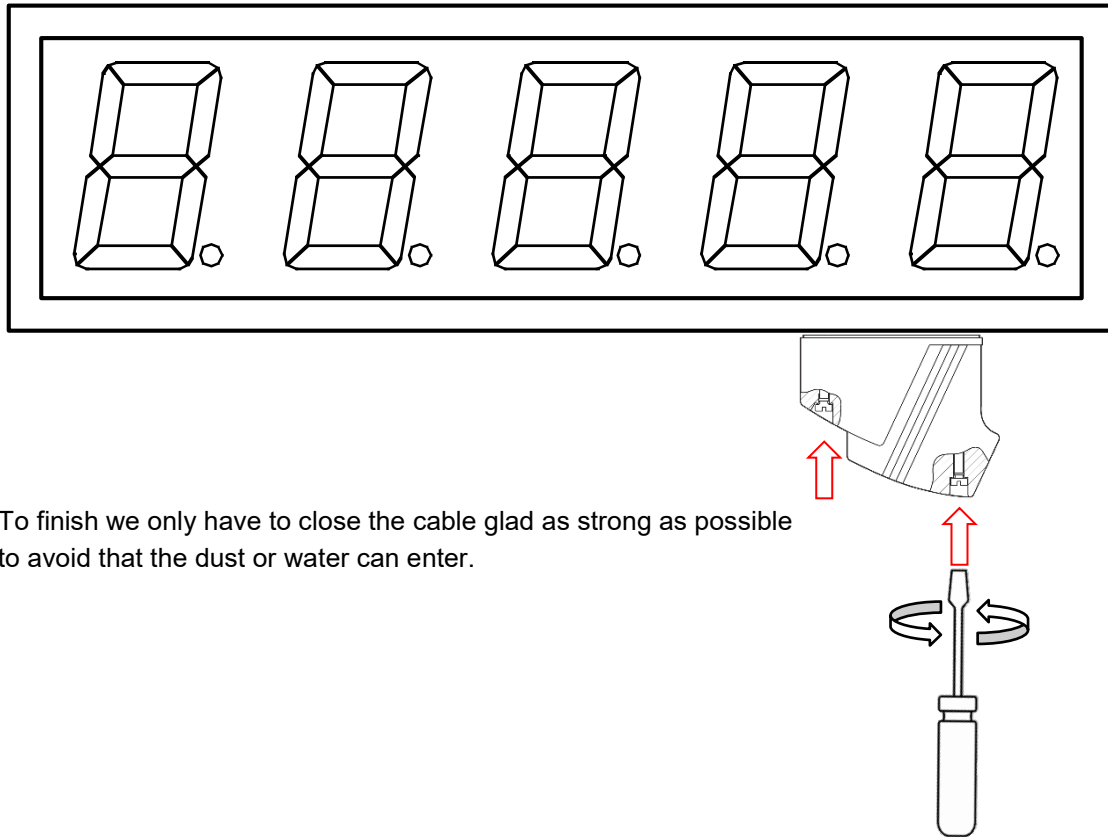
3.4.2   DB-9 connector with cover (temperature and humidity probe)

The DB-9 mounting is really easy and quick to make, for it, we will pass the patch cable through the cable glad and leave enough space for his welding (See section 3.3).

Once finished, we must put the connector inside the cover, placing correctly the connector holes with the inner screws, then push hard until we notice the "click".

Click
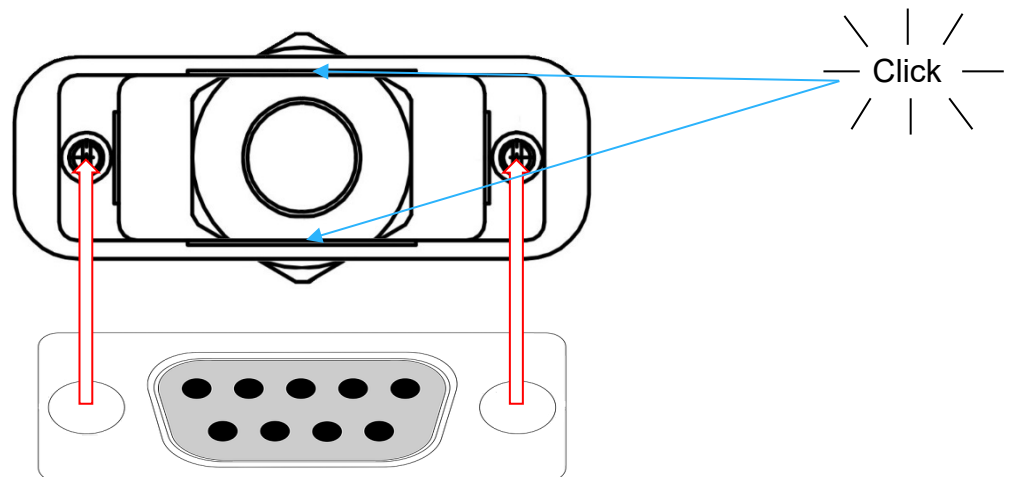
Then we must connect it to the display tightening the screws with a screwdriver for let it well secured, then with the help of a tool we have to tight the cable gland of the connector to acquire finally the protection wished.
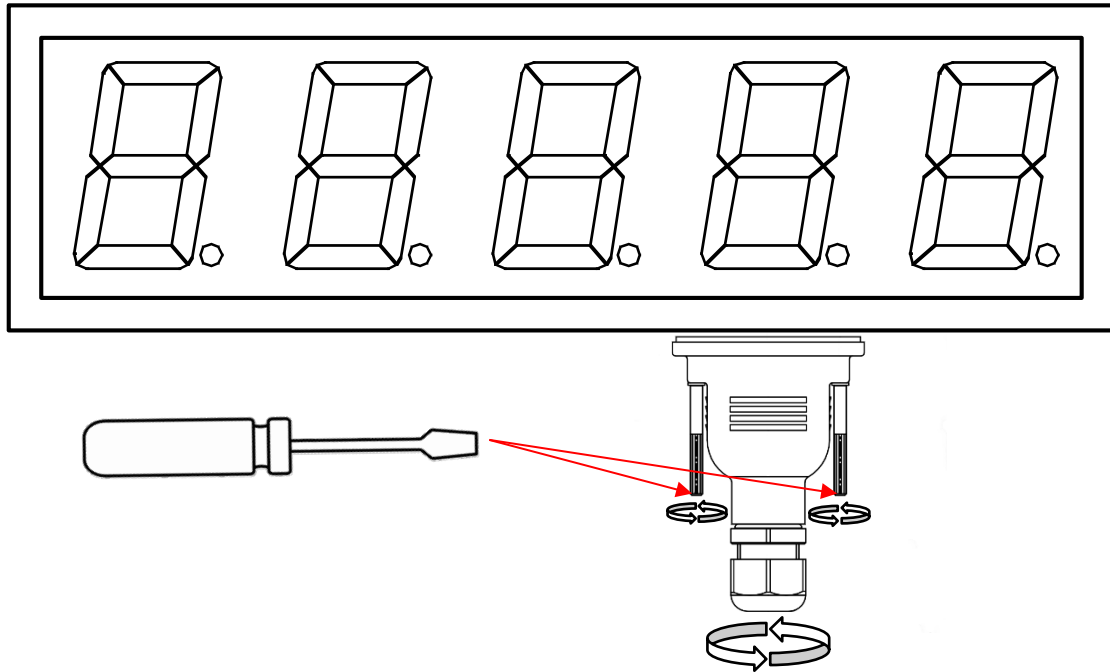
⚠ **Improper installation cancels the protection IP65 and the warranty.**

4   OPERATION

4.1   Initial turn on

Before connecting the display to the network, we must ensure that all the connections have been properly done and that the display is firmly in place.

Each time we connect the display to the power supply, the device perform a system test. The test consists in displaying a sequence with all the digits showing number "8", all the digits showing number "0" and all the decimal points are lit up. It stops with the Firmware version. At this point any of the following three situations may occur:

a)   The display receives data from the Profinet network and displays it.

b)   The display does not receive data and the time without data is zero (See section 4.2.2.3). Keep showing the Firmware version.

c)   The display does not receive data and the time without data is different to zero. After the specified time without data it displays a dash in each digit.

4.2   Programming parameters.

Before using the display, the configuration parameters must be set as required.

The parameters configuration is done through a menu that is selected by two buttons placed at the bottom part of the display. The field that can be modified is displayed flashing.

The configuration parameters are:

1-Datatype (Float, UFloat, WORD, UWORD, ASCII)
2-Communication protocol (in case of multiprotocol equipment)
3-Time without receiving data
B, C, D, E, nr, r1, r2 y r3- Only for display with color option.
F- To exit parameter configuration.

Displays of 3 or more digits:

The 3 rightmost digits are used for the parameters programming. The third right digit can be identified as the one which has the decimal dot activated.
The third right digit shows the parameter number and the others show the value, the flashing digit is the one that can be modified using push buttons.

Displays of 2 digits:

In this case, the parameters programming must be done in two steps:

1-   Access to the parameters using the advance button "∗". Then, you will see two digits with the format: "*nº of parameter . subparameter"*.

2-   Press again the advance key to see the parameter value, and modify the flashing digit.

4.2.1   Enter to configure parameters.

To configure the display parameters, the Advance key "✱" must be pressed and held for three seconds. After this, the first parameter will be displayed, showing the most significant digit flashing.

There are two options:

1-Modify the parameter value.
- By pressing the Advance key "✱", you can select values and the parameter number correlatively.
- Press "✱" to visualize again the parameter number.
- To increase the parameter value press the key "✚". It increases the digit value selected till arrive to the maximum value and go on to the minimum value in the next press.

⚠ **If the parameter inserted is not compatible with the equipment, the parameter will not be accepted. For instance, our equipment have a parameter code for each protocol ("2" ISO 1745, "3" ModBus … "10" Profinet, etc). A display of the DN-NN series, which in this version only works with Profinet, will not accept another parameter than "10".**

2-Select another parameter.
Use the key "✱" to blink the desired parameter, and select the new one using the key "✚". The parameter number is:
- 2 digits displays: the left digit with the decimal dot activated.
- 3 or more digits displays: the third digit starting on the right.

You will end the parameter configuration, selecting the parameter F and pressing the advance key ("✱") to exit.

4.2.2   Function of each parameter.

4.2.2.1   Parameter1: Type of numerical data.

Configure the datatype; text format (ASCII) or numeric types like Float or Word data (with or without sign)

Parameter	Type	Numerical range
01	Float	-2147483648 a 2147483647
02	UFloat	0 a 4294967295
03	Word	-32768 a 32767
04	UWord	0 a 65535
05	ASCII	1 numerical character/digit (maximum 10 characters)

⚠ **If the parameter selected is zero, the minimum value of this table will be saved (01). If the value inserted is higher than the allowed, it will save the maximum value of this table (05).**

4.2.2.2   Parameter 2: Communication protocol

Define the communication protocol. The actual version of the DN-NN family only allows the Profinet protocol.

Parameter	Protocol
10	Profinet

⚠ **Only "10" will be accepted in this equipment.**

4.2.2.3   Parameter 3: Time without receiving data

This parameter specifies a time to warn that the equipment is not receiving data. The warning occurs if the programmed time is exceeded.

If data is received within the specified time, the timer is reset to zero. The code "00" (No time) does not trigger any warning.

To indicate that the time limit has been exceeded, a dash will be displayed on each digit.

Code	Time	Code	Time
00	Without time	11	1 min.
01	2 s	12	2 min.
02	4 s	13	5 min.
03	6 s	14	10 min.
04	8 s	15	20 min.
05	10 s	16	40 min.
06	14 s	17	1 hours.
07	20 s	18	2 hours.
08	26 s	19	5 hours.
09	30 s	20	10 hours.
10	40 s	21	25 hours.

4.2.2.4 Parameters B, C, D, E (color option)

The color option allows auto set the display color according to the value displayed. The possible colors are: Red, Green and Yellow.

In order to be able to manage the color, 2 internal bits are used (r1 y r2) that change according to display value. To configure the activation levels of these bits, two parameters for each one are used. Parameter B and C configures the bit r1, and parameter D and E configure the bit r2.

4.2.2.4.1 Parameters to define the internal bit r1.

Parameter B is used to set up the activation condition and the delay or hysteresis

Parameter C defines the trigger level. The most significant digit allows setting up a negative value.

Parameter B				
Left Digit	Control bit		Right Digit	Set/Reset
0	ON if Value > Parameter C		0	No delay / No hysteresis
1	ON if Value < Parameter C		1	Delay 1s
2	Always OFF		2	Delay 2s
			3	Delay 4s
			4	Delay 6s
			5	Delay 10s
			6	Hysteresis = 2
			7	Hysteresis = 4
			8	Hysteresis = 8
			9	Hysteresis = 12

4.2.2.4.2 Parameters to define the internal bit r2

Parameter D is used to set up the activation condition and the delay or hysteresis.

Parameter E is used to set up the trigger level. The most significant digit allows setting up a negative value.

Parameter D				
Left Digit	Control bit		Right Digit	Set/Reset
0	ON if Value > Parameter E		0	No Delay / hysteresis
1	ON if Value < Parameter E		1	Delay 1s
2	Always OFF		2	Delay 2s
			3	Delay 4s
			4	Delay 6s
			5	Delay 10s
			6	Hysteresis = 2
			7	Hysteresis = 4
			8	Hysteresis = 8
			9	Hysteresis = 12

4.2.2.5   Parameters nr, r1, r2, r3 (color option)

To define the color, two internal bits (**r1** and **r2**) are used.

The following parameters are used to define colors.

nr	Color if internal bits are OFF. To change the color push * key. Upon pressing + the next parameter is shown.
$r1$	Color if internal bit **r1** is ON. To change the color push * key. Upon pressing + the next parameter is shown.
$r2$	Color if internal bit **r2** is ON. To change the color push * key. Upon pressing + the next parameter is shown.
$r3$	Color if internal bits **r1** and **r2** are ON. To change the color push * key. Upon pressing + the next parameter is shown.

4.2.2.5.1   Work with one color only

To set one color only, configure the following parameters:

Parameter	Value
B	20
C	0
D	20
E	0
nr	colour
r1	colour
r2	colour
r3	colour

Parameters **C** and **E** may have any value.

Parameters **nr**, **r1**, **r2** and **r3** should have the same color.

Independently of the color configured, the RED color is used for parameter configuration.

4.2.2.6   Parameter F

End of parameters configuration. Press the key ("✶") to exit. The parameters will be saved automatically.

If you wish to keep on configuring parameters, press the key "+" as times as necessary to find the parameter to configure.

5 PROTOCOL AND OPERATIONAL WORK

This section describes PROFINET protocol, as well as the communication with the Displays using this protocol.

The notation of the numerical values which is used in this manual is the following:

- When a **hexadecimal** number is used, we express the number followed by "h"
- When a **decimal** number is used, we express the number followed by "d"
- When a **binary** number is used, we express the number followed by "b"
- When a number is expressed as **ASCII,** we express the number with its ASCII character.

For example: the character X ASCII, can be seen as 58h, 88d or 1011000b. The number 15 ASCII can be described as 31h 35h, 49d 53d or 110001d 110101d according to the context.

Definitions of words used in this chapter description;

- **Offline:** Operations that must be done on the equipment by means of Display settings or software tools, previous to the installation or operation of the equipment in the network.
- **Online:** Configuration change that can be done with the equipment operating in network.
- **XXX** o **xxx**: The 'X' sequences are used to indicate characters that can be variable, as versions or dates.
- **< >:** These signs indicate an option that the user has to particularize according the acquired equipment.

5.1   PROFINET protocol.

In this section we will describe the configuration and commissioning of the Profinet Display using the engineering tool TIA Portal V13 by Siemens. In the case of using another engineering tool you must consult the corresponding documentation.

5.1.1   Before the configuration.

As each PROFINET device is based on DNS (Domain Name System) and the conventions for the denomination of equipment connected to network, it is necessary to assign an identification name to the Display (Device Name). Device Name is assigned to the device through a PROFINET tool that it can be from an engineering tool such as TIA Portal or an independent tool.

In our Displays we use an independent tool called SW67602[1] which can be downloaded freely from our website and it allows you to edit the Device Name and other Ethernet network parameters like IP address, network masks, etc.

When done, you must generate the new GSD file and update the display with the new configuration.

Let's see when it is mandatory to change GSD:

1. **In the Profinet network there is only a DN-NN family display.**
   The display is always configured at factory with a default Device Name, according to the equipment model.

   For example: If we have a **DN-109 of 4 characters one side** (our reference DN-109/4S) the **Device Name** assigned is **dn1x9**. This device name includes all the options of our Profinet numeric displays.

   In installations with <u>only one</u> Display of the DN-NN family, it is recommended to use the factory configuration, downloading the GSD with the default configuration from our website and configure TIA Portal as it is described at the section 5.1.4

2. **The Profinet network has more than one DN-NN family Display.**

   In the case you want to install more than one numerical display on the same Profinet network it is mandatory to change device name of at least one of it. Please use the tool provided.

   The procedure for using the configuration application SW67602 is described in the section 5.1.3.

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[1] It runs in Operating System MS Windows (XP.Vista,7,8,10)

5.1.2 Download of GSD file.

On the product page corresponding to Profinet numeric displays at our website, you can find the GSD file that allows the configuration of series **DN-109, DN-119, DN-129, DN-189** for any number or digits either simple/double face and also with the color option.

The file format is the following:
GSDML-V2.31-XXXxxx-XXXXXXX-**DN1x9**-XXXXXXXX.xml

Once downloaded, you can proceed to configure the display with the corresponding engineering tool.

5.1.3 Creating a GSD custom file.

In the case that you need avoid the duplicity of devices with the same Device Name, you must use the SW67602 software to change the Profinet parameters, create the new GSD and update the Display Firmware.

Find and download the GSD file **FW_DNNN_Vx-xx.zip** at our website, containing the configuration project for the DN-NN display family.

Once unzipped you should find the folder **FW_DN1x9_10C.**

Using the software SW67602 find the folder "Projects" on its directory tree and copy the configuration project (FW_DN1x9_10C) on that directory.

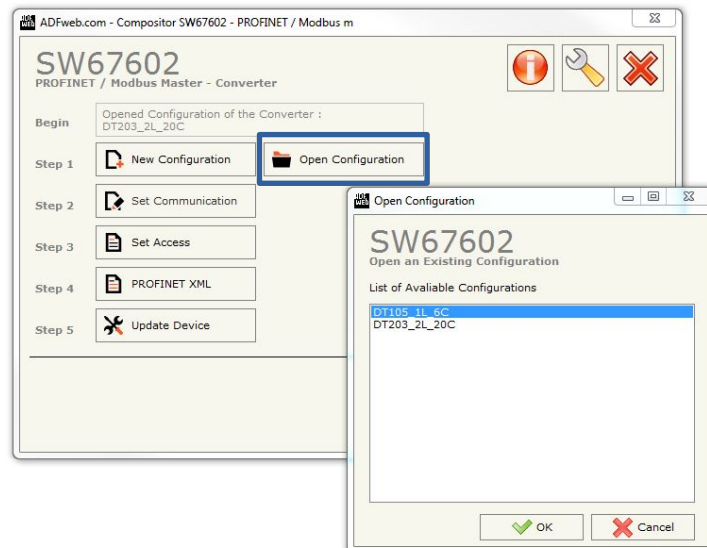Run the application and select "***Open Configuration***" to open the configuration Project.

Fig. 3 Open the project configuration

Check our configuration Project (FW_DN1x9_10C) and press OK. Select the option "***Set Communication***" and edit the communication parameters.
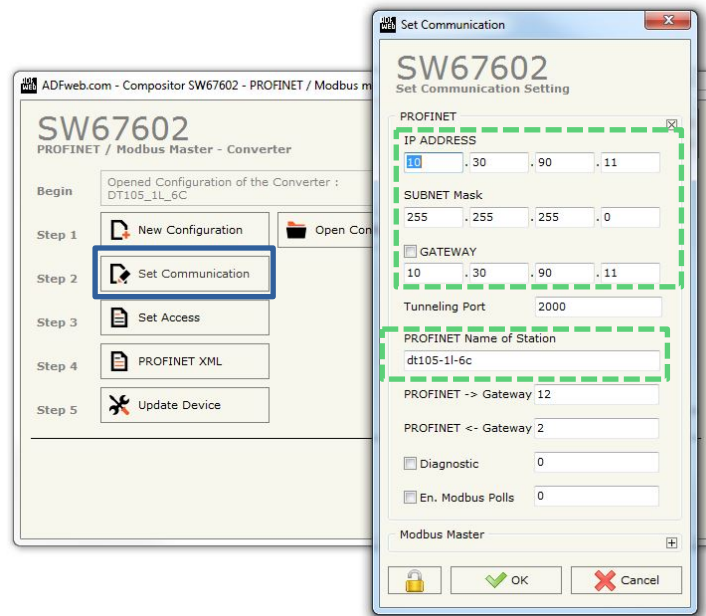
Fig. 4 Set communication parameters.

⚠ **Edit only the data fields delimited by the dashed line, value changes in any other fields can result in display malfunction.**

With the communication parameters updated to the installation requirements, press 'OK' to accept the new values and choose the "*PROFINET XML*" option to create the new GSD.
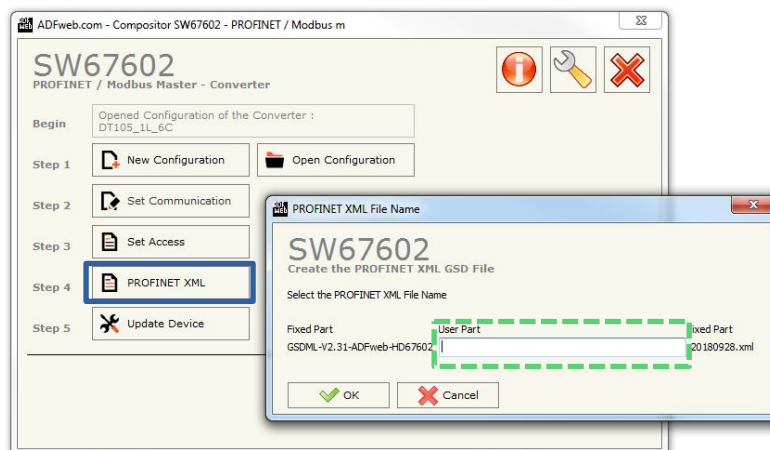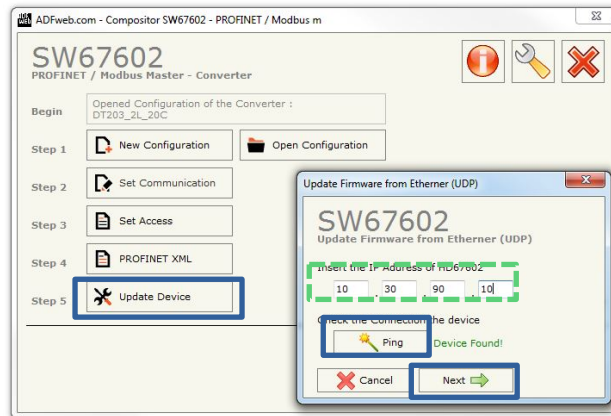

Fig. 5 Creating the updated GSD

Name your customized GSD and write it in the data field, accept and this will generate the updated GSD. The new GSD will be created inside the folder "FW_DN1x9_10C ".

As last step, we must update the display firmware with the new parameters, selecting "**Update Device**".

The factory IP address is 10.30.90.10. We must insert this address in the data field to update the device. The "**Ping**" button detects the device before starting the update. If the device is found, the message "**Device Found!**" will appear, press the button "**Next**" and "**Execute Update Firmware**" to continue with the update process. Once finished the process the display will be ready to install with the TIA Portal utility or similar.

If the device is not found, the message "**Error!!! Check the IP Address**" will be showed. This can happen with equipment already installed that works with a dynamically IP assigned by the PLC, or with offline equipment, which for some reason the IP address has been changed from default value. If the equipment IP address is unknown, there ae some utilities that finds automatically Profinet equipment connected to the network and show their main parameters. We point out among them the application "Proneta" by Siemens, which is free download.

This program will perform a network scan and will display the Profinet devices connected.

#	Name	DNS Name	Device Type	IP Address	Device ID	MAC Address	Role	Gateway	Vendor ID	Vendor Name
1	cristinag	cristinag	SIMATIC-PC	10.30.90.26	0x0202	fc:3f:db:b2:a9:4d	Unspecified	10.30.90.200	0x002A	SIEMENS AG
2	dn1x9	dn1x9	HD67602	10.30.90.14	0x0078	10:64:e2:07:be:59	Device	10.30.90.14	0x1111	Unknown (436}
3	dt203-2l-20c	dt203-2l-20c	HD67602	10.30.90.12	0x0078	10:64:e2:07:be:67	Device	10.30.90.12	0x1111	Unknown (436}
4	plc_1	plcxb1d0ed	S7-1500	10.30.90.16	0x010E	00:1b:1b:13:38:67	Controller	10.30.90.16	0x002A	SIEMENS AG

Fig. 6 Profinet Displays

5.1.4   Display installation in TIA Portal V13

This section shows the steps for the display integration in the Profinet network.

1. **Install the displays GSD/s**

   In TIA Portal V13, press the button "***Options***" and select "***Install general station description file (GSD)***" (The field "***Source path***" must contain the directory where the GSDs has been saved to list the content).
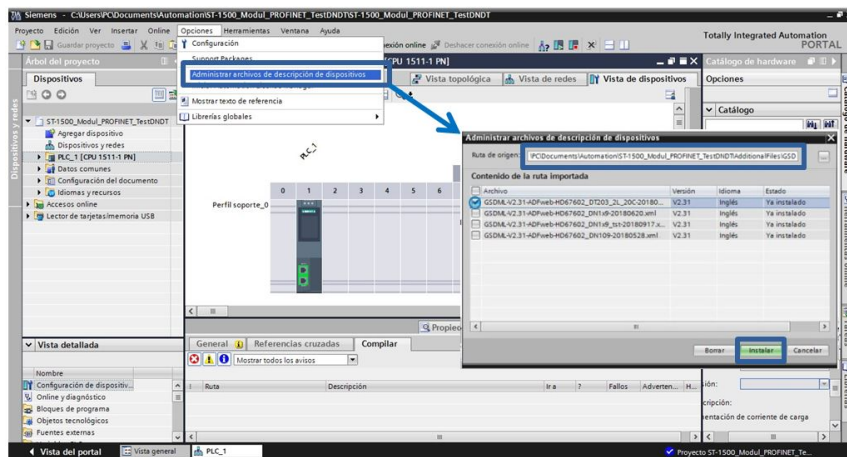

Fig. 7 Install the description file of the device (GSD)

Choose the GSD files for the displays which will be included in the Project and press the button "***Install***". Wait until the installation process ends and the devices will be ready to be configured as follows.

2. **Add the displays to the Project.**

   Press the button "***Devices and networks***" (1), from the right drop-down menu "***Hardware Catalog***", inside "***Other field devices***" (2), look for HD67602 and select the module "***serial***" and at the "***Version***" field (3) choose the GSD that you want to include in the project. Move the serial module to the "***Network view"***
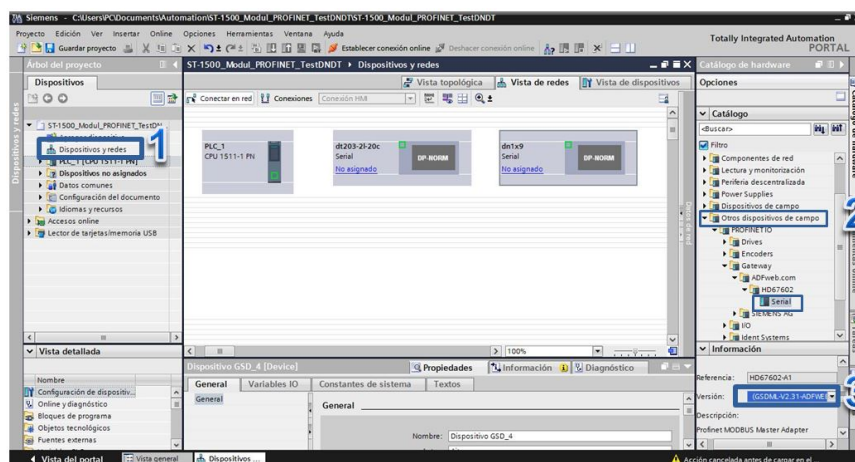

Fig. 8 Add displays to the project.

3. **Add displays and PLC to the Profinet Network**

Connect the displays to the PLC by drawing the Ethernet wire joining the display ports with the PLC Port.
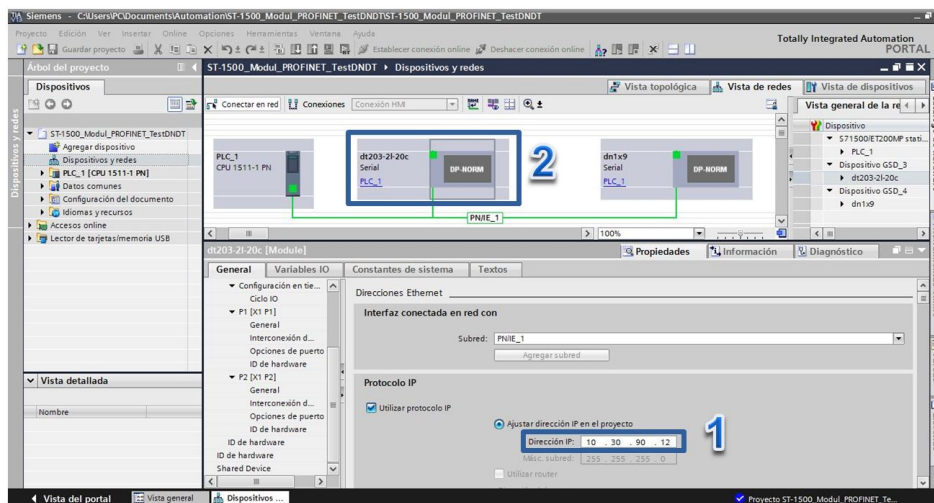
Fig. 9 Define the Displays connection with PLC

Select each one of the displays modules included and assign the IP (1) which they will have in the Profinet network. The "*Device view"* will be displayed *double clicking* in a particular display*.

4. **Assign the E/S address space.**

In the "*Device view"* field, check that the "*Name*" (1) matches with the "Device Name" assigned to the device (TIA Portal add the suffix _1, 2… to avoid duplicity). If the name is different to the one programmed into the Display, rename it to match with the programmed.

Fig. 10 Assign the E/S addresses of the devices.

To define the input/output address range in the PLC, move "Module" to the address fields of slot 1 in the device and fix the start addresses corresponding to input and output according your available addresses.
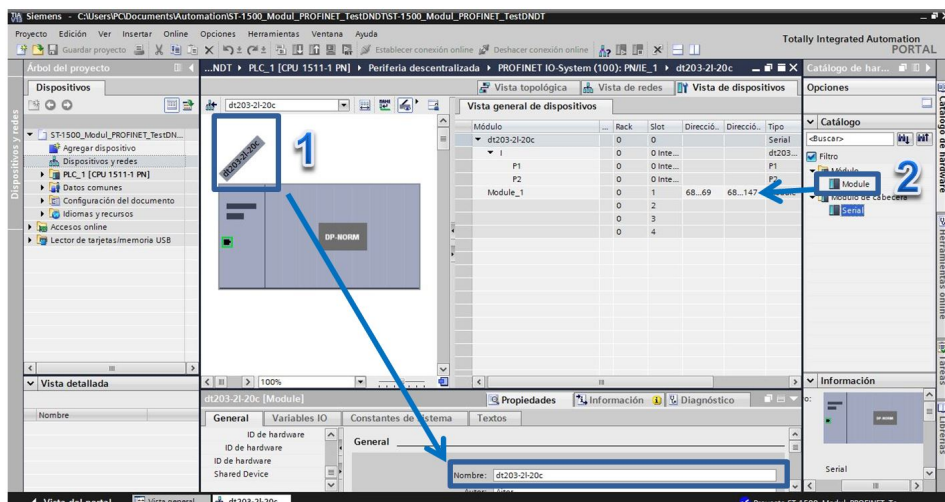
A range of 20 output addresses are reserved in the PLC for communication and only 2 input addresses are used for return control information in future updates of the product (actually no data is returned)

5. **Compile and update the project in the PLC**

With all the elements added and configured, compile the project *(1). Once verified that there are no compilation errors, load the configuration into the PLC* (2).
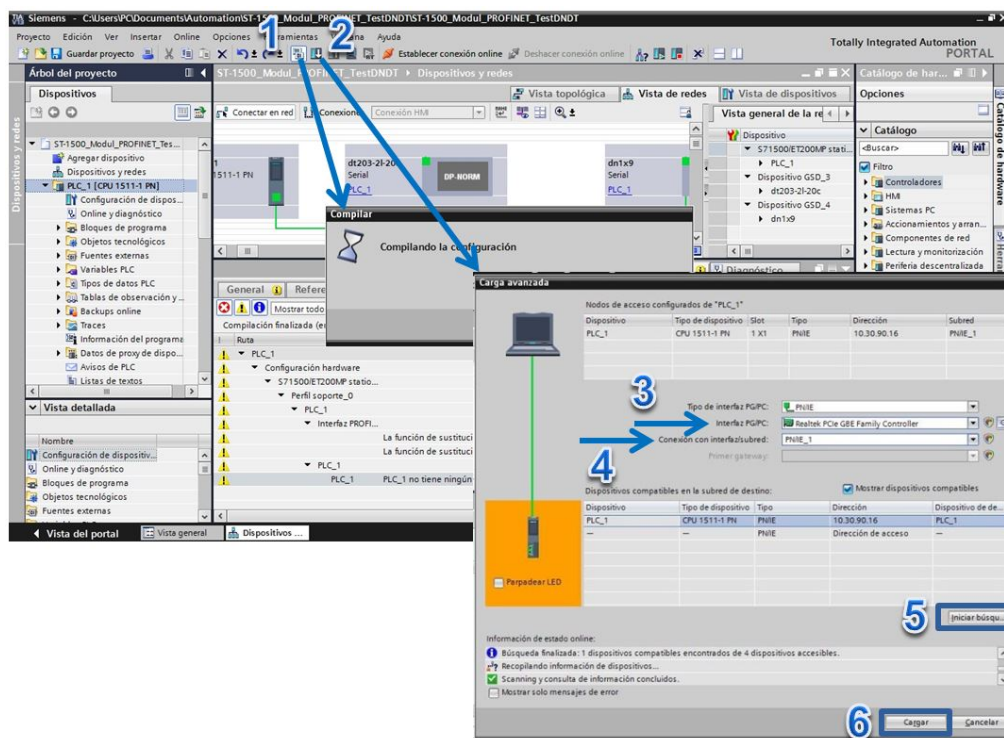
Fig. 11 Compilation and configuration upload in the PLC

To download the configuration to the device, select the network card in the "*PG/PC interface*" field (3) at "*Extended download to device*" window, and establish the identifier of the Profinet network (PN/IE_1 in this example, See Fig. 9) in the "*Connection to subnet*" field (4).

Press "**Refresh**" (5), to detect the PLC and "**Load**" (6) to start the PLC programming.

5.2   Operational modes

As mentioned previously, this display can work with numerical data types and a reduced set of ASCII codes. If ASCII mode is selected, control commands are available which allow special functions like flashing data and color change in displays with this option. In the next sections are detailed how to configure and operate each one of the operational modes.

5.2.1   Type of numerical data.

The FLOAT and WORD (signed or unsigned) datatypes are available.

In the **FLOAT** datatype, 6 bytes must be sent. The first four correspond to the data value, and the two remaining determine the decimal dot position, coded according the Table 1.

Data				Decimal Dot	
B0 (MSB)	B1	B2	B3 (LSB)	B4 (MSB)	B5 (LSB)

In the **WORD** datatype format only two data bytes are sent.

Data	
B0 (MSB)	B1(LSB)

To work with different datatypes, follow the next steps:

1. **Display parameters configuration.**

Use the equipment buttons to adjust the parameter 1 according to the datatype that you want to work.

Parameter	Value	Type
1.	01	FLOAT with sign
	02	FLOAT without sign
	03	WORD with sign
	04	WORD without sign

The parameter 2 should be configured with the value "10" (PROFINET).

If you want to set a time to warn that no data has been received, configure parameter 3 according to the values in the table section 4.2.3.3.

For displays with color option, see the section 4.2.3.4 for color configuration.

2. **Sending numerical values through the Profinet Network**

The maximum data block is six bytes (B0 to B5) for Float datatype, or two bytes (B0 and B1) for Word datatype.

The data block is the following:

%QBx	%QBx+1	%QBx+2	%QBx+3	%QBx+4	%QBx+5
B0	B1	B2	B3	B4	B5

Being %QBx, the <u>first</u> output PLC address which we have configured the display module and %QBx+1, %QBx+3 the successive byte address.

B0, B5 Are the data contained in these addresses, where:

In **FLOAT data**type:

B0: Most Significant Byte of the data.

B1 y B2: Data bytes.

B3: Least significant Byte of the data.

B4: Most Significant Byte of the decimal dot position.

B5: Least Significant Byte of the decimal dot position.

B4..B5	Pos. Decimal Dot
01h	00000000.0
02h	0000000.00
04h	000000.000
08h	00000.0000
10h	0000.00000
11h	000.000000
12h	00.0000000
14h	0.00000000

Table 1 Dot possition codification

In **WORD** datatype:

B0: Most Significant Byte of the data.

B1: Least significant Byte of the data.

Example: The next table shows some examples to display numerical data using different data types, according to the address range defined in Fig. 12.

Type	Frame to send						Visualized Value
FLOAT signed	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	12,34
	00h	00h	04h	D2h	00h	02h	
	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	-567,8
	FFh	FFh	E9h	D2h	00h	01h	
FLOAT unsigned	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	45678
	00h	00h	B2h	6Eh	00h	00h	
	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	99,999
	00h	01h	86h	9Fh	00h	04h	
WORD signed	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	-600
	FDh	A8h					
	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	1525
	05h	F5h					
WORD unsigned	%QB68	%QB69	%QB70	%QB71	%QB72	%QB73	62525
	F4	3D					

5.2.2 ASCII data type

Using this mode, the numerical value must be sent in ASCII code. An advantage of this mode is the control commands which can blink the information displayed or change the display color.

In ASCII format you will send as many bytes as digits have the display plus the control commands (bytes) that you use. The maximum buffer allowed is 20 characters so the data transferred must be equal or less than this value.

In this mode, the <u>first</u> byte of the Profinet frame corresponds to the <u>right</u> digit on the Display (frontal view). So, the byte sequence will be represented in the following way.

Profinet Frame					Value Displayed
%QBx	%QBx+1	%QBx+2	...	%QBx+n	Dn...D2,D1,D0
D0	D1	D2	...	Dn	

1. Display parameters configuration (ASCII Mode)

Using the equipment buttons, we will configure the parameter **1** with the value **05**.

The remaining parameters must be configured according to the section 5.2.1.

2. Sending of characters sequence of the message by Profinet network.

The numerical value of each digit must be coded in ASCII and sent in the abovementioned sequence. Some alphanumeric characters are valid to represent in 7 segments digits. The following table sum up the characters accepted in this mode:

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	64h	45h	46h	48h	68h	69h	4Ah	4Ch	6Eh	6Fh
DEC	67d	99d	100d	69d	70d	72d	104d	105d	74d	76d	110d	111d

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

The control commands available which allow you to blink displayed data and change display color are the following:

08h   **start of digits blinking** (must be indicated before the first blinking digit)

09h   **end of digits blinking** (must be indicated after the last blinking digit)

Only Color option displays

58h + **30h**   **Red colour digits**
58h + **31h**   **Green colour digits**
58h + **32h**   **Yellow colour digits**

Example: The next table shows some examples combining numerical values in ASCII format and control commands (assuming the address range defined in Fig. 10)

Frame to send								Visualized Value
%QB68	%QB69	%QB70	%QB70	%QB71	%QB72	%QB73	%QB74	89,572[1]
32h	37h	35h	2Eh	39h	38h			
08h	30h	31h	2Eh	37h	36h	2Dh	09h	-67.10[2]
33h	32h	36h	34h	2Eh	36h			6,4623
33h	32h	36h	34h	2Eh	36h	58h	31h	6,4623[3]

(1) Monochrome or color equipment with red color set by default.
(2) The value displayed blinks.
(3) Configuring the color with the control command.

5.2.3   Automatic color control (Color option)

By means of color parameters we can define value intervals linked to a specified color (Red, Green and Yellow). In this way, when the value represented is within the defined interval, the value will be showed in the selected color.

As it was commented in section 4.2.3.4, two internal bits (r1, r2) are used as triggers for the color representation. Each one of these bits uses two control parameters B, C for r1 and D, E for r2. The parameters B and D define the activation condition for r1 and r2 respectively, and C and D parameters assign the trigger value for these bits.

In the abovementioned section, the configuration values for each parameter are specified in detail.

Let's see an **example** to program an easy semaphore where the following conditions are specified:

Value ≤250 Green color
250<*Value* ≤ 500 Yellow color
Value>500 Red color

Neither hysteresis nor delay time are used.

One of the possible configurations of the parameters would be the following:

Parameters	Values
B	00
C	250
D	00
E	500
nr	Green
r1	Yellow
r2	Yellow
r3	Red

Values ≤250	250<Values ≤ 500	Values>500
Color (nr)	Color (r1)	Color (r3)
r1=r2=OFF	r1 =ON r2=OFF	r1=r2=ON

5.2.4   Status LEDs

For troubleshooting in Profinet communication, the equipment has status LEDs that indicate problems with duplicate IPs, repeated Device Names, or problems in the ARs between controller and network devices.

The following table describes the meaning of the LEDs

LED	SIGNIFICADO
BF (Failure bus) 🔴	**ON:** The Ethernet connection is defective; IP address is duplicated in the network; DeviceName is duplicated in the network; The IP is not defined. **Flashing:** At least one configured AR is no longer in the data exchange. **OFF:** No errors are present.
SF (Group error) 🔴	**ON:** At least one AR is not in the data exchange. **OFF:** No errors are present.

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