OPERATION MANUAL

FOR DISPLAYS SERIES

DN-109P, DN-119P,

DN-129P AND DN-189P

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1. INTRODUCTION

The family of numeric displays **DN-109P, DN-119P, DN-129 and DN-189P** has been designed to provide, in a single display, the following functions:

Direct BCD. Only for 3 digits displays. With 12 inputs you may codify 3 digits. Two more inputs lest you to codify the dot position.

Multiplexed BCD. For displays up to 7 digits. With 8 inputs you may codify all 7 digits values and theirs dots.

Counter. For display up to 10 digits. Inputs for preset, reset, increase and decrease. Input with fast and low speed selectable. Back-up of display value if no power supply.

Tachometer. For displays of 3, 4 or 5 digits. The display value is proportional to the input frequency. Totally configurable.

Chronometer. For displays of 3, 4 o 5 digits. It lets you configure a chronometer with hours: minutes or minutes: seconds running in increment or decrement. The display has inputs for preset, reset and input for run/stop.

Binary. For displays up to 5 digits. Displays the decimal value of binary code represented by the 14 inputs. Maximum value: 16383.

The size of the digits is **57mm for DN-109P, 100mm for DN-119P, 250mm for DN-129P and 180mm for DN-189P.** The viewing distance from 30m to 120m, is one of the most interesting characteristics.

2. GENERAL CHARACTERISTICS.

2.1. Electrical characteristics

2.1.1. Electrical characteristics of the DN-109 displays.

Supply Voltage.....88 to 264 VAC 47 to 63Hz
Option 24V.....19 to 36VDC.
Consumption .....See “Display weight and power consumption.”
Display .....7 segments, 57mm high + decimal point.
.....Red Led colour. Viewing distance: max 30 meters.
Colour option .....Red, green, and yellow colour.
Text (LED).....Formed by leds of 5mm diameter, 50mm character
.....height.
Text (Vinyl) .....White vinyl. 50mm character height.
Parameter memory .....Eeprom.
Output voltage (for sensors) 12V 1A
Control inputs .....12 to 24Vcc. PNP, NPN or contact.
Serial line option (X).....RS-232 and RS-485. 9600 – 19200 bauds
Relay option (R) .....Contact SPDT. Maximum 48V 1A.
Environmental Conditions.....Operation Temperature: -20 to 60ºC.
.....Storage temperature: -30ºC to 70ºC.
.....Humidity: 5-95% RH non condensing.
.....Maximum environmental illumination: 1000 lux.
.....Sealing: IP41 or IP65.

2.1.2. Electrical characteristics of the DN-119 displays.

Supply Voltage.....88 to 264 VAC 47 to 63Hz
Option 24V.....19 to 36VDC.
Consumption .....See “Display weight and power consumption.”
Display .....7 segments, 100mm high + decimal point.
.....Red Led colour. Viewing distance: max 50 meters.
Colour option .....Red, green, and yellow colour.
Text (LED).....Formed by leds of 5mm diameter, 65mm character
.....height.
Text (Vinyl) .....White vinyl. 65mm character height.
Parameter memory .....Eeprom.
Output voltage (for sensors) .....
Red displays 12V 1A
Colour displays..... 24V 0,5A
Control inputs .....12 to 24Vcc. PNP, NPN or contact.
Serial line option (X).....RS-232 and RS-485. 9600 – 19200 bauds
Relay option (R) .....Contact SPDT. Maximum 48V 1A.
Environmental Conditions.....Operation Temperature: -20 to 60ºC.
.....Storage temperature: -30ºC to 70ºC.
.....Humidity: 5-95% RH non condensing.
.....Maximum environmental illumination: 1000 lux.
.....Sealing: IP41 or IP65.

2.1.3. Electrical characteristics of the DN-189 displays.

Supply Voltage.....88 to 264 VAC 47 to 63Hz.
Option 24V.....19 to 36VDC.
Consumption .....See “Display weight and power consumption.”
Display .....7 segments, 180mm high + decimal point.
.....Red Led colour. Viewing distance: max 90 meters.
Text (Vinyl) .....White vinyl.
Parameter memory.....Eeprom.
Output voltage (for sensors) 24V 0,5A
Control inputs .....12 to 24Vcc. PNP, NPN or contact.
Serial line option (X).....RS-232 and RS-485. 9600 – 19200 bauds
Relay option (R) .....Contact SPDT. Maximum 48V 1A.
Environmental Conditions.....Operation Temperature: -20 to 60ºC.
.....Storage temperature: -30ºC to 70ºC.
.....Humidity: 5-95% RH non condensing.
.....Maximum environmental illumination: 1000 lux.
.....Sealing: IP41 or IP65.

2.1.4. Electrical characteristics of the DN-129 displays.

Supply Voltage.....88 to 264 VAC 47 to 63Hz.
Option 24V.....19 to 36VDC.
Consumption .....See “Display weight and power consumption.”
Display .....7 segments, 250mm high + decimal point.
.....Red Led colour. Viewing distance: max 120 meters.
Text (Vinyl) .....White vinyl.
Parameter memory.....Eeprom.
Output voltage (for sensors) 24V 0,5A
Control inputs .....12 to 24Vcc. PNP, NPN or contact.
Serial line option (X).....RS-232 and RS-485. 9600 – 19200 bauds
Relay option (R) .....Contact SPDT. Maximum 48V 1A.
Environmental Conditions.....Operation Temperature: -20 to 60ºC.
.....Storage temperature: -30ºC to 70ºC.
.....Humidity: 5-95% RH non condensing.
.....Maximum environmental illumination: 1000 lux.
.....Sealing: IP41 or IP54.

2.2. Display weight and power consumption.

2.2.1. DN-109 weight and power consumption.

Reference	Display Weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)
DN-109/3S	3,0	5,9	DN-109/3S+TL	3,0	7,9	DN-109/3S+TV	3,0	5,9
DN-109/3D	3,0	10	DN-109/3D+TL	3,0	11,7	DN-109/3D+TV	3,0	10
DN-109/4S	3,0	7,54	DN-109/4S+TL	3,5	9,6	DN-109/4S+TV	3,5	7,54
DN-109/4D	3,5	14,44	DN-109/4D+TL	3,5	15,1	DN-109/4D+TV	3,5	14,44
DN-109/5S	3,0	9,2	DN-109/5S+TL	3,5	11,2	DN-109/5S+TV	3,5	9,2
DN-109/5D	3,5	18	DN-109/5D+TL	4,5	21,7	DN-109/5D+TV	4,0	18
DN-109/6S	3,5	10,7	DN-109/6S+TL	4,0	12,8	DN-109/6S+TV	4,0	10,7
DN-109/6D	4,0	20,85	DN-109/6D+TL	4,5	25	DN-109/6D+TV	4,0	20,85
DN-109/7S	4,0	12,36	DN-109/7S+TL	4,0	14,4	DN-109/7S+TV	4,0	12,36
DN-109/7D	4,5	24,1	DN-109/7D+TL	5,0	28,1	DN-109/7D+TV	5,0	24,1
DN-109/8S	4,0	14	DN-109/8S+TL	4,5	16	DN-109/8S+TV	4,5	14
DN-109/8D	5,0	27,3	DN-109/8D+TL	5,5	31,3	DN-109/8D+TV	5,5	27,3
DN-109/9S	4,5	15,7	DN-109/9S+TL	4,5	17,6	DN-109/9S+TV	4,5	15,7
DN-109/9D	5,0	30,5	DN-109/9D+TL	5,5	34,6	DN-109/9D+TV	5,5	30,5
DN-109/10S	4,5	17,2	DN-109/10S+TL	5,0	19,2	DN-109/10S+TV	5,0	17,2
DN-109/10D	5,5	33,7	DN-109/10D+TL	6,0	37,7	DN-109/10D+TV	6,0	33,7

2.2.2. DN-119 weight and power consumption.

Reference	Display Weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)
DN-119/3S	4,0	10,8	DN-119/3S+TL	4,5	13,4	DN-119/3S+TV	4,5	10,8
DN-119/3D	4,0	18	DN-119/3D+TL	5,0	20	DN-119/3D+TV	5,0	18
DN-119/4S	4,5	14	DN-119/4S+TL	5,5	16.6	DN-119/4S+TV	5,5	14
DN-119/4D	5,0	26,6	DN-119/4D+TL	5,5	31,9	DN-119/4D+TV	5,5	26,6
DN-119/5S	5,0	17	DN-119/5S+TL	5,5	19,7	DN-119/5S+TV	5,5	17
DN-119/5D	5,5	32,9	DN-119/5D+TL	6,0	38,1	DN-119/5D+TV	6,0	32,9
DN-119/6S	5,5	20,2	DN-119/6S+TL	6,0	22,8	DN-119/6S+TV	6,0	20,2
DN-119/6D	6,0	39,2	DN-119/6D+TL	6,5	44,5	DN-119/6D+TV	6,5	39,2
DN-119/7S	6,0	23,3	DN-119/7S+TL	7,0	25,9	DN-119/7S+TV	7,0	23,3
DN-119/7D	3,5	25,5	DN-119/7D+TL	7,5	50,8	DN-119/7D+TV	7,5	25,5
DN-119/8S	6,5	26,4	DN-119/8S+TL	7,5	29	DN-119/8S+TV	7,5	26,4
DN-119/8D	7,0	51,6	DN-119/8D+TL	8,0	56,8	DN-119/8D+TV	8,0	51,6
DN-119/9S	7,0	29,4	DN-119/9S+TL	8,0	32	DN-119/9S+TV	8,0	29,4
DN-119/9D	7,5	57,6	DN-119/9D+TL	8,5	62,9	DN-119/9D+TV	8,5	57,6
DN-119/10S	7,5	32,5	DN-119/10S+TL	8,5	35,2	DN-119/10S+TV	8,5	32,5
DN-119/10D	8,0	64	DN-119/10D+TL	9,0	69	DN-119/10D+TV	9,0	64

2.2.3. DN-189 weight and power consumption.

Reference	Display Weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)
DN-189/2S	4,0	13,3	DN-189/2S+TV	5,5	13,3
DN-189/2D	4,5	25,8	DN-189/2D+TV	6,5	25,8
DN-189/3S	5,0	19,4	DN-189/3S+TV	6,5	19,4
DN-189/3D	6,0	38,2	DN-189/3D+TV	8,0	38,2
DN-189/4S	6,0	25,7	DN-189/4S+TV	7,5	25,7
DN-189/4D	7,5	50,8	DN-189/4D+TV	9,0	50,8
DN-189/5S	7,0	31,8	DN-189/5S+TV	9,0	31,8
DN-189/5D	8,5	63,2	DN-189/5D+TV	10,5	63,2
DN-189/6S	8,5	37,8	DN-189/6S+TV	10,0	37,8
DN-189/6D	10,0	75,5	DN-189/6D+TV	11,5	75,5
DN-189/7S	9,5	44	DN-189/7S+TV	11,0	44
DN-189/7D	11,0	88,1	DN-189/7D+TV	13,0	88,1
DN-189/8S	10,5	50,3	DN-189/8S+TV	12,0	50,3
DN-189/8D	12,5	100,6	DN-189/8D+TV	14,0	100,6
DN-189/9S	11,0	56,6	DN-189/9S+TV	13,0	56,6
DN-189/9D	13,5	113,2	DN-189/9D+TV	15,5	113,2
DN-189/10S	12,0	62,9	DN-189/10S+TV	14,0	62,9
DN-189/10D	15,0	125,8	DN-189/10D+TV	16,5	125,8

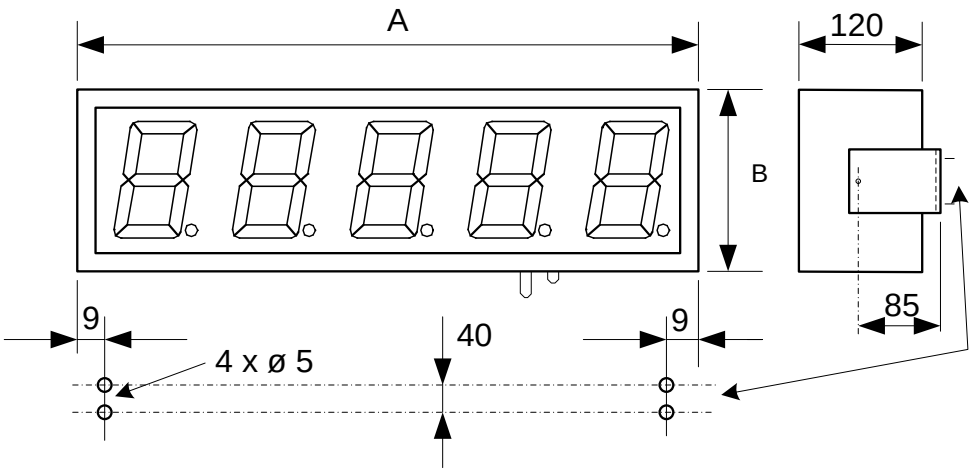
2.2.4. DN-129 weight and power consumption.

Reference	Display Weight (kg)	Power (W)	Reference	Display weight (kg)	Power (W)
DN-129/2S	6,5	13	DN-129/2S+TV	9,5	13
DN-129/2D	8,0	26	DN-129/2D+TV	11,5	26
DN-129/3S	8,5	20	DN-129/3S+TV	11,5	20
DN-129/3D	10,5	40	DN-129/3D+TV	13,5	40
DN-129/4S	10,5	26	DN-129/4S+TV	13,0	26
DN-129/4D	13,0	52	DN-129/4D+TV	16,0	52
DN-129/5S	12,0	32	DN-129/5S+TV	15,0	32
DN-129/5D	15,5	64	DN-129/5D+TV	18,5	64
DN-129/6S	14,0	40	DN-129/6S+TV	17,0	40
DN-129/6D	18,0	77	DN-129/6D+TV	21,0	77
DN-129/7S	16,0	45	DN-129/7S+TV	18,5	45
DN-129/7D	20,0	90	DN-129/7D+TV	23,5	90
DN-129/8S	17,5	51	DN-129/8S+TV	20,5	51
DN-129/8D	23,0	102	DN-129/8D+TV	26,0	102
DN-129/9S	19,5	58	DN-129/9S+TV	22,5	58
DN-129/9D	25,5	115	DN-129/9D+TV	28,5	115
DN-129/10S	21,5	64	DN-129/10S+TV	24,0	64
DN-129/10D	28,0	128	DN-129/10D+TV	31,0	128

2.3. Dimensions and mounting of the displays

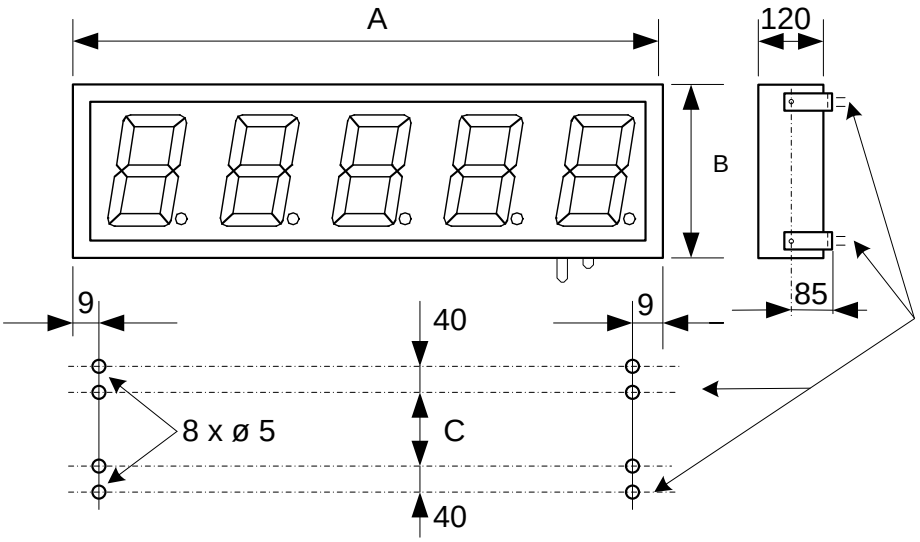
2.3.1. Dimensions and mounting of the DN-109 and DN-119

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



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



3. INSTALLATION

The installation of the **DN-109P, DN-119P, DN-129P and DN-189P** is not particularly delicate 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-109P, DN-119P, DN-129P and DN-189P** is IP41, meaning that they are protected against penetration by solid foreign objects of a diameter of about 1mm and against the vertical fall of water droplets.

Displays **DN-109P, DN-119P and DN-189P** should not be installed in places with an illumination level in excess of 1000 lux. Neither should the display be placed in direct sunlight as visibility would be lost. DN-129P can be placed in high brightness condition

The **DN-109eh/P, DN-119eh/P, DN-129fh/P and DN-189eh/P** may work on direct sunlight.

In the electrical installation, proximity to lines of high intensity circulation and high voltage lines must be avoided, as well as proximity to High Frequency generators and U/F converters for motors.

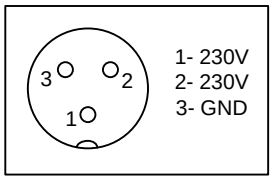
3.1. Power supply.

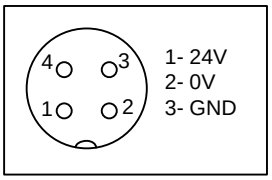
The power supply must be 88 to 264VAC, 47 to 63 Hz or 19 to 36VDC.

The power supply conductor section will be in line with consumption and the ground conductor will be a minimum section of 1.5m².

The power supply connector for 220VAC has 3 contacts and is situated in the lower part of the unit. Connect the power wires following the schema below

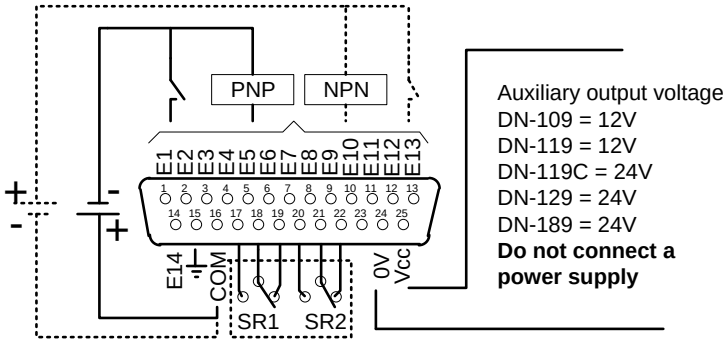
The power supply connector for 24VDC has 4 contacts and is situated in the lower part of the unit. Connect the power wires following the schema below





3.2. Wiring inputs

In all functions, the inputs should be between 12 to 26Vcc and allow PNP, NPN and contact



DB25 MALE CONECTOR

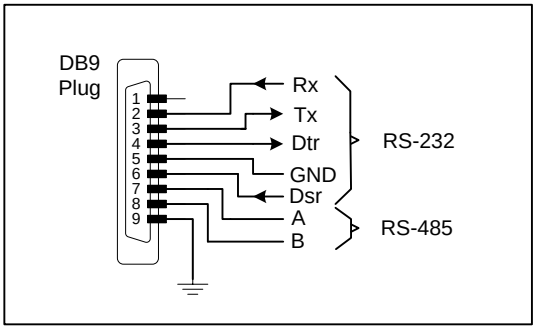
Each input has a different use depending on the function (BCD, counter, etc.). To know how to wire them, see 4.3 “Functions”.

The inputs power supply must be between 12V and 26V CC with a maximum wave of 500mV. Surpassing this values can damage the display. The auxiliary output can supply up to 180mA

3.3. Serial line connection

All displays DN-109PX, DN-119PX, DN-129PX and DN-189PX may use RS232 and RS485 serial lines. Both use the same connector located at the bottom of display.

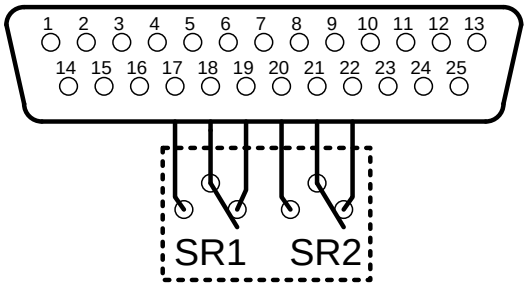
The DN-109PX, DN-119PX, DN-129PX and DN-189PX displays use DB9 connector.



3.4. Characteristics of the relay output option.

SPDT contact.
Maximum current:
Resistive load 1A
Inductive load 1A
Maximum voltage: ..... 48V AC/DC

3.4.1. Wiring the relay output



4. OPERATION

4.1. Initial reset.

Before connecting the display to the network, we must ensure that all of the connections have been carried out correctly and that the display is firmly in place.

Each time we connect the display to the power supply network, an initial reset occurs which tests all of the segments comprising the display. The test consists of the sequential illumination of all of the digits with the number "8", all of the digits with the value "0", all of the decimal points are lit up and finally the version code.

4.2. Programming parameters.

Displays DN-109/119/129/189P can be adapted to the demands of any customer through the parameters programming

To program the display, it includes 2 keys (“+” and “*”) placed in the bottom of the display. In the DN-P displays, these keys can be accessed through the digital inputs. Activating the E11 input is the same as pressing the “+” key and activating the E12 input is the same as pressing the “*” key.

4.2.1. Enter to modify parameters.

In order to enter the sequence to modify the parameters, the Advance key “*” must be pressed and held for three seconds. After this, the first parameters will be displayed, showing the most significant digit flashing.

There are then two options:

1- Modify the parameter value

By pressing the Advance key "*", entry is gained to modify the parameter value.

To go back to displaying the parameter number, press “*”again.

To increase the parameter value, press the “+” key. After parameter 7 it returns to 1.

2- Select another parameter

In order to select another parameter, the parameter number must be made to flash using the “*” key and then the new parameter may be selected using the “+” key.

4.2.2. Exit modify parameters.

In order to exit the sequence for modifying parameters, select the last parameter in the menu. Then press "*".

4.2.3. Common parameters

4.2.3.1. Parameter 1: Function

This parameter determines the function of the display. Possible values are:

Parameter value	Function	Digits limit
01	8 bits. Multiplexed BCD. Models 3 to 7 digits. (-/White)	10
11	8 bits. Multiplexed BCD. Models 3 to 7 digits. (E/F)	10
02	Direct BDC. Only 3 digits models (-/White)	3
12	Direct BDC. Only 3 digits models. (E / F)	3
03	Counter	10
04	Chronometer	8
14	Chronometer format HH:MM:SS	8
05	Tachometer	5
06	Binary	5
07	Digit to digit	10
15	Tachometer with the less significant digit = 0	5
25	Tachometer with the 2 less significant digits = 0	5

See what each function does in 4.3 “Functions”.

In 01/11 (8 bit multiplexed BCD) and 02/12 (direct BCD) functions, the function is the only parameter configurable.

The chronometer function 14 is used in displays with format HH:MM or HH:MM:SS. This function lets to display the parameter number on the fourth digit.

4.2.4. Parameters of the function 03 (Counter)

Parameter 2. Co: Multiplying or splitter factor, maximum frequency and preset function.
Parameter 3. P1: Value of preset 1.
Parameter 4. P2: Value of preset 2.
Parameter 5. A1: Value of alarm 1.
Parameter 6. A2: Value of alarm 2.
Parameter 7. S1: Activation and temporization conditions of output 1
Parameter 8. S2: Activation and temporization conditions of output 2
Parameter 9. FA: Value of multiplying or splitter factor
Parameter A. PU: Decimal point position.
Parameter B. So: Exit programming parameters.

In the 2 digits DN-129 and DN-189 models, only the parameter number and the first letter are shown.

4.2.4.1. Parameter 2 Co

This is a 2 digit parameter. The function of each digit is indicated in the following table.

Left digit	Operating modes	Right digit	Automatic function
0	High counting freqüency	0	Not activated
1	Low counting freqüency	1	Counter = Alarm 1 → Reset
		2	Counter = Alarm 2 → Reset
		3	Counter = Alarm 1 → Preset 1
		4	Counter = Alarm 2 → Preset 1
		5	Counter = Alarm 1 → Preset 2
		6	Counter = Alarm 2 → Preset 2

The multiplying factor permits increasing or decreasing the value of the counter with a equal or more than 1 factor. With a factor = 4, the counter increase o decrease 4 units each time that receives a impulse.

The splitter factor is similar. The counter increases 1 unit when it has received as many impulses as the factor indicates.

The maximum value of the factor is 999 in a 3 digits display, 9999 in a 4 digits, 99999 in a 5 digits and 999999 in a 6, 7, 8 or 9 digits.

The automatic function (right digit) allows to modify the value of the counter when it has a determinate value..

0 Counter's value not modified.
1 Resets the counter if it is equal to alarm 1
2 Resets the counter if it is equal to alarm 2
3 Loads preset 1 if it is equal to alarm 1
4 Loads preset 1 if it is equal to alarm 2
5 Loads preset 2 if it is equal to alarm 1
6 Loads preset 2 if it is equal to alarm 2

The automatic function doesn't work in high frequencies.

4.2.4.2. Parameter 3. P1: Preset 1 value

It can be from 0 to as many 9 as digits the display has.

4.2.4.3. Parameter 4. P2: Preset 2 value

It can be from 0 to as many 9 as digits the display has.

4.2.4.4. Parameter 5. A1: Alarm 1 value

It can be from 0 to as many 9 as digits the display has.

4.2.4.5. Parameter 6. A2: Alarm 2 value

It can be from 0 to as many 9 as digits the display has.

4.2.4.6. Parameter 7. S1: Activation and temporization conditions of output 1.

See 4.4.2 “Using functions counter or chronometer”

4.2.4.7. Parameter 8. S2: Activation and temporization conditions of output 2

See 4.4.2 “Using functions counter or chronometer”

4.2.4.8. Parameter 9. FA: Value of the multiplying or splitter factor

The maximum value is 999 in a 3 digits display, 9999 in a 4 digits, 99999 in a 5 digits and 999999 in a 6, 7, 8 or 9. The function of the multiplying or splitter factor is indicated in parameter 2 Co.

4.2.4.9. Parameter A. PU: Decimal point

Selects the decimal point position (the number of decimal digits). With a value of 0 no decimal digits will be shown.

4.2.4.10. Parameter B. So: Exit modify parameters.

In order to exit the sequence for modifying parameters, select the last parameter in the menu. Then press "*".

See the input wiring and examples in 4.3 “Functions”.

4.2.5. Parameters of function 04 (Chronometer).

The chronometer format and its maximum value depends on the display’s digit number:

2 Digits display: DD	Maximum value: 59
3 Digits display: D.DD	Maximum value: 9.59
4 Digits display: DD.DD	Maximum value: 99.59
5 Digits display: DD-DD o DD:DD	Maximum value: 99-59
6 Digits display: DDD-DD o DDD:DD	Maximum value: 999-59
7 Digits display: DDDD-DD o DDDD:DD	Maximum value: 999-59
8 Digits display: HH-MM-SS o HH:MM:SS	Maximum value: 99-59-59

The standard display’s reference is with symbol “-” between digits. Displays with symbol “:” must be ordered HH:MM.

Displays from 2 to 7 digits may be setup to count hours/minutes or minutes/seconds.
8 Digits displays always count hours, minutes and seconds.

Parameter 2.Co: Control of Hours/Minutes or Minutes/Seconds, increase/decrease and function preset.

Parameter 3. P1: Value of preset 1.
Parameter 4. P2: Value of preset 2.
Parameter 5. A1: Value of alarm 1.
Parameter 6. A2: Value of alarm 2.
Parameter 7. S1: Activation and temporization conditions of output 1
Parameter 8. S2: Activation and temporization conditions of output 2
Parameter 9. So: Exit programming parameters.
In the 2 digits DN-129 models, only the parameter number and the first letter are shown.

4.2.5.1. Parameter 2 Co

This is a 2 digit parameter. The function of each digit is indicated in the following table.

Left digit	Operating modes	Right digit	Automatic function
0	Increase Hours/Minutes	0	Not activated
1	Decrease Hours/Minutes	1	Time = Alarm 1 → Reset
2	Inc/Dec Hours/Minutes → Input 5	2	Time = Alarm 2 → Reset
3	Increase Minutes/Seconds	3	Time = Alarm 1 → Preset 1
4	Decrease Minutes/Seconds	4	Time = Alarm 2 → Preset 1
5	Inc/Dec Minutes/Seconds → Input 5	5	Time = Alarm 1 → Preset 2
		6	Time = Alarm 2 → Preset 2
			Time = Alarm 1 → Stop
			Time = Alarm 2 → Stop

In types of working 2 and 5 (Inc./Dec. Hours/Min. → input 5 and Inc./Dec. Min./Sec. → input 5) the time is increased or decreased depending on the state of input5.

With the input 5 activated, the time increases. With the input 5 deactivated, the time decreases.

The automatic function (right digit) permits modifying the stopwatch.

0 Stopwatch's value not modified.
1 Resets the stopwatch if it is equal to alarm 1
2 Resets the stopwatch if it is equal to alarm 2
3 Loads preset 1 if it is equal to alarm 1
4 Loads preset 1 if it is equal to alarm 2
5 Loads preset 2 if it is equal to alarm 1
6 Loads preset 2 if it is equal to alarm 2
7 Stops the chronometer if it is equal to alarm 1
8 Stops the chronometer if it is equal to alarm 2

4.2.5.2. Parameter 3. P1: Preset 1 value

The maximum value is 23h:59m or 59m:59s.

4.2.5.3. Parameter 4. P2: Preset 2 value

The maximum value is 23h:59m or 59m:59s.

4.2.5.4. Parameter 5. A1: Alarm 1 value

The maximum value is 23h:59m or 59m:59s.

4.2.5.5. Parameter 6. A2: Alarm 2 value

The maximum value is 23h:59m or 59m:59s.

4.2.5.6. Parameter 7. S1: Activation and temporization conditions of output 1.

See 4.4.2 “Using functions counter or chronometer”

4.2.5.7. Parameter 8. S2: Activation and temporization conditions of output 2

See 4.4.2 “Using functions counter or chronometer”

4.2.5.8. Parameter B. So: Exit modify parameters.

In order to exit the sequence for modifying parameters, select the last parameter in the menu. Then press "*".

See the input wiring and examples in 4.3.6 “Function 4. Chronometer”.

4.2.6. Parameters of functions 05, 15 and 25 (Tachymeter).

Parameter 2. FE: input frequency
Parameter 3. dt: display’s value.
Parameter 4.EL: updating time.
Parameter 5. LI: Limit time without impulses.
Parameter 6. Pd: number of decimals.
Parameter 7. FA: mortifying factor.
Parameter F. in: Exits programming.

In the 2 digits models of DN-129 and DN-189 it isn't possible to use the Tachometer function.

4.2.6.1. Parameter 2.FE: Input frequency.

Adjusts the value of the input frequency according to the following table:

Number of digits	Maximum frequency	Minimum frequency
3	999	0,01
4	9999	0,001
5	15000	0,0001

The decimal point is selected with the increase key (+) after programming the frequency

4.2.6.2. Parameter 3.dI: Value of the display.

Selects the number shown when the frequency is equal to the input frequency of parameter 2.

Number of digits	Maximum value	Minumum value
3	999	0,01
4	9999	0,001
5	15000	0,0001

The decimal point is selected with the increase key (+) after programming the frequency

4.2.6.3. Parameter 4.EL: Updating time

Selects the updating time of the display. The time is measured in tenths of seconds and the rank is between 1 and 199 (0.1s and 19.9s).

With a big updating time there will be less changes on the frequency shown by the display. If the input frequency is unstable, select a big updating time to reduce the display's changes.

4.2.6.4. Parameter 5.LI: Time without pulses limit.

Adjust the maximum time between two impulses. If this time is surpassed, the display shows 0. The time is measured in seconds and the rank is between 1s and 99s

4.2.6.5. Parameter 6Pd: Number of decimals.

Selects the maximum number of decimal positions. If there isn't enough space to show all the integers numbers, the number of decimal positions will automatically decrease.

The possible values are: 0, 1, 2, 3, 4 and 9. A value of 9 indicates that there will be used as many decimal positions as possible.

Example: If the number of decimal positions is 2, the display has 5 digits and the shown number is 99.99, when we increase 0.01 the new number is 100.00

4.2.6.6. Parameter 7.FA: Average factor.

Selects the number of samples that are used to do an average and reduce the changes. When the input frequency has a big change and you don't wants to see it, the average factor reduce the change.

Each time that the data is updated, the new number erase the oldest. The possible values are from 0 to 9. The number of samples are the average factor multiplied 5.

4.2.6.7. Parameter B. So: Exit modify parameters.

In order to exit the sequence for modifying parameters, select the last parameter in the menu. Then press "*".

See the input wiring and examples in 4.3.7 "Function 5.Tachometer".

4.2.7. Parameters of function 06 (Binary)

4.2.7.1. Parameter A. PU: Decimal points

Selects the decimal point position (the number of decimal digits). With a value of 0 no decimal digits will be shown.

4.2.8. Parameters of function 07 (Digit by digit)

Function 07 has no parameters, excepting in displays with color or serial line options.

4.3. Functions

4.3.1. Function 1. 8 bits multiplexed BCD.

The 8 bits multiplexed BCD function allows controlling displays from 3 to 10 digits with 8 data bits. The PLCs only need 8 data bits to control a 8 bits multiplexed BCD display.

The input's power supply should be between 12V and 26V CC and can be connected to PNP, NPN and CONTACT outputs. The function of each input is:

Inputs E5, E6, E7 and E9: If the four inputs are 0, with the E1to E4 the decimal point position is codified. If not, they codify the digit's position and E1, E2, E3 and E4 are the code of the value.

Input E8: (strobe) validate the codified data.

The digit 1 is in the right of the display.

	Decimal point position										
Digit	No point	1	2	3	4	5	6	7	8	9	10
E1	0	1	0	1	0	1	0	1	0	1	0
E2	0	0	1	1	0	0	1	1	0	0	1
E3	0	0	0	0	1	1	1	1	0	0	0
E4	0	0	0	0	0	0	0	0	1	1	1

	Point selection	Digit position selection									
		1	2	3	4	5	6	7	8	9	10
E5	0	1	0	1	0	1	0	1	0	1	0
E6	0	0	1	1	0	0	1	1	0	0	1
E7	0	0	0	0	1	1	1	1	0	0	0
E9	0	0	0	0	0	0	0	0	1	1	1

Function	Symbol	0	1	2	3	4	5	6	7	8	9	A	b	C	d	-	Space
		:		+			/		%					-		º	
= 01	Value	0	1	2	3	4	5	6	7	8	9	A	b	C	d	-	Space
= 11	Value	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F
	E1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
	E2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
	E3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
	E4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Example 1: Modifying one digit

Initial display value

1	2	3	4.	5	6

Replace value 5 with a 7

E8	E7	E6	E5	E4	E3	E2	E1
0	0	1	0	0	1	1	1

E1-E4: Value = 7
E5-E7: Second position from the right
This data must be stable for 5 ms

E8 High (Strobe)

E8	E7	E6	E5	E4	E3	E2	E1
0	0	1	0	0	1	1	1

This data must be stable for 5 ms

Final display value

1	2	3	4.	7	6

Example 2: Modifying the decimal point position

Initial display value

1	2	3	4.	5	6

Display the decimal point in the value 3:

E8	E7	E6	E5	E4	E3	E2	E1
0	0	0	0	0	1	0	0

E1-E4: Decimal point position
E5-E7: Modify the decimal point position
Dato estable durante 5ms

E8 High (Strobe)

E8	E7	E6	E5	E4	E3	E2	E1
1	0	0	0	0	1	0	0

This data must be stable for 5 ms

Final display value

1	2	3.	4	5	6

4.3.2. Function 11. 8 bits multiplexed BCD

Function 11 acts in the same way as the function 1, except the values (1110 = E) and (1111= F). See the table on previous page.

4.3.3. Function 2. Direct BCD.

The direct BCD is only useful for 3 digits displays. The models are DN-1_9/3SP, DN-1_9/3SPR.

The BCD direct function permits control a display digit by digit with 14 inputs. Three groups of 4 inputs control the value of the digits. The other two inputs control the decimal point.

The inputs power supply should be between 12V and 26V CC and the inputs can be PNP, NPN or CONTACT.

The inputs E1-E4 control the digit 1. The one of the right.

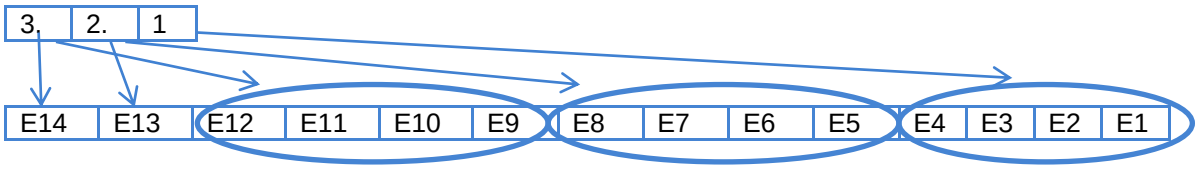
The inputs E5-E8 control the digit 2. The one of the center.

The inputs E9-E12 control the digit 3. The one of the left.

The input E13 controls the decimal point of the digit 2. Central digit.

The input E14 controls the decimal point of the digit 3. Left digit.

The function of each input is explained in the following table.



The values shown depending on the inputs are

			Displayed value															
Function = 02			0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F
Fuction = 12			0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	Space
E1	E5	E9	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
E2	E6	E10	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
E3	E7	E11	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
E4	E8	E12	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Example: To display

8	5.	3

The imputs must be

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

4.3.4. Fuction 12.Direct BCD.

Function 12 acts in the same way as the function 2, except the values (1110 = E) and (1111= F). See the previous table.

4.3.5. Function 3. Counter

The counter function permits to configure the display to work as a impulses counter. It has inputs to load presets (2), increase, decrease and Reset.

It can work with a multiplying or splitter factor.

When it work with a multiplying factor, the counter is increased or decreased the number of the factor. If the multiplying factor is 5, each impulse increase o decrease 5 units in the counter.

When it works with a splitter factor, the counter only increase when has received the number of impulses of the factor. If the splitter factor is 4, the counter will increase o decrease when has received 4 impulses.

To work with low frequencies, the counter can be configured to ignore parasite impulses like bounce contacts.

The maximum frequency is 10kHz

When it arrives to the maximum or minimum the counter flashes. A 5 digits display has a maximum value of 99999 and a minimum value of -9999.

Programming the automatic functions:

The automatic functions are programmed modifying the right's digit of the second parameter 2 Co. See 4.2.4 "Parameters of the function 03 (Counter)". Remember that the automatic functions are available in low frequencies.

When the counter's value is equal to one of the values of the alarms, one programmed action starts.

Example:

Parameter 2 Co = 03. Parameter 3 P1 = 75.
Parameter 5 A1 = 40. Parameter 9 FA = 1.

The parameter 2 has been programmed to increase in one unit (parameter 9 = 1). Load the value of preset 1 (75) when the counter's value is equal to the value of alarm 1 (40).

Displays with relay:

If the display has the relay option, the relay can be configured to be activated in different situations. Each relay has an independent parameter to program. (see 4.4 "Colour configuration")

Example:

Parameter 7 S1 = 15

Activate output 1 during 2 seconds, when the counter's value is equal to the alarm's 1 value.

Control inputs:

The power supply of the inputs should be between 12V and 26V CC and the inputs can be PNP, NPN or CONTACT.

E1 Loads preset 1
E2 Loads preset 2
E3 Reset
E4 Increase the counter
E5 Decrease the counter.
E11: Key +. Same function as the physical key.
E12 Key *. Same function as the physical key.

If the display includes colour option and the alarms are not programmed , the E13 and E14 inputs allow the user to change the colour of the display.

E13 = '0' and E14 = '0'. Red.
E13 = '0' and E14 = '1'. Green.
E13 = '1' and E14 = '0'. Red.
E13 = '1' and E14 = '1'. Yellow.

There are some parameters that can be changed using the inputs. To do it, activeE10 and activate the input for the desired parameter:

E6: Preset 1. Parameter 3.P1.
E7: Preset 2. Parameter 4.P2.
E8: Alarm 1. Parameter 5.A1.
E9: Alarm 2. . Parameter 6 A2.

Once entered the corresponding parameter, the increment and change of digit is made using the + and * keys (or E11 and E12). Once set the desired value, exit the parameters by using * until the name of the parameter is displayed (as if the classical menu was used). Deactivate E10 and the parameter input (E6-E9). To change another parameter, start the process again activating E10.

4.3.6. Function 4. Chronometer

The chronometer function permits working with the display as a stopwatch. It can be programmed to increase, decrease or increase/decrease depending on a input.

Besides of the control inputs that resets the display or loads a preset (it has two presets), it's also possible to reset de display, load a preset or stop it automatically with the alarms

Programming the automatic functions:

The automatic functions are programmed modifying the right's digit of the second parameter 02.Co. (See 4.2.5.1 "Parameter 2 Co").

When the chronometer's value is equal to one of the values of the alarms, one programmed action starts.

Example:

Parameter 2 Co = 35.
Parameter 4 P2 = 15 - 30.
Parameter 5 A1 = 30 - 28.

The parameter 2 has programmed increase minutes and seconds. Load the preset 2 (15m - 30s) when the chronometer is equal to the alarm 1 value (30m - 28s)

Displays with relay:

If the display has the relay option, the relay can be configured to be activated in different situations. Each relay has an independent parameter to program. (see 4.3.2)

Example:

Parameter 7 S1 = 58

Activate output 1 if the chronometer's value is bigger than the alarm 1, the output is flashing, 1 second is On and 1 second is Off.

Combining the automatic functions (parameter 2) with the output functions (parameters 7 and 8 , the display can have many applications.

Control inputs:

The power supply of the inputs should be between 12V and 26V CC and the inputs can be PNP, NPN or CONTACT. Control input can work on PLC mode or Pushbutton mode, which has been designed to be used with a pushbutton panel. To use Pushbutton mode, short-circuit E12 and Common previously to a system reset.

PLC mode

E1 Control Run = ON / Stop = OFF.

E2 Reset

E3 Loads preset 1

E4 Loads preset 2

E5 Increase = ON / Decrease = OFF.

E11: Key +. Same function as the physical key.

E12 Key *. Same function as the physical key.

If the display includes colour option and the alarms are not programmed , the E13 and E14 inputs allow the user to change the colour of the display.

E13 = '0' and E14 = '0'. Red.

E13 = '0' and E14 = '1'. Green.

E13 = '1' and E14 = '0'. Red.

E13 = '1' and E14 = '1'. Yellow.

There are some parameters that can be changed using the inputs. To do it, activeE10 ans activate the input for the desired parameter:

E6: Preset 1. Parameter 3.P1.

E7: Preset 2. Parameter 4.P2.

E8: Alarm 1. Parameter 5.A1.

E9: Alarm 2. . Parameter 6 A2.

Once entered the corresponding parameter, the increment and change of digit is made using the + and * keys (or E11 and E12). Once set the desired value, exit the parameters by using * until the name of the parameter is displayed (as if the classical menu was used). Deactivate E10 and the parameter input (E6-E9). To change another parameter, start the process again activating E10.

Pushbutton mode

E1: RUN: Start chronometer.

E2: RESET: Reset chronometer.

E3: PRESET: Load the value of Preset 1.

E5: CHRON +: If this input is activated, the chronometer increments its value. If this input is deactivated, the chronometer decrements its value. This mode is active only if parameter 2.Co is 2 or 5.

E6: Sx1: Increment the unit of the second in Preset 1. This only works If the display is stopped and PRESET OFF is active.

E7: Sx10: Increment the tens of the second in Preset 1. This only works If the display is stopped and PRESET OFF is active.

E8: Mx1: Increment the unit of the minute in Preset 1. This only works If the display is stopped and PRESET OFF is active.

E9: Mx10: Increment the tens of the minute in Preset 1. This only works If the display is stopped and PRESET OFF is active.

E10: STOP: Stop the chronometer.

E11: PRESET OFF. If this input is activated, the display works as usual. If this input is deactivated. The value of Preset 1 can be modified.

4.3.7. Function 5.Tachometer

With the function tachometer we can measure the time that a event is repeated. Programming the input frequency and the shown value, you can get the necessary result.

To correct the big changes of the input frequency that makes big changes of the display's value there are two parameters that softness the problem. The two parameters are the updating time and the average factor. (see section 4.3.3. parameters 4EL and 7FA)

The updating time is independent from the input frequency. If the input frequency is stable we can program a updating time of 0.1s to read a input frequency of 0.05Hz (1 impulse every 20s). By this way the display is updated immediately after the impulse is received. The updated data between the impulses has the same result.

To use the tachometer to count the turns in a minute (tpm), see examples below.

Connexion: the input signal of the function tachometer is E6, the pin number 6 of the DB25 connector (see 3.2 "Wiring inputs"). The maximum input frequency is 15kHz.

Before using the tachometer, you have to program the parameters. See 4.2.6 "Parameters of functions 05, 15 and 25 (Tachymeter)."

Versions:

Tachometer function may be used on DN-1_9P with 3, 4 or 5 digits and 1 or 2 sides.

Exemples:

Show the value of the input frequency without correction.

The input frequency is 100Hz. Variable oscillator. 5 digits display.

Parameter	Value	
2.FE	0001	1Hz input frequency
3.dl	0001	Display 1 when 1 Hz input frequency
4.EL	001	Update value every 0,1s
5.LI	01	Maximum time without pulses: 1s.
6.Pd	9	Maximum number of decimals shown
7.FA	0	Without average factor

Show the value of the input frequency without correction.

The input frequency is 100Hz. A little stable oscillator. 4 digits display.

Parameter	Value	
2.FE	0001	1Hz input frequency
3.dl	0001	Display 1 when 1 Hz input frequency
4.EL	030	Update value every 3s
5.LI	01	Maximum time without pulses: 1s.
6.Pd	1	Show 1 decimal
7.FA	0	Without average factor

Show the value of the input frequency multiplied by 25,7.

The input frequency is 10Hz. A little stable oscillator. 5 digits display.

Parameter	Value	
2.FE	0001	1Hz input frequency
3.dl	0025,7	Display 25,7 when 1 Hz input frequency
4.EL	010	Update value every 1s
5.LI	01	Maximum time without pulses: 1s.
6.Pd	2	Show 2 decimals
7.FA	2	Average factor: 2 (10 samples average)

Measure the rotation speed of a motor that turns round at 540 tpm and sends 8 impulses each turn. Frequency (540/60) x 8 = 72.

Variable oscillator. 5 digits display.

Parameter	Value	
2.FE	00072	72Hz input frequency
3.dl	00540	Display 540 when 1 Hz input frequency
4.EL	001	Update value every 0,1s
5.LI	01	Maximum time without pulses: 1s.
6.Pd	0	Without decimals
7.FA	0	Without average factor

Measure the making cadence of a machine that makes 450 pieces in an hour with a sensor that detects a piece each 8 seconds.

A little stable oscillator. 4 digits display.

Parameter	Value	
2.FE	0,125	0,125 input frequency = 1 piece each 8s
3.dl	0450	Display 450 when 0,125 Hz input frequency
4.EL	020	Update value every 2
5.LI	10	Maximum time without pulses: 10s.
6.Pd	0	Without decimals
7.FA	1	Average factor: 1 (5 samples average)

Measure the making cadence of a machine that makes 16200 pieces in an hour with a sensor that detects a piece each 4.5 seconds.

A little stable oscillator. 5 digits display.

Parameter	Value	
2.FE	0004,5	4,5Hz input frequency
3.dl	16200	Display 16200 when 4,5 Hz input frequency
4.EL	080	Update value every 8s
5.LI	02	Maximum time without pulses: 2s.
6.Pd	0	Without decimals
7.FA	8	Average factor: 8 (40 samples average)

Control inputs:

The power supply of the inputs should be between 12V and 26V CC and the inputs can be PNP, NPN or CONTACT.

E11: Key +. Same function as the physical key.

E12 Key *. Same function as the physical key.

If the display includes colour option and the alarms are not programmed , the E13 and E14 inputs allow the user to change the colour of the display.

E13 = '0' and E14 = '0'. Red.

E13 = '0' and E14 = '1'. Green.

E13 = '1' and E14 = '0'. Red.

E13 = '1' and E14 = '1'. Yellow.

4.3.8. Function 15. Tachometer with the less significant digit = 0.

The function 15 has the same working as the function 5 but the digit of less weight is always 0.

Example: Value of the frequency without correction = 14597
Shown value = 14590

4.3.9. Function 25. Tachometer with the 2 less significant digit = 0.

The function 25 has the same working as the function 5 but the two digits of less weight are always 0.

Example: Value of the frequency without correction = 14597
Shown value = 14500

4.3.10. Function 6. Binary.

The function 6 permits display a 14 bits binary value in decimal format.

Value 0 is shown with all inputs OFF and value 16383 is shown with all inputs ON.

The parameter A.PU allows configuring the decimal point position.

4.3.11. Parameter 7. Digit by digit

Function 7 allows the user to modify every digit independently using an input.

If the display has more than 7 digits, each of the inputs increments one digit. On the other side, inputs 1 to 7 allow incrementing digits and 8 to 14 decrement digits

Digit one is the one on the far right of the display.

The decimal point cannot be configured.

More than 7 digits		7 digits or less	
Input	**Function**	**Input**	**Function**
E1	Incr. Digit 1	E1	Incr. Digit 1
E2	Incr. Digit 2	E2	Incr. Digit 2
E3	Incr. Digit 3	E3	Incr. Digit 3
E4	Incr. Digit 4	E4	Incr. Digit 4
E5	Incr. Digit 5	E5	Incr. Digit 5
E6	Incr. Digit 6	E6	Incr. Digit 6
E7	Incr. Digit 7	E7	Incr. Digit 7
E8	Incr. Digit 8	E8	Decr. Dígit 1
E9	Incr. Digit 9	E9	Decr. Dígit 2
E10	Incr. Digit 10	E10	Decr. Dígit 3
		E11	Decr. Dígit 4
		E12	Decr. Dígit 5
		E13	Decr. Dígit 6
		E14	Decr. Dígit 7

4.4. Colour configuration

The colour option allows you to modify automatically the display colour according to the present value. The possible colours are: Red, Green and Yellow.

In order to be able to manage the colour 2 internal bits are used, they change depending on display value. Eight parameters are needed to set up the levels. Four parameters are used to define the activation form and the activation level. The other four allow defining the colour according to a combination of the 2 internal bits.

The parameter number that defines the activation mode and the activation level changes depending on the function used.

In the displays with relay output, the counter and chronometer functions use the same parameters for the colour than the relay output. So, the colour change must be related with the relay activation

The following table defines the parameters depending on the function used in the display.

	BCD	Count	Chronom	Tachym	Binary	Digit by digit
A1	8.A1	5.A1	5.A1	8.A1	8.A1	8.A1
A2	9.A2	6.A2	6.A2	9.A2	9.A2	9.A2
S1	A.S1	7.S1	7.S1	A.S1	A.S1	A.S1
S2	B.S2	8.S2	8.S2	B.S2	B.S2	B.S2
nr = r1 y r2 deactivated						
r1 = r1 activated						
r2 = r2 activated						
r3 = r1 y r2 activated						

4.4.1. Using functions BCD, tachometer. binary or digit by digit

4.4.1.1. Parameters to define the internal bit r1.

To set up the internal bit **r1** parameters **A1** and **S1** are used.

Parameter S1 is used to set up the activation form and delay or hysteresis.

Parameter A1 is used to set up the trigger level. The most significant digit allows setting up a negative value.

Parameter S1			
Left Digit	Control bit	Right Digit	Set/Reset
0	ON if Value > Parameter A1	0	No delay / No hysteresis
1	ON if Value < Parameter A1	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

4.4.1.2. Parameters to define the internal bit r2.

To set up the internal bit **r2** parameters **A2** and **S2** are used.

Parameter S2 is used to set up the activation form and delay or hysteresis.

Parameter A2 is used to set up the trigger level. The most significant digit allows setting up a negative value.

Parameter S2			
Left Digit	Control bit	Right Digit	Set/Reset
0	ON if Value > Parameter A2	0	No delay / No hysteresis
1	ON if Value < Parameter A2	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

4.4.2. Using functions counter or chronometer

4.4.2.1. Parameter 7. S1: Activation and temporization conditions of output 1.

ONLY FOR DISPLAYS WITH RELAY OUTPUT WORKING IN LOW FREQUENCIES (see 4.2.4.1 "Parameter 2 Co").

Permits programming the activation conditions of output 1 and the time that will be activated. This parameter has two digits. The function of each one is explained in the following table where, value means the value of the counter in the counter function or the time in the timer function:

Left digit	SR1 output condition	Right digit	Output delay
0	Not activated	0	No delay
1	SR1 ON if Value = Level Alarm 1	1	0,5s delay
2	SR1 ON if Value >= Level Alarm 1	2	0,8s delay
3	SR1 ON if Value = Level Alarm 2	3	1s delay
4	SR1 ON if Value <= Level Alarm 2	4	1,5s delay
5	SR1 ON if Value > Level Alarm 1	5	2s delay
6	SR1 ON if Value < Level Alarm 1	6	0,5s flashing.
7	SR1 ON if Value > Level Alarm 2	7	0,8s flashing
8	SR1 ON if Value < Level Alarm 2	8	1s flashing
9	SR1 ON if Counter = 0	9	Output always OFF
A	SR1 ON if Value <= AL1 and >= AL2		
b	SR1 ON if Value >= AL1 and <= AL2		

SR1 is the state of the output 1. AL1 is the value of alarm 1. AL2 is the value of alarm 2. SR1 will be activated when the activation conditions have been accomplished. SR1 will be deactivated when the time has passed or when the activation condition is not accomplished.

4.4.2.2. Parameter 8. S2: Activation and temporization conditions of output 2

ONLY FOR DISPLAYS WITH RELAY OUTPUT WORKING IN LOW FREQUENCIES (see 4.2.4.1 "Parameter 2 Co").

Permits programming the activation conditions of output 1 and the time that will be activated. This parameter has two digits. The function of each one is explained in the following table:

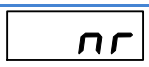
Left digit	SR2 output condition	Right digit	Output delay
0	Not activated	0	No delay
1	SR1 ON if Value = Level Alarm 1	1	0,5s delay
2	SR1 ON if Value >= Level Alarm 1	2	0,8s delay
3	SR1 ON if Value = Level Alarm 2	3	1s delay
4	SR1 ON if Value <= Level Alarm 2	4	1,5s delay
5	SR1 ON if Value > Level Alarm 1	5	2s delay
6	SR1 ON if Value < Level Alarm 1	6	0,5s flashing.
7	SR1 ON if Value > Level Alarm 2	7	0,8s flashing
8	SR1 ON if Value < Level Alarm 2	8	1s flashing
9	SR1 ON if Value = 0	9	Output always OFF
A	SR1 ON if Value <= AL1 and >= AL2		
b	SR1 ON if Value >= AL1 and <= AL2		

SR2 is the state of the output 1. AL1 is the value of alarm 1. AL2 is the value of alarm 2. SR2 will be activated when the activation conditions have been accomplished. SR1 will be deactivated when the time has passed or when the activation condition is not accomplished.

4.4.3. Parameters to define the colour.

To define the colour the 2 internal bits (**r1 and r2**) are used.

The following parameters are used to define colours.

	Colour if internal bits are OFF. To change the colour push * key. Upon pressing + the next parameter is shown.
	Colour if internal bit **r1 or SR1** is ON. To change the colour push * key. Upon pressing + the next parameter is shown.
	Colour if internal bit **r2 or SR2** is ON. To change the colour push * key. Upon pressing + the next parameter is shown.
	Colour if internal bits **r1** and **r2** or **SR1** and **SR2** are ON. To change the colour push * key. Upon pressing + the next parameter is shown.

4.4.4. Work with only one colour.

To work always with only one colour set up the following parameters:

BCD	Counter
Tachometer	Chronometer
Binary	
Digit by digit	

Parameter		Value
8.A1	5. A1	0
9.A2	6. A2	0
A.S1	7.S1	20
B.S2	8.S2	20
nr		colour
r1		colour
r2		colour
r3		colour

Parameters **8.A1, 9.A2, 5.A1** and **6.A2** may have any value.
Parameters **nr, r1, r2** and **r3** should have the same colour.
Independently of work colour, the parameters set up always uses RED colour.

4.5. Serial line connection

You may use the serial line to connect the displays DN-1_9PX with equipments.

4.5.1. Parameters

The parameters to configure are listed below.

1– Display address.

2– Baud rate, data bits, parity and stop bits.

3– Serial line type: RS-232 o RS-485.

4.5.1.1. Parameter C.LS: Display address

It configures the display address on network. This value is used in RS-232 and RS-485. The address range is between 0 and 99.

4.5.1.2. Parameter D. Ps: Transmission baud rate, data bits, parity and stop bits.

The parameters of the serial line are codified in the following table:

Code	Baud Rate	Data bits	Parity	Stop bits
01	4800 Bauds	7 bits	No parity	1
02	9600 Bauds	7 bits	No parity	1
03	19200 Bauds	7 bits	No parity	1
04	4800 Bauds	8 bits	No parity	1
05	9600 Bauds	8 bits	No parity	1
06	19200 Bauds	8 bits	No parity	1
07	4800 Bauds	7 bits	Even	1
08	9600 Bauds	7 bits	Even	1
09	19200 Bauds	7 bits	Even	1
10	4800 Bauds	8 bits	Even	1
11	9600 Bauds	8 bits	Even	1
12	19200 Bauds	8 bits	Even	1
13	4800 Bauds	7 bits	Odd	1
14	9600 Bauds	7 bits	Odd	1
15	19200 Bauds	7 bits	Odd	1
16	4800 Bauds	8 bits	Odd	1
17	9600 Bauds	8 bits	Odd	1
18	19200 Bauds	8 bits	Odd	1
19	4800 Bauds	7 bits	No parity	2
20	9600 Bauds	7 bits	No parity	2
21	19200 Bauds	7 bits	No parity	2
22	4800 Bauds	8 bits	No parity	2
23	9600 Bauds	8 bits	No parity	2
24	19200 Bauds	8 bits	No parity	2
25	4800 Bauds	7 bits	Even	2
26	9600 Bauds	7 bits	Even	2
27	19200 Bauds	7 bits	Even	2
28	4800 Bauds	8 bits	Even	2
29	9600 Bauds	8 bits	Even	2
30	19200 Bauds	8 bits	Even	2
31	4800 Bauds	7 bits	Odd	2
32	9600 Bauds	7 bits	Odd	2
33	19200 Bauds	7 bits	Odd	2
34	4800 Bauds	8 bits	Odd	2
35	9600 Bauds	8 bits	Odd	2
36	19200 Bauds	8 bits	Odd	2

4.5.1.3. Parameter E.rS: Type of serial line and protocol

It allows selecting one of the serial line types, as well as the protocol.

Type 1: Protocol ASCII slave. RS-232C
Type 2: Protocol ASCII slave. RS-485
Type 3: Protocol ASCII master. RS-232
Type 4: Protocol ASCII master. RS-485

4.5.2. Protocols

Only for displays with serial line option.

In this paragraph, the different protocols will be explained, as well as the programmation of the displays through them. The formats of values of the numbers and characters are written in this manual are:

- When telling about a hexadecimal number, this will be followed by an “h”.
- When telling about a decimal number, this will be followed by a “d”.
- When telling about a binary number, this will be followed by a “b”.
- When telling about an ASCII character, this will be explained in the context.

As an example, the “X” ASCII character can be explained as 58h, 88d or 1011000b, as needed in the moment. Number “15” ASCII can be seen as 31h 35h, 49d 53d or 110001d 110101d.

4.5.2.1. ASCII slave communications protocol

This protocol permits easy communication with any unit that features a serial line and that can have the protocol configured, as with a computer, a PLC Omron working in RS-232 mode, etc. Another possibility is to connect various displays from the same unit on a RS-485 network.

With this protocol, the display works in slave mode, which is to say the display waits to receive a message and once received, it will show the value as long as it conforms.

The data transmission block must be as follows:

	Start	High Address	Low Address	Code to get data	End of block
ASCII	@	0 to 9	0 to 9	E D A B	* CR
HEXA	40h	30h to 39h	30h to 39h	45h 44h 41h 42h	2Ah 0Dh

Start: 1 Byte. Always must start with the character @ (40h).

Address: 2 Bytes. Same as the address of the display (parameter C). Value between 0 and 99.

Code: 2 Bytes. Always the characters E D A B. (45h, 44h, 41h, 42h).

End: 2 Bytes. End of block. Always *CR (2Ah 0Dh).

If the message address is equal to display's address, the displays returns the following answer block.

	Start	High Address	Low Address	Start of data	Data	Relays status
ASCII	@	0 to 9	0 to 9	E D	12 characters	R R
HEXA	40h	30h to 39h	30h to 39h	45h 44h	12 characters	52h 52h

Relay 1	Relay 2	Colour code	Colour	End of block
0 or 1	0 or 1	C	0 to 2	* CR
30h or 31h	30h or 31h	43h	30h to 32h	2Ah 0Dh

The display data values not used are replaced by the code of white space (20h).

The colour and relays codes are:

Colour		Relay	
Red	0	OFF	0
Green	1	ON	1
Yellow	2		

All display's models return the same block of data, regardless of the option they have installed.

Example 1: Ask data from a computer

Display address = 08	Parameter C	8
Serial line: 9600 bauds, 8bits, even parity, 2 stop bits	Parameter D	29
Serial line: RS-232	Parameter E	1

Display value

2	4.	6	7

Data block from the computer to the display

	Start	High Address	Low Adress	Code to get data	End of block
ASCII	@	0	8	E D A B	* CR
HEXA	40h	30h	38h	45h 44h 41h 42h	2Ah 0Dh

Response from the display

	Start	High address	Low address	Start of data	Data from the display							
ASCII	@	0	8	E D								2
HEXA	40h	30h	38h	45h 44h	20h	20h	20h	20h	20h	20h	20h	32h

Data from the display				Relays statuts	Relay 1	Relay 2	Colour code	Colour	End of block
4	.	6	7	R R	1	0	C	2	* CR
34h	2Eh	36h	37h	52h 52h	31h	30h	43h	32h	2Ah 0Dh

4.5.2.2. ASCII master communications protocol

This protocols allows communicating easily with any equipment that has serial line and can configure its protocol, as a PC, or a DN-X working as a repeater.

With this protocol the display works in master mode, the display is constantly sending the data frame corresponding to the display value. In a 2-digit display it is sent every 8ms. In a 10 digits display, it is sent every 18ms. In the rest of the displays, the time follows a linear proportion.

The number of values of the frame depends on the number of display digits.

The frame sent to a display of five digits has the following format.

	Start	High address	Low address	Data	End of block
ASCII		0 to 9	0 to 9	12345	CR
HEXA	02h	30h to 39h	30h to 39h	31h 32h 33h 34h 35h	0Dh

Start: 1 Byte. Always must start with the character 02h.

Address: 2 Bytes. Same as the address of the display. Parameter C. Value between 0 and 99.

Data: 2 to 10 Bytes, depending on the number of digits. Value in ASCII.

End: 2 Bytes. End of block. Always CR (0Dh).

4.5.2.3. Communication between a DN-PX and a DN-X

Tu use a DN-X display as a repeater of the value of the DN-PX, a RS.232 or a RS.485 connection can be used. The parameters to configure are::

DN-PX	DN-X
C-Ls = 1	1 = 01
d.PS = 29	2 = 05
E.rS = 3 (RS-232) =4 (RS-485)	3 = 29
	4 = 1 (RS-232) =2 (RS-485)
	6 = 02
	7 = 04
	8 = 00
	9 = 19
	A = 0

Parameters C-LS (DN-PX) and 1 (DN-X) must be the same in both, but they can be different than the ones shown above. Valid values between 0 and 99.

Parameters d.PS (DN-PX) and 3 (DN-X) must be the same in both, but they can be different than the ones shown above. See values available in 4.5.1.2 “Parameter D. Ps: Transmission baud rate, data bits, parity and stop bits.”.

Revision history

Revision N (March 2013).

Updated introduction in 4.4.
Key “7->5” changed to “*”.
Updated paragraph 4.5
Added sections 4.4.2 and 4.4.3
Added sections 4.2.7, 4.2.7.1 and 4.2.8

Revision O (September 2013).

Updated dimensions and weight of DN-109/3. Paragraphs 2.2.1 and 2.3.1.

Revision P (October 2014).

Added section 3.4
Section 4.4 moved to 4.5.2
Updated electrical characteristics of the 24VDC power. Paragraphs 2.1 and 3.1.
Modified 4.3.5, 4.3.6 and 4.3.7. Keys can be accessed using digital inputs.

Revision Q (October 2016).

Modify electrical characteristics.

STATEMENT OF CONFORMITY

CE

DISEÑOS Y TECNOLOGIA, S.A.
Poligon Industrial Les Guixeres
C/ Xarol 8C
08915 BADALONA España

As the builder of the equipment of the **DITEL** brand:

Model : DN-109P in all versions.
Model : DN-119P in all versions.
Model : DN-129P in all versions.
Model : DN-189P in all versions.

We declare under our sole responsibility that the aforementioned product complies with the following European directives:

Directive: LVD 2006/95/CEE Low Voltage Directive.
Standard UNE-EN61010-1 Security in electric equipment.

Directive: EMC 2014/30 UE Electromagnetic Compatibility
Standard UNE-EN 61000-6-4 Generic Emission Standard. Industrial environment.
Standard UNE-EN 61000-6-2 Generic Immunity Standard. Industrial environment.
Directive 2011/65/CE: Restriction of the use of certain hazardous substances in electrical and electronic equipment

Badalona, 29th January 2014

Alicia Alarcia
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