



N1040i Digital Panel Meter

UNIVERSAL DIGITAL PANEL METER – USER MANUAL – V2.0x J

SAFETY ALERTS

The symbols below are used on the equipment and throughout this manual to draw the user's attention to valuable information related to the equipment safety and operation.

CAUTION: Read the manual thoroughly before installing and operating the equipment	CAUTION OR DANGER: Electrical shock hazard

All safety related instructions that appear in the manual must be observed to ensure personal safety and to prevent damage to either the instrument or the system. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

PRESENTATION

N1040i is a versatile digital panel meter. With a wide list of input types (thermocouples, thermo-resistance, voltage and current), **N1040i** can measure most of the variables and sensors encountered in industrial processes.

Configuration can be performed either directly on the controller or via the USB interface once **QuickTune** software has been installed on the computer to be used. Once connected to USB, the device will be recognized as a serial communication (COM) port operating with Modbus RTU protocol.

Through the USB interface, even if disconnected from the power supply, the configuration performed in a device can be saved in a file and repeated in other devices that require the same configuration.

It also features various alarm functions, display offset, configuration with password protection, serial communication, indication in degrees Celsius (°C) or Fahrenheit (°F), among others.

FEATURES

SIGNAL INPUT (INPUT)

The input type is defined in the device configuration. **Table 1** presents the options available:

TYPE	CODE	MEASUREMENT RANGE
J	tc J	Range: -110 to 950 °C (-166 to 1742 °F)
K	tc K	Range: -150 to 1370 °C (-238 to 2498 °F)
T	tc t	Range: -160 to 400 °C (-256 to 752 °F)
N	tc n	Range: -270 to 1300 °C (-454 to 2372 °F)
R	tc r	Range: -50 to 1760 °C (-58 to 3200 °F)
S	tc S	Range: -50 to 1760 °C (-58 to 3200 °F)
B	tc b	Range: 400 to 1800 °C (752 to 3272 °F)
E	tc E	Range: -90 to 730 °C (-130 to 1346 °F)
Pt100	Pt	Range: -200 to 850 °C (-328 to 1562 °F)

TYPE	CODE	MEASUREMENT RANGE
0-20 mA	L0.20	Analog Linear Signal Indication programmable from -1999 to 9999.
4-20 mA	L4.20	
0-50 mV	L0.50	
0-5 Vdc	L0.5	
0-10 Vdc	L0.10	
4-20 mA NON-LINEAR	Ln J	Non-Linear Analog Signal Indication range according to the sensor.
	Ln P	
	Ln t	
	Ln n	
	Ln r	
	Ln S	
	Ln b	
	Ln E	
	LnPt	

Table 1 – Input types

ALARMS

N1040i can have none, one or two alarms. Each alarm present is associated to one output with the same name (ALARM1 and ALARM2).

OUTPUT ALARM1: Relay SPDT. Available in the following terminals: 10, 11 and 12.

OUTPUT ALARM2: Relay SPST-NO. Available in the following terminals: 13 and 14.

These alarms can be configured for the functions described in **Table 2:**

oFF	Alarm off.	
Lo	Alarm of the absolute minimum value. It triggers when the PV value is below the value defined by the alarm Setpoint (SPA1 or SPA2).	
Hi	Alarm of the absolute maximum value. It triggers when the PV value is above the value defined by the alarm Setpoint.	
dIF	Alarm of the differential value. In this function, " SPA1 " and " SPA2 " represent errors (difference) between the PV and the reference value of ALrF .	
dIFL	Alarm of the minimum differential value. It triggers when the PV value is below the point defined by: ALrF - SPA1 (using alarm 1 as an example).	

dIFH	Alarm of the maximum differential value. It triggers when the PV value is above the point defined by: ALrF + SPA1 (using alarm 1 as an example).
IErr	Alarms of the Sensor Break. It is activated when the Input presents problems such as interrupted sensor, bad connection, etc.

Table 2 – Alarm functions

Note: The figures are also valid for Alarm 2 (SPA2).

Important note: Alarms configured with the **HI**, **dIF** and **dIFH** functions also trigger their associated output when a sensor fault is identified and signaled by the digital panel meter. A relay output, for example, configured to function as a High Alarm (**HI**), will operate when the SPAL value is exceeded and when the sensor connected to the digital panel meter input is broken.

ALARM INITIAL BLOCKING

The **initial blocking** option inhibits the alarm from being recognized if an alarm condition is present in the process when the digital panel meter is turned on. The alarm will be enabled only after the occurrence of no alarm condition.

The initial blocking is useful, for example, when one of the alarms is configured as a minimum value alarm, which can cause the alarm to be triggered as soon as the process is started (often undesired behavior).

The initial blocking is not valid for the **IErr** (Sensor Break) function.

OFFSET

Feature that enables you to make small adjustments to the PV indication. Allows to correct measurement errors that appear, for example, when replacing the temperature sensor.

USB INTERFACE

The USB interface is used to CONFIGURE, MONITOR or UPDATE the controller FIRMWARE. You should use **QuickTune** software, which offers features to create, view, save and open settings from the device or files on the computer. The tool for saving and opening configurations in files allows you to transfer settings between devices and perform backup copies.

For specific models, **QuickTune** allows to update the controller firmware (internal software) via the USB interface.



For MONITORING purposes, you can use any supervisory software (SCADA) or laboratory software that supports the MODBUS RTU communication over a serial communication port. When connected to a computer USB, the controller is recognized as a conventional serial port (COM x).

You must use **QuickTune** software or consult the DEVICE MANAGER on the Windows Control Panel to identify the COM port assigned to the controller.

You should consult the mapping of the MODBUS memory in the controller communication manual and the documentation of the supervision software to start the MONITORING process.

Follow the procedure below to use the USB communication of the device:

1. Download **QuickTune** software from our website and install it on the computer. The USB drivers necessary for operating the communication will be installed with the software.
2. Connect the USB cable between the device and the computer. The controller does not have to be connected to a power supply. The USB will provide enough power to operate the communication (other device functions may not operate).
3. Run **QuickTune** software, configure the communication and start the device recognition.

The USB interface IS NOT ISOLATED from the signal input (PV) or the digital inputs and outputs. It is intended for temporary use during CONFIGURATION and MONITORING periods.

For the safety of people and devices, it must only be used when the device is completely disconnected from the input/output signals.

Using the USB in any other type of connection is possible but requires a careful analysis by the person responsible for installing it.

When MONITORING for prolonged periods and with connected inputs and outputs, it is recommended to use the RS485 interface, which is available or optional in most of **NOVUS** products.

PV RETRANSMISSION

The digital panel meter may include an analog output which performs the retransmission of the values of PV into a signal of 0-20 mA or 4-20 mA. The analog retransmission can be scaled, i.e., there are minimum and maximum limits to establish the retransmission range, defined in the **rELL** and **rEHL** parameters.

The analog output is available on terminals 13 and 14 for models **N1040i-RA** and **N1040i-RA-485**.

To obtain retransmission in electrical voltage, you must install a shunt resistor (500 Ω max.) across the analog output terminals. This resistor value depends on the desired voltage range.

The analog retransmission output is not electrically isolated from the RS485 serial communication.

24 Vdc AUXILIARY VOLTAGE SOURCE

Another feature that may be available in the digital panel meter is an auxiliary power supply for exciting field transmitters (two-wire 4-20 mA transmitters).

The 24 Vdc output is on terminals 13 and 14 for models **N1040i-RE** and **N1040i-RE-485**.

The 24 V auxiliary power supply is not electrically isolated from the RS485 serial communication.

INSTALLATION / CONNECTIONS

The digital panel meter shall be fastened on a panel, following the sequence of steps described below:

- Make a 46 x 46 mm cutout in the panel.
- Remove the mounting clip from the digital panel meter.
- Insert the digital panel meter in the cutout from the front of the panel.
- Replace the clip on the digital panel meter, pressing until you get a tight hold.

ELECTRICAL CONNECTIONS

Figure 1 shows the layout of the features on the rear panel of the digital panel meter:

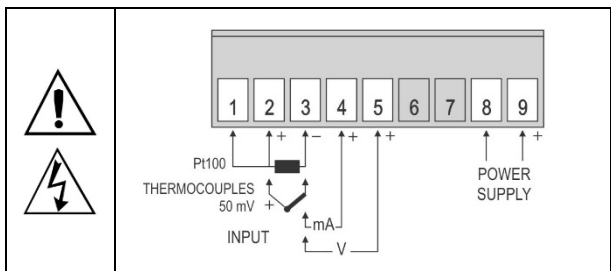


Figure 1 – Inputs connections and power supply

In models with two alarms and serial communication, the connections are:

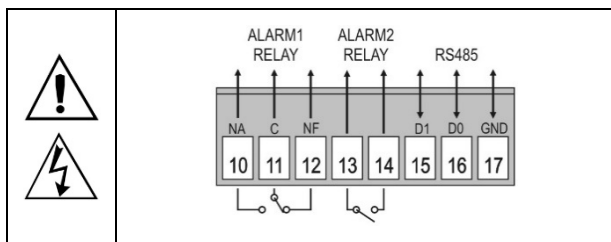


Figure 2 – Alarms and serial communication connections

In models with one alarm, PV retransmission and serial communication, the connections are:

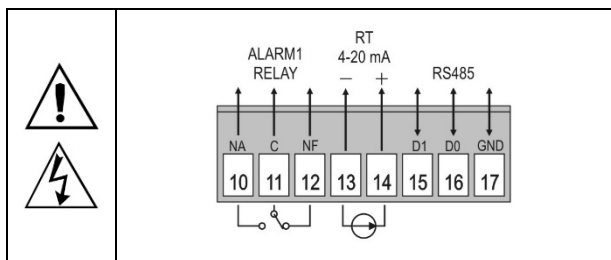


Figure 3 – Alarm, retransmission, and serial communication connections

In models with one alarm, 24 Vdc auxiliary voltage source and communication, the connections are:

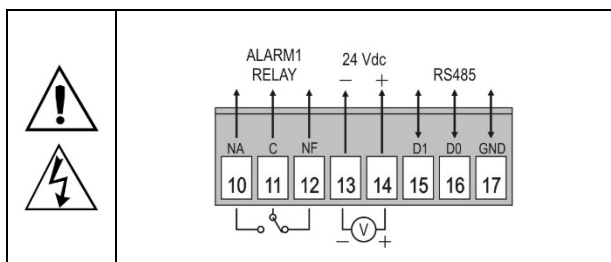


Figure 4 – Alarm, auxiliary source, and communication connections

A typical application of the auxiliary voltage source is to supply loop power for field transmitters (2-wire 4-20 mA). Figure 5 shows the wiring for this application:

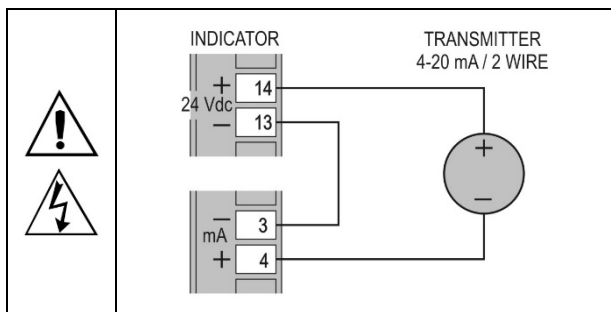


Figure 5 – Example for the use of the digital panel meter auxiliary voltage source

INSTALLATION RECOMMENDATIONS

- Input signal conductors should run through the plant separately from output and supply conductors. If possible, in grounded conduits.
- The power supply for the electronic instruments must come from a network suitable for the instrumentation.
- It is recommended to use RC FILTERS (noise suppressor) in contactor coils, solenoids, etc.
- In control applications, it is essential to consider what can happen when any part of the system fails. The internal devices of the digital panel meter do not guarantee full protection.

OPERATION

The front panel can be seen in Figure 6:



Figure 6 – Identification of the front panel parts

Display: Shows the measured value, the configuration parameters symbols, and their respective values/conditions.

A1 and A2 Indicators: Shows the occurrence of an alarm condition.

P Key: Key used to advance cycles and parameters during configuration.

▲ Increment key and ▼ Decrement key: Keys used to change parameter values.

◀ Key: Key used to retrocede to the previous displayed parameter during configuration.

START-UP

When powered up, the digital panel meter shows for the first 3 seconds the number of the present software version, then starts showing in the upper display the value of the process variable (PV). This is the **Indication Screen**.

Before the digital panel meter is ready to be used, it requires some basic configuration, consisting of assigning values to the parameters according to the desired behavior. You shall understand the importance of each parameter and determine a valid condition or a valid value for each one of them.

The configuration parameters are grouped in parameters cycles according to their functionalities. The 4 parameters cycles are:

- 1 – Operation
- 2 – Alarms
- 3 – Input
- 4 – Calibration

The **P** key provides the access to the cycles and to the parameters of these cycles.

When keeping the **P** key pressed, the digital panel meter jumps from one level to another at every 2 seconds, presenting the first parameter of each cycle:

PV >> FUR I >> TYPE >> PASS >> PV ...

To enter a particular cycle, simply release the **P** key when the first parameter in that cycle is displayed.

To walk through the parameters in a cycle, press the **P** key with short strokes. To go back to the previous parameters, use the **◀** key.

Each parameter symbol is shown on the upper display while its respective value/condition is shown on the lower display.

Depending on the parameter protection adopted, the **PASS** parameter precedes the first parameter in the cycle where the protection is active. See [CONFIGURATION PROTECTION](#) section.

PARAMETERS DESCRIPTION

OPERATION CYCLE

PV	PV display indication. The value of the measured variable (PV) is shown on the upper display (red).
SPA1 SPA2 Setpoint Alarm	Alarm SP. Value that defines the alarm activation point. For the alarms set up with the Differential type, these parameters define the maximum differences accepted between PV and a reference value defined in the ALRF parameter. For the IErr alarm function, this parameter is not used. Parameters are shown in this cycle only when enabled in the SP1E and SP2E parameters.

ALARMS CYCLE

FJA1 FJA2 Function Alarm	Alarm functions. It defines the alarm function among the options in Table 2 .
ALRF Alarm Reference	Reference value used by alarms with differential function, minimum differential, or maximum differential.
SPA1 SPA2 Setpoint Alarm	Alarm SP. Value that defines the activation point of the alarm outputs. For the alarms programmed with the Differential type, these parameters represent the deviations. For the IErr alarm function, this parameter has no function.
SP1E SP2E SP Enable	It allows the device to display SPA1 and SPA2 parameters also in the Operation Cycle. YES Shows SPA1/SPA2 parameters in the Operation Cycle. no DOES NOT show SPA1/SPA2 parameters in the Operation Cycle.
bLA1 bLA2 Blocking Alarm	Alarm Initial Blocking. YES Enables the initial blocking. no Inhibits the initial blocking.
HYA1 HYA2 Hysteresis of Alarm	Alarm hysteresis. It defines the difference between the value of PV at which the alarm is triggered and the value at which it is turned off.
FLSh Flash	It allows the device to signal an alarm condition occurrence by flashing the PV indication on the indication display. YES Enables alarm signalization by flashing PV. no Does not enable alarm signalization by flashing PV.

INPUT CYCLE

TYPE Type	Input type. Selection of the input type used by the digital panel meter. Refer to Table 1 .
FLtr Filter	Digital input filter. Used to improve the measured signal (PV) stability. Adjustable between 0 and 20. At 0 (zero), it means filter turned off. At 20, it means maximum filter. The higher the filter value, the slower is the response of the measured value.
dPPO Decimal Point	It determines the position of the decimal point on the display.
un t Unit	It defines the temperature unit to be used: C Indication in Celsius. F indication in Fahrenheit.

OFFS Offset	Parameter that allows you to make corrections in the PV value indicated.
InLL Input Low Limit	It defines the lower value of the indication range when using the following input types: 0-20 mA, 4-20 mA, 0-50 mV, 0-5 V, and 0-10 V.
InHL input High Limit	It defines the upper value of the indication range when using the following input types: 0-20 mA, 4-20 mA, 0-50 mV, 0-5 V, and 0-10 V.
rEtr Retransmission	It allows you to define the PV retransmission mode. P020 Determines retransmission in 0-20 mA. P420 Determines retransmission in 4-20 mA. Parameter showed when there is retransmission of PV available on the digital panel meter.
rELL Retransmission Low Limit	It defines the lower limit of the PV retransmission range. Parameter displayed when PV retransmission is available.
rEHL Retransmission High Limit	It defines the upper limit of the PV retransmission. Parameter displayed when PV retransmission is available.
bAud Baud Rate	Serial communication Baud Rate. In kbps. 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6 and 115.2
Prty Parity	Serial communication parity. nonE Without parity EuEn Even parity Odd Odd parity
Addr Address	Communication address. A number between 1 and 247 that identifies the digital panel meter in the serial communication network.

CALIBRATION CYCLE

All input types are calibrated at the factory. If it is necessary to recalibrate the device, the process must be performed by a specialized professional. If this cycle is accessed by accident, do not change its parameters.

PASS	Password. Allows you to enter the access password. This parameter is presented before the protected cycles. See CONFIGURATION PROTECTION section.
CAL Ib	Calibration. Allows you to calibrate the digital panel meter. When the calibration is not enabled, the related parameters are hidden.
InLC	Input Low Calibration. Indication of the low scale calibration signal applied to the input.
InHC	Input High Calibration. Indication of the full-scale calibration signal applied to the input.
ouLC	Output Low Calibration. Enter the analog value as measured at the analog output.
ouHC	Input High Calibration. Enter the analog value as measured at the analog output.
rStr	Restore. Allows you to restore the input factory calibration, disregarding any modifications.
CJ	Cold Junction. Cold junction temperature.
PASC	Password Change. Allows you to define a new access password, always different from zero.
Prot	Protection. Allows you to define a protection level. See Table 3 .
FrEQ	Frequency. Frequency of the local electrical network.

CONFIGURATION PROTECTION

The digital panel meter allows protecting the configuration made by the user, preventing undue changes.

In the Calibration level, the **Protection (Prot)** parameter determines the protection level to be adopted, limiting access to the cycles, according to the table below:

PROTECTION LEVEL	PROTECTED LEVELS
1	Only the Calibration cycle is protected.
2	Input and Calibration cycles are protected.
3	Alarms, Input, and Calibration cycles are protected.

Table 3 – Protection levels

ACCESS PASSWORD

When accessed, the protected cycles request the **Access Password**, which, if entered correctly, allows changing the parameter settings of these cycles. The password must be entered in the **PRSS** parameter, shown in the first of the protected cycles.

Without the password, it is only possible to view the parameters of the protected cycles.

You set the password in the **Password Change (PRSL)** parameter, present in the Calibration cycle. **The device leaves the factory with the password set to 1111.**

PASSWORD PROTECTION

The digital panel meter has a security system that helps prevent the entry of numerous passwords in an attempt to find the correct one. Once 5 consecutive invalid passwords are identified, the digital panel meter stops accepting passwords for 10 minutes.

MASTER PASSWORD

If you forget the password, you can use the Master Password feature. When entered, this password allows you to change ONLY the **Password Change (PRSL)** parameter, which allows you to set a new password for the digital panel meter.

The master password is composed of the last three digits of the serial number **plus** the number 9000.

As an example, the master password for a device with serial number 07154321 is 9321.

You can get the serial number of the digital panel meter by pressing the **◀** key for 5 seconds.

MAINTENANCE

PROBLEMS WITH THE DIGITAL PANEL METER

Connection errors and inadequate programming are the most common problems encountered during the digital panel meter operation. A final revision can avoid loss of time and damages.

The digital panel meter displays some messages to help you identify problems:

MESSAGE	PROBLEM DESCRIPTION
----	Open input. Without sensor or signal.
Err 1 Err 6	Connection and/ or configuration problems. Check the wiring and the configuration.

Other error messages imply internal damage that requires the equipment to be sent for maintenance. In this case, you must inform the device serial number, which you can get by pressing the **◀** key for more than 3 seconds.

INPUT CALIBRATION

All input types leave the factory already calibrated. Recalibration is not recommended for inexperienced operators. If it is necessary to recalibrate any scale, proceed as follows:

1. Configure the input type to be calibrated.
2. Configure the lower and upper indication limits for the maximum span of the input type.
3. Apply to the input a signal corresponding to a known indication and just above the lower indication limit.
4. Access the **inLC** parameter. Use the **▲** and **▼** keys to adjust the display. Then press the **P** key.
5. Apply to the input a signal corresponding to a known indication and just below the upper indication limit.
6. Access the **inHC** parameter. Use the **▲** and **▼** keys to adjust the display. Then press the **P** key.

Note: When checking the digital panel meter calibration with a Pt100 simulator, pay attention to the simulator minimum excitation current requirement, which may not be compatible with the 0.170 mA excitation current provided by the digital panel meter.

ANALOG OUTPUT CALIBRATION

1. Configure the retransmission type (**rEtr = P.020**).
2. Use a milliamp meter on terminals 13 and 14.
3. Enter the Calibration Cycle.
4. Access **ouLC** parameter. Press **▲** and **▼** keys.
5. Read the current indicated on the milliamper meter and, using the **▲** and **▼** keys, display it on the **ouLC** screen.
6. Access **ouHC** parameter. Press **▲** and **▼** keys.
7. Read the current indicated on the milliamper meter and, using the **▲** and **▼** keys, display it in the screen **ouHC**.
8. Using **▲** or **▼** Keys, set **ouHC** parameter to the same value read in the milliamp meter.
9. Exit the Calibration Cycle.

SPECIFICATIONS

DIMENSIONS:.....48 x 48 x 80 mm
 Approximate weight: 75 g
POWER SUPPLY:.....100 to 240 Vac/dc ($\pm 10\%$), 50/60 Hz
 Optional 24 V12 a 24 Vdc / 24 Vac (-10% / $+20\%$)
 Maximum consumption:..... 6 VA

ENVIRONMENTAL CONDITIONS:
 Operation temperature: 0 to 50 °C
 Relative humidity:80 % @ 30 °C
 For temperatures above 30 °C, reduce 3 % per °C
 Indoor use; Installation Category II, Pollution Degree 2; altitude < 2000 meters

INPUTAccording to **Table 01**
 Internal Resolution:.....32767 levels (15 bits)
 Display Resolution:.....0.1 / 1 (°C / °F)
 Input reading rate: up to 55 per second
 Accuracy @ 25 °C: **J, K, T, E:** 0.25 % of the span ± 1 °C / °F
 **N, R, S, B:** 0.25 % of the span ± 3 °C / °F
 Pt100: 0.2 % of the span
4-20 mA, 0-50 mV, 0-5 V, 0-10 V: 0.2 % of the span
 Input impedance: Pt100, thermocouples, 0-50 mV: > 10 M Ω
0-5 V, 0-10 V: > 500 k Ω
4-20 mA: 100 Ω
 Pt100 measuring: 3-wire type, ($\alpha=0.00385$)
 With compensation of the cable length, max 50 meters, excitation current of 0.170 mA.

OUTPUT ALARM1:.....Relay SPDT; 240 Vac / 30 Vdc / 3 A
OUTPUT ALARM2:..... Relay SPST-NA; 240 Vac / 30 Vdc / 1,5 A
PV RETRANSMISSION:

.....0-20 mA / 4-20 mA / 500 Ω max. / 12.000 levels
24 Vdc SOURCE:.....24 Vdc ($\pm 10\%$) / 20 mA max.

HOUSING: Polycarbonate (PC) UL94 V-2
BACK PANEL:.....ABS+PC UL94 V-0

ELECTROMAGNETIC COMPATIBILITY: EN 61326-1:1997 and EN 61326-1/A1:1998

SAFETY: EN61010-1:1993 and EN61010-1/A2:1995

ADEQUATE CONNECTIONS FOR TERMINALS OF THE CLAMP TYPE.

START-UP OPERATION: after 3 seconds connected to the power supply.

CERTIFICATIONS: CE, UKCA and UL.

IDENTIFICATION

N1040i -	A -	B -	C
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- A: Outputs Features
 - RR** 2 relays available (ALARM1 / ALARM2).
 - RA** 1 relay and one analog output 0-20 / 4-20 mA.
 - RE** 1 relay and one auxiliary 24 Vdc voltage source.

- B: Digital Communication
 - 485** RS485 available.

- C: Power Supply Features (POWER)
 - Blank** 100 a 240 Vac/dc.
 - 24V** 12 a 24 Vdc / 24 Vac.

WARRANTY

Warranty conditions are available on our website www.novusautomation.com/warranty.

APPENDIX 1 – SERIAL COMMUNICATION

The digital panel meter may be supplied with an asynchronous serial communication RS-485 interface, with a master-slave connection for communication with a host computer (master). The digital panel meter is always the slave. The communication is always initiated by the master, which sends a command to the slave address with which to communicate. The addressed slave recognizes the command and sends a response to the master. The digital panel meter also accepts broadcast commands.

FEATURES

- Signals compatible with RS-485 standard. MODBUS (RTU) Protocol. Two wire connection between 1 master and up to 31 (addressing up to 247 possible) instruments in bus topology.
- Communication signals are electrically isolated from the INPUT and POWER terminals. Not isolated from the retransmission circuit and the auxiliary voltage source when available.
- Maximum connection distance: 1000 meters.
- Time of disconnection for the digital panel meter: Maximum 2 ms after last byte.
- Programmable baud rate: 1200 to 115200 bps.
- Data Bits: 8
- Parity: Even, Odd or None
- Stop bits: 1
- Time at the beginning of response transmission: maximum 100 ms after receiving the command.

The RS-485 signals are:

D1	D	D +	B	Bidirectional data line	Terminal 15
D0	\bar{D}	D -	A	Inverted bidirectional data line	Terminal 16
C				Optional connection that improves the performance of the communication.	Terminal 17
GND					

CONFIGURATION OF SERIAL COMMUNICATION PARAMETERS

Three parameters must be configured in the device for serial communication:

bAud: Communication speed.

Prty: Communication parity.

Addr: Communication address for the digital panel meter.