ThermoEst


# N1500G

## DIGITAL PANEL METER – USER MANUAL – V2.3x F

## 1. PRESENTATION

**N1500G** is a universal digital panel meter, which accepts a large variety of input signals and sensors. A five-digit LED display shows measured value and all programming parameters.

Instrument configuration is achieved from the keyboard, without any hardware change.

Some of the features of the basic version are:

- Universal input: Pt100, thermocouples, 4-20 mA, 0-50 mV, and 0-5 Vdc
- 24 Vdc power supply for remote transmitters excitation
- **Maximum** and **minimum** memory
- Function **Hold, Peak Hold**, and **Tare**

Optionally, it may have:

- Process variable retransmission in 0-20 mA or 4-20 mA
- RS485 Modbus RTU serial communication
- Digital input

### 1.1. FRONT PANEL IDENTIFICATION

**Display**: Shows process variable (PV) and the programming screens.

**ALM1 and ALM2**: Show alarm status.

**INDEX key**: Key is used to access the programming menu and screens.

**BACK key**: Key used to go back to the previously reached screen in the menu cycle.

**UP / MAX key and DOWN / MIN key**: Key used to increase and decrease parameters values. These keys are also used to display maximum and minimum values stored in memory.

**Special FUNCTION key**: This special function key is used for pre-programmed functions as explained in the SPECIAL FUNCTION KEY section of this manual.

## 2. SPECIFICATIONS

- Power: 100 to 240 Vac/dc ±10 %; 50/60 Hz
- Max. Consumption: 10 VA
- Internal resolution: 19500 levels. Display: 12000 levels (-1999 to 9999)
- Input sample rate: 5 per second
- Accuracy: Thermocouples J, K, T, and N: 0.25 % of span ±1 °C
  Thermocouple E, R, S, and B: 0.25 % of span ±3 °C
  Pt100: 0.2 % of span
  Current or linear voltage: 0.2% of the maximum range
- Minimum heating time: 15 minutes
- Input impedance: 0-50 mV, Pt100, and thermocouples: >10 MΩ
  0-5 V: >1 MΩ
  0-20 mA, 4-20 mA: 22 Ω
- Pt100 measurement: 3-wire circuit. Current: 0.170 mA.
- PV retransmission resolution: 1500 levels, 550 Ω max.
- Relays: SPST-NA - 3A / 250 Vac
- Digital input: Dry contact or NPN open collector
- Auxiliary voltage source: 24 Vdc (±10 %) / 25 mA max.
- Operating temperature: 0 to 55 °C. Maximum RH: 80 % up to 30 °C. For temperatures above 30 °C, decrease 3 % per °C.
- Approximate weight: 1 kg
- Dimensions: 310 x 110 x 37 mm
- Protection: IP30 (when installed properly)

## 3. PROCESS VARIABLE INPUT – PV

The Process Variable input type should be keyboard programmed according to the codes shown in **Table 1** (refer to **IntYP** parameter).

| TYPE | CODE | FEATURE |
|---|---|---|
| J | tc J | Range: -50 to 760 °C (-58 to 1400 °F) |
| K | tc h | Range: -90 to 1370 °C (-130 to 2498 °F) |
| T | tc t | Range: -100 to 400 °C (-148 to 752 °F) |
| E | tc E | Range: -35 to 720 °C (-31 to 1328 °F) |
| N | tc n | Range: -90 to 1300 °C (-130 to 2372 °F) |
| R | tc r | Range: 0 to 1760 °C (-32 to 3200 °F) |
| S | tc S | Range: 0 to 1760 °C (-32 to 3200 °F) |
| B | tc b | Range: 150 to 1820 °C (302 to 3308 °F) |
| Pt100 | Pt 100 | Range: -199.9 to 530.0 °C (-327.8 to 986.0 °F) |
| Pt100 | Pt 100 | Range: -200 to 530 °C (-328 to 986 °F) |
| 4-20 mA | L In J | J linearization. Adjustable range: -110 to 760 °C |
| 4-20 mA | L In h | K linearization. Adjustable range: -150 to 1370 °C |
| 4-20 mA | L In t | T linearization. Adjustable range: -160 to 400 °C |
| 4-20 mA | L In E | E linearization. Adjustable range: -90 to 720 °C |
| 4-20 mA | L In n | N linearization. Adjustable range -150 to 1300 °C |
| 4-20 mA | L In r | R linearization. Adjustable range 0 to 1760 °C |
| 4-20 mA | L In S | S linearization. Adjustable range: 0 to 1760 °C |
| 4-20 mA | L In b | B linearization. Adjustable range: 100 to 1820 °C |
| 4-20 mA | L InPt | Pt100 linearization. Adjustable range: -200.0 to 530.0 °C |
| 4-20 mA | L InPt | Pt100 linearization. Adjustable range: -200 to 530 °C |
| 0 -50 mV | 0 - 50 | Linear. Adjustable range: -1999 to 9999 |
| 4-20 mA | 4 - 20 | Linear. Adjustable range: -1999 to 9999 |
| 0 to 5 V | 0 - 5 | Linear. Adjustable range: -1999 to 9999 |
| 0 to 50 mV | c.0 - 50 | User defined linearization |
| 4-20 mA | c.4 - 20 | User defined linearization |
| 0 to 5 V | c.0 - 5 | User defined linearization |

**Table 1 –** Input type codes

All input types are factory calibrated and no additional calibration is required. Thermocouples are calibrated to NBS standards. RTD's are calibrated to DIN 43760 ($\alpha$ = 0.00385).

## 4. ALARMS

The digital panel meter features 2 alarm outputs in the basic version. Each alarm has a corresponding LED in the front panel to show alarm status.

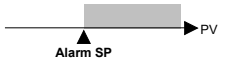
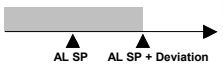
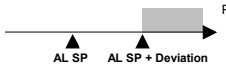
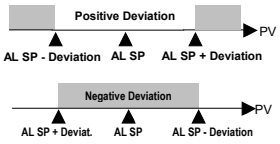
| TYPE | SCREEN | ACTION |
|---|---|---|
| Disabled | oFF | Alarm is inactive. |
| Sensor Break (input **Err**or) | lErr | Alarm will go ON if sensor breaks, input signal is out of range or Pt100 is shorted. |
| Low Alarm | Lo |  |
| High Alarm | HI |  |
| Differential Low | dIFLo |  |
| Differential High | dIFHI |  |
| Differential | dIF |  <br> |

**Table 2 –** Alarm functions

### 4.1. ALARM FUNCTIONS

The alarms can set to operate in six functions: Sensor Break, Low Alarm, High Alarm, Differential Low, Differential High or Differential (Band).

These functions are shown in **Table 2** and described as follows.

#### 4.1.1. SENSOR BREAK

The alarm will go ON whenever the sensor breaks or is badly connected.

#### 4.1.2. LOW ALARM

The alarm relay will go ON whenever the measured value is **below** the alarm set point.

#### 4.1.3. HIGH ALARM

The alarm relay will be ON whenever the measured value is **above** the alarm set point.

#### 4.1.4. DIFFERENTIAL (RANGE)

For differential alarm, 2 parameters must be set: Differential Alarm Reference value (**RLrEF**) or alarm setpoint and Alarm Deviation (Range).

For a positive deviation, the alarm will switch on whenever the measured value is **out** of the range defined as:

**(RLrEF - Deviation) and (RLrEF + Deviation)**

For a negative deviation, the alarm will be switched on whenever the measured value is **within** the range defined above.

#### 4.1.5. DIFFERENTIAL LOW

The alarm relay will be ON whenever the measured value is **below** the range defined as:

**(RLrEF - Deviation)**

#### 4.1.6. DIFFERENTIAL HIGH

Alarm relay will be ON when the measured value is **above** the range defined as:

**(RLrEF + Deviation)**

### 4.2. ALARM TIMER

The alarms can be programmed to have timer functions where the user can set a delayed alarm action, just one pulse in an alarm event, or an oscillator function with sequential pulses.

**Table 3** shows these advanced functions. Times T1 and T2 can be programmed from 0 to 6500 seconds. Set 0 (zero) at the T1 and T2 screen for a normal non-timer alarm operation.

The LEDs alarm indicators will go ON whenever there is an alarm condition regardless of the present alarm status, which may be temporarily off because of timer action.

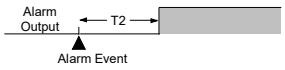
| ADVANCED FUNCTION | T1 | T2 | ACTION |
|---|---|---|---|
| Normal Operation | 0 | 0 |  |
| Delayed | 0 | 1s to 6500s |  |
| Pulse | 1s to 6500s | 0 |  |
| Oscillator | 1s to 6500s | 1s to 6500s |  |

**Table 3 –** Timer alarm functions

### 4.3. ALARM INITIAL BLOCKING

The initial blocking option inhibits the alarm from being recognized if an alarm condition is present when the controller is first energized. The alarm will actuate only after the occurrence of a non-alarm condition followed by a new occurrence for the alarm.

The initial blocking is disabled for the **Sensor Break** alarm function.

## 5. SPECIAL FUNCTIONS

### 5.1. MAXIMUM AND MINIMUM

The digital panel meter memorizes the measured maximum and minimum values (peak and valley). These two values are shown by pressing either the MAX or MIN key.

Pressing both keys simultaneously will clear the memory for a new peak and valley detection.

### 5.2. SPECIAL FUNCTION KEY AND DIGITAL INPUT

The **F** key and the optional digital input can execute special functions according to the user selection.

These functions can be chosen independently to the **F** key or to the digital input. A closed contact or a short circuit at terminals 12 and 13 is recognized as activating the digital input.

The special functions for the **F** key and for the digital input are explained as follows.

#### 5.2.1. HOLD

The **Hold** function freezes the measured value in the display. Each touch at the **F** key or closing the digital input alternates from **Hold** to normal mode.

Whenever the device is in the **Hold** mode a **HoLd** message is briefly displayed to show the operator that the displayed value is the frozen value and not the present reading.

#### 5.2.2. PEAK HOLD

The digital panel meter turns automatically to **Peak Hold** mode whenever the **F** key or the digital input are programmed for **PHoLd**.

This operation mode makes the device display only the maximum reading value from the time the key was pressed of the digital input was activated.

Each activation of the **F** key or digital input triggers a new **Peak Hold** cycle and the display resets with a new peak value.

#### 5.2.3. rESEt (CLEARS MAXIMUM AND MINIMUM)

This function works the same way as the MAX and MIN keys pressed simultaneously

If this rESEt function is programmed, for every touch of the **F** key or activation of the digital input the memory will be cleared and a new cycle of maximum and minimum will start.

#### 5.2.4. AL.oFF – ALARM BLOCKING

This function allows the user to block or inhibit the alarm relays by pressing the **F** key or by activating the digital input. Each touch of the key or activation of the digital input will alternate the function from ON to OFF and vice-versa.

If an alarm situation occurs, the respective alarm status LEDs in the front panel will light regardless of the relay alarm blocking status.

#### 5.2.5. TARE

This function is used to zero the display. The tare residual values are subtracted or added to the total measured value.

This function is used with load cells and strain gauges and applies to linear 4-20 mA, 0-50 mV, and 0-5 V inputs.

### 5.3. PROCESS VARIABLE RETRANSMISSION

As an option, the digital panel meter can be supplied with an isolated 0-20 mA or 4-20 mA analog output for Process Variable (PV) retransmission.

The PV values which define the range of the 0-20 mA or 4-20 mA retransmission can be programmed by the user in the **high and low indication limits**.

The PV retransmission does not take an action of the special **Hold** and **Peak Hold** functions.

### 5.4. CUSTOMIZED LINEARIZATION

The digital panel meter features three types of input signals that allow for custom linearization, this is, the user can configure the device to obtain accurate indications for electrical signals with non-linear and ever-increasing characteristics.

The three types of input signal are: c.0-50, c.4-20 and c.0-5. When selected, the digital panel meter creates the Custom Linearization Cycle.

The input signal must be divided in segments (maximum 19), defined to minimize the error between the input signal and the corresponding indication.

In the Custom Linearization cycle, the user finds the parameter InP.0 1, which corresponds to the start point of the first segment and must set the minimum value of the input signal.

Then, the parameter out.0 1 corresponds to the desired indication for this first point. Soon after, InP.02, which is the starting point of the second segment and out.02, the respective indication.

In InP.o 1, the user must always set the minimum value of the selected signal type: 0.0 mV for c.0-50, 4.0mA for c.4-20 and 0.0 V for c.0-5.

For linearization that do not require all 19 segments, simply set the maximum value of the selected input type to the last required segment.

The Lower Indication Limit and Upper Indication Limit parameters must be set before these Custom Linearization settings.

In this mode, the sampling rate is 4 measurements per second.

## 6. INSTALLATION

### 6.1. PANEL ASSEMBLY

The digital panel meter is composed of two parts: The fixing base and the front part with main circuits.

The base must be removed from the front and fixed onto a wall by means of four designed holes, as shown in **Figure 1.**

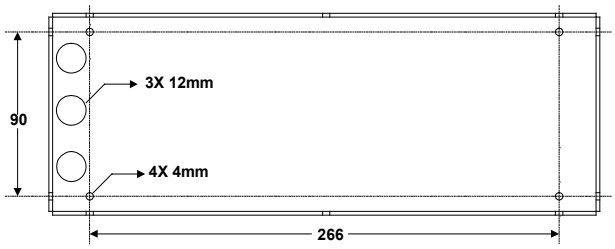



**Figure 1 –** Mounting the device in the panel cut-out

The front part is only attached to the fixing base after all electrical wire connections are done.

### 6.2. ELECTRICAL CONNECTIONS

The internal electronics can be removed from the front panel without any cable disassembly.

The input signals and power connections are shown in **Figure 2**:

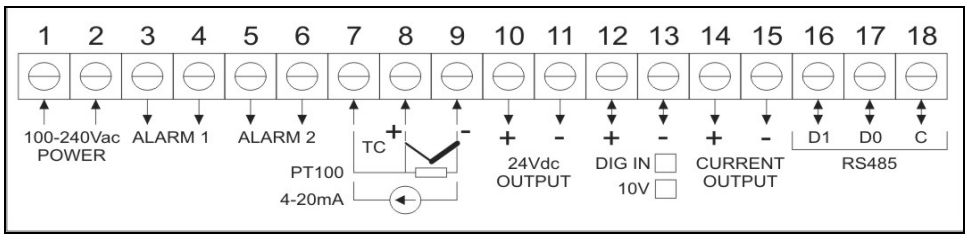



**Figure 2 –** Back panel terminals

**Note:** The left side of the device is removable. It is fixed there a label containing the connections.

#### 6.2.1. INSTALLATION RECOMMENDATIONS

- Input signal wires should be laid out away from power lines and preferably inside grounded conduits.
- Instrument mains (line) supply should be suitable for this purpose and should not be shared.
- In controlling and monitoring applications, consequences of any system failure must be considered in advance. The internal alarm relay does not warrant total protection.
- RC filters (47 Ω and 100 nF) are highly recommended for valve and contactor coils, etc.

#### 6.2.2. SENSOR OR INPUT SIGNAL CONNECTION

These connections should be properly done, and terminals must be well tightened. Thermocouples must be installed with proper extension or compensation cables.

Pt100 RTDs must be 3-wire connected and the wires connected should have the same electrical resistance (same wire gauge) for correct cable length compensation.

Four-wire RTDs can be connected by disconnecting the fourth wire. Two-wire RTDs can be connected by shortening terminals 7 and 8 and connecting the Pt100 to terminals 8 and 9.

## 7. OPERATION

For best results, this digital panel meter requires correct setting of parameters as input type (T/C, Pt100, 4-20 mA, etc.), alarms actuation point, alarm function, etc.

These parameters are divided in five levels or groups of parameters, which we will refer to as CYCLES.

| CYCLE | ACCESS |
|---|---|
| 1 − Work | Free access |
| 2 − Alarms | Reserved access |
| 3 − Functions | |
| 4 − Configuration | |
| 5 − Calibration | |

**Table 4 –** Parameters cycles

The work cycle has free access. All other cycles require a certain combination of keys to be accessed. The combination is:

**[P] and [BACK] keys pressed simultaneously**

Within a certain cycle, just press [P] to go to the following parameters. At the end of each cycle, the display will go back to the work cycle.

At the desired screen, just press the [MAX] or [MIN] key to change this parameter accordingly.

All changes are recorded in non-volatile memory as we move to next screen. After 25 seconds with no key pressed, the digital panel meter will return to the measuring cycle (work cycle).

### 7.1. CYCLE PROTECTION

The values of parameters of a certain cycle can be protected against non-authorized users.

The protected parameters can still be viewed but cannot be changed.

To protect a cycle, just press the [BACK] and [MAX] keys for 3 seconds at the beginning of the referred cycle. To unlock this cycle (allow changes in parameters), press the keys [BACK] and [MIN] for 3 seconds.

**The display will briefly blink confirming that the locking or unlocking of the cycle.**

## 8. PROGRAMMING THE DEVICE

### 8.1. WORK CYCLE

This is the first and main cycle. At power up, the device will display the Process Variable (PV). The alarm Setpoints are also displayed at this cycle. To run through this cycle, just press the [P] key.

Whenever an alarm is set with differential function, the respective alarm setpoint is blocked (**SPAL 1**, **SPAL2**, ...) and the display shows **d IF** to advise the operator that this is a configuration parameter, and that the respective deviation value must be programmed at the Alarms Cycle.

The **ALrEF** screen will be displayed, showing the reference value for the alarm with differential function.

| SCREEN | PARAMETER DESCRIPTION |
|---|---|
| 8.8.8.8. | **Measure.**<br>Shows the measured variable. For Pt100 or thermocouples, the display will show the absolute temperature value.<br>For 4-20 mA, 0-50 mV, and 0-5 V inputs, the display shows the values defined in the **InLoL** and **Inh IL** screens.<br>With the **Hold** function programmed, the display shows the frozen variable and alternates with the message **hoLd**.<br>Likewise, with **Peak Hold** function programmed, the high limit is displayed with the **PhoLd** screen alternately.<br>Should any fault situation occur, the device will display an error message. |
| ALrEF | **Differential alarm reference value.**<br>This screen is shown only when there is an alarm programmed with differential function. |
| SPAL 1<br>SPAL2 | **Setpoints for Alarms 1 and 2.**<br>Defines the operation point of each alarm programmed with **Lo** or **h I** function.<br>When the alarms are programmed with differential function, the alarm Setpoint cannot be changed at this cycle and a **d IF** message will be shown.<br>The SP differential (deviation) value is set at the Alarm Cycle. |

### 8.2. ALARM CYCLE

| | |
|---|---|
| FuAL 1<br>FuAL2 | **Alarm Function**.<br>Defines the alarms 1, 2, 3 and 4 function:<br>**oFF** Alarm off<br>**tErr** Broken or Shorted Sensor<br>**Lo** Low value<br>**h I** High value<br>**d IFL** Differential low<br>**d IFh** Differential high<br>**d IF** Differential |
| dFAL 1<br>dFAL2 | **Differential SP for Alarms 1 and 2.**<br>Defines the deviation value from the alarm Setpoint in relation to the Reference Value defined in the **ALd IF** screen.<br>This value cannot be changed at this cycle for alarms with non-differential function and the **Abs** is then displayed. |
| HYAL 1<br>HYAL2 | **Alarm hysteresis.**<br>This is the difference from the measured value to the point where the alarm is turned ON and OFF. |
| bLAL 1<br>bLAL2 | **Alarm blocking.**<br>Should any alarm condition occur, each alarm can be disabled when energizing the device. |
| AL 1t 1<br>AL 1t2<br>AL2t 1<br>AL2t2 | **Time alarms.**<br>The user can set delayed or sequential alarms as shown in **Table 3** by defining times T1 and T2.<br>To disable this function, just set zero for T1 and T2. |

### 8.3. FUNCTION CYCLES

| | |
|---|---|
| FFunc | **F key function.**<br>The options are:<br>oFF Key not used<br>hoLd Hold PV<br>RLoFF Alarm disabled<br>rESEt Resets Peak and Valley<br>PhoLd Peak Hold<br>tArE Tare zeroing |
| d IG. In | **Digital input function.**<br>The same function available for the **F** key:<br>oFF – hoLd – RLoFF – rESEt – PhoLd – tArE |
| F ILtr | **Input digital filter.**<br>Adjustable from 0 to 20.<br>This is used to reduce instability of the measured value.<br>0 means the filter is off and 20 means maximum filtering. The higher the filter value the lower is the measured value response. |
| oFSEt | **Display offset**.<br>This a value which is added to the PV to offset any measurement deviation or sensor error.<br>The offset is shown directly in the programmed engineering unit.<br>For °F measurements, the null reference is at 32 °F. |
| bAud | **Baud Rate.**<br>Serial digital communication speed in **bps**.<br>Programmable: 1200, 2400, 4800, 9600, and 19200 bps. |
| AdrES | **Communication address**.<br>A number which identifies the device in a multidrop network. |

### 8.4. CONFIGURATION CYCLE

| | |
|---|---|
| InTYP | **Input type**.<br>Selects the input signal or sensor type to be connected to the PV terminals. Refer to **Table 1.**<br>Changing this parameter will change all other parameters related to PV and alarms. Therefore, it should be the first parameter to be set. |
| dPPoS | **Decimal point position**.<br>Defines the decimal point position in the displayed value.<br>This applies to linear input types 0 to 50 mV, 4 to 20 mA, and 0 to 5 V, as selected at the InTYP screen. |
| un It | **Temperature unit**.<br>Selects °C or °F indication.<br>This screen is not shown for input types 0 to 50 mV, 4 to 20 mA, and 0 to 5 V, as selected at the InTYP screen. |
| Sroot | **Square root**.<br>This screen is only shown for input types 0 to 50 mV, 4 to 20 mA and 0 to 5 V as selected at the InTYP screen.<br>Set YES and the square root will be applied to the measured value within the limits programmed in InLoL and InH IL.<br>The display will show the low limit value should the input signal be below 1% of the range. |
| InLoL | **Input low limit**.<br>Sets the low limit for input type 0 to 50 mV, 4 to 20 mA, or 0 to 5 V.<br>When the **PV Retransmission** is used, this limit defines the corresponding 4 mA (or 0 mA) in relation to the input value. |
| InH IL | **Input high limit**.<br>Sets the high limit for input type 0 to 50 mV, 4 to 20 mA, or 0 to 5 V.<br>When the **PV Retransmission** is used, this limit defines the corresponding 20 mA in relation to the input value. |
| SCALE | **Scale factor**.<br>Multiplies the displayed value by 10 to increase measured range. |
| outtY | **Analog output type**.<br>Selects the analog output type to either 0 to 20 mA or 4 to 20 mA. |

### 8.5. CUSTOMIZED LINEARIZATION CYCLE

| | |
|---|---|
| InP.01<br>InP.20 | Defines the initial and end analog input values for each custom segment line.<br>The values must be entered in the input signal unit: 0-50 mV, 4-20 mA, or 0-5 V. |
| out.01<br>out.20 | Defines the corresponding indication that each custom segment is to show.<br>Values are expressed in the desired indication unit (within the **Indication Lower and Upper Limits**). |

### 8.6 CALIBRATION CYCLE

All input types are factory calibrated and field calibration is seldom necessary. Should it be required, the calibration should only be done by experienced personnel.

If this cycle is accidentally accessed, do not touch the MAX or MIN keys. Just press the index key and go through all cycles until the display shows the main or operation menu.

| | |
|---|---|
| InLoC | **Input low calibration.**<br>Defines the Process Variable low calibration (Offset).<br>Several keystrokes at MAX or MIN might be necessary to increment one digit. |
| InH IC | **Input high calibration.**<br>Defines the Process Variable span calibration (gain).<br>Several keystrokes at MAX or MIN might be necessary to increment one digit. |
| ouLoC | **Analog output low calibration**.<br>Defines the analog current output low calibration (Offset). |
| ouH IC | **Analog output Span calibration**.<br>Defines the analog current output high calibration (Span). |
| CJ Lo | **Cold Junction calibration**.<br>Allows the user to adjust the calibration directly in degrees for achieving best results with thermocouples. |
| HtYPE | **Hardware type**.<br>These parameters adapt the software to the hardware available and should not be changed by the user.<br>0 No options<br>1 With alarms 3 and 4<br>2 With digital input |

**Figure 3** shows the sequence of levels and parameters presented in the display. There are parameters that must be defined for each alarm available.

| WORK CYCLE | ALARM CYCLE | FUNCTION CYCLE | CONFIGURATION CYCLE | CUSTOMIZED LINEARIZATION CYCLE | CALIBRATION CYCLE |
|---|---|---|---|---|---|
| 88888 | * FuAL 1 | FFunC | InTyP | InP.01 - InP.20 | InLoC |
| RLrEF | * dFAL 1 | d IG. In | dPPoS | out.01 - out.20 | InH IC |
| * SPAL 1 | * HYAL 1 | F ILtr | un It | | ouLoC |
| | * bLAL 1 | oFSEt | Sroot | | ouH IC |
| | * AL. It 1 | bAud | InLoL | | CJ Lo |
| | * AL. It2 | AdrES | InH IL | | HtYPE |
| | | | SCALE | | |
| | | | outtY | | |

**Table 5 –** Sequence of cycle and parameters displayed by the digital panel meter

* Parameters that require definition for each available alarm.

## 9. DIGITAL COMMUNICATION

The digital panel meter can be supplied with an asynchronous RS485 digital communication interface for master-slave connection to a host computer (master).

The digital panel meter works as a slave only and all commands are started by the computer, which sends a request to the slave address. The addressed device processes the command and sends back the answer.

Broadcast commands (addressed to all units in a multidrop network) are accepted but no response is generated.

### 9.1. FEATURES

RS485 compatibility with two-wire bus from the host to up to 31 slaves in a multidrop network topology. Up to 247 units can be addressed by the Modbus RTU protocol.

- Maximum network distance: 1200 m.
- Time of disconnection: Maximum of 2 ms after the delivery of the last byte.
- Communication signals electrically isolated from the rest of the device.
- Baud rate: 1200, 2400, 4800, 9600, 19200, 38400 or 57600 bps.
- Number of data bits: 8, without parity or even parity
- Number of Stop Bits: 1
- Time to start response transmission: 100 ms maximum delay after acknowledging the command.
- Protocol: Modbus (RTU)

### 9.2. RS485 INTERFACE: ELECTRICAL CONNECTION

The RS485 signals are:

| | | | | | |
|---|---|---|---|---|---|
| **D1** | **D** | **D +** | **B** | Bi-directional data line. | Terminal 16 |
| **D0** | $\overline{D}$ | **D -** | **A** | Bi-directional inverted data line. | Terminal 17 |
| **C** | | | | Optional connection that improves the communication performance. | Terminal 18 |
| **GND** | | | | | |

**Table 6 –** RS485

## REDUCED REGISTERS TABLE FOR SERIAL COMMUNICATION

### COMMUNICATION PROTOCOL

The Mosbus RTU slave is implemented. All configurable parameters can be accessed for reading or writing through the communication port. Broadcast commands are supported as well (address 0).

The available Modbus commands are:

*01 – Read Coils* — *05 – Write Single Coil*

*03 - Read Holding Register* — *06 - Write Single Register*

### HOLDING REGISTER TABLE

Follows a description of the usual communication registers. For full documentation, download the **Registers Table for Serial Communication** in the **N1500G** section of our website: www.thermoest.com

All registers are 16-bit signed integers.

| ADDRESS | PARAMETER | REGISTER DESCRIPTION |
|---|---|---|
| 0000 | PV | Read: Process variable.<br>Write: Not allowed.<br>Range: The minimum value is established in **InLoL**. The maximum value is established in **InH IL**. The decimal point position depends on **dPPoS**. |
| 0003 | PV | Read: Normalized process variable.<br>Write: Not allowed.<br>Maximum range: 0 to 62000. |

**Table 7 –** Register table

## 10. PROBLEMS WITH THE DEVICE

Connection errors or improper configuration will result in malfunctioning. Carefully revise all cable connections and programming parameters before operating the device.

Some error messages will help the user identify potential problems.

| MESSAGE | POSSIBLE PROBLEM |
|---|---|
| uuuuu | Measured value is above the programmed sensor or input signal limit. |
| nnnnn | Measured value is below the programmed sensor or input signal limit. |
| ----- | Open input. No sensor is connected, or the sensor is broken. |
| Err 1 | Pt100 cable resistance is too high, or the sensor is badly connected. |

**Table 8 –** Error messages

Different messages other than the ones above should be reported to the manufacturer. Please inform the serial number if this should occur.

The serial number can be viewed at the display by pressing the **BACK** key for about 3 seconds.

The software version of the device can be viewed at the time it is powered. The device might display false error messages when wrongly programmed or when connected to a sensor for which it was not programmed.

## 11. WARRANTY

Warranty conditions are available on our website www.thermoest.com