NOVUS
We Measure, We Control, We Record

Indicator N1500G

UNIVERSAL INDICATOR - OPERATING MANUAL – V2.3x C

1. PRESENTATION

N1500G is a universal process indicator 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.

The user should read this manual thoroughly before using the instrument. It is a fine electronic device and should be used accordingly for best results.

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 may have:

- Process Variable retransmission in 0-20 mA or 4-20 mA
- RS485 MODBUS RTU serial communication
- Stabilized 10 V supply to feed load cell
- Digital input

1.1. FRONT PANEL IDENTIFICATION

Display: Shows process variable (PV) and the programming prompts.
ALM1 and ALM2: show alarm status.

INDEX key - This key is used to access the programming menu and prompts.

BACK key - This key is used to go back to the previously reached prompt in the menu cycle.

UP / MAX key and **DOWN / MIN** - 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 a 9999)
- Input sample rate: 5 per second
- Accuracy: Thermocouples J, K, T and N: 0.25 % of span ±1 ºC.
  Thermocouple E, R, S and B: 0.25 % of span ±3 ºC.
  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 Resolution of retransmission: 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 máx.
- Operating temperature: 0 to 55 °C, Maximum RH: 80 % up to 30 ºC. For temperatures above 30 ºC, decrease 3 % per ºC.
- Approximate weight: 1 kg
- Dimensions: 310 x 110 x 37 mm (C x A x P)
- Protection: IP30 (when installed properly)

3. PROCESS VARIABLE INPUT - PV

The Process Variable input type should be keyboard programmed by the user according to the codes shown on **Table 1** (refer to INPUT TYPE parameter " **InPUT**").

TIPO	CODE	CARACTERÍSTICAS
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	Linearizes J. Adjustable range: -110 to 760 °C
4-20 mA	L In h	Linearizes K. Adjustable range.: -150 to 1370 °C
4-20 mA	L In t	Linearizes T. Adjustable range.: -160 to 400 °C
4-20 mA	L In E	Linearizes E. Adjustable range.: -90 to 720 °C
4-20 mA	L In n	Linearizes N. Adjustable range -150 to 1300 °C
4-20 mA	L In r	Linearizes R. Adjustable range 0 to 1760 °C
4-20 mA	L In S	Linearizes S. Adjustable range.: 0 to 1760 °C
4-20 mA	L In b	Linearizes B. Adjustable range.: 100 to 1820 °C
4-20 mA	L InPt	Linearizes Pt100. Adj. range.:-200.0 to 530.0 °C
4-20 mA	L InPt	Linearizes Pt100. Adj. 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 a 5 V	0 - 5	Linear. Adjustable range.: -1999 to 9999
0 a 50 mV	c.0 - 50	User defined linearization
4-20 mA	c.4 - 20	User defined linearization
0 a 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 (α=0.00385).

4. ALARMS

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

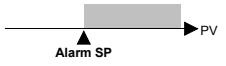
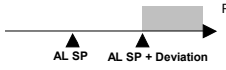
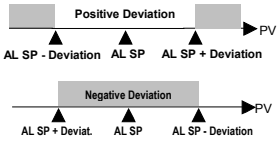
TYPE	PROMPT	ACTION
Disabled	oFF	Alarm is inactive
Sensor Break (input **Err**or)	iErr	Alarm will go ON if sensor breaks, input signal is out of range or Pt100 is shorted.
Low Alarm	Lo	
High Alarm	HI	
Diferential Low	dIFLo	
Diferential High	dIFHI	
Diferential	dIF	

Table 2 - Alarm functions

4.1. ALARM FUNCTIONS

The alarms can set to operate in six different 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 (Band)

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

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

(ALrEF - Deviation) and (ALrEF + Deviation)

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

4.1.5. Differential Low

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

(ALrEF - Deviation)

4.1.6. Differential High

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

(ALrEF + 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 (refer to item 8.2). Set 0 (zero) at the T1 and T2 prompt 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.

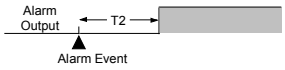
Advanced Function	T1	T2	ACTION
Normal Operation	0	0	
Delayed	0	1s to 6500s	
Pulse	1s to 6500s	0	
Oscillator	1s to 6500s	1s to 6500s	

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 indicator 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 indicator 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 indicator turns automatically to **Peak Hold** mode whenever the **F** key or the digital input are programmed for "**PHoLd**"

This operation mode makes the indicator 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, as explained in the 5.1 section.

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. ALoFF - 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 is subtracted or added to the total measured value. This function is generally 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 indicator 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**.

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

5.4. CUSTOMIZED LINEARIZATION

The indicator features three types of input signals that allow for custom linearization, this is, the user can configure the device in order 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 indicator creates the Custom Linearization Cycle.

The input signal must be divided in segments (maximum 19), defined in order to minimize the error between the input signal and the corresponding indication. In the Custom Linearization cycle the user finds the parameter **InP.01** which corresponds to the start point of the first segment and must set the minimum value of the input signal. Then the parameter **out.01** that 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.01** 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's that do not require all 19 segments, simply set the maximum value of the selected input type to the last required segment. Note: 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 indicator 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.**

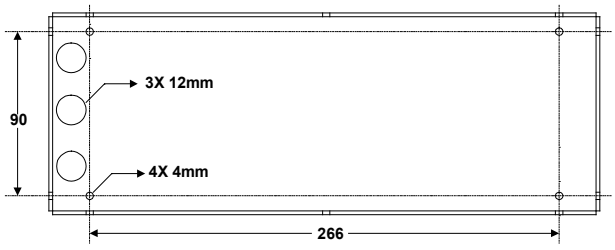


Figure 1 - Mounting the indicator in the panel cut-out.

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**.

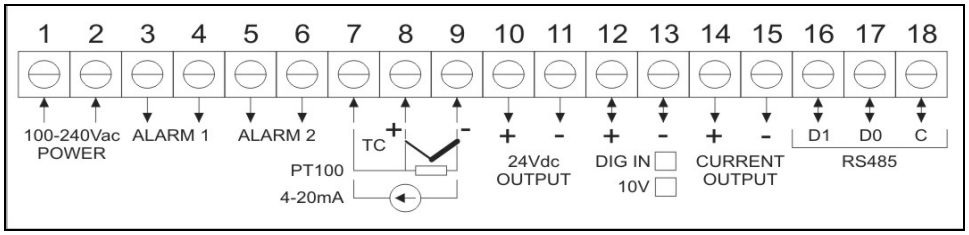


Figure 2 - Back panel terminals

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

6.2.1. Recommendations for Installation

- 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, possible 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 indicator 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 key strokes to be accessed. The combination is:

[↵] and [BACK] keys pressed simultaneously

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

At the desired prompt 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 prompt. After 25 seconds with no key pressed the indicator 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 can not 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 INDICATOR

8.1. WORK CYCLE

This is the first and main cycle. At power up the indicator will display the Process Variable (PV). The alarm setpoints are also displayed at this cycle. To run through this cycle just press the [⏎] 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 "**AL.rEF**" prompt will be displayed showing the reference value for the alarm with differential function.

SCREEN	PARAMETER DESCRIPTION
88888	**Measure** Shows the measured variable. For Pt100 or thermocouples the display will show the absolute temperature value. For 4-20 mA, 0-50 mV and 0-5 V inputs the display shows the values defined in the "**InLoL**" and "**InH IL**" prompts. With the **hold** function programmed the display shows the frozen variable and alternates with the message "**hoLd**". Likewise, with ***Peak Hold*** function programmed the high limit is displayed with the "**P.hoLd**" prompt alternately. Should any fault situation occur the indicator will display an error message which can be identified at item 10 of this manual.
AL.rEF	**Differential Alarm Reference Value** - This prompt is shown only when there is an alarm programmed with differential function.
SPAL 1 SPAL2	**Set Points of Alarms 1 and 2** - Defines the operation point of each alarm programmed with "**Lo**" or "**h I**" function. Note: 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. The SP differential (deviation) value is set at the Alarm Cycle.

8.2. ALARM CYCLE

FuAL 1 FuAL2	**Alarm Function** - Defines the alarms 1, 2, 3 and 4 function, as defined in item 4.1 oFF : Alarm off IErr : Broken or Shorted Sensor Lo : Low value h I : High value d IFL : Differential low d IFh : Differential high d IF : Differential
dFAL 1 dFAL2	**Differential SP for Alarms 1 and 2** - Defines the deviation value from the alarm setpoint in relation to the Reference Value defined in the "**ALd IF**" prompt. Note: This value cannot be changed at this cycle for alarms with non-differential function and the "**Ab5**" is then displayed.
HyAL 1 HyAL2	**Alarm Hysteresis** This is the difference from the measured value to the point where the alarm is turned ON and OFF.
bLAL 1 bLAL2	**Alarm Blocking** Should any alarm condition occur, each alarm can be disabled when energizing the indicator. Refer to item 4.3.
AL 1t 1 AL 1t2 AL2t 1 AL2t2	**Time Alarms** The user can set delayed or sequential alarms as shown in table 3 by defining times T1 and T2. To disable this function just set zero for T1 and T2.

8.3. FUNCTION CYCLES

F.Func	**F KEY FUNCTION** - Options are: oFF - Key no used. hoLd - Hold PV AL.oFF - Alarm disabled rESEt - Resets Peak and Valley PhoLd - Peak Hold tArE - Tare zeroing These functions are described in item 5.2.
d IG. In	**Digital Input Function** - The same function available for the **F** key: oFF - hoLd - AL.oFF - rESEt - PhoLd - tArE Refer to item 5.2.
F ILtr	**Input Digital Filter** - Adjustable from 0 to 20, this is used to reduce instability of the measured value. 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** - This a value which is added to the PV to offset any measurement deviation or sensor error. The offset is shown directly in the programmed engineering unit. For °F measurements the null reference is at 32 °F.
bAud	**Baud Rate** - Serial digital communication speed in **bps**. Programmable: 1200, 2400, 4800, 9600 and 19200 bps.
AdrES	**Communication Address** - A number which identifies the instrument in a multidrop network.

8.4. CONFIGURATION CYCLE

InTYP	**Input Type** - Selects the input signal or sensor type to be connected to the PV terminals. Refer to **Table 1.** 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** - Defines the decimal point position in the displayed value. This applies to linear input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " InTYP" prompt.
un It	**Temperature Unit** - Selects °C or °F indication. This prompt is not shown for input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " InTYP" prompt.
Sroot	**Square Root** - This prompt is only shown for input types 0 to 50mV, 4 to 20mA and 0 to 5V as selected at the " InTYP" prompt. Set "YES" and the square root will be applied to the measured value within the limits programmed in " InLoL" and " InH IL". The display will show the low limit value should the input signal be below 1% of the range.
InLoL	**Input Low Limit** - Sets the low limit for input type 0 to 50 mV, 4 to 20 mA or 0 to 5 V. When the **PV Retransmition** is used this limit defines the corresponding 4 mA (or 0 mA) in relation to the input value.
InH IL	**Input High Limit** - Sets the high limit for input type 0 to 50 mV, 4 to 20 mA or 0 to 5 V. When the **PV Retransmition** is used this limit defines the corresponding 20 mA in relation to the input value.
SCALE	**Scale Factor** - Multiplies the displayed value by 10 to increase measured range.
outtY	**Analog Output Type** - Selects the analog output type to either 0 to 20 mA or 4 to 20 mA.

8.5. CUSTOMIZED LINEARIZATION CYCLE

InP.01 InP.20	Defines the initial and end analog input values for each custom segment line. The values must be entered in the input signal unit: 0-50 mV, 4-20 mA or 0-5 V.
out.01 out.20	Defines the corresponding indication that each custom segment is to show. 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** - Sets the Process Variable low calibration (offset). Several key strokes at MAX or MIN might be necessary to increment one digit.
InH IC	**Input Hi Calibration** - Sets the Process Variable span calibration (gain). Several key strokes at MAX or MIN might be necessary to increment one digit.
ouLoC	**Analog Output Low Calibration** - Sets the analog current output low calibration (offset).
ouH IC	**Analog Output Span Calibration** - Sets the analog current output high calibration (span).
CJ Lo	**Cold Junction Calibration** - Allows the user to adjust the calibration directly in degrees for achieving best results with thermocouples.
HtYPE	**Hardware Type** - These parameters adapts the software to the hardware available and should not be changed by the user. 0 - No options 1 - With alarms 3 and 4 2 - With digital input

Figure 3 shows the sequence of levels and parameters presented in the indicator 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
ALrEF	* 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		

Figure 3 - Sequence of cycle and parameters displayed by the indicator

* Parameters that require definition for each available alarm.

9. DIGITAL COMMUNICATION

The indicator can be supplied with an asynchronous RS-485 digital communication interface for master-slave connection to a host computer (master).

The indicator works as a slave only and all commands are started by the computer which sends a request to the slave address. The addressed unit processes the command and sends back the answer.

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

9.1. CHARACTERISTICS

- RS-485 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 indicator disconnection: Maximum of 2 ms after the delivery of the last byte.
- Communication signals electrically isolated from the rest of the instrument.
- 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 RS-485 signals are: D1 = D: Bidirectional data line

D0 = $\overline{D}$: Inverted bidirectional data line

C = GND: Optional connection. Improves communication performance for long cable runs.

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.novusautomation.com.

All registers are 16 bit signed integers.

Address	Parameter	Register Description
0000	PV	Read: process variable. Write: not allowed. Range: the minimum value is in **InLoL** seted and the maximum value is in **InHIL** seted an the decimal point position depends of **dPPoS**.
0003	PV	Read: normalized Process Variable. Write: not allowed. Maximum range: 0 to 62000.
0004	Display Value	Read: current display value. Write: current display value. Maximum range: -31000 to 31000. The range depends of the showed display.

10. PROBLEMS WITH THE INDICATOR

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

Some error messages will help the user identify possible 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.

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 instrument can be viewed at the time the unit is powered. The instrument 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.novusautomation.com/warranty.