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Indicator N1500

UNIVERSAL PROCESS INDICATOR – INSTRUCTIONS MANUAL – V2.3 C

SAFETY SUMMARY

The symbols below are used on the equipment and throughout this document to draw the user's attention to important operational and safety information.

CAUTION or WARNING: Read complete instructions prior to installation and operation of the unit.	**CAUTION or WARNING:** 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.*

TECHNICAL ASSISTANCE

If you encounter a problem with your controller, review the configuration with regard to inputs, outputs, alarms, etc. If the problem persists, contact your supplier.

SPECIAL RECOMMENDATIONS

Should the indicator be repaired, some special handling care should be taken. The device must be withdrawn from the case and immediately placed in an anti-static wrap; protected from heat and humidity.

PRESENTATION

N1500 is a universal process indicator which accepts a large variety of input signals and sensors. A six-digit LED display shows measured value and all programming parameters.

Instrument configuration is achieved from the keypad, without any hardware change. Thus, the selection of input type and alarms modes, besides other special functions, are accessed and defined from the frontal keypad.

The user should read this manual thoroughly before using the instrument. It must be handled with care 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, 0-5 V and 0-10 V.
- 2 alarm relays
- 24 Vdc power supply for remote transmitter excitation
- Memory for **maximum** and **minimum** values.
- **Hold** and **peak hold** functions.

Extra options are:

- Process Variable (PV) retransmission in 0-20 mA or 4-20 mA.
- RS485 MODBUS RTU serial communication.
- 3rd and 4th alarm relays.

The front panel is shown below.

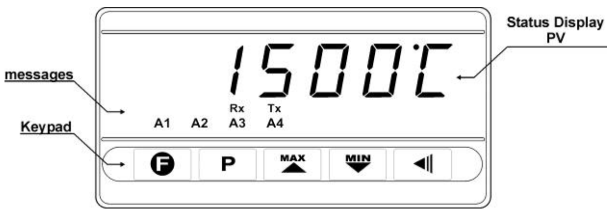


Figure 1 - Front panel identification

Status Display: Shows the process variable (PV) and the programming prompts.

Indicators A1, A2, A3 and **A4**: show active alarms.

Indicators Rx and **Tx**: indicate RS485 communication line is active.

PROGRAM key - This key is used to access different displays with the programmable parameters of the device.

BACK key - This key is used to go back to the previous parameter displayed in the menu cycle.

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

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

PROCESS VARIABLE INPUT - PV

The process variable (PV) input type is configured through the frontal keypad according to the codes shown in **Table 1** (refer to INPUT TYPE parameter "**in.typ"**).

All input types are factory calibrated and no additional calibration is required.

TYPE	CODE	MEASURING RANGE
J	**Tc j**	range: -130 to 940 °C (-202 to 1724 °F)
K	**Tc h**	range: -200 to 1370 °C (-328 to 2498 °F)
T	**Tc t**	range: -200 to 400 °C (-328 to 752 °F)
E	**Tc e**	range: -100 to 720 °C (-148 to 1328 °F)
N	**Tc n**	range: -200 to 1300 °C (-328 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: 500 to 1800 °C (932 to 3272 °F)
Pt100	**Pt100**	range: -200.0 to 850.0 °C (-328.0 to 1562.0 °F)
0 – 50 mV	**0-50**	Linear. Scalable from -31000 to 31000
0 – 5 V	**0-5**	Linear. Scalable from -31000 to 31000
0-10 V	**0-10**	Linear. Scalable from -31000 to 31000
0 – 50 mV	**c.0-50**	Custom Linearization, user configurable
0 – 5 V	**c.0-5**	Custom Linearization, user configurable
0-10 V	**c.0-10**	Custom Linearization, user configurable
4-20 mA	**Lin J**	T/C type J linearization. Range: -130 to 940 °C
4-20 mA	**LIn h**	T/C type K linearization. Range: -200 to 1370 °C
4-20 mA	**LIn t**	T/C type T linearization. Range: -200 to 400 °C
4-20 mA	**LIn e**	T/C type E linearization. Range: -100 to 720 °C
4-20 mA	**LIn n**	T/C type N linearization. Range: -200 to 1300 °C
4-20 mA	**LIn r**	T/C type R linearization. Range: 0 to 1760 °C
4-20 mA	**LIn s**	T/C type S linearization. Range: 0 to 1760 °C
4-20 mA	**LIn b**	T/C type B linearization. Range: 500 to 1800 °C
4-20 mA	**Linpt**	Pt100 linearization. Range:-200.0 a 850.0 °C
0-20 mA	**0-20**	Linear. Scalable from -31000 to 31000
4-20 mA	**4-20**	Linear. Scalable from -31000 to 31000
0-20 mA	**c.0-20**	Custom Linearization, user defined
4-20 mA	**c.4-20**	Custom Linearization, user defined

Table 1 - Input type codes

ALARMS

The indicator has 2 alarm outputs in the basic version and up to 4 alarms outputs optionally.

Each alarm has a corresponding LED message in the front panel to show alarm status.

ALARM FUNCTIONS

The alarms can be set to operate in seven different modes. These modes are shown in **Table 2** and described below. The alarm can also be set as 'disabled'.

- Sensor break - **Ierr**

The alarm is triggered whenever the sensor breaks or is badly connected.

- Low alarm - **Lo**

The alarm relay is triggered whenever the measured value is below the alarm set point.

- High alarm - **Ki**

The alarm relay is triggered whenever the measured value is **above** the alarm set point.

- Differential low – **Dif.lo**

Deviation alarm. Alarm relay is triggered whenever the difference (deviation) between the Process Variable and the reference value (**AlrEF**) is lower than the values defined in **SP.AL**. For this function, the triggering point is defined as:

(ALrEF – SP.AL)

- Differential High – **Dif.ki**

Deviation alarm. Alarm relay is triggered when the difference (deviation) between the Process Variable value and the reference value (**AlrEF**) is greater than the value defined in **SPAL**. For this function, the triggering point is defined as:

(ALrEF + SP.AL)

- Differential (or Band) out of range – **Dif.ov**

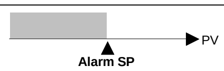
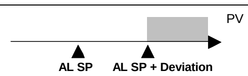
Deviation alarm. Alarm relay is triggered when the difference (deviation) between the Process Variable value and the reference value (**AlrEF**) has its modulus greater than the value configured in **SPAL**. For this function, the triggering point is defined as:

(ALrEF – SP.AL) and (ALrEF + SP.AL)

- Differential (or Band) within range – **Dif.In**

Deviation alarm. Alarm relay is triggered when the difference (deviation) between the Process Variable value and the reference value (**AlrEF**) has its modulus lower than the value defined in **SPAL.** For this function, the triggering points are defined as:

(ALrEF – SP.AL) and (ALrEF + SP.AL)

TYPE	PROMPT	ACTION
Disabled	**Off**	Alarm is inactive
Sensor Break (input **Err**or)	**Ierr**	Alarm will go ON if sensor breaks
Low Alarm (**Lo**w)	**Lo**	
High Alarm (**Hi**gh)	**Ki**	
Differential Low (**diff**erential **Lo**w)	**Dif.lo**	
Differential High (**diff**erential **Hi**gh)	**Dif.ki**	

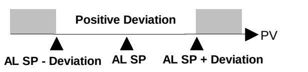
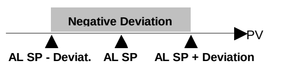
Differential out of range (**dif**ferential out)	**Dif.ov**	
Differential within range (**diff**erential **With**in)	**Dif.In**	

Table 2 - Alarm functions

ALARM TIMER

The alarms can be configured to perform timing functions. The configuration allows the alarm output to be delayed, or to deliver a single pulse or a train of pulses. The delay, the pulse width and the period are defined by the user.

Table 3 shows these advanced functions. Times T1 and T2 can be programmed from 0 to 6500 seconds. Programming 0 (zero) in the timer parameters T1 and T2 disables the timer function.

The display alarm indicators (**A1**, **A2**, **A3** or **A4**) remain ON while their respective alarm conditions are present, regardless of the current output status, which may be temporarily off due to the timer action.

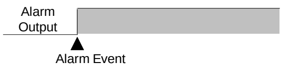
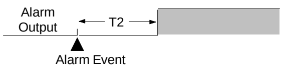
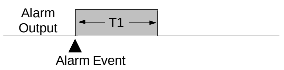
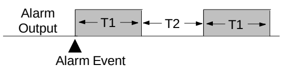
Advanced Function	T1	T2	ACTION
Normal Operation	0	0	
Delayed	0	1 s to 6500 s	
Pulse	1 s to 6500 s	0	
Oscillator	1 s to 6500 s	1 s to 6500 s	

Table 3 - Timer Alarm Functions

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 be triggered 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.

SPECIAL FUNCTIONS

MAXIMUM AND MINIMUM

The indicator memorizes the measured maximum and minimum values (peak and valley). These two values are shown when pressing the **MAX** or **MIN** keys. Pressing both keys simultaneously will clear the memory for a new peak and valley detection.

SPECIAL FUNCTION KEY AND DIGITAL INPUT

The F key (special function key) in the frontal panel and the optional digital input can execute special functions according to the user selection. **Figure 8** shows how to activate the digital input. The special functions for the F key and for the digital input are explained as it follows.

- **Kold** - Freeze measured value

The **hold** function freezes the measured value showed in the display. This function is toggled each time the F key is pressed or the digital input is selected.

Whenever the indicator is in the **hold** mode a "**koLd**" message is briefly displayed to show the operator that the displayed value is the frozen value and not the current input reading.

- **Pkold** – Maximum value

The **Peak Hold** function shows the maximum value measured since the last time the F key was pressed or the digital input 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.

- **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, every touch of the F key or activation of the digital input will clear the memory and a new cycle of maximum and minimum values memorization will start.

EXTRA 24 VDC POWER SUPPLY – AUXILIAR P.S.

The indicator provides a voltage power supply of 24 Vdc to excite field transmitters with 25 mA current capacity. Available at the back panel terminals 16 and 17.

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 that define the scale of the 0 mA / 4 mA to 20 mA retransmission can be programmed by the user in the **high and low output limits** (**0v.lol** e **0v.kol**),at configuration level. High and low limits can be freely programmed, even with a low limit higher than high limit, resulting in a reversed retransmission signal (decreasing signal when PV increases).

When this option is available, retransmission will be always active, so that the user will not be required to turn it on or off.

For a voltage output signal an external shunt (calibrated resistor) should be installed at the analog output terminals.

CUSTOMIZED LINEARIZATION.

Three types of signals can be user-customized to fit particular linearization profiles. This means that the operator can configure the instrument to read non-standard crescent non-linear signals with high accuracy.

INSTALLATION

The indicator is designed to be panel mounted. Remove the two plastic fixing clamps from the instrument, insert the unit into the panel cut-out and slide firmly the fixing clamps from the rear against the panel.

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.
- Use of RC filters (47 R and 100 nF, serial) are highly recommended when driving solenoids, contactor coils or other inductive loads.

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**.

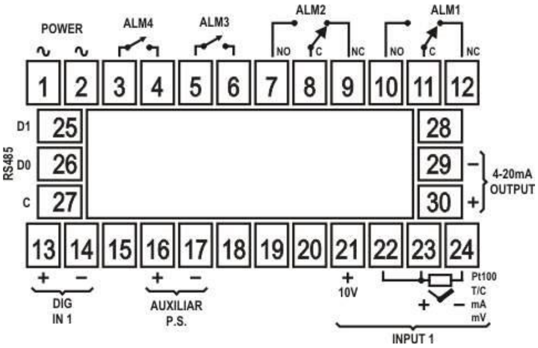


Figure 2 – Back Panel Terminals

- **Power Connection**

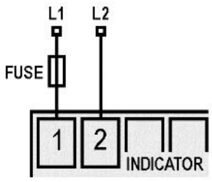


Figure 3 – Power Connection

- **Sensor and input signal connections**

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 to terminals 22 and 23 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 22 and 23 and connecting the Pt100 to terminals 23 and 24.

The figures below show the connections relative to each type of input.

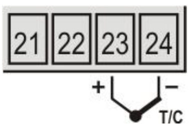


Figure 4 – Thermocouple input

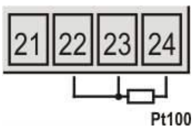


Figure 5 – 3 wire Pt100 input

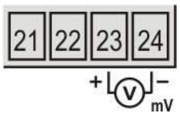


Figure 6 – Voltage input

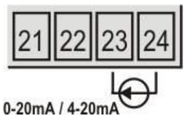


Figure 7 – Current input

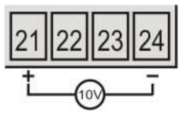


Figure 8–Connection for 0-5 V or 0-10 V

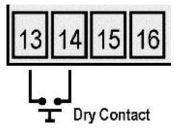


Figure 9 – Digital Input

Figure 10 shows the connections for a 4-20 mA transmitter powered by the 24 V power supply of the indicator.

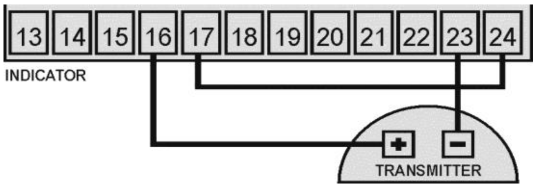


Figure 10 – Two-wire transmistter with internal power supply

- **Digital Input (Dig In)**

The digital input is activated by connecting a switch (or equivalent) to its terminals, as shown in **Figure 9** above.

- **Analog output**

The N1500 can deliver either 0-20 mA or 4-20 mA analog output, depending on how the instrument is configured. The output is available at terminals 29 and 30.

OPERATION

The indicator requires that the internal parameters be properly configured such as to fit the application need. These parameters are the input type (T/C, Pt100, 4-20 mA, etc), alarms triggering points, alarm functions, 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- Customized Linearization	
6- 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:

P and ◄ keys pressed simultaneously

Once within a cycle, just press P to move to the subsequent parameters of this cycle. At the end of each cycle the display will go back to the work cycle.

After reaching the intended prompt just press the MIN or MAX keys 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).

CONFIGURATION PROTECTION

As safety measure, parameter changes can be prevented by a combination of keys, valid for each cycle. The protected parameters can be inspected but not modified.

To protect a cycle press the  and  keys simultaneously for 3 seconds while in the cycle. To unlock the cycle, press  and  for 3 seconds.

The display will briefly flash confirming that the cycle was successfully locked or unlocked.

For further protection, the keypad unlock operation can be disabled by changing the position of an internal strap inside the indicator:

When **PROT** is **OFF**, the user is allowed to lock and unlock the cycles using the keypad as explained above. If **PROT** is **ON**, the cycles lock/unlock operation is disabled.

PROGRAMMING THE INDICATOR

WORK CYCLE

This is the first cycle. At power up the indicator will display the Process Variable (PV). The alarm triggering points are also displayed at this cycle (alarm Setpoints). To advance in this cycle simply press P.

TELA	PROMPT PARAMETER DESCRIPTION
8.8.8.8.8.	**PV Measurement**. Shows the measured variable. For Pt100 or thermocouples the display will show the absolute temperature value. For 4-20 mA, 0-50 mV, 0-5 V and 0-10 mV inputs the display shows the values defined in the "**in.LoL**" and "**in.kiL**" parameters. With the **hold** function programmed the display shows the frozen variable and alternates with the message "**koLd**". Likewise, with ***Peak Hold*** function programmed the high limit is displayed with the "**P.koLd**" 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. This value is used as a reference for differential alarms triggering.
Sp.al1 **Sp.al2** **Sp.al3** **Sp.al4**	**Alarms Set Points 1, 2, 3 and 4** - Defines the operation point of each alarm programmed with "**Lo**" or "**ki**" functions. When an alarm is programmed with a differential function, the alarm setpoint value represents the deviation value of the alarm relative to the reference **Al.ref**.

ALARM CYCLE

fV.al1 **fV.al2** **fV.al3** **fV.al4**	**Alarm Function** - Defines functions for the alarms 1, 2, 3 and 4. **oFF** : Alarm off **iErr** : Broken or Shorted Sensor **Lo** : Low value **ki** : High value **DiF.Lo** : Differential low **DiF.Hi** : Differential high **DiF.ov** : Differential outside the range **DiF.in** : Differential within range
Ky.al1 **Ky.al2** **Ky.al3** **ky.al4**	**Alarm Hysteresis** This is the difference from the measured value to the point where the alarm is turned ON and OFF.
Bl.al1 **Bl.al2** **Bl.al3** **bl.al4**	**Alarm Blocking** Should any alarm condition occur, the alarms can be individually disabled when energizing the indicator.
Al1t1 **Al1t2** **Al2t1** **Al2t2** **Al3t1** **Al3t2** **Al4t1** **Al4t2**	**Alarm Timer** The user can set delayed, momentary or sequential alarms by configuring times T1 and T2 according to **Table 3**. To disable this function just set zero for T1 and T2.

FUNCTION CYCLE

f.fvnc	F **KEY FUNCTION** – Defines functions for the F key. The available options are: **oFF** - Key not used. **Hold** - Hold PV **RSt** - Resets Peak and Valley (MAX and values) **P.koL** - Peak Hold
Dig.in	**Digital Input Function** – Defines the function for the digital input. Refer to item 5.2. Options are: **oFF - kold - rESEt - PkoLd**
filtr	**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 slower the 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 in the programmed engineering unit. For °F measurements the null reference is at 32 °F.
bavd	**Baud Rate** - Serial digital communication speed in **bps**. Programmable: 1200, 2400, 4800, 9600, 19200, 38400 and 57600 bps.
Adres	**Communication Address** - A number that identifies the instrument in a multidrop network.

CONFIGURATION CYCLE

In.typ	**Input Type** - Selects the input signal or sensor type to be connected to the PV terminals. Refer to **Table 1** for options. *Changing the input type causes all other parameters related to PV and alarms to be changed as well, therefore, this parameter shall be the first to be set.*
Dp.pos	**Decimal Point Position** - Defines the decimal point position in the displayed value. It is displayed when linear input types 0-50mV, 4-20 mA, 0-5 V or 0-10 V are selected at the "**in.tYP**" prompt.
Vnit	**Temperature Unit** - Selects °C or °F indication. This prompt is not shown for input types 0-50mV, 4-20 mA, 0-5 V or 0-10 V are selected at the "**in.tYP**" prompt.
s.root	**Square Root** - This prompt is only shown when input types 0-50 mV, 4-20mA and 0-5 V are selected at the "**in.tYP**" prompt. Set "**YES**" and the square root will be applied to the measured value within the limits programmed in "**in.LoL**" and "**in.kiL**". The display will show the low limit (**in.LoL**) value should the input signal be below 1 % of the range.
Scale	**Scale** - Defines the indication range for linear inputs (0-50 mV, -20 mA, 0-5 V and 0-10 V). **0** Configurable indication from – 31000 to + 31000. **1** Configurable indication from 0 to + 60000. **2** Configurable indication from 0 to +120000. Only even values will be displayed (resolution is not improved). The selected scale affects values of PV, alarm setpoints and Offset.
In.lol	**Input Low Limit** - Sets the low limit for input type 0-50 mV, 4-20 mA, 0-5 V or 0-10 V. When the **PV Retransmission** is used this limit defines the corresponding 4 mA (or 0 mA) in relation to the input value.
In.kil	**Input High Limit** - Sets the high limit for input type 0-50 mV, 4-20 mA, 0-5 V or 0-10 V. When the **PV Retransmission** is used this limit defines the corresponding 20mA in relation to the input value.
Ou.lol	**Low Limit for Analog Retransmission** – Defines the PV value that results in a 4 mA (or 0 mA) analog output current.
Ou.kil	**High Limit for Analog Retransmission** – Defines the PV value that results in a 20mA analog output current.
Ovt.ty	**Analog Output Type** - Selects the analog output type to either 0- 20 mA or 4-20 mA.
Ovt.er	**4-20 mA Output behavior in case of failures** – Defines the output as 4-20 mA when there is an error in the indication. **Do** – Applies a value < 4 mA; **UP** – Applies a value > 20 mA

CUSTOMIZED LINEARIZATION CYCLE

Inp.01 **Inp.30**	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. For 0-10 V select 0-5 V.
Ovt.01	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**
ovt.30	**Limits**).

Table 5 shows the sequence of cycles 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
8.8.8.8.8.	*** Fv.al1**	**f.fvn(**	**In.typ**	**Inp.01 -inp.30**	**In.lo(**
Al.ref	*** Df.al1**	**Dig.in**	**Dp.pos**	**OVt.01 - ovt.30**	**In.ki(**
*** Sp.al1**	*** Ky.al1**	**Filtr**	**Vnit**		**Ov.lo(**
	*** Bl.al1**	**Ofset**	**Sroot**		**Ov.ki(**
	*** Al.1t1**	**Bavd**	**Scale**		**(j lo**
	*** Al.1t2**	**adres**	**In.lol**		**k.type**
			In.kil		
			ov.lol		
			Ov.kil		
			OVT.TY		
			OVT.er		

Table 5

CALIBRATION CYCLE

All input and output types are factory calibrated. This cycle should only be accessed by experienced personnel. If this cycle is accidentally accessed do not touch the MIN or MAX keys, just press the P key a few times to go back to the Work Cycle.

In.lo(	**Input Low Calibration** - Sets the Process Variable low calibration (offset). Several key strokes at MAX or MIN might be necessary to increment one digit.
In.ki(	**Input Hi Calibration** - Sets the Process Variable span calibration (gain).
Ov.lo(	**Analog Output Low Calibration** - Sets the analog current output low calibration (offset).
Ov.Ki(	**Analog Output Span Calibration** - Sets the analog current output high calibration (span) of the analog output (20 mA).
(J lo	**Cold Junction Calibration** - Allows the user to calibrate the cold junction temperature (at the indicator input terminals) directly in degrees.
k.type	**Hardware Type** - This parameter adapts the firmware to the actual indicator hardware (optional features) and should not be changed by the user. 2 Alarms .... **3** 2 Alarms and 4-20 mA .... **19** 2 Alarms and RS485.................... **35** 2 Alarms, 4-20 mA and RS485.... **51** 4 Alarms .... **15** 4 Alarmes and 4-20 mA............... **31** 4 Alarmes and RS485 .... **47** 4 Alarmes, 4-20 mA and RS485........... **63**

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
VVVVV	Measured value is above the value allowed for the selected sensor or above the configured input signal limit.
nnnnn	Measured value is below the value allowed for the selected sensor or below the configured 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 ◄ key for about 3 seconds.

The software version of the instrument can be viewed at the time the unit is powered.

When not properly configured, the instrument may show false error messages, particularly those related to the type of input selected.

SPECIAL RECOMMENDATIONS

Should the indicator be repaired, some special handling care should be taken. The device must be withdrawn from the case and immediately placed in an anti-static wrap; protected from heat and humidity.

INPUT CALIBRATION

All inputs are factory calibrated and recalibration should only be done by qualified personnel. If you are not familiar with these procedures do not attempt to calibrate this instrument.

The calibration steps are:

a) Select the input type to be calibrated.

b) Set the desired upper and lower display limits.

c) At the input terminals inject an electrical signal corresponding to a known indication value a little higher than the lower display limit.

d) Select the **inLC** prompt. Through the MIN and MAX keys adjust PV so that it matches the injected signal.

e) Inject a signal that corresponds to a value a little lower than the upper limit of the display.

f) Select the **inkC** prompt. Through the MIN and MAX keys adjust PV so that it matches the injected signal.

g) Repeat steps **c)** to **f)** until no further adjustment is necessary.

Note: When verifications are proceeded, note if the Pt100 excitation/activation current the calibrator requires is compliant to the Pt100 excitation current used in this instrument: 0.750 mA.

SERIAL 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.

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)

Dois parâmetros devem ser configurados para utilização da interface de comunicação serial: o *Baud-Rate* de Comunicação (parâmetro **bavd**) e o Endereço de Comunicação (parâmetro **adres**).

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 N1200 section of our web site – 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 **inkil** 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.

SPECIFICATIONS

DIMENSIONS:.. 48 x 96 x 92 mm (1/16 DIN).
Approximate weight: 250 g

PANEL CUT-OUT:.. 45 x 93 mm (+0.5 -0.0 mm)

TERMINAL CONNECTION: .... 18 screws accepting 6.3 mm fork lugs

POWER: .... 100 to 240 Vac/dc ±10 %, 50/60 Hz
Optional: .... 24 Vac/dc ±10 %
Max. Consumption: .... 7.5 VA

ENVIRONMENTAL CONDITIONS:
Operating temperature: .... 5 to 50 ºC
Maximum RH: .... 80 % up to 30 ºC.
.... For temperatures above 30 ºC, decrease 3 % per ºC.
.... for indoor use; Installation category II, pollution degree 2; altitude < 2000 m

INPUT .... Keyboard selection of input type (refer to **Table 1**)
Internal resolution: .... 128000 levels
Display resolution: 62000
Input sample rate: .... 5 per second
.... 15 to 0-50mV, 4-20 mA, 0-5 V and 0-10 V
Accuracy: .... Thermocouples J, K, T, N: 0.25 % of span ±1 ºC
.... Thermocouple E, R, S, B: 0.25 % of span ±3 ºC
.... Pt100: 0.2 % of span
.... 4-20 mA, 0-50 mV, 0-5 V, 0-10 V: 0.15 % of span
Input impedance: .... 0-50 mV, Pt100 and thermocouples: >10 MΩ
.... 0-5 V, 0-10 V: >1 MΩ
.... 0-20 mA, 4-20 mA: 15 Ω
Pt100 measurement: .... DIN 43760 standard (α=0.00385)
Excitation current: .... 0.750 mA. 3-wire circuit, cable resistance compensation

ANALOG OUTPUT: .... 0-20 mA or 4-20 mA, 550 Ω max.
.... 4000 levels, Isolated

RELAY OUTPUT: .... ALM1, ALM2: SPDT 3 A / 240 Vac (3 A / 30 Vdc Res.)
.... ALM3, ALM4: SPST-NO: 1.5 A / 250 Vac (3 A / 30 Vdc Res.)

EMC : .... EN 61326-1:1997 and EN 61326-1/A1:1998

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

START UP 3 SECONDS AFTER POWER UP.

ORDERING INFORMATION:

N1500 -	4R -	RT -	485 -	24V
A	B	C	D	E

A: Series model: **N1500**
B: Relays outputs: **blank** (2 relays); **4R** (4 relays)
C: Analog output: **RT –** (Retransmission of the input signal) or **Blank**
D: Digital Communication: **485 –** (RS485, ModBus protocol) or **Black**
E: Voltage rating: **blank** (100-240 Vac/dc); **24V** (24 Vdc/ac)