CONTROLLER N1040

USER GUIDE V2.2x D

We Measure, We Control, We Record

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1. SAFETY ALERTS

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 Read the manual fully before installing and operating the device.	**CAUTION OR HAZARD** Risk of electric shock.	**ATTENTION** Electrostatic-sensitive device. Make sure you take the necessary precautions before handling it.

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.

2. INSTALLATION / CONNECTIONS

The controller must be fastened on a panel, following the sequence of steps described below:

- Prepare a panel cut-out according to SPECIFICATIONS.
- Remove the mounting clamps from the controller.
- Insert the controller into the panel cut-out.
- Slide the mounting clamp from the rear to a firm grip at the panel.

2.1 ELECTRICAL CONNECTIONS

The figure below shows the electrical terminals of the controller:

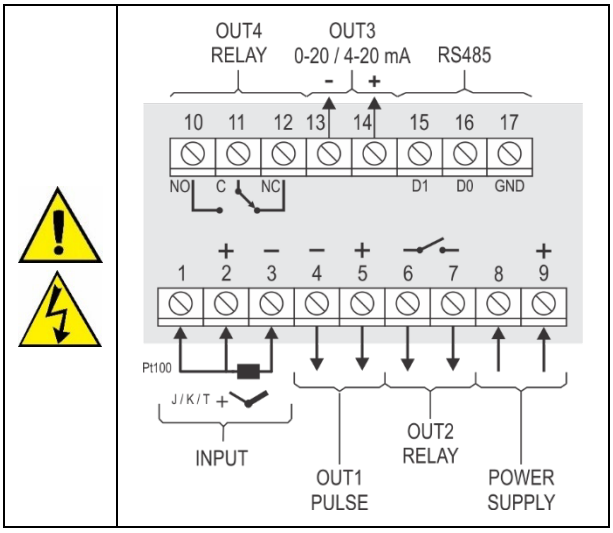


Figure 1

2.2 INSTALLATION RECOMMENDATIONS

- Input signal conductors should run through the plant separate from output and supply conductors. If possible, in grounded conduits.
- The power supply for electronic instruments must come from a network specific to the instrumentation.
- It is recommended to use RC FILTERS (noise suppressors) in contactor coils, solenoids, etc.
- When using relay outputs to control contactors, the **PWM Cycle Time** parameter (**Ct**) must be set to values greater than 10 seconds.
- In control applications, it is essential to consider what can happen when any part of the system fails. The internal devices of the equipment do not guarantee full protection.

3. FEATURES

3.1 INPUT TYPE SELECTION

The table below shows the sensor types accepted and their respective codes and ranges:

TYPE	CODE	MEASUREMENT RANGE
Thermocouple **J**	tc J	Range: -110 to 950 °C (-166 to 1742 °F)
Thermocouple **K**	tc K	Range: -150 to 1370 °C (-238 to 2498 °F)
Thermocouple **T**	tc t	Range: -160 to 400 °C (-256 to 752 °F)
Pt100	Pt	Range: -200 to 850 °C (-328 to 1562 °F)

Table 1

3.2 OUTPUTS

The controller offers two, three or four output channels, depending on the loaded optional features. The output channels are user configurable as **Control Output**, **Alarm 1 Output**, **Alarm 2 Output**, **Alarm 1 OR Alarm 2 Output**, and **LBD (Loop Break Detect) Output**.

OUTPUT **OUT1**	Pulse type output of electrical voltage. 5 Vdc / 50 mA max. Available on terminals 4 and 5.
OUTPUT **OUT2**	SPST-NO relay. Available on terminals 6 and 7.
OUTPUT **OUT3**	SPST-NO relay. Available on terminals 13 and 14 (PRRR Model). Analog Output or Current Output. 0-20 / 4-20 mA, 500 R max. Available on terminals 13 and 14 (PRAR model).
OUTPUT **OUT4**	SPDT relay. Available on terminals 10, 11, and 12.

3.3 CONTROL OUTPUT

It is the output that will command the process actuator (heating resistor, cooling compressor, etc.). The control output can be directed to a relay, an analog output, or even a Pulse type Electrical Voltage output, according to availability.

3.4 ANALOG OUTPUT OR CURRENT OUTPUT

The controller has an analog output of electric current that can perform the following functions:

- Process control output.
- Process PV retransmission output.
- Process SP retransmission output.

As a control output, it relates the MV range (0 to 100 %) to the current range: 4 to 20 mA or 0 to 20 mA.

- 0 % MV determines 4 mA (or 0 mA) on the Analog Output
- 100 % MV determines 20 mA on the Analog Output

As the PV / SP relay output of the process, the electrical current applied to the analog output will be proportional to the ratio between the value of the variable (PV or SP) and the retransmission range defined by parameters rtLL and rthL.

The analog output is electrically isolated from the other controller circuits.

It has a measurement accuracy of 0.25 % of the Operating Range or 0.4 mA.

3.5 ALARM OUTPUT

The controller contains 2 alarms that can be directed (assigned) to any output channel. The alarm functions are described in the table below:

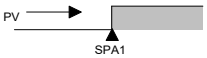
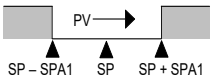
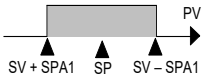
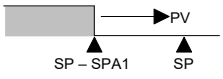
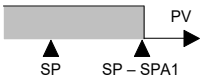
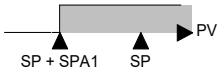
oFF	Output is not used as alarm.	
Lo	Alarm of absolute minimum value. Triggers when the value of measured PV is **below** the value defined for alarm Setpoint (SPA1 or SPA2).	
HI	Alarm of absolute maximum value. Triggers when the value of measured PV is **above** the value defined for alarm Setpoint.	
dIF	Alarm of differential value. In this function the parameters SPA1 and SPA2 represent the deviation of PV in relation to the SP of CONTROL.	
		
	Positive SPA1	Negative SPA1
dIFL	Alarm of minimum differential value. It triggers when the value of PV is **below** the defined point by (using the Alarm 1 as example).	
		
	Positive SPA1	Negative SPA1
dIFH	Alarm of valor maximum differential value. Triggers when the value of PV is **above** the defined point by (using Alarm 1 as example):	
		
	Positive SPA1	Negative SPA1
IErr	Alarms of the Sensor Break (Sensor *Break Alarm*). It is activated when the Input presents problems such as interrupted sensor, bad connection, etc.	

Table 2

Note: Alarm functions on the table below 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 controller. 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 controller input is broken.

3.6 INITIAL BLOCKING OF ALARM

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 enabled only after the occurrence of a non-alarm condition.

The initial blocking is useful, for example, when one of the alarms is configured as a minimum value alarm, causing the activation of the alarm soon upon the process start-up, an occurrence that may be undesirable.

The initial blocking is disabled for the sensor break alarm function IErr (Open sensor).

3.7 SAFE OUTPUT VALUE WITH SENSOR FAILURE

Function that places the control output in a safe condition for the process when an error in the sensor input is identified.

With a fault identified in the sensor, the controller determines the percentage value defined in parameter IEou for the control output. The controller will remain in this condition until the sensor failure disappears. IEou values are only 0 and 100 % when in ON/OFF control mode. For PID control mode, any value in the range from 0 to 100 % is accepted.

3.8 LBD FUNCTION – LOOP BREAK DETECTION

The Lbdt parameter allows you to set a maximum time interval (in minutes) for the process temperature (PV) to react to the command from the control output. If the PV does not react properly within the time interval configured, the controller signals in its display the occurrence of the **LBD** event, which indicates problems in the control loop.

The **LBD** event can also be sent to one of the output channels of the controller. To do this, simply configure the desired output channel with the Ldb function which, in the event of this event, is triggered.

This function is disabled with value 0 (zero).

This function allows the user to detect problems in the installation, such as defective actuators, power supply failure, etc.

3.9 OFFSET

Feature that allows the user to make small adjustment in the temperature indication. Allows correcting measurement differences that appear, for example, when replacing the temperature sensor.

3.10 USB INTERFACE

The USB interface is used to CONFIGURE, MONITOR, or UPDATE the controller FIRMWARE. The user 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 the user to transfer settings between devices and perform backup copies.

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

For MONITORING purposes, the user 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's USB, the controller is recognized as a conventional serial port (COM x).

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

The user should consult the mapping of the Modbus memory in the controller's 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 communication (other device functions may not operate).
3. Run the **QuickTune** software, configure the communication and start recognition of the device.

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

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

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

When MONITORING for prolonged periods of time and with connected inputs and outputs, we recommend using the RS485 interface.

4. OPERATION

The front panel can be seen in the figure below:

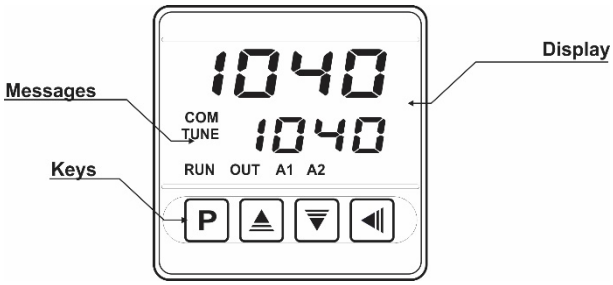


Figure 2

Display: Displays the measured variable, symbols of the configuration parameters and their respective values/conditions.

COM Indicator: Flashes to indicate communication activity in the RS485 interface.

TUNE Indicator: Stays ON while the controller is in tuning process.

OUT Indicator: For relay or pulse control output; it reflects the actual state of the output.

A1 and A2 Indicators: Signalize the occurrence of an alarm situation.

[P] **Key**: Used to walk through the menu parameters.

[▲] **Increment key and** [▼] **Decrement key**: Allow altering the values of the parameters.

[◀] **Back key**: Used to retrocede parameters.

4.1 STARTUP

When the controller is powered up, it displays its firmware version for 3 seconds, after which the controller starts normal operation. The value of PV and SP is then displayed, and the outputs are enabled.

For the controller to operate properly in a process, its parameters need to be configured first, such that it can perform according to the system requirements. The user must be aware of the importance of each parameter and for each one determines a valid condition.

The parameters are grouped in cycles, according to their functionality and operation easiness. The 5 cycles of parameters are:

1 – Operation / 2 – Tuning / 3 – Alarms / 4 – Input / 5 – Calibration

The [P] key is used for accessing the parameters within a cycle.

Keeping the [P] key pressed, at every 2 seconds the controller jumps to the next cycle of parameters, showing the first parameter of each cycle:

PV >> AtUn >> FuA1 >> 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 parameter in a cycle, press [◀].

Each parameter is displayed with its prompt in the upper display and value/condition in the lower display. Depending on the level of parameter protection adopted, the parameter **PASS** precedes the first parameter in the cycle where the protection becomes active. See section CONFIGURATION PROTECTION.

5. PARAMETER DESCRIPTION

5.1 OPERATION CYCLE

PV + SP	**PV Indication screen**. On the higher display (red) the value of the measured variable (PV) temperature is shown. On the lower display (green), the control Setpoint (SP) is shown.
SPA1 **SPA2** *Setpoint Alarm*	Alarm SP. This value defines the alarm activation point. For the alarms set up with the **Differential** functions, these parameters define deviations. This parameter is not used for the alarm function **tErr**. Parameters shown in this cycle only when enabled in the parameters **SP1E** and **SP2E**.

5.2 TUNING CYCLE

AtUn *Auto-tuning*	**AUTO-TUNE**. Enables the auto-tuning function for the PID parameters (**Pb**, **Ir**, **dt**). Defines the control strategy to be taken: **oFF** Turned off (no PID tuning). **FAST** Automatic tuning. **FULL** More accurate automatic tuning.
Pb *Proportional Band*	Proportional Band. Value of the term **P** of the control mode PID, in percentage of the maximum span of the input type. Adjust of between 0 and 500.0 %. **When set to 0, control action is ON / OFF.**
Ir *Integral Rate*	Integral Rate. Value of the term **I** of the PID algorithm, in repetitions per minute (Reset). Adjustable between 0 and 24.00. Displayed only if proportional band ≠ 0.
dt *Derivative Time*	Derivative Time. Value of the term **D** of the control mode PID, in seconds. Adjustable between 0 and 250.0 seconds. Displayed only if proportional band ≠ 0.
Ct *Cycle Time*	Cycle time. Pulse Width Modulation (PWM) period in seconds. Adjustable between 0.5 and 100.0 seconds. Displayed only if proportional band ≠ 0.
HYSt *Hysteresis*	Hysteresis. Hysteresis value for ON / OFF control. Adjustable between 0 and the width of the measurement range of the selected input type.
ACt *Action*	Action control: **rE** Control with **Reverse Action**. Appropriate for **heating**. Turns on the control output when PV is below SP. **dIr** Control with **Direct Action**. Appropriate for **cooling**. Turns on the control output when PV is above SP.
SFSt *Soft Start*	Soft Start Function. Time interval, in seconds, while the controller limits the control output (MV) rising rate. When set to 0, disables the Soft Start function.
out1 **out2** **out3** **out4** *Output*	Assign functions to the Output channels OUT1, OUT2, OUT3, and OUT4: **oFF** Not used. **CtrL** Function as control output. **A1** Function as Alarm 1 output. **A2** Function as Alarm 2 output. **A1A2** Function as Alarm 1 + Alarm 2, simultaneously. **Lbd** Function as an LBD function.
out3 *Output*	On controller models with the analog output feature, the OUT3 configuration options are: **oFF** Not used. **c.0.20** Control output 0 to 20 mA. **c.4.20** Control output 4 to 20 mA. **P.0.20** Retransmission in 0 to 20 mA of the measured temperature value (PV). **P.4.20** Retransmission in 4 to 20 mA of the measured temperature value (PV). **S.0.20** Retransmission in 0 to 20 mA of the Setpoint value (SP). **S.4.20** Retransmission in 4 to 20 mA of the Setpoint value (SP).

5.3 ALARMS CYCLE

FuA1 FuA2 *Function Alarm*	Alarm functions. Defines the functions for the alarms among the options of Table **2**.
SPA1 SPA2 *Setpoint Alarm*	Alarm SP. Value that defines the point of activation of the alarm outputs. For the alarms programmed with the **Differential** functions, these parameters represent the deviations. This parameter is not used for the alarm function **lErr**.
SP1E SP2E *Setpoint Enable*	SP Enable. Configures display of **SPA1** and **SPA2** also in the Operation Cycle: **YES** **SPA1** / **SPA2** are displayed in the Operation Cycle. **no** **SPA1** / **SPA2** are not displayed in the Operation Cycle.
bLA1 bLA2 *Blocking Alarm*	Blocking alarms. **YES** Enables initial blocking. **no** Inhibits initial blocking.
HYA1 HYA2 *Hysteresis Alarm*	Alarm hysteresis. 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*	Allows visual signalization of an alarm occurrence by flashing the indication of PV in the Operation Cycle: **YES** Enables alarm signaling when flashing PV. **no** Disables alarm signaling when flashing PV.

5.4 INPUT CYCLE

tYPE *Type*	Input Type. Selects the input signal type to be connected to the process variable input. Refer to **Table 1**. (J) **tc J** -110 to 950 °C | -166 to 1742 °F (K) **tc K** -150 to 1370 °C | -238 to 2498 °F (T) **tc t** -160 to 400 °C | -256 to 752 °F (Pt100) **Pt** -200 to 850 °C | -328 to 1562 °F
FLtr *Filter*	Digital Input Filter. Used to improve the stability of the measured signal (PV). Adjustable between 0 and 20. In 0, it means filter turned off. In 20, it means maximum filter. The higher the filter value, the slower is the response of the measured value.
dPPo *Decimal Point*	Decimal point position. When configuring the input (**tYPE**) with temperature sensors (J, K, Pt100, etc), in addition to the integer part of the measurement, the **dPPo** parameter will only display decimal values (XXX.X). When configuring the input (**tYPE**) with linear signals (mA, mV, V), the **dPPo** parameter determines the position of the decimal point of the measured value (XXXX, XXX.X, XX.XX, X.XXX).
unit *Unit*	Selects display indication for degrees Celsius or Fahrenheit: **C** Indication in Celsius. **F** Indication in Fahrenheit.
OFFS *Offset*	Offset value to be added to the PV reading to compensate sensor error. Default value: Zero.
SPLL *SP Low Limit*	SP Low Limit. Defines the SP lower limit of.
SPHL *SP High Limit*	SP High Limit. Defines the upper limit for adjustment of SP.
rt.LL *Retransmission Low Limit*	Allows you to set the lower limit of the SP or PV retransmission range on OUT3. Parameter displayed only when selecting one of the Retransmit functions available for the Analog Output.
rt.HL *Retransmission High Limit*	Allows you to set the upper limit of the SP or PV retransmission range on OUT3. Parameter displayed only when selecting one of the Retransmission functions available for the Analog Output.
Lbdt *Loop Break Detection time*	Loop Break Detection Time. Time interval for the LBD function. Defines the maximum interval of time for the PV to react to a control command. In minutes.
IE.ou	Percentage value to be applied to the output on any failure of the sensor that is connected to the controller input.
bAud *Baud Rate*	Digital communication Baud Rate selection. In kbps. With the following speeds available: 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, and 115.2. Parameter shown only on models with serial communication.

PrtY *Parity*	Parity of serial communication: nonE Without parity. EvEn Even parity. Odd Odd parity. Parameter shown only on models with serial communication.
Addr *Address*	Communication address. Number that identifies the controller in the serial communication network, between 1 and 247. Parameter shown only on models with serial communication.

5.5 CALIBRATION CYCLE

All types of input are calibrated in the factory. In case recalibration is required; it shall be conducted by a specialized professional.

In case this cycle is accidentally accessed, do not perform alteration in its parameters.

PASS *Password*	Password. This parameter is presented before the protected cycles. See item Protection of Configuration.
cALb *Calibration*	Calibration. Enables the possibility for calibration of the indicator. When the calibration is not enabled, the related parameters are hidden.
inLC *Input Low Calibration*	Input Low Calibration. Enter the value corresponding to the low scale signal applied to the analog input.
inhC *Input High Calibration*	Input High Calibration. Enter the value corresponding to the full-scale signal applied to the analog input.
AoLC *Analog Output Low Calibration*	Analog Output Low Calibration. Analog Output (AO) user calibration. Declaration of the electrical current value present at the analog output. Low point adjustments. See MAINTENANCE chapter.
AoHC *Analog Output High Calibration*	Analog Output High Calibration. Analog Output (AO) user calibration. Declaration of the electrical current value present at the analog output. High point adjustments. See MAINTENANCE chapter.
rStr *Restore*	Restore. Restores the factory calibration for all inputs and outputs, disregarding modifications conducted by the user.
CJ *Cold Junction*	Cold Junction. This screen is for information purposes only.
PASC *Password Change*	Password Change. Allows defining a new access password, always different from zero
Prot *Protection*	Protection. Sets up the Protection Level. See **Table 3**.

6. CONFIGURATION PROTECTION

The controller provides means for protecting the parameters' configurations, not allowing modifications to the parameter values, avoiding tampering or improper manipulation.

The parameter **Protection** (*Prot*), in the Calibration Cycle, determines the protection strategy, limiting the access to levels, as shown in the table below:

PROTECTION LEVEL	PROTECTION CYCLES
1	Only the Calibration cycle is protected.
2	Calibration and Input cycles are protected.
3	Calibration, Input, and Alarms cycles are protected.
4	Calibration, Input, Alarms, and Tuning cycles are protected.
5	All cycles are protected, but the SP screen in the Operation Cycle.
6	All cycles are protected, including SP.

Table 3

6.1 ACCESS PASSWORD

The protected cycles, when accessed, request the user to provide the **Access Password** for granting permission to change the configuration of the parameters on these cycles.

The prompt *PASS* precedes the parameters on the protected cycles. If no password is entered, the parameters of the protected cycles can only be visualized.

The Access Password is defined by the user in the parameter **Password Change** (*PASC*), present in the Calibration Cycle.

The factory default for the password code is 1111.

6.2 PROTECTION ACCESS PASSWORD

The protection system built into the controller blocks for 10 minutes the access to protected parameters after 5 consecutive frustrated attempts to guess the correct password.

6.3 MASTER PASSWORD

The Master Password is intended for allowing the user to define a new password in the event of it being forgotten. The Master Password does not grant access to all parameters, only to the **Password Change** parameter (*PASC*). After defining the new password, the protected parameters may be accessed (and modified) using this new password.

The master password is made up by the last three digits of the serial number of the controller **added** to the number 9000. As an example, for the equipment with serial number 07154321, the master password is 9 3 2 1.

Controller serial number is displayed by pressing ◀ for 5 seconds.

7. DEFINITION OF PID PARAMETERS

During the process of determining automatically the PID parameters, the system is controlled in **ON / OFF** in the programmed Setpoint. The auto-tuning process may take minutes to be completed, depending on the system. The steps for executing PID auto-tuning are:

- Select the process Setpoint.
- Enable auto-tuning at the parameter **AtUn**, selecting **FASt** or **FULL**.

The option **FASt** performs the tuning at the minimum possible time, while the option **FULL** gives priority to accuracy over the speed.

The flag **TUNE** remains lit during the whole tuning phase. The user must wait for the tuning to be completed before using the controller.

During the auto tuning period the controller will impose oscillations on the process. PV will oscillate around the programmed set point and controller output will switch on and off many times.

If the tuning does not result in a satisfactory control, refer to the table below for guidelines on how to correct the behavior of the process:

PARAMETER	VERIFIED PROBLEM	SOLUTION
Band Proportional	Slow answer	Decrease
	Great oscillation	Increase
Rate Integration	Slow answer	Increase
	Great oscillation	Decrease
Derivative Time	Slow answer or instability	Decrease
	Great oscillation	Increase

Table 4

8. MAINTENANCE

8.1 PROBLEMS WITH THE CONTROLLER

Connection errors and inadequate programming are the most common errors found during the controller operation. A final revision may avoid loss of time and damage.

The controller displays messages to help the user identify problems:

MESSAGE	PROBLEM DESCRIPTION
----	Open input. No sensor or signal.
nnnn	Input value above limit or open sensor.
uuuu	Input value below limit or open sensor.
Err 1 Err6	Connection and/or configuration problems. Check the wiring and the configuration.

Table 5

Other error messages may indicate hardware problems requiring maintenance service.

8.2 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:

1. Configure the input type to be calibrated in the **tYPE** parameter.
2. Configure the lower and upper limits of indication for the maximum span of the selected input type.
3. Go to the Calibration Cycle.
4. Enter the access password.
5. Enable calibration by setting **YES** in **CAL Ib** parameter.
6. Using an electrical signals simulator, apply a signal a little higher than the **low** indication limit for the selected input.
7. Access the **InLC** parameter. With the ▲ and ▼ keys, adjust the display reading such as matching the applied signal. Then press the P key.
8. Apply a signal that corresponds to a value a little lower than the **upper** limit of indication.
9. Access the **InhC** parameter. With the ▲ and ▼ keys, adjust the display reading such as matching the applied signal.
10. Return to the Operation Cycle.
11. Check the resulting accuracy. If it is not good enough, repeat the procedure.

Note: When checking the controller 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 controller.

8.3 ANALOG OUTPUT CALIBRATION

1. Set the PV retransmission type in the OUT3 parameter.
2. Connect a milliampere meter to terminals 13 and 14 of the analog output.
3. Enter the Calibration Cycle.
4. Select parameter **AoLC**.
5. Press the ▲ and ▼ keys and observe the value displayed by the milliampere meter.
6. Use the ▲ and ▼ keys to change the controller display to the value of the current indicated on the milliampere meter.
7. Select the screen **AoHC**.
8. Press the ▲ and ▼ keys and observe the value shown by the milliampere meter.
9. Use the ▲ and ▼ keys to change the controller display to the value of the current indicated on the milliampere meter.
10. Exit the Calibration Cycle.
11. Validate the calibration performed.

9. SERIAL COMMUNICATION

The controller can be supplied with an asynchronous RS485 digital communication interface for master-slave connection to a host computer (master).
The controller works as a slave only and all commands are started by the computer which sends a request to the slave address. The addressed unit sends back the requested reply.
Broadcast commands (addressed to all indicator units in a multidrop network) are accepted but no reply is sent back in this case.

9.1 FEATURES

- Signals compatible with RS485 standard. Modbus (RTU) Protocol. 2-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: Maximum 2 ms after the 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 RS485 signals are:

D1	**D**	**D +**	**B**	Bi-directional data line.	Terminal 15
D0	$\overline{D}$	**D -**	**A**	Bi-directional inverted data line.	Terminal 16
C				Optional connection that improves the performance of communication.	Terminal 17
GND					

Table 6

9.2 PARAMETER CONFIGURATION

You must configure the following parameters to use the serial type:

bAud Communication speed.
PrtY Communication parity.
Addr Communication address for the controller.

9.3 COMMUNICATION PROTOCOL

The Modbus 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:

03 - *Read Holding Register*

06 - *Preset Single Register*

05 - *Force Single Coil*

9.4 HOLDING REGISTERS TABLE

Follows a description of the usual communication registers. For full documentation download the **Registers Table for Serial Communication** in the product section of **NOVUS** website (www.novusautomation.com).

All registers are 16-bit signed integers.

ADDRESS	PARAMETER	REGISTER DESCRIPTION
0000	Active SP	Read: Active control SP (main SP, from ramp and soak or from remote SP). Write: To main SP. Range: from **SPLL** to **SPHL**.
0001	PV	Read: Process Variable. Write: Not allowed. Range: Minimum value is the one configured in **SPLL** and the maximum value is the one configured in **SPHL**. Decimal point position depends on **dPPo** value. When reading a temperature, the value read is always multiplied by 10, independently of **dPPo** value.

ADDRESS	PARAMETER	REGISTER DESCRIPTION
0002	MV	Read: Output Power in automatic or manual mode. Write: Not allowed. See address 29. Range: 0 to 1000 (0.0 to 100.0 %).

Table 7

10. IDENTIFICATION

N1040 -	A -	B -	C

A: Outputs features:

PR: OUT1 = Pulse / OUT2 = Relay

PRRR: OUT1 = Pulse / OUT2 = OUT3 = OUT4 = Relay

PRAR: OUT1 = Pulse / OUT2 = Relay / OUT3 = 0-20 / 4-20 mA / OUT4 = Relay

B: Serial communication:

Blank: Basic version, without serial communication.

485: Version with RS485 serial, Modbus protocol.

C: Power supply:

Blank: Standard model
100~240 Vdc / 24 Vac; 50~60 Hz

24V: 24V Model
12~24 Vdc / 24 Vac; 50~60 Hz

11. SPECIFICATIONS

DIMENSIONS: ..... 48 x 48 x 80 mm (1/16 DIN)

Panel cut-out: ..... 45.5 x 45.5 mm (+0.5 -0.0 mm)

Approximate weight: ..... 75 g

POWER SUPPLY:

Standard model: ..... 100 to 240 Vac (±10 %), 50/60 Hz

..... 48 to 240 Vdc (±10 %)

24V model: ..... 12 to 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 % for each °C.

Internal use | Category of installation II | Pollution degree 2 | Altitude < 2000 meters.

INPUT ..... Thermocouples **J**, **K**, **T**, and **Pt100** (according to **Table 1**)

Display resolution: ..... 0.1 and 1(12000 levels, from -1999 up to 9999)

Internal resolution: ..... 32767 levels (15 bits)

Rate of input reading: ..... up 10 per second (*)

Accuracy (**): ..... Thermocouples J, K, T: 0.25 % of the span ±1 °C (***)

..... Pt100: 0.2 % of the span

Input impedance: ..... Pt100 and thermocouples: > 10 MΩ

Pt100 measurement: ..... 3-wire type, (α=0.00385)

With compensation for cable length, excitation current of 0.170 mA.

All input types are factory calibrated. Thermocouples according to NBR 12771/99 standard; Pt100 NBR 13773/97.

(*) Value adopted when the Digital Filter parameter is set to 0 (zero) value. For Digital Filter values other than 0, the Input Reading Rate value is 5 samples per second.

(**) To check the accuracy of temperature measurements, you must consider the specifications of the sensor used.

(***) To check the accuracy of measurements when using thermocouples, you must observe the heating time of 20 minutes.

OUTPUTS:

OUT1: ..... Voltage pulse, 5 V / 50 mA max.

OUT2: ..... SPST relay; 1.5 A / 240 Vac / 30 Vdc

OUT3 (PRRR): ..... SPST relay; 1.5 A / 240 Vac / 30 Vdc

OUT3 (PRAR): ..... 0-20 mA or 4-20 mA

..... 500 Ohms max.; 12000 levels; Isolated

..... Accuracy: 0.25 % F.S. (****)

OUT4: ..... SPDT relay; 3 A / 240 Vac / 30 Vdc

PWM PROGRAMABLE CYCLE: ..... From 0.5 up to 100 seconds / 0.5 ms resolution

FRONT PANEL: ..... IP65, Polycarbonate (PC) UL94 V-2

HOUSING: ..... IP20, ABS+PC UL94 V-0

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

EMISSION: CISPR11/EN55011

IMMUNITY: ..... EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, and EN61000-4-11

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

SPECIFIC CONNECTIONS FOR TYPE FORK TERMINALS.

PROGRAMMABLE CYCLE OF PWM: From 0.5 up 100 seconds.

STARTS UP OPERATION: After 3 seconds connected to the power supply.

CERTIFICATIONS:

(****) F.S.= Full scale. Maximum range of the sensor used.

12. WARRANTY

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