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N960 CONTROLLER

USER GUIDE V4.0x I

novus
We Measure, We Control, We Record

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1 SAFETY ALERTS

The following symbols are used on the equipment and throughout this manual to draw the user's attention to important information related to the safety and use of the equipment.

		
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 recommendations appearing in this manual must be followed to ensure personal safety and prevent damage to the instrument or system. If the instrument is used in a manner other than that specified in this manual, the device safety-protections may not be effective.

2 PRESENTATION

The **N960** temperature controller replaces obsolete potentiometric controllers, combining simple operation with the high precision of a PID controller. It has a dual display, with an 18 mm display for measuring variables and a 13 mm display for Setpoints.

N960 is the ideal device for applications that require a temperature controller with larger digits that make it easier to view variables from a distance.

3 RESOURCES

3.1 INPUT

The table below shows the types of temperature sensors accepted by the controller and the respective code used to configure it:

TYPE	CODE	RANGE
J	tc J	Range: -110 to 950 °C (-166 to 1742 °F)
K	tc K	Range: -150 to 1370 °C (-238 to 2498 °F)
T	tc t	Range: -160 to 400 °C (-256 to 752 °F)
N	tc n	Range: -270 to 1300 °C (-454 to 2372 °F)
R	tc r	Range: -50 to 1760 °C (-58 to 3200 °F)
S	tc S	Range: -50 to 1760 °C (-58 to 3200 °F)
B	tc b	Range: 400 to 1800 °C (752 to 3272 °F)
E	tc E	Range: -90 to 730 °C (-130 to 1346 °F)
Pt100	Pt	Range: -199.9 to 850 °C (-328 to 1562 °F)

Table 1

3.2 CONTROL OUTPUT AND ALARM (OUT)

The controller can have 3 outputs, which can be used as control or alarm outputs. These outputs are identified in the back panel as **OUTA**, **OUTB** and **OUTD**.

The type of output (control or alarm) must be set during configuration. The configuration of each output is unique and set in the following parameters: **out.A**, **out.b** and **out.d**.

- **Control output:** The control output is used to control the process temperature. It is possible to set different outputs as control outputs. However, when configuring output **OUTD** as **Analog Control Output**, other control outputs will be disabled.
- **Alarm output:** The alarm output is used to signal and/or ensure the safety of the process. For outputs set as alarm output, you must set an alarm function (see chapter ALARM FUNCTION DESCRITION).

3.3 USB INTERFACE

The USB interface is used to CONFIGURE, MONITOR or UPDATE the controller FIRMWARE. You should use **QuickTune**, 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, it is possible to use **QuickTune** to update the firmware (internal software) of the controller via USB interface.

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

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

You 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 equipment 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 functions may not operate).
3. Run **QuickTune**, configure the communication and start the process to recognize the equipment.

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 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.

4 INSTALLATION AND CONNECTIONS

4.1 PANEL MOUNTING

The equipment should be fixed to a panel, following the sequence of steps below:

- Make a cutout in the panel according to the Specifications.
- Remove the fixing clip from the controller.
- Insert the controller into the cutout from the front of the panel.
- Replace the clip on the controller, pressing until it is well fixed.

4.1.1 INSTALLATION RECOMMENDATIONS

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

4.2 ELECTRICAL CONNECTIONS

The figure below shows the connections on the back panel of the controller:

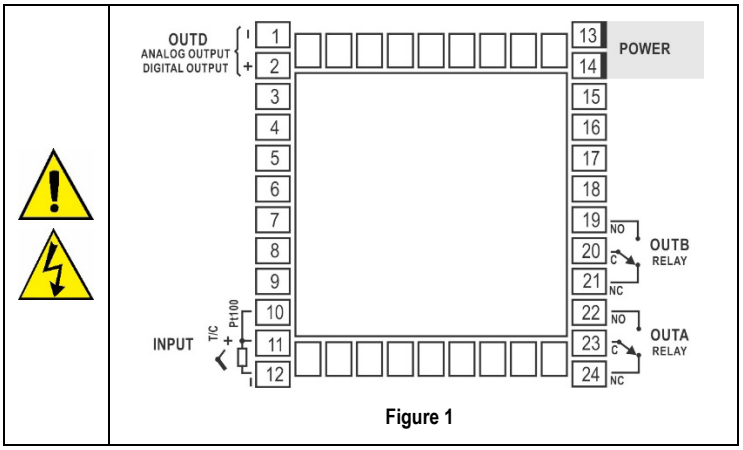


Figure 1

Thermocouples must be connected between pins 11 and 12. The extension cable positive must be connected to terminal number 11.

Pt100 must be connected in 3 wires to terminals 10, 11 and 12. For Pt100 in 2 wires, terminals 10 and 11 must be interconnected. For adequate compensation of the cable length, the conductors of this cable must have the same section (gauge).

5 OPERATION

5.1 INICIALIZATION

Prior to the first operation, the controller should be fully configured. You must set a condition for each parameter, such as the type of temperature sensor to be used (**tYPE**), process temperature desired (**SP**), temperature values for alarms (**A1SP** and **A2SP**), etc.

The configuration can be performed directly on the controller or through the USB interface. The **QuickTune** software (free of charge) is the tool to manage configuration. Connected to the USB of a Windows computer, the controller is recognized as a serial communication port (COM) running with a Modbus RTU protocol.

When using the USB interface, even if the equipment is disconnected from the power supply, the configuration can be saved in a file and repeated in other equipment that requires the same configuration.

5.2 PARAMETER CONFIGURATION

The parameters are organized in cycles (parameters groups):

- Operation cycle
- Tuning cycle
- Program cycle
- Input cycle
- Calibration cycle

When turned on, the controller displays the first screen of the Operation cycle. On the red display (upper), it shows the measured temperature value (PV). On the green display (lower), it shows the process Setpoint value (temperature desired for the process). During operation, the controller remains showing this screen. To access the other screens of this cycle, just press [P].

You can access the other cycles to change the configuration. To access them, just keep [P] pressed for approximately 3 seconds. After this time, the controller will show the first parameter of the next cycle. By keeping the key pressed for more than 3 seconds, it is possible to access the next cycle.

At the desired cycle, just release [P]. By pressing [P] again, you can access the other parameters of this cycle. Use [◄] to return parameters within the cycle.

The upper display shows the parameter, and the lower display shows the value for this parameter. Use [▲] and [▼] to change these values.

After the last parameter of a cycle, the controller will return to the Operation cycle, displaying the process temperature and SP. When the keyboard remains inactive for more than 20 seconds, the controller will also return to the Operation cycle.

The value of the changed parameter is saved in permanent memory. It will be used by the controller when going to the next parameter or if you do not press any key for 20 seconds.

6 CONFIGURATION PARAMETERS

6.1 OPERATION CYCLE

TEMPERATURE INDICATION Control Setpoint	Temperature indication (PV) and control Setpoint. When turned on, the controller indicates the process temperature on the upper display. The lower display shows the SP value, which is the desired temperature for the process.
rAtE *Rate*	Temperature increase rate. Allows you to define the increase or decrease feature of the process temperature, from the current value up to the value programmed in SP. The rate is defined in degrees per minute. Adjustable from 0.0 to 100.0 °C per minute. Function available when the **rAtE** option is selected in the **Pr.tY** parameter of the Input cycle.
t SP	Soak time. Allows you to set the time interval that the process must remain in the temperature defined in SP. In minutes. Adjustable from 0 to 9999. Function available when the **rAtE** option is selected in the **Pr.tY** parameter of the Input cycle.
E Pr *Enable Program*	Program execution. Allows you to define the ramps and soaks program to be executed: **YES** Executes program. **no** Does not execute any program. With the outputs are enabled (**run** = **YES**), the selected program immediately enters in execution. Function available when the **Pr** option is selected in the **Pr.tY** parameter of the Input cycle.
run *Run*	Allows you to enable or disable the action of the controller over the process. It acts as a switch, turning the controller on or off. **YES** Outputs enabled. **no** Outputs disabled.

6.2 TUNING CYCLE

AtUn *Auto Tune*	Allows you to enable the automatic tuning of the PID parameters (**Pb**, **Ir**, **dt**). See chapter DEFINITION OF PID PARAMETERS. **YES** Run the Auto-tuning. **no** Does not run the auto-tuning.
Pb *Proportional Band*	Proportional band. Allows you to set the value of 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, the control mode is **ON / OFF**.
Ir *Integral Rate*	Integral rate. Allows you to set the value of term **I** of the control mode PID. In repetitions per minute. Adjustable between 0.00 and 55.20. This constant is not used when the controller is set to **ON / OFF** control mode (**Pb** = **0**).
dt *Derivative Time*	Derivative time. Allows you to set the value of term **D** of the control mode PID. In seconds. Adjustable between 0 and 250. This constant is not used when the controller is set to **ON / OFF** control mode (**Pb** = **0**).
Ct *Cycle Time*	Cycle time. Allows you to set the Pulse Width Modulation (PWM) period. In seconds. Adjustable between 0.5 and 99.99. This constant is not used when the controller is set to **ON / OFF** control mode (**Pb** = **0**).
HySt *Hysterisis*	Control hysteresis. Allows you to set the hysteresis for **ON / OFF** control (set in temperature units). This parameter is only used when the controller is in **ON / OFF** control mode (**Pb** = **0**).
A1SP **A2SP** *Alarm SP*	Setpoint for alarm 1 and 2. Allows you to set the temperature value to trigger alarm 1 and 2.

6.3 PROGRAMA CYCLE

PtoL *Program Tolerance*	Allows you to set the maximum admitted deviation of PV with respect to SP. If exceeded, the program execution is suspended (the internal timer freezes) until the deviation be returns within the defined tolerance. The value 0 disables the function.
PSP0 **PSP9** *Program SP*	Program SPs. From 0 to 9. Group of 10 values of SP that define the Ramp and Soak profile segments.
Pt 1 **Pt9** *Program Time*	Time intervals of the program segments. Allows you to set the duration of each of the 9 program segments. Adjustable between 0 and 9999 minutes.
PE 1 **PE9** *Program event*	Program Segment Alarm (Event Alarm). Allows you to define which alarm must be triggered when running a certain program segment: **oFF** It does not trigger any alarm in this segment. **A 1** It triggers alarm 1 when the program reaches this segment. **A2** It triggers alarm 2 when the program reaches this segment. **A 1A2** It triggers alarms 1 and 2 when the program reaches this segment. The alarms chosen must have their function configured as **rS**.
rPtP *Repeat Program*	Allows you to define the number of times the program must be REPEATED, besides the initial execution. Adjustable between 0 and 9999 times. After the last execution, all controller outputs are turned off (**run** =**oFF**).

6.4 INPUT CYCLE

tYPE *Type*	**Input type.** Allow you to select the type of temperature sensor to be used. See section INPUT. This must be the first parameter to be configured.
dPPo *Decimal Point*	Decimal point position. Allows you to define the position of the decimal point in the display. 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).
un it *Unit*	Unit. Allows you to define the indication unit: **C** Celsius (°C) degrees. **F** Fahrenheit (°F) degrees.
ACt *Action*	Allows you to define a control action: **rE** Reverse action. Suitable for heating. **d ir** Direct action. Suitable for cooling.
outA **outb** **outd**	Allows you to define the OUTA, OUTB and OUTD function: **oFF** Output not used. **Ctr** Output defined as control output. **AL 1** Output defined as alarm output 1. **AL2** Output defined as alarm output 2. **C.020** Output defined as control output 0-20 mA (only for **OUTD**). **C.420** Output defined as control output 4-20 mA (only for **OUTD**).
F.Fnc	Allows you to define a function for the **F** key: **oFF** Not used / No function assigned. **run** Commands control and alarm outputs (function of the **run** parameter). **HPrG** Interrupts the execution of the ramp and soak program. **EPr** Triggers the execution of the ramp and soak program.
SPLL *SP Low Limit*	Setpoint low limit. Allows you to select the minimum adjustment for parameters relative to the SP (**SP**, **A 1SP**, **A2SP**).
SPHL *SP High Limit*	Setpoint high limit. Allows you to select the maximum adjustment for parameters relative to the SP (**SP**, **A 1SP**, **A2SP**).
oFFS *Offset*	PV Offset. Allows you to add a value to PV to generate an indication displacement.
A 1Fu **A2Fu** *Alarm Function*	Allows you to define a function for alarms 1 and 2. See chapter ALARM FUNCTION DESCRIPTION.

A 1HY A2HY *Alarm Hysteresis*	Alarm hysteresis 1 and 2. Allows you to define the difference between the measured value when the alarm is activated and the value that is deactivated.
A 1bL A2bL *Alarm Blocking*	Allows you to set the Initial Alarm block: YES It enables the initial block. no It does not enable the initial block.
PrtY *Program Type*	Type of program to be used by controller: nonE It does not use any type of program. rAtE It uses ramp to soak function. ProG It uses a complete Ramp and Soak program.

6.5 CALIBRATION CYCLE

All types of input and output are calibrated at the factory. If it is required, recalibration must be performed by a specialist. If this cycle is accessed accidentally, pass through all parameters without making changes to their values.

PASS *Password*	Allows you to enter the Access Password. This parameter is presented before the protected cycles. See chapter CONFIGURATION PROTECTION.
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.
outC *Output Low Calibration*	Output Low Calibration. Enter of the value measured at the analog output.
ouHC *Output High Calibration*	Output High Calibration. Enter of the value measured at the analog output.
rStr *Restore*	Allows you to restore the factory calibration for all input, analog output and remote SP.
CJ *Cold Junction*	Allows you to adjust the Cold Junction temperature value.
PASC *Password Change*	Allows you to set a new access password, always different from 0.
Prot *Protection*	Allows you to define the protection level. See chapter CONFIGURATION PROTECTION.

7 CONFIGURATION PROTECTION

The controller allows you to protect its configuration, preventing undue changes. In the Calibration cycle, the **Protection** parameter (**Prot**) allows you to define the protection cycle to be adopted, limiting access to the cycles, as shown in the table below:

PROTECTION CYCLE	PROTECTION CYCLES
1	Only the Calibration cycle is protected.
2	Input and Calibration cycles.
3	Program, Input and Calibration cycles.
4	Tuning, Program, Input and Calibration cycles.
5	Operation (except SP), Tuning, Program, Input and Calibration.
6	All cycles are protected.

Table 2

7.1 ACCESS PASSWORD

To access the Calibration cycle, a password is required. If entered correctly, it allows changing the configuration of the parameters of these cycles, including the **Protection** parameter (**Prot**).

You can set the password in the **Password Change** parameter (**PASC**), which is also present in the Calibration cycle.

The controllers leave the factory with the password set to 1111.

7.2 PROTECTION ACCESS PASSWORD

The controller has a security system that helps prevent the entry of numerous passwords to guess the correct password. Once 5 consecutive invalid passwords are identified, the controller stops accepting passwords for 10 minutes.

7.3 MASTER PASSWORD

If you forget the password, you can use the Master Password feature. When entered, this password gives access and allows changing the **Password Change** parameter (**PASC**). This makes it possible to set a new password for the controller.

The master password is formed by the last 3 digits of the controller serial number **plus** the number 9000.

Example: For a device with serial number 07154321, the master password is 9321.

8 PROGRAMS

There are 2 ways to run programs on the controller. The **Program Type** (**Pr.tY**) parameter allows you to choose between **Ramp to Soak** (**rAtE**) and a complete **Ramp and Soak** program (**ProG**). You can also choose not to run any type of program (**nonE**).

The controller displays the configuration parameters according to the user's selection.

8.1 RAMP TO SOAK PROGRAM

Available when selecting the **rAtE** option in the **Pr.tY** parameter.

The controller allows the process temperature to vary gradually from an initial value to a specified final value, determining a Ramp-like behavior. The initial value of the Ramp will always be the process initial temperature (PV). The final value will always be the value defined in SP.

User determines the increase (or decrease) speed of the ramp in the **rAtE** parameter, which defines a temperature variation rate in **degrees per minute**. To disable the Ramp function, program the value 0.0.

When the SP value is reached, the controller starts to control the process in SP (level) by an interval of time or indefinitely.

The **t SP** parameter, adjustable between 0 and 9999 minutes, determines the level duration. At the end of the level, the control is disabled (**run** = **no**) and all outputs are turned off. When programing the **t SP** parameter with value 0, the control continues indefinitely without time limit.

An alarm can be associated at the end of the soak. The **End.t** alarm function determines that an alarm is activated at the end of the soak. Valid only with **t SP** ≠ 0.

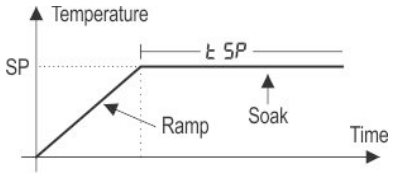


Figure 2

Upon returning from a power failure, the controller automatically restarts the execution of the **Ramp to Soak** function. If the PV value is smaller than the SP value, the Ramp restarts at this point until it reaches SP. If the temperature is equal to SP, Soak execution is restarted.

8.2 COMPLETE RAMPS AND SOAKS PROGRAM

Available when selecting the **ProG** option in the **Pr.tY** parameter.

The controller allows you to elaborate one temperature ramp and soak program. This program is created from the SP value definition and time intervals, defining up to 9 program segments. The figure below shows a program model with 9 segments:

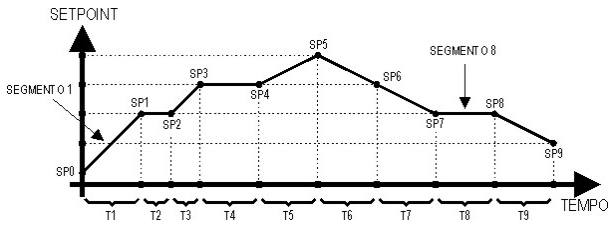


Figure 3

The program created is permanently stored in the controller's memory. It can be modified freely, executed when necessary and repeated as often as necessary.

To execute a program:

1) Turn off outputs (**run** = **no**).

2) Enable execution of parameter **EPr** = **YES**.

3) Trigger start turning on outputs (**run**= **YES**).

Once a program is initiated, the controller starts to automatically generate the SP values defined for each program segment. SP adjustment in the indication screen remains blocked.

8.3 PROGRAM TOLERANCE FUNCTION (PtoL)

The **Program Tolerance** (**PtoL**) allows you to define the maximum allowable error between PV and SP when running a program. If this limit is exceeded, the time counting of the segment (Pt1…Pt9) will be paused until the error falls back within the specified tolerance.

When configuring it with a value other than 0, you will indicate that PV accuracy should take precedence over the programmed time values.

When configuring it with 0 (**PtoL**= **0**), the controller will run the defined program without regard to any discrepancies between PV and SP, thus prioritizing the program's runtime.

8.4 PROGRAMS WITH FEW SEGMENTS

To run a program with fewer segments, simply set the time interval of the segment immediately following the last desired segment to 0.

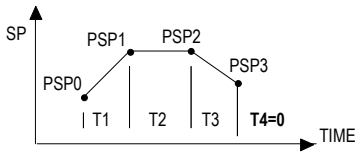


Figure 4

8.5 SUCCESSIVE REPETITIONS OF A PROGRAM

The configured program can be repeated multiple times, restarting immediately at the end of each run. The **Repeat Program (rPtP)** parameter, found in the Program cycle, allows you to configure how many additional executions should occur beyond the initial run. When setting the value to 0, the program will only be executed once.

Important: After the final execution, all outputs are turned off and the run parameter switches to oFF.

9 DEFINITION OF PID PARAMETERS

During the automatic tuning, the process is controlled in **ON / OFF** mode in the programmed Setpoint (SP). The automatic tuning may take many minutes to be concluded, particularly in slow processes. Some recommendations for the automatic tuning process are:

- Program SP to the value desired for the process.
- On the **AtUn** screen, enable automatic tuning by selecting **YES**.
- On the **run** screen, program the value **YES**.

The **TUNE** indicator on the display stays lit until the completion of the **automatic tuning** process.

During the execution of automatic tuning, large oscillations can be induced in the process around the set point. Check if the process supports these oscillations.

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

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

Table 3

10 ALARM FUNCTION DESCRIPTION

The minimum and maximum alarms are used to signalize extreme temperature values. These extreme values are defined on the **A1SP** and **A2SP** screens.

Differential alarms are used to signalize deviations between temperature and Setpoint control (SP). Values defined by user on the **A1SP** and **A2SP** screens represent the values of these deviations.

Initial blocking prevents alarm activation when the controller is turned on until the temperature reaches the SP value for the first time.

The error alarm in the sensor allows the controller to signalize errors in the sensor.

The **Level End** function (**End.t**) determines that the alarm will be activated at the end of the soak.

With using the **Event Alarm** function, an alarm is activated during execution of a certain program segment.

The table below illustrates the operation of each alarm function, using alarm 1 as an example, and presents its identification code on the **A1Fu** e **A2Fu** screens.

Using Alarm 1 as an example.

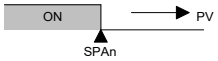
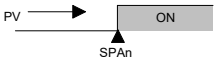
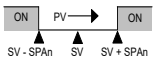
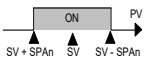
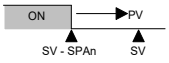
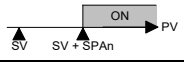
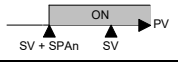
SCREEN	TYOE	ACTION	
oFF	Disabled	Output is not used as alarm.	
Lo	Minimum Value (Low)		
H I	Maximum Value (High)		
d IF	Differential		
		Positive SPAn	Negative SPAn
d IFL	Minimum Differential (Differential Low)		
		Positive SPAn	Negative SPAn
d IFH	Maximum Differential (Differential High)		
		Positive SPAn	Negative SPAn
IErr	Sensor Break (Input Error)	Activated when the input signal of PV is interrupted, out of the range limits or Pt100 in short-circuit.	
End.t	End of Level	Activate at the end of the level time.	
rS	Event (Ramp and Soak)	It can be activated at a specific segment of program.	

Table 4

Where SPAn refers to Setpoints of Alarm **SPA1** and **SPA2**.

11 MAINTENANCE

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

The controller displays some messages to help the user identify problems:

MESSAGE	PROBLEM
----	Open input. Without sensor or signal.
Err 1 Err6	Configuration or connection problem in the Pt100 cable.

Table 5

Other error messages displayed by the controller can account for errors in the input connections or type of selected input non-compliant with the sensor or signal applied to the input. If errors persist, even after a review, contact the manufacturer. Inform the device serial number. To find out the serial number, press ◄‖ for more than 3 seconds.

This information is necessary for eventual contact with the controller's manufacturer.

12 SPECIFICATIONS

DIMENSIONS: ..... 96 x 96 x 90 mm (1/4 DIN)

Approximate weight: ..... 330 g

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

POWER SUPPLY: ..... 100 to 240 Vac/dc (±10 %), 50/60 Hz

Optional 24 V: ..... 12 to 24 Vdc / 24 Vac (-10 % / +20 %)

Maximum consumption: ..... 6 VA

ENVIRONMENTAL CONDITIONS:

Operation temperature: ..... 5 to 50 °C

Relative humidity: ..... 80 % max. up 30 °C

For temperatures above 30 °C, reduce 3 % for each °C.

Internal Use. Installation category II. Pollution degree 2. Altitude < 2000 m.

INPUT: ..... Thermocouples, Pt100 (according to **Table 1**)

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

Display resolution: ..... 0.1 / 1 (°C / °F)

Rate of input reading: ..... Up to 55 per second

Accuracy @ 25 °C: ..... **J**, **K**, **T**, **E**: 0.25 % of the span ±1 °C / °F

..... **N**, **R**, **S**, **B**: 0.25 % of the span ±3 °C / °F

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

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

Pt100 measurement: ..... 3-wires type, (α = 0.00385) with compensation for cable length, excitation current of 0.170 mA.

All input and output types are factory calibrated. Thermocouples according to standard NBR 12771 / 99, RTD's NBR 13773 / 97.

OUTPUTS:

OUTA / OUTB ..... Relay SPST-NO: 3 A / 240 Vac, General use, resistive load; 100 k cycles

OUTD ..... Pulse 12 V / 0-20 mA or 4-20 mA, 550 Ω max. / 31000 levels / Isolated

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

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

USB INTERFACE: Mini-USB 2.0, CDC class (virtual communications port), Modbus RTU protocol.

FRONT PANEL: IP65, polycarbonate UL94 V-2.

CASE: IP30, ABS+PC UL94 V-0.

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

CERTIFICATIONS: CE / UL (FILE: E300526)

13 IDENTIFICATION

The label attached to the controller shows the model identification, as described below.

N960 - A

Where A =

Blank: Power supply 100~240 Vac /dc

24 V: Power supply 12 to 24 Vdc / 24 Vac

14 WARRANTY

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

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