



The N440 is a digital temperature controller in 1/16 DIN size with 2 ON/OFF outputs for control and alarm. Its 3½ digit display is used for temperature indication as well as for parameter configuration. Easy to configure, the N440 is intended for use in furnaces, ovens, fryers, etc., delivering accurate temperature measurements with excellent immunity to electromagnetic fields. Three sensor types are available (Pt100 and thermocouples J or K) with sensor offset correction.

### 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.

<b>CAUTION or WARNING:</b> Read complete instructions prior to installation and operation of the unit.	<b>CAUTION or WARNING:</b> 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.

### SPECIFICATIONS

**Sensor input:** The sensor type is defined in the production process. Check the instrument label to find out the input type of your particular model. The available sensors options are:

- **Pt100:** range: -50 °C to 530 °C (-58 to 986 °F); Accuracy: 1 °C (1.8 °F);  $\alpha=385$ . 3-wire connection. Excitation current: 0.170 mA;
- **Thermocouple J:** 0 to 600 °C (32 to 999 °F); Accuracy: 2 °C (3.6 °F);
- **Thermocouple K:** 0 to 1370 °C (32 to 2498 °F); Accuracy: 3 °C (5.4 °F);

**Measurement resolution:**

- Pt100: 0,1 °C in the range -19.9 to 199.9 °C/°F, 1 °C/°F otherwise
- Thermocouples: 1 °C/°F;

**Output 1 (OUT1)** (check instrument label for installed option)

- Relay SPDT: 3 A / 250 Vac (3 A / 30 Vdc);

**Output 2 (OUT2)** (check instrument label for installed option)

- Relay SPST-NO 1.5 A / 240 Vac (1.5 A / 30 Vdc);
- Logic pulse: 5 Vdc, 15 mA max;

**Power supply:**

- 100 to 240 Vac/dc or 24 Vac/dc  $\pm 10\%$  (check instrument label for installed option);
- Frequency: 50/ 60 Hz; Power consumption: 2 VA

**Environmental conditions:** Temperature: 5 to 50 °C. Relative humidity (maximum): 80 % up to 30 °C. For temperatures above 30 °C, decrease 3 % per °C. Installation category II. Pollution degree 2. Altitude < 2000 m.

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

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

**Warm-up time:** 15 minutes;

**Housing:** Front panel: Polycarbonate UL94 V-2; Rear case: ABS+PC UL94 V-0

**Dimensions:** 48 x 48 x 110 mm. **Panel cut-out:** 45,5 x 45,5 mm; **Weight:** 150 g

### OVER-TEMPERATURE PROTECTION

When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is one in which the heating remains constantly on. In any application where physical injury or destruction of equipment might occur, it is recommend to install an independent protection equipment, with a separate temperature sensor, to disable the heating circuit in case of overheating. Please note that the alarm relays within the controller will not give protection under all failure conditions.

### INSTALLATION

**Panel mounting:** Insert the unit into the panel cut-out and slide the mounting clamp from the rear to a firm grip at the panel.

**Electrical connections:**

All electrical connections are made to the screw terminals at the rear of the controller. They accept wire sizes from 0.5 to 1.5 mm<sup>2</sup> (16 to 22 AWG). The terminals should be tightened to a torque of 0.4 Nm (3.5 lb in).

**Routing of wires**

To minimize the pick-up of electrical noise, the low voltage DC connections and the sensor input wiring should be routed away from high-current power conductors. If this is impractical, use shielded cables. In general, keep cable lengths to a minimum.

It is strongly recommended to install RC filters (47 R and 100 nF, serial combination) at contactor coils and other inductors.

**WARNING:** System failure should always be taken into account when designing a control panel to avoid irreversible damage to equipment or people.

The figure below shows the N440 connections to mains, sensor and outputs.

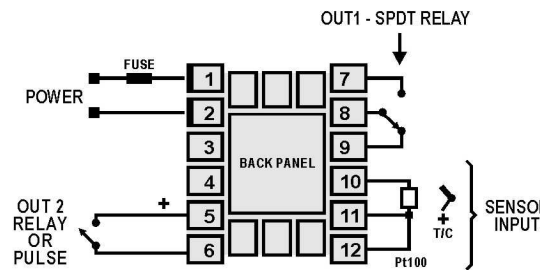


Figure 1 - N440 back panel terminals

	The installation must include a power isolating switch or circuit breaker that disconnects all current carrying conductors. The device should be mounted close to the controller, within easy reach of the operator and marked as the disconnecting device for the instrument.
	Wire sensor and outputs according to figure 1.

### OPERATION

Before the controller is ready to be used in a given process, it requires some basic configuration. The parameters are arranged in 4 levels:

Level	Access	Function
0	-	Temperature measurement
1	<b>P</b>	Set point for output <b>OUT1</b>
2	<b>P</b> holding for 2 seconds	Set point for output <b>OUT2</b>
3	<b>P</b> holding for 6 seconds	Parameter configuration
4	<b>P</b> holding for 10 seconds	Calibration

After power-up, the controller will display the firmware version for 1 second. This information is important for traceability and when contacting the manufacturer.

The instrument then shows the temperature measured by the sensor. This is the level **0** or temperature measurement level.

Pressing **P** will lead to level 1, causing the display to alternate between the messages "**SP 1**" (set point 1) and the programmed value. To go back to level **0**, press **P** again.

To reach level 2, press **P** for 2 seconds until the parameter "**SP2**" is displayed. Release the **P** key to stay in this level. To go back to level **0**, press **P** again.

To enter level 3, press the **P** key for 4 seconds and the parameter "**Rc 1**" will be displayed. Release the key to stay in this level. Press **P** to access other parameters in this level. At the end of this cycle, the controller will return to level 0.

To enter the calibration level (level 4) press the **P** key for 10 seconds.

To change a parameter setting, press the keys **▲** and **▼** until the desired value is reached.

The new configuration value is saved in the controller by pressing the **P** key (when advancing to the next parameter in the level).

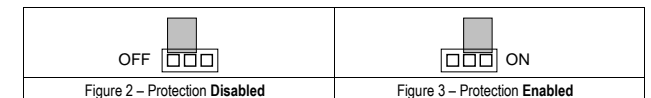
### PROGRAM SECURITY

To avoid tampering, parameter "**Prot**" and a hardware jumper can be used to disable access to programming parameters.

With the jumper in the **OFF** position, all program levels are unprotected. The "**Prot**" parameter can only be changed with the jumper in the **OFF** position.

With the jumper in the **ON** position or **removed**, the protection level is defined by the current value of the "**Prot**" parameter:

- 0** No protection. All parameters can be accessed;
- 1** No access to the Calibration level;
- 2** No access to Calibration and Configuration levels;
- 3** No access to Calibration, Configuration and SP2 levels;
- 4** Full protection.



### LEVEL 1 -OUT1 SET POINT

Parameter	Description/Parameter function
<b>SP 1</b> Set Point 1	Temperature set point associated to the <b>OUT1</b> output. Possible values are limited by the parameters <b>SPL</b> e <b>SPH</b> in level 3

## LEVEL 2 –OUT2 SET POINT



(Available only on models with 2 outputs).

<b>SP2</b> Set Point 2	Temperature set point associated to the <b>OUT1</b> output. Possible values are limited by the parameters <b>SPL</b> e <b>SPH</b> in level 3
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## LEVEL 3 – PARAMETERS CONFIGURATION

<b>Rc 1</b> Action 1	<b>OUT1 Functions:</b> <b>0</b> Reverse action usually used for heating <b>1</b> Direct Action usually used for cooling. <b>2</b> Low temperature alarm <b>3</b> High temperature alarm <b>4</b> Low temperature alarm with initial blocking <b>5</b> High temperature alarm with initial blocking <b>6</b> Out of range alarm (differential). <b>7</b> In range alarm (differential). <b>8</b> Out of range alarm with initial blocking. <b>9</b> In range alarm with initial blocking. See the following section for details.
<b>Rc 2</b> Action 2	<b>OUT2 Functions:</b> <b>0</b> Reverse action usually used for heating <b>1</b> Direct Action usually used for cooling. <b>2</b> Low temperature alarm <b>3</b> High temperature alarm <b>4</b> Low temperature alarm with initial blocking <b>5</b> High temperature alarm with initial blocking <b>6</b> Out of range alarm (differential). <b>7</b> In range alarm (differential). <b>8</b> Out of range alarm with initial blocking. <b>9</b> In range alarm with initial blocking. See the following section for details.
<b>HY 1</b> Hysteresis 1	<b>OUT1 Hysteresis:</b> Defines the differential range between the temperature value at which the alarm is turned on and the value at which it is turned off (in engineering units - °C or °F). Adjustable in the range 0.1 to 70.
<b>HY 2</b> Hysteresis 2	<b>OUT2 Hysteresis:</b> Defines the differential range between the temperature value at which the alarm is turned on and the value at which it is turned off (in engineering units - °C or °F). Adjustable in the range 0.1 to 70.
<b>oFS</b> Offset	Offset value to be added to the measured temperature to compensate sensor error. Default value: zero. Range: -15 to +15.
<b>SPL</b> SP Low Limit	<b>Set point Low Limit:</b> sets the minimum value allowed for the set points 1 and 2. <b>SPL &lt; SPH</b>
<b>SPH</b> SP High Limit	<b>Set point High Limit:</b> sets the maximum value allowed for the set points 1 and 2. <b>SPH &gt; SPL</b>
<b>Unt</b> Unit	Selects the display indication to be in °C or °F. <b>0</b> Temperature in degrees Celsius. <b>1</b> Temperature in degrees Fahrenheit.
<b>Pr t</b> Protection	Configuration protection: <b>0</b> No protection <b>1</b> No access to the Calibration level; <b>2</b> No access to Calibration and Configuration levels; <b>3</b> No access to Calibration, Configuration and SP2 levels; <b>4</b> No access to Calibration, Configuration, SP2 and SP1 levels;

## LEVEL 4 – CALIBRATION

<b>CAL</b> CAIbration Low	INPUT LOW CALIBRATION: Sets the Process Variable low calibration (offset). Several keystrokes at  or  might be necessary to increment one digit. The displayed value corresponds to the actual (calibrated) temperature as seen by the controller.
<b>CAH</b> CAIbration High	INPUT HIGH CALIBRATION: Adjusts the Process Variable span calibration (gain).
<b>CJL</b> Cold Junction Low Calibration	COLD JUNCTION OFFSET CALIBRATION: Adjusts the offset of the cold junction temperature. Valid for thermocouple inputs only.

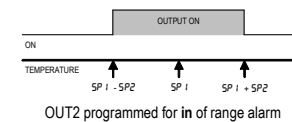
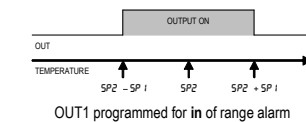
## USING THE CONTROLLER

When in the process, the N440 displays the temperature measured by the sensor connected in the terminals named SENSOR INPUT.

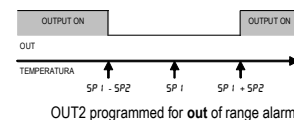
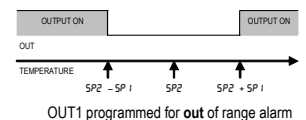
The sensor is defined at the purchase. The user needs then to configure outputs **OUT1** and **OUT2** (OUT2 is optional) with the desired functionality. Parameters **Rc 1** and **Rc 2** define the outputs working mode. **OUT1** is normally used as the control output, whereas **OUT2** is used as the alarm output. Depending on output requirements (relay or logic pulse), the outputs may be configured differently.

The **OUT1** e **OUT2** outputs can perform in the following ways:

- 0- Reverse action usually used for heating.**  
Output turns on when temperature is below set point minus hysteresis. Output turns off when temperature is above set point.
- 1- Direct Action usually used for cooling.**  
Output turns on when temperature is above set point plus hysteresis Output turns off when temperature is below set point.
- 2- Low temperature alarm.**  
Output turns on when temperature is below set point. Output turns off when temperature is above set point plus hysteresis.
- 3- High temperature alarm.**  
Output turns on when temperature is above set point. Output turns off when temperature is below set point minus hysteresis.
- 4- Low temperature alarm with initial blocking.**  
Same as low temperature alarm, but with initial blocking as described next.
- 5- Low temperature alarm with initial blocking.**  
Same as high temperature alarm, but with initial blocking as described next.
- 6- In range alarm (differential).**  
Available only for OUT2. Output turns on when temperature is in the range from (**SP 1 - SP2**) to (**SP 1 + SP2**).



- 7- Out of range alarm (differential).**  
Available only for OUT2. Output turns on when temperature is out of the range from (**SP 1 - SP2**) to (**SP 1 + SP2**).



- 8- In range alarm with initial blocking.**  
Same as in range alarm, but with initial blocking as described next.
- 9- Out of range alarm with initial blocking.**  
Same as out of range alarm, but with initial blocking as described next.

**Note 1:** OUT1 and OUT2 outputs can't be simultaneously configured for **In Range** and **Out of Range** alarm.

**Note 2:** The initial blocking feature, when enabled, results in the controller ignoring alarm conditions which exists when the controller is powered-on or started.

### Alarms with initial blocking:

The initial blocking option inhibits the alarm from being recognized if an alarm condition is present when the controller is first energized. The alarm will actuate only after the occurrence of a non alarm condition followed by a new occurrence for the alarm. In the front panel, **OUT** indicator will light on when **OUT1** is active, and **AL1** indicator will light on when **OUT2** is active.

Hysteresis parameters **HY 1** and **HY 2** are associated to outputs OUT1 and OUT2, and defines the differential range between the temperature value at which the alarm is turned on and the value at which it is turned off

**Offset (oFS)** parameter may be adjusted to correct temperature indication due to sensor error. The adjusted value is added to the temperature read before indication.



### Parameters write protection:

Write to parameters may be disabled for each parameter level by means of an internal protection strap key which when ON will block access to configuration. The instrument is not protected with the strap key in OFF position. By placing the strap at ON, access will be limited as defined in the "**Pr t**" parameter description.

The protection parameter "**Pr t**" must be defined with the strap key in place otherwise it cannot be changed.

## PROBLEMS WITH THE CONTROLLER

Connection and configuration errors state for most of the problems in using the controller. A final revision of parameters will save time and further losses. Error messages are displayed to help the user to identify possible problems. If one of the messages below is displayed, all outputs are turned off for safety.

	<ul style="list-style-type: none"> <li>• Temperature above high limit.</li> <li>• Broken sensor. Pt100 badly connected</li> </ul>
	<ul style="list-style-type: none"> <li>• Temperature below low limit.</li> <li>• Pt100 short-circuited.</li> </ul>

## 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 or Novus at [info@novus.com.br](mailto:info@novus.com.br).

## ORDERING INFORMATION:

<b>N440 -</b>	<b>J</b>	<b>R</b>	<b>R</b>	<b>- 24V</b>
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>

- A. Series model: **N440**;
- B. Input sensor: **C** (Pt100), **J** (type J thermocouple) or **K** (type K thermocouple);
- C. Output 1: **R** (Relay);
- D. Output 2: **R** (Relay) or **P** (Pulse);
- E. Voltage rating: **blank** (100-240 Vac or **24V** (24 Vac/dc);