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The N440 is a digital temperature controller in 1/16 DIN size with 2 ON/OFF outputs for control and alarm. Its 3-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.

SPECIFICATIONS

Sensor Input: The sensors supported are (check for mark in the case for your particular model):

- **Pt100;** range: -50°C to 530°C (-58°F to 986°F); 1°C (1.8°F) accuracy; α=385. 3-wire connection. Excitation current: 170µA;
- Thermocouple **J;** 0 to 600°C (32 to 999°F); 2°C (3.6°F) accuracy;
- Thermocouple **K;** 0 to 1370°C (32 to 2498°F); 3°C (5.4°F) accuracy;

Measurement resolution:

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

Control output (OUT1) (check for mark in the case):

- Relay SPDT: 5A / 250Vac (3A / 30Vdc) ou 24Vac/dc ±10%;
- Logic pulse: 12Vdc, 15mA max;

Alarm output (OUT2) (check for mark in the case):

- Relay SPST 3A / 250Vac (3A / 30Vdc) ou 24Vac/dc ±10%;

Power supply:

- 85 to 250 Vac/dc 24Vac/dc ± 10% (check for mark in the case);
- Frequency: 50/ 60 Hz;
- Power consumption: 2 VA

Operating environment: 0 to 55°C, 20 to 85% RH, non-condensing

Warm-up time: 15 minutes;

Housing: ABS self-extinguishing.

Dimensions: 48x48x110mm

Panel cut-out: 45,5x45,5mm

Weight: 190g

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. The N440 internal circuitry can be removed from the case without disconnecting the wires. Release the front panel lock in the low side of the panel a pull the instrument out.

Electrical connections

It is important to follow the recommendations below:

- Signal wires should be installed in grounded conduits and away from power or contactor wires.
- The instrument should have its own power supply wires, which should not be shared with electrical motors, coils, contactors, etc.
- Installing RC filters (47R and 100nF, serial combination) is strongly recommended at contactor coils or any other inductors.
- 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.

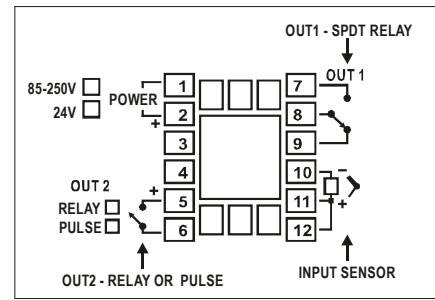


Figure 1 – N440 back panel terminals

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	P	Set point for output OUT1
2	P holding for 2 seconds	Set point for output OUT2
3	P holding for 4 seconds	Parameter configuration

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

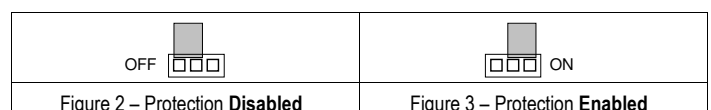
The new configuration value is saved in the controller by pressing the **P** key (when advancing to the next parameter in the level).

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
SP 1 Set Point 1	Temperature set point associated to the OUT1 output. Possible values are limited by the parameters SPL e SPH in level 3

Level 2 –OUT2 Set point

(Available only on models with 2 outputs).

SP2 Set Point 2	Temperature set point associated to the OUT1 output. Possible values are limited by the parameters SPL e SPH in level 3
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Level 3 – Parameters Configuration

Ac1 Action 1	<p>OUT1 Functions:</p> <ul style="list-style-type: none"> 0 Reverse action usually used for heating 1 Direct Action usually used for cooling 2 Low temperature alarm 3 High temperature alarm 4 Low temperature alarm with initial blocking 5 High temperature alarm with initial blocking <p>See the following section for details.</p>
Ac2 Action 2	<p>OUT2 Functions:</p> <ul style="list-style-type: none"> 0 Reverse action usually used for heating 1 Direct Action usually used for cooling. 2 Low temperature alarm 3 High temperature alarm 4 Low temperature alarm with initial blocking 5 High temperature alarm with initial blocking 6 Out of range alarm (differential). 7 In range alarm (differential). 8 Out of range alarm with initial blocking. 9 In range alarm with initial blocking. <p>See the following section for details.</p>
HY1 Hysteresis 1	OUT1 Hysteresis: 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.
HY2 Hysteresis 2	OUT2 Hysteresis: 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.
oF5 Offset	Offset value to be added to the measured temperature to compensate sensor error. Default value: zero. Range: -15 to +15.
SPL SP Low Limit	Set point Low Limit: sets the minimum value allowed for the set points 1 and 2. SPL < SPH
SPH SP High Limit	Set point High Limit: sets the maximum value allowed for the set points 1 and 2. SPH > SPL
Unit Unit	Selects the display indication to be in °C or °F. <ul style="list-style-type: none"> 0 Temperature in degrees Celsius. 1 Temperature in degrees Fahrenheit.
PrE Protection	Configuration protection: <ul style="list-style-type: none"> 0 No protection 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 No access to Calibration, Configuration, SP2 and SP1 levels;

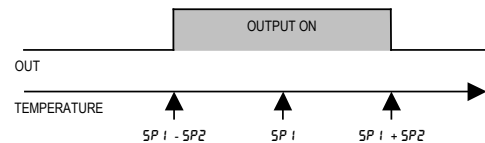
USING THE CONTROLLER

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

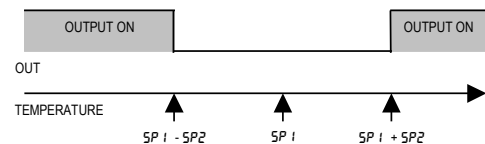
The sensor is predefined at the purchase. The user needs then to configure outputs **OUT1** and **OUT2** (OUT2 is optional) with the desired functionality. Parameters **Ac1** and **Ac2** define the outputs working mode. **OUT1** is normally used as the control output, whereas **OUT2** is used as the 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 bellow 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 bellow set point.
- 2- Low temperature alarm.**
Output turns on when temperature is bellow 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 bellow 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 $(SP1 - SP2)$ to $(SP1 + SP2)$.



- 7- Out of range alarm (differential).**
Available only for OUT2. Output turns on when temperature is out of the range from $(SP1 - SP2)$ to $(SP1 + SP2)$.



- 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.

Alarms with initial blocking:

If an alarm function with initial blocking is selected, the alarm will not be active at power-up waiting for temperature to reach a non-alarm situation. From this point on the alarm will be free to actuate should a new alarm situation occur.

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 **HY1** and **HY2** 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 (oF5) 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 "**PrE**" parameter description.

The protection parameter "**PrE**" 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 bellow is displayed, all outputs are turned of for safety.

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