We Measure, We Control, We Record

N323RHT

TEMPERATURE CONTROLLER – USER GUIDE – V2.0x A

1. SAFETY ALERTS

The symbols below are used in the device and throughout this manual to draw the user's attention to valuable information related to device safety and use.

	
CAUTION: Read the manual fully before installing and operating the device.	**CAUTION OR HAZARD:** Risk of electric shock.

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's safety protections may not be effective.

2. SUMMARY

3. PRESENTATION

N323RHT is a digital temperature and relative humidity controller. It has 3 relay control outputs. They can be configured independently to act as control or alarms. All outputs can be timed.

The humidity and temperature sensor, sold separately, is protected by a polyamide capsule and has a 3- or 6-meter-long cable.

The details of the controller are in accordance with the purchase order and are shown on the label attached to the controller.

4. SPECIFICATIONS

HUMIDITY SENSOR INPUT:

Measurement range: 0 and 100 % relative humidity (RH) (see **Figure 1**)

Accuracy: See **Figure 1**

Repeatability: ± 1% RH

Hysteresis: ± 1 % RH

Linearity error: << 1 % RH

Stability: < 1 % RH per year

Response time: Around 8 seconds to reach 63 % of a sudden change in input. Valid for 25 °C at an air flow of 1 m/s.

TEMPERATURE SENSOR INPUT:

Accuracy: See **Figure 1**

Repeatability: ± 0.1 °C

Measurement range: -20 and 100 °C (see **Figure 1**)

Response time: Up to 30 seconds with softly moving air.

Warm-up time: ..... 15 minutes

Measurement resolution:

RH: ..... 1 % over the entire range

T: ..... 0.1° from -19.9 to 119.9°

Note: The equipment maintains accuracy over the entire range, although the low resolution of the display in a portion of the range does not allow it to be visualized.

Measurement resolution: ..... 0.1° in the -19.9 to 119.9° range

..... 1° elsewhere

OUTPUT1: ..... SPDT relay; 1 HP 250 Vac / 1/3 HP

..... 125 Vac (16 A Res.)

..... Optionally: Pulse, 5 Vdc, 25 mA maximum

OUTPUT 2: ..... Relay: 3 A / 250 Vac, SPST-NO

OUTPUT 3: ..... Relay: 3 A / 250 Vac, SPST-NO

POWER SUPPLY:

Voltage: ..... 100~240 Vac/dc 10 %

Optionally: ..... 24 V (12~30 Vdc) (*)

Frequency: ..... 50~60 Hz

Consumption: ..... 5 VA

(*) **Note:** Models with a 24 V power supply do not have electrical isolation between the power supply, input, and RS485 communication circuits.

In direct current (Vdc) supply networks, you must observe the polarity of the connection.

Dimensions:

Width x Height x Depth: .....75 x 33 x 75 mm

Panel cutout: .....70 x 29 mm

Weight: ..... 100 g

Operating environment of the electronic module: .....0 to 40 °C / .....20 to 85 % RH

Operating environment of the sensor module: .....-20 to 100 °C / .....0 to 100 % RH

UL94 V-2 Polycarbonate housing.

Protection index: Housing: IP42 | Front: IP65 | Sensor housing: IP40 (sold separately)

Connections for wires up to 4.0 mm².

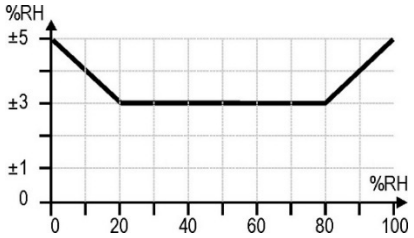
RS485 interface with Modbus protocol (optional).

Certifications: CE, UKCA, UL.

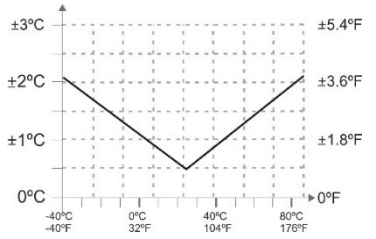
⚠	**The RS485 interface (when available on the controller) is NOT electrically isolated from the input circuit.** **It is also NOT isolated from the power supply circuit in 24V power supply models (12~24 Vdc).**

4.1 MEASUREMENT ACCURACY AND OPERATING LIMITS OF THE SENSORS

Relative humidity accuracy @ 25 °C:



Temperature accuracy:



Sensor operating conditions:

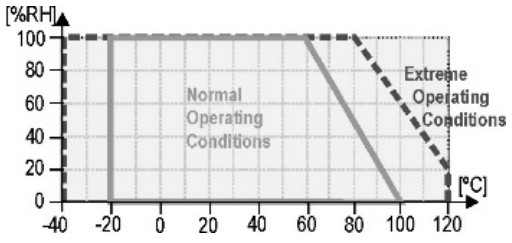


Figure 1 – Measurement accuracy and operating limits figures

4.2 IMPORTANT

The sensor used in this equipment can be damaged or lost calibration if exposed to atmospheres contaminated with chemical agents.

Hydrochloric Acid, Nitric Acid, Sulfuric Acid, and Ammonia in high concentrations can damage the sensor. Acetone, Ethanol, and Propylene Glycol can cause reversible measurement error.

Corrections to any errors detected during sensor readings can be made directly in the controller, using parameters **OFH** and **OFL**, within the configuration level.

5. ELECTRICAL CONNECTIONS

The following figure shows the connection, power, and output terminals of the controller:

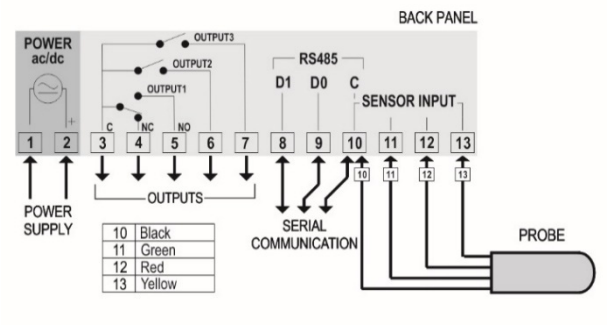


Figure 2 – Electrical connections

5.1 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.

6. OPERATION

Before use, the controller must be configured. To configure it, you must set values for the parameters that determine how the equipment operates.

These configuration parameters are organized in groups or Levels, called Parameter Levels.

LEVEL	RELATED FUNCTIONS
0	Temperature measurement
1	Setpoint adjustment
2	Configuration
3	Calibration

Table 1 – Levels

When the controller is turned on, the display will show the version of the internal software. This information is important for any contact with the manufacturer. The controller will then start operating and display the environment's temperature value, measured by sensor 1. This is level **0** or the Temperature Measurement level.

To access level 1, press **P** for **1 second**, until **SP 1** parameter is displayed. Release the **P** key to remain at this level. To return to the Temperature Measurement level, press **P**.

To access level 2, press **P** for 1 seconds, until **rHt** parameter is displayed. Release the **P** key to remain at this level. To access the other parameters of this level, press **P** again. After the last parameter, the equipment will return to the Temperature Measurement level.

To change the parameter values, use the ▲ and ▼ keys.

Notes:

1. When you move from one parameter to another, the configuration will be saved automatically and only then considered valid. Even in the event of a power outage, the configuration is stored in permanent memory.
2. If the keys are not used for a time longer than 20 seconds, the equipment returns to the Measurement level, finishing and saving the configuration done so far.

6.1 LEVEL 1 – SETPOINT ADJUSTMENT LEVEL

This level displays only the Setpoint parameter (SP). It sets the desired humidity or temperature value for the system. The current SP value is shown alternately with the parameter value.

To set the desired value, use the ▲ and ▼ keys.

SP 1 *Setpoint 1*	Set the desired temperature for control output 1. This adjustment is limited to the values programmed in **SL 1** and **SH 1**.
SP2 *Setpoint 2*	Set the desired temperature for control output 2. This adjustment is limited to the values programmed in **SL2** and **SH2**.
SP3 *Setpoint 3*	Set the desired temperature for control output 1. This adjustment is limited to the values programmed in **SL4** and **SH3**.

6.2 LEVEL 2 – CONFIGURATION LEVEL

It displays the sequency of parameters that must be defined. The parameters are shown alternately with their values.

To set the desired values, use the ▲ and ▼ keys.

rHt *RH - Temp*	Allows you to define how the humidity and temperature variables will be shown on the display: **0** Humidity. **1** Temperature. **2** Alternates between humidity and temperature every 2 seconds. **3** Alternates between humidity and temperature every 3 seconds. **4** Alternates between humidity and temperature every 4 seconds. **5** Alternates between humidity and temperature every 5 seconds. For options **0** and **1**: By quickly pressing the **P** key, the controller displays the value of the other variable for 10 seconds.
Unt *Unit*	Allows you to select the display unit of the measured temperature: **0** Temperature in Celsius degrees. **1** Temperature in Fahrenheit degrees.
OFH *Offset Humidity*	Value to correct humidity indication. Allows you to make small adjustments to the relative humidity indication to correct measurement errors that appear, for example, when replacing the temperature sensor. Adjustable between -10.0 and 10.0. Normally, it should remain at 0.0.
OFt *Offset temperature*	Value to correct temperature indication. Allows you to make small adjustments to the temperature indication to correct measurement errors that appear, for example, when replacing the temperature sensor. Adjustable between -10.0 and 10.0. Normally, it should remain at 0.0.
SL 1 *SP Low Limit 1*	Setpoint 1 (**SP 1**) lower limit. Minimum value that can be set for Setpoint 1. It must be programmed with a lower value than the one programmed in **SH 1**.
SH 1 *SP High Limit 1*	Setpoint (**SP 1**) upper limit. Maximum value that can be set for Setpoint 1. It must be programmed with a higher value than the one programmed in **SH 1**.
SL2 *SP Low Limit 2*	Setpoint 2 (**SP2**) lower limit. Minimum value that can be set for Setpoint 2. It must be programmed with a lower value than the one programmed in **SH2**.
SH2 *SP High Limit 2*	Setpoint (**SP2**) upper limit. Maximum value that can be set for Setpoint 2. It must be programmed with a higher value than the one programmed in **SL2**.
SL3 *SP Low Limit 3*	Setpoint 3 (**SP3**) lower limit. Minimum value that can be set for Setpoint 3. It must be programmed with a lower value than the one programmed in **SH3**.
SH3 *SP High Limit 3*	Setpoint (**SP3**) upper limit. Maximum value that can be set for Setpoint 3. It must be programmed with a higher value than the one programmed in **SL3**.
AC 1 *Action 1*	Control action for OUTPUT 1: **0** Control with Reverse Action. For heating and humidification. **1** Control with Direct Action. For refrigeration and dehumidification (*). **2** Minimum alarm. **3** Maximum alarm. **4** Minimum alarm with Initial Block. **5** Maximum alarm with Initial Block.
AC2 *Action 2* **AC3** *Action 3*	Control action for OUTPUT 2 and OUTPUT 3: **0** Control with Reverse Action. For heating and humidification. **1** Control with Direct Action. For refrigeration and dehumidification (*). **2** Minimum alarm. **3** Maximum alarm. **4** Minimum alarm with Initial Block. **5** Maximum alarm with Initial Block. **6** Within-range alarm. **7** Out-of-range alarm. **8** Within-range alarm with Initial Block. **9** Out-of-range alarm with Initial Block. **10** Cycle timer (only available for **AC3**). See the WORKING WITH THE CONTROLLER section, where these functions are detailed.

CnE *Control*	Allows you to define the layout of the outputs: 0 OUTPUT 1 = Humidity OUTPUT 2 = Humidity OUTPUT 3 = Humidity 1 OUTPUT 1 = Humidity OUTPUT 2 = Humidity OUTPUT 3 = Temperature 2 OUTPUT 1 = Humidity OUTPUT 2 = Temperature OUTPUT 3 = Humidity 3 OUTPUT 1 = Humidity OUTPUT 2 = Temperature OUTPUT 3 = Temperature 4 OUTPUT 1 = Temperature OUTPUT 2 = Humidity OUTPUT 3 = Humidity 5 OUTPUT 1 = Temperature OUTPUT 2 = Humidity OUTPUT 3 = Temperature 6 OUTPUT 1 = Temperature OUTPUT 2 = Temperature OUTPUT 3 = Humidity 7 OUTPUT 1 = Temperature OUTPUT 2 = Temperature OUTPUT 3 = Temperature
HY1 HY2 HY3 *Hysteresis*	Control hysteresis. Differential between the on and off point of the control output relay. Adjustable between 0.1 and 50.0.
dL1 dL2 dL3 *Delay*	Delay to the start of control. Once the controller is turned on, the output (1, 2, or 3) will only be turned on after the time programmed in this parameter has elapsed. Used in large refrigeration systems to prevent compressors from being activated simultaneously during a power outage. Value in seconds. From 0 to 250 seconds.
(*) OF1 OF2 OF3 *Off time*	Level available when AC1, AC2, and AC3 are set to 1. Allows you to set the minimum off time for the output. When the output is turned off, it will remain in this condition for at least the time programmed in this parameter. Typically used to extend the lifespan of the compressor in a refrigeration system. For heating applications, set to 0. Value in seconds. From 0 to 999 seconds.
(*) On1 On2 On3 *on_time*	Level available when AC1, AC2, and AC3 are set to 1. Allows you to set the minimum on time for output 1. When the output is turned on, it will remain in this condition for at least the time programmed in this parameter. Typically used to extend the lifespan of the compressor in a refrigeration system. For heating applications, set to 0. Value in seconds. From 0 to 999 seconds.

1t1 2t1 *Timer T1*	**T1** time interval for output timing. Allows you to set the timed actuation of the outputs, as shown in **Table 1**. Adjustable between 0 and 1999 seconds. Parameter unavailable when outputs 1 or 2 are configured for Direct Action.
3t1 *Timer T1*	**T1** time interval for output timing. Allows you to set the timed actuation of the outputs, as shown in **Table 1**. Adjustable between 0 and 1999 seconds. Parameter unavailable when output 3 is configured for Direct Action. If AC3 is configured as a Cycle Timer, the time base will be in minutes. Timer output trigger duration.
1t2 2t2 *Timer T2*	**T2** time interval for output timing. Allows you to set the timed actuation of the outputs, as shown in **Table 1**. Adjustable between 0 and 1999 seconds. Parameter unavailable when outputs 1 or 2 are configured for Direct Action.
3t2 *Timer T2*	**T2** time interval for output timing. Allows you to set the timed actuation of the outputs, as shown in **Table 1**. Adjustable between 0 and 1999 seconds. Parameter unavailable when output 3 is configured for Direct Action. If AC3 is configured as a Cycle Timer, the time base will be in minutes. Interval between activations of the timer output.
AdR *Address*	Controllers with RS485 serial communication interface display the Adr parameter. In this parameter, you can define a communication address for each network element. The address defined must be between 1 and 247.

Note: The use of the delay between compressors (dL1 and dL2) ensures that, when returning from a power failure or during system start-up, the compressors are started one by one, according to the set timing. This reduces the energy demand at that time.

6.3 LEVEL 3 – CALIBRATION LEVEL

The controller leaves the factory already calibrated. When a recalibration is necessary, it must be performed by a specialized professional.

To access this level, press the P key for more than 3 seconds. This level also contains the protection and formatting parameters of the controller.

If you access it by accident, simply step through all parameters, until the controller returns to the Measurement Level.

PAS *Password*	Allows you to enter a password to enable changes to other parameters.
rCL *RH Calibration Low*	Relative humidity Offset calibration.
tCL *T Calibration Low*	Temperature Offset calibration.
Prt *Protection*	Allows you to set the parameter levels to be protected.
PAC *Password Change*	Allows to change the current password. You can set the password to a number between 1 and 999.

Sn2 *Serial Number 2*	Displays the first 2 digits of the electronic serial number of the controller.
Sn1 *Serial Number 1*	Displays the middle 3 digits of electronic serial number of the controller.
Sn0 *Serial Number 0*	Displays the last 2 digits of the electronic serial number of the controller.

7. WORKING WITH THE CONTROLLER

The controller acts on the OUTPUT1, OUTPUT2, and OUTPUT3 outputs to bring the measured variable (temperature or humidity) to the desired value, set by the Setpoint (SP1, SP2, and SP3).

OUTPUT 1, OUTPUT 2, and OUTPUT 3 can act as control outputs when they act directly on the system load (resistance, compressor, humidifier etc.) or they can act as alarm outputs, which signal the occurrence of a specific situation defined by the user.

The actuation modes are shown below and can be set in parameters AC1, AC2, and AC3.

0 **Control output with Reverse Action.**

Turns the output on when the measured variable is below the Setpoint assigned to this output.

Type of action used for heating control

1 **Control output with Direct Action.**

Turns the output on when the measured variable is above the Setpoint assigned to this output.

Type of action used for refrigeration control

2 **Minimum alarm.**

Turns the output on when the measured variable is below the Setpoint assigned to this output.

3 **Maximum alarm.**

Turns the output on when the measured variable is above the Setpoint assigned to this output.

4 **Minimum alarm with Initial Block.**

Same as the Minimum Alarm + the Initial Block feature, as described in the note below

5 **Maximum alarm with Initial Block.**

Same as the Maximum Alarm + the Initial Block feature, as described in the note below

6 **Within-range alarm.**

Turns the output on when the measured variable is within the range defined in the figure below:

(SP1 – SP2) and (SP1 + SP2)
or (SP1 – SP3) and (SP1 + SP3)

7 **Out-of-range alarm.**

Turns the output on when the measured variable is outside the range defined in the figure below:

(SP1 – SP2) and (SP1 + SP2)
or (SP1 – SP3) and (SP1 + SP3)

8 **Within-range alarm with Initial Block.**

Same as the Alarm Within Range + the Initial Block feature, as described in the note below

9 **Out-of-range alarm with Initial Block.**

Same as the Alarm Out of Range + the Initial Block feature, as described in the note below

Note: Actuation modes 6, 7, 8, and 9 are only available for OUTPUT 2 and OUTPUT 3.

For OUTPUT 2, when Cnt is set to 0, 1, 6, or 7.

For OUTPUT 3, when Cnt is set to 0, 2, 5, or 7.

Note: Initial Block makes the controller disregard alarm situations at the beginning of the process when the controller is switched on and starts control operation.

Initial Block prevents (blocks) the alarm from being switched on at the beginning of the control process. The alarm will only be unblocked once the measured variable has passed through a non-alarm condition. This feature is useful, for example, when a minimum alarm is programmed into a heating process. Without blocking, the process would start with the alarm activated until the control Setpoint was reached.

7.1 OUTPUT TIMING

The controller allows you to program the timing of the outputs. Three conditions can be established:

1. Delayed output activation
2. Temporary activation
3. Sequential activation

Timing is only available for outputs 1, 2, and 3 and is programmed using parameters t1, t2, t3, t1t2, t2t2, and t3t2. The figures below represent these functions.

T1 and **T2** can vary from 0 to 1999 seconds and their combinations determine the timing mode.

If you want the alarms to operate normally, without timers, set 0.

On the frontal panel, **P1**, **P2**, and **P3** flags light up when the respective outputs are triggered. During the delay, the respective flag will remain flashing.

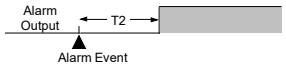
TIMER FUNCTION	T1	T2	PERFORMANCE
Normal operation	0	0	
Delayed activation	0	1 to 1999 s	
Temporary activation	1 to 1999 s	0	
Sequential activation	1 to 1999 s	1 to 1999 s	

Table 2 – Timer functions

8. CONFIGURATION PROTECTION

The configuration protection system prevents undue changes to the parameters of the controller and, consequently, its operating mode.

This system is composed of parameters that define the degree of protection to be adopted (full or partial).

Parameters that define the protection:

PAS Allows you to enter a password to enable changes to other parameters.

Prt Allows you to set the parameter levels to be protected:

1. Only **Calibration** level is protected (factory configuration).
2. **Calibration** and **Configuration** levels are protected.
3. All levels are protected: **Calibration**, **Configuration**, and **SP**.

PAC Allows you to change the current password. You can set the password to a number between 1 and 999.

8.1 CONFIGURATION PROTECTION OPERATION

The PAS parameter appears at the beginning of the protected level.

If you enter the password correctly, it is possible to change the parameters of the protected levels. If you do not enter the password correctly or simply pass by this parameter, the parameters of the protected levels can only be viewed.

Notes:

1. When you enter an incorrect password **5** consecutive times, the equipment will prevent new attempts for 10 minutes. If you do not remember the current password, you can enter the **master password**, which only allows you to set a new password.
2. When the equipment leaves the factory, the password is set to **111**.

9. MASTER PASSWORD

The master password, which allows you to set a new password for the controller, uses the serial number of the equipment (Sn2, Sn1, and Sn0). It is composed as follows:

[1] + [largest number of Sn2] + [largest number of Sn1] + [largest number of Sn0]

The master password for an equipment with serial number 97123465 is: **1 9 3 6**

Example: Sn2 = 97; Sn1 = 123; Sn0 = 465 = 1 + 9 + 3 + 6

9.1 HOW TO USE YOUR MASTER PASSWORD

1. In the PAS parameter, enter the master password.
2. In the PAC parameter, enter any new non-zero (0) password.
3. Use the new password.

10. ERROR INDICATION

On the display, the controller shows messages that correspond to problems related to humidity measurement. Whenever they are displayed, the control output relay will be turned off immediately.

	Indicates that the measurement has exceeded the upper limit of the sensor's range. The sensor is malfunctioning.
	Indicates that the measurement has exceeded the lower limit of the sensor's range. The sensor is malfunctioning.
	Sensor problem. Check the connections between the sensor and the controller. If the problem persists, contact technical assistance.

Table 3 – Error indications

11. WARRANTY

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