TEMPERATURE AND HUMIDITY CONTROLLER

N323RHT (EI)

OPERATING MANUAL - V1.8x D

Man 5001296

The N323RHT is a digital controller for relative humidity and temperature with three **relay** outputs configurable independently for control, alarm or timer.

The RHT probe (3 m length) is provided along with the instrument.

SPECIFICATIONS

SENSOR INPUT: Humidity measurement
Range: 0 and 100 % (RH);
Accuracy: See **Fig. 1**;
Repeatability, Hysteresis and Linearity error: < 1 % RH;
Stability: < 1 % RH by year;
Response time: 4 seconds in range of 10 to 90 % in slow moving air.

SENSOR INPUT: Temperature
Accuracy: See **Fig. 1**;
Repeatability: ±0,1 °C;
Range: -20 and 100 °C;
Response time: up 30 seconds in slow moving air.

WARM-UP: ..... 15 minutes

MEASUREMENT RESOLUTION: **RH:** ..... 1 % in all range
T: ..... 0,1° from –19,9 to 100,0°

Note: the equipment keeps its precision all over the range, despite the lack of display resolution in a part of the range does not allow its visualization.

OUTPUT1: .....Relay SPDT; 1 HP 250 Vac / 1/3 HP 125 Vac (16 A Res.)
..... Optional: Pulse, 5 Vcc, 25 mA max.

OUTPUT2: .....Relay: 3 A / 250 Vca, SPST-NA

OUTPUT3: .....Relay: 3 A / 250 Vca, SPST-NA

POWER SUPPLY: Tension:..... 100 to 240 Vca/cc ±10 %
Optional: ..... 12 a 30 Vcc
Frequency:..... 50~60 Hz
Consumption: ..... 5 VA

Dimensions: Width x Height x Depth: ..... 75 x 33 x 75 mm
Weight: ..... 100 g
Panel cut-out: ..... 70 x 29 mm

Instrument operating environment:..... 0 a 40 °C / 20 a 85 % RH

Probe operating environment: ..... See **Fig. 1**

Case: Polycarbonate UL94 V-2

Protection: Box: IP42; Front panel: IP65

Suitable wiring: Up to 4.0 mm²

Interface RS485 with RTU MODBUS protocol (Optional)

Serial interface not isolated from input circuitry.

Input circuitry isolated from power supply, except in the 24 V powered model.

Measurement Accuracies and Sensor Operational Limits:

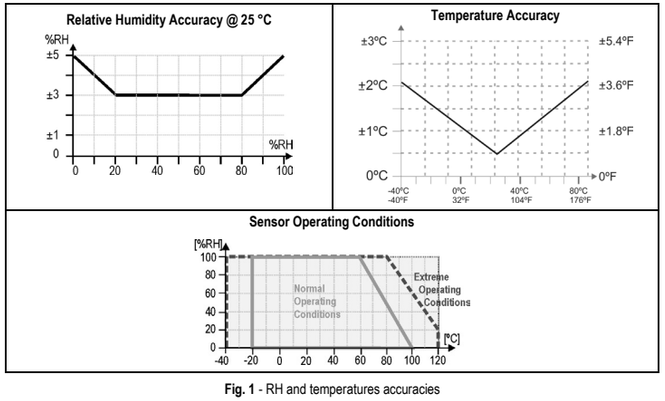


Fig. 1 - RH and temperatures accuracies

IMPORTANT

The sensor used in this controller may be damaged or lose calibration if exposed to atmospheres contaminated with chemical agents. Chloride Acid, Nitride Acid, Sulphuric Acid or Ammonia. Acetone, Ethanol and Propylene Glycol with high concentrations may cause reversible measurement drifts. Acetone, Ethanol and Propylene Glycol may cause reversible measurement errors.

Corrections of eventual mistakes in sensors reading can be realized directly in the controller, at the parameters **OFH** e **OFt**, in the configuration level.

ELECTRICAL WIRING

The figure below indicates the connection to the sensor, power supply and controller output, as well as a connection example.

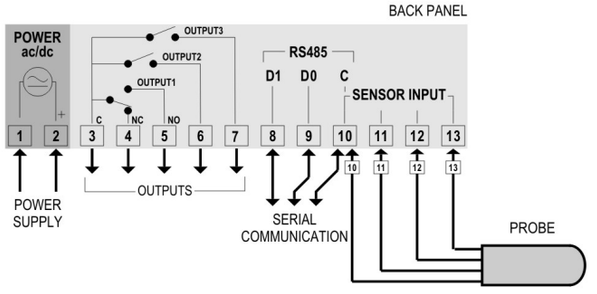


Fig. 2 – N323RHT terminals – Relays share a common terminal - Standard Model

RECOMMENDATIONS FOR INSTALLATION

The humidity sensor Conductors shall go through the system plant separately from the control and feeding output conductors, if possible in grounded electrical ducts.

The controller feeding shall be preferably provided from a proper instrumentation network with a phase different from the one used for the control output.

It is recommendable to use RC FILTERS (47 R and 100 nF, series) in contactor coils, solenoids, etc.

WORKING WITH THE CONTROLLER

Outputs for Control and Alarm – OUTPUT1 and OUTPUT2

The controller operates on the outputs OUTPUT1 and OUTPUT2 to lead the measured variable (temperature or humidity) to the intended value, defined by the setpoints **SP 1**, **SP2**.

The outputs operate as control outputs when they operate directly on the system load (resistance, compressor, humidifier, etc.). They operate as alarm outputs when only notifying the operator about the occurrence of any specific situation, defined by the user.

This two operation modes and they variations are presented below and can be defined on parameters **AC 1** and **AC2**.

0- **Reverse control action**
Activates the corresponding OUTPUT when the process variable is **below the setpoint** of that output. Normally used for heating control.

1- **Direct control action**
Activates the output whenever the process variable is **above the setpoint** for that output. The direct action is used for refrigeration control.

2- **Low Alarm**
Activates the output whenever the process variable is **below the setpoint** of that output.

3- **High Alarm**
Activates the output whenever the process variable is **above the setpoint** for that output.

4- **Low Alarm with Initial Blocking**
Identical to the Low Alarm, with the addition of the Initial Blocking feature explained in note below.

5- **High Alarm with Initial Blocking**
Identical to the High Alarm, with the addition of the Initial Blocking feature explained in note below.

6- **Inside Range Alarm (only for OUTPUT2)**
Activates the output when the process variable is **within** the interval defined below:

(SP 1 – SP2) and **(SP 1 + SP2)**

7- **Outside Range Alarm (apenas para OUTPUT2).**
Activates the output when the process variable is **outside** the interval defined below:

(SP 1 – SP2) and (SP 1 + SP2)

8- **Inside the Range Alarm with Initial Blocking (only fot OUTPUT2)**
Identical to the Inside the Range Alarm with the addition of the Initial Blocking feature, describe in note below.

9- **Outside the Range Alarm with Initial Blocking (only for OUTPUT2)**
Identical to the Outside the Range Alarm with the addition of the Initial Blocking feature, describe in note below.

The Initial Blocking impedes (blocks) the alarm from being switched on in the beginning of the control process. The alarm will only be unblocked after the passage of the variable measured by a non-alarm condition. This feature is useful when, for example, a minimum alarm is programmed in a heating process. Without the blocking, the process would start with an enabled alarm until the control setpoint is achieved.

Output Timing OUTPUT1 and OUTPUT2

The controller allows for the Output Timing programming of the output1 and output2, where the user can establish three conditions: output **tripping delay**, **temporary activation and sequential activation**.

The timing is available only for outputs 1, 2 and 3 and is programmed by means of the " **it 1**", "**2t 1**", " **it2**" and "**2t2**" parameters.

The figures below represent these functions; T1 and T2 can vary from 0 to 1999 **seconds** and their combinations determine the timing mode. For normal operation of the alarms, without timing, program 0 (zero).

On the front panel, the controllers **P1**, **P2** and **P3** light when the respective outputs are activated. During the delay, the respective signaler remains flashing.

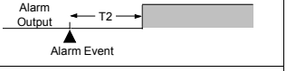
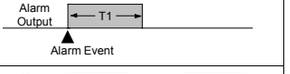
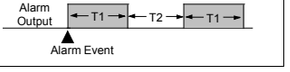
TIMER FUNCTION / OUTPUT	**it 1** or **2t 1**	**it2** or **2t2**	ACTION
Normal operation	0	0	
Delayed activation	0	1 to 1999 s	
Temporary activation	1 to 1999 s	0	
Sequential activation	1 to 1999 s	1 to 1999 s	

Table 1 – Timer alarm functions (outputs 1 and 2)

OUTPUT3

The output OUTPUT3 performs functions of a simple timer. It operates as definded in the paramaters **t 1** and **t2**, which establish, respectively, the activation duration of OUTPUT3 (Relay On) and activation interval of OUTPUT3 (Relay Off).

OPERATION

The controller shall be set up by the user before using. This consideration consists in the definition of the values for the various parameters that determine the equipment operation mode.

These set up parameters are organized in groups or Levels, called parameter levels.

Level	Function
0	Measurement
1	Setpoints and Time Adjustment
2	Configuration
3	Calibration

Upon power-up controller, the controller display shows for 1 second its firmware version. This information is useful when consulting the factory.

Then, the temperature measured by the sensor is shown on the display. This is the parameter level **0** or Temperature Measurement level.

For access to level 1 press **P** for **1 second** till the "**SP 1**" parameter appears. Release the **P** key to remain in this level. Press **P** again to access other parameters from this level. After the last parameter, the controller goes back to the temperature measurement level.

To access level 2 of parameters, press **P** for 2 seconds until the "**rHt**" message is shown. Release the **P** key to remain in this level. Press **P** again to access other parameters from this level. After the last parameter, the controller goes back to the temperature measurement level.

To change the parameters values, use the keys ▲ and ▼ until the achievement of the desired values.

Notes: 1 Each parameter, when accessed, alternately displays its symbol and its value.

2 The programming is saved by the controller when the latter goes from one parameter to the other and only then it is considered valid. The programming is stored in a permanent memory, even if there is a power supply interruption.

2 If no keyboard activity is detected for over 20 seconds, the controller saves the current parameter value and returns to the measurement level.

Level 1 – Setpoints and Time Adjustment

In this level, only the parameters Setpoints (SP) and time adjustment are shown by the display in OUTPUT3:

SP 1 *Set Point 1*	Set point adjustment for control OUTPUT 1. The setting range is limited by the values in **SL 1** and **SH 1** (this parameter belong to the Configuration level).
SP2 *Set Point 2*	Set point adjustment for control OUTPUT 2. The setting range is limited by the values in **SL2** and **SH2**.
t 1 *Tempo 1*	Activation duration of OUTPUT 3. Adjustable between 1 and 1999 s.
t2 *Tempo 2*	Activation interval of OUTPUT 3. Adjustable between 0 and 1999 minutes.

Level 2 – Configuration Level

Presents a sequence of other parameters that shall be defined by the user.

rHt *RH - Temp*	Defines how the variables, relative humidity and temperature, will be displayed: **0** Only the value **Humidity** is shown. **1** Only the valie **Temperature** is shown. **2** Toggles the indications of relative humidity and temperature every 2 seconds. **3** Toggles the indications of relative humidity and temperature every 3 seconds. **4** Toggles the indications of relative humidity and temperature every 4 seconds. **5** Toggles the indications of relative humidity and temperature every 5 seconds. For options **0** and **1**, a fast click on the P, key forces the other variable to be displayed for 10 seconds.
Unt *Unit*	**Temperature Unit** . Allows the user to choose the measured temperature presentation unit. **0** Temperature in degrees Celsius. **1** Temperature in degrees Fahrenheit
OFH *Offset Humidity*	Correction value for Humidity indication. Allows the user to perform small adjustments on the relative humidity indication, trying to correct measurement errors that appear, for example, in the sensor replacement. Adjustment range: between –10.0 and 10.0 % of RH. Default value: 0.0
OFt *Offset temperature*	Correction value for Temperature indication. Allows the user to perform small adjustments on the relative temperature indication, trying to correct measurement errors that appear, for example, in the sensor replacement. Adjustment range: between –10.0 and 10.0 % of RH. Default value: 0.0
SL 1 *SP Low Limit 1*	Lower limit value for setpoint *1* (**SP 1**): minimum value with which **SP 1** can be configured is 1. **SL 1** must be programmed with a lower value than **SH 1**.
SH 1 *SP High Limit 1*	Upper limit for for setpoint *1* (**SP 1**): maximum allowed value for **SP 1**. **SH 1** must be programmed with a higher value than the one configured in **SL 1**.
SL2 *SP Low Limit 2*	Lower limit value for setpoint *2* (**SP2**): minimum value with which **SP2** can be configured. **SL2** must be programmed with a lower value than **SH2**.
SH2 *SP High Limit 2*	Upper limit for setpoint 2 (**SP2**): maximum allowed value with which **SP2** can be configured. **SH2** must be programmed with a higher value than the one in **SL2**.
Ac 1 *Action 1*	Control action for OUTPUT 1: **0** Reverse: For heating or humidification; **1** Direct: For cooling or dehumidification; **2** Low (minimum value) alarm; **3** High (maximum value) alarm; **4** Low alarm with initial blocking; **5** High alarm with initial blocking. The section **Working With The Controller** describes how these functions work.
Ac2 *Action 2*	Control OUTPUT 2 action: **0** Reverse control action (heating or humidification); **1** Direct control action (cooling or dehumidification); **2** Low (minimum value) alarm; **3** High (maximum value) alarm; **4** Low alarm with initial blocking; **5** High alarm with initial blocking; **6** Alarm inside the range; **7** Alarm outside the range; **8** Inside the range alarm with initial blocking; **9** Outside the range alarm with initial blocking; The section **Working With The Controller** describes how these functions work.
Cnt *Control*	Defines the outputs positioning 1 and 2 in relation to the variables. **0** OUTPUT 1 = controls **Humidity**; OUTPUT 2 = controls **Temperature** **1** OUTPUT 1 = controls **Temperature**; OUTPUT 2 = controls **Humidity**
HY 1 **HY2**	Control hysteresis: Differential between the point of switching on and off the relay of the output, set up as a **control output**. Adjustable between 0.1 and 50.0.
dL 1 **dL2** *Delay*	Time of delay for starting the control. After the controller has been switched on, the output (1, 2 or 3) will only be switched on when the time programmed in this parameter has passed. Used in large refrigeration systems to impede simultaneous routing of compressors upon recovery of power supply interruption. Value in seconds, 0 to 250 s.
oF 1 **oF2** *Off time*	Defines the minimum ***off*** time for control OUTPUT. Once the OUTPUT is turned off, it remains so for at least the time programmed in this parameter. This parameter is useful in extending compressor life in refrigeration systems. For heating systems, program to zero. Value in seconds, 0 to 999 s.
on 1 **on2** *on time*	Defines the minimum ***on*** time for control OUTPUT 1. Once the OUTPUT is turned on, it remains so for at least the time programmed in this parameter. This parameter is useful in extending compressor life in refrigeration systems. For heating systems, program to zero. Value in seconds, 0 to 999 s.
It 1 **2t 1** *Timer T1*	Time interval **T1** for alarm temporization (1 or 2). Defines the temporization mode, as shown in **Table 1**. Adjustable from 0 to 1999 seconds. Not available when outputs 1 and 2 are configured as direct action.
It2 **2t2** *Timer T2*	Time interval **T2** for alarm temporization (1 or 2). Defines the temporization mode, as shown in **Table 1**. Adjustable from 0 to 1999 seconds. Not available when outputs 1 and 2 are configured as direct action.
Add *Address*	The controllers with incorporated serial communication interface RS485 present the parameter **Add** in their programming level. In this parameter, the user defines a **communication address** for each network element. The defined address shall be between 1 and 247.

Note 3: The correct use of the delays **dL 1** and **dL2** contributes to a smooth start-up following a energy fail; the compressors will be turned on in sequence, according to the programmed temporization, reducing the energy demand after power-up.

Level 3 – Calibration Level

The controller is factory adjusted. When a recalibration is needed, must be realized by a specialized professional. The following parameters should be accessed only by experienced personnel. To enter this cycle, the P key must be kept pressed for 3 seconds.

In case of accidental access, the keys ▲ and ▼ shall not be pressed. Just pass through all parameters, till the controller goes back to the measuring screen.

PAS	**Password** - Enter the correct **password** to unlock write operations on the parameters in the following levels.
CrH	**RH Calibration low**. Offset calibration for RH.
CtP	**T Calibration low**. Offset calibration for Temperature.
Prt	**Protection** - Defines the levels of parameters that will be password protected.
PAC	**Password Change** - Allows changing the current password to a new one. Values from 1 to 999 are allowed.
Sn2	Shows the first two digits of the controller electronic serial number.
Sn 1	Shows the three central digits of the controller electronic serial number.
Sn0	Shows the three last digits of the controller electronic serial number.

ERROR MESSAGES

The controller shows messages on the display that correspond to the problems related to the humidity measurement. The control output relay is immediately switched off, when they are shown.

▬ ▬ ▬	Indicates that: the measurement exceeded the upper level of the sensor range. Sensor problem.
▬ ▬ ▬	Indicates that: the measurement exceeded the lower level of the sensor range. Sensor problem.
▬ ▬ ▬	Sensor problem. Revise sensor wiring. If problem persists, contact the factory.

CONFIGURATION PROTECTION

The protection system aims to avoid unwanted changes to the controller when parameters are implemented. The level of protection can be selected from partial to full. The following parameters are part of the protection system:

PAS: When this parameter is presented, the correct **password** must be entered to allow changes of parameters in the following levels.

Prt: Defines the level of parameters that will be password protected:
1 - Only **calibration** level is protected (factory configuration);
2 - **Calibration** and **Configuration** levels are protected;
3 - All levels are protected - **calibration**, **configuration** and **setpoints**.

PAC Parameter for definition of a new password. Valid passwords are in the range 1 to 999.

CONFIGURATION PROTECTION USAGE

The **PAS** parameter is displayed before entering a protected level. If the correct password is entered, parameters in all following levels can be changed. If wrong or no password is entered, parameters in the following levels will be read only.

Important notes:

1- After **five** consecutive attempts to enter a wrong password, new tentative will be blocked for the next 10 minutes. If the current valid password is unknown, the **master password** can be used **only** to define a new password for the controller.

2- The factory default password is **111**.

MASTER PASSWORD

The master password, which allows user to define a new password for the controller, is based in the serial number of the controller. Is calculated as following:

[1] + [higher digit of SN2] + [higher digit of SN1] + [higher digit of SN0]

The master password for the device with serial number 987123465 is: **1 9 3 6**

As follows: **1 + Sn2**= 987; **Sn 1**= 123; **Sn0**= 465 = 1 + 9 + 3 + 6

How to use the master password:

1- Enter the master password value at **PAS** prompt.

2- Go to **PAC** parameter and enter the new password, which must not be zero (**0**).

3- Use this new password.

WARRANTY

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