We Measure, We Control, We Record

N322RHT

TEMPERATURE AND HUMIDITY 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 safety protections may not be effective.

2. SUMMARY

3. PRESENTATION

N322RHT is a digital controller for relative humidity and temperature. Its 2 relay outputs can be configured independently as control or alarm, either for temperature or relative humidity.

The humidity and temperature sensor, sold separately, is protected by a polyamide capsule, and have 3 or 6-meters long cables.

The features of a particular model (mains supply, digital communication, etc.) are identified by the label placed on the controller body.

4. SPECIFICATIONS

Sensor Input: Humidity measurement

Range: 0 and 100 % RH;

Accuracy: Refer to **Fig. 1**;

Repeatability: ± 1 % RH;

Hysteresis: ± 1 % RH;

Linearity error: << 1 % RH;

Stability: < 1 % RH / year;

Response time: Around 8 s to reach 63 % of a fast input change. Valid at 25 °C and 1 m/s airflow.

Sensor Input: Temperature measurement

Range: -20 and 100 °C;

Accuracy: Refer to **Fig. 1**;

Repeatability: ±0.1 °C;

Response time: up to 30 seconds in slow moving air.

Warm-up: ..... 15 minutes

Measurement resolution:

RH: ..... 1 %

T: ..... 0.1° from -19.9 to 119.9°

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 Resistive)
..... Optional: Pulse, 5 Vdc, 25 mA max.

OUTPUT2: ..... Relay: 3A / 250 Vac, SPST

POWER SUPPLY:

Voltage: ..... 100~240 Vac/dc (± 10 %)

Optional: ..... 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 cut-out: ..... 70 x 29 mm

Weight:..... 100 g

Electronic module operating environment:.....0 to 40 °C /

.....20 to 85 % RH

Sensor module operating environment: .....-20 to 100 °C /

.....0 to 100 % RH

Case: Polycarbonate UL94 V-2.

Protection: box IP42, front panel IP65, sensors capsule IP40 (sold separately).

Suitable wiring: Up to 4.0 mm².

RS485 digital communication; RTU MODBUS protocol (optional).

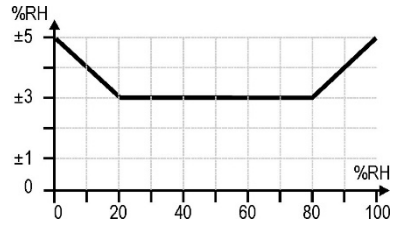
Serial interface not isolated from input circuitry.

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

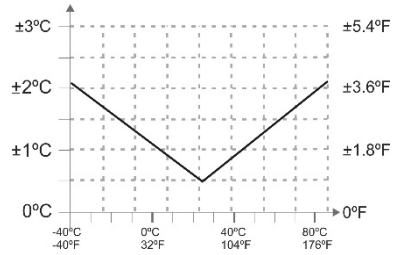
Certifications: CE, UKCA, UL.

4.1 MEASUREMENT ACCURACY AND SENSORS OPERATIONAL LIMITS

Relative Humidity Accuracy at 25 °C



Temperature Accuracy



Sensor Operating Conditions

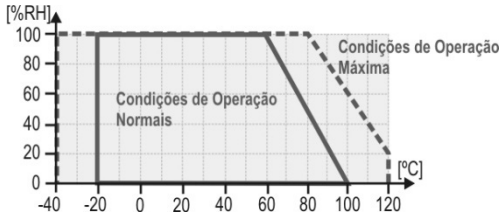


Figure 1 – RH and temperature accuracies

IMPORTANT

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

Fine trimming in the indication of RH and Temperature are available at the parameters **OFH** and **OFt**, in the configuration level of parameters.

5. ELECTRICAL CONNECTIONS

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

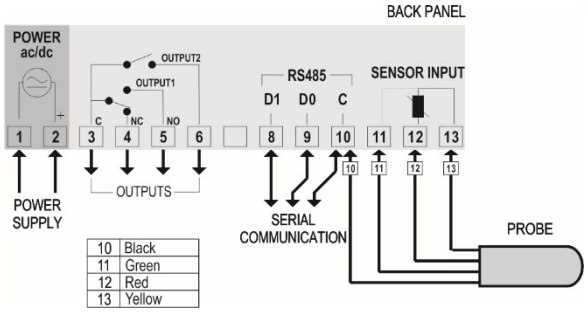


Figure 2 – Electrical connections

5.1 INSTALLATION RECOMMENDATIONS

- The temperature sensor wires should run through the system plant **separately** from the control output and power supply wires. If possible, in grounded conduits.
- The controller power supply should preferably come from a network suitable for instrumentation or from a different phase from that used by the control output.
- It is recommended to use RC FILTERS (47 Ω and 100 nF, series) in contactor coils, solenoids, etc.

6. OPERATION

Before use, the controller must be configured. That is, you must set values for the parameters that determine how the equipment operates.

The configuration parameters are organized in groups or Levels, called parameter levels.

LEVEL	FUNCTION
0	Measurement
1	Setpoint Adjustment
2	Configuration
3	Calibration

Table 1 – Parameter level

When you turn on the controller, the **N322RHT** display shows for 1 second its firmware version. This information is useful when consulting the manufacturer. The controller then starts displaying the temperature value measured by the sensor. This is level **0** or the Measurement level.

To access level 1, press P for **1 second** until the **SP 1** parameter appears. To move forward, press P once more.

To acess level 2, press P for **2 seconds** until the **rHt** parameter appears. Release P to remain on this level. Press P again to access the other parameters of this level. After reaching the last parameter, the controller will return to the first level (0).

Use the ▲ and ▼ keys to alter a parameter value.

Notes: **1** The configuration will be saved by the controller upon advancing to the next parameter in a level. Even in the event of a power outage, the configuration will be saved in permanent memory.

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

6.1 LEVEL 1 – SETPOINT ADJUSTMENT LEVEL

This level displays the Setpoint parameters. They define the differential temperatures values for the control.

Use the ▲ and ▼ keys for setting the suitable values.

SP 1 *Setpoint 1*	Set Point adjustment for control OUTPUT 1. **SP 1** value is limited to the values programmed in **SPL** and **SPH** in the programming level (Parameter configuration, level 2).
SP2 *Setpoint 2*	Set Point adjustment for control OUTPUT 2. **SP2** value is limited to the values programmed in **SPL** and **SPH**

6.2 LEVEL 2 – PROGRAMMING LEVEL

This level displays the remaining parameters. The parameters and their values are shown alternately.

Use the ▲ and ▼ keys for setting the suitable values.

rHt *RH - Temp*	Defines how the variables, relative humidity, and temperature, will be displayed: **0** Relative humidity. **1** Temperature. **2** Toggles the indication every 2 seconds. **3** Toggles the indication every 3 seconds. **4** Toggles the indication every 4 seconds. **5** Toggles the indication 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**. Selects display indication for degrees Celsius or Fahrenheit. **0** Temperature in Celsius. **1** Temperature in Fahrenheit
OFH *Offset Humidity*	**RH Offset**. Offset value to be added to the displayed relative humidity to compensate for sensor mismatches (when replacing a sensor, for instance). Adjustment range: Between -10.0 and 10.0 % of RH. Default value: 0.0
OFt *Offset temperature*	**Temperature Offset**. Offset value to be added to the measured temperature to compensate for sensor mismatches. Adjustment range: Between -10.0 and 10.0 % of RH. Default value: 0.0
SL 1 *SP Low Limit 1*	Lower limit value for **SP 1** (minimum value with which **SP 1** can be configured). **SL 1** must be programmed with a lower value than **SH 1**.
SH 1 *SP High Limit 1*	Upper limit for **SP 1** (maximum allowed value for **SP 1**). **SH 1** must be programmed with a value higher than the one configured in **SL 1**.
SL2 *SP Low Limit 2*	Lower limit value for **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 **SP2** (maximum allowed value for **SP 1**). **SH2** must be programmed with a value higher than the one in **SL 1**.

AC 1 *Action 1*	Control action for OUTPUT 1: **0** Reverse: For heating or humidification. Outputs turn on when variable is lower than SP (See **Cnt** parameter below). **1** Direct: For cooling or dehumidification. Output turns on when variable is above SP. **2** Low (minimum value) alarm. **3** High (maximum value) alarm. **4** Low alarm with initial blocking. **5** High alarm with initial blocking
AC2 *Action 2*	Action 2. Control OUTPUT 2 action or alarm functions: **0** Reverse control action (heating or humidification). (See **Cnt** parameter below). **1** Direct control action (cooling or dehumidification). **2** Low (minimum value) alarm. **3** High (maximum value) alarm. **4** Alarm inside the range. **5** Alarm outside the range. **6** Low alarm with initial blocking. **7** High alarm with initial blocking. **8** Inside the range alarm with initial blocking. **9** Outside the range alarm with initial blocking. The section **Working with the RHT Controller** describes how these functions work.
Cnt *Control*	Assigns the relay for each variable: **0** OUTPUT 1 = RH; OUTPUT 2 = RH. **1** OUTPUT 1 = RH; OUTPUT 2 = Temperature. **2** OUTPUT 1 = Temperature; OUTPUT 2 = RH. **3** OUTPUT 1 = Temperature; OUTPUT 2 = Temperature.
OF 1 *Off time 1*	**Off time 1**. Defines the minimum ***off*** time for control OUTPUT 1. Once OUTPUT 1 is turned off, it remains so for at least the time programmed in **oF 1**. For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, program **oF 1** to zero. Value in seconds (0 to 999 s).
On 1 *on time 1*	**On time 1**. Defines the minimum ***on*** time for control OUTPUT 1. Once turned on, OUTPUT 1 remains so for at least the time programmed in **On 1**. For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where increased compressor life is desired. For heating systems, program **on 1** to zero. Value in seconds (0 to 999 s).
dL 1 *Delay 1*	**Delay 1**. Delay time to start control. Upon power-on, control OUTPUT 1 is kept *off* until the time programmed in **dL 1** is elapsed. Its usage is intended to prevent multiple compressors to start simultaneously after the turn-on of a system with several instruments. Value in seconds (0 to 250 s).

OF2 *Off time 2*	**Off time 2**. Defines the minimum ***off*** time for control OUTPUT 2. Once OUTPUT 2 is turned off, it remains so for at least the time programmed in OF2. For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where increased compressor life is an issue. For heating systems, program on2 to zero. Value in seconds (0 to 999 s).
On2 *on time 2*	**On time 2**. Defines the minimum *on* time for control OUTPUT 2. Once turned on, OUTPUT 2 remains so for at least the time programmed in On2. For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where increased compressor life is desired. For heating systems, program OF2 to zero. Value in seconds (0 to 999 s).
dL2 *Delay 2*	**Delay 2**. Delay time for OUTPUT 2 to turn on relative to OUTPUT 1. This parameter defines a particular working mode, typically used in multiple stage systems, where OUTPUT 2 is allowed to go **on** only if OUTPUT 1 is already on for at least dL2 seconds. Also, OUTPUT 2 is driven **off** whenever OUTPUT 1 goes off. dL2 = 0 disables this function. Value in seconds (0 to 250 s).
Adr *Address*	**Address**. The parameter Adr is presented in instruments loaded with the optional RS485 Modbus RTU communication interface. Set a unique Modbus address for each equipment connected to the network. Address range is from 1 to 247.

6.3 LEVEL 3 – CALIBRATION LEVEL

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

Press the P key for **10 seconds** to access this level. This level also contains the parameters for configuration protection.

If you have entered this level by accident, go through all the parameters without making any changes until the controller returns to the measurement level.

PAS	**Password**. Enter the correct password to unlock write operations in the following parameters.
CL1	**Calibration Low Input 1**. Calibration of the input 1 measurement range offset. Adjustment of the lower value of the sensor measurement range.
CH1	**Calibration High Input 1**. Input 1 gain adjustment (full scale value). Adjustment of the upper value of the sensor measurement range.
CL2	**Calibration Low Input 2**. Calibration of the input 2 measurement range offset. Adjustment of the lower value of the sensor measurement range.
CH2	**Calibration High Input 2**. Input 2 gain adjustment (full scale value). Adjustment of the upper value of the sensor measurement range.
FAC	**Factory calibration.** Defines the parameter levels to be protected.
Prt	**Protection**. Defines the parameter levels to be protected.
PAC	**Password change**. Parameter that allows changing the current password. Values from 1 to 999 are allowed.
Sn2	**Serial number 2**. First part of the controller electronic serial number.
Sn1	**Serial number 1**. Second part of the controller electronic serial number.
Sn0	**Serial number 0**. Third part of the controller electronic serial number.

7. OPERATION

The controller operates on the outputs OUTPUT1 and OUTPUT2 to lead the measured variable (temperature or humidity) to the intended value, defined by the setpoint (SP1 and SP2).

OUTPUT1 and OUTPUT2 can operate either as control outputs, when they operate directly on the system load (resistance, compressor, humidifier, etc.) or as alarm outputs that operate notifying the operator about the occurrence of any specific situation, defined by the user.

The operation modes are presented below, and they can be defined on parameters AC1 and AC2.

0 - **Reverse control action.**

Activates the corresponding OUTPUT when the process variable (RH or temperature) 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**

Minimum value alarm. Indicates that the process value is **below the alarm Setpoint** defined for the output.

3 - **High alarm**

Maximum value alarm. Indicates that the process is **above the alarm Setpoint** defined for that output.

4 - **Low alarm with initial blocking.**

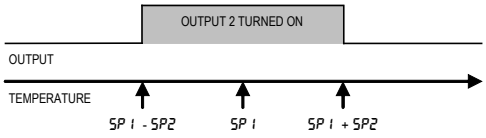
Identical to the Low Alarm, with the addition of the initial blocking feature explained in note below.

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.**

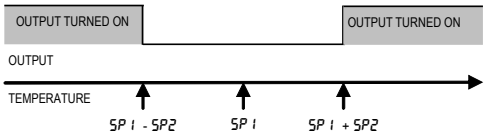
Activates the output when the process variable is **within** the interval defined by:



Inside Range Alarm OUTPUT 2

7 - **Outside Range Alarm.**

Activates the output when the process variable is **outside** the interval defined by:



Outside Range Alarm OUTPUT 2

8 - **Inside the range alarm with initial blocking.**

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.**

Identical to the Outside the Range Alarm with the addition of the initial blocking feature, describe in note below.

Note 1: The action modes 6, 7, 8 and 9 are available to OUTPUT2 only when **Cnt** is set to 0 or 3.

Note 2: The **Initial Blocking** causes the controller to disregard alarm situations at the **beginning of the process** when the controller is turned on and starts the control operation.

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.

The output status LEDs **P1** and **P2** in the instrument panel signal the current action being performed.

8. CONFIGURATION PROTECTION

The purpose of the configuration protection system is to prevent undue changes to the controller parameters and, consequently, to 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 Parameter for defining the parameter levels to be protected.

Prt Parameter for defining 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 **Setpoints**.

PAC Parameter for changing the current password. You can set the password to a number between 0 and 1999.

8.1 HOW CONFIGURATION PROTECTION WORKS

The **PAS** parameter appears at the beginning of the protected level. By entering the correct password, you can change the parameters of the protected levels. If you do not enter the correct password or if you just pass this parameter, the parameters of the protected levels can only be viewed and not changed.

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**.

9. MASTER PASSWORD

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

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

The master password for the device with serial number 97123465 is: **1936**

As follows: **Sn2** = 97; **Sn1** = 123; **Sn0** = 465 = 1 + 9 + 3 + 6

9.1 HOW TO USE THE MASTER PASSWORD

1. In the **PAS** parameter, enter the master password.
2. In the **PAC** parameter, enter the new password, which must not be zero (**0**).
3. Use the new password.

10. ERROR MESSAGES

On the display, the controller shows messages that correspond to problems related to the temperature measurement. Whenever they are displayed, the control output relay will be turned off. If it is configured to show the differential temperature, the value shown will be zero.

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

Table 2 – Error messages

11. WARRANTY

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