RHT *Climate* Transmitter

WM and DM models

INSTRUCTION MANUAL V1.0x C

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We Measure, We Control, We Record

CE Mark

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

1 SAFETY ALERTS

The symbols below are used in the device and throughout this manual to draw the user's attention to important 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.	ATTENTION Material sensitive to static charge. Check precautions before handling.

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 INTRODUCTION

RHT *Climate* Transmitters Wall Mount (WM) and Duct Mount (DM) models incorporate high-precision, stable sensors for measuring temperature and relative humidity. Because they are microprocessed device, they can be fully configured via a USB or RS485 interface, using command Modbus RTU. NXperience allows for configuring all transmitter features and diagnostics thereof.

Apart from the temperature and relative humidity values, which are read directly from the sensor, the transmitter calculates the value of the following psychrometric properties[1]:

- Dew Point Temperature;
- Wet Bulb Temperature;
- Absolute Humidity;
- Frost Point Temperature;
- Specific Enthalpy;
- Partial Vapor Pressure;
- Mixture Ratio.

Any variable read by the sensor, or calculated by the device, can be transmitted via one of the two available analog outputs. The user is also allowed to configure the electrical operating level of each output:

- 0-10 V;
- 4-20 mA.

Two digital outputs with alarm or control functions can be related to any variable read or calculated by RHT *Climate* Transmitter.

The following options are also available:

- RS485;
- Display with Backlight;
- Audible signal.

It's important for the user to read the manual carefully before using this device. Check whether the manual and instrument manual version match (the software version number is shown when the controller is powered on).

[1] Psychrometry is the study of thermodynamic properties of dry air and water vapor mixtures. Obtaining the psychrometric properties is crucial in the psychrometric processes of air conditioning, refrigeration, cooling and freezing, air humidification and dehumidification, drying and dehydration of humid devices, as well as in environmental and meteorological control.

3 IDENTIFICATION

3.1 MODELS WITHOUT DISPLAY

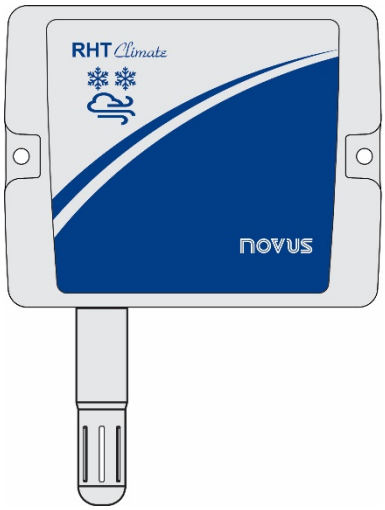


Fig. 01 – Device without display

3.2 MODELS WITH DISPLAY

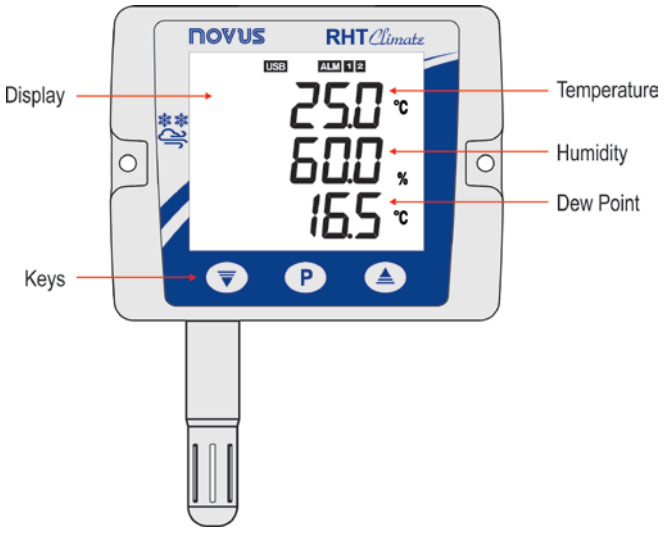


Fig. 02 – Device with display

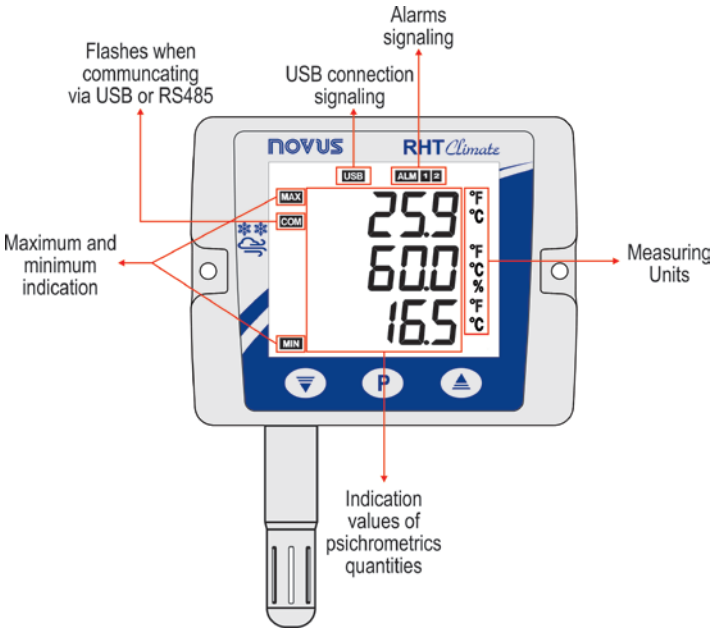


Fig. 03 – Display Indications

Key P: Key used to advance to successive parameters and parameter cycles. Pressing quickly advances parameters within a cycle. Pressing and holding advances parameter cycles.

Key ▼: Parameter decrement key. If pressed and held while displaying the home screen, it executes the action linked to the key's second function:

- None;
- Clears registered minimum and maximum values.

Key ▲: Parameter increment key. If pressed and held while displaying the home screen, it executes the action linked to the key's second function:

- None;
- Mutes buzzer;
- Mutes buzzer and turns off alarm outputs.

3.3 DEVICE MODELS

The RHT *Climate* Transmitter line is available in various device configurations to adapt perfectly to multiple market needs:

- Wall Mount Model (WM): For mounting on the wall.
- Duct Mount Model (DM): For mounting in ducts. DM models are available with a stainless steel (S) sensor rod, with lengths of 150 mm, 250 mm or 400 mm.

The table below shows all available models:

Model	RS485	Display	Stainless Steel Rod	Economic Sensor	Premium Sensor
RHT Climate-WM					✔
RHT Climate-WM-L				✔	
RHT Climate-WM-485-LCD	✔	✔			✔
RHT Climate-WM-485-LCD-L	✔	✔		✔	
RHT Climate-DM-150S			150 mm		✔
RHT Climate-DM-150S-485	✔		150 mm		✔
RHT Climate-DM-150S-485-LCD	✔	✔	150 mm		✔
RHT Climate-DM-250S			250 mm		✔
RHT Climate-DM-250S-485	✔		250 mm		✔
RHT Climate-DM-250S-485-LCD	✔	✔	250 mm		✔
RHT Climate-DM-400S			400 mm		✔
RHT Climate-DM-400S-485	✔		400 mm		✔
RHT Climate-DM-400S-485-LCD	✔	✔	400 mm		✔

Table 01 – Available RHT *Climate* models

4 DISPLAY INDICATIONS

4.1 HOME SCREEN

The home screen displays the temperature read by the sensor on line 1, the relative humidity value on line 2, and the dew point temperature on line 3.

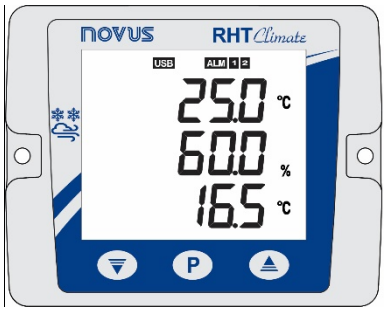


Fig. 04 - Home screen

4.2 DISPLAYING MAXIMUM AND MINIMUM VALUES

To navigate to secondary screens, the user should quickly press the key P (tap) from the home screen. With each quick touch on the key, the display will show the screens below.

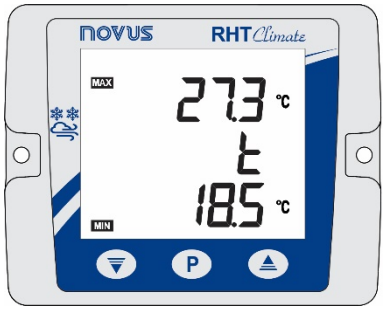


Fig. 05 - Maximum and minimum temperature

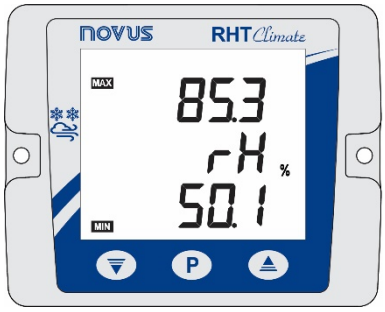


Fig. 06 - Maximum and minimum relative humidity

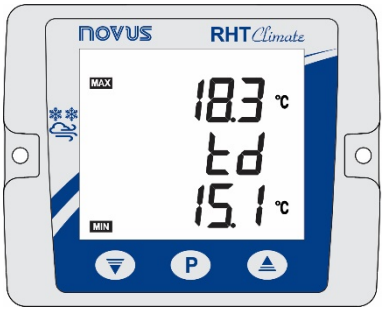


Fig. 07 - Maximum and minimum dew point temperature

On the central line, the display will show the name of the variable to which the maximum and minimum values refer:

- t: Temperature;
- rH: Relative humidity;
- td: Dew point.

The upper line shows the MAX symbol followed by the maximum value for that variable, while the lower line shows the MIN symbol, followed by the minimum value. If no key is pressed for 15 seconds, the display will return to the home screen.

4.3 DISPLAYING OTHER PSYCHROMETRIC PROPERTIES

After the maximum and minimum value screens, screens for viewing the other psychrometric variables are available. With each quick touch on the key P, the RHT *Climate* Transmitter will advance one screen, abiding by the sequence below.

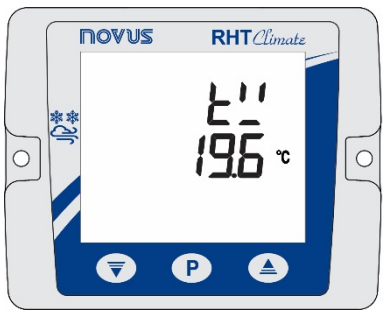


Fig. 08 - Wet bulb temperature

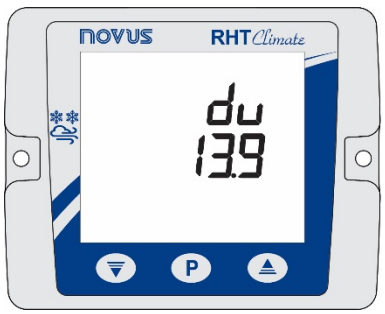


Fig. 09 - Absolute humidity

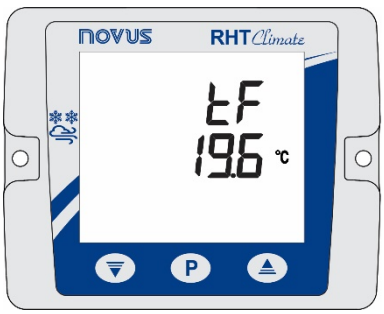


Fig. 10 - Frost point temperature

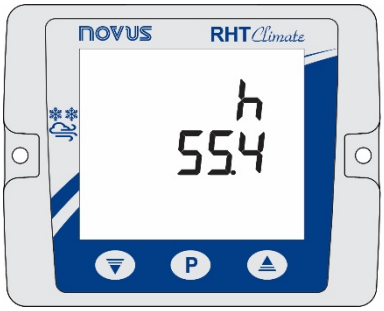


Fig. 11 - Specific enthalpy

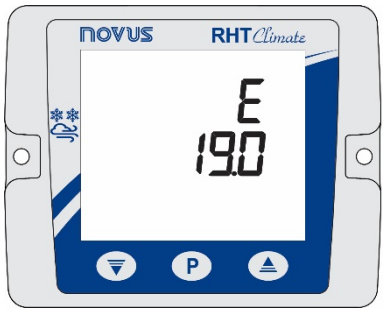


Fig. 12 - Partial vapor pressure

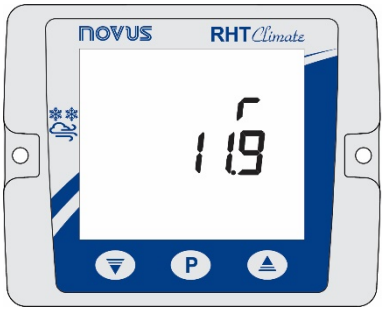


Fig. 13 - Mixture ratio

4.4 SIGNALS

- ALM + 1: Alarm 1 output is in alarm condition.
- ALM + 1 flashing: Alarm output 1 in alarm condition, but the output is reset due to overcurrent protection.
- ALM + 2: Alarm 2 output is in alarm condition.
- ALM + 2 flashing: Alarm output 2 in alarm condition, but the output is reset due to overcurrent protection.
- BUZZER: The buzzer may be activated in three conditions:
    - BUZZER output alarm;
    - ALM1 output alarm, if the buzzer is enabled in alarm 1 configurations;
    - ALM2 output alarm, if the buzzer is enabled in alarm 2 configurations.
- USB: Indicates that the controller is connected to a USB port.
- COM flashing: Indicates that the device is responding to a data request or command.
- nnnn: The value to be displayed on one of the lines is higher than the display limit.
- uuuu: The value to be displayed on one of the lines is lower than the display limit.

5 INSTALLATION

5.1 MECHANICAL INSTALLATION

The RHT *Climate* Transmitter WM model was designed to be secured to a wall by two mounting holes on the transmitter, as shown in Fig. 14.

Mounting should follow the sequence of steps below:

- Use the device's perforation template to mark the position of transmitter mounting bore holes;
- Make the two holes using a drill with bit number 6. The bore holes should be deeper than the size of bushings;
- Insert bushings in holes. Bushings should be completely inserted into the wall;
- Position the transmitter on the wall, aiming to align with the perforations, and use bolts to secure it to the wall.

	Bolts and bushings do not come with the device. The device should be mounted with the sensor capsule facing downward to ensure the specified precision and protection rating.

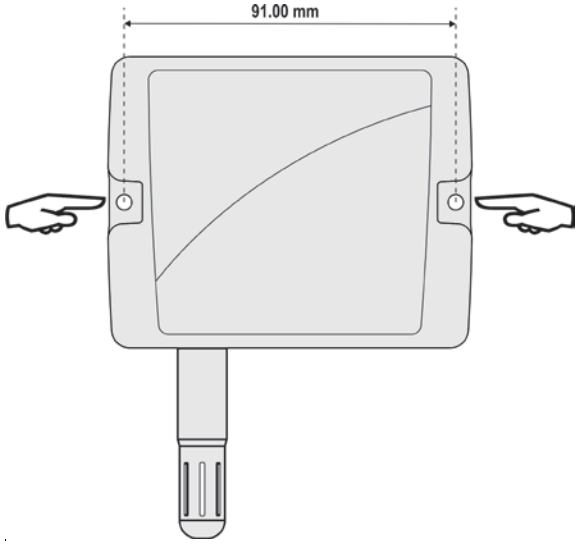


Fig. 14 – Mechanical Installation

The RHT *Climate* Transmitter DM model it is mounted via a flange. First the flange is mounted on the duct wall, then the transmitter rod is inserted into the central bore hole on the flange and secured.

5.1.1 DIMENSIONS

5.1.1 RHT *Climate* Transmitter (WM model)

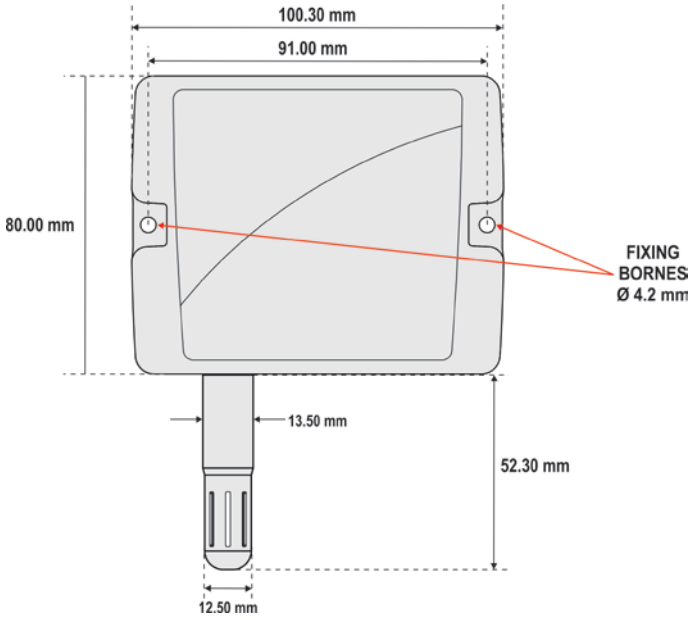


Fig. 15 – Dimensions of WM model

5.1.2 RHT *Climate* Transmitter (DM model)

Fig. 16 shows the flange dimensions and perforation:

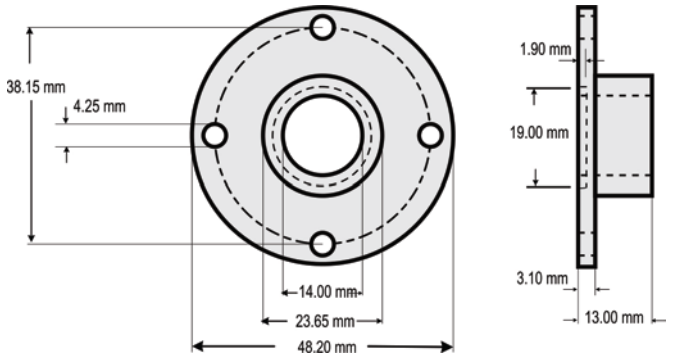


Fig. 16 - Flange for mounting DM model

The rods for these models are made of stainless steel, with lengths of 150, 250 or 400 mm.

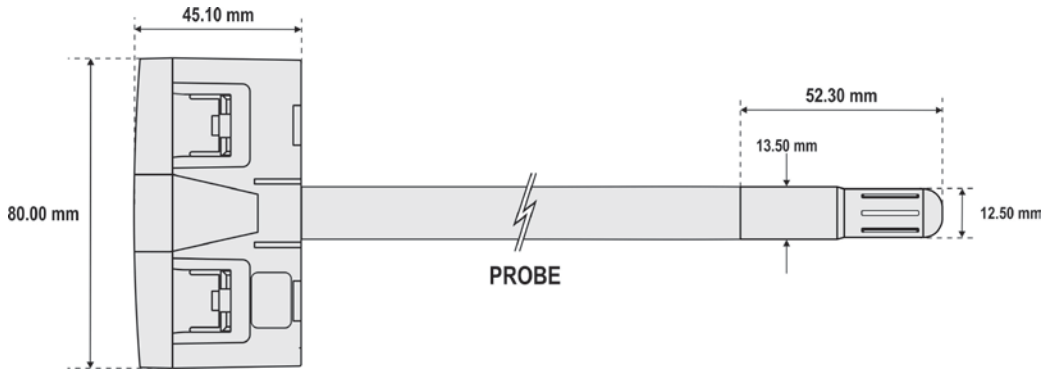


Fig. 17 – Dimensions of DM model

5.1.2 REMOVING AND INSTALLING THE FRONT COVER

To remove the front cover, insert a screwdriver. It is necessary to fit in the lateral handles and to force it lightly until realizing its release. The procedure should be repeated on each of the side handles of the device, as shown in the figures below. With all sides clear, the cover can be easily removed:

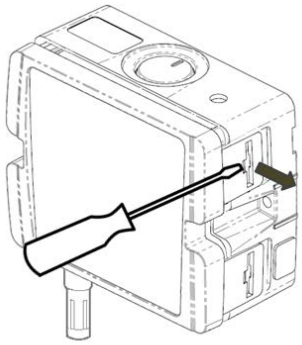


Fig. 18 - Removing the front cover of the transmitter

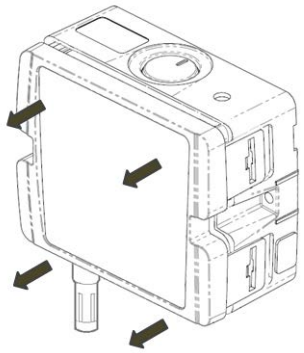


Fig. 19 - Removing the front cover of the transmitter

To install, fit the cover onto the base by pressing it with care to fully secure the transmitter, as shown in the figure below:

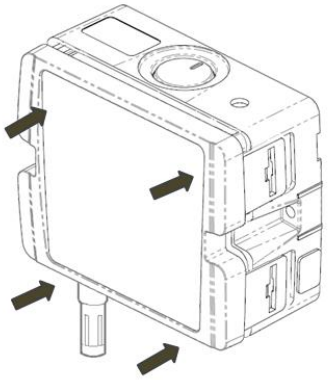


Fig. 20 - Device cover fitting

5.2 ELECTRICAL INSTALLATION

5.2.1 RECOMMENDATIONS FOR INSTALLATION

- Signal conductors should run through the plant separately from the power supply and output conductors, if possible in grounded conduits.
- The power supply for electronic instruments must come from an appropriate grid for instruments.
- RC FILTERS (noise suppressor) are recommended in contactor coils, solenoids, etc.
- In control applications, it's essential to consider what could happen when some part of the system fails. The device's internal devices do not ensure total protection.
- Grounding helps limit the effects of noise due to electromagnetic interference (EMI). Run the grounding connection by using the grounding bolt and the grounding plane before turning on the device.

5.2.2 SPECIAL PRECAUTION

Because the transmitter is an electronic module, it requires some care when handling:

- When opening the transmitter to connect electrical wiring, avoid contact with the electronic circuit due to the risk of damage caused by static electricity.
- Pay close attention when connecting wires.
- Remember to pass all wires through a cable clip before completing electrical connections.
- When closing the housing, the cover should be placed again properly, ensuring proper sealing for this model.

5.2.3 ELECTRICAL CONNECTIONS

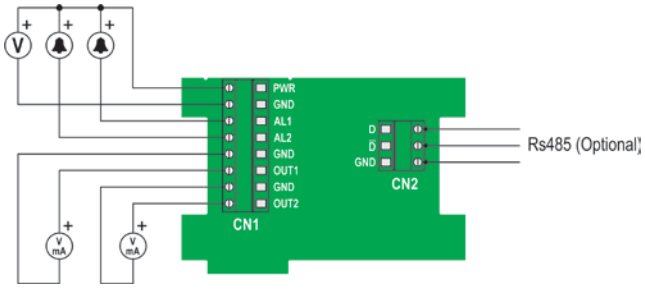


Fig. 21 – RHT *Climate* electrical connections

* Connector CN2 is only mounted on models that have RS485 interface (Optional).

5.2.4 USB CONNECTION

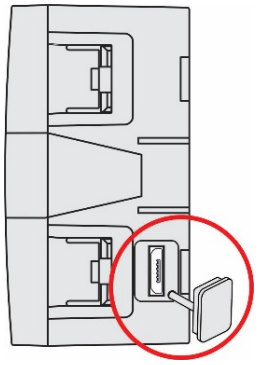


Fig. 22 – USB cable connection

5.3 SENSOR MAINTENANCE

5.3.1 PRECAUTIONS WITH SENSORS

The sensor used in the RHT *Climate* Transmitter is a device that is sensitive to electrostatic discharge (ESD). Whenever the sensor is touched, measures need to be taken to prevent ESD damage.

The sensor may be damaged or lose its calibration if exposed to atmospheres contaminated with chemical agents. Hydrochloric Acid, Nitric Acid, Sulfuric Acid and Ammonia at high concentrations can damage the sensor. Acetone, Ethanol and Propylene Glycol can cause reversible measurement errors.

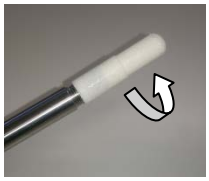
The humidity sensor's calibration can be altered if it is exposed to contaminating vapors or extreme humidity and temperature conditions for prolonged periods. To speed up calibration restore, proceed as described below:

- Remove sensor from capsule;
- If there are solid particles on the sensor, wash it with water;
- Place the sensor in an oven at 80 °C (+/-10 °C) for 24 hours;
- Place the sensor for 48 hours in a location with temperature between 20 and 30 °C humidity higher than 75% RH;
- Place the sensor in the capsule again.

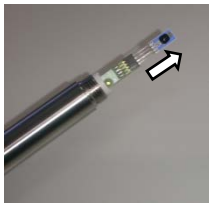
5.3.2 SENSOR REPLACEMENT

In case of damage, the humidity and temperature sensor may need to be replaced. To perform this procedure, follow the steps below:

- Step 1: Unplug the transmitter from the power supply and remove the USB cable, if connected. Find the protective sensor tip. In this example, we are showing how a sensor is replaced in a RHT *Climate* Transmitter, where the sensor is located at the end of the rod.

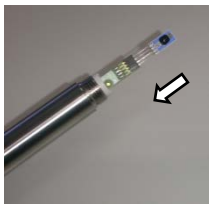


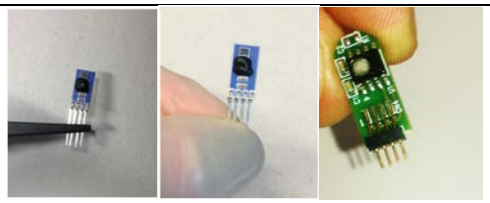
- Step 2: Remove the tip by turning it counter-clockwise.



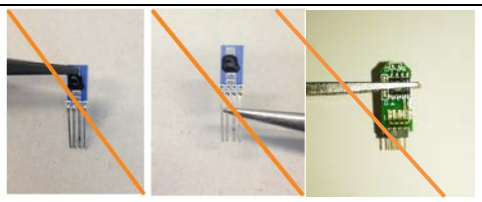
- Step 3: Without the tip the sensor will be exposed. Remove it by pulling it forward to disconnect it.

- Step 4: Connect the new sensor at the rod tip connector. For this step, measures to prevent electrostatic discharge should be taken.

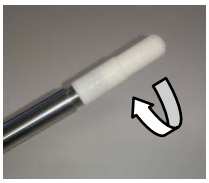




Hold the sensor only by its terminals, using plastic tweezers or gloves.



Do not hold the sensor by the sensing element and do not use metal tweezers.



- Step 5: Place the protection tip again and turn it clockwise to secure it to the transmitter.

6 PARAMETER CYCLES

The configuration parameters are clustered in affinity groups, called parameter cycles. The 10 parameter cycles are:

CYCLE	ACCESS
1- Primary Cycle: The psychrometric variable viewing screens are in this cycle.	Unrestricted access
2- Out1 Cycle: The transmission 1 output configuration parameters are in this cycle.	Allows for enabling protection mode for these cycles
3- Out2 Cycle: The transmission 2 output configuration parameters are in this cycle.	
4- ALn1 Cycle: The alarm 1 output configuration parameters are in this cycle.	
5- ALn2 Cycle: The alarm 2 output configuration parameters are in this cycle.	
6- bu22 Cycle: The buzzer configuration parameters are in this cycle.	
7- IHn Cycle: The IHn configuration parameters are in this cycle.	
8- diAG Cycle: Forcing parameters for temperature, relative humidity and transmission, alarm and buzzer output values are available in this cycle.	
9- COn Cycle: In this cycle, the user can configure parameters related to RS485 Modbus communication.	
10- CnFG Cycle: To access the parameters in this cycle, the user must enter with the device password. The parameters in this cycle allow for selecting units of measure, adjusting atmospheric pressure, as well as offsets and digital filters for the sensor readings. Also in this cycle, the user can enable configuration parameter protection and change the password.	
11- Information Cycle: The device's serial number (Sn) and firmware version (Fwn) are displayed in this cycle.	

Table 02 – Parameter cycles

7 CONFIGURATION

The RHT *Climate* Transmitter has a series of parameters that allow for configuring its two transmission outputs and its two alarm outputs, allowing for assigning the psychrometric properties below to each of them, which may be expressed in the International System of Measures (SI) or in the English System of Measures (U.S.).

		SI			US		
Psychrometric properties		Min.	Max.	Unit	Min.	Max.	Unit
Temperature (measured value)	t	-40	100	°C	-40	212	°F
Relative humidity (measured value)	rH	0	100	% RH	0	100	% RH
Dew point temperature (calculated value)	td	-90	100	°C	-130	212	°F
Wet bulb temperature (calculated value)	t_	-40	100	°C	-40	212	°F
Absolute humidity (calculated value)	du	0	600	g/m³	0	262	gr/ft³
Frost point temperature (calculated value)	tF	-90	100	°C	-130	212	°F
Specific enthalpy (calculated value)	h	-40	700000	kJ/kg	-18	300945	BTU/lb
Partial vapor pressure (calculated value)	E	0	1035	mbar	0	15	psi
Mixture ratio (calculated value)	r	0	260000	g/kg	0	1820000	gr/lb
Temperature and relative humidity are the only variables that are measured directly from the sensor that comes with the device. All other measurements are obtained via algorithms that can lead to slight variations in relation to the real values.							

Table 03 – Psychrometric properties

7.1 ANALOG OUTPUTS Out1 / Out2

The configuration cycle for analog outputs 1 and 2 lets the user assign to each of them:

- The psychrometric property associated with the output;
- The default electrical output;
- The value to be shown in case of error in the sensor reading;
- The excursion range of the transmitted psychrometric property.

Note: When the lower limit is defined with a value higher than the higher limit the output current operates from 20 to 4 mA.

7.1.1 Psychrometric property to be transmitted by analog outputs Out1 / Out2

Lets the user configure the psychrometric property to be transmitted by analog outputs Out1 / Out2.

	Psychrometric property to be transmitted	Default: oFF
Out1 MEAS Out2 MEAS	Outputs Out1 /Out2 off	oFF
	Temperature	t
	Relative humidity	rH
	Dew point temperature	td
	Wet bulb temperature	t_
	Absolute humidity	dU
	Frost point temperature	tF
	Specific enthalpy	h
	Partial vapor pressure	E
	Mixture ratio	r

Table 04 – Psychrometric property to be transmitted

7.1.2 Operating mode for analog outputs Out1 / Out2

Lets the user configure the type of electric signal to be used by the analog outputs Out1 / Out2.

	Type of signal from analog outputs Out1 / Out2	Default: 4-20
Out1 MODE Out2 MODE	Analog output 1 operating in mode 4-20 mA	4-20
	Analog output 1 operating in mode 0-10 V	0-10

Table 05 – Type of signal from analog outputs

7.1.3 Lower limit of the transmission range from analog outputs Out1 / Out2

Lets the user configure the lower background scale for analog outputs Out1 / Out2.

		SI				US			
	Lower limit of the transmission range from analog outputs Out1 / Out2	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
Out1 L-Lo / Out2 L-Lo	Temperature t	-40	100	°C	-40	-40	212	°F	-40
	Relative humidity rH	0	100	% RH	0	0	100	% RH	0
	Dew point temperature td	-90	100	°C	-90	-130	212	°F	-130
	Wet bulb temperature t..	-40	100	°C	-40	-40	212	°F	-40
	Absolute humidity dU	0	600	g/m³	0	0	262	gr/ft³	0
	Frost point temperature tF	-90	100	°C	-90	-130	212	°F	-130
	Specific enthalpy h	-40	700000 *	kJ/kg	-40	-18	300945*	BTU/lb	-18
	Partial vapor pressure E	0	1035	mbar	0	0	15	psi	0
	Mixture ratio r	0	260000 *	g/kg	0	0	1820000 *	gr/lb	0

* These values extrapolate the maximum value that can be shown by the display. Using the HMI, the user can set up to the limit of 19999. When configured via NXperience, these parameters can be adjusted up to the values shown on the table above, but when accessing these parameters via the HMI, they will display the value nnnn.

Table 06 – Lower limit of the transmission range from analog outputs

7.1.4 Upper limit of the transmission range from analog outputs Out1 / Out2

Lets the user configure the upper background scale for analog outputs Out1 / Out2.

		SI				US			
	Upper limit of the transmission range from analog outputs Out1 / Out2	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
Out1 L-Hi / Out2 L-Hi	Temperature	-40	100	°C	100	-40	212	°F	212
	Relative humidity	0	100	% RH	100	0	100	% RH	100
	Dew point temperature	-90	100	°C	100	-130	212	°F	212
	Wet bulb temperature	-40	100	°C	100	-40	212	°F	212
	Absolute humidity	0	600	g/m³	600	0	262	gr/ft³	262
	Frost point temperature	-90	100	°C	100	-130	212	°F	212
	Specific enthalpy	-40	700000 *	kJ/kg	700000	-18	300945*	BTU/lb	300945
	Partial vapor pressure	0	1035	mbar	1035	0	15	psi	15
	Mixture ratio	0	260000 *	g/kg	260000	0	1820000 *	gr/lb	1820000

* These values extrapolate the maximum value that can be shown by the display. Using the HMI, the user can set up to the limit of 19999. When configured via NXperience, these parameters can be adjusted up to the values shown on the table above, but when accessing these parameters via the HMI, they will display the value nnnn.

Table 07 – Upper limit of the transmission range from analog outputs

7.1.5 Status of analog outputs Out1 / Out2 in case of sensor error

Lets the user configure the status of analog outputs Out1 / Out2 in case of error in the sensor reading.

Out1 Err / Out2 Err	Value of analog outputs Out1 / Out2 in case of error	Default: Hi
	Sets analog outputs Out1 / Out2 to the minimum value in case of error in the sensor reading.	Lo
	Sets the analog outputs Out1 / Out2 to the maximum value in case of error in the sensor reading.	Hi

Table 08 – Value of analog outputs Out1 / Out2 in case of error

7.2 ALARM OUTPUTS AL1 / AL2

All models of RHT *Climate* Transmitters have two alarm outputs, which can also be used with ON/OFF control outputs. For models with display, there is the additional feature of an internal buzzer for audible signaling. For each alarm output and for the buzzer, the following can be configured:

- The associated psychrometric property;
- Alarm type Lo, Hi, L--H, -LH-;
- The setpoints;
- Hysteresis;
- Output condition in case of sensor error;
- And the timing.

The configuration cycle for alarms **AL1** / **AL2** allows for assigning the psychrometric property associated with alarm outputs **AL1** / **AL2**, the operating mode for alarms **AL1** / **AL2** (type of alarm), activation points for alarms **AL1** / **AL2**, their timing values, inhibition of alarm condition when turning the device on, and the alarm activation mode in case of sensor reading error.

The figure below shows how the alarm outputs are activated and deactivated according to the type of alarm selected.

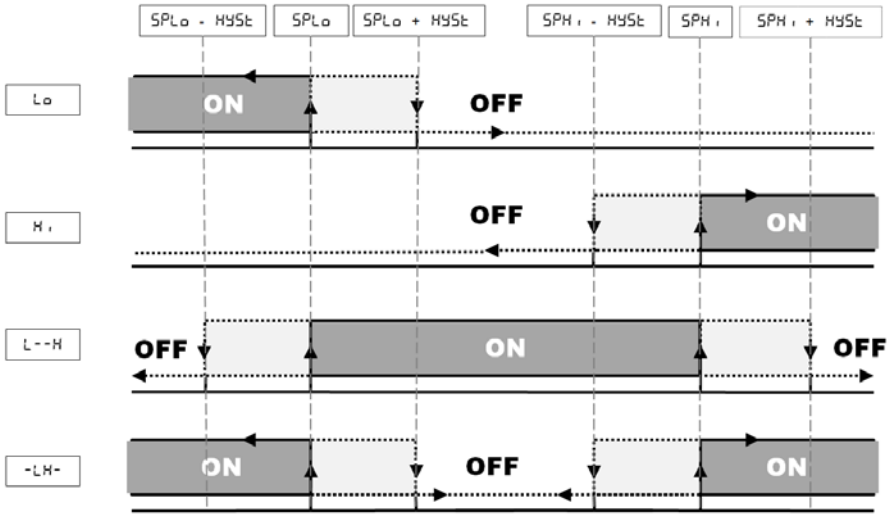


Fig. 23 - Alarm output activation and deactivation

The RHT *Climate* Transmitter allows for four timing options for its alarm outputs and for the buzzer:

- Normal operation;
- Activation for set time;
- Delay in activation;
- Intermittent activation.

The figures in Table 4 show the behavior of alarm outputs with these activation variations defined by the **tOn** and **tOFF** time intervals.

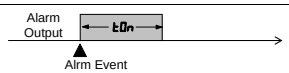
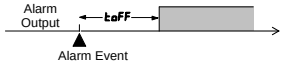
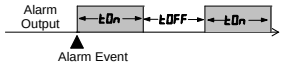
OPERATION	tOn	tOFF	ACTUATION
Normal operation	0	0	
Activation with set time	1 to 6500 s	0	
Delayed activation	0	1 to 6500 s	
Intermittent activation	1 to 6500 s	1 to 6500 s	

Table 09 - Timing functions for alarms

The Initial Blocking option prevents alarm activation if there is an alarm condition when the controller is turned on. The alarm is only enabled after the process passes through a non-alarm condition.

The initial block is useful, for example, when one of the alarms is configured as minimum value alarm, potentially setting off the alarm right when the process is started up, which is often undesirable behavior.

Initial blocking is not valid for the Sensor Open function.

7.2.1 Psychrometric property associated with alarms AL1 / AL2

Lets the user configure a psychrometric property that will be associated with alarms AL1 / AL2.

	Psychrometric property associated with alarms AL1 / AL2	Default: t
AL1 MEAS AL2 MEAS	Temperature	t
	Relative humidity	rH
	Dew point temperature	td
	Wet bulb temperature	tU
	Absolute humidity	dU
	Frost point temperature	tF
	Specific enthalpy	h
	Partial vapor pressure	E
	Mixture ratio	r

Table 10 – Psychrometric property associated with alarms AL1 / AL2

7.2.2 Activation mode for alarms AL1 / AL2

Lets the user turn off alarms AL1 / AL2 or configure them to operate as one of the alarm types indicated below:

	Activation mode for alarm outputs AL1 / AL2	Default: oFF
AL1 MODE AL2 MODE	Off	oFF
	Sets off alarm in case of sensor error	iErr
	Sets off alarm below setpoint SPLo	Lo
	Sets off alarm above setpoint SPH	H
	Sets off alarm between SPLo and SPH	L--H
	Sets off alarm below SPLo and above SPH	-LH-

Table 11 – Activation mode for alarm outputs AL1 / AL2

7.2.3 Lower Setpoint for activating alarms AL1 / AL2

Lets the user configure the set point for alarm types Lo, L--H and -LH-.

		SI				US			
	Setpoint lower than alarm outputs AL1 / AL2	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
AL1 SPLo AL2 SPLo	AL1 / AL2 for temperature	-40	100	°C	-40	-40	212	°F	-40
	AL1 / AL2 for relative humidity	0	100	% RH	0	0	100	% RH	0
	AL1 / AL2 for dew point temperature	-90	100	°C	-90	-130	212	°F	-130
	AL1 / AL2 for wet bulb temperature	-40	100	°C	-40	-40	212	°F	-40
	AL1 / AL2 for absolute humidity	0	600	g/m³	0	0	262	gr/ft³	0
	AL1 / AL2 for frost point temperature	-90	100	°C	-90	-130	212	°F	-130
	AL1 / AL2 for specific enthalpy	-40	700000 *	kJ/kg	-40	-18	300945*	BTU/lb	-18
	AL1 / AL2 for partial vapor pressure	0	1035	Mbar	0	0	15	psi	0
	AL1 / AL2 for mixture ratio	0	260000 *	g/kg	0	0	1820000 *	gr/lb	0

***** These values extrapolate the maximum value that can be shown by the display. Using the HMI, the user can set up to the limit of 19999. When configured via NXperience software, these parameters can be adjusted up to the values shown on the table above, but when accessing these parameters via the HMI, they will display the value nnnn.

Table 12 – Setpoint lower than alarm outputs AL1 / AL2

7.2.4 Higher Setpoint for activating alarms AL1 / AL2

Lets the user configure the set point for alarm types H, L--H and -LH-.

		SI				US			
	Setpoint higher than alarm outputs AL1 / AL2	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
AL1 SPH, AL2 SPH,	AL1 / AL2 for temperature	-40	100	°C	100	-40	212	°F	212
	AL1 / AL2 for relative humidity	0	100	% RH	100	0	100	% RH	100
	AL1 / AL2 for dew point temperature	-90	100	°C	100	-130	212	°F	212
	AL1 / AL2 for wet bulb temperature	-40	100	°C	100	-40	212	°F	212
	AL1 / AL2 for absolute humidity	0	600	g/m³	600	0	262	gr/ft³	262
	AL1 / AL2 for frost point temperature	-90	100	°C	100	-130	212	°F	212
	AL1 / AL2 for specific enthalpy	-40	700000 *	kJ/kg	700000 *	-18	300945*	BTU/lb	300945*
	AL1 / AL2 for partial vapor pressure	0	1035	mbar	1035	0	15	psi	15
	AL1 / AL2 for mixture ratio	0	260000 *	g/kg	260000 *	0	1820000 *	gr/lb	1820000 *

***** These values extrapolate the maximum value that can be shown by the display. Using the HMI, the user can set up to the limit of 19999. When configured via NXperience software, these parameters can be adjusted up to the values shown on the table above, but when accessing these parameters via the HMI, they will display the value nnnn.

Table 13 – Setpoint higher than alarm outputs AL1 / AL2

7.2.5 Hysteresis for turning off alarms AL1 / AL2

Lets the user adjust the differential for turning off alarms AL1 / AL2.

		SI				US			
	Output hysteresis of alarms AL1 / AL2	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
AL1 HYSt AL2 HYSt	AL1 / AL2 for temperature	0	20	°C	0	0	20	°F	0
	AL1 / AL2 for relative humidity	0	20	% RH	0	0	20	% RH	0
	AL1 / AL2 for dew point temperature	0	20	°C	0	0	20	°F	0
	AL1 / AL2 for wet bulb temperature	0	20	°C	0	0	20	°F	0
	AL1 / AL2 for absolute humidity	0	20	g/m³	0	0	20	gr/ft³	0
	AL1 / AL2 for frost point temperature	0	20	°C	0	0	20	°F	0
	AL1 / AL2 for specific enthalpy	0	20	kJ/kg	0	0	20	BTU/lb	0
	AL1 / AL2 for partial vapor pressure	0	20	mbar	0	0	20	psi	0
	AL1 / AL2 for mixture ratio	0	20	g/kg	0	0	20	gr/lb	0

Table 14 – Output hysteresis of alarms AL1 / AL2

7.2.6 Alarms AL1 / AL2 on time

		Min.	Max.	Unit	Default
AL1 tOn AL2 tOn	Time of alarms on	0	6500	s	0

Table 15 – Time of alarms on

7.2.7 Alarms AL1 / AL2 off time

		Min.	Max.	Unit	Default
AL1 tOFF AL2 tOFF	Time of alarms off	0	6500	s	0

Table 16 – Time of alarms off

7.2.8 Initial blocking of alarms AL1 / AL2

Allows for blocking the activation of alarms AL1 / AL2 if the transmitter starts up in alarm condition.

AL1 bLA	Initial blocking of alarms AL1 / AL2	Default: YES
	Without initial blocking of alarms AL1 / AL2	no
AL2 bLA	With initial blocking of alarms AL1 / AL2	YES

Table 17 – Initial blocking of alarms AL1 / AL2

7.2.9 Status of alarms AL1 / AL2 in case of sensor error

Lets the user configure the outputs from alarms AL1 / AL2 so that they are activated in case of sensor reading error.

AL1 Err	Status of alarm outputs AL1 / AL2 in case of sensor error	Default: oFF
	Alarms AL1 / AL2 off	oFF
AL2 Err	Alarms AL1 / AL2 on	on

Table 18 – Status of alarm outputs AL1 / AL2 in case of sensor error

7.2.10 Enable buzzer activation linked to alarms AL1 / AL2

Lets the user enable buzzer activation linked to alarms AL1 / AL2.

AL1 bu22	Enable buzzer for alarm outputs AL1 / AL2	Default: dSbL
	The buzzer will not be activated when alarms AL1 / AL2 occur.	dSbL
AL2 bu22	The buzzer will be activated when alarms AL1 / AL2 occur.	EnbL

Table 19 – Enable buzzer for alarm outputs AL1 / AL2

7.3 BUZZER CONFIGURATION CYCLE

The buzzer configuration cycle allows for assigning the psychrometric property associated with the buzzer, the buzzer operating mode (type of alarm), buzzer activation points, their timing values, inhibition of alarm condition when turning the device on, and the buzzer activation mode in case of sensor reading error.

7.3.1 Psychrometric property associated with the buzzer

Lets the user configure the psychrometric property that will be associated with the buzzer.

bu22 MEAS	Psychrometric property associated with the buzzer	Default: t
	Temperature	t
	Relative humidity	rH
	Dew point temperature	td
	Wet bulb temperature	t''
	Absolute humidity	dU
	Frost point temperature	tF
	Specific enthalpy	h
	Partial vapor pressure	E
	Mixture ratio	r

Table 20 – Psychrometric property associated with the buzzer

7.3.2 Buzzer activation mode

Lets the user turn off the buzzer or configure it to operate as one of the alarm types set forth below:

bu22 ModE	Buzzer activation mode	Default: oFF
	Off	oFF
	Activates the alarm in case of sensor error	iErr
	Activates alarm below setpoint SPLo	Lo
	Activates alarm above setpoint SPH i	Hi
	Activates alarm between SPLo and SPH i	L--H
	Activates alarm below SPLo and above SPH i	-LH-

Table 21 – Buzzer activation mode

7.3.3 Lower psychrometric property setpoint for buzzer activation

Lets the user configure the set point for alarm types **Lo**, **L--H** and **-LH-**.

		SI				US			
	Psychrometric property	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
bu22 SPLo	Temperature	-40	100	°C	-40	-40	212	°F	-40
	Relative humidity	0	100	% RH	0	0	100	% RH	0
	Dew point temperature	-90	100	°C	-90	-130	212	°F	-130
	Wet bulb temperature	-40	100	°C	-40	-40	212	°F	-40
	Absolute humidity	0	600	g/m³	0	0	262	gr/ft³	0
	Frost point temperature	-90	100	°C	-90	-130	212	°F	-130
	Specific enthalpy	-40	700000 [2]	kJ/kg	-40	-18	300945 [2]	BTU/lb	-18
	Partial vapor pressure	0	1035	mbar	0	0	15	psi	0
	Mixture ratio	0	260000 [2]	g/kg	0	0	1820000 [2]	gr/lb	0

Table 22 – Psychrometric property

7.3.4 Higher Setpoint for buzzer activation

Lets the user configure the set point for alarm types **H1**, **L--H** and **-LH-**.

		SI				US			
	Higher Setpoint for buzzer activation	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
bu22 SPH1	Temperature	-40	100	°C	100	-40	212	°F	212
	Relative humidity	0	100	% RH	100	0	100	% RH	100
	Dew point temperature	-90	100	°C	100	-130	212	°F	212
	Wet bulb temperature	-40	100	°C	100	-40	212	°F	212
	Absolute humidity	0	600	g/m³	600	0	262	gr/ft³	262
	Frost point temperature	-90	100	°C	100	-130	212	°F	212
	Specific enthalpy	-40	700000 [2]	kJ/kg	700000 [2]	-18	300945 [2]	BTU/lb	300945 [2]
	Partial vapor pressure	0	1035	mbar	1035	0	15	psi	15
	Mixture ratio	0	260000 [2]	g/kg	260000 [2]	0	1820000 [2]	gr/lb	1820000 [2]

Table 23 – Higher Setpoint for buzzer activation

7.3.5 Hysteresis for turning off buzzer

Lets the user adjust the differential for turning off the buzzer.

		SI				US			
	Hysteresis for turning off buzzer	Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
bu22 HYSt	Temperature	0	20	°C	0	0	20	°F	0
	Relative humidity	0	20	% RH	0	0	20	% RH	0
	Dew point temperature	0	20	°C	0	0	20	°F	0
	Wet bulb temperature	0	20	°C	0	0	20	°F	0
	Absolute humidity	0	20	g/m³	0	0	20	gr/ft³	0
	Frost point temperature	0	20	°C	0	0	20	°F	0
	Specific enthalpy	0	20	kJ/kg	0	0	20	BTU/lb	0
	Partial vapor pressure	0	20	mbar	0	0	20	psi	0
	Mixture ratio	0	20	g/kg	0	0	20	gr/lb	0

Table 24 – Hysteresis for turning off buzzer

[2] Estes valores extrapolam o valor máximo que pode ser exibido pelo display. Pela IHM o usuário poderá ajustar até o limite de 19999. Quando configurado pelo software NXperience, estes parâmetros podem ser ajustados até os valores exibidos na tabela acima, entretanto ao acessar esses parâmetros pela IHM, estes exibirão o valor **nnnn**.

7.3.6 Buzzer on time

		Min.	Max.	Unit	Default
buZZ tOn	Buzzer on time	0	6500	s	0

Table 25 – Buzzer on time

7.3.7 Buzzer off time

		Min.	Max.	Unit	Default
buZZ tOFF	Buzzer off time	0	6500	s	0

Table 26 – Buzzer off time

7.3.8 Initial buzzer blocking

Allows for blocking buzzer activation if the transmitter starts up in alarm condition.

	Initial buzzer blocking	Default: YES
buZZ bLA	Without initial buzzer blocking	no
	With initial buzzer blocking	YES

Table 27 – Initial buzzer blocking

7.3.9 Buzzer status in case of sensor error

Lets the user configure the buzzer output so that it is activated in case of sensor reading error.

	Buzzer status in case of sensor error	Default: oFF
buZZ Err	Buzzer off	oFF
	Buzzer on	on

Table 28 – Buzzer status in case of sensor error

7.4 CONFIGURATION CYCLE FOR IHM

The IHM configuration cycle allows for adjusting contrast, display backlight operating mode and functions of increment and decrement keys.

7.4.1 Backlight

Adjusts the display backlight operating mode.

	Backlight	Default: on
IHM bcLt	Off	oFF
	Always on	on
	On for 15 seconds after pressing any key	PrSS

Table 29 – Backlight

7.4.2 Contrast

Adjusts the display contrast. Depending on the preferred viewing angle, the contrast may need to be adjusted to improve the clarity of information on the display.

	Contrast	Default: on
IHM cont	Contrast 1 (-40° in relation to the horizontal line)	1
	Contrast 2 (-20° in relation to the horizontal line)	2
	Contrast 3 (0° in relation to the horizontal line)	3
	Contrast 4 (+20° in relation to the horizontal line)	4
	Contrast 5 (+40° in relation to the horizontal line)	5

Table 30 – Contrast

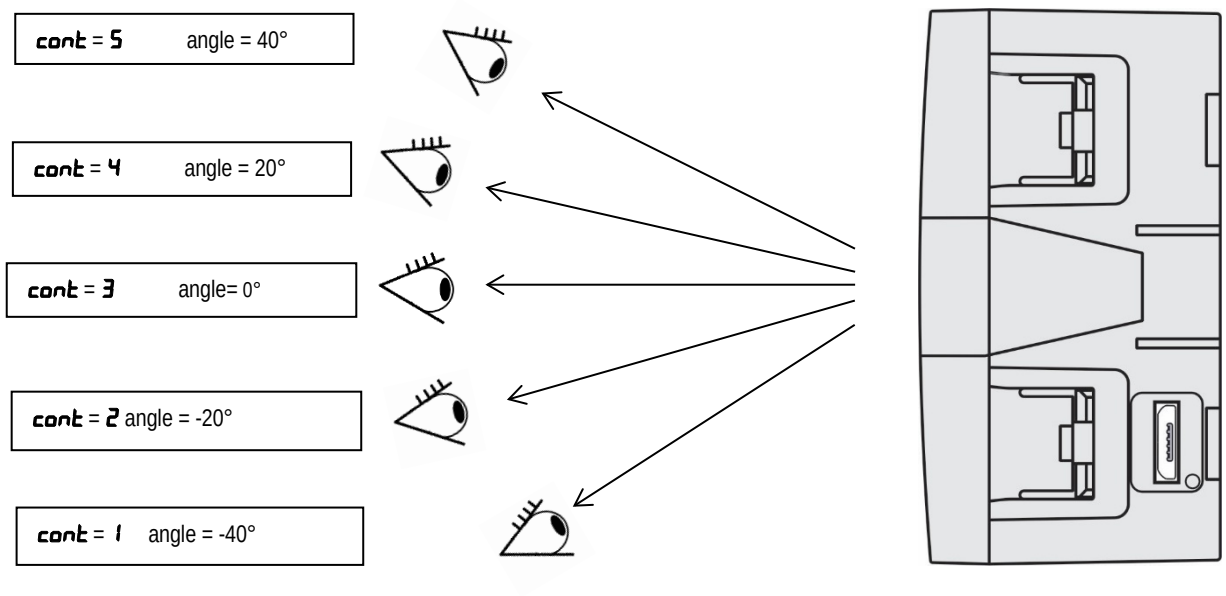


Fig. 24 – RHT *Climate* Transmitter display contrast

7.4.3 Second function of key

Configures the second function of the increment key.

IHn F1	Second function of increment key	Default: nonE
	None	nonE
	Mutes buzzer	b2
	Mutes buzzer and turns off alarm output	b2AL

Table 31 – Second function of increment key

7.4.4 Second function of key

Configures the second function of the decrement key.

IHn F2	Second function of decrement key	Default: nonE
	None	nonE
	Clear maximum and minimum values	clr

Table 32 – Second function of decrement key

7.5 DIAGNOSTIC CYCLE

The diagnostic cycle lets the user test the operation of the RHT *Climate* Transmitter, making sure that all of its peripherals are working properly.

7.5.1 Analog output FoU1 / FoU2 forcing

Lets the user force a current or voltage value at the analog output OUT1 / OUT2. If the output is configured as output at voltage 0-10 V, the user can adjust the value between 0.00 V and 10.00 V. If the output is configured as an output at current 4-20 mA, the user can adjust the value between 4.00 mA and 20.00 mA (to check the operating range for the output in current). Above 20.0 mA, the user will be able to adjust the output to 21.0 mA, to simulate the transmission failure signal. The same thing happens for the lower limit, which may shift to 3.6 mA. The figure below shows the normal transmission range limits and the transmission failure signal zones.

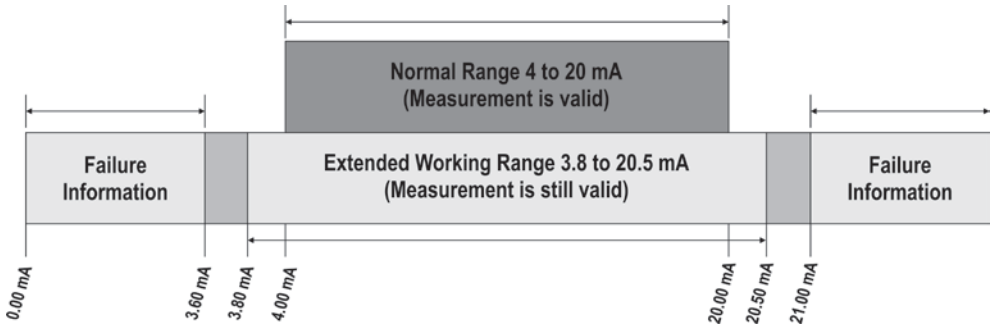


Fig. 25 – Normal Transmission Range Limits

		Min.	Max.	Unit	Default
diAG FoU1	Forces voltage value at analog output 1. (If Out1 / Out2 ModE = 0-10)	0	10.00	V	0
diAG FoU2	Forces current value at analog output 1. (If Out1 / Out2 ModE = 4-20)	3.6	21.00	mA	4

Table 33 – Analog output FoU1 / FoU2 forcing

7.5.2 Temperature reading forcing

Lets the user force a temperature value. This feature can be used to simulate temperature alarms or alarms for other variables due to change.

		SI				US			
		Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
diAG F_t	Forces the temperature reading value.	-40	100	°C	-40	-40	212	°F	-40

Table 34 – Temperature reading forcing

7.5.3 Relative humidity reading forcing

Lets the user force a relative humidity value. This feature can be used to simulate relative humidity alarms or alarms for other variables due to change. If, for example, alarm output 1 is configured to activate whenever relative humidity is higher than 80% RH or lower than 40 % RH, the user can evidence the AL1 output operating as the forced value varies.

		Min.	Max.	Unit	Default
diAG FrH	Forces relative humidity reading value.	0	100	%	0

Table 35 – Relative humidity reading forcing

7.5.4 Alarm AL1 / AL2 output forcing

Lets the user force activation of alarm output AL1 / AL2.

diAG FA1 / diAG FA1	Forces alarm output AL1 / AL2	Default: oFF
	Forces alarm AL1 / AL2 off output	oFF
	Forces alarm AL1 / AL2 on output	on

Table 36 – Forces alarm output AL1 / AL2

7.5.5 Buzzer forcing

Lets the user force buzzer activation.

diAG Fb22	Forces buzzer output	Default: oFF
	Forces buzzer off output	oFF
	Forces buzzer on output	on

Table 37 – Buzzer forcing

7.6 COMMUNICATION CYCLE

In the communication cycle, the user will find configuration parameters for the RS485 Modbus serial port: Baud rate, parity and address.

7.6.1 Baud Rate

The RHT Transmitter can be access via a Modbus-RTU network. The baud rate, parity and device address on the network need to be configured for this. The device responds to the read and write commands in its internal registers according to the specifications set out in this manual (see chapter on SERIAL COMMUNICATION).

CnFG bAUd	Baud Rate	19.2
	1200 bps	1.2
	2400 bps	2.4
	4800 bps	4.8
	9600 bps	9.6
	19200 bps	19.2
	38400 bps	38.4
	57600 bps	57.6
	115200 bps	115.2

Table 38 – Baud rate

7.6.2 Parity

This parameter configures the parity for RHT *Climate* Transmitter communication on a Modbus-RTU network.

CnFG PrtY	Parity	Default: nonE
	Without parity	nonE
	Even Parity	EuEn
	Odd Parity	odd

Table 39 – Parity

7.6.3 Address

This parameter configures the address for RHT *Climate* Transmitter communication on a Modbus-RTU network. This parameter should be adjusted so that no two devices use the same address within a Modbus-RTU network.

		Min.	Max.	Unit	Default
CnFG Addr	Internet address	1	247	-	1

Table 40 – Address

7.7 GENERAL CONFIGURATION CYCLE

To access the parameters in this cycle, the user must enter with the device password. The parameters in this cycle allow for selecting units of measure, adjusting atmospheric pressure, as well as offsets and digital filters for the sensor readings. Also in this cycle, the user can enable configuration parameter protection and change the password.

7.7.1 Unit of Measure

The RHT *Climate* Transmitter can operate using the standard measurements in the International System of Measures (SI) or the English System of Measures (US). The table below shows the measurement unit adopted for each psychrometric property according to the value configured in this parameter.

CnFG Unit	Units of measure	Default: SI
	International System of Measures	SI
	English System of Measures	US

	SI	US
Temperature	°C	°F
Relative humidity	% RH	% RH
Dew point temperature	°C	°F
Partial vapor pressure	mbar	psi
Wet bulb temperature	°C	°F
Absolute humidity	g/m³	gr/ft³
Mixture ratio	g/kg	gr/lb
Specific enthalpy	kJ/kg	BTU/lb
Frost point temperature	°C	°F

Table 41 – Units of measure

7.7.2 Atmospheric Pressure

The RHT *Climate* Transmitter uses the atmospheric pressure value to calculate some psychrometric properties. The default value used by this device is 1013 mbar (14.7 psi), but the user can refine this information by inserting the value read by another reference instrument. Atmospheric pressure may vary according to altitude, or due to conditions of the process itself.

		SI				US			
		Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
CnFG PrES	Configures the atmospheric pressure value. This value is used for the calculation of psychrometric properties.	0	10000	mbar	1013	0	145	psi	14.7

Table 42 – Atmospheric pressure

7.7.3 Digital temperature reading filter

A digital filter can be inserted at the temperature value read by the sensor, to reduce undesirable variations. The higher the time value configured in the digital filter, the slower the temperature reading response will be.

		Min.	Max.	Unit	Default
CnFG FLt	Temperature sensor reading filter	0	300	s	60

Table 43 – Digital temperature reading filter

7.7.4 Digital relative humidity reading filter

A digital filter can be inserted at the relative humidity value read by the sensor, to reduce undesirable variations. The higher the time value configured in the digital filter, the slower the relative humidity reading response will be.

		Min.	Max.	Unit	Default
CnFG FLrH	Humidity sensor reading filter	0	300	s	0

Table 44 – Digital relative humidity reading filter

7.7.5 Temperature reading offset

This parameter allows for correcting offset displacement in the temperature reading.

		SI				US			
		Min.	Max.	Unit	Default	Min.	Max.	Unit	Default
CnFG OFt	Temperature reading offset	-5	5	°C	0	-9	9	°F	0

Table 45 – Temperature reading offset

7.7.6 Relative humidity reading offset

This parameter allows for correcting offset displacement in the relative humidity reading.

		Min.	Max.	Unit	Default
CnFG OFrH	Humidity reading offset	-5	5	%	0

Table 46 – Relative humidity reading offset

7.7.7 Password

The RHT *Climate* Transmitter can be protected with a password, which ensures greater protection for the parameters defined in the device. This feature prevents unauthorized people from making changes to the transmitter's operating mode.

The configured factory default password is "1111". To change the password, the user must enter the master password, which is formed as follows:

Master password = 9 followed by the last three digits forming the serial number.

After entering the master password, the user can insert a new password.

		Min.	Max.	Unit	Default
CnFG PASS	*Password*	0	9999	-	1111

Table 47 – Password

7.7.8 Parameter Protection

This parameter allows for enabling and disabling the protection of other parameters. When parameter protection is enabled, the RHT *Climate* Transmitter will allow for viewing the parameters, but will not allow any change to the configured values. The device leaves the factor with parameter protection disabled.

	Parameter protection	Default: dSbL
CnFG Prot	Parameter protection disabled	dSbL
	Parameter protection enabled	EnbL

Table 48 – Parameter protection

After configuring the transmitter, the user can access this parameter and select the **EnbL** option to enable protection. As of this moment, the protection will be enabled.

To disable protection, the user should access the **PASS** parameter and enter the configured password. Next the user should access the **Prot** parameter and select the **dSbL** option. As of this moment, the protection will be disabled.

If the protection is enabled and the user attempts to alter any parameter, the transmitter will show the **Prot** message on the display instead of the defined value.

7.8 INFORMATION CYCLE

In the information cycle, the RHT *Climate* Transmitter shows the device's serial number (Sn) and firmware (Firm) version.

Fig. 26 - Serial number and firmware version information

8 PARAMETER MAP

PRIMARY CYCLE	Out1	Out2	AL1	AL2	bu22	INP	diAG	CO n	CnFG	
Temperature Relative humidity Dew point temp.	MEAS	MEAS	MEAS	MEAS	MEAS	bcLt	FOu1	bAud	PASS	Sn
Maximum temperature Minimum temperature	ModE	ModE	ModE	ModE	ModE	Cont	FOu2	PrtY	Unit	FinA
Maximum relative humidity Minimum relative humidity	L-Lo	L-Lo	SPLo	SPLo	SPLo	F1	FIt	Addr	PrES	
Maximum dew point Minimum dew point	L-H	L-H	SPH	SPH	SPH	F2	FInH		FLt	
Wet bulb temperature	Err	Err	HYSt	HYSt	HYSt		FAL1		FLnH	
Absolute humidity			tOn	tOn	tOn		FAL2		OFt	
Frost point temp.			tOFF	tOFF	tOFF		Fb22		OFnH	
Enthalpy			bLA	bLA	bLA				PASS	
Partial vapor pressure			Err	Err	Err				Prot	
Mixture ratio			bu22	bu22						

Table 49 – Map of transmitter parameters

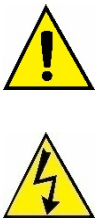
9 USB INTERFACE

The USB interface is used for CONFIGURING or MONITORING the device. For CONFIGURATION, the NXperience software should be used, which offers features for creating, viewing, saving and opening configurations from the device or from files on your computer. The feature for saving and opening configurations in files makes it possible to transfer configurations between device and make backup copies. For specific models, NXperience also allows for updating the controller's firmware (internal software) via USB interface.

For MONITORING, any supervision (SCADA) or laboratory software may be used that offers support for Modbus RTU communication over a serial communication port. When connected to a computer USB port, TEMP *Climate* Transmitter is recognized as a conventional serial port (COM x). Use NXperience or refer to the Device Manager on Windows Control Panel to identify the COM port that was assigned to the transmitter. Refer to the Modbus memory mapping in the device's communication manual and its supervision software documentation to perform MONITORING.

Follow the procedure below to use the device's USB communication:

- Download NXperience from our website and install it on your computer (see chapter NXPERIENCE SOFTWARE). The USB drivers required for communication will be installed along with the software.
- Connect the USB cable between the device and the computer. The controller doesn't need a power supply. The USB will provide enough power for the communication operation (other device functions may not operate).
- Launch NXperience, configure communication and start device recognition.



The USB interface IS NOT ISOLATED from the retransmission outputs and alarm outputs. Its purpose is temporary use during CONFIGURATION and MONITORING periods. For the safety of people and device, it should only be used with the device fully disconnected from the external power supply inlet. USB use in any other connection condition is possible, but it requires careful analysis by the person in charge of installation. For MONITORING for long periods and with inputs and outputs connected, use of the RS485 interface is recommended, available or optional in most of our devices.

10 SERIAL COMMUNICATION

The RHT *Climate* Transmitter can be recognized on an RS485 network with MODBUS RTU protocol as a slave device. All of the controller's configurable parameters can be read and/or written via serial communication. Writing to Registers in broadcast mode is also allowed, using address 0.

The available Modbus commands are as follows:

03 – Read Holding Register

05 – Force Single Coil

06 – Present Single Register

16 – Present Multiple Register

10.1 TABLE OF HOLDING REGISTER TYPE REGISTERS

For writing in RW registers, a configuration session needs to be opened. For this, 0x5AA5 needs to be written in the address 223 register.

			SI			US		
Primary Cycle Indication Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
0	Relative humidity value	RO	0	1000	-	0	1000	-
1								
2	Dry bulb temperature value	RO	-400	1000	-	-400	2120	-
3								
4	Wet bulb temperature value	RO	-400	1000	-	-400	2120	-
5								
6	Dew point value	RO	-900	1000	-	-1300	2120	-
7								
8	Frost point value	RO	-900	1000	-	-1300	2120	-
9								
10	Specific enthalpy value	RO	-400	7000000	-	-180	3009450	-
11								
12	Absolute humidity value	RO	0	6000	-	0	2620	-
13								
14	Partial vapor pressure value	RO	0	10350	-	0	150	-
15								
16	Mixture ratio value	RO	0	2600000	-	0	18200000	-
17								
18	Minimum humidity value	RO	0	1000	-	0	1000	-
19								
20	Maximum humidity value	RO	0	1000	-	0	1000	-
21								
22	Minimum temperature value	RO	-400	1000	-	-400	2120	-
23								
24	Maximum temperature value	RO	-400	1000	-	-400	2120	-
25								
26	Minimum dew point value	RO	-900	1000	-	-1300	2120	-
27								
28	Maximum dew point value	RO	-900	1000	-	-1300	2120	-
29								

Table 50 – Primary Cycle Indication Registers

Analog Output OUT1 Transmission Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
101	Transmission output type	RW	0	2	0	0	2	0
102	Variable that will be transmitted	RW	0	8	0	0	8	0
103	Upper retransmission limit	RW	The limits depend on the psychrometric property configured at address 102					
104								
105	Lower retransmission limit	RW	The limits depend on the psychrometric property configured at address 102					
106								
107	Value in case of error	RW	0	1	1	0	1	1

Table 51 – Analog Output OUT1 Transmission Registers

Analog Output OUT2 Transmission Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
113	Retransmission output type	RW	0	2	0	0	2	0
114	Variable that will be transmitted	RW	0	8	0	0	8	0
115	Upper retransmission limit	RW	The limits depend on the psychrometric property configured at address 114					
116								
117	Lower retransmission limit	RW	The limits depend on the psychrometric property configured at address 114					
118								
119	Value in case of error	RW	0	1	0	0	1	0

Table 52 – Analog Output OUT2 Transmission Registers

Filter and Unit System Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
125	Filter for humidity reading	RW	0	300	60	0	300	60
126	Filter for temperature reading	RW	0	300	60	0	300	60
127	Configuring units	RW	0	1	0	0	1	0

Table 53 – Filter and Unit System Registers

Alarm ALM1 Output Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
133	Variable that will set off alarm	RW	1	9	1	1	9	1
134	Type of alarm	RW	0	5	0	0	5	0
135	High Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 133					
136								
137	Low Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 133					
138								
139	Alarm blocking	RW	0	1	1	0	1	1
140	Alarm hysteresis	RW	0	200	0	0	200	0
141	Alarm ON time	RW	0	6500	0	0	6500	0
142	Alarm OFF time	RW	0	6500	0	0	6500	0
143	Determines the alarm status in case of sensor error	RW	0	1	0	0	1	0
144	Determines buzzer activation	RW	0	1	0	0	1	0

Table 54 – Alarm ALM1 Output Registers

Alarm ALM2 Output Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
150	Variable that will set off alarm	RW	1	9	1	1	9	1
151	Type of alarm	RW	0	5	0	0	5	0
152	High Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 150					
153								
154	Low Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 150					
155								
156	Alarm blocking	RW	0	1	1	0	1	1
157	Alarm hysteresis	RW	0	200	0	0	200	0
158	Alarm ON time	RW	0	6500	0	0	6500	0
159	Alarm OFF time	RW	0	6500	0	0	6500	0
160	Determines the alarm status in case of sensor error	RW	0	1	0	0	1	0
161	Determines buzzer activation	RW	0	1	0	0	1	0

Table 55 – Alarm ALM2 Output Registers

Alarm ALM3 Output Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
167	Variable that will set off alarm	RW	1	9	1	1	9	1
168	Type of alarm	RW	0	5	0	0	5	0
169	High Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 167					
170								
171	Low Setpoint for alarm	RW	The limits depend on the psychrometric property configured at address 167					
172								
173	Alarm blocking	RW	0	1	1	0	1	1
174	Alarm hysteresis	RW	0	200	0	0	200	0
175	Alarm ON time	RW	0	6500	0	0	6500	0
176	Alarm OFF time	RW	0	6500	0	0	6500	0
177	Determines the alarm status in case of sensor error	RW	0	1	0	0	1	0
178	Determines buzzer activation	RW	0	1	0	0	1	0

Table 56 – Alarm ALM3 Output Registers

RS485 Modbus Communication Port Configuration Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
184	Baud rate	RW	0	7	7	0	7	7
185	Parity	RW	0	2	0	0	2	0
186	Slave address	RW	1	247	1	1	247	1

Table 57 – RS485 Modbus Communication Port Configuration Registers

Offset Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
192	Temperature Offset	RW	-50	50	0	-50	50	0
193	Humidity Offset	RW	-50	50	0	-50	50	0
194	Dew point offset	RW	-50	50	0	-50	50	0
200	Pressure value used for calculations	RW	0	10000	1013	0	10000	147

Table 58 – Offset Registers

Forcing Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
201	Enables output 1 forcing	RW	0	1	0	0	1	0
202	Forced value for output 1	RW	Limits depend on the analog output 1 configuration					
203	Enables output 2 forcing	RW	0	1	0	0	1	0
204	Forced value for output 2	RW	Limits depend on the analog output 2 configuration					
205	Enables forcing of alarm 1	RW	0	1	0	0	1	0
206	Changes alarm status	RW	0	1	0	0	1	0
207	Enables forcing of alarm 2	RW	0	1	0	0	1	0
208	Changes alarm status	RW	0	1	0	0	1	0
209	Turning backlight on	RW	0	2	1	0	2	1
211	Enables buzzing forcing	RW	0	1	0	0	1	0
212	Buzzer activation	RW	0	1	0	0	1	0
213	Enables humidity forcing	RW	0	1	0	0	1	0
214	Forced humidity value	RW	0	1000	0	0	1000	0
215	Enables temperature forcing	RW	0	1	0	0	1	0
216	Forced temperature value	RW	-400	1000	0	-400	2120	0

Table 59 – Forcing Registers

Minimum and Maximum Psychrometric Properties and Second Key Function Reset Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
217	*Reset* of all min. and max. values	RW	0	1	0	0	1	0
221	Second function of key 	RW	0	2	0	0	2	0
222	Second function of key 	RW	0	1	0	0	1	0

Table 60 – Minimum and Maximum Psychrometric Properties and Second Key Function Reset Registers

Device Tag Registers					
Address	Description	R/W	Min.		
224	Device name string	RW	ASCII	CHARACTER 2	CHARACTER 1
225		RW	ASCII	CHARACTER 4	CHARACTER 3
226		RW	ASCII	CHARACTER 6	CHARACTER 5
227		RW	ASCII	CHARACTER 8	CHARACTER 7
228		RW	ASCII	CHARACTER 10	CHARACTER 9
229		RW	ASCII	CHARACTER 12	CHARACTER 11
230		RW	ASCII	CHARACTER 14	CHARACTER 13
231		RW	ASCII	CHARACTER 16	CHARACTER 15
232		RW	ASCII	CHARACTER 18	CHARACTER 17
233		RW	ASCII	CHARACTER 20	CHARACTER 19

Table 61 – Device Tag Registers

Sensor Linearization Registers								
Address	Description	R/W	Min.	Max.	Default	Min.	Max.	Default
234	Enables temperature linearization	RW	0	1	0	0	1	0
235	Real temperature value 1	RW	-400	1000	0	-400	2120	0
236	Target temperature value 1	RW	-400	1000	0	-400	2120	0
237	Real temperature value 2	RW	-400	1000	0	-400	2120	0
238	Target temperature value 2	RW	-400	1000	0	-400	2120	0
239	Real temperature value 3	RW	-400	1000	0	-400	2120	0
240	Target temperature value 3	RW	-400	1000	0	-400	2120	0
241	Real temperature value 4	RW	-400	1000	0	-400	2120	0
242	Target temperature value 4	RW	-400	1000	0	-400	2120	0
243	Real temperature value 5	RW	-400	1000	0	-400	2120	0
244	Target temperature value 5	RW	-400	1000	0	-400	2120	0
245	Enables humidity linearization	RW	0	1	0	0	1	0
246	Real humidity value 1	RW	0	1000	0	0	1000	0
247	Target humidity value 1	RW	0	1000	0	0	1000	0
248	Real humidity value 2	RW	0	1000	0	0	1000	0
249	Target humidity value 2	RW	0	1000	0	0	1000	0
250	Real humidity value 3	RW	0	1000	0	0	1000	0
251	Target humidity value 3	RW	0	1000	0	0	1000	0
252	Real humidity value 4	RW	0	1000	0	0	1000	0
253	Target humidity value 4	RW	0	1000	0	0	1000	0
254	Real humidity value 5	RW	0	1000	0	0	1000	0
255	Target humidity value 5	RW	0	1000	0	0	1000	0

Table 62 – Sensor Linearization Registers

Device Information Registers		
Address	Description	R/W
300	High serial number	RO
301	Low serial number	RO
302	Firmware version	RO
303	Release version	RO
304	ID	RO
305	Informs the device model	RO

Table 63 – Device Information Registers

Diagnostic Registers		
Address	*bit*	Description
341	0	-
	1	Analog Output 1 in overload
	2	Analog Output 2 in overload
	3	Alarm 1 Output Status
	4	Alarm 2 Output Status
	5	Alarm 1 Condition Status
	6	Alarm 2 Condition Status
	7	Buzzer Status in Alarm 1
	8	Buzzer Status in Alarm 2
	9	Buzzer Status
	10	Alarm 1 Forcing Status
	11	Alarm 2 Forcing Status
	12	Analog Output 1 Forcing Status
	13	Analog Output 2 Forcing Status
342	0	Sensor Error
	1	Error in Water Vapor Saturation Pressure
	2	Error in Water Vapor Pressure
	3	Error at Dew Point
	4	Error in Absolute Humidity
	5	Error in Mixture Ratio
	6	-
	7	-
	8	Error in Wet Bulb Temperature
	9	Error in Specific Enthalpy
	10	-
	11	Error in Frost Point

Table 64 – Diagnostic Registers

11 NXPERIENCE SOFTWARE

The NXperience software is the main tool for configuring, downloading and analyzing data for RHT *Climate* Transmitter. It allows for exploring all features and resources of devices by communicating through its USB interface.

This manual describes the software's generic features. For instructions about device configuration, refer to the specific operating manual. The software and its manual can be downloaded free of charge from our website www.novusautomation.com, in the Downloads Area.

11.1 INSTALLING NXPERIENCE

NXperience is used to configure parameters and to monitor the measured and calculated variables. To install NXperience, just execute the *NxSoftwareSetup.exe* file available from our website.

11.2 RUNNING NXPERIENCE

When opening NXperience software, the home screen is displayed:

Fig. 27 – NXperience Home Screen

To communicate with the software, the RHT *Climate* Transmitter needs to be connected to the computer and have USB drivers previously installed.

Then you can click on Configure or Monitor. The Collect option is not available for this device model.

The first time that the device reading is taken, the software asks the user to choose which device to connect to, by just double-clicking on the desired device or selecting and clicking the OK button, as shown in the image below. This device will be used by default for the next times the software communicates with the device.

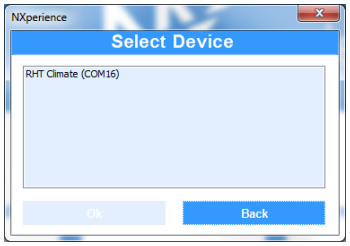


Fig. 28 – Select Device Screen

11.3 CONFIGURING WITH NXPERIENCE

To configure the device, the device needs to be connected to a USB port on the computer where the software is running.

When clicking on the Configure button, the following screen is displayed:

Fig. 29 – Configuring the Device Screen

The Create Configuration button creates a configuration from scratch, without needing the device. This configuration can be saved in a file for future use, or saved to a connected device.

The Configuration File button is used for reading from an already created configuration file.

The device's current configuration is read by clicking on the Device Reading button. When selecting this option, all features available for configuration will be displayed, as shown in the figure below:

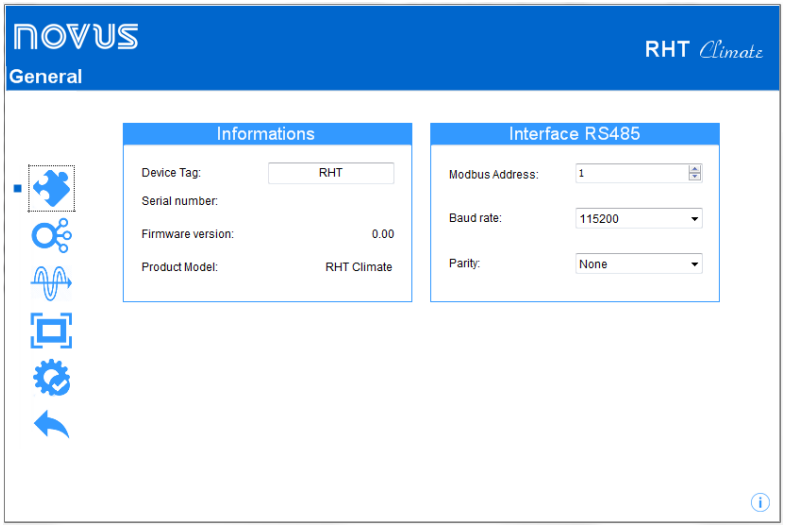


Fig. 30 – Configuration Screen

General: On this configuration tab, the user can assign an identification name to the device and define the configuration parameters for the RS-485 interface. Additionally, the device model, serial number and firmware version can be identified.

Input: On this configuration tab, the user can select the system of measures to be used by the device, in addition to configuring the offset and digital filter for the temperature and relative humidity sensor input. The user can perform linearization.

Output: On this configuration tab, the user can configure the two transmission analog outputs, the two alarm outputs and the buzzer.

HMI: On this configuration tab, the user can configure the information and parameters that will be available on the device's display. The display contrast and backlight can also be adjusted on this tab, as well as additional functions for navigation keys.

* The HMI features are only available for models with LCD display.

Diagnostics: On this tab, the user can check that the device is functioning properly by forcing the temperature and relative humidity readings and forcing the alarm and buzzer outputs.

Completion: On this tab, the user can send the configuration to the device, save the configurations in a file, update the device firmware, and configure a password to protect the device.

Go back: Returns to NXperience home screen.

11.3.1 GENERAL PARAMETERS

By clicking on the icon , the software will display the screen below with information on the device that is being configured and the RS485 interface configuration parameters.

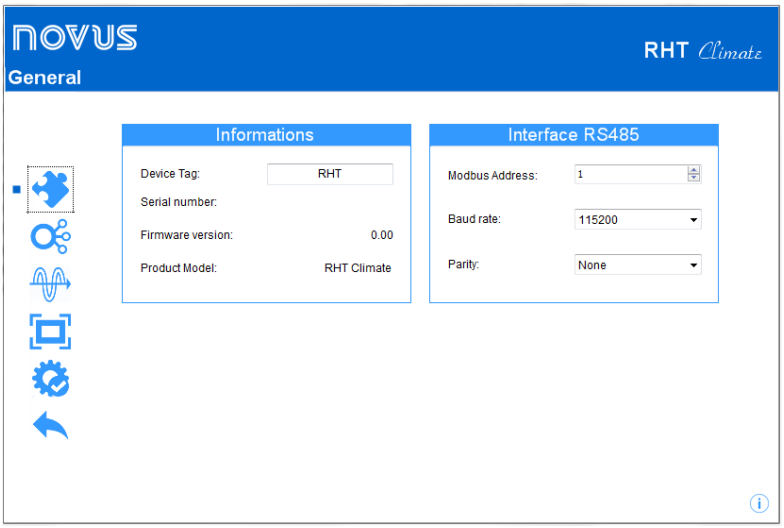


Fig. 31 – General Screen

In the Device Tag field, a name can be assigned to the device to be configured in order to make it easily identifiable on a network with multiple devices. The device's Serial Number, Firmware Version and Model are read-only fields and are read from the device directly by the software.

In order for the RHT *Climate* Transmitter to be recognized as a slave device on an RS485 Modbus network, it needs to be assigned a unique Modbus Address on the network, and the Baud Rate and Parity need to be configured.

11.3.2 INPUT PARAMETERS

By clicking on the icon , the software will display the screen below and the user can configure the temperature and relative humidity sensor's input channel.

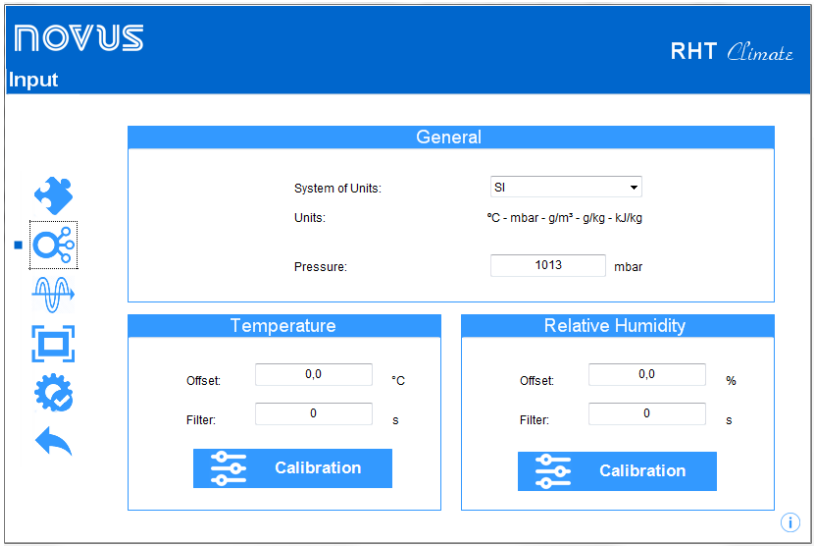


Fig. 32 – Temperature and relative humidity sensor input channel configuration screen

In the System of Units field, the user can select the international system of measures (SI) or the English system of measures (US). See the GENERAL CONFIGURATION CYCLE section.

In the Pressure field, the RHT *Climate* Transmitter allows for configuring atmospheric pressure. The device comes factory configured with a pressure valor equal to atmospheric pressure at sea level. The values of psychrometric properties calculated by the RHT *Climate* Transmitter may undergo variations due to pressure. In locations with high altitude or in pressurized environments, the user needs to adjust the value of this parameter so that the RHT *Climate* Transmitter uses it in its offset algorithms.

For the temperature and relative humidity reading, the device provides Offset and Filter settings. With these features, minor corrections can be made to the sensor readings, and the sensor's response speed can be reduced.

To obtain higher precision from the sensor, the device offers the Custom Calibration feature, which lets the user insert up to five temperature points and five points for relative humidity. To make this adjustment, click on Calibration to access the custom calibration window. For further details about this feature, refer to the NXperience manual at www.novusautomation.com.

11.3.3 OUTPUT PARAMETERS

By clicking on the icon , the software will display the screen below and the user can configure the transmission analog outputs, the alarm outputs and the buzzer.

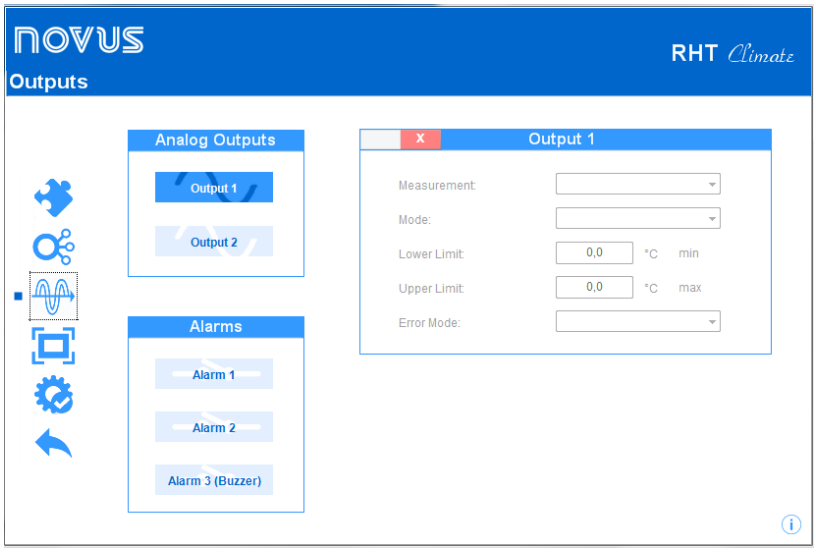


Fig. 33 – Output configuration screen

11.3.3.1 Configuring Transmission Outputs

To select the analog output to be configured, click once on the button for the analog output and enable it by sliding the enable key right.

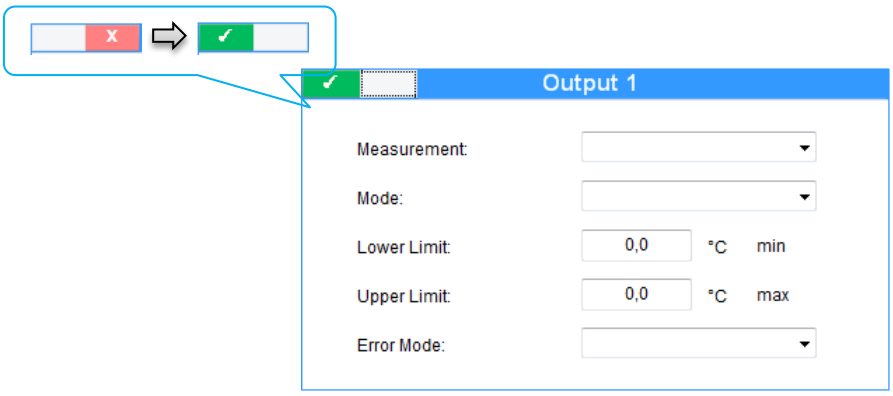


Fig. 34 – Output 1

In the Measurement field, the psychrometric property to be transmitted by the analog output can be selected. The analog output Mode allows for selecting the electrical standard to be used for transmission: 0-10 V or 4-20 mA. The electrical signal from the output will be proportional to the selected variable, abiding by the values configured for Lower Limit and Upper Limit.

In case of sensor failure, the variable to be transmitted by the analog output will go into Error Mode. For this error condition, the user can select High or Low status.

	Error mode	
Mode	Low	High
0 - 10 V	0 V	10 V
4 - 20 mA	3.6 mA	21.0 mA

Table 65 – Error mode

11.3.3.2 Configuring Alarm and Buzzer Outputs

To select the alarm output to be configured, click once on the button for the alarm output Alarm 1 and enable it by sliding the enable key right.

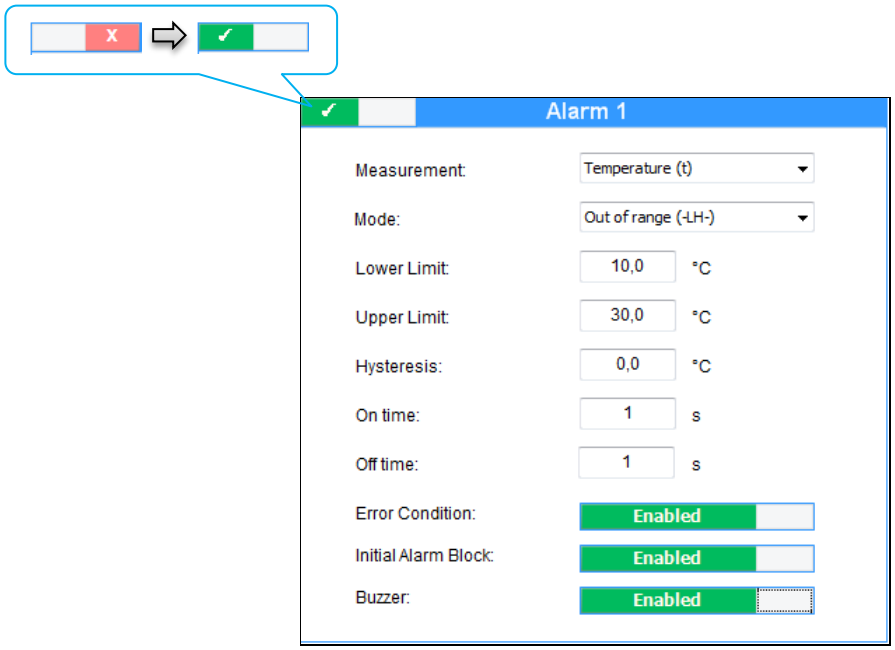


Fig. 35 – Alarm 1

The alarm output may be timed using the Time on and Time off parameters. Depending on the set values, the output may behave in the following ways:

If the device is configured with alarm Lo, Hi, L--H or -LH-, the Error condition parameter allows for configuring the alarm output if the temperature and relative humidity sensor fails. In this case, the output will be turned on or off according to the value configured in this parameter.

In some applications using the RHT *Climate* Transmitter, the occurrence of alarms right when turning the device on may need to be disregarded. A typical example is an application in which an environment needs to be kept cool. Supposing that the alarm is configured to go off when temperatures is lower than -10 °C or higher than 2 °C, if the initial environment temperature is 25 °C when the RHT *Climate* Transmitter is turned on, the alarm will be activated. To inhibit this initial activity, the user can enable Initial alarm blocking. With initial blocking enabled, the device will need to reach a non-alarm condition for an alarm event to activate the output.

The buzzer* activation can be linked to each alarm output. As such, whenever the alarm output is turned on, the buzzer will be activated, abiding by the buzzer timing configurations. To link the buzzer to the alarm output, the Buzzer parameter must be enabled.

*The buzzer can only be linked to an alarm output in LCD models.

To select the buzzer configurations, click once on the button Alarm 3 (Buzzer) and enable it by sliding the enable key right.

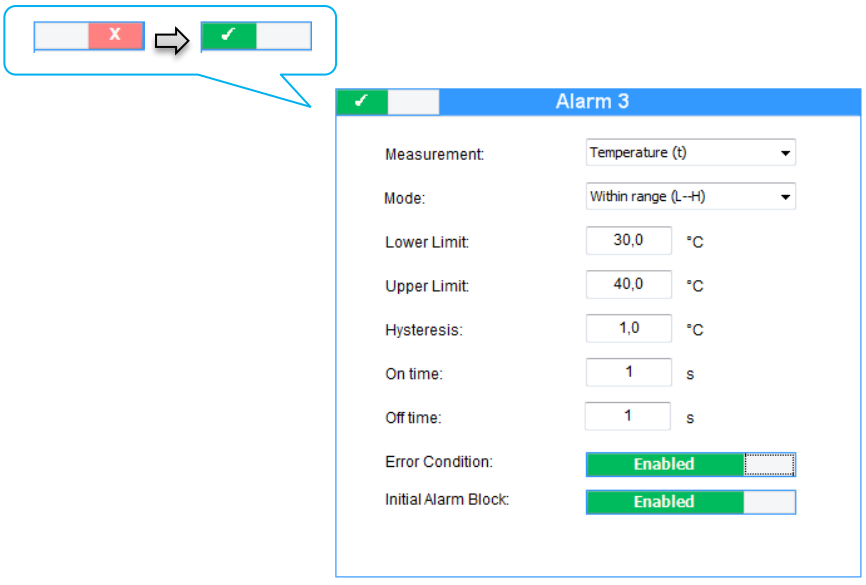


Fig. 36 – Alarm 3

The buzzer configurations are similar to those of alarms 1 and 2.

11.3.4 HMI PARAMETERS

By clicking on the icon , the software will display the screen below and the user can configure some features of the device's display and keypad. These features are available for the LCD models.

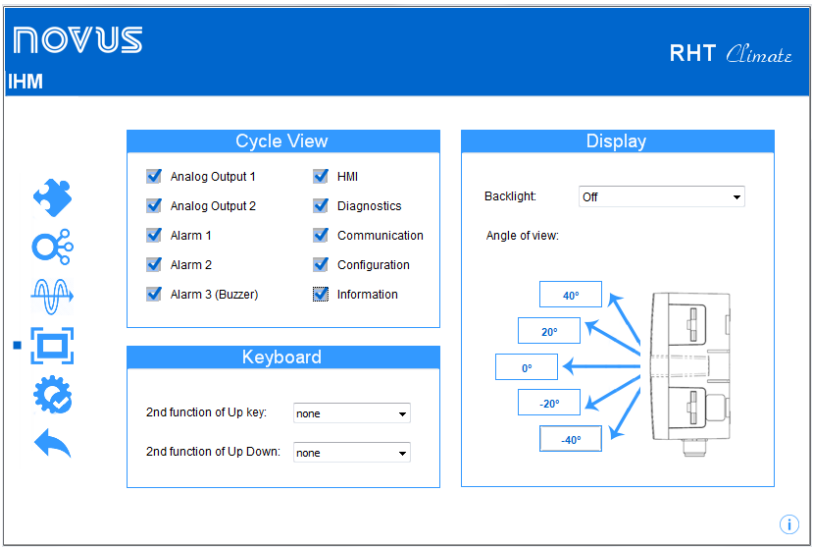


Fig. 37 – HMI Parameters

On this screen the user can:

- Select the configuration cycles that will be visible on the HMI;
- Set the second function of key and key ;
- Select the Backlight operating mode;
- And adjust the display contrast to favor the viewing angle.

When navigating through the configuration screens of the RHT *Climate* Transmitter using the device's keypad, the user will only be able to access the cycles that are enabled via NXperience. The figure below shows an example in which only the HMI configuration and the serial number and firmware version information are available to the user.

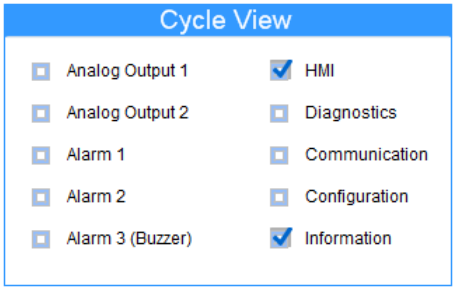


Fig. 38 – Cycle View

The device's keys and , in addition to the increment, decrement, and option selection functions, may have a second function that adds more versatility to the device. The figure below shows the configuration interface for this feature in NXperience.

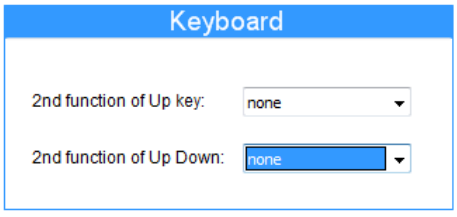


Fig. 39 – Keyboard

For key , the second function can be selected from among these options:

- None;
- Prevent buzzer;
- Blocks buzzer and alarm output.

If the second function of key is configured to suppress the buzzer, and if this key is pressed and held during an alarm, the buzzer will be muted but the alarm output will be remain enabled.

If the second function of key is configured to suppress the buzzer and the alarm output, and if this key is pressed and held during an alarm, the buzzer will be muted and the alarm output will be turned off. The buzzer and the alarm output will only be reactivated if the RHT *Climate* Transmitter goes into a non-alarm condition and returns to an alarm condition.

For key , the second function can be selected from among these options:

- None;
- Reset minimum and maximum values.

If the second function of key is configured to reset the minimum and maximum values, and if any this key is pressed and held when viewing any minimum and maximum indication screen, the minimum and maximum values of all psychrometric properties will be resent for the device.

The figure below shows the display's backlight and contrast configuration interface:

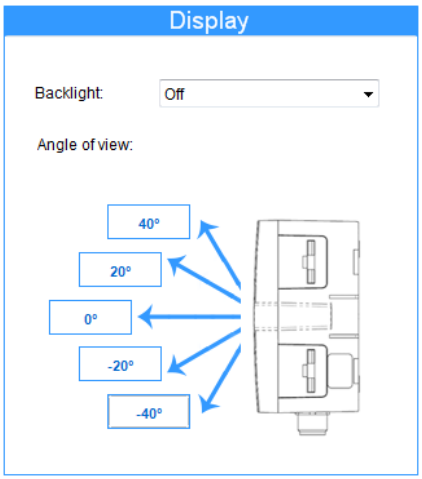


Fig. 40 – Display

For this device, the Backlight operating mode can be selected, which operates as follows:

- Off: The display backlight is always off;
- On: The display backlight is always on;
- On for a time: The display backlight always comes on when a key is pressed. If no key is pressed for 15 seconds, the backlight will turn off automatically.

The RHT *Climate* Transmitter display allows for setting five contrast levels that favor viewing of display information from different viewing angles. To select the best angle, click on the desired angle value.

11.3.5 DIAGNOSTICS PARAMETERS

To access these parameters, the device must be connected to the USB port and the Read Configuration option must be selected.

By clicking on the icon , the software will display the screen below and the user can check that the device is functioning properly by forcing the temperature and relative humidity readings and forcing the alarm and buzzer outputs.

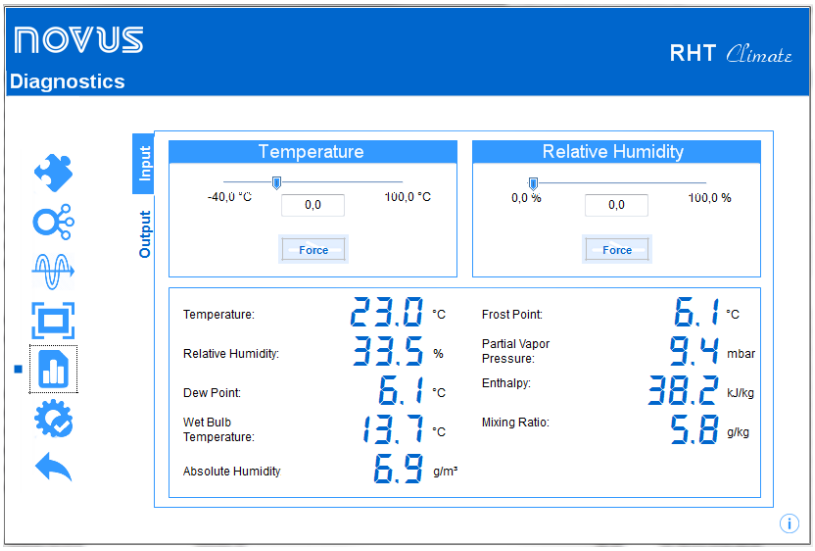


Fig. 41 – Diagnostics parameters

In input diagnostics, the user can view the instantaneous value of psychrometric properties and force a temperature and relative humidity value. To force a value, use the slider or type the input value for temperature or relative humidity and then press the button Force .

In the example shown on the screen below, the value of 18 °C is being forced in the temperature field, while the relative humidity value is being read directly from the sensor. The other psychrometric properties are calculated by the RHT *Climate* Transmitter based on these values. Note that the button that was used for forcing temperature changed to Release .

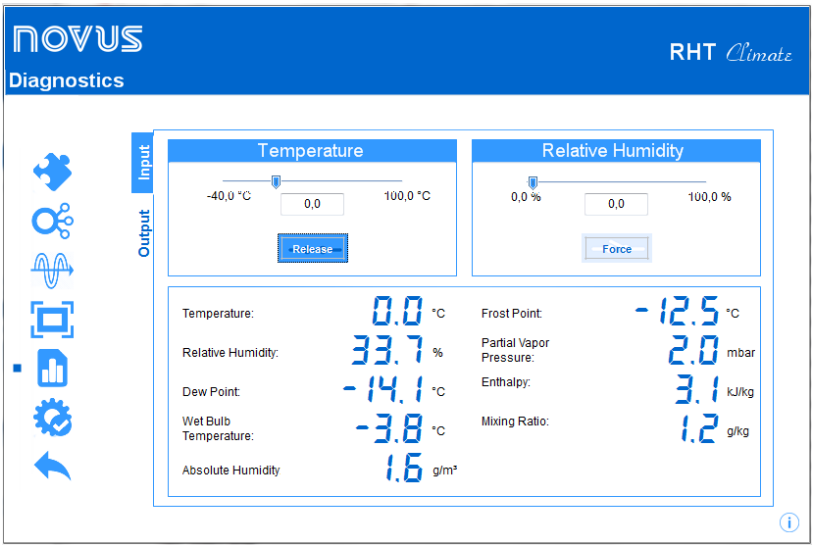


Fig. 42 – Diagnostics Input Parameters

During output diagnostics, the user can force voltage or current values at the two transmission analog outputs. The transmission mode (0 - 10 V or 4 – 20 mA) that will be forced at outputs depends on the configuration applied to each of them. The alarm outputs and the buzzer also have the forcing feature and need to be enabled for forcing to be possible. Output forcing is very useful for checking proper functioning of the device and testing the configurations applied to the RHT *Climate* Transmitter. The figure below shows the output forcing screen in NXperience.

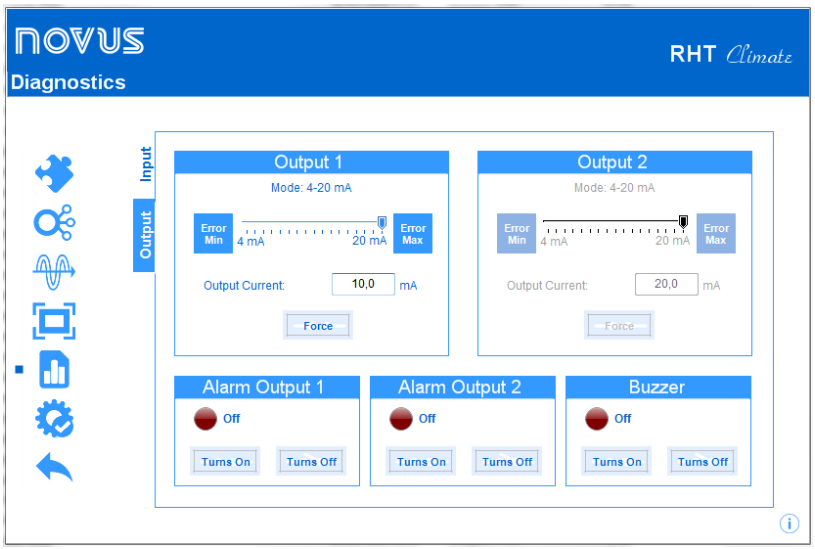


Fig. 43 – Diagnostics Output Parameters

To force a value at a transmission analog output use the slider or type the desired value directly into the edit field and then press the button Force . As of this time, the RHT *Climate* Transmitter will be forcing the set value at the transmission output. Note that the button that was used for forcing changed to Release . If the user presses the key again, the forced value is no longer applied to the output. In the example on the screen below, the 10.0 mA value is being forced at analog output 1.

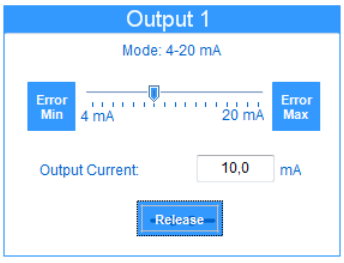


Fig. 44 – Output 1

For each analog output, transmission of an error value can also be forced via buttons Error min and Error max. These values depend on the mode (0-10 V or 4-20 mA) configured for each output.

Alarm and buzzer outputs allow for forcing the on and off condition. As the alarm output can be activated due to an alarm condition in some cases, it may be desirable to force the off status so that the user can identify a possible failure in the device's electrical installation or configuration. The images below show the interface for forcing alarm output 1 in the three possible conditions: Without forcing, forcing in on state, and forcing in off state.

Fig. 45 – Alarm 1 output without forcing

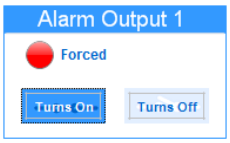


Fig. 46 – Alarm 1 output with forcing in on state

Fig. 47 – Alarm 1 output with forcing in off state

11.3.6 FINALIZATION PARAMETERS

By clicking on the icon , the software will display the screen below and the user can send the configuration to the device, save the configurations in a file, update the device firmware, and configure a password to protect the device.

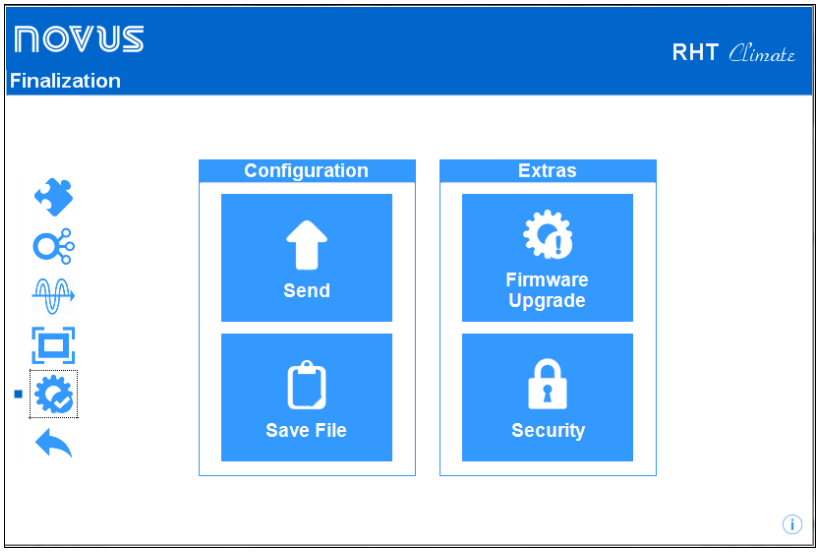


Fig. 48 – Finalization parameters

12 TECHNICAL SPECIFICATIONS

	MODELS WITH PREMIUM SENSOR	MODELS WITH ECONOMIC SENSOR
Humidity measurement	Measurement range: • Configurable: between 0% RH and 100% RH (no condensing); • Configurable: between -90 °C at 100 °C dew point.	
	Response time (1/e (63%)): < 4 seconds @25 °C (with air moving at 1 m/s)	Response time (1/e (63%)): 8 seconds @25 °C (with air moving at 1 m/s)
Temperature measurement	Measuring Range: • -40 °C to 100 °C for DM models • -40 °C to 60 °C for WM models	Measuring Range: • -25 °C to 85 °C for DM models • -25 °C to 60 °C for WM models
	Response time (1/e (63%)): < 5 seconds @25 °C (with air moving at 1 m/s)	Response time (1/e (63%)): < 30 seconds 25 °C (with air moving at 1 m/s)
Accuracy	• Temperature: ± 0.2 K (0 °C to 60 °C); • Relative Humidity: ± 1.8 % RH to 23 °C (0 % to 90 % RH).	• Temperature: ± 0.5 °C from 0 °C to 60 °C; • Relative Humidity: ± 4 % RH to 23 °C from 0 % to 90 % RH.
Power supply	• Power supply via PWR terminals: 12 Vdc to 30 Vdc; • Power supply via USB cable: 4.75 Vdc to 5.25 Vdc; Internal protection against power supply voltage reverse polarity.	
Maximum power supply current	< 70 mA ±10 % @ 24 Vdc	

Output Out1 / Out2	They may be configured independently to operate with signals 0-10 V or 4-20 mA.
	• 0-10 V
	  • Maximum current: 2 mA;
	  • Resolution: 0.003 V.
	• 4-20 mA
	  • 500 R maximum load;
	  • Resolution: 0.006 mA.	

Alarm AL1 Alarm AL2	• Channel N 30 V / 200 mA type output; • Protection against current > 200 mA; • Current protection reset time: 5 seconds.	
Protection rating	• Electronic module casing: IP65; • Sensor capsule: IP20 or IP40, according to the models: polyamide (with device) or sintered PTFE (optional).	
Enclosure	ABS+PC	
NXperience	Windows XP, Vista, 7, 8 / 8.1 and 10 (32 and 64 bits) configurator software. Menus in Portuguese, Spanish and English.	

Table 66 – Technical specifications

13 WARRANTY

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

14 ANNEX I – NOTIONS ABOUT PSYCHROMETRY

Psychrometry is the study of thermodynamic properties of dry air and water vapor mixtures. Obtaining the psychrometric properties is crucial in the psychrometric processes of air conditioning, refrigeration, cooling and freezing, air humidification and dehumidification, drying and dehydration of humid devices, as well as in environmental and meteorological control.

The psychrometric properties provided by the RHT *Climate* Transmitter are:

- Dry Bulb Teperature
- Relative Humidity
- Dew Point Temperature
- Wet Bulb Temperature
- Absolute Humidity
- Frost Point Temperature
- Specific Enthalpy
- Partial Vapor Pressure
- Mixture Ratio

Dry Bulb Temperature [°C] or [°F]:

It is simply the temperature of the air and water vapor mixture surrounding the thermometer.

Relative Humidity [%RH]:

Relative humidity expresses the percentage of water vapor contained in a certain amount of air. When the air reaches 100% relative humidity, it will have reached its maximum water absorption capacity. In this condition, the air is said to be saturated and water vapor condensation starts to be evident on the surfaces surrounded by this mixture.

Dew Point Temperature [°C] or [°F]:

The dew point is defined as the temperature to which the air must be cooled in order for water condensation to begin, meaning in order for the air to be saturated with water vapor. At dew point temperature, the amount of water vapor present in the air is maximum.

The capacity to retain water by air is heavily dependent on temperature: hot air can retain more water. The dew point is typically used to represent the amount of water vapor in dry air or gas. At low humidity, changes in dew point temperature are greater than changes in relative humidity, allowing for greater measurement precision and control.

Wet Bulb Temperature [°C] or [°F]:

The wet bulb temperature is measured by a thermometer with bulb covered by a mesh (usually cotton) that is submerged in a recipient containing distilled water. Water evaporation draws out heat from the bulb, making the wet bulb thermometer indicate a temperature lower than the ambient air. Evaporation consumes heat, causing cooling. This evaporation, and consequently the wet bulb temperature, is greater when the atmospheric air is drier, and is null when the atmosphere is saturated with water vapor (relative air humidity equal to 100%).

Absolute humidity [g/m³] or [gr/ft³]:

Absolute humidity expresses the mass of water vapor contained in a given volume. If all the water of one cubic meter of air is condensed in a vessel, this vessel will contain all the absolute humidity of that portion of air and the amount of condensed water can be weighed to quantify the absolute humidity.

Frost Point Temperature [°C] or [°F]:

The frost point temperature is the temperature to which air must be cooled, with constant pressure, to reach saturation (in relation to liquid water) and to settle in the form of frost on a surface.

Specific enthalpy [kJ/kg] or [BTU/lb]:

It is the energy contained in moist air by the amount of dry air. For a given mass of air to occupy a given volume at a given pressure, this occurs at the expense of energy. The higher the relative air humidity, the higher its specific enthalpy will be.

Partial Vapor Pressure [mbar] or [psi]:

The partial pressure of a gas in a gaseous mixture of ideal gases corresponds to the pressure that it would exert if it were occupying the whole container alone, at the same temperature as the ideal mixture. As such, the total pressure is calculated via the sum of partial pressures of the gases that make up the mixture.

Mixture Ratio [g/kg] or [gr/lb]:

The mixture ratio is expressed as the ratio of the mass of water vapor per kilogram of dry air into any portion of the atmosphere separated for study. The mixture ratio varies with temperature, except if the temperature is lower than the dew point, or when the air is completely saturated with water vapor. In these conditions, the drop in temperature will cause forced water condensation.