



RHT-Air

WIRELESS DEVICE FOR TEMPERATURE,
RELATIVE HUMIDITY AND DEW POINT



INSTRUCTIONS MANUAL V1.0x A

FCC

This device has been tested and complies with the parameters for a Class A digital device, pursuant to Part 15 of the FCC Rules. Such limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this manual, may cause harmful interference to radio communications.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

RF Exposure: It is necessary to keep 20 cm between the antenna and the user and the transmitter module cannot be co-located with any other transmitter or antenna.

Canada

This Class A device complies with Canadian standard ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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.

ANATEL

This device is homologated by ANATEL, in accordance with the procedures regulated by Resolution 242/2000, and meets the technical requirements applied.

This device is operated in a secondary fashion, that is, it is not entitled to protection against harmful interference, even from the same type of stations, and it cannot cause interference to systems operating on a primary basis.

For more information, see the ANATEL website www.anatel.gov.br.

1 INTRODUCTION

RHT-Air comes with a high precision and stability sensor to measure temperature, relative humidity and dew point. Because it operates with a microprocessor, it can be fully configured through its USB and IEEE 802.15.4 interfaces, using *Modbus RTU* commands. The software **DigiConfig** enables for all the device's resources to be configured.

RHT-Air can be configured to display the temperature, the relative humidity and the dew point and can display up to two of them simultaneously.

RHT-Air must be connected to an **AirGate-Modbus** so that it can access its parameters when in operation. The **AirGate Modbus** will provide *Modbus RTU* access to its registers over the IEEE 802.15.4 wireless network.

In addition to battery operation with typical range of one year (for an update interval higher than 60 seconds and stable connection in an IEEE 802.15.4 network), the RHT-Air can also be powered by an external source.

1.1 IDENTIFICATION

The following elements appear in the front part of the device:

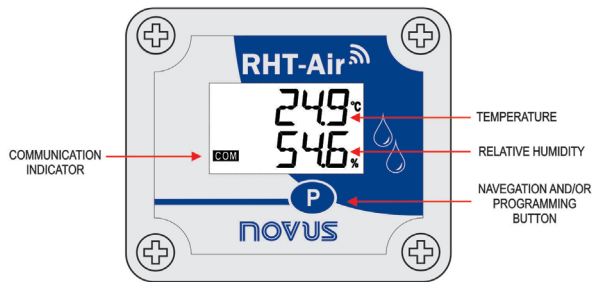


Fig. 1 –RHT-Air main screen

Communication Indicator (COM): It signals that the device is receiving data from the Modbus network.

P Button (Programming): This button is used to configure the Modbus address, the Update Interval and to screen changes.

Temperature: Environment temperature measured by the device.

Relative Humidity: Relative humidity measured by the device.

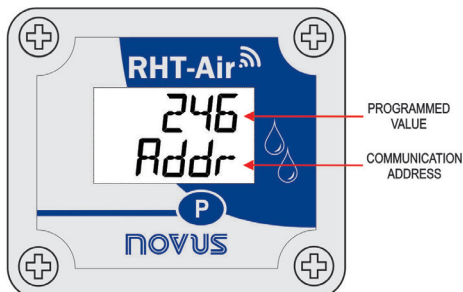


Fig. 2 –RHT-Air's second screen

Communication Address: Programmed value to identify the Modbus network device. Programmable between 1 and 246.

2 SPECIFICATIONS

Device's operating temperature	-10 °C to 70 °C.
Sensor's measurement range	Temperature: -40.0 °C to 100.0 °C. Relative Humidity (RH): 0.0 to 100.0 % RH. (No Condensation) Dew point: -40.0 °C and 100.0 °C.
Resolution of measurement	Temperature: 0.1 °C 14 bits (16383 levels) Relative Humidity (RH): 0.1 % 12 bits (4095 levels)
Precision of measurements	See Fig. 3. Note: It is possible to perform an OFFSET adjustment using the DigiConfig software to reduce the measurement error found.
Response time (Sensor)	Temperature: Up to 30 s with air movement at 1 m/s. Humidity: Up to 8 s with air movement at 1 m/s (20 to 80% RH).
Interval between updates	Configurable between 15 seconds and 10 minutes (600 s).
Power supply	Power supply: 12 Vcc to 30 Vcc. Consumption < 100 mA. Internal battery (included): Lithium 3.6 Vcc 1/2 AA 0,80 Ah. OmniCel manufacturer, ER14250HD model.
Estimated battery life	Typical 1 year - Update interval greater than 60 seconds.
Connections	<ul style="list-style-type: none"> Internal USB Device (micro-B) for configuration and firmware update. RP SMA female connector for antenna (included). M12 connector for external power (cable included).
Communication	Modbus RTU about Wireless IEEE 802.15.4 protocol (AirGate-Modbus necessary).
Wireless	<ul style="list-style-type: none"> Maximum transmission power of 25,11 mW (14 dBm). Maximum Range: 500 meters line-of-sight in open field. Data rate: RF 250 Kbps. Receptor sensibility - 92 dBm. Operation band: ISM 2.4 GHz. DSSS Technology (Direct Sequence Spread Spectrum). OQPSK Modulation (Offset Quadrature Phase Shift Keying). 15 operation channels. AES-CBC-128 (Advanced Encryption Standard).
Housing	Polycarbonate.
Level of protection	IP40
Dimensions	60 x 70 x 35 mm. Antenna measurement: 105 mm. Sensor measurement: 37,2 mm.
Weight	171 grams / 40 grams (cable).
Configuration software	DigiConfig – Configuration software for Windows®.
Certifications	CE, FCC, ANATEL (00172-13-07089)
Electromagnetic compatibility	EMC: EN61326-1:2006 CISPR11/EN55011, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-6, EN61000-4-8

2.1 PRECISION OF MEASUREMENTS AND OPERATIONAL LIMITS OF SENSORS

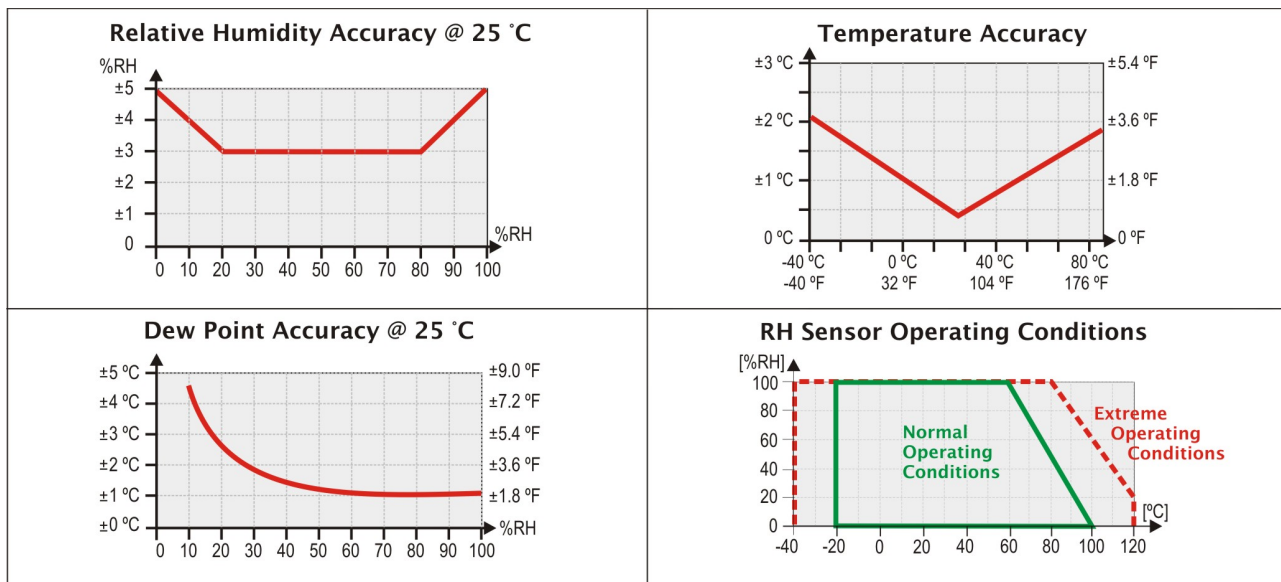


Fig. 3 - Precision of the humidity and temperature measurement

3 MECHANICAL INSTALLATION

RHT-Air was designed to be attached to walls. By removing the device's cover, users will have access to two molding holes of the base, as shown in Fig. 4. The device should be attached with the sensor capsule facing downwards in order to ensure precision and the specified level of protection.

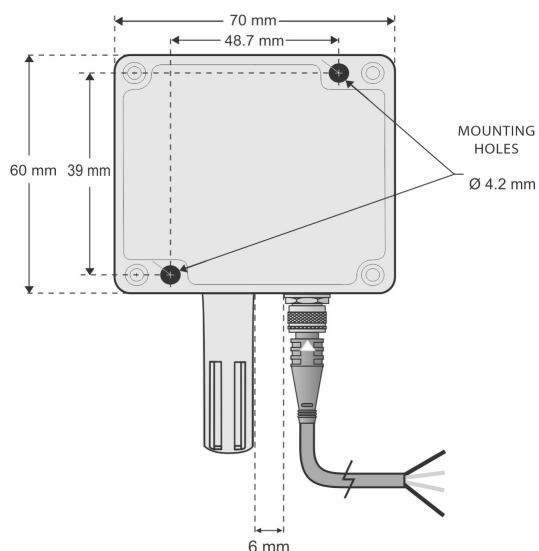


Fig. 4 - RHT-Air mounting holes and measures

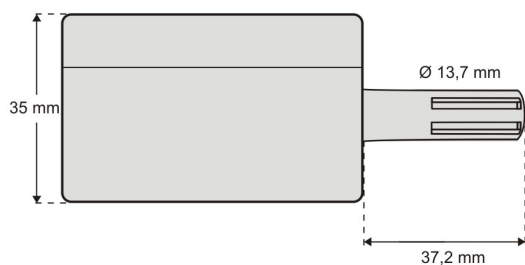


Fig. 5 - RHT-Air measurements

4 CONFIGURATION

4.1 CONFIGURATION VIA USB INTERFACE

Initially, the first configuration must be done through USB interface.

- Remove the four set screws of the front panel of the RHT-Air device, taking the necessary precaution not to apply force on the internal connector of the electronic circuit.

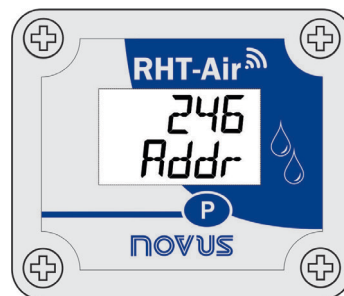


Fig. 6 - RHT-Air screws

- In order to configure the USB interface, connect the cable as shown in the following figure. The external power cable is not used during the configuration because the device will be powered by the USB interface.

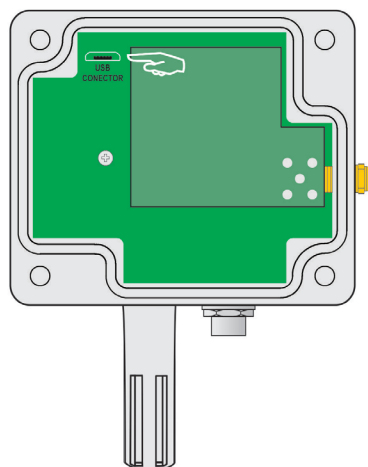


Fig. 7 - USB connector

5 ELECTRICAL INSTALLATION

5.1 EXTERNAL POWER SUPPLY CONNECTION

Fig. 6 below shows RHT-Air's necessary electrical connection. Terminals 1 and 2 are to be used in the electrical connection and terminals 3 and 4 are not used.

1	- VCC	Power supply	Black wire
2	+ VCC	Power supply	White wire
3		Not used	Blue wire
4		Not used	Brown Wire

Disconnect the power supply while the device is opened.

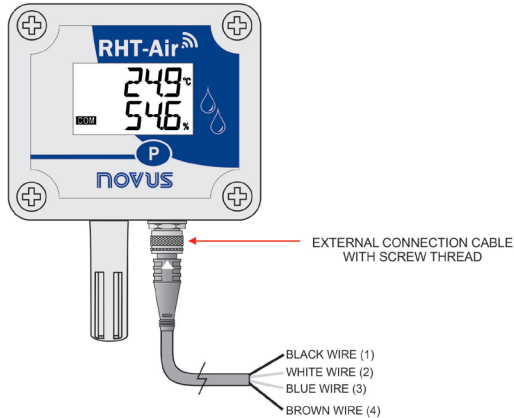


Fig. 8 - Electrical connection

M8 4-pin female power supply cable. For replacement, consult commercial department.

5.1.1 RECOMMENDATIONS FOR INSTALLATION

- Conductors of small electric signals must be separated from activation conductors or higher current or power in the system's plan. If possible, in grounded electroducts.
- The instrument's supply must come from a network proper for instrumentation.
- In control and monitoring applications, it is essential to consider what may happen when any part of the system fails.
- It is recommended to use RC FILTERS (47 Ω and 100 nF, series) in parallel with coils of contactors and solenoids, etc.

5.2 BATTERY POWER SUPPLY

RHT-Air can be supplied by an internal battery whenever the device is not energized by the electrical grid. It can be a power backup, being automatically used when the power from the external power source is not present.

RHT-Air is shipped with a battery insulation film. Therefore, it must be removed before first use. When the device is not in use, remove the battery or put the insulation film on it in order to avoid the battery premature death.

The following step-by-step will guide you on how to proceed to power the device using the battery.

- Remove the four screws from the RHT-Air front panel. Be careful not to force the internal connector of the electronic circuit.

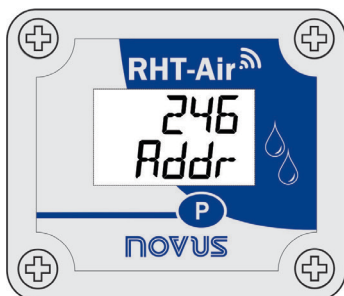


Fig. 9 – RHT-Air screws

- After removing the front panel, remove the insulation film from the battery.

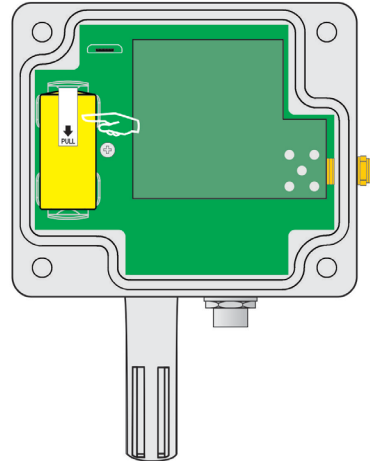


Fig. 10 – Insulation film from the battery

5.2.1 REPLACING THE INTERNAL BATTERY

It is possible to check the battery's charge through register "29". A fully charged battery typically has a power above 3.6 V. As you use the RHT-Air, the power of the battery will gradually decrease.

It is recommended to periodically check the value of the "29" register. When it reaches values below 3.3 V, a battery change must be scheduled (this register may present a measurement error of up to 5 %).

Note: Even when the power is below 100 %, the device will operate normally.

The only suitable replacement battery for this device is:
MANUFACTURER: OMNICELL
MODEL: ER14250HD

- Remove the four molding screws of the front panel, taking the necessary precaution not to apply force on the internal connector of the electronic circuit. After removing the front panel, replace the battery, taking the necessary precaution not to touch the electronic circuit.

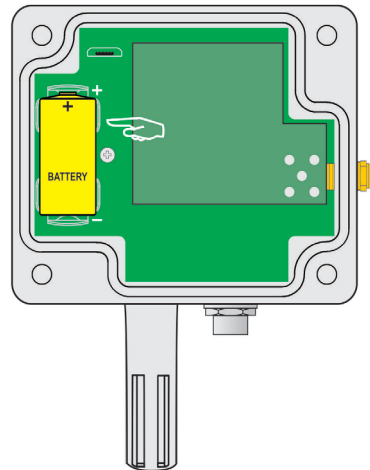


Fig. 11 – Battery replacement

- Insert a new battery and replace the front panel carefully, placing the four molding screws.

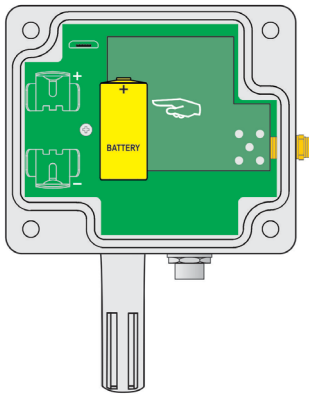


Fig. 12 - Inserting the battery

5.2.2 BATTERY LIFE

The battery is estimated to last for over a year for update intervals higher than 60 seconds. There is a fine line between its life and how the device is used. The lower the sensor's reading interval, the shorter it will last, as it may. In the worst case scenario, last for 30 days only.

To save battery's energy, you must put as much time as possible between upgrades. The transmission power level for communicating with the **AirGate-Modbus** network also influences the battery life. Thus, the device must be configured to operate at minimum power and as close as possible to an **AirGate-Modbus** network as possible.

In addition, in order to achieve autonomy over one year, it is necessary to use it in a network where there is an **AirGate-Modbus**, stable and available for pairing. Every need to repair with the network significantly degrades the battery.

In a situation where the **RHT-Air** is well installed, it is possible that the battery of the **RHT-Air** lasts more than two years.

Remove the battery or insert the insulation film when the device is not in use. Leaving the powered device out of range of a Wireless network will cause the device to continually attempt to pair, which may lead to premature battery death.

6 CONFIGURATION / OPERATION

The application **DigiConfig** is a **Windows®** software used for configuring **RHT-Air**. In order to install it, please run the file "**DigiConfigSetup.exe**", available in our website www.novusautomation.com.

DigiConfig comes with an unabridged help tutorial, containing all the necessary information for you to use it. If you want to use help tutorial, start the application and select the **Help** menu or press F1.

Check our website for get the **DigiConfig** installer and the additional manual guides.

Users will receive the fully calibrated adjustment-free device. The original configuration is shown below:

Raddr (Communication address) = 246

Time (Update interval) = 60 s

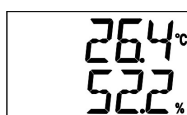
In order to configure it for the first time, it is necessary to remove the front cover and connect it to a computer through a mini-B USB cable. The initial configurations for wireless are described as follows:

PAN ID (Network Identifier) = 22350 (0x574E)

RF Power (Power Level) = 0 dBm

6.1 RHT-Air SCREENS

Indication screen of the values measured in the device:



1ª Screen: Main

In order to configure the communication parameters, you should press the button **P** (for about 5 seconds) until it starts to blink. Release it and press it again to expand it. When the expected value appears, release the button

and wait until the screen stops blinking (for about 10 seconds). If you want to move on to the following screens, press the button **P**.

Modbus Address configuration screen: Sets the address of the module on the Modbus network. Values between 1 and 246.



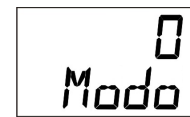
2ª Screen: Modbus Address

Time configuration screen: Sets the update interval in seconds.



3ª Screen: Update interval

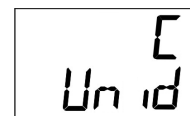
Mode configuration screen: Sets the indication mode.



4ª Screen: Indication mode

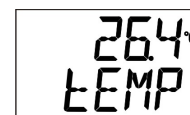
CODE	DESCRIPTION
0	Indicates temperature and relative humidity.
1	Indicates temperature and dew point.
2	Indicates relative humidity and dew point.
3	Indicates only temperature.

Unit configuration screen: Sets which temperature unit should be used (°C or °F).

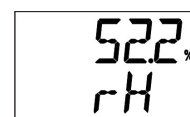


5ª Screen: Unit

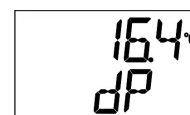
Display screens only for measured values on the device:



6ª Screen: Temperature



7ª Screen: Relative humidity



8ª Screen: Dew point

7 WIRELESS COMMUNICATION

RHT-Air has an IEEE 802.15.4 wireless communication to connect to **AirGates-Modbus** that has its firmware updated to a version more recent than V1.23. The first **RHT-Air** configuration must be performed via the USB interface through the **DigiConfig** software. In it, the necessary parameters for communication with **AirGates** network should be set. After the first time it is configured and matched with a **AirGate-Modbus**, **RHT-Air** will operate as a Modbus RTU slave. From this moment on, all its resources can be accessed by reading its registers anywhere in any Modbus RTU network. Some settings can be made via the programming button **P**.

In this section you will find the necessary information to carry out the data readings without the use of the **DigiConfig** software. To ensure the correct device configuration, use the **DigiConfig** software. Once configured, the data of its inputs can be accessed by any other software with Modbus RTU communication capability.

7.1 MODBUS COMMANDS

The following Modbus RTU commands (functions) are implemented. For further information on each one of these functions and on the Modbus protocol in general, go to www.modbus.org.

READ HOLDING REGISTERS – 0x03

This function can be used to read a value of one or up to 42 retentive registers, as per the Retentive Registers Table.

WRITE HOLDING REGISTERS – 0x06

This function can be used to write in a retentive register, as per the Retentive Registers Table.

7.2 DESCRIPTION OF SOME REGISTERS

Once the **RHT-Air** meets an **AirGate-Modbus** and is matched, this **AirGate** will be last published by **RHT-Air**. Therefore, when the Master of the Modbus network requires that the **RH-Air** address be read, the response is sent immediately and the expiration of this publication can be checked through register 30, which shows how long it has been since the last publication.

REGISTER 6 – PAN ID

Common identifier for each IEEE 802.15.4 wireless network. All devices on the same network (**AirGates-Modbus** and **RHTs-Air**) must be configured with the same **PAN ID**.

REGISTER 7 – ENCRYPTION

This register should be used to enable or disable the use of encryption. If it is enabled, the encryption key should be the same used for all device configured with the same **PAN ID**.

REGISTER 16 – POWER LEVEL

According to the variations presented in the table below, the power level can be adjusted as needed. The higher the power set, the greater the range and the greater the consumption. It is suggested that the lowest value possible be configured, since in the event that **RHT-Air** is not able to communicate with the **AirGate-Modbus**, it will automatically increase the transmission power gradually, until it is able to communicate with **AirGate-Modbus** or reach the highest

configurable limit. It may be that this register is configured with a value and, after some time, this value may be altered to adjust to a communicable power.

CODE	POWER LEVEL
0	0 dBm
1	2 dBm
2	4 dBm
3	6 dBm
4	8 dBm
5	10 dBm
6	12 dBm
7	14 dBm

REGISTER 27 – OPERATION CHANNEL

It indicates the operation channel in which the device is operating in the network. It may vary from 11 to 25, in that every channel is equivalent to one frequency of operation. The network will always operate on the channel with less interference among all the 15 possible ones.

CHANNEL	OPERATION FREQUENCY
11	2405 MHz
12	2410 MHz
13	2415 MHz
14	2420 MHz
15	2425 MHz
16	2430 MHz
17	2435 MHz
18	2440 MHz
19	2445 MHz
20	2450 MHz
21	2455 MHz
22	2460 MHz
23	2465 MHz
24	2470 MHz
25	2475 MHz

REGISTER 28 – LINK QUALITY INDICATOR

It serves to inform the quality of the reception link of the connection between the device and the **AirGate-Modbus** with which it is matched. This value is obtained by measuring the power of the last package received. This power is measured in dBm, which is a logarithmic power unit in mW. The LQI may vary from -100 dBm (worst reception quality) to -15 dBm (best reception quality).

For devices operating in ideal environments where there are no obstacles and no electromagnetic interference, the LQI will behave in a way close to the graph below, where the comparison between different power levels is performed for the distance versus LQI ratio.

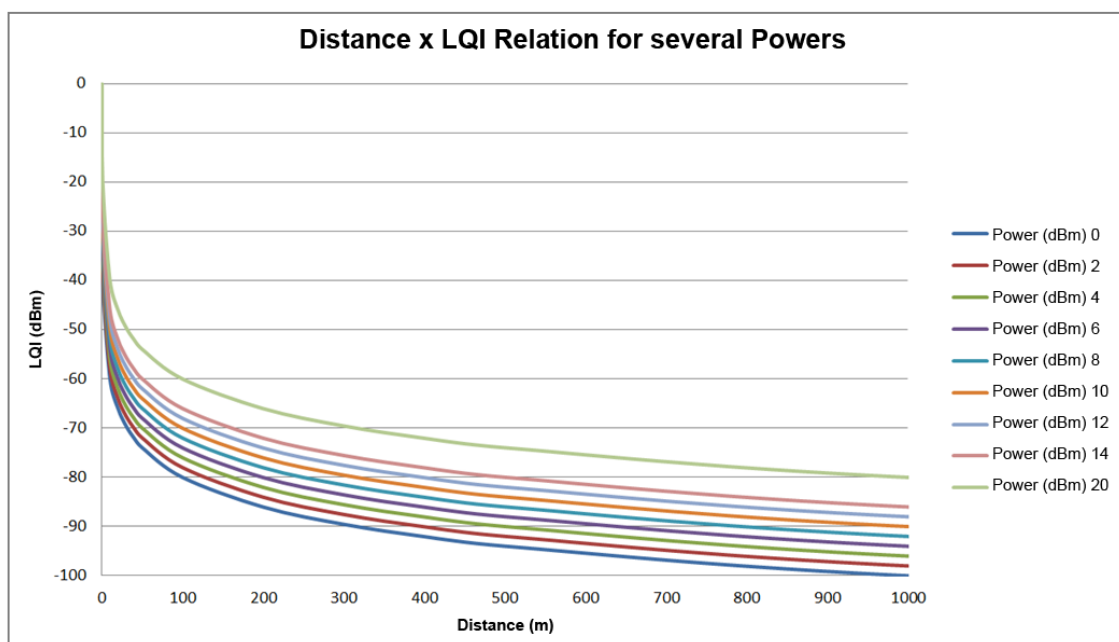


Fig. 13 – Distance x LQI relation for several powers

The table below lists the values obtained in the LQI reading with the evaluation of signal quality. This information can be viewed more intuitively in the **DigiConfig Diagnostics** tab.

REGISTER VALUE	QUALITY	ICON
0	USB-connected device	
-15 to -60	Great	
-60 to -70	Very Good	
-70 to -80	Good	
-80 to -90	Regular	
-90 to -100	Bad	

NOTE: The model described in the graphic takes in consideration the propagation channel only. LQI may vary due to several factors, such as due to peripheral obstacles like trees, buildings and hills that interfere in the propagation channels as explained by the Fresnel Zone phenomenon.

REGISTER 29 – BATTERY POWER

It has the value of measuring the voltage level of the battery in engineering unit. The decimal point is fixed in three houses. The value is without the point and must be predicted by the reading software. Reading the battery voltage may show an error of up to 5 %.

Typically, a battery with 100 % of its load has voltage above 3.6V. Depending on the use of **RHT-Air**, the battery will gradually decrease voltage. It is recommended to periodically check the value of this register so that, when it reaches values below 3.3 V, a battery change is scheduled.

Checking the battery capacity can be done using the **Diagnostics** tab of the **DigiConfig** software, which will display an icon. The evaluation of battery capacity can be performed according to the criteria presented in the table below:

REGISTER VALUE	BATTERY CAPACITY	ICON
0	USB-connected device.	
3500 to 3700	Great	
3400 to 3500	Very Good	
3300 to 3400	Good	
3200 to 3300	Average – Get ready to replace your battery.	
Lower than 3200	Bad – Replace the battery as soon as possible.	

NOTE 1: Even when the power is below 100 %, the device will operate normally.

NOTE 2: The gradual failure of the battery's power is not linear, therefore, though the device is able to continue working under tensions below 3.0 V, when it reaches this level, there is little left for its life, since the power will fail more quickly.

NOTE 3: While the device is being powered from an external source, you may notice a slight rise in battery voltage. This is because the battery voltage increases whenever power from the same battery is not being consumed.

NOTE 4: The machine's operating temperature has a significant impact on the battery's capacity. Temperatures below 0 °C will typically shorten the battery's life.

NOTE 5: Battery chemistry is directly affected by the ambient temperature. High temperatures tend to raise battery voltage, as low temperatures tend to decrease battery voltage. In both cases, autonomy is negatively affected.

NOTE 6: The update time, as well as the operating power, have a significant impact on the battery's capacity. If the device is configured for the lowest update interval, the battery will typically last less. The same happens when the device is far from the **AirGate-Modbus** with which it should be matched, needing a higher transmission power to operate.

NOTE 7: Remove the battery or insert the insulation film when the device is not in use. Leaving the powered device out of range of a Wireless network will cause the device to continually attempt to pair, which may lead to premature battery death.

REGISTER 30 – LAST POLL'S DURATION

Every time the **RHT-Air** publishes something on **AirGate-Modbus**, this register gets a zero value. Every 100 ms, this register is increased in 1 unit in order to indicate how long it has been since the last publication.

REGISTER 31 – MODBUS ADDRESS

It sets the address of the device on the Modbus network. This address identifies the device on the Modbus network. Its configuration may range from 1 and 247. There cannot be more than one piece of device with the same address on the same network. **RHT-Air** is originally manufactured with the address 246. When connected to a USB interface, it always responds to Modbus functions through the address 246. When it is in operation, it always responds through the address it was configured for in this register according to the communication parameters of the Modbus network on which it was installed.

REGISTER 32 – UPDATE TIME

It sets the configuration for how often the device wakes to publish information on the **AirGate-Modbus** with which it is matched and update the IHM screen.

The shorter the update time, the more recent the data available to the master of the Modbus network will be, but the higher the energy consumption spent and the battery's life will be proportionately shorter. On the other hand, the higher the update time set, the lower the energy consumption spent will be, thus providing a longer life for the battery.

REGISTER 33 – INDICATION MODE

It sets the mode of indication of the values read on the display. The device is originally manufactured with the indication of temperature and relative humidity.

CODE	DESCRIPTION
0	Indicates the temperature and relative humidity.
1	Indicates the temperature and dew point.
2	Indicates relative humidity and dew point.
3	Indicates the temperature only.

REGISTER 34 – CONFIGURATION OF THE MEASUREMENT UNIT

It sets the measurement unit for both temperature and dew point. The device is originally configured in (°C).

CODE	UNIT
0	°C
1	°F

REGISTER 35 – DISABLES CONFIGURATION THROUGH A BUTTON

It sets the alteration of configuration through a button.

CODE	DESCRIPTION
0	Factory default value.
1	Disables the alteration of configuration of communication parameters via button.

REGISTER 36 – USER OFFSET FOR TEMPERATURE

It sets the user's offset value in engineering units for temperature. The device's offset value is originally zero.

REGISTER 37 – USER OFFSET FOR HUMIDITY

It sets the user's offset value in engineering units for relative humidity. The device's offset value is originally zero.

REGISTER 38 – ERROR VALUE

It contains the error value that is transmitted when the sensor has a problem. The device's original value is -9999.

REGISTER 39 – TEMPERATURE VALUE (°C or °F)

It contains the value of temperature measurement in an engineering unit, including the users' offset corrections for temperature. The decimal point is fixed in one place. The value has no point and must be provided in the reading software.

REGISTER 40 – RELATIVE HUMIDITY VALUE (%)

It contains the value of relative humidity measurement in an engineering unit, including the users' offset corrections for temperature. The decimal point is fixed in one space. The value has no point and must be provided in the reading software.

REGISTER 41 – DEW POINT VALUE (°C or °F)

It has the value of the measurement in an engineering unit. The decimal point is fixed in one place. The value has no point and must be provided in the reading software.

HOLDING REGISTERS TABLE

The specified addresses correspond to lower level physical addresses, as zero (0) corresponds to the PLC 40001 address. The columns reserved for **Minimum** and **Maximum** contain a range of valid values for each parameter. The column reserved for **R/W** indicates whether the parameters are meant for reading and writing (R/W) or reading only (R).

ADDRESS	DESCRIPTION	MINIMUM	MAXIMUM	R/W
0	Retentive register used to manage the RHT-Air configuration stages (Used by DigiConfig).	0	7	R/W
1	Title	-	-	R/W
2	Title	-	-	R/W
3	Title	-	-	R/W
4	Title	-	-	R/W
5	Title	-	-	R/W
6	PAN ID	0	65535	R/W
7	Encryption	0	1	R/W
8	Security keys 0 and 1	0	65535	R/W
9	Security keys 2 and 3	0	65535	R/W
10	Security keys 4 and 5	0	65535	R/W
11	Security keys 6 and 7	0	65535	R/W
12	Security keys 8 and 9	0	65535	R/W
13	Security keys 10 and 11	0	65535	R/W
14	Security keys 12 and 13	0	65535	R/W
15	Security keys 14 and 15	0	65535	R/W
16	Power Level	0	7	R/W
17	Reserved	-	-	R
18	Serial Number (<i>word high</i>)	0	65535	R
19	Serial Number (<i>word low</i>)	0	65535	R
20	<i>Long MAC address 0 e 1</i>	0	65535	R
21	<i>Long MAC address 2 e 3</i>	0	65535	R
22	<i>Long MAC address 4 e 5</i>	0	65535	R
23	<i>Long MAC address 6 e 7</i>	0	65535	R
24	<i>Short MAC address</i>	0	65535	R
25	Firmware version	0	65535	R
26	Device code	103	103	R
27	Operation channel	11	25	R
28	LQI – Link quality indicator	-100	-15	R
29	Battery power (V)**	0	3700	R
30	Time of last publication (100 ms)	0	65535	R
31	Modbus Address	1	247	R/W
32	Update time (s)	15	1800	R/W
33	Indication mode	0	3	R/W
34	Measurement unit configuration	0	1	R/W
35	Disables configuration through a button	0	1	R/W
36	User offset for temperature *	-100	100	R/W
37	User offset for humidity *	-100	100	R/W
38	Error value	-9999	9999	R/W
39	Temperature value (°C or °F)*	-400	1000	R
40	Relative humidity value (%)*	0	1000	R
41	Dew point value (°C or °F)*	-400	800	R

* For the abovementioned table ranges, one decimal place should be considered. Example: -100 means -10.0.

** For the abovementioned table ranges, three decimal places should be considered. Example: 3600 means 3600 V.

8 SPECIAL CARE

Because it is an electronic module, the device needs some care in handling:

- When opening it for fixation, you should keep away from the electronic circuit due to the risk of damages caused by static electricity.
- The wiring should be carefully observed.
- When closing the box, the cover must be replaced properly, thus ensuring that it is sealed.

8.1 CARE WITH SENSORS

The calibration of the humidity sensor can be altered if it is exposed to contaminating vapors or extreme humidity or temperature conditions for longer periods. In order to speed up the calibration, do as follows:

- Remove the sensor from the capsule.
- If solid particles are deposited 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 place at around 20 and 30 °C and humidity higher than 75 % RH.
- Replace the sensor into the capsule.

8.2 BATTERY CARE



Remove the battery or insert the insulation film when the device is not in use. Leaving the powered device out of range of a Wireless network will cause the device to continually attempt to pair, which may lead to premature battery death.

The Lithium battery, due to its chemical behavior, may present some passivation symptoms when not used for long periods of time. This can be observed by checking the battery voltage after 2 hours of device operation. If the battery voltage measures less than 3.5 V, then the battery may be passivated (not necessarily worn out). If this is the case, please try applying the following procedures to recover the battery:

- Operate the device at its maximum power (14 dBm) and minimum sample period (15 s).
- Let the instrument operate continuously in the above conditions for 24 h while monitoring the battery voltage through reading register number 29 or the **Diagnostic** menu of the *DigiConfig* software.
- If the battery voltage exceeds 3.5 V, the battery can be considered rehabilitated (depassivated). The device is then ready to use.
- In case the above doesn't work, please remove the battery from the device and discharge it for 5 minutes connecting a 220 ohm resistor across the terminals.
- After that, you should put the battery in the device and leave it running for about 2 hours. If the battery has a voltage above 3.5 V, it has been undone and can operate normally.
- If after going through the above procedures the battery still fails to work properly, please contact technical assistance for arranging battery replacement.

IMPORTANT

The sensor used in this device may be damaged or de-calibrated if exposed to contaminated atmospheres with chemical agents. Hydrochloric acid, nitric acid, sulfuric acid and ammonia in high concentrations may damage the sensor. Acetone, ethanol and propylene glycol may cause reversible measurement errors.

9 WARRANTY

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