Specifications for

LoRa Environmental Sensor

RAK7204

Version V1.1 | August 2019

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1. Overview

1.1 Introduction

The RAK7204 is a LoRaWAN node with integrated environmental sensors. The high-precision environmental sensors, can measure changes in temperature, humidity, gas pressure and provide an indoor air quality index. All the accumulated data can be send to a LoRaWAN Gateway in order for it to be forwarded to the Cloud.

Because RAK7204 is built-around a low-power MCU and low-power sensors, and the firmware has been optimized for efficiency, it can achieve a very low-power operation in both dormancy and when measuring and transmitting. The non-rechargeable battery that comes with the unit can last more than 2 years. With the ability to regularly report battery status in addition to having an alarm for when critical levels are reached, you can be sure you will never be surprised and be left with your device not operational when you need it most. Furthermore, the design still allows for replacing the battery, so even after those 2 year are up you can still refresh your node for another 2 years of operation.

The firmware has built-in functionality that allows the user to adjust the sampling interval of the sensors and the transmission cycle. This allows for flexibility, as one can choose to have more granular measurements at the cost of battery life, or extend operational time, trading the volume of data generated.

Last but not least, the RAK7204 adopts a highly integrated design. The environmental sensors, LoRa transceiver module, LoRa antenna, and the battery are fitted in a 90x85mm sized housing. These small dimensions allow for installation in tight spaces or ones that require the sensor to have a minimal impact on the overall feel of the surrounding environment. The housing adopts a hollow, permeable design to facilitate air flow in order to more accurately detect the environmental changes.

1.2 Main Features

- Measurement of a variety of environmental parameters: Temperature, Humidity, Gas Pressure and Indoor Air Quality (IAQ)
- BOSCH BME680 Integrated Environmental Unit
- LoRaWAN 1.0.2 fully compliant
- Low power operation, standby current of less than 15uA with the ability to adjust sampling and transmission interval.
- Comes with a replaceable 3500 mAh high capacity lithium battery with a battery life of more than 2 years (calculated by acquiring and sending a full data set every 15 minutes). Real time battery status monitoring.
- Compact in size (LoRa antenna is built-in), easy to install and maintain (easy battery swapping)

2. RAK7204 Typical Applications

The combination of the BME680 environmental unit and the LoRa radio make this device especially suite for deploying sensor networks of large size in tall buildings or warehouses, for example.

When used in conjunction with one of the RAKwireless Gateways, as for example the RAK7258 indoor Gateway, deploying a LoRaWAN sensor network becomes a breeze. One just needs to mount the nodes on a wall or the ceiling, power them on and start monitoring the working conditions of the factory/office.

Furthermore, as all RAKwireless Industrial Gateways (including the aforementioned RAK7258) come with built-in LoRaServer the time from deploying the Gateways and nodes to having a functioning LoRaWAN network can be further reduced. There is no need to have a LoRa Networks Server deployed separately, however if one chooses an integration can be created via MQTT at any time.

Thus, the solution is both incredibly quick an easy to deploy initially, and also allows for scaling as the number of nodes grows and application requirements change.

The aforementioned combination of RAK7204 and RAK7258 is visualized in Figure 1.

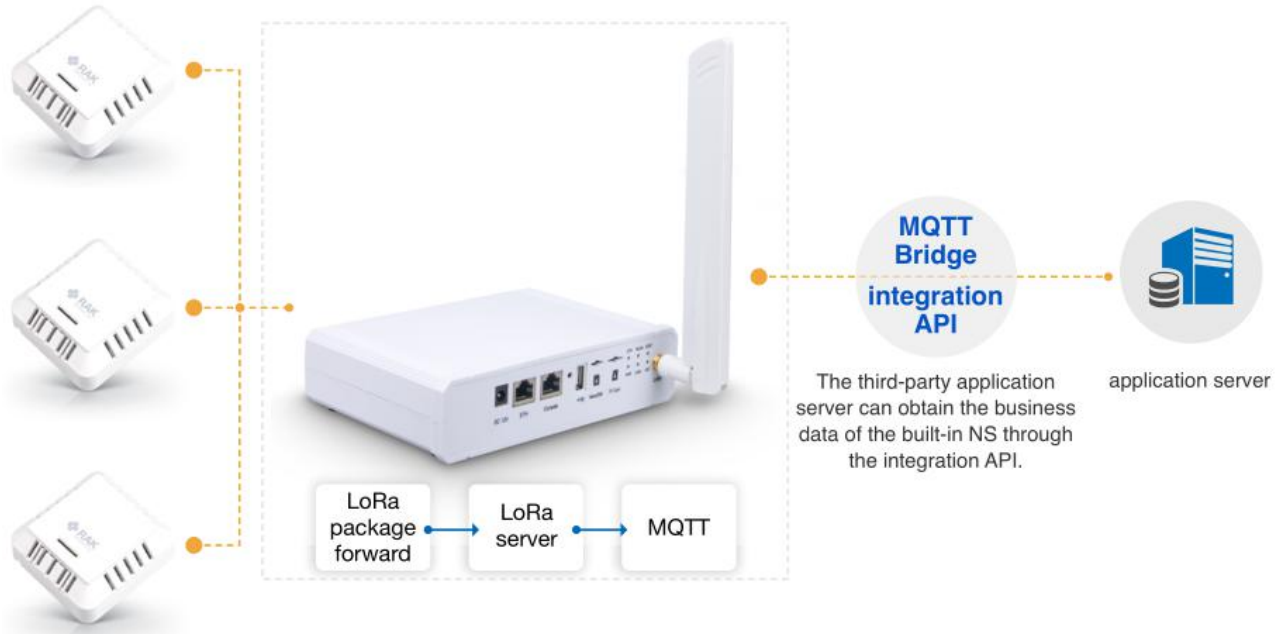


Figure 1 | Typical deployment scenario

3. RAK7204 Specifications

3.1 Battery Specifications

The RAK7204 comes with 3500 mAh high capacity lithium battery included. It is removable and can be exchanged at any time. In case you are to replace it please adhere to the specification in the table below.

Parameter	Max.	Unit
Nominal Battery Voltage	3.6	V
Battery Specification	ER18505	
Nominal Capacity	3500	mAh
Temperature Range	-55---85	ºC
Battery Dimensions	18*50.5	mm

Table 1 | Battery Specifications

Note:
The included battery is non rechargeable. Please do note that when configuring the device, you have to connect the battery first in order for it to work.

The battery connector is shown in the following figure:

Figure 2 | Battery connector

Note:

The pin distance of the battery connector is 2.0mm. When choosing a battery, attention should be paid to the consistency of positive and negative poles with the figure above. Reverse connection or short circuit may damage the device and may cause overheating and combustion of the battery. Therefore, when replacing the battery, it is necessary to strictly confirm whether the positive and negative poles of the connector are correct.

3.2 Frequency Bands of Operation

The RAK7204 supports different LoRaWAN frequency bands for different country regions.

See the supported range in the table below:

Region	Frequency band (MHz)
Europe	EU433, EU868
China	CN470
Indian	IN865
North America	US915
Australia	AU915
Asia	AS923
Korea	KR920

Table 2 | Frequency band support

3.3 Operational Temperature Ranges

Parameter	Min.	Typical	Max.
Operating Temperature	-40 ºC	+25 ºC	+85 ºC
Storage Temperature	-40 ˚C	+25 ºC	+85 ˚C

Table 3 | Temperature ranges

3.4 Power Consumption

Parameter	Value	Unit
Standby Current	<15	uA
Current when Sensors are working	<10	mA
Current in when LoRa frames are transmitted	<150	mA

Table 4 | Power consumption

3.5 Temperature Sensor Specifications

Parameter	Min.	Typical.	Max.
Temperature Range	-40 ºC	+25 ºC	+85 ºC
Accuracy		0.5 ºC	
Output Resolution		0.01 ºC	

Table 5 | Temperature sensor specs

3.6 Humidity Sensor Specifications

Parameter	Min.	Typical.	Max.
Humidity Range	0% r.H.		100 % r.H.
Accuracy		+-3% r.H.	
Output Resolution		0.008% r.H.	

Table 6 | Humidity sensor specs

3.7 Gas Pressure Sensor Specifications

Parameter	Min.	Typical.	Max.
Range	300 hPa		1100 hPa
Accuracy		+-0.6 hPa	
Output Resolution		0.18 Pa.	

Table 7 | Gas Pressure sensor specs

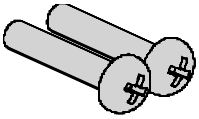
3.8 IAQ Sensor Specifications

Parameter	Min.	Typical.	Max.
IAQ Range	0.		500.
Accuracy		15.	
Output Resolution		1	

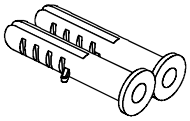
Table 8 | IAQ sensor specs

4. Package Contents

RAK7204(1x) - (Includes a battery)



Tapping Screw(2x)



Screw Anchor(2x)

5. Revision History

Revision	Description	Date
1.0	Initial version	2019-08-13
1.1	Minor improvements to the style of the text	2019-08-15

6. Document Summary

Prepared by	Checked by	Approved by
Terry & Penn	Vladislav	

About RAKwireless:

RAKwireless is the pioneer in providing innovative and diverse cellular and LoRa connectivity solutions for IoT edge devices. It's easy and modular design can be used in different IoT applications and accelerate time-to-market.
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