Nexelec

D1023C_Technical guide

X862LS - KARE+

LORAWAN

26/06/2024

I. Product overview

1. Main functionalities

This document describes the technical operation of the LoRaWAN-connected, NFC-configurable smoke sensor. The KARE+ product integrate temperature/humidity sensor and replaceable battery.

Electronic maintenance certificate	**Temperature/Humidity**
After each maintenance operation, a unique certificate is recorded in the sensor's secure NFC chip	For a better indoor comfort. Measures home environment parameters

Powerful audible alarm
85 dB at 3 metres to quickly alert occupants

Air 360°
Exclusive detection technology. Simplifies maintenance by residents

Test/Silence button
Large, easy-to-reach touch button on front panel

Silence function
Stops the alarm and/or puts the detector on standby for 10 minutes without removing it from its base

Compact mounting base
Only 3 cm in diameter to avoid damaging the installation surface

Insect barrier
Pest protection grid integrated into the detector

Signal light
Discreet LED indicator in standby mode, powerful in alarm mode

Calibration certificate
Temperature and humidity measurement accuracy validated by an accredited metrology laboratory

8-hour beep delay
Temporarily silences fault beeps until detector is replaced

Remote surveillance compatible
To report fire alarms, remove doubts or request on-site intervention by an approved company

2. Product scheme

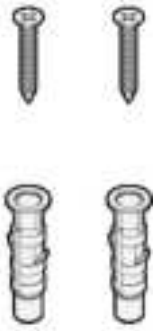
DIMENSIONS & WEIGHT

150 g (including battery and stand)

3. Set contents

1x Sensor

1x BASE / BASE+ mounting base



2x nylon screws and plugs

4. Product terms of use and certifications

CONDITIONS OF USE

> Indoor household environment

> Temperature: -10°C to + 65°C

Note: The sensors have a lifespan of 10 years in a standard domestic environment (temperature between 15 ° C and 30 ° C). The sensors can be used in an exceptional domestic environment (temperature between -10°C and 65°C). Recurring and / or prolonged use in this exceptional environment can reduce battery life and therefore sensors autonomy. Residual battery estimation may also be wrong outside standard domestic environment.

> Relative humidity: from 0 to 99% RH (non-condensing)

CERTIFICATIONS

Applicable certifications and associated declarations of conformity are available on the Nexelec support website support.nexelec.fr

5. Support and integration tools

Documentation and tools for this product can be found on our website support.nexelec.fr
Here you'll find :

- CODEC, Javascript code for decoding LoRaWAN messages:
  https://support.nexelec.fr/fr/support/solutions/folders/80000678871
- Online decoding tool for LoRaWAN messages :
  https://nexelec-support.fr/n/decoder/
- Online downlink calculation tool for remote product reconfiguration:
  https://nexelec-support.fr/n/downlink/
- VOTL: Online product autonomy calculator :
  https://nexelec-support.fr/n/volt/

If you have any questions, our support team can be contacted by e-mail at support@nexelec.fr

II. Product installation

1. Installation sites

Depending on the layout and the surface area of the dwelling, several smoke sensors may be required to ensure minimum protection and guarantee efficient detection, the range of the alarm and quick evacuation of the dwelling.

STANDARD INSTALLATION

- One sensor per floor
- In hallways and/or stairwells
- Between rest areas (bedrooms), the possible ignition sources (garage, area with a high electrical system, etc.) and exits leading outside of your home (door, window)

RECOMMENDED PLACES

Place a sensor:

- One sensor per floor
- One sensor per corridor
- One sensor per staiwell
- In each room (1 for 50 m²), except in the kitchen and the bathroom (refer to paragraph below: «Places to be avoid»)

It is recommended to install smoke sensors:

- Close to possible ignition sources
- less than 7 m from rest areas (3 m if the doors are closed)
- less than 7 m from exits

Locate the sensor in line with the current building standards.

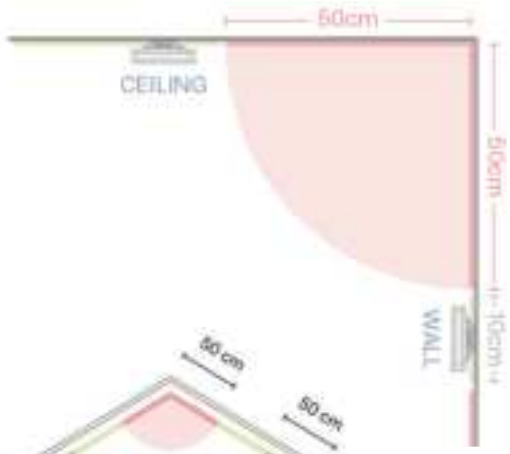
PLACES TO AVOID

Do not install the smoke sensor:

- Outside
- In a place where the alarm will be difficult to hear (room with closed door)
- In a place where the sensor will be difficult to reach, in particular to perform tests
- In a place where the temperature is lower than -10°C or higher than 50°C
- In a place where humidity is less than 10% or exceeds 95% (bathroom, kitchen, laundry room, etc.)
- In a place subject to high and/or rapid temperature, pressure or humidity variations
- In a place where the sunlight hits directly on the sensor
- In a dusty or dirty area (garage, workshop, etc.)
- In insect-infested areas
- In a place where spurious smoke may disturb the smoke sensor: kitchen, chimney, garage (exhaust gas), furnaces, boiler rooms, combustion radiators, etc.
- Close to heating appliances, windows, ventilation ducts, air conditioners, fans or any other item of equipment that may produce air flows
- Close to an area that is hotter or cooler than the rest of the room (non-insulated walls, hatches, etc.)
- Less than 50 cm from obstacles preventing the smoke from accessing the sensor (decorative objects, walls, doors, plants, chandeliers, curtains, etc.)
- Less than 50 cm from lighting appliances (ceiling light, incandescent lamps, halogen or fluorescent lamps, etc.)
- Less than 1.5 m from electrical appliances or their wiring

CEILING MOUTING

Install the sensor on the ceiling in the center of the room, at least 50 cm from corners, walls, beams or any other obstacles.

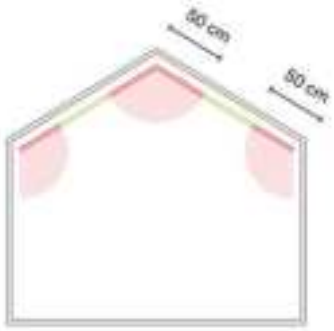


WALL MOUNTING

Install the sensor to the wall at a distance of between 50 cm and 60 cm from the ceiling.

MOUNTING ON A SLOPED CEILING

Install the sensor more than 50 cm from any corner of the room



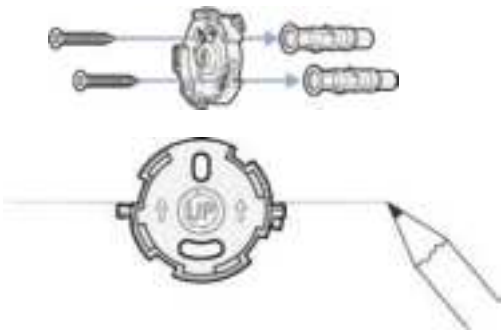
2. Sensor mounting

The KARE+ sensor must be wall-mounted for temperature and humidity measurements to be valid.

FITTING THE BASE/BASE+ BASE WITH SCREWS AND PLUGS

To secure the base to the wall or ceiling:

- > Use a level to draw a 5 cm line on the wall
- > Position the base on the line with the “UP” marking and arrows pointing upwards. The small ears on either side of the base should be on the lower edge of the line
- > Mark the screw holes with a pencil, then drill the holes
- > Insert the nylon plugs supplied and screw on the mounting base



FITTING THE BASE/BASE+ BASE WITH FIX ADHESIVE FASTENER (OPTIONAL)

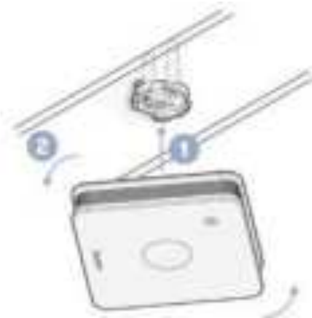
FIX adhesive fasteners are to be used exclusively with BASE and BASE+ bases. They are not supplied with the product, and are available as accessories.

- > Place the adhesive on the base and press firmly with your fingers for 10 seconds
- > Remove the adhesive backing and stick the mounting base to the wall or ceiling
- > Press firmly with your fingers for 10 seconds and wait 30 seconds

Place the sensor on the mounting base, then turn it a quarter-turn to the right to secure it.

You should hear a “click”, indicating that the sensor is secured to the base. Check that the sensor is securely fixed to the wall or ceiling.

Warning - If the sensor is fixed with the adhesive mount, do not turn it too much, as this may twist the mount.



Compatible mounting accessories: FIX, BASE, BASE+, TAPE, MOUNT, MOUNT+. Use of any accessory other than those listed above will invalidate product certification.

MOUNT / MOUNT+ BASE INSTALLATION WITH SCREWS AND PLUGS (OPTIONAL)

The MOUNT base can be installed on existing wall plugs, so there’s no need to drill new holes in the base. It is ideal for replacing older smoke sensors.

To secure the base to the wall or ceiling:

> Use a level to draw a 5 cm line on your wall
> Position the base on the line with the “UP” marking and arrows pointing upwards. The 3 cm hole in the center of the sensor should be on the line.
> Mark the screw holes with a pencil, then drill the holes
> Insert the nylon plugs supplied and screw on the mounting base

MOUNT / MOUNT+ BASE INSTALLATION WITH TAPE ADHESIVE FASTENER (OPTIONAL)

TAPE adhesive fasteners are to be used exclusively with MOUNT and MOUNT+ bases. They are not supplied with the product, and are available as accessories.

> Place the adhesive on the mounting base and press firmly with your fingers for 10 seconds
> Remove the adhesive backing and stick the mounting base to the wall or ceiling
> Press firmly with your fingers for 10 seconds and wait 30 seconds

Place the sensor on the mounting base, then turn it a quarter-turn to the right to secure it. You should hear a “click”, indicating that the sensor is secured in its base. Check that the sensor is securely fastened to the wall or ceiling.

Warning - If the sensor is fixed with the adhesive mount, do not turn it too much, as this may twist the mount.

Compatible mounting accessories: FIX, BASE, BASE+, TAPE, MOUNT, MOUNT+. Use of any accessory other than those listed above will invalidate product certification.

3. Anti-tear detection

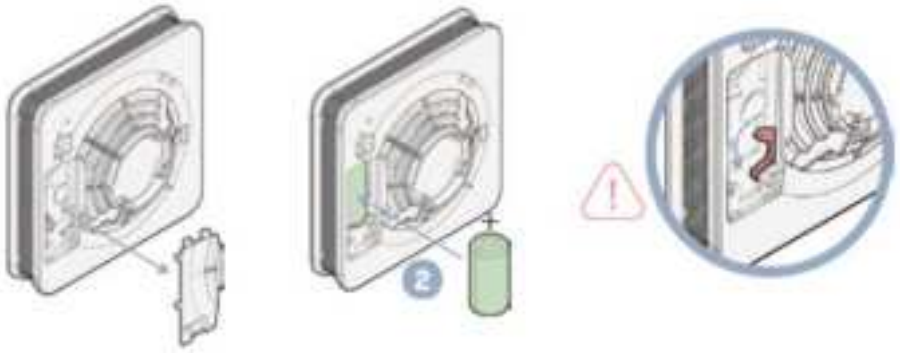
The product is fitted with a magnet to check whether the product is installed on its mounting base or not. This function ensures that products have not been removed from their base. As soon as the product is inserted or removed from its base, a LoRaWAN “Product Status” message is transmitted.

4. Product commissioning

— 01. KARE + product

KARE+ product is automatically commissioned by inserting the battery (2). Make sure to press the tab downwards with the negative side of the battery.

Recommended compatible batteries: CR17335EG-ZZ6 (FDK) or CR123A-R (VARTA)



Warning – If the recall tab is not held down by the battery, it will be impossible to close the battery door.

— 02. Automatic network connection

Once powered, the product:

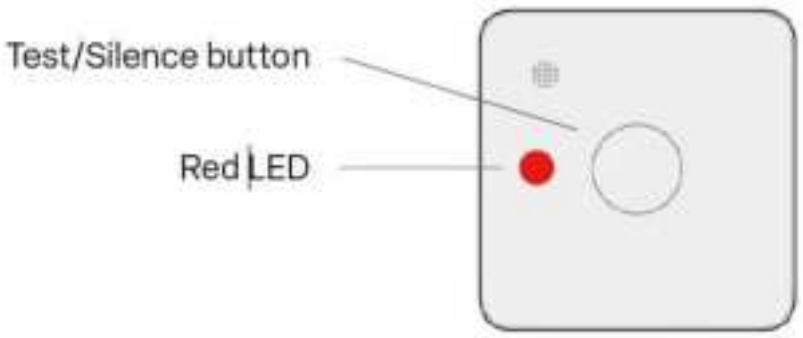
> Initializes for approx. 5 seconds: steady reverse orange LED
> Attempts to connect to the LoRaWAN network on:
  - Detection of a magnet base
  - After a short press on the bottom button
  - 30 seconds after powering the product if necessary

The reverse LED displays the stages of the product initialization and connection phase:

At the end of the connection phase (approx. 60 seconds), the product is ready for use. In the event of failure, the product will immediately attempt a second connection to the network and then periodically (more information is available in section IX.2. Network connection).

III. Main buttons and LEDs

The main button is located on the front of the product.



Mode	Support type	Action generated	Reverse LED
Normal	Long press	• Manual test • LoRa network status indication	1 flash of the LED, repeated 5 times: LoRa OK LoRa NOK
Alarm	Short press	• Alarm paused during 9 minutes	/
Low battery default	Short press	• Low battery default paused during 8 hours	/

— 01. Short press

Short press is used for pausing or stopping the smoke alarm. Pausing the alarm helps to control a pending false alarm in advance (e.g.: smoke or steam when cooking, use of candles or incense, cigarette smoking, etc.). After 9 minutes, your product automatically resumes normal operation.

— 02. Long press to test your product

To test your alarm, press the button (> 3 seconds) until the alarm sounds then release. If the test does not work, the sensor probably detected an operating defect.
A LoRa “Smoke alarm” message is sent to indicate a test has been done (Refer to section IX.4. — 03. Smoke alarm status).
A LoRa “Periodic data” message containing temperature and humidity is also generated (Refer to section — 05. Periodic Data). Temperature and humidity data measured after a product test are also available in NFC.

— 03. Product maintenance

The product must be dusted every year to ensure correct operation. To do this:

> Remove the product from its base
> Clean it
> Place it back on its base
> Press the main button (> 3 seconds) until the alarm sounds then release

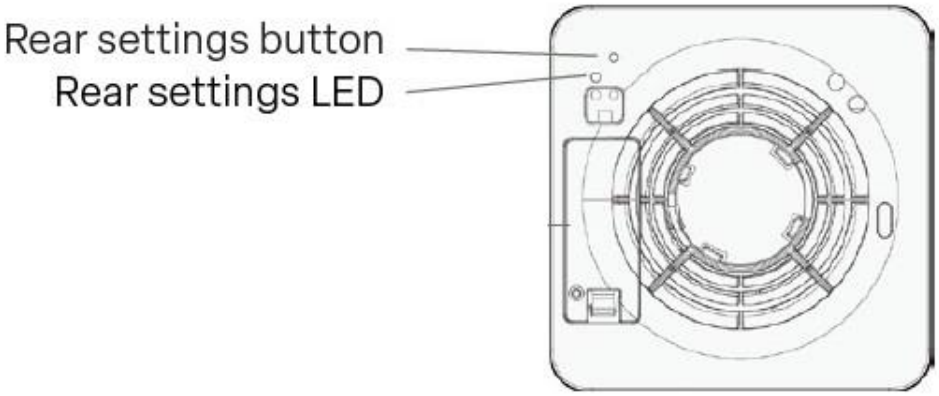
A LoRa “Smoke alarm” message is sent to indicate a test has been done (Refer to section IX.4. — 03. Smoke alarm status). If the product is equipped with a BASE+ or MOUNT+ base:

- The “Maintenance” field is set in the LoRa “Smoke Alarm” message.
- A flag is set to 1 in the NFC interface to indicate a product maintenance has been done. This flag is reset after 24h.

A LoRa “Periodic data” message containing temperature and humidity is also generated (Refer to section — 05. Periodic Data). Temperature and humidity data measured after a product test are also available in NFC.

IV. Reverse buttons and LEDs

The secondary button is located at the rear of the product. An object (pen, paper clip, etc.) is required to activate the button. The sequence of actions induced by the use of the reverse button can be observed on the reverse LED, located next to the reverse button.



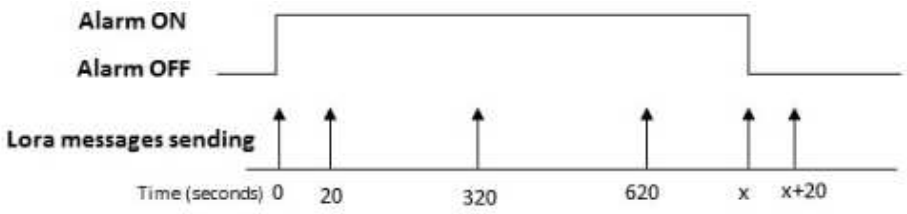
	Actions generated	Reverse LED
Short press	Manual attempt to connect to LoRaWAN network (Join)	Flashing 🟡 : Connection attempt in progress 🟢 : Successful connection 🔴 : Failed connection

V. Product operation – Normal mode

	Test/Silence Button			
Test	Press the Test / Silence button until the alarm signal sounds, then release	1 Flash several times per second	Audible alarm signal	OPERATIONAL after 10 minutes
Pause alarm	Briefly press the Test / Silence button	1 flash every 10 seconds for about 10 minutes		OPERATIONAL after 10 minutes
Alarm stop	Briefly press the Test / Silence button	1 flash every 10 seconds for about 10 minutes		OPERATIONAL after 10 minutes
Low battery warning		1 Flash every 45 seconds for at least 30 days	1 Bip toutes les 45 secondes pendant 30 jours minimum	NON-OPERATIONAL
Pause Low battery warning	Briefly press the Test / Silence button	1 Flash every 45 seconds for about 8 hours		NON-OPERATIONAL
End-of-life			3 beeps every 45 seconds	NON-OPERATIONAL
Default		1 Flash every 45 seconds	3 beeps every 45 seconds	NON-OPERATIONAL

Product is working locally as a standalone smoke alarm by activating its sounder and LED when smoke is detected.

A LoRa “Smoke Alarm” message (Refer to section IX.4. — 03. Smoke alarm status) is sent twice at 20 seconds intervals after the smoke alarm activation occurs. Then, the message is sent once every 5 minutes until smoke alarm deactivation. This event will also trigger a message sent twice at 20 seconds intervals.



VI. Air quality analysis

KARE+ embed a temperature/humidity sensor that enables air quality analysis. Depending on the use-cases, you can select the appropriate function to get temperature / humidity. More details are available on section IX.3. Description of data transmission modes).

Type	Unit	Range	Resolution	Precision		Measuring period
				Typ.	Max.	
Temperature	°C	-30 .. +70	0.1	±0.2 °C	±0.4 °C	10 minutes
Humidity	%RH	0 - 100	0.5	±2 %RH	±3 %RH	10 minutes

VII. NFC access to temperature/humidity measurements

The data measured by the product (Temperature, humidity) can be consulted via the Nexelec TOUCH application. This function is particularly useful for :

- Viewing the current values of environmental parameters
  - Temperature
  - Relative humidity
- Viewing product status information
  - Status of sensors, battery etc.
  - Software and hardware version

To access data measured by the product via NFC:

- Long press on the product's main button (the product will launch a test and then measure environmental data)
- Use the Nexelec TOUCH smartphone application

VIII. Autonomy

KARE+ is powered with one replaceable battery. When the battery is empty, the battery must be replaced. These products are designed for an autonomy of 5 years in their standard configuration.

1. Remaining lifetime forecast

The product lifetime is 10 years. A countdown indicating the remaining time until product end of life is given in the product status frame (Refer to section IX.4.— 01. Product status, Remaining product lifetime field).

The connectivity autonomy part depends on the number of messages sent per days and the network coverage. The standard configuration of the product ensures a product lifetime of 5 years for KARE+ product (Refer to section 0.

Product configuration and remote command).

2. Estimating my product's autonomy

An online calculation tool is available : https://nexelec-support.fr/n/volt/

It allows you to evaluate product autonomy according to transmission modes, network parameters. You can also access it by scanning the Qr Code:

3. Factors influencing product autonomy

— 01. Data transmission frequency

The product consumes energy when transmitting the data measured by the sensors. The lower the number of transmissions, the greater the product's autonomy.

— 02. LoRaWAN network coverage quality

LoRaWAN technology uses a mechanism called ADR, which adapts radio transmission parameters according to the level of network coverage. A product placed in an environment with very good radio coverage can consume up to 20 times less energy than a sensor placed in a less favorable environment. Your product's radio coverage is therefore a decisive factor in determining its autonomy.

IX. LoRaWAN parameters

1. Recommended LoRaWAN parameters

LoRaWAN protocol version : Product compatible with version 1.0.4 and 1.1.0
Regional parameters : Product compatible with parameters RP002 1.0.4 and RP001 1.1 rev B
Profile: Class A (RX2SF9 or RX2SF12)
Available frequencies : US902-928
Join type : OTAA
AppEUI : 0x70B3D540FA4A80ED

DevEUI : Unique identifier for each product. Information available on the label and provided on product delivery.
AppKey : Unique security key for each product. Information provided on product delivery.
Application port (uplink / downlink) : 56
ADR : Yes

2. Network connection

— 01. Automatic commissioning on power-up

When the device is switched on, 2 commissionings are launched on:

- Detection of a magnetic base
- After a short press on a the bottom button
- 30 seconds after powering the product if necessary

If the process has been successful, the product will send its status (refer to section I— 01. Product status), its configuration (Refer to section IX.4.— 02. Configuration of product function) and a “Periodic data” message (Refer to section IX.4.5 Periodic Data).

— 02. Commissioning strategy in case of initial failure

If the initial commissioning process failed, the product will automatically try to join the network with an increasing period between each try:

1st retry will occur 20 minutes after initial commissioning.
2nd retry will occur 40 minutes after 1st try.
3rd retry will occur 80 minutes after 2nd try.
….
In case of failure, the product will then try to join the network every 24h.

— 03. Schedule a recommissioning

You can schedule a join request via a downlink command. The typical use case is when you want to switch from a server to another. A configuration message is sent twice to confirm the activation of the scheduling (Refer to section I— 01. Product status, “Pending Join” field set to 1).

It’s also possible to launch a join request via the Nexelec TOUCH smartphone application.

— 04. Periodic check of the network connection

The product checks its network connection every day by sending the “Product status” message via the standardized LoRaWan system “Linkcheck”. After 3 attempts without any answer from the network, the product will automatically try to join the network as described in the section “Commissioning strategy in case of initial failure”.

3. Description of data transmission modes

— 01. Daily air quality

This function measures temperature, humidity and air quality every 10 minutes.
Every day, it provides:

- Minimal, maximal and average temperature and humidity over 24h.

4. General description

The different types of messages are described below:

Details of the function	ID message	Transmission of message	Can be deactivated	Configurable
Product Status	0x00	On event + Periodic	No	No
Product Function Configuration	0x01	On event + Periodic	No	No
Smoke Alarm status	0x02	On event + Periodic	No	No
Daily air quality	0x03	Periodic	Yes	Yes
Periodic Data	0x04	On event + Periodic	Yes	Yes

— 01. Product status

This message is sent when product is powered on, every day or when one of this information changes:

- Battery level indication is defined using 4 levels:
  - High level: More than 50% remaining battery capacity
  - Medium level: 20-50% remaining battery capacity
  - Low level: 1-10% remaining battery capacity
  - Critical level: Less than 1% remaining battery capacity
- Product HW status: Smoke sensor status, Temperature/Humidity sensor status
- Smoke sensor activation
- Magnetic base detection

Offset	Size (bit)	Bit-range	Data	Description	Valid Range	Scale	Unit
0	8	DB0.7 – DB0.0	Type of product	Product model	KARE+: 0xBC		
8	8	DB1.7 – DB1.0	Type of message	Product Status	0x00		
16	8	DB2.7 – DB2.0	HW revision	Hardware revision	1 - 255	1: V001 … 255: V255	
24	8	DB3.7 – DB3.0	SW revision	Software revision	10 - 255	10: V01.0 … 255: V25.5	
32	8	DB4.7 – DB4.0	Remaining product lifetime	Countdown time in months until product end of life	0-120	0-120	Month
40	1	DB5.7	Smoke sensor status	Status of the smoke sensor	0: OK 1: Smoke sensor fault		
41	1	DB5.6	Temperature / humidity sensor status	Status of the temperature / humidity sensor	0: OK 1: T°/humidity Sensor fault		
42	1	DB5.5	Reserved	Reserved	Reserved		
43	3	DB5.4 DB5.2	Magnetic base detection	Flag indicating if the product detects a magnetic base	0: Magnetic base not detected 1: Magnetic base detected 2: Product removed from its based just now		

					3: Product installed on its base just now 4: Magnetic base never detected		
45	2	DB5.1 – DB5.0	Energy status	Battery Level	0: high 1: Medium 2: Low 3: Critical		
47	8	DB6.7 – DB6.0	Battery voltage	Battery voltage, 5 mV step	0 - 250	2000 - 3250	mV

— 02. Configuration of product function

At the start-up product phase, during each reconfiguration and every 7 days, a message is sent to indicate the configuration of the product.

Offset	Size (bit)	Bit-range	Data	Description	Valid Range	Scale	Unit
0	8	DB0.7 DB0.0	Type of product	Product model	KARE+: 0xBC		
8	8	DB1.7 DB1.0	Type of message	Product general Configuration	0x01		
16	3	DB2.7 DB2.5	Reconfiguration source	Source of reconfiguration process	0 : NFC 1 : Applicative Downlink 2 : Product start-up 3-4: Reserved 5 : Local 6-8 : Reserved		
19	2	DB2.4 DB2.3	Reconfiguration status	Result of reconfiguration process : success or failure ?	0 : Total success 1 : Partial success 2 : Total failure 3 : Reserved		
21	1	DB2.2	Reserved	Reserved	Reserved		
22	1	DB2.1	Daily air quality data enable	Daily air quality data function activated?	0: Non-active; 1: Active		
23	1	DB2.0	Reserved	Reserved	Reserved		
24	1	DB3.7	Pending join	Join request scheduled	0: No join request scheduled 1: Join request scheduled		
25	2	DB3.6 DB3.5	NFC status	Status of NFC interface	0: Discoverable 1: Not discoverable 2..3: RFU		

27	5	DB3.4 DB3.0	Reserved	Reserved	Reserved		
32	1	DB4.7	Periodic data	Periodic data function activated?	0: Function non-active 1: Function active		
33	7	DB4.6 DB4.0	Delta temperature	Temperature changes leading to instantaneous transmission	0-99	0-9.9	°C
40	6	DB5.7 DB5.2	Periodic data transmission period	Periodic data transmission period in minutes	10-60	10-60	min
46	21	DB5.1 DB8.5	Reserved	Reserved	Reserved		
67	5	DB8.4 DB8.0	Reserved	Reserved	Reserved		
72	16	DB9.7 DB10.0	Downlink counter	Downlink counter	0 - 65535		

— 03. Smoke alarm status

This message is sent when one of this information changes:

> Smoke alarm status
> Smoke test
> Time since last smoke test
> Time since last smoke maintenance

Data are sent in the following format:

Offset	Size (bit)	Bit-range	Data	Description	Valid Range	Scale	Unit
0	8	DB0.7 – DB0.0	Type of product	Product model	KARE+: 0xBC		
8	8	DB1.7 – DB1.0	Type of message	Smoke Alarm message	0x02		
16	2	DB2.7 DB2.6	Smoke Alarm status	Status of smoke detection	0: Smoke Alarm non-activated 1: Local smoke Alarm activated 2: Remote smoke Alarm activated 3: Not used		
18	2	DB2.5 DB2.4	Smoke Alarm Hush	Smoke Alarm Hush	0: Smoke alarm stopped because no smoke anymore 1: Smoke alarm stopped following central button press		

					2: Smoke alarm stopped following a remote silence		
20	2	DB2.3 DB2.2	Smoke Test	Flag indicating if a smoke test has been done	0: Smoke test off 1: Local smoke test was done 2: Remote smoke test was done		
22	8	DB2.1 DB3.2	Time since last smoke test	Time since last smoke test	0-255	0-255	Week
30	1	DB3.1	Maintenance	Flag indicating if a maintenance has been done	0: Maintenance not done 1: Maintenance has been done		
31	8	DB3.0 DB4.1	Time since last maintenance	Time since last maintenance	0-255	0-255	Week
39	10	DB4.0 – DB6.7	Temperature	Temperature (linear), Increment = 0.1°C offset 30°C (e.g: 0=-30°C, 300=0°C, 1000=70°C)	0-1000	-30...70	°C
					1023: Error		
					1022: Sensor not present		
49	7	DB6.6 DB6.0	Not used	Not used	Not used		

04. Daily air quality

Data are sent in the following format:

Offset	Size (bit)	Bit-range	Data	Description	Valid Range	Scale	Unit
0	8	DB0.7 – DB0.0	Type of product	Product model	KARE+: 0xBC		
8	8	DB1.7 – DB1.0	Type of message	Air quality message	0x03		
16	10	DB2.7 DB3.6	Temperature min.	Temperature (linear), Increment = 0.1°C offset 30°C	0-1000	-30..70	°C
					1023: Error		

				(e.g: 0=-30°C, 300=0°C, 1000=70°C)	1022: Sensor not present		
26	10	DB3.5 DB4.4	Temperature max.	Temperature (linear), Increment = 0.1°C offset 30°C (e.g: 0=-30°C, 300=0°C, 1000=70°C)	0-1000	-30..70	°C
					1023: Error		
					1022: Sensor not present		
36	10	DB4.3 DB5.2	Temperature average.	Temperature (linear), Increment = 0.1°C offset 30°C (e.g: 0=-30°C, 300=0°C, 1000=70°C)	0-1000	-30..70	°C
					1023: Error		
					1022: Sensor not present		
46	8	DB5.1 DB6.2	Relative Humidity min.	Relative Humidity (linear), 0.5%RH step	0-200	0-100	% RH
					255: Error		
54	8	DB6.1 DB7.2	Relative Humidity max.	Relative Humidity (linear), 0.5%RH step	0-200	0-100	% RH
					255: Error		
62	8	DB7.1 DB8.2	Relative Humidity average	Relative Humidity (linear), 0.5%RH step	0-200	0-100	% RH
					255: Error		
70	2	DB8.1 DB8.0	Not used	Not used	Not used		

05. Periodic Data

Data are sent in the following format:

Offset	Size (bit)	Bit-range	Data	Description	Valid Range	Scale	Unit
0	8	DB0.7 DB0.0	Product Type	Product model	KARE+: 0xBC		
8	8	DB1.7 DB1.0	Type of message	Periodic data	0x04		
16	10	DB2.7 DB3.6	Temperature	Temperature (linear), Increment = 0.1°C offset 30°C	0-1000	-30..70	°C
					1023: Error		

				(e.g: 0=-30°C, 300=0°C, 1000=70°C)	1022: Sensor not present		
26	8	DB3.5 DB4.6	Relative Humidity	Relative humidity (linear), increment = 0.5%RH	0-200	0-100	% RH
					255: Error		
34	6	DB4.5 DB4.0	Not used	Not used	Not used		

X. Product configuration and remote commands

An online downlink calculation tool is available : https://nexelec-support.fr/n/downlink

The product can be reconfigured to best fit each use case. This reconfiguration can be done :

- Locally, using a smartphone or a tablet via the Nexelec TOUCH application
- Remotely, via the LoRaWAN connection interface

1. Configurations for temperature/humidity transmission

Configuration type	Default value	Possible configuration
Daily air quality	On	On | Off
Periodic data	On	On | Off
Periodic transmission period	60 minutes	10 – 60 minutes
Delta temperature	0.5 °C	0 – 9.9 °C

2. Configurations for product maintenance, reliability and security

Configuration type	Possible configuration
NFC interface accessibility	Discoverable | Not discoverable
Product restart	-
Restore to factory configuration	-
LoRaWAN Join request	Delay before connection attempt : 10 – 10080 minutes*

*: Via Nexelec TOUCH smartphone application, this parameter is not reconfigurable and the join request is immediate.

XI. Product reconfiguration via downlink message

Product can be reconfigured via downlink message in response to any uplink message. The downlink message must be sent on port 56.

1. Reconfiguration acknowledgment

After reconfiguration, the product will send a message twice with its updated configuration (Refer to section IX.4.— 02. Configuration of product function).

2. Downlink message structure

First byte is the header: 0x55.

Then the following bytes can be used to reconfigure the product with respect to the format: Command ID and DATA.

Note: Downlink functionalities will certainly progress in the future. To ensure backwards-compatibility, Nexelec recommends sending the IDs from the lowest to the highest value.

ID	Data length (byte)	Range	Scale	Description
0x01	0	-	-	Ask for general configuration of the product (message Configuration of product functions)
0x05	1	0 / 1	0 : disabled 1 : enabled	Periodic data enable
0x0A	1	0 / 1	0 : disabled 1 : enabled	NFC interface enable
0x0E	1	0 - 99	0 – 9.9°C	Delta temperature: Temperature change leading to instantaneous transmission of a measurement, in 0.1°C steps.
0x1C	2	1 - 1008	10 – 10080 minutes	Schedule a join request in x minutes
0x2A	1	0/1	0 : disabled 1 : enabled	Daily air quality enable
0x4A	1	1	-	Product restart

0x49	1	10-60	10-60 minutes	Periodic data transmission period
0xXX				Reserved

Example 1:

> Deactivate daily air quality function

Frame structure from LSB to MSB:

Byte	Value	Info
0	0x55	Header for 1- message reconfiguration
1	0x2A	ID Daily Air quality enable
2	0x00	Value to disable daily air quality

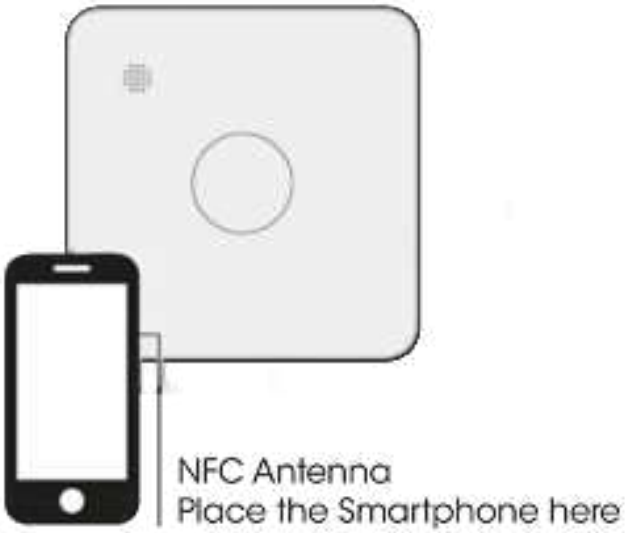
XII. NFC configuration

The product has a NFC interface that allows communication with a smartphone equipped with the Nexelec TOUCH application. This interface allows to:

> Configure the product according to your use case
> Access the latest temperature and humidity data
> Update the product software

The NFC interface can be remotely activated or deactivated via a LoRaWAN downlink message. By this way, the NFC memory is no more discoverable by a phone, preventing reconfiguration of the product once deployed.

1. NFC antenna location



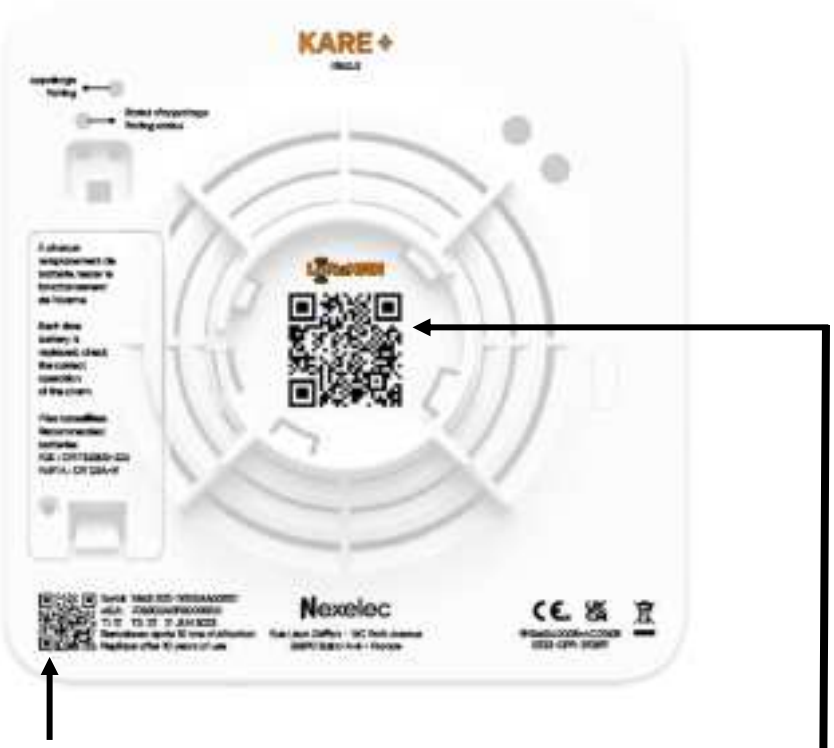
2. Application download

The Nexelec TOUCH product reconfiguration application is available on Android and iOS for devices (mobile, tablet) equipped with NFC interface.

3. Access to Nexelec TOUCH application documentation

Documentation for the Nexelec TOUCH application is available on the support site :
https://support.nexelec.fr/en/support/solutions/folders/80000680573

XIII. Traceability and markings



QR Code format : Serial_number;Testbench;Date;LoRadevEUI

Example : X862LS24-0532PV0014;1M-2F;160124; 70B3D540F657D40E

QR Code format : LW:Device_schema_version:LoRa_AppEUI:LoRa_DevEUI :Owner_Token:SSerial_number

Example : LW:D0:70B3D540FA4A80ED: 70B3D540F657D40E:FFFF0870:SX862LS24-0532PV0014

XIV. ISED Statement

English:This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

The digital apparatus complies with Canadian CAN ICES-3 (B)/NMB-3(B).

French: Cet appareil contient des émetteurs/récepteurs exempts de licence qui sont conformes aux RSS exemptés de licence d'Innovation, Sciences et Développement économique Canada.

L'exploitation est soumise aux deux conditions suivantes :

(1) Cet appareil ne doit pas provoquer d'interférences.

(2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

l'appareil numérique du ciem conforme canadien peut - 3 (b) / nmb - 3 (b).

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du cnr - 102 et conformité avec rss 102 de l'exposition aux rf, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs rf et la conformité.

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme aux limites d'exposition aux rayonnements du Canada établies pour un environnement non contrôlé.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

XV. FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

XVI. Revision history

Document revision	Details	Date
A	Created	21/03/2024
B	FCC Warning added	24/04/2024
C	FCC Statement updated	28/05/2024