UnaBell LTE-M
User Manual

unabiz

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ACTIVATION AND INSTALLATION

	Loosen two screws and open the bottom casing of the device
	↓
	Flip the cover to insert the Plastic Nano SIM or set up the eSIM with your local network provider[1]
	↓
	Insert two 1.5V Alkaline AA batteries ← Remove and re-insert the batteries to try again Fail LED: Red
	↓
LED: Orange blinking	The device starts to initialize and scan the local LTE-M network[2]
	Success LED: Green ↓
LED: Green blinking	The device sends its first downlink request to UnaConnect
	↓
LED: Green blinking	UnaConnect sends a downlink message to the device with new configurations if available, which might take 30-40 seconds
	↓
	Close and screw back the bottom casing of the device[3]

After the activation, you can press the button and should see the data in the UnaConnect platform

Note:
1. If you use the Plastic Nano SIM, the device will use it for network connection instead of eSIM.
2. It might take up to 5 minutes if the device is connecting to a new network in a new region.
3. Be sure to put the casing back.

Here are our recommendations for installing the device:

- If the surface is flat and smooth, you can use strong double-sided tape on the bottom of the device
- If the surface could be bolted or screwed, you can hang the device on the surface
- You can tie a string or rope around the hole on the bottom casing of the device and hang it on other items (e.g. a doorknob)
- Please always install the device with the top facing outwards and keep it away from metal or obstacles

1. PRODUCT INTRODUCTION

UnaBell LTE-M is a battery-powered smart button that can be configured to send messages and trigger actions for a variety of applications, which can last at least 2,000 clicks. The device is also dust and water resistant.

Plug-and-play accessories such as a reed switch or temperature probe can be purchased as add-ons to the smart button via the 3.5mm audio jack connectors to detect the opening/closing of doors or measure the ambient temperature of a space. Seamlessly integrated with UnaConnect, a secure and reliable IoT Device Management Data Platform, UnaBell LTE-M and its accessories are easy to install and configure, allowing you collect data for a variety of use cases immediately.

1.1.   Features

- **Long Battery Life:** Minimum 2,000 clicks with replaceable alkaline AA batteries
- **Dust & Waterproof:** IP54 casing protection (Protected from limited dust ingress.Protected from water spray from any direction.)
- **Local Network:** eSIM or Nano SIM can be used based on your local network provider
- **Firmware Over-the-Air (FOTA) Update:** via LTE-M network to update device firmware
- **UnaConnect Compatible:** UnaBell LTE-M sends data through the LTE network and is natively received by the UnaConnect IoT Middleware for data parsing, configuration, enrichment and connection to end-points
- **4 Click Types:** Single, double, long, extra-long clicks can be used to configure the trigger messages from the device
- **Battery Monitoring:** Heartbeat messages are used to monitor device health

1.2.   Specifications
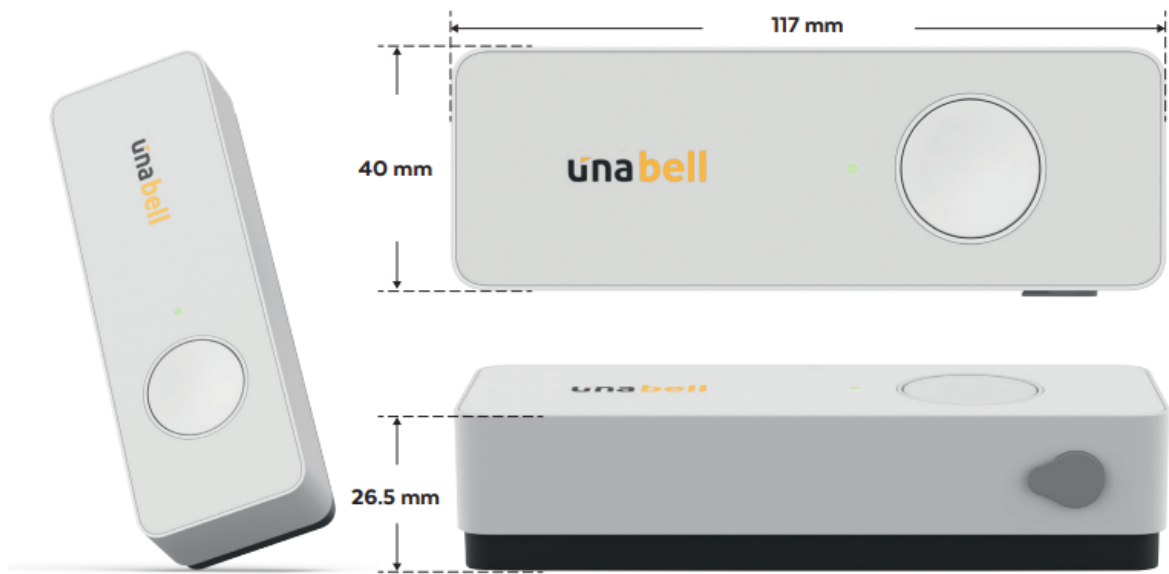
Connectivity	
LTE-M Networks	Supported Bands: 2, 3, 4, 5, 8, 12, 13, 17, 20, 28
SIM Cards	eSIM or Plastic Nano SIM
Module	Sequans Monarch 1 GM01Q

Battery	
Type	Replaceable 1.5V Alkaline AA Batteries
Battery Life	Minimum 2,000 clicks

Mechanical	
Dimension	117 x 40 x 26.5mm
Weight	78g (without batteries)
Dust & Water Proof	IP54 casing protection
External Connector	3.5 mm audio jack
Casing Color	White top casing & black
Operating Temperature	-10 to 60 degree Celsius

Accessory: Temperature Probe	
Dimension	6 mm x 50 mm
Wire Length	2 m
Operating Temperature	-55 to 125 degree Celsius
Temperature Range & Accuracy	± 0.5 degree Celsius between -10 to 85 degree Celsius

Accessory: Reed Switch	
Dimension	23 mm x 14.6 mm
Wire Length	1 m
Operating Temperature	-40 to 125 degree Celsius

Accessory: 2-Wire	
Wire Length	16 cm

Optional Accessories with 3.5mm Audio Jack:
- Reed Switch to detect opening/closing of doors
- Temperature Probe to measure ambient temperature of a space
- 2-Wire to connect with other sensors (e.g. pressure sensor)

Smart Modes:
- **Event Mode** to immediately send a message when the button is clicked. In addition, this can be used with the reed switch accessory to send messages when a door is opened or closed
- **Timer Mode** to count the number of clicks on the button at pre-configured intervals. In addition, this can be used with the temperature probe accessory or a sensor with the 2-wire that sends metrics, example a pressure sensor, to send temperature data at predefined intervals
- **Occupancy Mode** to send a message at the start and end of a state. For example, this can be used with the 2-wire accessory to connect to pressure sensors to detect the state of a seat (occupied/vacant)

1.3.   Click Action and LED Indicators

While making short, double or long clicks, the LED green light blinks one time immediately to indicate the button click is recognized.

Please refer to the visuals below for click action and LED feedback information:

- **Click Action**

Click Types	Description
Single	1 click
Double	2 clicks within 2 secs
Long	1 click and press for longer than 2 secs
Extra Long	1 click and press for longer than 6 secs
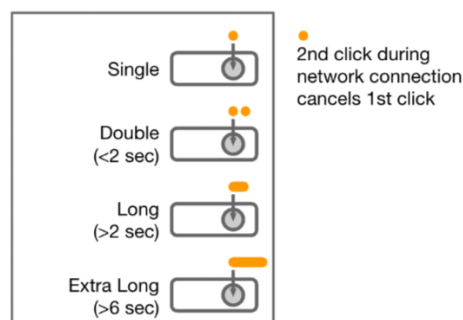
- **LED Indicators**

Orange **Blinking**	• Power ON/Activation • Network Scanning/Searching SIM Card • Firmware Upgrade (FOTA)/eSIM OTA
Green **1 Short ON**	Button click detected
Green **Slow Blinking**	Network Connecting
Green **Fast Blinking**	Data Transmitting
Green **1 Long ON**	• Data Transmission Completed • Communication Success
Red **1 Long ON**	• Data Transmission ERROR • Communication Failed • Network ERROR
Red **Fast Blinking**	Low Battery
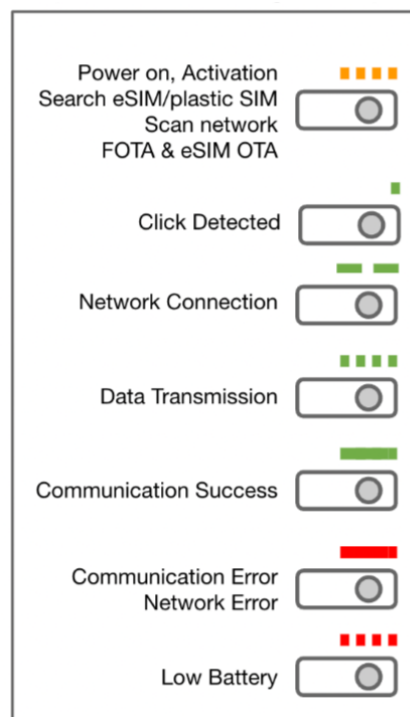
1.4.　Monitor and Configure the Product

The UnaConnect platform can help you monitor all the data received and configure the behavior of your devices

1. Login https://console.unaconnect.io/ with the credential provided by UnaBiz
2. Click on the device group containing your devices
3. Click on 'Devices' on the left navigation bar
4. Click on the device for data information and configuration

● Sensor Data

The Sensor Data tab is the main tab that displays all the messages containing raw data that have been sent from the device

In the Graph section:
- Select the data types that you want to visualize in the Metrics dropdown menu
- Enter the Tick Total value to change the scale of the horizontal axis
- If you want to replace null value by other values, click on the Null Data checkbox and enter the value to replace null

In the Device data section:
- The table displays the timestamp of each message, the data contained in each message that have been processed or translated by UnaConnect, and the raw data in the message sent from the device
- The data and raw messages are based on the different device types, modes and events that triggered each of the messages to be sent from the device
- Export for a CSV file of all the sensor data messages sent from the device

- **Event Data**

The Event Data tab displays all the messages containing descriptions of the events that are device-related such as downlink messages, downlink acknowledgement messages, Sigfox network error messages (example, a break in sequence message) along with the timestamp of these events

2. DEVICE OPERATION

2.1. Glossary

Uplink (UL)	An uplink message is sent from the device to the cloud platform
Downlink (DL)	A downlink message is sent from the cloud platform to the device
Timer Mode	The device counts the number of clicks detected and sends the count in an uplink message at pre-configured intervals
Event Mode	The device immediately sends an uplink message when a click is pressed
Heartbeat Mode	The heartbeat mode can be selected along with Event or Occupancy modes. A heartbeat message is sent periodically by the device to inform the user on battery life, changes in configuration etc
Occupancy Mode	The device sends an uplink message as it identifies the state has changed between Open or Closed States
Open State	The state when the external connector is in the open state, for example: the reed switch has the magnet away from it = open
Closed State	The state when the external connector is in the closed state, for example: the reed switch has the magnet next to it = closed
Debounce Timer	A countdown timer used in occupancy mode which would be reset every time the external connector detects a state change to distinguish if a state is in open or closed states
Occupancy Duration	The period of time from which the debounce timer starts to countdown so if no state change is detected past the occupancy duration (and the timer countdown reaches 00:00) then the device identifies the space as open
External I/O	External I/O (Input/Output) are the sensors or accessories that can be plugged in to communicate with the device
Edge Mode	In edge mode, the device can detect the status change of accessories
Pulse Mode	In pulse mode, the two-wire accessory can be used as an extension
Rising/Falling Edge	It shows the status of accessories: Reed Switch: the magnet is away from it/next to it Two Wire: disconnected/connected

Full-band Scan	This command is to search the network which has better connectivity
eSIM OTA	This command is to update the contract or information of eSIM
FOTA	This command is to update the firmware via LTE-M network

2.2. Message Type

2.2.1. Downlink Messages

A downlink message is sent from the UnaConnect platform to UnaBell LTE-M; the device initiates the downlink process by sending an uplink message with current device information to the cloud platform for downlink request, when the cloud platform receives the downlink request, it will send a downlink message to update the latest configuration set in UnaConnect to the device.

All the configurations for UnaBell LTE-M can be defined on the UnaConnect platform. The Downlink Interval (DI) defines how often the device performs a downlink process with the cloud platform to update the configurations. An immediate downlink message can also be manually triggered by the user by applying an extra long click to the button (1 click and press for longer than 6 secs).

| Parameter	Default Configuration	Description
Operation mode	Event	There are 6 modes available: ● Timer ● Event ● Event + Timer ● Event + Heartbeat ● Occupancy ● Occupancy + Heartbeat
Uplink Frequency	24 messages per day	This defines the frequency of messaging in 24 hours and is only utilized in Timer and Heartbeat modes. The ranges are: ● 1 timer message in one day (periodic 24 hours) ● 2 timer messages in one day (periodic 12 hours) ● 3 timer messages in one day (periodic 8 hours) ● 4 timer messages in one day (periodic 6 hours)… ● 144 messages in one day (periodic 10 minutes)
Downlink Interval	24 hours	This defines the time interval for the device to initiate the downlink process. Minimum = 6 hours Maximum = 336 hours (2 weeks)

Parameter	Default Configuration	Description
Occupancy Duration	0 second	In Occupancy Modes, this sets the period of time from which the debounce timer starts to countdown so if no state change is detected past the occupancy duration (and the timer countdown reaches 00:00) then the device identifies the state that has changed. For example, if this is set at 10 secs, then the device will only change state after it detects the same state for longer than 10 secs.
Command	No command	There are 4 commands available: ● No command ● Full-band scan ● eSIM OTA ● FOTA
Config external I/O detection mode	Disable, no external I/O	There are 4 external I/O detection modes available: ● Disable, no external I/O ● Edge ● Pulse ● Temperature Sensor
Detection Delay Time	0 second	Delay on the detection of the triggers in edge detection mode. Unit: seconds Minimum = 0 (disable detection delay) Maximum = 7200 seconds
Event mask	All event triggers enabled	This defines the detection types (rising/falling edge) and click types that can trigger the device to send messages. The options are: ● Rising edge or occupied ● Falling edge or vacant ● Short click ● Long click ● Double short click ● Extra-long click

2.2.2. Uplink Messages

UnaBell LTE-M supports 6 operation modes, each with its corresponding uplink message type, that could be configured by the user on the UnaConnect platform:
- Event
- Timer
- Event + Timer
- Event + Heartbeat
- Occupancy
- Occupancy + Heartbeat

Click Types	Description
Single	1 click
Double	2 clicks within 2 secs
Long	1 click and press for longer than 2 secs
Extra Long	1 click and press for longer than 6 secs
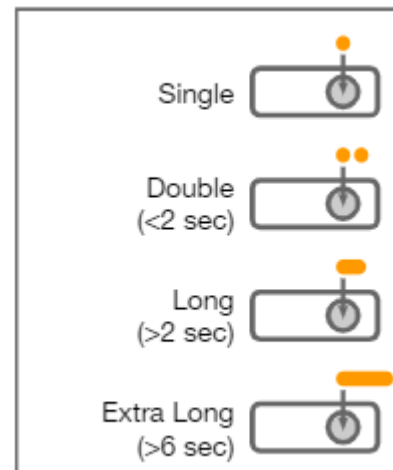
2.3. Operation Modes

2.3.1. Event Mode and Messages

In event mode, the device sends an uplink message immediately each time a click type is applied on the button.

For example, this mode can be used as a maintenance call to repair equipment on a production line, an emergency button to call for assistance in an elderly home or a service call for cleaning in a bathroom.

The uplink message for Event mode contains the following data:
- Message type: Event
- Sequence number: counter from 0 to 4095
- Enabled detection type: Rising edge, Falling edge, Single, Double, Long, Extra Long

Note: If the Temperature Sensor is connected as the external connector, then the current temperature will be sent in event messages when the button is pressed

2.3.2. Timer Mode and Messages

In timer mode, the device logs a count of the number of clicks for each click type over a period of time and sends an uplink message at an uplink frequency configured on the UnaConnect platform.

For example, this mode can be used to count the number of maintenance or service calls sent from the buttons installed at various points of a facility during a period of time to help with resource allocations and operations.

The uplink message for Timer mode contains the following data:
- Message type: Timer
- Sequence number: counter from 0 to 4095
- Uplink frequency: from 1 to 144 messages per 24 hours
- Summary of number of clicks detected: Edge, Single, Double, Long, Extra Long

Note: If the Temperature Sensor is connected as the external connector, then the temperature values will be sent in timer messages

2.3.3. Event + Timer Mode and Messages

The event + timer mode combines the two modes so that it sends an uplink message immediately each time a click type is applied on the button, and logs a count of the number of clicks for each click type over a period of time and sends an uplink message at an uplink frequency configured on the UnaConnect platform.

The uplink message for Event + Timer mode contains the following data:
● Message type: Event + Timer
● Sequence number: counter from 0 to 4095
● Uplink frequency: from 1 to 144 messages per 24 hours
● Summary of number of clicks detected: Edge, Single, Double, Long, Extra Long

2.3.4. Event + Heartbeat Mode and Messages

In event + heartbeat mode, the device sends an uplink message immediately each time any of the click type is applied on the button, and sends a heartbeat message at an interval configured on the UnaConnect platform.

The heartbeat message contains battery voltage data to help monitor the batteries and manage the device lifecycle in your operations.

The uplink message for Event + Heartbeat mode contains the following data:
● Message type: Event + Heartbeat
● Sequence number: counter from 0 to 4095
● Battery voltage: remaining voltage measured in mV
● Enabled detection type: Rising edge, Falling edge, Single, Double, Long, Extra Long

2.3.5.   Occupancy Mode and Messages

The occupancy mode sends an uplink message at the start and end of a state. In Occupancy Modes, a debounce timer counts down from a preconfigured occupancy duration and if no state change is detected past the occupancy duration, then the device identifies the state that has changed.

For example, if the occupancy duration is set at 10 secs, then the device will only change state after it detects the same state for longer than 10 secs. This mode can be used with the 2 wire accessory to connect to pressure sensors to detect the state of a seat (occupied/vacant).

The uplink message for Occupancy mode contains the following data:
- Message type: Occupancy
- Sequence number: counter from 0 to 4095
- Sensor status: status of external I/O connector configured as Pulse or Edge mode

2.3.6.   Occupancy + Heartbeat Mode and Messages

The Occupancy + Heartbeat mode sends an uplink message at the start and end of a state, and sends a heartbeat message at an interval configured on the UnaConnect platform.

The uplink message for Occupancy + Heartbeat mode contains the following data:
- Message type: Occupancy + Heartbeat
- Sequence number: counter from 0 to 4095
- Battery voltage: remaining voltage measured in mV
- Sensor status: status of external I/O connector configured as Pulse or Edge mode

2.4.   External I/O

To fulfill an even wider range of applications and use cases, UnaBell LTE-M may also act as a battery-powered gateway when used with its corresponding plug-and-play accessories in addition to the embedded button on the device. The configuration in UC should be updated to the accessory that is plugged into the device.

The accessories can be plugged to UnaBell LTE-M via 3.5mm audio jack connectors and their main use cases are:

- **Reed Switch Accessory**: detect opening/closing of doors
- **Temperature Probe Accessory**: measure ambient temperature of the surrounding space
- **2 Wire Accessory:** connect with other sensors (e.g. pressure sensor)

> *You can put the rubber plug inside the device casing.*
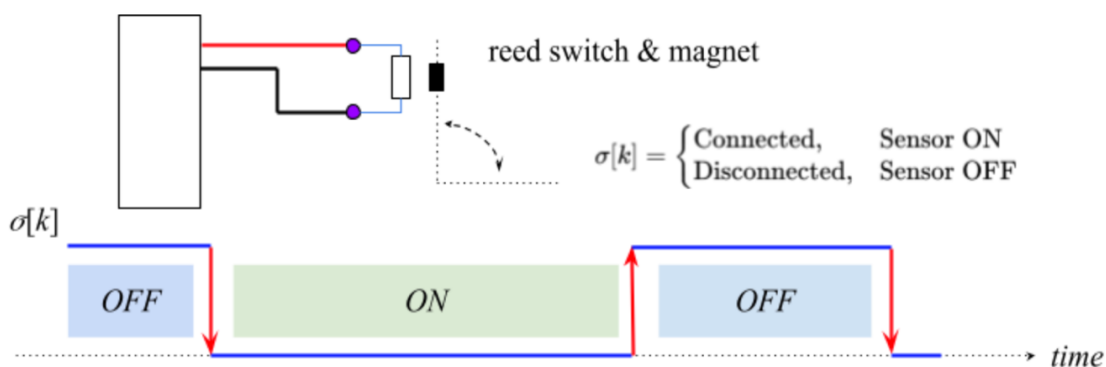

2.4.1.   Reed Switch Accessory

When the reed switch accessory is connected to UnaBell LTE-M, the same operation mode and configurations for the embedded button is applied to the reed switch external I/O connector, and the recommended detection mode for the external I/O is edge detection.

An example scenario is that the reed switch sensor is connected to UnaBell LTE-M to detect the opening and closing of a door. The edge detection in event mode detects the instance that the magnets are closed or separated and sends a message immediately when the door is opened and closed.

reed switch & magnet

$$\sigma[k] = \begin{cases} \text{Connected,} & \text{Sensor ON} \\ \text{Disconnected,} & \text{Sensor OFF} \end{cases}$$

$\sigma[k]$

OFF   ON   OFF

time

2.4.2.   Temperature Probe Accessory

When the temperature probe accessory is connected to UnaBell LTE-M, the embedded button continues to operate in its mode and configurations. The temperature probe only operates in event, timer or event + timer modes. For event modes, it sends an uplink message containing the current temperature data when the button is pressed. For timer modes, it sends a log of temperature data at an uplink frequency configured on the UnaConnect platform.

An example scenario is that the temperature probe is connected to UnaBell LTE-M to monitor the temperature of a meeting room. The timer mode sends temperature data at predefined intervals for facility monitoring and if a user wishes to call the facility control to change the air-condition setting, they can use the embedded button in event mode to send a request message.

2.4.3.   2 Wire Accessory

When the 2 wire accessory is connected to UnaBell LTE-M, the same operation mode and configurations for the embedded button is applied to the 2 wire external I/O connector, and the recommended detection mode for the external I/O is edge detection.

An example scenario is that a 2 wire pressure sensor customized by the user is connected to the UnaBell LTE-M to detect the state of a seat. The edge detection in occupancy mode detects when the pressure is applied and sends an 'occupied' message, then ignores other triggers from the sensor for a pre-defined period of time (occupancy duration), then checks if the pressure is still being applied. If it has been removed, the sensor sends a 'vacant' message to notify the user of the state change for the seat.

3. TROUBLESHOOTING

1. <u>The device cannot initialize or connect to the local LTE-M network</u>

If the device continues to blink orange LED light for a long time, this indicates that it is having trouble initializing, scanning or connecting to the local LTE-M network. This may be due to the network environment or limitations of the local LTE-M network provider.

Please try the steps below:
A: Manually trigger a downlink message immediately by applying an extra long click to the button (1 click and press for longer than 6 secs)
B: Take the device to another location with a better network environment, then remove and insert the two 1.5V Alkaline AA batteries to trigger the initialization process again

2. <u>The device cannot send data after the Nano SIM card is inserted/removed</u>

If the Nano SIM card is inserted, the Nano SIM card overrides the embedded eSIM. If the Nano SIM card is removed, the device returns to utilizing the embedded eSIM.

If the device cannot connect to the local LTE-M network and send data after the Nano SIM card is inserted or removed, you may open the bottom casing and press the **Reset** button in the small hole next to the battery with a pin to manually trigger the device for initialization and connection to the local LTE-M network again.

3. <u>The device is not behaving according to its configuration</u>

All the configurations for UnaBell LTE-M can be defined on the UnaConnect platform. The Downlink Interval (DI) defines how often the device performs a downlink process with the cloud platform to update the configurations.

If the device is not behaving according to its configuration on the UnaConnect platform, it could be that it has not reached its scheduled Downlink Interval to update the configuration to the device. Please try to manually trigger a downlink message immediately by applying an extra long click to the button (1 click and press for longer than 6 secs).

Appendix

Copyright Information

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Declaration and Safety Statement

Federal Communications Commission Statement

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.

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.

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

FCC Radio Frequency (RF) Exposure Caution Statement

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

Declaration of Conformity
(Radio Equipment directive: 2014/53/EU)

This device complies with the essential requirements of the Radio Equipment directive: 2014/53/EU. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the Radio Equipment directive: 2014/53/EU:

EN 301 908-13 V13.1.1
EN 301 908-1 V15.1.1
EN IEC 62311:2020
EN 50665: 2017
EN 50385: 2017
EN 301 489-1 V2.2.3
EN 301 489-52 V1.2.1
EN IEC 62368-1:2020

Cat M1	Power (dBm)
Band 3	23
Band 8	23
Band 20	23
Band 28	23

SW Version: V2116

CE Marking

RF Exposure Statement

The minimum distance between the user and/or any bystander and the radiating structure of the transmitter is 20cm.

Safety Notices

- **Keep the device away from water, fire, humidity, or hot environments.**
- **Do not operate the device next to flammable gases or fumes.**
- **Do not place the device next to a heat source.**
- **Do not spill food or liquid on your product, and never push any objects into the openings of your device.**
- **Do not attempt to disassemble, repair, or modify the device.**
- **Do not use this product where wireless devices are not allowed.**
- **Children should be supervised to ensure they do not play with the device and its parts.**
- **Please read and follow the instructions about replacing the batteries. There is a risk of explosion if the battery is replaced by an incorrect type.**