

FCL Components Wireless modules

Mesh Tag Unit (Wirepas Mesh 2.4 GHz based)

FWM8BLZ08T-109133 Datasheet

Ver. 2
Feb 1, 2024

The above Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated (1)for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2)for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite), hereinafter referred to as "High Safety Required Use". You shall not use this Product without securing the sufficient safety or reliability required for the High Safety Required Use. If you wish to use this Product for High Safety Required Use, please consult with our sales representatives in charge before such use.

FCL Components Limited

All specifications are preliminary which may be changed without any prior notice

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1. Summary

This datasheet applies to the Wirepas Mesh 2.4 GHz based Mesh Tag Unit FWM8BLZ08T.

2. Features

This product is an antenna integrated Mesh unit which incorporates Wirepas Mesh 2.4 GHz. It is possible to communicate in 2.4 GHz ISM (Industrial Scientific Medical) band.

Since Wirepas Mesh is a wireless mesh network technology that enables wireless IoT networking at massive scale mainly used for asset tracking.

The followings are the key features.

- Wirepas Mesh 2.4 GHz enabled
- Dimension : 76.5mm x 74.2mm x 29.0mm
- Weight : 75 g (exclude AA batteries)
- Operating Temperature : -20 to +60 °C
- Operating Humidity : +20 to +80 %RH (Noncondensing)
- Power Supply : Four AA batteries or
+5V via USB type-C connector
- Water resistant and dustproof : IP65 (When battery operated)

Functions:

- Tag for positioning application
- LED indicator (RED)
- Configurable by App config message or Remote API.
- Battery voltage level monitoring

3. Applicable Standard

- Wirepas Mesh 2.4 GHz v5
- FCC, ISED certification
FWM8BLZ08T contains the certificated module (FWM7BLZ20B).
FCC ID of the certificated module: SQK-7BLZ20
ISED ID of the certificated module: 337L-7BLZ20
- CE, UKCA Marking
- ARIB STD-T66
Radio Act (Japan) Certification No. 007-AG0232
(Certificated by the combination of embedded module.)
- RCM, R-NZ certification
- RoHS Compliant

4. Block Diagram

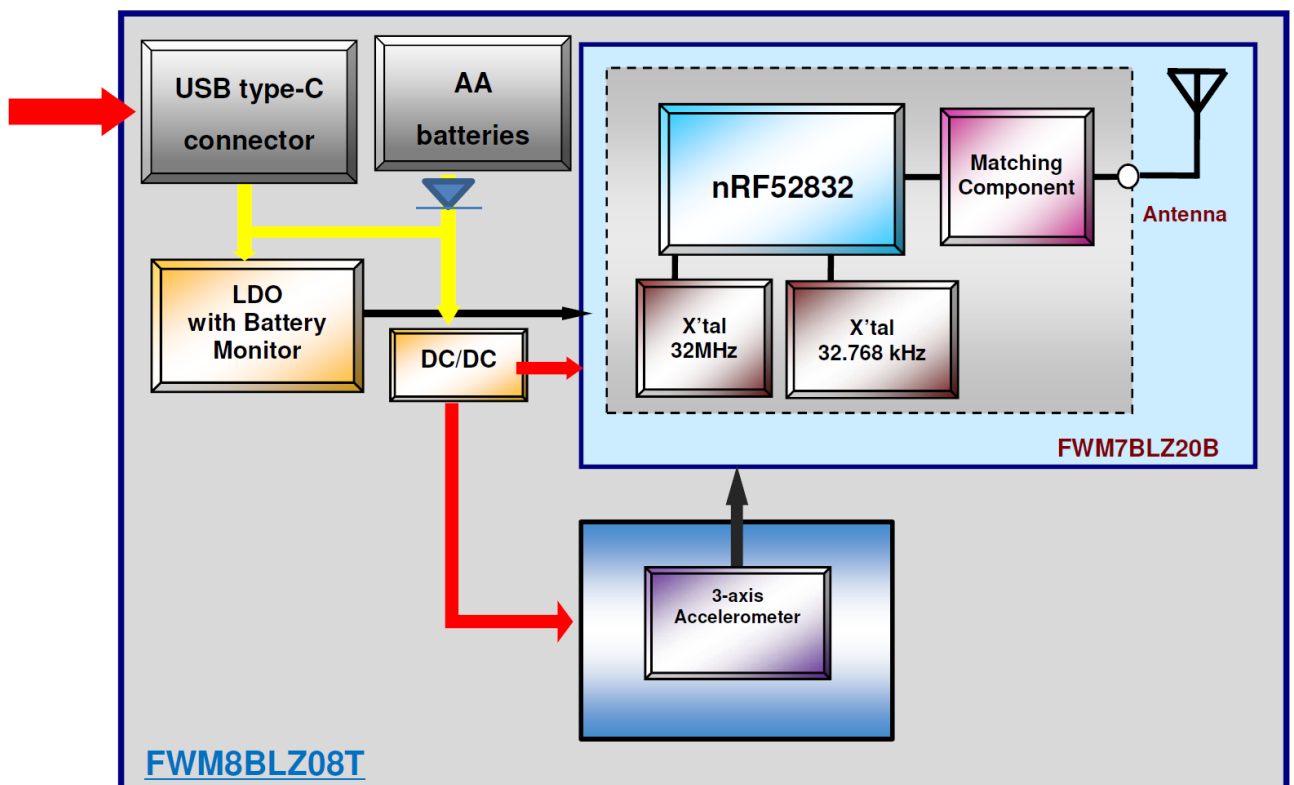


Figure 4-1: Block Diagram

5. Electrical Characteristics

5-1. General Features

Wirepas Mesh 2.4 GHz enabled

Carrier frequency : 2400 MHz to 2483.5 MHz

Modulation : GFSK

Data rate : 1 Mbps

Modulation index : 0.5

Channel : 40 channels

Channel spacing : 2 MHz

Output power : +4 dBm max

5-2. Absolute Maximum Rating

Items	Symbol	Min	Max	Unit
Supply Voltage (VDD)	VDD	-0.3	5.5	V
Supply Voltage (GND)	GND	-	0	V
Storage Temperature	Tstg	-20	+60	°C
Acceleration (Any axis)			20,000 g for 0.2msec	

5-3. Recommended Operating Condition

Items	Symbol	Min	Typ.	Max	Unit
Operating Voltage (USB)	VDD	4.5	5.0	5.5	V
Operating Voltage (Battery)	VDD	2.2	3.0	3.6	V
Operating Temperature	Ta	-20	25	+60	°C
Operating Humidity*	Hopr	20	-	80	%RH

*No dew condensation

5-4. General radio characteristics

Ta=25±2°C

Items	Condition	Min	Typ.	Max	Unit
Operating frequencies	2MHz channel spacing	2400	-	2483.5	MHz
PLL programming resolution			1		MHz
Frequency deviation			±250		kHz

5-5. Transmitter Specifications

Ta=-20°C to 60°C

Items	Condition	Min	Typ.	Max	Unit
Output power		-20		+4	dBm
Step size of RF power control			4		dB
RF power control range			+24		dB

5-6. Receiver sensitivity

Ta=-20°C to 60°C

Items	Condition	Min	Typ.	Max	Unit
Maximum received signal strength	< 30.8% PER		0		dBm
Receiver sensitivity	Dirty transmitter < 30.8% PER		-94		dBm

Receiver specifications

Ta=25±2°C

Items	Condition	Min	Typ.	Max	Unit
RX selectivity (C/I performance)	Co-channel interference		6		dB
	Adjacent (-1 MHz) interference		-2		dB
	Adjacent (+1 MHz) interference		-9		dB
	Adjacent (-2 MHz) interference		-22		dB
	Adjacent (+2 MHz) interference		-46		dB
	Adjacent (>= 3 MHz) interference		-50		dB
	Image frequency interference		-22		dB
	Adjacent (1 MHz) interference to in-band image frequency		-35		dB
RX intermodulation	IMD performance (3 MHz, 4 MHz, and 5 MHz offset)		-30		dBm

5-7. Current Consumption

5-7-1. Current consumption of RF part

Vin=3.0V ,Ta=25±2°C

Description	Symbol	Typ.	Max.	Unit
TX current @ P _{OUT} = +4 dBm	I _{TX,+4dBm}	10.9		mA
TX current @ P _{OUT} = 0 dBm	I _{TX,0dBm}	8.0		mA
TX current @ P _{OUT} = -4 dBm	I _{TX,-4dBm}	7.3		mA
TX current @ P _{OUT} = -8 dBm	I _{TX,-8dBm}	6.6		mA
TX current @ P _{OUT} = -12 dBm	I _{TX,-12dBm}	6.3		mA
TX current @ P _{OUT} = -16 dBm	I _{TX,-16dBm}	6.1		mA
RX current	I _{RX}	11.2		mA
Deep Sleep current	I _{SLEEP}	5.5		uA

5-7-2. Average current consumption of sensor (reference value)

Ta=25±2°C

Description	Typ.	Max.	Unit
3-axis Acceleration	2		uA

5-8. Sensor specification

5-8-1. 3-axis Acceleration sensor

Items	Symbol	Min	Typ.	Max	Unit
ACCELEROMETER SENSITIVITY					
Full-Scale Range		0		±16	G
Output resolution			0.001		G

The 3-axis acceleration sensor is only used to wake up the unit from sleep mode by shock detection. Therefore, the sensor will output nothing. For the details about accelerometer shock detection and the data calculation method, please refer to the "Wirepas Mesh Sensor Unit Firmware Specification".

6. Interface specifications

6-1. Hardware Interface

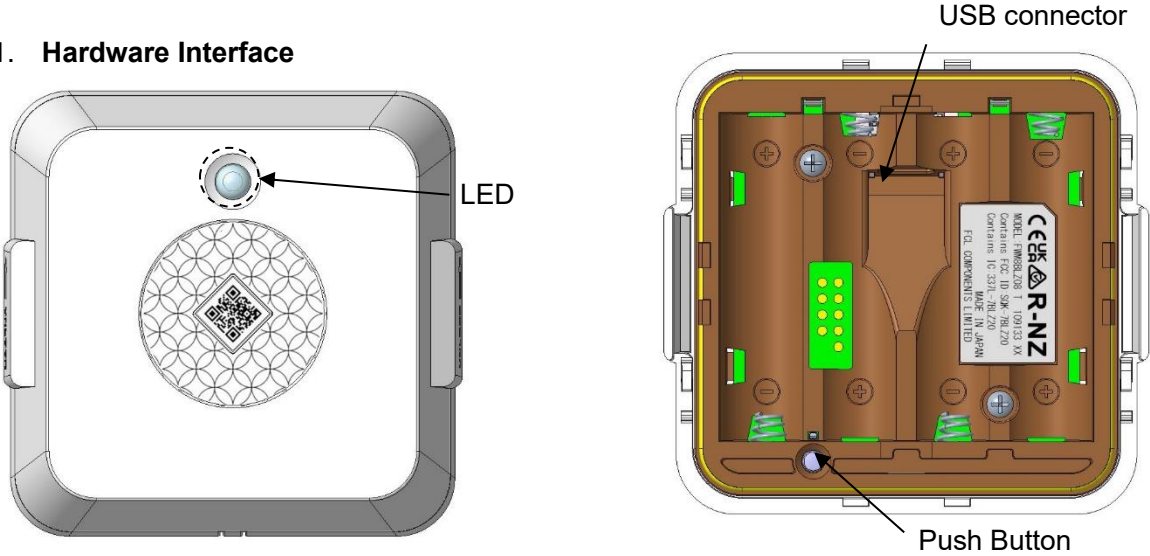


Figure 6-1: Hardware Interface

7. Function Specification

7-1. Operation Mode

This product has two types of operation modes shown in the table below, and the modes can be switched by operating the button at startup.

Operation Mode	Description
Mode 1 (Normal mode)	This mode is intended for use in normal operation.
Mode 3 (Recovery mode)	Deletes all settings and restores the default firmware.

Various operation settings of this product can be changed.

Settings can be changed using the Wirepas Terminal or Wirepas Network Tool.

(Settings can also be changed using the AppConfig function or Remote API.)

7-1-1. Mode 1 (Normal mode)

Operating Instructions	Push Button	LED
Turn on the unit (apply the battery or insert the USB cable). *Please don't touch the push button during this process.	OFF	OFF
		Blinking (2 seconds)
		OFF

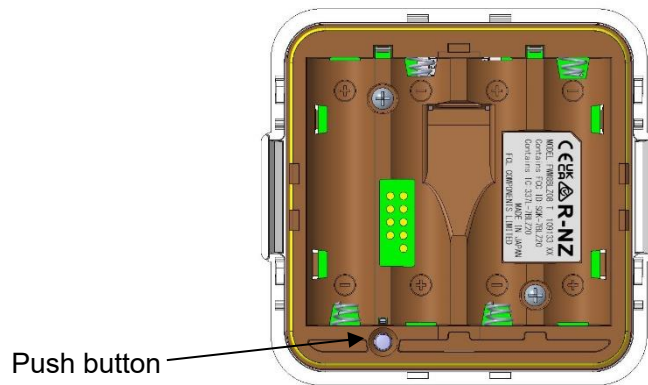


Figure 7-1: Mode 1

Behavior of Mode 1

When the unit is turned on, the LED indicator blinks for 2 seconds and then goes off.

This LED blinking behavior can't be changed.

* Refer to "Wirepas Mesh Sensor Unit Firmware Specification " for details.

7-1-2. Mode 3 (Recovery mode)

Operating Instructions	Push Button	LED
Turn on the unit with the push button pressed. After 2 seconds, the LED turns on.	ON	OFF
		OFF (2 seconds)
ON		
ON (15 seconds)		
Blinking (within 5 seconds)		
Keep pressing the push button after the LED turns on for minimum 15 seconds. Release the push button within 5 seconds after the LED starts to flash. All the settings are restored to default settings and it reboots automatically.	OFF	

If the push button is not released within 5 seconds after the LED starts blinking, the unit will boot in Mode 1.

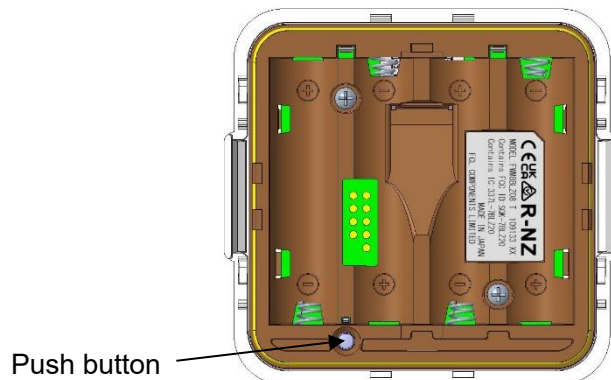


Figure 7-2: Mode 3

Behavior of Mode 3

The recovery mode is a function that aims to forcibly restore it to the initial settings when it is out of control due to a reason such as "Inappropriate settings are done to the product".

This deletes all the settings and restores the firmware to initial settings. It reboots automatically after the recovery.

8. Firmware

8-1. Firmware version

Revision *	Firmware version (Base version of Wirepas firmware is given in parenthesis).	App_version	App_specific_area_id
AA	wp_v1.00A_v5_** (05.01.00.61)	1.0.0.0	0xFC1081
BB	wp_v1.01A_v5_** (05.01.00.61)	1.01.0.0	0xFC1081
CC	wp_v2.00A_v5*_**(05.03.00.89)	2.0.0.0	0xFC1081

* Please refer to 9-3 Label specification.

There is no different behavior between the AA version and BB version of FWM8BLZ08T.

8-2. Initial setting

Initial setting is as follows.

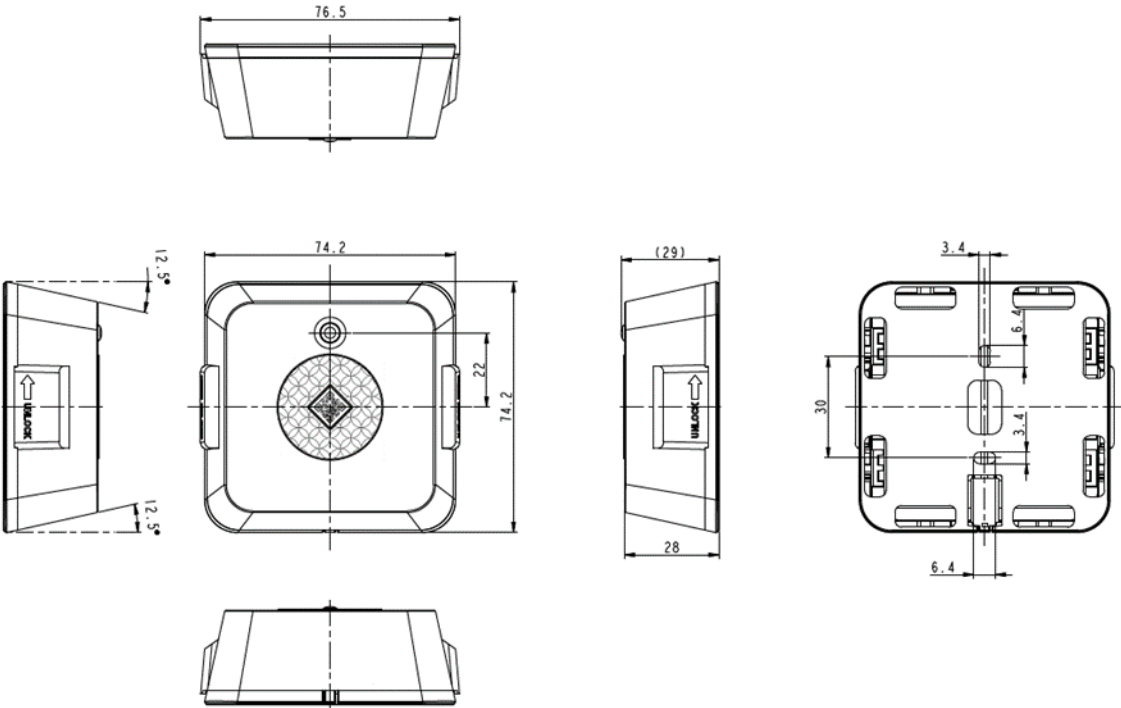
Parameter	Value
Node Address	Random number (4 byte)
Network Address	7986085 (0x79DBA5)
Network Channel	10
ENCRPTION_KEY_EN	0 (disable)
ENCRPTION_KEY_VALUE	-
AUTHENTICATION_KEY_EN	0 (disable)
AUTHENTICATION_KEY_VALUE	-
EP_BASE_NUM	0x06
NODE_ROLE	0x02 (Low Energy non-Router)
POS_OPERATION_MODE	0x01 (NRLS Tag)
POS_DEVICE_CLASS	0xFA
POS_MAX_SLEEP_TIME	0x03 (15 minutes)
POS_MAX_RUN_TIME	0x02 (2 minutes)
POS_MEASUREMENT_RATE	0x001E (30 seconds)
POS_ACCEL_THRESHOLD	0x60
POS_BATT	0 (disable)
DATA_QOS	0 (Normal)
COMMAND_QOS	0 (Normal)
ADV_EN	0 (disable)
ADV_DATA_SEL	1 (fixed data)
FIXED_ADV_DATA_SEL	1
ADV_INT	0x0A (1 second)
SEN_MSR_INT	0x06 (60 seconds)
SEN_CONFIG	0x00 (disable)
SEN_SERVICE_ID	0x01
SEN_PROJECT_ID	0x01
SEN_COMPANY_ID	0x0D28
SEN_TXT_OUT_EN	0x01
SEN_TXT_FORMAT_SEL	0x00
SEN_BINARY_FORMAT_SEL	0x00
ALARM_EN	0x01
SEN_CO2_IND_THRE_GREEN	0x14
SEN_CO2_IND_THRE_RED	0x28
SEN_CO2_IND_INT	0x05
custom_bootloader_keys auth	69 63 87 5F 9C A5 33 64 37 20 2E 6E 1C B6 31 63
encrypt	3E 77 0C 4D 13 5B 02 CA 23 A7 22 AE 59 5F 53 3C

If you turn on the product in Mode 3 as described in 7-1-2, all the settings are reset to the initial value of the firmware settings as shipped from the factory.

Unless otherwise specified, other settings will not be overwritten.

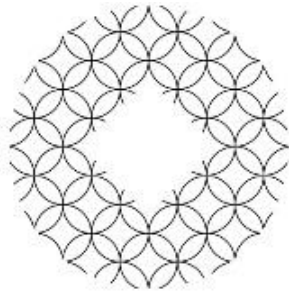
9. Mechanical Characteristics

9-1. Appearance and Dimensions

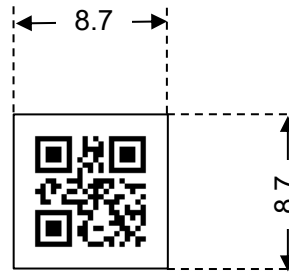


Unit [mm]

9-2. Graphic and QR code label



Graphic label



QR code label

QR code label specification

Dimension: Label size: 8.7 * 8.7 mm

QR code size: 7.0 * 7.0 mm (Typ)

Information:

(1) Node address

Notes

- Please keep the QR code label clean to prevent misreading QR code.
- When wiping off dirt, wipe gently with a soft cloth. Please do not wipe forcefully or using chemical cleaning such as alcohol to prevent damage the QR code label.

9-3. Label specification



(1) FCL Identification Number + Identification symbol: FWM8BLZ08 + T

(2) Version number, FCL Identification Number

109133 XX

Version:

A*:Initial version n (*: Firmware version. Please see section 8-1)

FCL identification number:

109105 (Mass production)

Sx : Sample (x:version)

(3) FCC ID of contained module.

(4) ISED ID of contained module.

(5) Certification logo (CE, UKCA, RCM, R-NZ)

10. Storage Conditions

- Do not store this product in the environments exposed to shock or vibration. It may result in damage, malfunction, or deterioration of quality.
- Do not throw or drop cartons containing this product during transportation. It may result in damage, malfunction, or deterioration of quality.

11. Warranty period

The warranty period for this product is 18 months after the product is shipped from us.

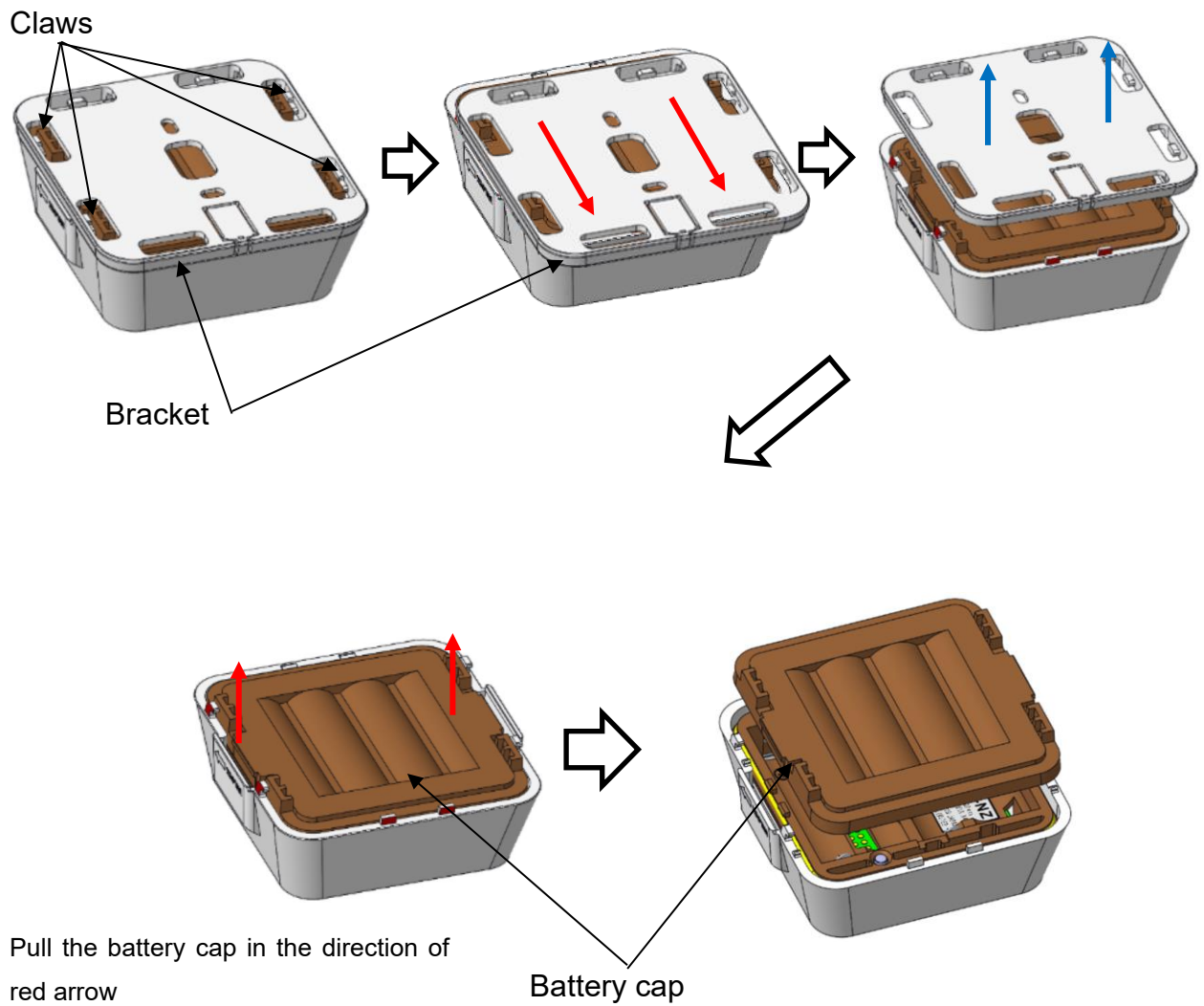
Note 1: We can not provide any warranty for the operation of this product in all vibrating condition.

Please check in your own environment before use.

12. Installation

12-1. Removal of the bracket and battery cap

1. Slide the bracket in the direction of red arrow, and claws will be unlocked.
2. Lift the bracket and remove it.
3. Remove the battery cap

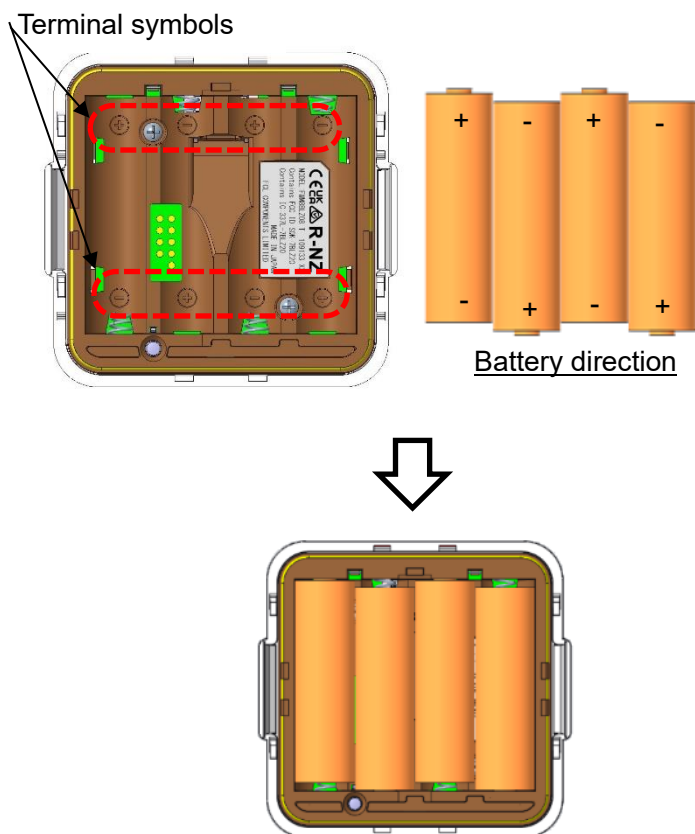
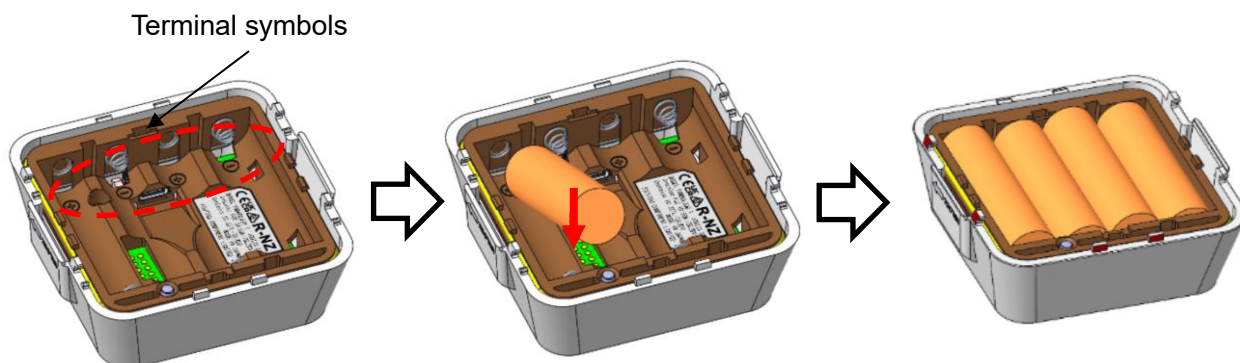


12-2. Power supply

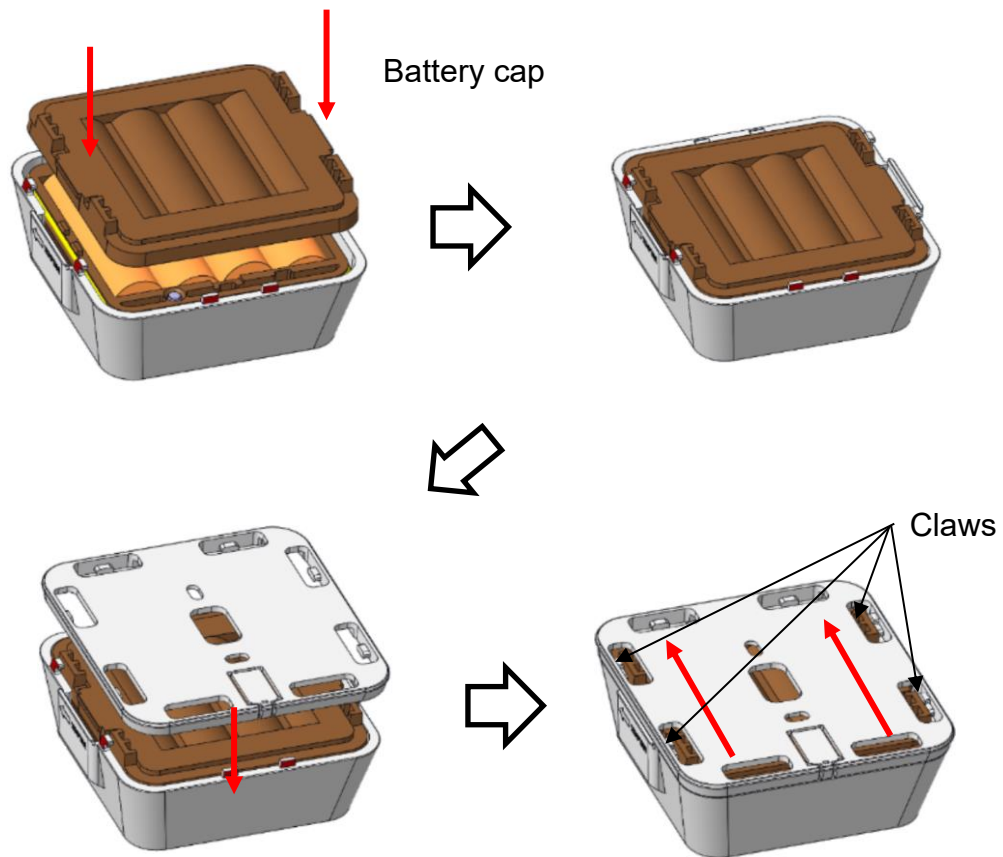
12-2-1. Case.1: Battery powered.

1. Insert 4 AA batteries with its positive (+) and negative (-) terminals properly aligned with the corresponding symbols in the battery box.

Caution: Do not mix old batteries and new batteries.



Close the battery cap and attach the bracket



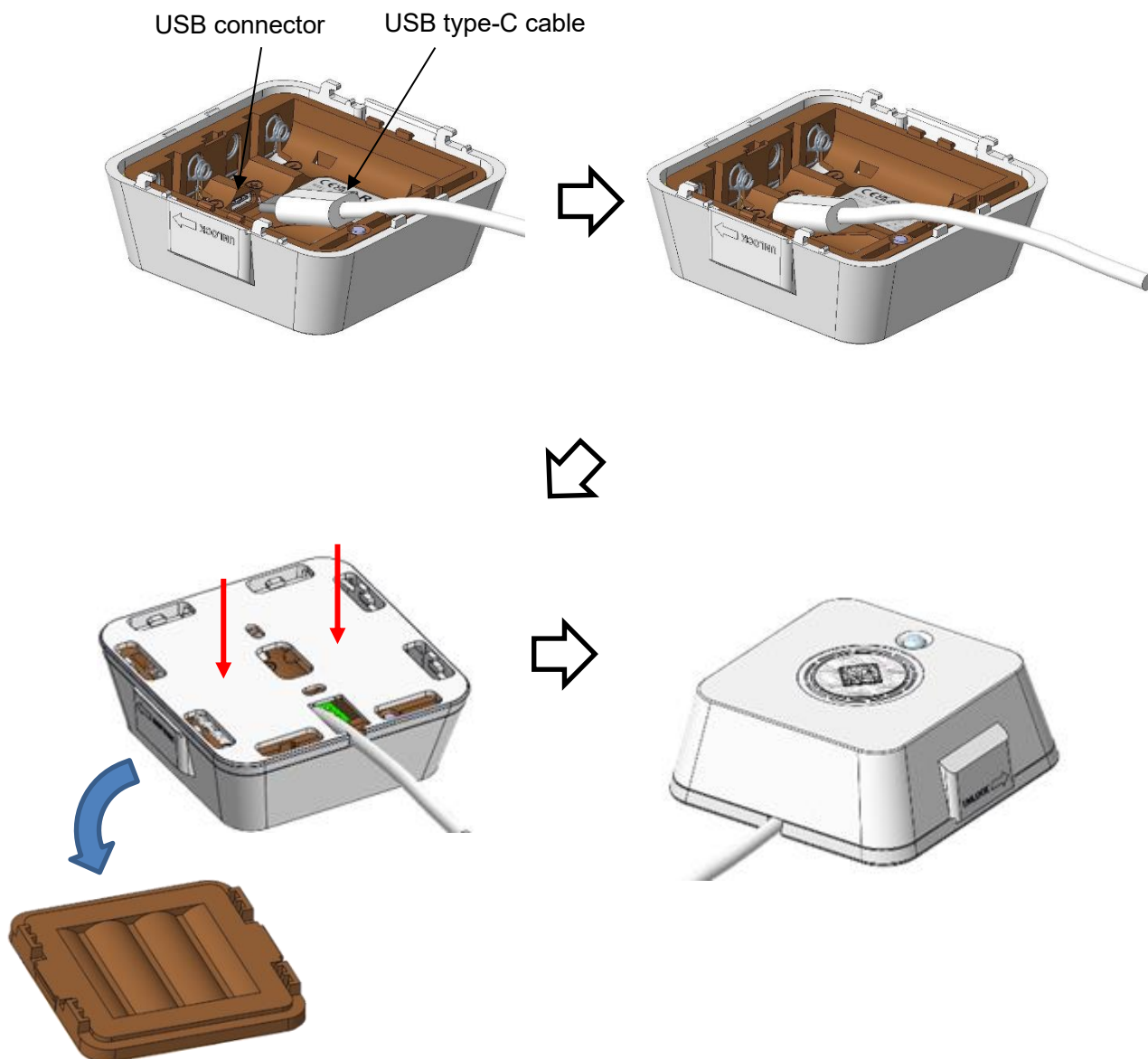
Caution : Please confirm the claws are locked correctly.

Note:

- Please press the battery cap all the way in to keep the water resistant and dustproof performance.

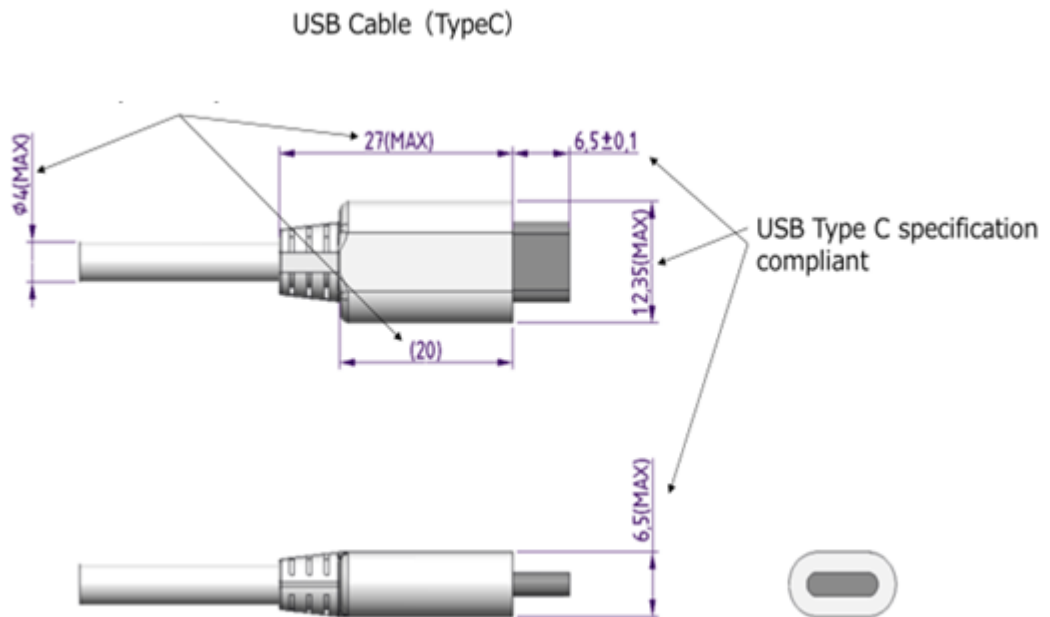
12-2-2. Case.2: USB powered.

1. Insert USB type-C cable to the USB connector.
2. Attached the bracket (Do not apply the battery cap).



12-2-3. USB cable

Recommended dimension of USB cable is as follows.

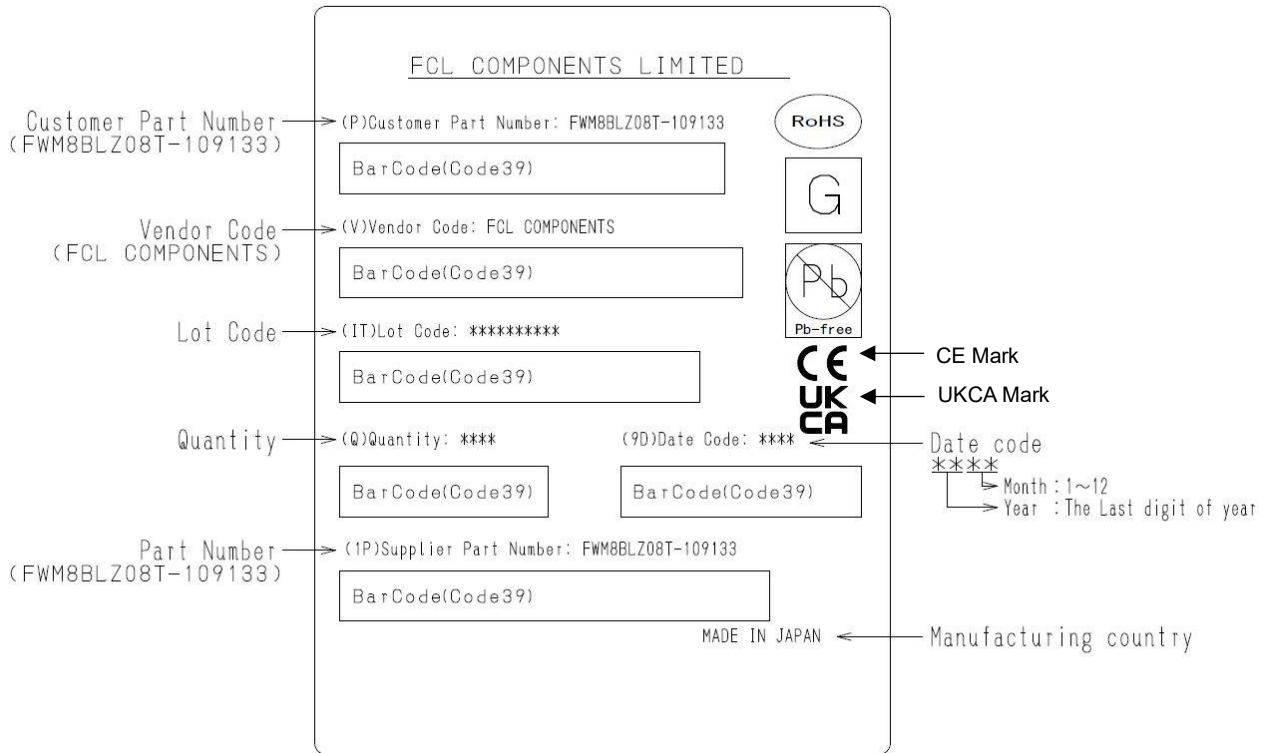


Notes

- The water resistant and dustproof performance are not applied if USB cable is used.
- Please do not connect the USB cable when the unit and/or USB cable is wet.

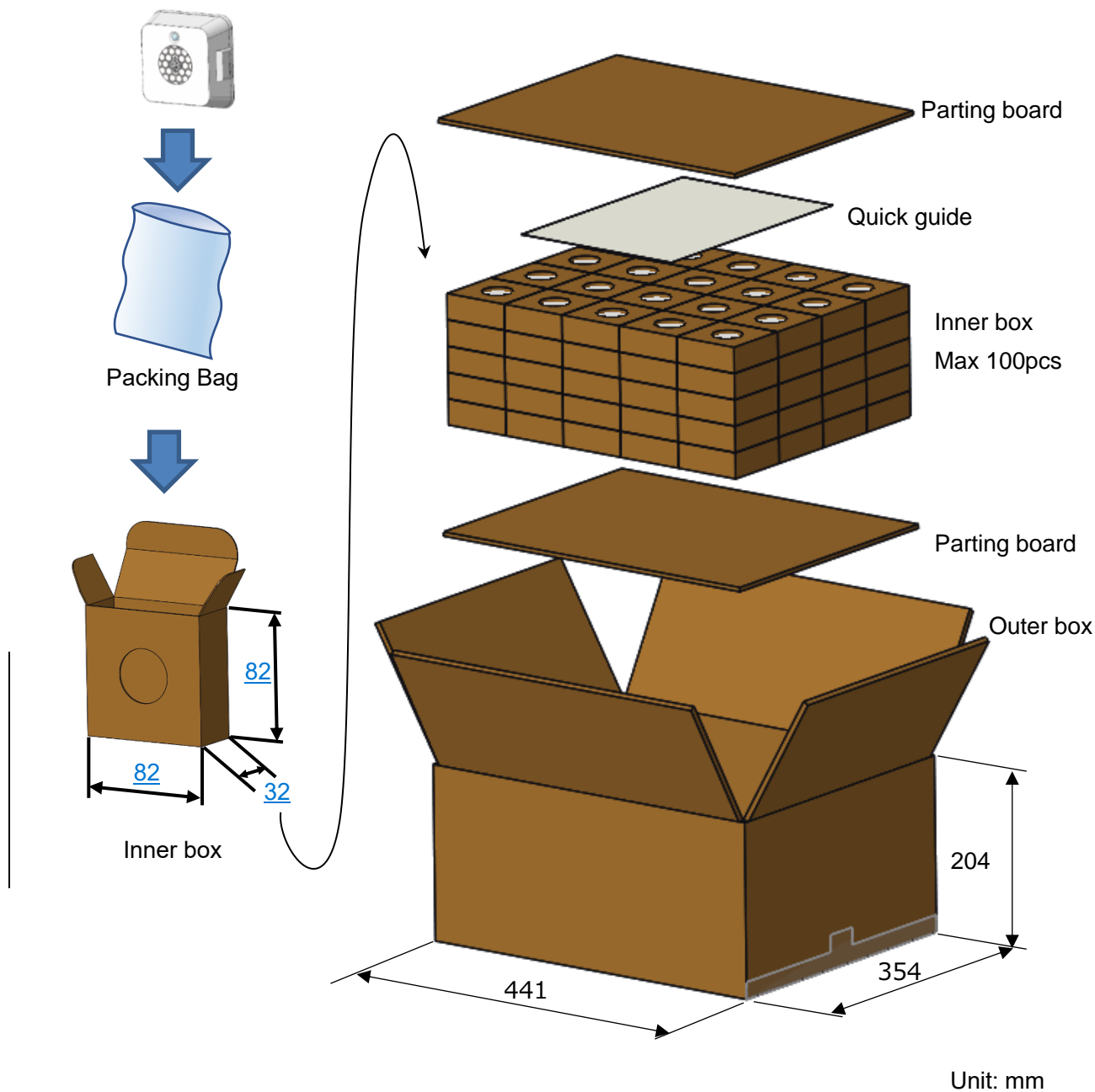
13. Packing Specification in shipment

13-1. Label



13-2. Shipment Packing

13-2-1. Shipping package



Note

- The purpose of the outer box and inner box is used to absorb the impact on the product during transportation. The boxes may be damaged or deformed due to the handling during the transportation.

14. Caution

14-1. Firmware

- FCL Components Limited (“FCL”) may update the firmware without prior notice.
- FCL does not provide the firmware update to the products already delivered to customer. If you wish to continuously use the prior version of firmware, please contact your nearest FCL Components’s sales office.

14-2. Lithium Battery

If any type of Lithium battery is used, be aware of following points.

- RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.
- RISK OF EXPLOSION OR THE LEAKING FLAMMABLE LIQUID OR GAS IF FOLLOWING IS APPLIED.
 - ✧ Replaced by incorrect battery type.
 - ✧ Mixture of new and used batteries.
 - ✧ Dispose to a heated furnace or incinerator.
 - ✧ Leaving at excessively high and low temperature condition.
 - ✧ Leaving at excessive low pressure.
 - ✧ Mechanical stress such as crushing, puncturing or cutting.
- Disposal of used batteries must follow the instruction or rules of the regional authority.

15. Compliance Statement

Note to users in the United States of America

Caution:

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

Declaration of Conformity

This device complies with part 15 of 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.

Note to users in the United States of America and Canada

Note to users

It is strictly forbidden to use antenna except designated.

This equipment must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that is deemed to comply without testing of specific absorption rate(SAR).

Note to users in Canada

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation de l'exposition maximale autorisée.

Note to users in Canada

This device complies with Industry Canada's license-exempt RSSs.

Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Remarque concernant les utilisateurs au Canada

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

European Community Compliance Statement

Note:

Hereby, FCL Components Limited, declares that this FWM8BLZ08 is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

The full text of the declaration of conformity is available at the following internet address:

<https://www.fcl-components.com/en/products/wireless-modules/>



Note to users in the Great Britain

United Kingdom conformity Assessed Compliance Statement

Note:

Hereby, FCL Components Limited, declares that this FWM8BLZ08 is in compliance with the relevant statutory requirements.

The full text of the declaration of conformity is available at the following internet address:

<https://www.fcl-components.com/en/products/wireless-modules/>



Risk assessment:

As part of the risk assessment on an on-going and periodic basis we will monitor the designated standards list published by the Office for Product Safety and Standard and also the Department for Business, Energy & Industrial Strategy relevant to the Statutory Instrument correct references to radio Equipment for new standards to ensure that the assessment methods are updated as new standards become available. We will also check the ETSI list of published standards for updates to EMC standards pending designation of suitable standards.

16. Version History

Version	Content change	Date
1	Initial release.	July 1, 2021
1.1	'9-3. Label specification' is changed. '12-2-3 USB cable' is added '13-2. Shipping package' is changed added. '14-2. Caution (Lithium battery)' is added.	Oct 27, 2021
1.2	2. Features, 9-1 Dimensions are changed. 3. Applicable standard: UKCA, RCM, R-NZ are added 8. Firmware is revised. '15. Compliance statement' is added	Jan 18, 2022
1.3	13-1. CE / UKCA marking are added to the label. 13-2-1. Quick guide is added.	Mar 28, 2022
2	Change of Company name	Feb 1, 2024