ABLIC

CLEAN-Boost™

User's Manual

Wireless Tag II, Sensor Ribbon I / Sensor Ribbon II
Battery-less Water Leak Sensor

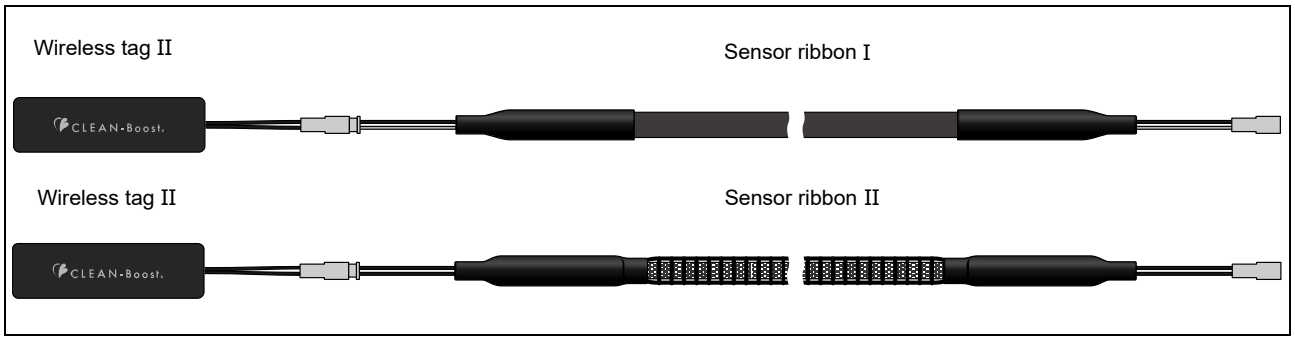
Rev.2.3_00

Thank you very much for purchasing the Battery-less Water Leak Sensor.
Please carefully read this User's Manual in order to use the unit safely.
Read "**1. Safety Precautions**" prior to first use to ensure appropriate product handling.

Remark 1. The accumulating and boosting circuit technologies, on which the CLEAN-Boost is mainly based, were developed through collaborative studies with Ritsumeikan University.
2. "CLEAN-Boost" is a registered trademark of ABLIC Inc.

Product configuration of the battery-less water leak sensor is as follows:
Upon detection of water leakage by sensor ribbon I, replace with a new product.
Sensor ribbon II can be used repeatedly. Apply sensor ribbon II for repeated use of the product upon detection of water leakage. Sensor ribbon II must be replaced with a new product if the alive monitoring timer detects a fault, or when the total electrical energy generation amounts to 500 hours.
Determine the length of sensor ribbon I / sensor ribbon II in accordance with the location where the sensor is to be installed. The ribbons may then be connected.
If the ribbons are connected, the total length must be equal to or less than the length shown in "**4. 3 Basic specifications**".

- Wireless tag II : S-CBTGAABI
- Sensor ribbon I 0.5 m: S-CBSSAAAC-001
  2.0 m: S-CBSSAAAC-002
  5.0 m: S-CBSSAAAC-003
- Sensor ribbon II 0.5 m: S-CBSSAABI-201
  2.0 m: S-CBSSAABI-202
  5.0 m: S-CBSSAABI-203



All of the information described in this User's Manual (product data, specifications, figures, tables, programs, algorithms, application circuits, etc.) is current as of the issue date, and is subject to change without prior notice. For details, please contact our sales representatives.

Contents

1. Safety Precautions

In order to use the battery-less water leak sensor in a safe manner, be sure to observe the descriptions under "**Warnings**" and "**Cautions.**"
The battery-less water leak sensor is intended for use under the supervision of persons knowledgeable in the field of electricity.

After reading, store the User's Manual such that it can be referred to at any time.

Warnings

Observe the following to prevent injury or death due to fire, improper winding of sensor ribbon I / sensor ribbon II, and other issues:

- To avoid injury and/or product failure, never disassemble or modify the unit.
- To avoid excessive heat generation and/or product failure, never connect other electronic devices or electric wires to the wireless tag II or sensor ribbon I / sensor ribbon II.
- Do not allow sensor ribbon I / sensor ribbon II to wind around your body. In addition, if sensor ribbon I / sensor ribbon II winds around a movable part of a machine or a facility, it could cause a serious accident. Take due care in selecting the spot where the unit is to be installed.
- Store and install this product out of reach of children.
- No explosion-proof specifications are noted for this product. Please contact us if you are considering using it in a designated explosion-proof location.
- Keep this product away from anything that may cause ignition and/or explosion.

Cautions

Observe the following to avoid inappropriate product handling and injury or damage that may result.

- The purpose of the battery-less water leak sensor is to detect water leakage. The Customer is solely responsible for any problems caused by using the product for anything but detection of water.
- Do not hit, step on, or apply excessive load on this product, as it may cause product failure.
- If sensor ribbon I / sensor ribbon II is left wet for an extended period of time, the internal electrodes may be eluted, resulting in discoloration that may stain the area.

2. Precautions for Use

The battery-less water leak sensor is an electronic device. Inappropriate use may cause failure and/or malfunction. Observe the descriptions under "**Handling Precautions,**" and correctly use the product in order to ensure maximum performance.

Handling Precautions

- Do not shield the antenna section of the wireless tag II with a metal object or similar, as this interferes with wireless communications.

Figure 1 Do Not Shield Antenna Section

- If sensor ribbon I / sensor ribbon II is subjected to mechanical stress, such as bending, forcefull pulling, twisting, pushing against it with a sharp edge, or rubbing against it with a hard object, the electrodes inside the sensor ribbon may disconnect or short-circuit. Carefully handle the sensor ribbon to prevent failure and/or malfunction including disconnection of the connectors and lead wires.

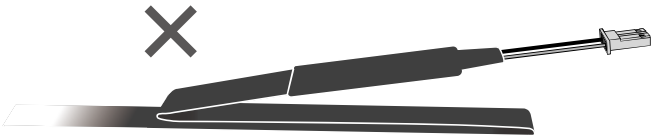


Figure 2 Do Not Over-bend

Figure 3 Do Not Over-twist

- Do not subject the unit to strong impact, such as hitting the wireless tag II and/or sensor ribbon I / sensor ribbon II as this may cause failure and/or malfunction.

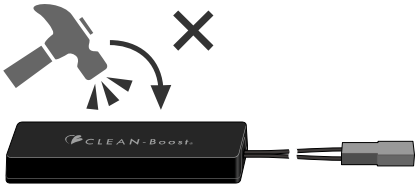


Figure 4 Do Not Hit Wireless Tag II

Figure 5 Do Not Hit Sensor Ribbon I / Sensor Ribbon II

- If you use binding bands around sensor ribbon I / sensor ribbon II, do not tighten them excessively as this may cause the internal electrodes to short-circuit and/or disconnect, resulting in failure and/or malfunction.

Figure 6 Do Not Tighten Binding Band Excessively

- If you use staples, etc., to fix sensor ribbon I / sensor ribbon II in place, do not allow the staples to bear down on the sensor ribbon main unit as this may cause the internal electrodes to short-circuit or disconnect, resulting in failure and/or malfunction. Make sure there is a space between staples and the sensor ribbon main unit, and use resin-coated staples or staples with insulative properties.

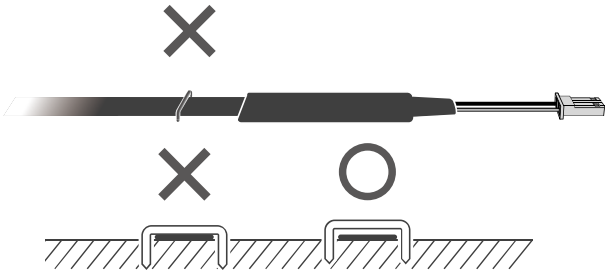


Figure 7 Do Not Apply Excess Pressure on Ribbon Main Unit / Do Not Use Metal Fittings to Fix in Place

- When installing sensor ribbon I / sensor ribbon II, do not allow any sharp corners to put any pressure on the sensor ribbon main unit. Take appropriate measures, such as slacking, to prevent damaging the sensor ribbon main unit.

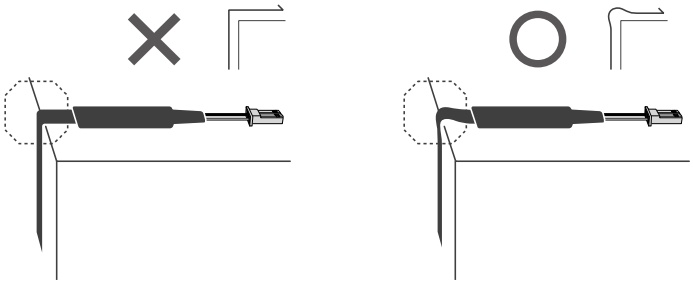


Figure 8 Do Not Apply Excessive Pressure on Ribbon Main Unit

- Do not cut the main unit of sensor ribbon I / sensor ribbon II as the electrodes in the area cut may short-circuit, resulting in malfunctioning, such as the unit may no longer be able to detect water leakage.

Figure 9 Do Not Cut Sensor Ribbon

- Do not stab sensor ribbon I / sensor ribbon II with a nail or any other sharp edge as this may cause failure and/or malfunction, including disconnection and/or short circuit of the internal electrode wires.

Figure 10 Do Not Stab Sensor Ribbon with Any Sharp Edges

- Do not use glue (including instant glue) to fix sensor ribbon I / sensor ribbon II in place, as this may cause failure and/or malfunction.

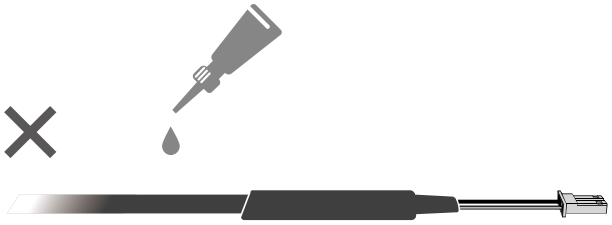


Figure 11 Do Not Use Glue

- Do not place sensor ribbon I / sensor ribbon II near fire or expose it to hot air at a temperature of 85°C or higher, as this may cause failure and/or malfunction.

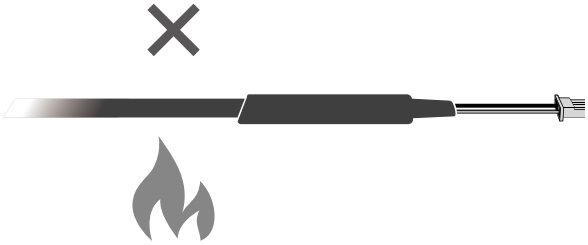


Figure 12 Do Not Place Sensor Ribbon near Fire

Figure 13 Avoid Hot Air

- Do not pull hard on sensor ribbon I / sensor ribbon II as this may cause the internal electrodes and/or the joints to disconnect, resulting in failure and/or malfunction. Avoid excessive tension when winding the sensor ribbon around a pipe or other object.
  In particular, special care must be taken when handling sensor ribbon II as the internal electrodes broken easily.

Figure 14 Do Not Pull Hard on Sensor Ribbon

- The main unit of sensor ribbon II seems wave shape due to its structure. Do not pull or stretch it in an attempt to wave shape. This may cause the internal electrodes and/or the joints to disconnect, resulting in failure and/or malfunction.

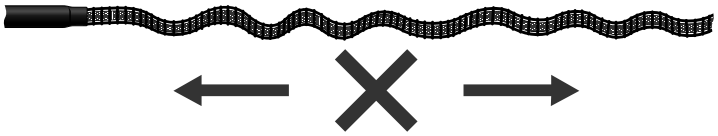


Figure 15 Do Not Forcefully Straighten Out Unit in Attempt to Wave Shape

- The main unit of sensor ribbon II has a structure such that the outer textile easily becomes loose. Do not forcibly pull the loose threads. If a loose thread is inconvenient for installation, cut it using scissors while taking care not to damage the textile on the ribbon main unit. At this time, leave approximately 0.5 mm of loose thread.

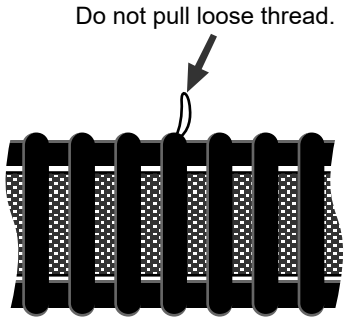


Figure 16 Handling Loose Threads on Sensor Ribbon II

- An environment where water absorbency of sensor ribbon I / sensor ribbon II is compromised may impact unit performance. Avoid oil, paint, detergent, dust, and dirt around the unit as these factors may compromise the water absorbency of the textile, resulting in possible failure and/or malfunction.

Figure 17 Do Not Allow Oil, Organic Solvent, etc., to Adhere to Unit

- Choose an open area to install the wireless tag II. Radio transmission may be impeded in corners of rooms, etc.

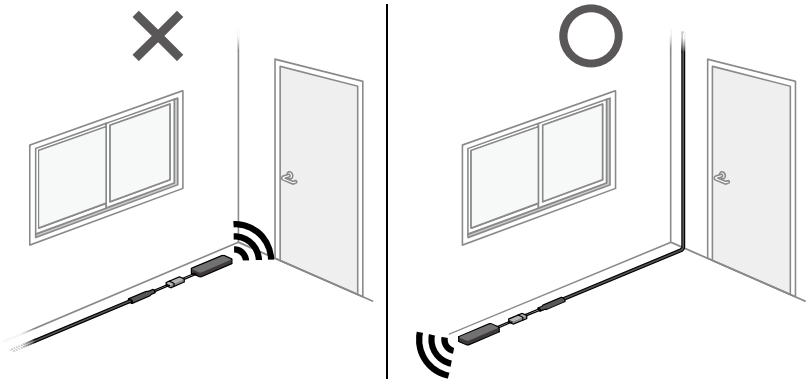


Figure 18 Installing Wireless Tag II in Open Area

- Use sensor ribbon II for repeated detection of water leakage.
  Sensor ribbon I is not intended for repeated use. Upon detection of water leakage by sensor ribbon I, replace with a new product.
  Sensor ribbon II can be used repeatedly. Sensor ribbon II must be replaced with a new product if the alive monitoring timer detects a fault, or where the total electrical energy generation amounts to 500 hours.

- For repeated use of sensor ribbon II, remove the connector connecting the wireless tag II with sensor ribbon II immediately after detection of water leakage.
  If the wireless tag II is left connected while the ribbon main unit is wet after water leakage detection, electrical energy continues to be generated, causing consumption of the electrodes inside the ribbon main unit and shortening product life. Remove the wireless tag II and then either naturally dry the wet ribbon or wipe it with absorbent clean paper or cloth. When wiping water away, do not apply force but cover the ribbon main unit with paper or cloth and allow it to absorb moisture. Strong pressure on the ribbon main unit damages the electrodes inside the ribbon main unit, potentially causing failures such as disconnection and short circuit.
  Similarly, when using alive monitoring timer, remove the connector after water leakage is detected.
- Wireless tag II is not designed for use underwater. Do not soak the wireless tag II in water for an extended period, as this may cause interference with radio transmission and/or failure.
- Sensor ribbon I is not designed for use underwater. Do not soak the sensor ribbon I in water for an extended period, as this may cause failure and/or malfunction.
  Contact us if you need to use the sensor ribbon II in an environment where the product is soaked in water.

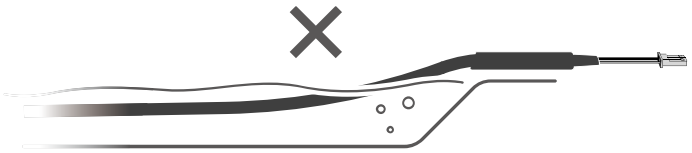


Figure 19 Do Not Soak in Water for Extended Period

- Sensor ribbon I / sensor ribbon II is not designed for use in a contaminated environment. It may malfunction if it is installed for an extended period in an environment characterized by higher-than-normal concentrations of sulfide gases, NOx, etc. If the sensor ribbon is installed in such an environment, the Customer is solely responsible for any issues with the unit.
- If sensor ribbon I / sensor ribbon II absorbs water due to the occurrence of water condensation, it may generate electricity and transmit. Be aware that it may be difficult to distinguish this activity from the unit's usual water leak detection function.
  In addition, power generation causes the metals of the electrodes to be eluted and the metals are reduced, and continuous power generation may shorten the life of the sensor, causing malfunction. Avoid water condensation over long periods as well as repeated cycles of water condensation and drying.
- If sensor ribbon I / sensor ribbon II is used in a high-temperature and high-humidity environment, the sensor ribbon may generate electricity due to absorption of moisture in air even unless water leakage is detected, causing radio transmission in error. In addition, generation of feeble electrical energy may shorten product life of sensor ribbon I / sensor ribbon II. For use in a high-temperature and/or high-humidity environment, additional use of the alive monitoring timer is recommended.
- Be aware that dehydration of sensor ribbon I / sensor ribbon II may serve to increase the detection limit water amount required for power generation.
- Sensor ribbon I / sensor ribbon II comes in moisture-proof packaging. Do not break the packaging for storage. The ribbons may not perform optimally if unpacked due to moisture absorption.
- Elution of the electrodes inside sensor ribbon I / sensor ribbon II weakens power generation performance. Because sensor ribbon I / sensor ribbon II that can no longer engender transmission cannot be re-used, they must be replaced with new ones once power generation levels decline. In addition, be aware that repetition of water absorption and dehydration of sensor ribbon I / sensor ribbon II weaken power generation, causing the detection limit water amount to increase and the detection time to prolong. Note that sensor ribbon I is not intended for repeated use. Use sensor ribbon II for repeated detection of water leakage.
- The sensor ribbon can detect leakage of not only water but also electrolyte solutions including acid, alkaline, and saline liquids. However, these substances may not be detected depending on the concentration and the type of the liquid, as well as the conditions of mixed impurities. The customer should sufficiently test the products and take all responsibility for any issues that may occur in using the product for the purpose of detecting liquids besides water.
- Concerning water with a high specific resistance, such as pure water, be aware that the detection limit water amount may be higher and detection time frame longer.
- If there is an obstacle between the wireless tag II and the receiver, it may interfere with wireless transmission. During installation, sufficiently test the wireless transmission function.
- Where sensor ribbon II is used for repeated detection of running water, it may degrade over time. In some cases, the product may not last for 500 hours of energy generation. For detection of running water, supplement with the alive monitoring timer and immediately replace the spent sensor ribbon II.

3. Product Configuration

Product configuration for the battery-less water leak sensor is as follows.
Use sensor ribbon II for repeated detection of water leakage.

- Wireless Tag II : S-CBTGAABI
- Sensor ribbon I*1 : S-CBSSAAAC-001/002/003
- Sensor ribbon II*2 : S-CBSSAABI-201/202/203

***1.** Sensor ribbon I is not intended for repeated use. Upon detection of water leakage by sensor ribbon I, replace with a new product.

***2.** Sensor ribbon II can be used repeatedly. Sensor ribbon II must be replaced with a new product if the alive monitoring timer detects a fault, or where the total electrical energy generation amounts to 500 hours.

3. 1 Names of parts

3. 1. 1 Wireless tag II

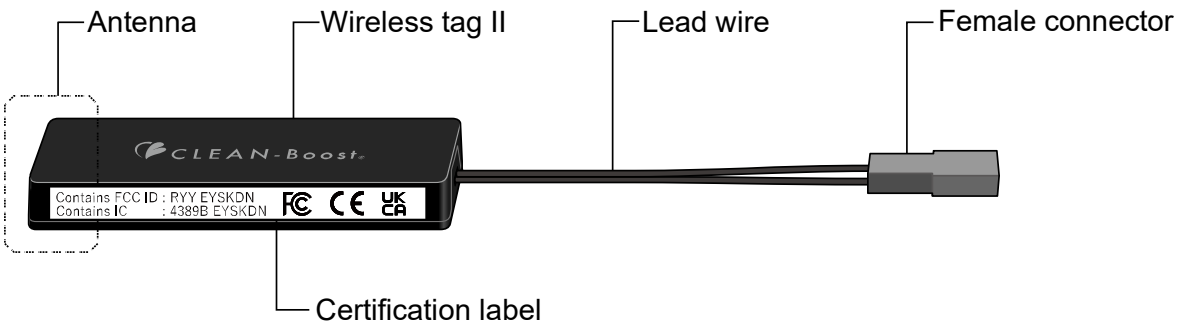


Figure 20 Wireless Tag II (Top)

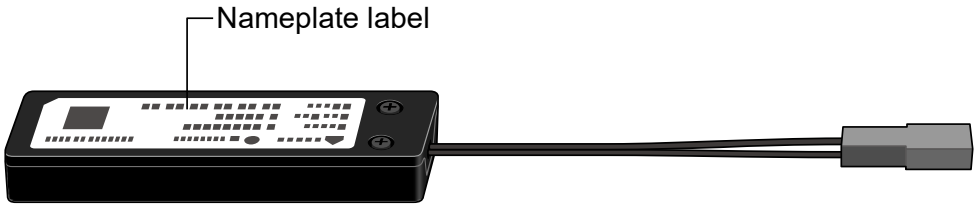
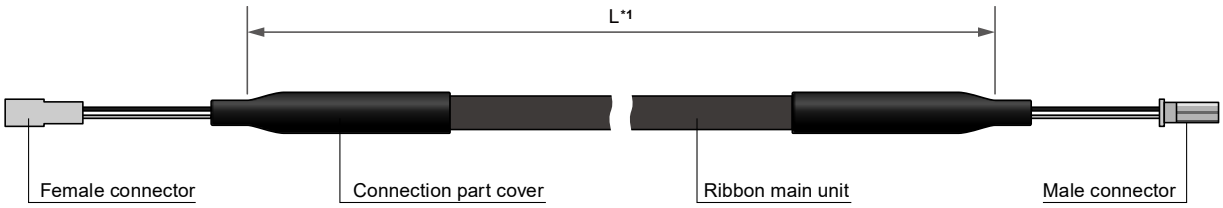


Figure 21 Wireless Tag II (Bottom)

3. 1. 2 Sensor ribbon I

Determine the length of sensor ribbon I in accordance with the location where the sensor is to be installed. The ribbons may then be connected.
Where multiple ribbons are connected, the length of the connected ribbon main units must total no longer than 15 meters.
Note, however, where multiple sensor ribbons I are connected for purposes of extending the unit, and they are used in a high-temperature and high-humidity environment, the sensor ribbons may generate electricity due to absorption of moisture in air even unless water leakage is detected, causing radio transmission in error. For this reason, be sure to sufficiently test the product before use.
Cables come in red and black.

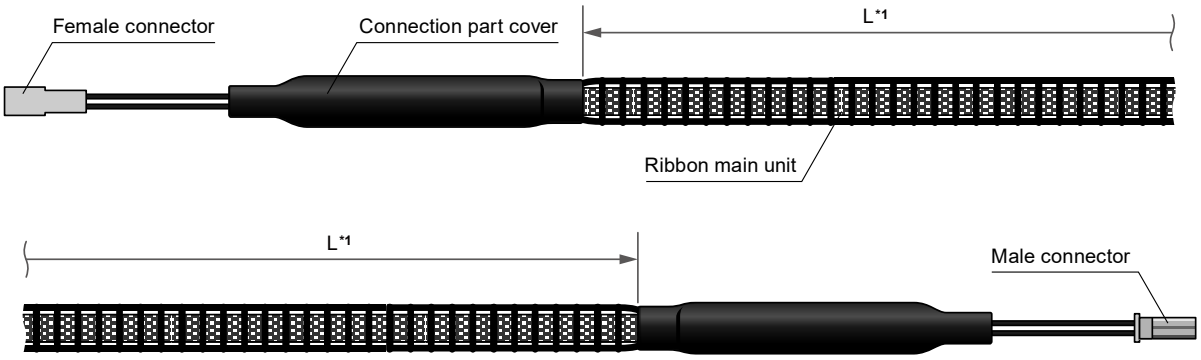


***1.** 0.5 m (S-CBSSAAAC-001), 2.0 m (S-CBSSAAAC-002), 5.0 m (S-CBSSAAAC-003)

Figure 22 Sensor Ribbon I

3. 1. 3 Sensor Ribbon II

Determine the length of sensor ribbon II in accordance with the location where the sensor is to be installed. The ribbons may then be connected.
Where multiple ribbons are connected, the length of the connected ribbon main units differs depending on the environment where the product is used. The total length must be equal to or less than the length shown in "**4. 3 Basic specifications**".
Note, however, where multiple sensor ribbons II are connected for purposes of extending the unit, and they are used in a high-temperature and high-humidity environment, the sensor ribbons may generate electricity due to absorption of moisture in air even unless water leakage is detected, causing radio transmission in error. For this reason, be sure to sufficiently test the product before use.
The cable color comes in black only.



***1.** 0.5 m (S-CBSSAABI-201), 2.0 m (S-CBSSAABI-202), 5.0 m (S-CBSSAABI-203)

Figure 23 Sensor Ribbon II

4. Product Overview of the Battery-less Water Leak Sensor

This battery-less water leak sensor is a wireless water leak sensor that does not require a battery or external power source. If water penetrates the main unit of sensor ribbon I / sensor ribbon II, it reacts to its internal electrodes, causing feeble electric power generation. This feeble electric power is accumulated and boosted by the wireless tag II that employs CLEAN-Boost technology. The boosted power drives the built-in BLE*1 module, which then engages in wireless transmission to notify the user of any water leakage.
Because no battery is required, no wiring work, including electric wire laying, is required either, which makes the product adaptable for use in a variety of environments.
To use the product, connect sensor ribbon I / sensor ribbon II (which absorb water and generate electric power) with the wireless tag II (which accumulates and boosts the electric power), by which it engenders wireless transmission.

Please note that ABLIC Inc. does not support any Bluetooth receiver.
For more information, refer to "**5. Using the Product**," "**5. 10 Setting up the receiver**."

***1.** Bluetooth® low energy

4. 1 CLEAN-Boost

CLEAN-Boost is a technology that accumulates and boosts feeble electric power that is not being utilized, in order to transform it into usable energy such as power for wireless transmission.
CLEAN-Boost renders various power generation devices usable as battery-less wireless sensors. Thanks to its easy installation feature, and because the battery doesn't need to be replaced, CLEAN-Boost contributes to realization of IoT cloud services.
This battery-less water leak sensor is a progressive sensor system that employs CLEAN-Boost technology.

4. 2 Intended use

The battery-less water leak sensor may be used in the places/facilities listed below for the purpose of detecting water, such as water leakage from piping, etc., and rain leakage in buildings:

- Houses
- Apartment buildings
- Office buildings, commercial facilities
- Infrastructures
- Plants
- Others

4. 3 Basic specifications

4. 3. 1 Basic specifications of battery-less water leak sensor

Table 1 Combination of Wireless Tag II and Sensor Ribbon I

Item	Wireless Tag II	Sensor Ribbon I (0.5 m)	Sensor Ribbon I (2.0 m)	Sensor Ribbon I (5.0 m)
Part number	S-CBTGAABI	S-CBSSAAAC-001	S-CBSSAAAC-002	S-CBSSAAAC-003
Dimensions (mm)	134 × 18 × 10 (Main unit: 65 × 18 × 10)	700 × 13 × 8 Length of sensor ribbon main unit = 500	2200 × 13 × 8 Length of sensor ribbon main unit = 2000	5200 × 13 × 8 Length of sensor ribbon main unit = 5000
		Width of sensor ribbon main unit = 9.5, Thickness of sensor ribbon main unit = 0.7		
Detection characteristic*1	• Detection limit water amount: 150 μl min. • Detectable temperature: 5°C to +85°C*2 • Output delay time: 300 s max.			
Total length of connected sensor ribbons*3	–	15 m max. (+70°C、95%RH)		
Repeated use	–	Not allowed*4		
Operating temperature	−10°C to +85°C	0°C to +85°C		
Operating humidity	95%RH max.	95%RH max. (+70°C max.)		
Storage temperature	−25°C to +85°C	−25°C to +85°C*5		

***1.** Ta = +25°C, 40%RH, new sensor ribbon. Based on tap water with electrical conductivity of 200 μS/cm
***2.** Keep free of freezing
***3.** Total length of sensor ribbon main units
***4.** Once water leakage has been detected by sensor ribbon I, be sure to replace it with a new product.
***5.** Product comes in moisture-proof packaging. Do not open during storage.

Table 2 Combination of Wireless Tag II and Sensor Ribbon II

Item	Wireless Tag II	Sensor Ribbon II (0.5 m)	Sensor Ribbon II (2.0 m)	Sensor Ribbon II (5.0 m)
Part number	S-CBTGAABI	S-CBSSAABI-201	S-CBSSAABI-202	S-CBSSAABI-203
Dimensions (mm)	134 × 18 × 10 (Main unit: 65 × 18 × 10)	740 × 13 × 5 Length of sensor ribbon main unit = 500	2240 × 13 × 5 Length of sensor ribbon main unit = 2000	5240 × 13 × 5 Length of sensor ribbon main unit = 5000
		Width of sensor ribbon main unit = 9.0, Thickness of sensor ribbon main unit = 2.5		
Detection characteristic*1	• Detection limit water amount: 100 μl min. • Detectable temperature: 5°C to +85°C*2 • Output delay time: 150 s typ. (100 μl), 90 s typ. (150 μl), 60 s max. (300 μl), 30 s max. (500 μl)			
Total length of connected sensor ribbons*3	–	20 m max. (+40°C, 90%RH) 10 m max. (+60°C, 90%RH) 5 m max. (+85°C, 90%RH)		
Repeated use	–	Allowed*4		
Operating temperature *5	−10°C to +85°C	0°C to +85°C		
Operating humidity *5	95%RH max.	95%RH max.		
Storage temperature	−25°C to +85°C	−25°C to +85°C*6		

***1.** Ta = +25°C, 40%RH, new sensor ribbon. Based on tap water with electrical conductivity of 200 μS/cm
***2.** Keep free of freezing
***3.** Total length of sensor ribbon main units
***4.** For repeated use after detection of water leakage, either supplement with the alive monitoring timer or replace sensor ribbon II with a new one after total electrical energy generation amounts to approx. 500 hours.
***5.** For use in a high-temperature and high-humidity environment with a temperature of +50°C or higher and a humidity level of 70% RH or higher, either supplement with the alive monitoring timer or replace sensor ribbon II with a new one after approx. 1000 hours.
***6.** Product comes in moisture-proof packaging. Do not open during storage.

Remark The min. and max. values on **Table 1** and **Table 2** indicate the ranges of guaranteed operation.
Numbers falling outside of these ranges are conditions under which the guarantee is not applicable, but the product may still operate.
If any additional conditions are specified, operation is guaranteed only if said condition is satisfied.

min.: Minimum value for guaranteed operation.
The product may operate even if the actual value falls below this value.
max.: Maximum value for guaranteed operation.
The product may operate even if the actual value exceeds this value.

Example: Detection limit water amount (Sensor ribbon I)
Detection limit water amount:
150 μl min. (Ta = +25°C, 40% RH, based on tap water with electrical conductivity of 200 μS/cm)

This indicates the minimum amount of detectable water dropped on sensor ribbon I, and with which operation is guaranteed.
Additional conditions: Temperature: 25°C; humidity: 40%RH; and electrical conductivity of water: 200 μS/cm.
For example, if the water amount is 100 μl, which is less than 150 μl, the device might not be able to detect water (product may not operate).
In addition, even at a water amount of 150 μl, if the temperature is 5°C, then the additional condition is not met, and thus the water may not be detected (product may not operate).

4. 3. 2 Specifications of wireless network

- Specification: Bluetooth® 5.0 low energy
- Frequency range: 2402 MHz to 2480 MHz
- Transmitting power: 8 dBm typ.
- Transmitting range: Approximately 100 m to 200 m, without obstruction

4. 3. 3 Certifications

4. 3. 3. 1 Bluetooth SIG Certification*1

***1.** Customers wishing to use the unit in a product, either as a built-in unit or in any other manner, and to sell said product as their own, are required to obtain the Bluetooth SIG Certification.

4. 3. 3. 2 Japan Radio Law: Certified Conformity to Technical Standards

EYSKDN : 005-102211

R 005-102211

ED2840 : 005-103104

R 005-103104

4. 3. 3. 3 FCC / ISED

Contains FCC ID: RYYEYSKDN / Contains IC: 4389B EYSKDN

FCC/ISED Compliance Statement
This device complies with Part 15 of the FCC Rules and 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 harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Statement
This equipment complies with FCC/ISED 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 your body.

FCC Class B Notice
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
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canada ICES-003 Compliance CAN ICES-003 (B) / NMB-003 (B)

Déclaration de conformité ISED (Canada)
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Déclaration d'exposition aux RF
Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

4. 3. 3. 4 CE Marking

CE

This product complies with the essential requirements of Radio Equipment Directive 2014/53/EU.

- Test Report No. : TERF2508002660E2
- Product Name : Battery-less water leak Sensor Wireless tag II
- Manufacturer : ABLIC Inc.
- Applicable standards : EN 300 328

This device operates in the 2.4 GHz band, with a frequency range of 2400 MHz to 2483.5 MHz and a maximum output power of less than +10 dBm.

4. 3. 3. 5 UKCA

UK CA

This product complies with the essential requirements of UK Legislation S.I. 2017 No. 1206, S.I. 2012 No.3032.

- Test Report No. : TERF2508002660E2
- Product Name : Battery-less water leak Sensor Wireless tag II
- Manufacturer : ABLIC Inc.
- Applicable standards : S.I. 2017 No. 1206, S.I. 2012 No.3032

This device operates in the 2.4 GHz band, with a frequency range of 2400 MHz to 2483.5 MHz and a maximum output power of less than +10 dBm.

4. 3. 4 Combinations of wireless tags, sensor ribbons, and alive monitoring timer

Please use wireless tags, sensor ribbons and alive monitoring timer in the correct combinations shown on **Table 3**. Where multiple sensor ribbons are to be connected, choose products from the same product series. Connection of sensor ribbon I and sensor ribbon II may compromise intrinsic performance.

Table 3 Table of Combinations

Wireless Tag	Sensor Ribbon	Alive Monitoring Timer
S-CBTGAAAC (Wireless tag)	S-CBSSAAAC-001/002/003 (Sensor ribbon I)	S-CBAMAAAC
S-CBTGAAAC (Wireless tag)	S-CBSSAABI-201/202/203 (Sensor ribbon II)	S-CBAMAAAC
S-CBTGAABI (Wireless tag II)	S-CBSSAAAC-001/002/003 (Sensor ribbon I)	S-CBAMAAAC / S-CBAMAAAC-001
S-CBTGAABI (Wireless tag II)	S-CBSSAABI-201/202/203 (Sensor ribbon II)	S-CBAMAAAC / S-CBAMAAAC-001

5. Using the Product

Before using this battery-less water leak sensor, be sure to read "**1. Safety Precautions**" and "**2. Precautions for Use**" to ensure proper use of the unit.

5. 1 Operation overview

For this battery-less water leak sensor, the configuration must be either: 1) the wireless tag II and sensor ribbon I or 2) the wireless tag II and sensor ribbon II.
The water absorbed by sensor ribbon I / sensor ribbon II reacts to the metal wire electrodes built in the sensor ribbon, causing feeble electric power to be generated. This feeble electric power is accumulated and boosted by the wireless tag II that employs the CLEAN-Boost technology. The boosted power drives the BLE module, which then engenders wireless transmission to notify the user of any water leakage. **Figure 24** illustrates the concept of operations.

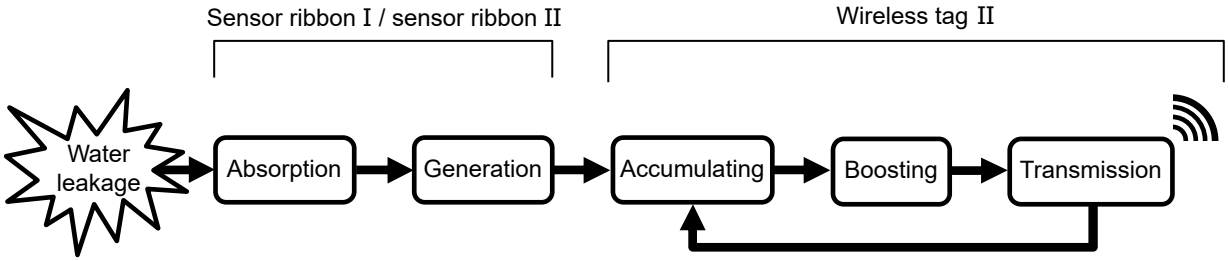


Figure 24 Operation Concept

5. 2 Description

Power generation starts where water is absorbed to the ribbon main unit of sensor ribbon I / sensor ribbon II. When the electric power accumulated and boosted by the wireless tag II exceeds a specific value, it drives the BLE module, initiating wireless transmission. When the electric power is entirely consumed by repeated operation of wireless transmission, the accumulating and boosting procedures are repeated. When power generation declines due to dehydration of the ribbon main unit and/or a decrease in electrolyte concentration, then power accumulation, boosting, and wireless transmission come to a stop.

Elution of the electrodes inside sensor ribbon I / sensor ribbon II weakens power generation. Sensor ribbon I / sensor ribbon II cannot be used repeatedly when it can no longer engender wireless transmission. Replace the product if power generation performance has declined.
Use sensor ribbon II for repeated detection of water leakage.
Sensor ribbon I is not intended for repeated use. Upon detection of water leakage by sensor ribbon I, replace with a new product.
Sensor ribbon II can be used repeatedly. Sensor ribbon II must be replaced with a new product if the alive monitoring timer detects a fault, or where the total electrical energy generation amounts to 500 hours.

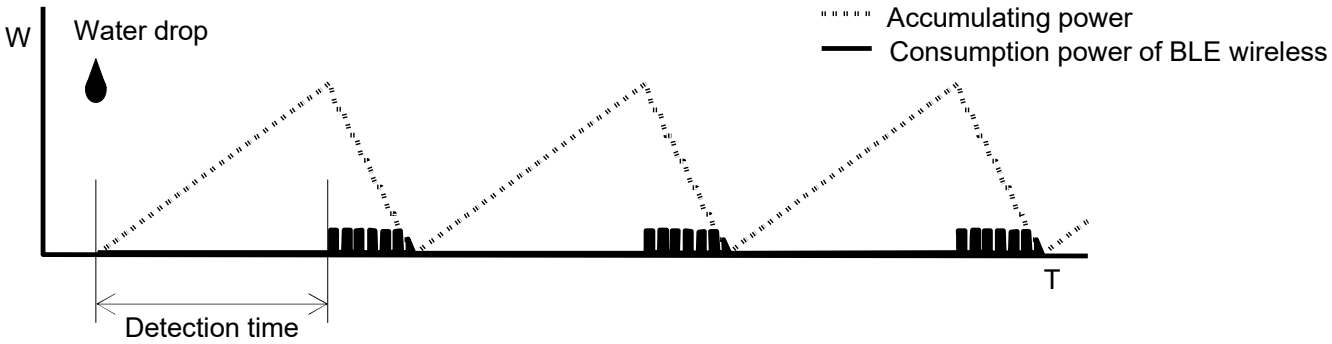


Figure 25 Power Accumulated by Wireless Tag II / Power Consumed by BLE Wireless Tag II

5. 3 Confirming initial operation

To confirm that the battery-less water leak sensor is working properly, check that power is being generated and transmission is occurring by dropping a small amount of tap water (150 μl to 1 cc or so) onto sensor ribbon I / sensor ribbon II connected to the wireless tag. Wireless transmission should be working within 30 seconds to five minutes.
After running an initial operation check, either wipe the ribbon main unit with absorbent, clean paper, or cloth for natural dehydration, or dry it by using a warm current of air at 85°C or less before reuse.

Where you are unable to use the water drop method to confirm that the unit is working, use the separately-sold Alive Monitoring Timer (S-CBAMAAAC). For details on how to use the alive monitoring timer to confirm operation, refer to "**Alive Monitoring Timer**" User's Manual.

If sensor ribbon I / sensor ribbon II is damaged, for example by bending, it is recommended to replace it with a new product.

5. 4 Repeated use (sensor ribbon II)

Use sensor ribbon II for repeated detection of water leakage.
If leaked water is detected, either wipe the ribbon main unit with absorbent, clean paper, or cloth for natural dehydration, or dry it by using a warm current of air at 85°C or less before reuse. Where water is absorbed from the ribbon main unit, cover the wet part with paper or cloth and lightly press it from above. Be aware that applying strong force, for example by pressing hard, may cause a failure.

While the ribbon main unit is wet before dehydration, keep the wireless tag II and the - alive monitoring timer disconnected.
If the wireless tag II and the alive monitoring timer are connected while the ribbon main unit is wet, the ribbon main unit continues generating electric power, shortening the product life of sensor ribbon II.

Where sensor ribbon II is used repeatedly, replace it with a new product when the total electrical energy generation time amounts to approx. 500 hours.
Additional use of the alive monitoring timer prevents problems such as sensor ribbon II no longer being able to detect water leakage. Replace sensor ribbon II with a new product where the alive monitoring timer detects a failure.
Repetition of water absorption, electrical energy generation, and dehydration prolongs the time required for detection. **Figure 26** gives a rough idea of delays in time required to detect.

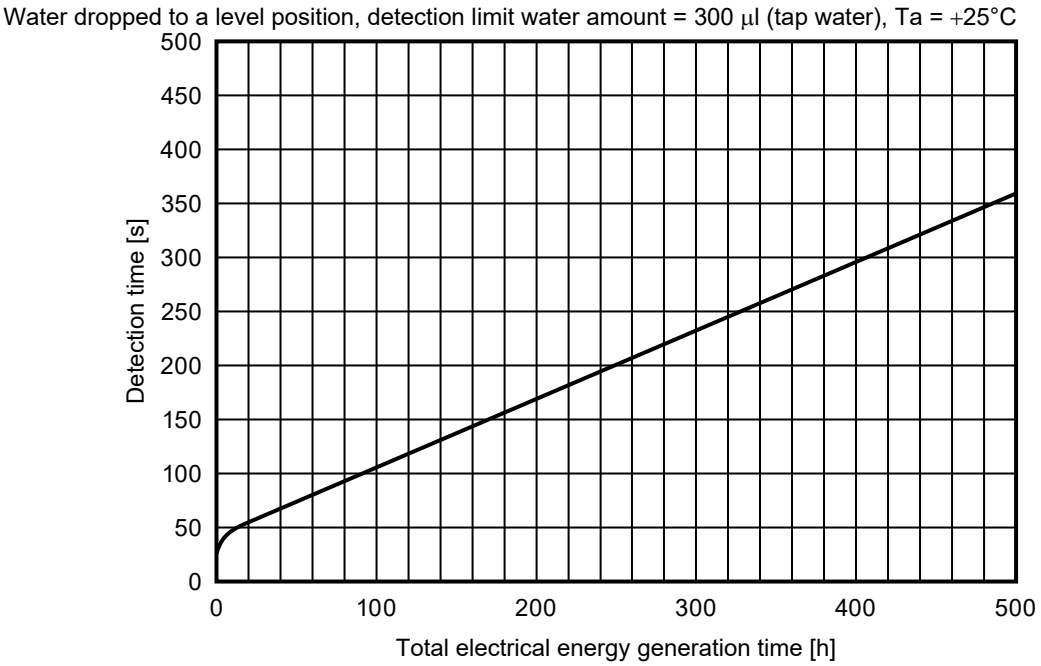


Figure 26 Detection Time Changed by Repeated Detection and Dehydration

In the event of repeated use, do not remove sensor ribbon II for cleaning and drying. It may cause a failure as the internal electrodes of sensor ribbon II are fragile. Be aware that it becomes particularly fragile after an extended time of total electrical energy generation. Keep sensor ribbon II installed while absorbing water from the wet part and drying it for reuse.
Carefully handle sensor ribbon II where the wireless tag II and the sensor ribbon II are relocated from the installation site for storage and reinstallation. Damaged ribbon main unit can cause failure.
Note that if you need to relocate the ribbon, additionally use the alive monitoring timer for early detection of failures.
In addition, be sure to run an initial operation check before reuse for detection of water leakage.

Remark Sensor ribbon I is not intended for repeated use. Upon detection of water leakage by sensor ribbon I, replace with a new product.

5. 5 Use in high-temperature and high-humidity environment (sensor ribbon II)

If sensor ribbon II is used in a high-temperature and high-humidity environment at 50°C or higher and 70% RH or higher, replace it with a new product after use for approx. 1000 hours.
Note that additional use of the alive monitoring timer detects failures of sensor ribbon II, which facilitates timely replacement of the sensor ribbon II with a new product.

5. 6 Connection

To connect the wireless tag II and sensor ribbon I / sensor ribbon II, use the female connector on the wireless tag II side and the male connector on the sensor ribbon side.
Fully insert the connector. When removing and inserting the connector, hold both the male side and the female side. Be careful not to damage the system by pulling the lead wires and the sensor ribbon.

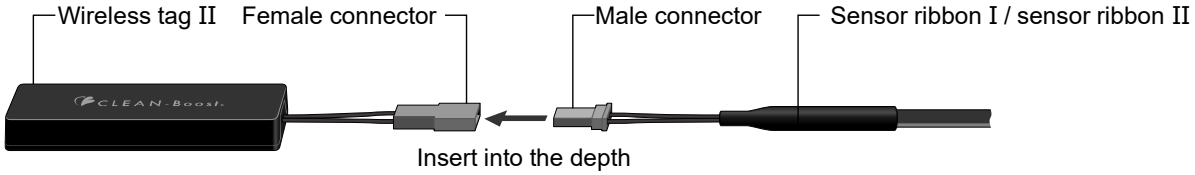


Figure 27 Connecting Connectors

If you want to detect water leakage over a broad area, connect multiple sensor ribbons I / sensor ribbons II.
Choose sensor ribbon products with lengths that properly correspond to the position where you are installing the device.
The total length of connectable sensor ribbons differs depending on the temperature and humidity level in the environment where they are used. Refer to "**4. 3 Basic specifications**" to determine the appropriate length of sensor ribbons I / sensor ribbons II for connection purposes.
Note, however, where multiple sensor ribbons I / sensor ribbons II are connected for purposes of extending the unit, and they are used in a high-temperature and high-humidity environment, the ribbon main units may generate electricity due to absorption of moisture in air even unless water leakage is detected, causing radio transmission in error. Be sure to sufficiently test the product before use.
Performance cannot be guaranteed if sensor ribbon I and sensor ribbon II are used together, so please use the same product series.

Figure 28

5. 7 Installation

Install sensor ribbon I / sensor ribbon II by tightly extending it in the location where you want to detect water leakage.
The main unit of sensor ribbon II seems wave shape due to its structure. Do not pull or stretch it in an attempt to wave shape. This may cause the internal electrodes and/or the joints to disconnect, resulting in failure and/or malfunction.
Sensor ribbon I / sensor ribbon II absorbs water from either side to detect water leakage.
If the sensor ribbon I / sensor ribbon II needs to be fixed in place, use binding bands, adhesive tape with insulative properties, or similar to fix it partially.
If you intend to wind sensor ribbon I / sensor ribbon II around a pipe, do not pull or twist the sensor ribbon. Be aware that the item may fail to detect water leakage if double-sided adhesive tape is applied on the entire surface, because this disables the sensor ribbon, preventing it from absorbing water from the bottom.

5. 8 Fixing in place

5. 8. 1 Fixing the unit in place using double-sided adhesive tape

Apply double-sided adhesive tape with insulative properties on the bottom (nameplate label side) of the wireless tag II and on the wiring connection covers at both ends of sensor ribbon I / sensor ribbon II.
If the tape is applied on the ribbon part, it may obstruct water absorption from the bottom, making it impossible to detect water leakage.

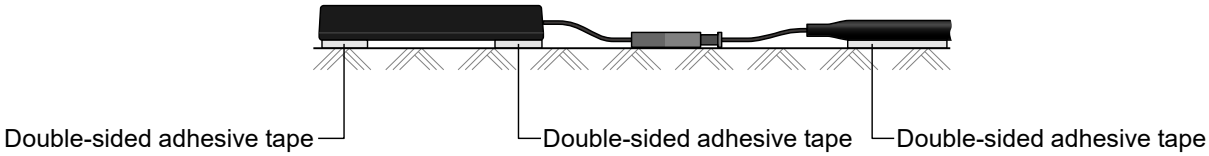


Figure 29

Caution 1. Use materials with insulative properties when fixing the wireless tag II and sensor ribbon I / sensor ribbon II in place.
2. If you are using double-sided adhesive tape to fix the unit in place, apply it partially at this point.
3. Do not shield the antenna section of the wireless tag II with a metal object.

5. 8. 2 Fixing device in place with binding bands

Binding bands are the recommended method of fixing the device in place along with a pipe, a square timber, or any other rod-shape object.
When fixing the wireless tag II in place, place the bottom (nameplate label side) on the surface of the pipe, etc., and tighten one or two parts.
When fixing sensor ribbon I / sensor ribbon II in place, place the wiring connection covers at the both ends.

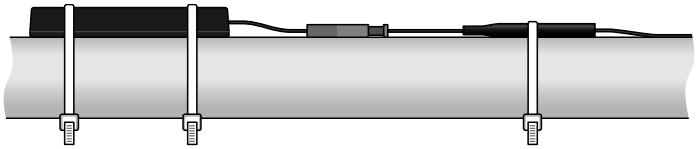


Figure 30

5. 8. 3 Wind around piping to fix the device in place

To wind the sensor ribbon I / sensor ribbon II around a pipe, do not to pull or twist the ribbon main unit.

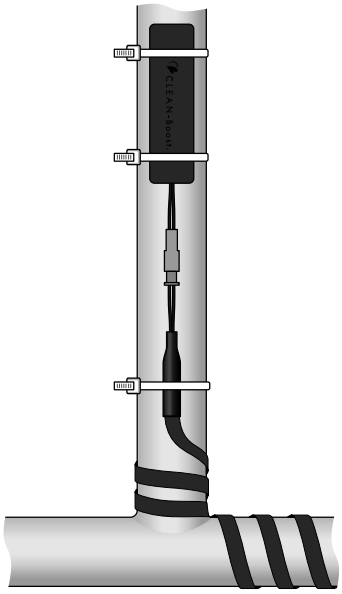


Figure 31

5. 9 Direction of wireless tag II installed

For detection of water surfaces such as submergence levels, install the wireless tag II so that the antenna section faces upward. In addition, because submergence can cause communication failures, install the wireless tag II at a higher location than the expected water surface level.

Consider the impact of radio disturbances in determining the direction of the antenna at the end of the wireless tag II. The wireless tag II should be installed such that it is facing the receiver.

5. 10 Setting up the receiver

The product package does not contain a receiver.
Install a receiver that supports Bluetooth 5.0 or 4.2, and adjust the settings so that the wireless signals from the battery-less water leak sensor are received in beacon mode.

5. 10. 1 Advertising packet

Table 4

Index	Value	Name	Remark
0	0x02	Ad Field Length	–
1	0x01	Advertising Field Type	
2	0x04	Flags	BDR/EDR Not Support
3	0x1A	Ad Field Length	–
4	0xFF	Advertising Field Type	Manufacture Data Flag
5	0x31	Company Code	–
6	0x07		
7	0x02	Magic Number	–
8	0x15	Data Length	–
9	UUID*1	Proximity UUID (128-bit)	–
・・・	UUID*1		
24	UUID*1		
25	UUID*1	Major Number (16-bit)	–
26	UUID*1		
27	UUID*1	Minor Number (16-bit)	–
28	UUID*1		
29	0xD0	Measured Power	–

***1.** Fixed ID for this battery-less water leak sensor. Use the following UUIDs. Index9 to Index24 data is as follows:
0x5D 0x49 0x0D 0x6C 0x7E 0xB9 0x47 0x4E 0x81 0x60 0x45 0xBD 0xE9 0x99 0x11 0x9A

5. 10. 2 Major-Minor numbers and BT address

This battery-less water leak sensor wireless tag II has descriptions of the Major-Minor numbers and the BT address on the nameplate label on the back.
The major number is "0x04." One unique minor number series is assigned to each wireless tag II, which means the same minor number series is never used twice.
As the BT address is unique and specific to each unit, use it in accordance with the receiving system. Note that the QR code is for purposes of manufacturing process control. It does not include descriptions of the UUID, the Major-Minor numbers, and the BT address.

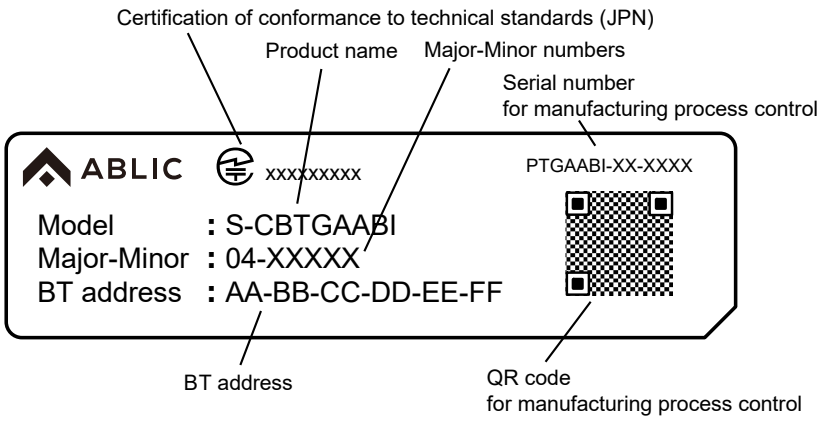


Figure 32

5. 10. 3 Transmitted signals

As the BLE beacon signal transmitted from the wireless tag II, one set of one to approximately five advertising packets is transmitted repeatedly at one time at an interval of approximately 0.1 seconds. Note that the number of advertising packets received may be lower, depending on receiver sensitivity.
In addition, depending on the power of electricity generated by sensor ribbon I / sensor ribbon II when it absorbs water due to water leakage, etc., detection time, signal reception interval, and the number of continued transmissions may differ.

When the alive monitoring timer is connected, the same beacon signals are also used as the alive monitoring scheduled signals.
For more information on scenarios where the alive monitoring timer is connected, refer to "**Alive Monitoring Timer**" User's Manual.

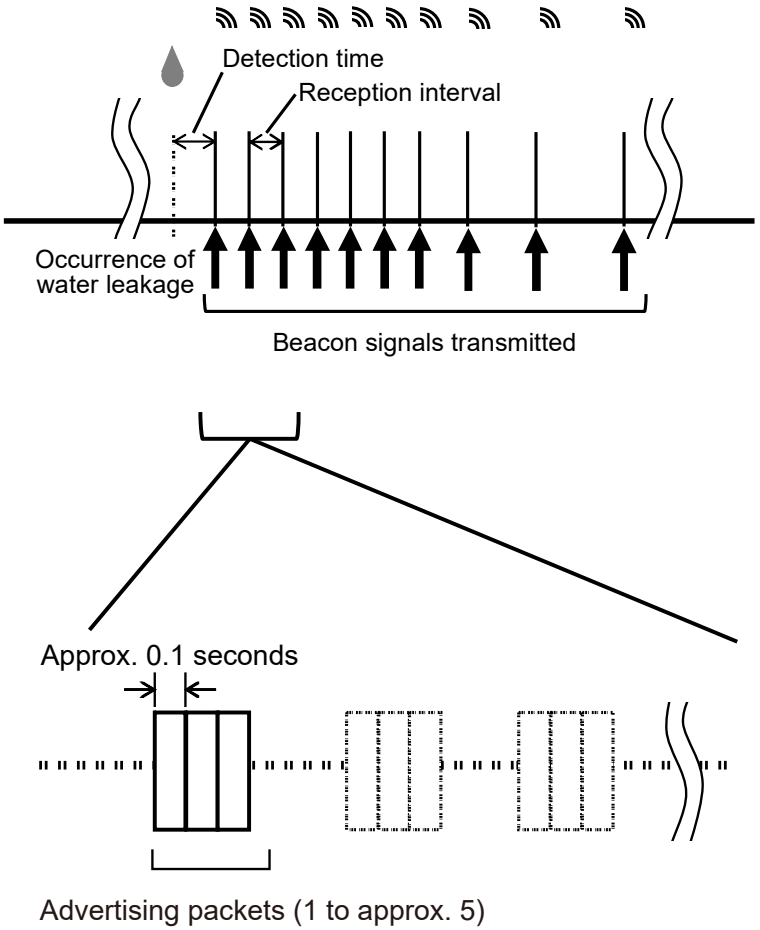


Figure 33

6. Product Warranty

6. 1 Product warranty overview

- The product described in this User's Manual (hereinafter referred to as the Battery-less Water Leak Sensor) is covered by the warranty only if no wireless transmission can be confirmed at the time the initial operation is checked during installation, even after the Battery-less Water Leak Sensor has been installed correctly, in accordance with the descriptions in the User's Manual (referred to as an initial defect or an initially defective product). The warranty does not cover malfunction not caused by ABLIC Inc., e.g. damage caused by the User or malfunction caused by inappropriate use.

- Never disassemble or modify the Battery-less Water Leak Sensor, as this will invalidate the warranty.

6. 2 Period of exchange of initially defective product

- The period during which any initially defective product may be exchanged shall be one (1) year after shipment of the product from ABLIC Inc. The exchange period shall be calculated from the date of shipment.

6. 3 Warranty information and warrantied article

- The warranty for ABLIC Inc.'s Battery-less Water Leak Sensor provides for a free replacement if ABLIC Inc. identifies an initial defect.

- To get a replacement, the customer must include the statement of delivery with the defective Battery-less Water Leak Sensor. Please note a number of days may be required for us to determine whether the failure has been caused by an initial defect.

6. 4 Returns, exchanges, and repairs

- Please note that we do not accept returns.

- Please contact us in advance if you wish to return a product.

- ABLIC Inc. will cover costs for return of products found to be initially defective.

- If the returned product is not found initially defective, the customer may be asked to pay the return postage as well as the price of the replacement.

6. 5 Disclaimers

- Please note the following items when using the product.

(1) When using this Battery-less Water Leak Sensor, please pay attention to the information noted under "Safety Precautions," "Precautions for Use," "Basic specifications," and "Using the Product." ABLIC Inc. shall not be liable for any damages related to any malfunction, accident, etc., incurred due to use of this Battery-less Water Leak Sensor under any other conditions than those described in the User's Manual.

(2) ABLIC Inc. shall not be liable for any damage, etc., resulting from use of the Battery-less Water Leak Sensor.

(3) ABLIC Inc. shall not be liable for any damages not resulting from the Battery-less Water Leak Sensor.

(4) The Battery-less Water Leak Sensor contains semiconductor products, which carry the possibility of malfunction or defect. In order to prevent injury, fire, or damage to the public in instances where the Battery-less Water Leak Sensor is defective or malfunctions, the Customer shall be responsible for ensuring safety, such as addressing redundant design issues, as well as taking steps to contain fire and prevent malfunction. In addition, please fully evaluate your entire system and determine the applicability of the Battery-less Water Leak Sensor on your own responsibility.

(5) ABLIC Inc. shall not be liable for any infection of computer viruses or other technical harmful programs, or unauthorized access to this Battery-less Water Leak sensor or systems, software, networks, databases, etc. using this sensor.

(6) The circuit examples and the methods of use described in this User's Manual are for reference purposes only, and therefore are not a guarantee of mass-production designs.

(7) If the descriptions of this User's Manual contain any incorrect information and damage occurs as a result, ABLIC Inc. shall not be liable for any damages incurred.

(8) When using the Battery-less Water Leak Sensor, observe the laws and regulations pertaining to the intended product use and the region or country where it is used, suitability of intended use, safety, etc.

(9) ABLIC Inc. strictly prohibits use and provision of the Battery-less Water Leak Sensor for the development of weapons of mass destruction and for military use. Where the Product is provided to any party that intends to develop, produce, use, or store nuclear weapons, biological weapons, chemical weapons, missiles, or that has any other military objective, ABLIC Inc. shall not be responsible or liable.

(10) When exporting the Battery-less Water Leak Sensor, comply with the Foreign Exchange and Foreign Trade Act and all other export-related laws, and follow the required procedures.

(11) This Disclaimers have been delivered in a text using the Japanese language, which text, despite any translations into the English language and the French language, shall be controlling.

- The Battery-less Water Leak Sensor was not designed as any equipment or a part of a device that may damage the human body or pose a threat to human life and/or assets (such as medical equipment, crime prevention equipment, combustion inhibition equipment, vehicle equipment, traffic equipment, onboard equipment, aviation equipment, space equipment, and nuclear power equipment). Never use the Battery-less Water Leak Sensor in the aforementioned devices or equipment without ABLIC Inc.'s prior written consent. In particular, the Battery-less Water Leak Sensor is not for use as a device that directly impacts human life, such as in life-support systems or as an instrument imbedded in the human body.

- The Battery-less Water Leak Sensor is not of a radiation-proof design. In accordance with your own intended use, take steps against radiation via your own product design.

- Normal use of the Battery-less Water Leak Sensor does not affect human health. Regardless, the unit should never be placed in your mouth because it contains chemicals and heavy metals.

- To properly dispose of the Battery-less Water Leak Sensor, observe the laws and regulations of the region or country and handle accordingly. Note that PVC (polyvinyl chloride) is used in part of this product.

- This User's Manual includes contents related to ABLIC Inc.'s know-how, and the copyright thereof belongs to ABLIC Inc. Reproducing, copying, or disclosure to any third party of this User's Manual, in whole or in part, is strictly prohibited without ABLIC Inc.'s approval.
  ABLIC Inc.'s supply of the Battery-less Water Leak Sensor to the Customer shall neither grant nor guarantee the Customer any rights to execute or use ABLIC Inc.'s or any other third party's intellectual property or other rights pertaining to the Battery-less Water Leak Sensor.

- Where the Customer uses the Battery-less Water Leak Sensor to manufacture a product, ABLIC Inc. shall not be liable for cases where the use of this Battery-less Water Leak Sensor in said product, specifications of said product, and/or said product incorporating the Battery-less Water Leak Sensor infringes upon any other third party's patent(s).

- ABLIC Inc. does not provide parameter sheets, etc.

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