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Water Leakage Sensor User Guide



RF-LW-WD-AM-3M RF-LW-WD-AM-1M
RF-LW-WD-AM-5M RF-LW-WD-AM-10M

LoRaWAN Wireless Water Leakage Sensor

- LoRaWAN long range wireless.
- Battery powered
- Available with various leak detection rope lengths



Status -L detects the presence of water leaks, flooding and condensation using water detection cable. Leakage or moisture is detected over the entire length of the cable, various cable lengths are available to facilitate leakage sensing over a wide area.

When a leak is detected, a message is transmitted using long range LoRa wireless to generate an alarm, so early action can be taken.

Readings are transmitted to the cloud using long range LoRa wireless, where the data can be displayed and analysed.

The unit is battery powered with long life of 3+ years#.

A built in USB port allows all parameters including detection thresholds, sampling interval, wireless signal strength and wireless network configuration to be viewed and set using simple menus via any USB enabled host such as a PC or Mac.

Features

- Various Rope lengths available
- LoRa long range wireless
- Frequency Range 863-870MHz*
- Frequency Range 902-928MHz*
- Up to +16dBm Tx Power
- Built in USB port for power and configuration
- Battery powered
- CE / FCC compliant
- RoHS compliant
- Made in the UK

*Option / Model dependent
Dependent on settings and environment

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- Detects leaks over the entire length of the cable
- Configurable alarm threshold sensitivity
- Adaptive transmission intervals

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Introduction

Status-L Water Leak Sensor helps protect your critical infrastructure from water related damage which could be caused by issues like faulty HVAC systems, leaks in pipes and adverse weather conditions.

The unit detects the presence of water using a special conductive water detection cable. The leak detection sampling interval and detection thresholds can be user configured for the application. Adaptive LoRaWAN transmission interval immediately notifies a detection event together with regular “heartbeat” status messages for assurance that the system is operating correctly.

2. Configuration

LoRaWAN devices are configured using OTAA (Over-the-Air-Activation).

OTAA is the most secure way to connect a device to the LoRaWAN network. In OTAA, the device performs a Join-procedure with the network, during which a dynamic DevAddr (device address) is assigned and security keys are negotiated with the device.

The OTAA configuration requires the following parameters to be correctly set:

- DevEUI: End-device Identifier. It is unique for every device and is set at device manufacture.
- AppEUI: Application Identifier. Used to identify the end application.
- AppKey: Application key. Used to create the session keys.

*Note: In LoRaWAN 1.1, AppEUI was renamed to JoinEUI.

Providing the LoRa gateway has the matching values, the join process will happen automatically once the Status unit is in wireless range and switched on.

The DevEUI is always set at device manufacture and is unique. The device AppEUI and AppKey can easily be set via the USB connection if required and the process is detailed later in this document.

Join devices to the LoRaWAN network

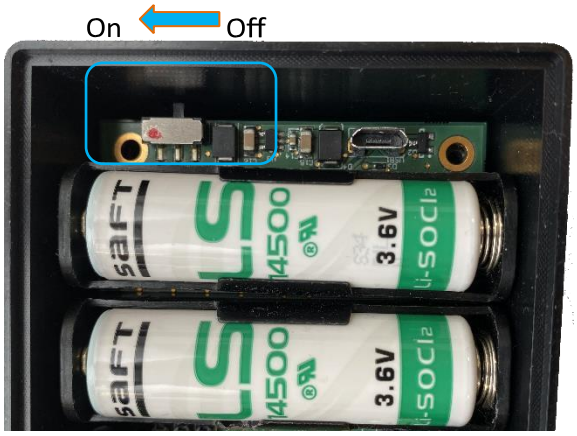
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Devices in wireless range and with the correct AppEUI and AppKey settings set will automatically join the LoRaWAN network when they are first powered up.

The unique DevEUI is printed on all devices and is also present in the QR code. The DevEUI can be used to identify the device once joined to the network.

To power the device ON, remove the cover of the Status by unscrewing the two screws on the cover.

Locate the power switch and using small screwdriver gently slide the power switch towards the ON position as shown.



Switch to the ON position

Once powered ON, the device will send a Join request message to the LoRaWAN network server. The Status LED will blink RED as shown below whilst the Join process is taking place. Depending on factors such as signal strength, RF interference etc. the join process may take several seconds to complete.



Blinking Red LED – Attempting Join

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When the device has successfully joined the network the Mode LED will blink GREEN five times to show that the join has been completed. The LED's will then switch off to conserve the batteries.

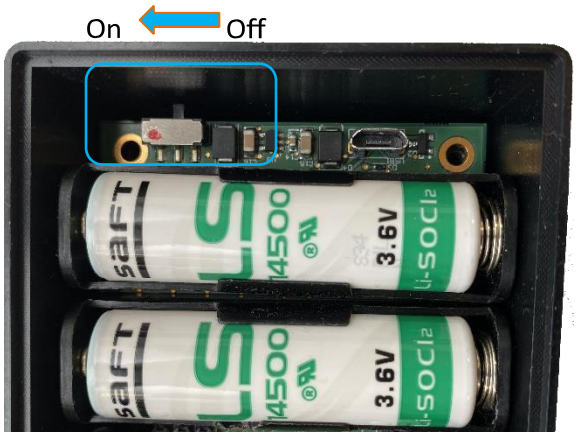
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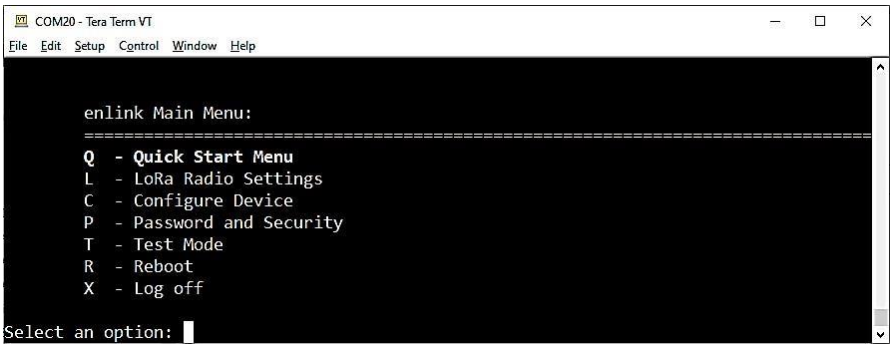
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Main Menu

The **Quick Start Menu** contains only the parameters that normally need to be configured to setup the device and join the LoRa network.

From the **Quick Start Menu** you can change the **AppEUI** and **AppKey**.



Quick Start Settings Menu

From the **Quick Start Settings Menu**, access the **AppEUI** setting by entering **e**. Enter the 16 character **AppEUI** using numbers and letters a to f. Do not include spaces or any other characters. Pressing **S** will enter the default **AppEUI** which you can then edit. **R** will set a random AppEUI. Press **Enter** when the key is correctly entered to return to the **Quick Start Settings Menu**.

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```
       E  - AppEui                    53-79-6e-00-00-00-00-00
       K  - AppKey                    e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d
       T  - Transmit Interval         15 mins
       X  - Exit Menu

Select an option: e

Enter a new 16 character AppEUI using only numbers and the letters A to F (no separators)
Hit <S> to enter the default value or <R> for a random value

Current Setting: AppEUI = 53-79-6e-00-00-00-00-00

           ----------------
New AppEUI: 53796e0000000000
```

AppEUI setting

From the **Quick Start Settings Menu** access the **AppKey** setting by entering **k**. Enter the 32 character **Appkey** using numbers and letters a to f. Do not include spaces or any other characters. Pressing **S** will enter the default **AppKey** which you can then edit. **R** will set a random AppKey. Press **Enter** when the key is correctly entered to return to the **Quick Start Settings Menu**.

```
       E  - AppEui                    53-79-6e-00-00-00-00-00
       K  - AppKey                    e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d
       T  - Transmit Interval         15 mins
       X  - Exit Menu

Select an option: k

Enter a new 32 character AppKey using only numbers and the letters A to F (no separators)
Hit <S> to enter the default value or <R> for a random value

Current Setting: AppKey = e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d

           --------------------------------
New AppKey:
```

AppKey setting

Press **X** from the **Quick Start Settings Menu** to return to the Main menu.

The header will show **** Reboot Required **** as shown below. The new key settings will not take effect until the device is restarted. Enter **R** to reboot followed by **OK**. The device will restart with the entered **AppEUI** and **AppKey** and attempt to join the LoRa network.

```
      enLink Main Menu:   ** Reboot Required **
      ========================================================================
      Q - Quick Start Menu
      L - LoRa Radio Settings
      C - Configure Device
      P - Password and Security
      T - Test Mode
      R - Reboot
      X - Exit and log off

Enter Selection:
```

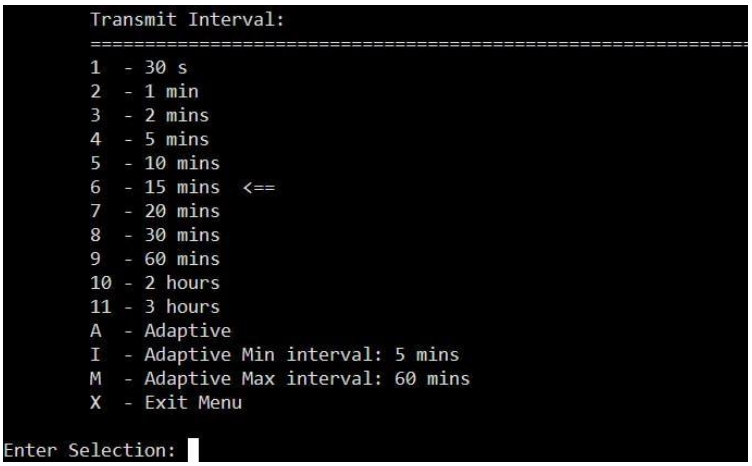
Reboot Required notification

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Check your LoRaWAN network server to verify that the device has joined successfully.

5. Setting / changing the transmit interval

Access the **Transmit Interval** setting by entering **t** from the quick start menu.



Transmit Interval settings

The transmit interval can be at affixed interval, or “adaptive”. Adaptive is recommended as when a leak event is detected a LoRaWAN message can be sent immediately, rather than waiting for the scheduled time.

If a fixed transmit interval is used, 15 minutes or longer is recommended to extend battery life.

To select **Adaptive Transmit Interval** select the **A** option and then change the settings for the **Adaptive Min interval** and **Adaptive Max interval** as required.

With adaptive transmit interval set, when a change of alarm state occurs a wireless message is sent immediately, however messages will not be sent more frequently than the **Adaptive Min interval.** The **Adaptive Max interval** acts like a heartbeat, so if no change of alarm state occurs then a message is sent at the **Adaptive Max interval.**

Press **Enter** when the key is correctly entered to return to the **Quick Start Settings Menu**.

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6. Setting / changing the leak detection threshold

The leak detection threshold can be changed to adjust the sensitivity to water.

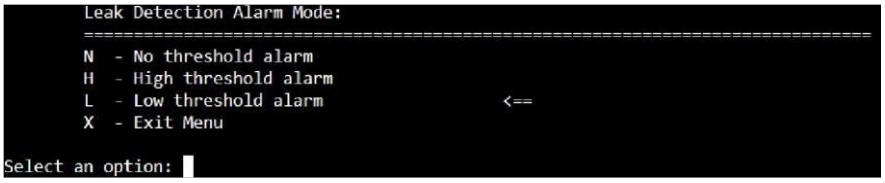
From the **Main Menu** access the configuration menu by entering **C**. This screen will display the current device temperature, humidity and Leak Detect parameters including the rope resistance and leak detection status.



Enter **A** to view the ADC menu



The **M** option allows the alarm mode to be set. This should be set to Low threshold alarm.

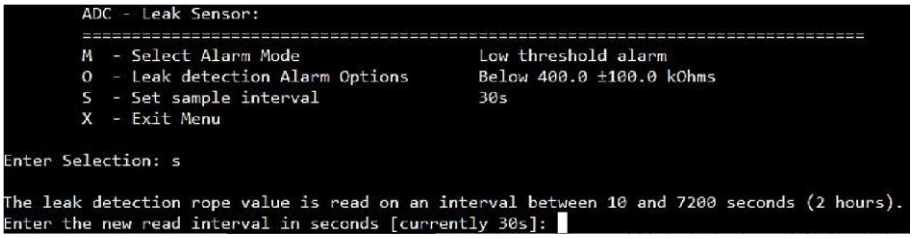


The **O** option allows the leak detection threshold to be set according to the required sensitivity. The defaults are:

- L - Lower bound alarm level 400.0 kOhms
- Y - Lower bound hysteresis ±100.0 kOhms

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The **S** option allows the sample interval to be set. This is the frequency that the leak rope is sampled to check if an alarm condition exists. The minimum sampling interval is 10 seconds. Sampling the leak detection rope more frequently will drain the batteries more quickly, so a balance between sampling interval and battery life should be considered.



From the configuration menu, the **D** option displays live readings



The Live display menu above can be used to verify the sensitivity settings before deployment.

7. Water Leak Cable Connections.

Status-L has an 8-way terminal block with screwless terminals for rapid connection of the leak cable. The cable is not polarity sensitive, so either cable can be attached in any order. Attach the leader cable to the terminals as shown below:

Terminal number	Function
1	Leak Cable
2	Leak Cable

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3	Not Used
4	Not Used
5	Not Used
6	Not Used
7	Not Used
8	Not Used

The connector is designed to accommodate the following cable sizes with a minimum of 10mm strip length.

- Connection capacity (single-wire): 0.2 – 0.5 mm²
- Connection capacity (single-wire): AWG 26 - 20

Water detection cable characteristics

Designed specifically to detect water anywhere along its entire length, the water detection cable is constructed with individual spacer cables and two stainless steel sensor wires all welded together to form a single cable with an overall diameter of 3mm. The cable is flexible and can be wiped clean to remove contaminants or water.

Areas requiring monitoring for water leaks can be fitted with various lengths of water leak detection cable. The water detection cable will detect water anywhere along its length giving better coverage than conventional spot probes.

Cable Specification

- Overall diameter: 3mm
- Each Signal cable: 16/0.2mm (0.5mm) 3amp 110vac to IEC 189-3
- Sensor wires: Annelid 0.4mm diameter Stainless Steel
- Sensor resistance: 7Ω per metre per sensor wire (14Ω per cable metre)
- Sensor spacing: 9mm
- Maximum continuous Length: 100 metres

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Positioning the water detection cable

The detection cable is susceptible to damage and should not be fitted to areas where the cable is likely to be damaged or walked on. If fitting the cable around Air Conditioning Units with humidifiers, ensure that the cable is positioned at least one metre from the AC unit to help prevent intermittent alarms being generated from humidity or water droplets from the AHU.

Clean the area where the cable will be installed, to remove debris and sources of contamination.

Fit the leak detection cable using insulated 3.5mm cable clips or P-clips. Metal clips should not be used as they will conduct electricity causing false alarms. Clips should be fitted approximately every 1 to 1.5 metres apart. Ensure that the cable touches the floor between the clips, DO NOT tighten the cable so that the cable does not touch the floor. Do not allow the cable to twist or the exposed stainless conductors to touch together.

Tools or heavy objects can damage sensing cable. Avoid rolling, dropping, or setting heavy items on sensing cable.

Do not use adhesive tapes or clamping devices to secure the sensing cable.

8. System Testing

To check that the unit is operating correctly, immerse a small area (50mm long) of the water detection cable into a vessel containing clean water and view the Leak Status on the Live Display screen. Verify that a LoRaWAN message is sent to the application.

The cable will need to be completely dry before the leak status returns to normal.

9. Battery Installation / Replacement

Devices use EVE ER14505 AA size 3.6 Volt Lithium Thionyl Chloride (Li-SOCl2) batteries (non rechargeable) or direct equivalent.

No other batteries are approved for use in the device.

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Lithium Thionyl Chloride batteries have very high energy capacity and must be used and handled with care observing the guidance below.



WARNING

Risk of death or serious injury from explosion or fire.

- Keep out of sight and reach of children.
- Fire, explosion and burn hazard - do not recharge, short circuit, crush, disassemble, incinerate.
- Due to the high terminal voltage (3.6V), they are not suitable as direct replacements for other battery technologies in the same can sizes.
- When not in use the Batteries must be stored in a non-Hazardous Area.
- Do not change batteries in an explosive gas atmosphere.
- When installing batteries, do not snag the battery terminal on the clip or the battery may be damaged. Do not apply excessive force.
- Do not drop. Dropping the battery may cause damage. If a battery is dropped, do not install the dropped battery into the unit. Dispose of dropped battery promptly per local regulations or per the battery manufacturer's recommendations.

Guidance

- Always install the batteries correctly as per instructions taking great care to observe the battery polarity.
- Ensure that the contact points are clean and conductive.
- All batteries must be the same model from the same manufacturer.
- Do not mix old and new batteries or batteries from different manufacturers.
- Do not heat or attempt to recharge the battery.
- Do not dispose of in a fire.
- Only install approved batteries: EVE ER14505 / SAFT LS14500 Lithium Thionyl Chloride AA Battery 3.6 Volt, or direct equivalent.

Safe disposal



- Please recycle responsibly, a wide range of schemes are available.

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- Do not dispose of in normal waste or in a fire.

