



## LWL01 – LoRaWAN Water Leak User Manual

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## 1. Introduction

#### 1.1 What is LWL01 LoRaWAN Water Leak Sensor

The Dragino LWL01 is a LoRaWAN Water Leak Sensor. It detects the water leak status and send it to LoRaWAN network. The LWL01 is small sensor, the dimension is as small as 64 x 30 x 14 mm.

LWL01 is powered by a CR2032 coin battery, in a good LoRaWAN Network Coverage case, it can transmit as many as 12,000 uplink packets (base on SF7, 14dB). in poor LoRaWAN network coverage, it can transmit ~ 1,300 uplink packets (base on SF10, 18dB). The design goal for one battery is up to 2 years. User can easily change the CR2032 battery for reuse.

The LWL01 will send periodically data every day as well as for water leak event. It also count the water leak event times and also calculate last water leak duration.

Each LWL01 is pre-loaded with a set of unique keys for LoRaWAN registrations, register these keys to local LoRaWAN server and it will auto connect after power on.





#### 1.2 Features

- ✓ LoRaWAN Class A v1.0.3
- ✓ Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915/IN865/RU864
- ✓ SX1262 LoRa Core
- ✓ Water Leak detect
- ✓ CR2032 battery powered
- ✓ AT Commands to change parameters
- ✓ Remote configure parameters via LoRa Downlink
- ✓ Firmware upgradable via program port

## **1.3 Applications**

- ✓ Smart Buildings & Home Automation
- ✓ Logistics and Supply Chain Management
- ✓ Smart Metering
- ✓ Smart Agriculture
- ✓ Smart Cities
- ✓ Smart Factory

## **1.4 Dimension**



## 1.5 Firmware Change log

LWL01 Image files – Download link

## Image v1.0

Release



## 2. Power ON LWL01

When receive the LWL01, please open the enclosure and remove the isolated paper and PRESS RESET so the coin battery can power on the device and device runs in low power mode. The LED will blink when devices is powered.



## 3. Operation Mode

## 3.1 How it works?

The LWL01 is configured as LoRaWAN OTAA Class A mode. It has OTAA keys to join network. To connect a local LoRaWAN network, user just need to input the OTAA keys in the network server and <u>power on</u> the LWL01. It will auto join the network via OTAA.

In case user can't set the OTAA keys in the network server and has to use the existing keys from server. User can <u>use AT Command</u> to set the keys in the devices.

## 3.2 Example to join LoRaWAN network

Here shows an example for how to join the TTN Network. Below is the network structure, we use our LG308 as LoRaWAN gateway here.



The LWL01 in installed on the door edge to detect the open / close event. And send the status to LoRaWAN server. The LWL01 will uplink two type of messages to the server.

- $\checkmark$  A keep-alive message which send once per day.
- ✓ An emergency event message when detect a water leak.
- ✓ A periodically update at every 5 minutes when in water leak.
- ✓ A message when switch from water leak to none water leak.

The LG308 is already set to connect to <u>TTN network</u>. So what we need to now is only configure the TTN:

**Step 1**: Create a device in TTN with the OTAA keys from LWL01.

Each LWL01 is shipped with a sticker with unique device EUI:





User can enter this key in their LoRaWAN Server portal. Below is TTN screen shot: Add APP EUI in the application.

ISOLE NHITY EDITION	Applications	Gateways	Suppo
Applications > 🤤 dragino_test_application1			
Application ID dragino_test_application1 Description a test application for Dragino Created 2 years ago Handler ttn-handler-eu (current handler)		documentat	lon
APPLICATION EUIS		o manage e	uis
<ul> <li>◇ 二 70 B3 D5 7E F0 80 46 18 回</li> <li>◇ 二 3F 77 AD E3 6B CA AB 65 割</li> </ul>			

#### Add APP KEY and DEV EUI

THE THINGS	CONSOLE	Applications	Gateways	Suppo
	Applications > 😂 dragino_test_application1 > Devices			
	REGISTER DEVICE		bulk import devi	<u>ces</u>
	Device ID This is the unique Identifier for the device in this app. The device ID will be immutable. It:332224-5480		0	
	IT-33222-1-5480			
	Device EUI The device EUI is the unique identifier for this device on the network. You can change the EUI later.			
	× A8 40 41 00 01 81 85 48		🥑 8 bytes	
	App Key The App Key will be used to secure the communication between you device and the network.			ĥ
	x 57 4E 37 E6 8A EC FC CD B3 B9 3D 87 A9 3B 4B 2C		🥑 16 bytes	
	App EUI			1
	3F 77 AD E3 68 CA AB 65		0	
				24

**Step 2**: <u>Power on</u> LWL01 and it will auto join to the TTN network. After join success, it will start to upload message to TTN and user can see in the panel.

NGS COM	NSOLE	DITION						Applicati	ions Gatew	ays Su	upport	
Applications	s > 🛑					ta						
									Overview	Data	Settings	
APPLIC	CATION	DATA								II pau	ise 🛍 <u>clear</u>	
Filters	uplink	downlink	activation	ack	error							
4	time	counter	port					_			<b>}</b> ▲	
▲ 1·	4:06:14	0	10		payload: OC	CC6 02 00 00 00 00 00 00 00	BAT_V: 3.27	LAST_WATER_LEAK_DUR	ATION: 0 MO	D: 2 WA	TER_L	
÷ 1-	4:06:08				dev addr:	app eui:		dev eui:				

## 3.3 Uplink Payload



#### Total 9 bytes.

Size(bytes)	3	1	3	3
value	Status&BAT	MOD	Total water	Last water leak
		Always:0x02	leak events	duration (unit: min)

#### Example:

payload: 48 E2 02 00 00 08 00 00 1 BAT\_V: 3.042 LAST\_WATER\_LEAK\_DURATION: 1 MOD: 2 WATER\_LEAK\_STATUS: 1 WATER\_LEAK\_TIMES: 8

#### Example Payload Decoder in TTN:

http://www.dragino.com/downloads/index.php?dir=LoRa End Node/LDS01/Payload/

#### 3.4 Downlink Payload

Downlink Control Type	Type Code	Downlink payload
		size(bytes)
TDC (Transmit Time Interval—Keep Alive Interval)	0x01	4
RESET	0x04	2
Clear Counting	0xA6	2

#### Example Downlink payload setting in TTN:

D	OWNLIN	١K				
	Schedulin	g			FPort	
	replace	first	last		2	Confirmed
	Payload					
	bytes	fields	01 00	00 3C		🥥 4 bytes

## Type Code 0x01

If the payload=0100003C, means to control the LWL01's Keep Alive interval to 0x00003C=60(S)

#### Type Code 0x04

If payload = 0x04FF, it will reset the LWL01.

#### Type Code 0xA6

Example: 0xA601: Clear Counting For LWL01: reset count number.



## 3.5 Integrate with Mydevice

Mydevices provides a human friendly interface to show the sensor data, once we have data in TTN, we can use Mydevices to connect to TTN and see the data in Mydevices. Below are the steps:

Step 1: Be sure that your device is programmed and properly connected to the network at this time.

Step 2: To configure the Application to forward data to Mydevices you will need to add integration. To add the Mydevices integration, perform the following steps:







DD INTEGRATIO	N		
	MyDevices (v2.6.0) myDevices		
my Devices	Quickly design, prototype and commercialize IoT solutions with myDevices Cayenne		
my Devices	documentation		
The unique identifier of t	he new integration process		
Access Key			
The access key used for o default key devices m			
		3	

Step 3: Create an account or log in Mydevices.

## Step 4: Search LWL01 and add DevEUI.

Cayenne Powered by myDevices	+Create new project					Create App Submit Project	💊 දිට t Community Docs	User Menu
Add new 🗸								1
Device/Widget	Devices & Widgets		-	Dragino LWL01 LoRaWAN Water		Enter Settings		1
Event 1	LWL01	Q		Leak Sensor	>			
Trigger	DEVICES 2		1~	LoRaWAN Water Leak Sensor	3	- Dragino	Technology Co.ltd	
Project	Single Board Computers	>			3		Water Leak Sensor	
Device 21fe						<b>N</b>		
Device 5517	MicroControllers	>				Name		
🛣 Device 64db	Sensors	~				Dragino LWL01 LoRaWAN W	later Leak Sensor	
📓 Device Bada	Actuators	~			4			
Device ecf9	Actuators	Ť			<b>`</b>	DevEUI		
🧕 Dragino LDS01 LoRaW 🔿	Extensions	~				Activation Mode Already Registered		-
Location	LoRa	~				Aneury negistered		
2 Dragino LGT92 v1.5 V	Acklio					Tracking		
2 Dragino LHT65	Actility				5 🔍			
Dragino LSN50 v1.6+ L 🔍	ChirpStack					This device doesn't move		-
Dragino LSN50 v1.6+ L V	CityKinect							
Dragino LSN50 v1.6+ L V	Everynet				6 👡	Address		
Dragino LSN50 v1.6+ L      Dragino LT-22222-L L	Kerlink					Add devi		
Dragino LI-22222-L L	Loriot					Add dev		



## 3.6 LEDs

Action	LED behavior
Power On	GREEN on 1s, RED on 1s, BLUE on 1s
Joined successful	GRENN LED on 5s
Send an uplink message	GREEN LED blinks once
Got a downlink message	BLUE LED blinks once

## 3.7 Battery



LWL01 is powered by a CR2032 coin battery, when running in deep sleep mode, the device power consumption is ~5uA.

The main power consumption is transmitting an uplink message. Depends on LoRaWAN network signal strength, the device can send different number of uplink messages.

- 1. In poor network coverage and US915 band. The device will transmit at SF10 at max power. in this case, it can uplink about ~1,300 messages.
- 2. In good network coverage and EU868 band, the device will transmit at SF7, and can uplink as many as 12,000 messages.

When battery voltage is below 2.75v, the LWL01 can't send uplink message.

Note: It is recommended to change battery when it reaches 2.8v. After change the battery, make sure to **PRESS RESET** button to active the low power mode.

Below shows the battery placement:





#### 4. Use AT Command

## 4.1 Access AT Command

LWL01 supports AT Command set. User can use a USB to TTL adapter to configure LWL01 via use AT command, as below.



USB to TTL <- -> LWL01 RX <- -> TX TX <- -> RX GND <- -> GND

In PC, User needs to set **serial tool**(such as <u>putty</u>, SecureCRT) baud rate to **115200** to access to access serial console of LWL01. The AT Access password is **123456**. Below is the output for reference:



Each AT Command need to add an ENTER at the end before send.

When entering the first command, the RED LED will on and user can now input AT Commands. After input all needed AT Commands, Please input AT+CLPM=1 to set the device to work in Low Power mode and RED LED will be off.

More detail AT Command manual can be found at AT Command Manual



## 5. FAQ

## 5.1 How to upgrade the image?

User can upgrade the firmware of LWL01 for bug fix, new features, or change working region. The upgrade instruction are here:

http://wiki.dragino.com/index.php?title=Firmware\_Upgrade\_Instruction

#### 5.2 How to change the LoRa Frequency Bands/Region?

User can follow the introduction for <u>how to upgrade image</u>. When download the images, choose the required image file for download.



#### 6. Order Info

#### Part Number: LWL01-XXX

<u>XXX</u>:

- EU433: frequency bands EU433
- **EU868**: frequency bands EU868
- KR920: frequency bands KR920
- CN470: frequency bands CN470
- > AS923: frequency bands AS923
- AU915: frequency bands AU915
- US915: frequency bands US915
- IN865: frequency bands IN865
- CN779: frequency bands CN779

#### 7. Packing Info

#### Package Includes:

✓ LWL01 x 1

#### Dimension and weight:

✓ Device Size: 64 x 30 x 14 mm

#### 8. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to

support@dragino.com