
SW3L -- LoRaWAN Outdoor Flow Sensor

last modified by Mengting Qiu

on 2025/02/17 16:42

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1. Introduction

1.1 What is SW3L LoRaWAN Flow Sensor

The Dragino SW3L is a **LoRaWAN Flow Sensor**. It detects water flow volume and uplink to IoT server via LoRaWAN network. User can use this to **monitor the water usage for buildings**.

SW3L is powered by **8500mAh Li-SOCI2 battery**, It is designed for long term use up to 10 years. (Actually Battery life depends on the use environment, update period.)

The SW3L will send water flow volume every 20 minutes. It can also **detect the water flow status** and **send Alarm**, to avoid the waste for water usage such as broken toilet case.

SW3L is designed for both indoor and outdoor use. It has a weatherproof enclosure and industrial level battery to work in low to high temperatures.

Each SW3L is pre-load with a set of unique keys for LoRaWAN registration, register these keys to LoRaWAN server and it will auto connect after power on

*Battery life depends on how often to send data, please see battery analyzer.

1.2 Features

- LoRaWAN v1.0.3 Class A protocol.

- Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915/IN865/RU864
- Upload water flow volume
- Monitor water waste
- 8500mAh industrial battery(none-rechargeable)
- AT Commands to change parameters
- Uplink on periodically and open/close event
- Datalog feature
- Remote configure parameters via LoRa Downlink
- Firmware upgradable via program port
- Wall Mountable
- Outdoor Use

1.3 Installation

Each SW3L package is shipped with a flow sensor. Install the flow sensor into water pipe with correct flow direction to start monitoring.

1.4 Storage & Operation Temperature

-40°C to +85°C

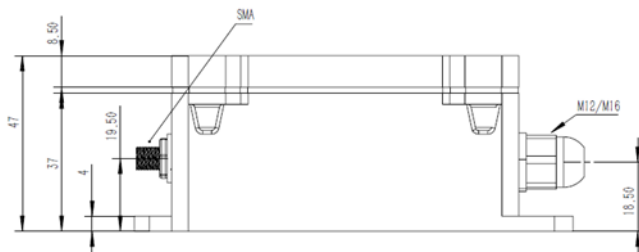
1.5 Applications

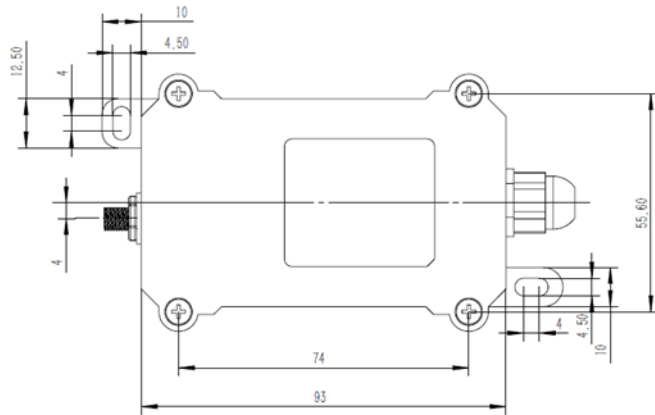
- Flow Sensor application
- Water Control
- Toilet Flow Sensor
- Monitor Waste water

1.6 Flow Sensor Spec

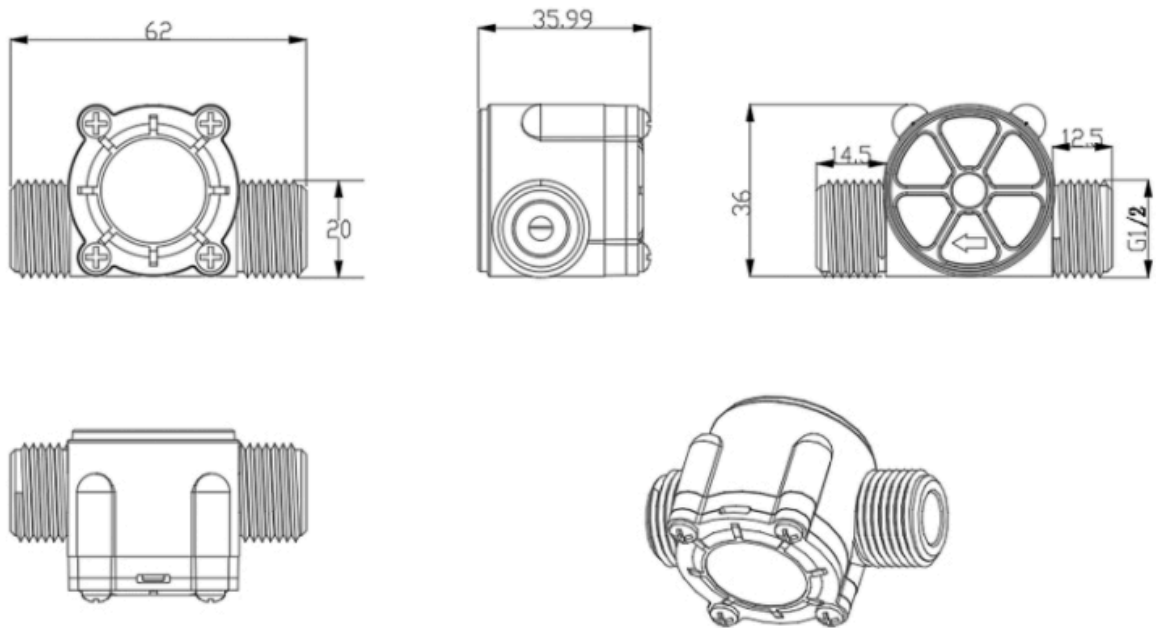
Model	SW3L-004	SW3L-006	SW3L-010	SW3L-020
Probe #	DW-004	DW-006	DW-010	DW-020
Diameter	G1/2" / DN15	G3/4" / DN20	G1" / DN25	G2" / DN50
Working Range	1~30L/min	1~60L/min	2~100L/min	10~300L/min
Measure	450 pulse = 1 L	390 pulse = 1 L	64 pulse = 1 L	12 pulse = 1 L
Accuracy	±5%	±5%	±5%	±5%
Power Consumption	1uA, 3.6v (Sensor Only)	1uA, 3.6v (Sensor Only)	1uA, 3.6v (Sensor Only)	1uA, 3.6v (Sensor Only)
Max Pressure	≤ 1.75Mpa	≤ 1.75Mpa	≤ 1.75Mpa	≤ 1.75Mpa
Temperature range	<80 °C	<80 °C	<80 °C	<80 °C
Humidity Range	35%~90%RH (no frost)	35%~90%RH (no frost)	35%~90%RH (no frost)	35%~90%RH (no frost)

1.7 Mechanical

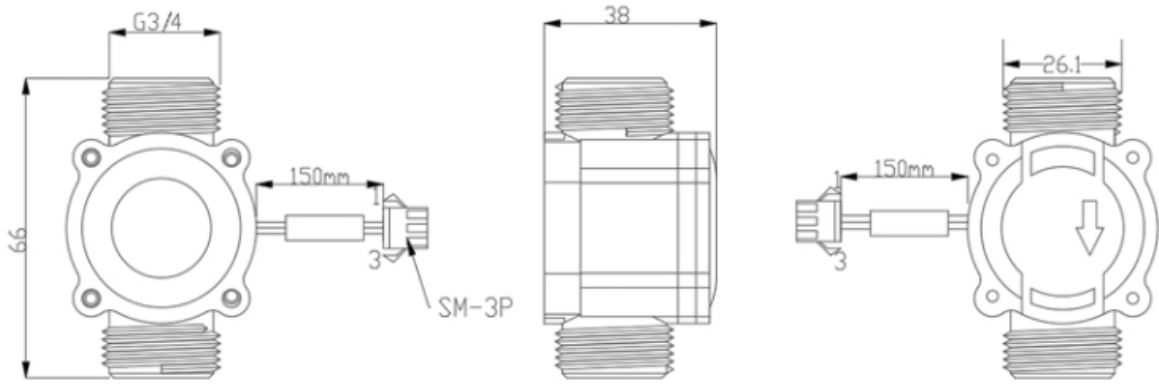




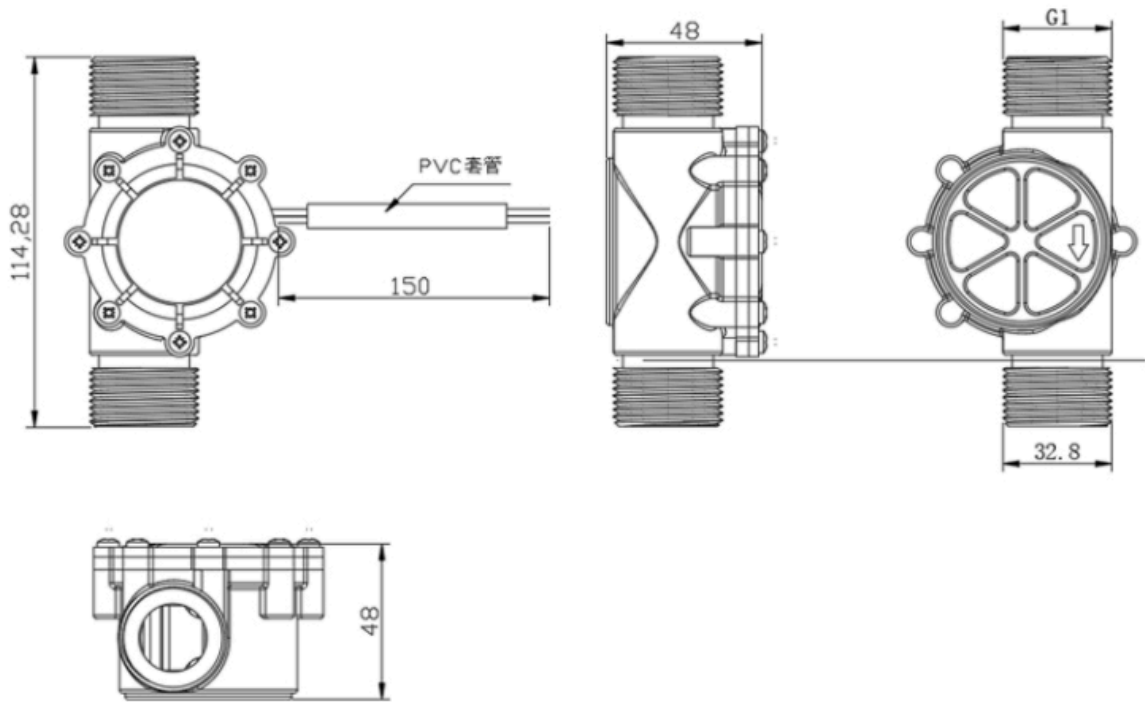
004: DW-004 Flow Sensor: diameter: G1/2" / DN15. 450 pulse = 1 L



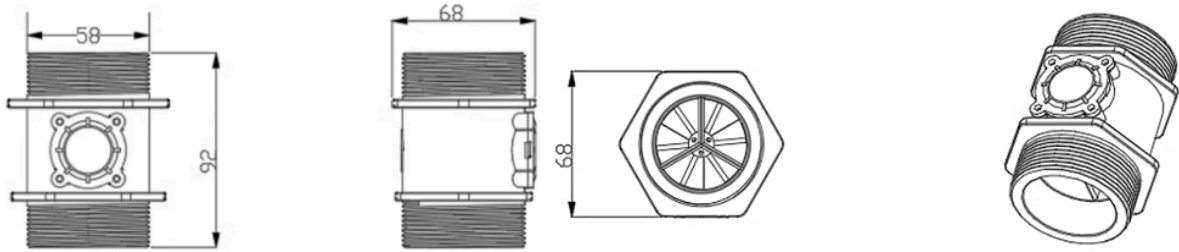
006: DW-006 Flow Sensor: diameter: G3/4" / DN20. 390 pulse = 1 L



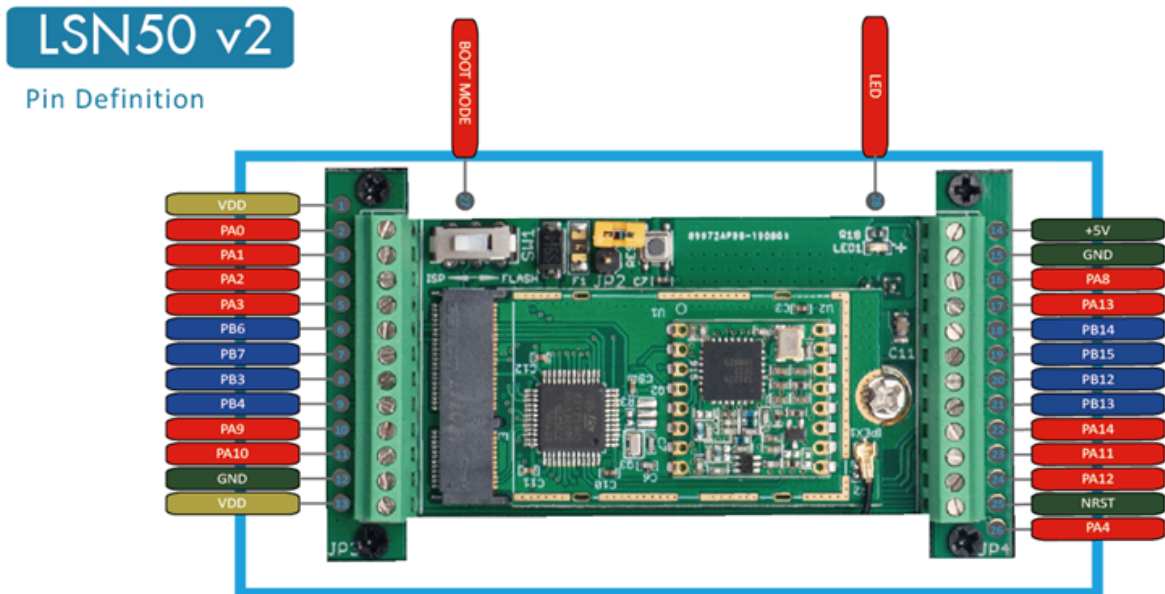
010: DW-010 Flow Sensor: diameter: G 1" / DN25. 64 pulse = 1 L



020: DW-020 Flow Sensor: diameter: G 2" / DN50. 12 pulse = 1 L



1.8 Pin Definitions and Switch



1.8.1 Pin Definition

SW3L is pre-configured to connect to two external wires. The other pins are not used. If user wants to know more about other pins, please refer to the user manual of LSN50v2 at:

<https://www.dropbox.com/sh/djkxs7mr17y94mi/AABVIWbM9uzK9OA3mXyAT10Za?dl=0>

Add PA11 digital input and PA12 digital input(Since firmware v1.2.0)

1.8.2 Jumper JP2(Power ON/OFF)

Power on Device when putting this jumper.

1.8.3 BOOT MODE / SW1

1) ISP: upgrade mode, device won't have any signal in this mode. but ready for upgrade firmware. LED won't work. Firmware won't run.

2) Flash: work mode, the device starts to work and send out console output for further debug

1.8.4 Reset Button

Press to reboot the device.

1.8.5 LED

It will flash:

- 1) Boot the device in flash mode
- 2) Send an uplink packe

2. Operation Mode

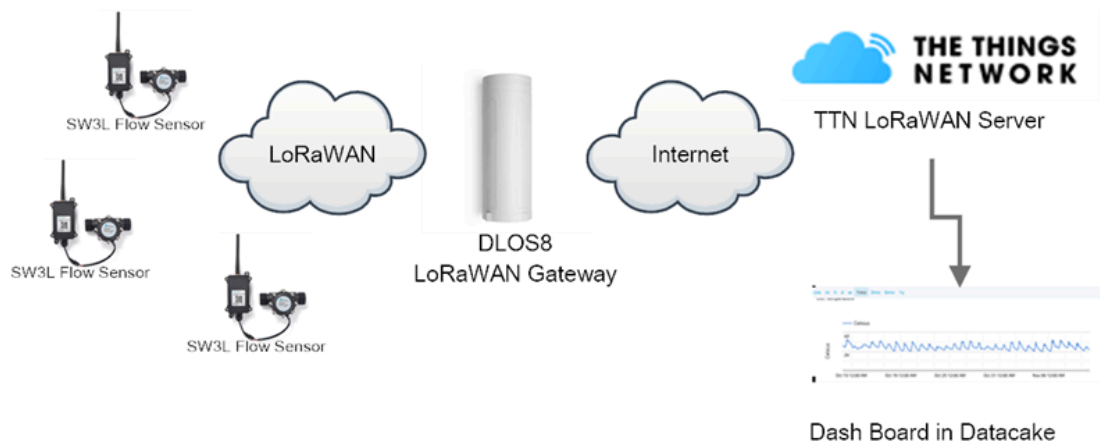
2.1 How it works?

Each SW3L is shipped with a worldwide unique set of OTAA keys. To use SW3L in a LoRaWAN network, user needs to input the OTAA keys in the LoRaWAN network server. So SW3L can join the LoRaWAN network and start to transmit sensor data.

2.2 Example to use for LoRaWAN network

This section shows an example of how to join the TTN V3 LoRaWAN IoT server. Usages with other LoRaWAN IoT servers are similar.

Use SW3L in TTN and Datacake

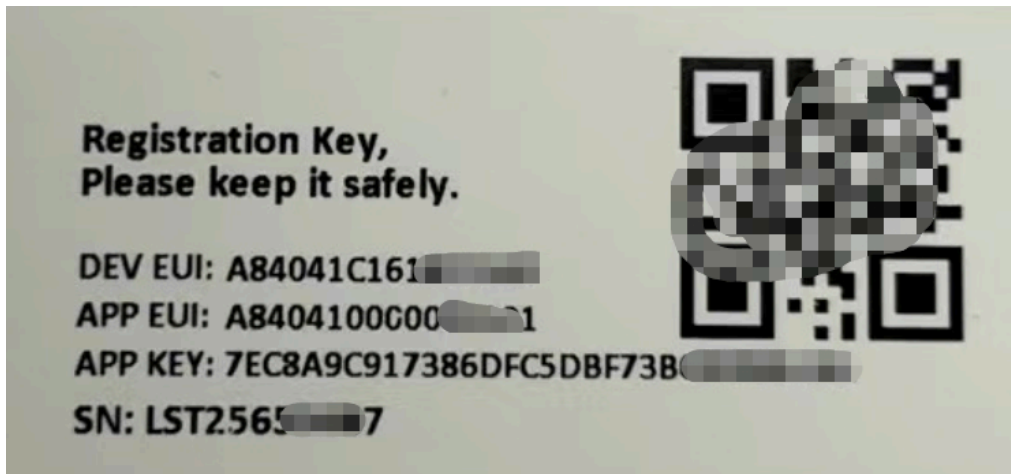


- In this use case, the SW3L is connected into water line to measure water flow and send the status to the LoRaWAN server. The SW3L will uplink different types of messages to the LoRaWAN server. See [Uplink payload](#) for detail.

Assume the DLOS8 is already set to connect to the [TTN V3 network](#). We need to add the SW3L device in TTN V3:

Step 1: Create a device in TTN V3 with the OTAA keys from SW3L.

Each SW3L is shipped with a sticker with the default device EUI as below:



Users can enter these keys in the LoRaWAN Server portal. Below is the TTN V3 screenshot:

Add APP EUI in the application.

S
K

THE THINGS STACK
Community Edition

Overview Applications Gateways Orga

Add application

Owner*

davidhuang

Application ID*

my-new-application

Application name

My new application

Description

Description for my new application

Optional application description; can also be used to save notes about the application

Create application



4 End devices 2 Collaborators 2 API keys

Created 95 days ago

General information

Application ID	123
Created at	Feb 2, 2021 11:12:30
Last updated at	Apr 30, 2021 11:00:33

Live data

See all activity →

- ↑ 10:09:42 1231234234... Forward data message to Application Server
- ⓘ 10:09:42 1231234234... Store upstream data message
- ↑ 10:09:42 1231234234... Forward uplink data message
- ↑ 10:09:42 1231234234... Receive uplink data message
- ↑ 10:09:42 1231234234... Successfully processed data message
- ↑ 10:09:42 1231234234... Drop data message

End devices (4)

Search by ID Import end devices **Add end device**

ID Name DevEUI JoinEUI Created

Register end device

From The LoRaWAN Device Repository

Manually

Preparation

Activation mode *

- Over the air activation (OTAA)
- Activation by personalization (ABP)
- Multicast
- Do not configure activation

LoRaWAN version ⓘ *

Network Server address

Application Server address

External Join Server ⓘ

Register end device

From The LoRaWAN Device Repository [Manually](#) ← 1

Frequency plan *

Select... ← 2

LoRaWAN version *

MAC V1.0.3 ← 3

Regional Parameters version *

PHY V1.0.3 REV A

Show advanced activation, LoRaWAN class and cluster settings ▾

DevEUI *

... .. Generate 0/50 used ← 4

AppEUI *

... .. Fill with zeros ← 5

AppKey *

... .. Generate ← 6

End device ID *

my-new-device ← 7

This value is automatically prefilled using the DevEUI

After registration

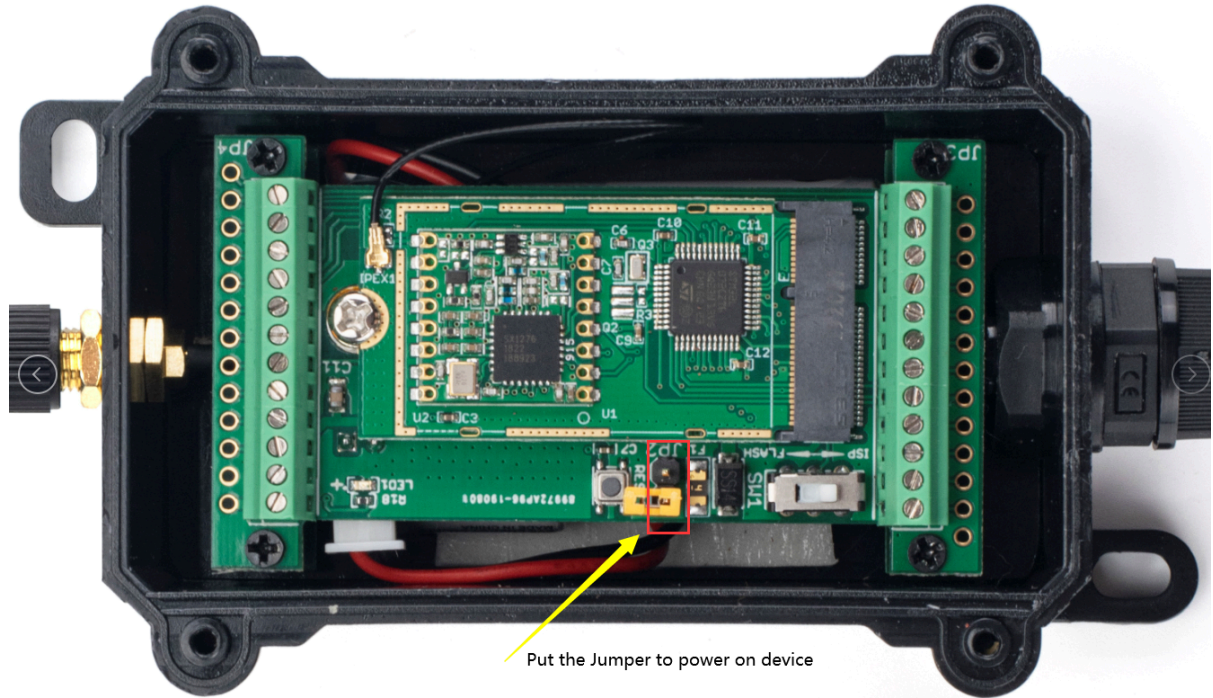
View registered end device

Register another end device of this type

Register end device ← 8

Add APP KEY and DEV EUI

Step 2: Power on SW3L



Put the jumper to power on SW3L and it will auto-join to the TTN V3 network. After join success, it will start to upload sensor data to TTN V3 and the user can see it in the panel.

l5n50-v2-sw3l
ID: l5n50-v2-sw3l

↑ 2 ↓ n/a • Last activity 13 seconds ago

Overview Live data Messaging Location Payload formatters Claiming General settings

Time	Type	Data preview
↑ 15:34:59	Forward uplink data message	load: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:34:58", MOD: 0, Total_pulse: 9577, Water_flow_value: 21.3 }
↑ 15:34:59	Successfully processed data	DevAddr: 26 08 10 21 FCnt: 2 FPort: 2 Data rate: SF7Bw125 SNR: 8.8 RSSI: -77
↑ 15:34:04	Forward uplink data message	load: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:34:03", MOD: 0, Total_pulse: 9407, Water_flow_value: 20.9 }
↑ 15:34:04	Successfully processed data	DevAddr: 26 08 10 21 FCnt: 1 FPort: 2 Data rate: SF7Bw125 SNR: 9.2 RSSI: -83
↓ 15:33:59	Schedule data downlink for t...	Rx1 Delay: 5
↑ 15:33:58	Forward uplink data message	Payload: { BAT: 3.324, FIRMWARE_VERSION: "1.0.0", FREQUENCY_BAND: "US915", SENSOR_MODEL: "SW3L", SUB_BAND: 0 } 11 01 00 02 00 0C F

2.3 Uplink Payload

Uplink payloads have two types:

- Open/Close Status: Use FPORT=2
- Other control commands: Use other FPORT fields.

The application server should parse the correct value based on FPORT settings.

2.3.1 Device Status, FPORT=5

Include device configure status. Once SW3L Joined the network, it will uplink this message to the server. After that, SW3L will uplink Device Status every 12 hours.

Users can also use the downlink command(0x26 01) to ask SW3L to resend this uplink. This uplink payload also includes the DeviceTimeReq to get time.

Device Status (FPORT=5)					
Size (bytes)	1	2	1	1	2
Value	Sensor Model	Firmware Version	Frequency Band	Sub-band	BAT

Example parse in TTNv3



- **Sensor Model:** For SW3L, this value is 0x11
- **Firmware Version:** 0x0100, Means: v1.0.0 version
- **Frequency Band:**

- *0x01: EU868
- *0x02: US915
- *0x03: IN865
- *0x04: AU915
- *0x05: KZ865
- *0x06: RU864
- *0x07: AS923
- *0x08: AS923-1
- *0x09: AS923-2
- *0x0a: AS923-3
- *0x0b: CN470
- *0x0c: EU433
- *0x0d: KR920
- *0x0e: MA869

- **Sub-Band:**
 - AU915 and US915:value 0x00 ~ 0x08
 - CN470: value 0x0B ~ 0x0C
 - Other Bands: Always 0x00

- **Battery Info:**

Check the battery voltage.

Ex1: 0x0B45 = 2885mV

Ex2: 0x0B49 = 2889mV

2.3.2 Sensor Configuration, FPORT=4

SW3L will only send this command after getting the downlink command (0x26 02) from the server.

Size(bytes)	3	1	1	2	1
Value	TDC(unit:sec)	N/A	Stop Timer	Alarm Timer	Reserve

- **TDC: (default: 0x0004B0)**

Uplink interval for the total pulse count, default value is 0x0004B0 which is 1200 seconds = 20 minutes.

- **STOP Duration & Alarm Timer**

Shows the configure value of [Alarm for continuously water flow](#)

The screenshot shows a terminal window with the following data messages:

- 15:59:03 Forward uplink data message: Payload: { Alarm_Timer: 1, Stop_Timer: 15, TDC: 60 } Hex: 00 00 3C FF 0F 00 01 FF FPort: 4 Data rate: SF7BW125 SNR: 8.2 RSSI: -82
- 15:59:03 Successfully processed data message: DevAddr: 26 0B 10 21 FCnt: 28 FPort: 4 Data rate: SF7BW125 SNR: 8.2 RSSI: -82
- 15:58:58 Schedule data downlink for transmission: FPort: 1 MAC payload: 9F 58 Rx1 Delay: 5
- 15:58:58 Forward uplink data message: Payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:58:58", Last_pulse: 0, MOD: 1, Water_flow_value: 0 } Hex: 00

2.3.3 Water Flow Value, Uplink FPORT=2

SW3L will send this uplink **after** Device Status once join the LoRaWAN network successfully. And SW3L will periodically send this uplink every 20 minutes, this interval [can be changed](#).

Uplink Payload totals 11 bytes.

Water Flow Value, FPORT=2					
Size(bytes)	1	4	1	1	4
Value	Calculate Flag & Alarm	Total pulse Or Last Pulse	MOD	Reserve(0x01)	Unix TimeStamp
Status & Alarm field					
Size(bit)	6		1	1	
Value	Calculate Flag		Alarm: 0: No Alarm; 1: Alarm	N/A	

lsn50-v2-sw3l
ID: lsn50-v2-sw3l

↑ 4 ↓ n/a • Last activity 21 seconds ago

Overview **Live data** Messaging Location Payload formatters Claiming General settings

Time	Type	Data preview
↑ 15:36:58	Forward uplink data message	payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:36:58", MOD: 0, Total_pulse: 9597, Water_flow_value: 21.3 }
↑ 15:36:58	Successfully processed data ...	DevAddr: 26 0B 10 21 <> FCnt: 4 FPort: 2 Data rate: SF7Bw125 SNR: 9.2 RSSI: -77
↑ 15:35:58	Forward uplink data message	payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:35:58", MOD: 0, Total_pulse: 9577, Water_flow_value: 21.3 }
↑ 15:35:58	Successfully processed data ...	DevAddr: 26 0B 10 21 <> FCnt: 3 FPort: 2 Data rate: SF7Bw125 SNR: 6.5 RSSI: -85
↑ 15:34:59	Forward uplink data message	payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:34:58", MOD: 0, Total_pulse: 9577, Water_flow_value: 21.3 }
↑ 15:34:59	Successfully processed data ...	DevAddr: 26 0B 10 21 <> FCnt: 2 FPort: 2 Data rate: SF7Bw125 SNR: 8.8 RSSI: -77
↑ 15:34:04	Forward uplink data message	payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:34:03", MOD: 0, Total_pulse: 9407, Water_flow_value: 20.9 }

• Calculate Flag

The calculate flag is a user defined field, IoT server can use this flag to handle different meters with different pulse factors. For example, if there are 100 Flow Sensors, meters 1 ~50 are 1 liter/pulse and meters 51 ~ 100 has 1.5 liter/pulse.

Example: in the default payload:

- calculate flag=0: for SW3L-004 Flow Sensor: 450 pulse = 1 L
- calculate flag=1: for SW3L-006 Flow Sensor: 390 pulse = 1 L
- calculate flag=2: for SW3L-010 Flow Sensor: 64 pulse = 1 L

Note: At present, the calculation flag can only be set to 0~2, and probe types other than this can directly calculate water flow using different decoding.

Default value: 0.

Range (6 bits): (b)000000 ~ (b) 111111

If user use with a meter for example is 0.02L/pulse. To proper decode the correct value in server,

1) User can set the Calculate Flag of this sensor to 3.

2) In server side, when a sensor data arrive, the decoder will check the value of Calculate Flag, If the value is 3, the total volume = 0.02 x Pulse Count.

NOTE: User need to set Calculate Flag to proper value before use Flow Sensor. Downlink or AT Command see: Refer: [Set Calculate Flag](#)

• Alarm

See [Alarm for continuously water flow](#)

Time	Type	Data preview
↓ 15:45:22	Schedule data downlink for t...	Rx1 Delay: 5
↑ 15:45:22	Forward uplink data message	Payload: { Alarm: "TRUE", Calculate_flag: 0, Data_time: "2022-04-01 07:45:21", Last_pulse: 14, MOD: 1, Water_flow_value: 0 }

• Total pulse

Total pulse/counting since factory

Range (4 Bytes) : 0x00000000~ 0xFFFFFFFF .

- **Last Pulse**

Total pulse since last FPORT=2 uplink. (Default 20 minutes)

Range (4 Bytes) : 0x00000000~ 0xFFFFFFFF .

- **MOD: Default =0**

MOD=0 --> Uplink Total Pulse since factory

MOD=1 --> Uplink total pulse since last FPORT=2 uplink.

- **Water Flow Value**

Total Water Flow Volume = (Calculate Flag) x (Total Pulse)=9597/450=21.3L

```

Time      Type      Data preview
↑ 15:37:58 Forward uplink data message  load: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:37:58", MOD: 0, Total_pulse: 9597, Water_flow_value: 21.3 }
    
```

Total Water Flow for TDC timer = (Calculate Flag) x (Last Pulse)=79/450=0.2L

```

Time      Type      Data preview
↑ 15:41:58 Forward uplink data message  Payload: { Alarm: "FALSE", Calculate_flag: 0, Data_time: "2022-04-01 07:41:58", Last_pulse: 79, MOD: 1, Water_flow_value: 0.2 }
    
```

2.3.4 Historical Water Flow Status, FPORT=3

SW3L stores sensor values and users can retrieve these history values via the [downlink command](#).

The historical payload includes one or multiplies entries and every entry has the same payload as Real-Time water flow status.

- Each data entry is 11 bytes and has the same structure as [real time water flow status](#), to save airtime and battery, SW3L will send max bytes according to the current DR and Frequency bands.

For example, in the US915 band, the max payload for different DR is:

- DR0:** max is 11 bytes so one entry of data
- DR1:** max is 53 bytes so devices will upload 4 entries of data (total 44 bytes)
- DR2:** total payload includes 11 entries of data
- DR3:** total payload includes 22 entries of data.

If SW3L doesn't have any data in the polling time. It will uplink 11 bytes of 0

Downlink:

0x31 62 46 B1 F0 62 46 B3 94 07

Uplink:

00 00 01 00 00 00 00 62 46 B2 26 00 00 01 00 00 00 00 62 46 B2 5D 00 00 01 00 00 00 00 62 46 B2 99 00 00 01
 00 00 00 00 62 46 B2 D5 00 00 01 00 00 01 15 62 46 B3 11 00 00 01 00 00 01 1F 62 46 B3 7E

Parsed Value:

[Alarm, Calculate Flag, MOD, Total pulse or Last Pulse, Water Flow Value, TIME]

- [FALSE,0,0,0,0,0,2022-04-01 08:04:54],
- [FALSE,0,0,0,0,0,2022-04-01 08:05:49],
- [FALSE,0,0,0,0,0,2022-04-01 08:06:49],
- [FALSE,0,0,0,0,0,2022-04-01 08:07:49],
- [FALSE,0,0,277,0.6,2022-04-01 08:08:49],
- [FALSE,0,0,287,0.6,2022-04-01 08:10:38],

AT+PDTA=1,1

Stop Tx events when read sensor data

```
8016000 22/4/1 08:04:54 bat:3313 mode:0 total_pulse:0 cal_flag:0 water_sum:0.0 alarm:false
8016010 22/4/1 08:05:49 bat:3313 mode:0 total_pulse:0 cal_flag:0 water_sum:0.0 alarm:false
8016020 22/4/1 08:06:49 bat:3316 mode:0 total_pulse:0 cal_flag:0 water_sum:0.0 alarm:false
8016030 22/4/1 08:07:49 bat:3316 mode:0 total_pulse:0 cal_flag:0 water_sum:0.0 alarm:false
8016040 22/4/1 08:08:49 bat:3313 mode:0 total_pulse:277 cal_flag:0 water_sum:0.6 alarm:false
8016050 22/4/1 08:10:38 bat:3313 mode:0 total_pulse:287 cal_flag:0 water_sum:0.6 alarm:false
8016060
8016070
```

Start Tx events

OK

2.4 Datalog Feature

When a user wants to retrieve sensor value, he can send a poll command from the IoT platform to ask the sensor to send value in the required time slot.

2.4.1 Unix TimeStamp

SW3L uses Unix TimeStamp format based on

Size (bytes)	4	1
DeviceTimeAns Payload	32-bit unsigned integer : Seconds since epoch*	8bits unsigned integer: fractional-second in $\frac{1}{2}^8$ second steps

Figure 10 : DeviceTimeAns payload format

Users can get this time from the link: <https://www.epochconverter.com/> :

Below is the converter example

The screenshot shows the EpochConverter website interface. The current Unix epoch time is 1641726793. A text box contains the value 1641726701, with a button labeled 'Timestamp to Human date [batch convert]'. Below this, the converted date is shown as GMT: 2022年1月9日SundayAM11点11分. To the right, a Windows calculator window is open, showing the conversion of the hex value 61DA C2ED to the decimal value 1,641,726,701. The calculator also shows the octal and binary representations of the decimal value.

2.4.2 Set Device Time

Through LoRaWAN MAC Command

Once SW3L Joined the LoRaWAN network, it will send the MAC command (DeviceTimeReq) and the server will reply with (DeviceTimeAns) to send the current time to SW3L. If SW3L fails to get the time from the server, SW3L will use the internal time and wait for the next time request [via Device Status (FPORT=5)].

Note: LoRaWAN Server needs to support LoRaWAN v1.0.3(MAC v1.0.3) or higher to support this MAC command feature.

2.4.3 Poll sensor value

Users can poll sensor values based on timestamps. Below is the downlink command.

Downlink Command to poll Open/Close status (0x31)			
1byte	4bytes	4bytes	1byte
31	Timestamp start	Timestamp end	Uplink Interval

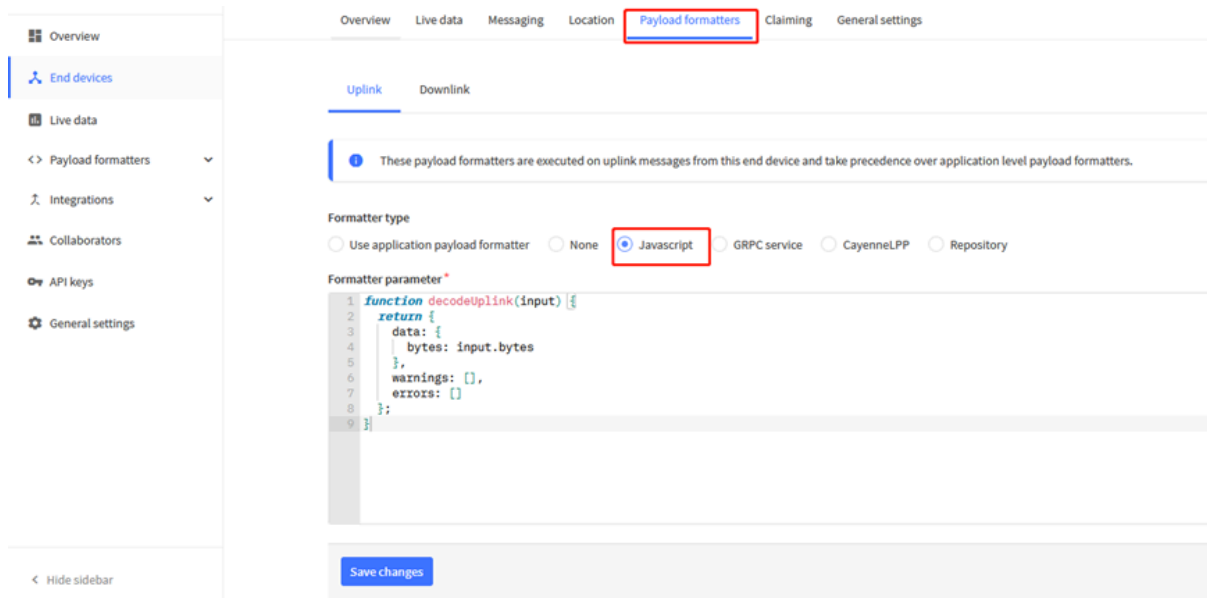
Timestamp start and Timestamp end-use Unix TimeStamp format as mentioned above. Devices will reply with all data logs during this period, using the uplink interval.

For example, downlink command `31 618E5740 618E8170 05`

Is to check 2021/11/12 12:00:00 to 2021/11/12 15:00:00's data

Uplink Interval =5s, means CPL01 will send one packet every 5s. range 5~255s.

2.4.4 Decoder in TTN V3



Please check the decoder from this link: <https://github.com/dragino/dragino-end-node-decoder>


2.5 Show data on Datacake


Datacake IoT platform provides a human-friendly interface to show the sensor data, once we have sensor data in TTN V3, we can use Datacake to connect to TTN V3 and see the data in Datacake. Below are the steps:


Step 1: Link TTNv3 to Datacake <https://docs.datacake.de/lorawan/Ins/thethingsindustries#create-integration-on-tti>


Step 2: Configure SW3L in Datacake


Add Device ×



LoRaWAN


PARTICLE


API


D Zero


D Zero LTE


PINCODE

STEP 1
Product

STEP 2
Network Server

STEP 3
Devices

STEP 4
Plan

Datacake Product

You can add devices to an existing product on Datacake, create a new empty product or start with one of the templates. Products allow you to share the same configuration (fields, dashboard and more) between devices.

New Product from template
Create new product from a template

Existing Product
Add devices to an existing product

New Product
Create new empty product

1

New Product

If your device is not available as a template, you can start with an empty device. You will have to create the device definition (fields, dashboard) and provide the payload decoder in the device's configuration.

Product Name






3

Next

Network Server

Please choose the LoRaWAN Network Server that your devices are connected to.

1

<input checked="" type="radio"/>		The Things Stack V3 TTN V3 / Things Industries	Uplinks	Downlinks
<input type="radio"/>		The Things Network V2 The old Things Network	Uplinks	Downlinks
<input type="radio"/>		Helium	Uplinks	Downlinks
<input type="radio"/>		LORIoT	Uplinks	Downlinks
<input type="radio"/>		Kerlink Wanesy	Uplinks	

Showing 1 to 5 of 8 results

[Previous](#) [Next](#)

2

[Back](#) [Next](#)

Payload Decoder

When your device sends data, the payload will be passed to the payload decoder, alongside the event's name. The payload decoder then transforms it to measurements.

```

1= function decode(c_bytes){
2   var aa=(bytes[0]>>8)>>8;
3   var bb=(bytes[1]>>8)>>8;
4   var cc=(bytes[2]>>8)>>8;
5   var dd=(bytes[3]>>8)>>8;
6   var ee=(bytes[4]>>8)>>8;
7   var string="["+aa+","+bb+","+cc+","+dd+","+ee+"]";
8
9   return string;
10 }
11
12 function get(c_num){
13   if(isNaN(c_num) < 0){
14     c_num = 0;
15   }
16   return c_num;
17 }
18
19 function getDate(str){
20   var c_date;
21   if(str < 1000000000){
22     c_date = new Date(parseInt(str));
23   } else {
24     c_date = new Date(parseInt(str) * 1000);
25   }
26
27   var c_year = c_date.getFullYear();
28   c_month = c_date.getMonth()+1;
29   c_day = c_date.getDate();
30   c_hour = c_date.getHours();
31   c_min = c_date.getMinutes();
32   var c_time = c_year + "-" + getzf(c_month) + "-" + getzf(c_day) + " " + getzf(c_hour) + ":" + getzf(c_min);
33
34   return c_time;
35 }
36
    
```

Productwide setting

Port: 1 [Try Decoder](#)

Output console.log Output Recognized measurements

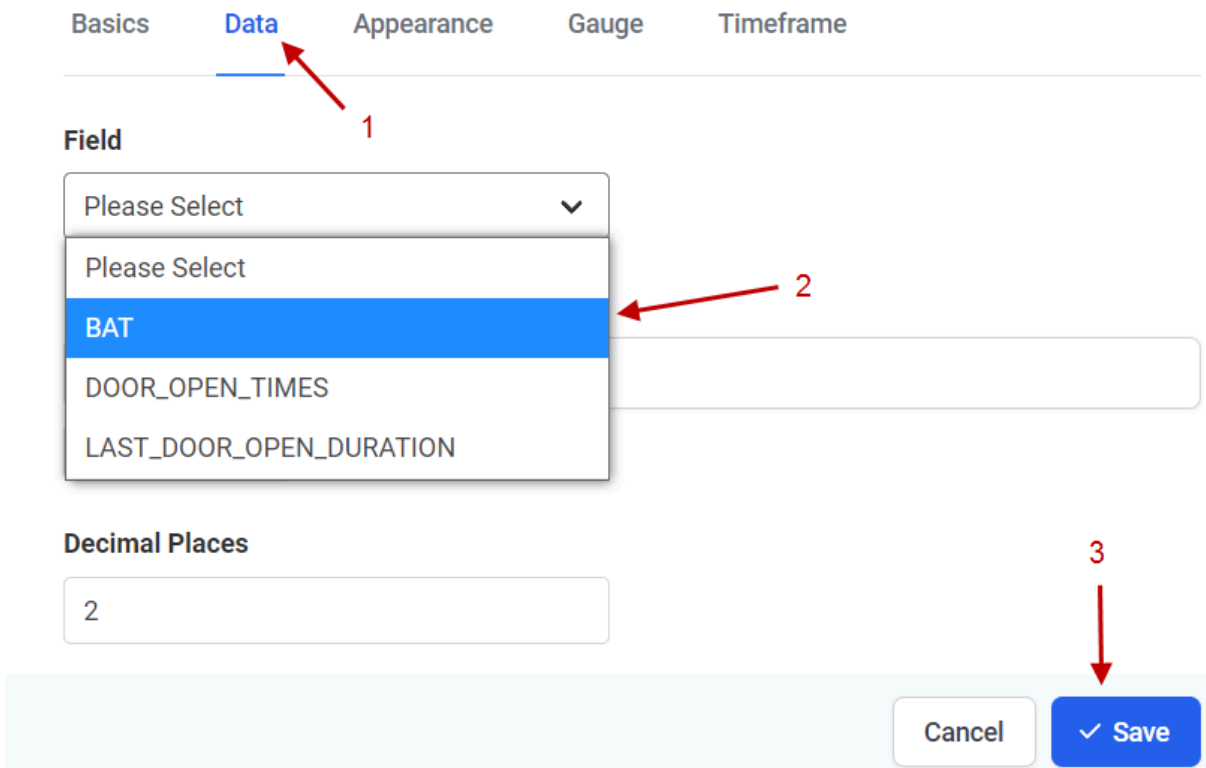
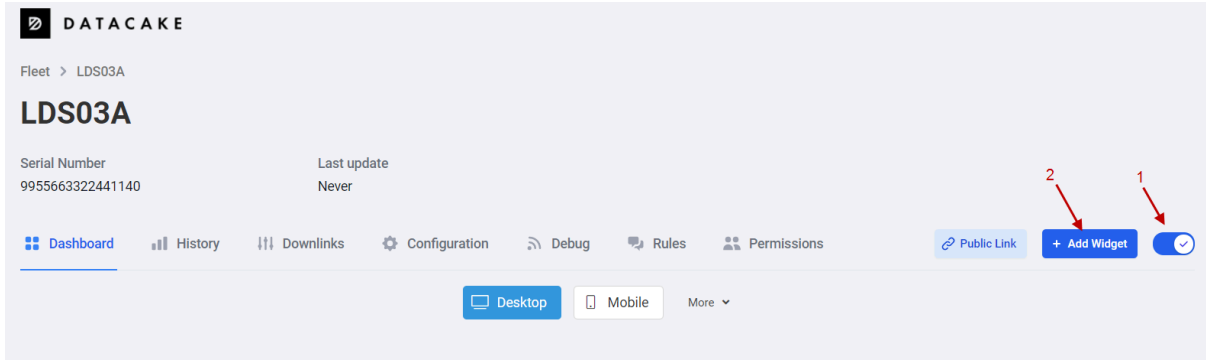
[Save](#)

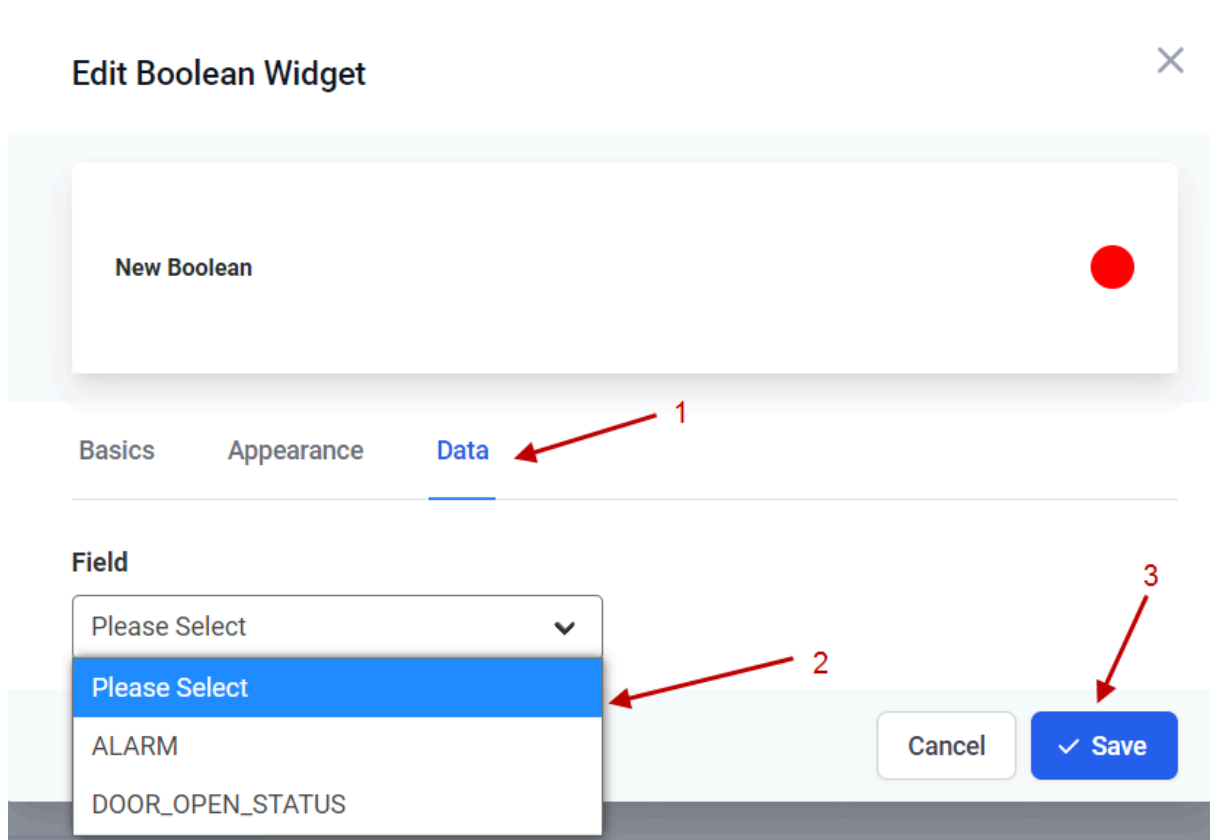
Fields

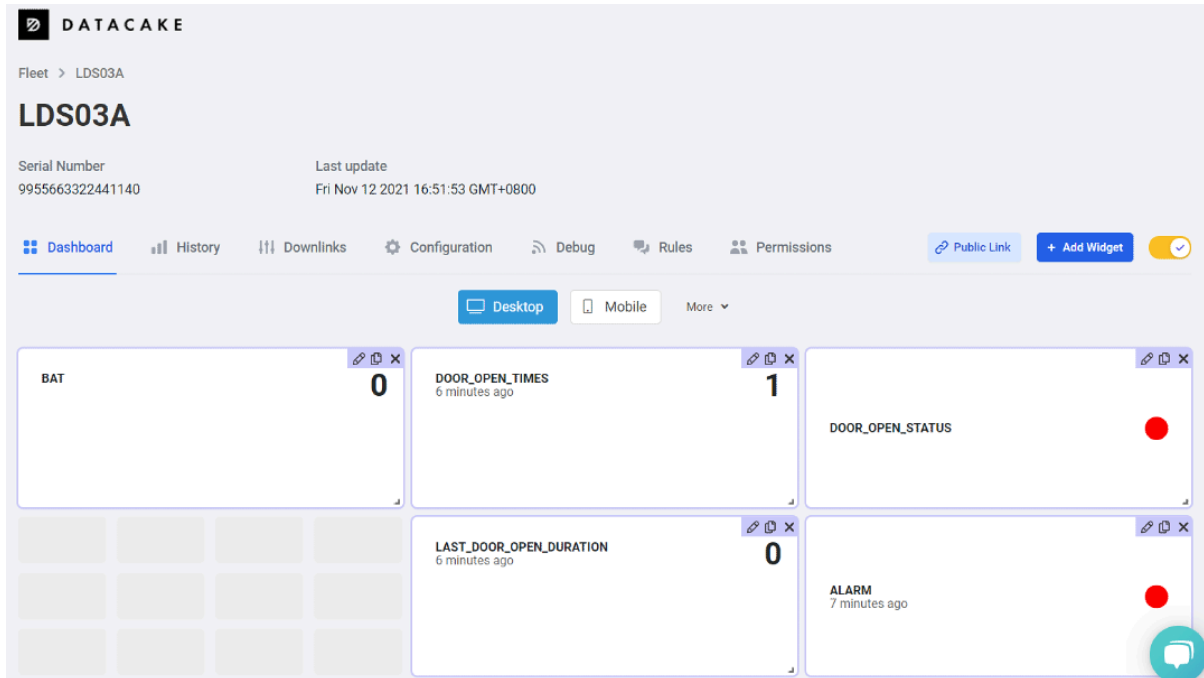
Fields describe the data the device will store.

[+ Add Field](#)

NAME	IDENTIFIER	TYPE	CURRENT VALUE	LAST UPDATE
BAT	BAT	Float	0	5 minutes ago
DOOR_OPEN_TIMES	DOOR_OPEN_TIMES	Float	0	3 minutes ago
LAST_DOOR_OPEN_DURATION	LAST_DOOR_OPEN_DURATION	Float	0	3 minutes ago
ALARM	ALARM	Boolean	False	a few seconds ago
DOOR_OPEN_STATUS	DOOR_OPEN_STATUS	Boolean	False	a few seconds ago







3. Configure SW3L via AT Command or LoRaWAN Downlink

Use can configure SW3L via AT Command or LoRaWAN Downlink.

- AT Command Connection: See [FAQ](#).
- LoRaWAN Downlink instruction for different platforms: [IoT LoRaWAN Server](#)

There are two kinds of commands to configure SW3L, they are:

- **General Commands.**

These commands are to configure:

- General system settings like uplink interval.
- LoRaWAN protocol & radio related command.

They are the same for all Dragino Devices which support DLWS-005 LoRaWAN Stack(Note**). These commands can be found on the wiki: [End Device AT Commands and Downlink Command](#)

- **Commands special design for SW3L**

These commands are only valid for SW3L, as below:

3.1 Set Transmit Interval Time

Feature: Change LoRaWAN End Node Transmit Interval.

AT Command: AT+TDC

Command Example	Function	Response
AT+TDC=?	Show current transmit Interval	30000 OK the interval is 30000ms = 30s
AT+TDC=60000	Set Transmit Interval	OK Set transmit interval to 60000ms = 60 seconds

Downlink Command: 0x01

Format: Command Code (0x01) followed by 3 bytes time value.

If the downlink payload=0100003C, it means set the END Node's Transmit Interval to 0x00003C=60(S), while type code is 01.

- **Example 1:** Downlink Payload: 0100001E // Set Transmit Interval (TDC) = 30 seconds
- **Example 2:** Downlink Payload: 0100003C // Set Transmit Interval (TDC) = 60 seconds

3.2 Set Password

Feature: Set device password, max 9 digits

AT Command: AT+PASSWORD

Command Example	Function	Response
AT+PASSWORD=?	Show password	123456 OK
AT+PASSWORD=999999	Set password	OK

Downlink Command:

No downlink command for this feature.

3.3 Quit AT Command

Feature: Quit AT Command mode, so user needs to input the password again before using AT Commands.

AT Command: AT+DISAT

Command Example	Function	Response
AT+DISAT	Quit AT Commands mode	OK

Downlink Command:

No downlink command for this feature.

3.4 Alarm for continuously water flow

This feature is to monitor and send Alarm for continuously water flow.

Example case is for Toilet water monitoring, if some one push toilet button, the toilet will have water flow. If the toilet button has broken and can't returned to original state, the water flow will keep for hours or days which cause huge waste for water.

To monitor this faulty and send alarm, there are two settings:

- **Stop Duration: Unit: Second**

Default: 15s, If SW3L didn't see any water flow in 15s, SW3L will consider stop of water flow event.

- **Alarm Timer: Units: Minute; Default 0 minutes (means Alarm disable)**

Example: 3 minutes, if SW3L detect a start of water flow event and didn't detect a stop event within Alarm timer, SW3L will send an Alarm to indicate a water flow abnormal alarm.

So for example, If we set stop duration=15s and Alarm Timer=3minutes. If the toilet water flow continuously for more than 3 minutes, Sensor will send an alarm (in Confirmed MODE) to platform.

Note: After this alarm is send, sensor will consider a stop of water flow and count for another new event. So if water flow waste last for 1 hour, Sensor will keep sending alarm every 3 minutes.

AT Command to configure:

- AT+PTRIG=15,3 --> Set Stop duration: 15s, Alarm Timer: 3 minutes.
- AT+ PTRIG=15,0 --> Default Value, disable water waste Alarm.

Downlink Command to configure:

Command: **0xAA aa bb cc**

AA: Command Type Code

aa: Stop duration

bb cc: Alarm Timer

If user send 0xAA 0F 00 03: equal to AT+PTRIG=15,3

3.5 Clear Flash Record

Feature: Clear flash storage for data log feature.

AT Command: AT+CLRDTA

Command Example	Function	Response
AT+CLRDTA	Clear flash storage for data log feature.	Clear all stored sensor data... OK

Downlink Command:

- **Example:** 0xA301 // Same as AT+CLRDTA

3.6 Set the calculate flag

Feature: Set the calculate flag

AT Command: AT+CALCFLAG

Command Example	Function	Response
AT+CALCFLAG=1	Set the calculate flag to 1.	OK
AT+CALCFLAG=2	Set the calculate flag to 2.	OK

Downlink Command:

- **Example:** 0XA501 // Same as AT+CALCFLAG=1

3.7 Set count number

Feature: Manually set the count number

AT Command: AT+SETCNT

Command Example	Function	Response
AT+SETCNT=0	Set the count number to 0.	OK
AT+SETCNT=100	Set the count number to 100.	OK

Downlink Command:

- **Example:** 0xA600000001 // Same as AT+SETCNT=1
- **Example:** 0xA600000064 // Same as AT+SETCNT=100

3.8 Set work mode

Feature: Manually set the work mode

AT Command: AT+MOD

Command Example	Function	Response
AT+MOD=0	Set the work mode to 0.	OK
AT+MOD=1	Set the work mode to 1	OK

Downlink Command:

- **Example:** 0x0A00 // Same as AT+MOD=0
- **Example:** 0x0A01 // Same as AT+MOD=1

4. Battery & Power Consumption

SW3L uses ER26500 + SPC1520 battery pack. See below link for detail information about the battery info and how to replace.

[Battery Info & Power Consumption Analyze](#) .

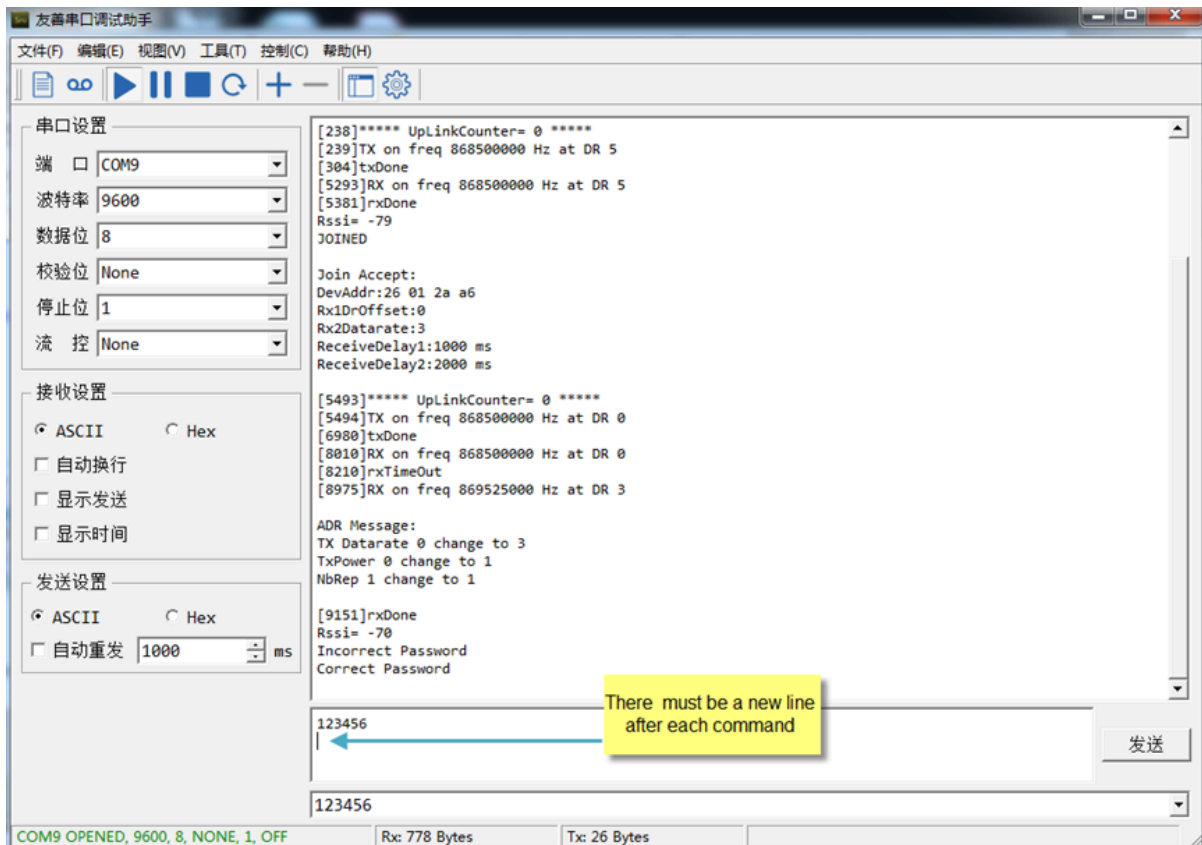
5. FAQ

5.1 How to use AT Command to configure SW3

SW3L UART connection photo



In the PC, you need to set the serial baud rate to **9600** to access the serial console for LSN50. LSN50 will output system info once power on as below:



5.2 How to upgrade the firmware?

A new firmware might be available for:

- Support new features
- For bug fix
- Change LoRaWAN bands.

Instruction for how to upgrade: [Firmware Upgrade Instruction](#)

Firmware location: https://www.dropbox.com/sh/jktdt8q674i87l/AADqk1zoUEekCjDR_4ic2Tg0a?dl=0

5.3 How to change the LoRa Frequency Bands/Region?

Users can follow the introduction for how to upgrade images. When downloading the images, choose the required image file for download.

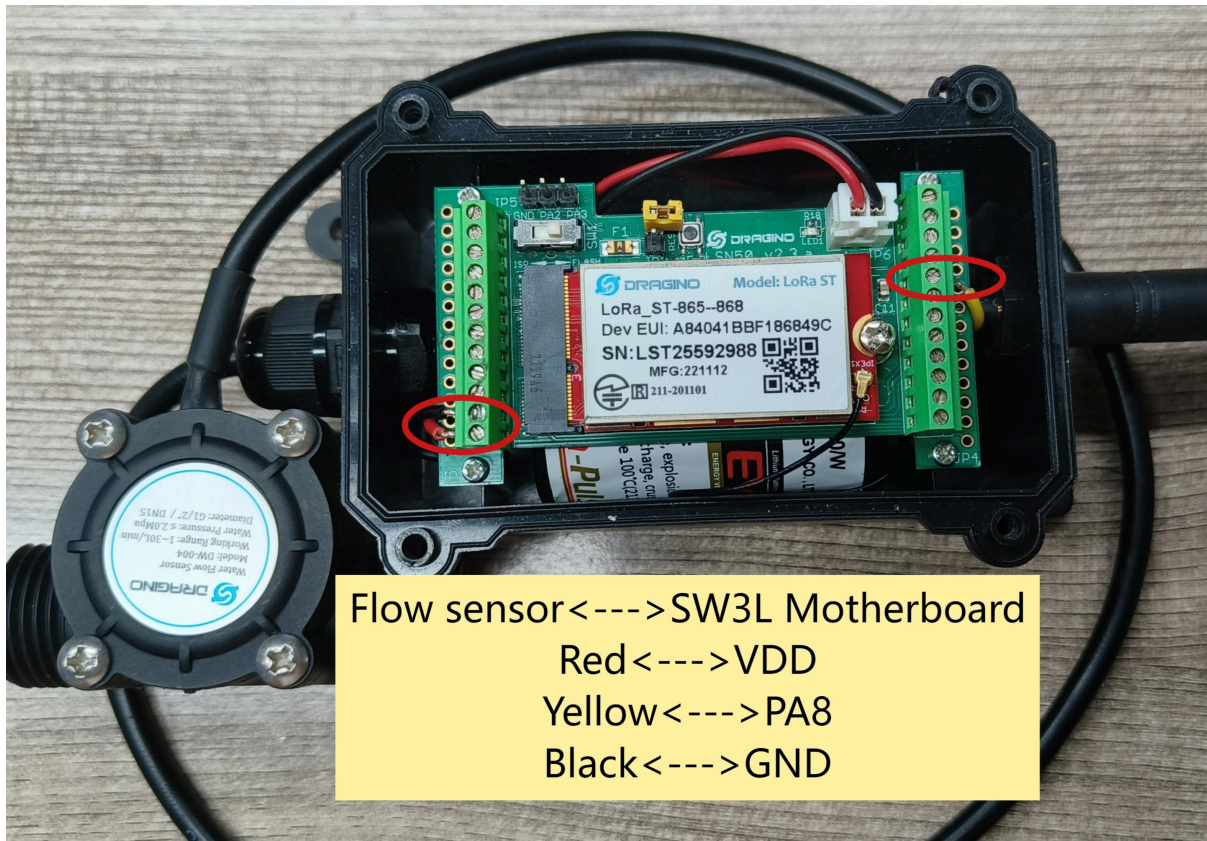
5.4 Can I connect 3rd party flow sensor other than the default one?

If a user wants to connect SW3L to a 3rd party flow sensor such as a [DN50 flow sensor](#), that is possible. A flow sensor with pulse output is needed.

Below is the notice for the connection:

1. Connect the 3rd party flow meter to the pulse input and GND of SW3L.
2. Make sure the pulse output voltage of 3rd party flow sensor is less than 5v.
3. It is not recommended to use SW3L to power the external flow meter, unless you are sure the external flow sensor is low power (several uA). Otherwise the battery of SW3L will be running out soon.
4. After connection, user needs to set the [Calculator Flag and change the payload](#) so to get the correct reading in the platform.

Connection:



5.5 What can I do if error in Flash Write operation is displayed on the serial port?

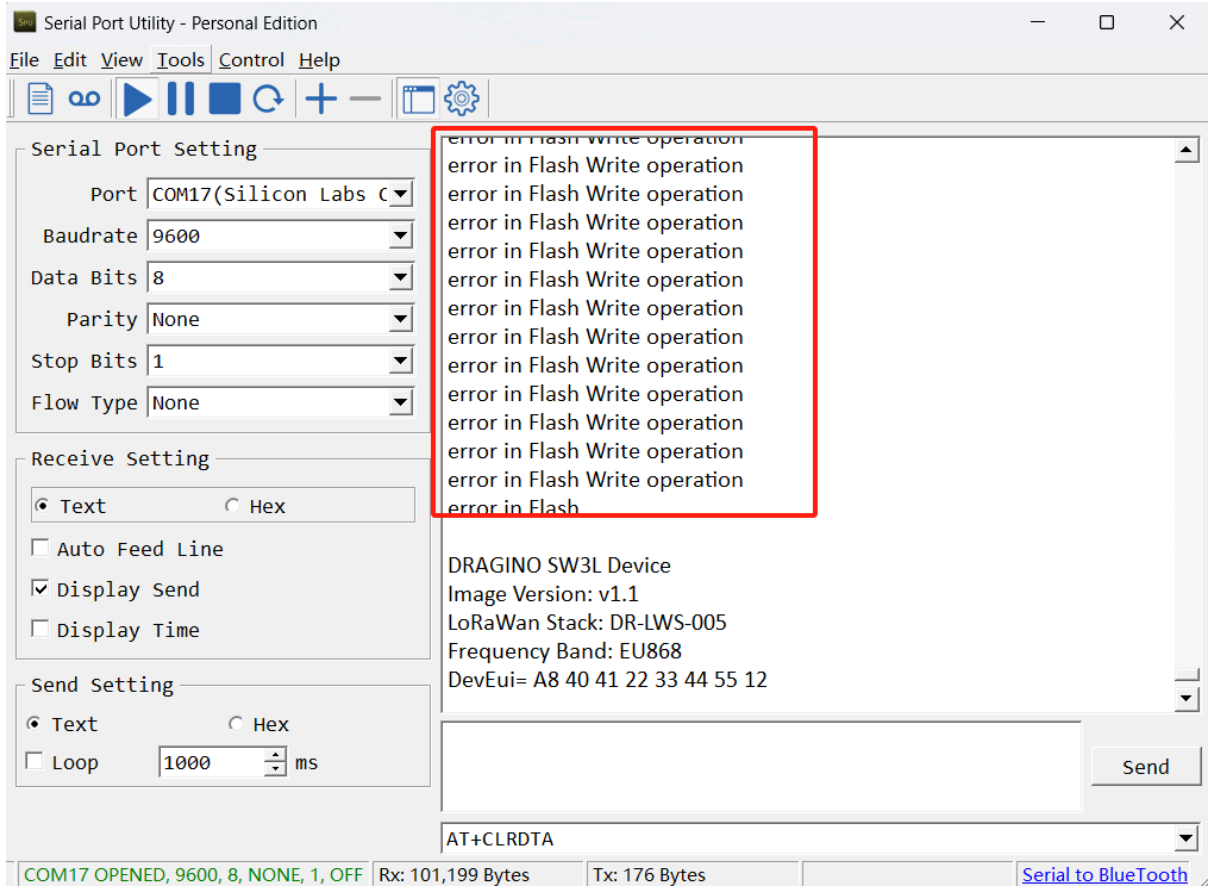
When the STM32 module is running, sometimes there is no uplink data (FPORT=2). When we use the serial port to view the printing information, we will find that the serial port is printed as "error in Flash Write operation".

Example:

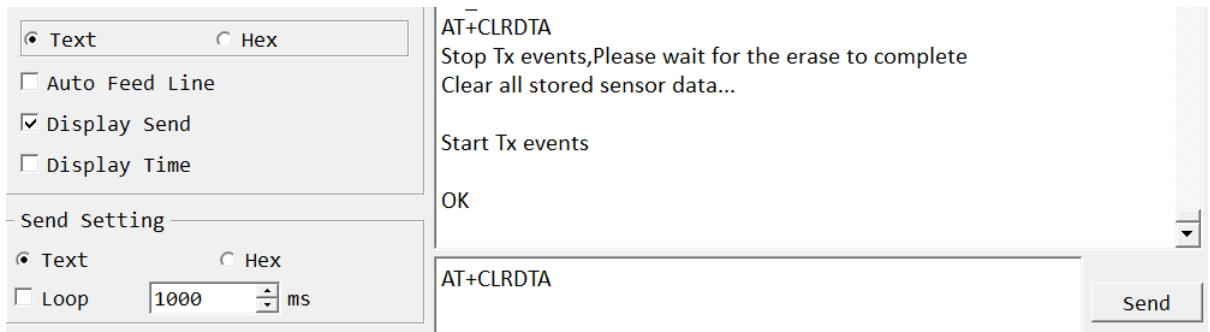
User Manual for LoRaWAN /NB -IoT End Nodes - SW3L -- LoRaWAN Outdoor Flow Sensor

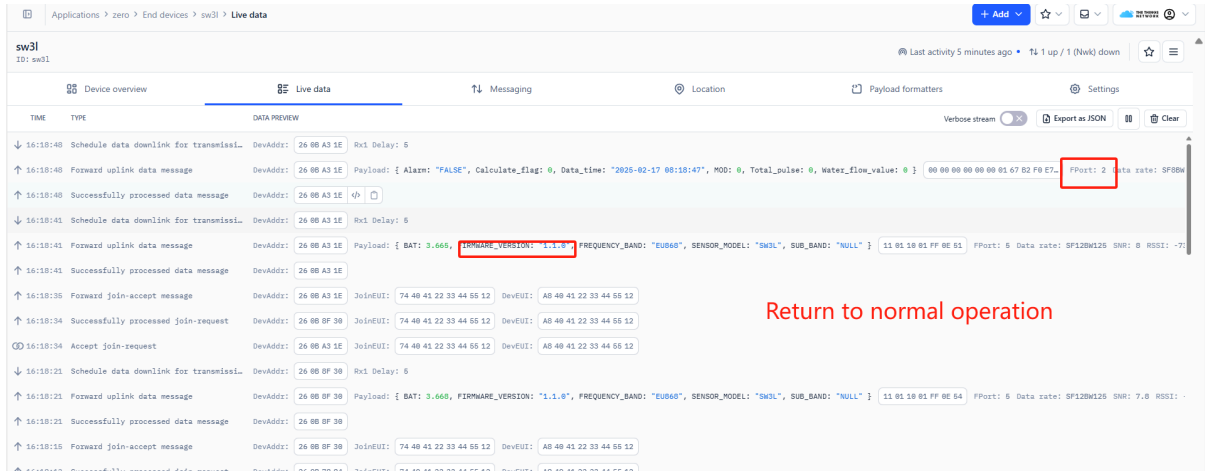
The screenshot displays a 'Live data' tab in a device management interface. The interface includes navigation tabs for 'Device overview', 'Live data', 'Messaging', 'Location', 'Payload formatters', and 'Settings'. The main area shows a log of messages with columns for 'TIME', 'TYPE', and 'DATA PREVIEW'. The log entries include various message types such as 'Forward uplink data message', 'Successfully processed data message', 'Forward join-accept message', 'Successfully processed join-request', 'Accept join-request', and 'Schedule data downlink for transmissi...'. Each entry shows the device address (DevAddr), join EUI (JoinEUI), and device EUI (DevEUI). The 'DATA PREVIEW' column shows the payload of the messages, including battery level (BAT), firmware version (FIRMWARE_VERSION), frequency band (FREQUENCY_BAND), sensor model (SENSOR_MODEL), and sub-band (SUB_BAND). A red box highlights the 'FPort' field in the log entries, which is set to 0. A red text annotation reads 'Only status packets, no FPORT=2 data'.

TIME	TYPE	DATA PREVIEW
16:17:49	Forward uplink data message	DevAddr: 26 08 78 84 Payload: { BAT: 3.665, FIRMWARE_VERSION: "1.1.0", FREQUENCY_BAND: "EU868", SENSOR_MODEL: "SW3L", SUB_BAND: "NULL" } 11 01 18 01 FF 0E 51 FPort: 0 data rate: SF12BW125 SNR: 7 RSSI
16:17:49	Successfully processed data message	DevAddr: 26 08 78 84
16:17:44	Forward join-accept message	DevAddr: 26 08 78 84 JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:17:42	Successfully processed join-request	DevAddr: 26 08 48 AE JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:17:42	Accept join-request	DevAddr: 26 08 78 84 JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:17:18	Schedule data downlink for transmissi...	DevAddr: 26 08 48 AE RxDelay: 5
16:17:18	Forward uplink data message	DevAddr: 26 08 48 AE Payload: { BAT: 3.660, FIRMWARE_VERSION: "1.1.0", FREQUENCY_BAND: "EU868", SENSOR_MODEL: "SW3L", SUB_BAND: "NULL" } 11 01 18 01 FF 0E 54 FPort: 0 data rate: SF12BW125 SNR: 4.2 RSSI
16:17:18	Successfully processed data message	DevAddr: 26 08 48 AE
16:17:13	Forward join-accept message	DevAddr: 26 08 48 AE JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:17:11	Successfully processed join-request	DevAddr: 26 08 09 87 JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:17:11	Accept join-request	DevAddr: 26 08 48 AE JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12
16:16:47	Schedule data downlink for transmissi...	DevAddr: 26 08 09 87 RxDelay: 5
16:16:47	Forward uplink data message	DevAddr: 26 08 09 87 Payload: { BAT: 3.660, FIRMWARE_VERSION: "1.1.0", FREQUENCY_BAND: "EU868", SENSOR_MODEL: "SW3L", SUB_BAND: "NULL" } 11 01 18 01 FF 0E 54 FPort: 0 data rate: SF12BW125 SNR: 9.2 RSSI
16:16:47	Successfully processed data message	DevAddr: 26 08 09 87
16:16:41	Forward join-accept message	DevAddr: 26 08 09 87 JoinEUI: 74 48 41 22 33 44 55 12 DevEUI: AB 48 41 22 33 44 55 12



The device will reset continuously, and we can use the **AT+CLRDTA** command to clear all stored sensor data. Then restart the device and the device will return to normal.





6. Order Info

Part Number: **SW3L-XXX-YYY**

XXX: The default frequency band

- **AS923**: LoRaWAN AS923 band
- **AU915**: LoRaWAN AU915 band
- **EU433**: LoRaWAN EU433 band
- **EU868**: LoRaWAN EU868 band
- **KR920**: LoRaWAN KR920 band
- **US915**: LoRaWAN US915 band
- **IN865**: LoRaWAN IN865 band
- **CN470**: LoRaWAN CN470 band

YYY: Flow Sensor Model:

- 004: DW-004 Flow Sensor: diameter: G1/2" / DN15. 450 pulse = 1 L
- 006: DW-006 Flow Sensor: diameter: G3/4" / DN20. 390 pulse = 1 L
- 010: DW-010 Flow Sensor: diameter: G 1" / DN25. 64 pulse = 1 L
- 020: DW-020 Flow Sensor: diameter: G 2" / DN50. 12 pulse = 1 L

7. Packing Info

Package Includes:

- SW3L Water Flow Sensor x 1

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 inquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to support@dragino.com.