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SL500 Vibration Sensor

Spec for SL500

LoRaWAN Vibration Sensor



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1. General Information

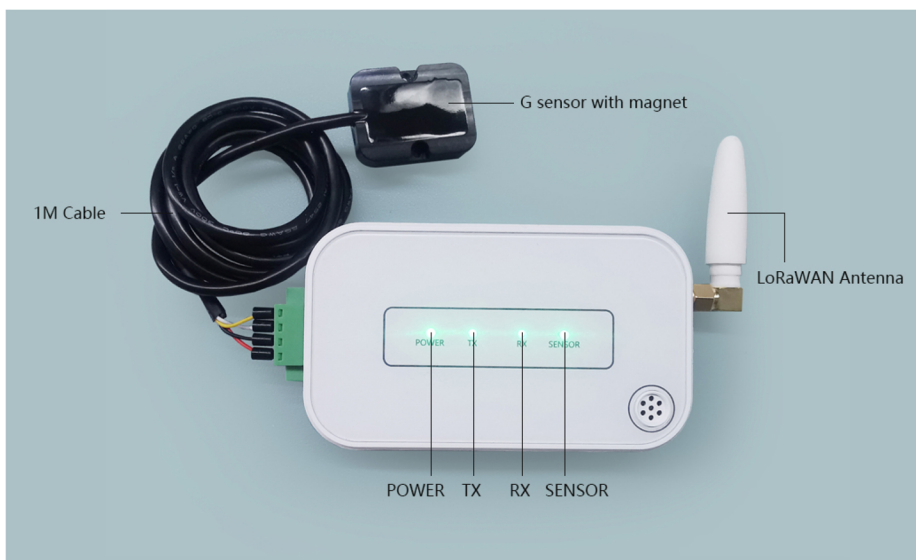
SL500 is long range low power vibration sensor based on Semtech SX1262/SX1268, which is standard LoRaWAN Class A compatible and is widely adopted in equipment monitoring.

Sensor Type	Product Number
G-Sensor	SL500CN, SL500EU,SL500US,SL500AS

1.1 Main features:

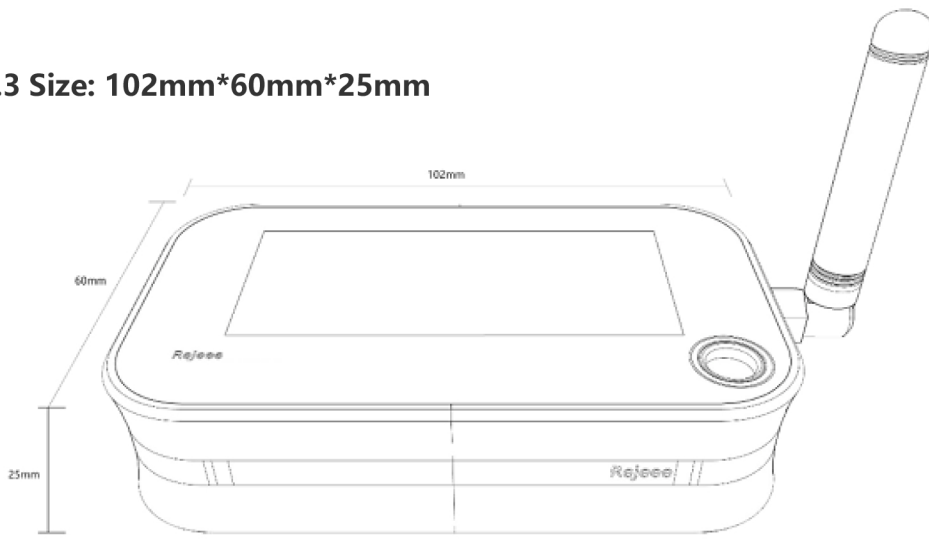
- 3-axis Accelerometer
- Type-C for Local Configuration
- Internal Battery Up to 10 Years
- LoRa SX1262/SX1268, Long Range Low Power
- LoRaWAN Class A Compatible

1.2 Details:

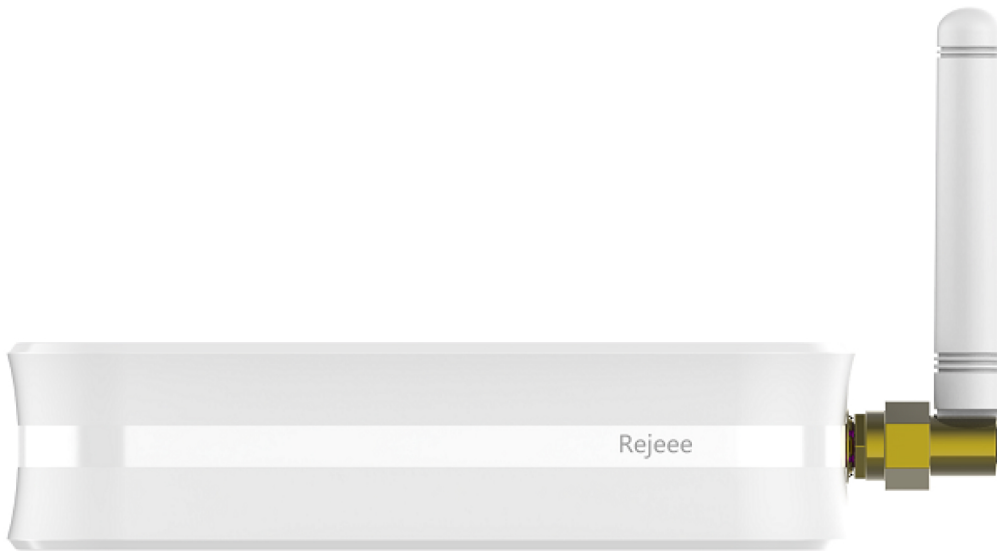


Parameter	Feature
CPU	STM32L151
Wireless	LoRaWAN(SX1262/SX1268)
Encryption	AES128
Battery	Built-in Li-battery (Changeable, and No Recharge)
Battery Capacity	5400mAh
Communication	Half duplex
Sensing Method	G sensor
Lifespan	Up to 10 Years, Data Uploading for Every 10 mins
Data Speed	300bps-62.5k bps
Size	102mm*60mm*25mm
TX Power	22dBm Max
RX Sensitivity	-140 dBm
Frequency	SX1268: CN470 SX1262: EU868 / US915 / AS923

1.3 Size: 102mm*60mm*25mm



1.4 Installation:



Lay the product flat on the table



Hang on the wall

For the G sensor, you can attach to equipment with magnet as below:



2. User Guide

Make sure antenna is well installed before turn on the device.

2.1 Turn on/off the device

When you get the device, it is off. Just press the button for 3 seconds and you can turn on the device. When you turn on the device, there are 4 led on the top, all led will twinkle from left to right. If you turn off the device, press the button for 3 seconds and all led will twinkle from right to left, after turn off the device, no data collecting and uploading.



2.2 Data uploading by press the button

When turn on the device, normally the sensor will read data and upload every 10 mins, if you want to send data immediately, you can just press the button for short time, less than 1 second, and sensor will read and upload data. While press the button, 4 led will be green at the beginning, and then TX led on the device will be green while sending data as below:



2.3 Led display on the device

4 led on top of the device, and they are POWER/TX/RX and SENSOR from left to right as below. POWER is the battery level, normally when you turn on the device, 4 led will be green which means the battery level is 100%. If only 3 led are green which means the battery is 75% left. There is low battery alert and POWER will be red while low battery level.

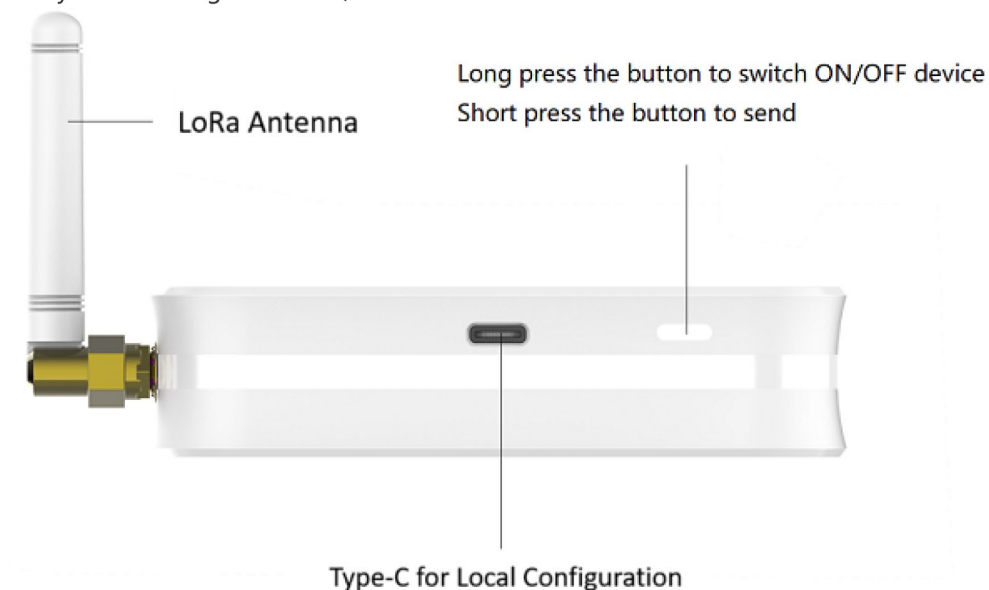
TX and RX means sensor is sending or receiving data.

Sensor is green means sensor is reading and uploading data, if sensor is red, that means sensor is not working, please kindly check if the sensor is will connected.



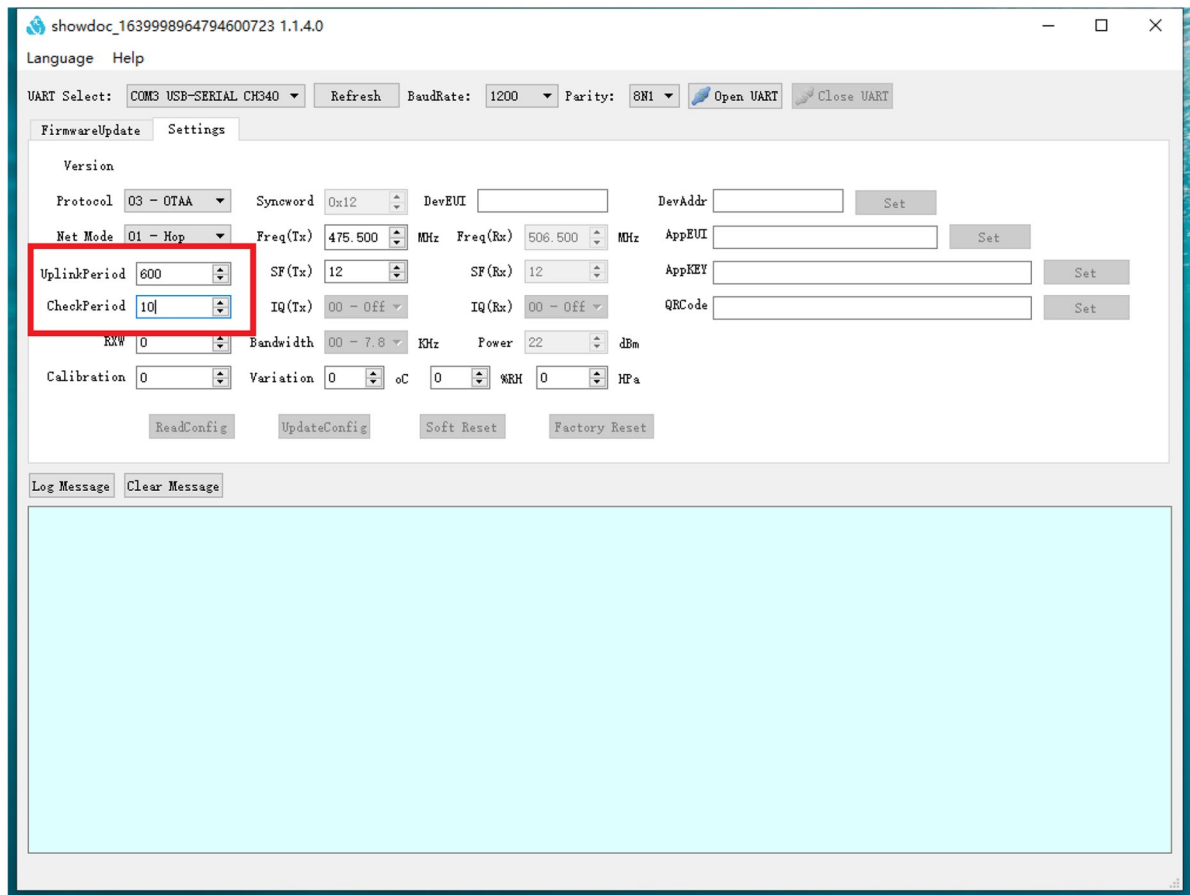
2.4 USB-C Port

There is one USB-C port as below, which is for power on and config, connect device to laptop with a USB-C cable, and you can config the device, make sure to install USB driver and here is the link for driver: [Serial Port Driver](#)



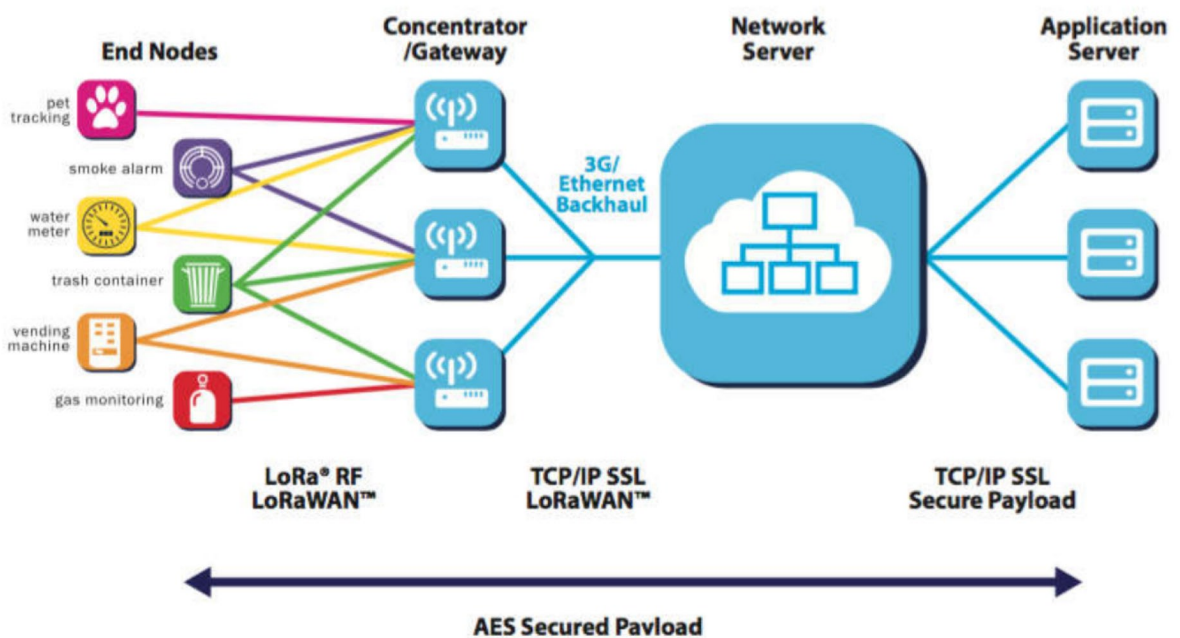
3. Data Uploading

When turn on the device, it will send data immediately, also you can press the button for 1 seconds, then the device will also send data. Normally when you get the device from factory, the default uplink period is every 10 mins and check period is 10 seconds, and if you want to change the period, you can connect the device to



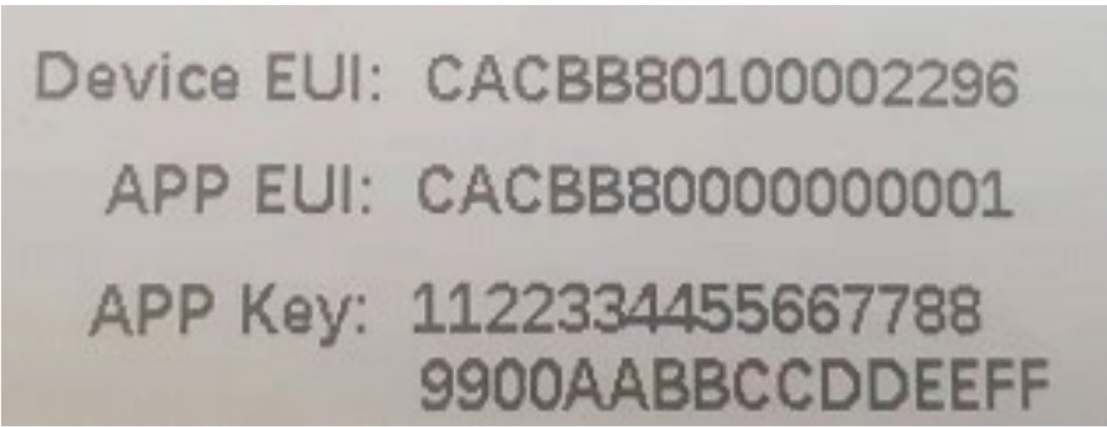
4. Connect to LoRaWAN Network

LoRaWAN Network Structure



SL500 vibration sensor is based on standard LoRaWAN Class A, so you can connect to any LoRaWAN network through OTAA.

On the back of device, you can find information as below, with this information, you can connect to any LoRaWAN server.



Here below take TTN as an example about how to connect the device to TTN server, please make sure to choose manually and the right frequency plan as below:

Sensor	LoRaWAN
SL500CN	<p>From The LoRaWAN Device Repository Manually</p> <hr/> <p>Frequency plan ⓘ *</p> <p>China 470-510 MHz, FSB 11 ▾</p> <p>LoRaWAN version ⓘ *</p> <p>MAC V1.0.3 ▾</p> <p>Regional Parameters version ⓘ *</p> <p>PHY V1.0.3 REV A ▾</p> <hr/> <p>Show advanced activation, LoRaWAN class and cluster settings ^</p> <p>Activation mode ⓘ *</p> <p><input checked="" type="radio"/> Over the air activation (OTAA)</p>
SL500EU	<p>Frequency plan ⓘ *</p> <p>Europe 863-870 MHz (SF12 for RX2) ▾</p> <p>LoRaWAN version ⓘ *</p> <p>MAC V1.0.3 ▾</p> <p>Regional Parameters version ⓘ *</p> <p>PHY V1.0.3 REV A ▾</p> <hr/> <p>Show advanced activation, LoRaWAN class and cluster settings ^</p> <p>Activation mode ⓘ *</p> <p><input checked="" type="radio"/> Over the air activation (OTAA)</p>
SL500US	<p>From The LoRaWAN Device Repository Manually</p> <hr/> <p>Frequency plan ⓘ *</p> <p>United States 902-928 MHz, FSB 2 (used by TTN) ▾</p> <p>LoRaWAN version ⓘ *</p> <p>MAC V1.0.3 ▾</p> <p>Regional Parameters version ⓘ *</p> <p>PHY V1.0.3 REV A ▾</p> <hr/> <p>Show advanced activation, LoRaWAN class and cluster settings ^</p> <p>Activation mode ⓘ *</p> <p><input checked="" type="radio"/> Over the air activation (OTAA)</p>

SL500AS

From The LoRaWAN Device Repository [Manually](#)Frequency plan [ⓘ] *

Asia 923 MHz with only default channels

LoRaWAN version [ⓘ] *

MAC V1.0.3

Regional Parameters version [ⓘ] *

PHY V1.0.3 REV A

[Show advanced activation, LoRaWAN class and cluster settings](#) ^Activation mode [ⓘ] * Over the air activation (OTAA)

And here is the data decoder for TTN platform, just copy the information as below:

```
function decodeUplink(input) {
  var obj = {};
  var warnings = [];
  var len = input.bytes?input.bytes.length:0;
  var offset = 0;
  var dtype;
  offset++;
  /* Battery voltage level: Battery voltage is from 0-31, 31 means battery is 100% left. */
  obj.battery = (input.bytes[offset++]&0x1F);
  /* This field is reserved. Generally, the voltage value of the memory chip is 0.1V. For
  example, the value of 33 is 3.3V */
  obj.vol = (input.bytes[offset++]);
  do {
    dtype = input.bytes[offset++]; /* dtype: Sensor type */
    if(0x01 == dtype){
      /**
       * dtype 01: 3D (G sensor) sensor data
       * evt: Event type: 0x00: Static, 0x01: Vibration, 0x04: Strike
       * acceX: X-axis acceleration, Unit:mg
       * acceY: Y-axis acceleration, Unit:mg
       * acceZ: Z-axis acceleration, Unit:mg
       * angle: Rotation angel
       */
      obj.evt = input.bytes[offset++];
      obj.acceX = (((input.bytes[offset] & 0x80 ? input.bytes[offset] - 0x100 :
input.bytes[offset]) << 8) + input.bytes[offset+1])
      offset += 2;
      obj.acceY = (((input.bytes[offset] & 0x80 ? input.bytes[offset] - 0x100 :
input.bytes[offset]) << 8) + input.bytes[offset+1])
      offset += 2;
      obj.acceZ = (((input.bytes[offset] & 0x80 ? input.bytes[offset] - 0x100 :
input.bytes[offset]) << 8) + input.bytes[offset+1])
      offset += 2;
      obj.angle = input.bytes[offset++];
    }
    len = len - offset;
  } while(len > 0)
  return {
    data: obj,
  }
}
```

```
warnings: warnings
```

```
};  
}
```

Applications > SL101-APP > End devices > eui-00742c6f1948141a > Payload formatters > Uplink

eui-00742c6f1948141a
ID: eui-00742c6f1948141a

Last seen 6 days ago ↑ 1 ↓ n/a

Overview Live data Messaging Location **Payload formatters** Claiming Ge

Uplink Downlink

Setup

Formatter type*
Javascript

Formatter parameter*

```
1 function decodeUplink(input) {  
2   return {  
3     data: {  
4       bytes: input.bytes  
5     },  
6     warnings: [],  
7     errors: []  
8   };  
9 }
```

copy here

5. Wireless LoraWAN Sensor Data Format

Picture as below, FRMPayload is sensor data.

PHYPayload:

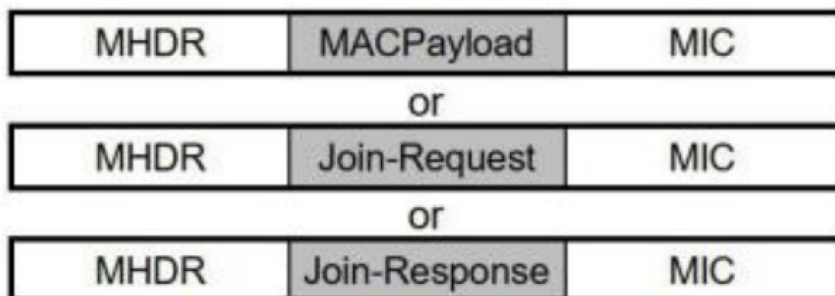


Figure 6: PHY payload structure

MACPayload:



Figure 7: MAC payload structure

MHDR	FHDR	FPort	FRMPayload=Sensor Data(Message)			MIC
			Data 1	...	Data N	4 Bytes
			Type+Value N Bytes	Type+Value N Bytes	Type+Value N Bytes	

6. Sensor Data Definition

6.1 Device Information(0x00)

Type	Value	Value	Value
1 Byte	3 bit	5bit	1 Byte
0x00	Version	Battery Level	Reserve

6.2 G Sensor(0x01)

Type	Value		
1 Byte	length 1 Byte	X 2Bytes Y 2Bytes Z 2Bytes	Reserve 1 Byte
0x01	0x00 Regular 0x01 Vibration	High in front, low in back, int_ 16 signed number e.g 0050 0020 0030 is X=80; Y=32; Z=48	

For Example:

FRM Payload is 00 3F 24 01 00 0040 0080 FC40 00

00 is device information

3F (binary is 0011 1111b)version 1 and level 31

24 is for reserve

01 is vibrating

00 regular status

0040 is X=64mg

0080 is Y= 128mg

FC40 is Z= -960mg

00 is reserve

7. Local Configuration:

Note: Factory reset data uploading is every 10 mins, customers can change data uploading frequency as below: Connect sensor with a USB-C cable to computer for local configuration, through local configuration, you can change the packet frequency. Refer [SensorTool Manual](#).

Parameters interpretation

LFT: Data uplink period

LCP: Sensor sample period

8. Shipping list

LoRaWAN vibration sensor*1

Mounting brackets*1

LoRaWAN antenna*1