SL710 Water Pressure Sensor

SL710 Water Pressure Sensor User Manual

1. General

SL710 series is a low-power water pressure monitoring sensor. The pressure seat is processed with 17-4PH stainless steel one-piece structure, with high overload performance. The pressure interface has no welds, silicone oil or other organic substances, and has good sealing performance. LoRa wireless communication ensure low power consumption, long distance, built-in high-capacity lithium sub battery and long service life. It can be used in low-power wide area IOT scenarios such as water pipe and valve pressure detection.

Sensor Type	Model No.
Water Pressure Sensor	SL710CN, SL710EU,SL710US,SL710AS

Note
CN: LoRaWAN CN470，Frequency：470~510 MHz
EU: LoRaWAN EU868，Frequency：863~870 MHz
US: LoRaWAN US915，Frequency：902~928 MHz
AS: LoRaWAN AS923，Frequency：920~925 MHz

1.1.Main Features:

- 1.The maximum transmission power is 22dbm, the transmission distance is long, and the open space can reach 3-5 km.
- 2.Built in 19ah high-capacity lithium sub battery, with a service life of more than 5 years.

- 3.The new generation of pressure transmitter is adopted, which has the electrical characteristics of high precision, high reliability and low power consumption.
- 4.Wireless inquiry and modification of configuration parameters are convenient for on-site installation and maintenance.
- 5.Open communication protocol and access to the third-party Lora gateway with simple configuration.
- 6.Full industrial chip design, working temperature range -40 ℃ ~+85 ℃.
- 7.IP66 waterproof design, suitable for harsh industrial environment.

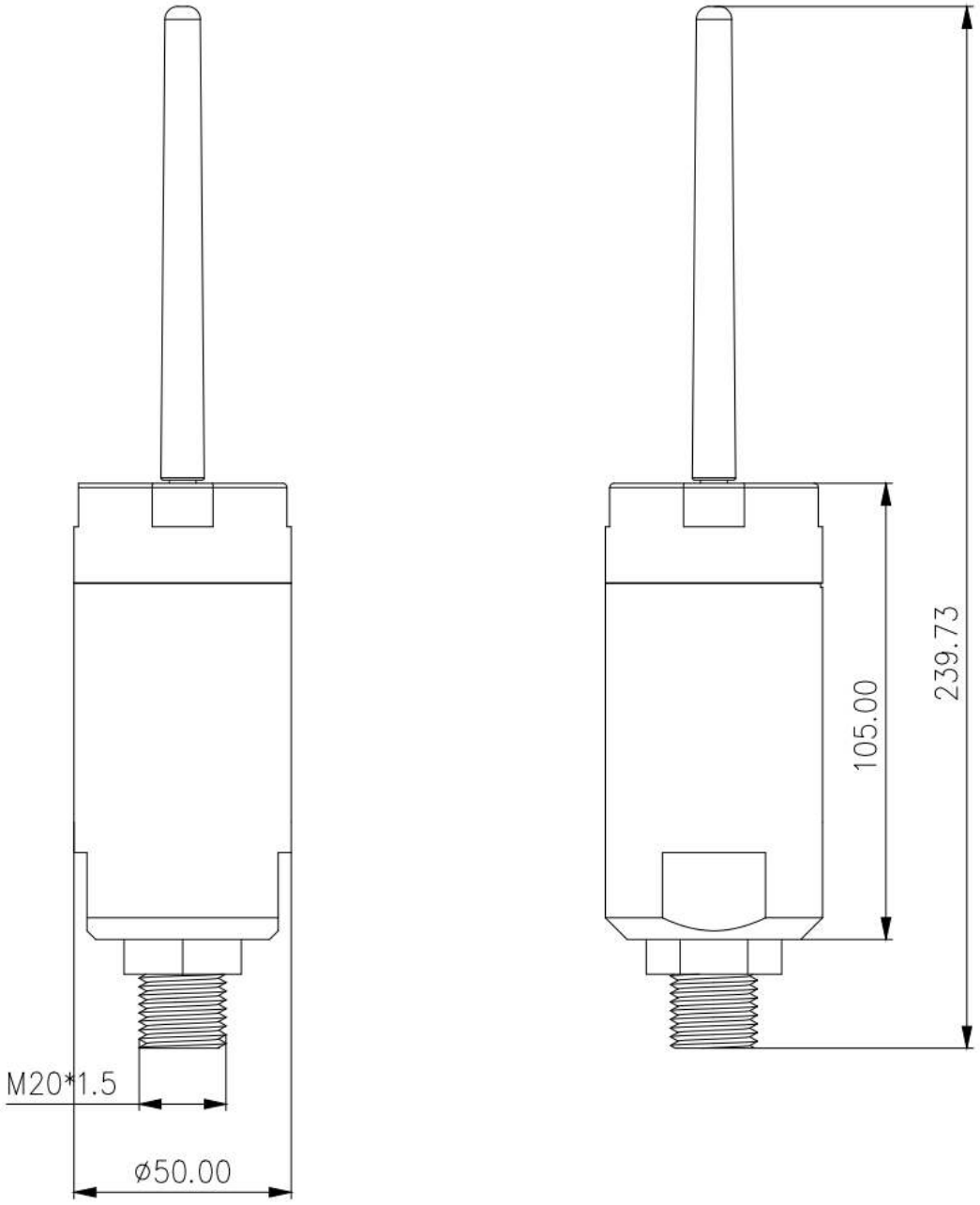
1.2. Parameters

Parameters	Feature
CPU	STM32L151 CPU
Wireless	LoRa（SX1268/SX1262）
Encryption	AES128
Power	Built-in Li-battary（Non-rechargable）
Capacity	19000 mAh
Battery life	8 Years(Data collecting every 5 seconds， data uploading every mins @SF9）
Measure Range	0~3.5 MPa
Precision	±0.5 %FS
Long Time Stability	±0.25 %FS

Parameters	Feature
Respond Time	5 Seconds（e.g data collecting time, configurable）
Communication	Half-duplex
Data Speed	300bps ~ 62.5 kbps
Size	102mm X 60mm X 25mm
Working Temperature	-40℃~85℃
TX Power	Max 22dBm
Sensitivity	-140 dBm
Antenna	SMA
Frequency	SX1268: CN470 SX1262: EU868 / US915 / AS923

1.3. Product Detail

Front



Size

2. Installation

Note:

1. Do not forcibly rotate the cylinder part of the sensor to avoid damaging the internal circuit of the sensor
2. When installing, please use a wrench to twist the hexagon nut part, and do not force the installation through the cylinder part of the sensor.
3. The impulse piping should be as short as possible and avoid sharp bends.
4. The installation slope of impulse piping should not be less than 1:12 to avoid sedimentation.
5. The layout of the impulse piping shall enable the bubbles in the measured liquid or the sediment in the measured gas to flow back to the process piping.
6. During installation, pay attention to the sealing of the interface to avoid oil leakage.

2.1.Magnetic induction trigger

The sensor enters the configuration mode through magnet induction triggering. When there is no magnet close to the magnetic induction area by default, the sensor is in a low-power operation state. When a magnet enters the sensing area, the sensor will trigger a configuration wait mode. (the magnet only needs to be detected once, and it is not necessary or recommended to stay in the sensing area for a long time.)

After entering the configuration waiting mode, the indicator light will remain green. At this time, LoRa dongle can be used for configuration and query. When there is configuration or query operation, the sensor will automatically extend the configuration time by 30s. If there is no operation for 30 seconds, enter the low-power operation mode.

2.2. Indicator

There is one indicator on the sensor with two colors: red and green.

2.2.1. Comfiguration indicator

while magnetic induction trigger, and in configuration, the indicator is green. While indicator is off, and sensor is in low power mode.

2.2.2. TX Indicator

While the sensor uploading data, and the indicator flushes in green.

2.2.3. Fault Indicator

While there is something wrong with the sensor, the indicator flushed in red.

2.4. Wireless Configuration

When the device enters the configuration mode, it supports wireless at commands and can be configured wirelessly through Rejeee USB dongle.
You can use SensorTool for configuration.
Follow steps below：http://doc.rejeee.com/web/#/32?page_id=449

2.5.Antenna

The antenna interface of the equipment adopts standard SMA and the specification of external thread and internal hole. During installation, attention shall be paid to avoiding metal and strong interference equipment. If the installation environment is poor, it is recommended to use a sucker antenna with feeder for installation.

2.6.Data Uploading

When sensor turn on, it will send data immediately.
When the pressure changes more than the set change compared with the last reported data, data uploading immediately.
When the system heartbeat cycle time expires, data uploading.

3. Configuration

3.1.Data check period

The default check period of the system is 5 seconds, the minimum configurable is 1 second, and the maximum configurable is 65553 seconds. The smaller the period is, the more sensitive the response will be, whereas the power consumption will increase.

3.2.Data uplink period

The default data uplink period of the system is 10 minutes (equivalent to heartbeat transmission). For example, in the environment of constant water pressure, the data is uploading every 10 minutes, and this parameter can be adjusted according to the actual situation.

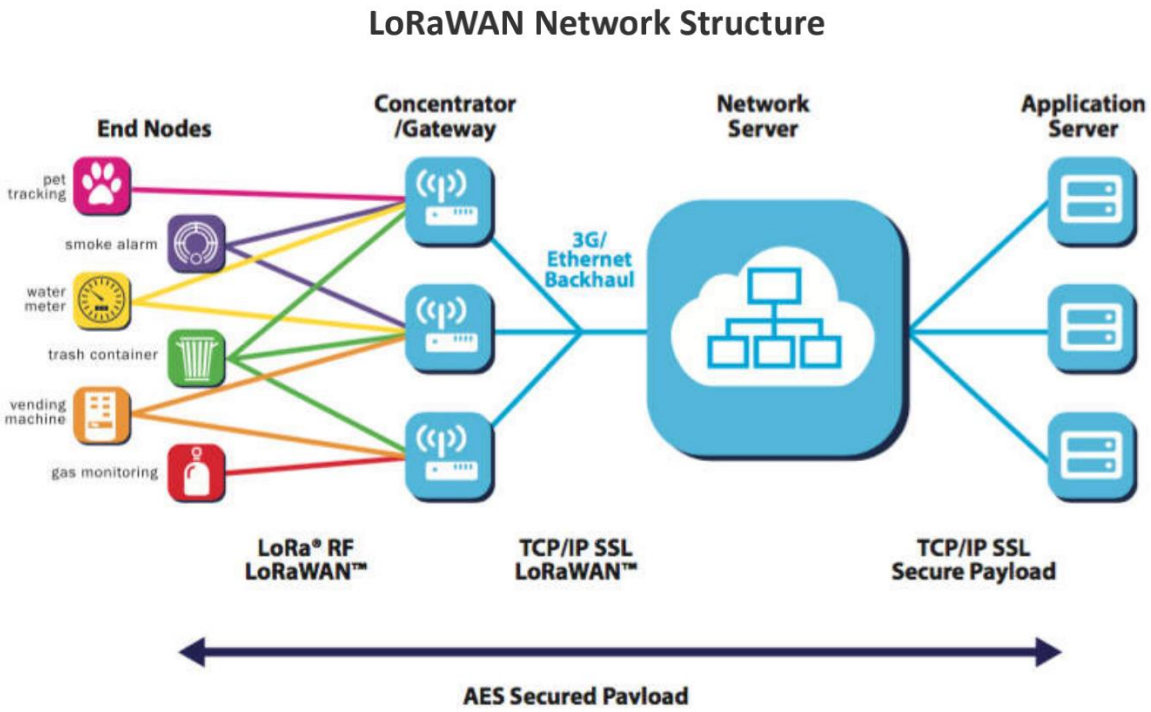
3.3.Calibration

The system does not configure the calibration value by default (i.e. 0). The user can modify the calibration value as needed. Negative numbers are supported. The unit is PA

3.4.Variation

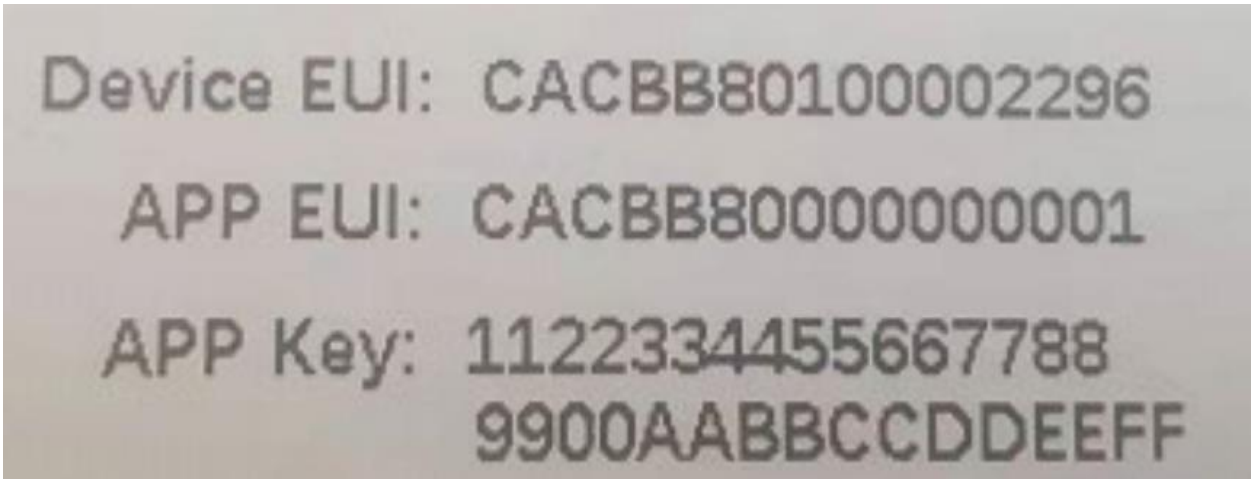
The system does not configure the change amount by default (that is, 0). In the water pressure sensor equipment, because the equipment range is generally large, when the change amount is 0, 5000 PA is automatically used as the change amount in the equipment for logical judgment.
The purpose of the design variation is to support the equipment to judge the variation according to the sampling cycle while reporting it by cycle. When the sampling data and the last sent data exceed the change amount, they will be reported immediately without waiting for the reporting cycle time. In order to support a rapid response to the measured object.

3.5. Connect to LoRaWAN Network

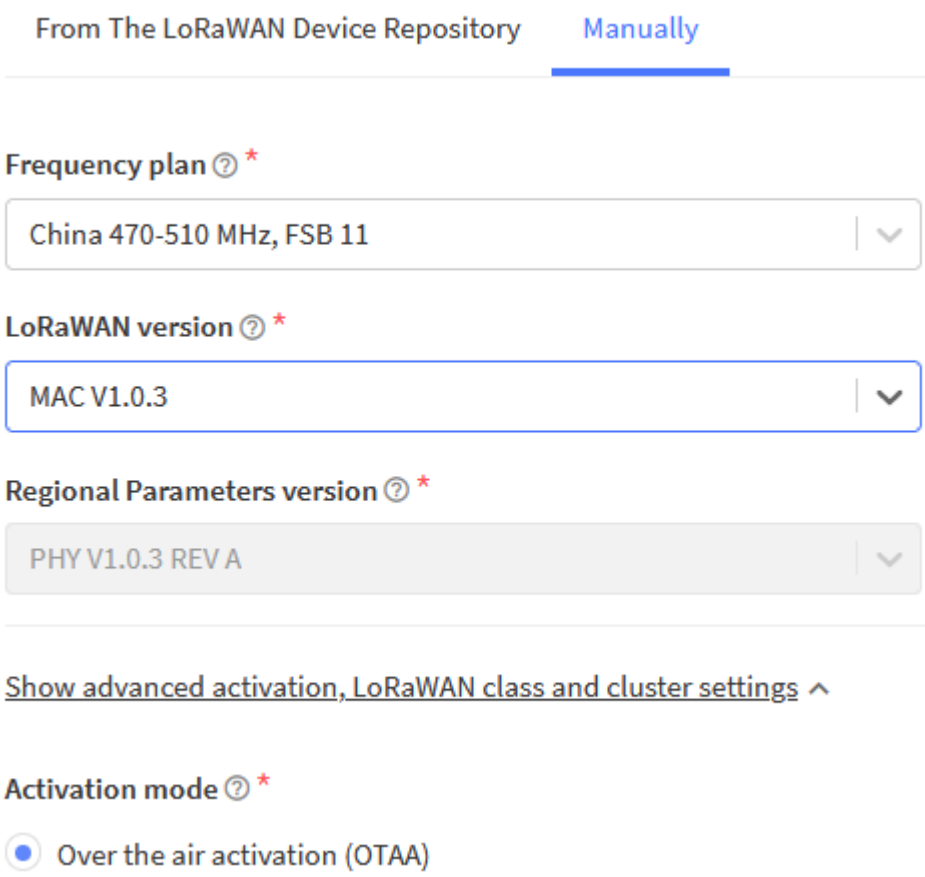


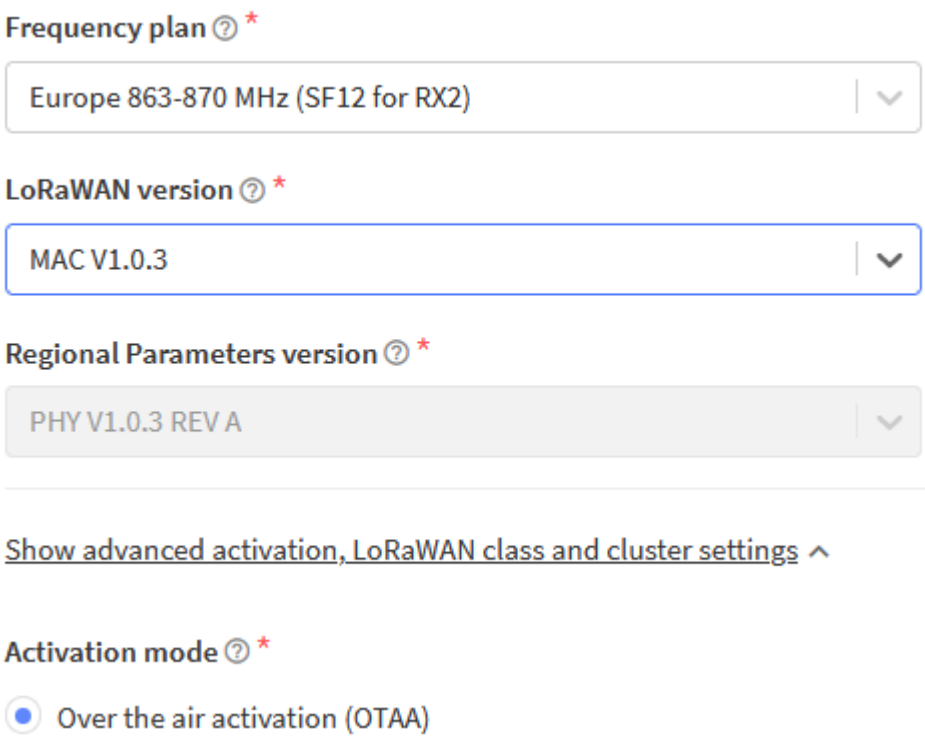
SL710 water pressure sensor is based on standard LoRaWAN Class A/C, so you can connect to any LoRaWAN network through OTAA or ABP.

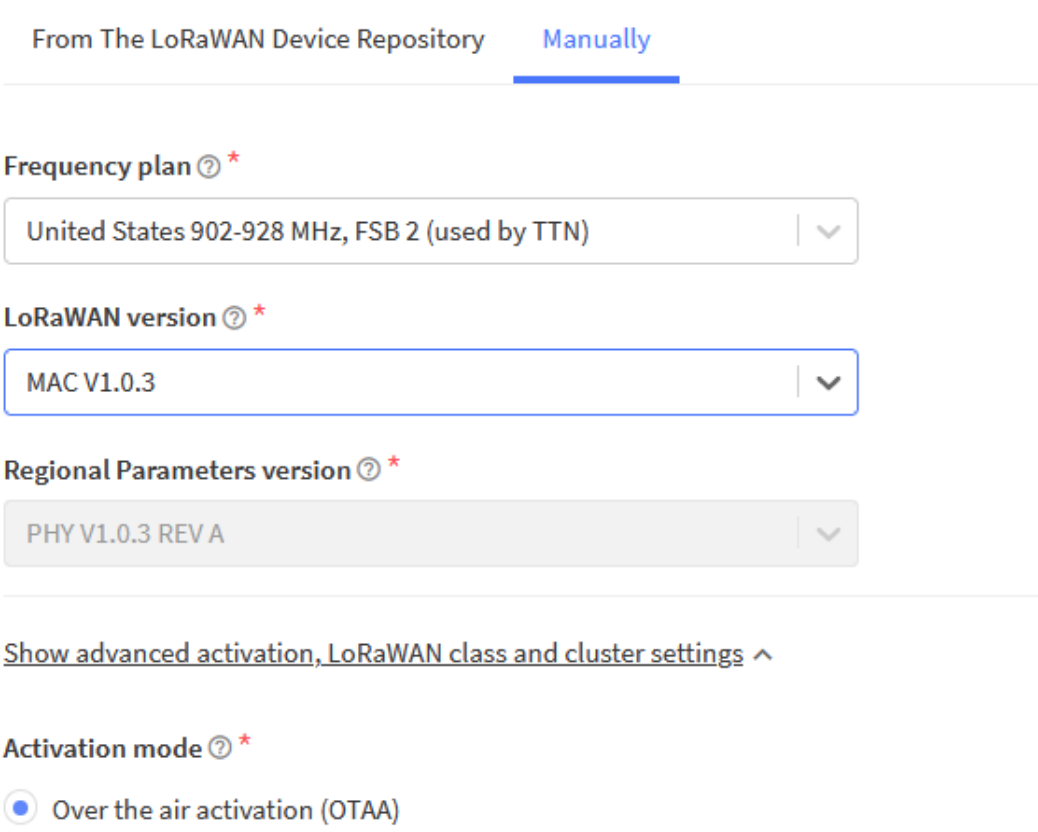
On the package of device, you can find information as below, with this information, you can connect to any LoRaWAN server.

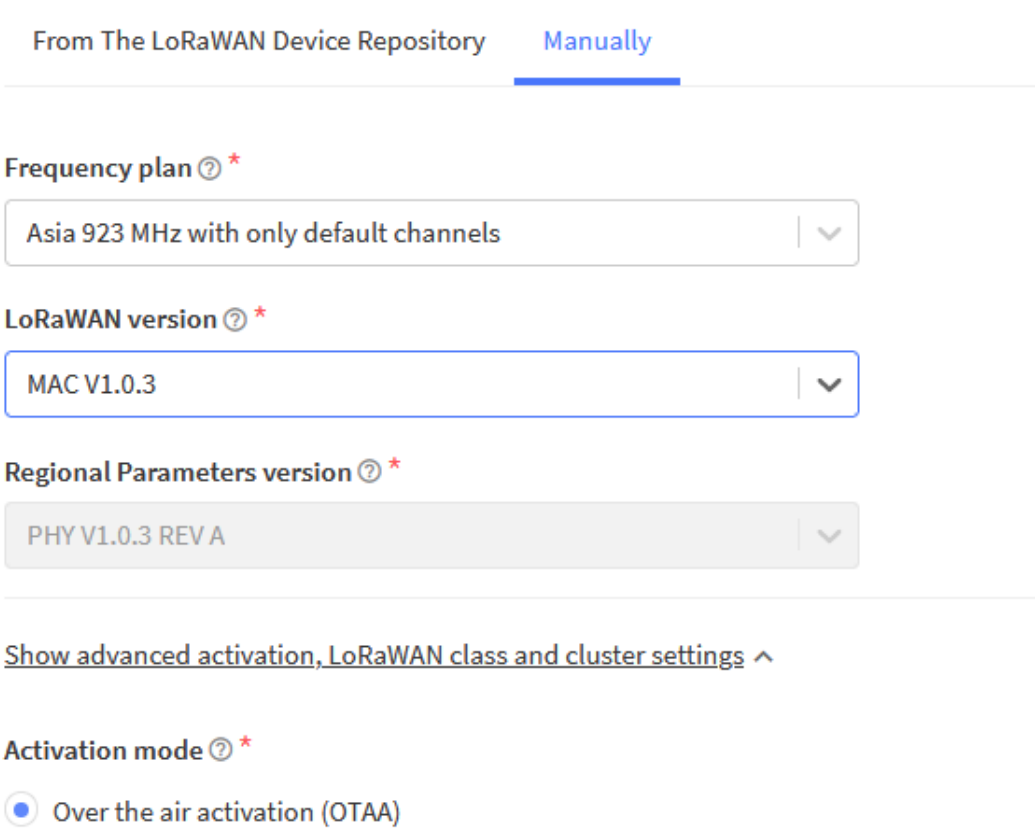


Here below take TTN as an example about how to connect the device to TTN server, please make sure to choose manually and the right frequency plan as below:

Sensor	LoRaWAN
SL710CN	

Sensor	LoRaWAN
SL710EU	

Sensor	LoRaWAN
SL710US	

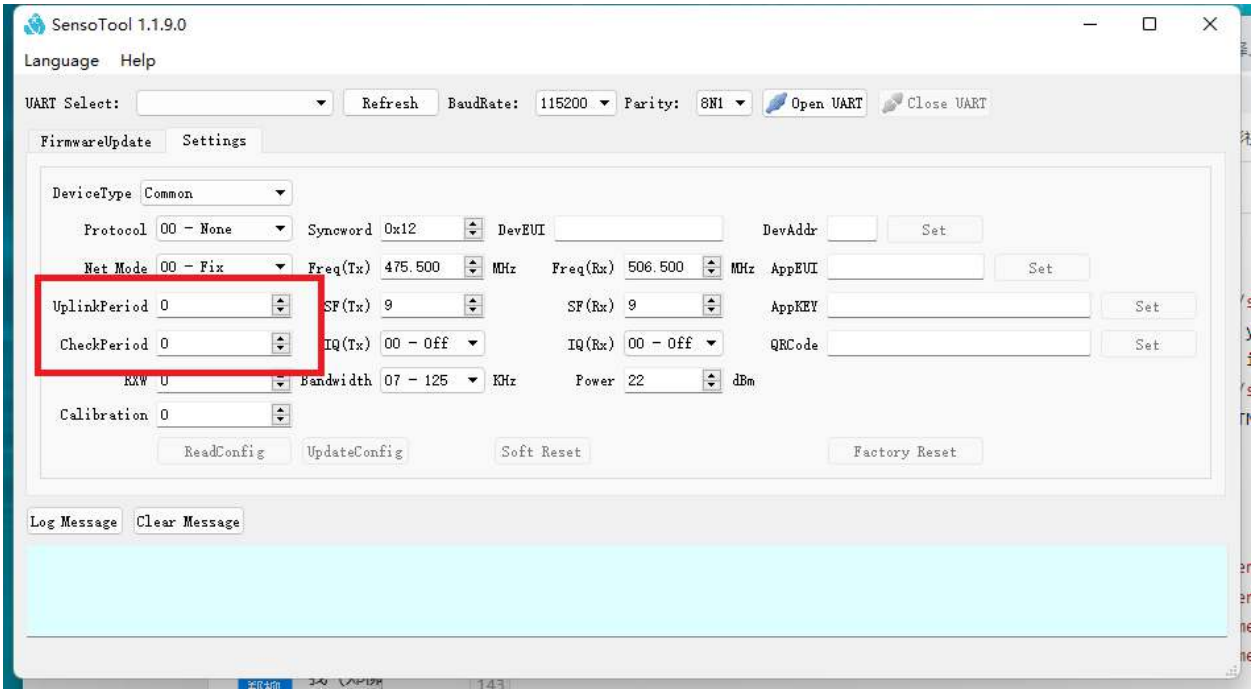
Sensor	LoRaWAN
SL710AS	

3.5.1 Data Configuration

Normally customer only needs to configure the following information under LoRaWAN:

- **Uplink Period**: Data uploading Period, that means sensor collect data and send to gateway

- **Check Period**：Data collecting period, that means sensor collect data but not upload



4.Wireless Data Format

4.1 SIP（02/03）— LoRaWAN

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

FPort：1

FRMPayload：e.g sensor data(Message Body)

Refer to Rejeee sensor data。

4.2 Sensor Data

4.2.1 Device Information（0x00）

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

4.2.3.Pressure（0x07）

Type 1 Byte	Value 4 Bytes	Note
0x07	Pressure	4-byte signed integer, default uni

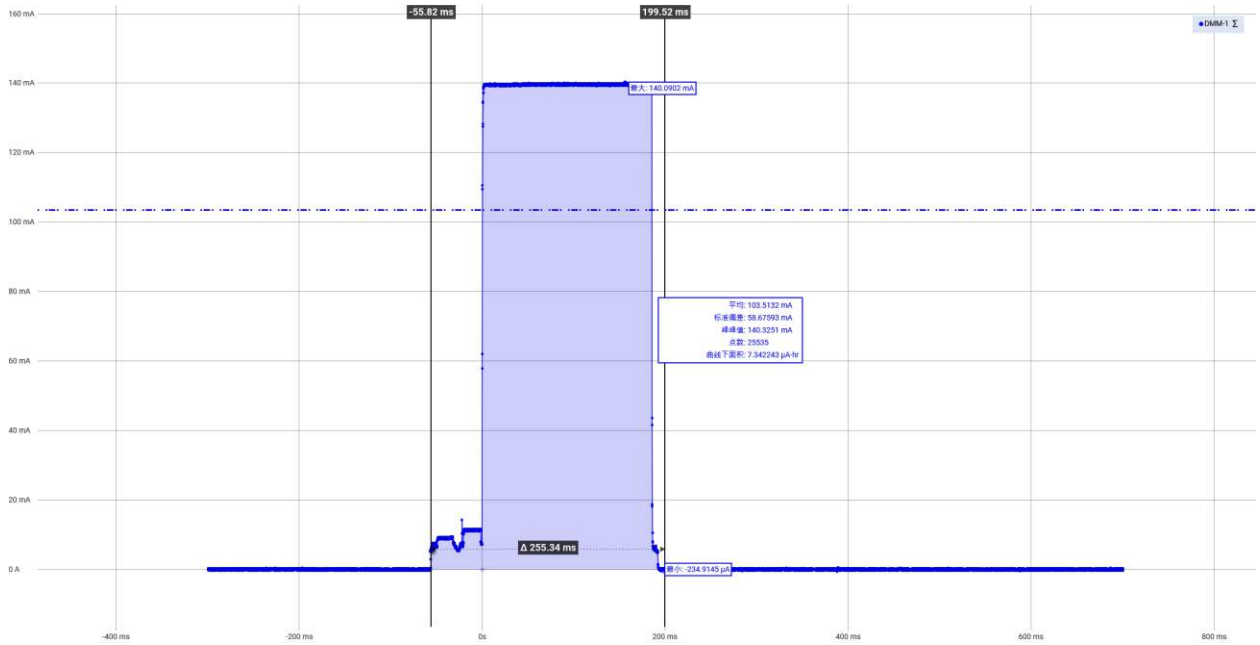
5.Feature Test

		功耗/次数			
运行时间（天）	1				
采样周期LCP(秒)	5	17280	次		
上报周期LFT(秒)	600	144	次		
扩频因子SF	9				
发送时长	0.225	s			
采样时长	35	ms			
发送平均电流	140	mA			
采样电流	9	mA			
休眠平均电流	0.006	mA			
单次采样功耗	0.0875	uAh			
单次发送功耗	8.75	uAh			
			占比	1年功耗	
采样功耗	1.512	mAh	51.85%	551.88	mAh
发送功耗	1.26	mAh	43.21%	459.9	mAh
休眠功耗	0.144	mAh	4.94%	52.56	mAh
预计总功耗	2.916	mAh		1064.34	mAh

5.1.Standby Current

Pic：Standby Current

5.2. Sensor TX Current

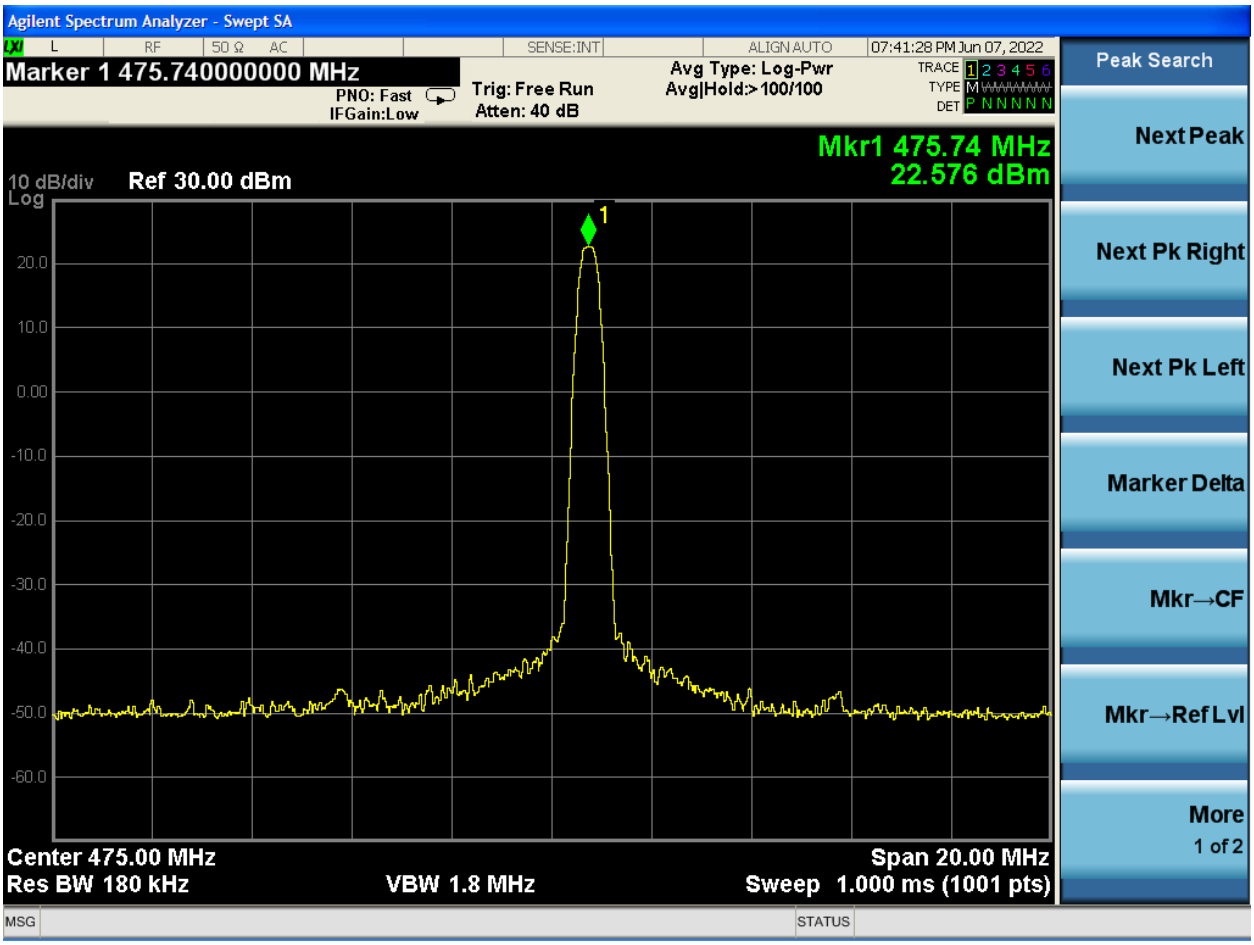


Pic: TX Current（SF9）

5.3.Sensitivity Test

扩频因子 SF	接收灵敏度 dBm，@BW=125K，470MHz
SF=7	-126
SF=8	-129
SF=9	-131
SF=10	-134
SF=11	-136
SF=12	-139

5.4.TX Power Test



Pic: Max TX Power

6.CRC Example

```
static uint16_t get_crc16(uint16_t inData, uint16_t outData) {
outData = (outData >> 8) | (outData << 8);
outData ^= inData;
outData ^= (outData & 0xff) >> 4;
outData ^= outData << 12;
outData ^= (outData & 0xff) << 5;
return outData;
}

static uint16_t cal_crc16(const uint8_t *pData, const uint32_t len)
{
uint32_t i = 0;
uint16_t crc16 = 0xFFFF;
for (i = 0; i < len; i++) {
crc16 = get_crc16(*(pData++), crc16);
```

```
16. }
17. return crc16; }
```