



# EM300 Series User Guide



## Safety Precautions

Ursalink will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

- ❖ The device must not be remodeled in any way.
- ❖ The device is not intended to be used as a reference sensor, and Ursalink will not should responsibility for any damage which may result from inaccurate readings.
- ❖ Do not place the device close to objects with naked flames.
- ❖ Do not place the device where the temperature is below/above the operating range.
- ❖ Make sure electronic components do not drop out of the enclosure while opening.
- ❖ When installing the battery, please install it accurately, and do not install the reverse or wrong model.
- ❖ Make sure both batteries are newest when install, or battery life will be reduced.
- ❖ The device must never be subjected to shocks or impacts.

## Declaration of Conformity

EM300 series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.



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## Revision History

Date	Doc Version	Description
October 14, 2020	V 1.0	Initial version
October 21, 2020	V 1.1	Model name change and pictures replace

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## 1. Introduction

### 1.1 Overview

EM300 series is a sensor mainly used for outdoor environment through wireless LoRa network. EM300 device is battery powered and designed for multiple mounting ways. It is equipped with NFC (Near Field Communication) and can easily be configured by a smartphone or a PC software.

Sensor data are transmitted in real-time using standard LoRaWAN protocol. LoRaWAN enables encrypted radio transmissions over long distance while consuming very little power. The user can obtain sensor data and view the trend of data change through Uursalink Cloud or through the user's own Network Server.

### 1.2 Features

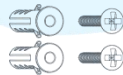
- Up to 11km communication range
- Easy configuration via NFC
- Standard LoRaWAN support
- Uursalink Cloud compliant
- Low power consumption with 4000mAh replaceable battery

## 2. Hardware

### 2.1 Packing List



1 × EM300



Wall Mounting  
Kits



1 ×  
Warranty Card



1 ×  
Quick Guide



Mounting Screws (for  
SLD or MCS sensor)



Double Sided Tape(for  
SLD or MCS sensor)

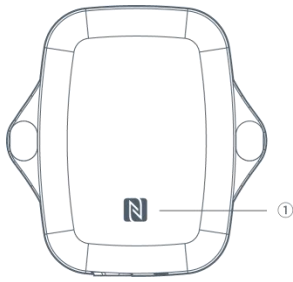


1 × NFC  
Reader(Optional)



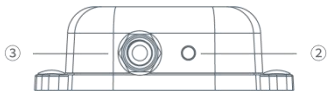
**If any of the above items is missing or damaged, please contact your Uursalink sales representative.**

## 2.2 Product Overview



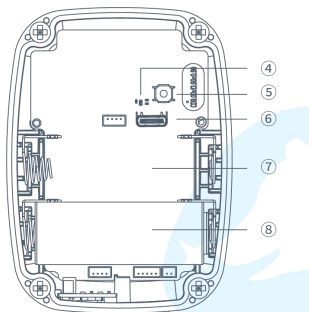
**Front View:**

- ① NFC Area



**Bottom View:**

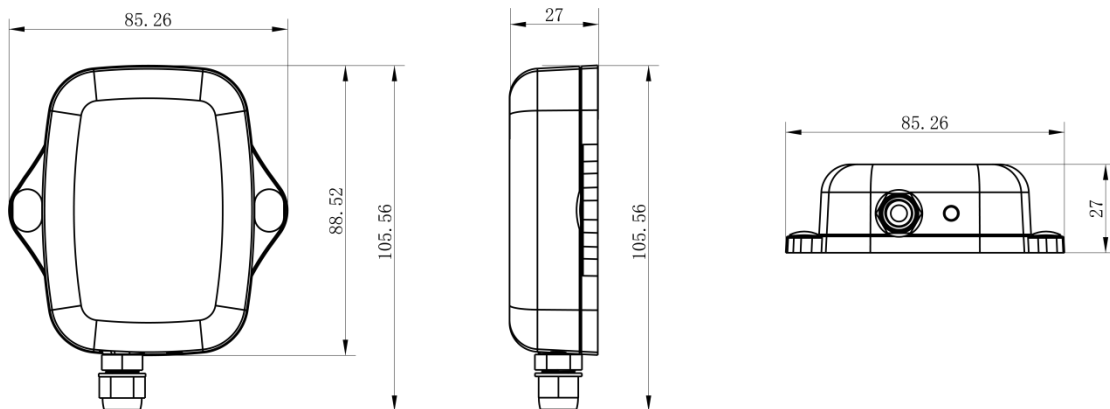
- ② Vent
- ③ Waterproof Connectors  
(For water leakage and magnet switch sensor)



**Internal View:**

- ④ LED
- ⑤ Power Button
- ⑥ USB Type-C
- ⑦ Expandable Battery Slot
- ⑧ Battery

## 2.3 Dimensions(mm)



## 2.4 Power Button Descriptions

**Note:** The LED indicator and power button are inside the device. EM300 can also be turned on/off and reset via Mobile APP or Toolbox.

Function	Action	LED Indication
Turn On	Press and hold the button for more than 3 seconds.	Off → Static Green
Turn Off	Press and hold the button for more than 3 seconds.	Static Green -> Off
Reset	Press and hold the button for more than 10 seconds. <b>Note:</b> EM300 will automatically power on after reset.	Blink 3 times.
Check On/Off Status	Quickly press the power button.	Light On: Device is on. Light Off: Device is off.

## 3. Configuration

EM300 sensor can be monitored and configured via one of the following methods:

- Mobile APP (NFC);
- Windows software (NFC or Type-C port).

In order to protect the security of sensor, password validation is required when configuring via unused phone . Default password is **123456**.

### 3.1 Configuration via Smartphone APP

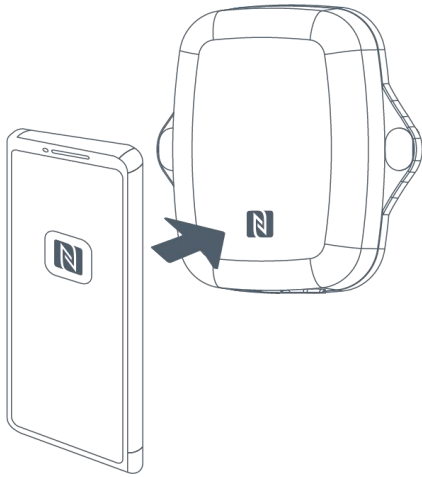
#### Preparation:

- Smartphone (NFC supported)
- Toolbox APP: download and install from Google Play or Apple Store.

#### 3.1.1 Read/Write Configuration via NFC

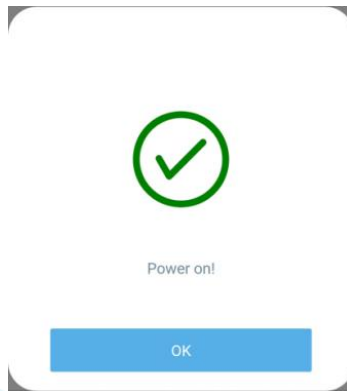
1. Enable NFC on the smartphone and open "Toolbox"APP.
2. Attach the smartphone with NFC area to the device to read basic information.

**Note:** Ensure your smartphone NFC area and it is recommended to take off phone case before using NFC.



EM300-SLD-470M		
Status	Setting	Reset
SN	6136A34715402206	
Model	EM300-SLD-470M	
Device EUI	24e124136a347154	
Firmware Version	V1.11	
Hardware Version	V2.0	
Device Status	Off <input type="checkbox"/>	

3. Change the on/off status or parameters, then attach the smartphone with NFC area to the device until the APP shows a successful prompt.



4. Go to "Device > Status" to tap "Read" and attach the smartphone with NFC area to the device to read real-time data of sensor.

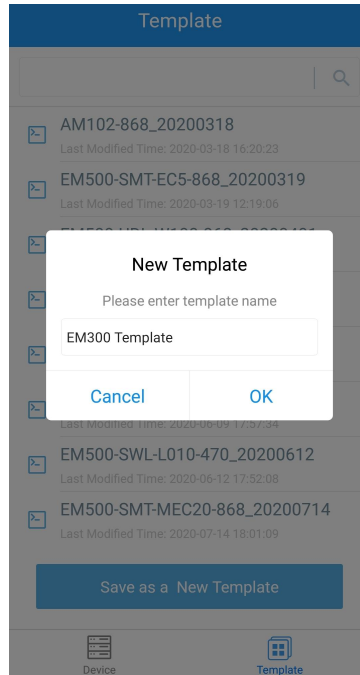
EM300-SLD-470M		
Status	Setting	Reset
Model	EM300-SLD-470M	
Device EUI	24e124136a347154	
Firmware Version	V1.11	
Hardware Version	V2.0	
Device Status	ON <input checked="" type="checkbox"/>	
Join Status	De-activated	
RSSI/SNR	0/0	
Temperature	27.5 °C	
Humidity	58.5 %	
Leakage status	No leak	
<input type="button" value="Read"/>		
<input type="button" value="Device"/> <input type="button" value="Template"/>		

### 3.1.2 Template Configuration

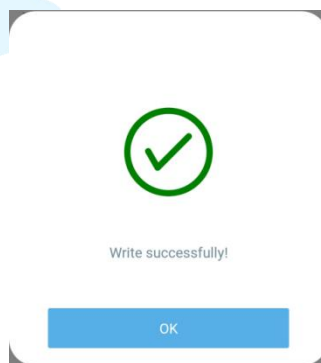
Template settings only work for easy and quick device configuration in bulk.

**Note:** Template function is allowed only for sensors with the same model and LoRa frequency band.

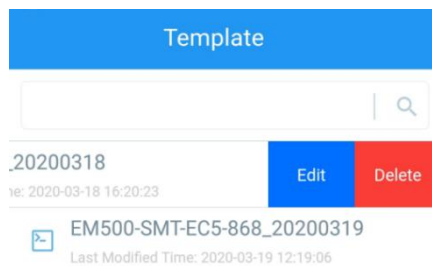
1. Go to “Template” page on the APP and save current settings as a template.



2. Attach the smartphone with NFC area to another device.
3. Select the template file from Toolbox APP and tap “Write”, keep the two devices close until the APP shows a successful prompt.



4. Slide the template item to the left to edit or delete the template.





## 3.2 Configuration via PC

### Preparation:

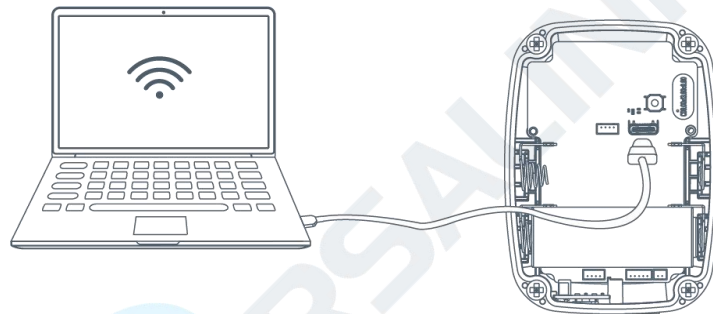
- Dedicated NFC Reader or Type-C USB cable
- PC (Windows 10)
- Toolbox: <https://www.ursalink.com/en/software-download/>

### 3.2.1 Log in the Toolbox

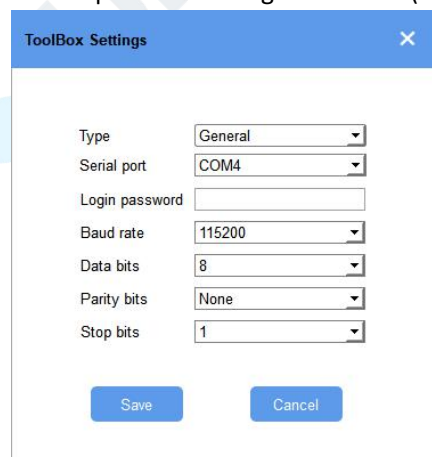
Make sure “Toolbox” is downloaded on your computer. Select one of the following methods to log in Toolbox.

#### Type-C Connection

1. Open the case of EM300 and connect the EM300 to computer via type-C port.

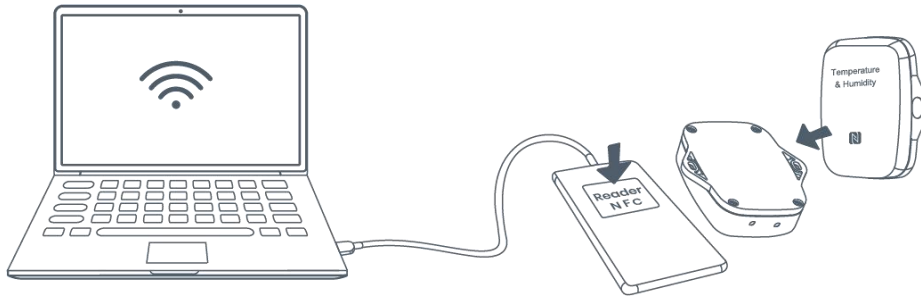


2. Select type as “General” and click password to log in Toolbox. (Default password: 123456)

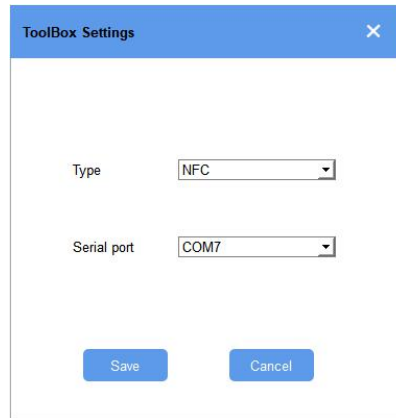
A screenshot of a software dialog box titled 'ToolBox Settings'. The dialog has a blue header bar with a close button (X). It contains several configuration fields: 'Type' (dropdown menu set to 'General'), 'Serial port' (dropdown menu set to 'COM4'), 'Login password' (text input field), 'Baud rate' (dropdown menu set to '115200'), 'Data bits' (dropdown menu set to '8'), 'Parity bits' (dropdown menu set to 'None'), and 'Stop bits' (dropdown menu set to '1'). At the bottom of the dialog are two buttons: 'Save' and 'Cancel'.

#### NFC Connection

1. Connect the NFC reader to computer, then attach the EM300 to NFC area of the reader.



2. Select type as “NFC” and serial port as NFC reader port on Toolbox.



### 3.2.2 Basic Configuration

1. Click “Read” to read current data of the sensor.

**Status >** Read Power Off

Model:	EM300-SLD-470M
Serial Number:	6136A34715402206
Device EUI:	24E124136A347154
Firmware Version:	01.11
Hardware Version:	2.0
Device Status:	On
Join Status:	De-Activate
RSSI/SNR:	0/0
Status:	No leak
Temperature:	27.2°C
Humidity:	55.5%
Battery:	100%
Channel Mask:	00#00000000000000000000
Uplink Frame-counter:	0
Downlink Frame-counter:	0

2. When you perform one of the following operations, enter the password and wait a few seconds until toolbox shows a successful prompt. (Password is not need if you connect it via type-C port)

- Turn on/off the sensor
- Reset the sensor
- Click “Write” to change settings
- Upgrade

LoRaWAN > Read Write

Basic
Channel

Device EUI

**Verify Password** ✕

Password:

Enter

Please put the NFC antenna close to the NFC reader.

Regular Report Confirmed

ADR Mode

Save

Downlink Frame-counter: 1

Success
Firmware Version: 01.01

### 3.2.3 Template Settings

**Note:** Template function is allowed only for sensors with the same model and LoRa frequency band.

1. Go to “Maintenance -> Template and Reset” page in Toolbox.
2. Click “Export” to save the current settings as a template.
3. Click “Browse” to select the correct template from computer.
4. Click “Import” to import the template to the device.

Upgrade
Template and Reset

Template Export

Config File  Browse Import

Restore Factory Defaults Reset

### 3.2.4 Upgrade

1. Download firmware on your computer.
2. Go to “Maintenance -> Upgrade” page in Toolbox.
3. Click “Browse” and select the firmware from computer.
4. Click “Upgrade” to upgrade the device.

**Note:** If NFC connection is selected, please keep the two devices close and don't move them in order to get the best connectivity as possible when upgrading.

#### Upgrade >

Upgrade		Backup and Reset	
Model:	EM300-SLD-470M		
Firmware Version:	01.11		
Hardware Version:	2.0		
FOTA:	Up to date		
Update Locally	<input type="text"/>	Browse	Upgrade

## 3.3 Configuration Examples

### 3.3.1 LoRaWAN Channel Settings

The configuration of LoRaWAN channel of EM300 must match the LoRaWAN gateway's. Refer to [Appendix](#) to check default channel settings of EM300.

#### Mobile APP Configuration:

Open Toolbox APP and go to “Device -> Setting -> LoRaWAN Settings” to change the frequency and channels.

#### Software Configuration:

Log in Toolbox and go to “LoRaWAN Settings -> Channel” to change frequency and channels.

**Note:** If frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

**Examples:**

1, 40: Enabling Channel 1 and Channel 40

1-40: Enabling Channel 1 to Channel 40

1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60

All: Enabling all channels

Null: Indicates that all channels are disabled

**LoRaWAN >**

Support Frequency: AU915

Enabled Channel Index: 0-71

Channel Index	Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	915.2 - 918.2	0.2	125
16 - 31	918.4 - 921.4	0.2	125
32 - 47	921.6 - 924.6	0.2	125
48 - 63	924.8 - 927.8	0.2	125
64 - 71	915.9 - 927.1	1.6	500

Note:  
64 channels numbered 0 to 63 utilizing LoRa 125 kHz BW starting at 915.2 MHz and incrementing linearly by 0.2 MHz to 927.8  
8 channels numbered 64 to 71 utilizing LoRa 500 kHz BW starting at 915.9 MHz and incrementing linearly by 1.6 MHz to 927.1

### 3.3.2 Alarm Settings

When water leakage sensor or magnet switch sensor is triggered, it will send alarm message once by default. Toolbox allows users to change the alarm reporting interval and reporting times.

**Mobile APP Configuration:**

Open Toolbox APP and go to "Device -> Setting -> Threshold Settings" to enable the threshold settings and input the threshold.

**Threshold Settings**

When the value meets the threshold, the device will report the value immediately.

**CO2**

Over / ppm  
1000

Below / ppm  
0

Collecting Interval  3  min

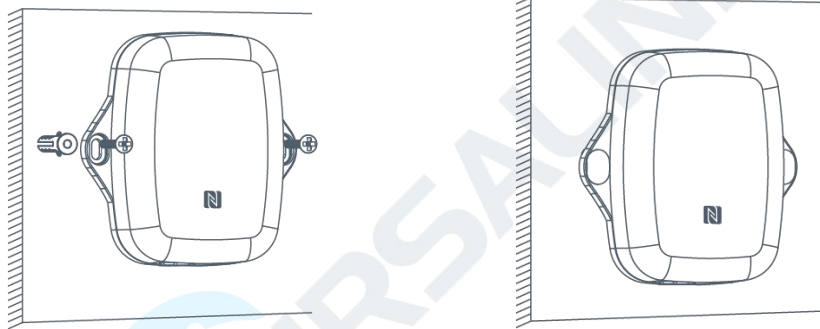
**Software Configuration:**

Log in Toolbox and go to "Device Settings -> Basic -> Threshold Settings" to enable the calibration and input the calibration value.

Alarm Settings <span>?</span>	
Leakage Alarm	<input checked="" type="checkbox"/>
Alarm reporting interval	1 <input type="text"/> min
Alarm reporting times	2 <input type="text"/>

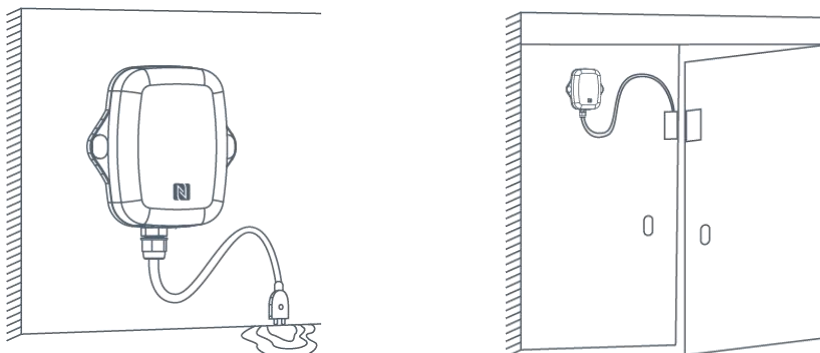
## 4. Installation

1. Attach EM300 to the wall and mark the two holes on the wall. The connecting line of two holes must be a horizontal line.
2. Drill the holes according to the marks and screw the wall plugs into the wall.
3. Mount the EM300 to the wall via mounting screws.
4. Cover the mounting screws with screw caps.



5. For leak detection sensor, install the probe/cable to the place where liquid may leak. For magnet switch sensor, install the magnet beside the door/window.

**Note:** For SLD sensor, please ensure the metal pins of the probe are flat on the floor; for ZLD sensor, the cable can't be twined or accumulated together. The probe or cable of water leakage sensor should be placed in an area of concern where water from a leak would likely accumulate.



## 5. Payload Format

All data are based on following format:

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel 3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...

Please refer to decoder example: <https://github.com/Ursalink-CN/ursalink-decoder>

### Uplink Packet(HEX)

Channel	Type	Data Example	Description
01	75(Battery Level)	64	64=>100 Battery level =100%
03	67 (Temperature)	10 01	10 01 => 01 10 = 272 Temp=272*0.1=27.2°C
04	68(Humidity)	71	71=>113 Hum=113*0.5=56.5%
05	00	00	Not water leakage
		01	Water leakage
06	00	00	Magnet switch closed
		01	Magnet switch open
ff	01(Ursalink Protocol Version)	01	V1
	08 (Device SN)	64 10 90 82 43 75 00 01	Device SN is 641090824375000
	09 (Hardware Version)	01 40	V1.4
	0a(Software Version)	01 14	V1.14
	0f(Device Type)	00	Class A

### Downlink Packet(HEX)

Channel	Type	Data Example	Description
ff	03(Set Reporting Interval)	b0 04	b0 04 => 04 b0 = 1200s

## 6. Ursalink Cloud Management

EM300 sensors can be managed by Ursalink Cloud platform. Ursalink cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures. Please register a Ursalink Cloud account before operating following steps.

Ursalink Cloud URL: <https://cloud.ursalink.com/login.html>

### 6.1 Add a Ursalink LoRaWAN Gateway

1. Enable “Ursalink” type network server and “Ursalink Cloud” mode in gateway web GUI.

**Note:** Ensure gateway has accessed the Internet.

The first screenshot shows the 'General Setting' page under the 'Network Server' tab. The 'Multi-Destination' table has a row for ID '0' with 'Enabled', 'Ursalink', and 'localhost' settings, highlighted with a red box.

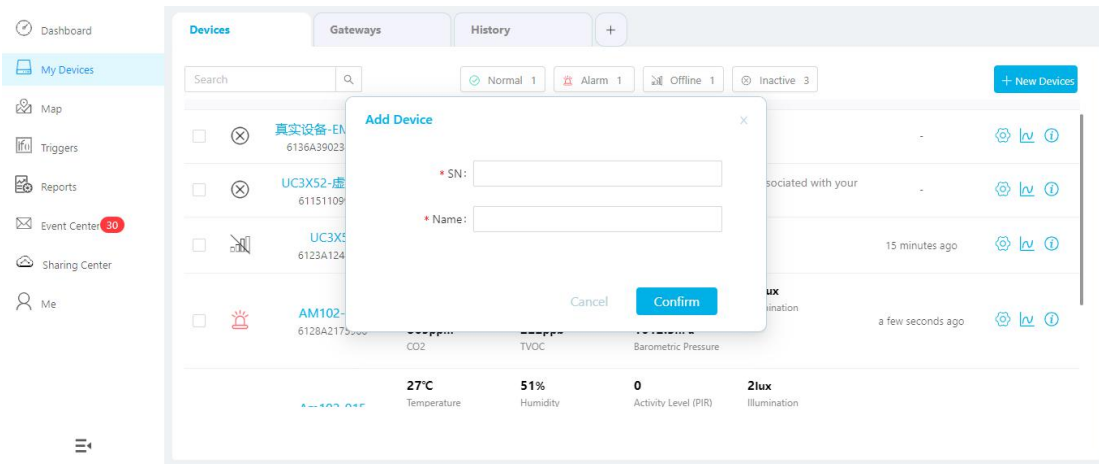
ID	Enable	Type	Server Address	Operation
0	Enabled	Ursalink	localhost	[Edit] [Delete] [Add]

The second screenshot shows the 'General Setting' page under the 'Network Server' tab. The 'Enable' and 'Ursalink Cloud' checkboxes are checked and highlighted with a red box.

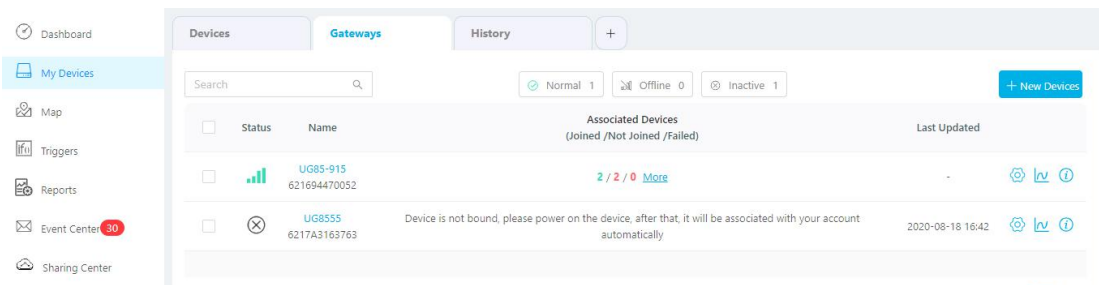
Setting	Value	Unit
Enable	<input checked="" type="checkbox"/>	
Ursalink Cloud	<input checked="" type="checkbox"/>	
NetID	010203	
Join Delay	5	sec
RX1 Delay	1	sec
Lease Time	876000-0-0	hh-mm-ss
Log Level	info	

2. Go to “My Devices” page and click “+New Devices” to add gateway to Ursalink Cloud via SN. Gateway will be added under “Gateways” menu.





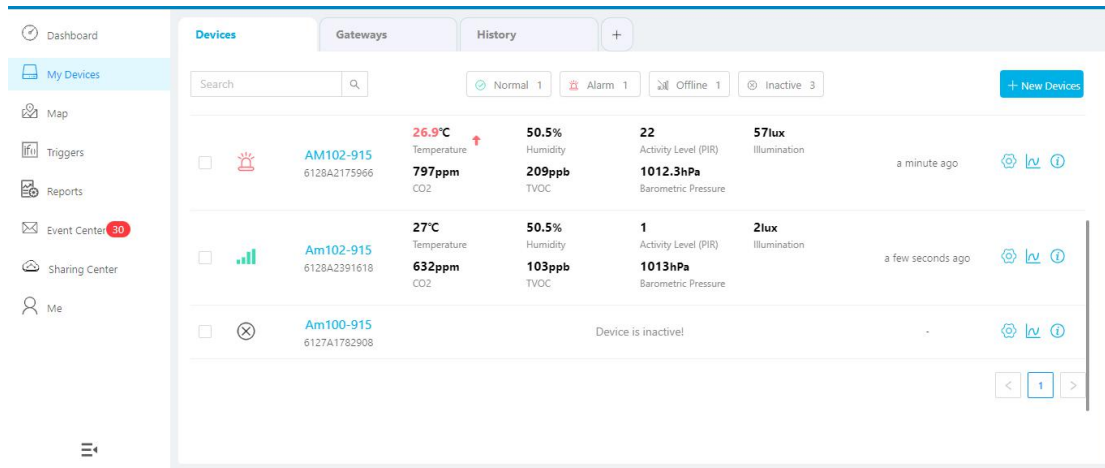
### 3. Check if gateway is online in URSalink Cloud.



## 6.2 Add EM300 to Cloud

1. Go to “My Devices” page and click “+New Devices”. Fill in the SN of EM300 and select associated gateway.

2. After EM300 is connected to URSalink Cloud, you could check the device information and data and create dashboard for it.



## Appendix

### Default LoRaWAN Parameters

<b>DevEUI</b>	24E124 + 2 <sup>nd</sup> to 11 <sup>th</sup> digits of SN e.g. SN = 61 26 A1 01 84 96 00 41 Then Device EUI = 24E124126A101849
<b>AppEUI</b>	24E124C0002A0001
<b>Appport</b>	0x55
<b>NetID</b>	0x010203
<b>DevAddr</b>	The 5 <sup>th</sup> to 12 <sup>th</sup> digits of SN e.g. SN = 61 26 A1 01 84 96 00 41 Then DevAddr = A1018496
<b>AppKey</b>	5572404C696E6B4C6F52613230313823
<b>NwkSKey</b>	5572404C696E6B4C6F52613230313823
<b>AppSKey</b>	5572404C696E6B4C6F52613230313823

### Default Uplink Channels

Model	Channel Plan	Channel Settings/MHz
EM300-470	CN470	470.3~489.3(All 95 channels)
EM300-868	EU868	868.1, 868.3, 868.5
	RU864	868.9, 869.1
	IN865	865.0625, 865.4025, 865.6025
EM300-915	AU915	915.2~927.1 (All 72 channels)
	US915	902.3~914.2 (All 72 channels)

	KR920	922.1, 922.3, 922.5
	AS923	923.2, 923.4

**-END-**

