AM100 Series

User Guide

Xiamen Milesight IoT Co., Ltd.

Safety Precautions

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

- The device must not be disassembled or remodeled in any way.
- Do not place the device outdoors where the temperature is below/above operating range. Do not place the device close to objects with naked flames, heat source (oven or sunlight), cold source, liquid and extreme temperature changes.
- The device is not intended to be used as a reference sensor, and Milesight will not should responsibility for any damage which may result from inaccurate readings.
- The battery should be removed from the device if it is not to be used for an extended period. Otherwise, the battery might leak and damage the device. Never leave a discharged battery in the battery compartment.
- The device must never be subjected to shocks or impacts.
- Do not clean the device with detergents or solvents such as benzene or alcohol. To clean the device, wipe with a soft moistened cloth. Use another soft, dry cloth to wipe dry.

Declaration of Conformity

AM100 series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.

For assistance, please contact
Milesight technical support:
Email: iot.support@milesight.com
Tel: 86-592-5085280
Fax: 86-592-5023065

Revision History

Date	Doc Version	Description
Apr. 7, 2020	V 1.0	Initial version
May 19, 2020	V 1.1	APP pictures replacement
Aug. 26, 2020	V 1.2	Add screen display mode and configuration examples(Firmware 1.17)
Sept. 14, 2020	V 1.3	Add screen alarm settings (Firmware 1.19)
Nov. 19, 2020	V 2.0	Layout replace

Contents

1. Product Introduction

1.1 Overview

AM100 series is a compact indoor ambience monitoring sensor including motion, humidity, temperature, light, TVOC, CO_2, barometric pressure for wireless LoRa network. AM100 series is a battery powered device and is designed to be wall-mounted. It is equipped with NFC (Near Field Communication) and can easily be configured via a smartphone or a PC software.

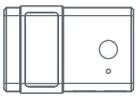
Sensor data are transmitted in real-time using standard LoRaWAN® protocol. LoRaWAN® enables encrypted radio transmissions over long distance while consuming very little power. The user can obtain sensor data and view the trend of data change through Milesight IoT Cloud or through the user's own Network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

1.2 Features

- Robust LoRa connectivity for indoor or HVAC environments
- Integrated multiple sensors like temperature, humidity, light, air quality, etc.
- Easy configuration via NFC
- Visual display via E-Ink screen
- Standard LoRaWAN® support
- Milesight IoT Cloud compliant
- Low power consumption (about 1 year battery life)
- Standard AA alkaline battery

2. Hardware Introduction

2.1 Packing List



1 × AM104/AM107

2 × AA Batteries (LR6)

1 × Mounting Sticker

2 × Mounting Screws

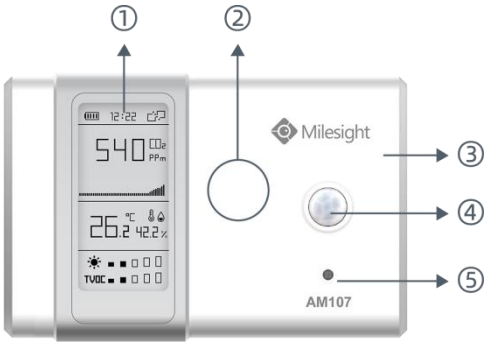
1 × Warranty Card

1 × Quick Guide

1 × NFC Reader (Optional)

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

2.2 Product Overview



Front Panel:

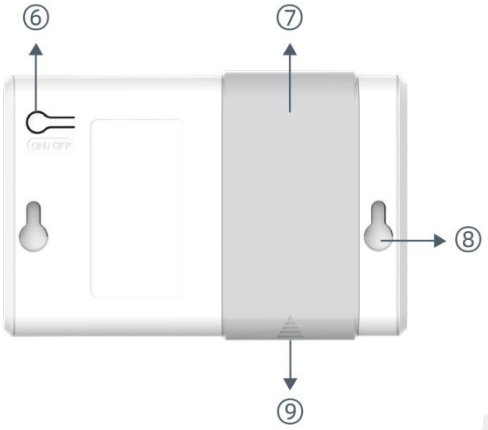
①E-ink screen

② NFC Area

③ LoRa Antenna (Internal)

④PIR Sensor

⑤Light Sensor



Back Panel:

⑥Power button

⑦Battery Cover

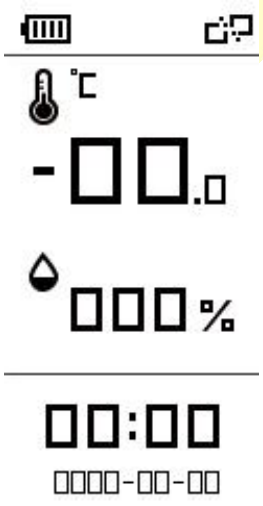
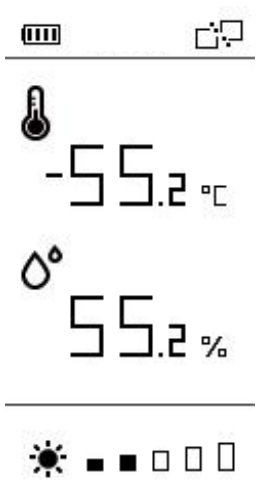
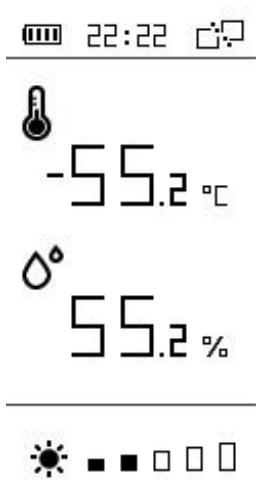
⑧Mounting Holes

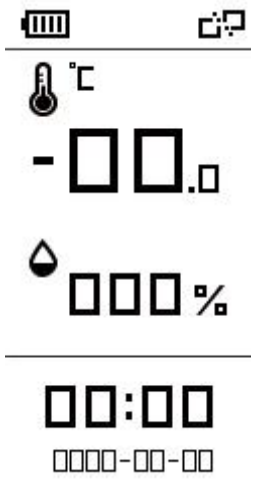
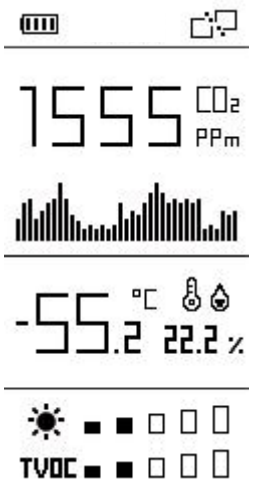
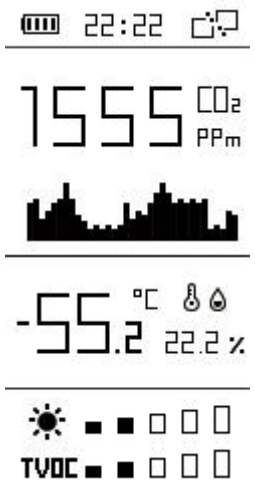
⑨Type-C Port

2.3 E-link Screen

2.3.1 Screen Description

AM100 series provide 3 types of display modes:

AM104		
Mode 1	**Mode 2**	**Mode 3**
		
AM107		

Mode 1	Mode 2	Mode 3
		

To learn what an icon means, find it below.

Icon	Description	Screen Update
	Battery level	Once per day
22:22	Sync time with software or mobile APP	1 min
	The device joins the network. The device fails to join the network.	According to join status
	Temperature	1 min
	Humidity	1 min
	Luminance Level 0：0-5 lux Level 1：6-50 lux Level 2：51-100 lux Level 3：101-400 lux Level 4：401-700 lux Level 5：≥701 lux	1 min
TVOC	Total volatile organic compounds Level 0：0-100 ppb Level 1：101-200 ppb Level 2：201-250 ppb Level 3：251-300 ppb Level 4：301-350 ppb Level 5：351-400 ppb	1 min
	Show alarm when TVOC exceeds the threshold value.(400 ppb by default)	

	Show CO_2 history tendency from 0 to 1400ppm. Show alarm when CO_2 exceeds the threshold value.(1200 ppm by default)	2 min

Note:

- AM100 series will do a full-screen refresh every 30 minutes in order to remove ghosting.
- Please refer section 4.3.3 for TVOC and CO_2 threshold settings.
- AM100 series shows current value on the screen and uplink the average value of the reporting interval to the gateway.

2.3.2 Screen Mode Switch

Here are 3 methods to switch between the three modes:

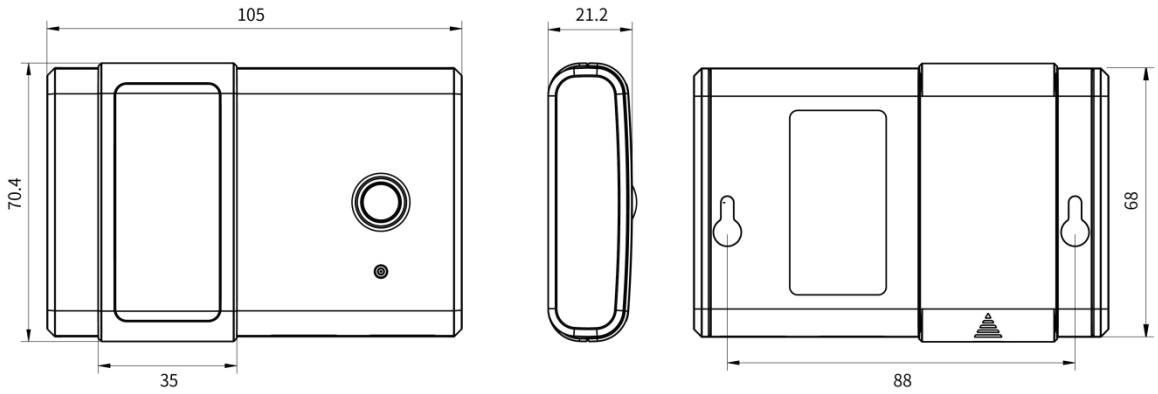
- Power button: Quick press on the power button to switch the mode.
- Mobile APP: Go to APP menu "Device > Settings > Basic Settings" to select screen display mode.
- Software: Go to Toolbox menu "Device Settings > Basic > Basic Settings" to select screen display mode.

2.3 Power Button

AM100 series can be turned on/off or reset by power button on the rear panel.

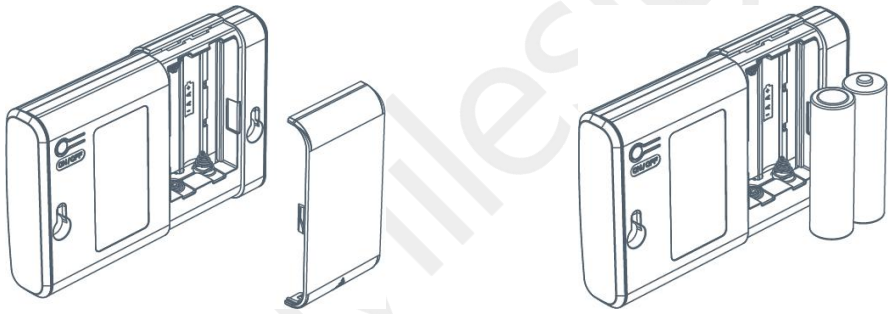
Function	Action
Turn On	Press and hold the power button for more than 3 seconds until the screen changes state.
Turn Off	Press and hold the power button for more than 3 seconds until the screen changes state.
Reset	Press and hold the power button for more than 10 seconds. **Note:** AM100 series will be automatically power on after reset.
Change Screen Mode	Quick press on the power button.

2.4 Dimensions(mm)



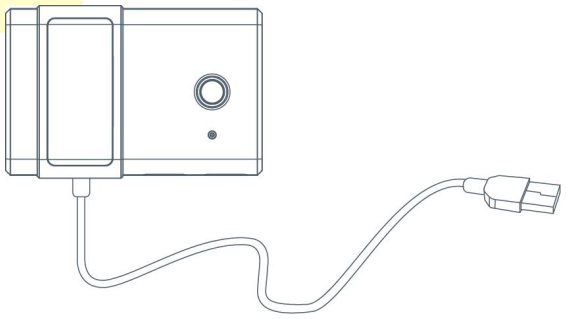
3. Power Supply

Remove the battery cover and install two new AA/LR6 batteries. Batteries can be replaced on the fly.



Note:

- AM100 series can also be powered by type-C USB port (5V, 100mA). When batteries and external power are both connected, external power will power the device first.
- USB port can't be used to charge battery.



4. Basic Configuration

AM100 series sensor can be monitored and configured through 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 first configuration. Default password is **123456**.

4.1 Configuration via Smartphone APP

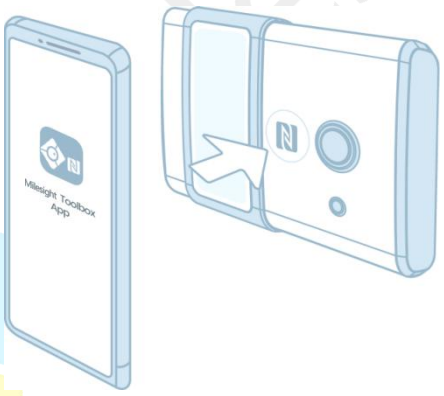
Preparation:

- Smartphone (NFC supported)
- Toolbox APP: APP can be download on Google Play or Apple Store.

4.1.1 Read/Write Configuration via NFC

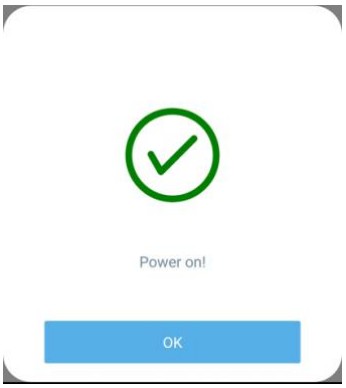
1. Enable NFC on the smartphone and open “Toolbox” APP.
2. Attach the smartphone with NFC area to the device to read basic information.

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



3. Click “Write” to change the configuration of AM sensor and attach the smartphone with NFC area to the device until the APP shows a successful prompt.

Note: If you use a new smartphone to configure the sensor at the first time, it’s necessary to enter the password. (Default password: 123456)



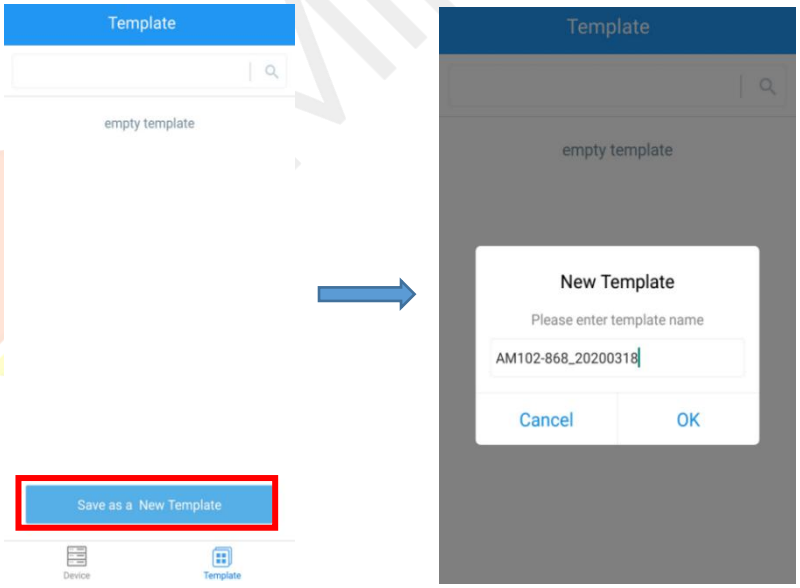
4. Click “Read” to fetch the current data of sensor.

4.1.2 Template Settings

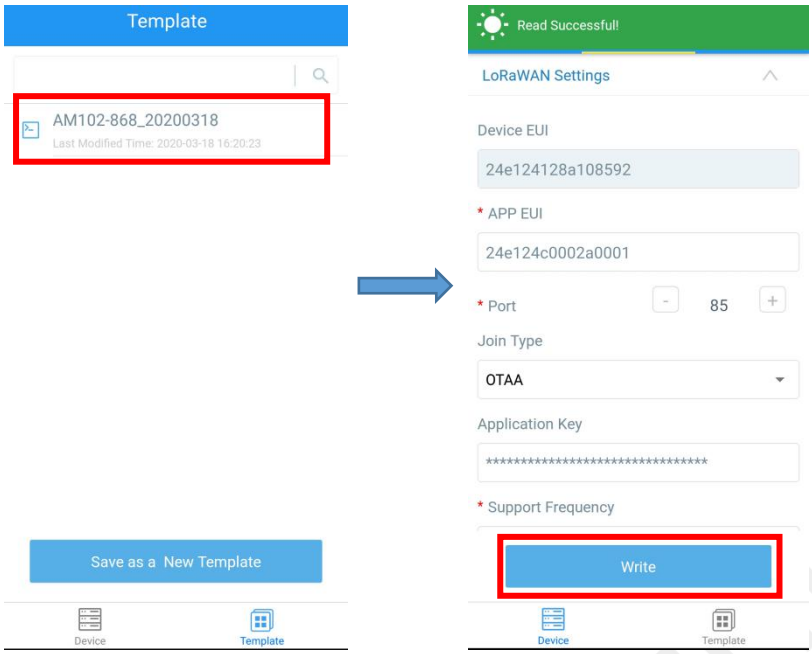
Template settings are used for easy and quick device configuration in bulk.

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

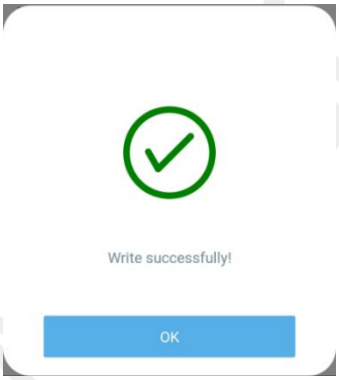
1. Go to “Template” page of APP and save current settings as a template.



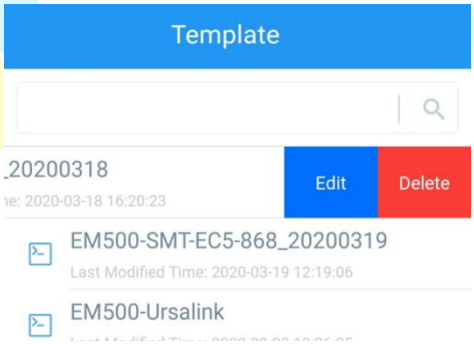
2. Attach the smartphone with NFC area to another device.
3. Select the template file from Toolbox and click “Write”.



4. Keep the two devices close until the APP shows a successful prompt.



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



4.2 Configuration via PC

Preparation:

- Dedicated NFC Reader or Type-C USB cable
- PC (Windows 10 is recommended)
- Toolbox: https://www.milesight-iot.com/software-download/

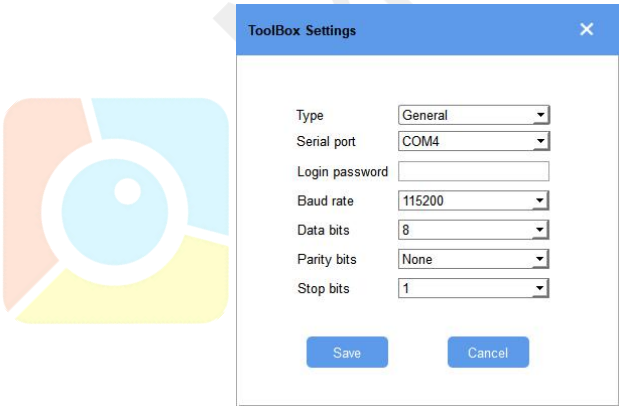
4.2.1 Log in the Toolbox

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

USB Connection

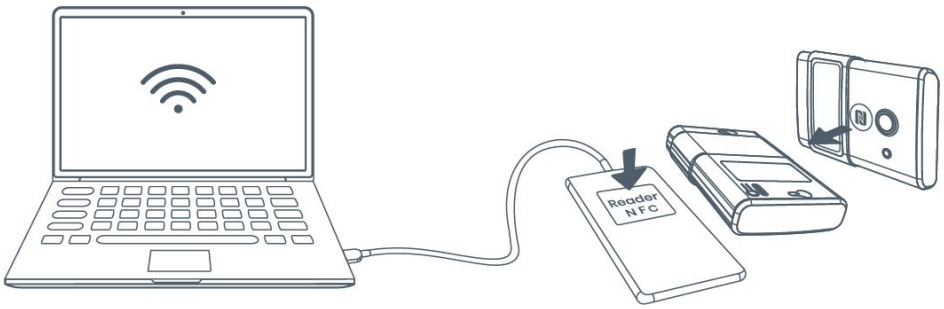
1. Connect the AM sensor to computer via type-C port.

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

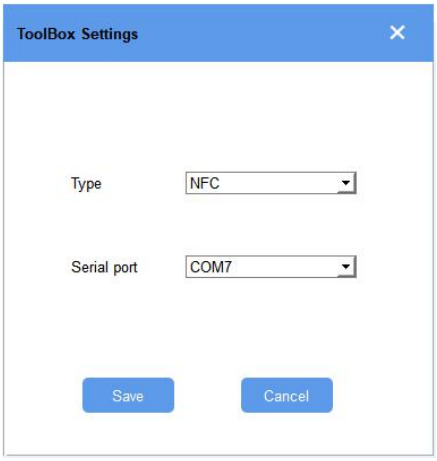


NFC Connection

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



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

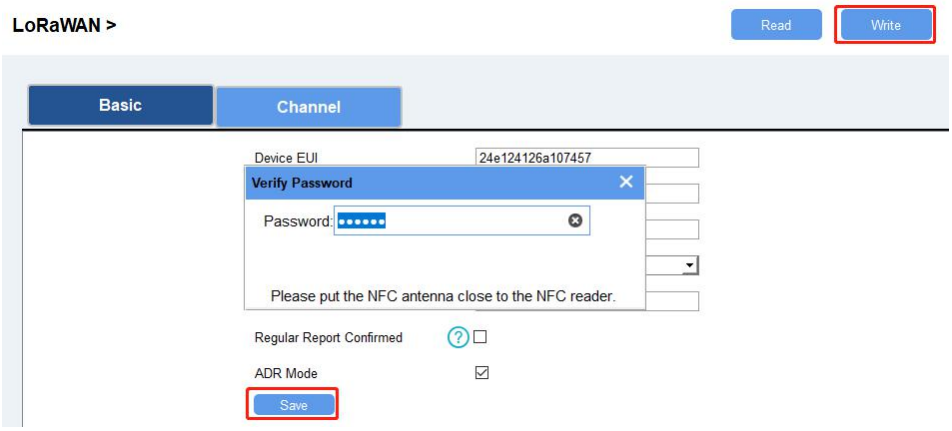


4.2.2 Basic Configuration

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

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

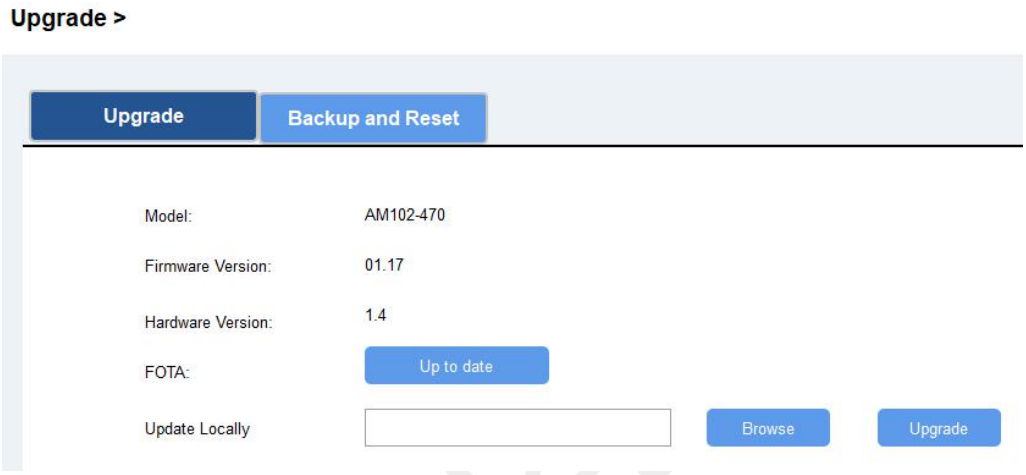
- Turn on/off the sensor
- Reset the sensor
- Sync the time
- Click “Write” to change settings
- Upgrade



4.2.3 Upgrade

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

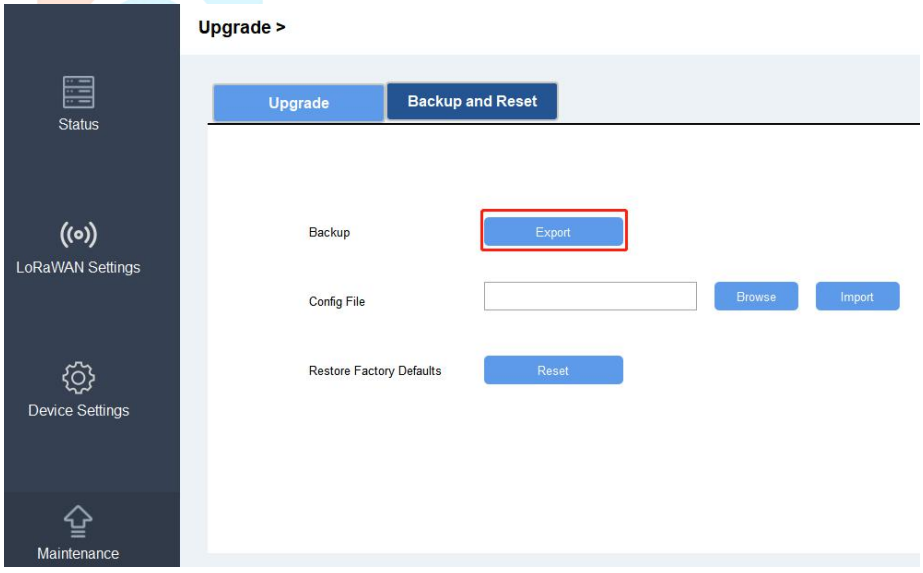
Note: If NFC connection is selected, please keep the two devices close and don’t move them in order to get the best connectivity as possible when upgrading.

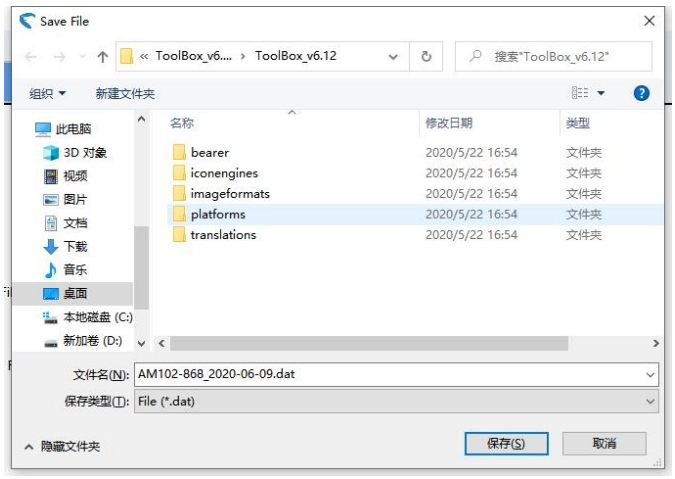


4.2.4 Template Settings

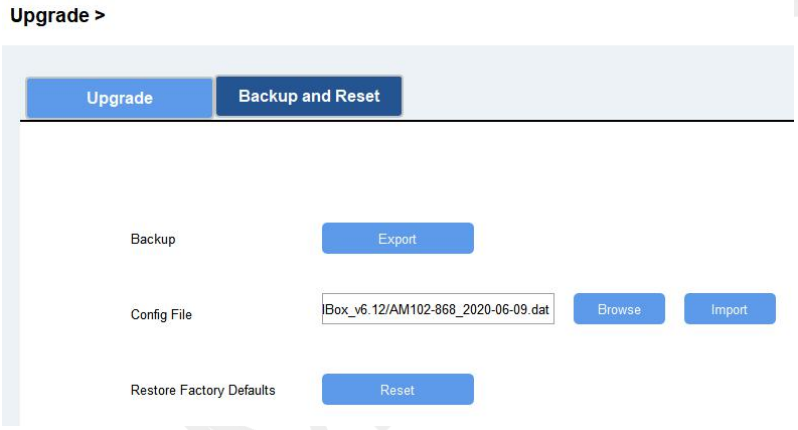
Note: Template function works only for sensors with the same model and LoRa frequency band.

1. Go to “Maintenance -> Template and Reset” page of 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.



4.3 Configuration Examples

4.3.1 LoRa Channel Settings

The configuration of LoRaWAN® channel of AM104/AM107 must match the gateway's. Refer to Appendix to check default channel settings of AM104/AM107.

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.

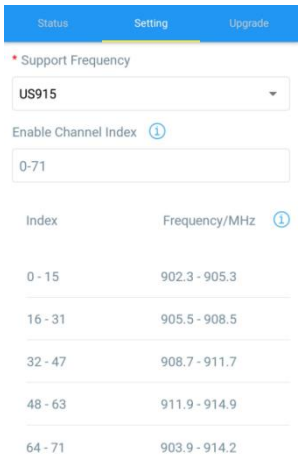
Note: If frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

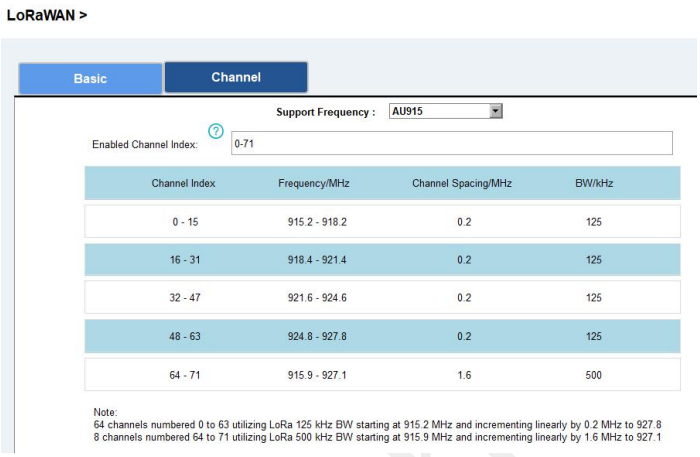
Examples:

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

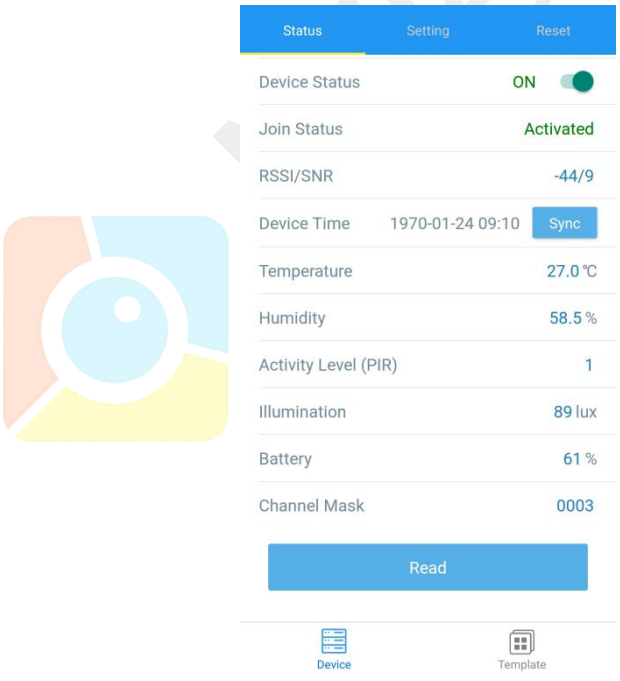




4.3.2 Time Synchronization

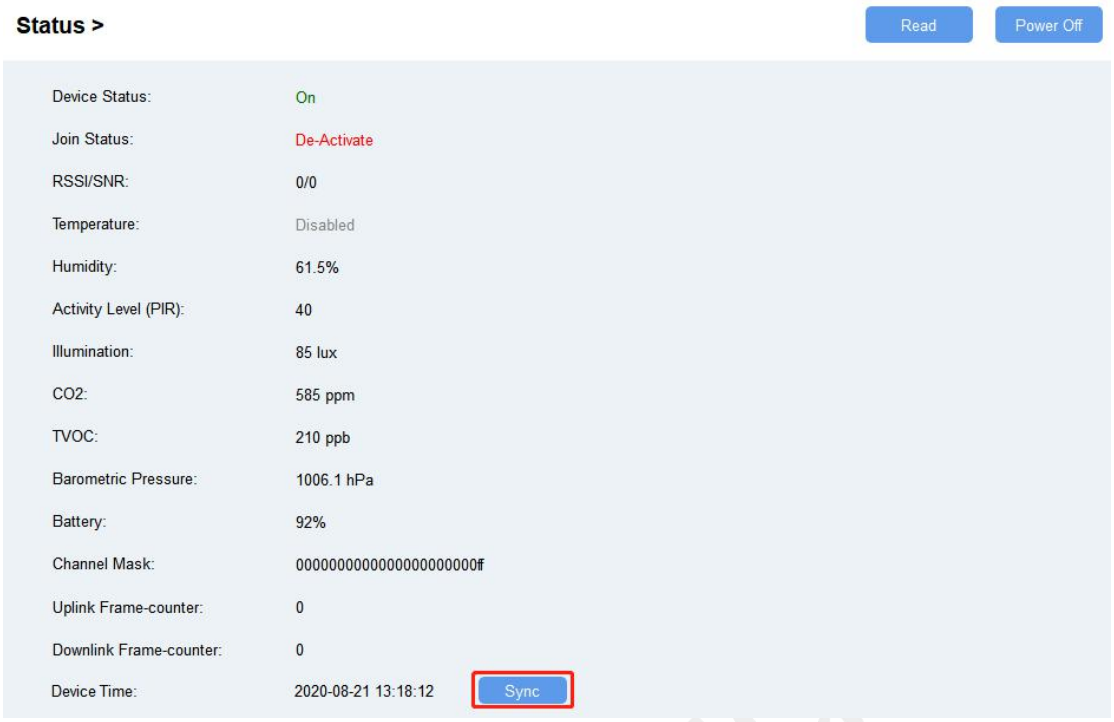
Mobile APP Configuration:

Open Toolbox APP and go to “Device ->Status”to click “sync” to sync the time on the screen.



Software Configuration:

Log in Toolbox and go to “Status” page to sync the time on the screen.



4.3.3 Alarm Settings

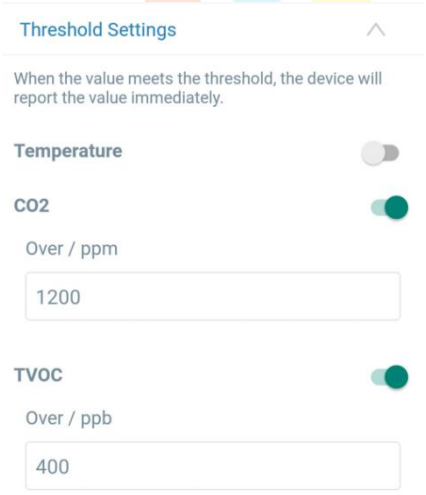
AM100 series will upload the current data instantly after the threshold is triggered. AM107 will also show alarms of CO_2 and TVOC on the screen.

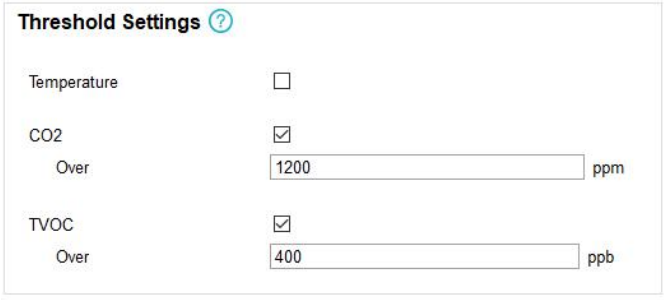
Mobile APP Configuration:

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

Software Configuration:

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





5. Installation

5.1 Installation Note

In order to ensure the best detection and LoRaWAN® communication effect, it is recommended to install AM100 series as follows:

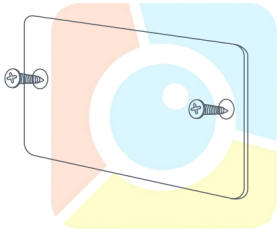
- There should not be any isolates or barriers in PIR and light detection range.
- Do not mount the device where the temperature is below/above operating range and temperature varies greatly.
- Stay far away from any heat source or cold source like oven, refrigerator.
- Do not mount the device close to where airflow varies greatly like windows, vent, fan and air conditioner.
- Do not mount the device upside down.
- Do not place the device right to the window or door. If you have to, you'd better pull the curtain.
- It is recommended to install at least 1.5m high from floor.

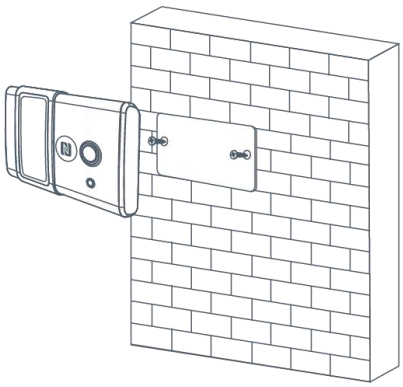
5.2 Wall Mounting

1. Attach the mounting sticker to the wall.
2. Mark the wall where the two mounting holes are according to the sticker's mark (around 88mm).

Note: The connecting line of two holes must be a horizontal line.

3. Drive two screws into wall at the marks using screw driver.
4. Mount the device on the wall.





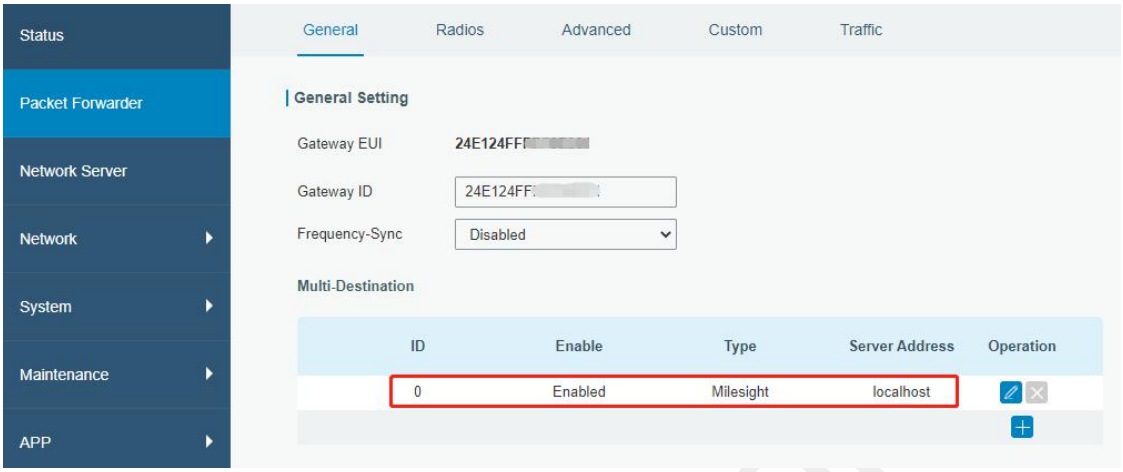
6. Milesight IoT Cloud Management

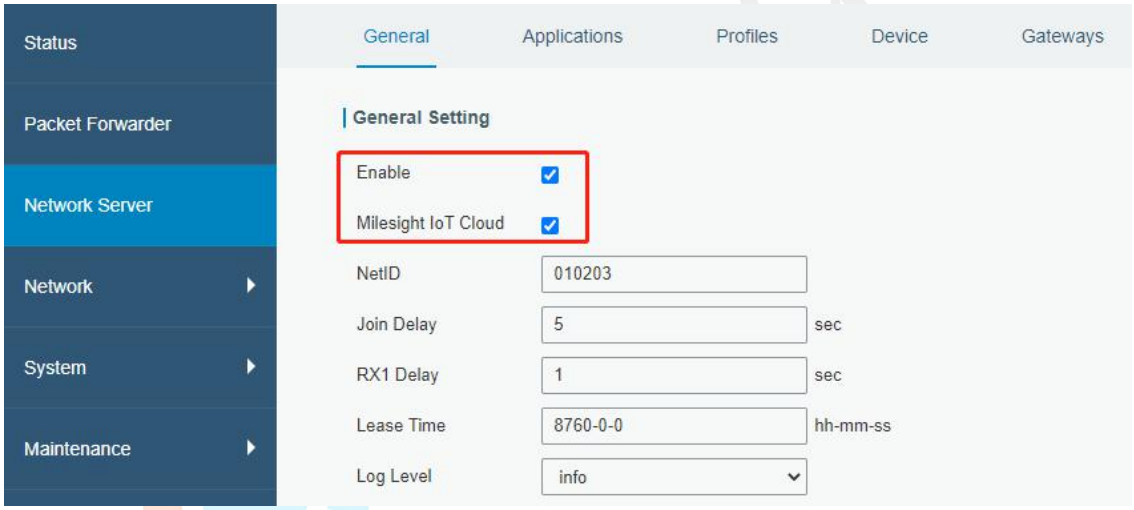
AM100 series sensors can be managed by Milesight IoT Cloud platform. Milesight IoT cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures. Please register a Milesight IoT Cloud account before operating following steps: cloud.milesight-iot.com.

6.1 Add a Milesight Gateway

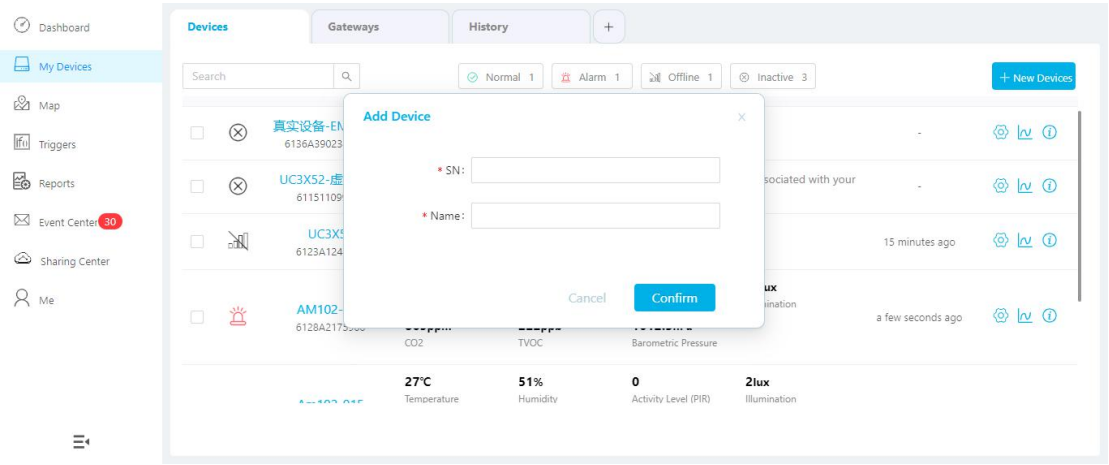
1. Enable “Milesight” type network server and “Milesight IoT Cloud” mode in gateway web GUI.

Note: Ensure gateway has accessed the Internet.

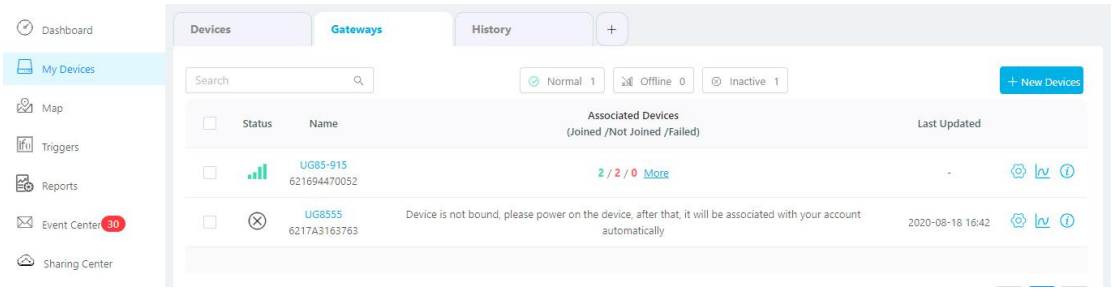




2.Go to “My Devices” page and click “+New Devices” to add gateway to Milesight IoT Cloud via SN. Gateway will be added under “Gateways” menu.

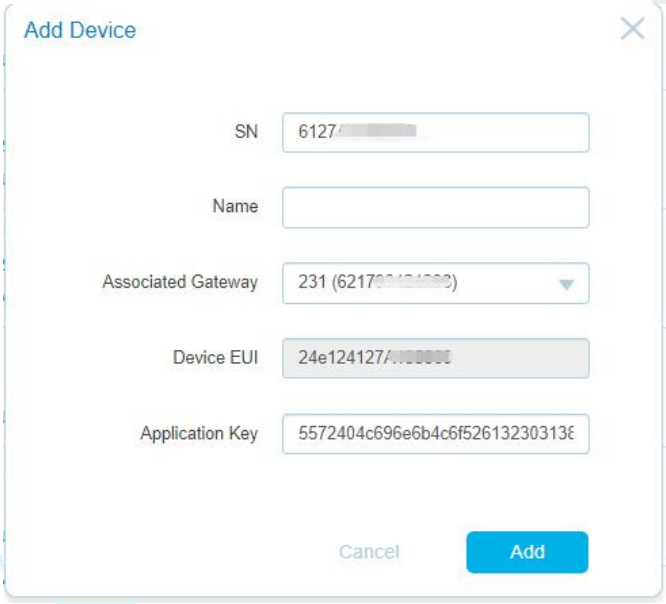


3. Check if gateway is online in Milesight IoT Cloud.

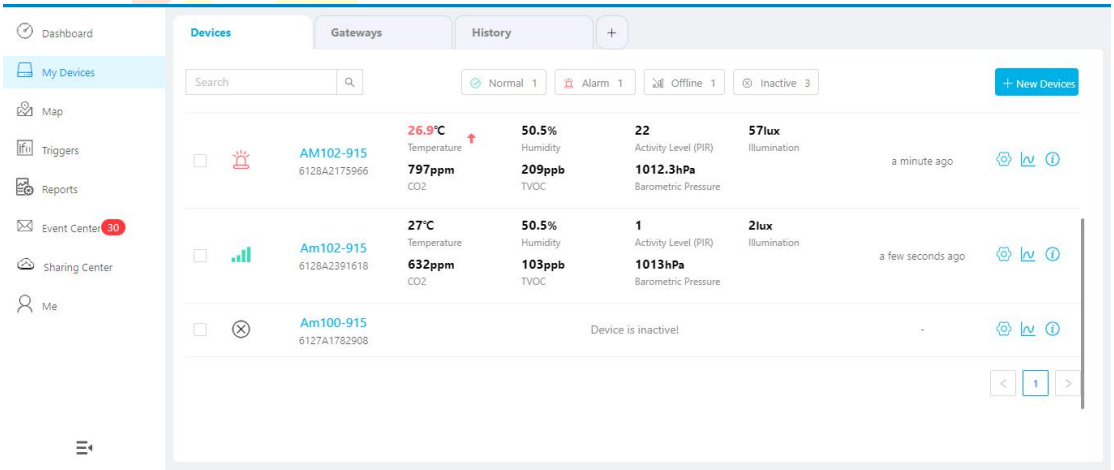


6.2 Add AM100 Series to Cloud

1. Go to “Device->My Devices” and click “Add Device”. Fill in the SN of AM sensor and select associated gateway.



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



7. Sensor Payload

All data are based on following format(HEX):

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

7.1 Basic Information

AM500 series sensors report basic information of sensor everytime joining the network.

Channel	Type	Data Example	Description
ff	01(Milesight Protocol Version)	01	V1
	16 (Device SN)	61 27 a2 17 41 32	Device SN is 6127a2174132
	09 (Hardware Version)	01 40	V1.4
	0a(Software Version)	01 14	V1.14
	0f(Device Type)	00	Class A
	18 (Sensor Status)	00 7f	00=>all sensors 7f=>0111 1111 means all sensors are open

7.2 Sensor Data

AM100 series sensors report sensor data according to reporting interval (10min by default). Battery level is reported every 24 hours.

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	6a(Activity Level)	49 00	49 00 => 00 49 =73 Activity Level = 73
06	65(Illumination)	1c 00 79 00 14 00	Illumination: 1c 00 => 00 1c =28 lux Visible + Infrared: 79 00=> 00 79= 121 Infrared: 14 00=> 00 14= 20

07	7d（CO_2）	67 04	67 04 => 04 67 =1127 CO_2 = 1127 ppm
08	7d(TVOC)	07 00	07 00 => 00 07=7 TVOC = 7 ppb
09	73（Barometric Pressure）	68 27	68 27=>27 68=10088 Pressure=10088*0.1=1008.8hPa

7.3 Downlink Commands

AM100 series sensors support downlink commands to configure the device. Application port is 85 by default.

Channel	Type	Data Example	Description
ff	03(Set Reporting Interval)	b0 04	b0 04 => 04 b0 = 1200s
	18 (Enable/disable sensor)	01 01 (Enable Temperature)	Byte 1: Select Sensor 01: Temperature 02: Humidity 03: PIR 04: Light 05: CO_2 06: TVOC 07: Barometric Pressure Byte 2: 00=disable, 01=enable

Appendix

Default LoRaWAN Parameters

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

NwkSKey	5572404C696E6B4C6F52613230313823
AppSKey	5572404C696E6B4C6F52613230313823

Default Uplink Channels

Model	Channel Plan	Channel Settings/MHz
AM104-470M AM107-470M	CN470	470.3~489.3(All 95 channels)
AM104-868M AM107-868M	EU868	868.1, 868.3, 868.5
	RU864	868.9, 869.1
	IN865	865.0625, 865.4025, 865.6025
AM104-915M AM107-915M	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-