Bathroom Odor Detector Sensor

GS301

User Guide

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Chapter 1. Preface

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Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss. Milesight will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

CAUTION:
Injury or equipment damage may be caused if any of these cautions are neglected.

- The device must not be disassembled or remodeled in any way.
- In order to protect the security of the device, please change device password when first configuration. Default password is 123456.
- 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 device must never be subjected to shocks or impacts.
- Keep the device away from the water to prevent damage to the detector and electric shock.
- Keep the device out of children's reach.

Revision History

Release Date	Version	Description
Jan.5, 2023	V 1.0	Initial version

Release Date	Version	Description
Dec. 18, 2024	V1.1	1. Support to display and report sensor ID 2. Add zero-point calibration for NH_3 and H_2S 3. Report H_2S data with resolution 0.001ppm

Chapter 2. Product Introduction

Overview

GS301 is a 4-in-1 LoRaWAN® bathroom odor detector to detect ammonia (NH_3) and hydrogen sulfide (H_2S) gas according to electrochemical principle. GS301 is also able to detect temperature and humidity to fully aware of the environment of bathrooms. When the NH_3 or H_2S gas concentration reaches the preset threshold, the detector will trigger both LED light alarm and buzzer to notify people timely to ventilate, which is an important part in smart bathroom solution.

Apart from local alarms, GS301 can also report the sensor data and alarm messages remotely by the use of LoRaWAN® technology. Integrating with Milesight LoRaWAN® gateway and Milesight IoT Cloud solution, users can monitor all the sensor data and control the device remotely and flexibly. Moreover, GS301 supports Milesight D2D to enable ultra-low latency control without gateways.

GS301 can be used in bathroom on hotels, building, etc.

Features

- Built-in high accuracy electrochemical gas detection sensor with more than 3-year-long life expectancy
- Built-in multiple sensors including NH_3, H_2S, temperature and humidity
- Built-in batteries to achieve wireless power supply and decrease the installation cost
- Equipped with buzzer and LED indicator to indicate threshold alarms
- Damp proof coating inside the device to ensure device working well on various conditions of bathrooms
- Support Milesight D2D protocol to enable ultra-low latency and direct ventilation control without gateways
- Built-in NFC for easy configuration
- Compatible with standard LoRaWAN® gateways and network servers
- Quick and easy management with Milesight IoT Cloud solution

Chapter 3. Hardware Introduction

Packing List



1 × GS301 Sensor



2 × Wall Mounting Kits



1 × Quick Guide

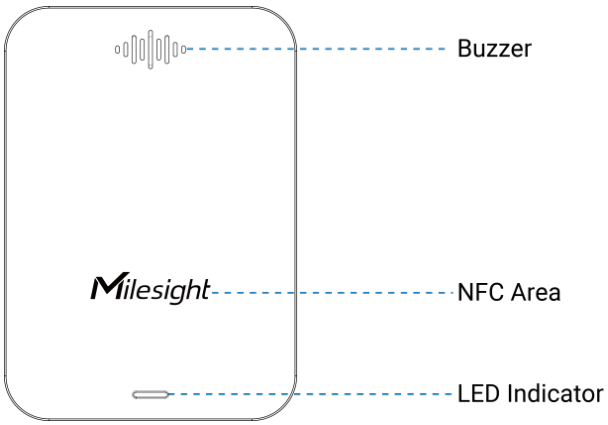


1 × Warranty Card

Note:

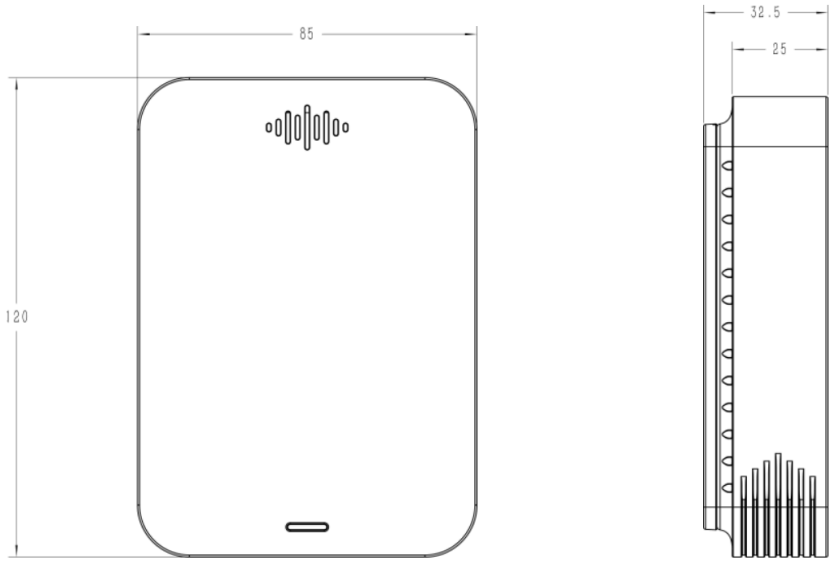
If any of the above items is missing or damaged, please contact your sales representative.

Hardware Overview





Dimensions(mm)



Button and LED Indicator

Function	Action	LED Indicator
Power ON/OFF	Press and hold the power button for more than 3 seconds.	Power On: Off → Green Light On
		Power Off: Green Light On → Off
Check On/Off Status	Quick press the power button once.	Device On: Green Light Blink Once
		Device Off: Off
Reset to Factory Default	Press and hold the power button for more than 10 seconds.	Green Light Quickly Blinks
Threshold Alarm	When any concentration of NH_3 or H_2S exceeds the threshold	Red Light Quickly Blinks

Chapter 4. Quick Start

This chapter describe the steps to quickly configure this device. If you requires more advanced settings, please refer to operation guide chapter.

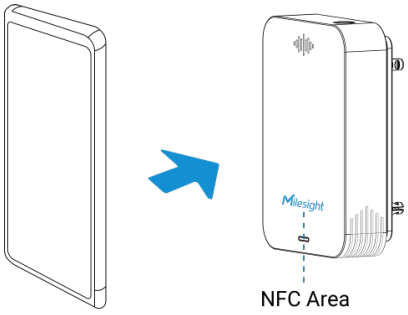
Access the Sensor via NFC

1. Press and hold the power button for more than 3 seconds to power on the device. After powering on or rebooting, wait for about 30 minutes for sensor polarization process. Only when the polarization completes, the device can collect NH_3 and H_2S data.

2. Download and install “Milesight ToolBox” App from Google Play or Apple App Store.

3. Enable NFC on the smartphone and launch Milesight ToolBox, select reading mode as NFC.

4. Attach the smart phone with NFC area to the device and click to read device information. Basic information and settings of the device will be shown on ToolBox App if it’s recognized successfully.



5. Adjust the settings on the App, then attach the smartphone with NFC area to the device and click **Write** to write the settings. After writing, reread the device to check if the configuration is written well.

Note:

- During polarization process, temperature and humidity data will be collected and displayed as usual, NH_3 and H_2S values will be shown as “Polarizing” on ToolBox page.
- Ensure the location of smartphone NFC area and it’s recommended to take off phone case.
- If the smart phone fails to read/write configurations via NFC, keep the phone away and back to try again.
- The default device password is 123456. Please change a new password for security.

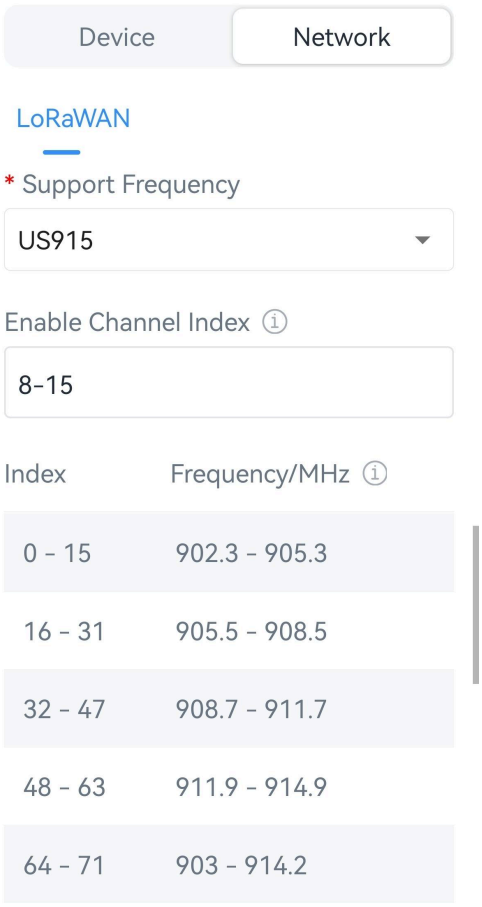
Configure the Network Setting

1. Go to **Network** settings page, select the join type as OTAA or ABP as required.

Note:
OTAA mode is required if you connect device to Milesight IoT Cloud or Milesight Development Platform.

2. Select supported frequency the same as LoRaWAN® gateway.

Note:
Set the channel index as 8-15 for US915 or AU915 if using default settings of Milesight gateways.



3. Keep other settings by default and click **Write** to save the settings.

Chapter 5. Operation Guide

LoRaWAN® Settings

This chapter describes the LoRaWAN® network settings of device.

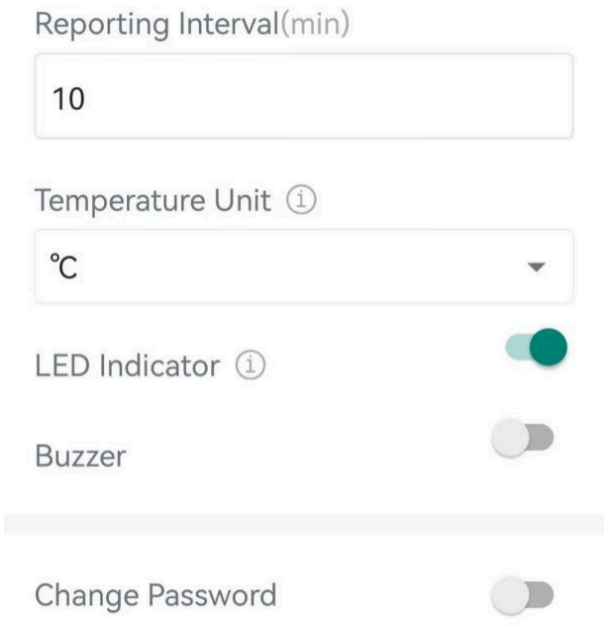
Parameter	Description
Device EUI	Unique ID of the device which can be found on the device. **Note:** please contact sales for device EUI list if you have many units.
App EUI	The default App EUI (join EUI) is 24E124C0002A0001.
Application Port	The port used for sending and receiving data, the default port is 85.
LoRaWAN® Version	V1.0.2 and V1.0.3 are available.
Work Mode	It's fixed as Class A.
Confirmed Mode	If the device does not receive ACK packet from network server, it will re-send data once.
Join Type	OTAA and ABP are available. **Note:** It's necessary to select OTAA mode if connecting device to Milesight IoT Cloud.
Application Key	Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890 **Note:** • The default value of earlier devices is 5572404C696E6B4C6F52613230313823. • Please contact sales before purchase if you require random App Keys.

Parameter	Description
Network Session Key	Nwkskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5th to 12th digits of SN.
Rejoin Mode	Reporting interval≤35 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval or every double reporting interval to validate connectivity; If there is no response, the device will re-join the network. Reporting interval > 35 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network. **Note:** 1. Only OTAA mode supports rejoin mode. 2. The actual sending number is **Set the number of packets sent** +1.
Channel Mode	Select **Standard-Channel** mode or **Single-Channel** mode. When **Single-Channel** mode is enabled, only one channel can be selected to send uplinks.
Supported Frequency	Enable or disable the frequency to send uplinks. If frequency is one of CN470/AU915/US915, enter the index of the channel 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

Parameter	Description
	Null: Indicate that all channels are disabled
ADR Mode	Enable or disable network server to adjust Spreading Factor, Bandwidth an Tx Power to optimize data rates, airtime and energy consumption in the network.
Spreading Factor	If ADR mode is disabled, the device will send uplink data following this SF parameter. The higher the spreading factor, the longer the transmission distance, the slower the transmission speed and the more the consumption.
Tx Power	Tx power (transmit power) refers to the strength of the outgoing signal transmitted by the device. This is defined by LoRa alliance.
RX2 Data Rate	RX2 data rate to receive downlinks or send D2D commands.
RX2 Frequency	RX2 frequency to receive downlinks or send D2D commands. Unit: Hz

General Settings

General settings include the basic parameters of the device.



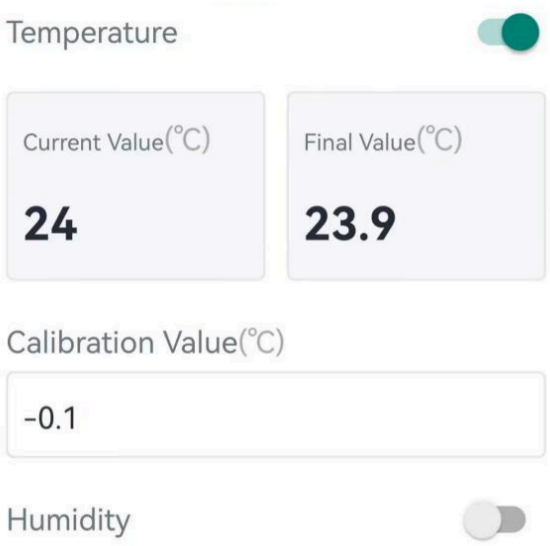
Parameter	Description
Reporting Interval	Reporting interval of transmitting current sensor values to network server. Default: 10 mins, Range: 1-1080 mins.
Temperature Unit	Change the temperature unit displayed on the ToolBox and screen. **Note:** 1. The temperature unit in the reporting package is fixed as Celsius(°C). 2. Please modify the threshold settings if the unit is changed.
LED Indicator	Disable or enable LED Indicator for alarming when the value of NH_3 or H_2S exceeds the threshold.
Buzzer	Disable or enable buzzer for alarming when the value of NH_3 or H_2S exceeds the threshold. The buzzer will automatically stop if both values are lower than the threshold. If you want to stop the buzzing, please disable the buzzer.
Change Password	Change the password for ToolBox App to write this device.

Note:
When temperature is higher than 35°C, LED indicator and buzzer alarm will stop working until the temperature goes back to 35°C or below.

Calibration Settings

Numerical Calibration

ToolBox supports numerical calibration for temperature and humidity. The device will add the calibration value to raw value and report the final values.

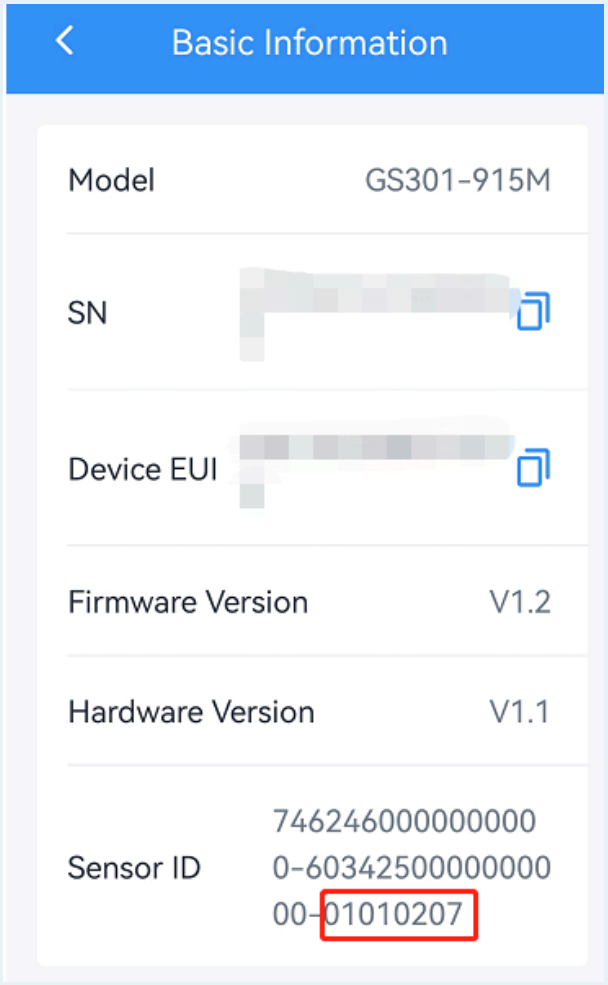


Zero-point Calibration

ToolBox supports zero-point calibration for NH_3 and H_2S. When you click the calibration button, the device will calibrate the NH_3 or H_2S value of current environment to 0 ppm. It is recommended to place the device to a clean environment when performing zero calibration.



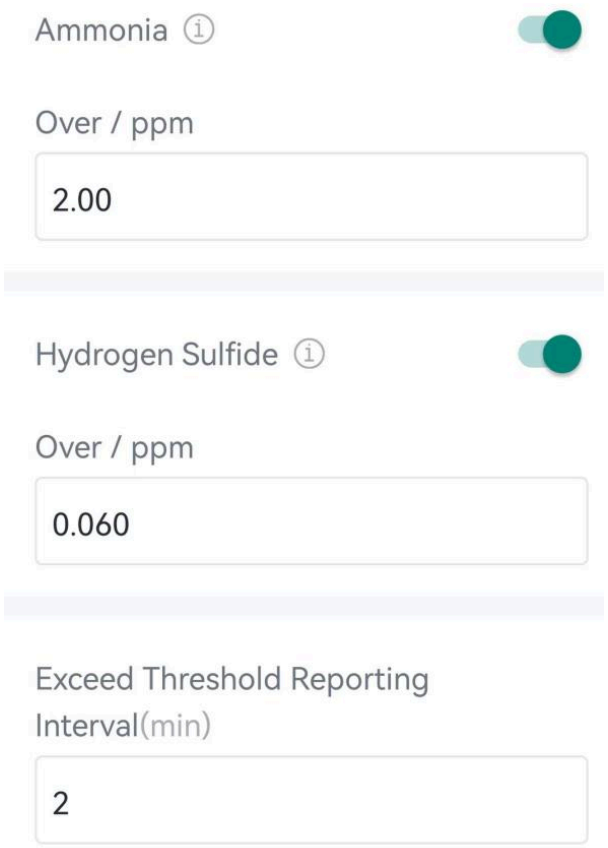
Note:
Zero-point calibration is supported only when sensor module version is 1.1.2.7 or later. The sensor module version can be checked via sensor ID.



Threshold Settings

ToolBox supports to enable the threshold settings and input the threshold. When one of NH_3 and H_2S exceeds threshold,the device will report the threshold value according to the **Exceed Threshold Reporting Interval.** When both values are below the threshold, it will also report the current data once.

Note:
When temperature is higher than 35°C, the threshold alarm will stop working until the temperature is back to 35°C or below.

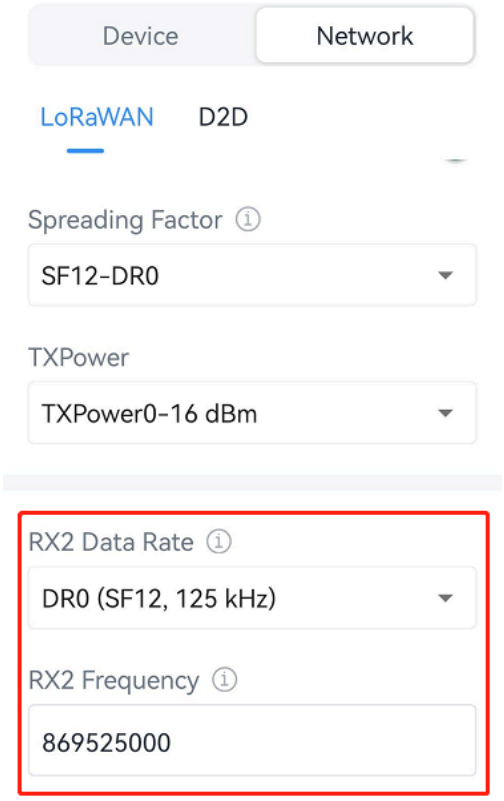


Milesight D2D Setting

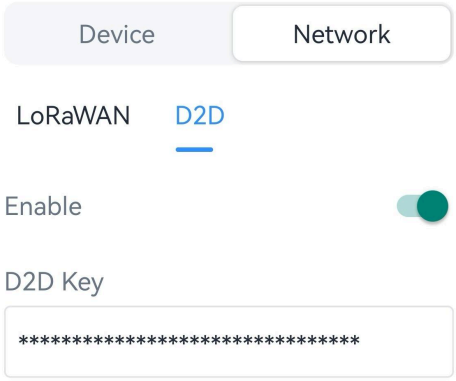
Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the Milesight D2D settings is enabled, the device can work as a D2D controller to send control commands to trigger Milesight D2D agent devices.

1. Configure the RX2 datarate and RX2 frequency.

Note:
It is suggested to change the default values if there are many LoRaWAN® devices around.

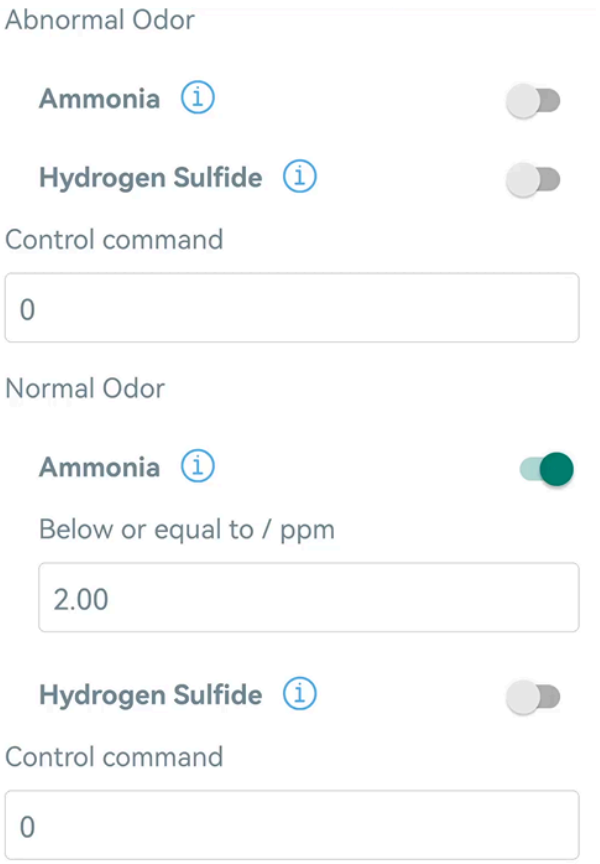


2. Enable Milesight D2D feature and define a unique D2D key that is the same as Milesight D2D agent devices. (Default D2D key: 5572404C696E6B4C6F52613230313823)



3. Define a 2-byte hexadecimal control command (0x0000 to 0xffff). GS301 will send the control command to correspond Milesight D2D agent devices according to the conditions. For abnormal odor, it will send D2D command when one of NH_3 or H_2S exceeds the value; for normal odor, it will send D2D command when both NH_3 and H_2S equals or are below the values.

Note:
When temperature is higher than 35°C, Milesight D2D will stop working until the temperature is back to 35°C or below.



Maintenance

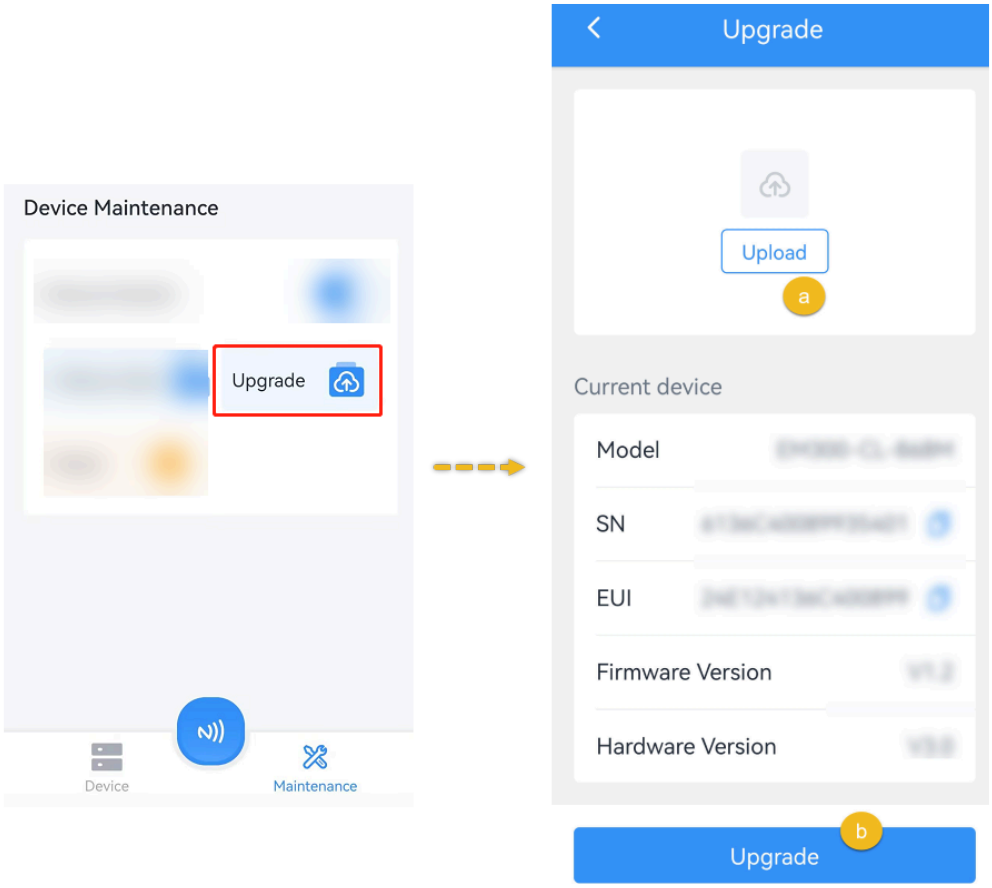
Upgrade

This chapter describes the steps to upgrade the device via ToolBox App.

1. Download firmware from Milesight official website to your smartphone.
2. Read the target device via ToolBox App, click **Upgrade** to upload the firmware file.
3. Click **Upgrade** to upgrade the device.

Note:

- Operation on ToolBox is not supported during an upgrade.
- Only Android version ToolBox supports the upgrade feature.



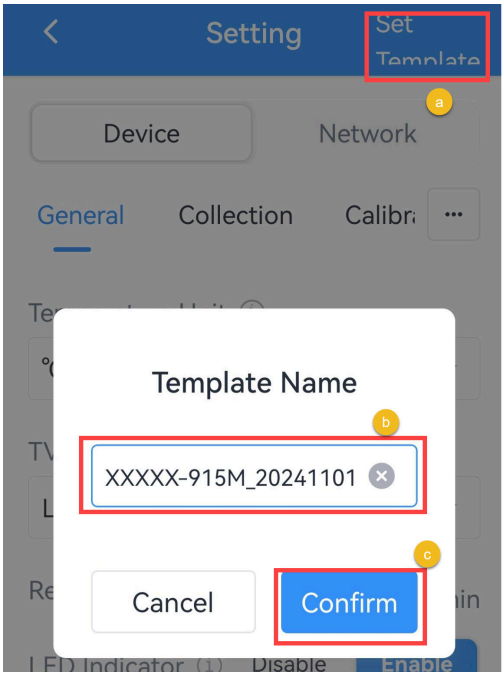
Backup and Restore

This device supports configuration backup for easy and quick device configuration in bulks. Backup and restore is allowed only for devices with the same model and frequency band.

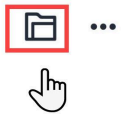
Backup and Restore

Step 1: Launch ToolBox App, attach the NFC area of smartphone to the device to read the configuration.

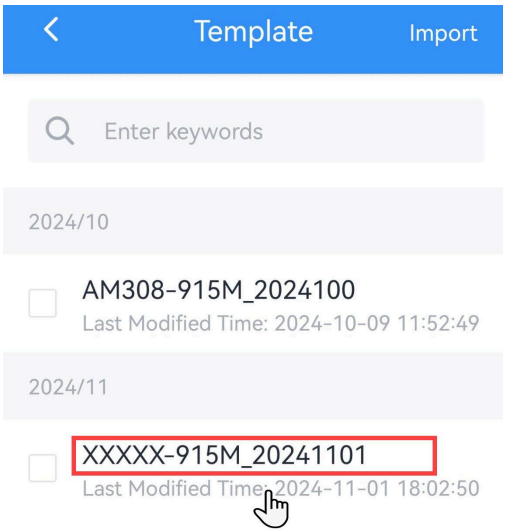
Step 2: Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.



Step 3: Go to **Device >Template** page.



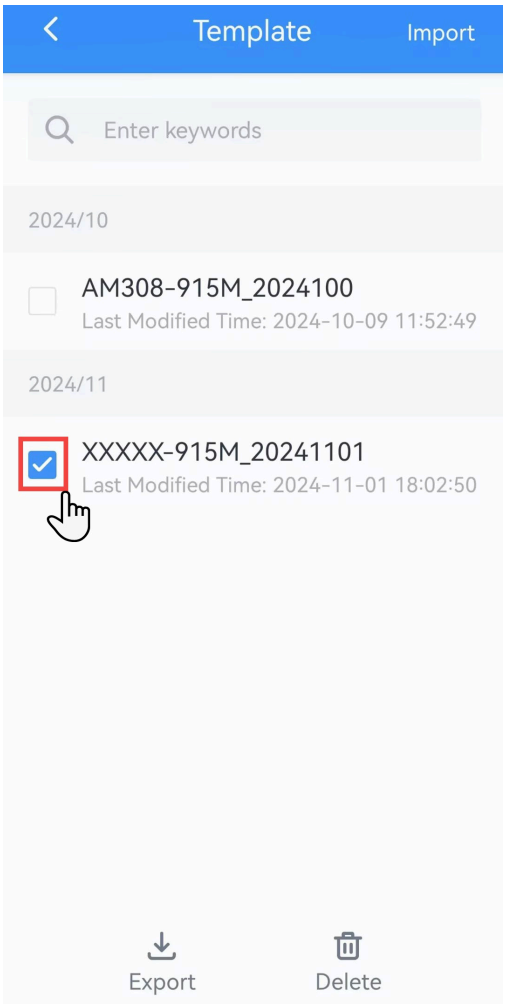
Step 4: Select and click the target template, click **Write** to import the configuration to target devices.



Export and Delete Template

Step 1: Check the box of the target template.

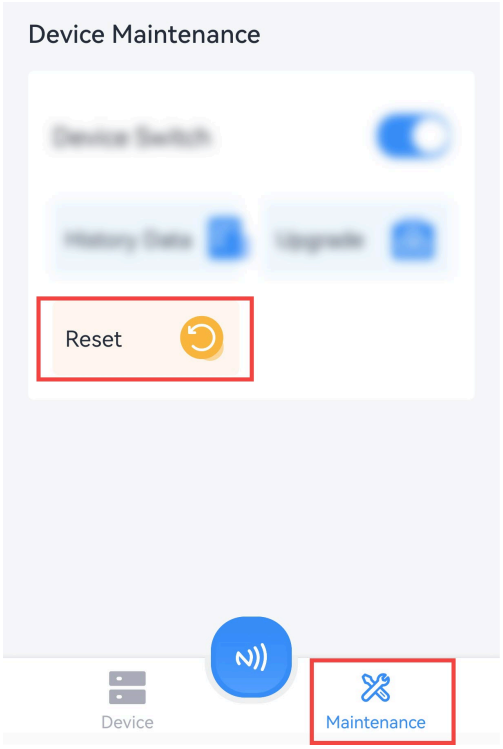
Step 2: Click **Export** to export this template as JSON format file and save it to the smartphone, click **Delete** to delete this template from your ToolBox App.



Reset to Factory Default

Via Hardware: Hold on the reset button for more than 10s until the LED indicator quickly blinks.

Via ToolBox App: Click **Reset** and attach the smartphone to device to reset the device.


Device Maintenance
Reset
Device
Maintenance

Chapter 6. Detector Maintenance

- The working life of the detector is 3 years, remember to replace the device after then.
- Avoid exposing the device to NH_3 and H_2S with high concentrations over a long period time, or it may damage the device and decrease the performance.
- The newly decorated or re-decorated room should be ventilated for some time before installing the detector.
- To ensure the air inlets are not blocked, wipe the device with a clean dry cloth, do not use a very wet cloth, alcohol, harsh chemicals or detergents which may damage the detector.
- Do not paint or cover the device, which may block the air inlets and interface.
- Do not modify, disassemble, strike or crush the device, which will cause the fault alarms.
- During the transportation and storage, keep out of direct sunlight, keep the temperature within 35°C and not more than 55°C, and keep the humidity not below 15%RH.

Chapter 7. Installation

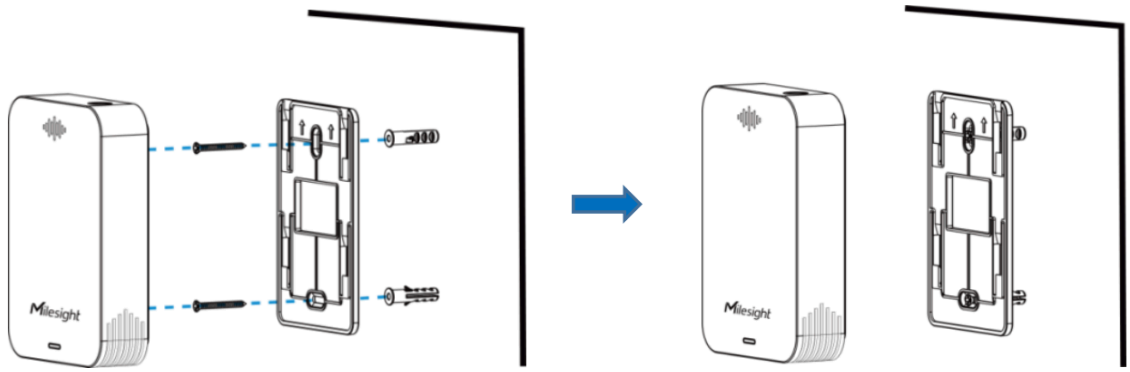
Location to avoid

- In a area expect for the operating temperature or larger temperature difference;
- Damp or very humid location expect for operating humidity (0 to 95%);
- The place close to heat source and even sunlight;
- In any outdoor places;
- Dusty or dirty environments may block the air inlets;
- Behind metal objects and obstacles which affect the LoRaWAN® transmission;
- The place with lots of electromagnetic interfaces;
- The place where strong vibration may happen or easy to be subjected to physical shock;
- Next to a door or window or any air ventilation openings like ventilation fans, bents, etc;
- The places spraying alcohol, perfume, fresheners, hair spray, gasoline, paint and other aerosols.

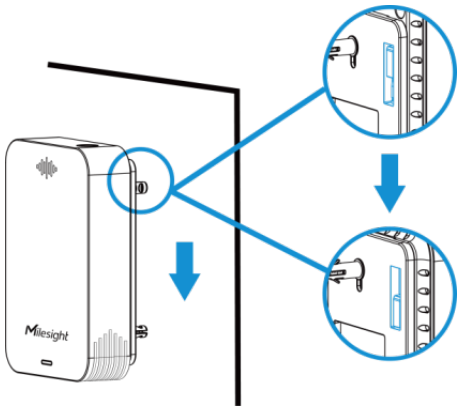
Wall Mounting

1. Take off the mounting bracket on the back of the device, drill 2 holes on the wall according to the wall mounting bracket, and then fix the wall plugs into the wall. It's suggested to install the device in the height of human breath which is a way from ground about 6.5 to 8.2 feet.

2. Fix the mounting bracket to the wall plugs with screws, and note the bracket should not be installed upside down.

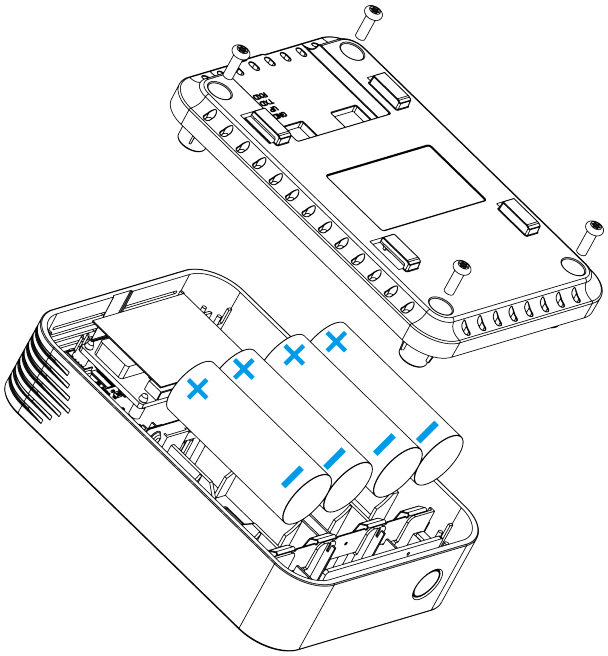


3. Hang the device to the bracket.


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Chapter 8. Battery Replacing

When the batteries have run out of power, please remove the back cover to replace the new batteries.



Note:

- The device can only be powered by the ER18505 Li-SoCl$_2$ batteries. The alkaline battery is not supported.
- The battery should be removed or replaced from the device if it is not used for an extended period.
- Ensure all replacing batteries are newest; otherwise, it may shorten battery life or cause inaccurate power calculations.

Chapter 9. Uplink and Downlink

Overview

All messages are based on following format (HEX), the Data field should follow little-endian:

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	N Bytes	1 Byte	...

For decoder examples please find files on https://github.com/Milesight-IoT/SensorDecoders.

Uplink Data

This chapter describes the reported data of the device.

Basic Information

The device will report a basic information packet whenever joining the network.

Item	Channel	Type	Byte	Description
Power On	ff	0b	1	Device is on
Protocol Version	ff	01	1	Example: 01=V1
Hardware Version	ff	09	2	Example: 03 10 = V3.1
Software Version	ff	0a	2	Example: 03 01 = V3.1
Device Type	ff	0f	1	00: Class A, 01: Class B, 02: Class C, 03: Class C to B
Serial Number	ff	16	8	16 digits
Sensor ID	ff	7c	43	Hex to ASCii **Note:** when frequency is US915/AU915/AS923 and spreading factor is SF10 or later, the device will not send this ID.

Example:

ff0bff ff0101 ff166798c38876450005 ff090100 ff0a0101 ff0f00 ff7c373436323436303030303030303030302d363033343235 3030303030303030303030302d303130313032303700		
Channel	**Type**	**Value**
ff	0b	ff
ff	01	01=V1
ff	16	SN: 6798c38876450005
ff	09	Hardware: 0100=V1.0
ff	0a	Software: 0101=V1.1
ff	0f	00: Class A
ff	7c	Sensor ID Hex to ASCii: 7462460000000000-6034250000000000-01010207

Periodic Report

The device supports the sensor data according to reporting interval.

Item	Channel	Type	Byte	Description
Battery Level	01	75	1	UINT8, Unit: %
Temperature	02	67	2	INT16/10, Unit: °C
Humidity	03	68	1	UINT8/2, Unit: %RH
Ammonia (NH_3)	04	7d	2	UINT16/100, Unit: ppm
Hydrogen Sulfide (H_2S)	05	7d	2	UINT16/100, Unit: ppm **Note:** this only report when firmware version is 1.1.
Hydrogen Sulfide (H_2S)	06	7d	2	UINT16/100, Unit: ppm

Note:
when the sensor reports value as ffff or ff, it means collection error; when the sensor reports value as fffe, it means polorizing.

Example:

017564 02670001 036856 047d0200 067d1800		
Channel	**Type**	**Value**
01	75	Battery Level: 64 => 100%
02	67	Temperature: 0001=> 0100 = 256/10=25.6°C
03	68	Humidity: 56=>86/2=43%
04	7d	NH_3: 02 00=>00 02=2/100=0.02 ppm
06	7d	H_2S: 18 00=>00 18=24/1000=0.024 ppm

Alarm Report

The device supports to report below types of alarm report packets.

1. NH_3 threshold alarm: report when the NH_3 exceeds the threshold.

047dc800		
Channel	**Type**	**Value**
04	7d	c8 00=>00 c8=200/100=2 ppm

2. H_2S threshold alarm: report when the H_2S exceeds the threshold.

067d3c00		
Channel	**Type**	**Value**
06	7d	3c 00=>00 3c=60/1000=0.06 ppm

3. Low battery level alarm: report when the battery level drops to 1%.

017501		
Channel	**Type**	**Value**
01	75	01=1%

Calibration Result

The device will report the zero point calibration result.

Channel	Type	Byte	Description
07	ea	5	**Byte 1**: 00=NH_3, 01=H_2S **Byte 2**: 00=reset to factory default, 01=set calibration value **Byte 3-4**: calibration value (set value of current environment), NH_3=UINT16/100, H_2S=UINT16/1000, unit: ppm **Byte 5**: 00=calibration success, 01=sensor module not support calibration, 02=sensor connection abnormal

Example:

07ea0001000000		
Channel	**Type**	**Value**
07	ea	00=NH_3 01=Set calibration value 00 00=>set current environment value as 0 00=calibration success

Downlink Command

This device supports downlink commands for configuration and control. The downlink application port is 85 by default. If the command takes effect, it will reply FE+type+command; if not, it will not send replies.

General Settings

Item	Channel	Type	Byte	Description
Reboot	ff	10	1	ff
Report Interval	ff	03	2	UINT16, Unit: s
LED Indicator	ff	2f	1	00: Disable, 01: Enable
Buzzer	ff	3e	1	00: Disable, 01: Enable
Exceed Reporting Interval	ff	66	2	UINT16, Unit: s

Example:

1. Reboot the device.

ff10ff

2. Set report interval as 20 minutes.

ff03b004		
Channel	**Type**	**Value**
ff	03	b004=>04b0=1200s=20 minutes

3. Disable the LED Indicator.

ff2f00		
Channel	**Type**	**Value**
ff	2f	00: Disable

Enquire Sensor Lifetime

Channel	Type	Byte	Description
ff	7d	1	ff Reply: 00=normal, 01=close to end, 02=end to life

Example:

Enquire the lifetime of the device.

ff7dff		
Channel	**Type**	**Value**
ff	7d	ff

Reply:

ff7d00		
Channel	**Type**	**Value**
ff	7d	00=Normal

Calibration Settings

Channel	Type	Byte	Description
ff	8d	4	Byte 1: 00=NH_3, 01=H_2S Byte 2: 00=reset to factory default, 01=set calibration value Byte 3-4: calibration value (set value of current environment), NH_3=UINT16/100, H_2S=UINT16/1000, unit: ppm

Example:

Zero calibration of NH_3 sensor.

ff8d00010000		
Channel	**Type**	**Value**
ff	8d	00=NH_3 01=Set calibration value 00 00=>0/100=0 ppm

Reply:

07ea0001000000		
Channel	**Type**	**Value**
07	ea	00=NH_3 01=Set calibration value 00 00=>0/100=0 ppm 00=calibration success

Threshold Setting

Item	Channel	Type	Byte	Description
Threshold Alarm	ff	06	9	CTRL (1B)+Min.Threshold (2B) +Max.Threshold (2B)+00000000 (4B) **CTRL:**

Item	Channel	Type	Byte	Description
				Bit0~Bit2: 000-disable 001-below (minimum threshold) 010-over (maximum threshold) 011-within 100-below or above Bit7~Bit3: id 00001: NH_3 00011: NH_3 (Abnormal Odor threshold in D2D Settings) 00101: NH_3 (Normal Odor threshold in D2D Settings) 00111: H_2S 01000: H_2S (Abnormal Odor threshold in D2D Settings) 01001: H_2S (Normal Odor threshold in D2D Settings) **Max./Min. Threshold:** NH_3=UINT16/100, H_2S=UINT16/1000, unit: ppm
Exceed Reporting Interval	ff	66	2	UINT16, Unit: s

Example:

When NH_3 is over 2ppm, it will trigger the threshold alarm .

ff060a0000c80000000000		
Channel	**Type**	**Value**
ff	06	CTRL: 0a=>0000 1010 (NH_3 over threshold) Min: 0000=>0 Max: c800=>00c8=>200/100=2ppm

Chapter 10. Appendix

Ammonia (NH_3) Levels and Guidelines

NH_3 Concentration	Description
0~0.10 ppm	Not perceptible or very weak
0.10~0.60 ppm	Weak
0.60~2.00 ppm	Distinct
2.00~10.00 ppm	Strong

Hydrogen Sulfide (H_2S) Levels and Guidelines

H_2S Concentration	Description
0~0.010 ppm	Not perceptible or very weak
0.010~0.060 ppm	Distinct
0.060~0.700 ppm	Strong

Chapter 11. Services

Milesight provides customers with timely and comprehensive technical support services. End-users can contact your local dealer to obtain technical support. Distributors and resellers can contact directly with Milesight for technical support.

Technical Support Mailbox: iot.support@milesight.com

Online Support Portal: https://support.milesight-iot.com

Resource Download Center: https://www.milesight.com/iot/resources/download-center/

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