

Residential Gas Detector

Featuring LoRaWAN®

GS101

User Guide

 **DANGER**

If you hear the gas leak alarm or smell the gas even without an alarm, please keep calm and carry out the following actions, not necessarily in the order given:

- ❖ Extinguish all naked flames, including all smoking material;
- ❖ Check and ensure gas appliances are off;
- ❖ Open doors and windows to improve ventilation;
- ❖ Do NOT use a phone, light a match, or turn on or off any electrical equipment indoors;
- ❖ EVACUATE IMMEDIATELY and NOTIFY the gas supplier and/or 24h-service gas emergency to test and make safe, any necessary repair carried out;
- ❖ Do NOT re-enter the place until told to do so by authorities.

 **WARNING**

- ❖ Please read this guide carefully before operation and retain it for future reference.
- ❖ This detector is not guaranteed to prevent personal injuries or property damage associated with a gas leak. Please ensure that your gas appliances and piping systems are properly installed, used and maintained to reduce the possibility of a gas leak.
- ❖ This installation should strictly comply with the electrical safety regulations of the local region.
- ❖ The output installation with other appliances and gas valves should be conducted by a qualified service person. Do not overload the output maximum capacity so as to avoid damage to the detector.
- ❖ Do not modify, disassemble, strike or crush the device, this will cause the fault alarms.
- ❖ Do not expose the detector to corrosive gas, silicon vapor or high levels of volatile organic compounds.
- ❖ Keep the device away from the water to prevent damage to the detector and electric shock.
- ❖ Do not paint or cover the device, which may block the air inlets and interfere with the detector work.
- ❖ Keep the device out of children's reach.
- ❖ Do not place your ear directly against or in close proximity to the device when it is alarming.

Declaration of Conformity

GS101 is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.



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Revision History

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1. Product Introduction

1.1 Overview

GS101 is a LoRaWAN® residential gas detector to detect the natural gas leak and send alarms. When the concentration caused by gas leak reaches the preset threshold, the detector will trigger LED light alarm and buzzer sound alarm, it also supports controlling outputs to close the gas valve and open the vent fans to prevent potential accidents.

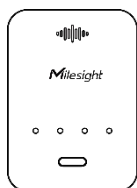
Apart from local alarms, GS101 can also report the normal status of the device and alarm messages remotely by the use of LoRaWAN® technology. Integrating with Milesight LoRaWAN® gateway and Milesight IoT Cloud solution, users can monitor all the sensor data and control the device remotely and visually.

1.2 Features

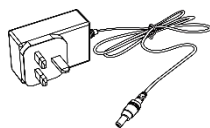
- Built-in semiconductor gas detection sensor with 5-year-long working life
- High sensitivity gas leak detection and support 8% LEL alarm threshold
- Equipped with buzzer and light indicators to indicate the device powered, faulty, alarmed and invalid status
- Equipped with a test button to test the device's normal or abnormal status
- Equipped with relay outputs for external appliances such gas valves and vent fans, reducing potential accidents
- Store 800 historical records locally in 7 types
- Easy configuration via NFC
- Milesight IoT Cloud compliant

2. Hardware Introduction

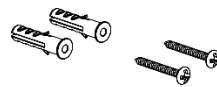
2.1 Packing List



1 × Residential Gas Detector



1 × Power Adapter



2 × Wall Mounting Kits



1 × Warranty Card

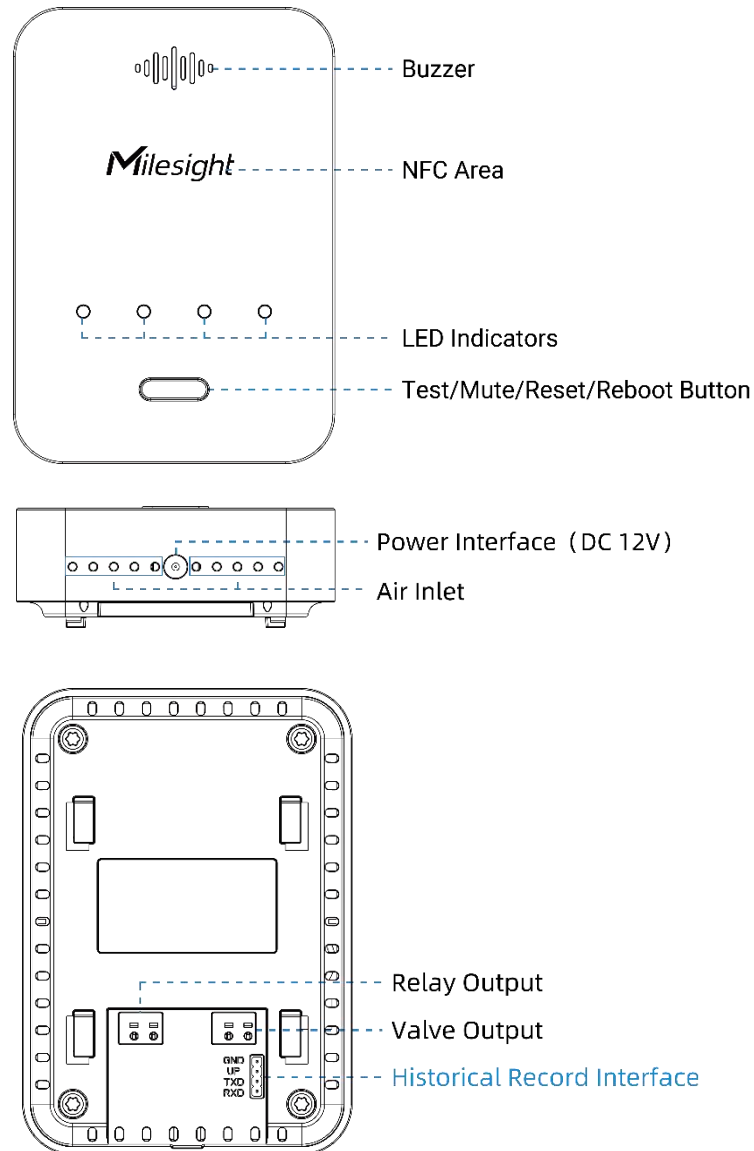


1 × Quick Guide



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

2.2 Hardware Overview

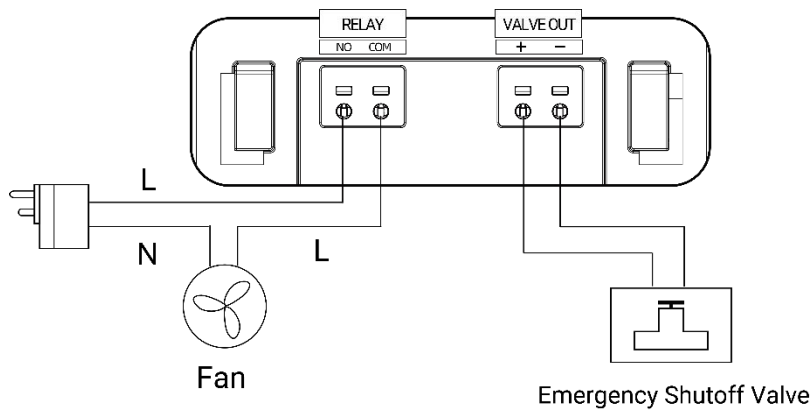


Note: The historical record interface is only for professional use. Users can use Milesight ToolBox App to read the historical records.

2.3 Wiring

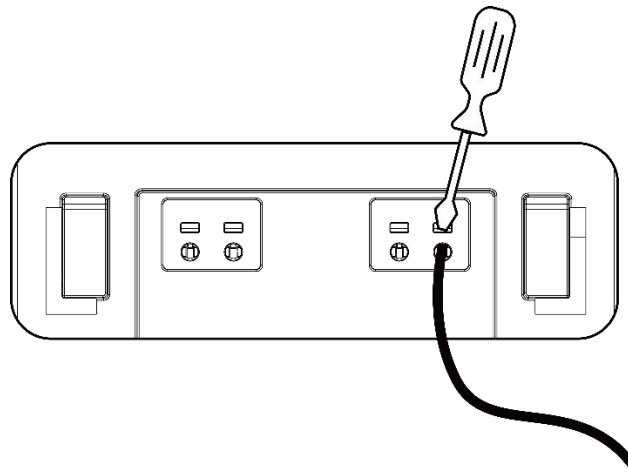
Wiring Diagram

The relay output can connect the device up to 250VAC/10A, and the solenoid valve output is a 12V/100ms pulse output. When the alarm is triggered, the relay output will open the fan and solenoid valve output will send a pulse to close the valve; when the alarm is dismissed, the relay output will close the fan, and the valve status will not change. You can open the solenoid valve manually or via send downlink commands.



Wiring Step

Insert a flathead screwdriver into the square holes and insert the wire into the circle holes, then release the screwdriver and ensure the cable is locked.



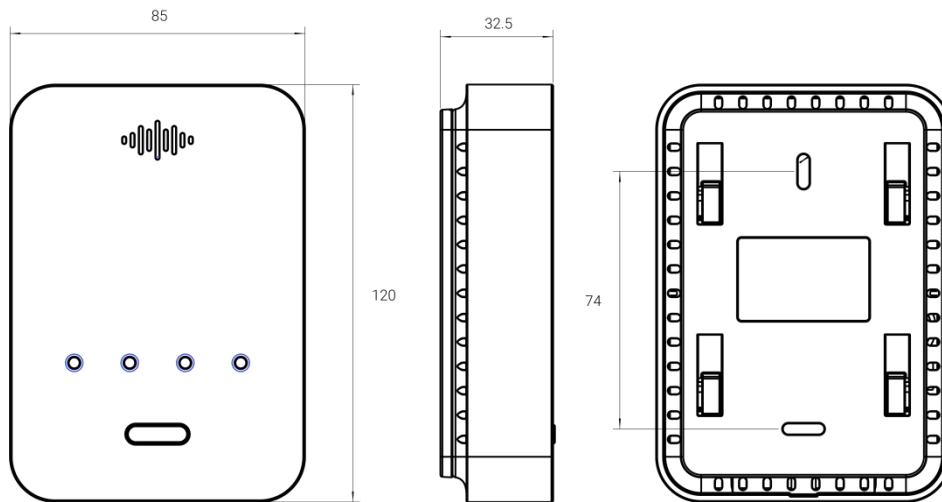
Note: power off all devices when wiring, do not touch the bare wires after the device is powered on.

2.4 LED and Button Patterns

Status/Function	LED	Buzzer
Warm-up Time (about 180s)	All Blinks	Beeping twice when the warm-up complete
Work Properly	Steady Power Light On, While Other Lights Off	/
Abnormal Working/ Collection/Output	Steady Fault Light On, While Other Lights Off	Beep Once Every 0.5s
Threshold Alarm: 8% LEL	Steady Alarm Light On, While Other Lights Off	Keep Beeping
End of Working Life	Invalid Light Blinks, While Others Off	Beep Once Every 0.5s
Test: Press the button ($\leq 3s$) when device is working properly	All Lights Blink until the Test Complete	Beep 1s

Mute: Press the button ($\leq 3s$) when device is in alarm status	Steady Alarm Light On, While Other Lights Off	Stop Beeping for 1 Minute
Reboot: Hold on the button for 3s to 10s	All Lights Blink Slowly	/
Reset to Factory Default: Hold on the button for more than 10s	All Lights Blink Quickly	/

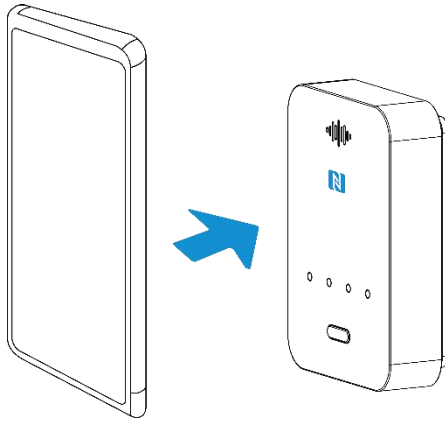
2.5 Dimensions(mm)



3. Operation Guide

3.1 Basic Configuration

1. Connect the outputs to the solenoid valve, fan or other devices.
2. Power on the detector via default power adapter and wait for about 180s for the warm-up process. When the warm-up finishes, the buzzer will beep twice and all indicators will stop blinking except for the Power indicator.
3. Press the Test button to check if the LED indicators and buzzer work properly, if the relay output can open the fan and valve output can close the gas valve. After testing, everything will recover back to normal status except the gas valve, please turn on the valve manually.
4. Download and install "Milesight ToolBox" App from Google Play or Apple App Store.
5. Enable NFC on the smartphone and launch Milesight ToolBox.
6. Attach the smartphone with the NFC area to the device to read device information. Basic information and settings of the device will be shown on ToolBox App if it's recognized successfully. You can read and configure the device by tapping the Read/Write device on the App. To order to protect the security of the device, please change the password when first configuration. The default password is **123456**.



Note:

- 1) After the warm-up, if the device is powered off for a short time, it will not warm up again.
- 2) If the device detects the threshold reaches during the warm-up, it will stop warming up and send alarms.
- 3) Ensure the location of smartphone NFC area and it's recommended to take off phone case.
- 4) If the smartphone fails to read/write configurations via NFC, keep the phone away and back to try again.
- 5) GS101 can also be configured by a dedicated NFC reader, which can be purchased from Milesight IoT.

3.2 LoRaWAN Settings

LoRaWAN settings are used for configuring the transmission parameters in LoRaWAN® network.

Basic LoRaWAN Settings:

Go to “**LoRaWAN Settings**” to configure join type, App EUI, App Key and other information. You can also keep all settings by default.

Device EUI

* APP EUI

* Application Port - 85 +

Join Type

* Application Key

Confirmed Mode (i)

Rejoin Mode

Set the number of detection signals sent (i)

ADR Mode (i)

Spreading Factor (i)

TXPower

Parameters	Description
Device EUI	Unique ID of the device which can also be found on the label.
App EUI	Default App EUI is 24E124C0002A0001.
Application Port	The port is used for sending and receiving data, the default port is 85.
Join Type	OTAA and ABP mode are available.
LoRaWAN Version	V1.0.2, V1.0.3, V1.1 are available.
Work Mode	It's fixed as Class C.
Application Key	Appkey for OTAA mode, default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5 th to 12 th digits of SN.
Network Session Key	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
RX2 Data Rate	RX2 data rate to receive downlinks.
RX2 Frequency/MHz	RX2 frequency to receive downlinks.
Spread Factor	If ADR is disabled, the device will send data via this spread factor.
Confirmed Mode	If the device does not receive ACK packet from the network server, it will resend data once. Note: alarm packets and alarm dismissed packets are fixed as confirmed packets.
Rejoin Mode	Reporting interval ≤ 30 mins: the device will send a specific number of

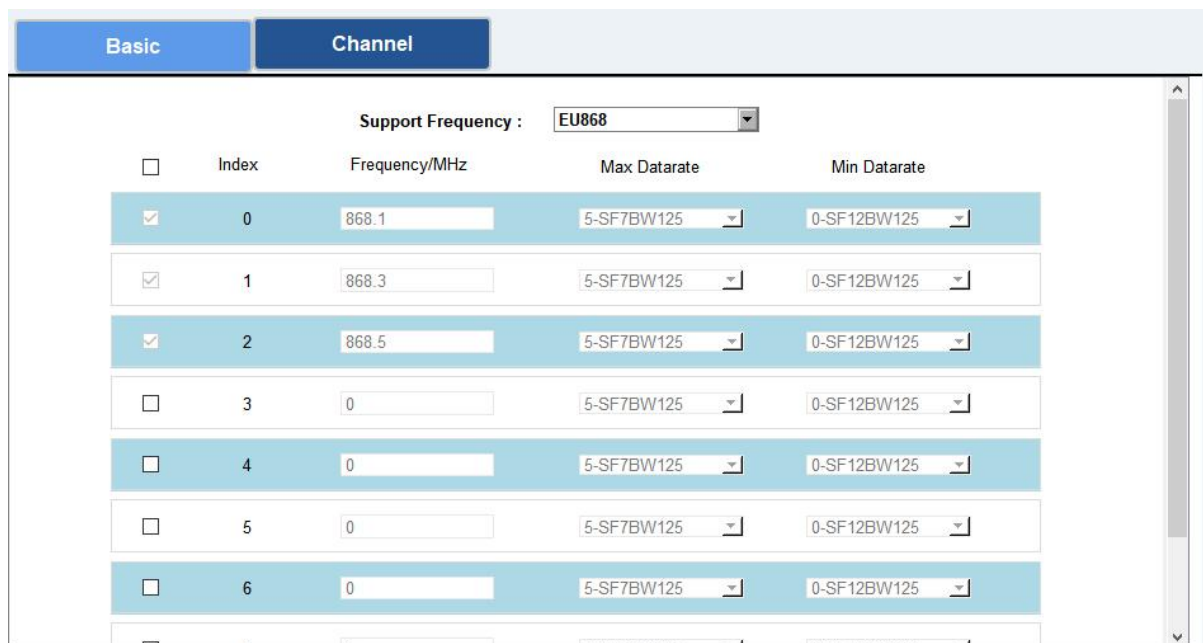
	<p>LinkCheckReq MAC packets to the network server every 30 mins to validate connectivity; If there is no response, the device will re-join the network.</p> <p>Reporting interval > 30 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network.</p>
Set the number of packets sent	When rejoin mode is enabled, set the number of LinkCheckReq packets sent.
ADR Mode	Allow the network server to adjust datarate of the device.
Tx Power	Transmit power of the device.

Note:

- 1) Please contact sales for device EUI list if there are many units.
- 2) Please contact sales if you need random App keys before purchase.
- 3) Select OTAA mode if you use Milesight IoT cloud to manage devices.
- 4) Only OTAA mode supports rejoin mode.

LoRaWAN Frequency Settings:

Go to “**Settings -> LoRaWAN Settings**” of ToolBox App to select supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN® gateway.



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

* Support Frequency

US915

Enable Channel Index ⓘ

8-15

Index	Frequency/MHz ⓘ
0 - 15	902.3 - 905.3
16 - 31	905.5 - 908.5
32 - 47	908.7 - 911.7
48 - 63	911.9 - 914.9
64 - 71	903 - 914.2

Note:

For -868M model, the default frequency is EU868;

For -915M model, the default frequency is AU915.

3.3 Basic Settings

Go to "Device -> Settings -> General Settings" of ToolBox App to change the reporting interval, etc.

Reporting Interval 20 min

Change Password

Parameters	Description
Reporting Interval	Reporting interval of transmitting current sensor values to the network server. Default: 20 mins, Range: 1-1080 mins
Change Password	Change the password for ToolBox App or software to read/write this device.

3.4 Historial Record Storage

GS101 supports storing more than 800 historical records locally in 7 types and these records will not be cleared even reset to factory default. When storing records reach the max capacity, the device will cover the oldest records according to record types. Record type, description and maximum amount are listed in the chart below:

Record Type	Record Description	Items
Device Alarm	The device detects the 8% LEL and triggers the alarm.	200
Device Alarm Dismissed	Recover from alarm status.	200
Device Fault	Abnormal working/collection/outputs or sensor detached.	100
Device Fault Recovered	Recover from device fault status.	100
Device Power On	The device is powered on.	50
Device Power Off	The device is powered off.	50
Device Invalid	The working life of the device is reached.	1

You can go to **“Device -> Maintenance”** of the ToolBox App and click **“Export”** to check records and save the records as a csv file. After saving, you can click **“Export Record”** to check the historical export records.

The screenshot shows the 'Maintenance' tab of the ToolBox App. On the left, device information is displayed: SN (6747C21194300001), Model (GS101-915M), Firmware Version (V1.1), and Hardware Version (V1.0). Below this are buttons for 'Browse', 'Reset', 'Reboot', 'Export', and 'Export Record'. On the right, a date range '2022-05-27 00:00 - 2022-07-27 10:42' is shown above a table of historical records. The table has two columns: 'Time' and 'Historical Record Type'. The records show a sequence of 'Device power on' and 'Device power off' events. At the bottom right, there are 'Cancel' and 'Export' buttons.

Time	Historical Record Type
2022-07-21 18:06	Device power off
2022-07-21 14:59	Device power on
2022-07-21 14:59	Device power off
2022-07-20 19:31	Device power on
2022-07-20 19:16	Device power off
2022-07-20 17:10	Device power on
2022-07-20 17:10	Device power off
2022-07-20 17:00	Device power on
2022-07-20 17:00	Device power off
2022-07-20 14:53	Device power on
2022-07-20 14:52	Device power off
2022-07-19 09:53	Device power on
2022-07-19 09:48	Device power on

3.5 Maintenance

3.5.1 Upgrade

1. Download firmware from www.milesight-iot.com to your smartphone.
2. Open ToolBox App and click "Browse" to import firmware and upgrade the device.

Note:

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

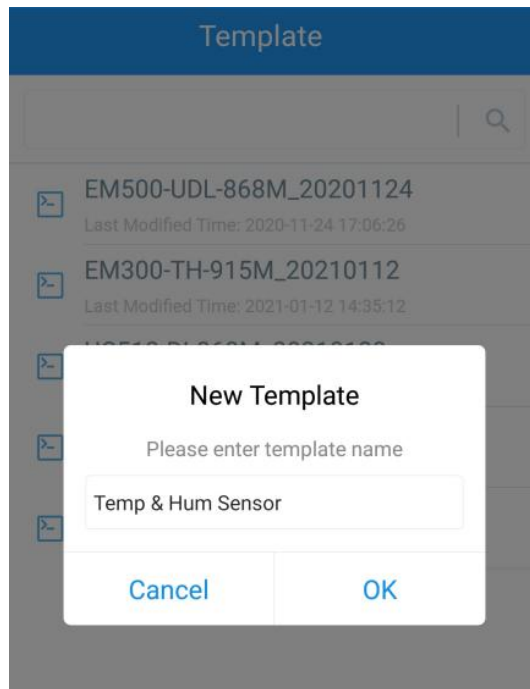
Status	Setting	Maintenance
SN	6747C21194300001	
Model	GS101-915M	
Firmware Version	V1.1	
Hardware Version	V1.0	
Manual Upgrade		

[Browse](#)

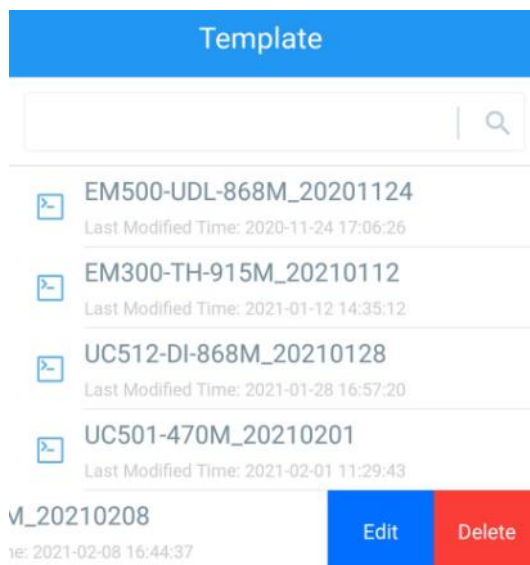
3.5.2 Backup

GS101 supports configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRaWAN® frequency band.

1. Go to "Template" page on the App and save current settings as a template. You can also edit the template file.
2. Select one template file that is saved in the smartphone and click "Write", then attach it to another device to write the configuration.



Note: Slide the template item to the left to edit or delete it. Click the template to edit the configurations.



3.5.3 Reboot and Reset

Please select one of the following methods to reset or reboot the device:

Via Hardware: Hold on the button on the front panel for 3 to 10s to reboot, and more than 10s to reset.

Via Toolbox App: Go to **“Device -> Maintenance”** to click **“Reset”** or **“Reboot”**, then attach smartphone with the NFC area to the device.

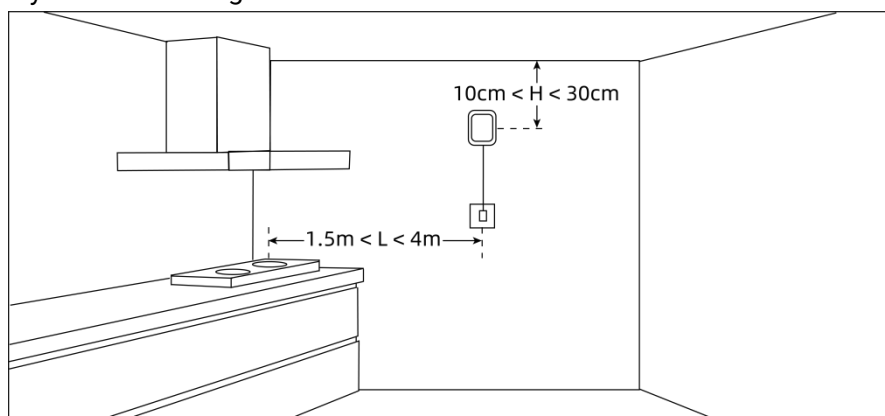
Status	Setting	Maintenance
SN	6747C21194300001	
Model	GS101-915M	
Firmware Version	V1.1	
Hardware Version	V1.0	
Manual Upgrade		
Browse		
Restore Factory Default		
Reset		
Reboot		

4. Installation

Recommended Installation Locations

The residential gas detector is designed to be installed in every room where gas leak may occur, such as the kitchen. The installation location should meet these requirements:

- within the range of the LoRaWAN® gateway;
- close to the ceiling and be high than any door or window;
- keep away from the gas supply between 1.5m to 4m;
- keep away from the ceiling between 10cm to 30cm.



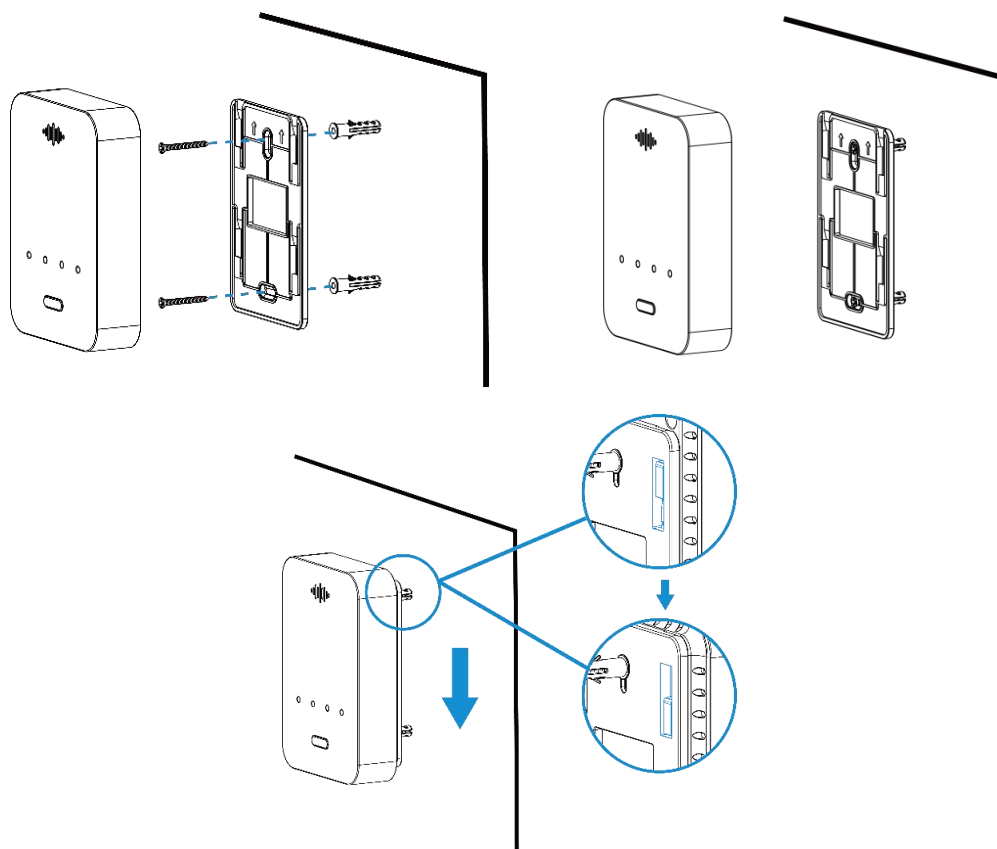
Locations to Avoid

- Behind metal objects and obstacles;
- The place with lots of electromagnetic interferences;

- The place where strong vibration may happen or easy to be subject to physical shock;
- On the top of cook appliances or sink or way of smoke;
- Enclose space or the place where curtains, furniture or other objects block the flow of air to the detector;
- Dusty or dirty environments may block the air inlets;
- Damp or very humid location which except operating humidity (0 to 95%), such as bathroom;
- Next to a door or window or any air ventilation openings like ventilation fan, vents, etc.
- In any outside place;
- In an area except for the operating temperature (-10°C to 55°C) or large temperature difference;
- The places spraying alcohol, perfume, fresheners, hair spray, gasoline, paint and other aerosols.

Installation Steps

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.
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.



5. Maintenance

- The working life of the detector is 5 years from power on, replace the device if you observe Invalid indicator blinks.
- The newly decorated or re-decorated room should be ventilated for some time before installing the detector.
- It's suggested to press the Test button to check the LED indicators, buzzer and outputs every month; besides, check if the device is online and send periodic status on the IoT platform.
- 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 use a lighter or other gas to test the detector, which may damage the detector.
- There is possible accuracy drift if you store without power for a long time in different devices. If you prefer a more consistent reading with better precision, you can keep the device powered on in clear air for some time according to the below list.

Storage Time (Power Off)	Operating Time
Less than 1 month	At least 2 days
1~6 months	At least 3 days
More than 6 months	At least 7 days

6. Device Payload

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

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

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

6.1 Basic Information

GS101 reports basic information of the device whenever joining the network.

Channel	Type	Description
ff	01 (Protocol Version)	01=>V1
	09 (Hardware Version)	01 40 => V1.4
	0a (Software Version)	01 14 => V1.14
	0b (Power On)	Device is on
	16 (Device SN)	16 digits

Example:

ff0bff ff0101 ff166747c21194300001 ff090100 ff0a0101		
Channel	Type	Value
ff	0b (Power On)	ff: device is powered on
ff	01 (Protocol version)	01 (V1)
ff	16 (Device SN)	6747c21194300001
ff	09 (Hardware Version)	0100: V1.0
ff	0a (Software Version)	0101: V1.1

6.2 Sensor Data

GS101 device will report the below packages:

1. Periodic package: reports Methane status, valve status and relay output status according to reporting interval (20 mins by default);
2. Alarm or alarm dismissed package: reports Methane status, valve status and relay output status when Methane status changes;
3. Device power off or fault package: reports when the corresponding event happens;
4. Device will be invalid soon: report alarm and remaining lifetime once per day, the device will send this alarm one month in advance;
5. Device invalid: report alarm once every hour.

Note: when warming up, the device will not upload data except if it detects the threshold reaches.

Item	Channel	Type	Description
Methane Status	05	8e	00-normal 01-alarm
Valve Status	06	01	00-off 01-on
Relay Output Status	07	01	00-off 01-on
Remaining Lifetime	08	90	4 Bytes, unit: s
Alarm Report	ff	3f	00-device power off 01-device power on 02-device fault 03-device fault recovered 04-device will be invalid soon 05-device invalid

Example:

1. Periodic Package

058e00 060101 070100		
Channel	Type	Value

05	8e (Methane Alarm)	00: normal
06	01	01: valve on
07	01	00: relay output off

2. Device is powered off

ff3f00		
Channel	Type	Value
ff	3f (Alarm Report)	00: device is powered off

6.3 Downlink Commands

GS101 supports downlink commands to configure the device. The application port is 85 by default.

Item	Channel	Type	Description
Control Valve	06	/	0000ff-close 0001ff-open
Control Relay Output	07	/	0000ff-close 0001ff-open
Enquire Working Lifetime	08	/	0000ff
Set Reporting Interval	ff	03	2 Bytes, unit: s
Reboot Device		10	ff
Set time zone		17	2 Bytes, desired UTC time zone * 10
Enquire Device Status		28	00
Mute the Buzzer		61	2 Bytes, unit: s

Example:

1. Turn the valve on.

060001ff		
Channel	Type	Command
06	-	0001ff=>Turn the valve on

2. Set reporting interval as 20 minutes.

ff03b004		
Channel	Type	Value

ff	03 (Set Reporting Interval)	b0 04 => 04 b0 = 1200s = 20 minutes
----	-----------------------------	-------------------------------------

3. Set time zone to GMT-4 for time display on ToolBox App.

ff17d8ff		
Channel	Type	Value
ff	17 (Set Time Zone)	d8 ff => ffd8 = -40 = -4 * 10

4. Mute the Buzzer for 1 minute

ff613c00		
Channel	Type	Value
ff	61 (Mute the Buzzer)	3c 00 => 00 3c = 60 seconds

-END-