



USER MANUAL



1 Safety Precautions

Introduction to the safety precautions



Safety Precautions

1.1 Safety precautions

Please read the following carefully before operating this device.

DANGER

When the device is turned on, do not look directly or use an optical instrument (such as a telescope or magnifying glass) to observe the green indicator laser on the front of the device to avoid burning your eyes!

DANGER

When the device is turned on, do not point the green indicator laser at the face of other people or animals, it may cause unexpected injury or damage!

DANGER

This device meets the requirements of Ex ib IIC T4 Gb intrinsically safe explosion-proof standard and can be used in an environment full of explosive gas. However, it is strictly prohibited to charge the device in the same case!

CAUTION

Do not let the device enter water, or make actions such as colliding, throwing and dropping the device, which may cause damage to the device or operation failure.



Safety Precautions

CAUTION

Using a wrist strap can avoid accidental drops of the device , thus prolonging the life of the device. It is recommended to always wear the wrist strap during use.

CAUTION

Do not attempt to repair or replace components and parts! When the device does not work properly or displays an error message, please refer to the relevant description in this manual for recovery operations or call for after-sales service.

CAUTION

Please avoid direct sunlight for long periods of time, or placing it in a car exposed to direct sunlight, or operation in harsh weather conditions such as rain, snow, hail, and strong wind! It is recommended to store the device in the dedicated package when not in use.

DANGER

Do not use non-original charger to charge! Check whether the charging port and charger are damaged before charging to avoid short circuit.





2 Instruction

Packaging, Structure and
Working Principle

Laser methane detector is a gas detection device for remote measurement of methane gas. The device emits two laser beams: a visible green laser pointing towards the detection area and an invisible infrared laser for measuring methane gas at a distance, with results expressed in the unit of concentration ppm·m.

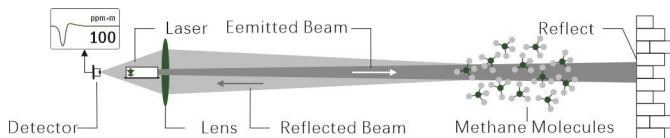
2.1 Measurement principle

Methane molecules absorb light at specific wavelengths.

—— Molecular absorption spectroscopy principle

There is a linear relationship between the concentration and the absorbance of the solution, which enables the concentration of a solution to be calculated by measuring its absorbance.

—— Lambert-Beer law



According to the above physical principle, a beam of specific wavelength can be used to penetrate the leaking methane gas mass and depending on how weakened the beam is, the concentration of methane in the air mass being passed through can be measured, it only responds to methane (Sole Selectivity).

In the detection, after the emitted beam passing through the leaked methane gas mass, must be reflected through the reflector surface, and then back to the detector before the device can complete the measurement and output the unit concentration value.

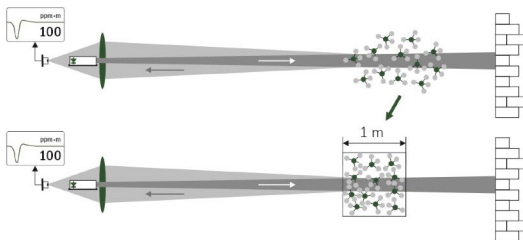
Due to the leaked methane gas mass is scattered by the wind, it is constantly changing and unevenly distributed in both space and time scale.

The distance from the device to the reflector is uncertain, and the thickness of the methane gas mass is also uncertain, in order to show the concentration values in this case, the concept of unit concentration (ppm·m) is commonly used in the industry, which is expressed: methane concentration (ppm) x standard thickness (1 m)

2.2 Unit Concentration (ppm·m)

The meaning of 100 ppm·m: to uniformly distribute 100 ppm of methane gas on a 1 meter thick air mass.

It can be approximated explained that the unit concentration is the concentration after the methane molecules on the straight line (laser detection line) between the detector and the reflection target are uniformly "compressed" or "expanded" into a region of 1 m thickness.



The device has a measured value of 100 ppm·m for a methane mass with a thickness of 5 m and a concentration of 20 ppm on the detection line, which is equivalent to the gas mass being "compressed" to a thickness of 1 m with a concentration of 100 ppm.



The measurement value is also 100 ppm·m, for a gas mass with a thickness of 0.5 meters and a concentration of 200 ppm on the detection line, which is equivalent to the gas mass being "expanded" to a thickness of 1 meter with a concentration of 100 ppm.



2.3 Detection environment

Select appropriate reflective surfaces

The ability of the target to reflect the laser directly affects the distance and effect of the measurement. If the target is dark, large-angle tilt, porous, mirror surface or a highly reflective surface, adjust the angle and position for optimal detection.

For example, black foam, facing glass, large angles to the ground, stainless steel metal grilles, etc., are poor reflection targets, while plaster walls, cement planes, continuous foliage vegetation, and earth or sandy land are excellent reflective backgrounds.

Highly reflective surfaces

The device is facing a highly reflective surface (glass, smooth tiles, water, smooth stainless steel railings), and false alarms can occur due to the direct reflection of specular light into the detector that will overload the detector instantaneously. In addition, highly reflective surfaces can lead to the detection beam being directed and not returning, resulting in an error of too weak intensity.

Penetrating transparent objects

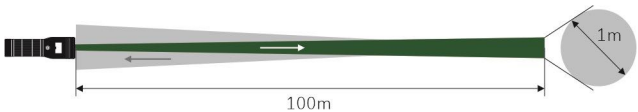
Laser can detect methane through transparent objects, but in the process of penetration, the measurement values may be underestimated due to the reflection from the transparent objects. The more transparent objects penetrated, the greater the loss will be.



When the detector is aimed at a transparent container placed in front of a good reflection, the measured value will be lower than the actual unit concentration in the container, because the laser light will be reflected on the container wall (first interface) first, but the reflected light does not pass through the gas, and the stronger the reflective ability of the container wall, the greater the deviation between the measured value and the actual value.

In the case of long-distance detection

The beam emitted by laser collimation is not a strict straight line, but will continue to diverge and weaken with the increase of distance; A cone-shaped divergent beam of light is formed. The spot size of the detection beam at a distance of 100 meters is about a circle with a diameter of 1 meter, so when the distance increases, the area of the detected gas is too small, which may cause a part of the laser to be reflected back to the detector without through the gas, resulting in the problem that the measured value is smaller than the actual value or even cannot be effectively detected.



When detecting high-rise residential building, when measuring elevation angle is too large, there will be the situation that elliptical light spot covers multi-floors, and the detection target cannot be filled with light spot, and causes the detection value smaller.

In the case of long-distance detection, the laser itself will be scattered, and this situation will be worse in windy, sandy, rainy and foggy weather, resulting in the light intensity reflected back to the detector is too weak, resulting in errors of small detection value or too weak light intensity.



Instruction

2.4 Packing list

Take the device and all accessories out of the device package^{*1} and check if the accessories are completely match with the following list^{*2} If you find part missing or damaged, please contact us immediately

ID	Name	Quantity
1	Detector (With hand strap)	1
2	Charger (Charging head, cable)	1(set)
3	Calibration gas cell or bag	1(set)
4	Optical maintenance tools (Wipes, lens cloth, etc.)	1(set)
5	Documents (Manual, quick guide, etc.)	1(set)

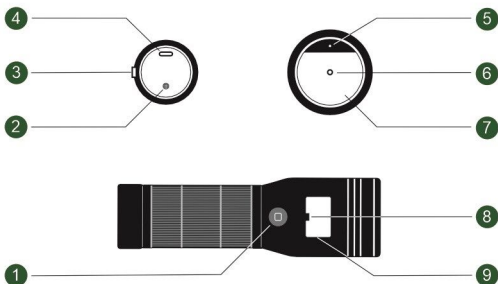
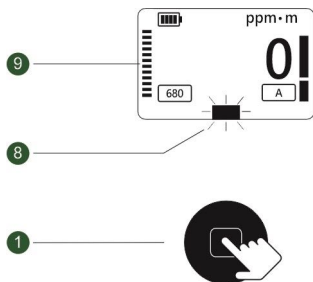
1. The device case of L10 is waterproof, moisture-proof and dustproof. Please store the device stored in the case when not using. Models L10E and L10M are not equipped with the same storage case. Please store the device in the case when not in use.

2.The accessories of the product may change, please refer to the packing list in the package.

2.5 Composition of the Device

The laser emitter and receiver are located in the front of the device while the charging port is located in the rear which is protected by a rubber plug. The operation panel is in the middle which contains a button, indicator light and the LCD display.

- [1] Operation panel-button
- [2] Buzzer
- [3] Wristband buckle
- [4] Charging port
- [5] Indication laser Emitter
- [6] Detection laser Emitter
- [7] Lens
- [8] Operation panel - Indicator light
- [9] Operation panel - LCD Display



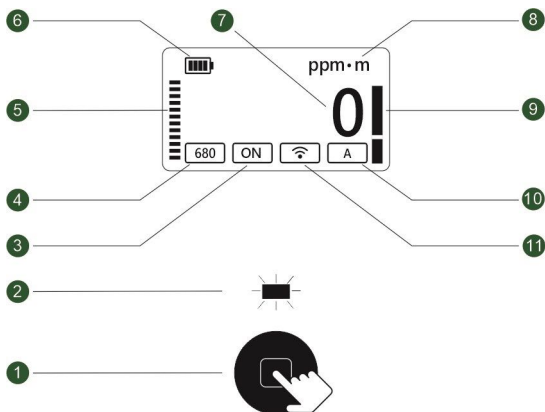


3 Operation Interface

Introduction of user interface, operation steps and buttons function

3.1 User Interface

The device shows information to the user through the display screen, indicator lights and buzzer, and responds to operations with the button.



- | | |
|---------------------------------|-------------------------------|
| [1] Button | [7] Concentration value |
| [2] LED Indicator | [8] Concentration unit |
| [3] Indicating laser on/off | [9] Concentration indicator |
| [4] Max concentration | [10] Detection mode |
| [5] Light intensity indicator | [11] Connection state |
| [6] Power | |



3.2 Button function

button	Short press	Double click	Press and hold
●	Check Battery /Turn off indicator laser/Switch detection mode	Turn on the indicator laser	Turn On/Off / Enter mode change/ Enter Calibration



4 Device Usage

Instruction of usage, Operation steps and relevant settings

4.1 Charges

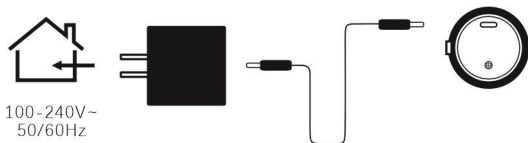
Please use the original charger to charge the device. The charger consists of a cable and a charging head. The charging port is located at the bottom of the device.

Proceed as follows:

[1] Connect the cable with the head, plug the head into a socket and make sure the socket has power.

[2] Insert the cable into the charging port.

[3] Short press ●, followed by a short beep, the battery icon  appears on the screen with flash, when the battery icon  is full, the battery is fully charged .



Check Battery

When the device is turned off, click ● button to check the battery status ^{*1}. After a short beep, the screen displays the current battery status.

^{*1} Battery power is affected by age and ambient temperature. It is recommended to turn on the device indoors in winter. The heat generated by the device itself helps to improve the battery performance; if the battery's endurance is seriously reduced, please contact the after-sales service for a battery replacement.


4.2 Operation


[1] Turn on / off

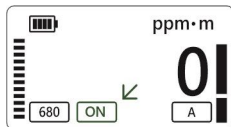
Press and hold the button ●, hear a short "beep" sound, the device is turned on.

Turn-off operation is the same as turn-on, after turning off the indicator laser, press and hold the button ● to hear a long "beep", the device turns off.

[2] Turn on / off indicating laser

After the device starts normally, double-click the button ● and you will hear two short "beep", At this time, the green indicator laser is turned on and the screen lights up the icon 

Press the button ● to turn off the indication laser and the icon  disappears.

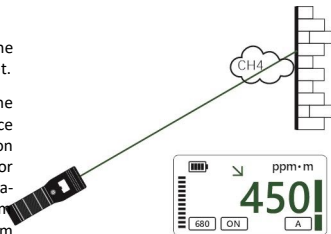


Note: The device will give alarm after it detects methane gas only when the indication laser is turned on.

[3] Point at the target


Point the device to the suspected leak area, the green indicator laser will guide you to the target.

If there are methane (CH₄) molecules in the straight line (detection line) between the device and the target. It will display its concentration on the screen, and the concentration indicator bar will also show the change of the concentration value in real time, and give a "beep" alarm for the concentration exceeding the alarm threshold, while the LED indicator flashes red.



[4] Set detection mode

The device has 4 detection modes - "automatic", "pipeline", "building" and "high sensitivity" mode.

Turn on the indication laser, press and hold the button  until you hear a short beep, the indication laser is off, the "Mode" icon on the screen is reversed color, click to switch modes, between the 4 modes in a cycle. If there is no action for 3 seconds, the current mode will be saved.

When the "Mode" icon in the lower right corner of the LED screen is "A", indicating the device is in automatic detection mode, "H" for building detection mode, "S" for pipeline inspection mode, and "F" for high sensitivity mode.

Automatic detection mode [A]: General use.

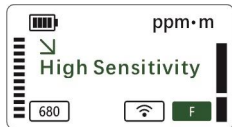
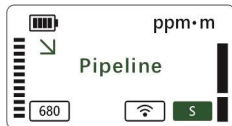
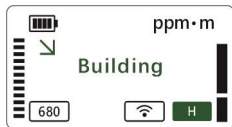
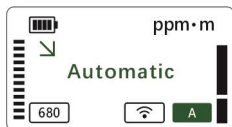
Building detection mode [H]:

For residential building detection and long-distance detection.

Pipeline inspection mode [S]:

Suitable for daily pipeline inspection and gas facility inspection.

High sensitivity mode [F]: To identify the leak point at close range.



TIPS







Before changing the detection mode, first turn on the indication laser and then enter the mode setting.

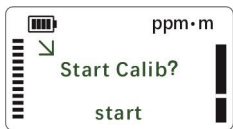
After pressing and holding the button to hear a short beep, please release the button immediately, otherwise it will enter the calibration mode.

4.3 Calibration

Changes in time and temperature may cause internal parameters of the device to drift, resulting in higher or lower measured values. In this case, it is necessary to restore the performance of the device through calibration. The calibration period is generally 3 months, or when the concentration value of the calibration gas cell "shows" less than 1000ppm·m.

Calibration step:

- [1] Place the detector and the gas cell in the device case with the screen facing upwards. Turn on and wait for the self-test to complete.
- [2] Double-click the button  to turn on the indicator laser, then press and hold the button  until you hear two short "beep-beep" at intervals, and the screen shows "Start Calib?", click the button  to start the calibration. If there is no action for 3 seconds, the calibration will be canceled and the detection interface will be restored.
- [3] The device automatically completes the calibration without user intervention. During the process, the screen displays the calibration progress (0~100%), accompanied by the flashing of the green LED indicator and "beep" sound.
- [4] The calibration takes about 10 seconds. If the calibration is successful, the device will display "Calib Finish", click the button , and the device will give three short "beep" to save the calibration configuration. Press and hold the button  the device sends out a short "beep" prompt to restore the previous setting; If the calibration fails, the device displays "Calib Failure" with the error code. Press and hold the button , the device sends out a short beep sound to restore the previous settings.




Note:

The calibration operation will modify the built-in measurement parameters of the device. Please ensure that the original standard gas is used for calibration.



4.4 Connect to the intelligent inspection APP

The device has Bluetooth function and can be connected to inspection terminal or mobile devices, to achieve more abundant functions through our intelligent inspection application.

The App can automatically search for and connect to the device. After the connection is successful, the Bluetooth icon  on the device will automatically light up to indicate the connection status .



5 Maintenance & Troubleshooting

Introduction to maintenance for the device and related components and corresponding troubleshooting



5.1 Routine maintenance

In order to keep the device in a good status, please follow below recommendation for routine maintenance.

- | | | |
|-------|---|--------------------------------------|
| [1] | Stored in the device case | Not using for long period |
| [2] | Turn on the indication laser | Only in detection |
| [3] | Charge the device (To wake-up) | Necessary or non-use for a long time |
| [4] | Cleaning the shell surface | When Necessary |
| [5] | Use maintenance tools to clean the lens | When the lens is dirty |
| [6] | Calibration (See details in 4.3) | By warning or periodically |

CAUTION

Strong vibration and impact may damage the equipment and accessories! Please ensure the strap is secured around your wrist during use, to prevent accidental drops.

Do not use the device as a tool to knock or hit other hard objects.



5.2 Components Maintenance

Maintenance of lens components

The lens is a precision optical component with a coating on the surface. Please clean the lens, if it encounters rain, snow, dust or other pollution during use.

The way to clean the lens is to blow the surface dust and then wipe it off with a soft lens cloth. If the pollution is severe, you can wipe it with optical wet wipes first, and then wipe it with a lens cloth, but no water stains can be left.

Do not wipe hard when there is dust on the lens to avoid scratching the coating and damaging the lens.

Maintenance of Battery

The device is equipped with a smart lithium-ion battery pack. When it is not in use for a long time, charge with 50% to 80% and store it in a dry and cool environment. The battery should be charged every 1 month to avoid irreversible capacity loss.

TIPS

In order to extend the battery life, it is recommended to perform a full charge operation at least once a month, that is, charge the battery to 100% and then keep using the device till the “Low Battery” warning displayed.



5.3 Error codes

The device has a self-diagnostic function. If an error occurs there will be a long and two short "beep". In this case, an error code like "E001" will be displayed on the screen. The meaning of the code, device behaviors, and recommended methods of handling are as follows:

[E001] Operation temperature is out of range

1. Turn off and move the device to room temperature for 1 hour.
2. Reboot. Please contact for after-sales service if the error repeats.

[E005 / E006 / E202] Temperature control can't be stabilized

1. Turn off and move the device to room temperature for 1 hour.
2. Reboot. Please contact for after-sales service if the error repeats.

[E102 / E103] Battery temperature is not stable

1. Turn off and move the device to room temperature for 1 hour .
2. Reboot. Please contact for after-sales service if the error repeats.

[E104 / E105] Battery failure

1. Turn off and reboot. Please contact for after-sales service if the error repeats.

[E200] Standard calibration gas cell is not detected

1. Place the calibration gas cell in the upper left corner of the device case and perform the calibration operation again.

[E201 / E203 / E204] Configuration error

1. Turn off and reboot. Please contact for after-sales service if the error repeats.

[E205 / E206 / E207] Calibration error

1. Turn off and reboot. Please contact for after-sales service if the error repeats.

[- - -] Abnormal light intensity

1. Please change the reflector the device is pointing. Please contact for after-sales service if the error repeats.