麦芽传感
MaiYaSensorTech

# MST 410

# Portable multi-gas detector & alarm

(Ver.1.0)

The manual is subject to change without prior notice

## User's Manual

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# I. Overview

This portable multi-gas detector,It can continuously detect a variety of gas concentrations, easy to use,for personal protection.It has a color TFT display, loud buzzer, alarm indicator and vibration alarm.The detector has an optional wireless function for remote data trans mission and personnel location.

Detector conforms to standards related provisions and requirements：

GB3836.1-2021《爆炸性环境第 1 部分：设备通用要求》

GB3836.2-2021《爆炸性环境第 2 部分：由隔爆外壳“d”保护的设备》

GB3836.4-2021《爆炸性环境第4 部分：由本质安全型“i”保护的设备》

# II. Characteristics

1.Optional for 1～4 types of gases measyring

2.The sensor can be inserted in any position, easy maintenance

3.Automatic calibration after replace new sensor, immediate use

4.Optional wireless module,for remote data trans,person location

5.Fall alarm function

6.The screen display can be inverted

7.Optional gas concentration unit

8.Full function test at startup

9.The monitoring of abnormal operation of the detector

10.Temperature monitoring

11.Calibration overdue reminder

12.Color TFT display,continuous real-time data display

13.Sound,light,vibration alarm modes

14.Built-in rechargeable lithium-ion battery

15.Coated anti-static shell

# III. Specifications

1. Gas type and measuring range:

| No. | GAS type | Range |
|---|---|---|
| 1 | carbon monoxide(CO) | （0～1000）μmol/mol |
| 2 | hydrogen sulfide(H2S) | （0～100）μmol/mol |
| 3 | oxygen(O2) | （0～30.0）% |
| 4 | combustible gas(LEL) | （0～100）%LEL |
| 5 | ammonia(NH3) | （0～100 ）μmol/mol |
| 6 | chlorine(CL2) | （0～10.0 ）μmol/mol |
| 7 | hydrocyanic acid(HCN) | （0～30.0 ）μmol/mol |
| 8 | nitrogen dioxide(NO2) | （0～100.0）μmol/mol |
| 9 | phosphine(PH3) | （0～10.0）μmol/mol |
| 10 | VOC | （0～1000）μmol/mol |

| | | |
|---|---|---|
| 11 | hydrogen(H2) | （0～1000）μmol/mol |
| 12 | carbon dioxide(CO2) | （0～5.00）% |
| 13 | sulfur dioxide(SO2) | （0～100 ）μmol/mol |
| 14 | hydrogen fluoride(HF) | （0～10.0 ）μmol/mol |
| 15 | hydrogen chloride(HCL) | （0～20.0 ）μmol/mol |

2. Battery parameters: rated voltage 3.7V,nominal capacity 3000mAh 3.

Working current:

Normal current:＜120mA (when the screen is off)

Alarm current:＜240mA

4. Explosion-Proof: Ex ib IIC T4 Gb(CLEx), II 1G Ex ia IIC T4 Ga(ATEX)

5. Sensor type:

Combustible gas: catalytic combustion type

Oxygen: The Kavani battery

CO,H2S,NH3,CL2,NO2,HCN,PH3 and etc.toxic gas：electrochemistry
CO2: Nondispersive infrared
VOC：PID

6. Sampling method: Diffuse

7. Response time:

combustible gas：$T_{90}$<60s O2：$T_{90}$<60s

Toxic gas ammonia, hydrocyanic acid, ozone gas within 160s, phosphine within 100s,The response time of other toxic gases is within 60s

8.Continuous working time on full charge:≥ 15H

9.Accuracy：

CO：±10%FS
H2S：±10%FS
LEL：±5%FS
O2：±3.0%FS

Othertoxic gases:
within ± 10% (display value) or ± 5% (full scale), take minimax value

10. Working Environment:

Temp.: -20℃～55℃ Humidity: 0%～95%RH, no condensation

11. Storage Conditions

Temp.: -40℃～55℃ Humidity: ≤90%RH, no condensation

12. Charging temperature range: 0℃～40℃

13. Carried Stard:

GB12358-2006,GB3836.1-2021,GB3836.2-2021,GB3836.4-2021

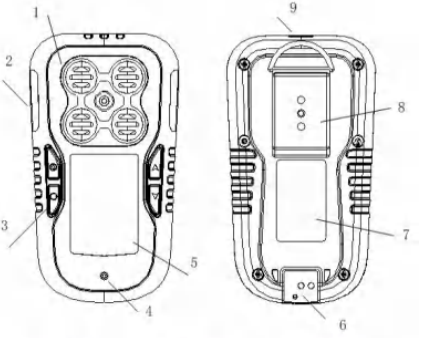
14. Case material: ABS,PC,antistatic TPE

15. Size: 130mm×74mm×37mm

16. Weight: About 330g

# IV. System structure and working principle

1 ). Appearance structure drawing




| | | |
|---|---|---|
| 1. sensor panel | 2. two alarm lamp | 3. four buttons |
| 4 . Buzzer | 5. Display | 6. Charging port |
| 7. Nameplate | 8. Crocodile clip | 9. SOS button |

fig 1

2). Description of the main screen

1.Working status area: Normal is white, failure is yellow, alarm is red.

2.Battery capacity: Shows the amount of battery left.

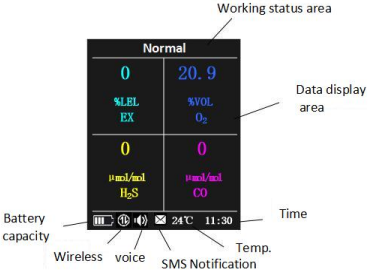



fig 2

3. Wireless: Icon indicates detector has wireless,otherwise not.

4. Voice: means the sound is off. means the sound is on.

5.SMS: It shows that there are new messages unread.

6. Temp.: It shows the current temperature.

7.Time: It shows the current time.

8.Data display area: Shows measured gases and realtime value.

3). The light indicator's description

1.Green light:

- It sparkles. The detector is working.

2.Yellow light:

- It sparkles.The detector is faulty.

3.Red light:

- When low alarm,the red light flashes once per second;

When high alarm,the red light flashes twice per second;

4). Description of the keys

Detector has 5 buttons, ON/OFF key SET key UP key

Down key ▽、Emergency key SOS

1、ON/OFF key

- In the off state,long press for about 3 seconds to turn on.
- In the on state,long press for about 5 seconds to power off.
- On the Settings interface,press once to confirm.
- In alarm and fault state, press once to mute or unmute.

2、SET key

- On Normal interface,long press for 3 seconds to enter the password interface.The correct password lead to Settings.
- On the Settings,press once to back to previous menu.

3、UP key

- On Normal interface,press once to show the sensor information.
- On the Settings,press to turn page up or increase the digit.

4、Down key

- On Normal interface,press once to show the sensor information.
- On the Settings,press to turn page down or reduce the digit.

5、Emergency key SOS

- Wireless detector sends a sos to connected phone or computer.
- Non-wireless detector sends local alarm for help.

5). Working principle

The detector adopts diffusion sampling.The sensor converts the collected gas concentration signal into a voltage signal, which is amplified and calculated intelligtively by the IC and then converted into digits show on the screen.

If the measured value exceeds the limited value,the detector will do sound, light,vibration alarms.

# V. Operating instructions

1. Startup self-test

1) Start up

Long press On/Off key for more than 3 seconds, then the device will start up.

2) Self test

- Detector is turned on, it shows the model and user ID first.
  If the detector has wireless,user's ID can be changed.Otherwise the user's ID is "health and peace".

- During self-test,the internal circuit, light, vibration and sound are tested successively, as shown in Figure 3.

fig 3

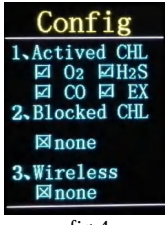



fig 4

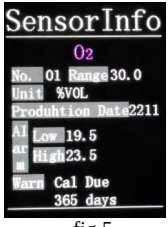



fig 5

- After self-test passes,the machine configuration info will be displayed, as shown in Figure 4.
- Then the info of sensors is displayed, as shown in Figure 5.
- If the zero-calibration function is turned on,detector will perform zero calibration after 5s.User can cancel it during 5s. After zero calibration,it displays pass or not. The zeroing process is shown in Figure 6,7,8.

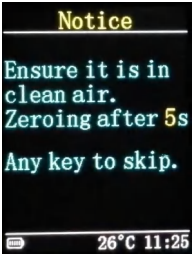



fig 6

fig 7

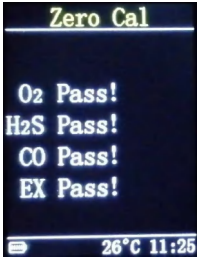



fig 8

2. Power off

The detector is on normal interface,press On/Off key for more than 5s,it shown as in Figure9. Continue to hold thebutton until it power off. If release the On/Off key during the process, the detector will return to the normal interface.

fig 9

3. Working statements

1) Normal working state

When the detector is working,it should show the Normal interface,as shown in FIG.10. the green light flashes once/5 sec. If powersaving mode is on,and there are no detection of alarms or anomalies,and no operation, detector will turn off the screen after 1 min.

2) Alarm

When alarms,the red light will flash,the alarm item will be displayed in the status bar, and there will be a red flashing sign in the data area.Red light blinks once/sec at low alarm.Red light blinks twice/sec at high alarm.There is a buzzer sound and vibration (sound/vibration is on in the Settings) when the a larm is triggered.

3)Fault state

When the detector encounters a fault, the sound will ring once/5 sec, and the yellow light will flash. The fault type will be displayed in the working status area.

4) Mute

When alarms, press the On/Off key to enable and disable mute.

5) Sensor info:Press the Up or Down key, and the display will switch between Normal interface as Fig 10 and the sensor info interface as Fig 5.

fig 10

fig 11

4. Confirm the password: The password is set to 2008.

1)Enter the password: long press the set key,the red light will be steady on. After about 5 seconds, it will enter the password input state, as shown in Figure 11.

2) Input the password: The password consists of 4 digits. Press the up or down key to add or subtract the password number.

Press the On/Off key to confirm the password bit by bit. If correct password,t he Settings menu is displayed. If the input
is incorrect, it need to reinput password.

5. Settings menu

Settings menu includes short message,record message,time,sensor,calibration, alarm setting,other Settings and machine info, as shown in Fig 12.

fig 12

1) Short message(MSG)

Record the information sent by platform. Only wireless detector have this function.

2) Record information(Data)

It has data records and event records. Only wireless detector have this function.

3) Time setting(Time)

The user can view the current time and can change it, as shownin Figure 13.

4) Sensor(SER)

It contains three options: sensor info, channel, and seek sensor, as shown in Figure 14.

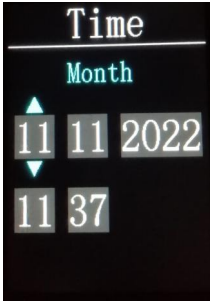



fig 13

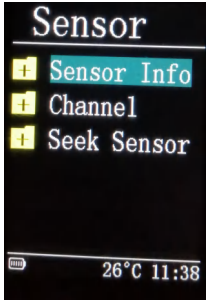



fig 14

a) Sensor info

It displays the sensor's position, type, range and unit information. Figure 15.

b) Channel

By selecting ON or OFF, user can turn on or turn off the corresponding sensor channel. Figure 16.

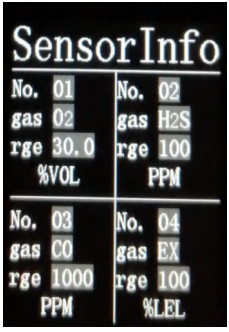



fig 15

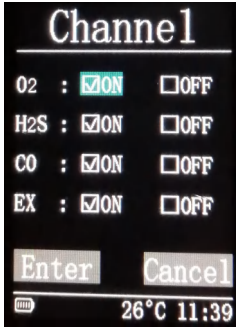



fig 16

c) Seek sensor

After replacing the sensor,user must re-identify the sensor.When searching, it'll scan positions 01-04 successively. After scanning,the info of sensors found will be displayed. As fig. 17, 18.

If correct,confirm it to storage. The process is shown below:

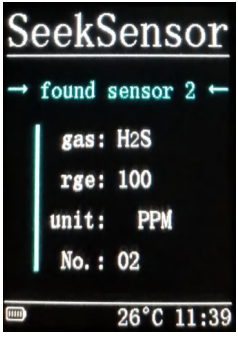



fig 17

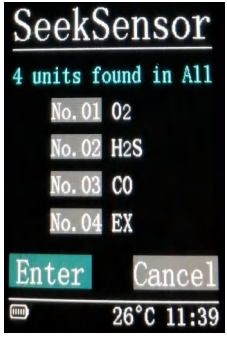



fig 18

5) Calibration(Cal)

It includes Zero calibration and Span calibration.

The cal-cover BDZ4-01 should be used for calibration. The cal-cover can be fixed by tightening the center knob.As shown in Figure 19.

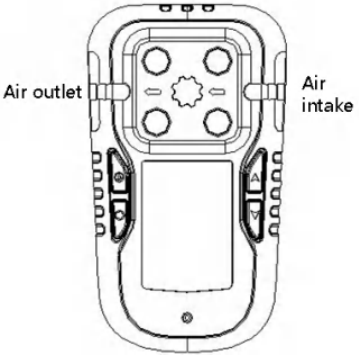



fig 19

During calibration, the air inlet on one side of the cover is connected to the span gas through ahose. The other side is used as an air vent.

fig 20

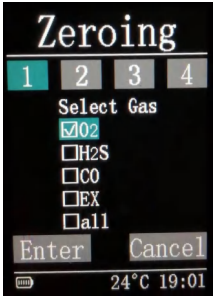



fig 21

a) Zero calibration

i. User can calibrate a single sensor or several sensors at the same time by ticking off √, as shown in Figure 21.

ii. Zero Calibration shall be carried out in clean air, or fed zero air into detector (Oxygen sensor can be automatically completed by internal circuit), as shown in Figure 22.

iii. Confirm it and wait for the calibration to complete, as shown in Figure 23.

iv. After the calibration is completed, a prompt will appear, as shown in Figure 24.

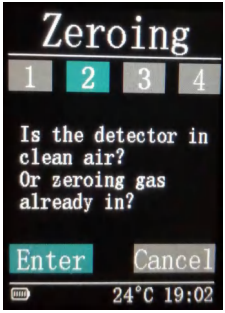



fig 22

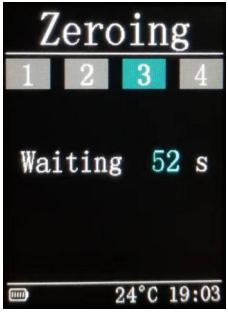



fig 23

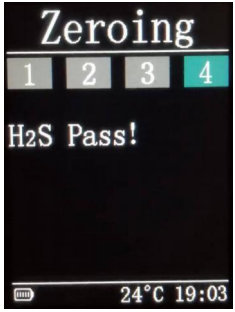



fig 24

b) Span calibration

i. Only one sensor can be calibrated each time, as shown in Fig.25.

ii.Enter correct concentration of span gas,as shown in Fig.26.

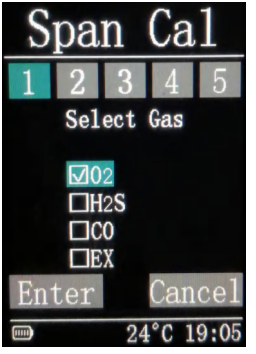



fig 25

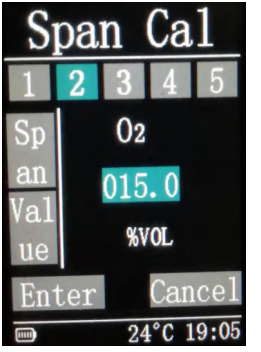



fig 26

iii. Enter the corresponding span gas,as shown in Fig.27.

iv. Keeping and wait for the end of timing,as shown in Fig.28.

v. After completed,it displays cal results,as shown in Fig.29.

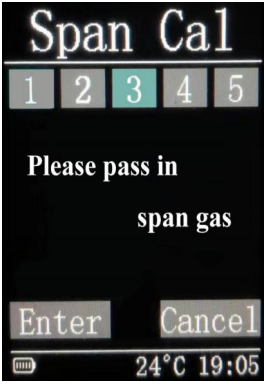



fig 27

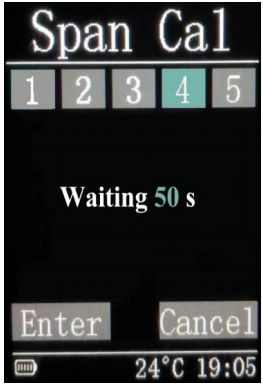



fig 28

fig 29

6) Alarm setting(Alm)

User can set the alarm point and alarm type.

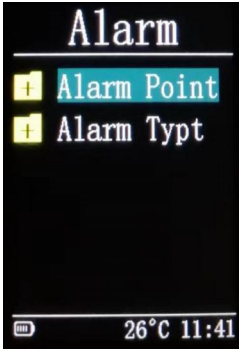



fig 30

a) Alarm point

Gas alarm limit value can be set severally, as shown in Fig.31.

i.Low alarm and high alarm can be set for O2 and LEL,in Fig.32.

ii.For toxic gases,low alarm,high alarm,STEL and TWAL can be set, as Fig.33.

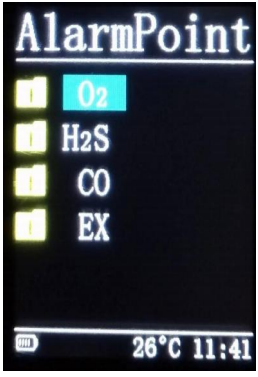



fig 31

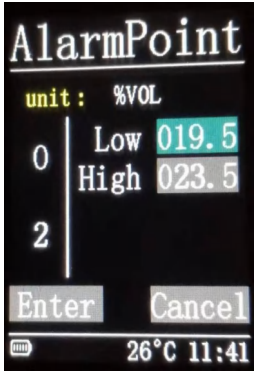



fig 32

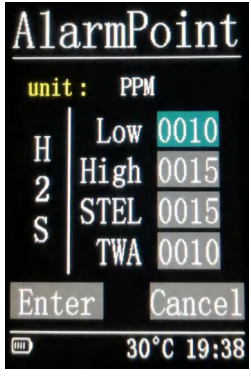



fig 33

b) The alarm type are optional of light, sound and vibration,as Fig.34

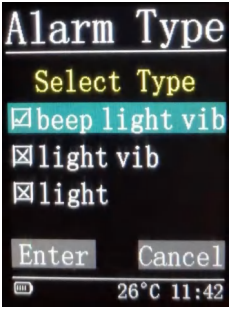



fig 34

7) Other Settings(Oth)

It includes auto calibration, gravity set, units set, calibration due warn, display set and wireless set. as fig.35.

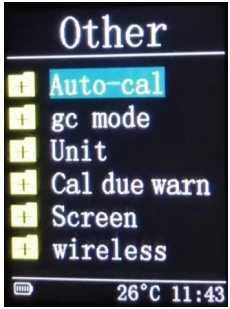



fig 35

a) Auto calibration(Auto-cal)

When it’ s On, the sensors will be automatically calibrated the zero point at power on,as Fig.36. The oxygen will be calibrated to 20.9%Vol.

b) gravity set

It provides founctions of inversion show and fall alarm, as Fig.37.

fig 36

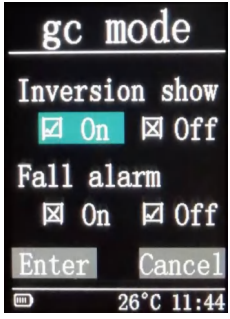



fig 37

i. Inversion show: When the detector is inverted 180°, the data interface will also rotate 180° to enable the user to adapt to the observation, as Fig.38.

ii. Fall alarm: When the detector is stationary within 25 seconds, the warning as shown in Fig39 will appear. If the detector does not operate or move within next 5 seconds, an alarm will be triggered, as shown in Figure 40. At this point, user can reset the alarm by pressing any key or moving the detector.The feature alerts people nearby that the user may have fallen and be in danger.

fig 38

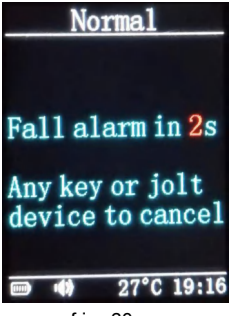



fig 39

fig 40

c) units set(Unit)

It is used to switch the concentration unit of the measured gas, optional PPM, μmol/mol,mg/m3, LEL%,Vol%, etc., as shown in Fig. 41.

**Note: The displaied units do not apply to all sensors. For example, $O_2$ has only unit Vol%.**

d) Calibration due warn

In this item, the user can check the days since the last calibration of the detector. If the detector has not been calibrated for more than 365 days, a hint will be sent . This hint can be reset by span calibration. User can also turn off the item. As shown inFig.42.

e) Display Set(Screen)

When the power saving mode is on, the screen will be closed after the detector has no operation or alarm for 1 minute.

User can adjust the brightness of the screen by check↑↓. As Fig.43.

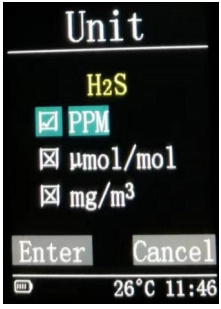



fig 41

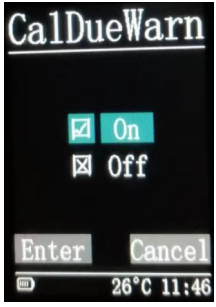



fig 42

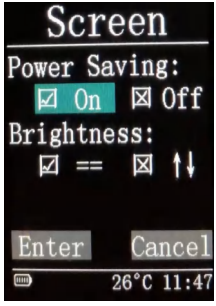



fig 43

f) wireless set（Wireless）

This function is used for detector to take remote communication with mobile phone or computer.

8) Machine info(Info)

In this item, user can view the detector's ID number, sensor ID number, software version, the latest calibration time of the sensor and other contents.

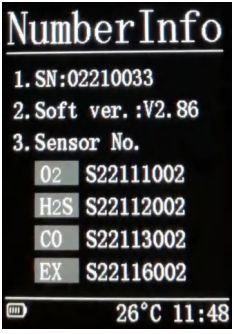



fig 44

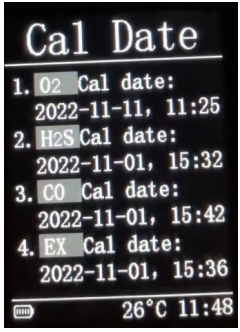



fig 45

6. Battery power indicator and charging

1) Battery power

There is a icon on the display screen. When the white bar fills the frame, it means that the battery is fully charged. When the battery is weakened, the bar decreases. There is only the outer frame left, it means that the battery is low,

and the detector will trigger sound and light alarm. Please charge the device in time, otherwise the device will shut down at any time.

2) Charging

The detector has a built-in rechargeable lithium battery. When charging, user only need to plug the charger into 220V AC and plug the charging head of the charger into the charging socket at the bottom of the detector to charge.

a) If the detector is charging under the starting state, the battery icon in the upper left corner of the screen will display a filling animation. After the charging is completed, the icon shows as full grid state.

b) If charging in the off state, press any key and the screen will light up for about 8 seconds and display as shown in Figure 47.

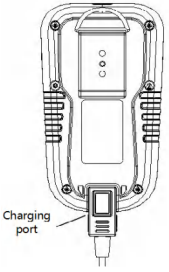



fig 46

fig 47

# VI. Maintenance of the detector

1.It is necessary to calibrate the detector regularly to maintain the measurement accuracy of the detector.

2.It should be avoided to impact the detector with high concentration of gas.

3.Please read the instructions carefully before use,to avoid the failure of the detector caused by improper operation.

4. The sensitivity of the LEL sensor will be affected by high concentrations of sulfide, halogen compounds, silicon-containing compounds, and lead-containing gas or steam, it means "poisoning". The use of the detector should be avoided in the above environment. If unavoidable, the detector should be tested and calibrated after use.

5. Detector should not be used under hypoxia condition.

6.LEL sensor is calibrated with CH4 concentration of 50%LEL.

7. Do not use organic solvents, soaps or silicon-based solutions to clean the instrument.

8. Use a damp cloth when wiping the shell to prevent static electricity.

9. Precautions for battery use:

- The battery has been explosion-proof treatment,don't replace it casually
- Only use the original battery replacement, otherwise failure will not be guaranteed.
- Do not charge in dangerous places.
- Do not allow the plug of the battery to touch metal objects. Otherwise, the battery may short circuit, discharge, heat, or leak.

# VII. Common fault and eliminating

Common fault diagnosis, analysis and elimination methods

| No. | common fault | analysis | solution |
|---|---|---|---|
| 1. | Display fault | The LCD is broken | return to depot |
| 2. | Error of memory | Memory is corrupted or contents are overwritten | contact manufacturer |
| 3. | Sensor fault | The sensor is damaged or loose | contact manufacturer |
| 4. | Sensor calibration is overdue | Calibration overdue | recalibrate |
| 5. | No sound,light,vibration alarm | Circuit failure | return to depot |

## VIII. Accessories list

1. One manual
2. One power adapter
3. One BDZ4-01 calibration cover
4. One certificate

## IX. Warranty

1.Within 1 year from the date of sale, we will provide free repair service for the faults and defects of portable multi-gas detection&alarm devices and accessories in terms of materials and processes.

2. The warranty does not apply to items for man-made damage, accidents, changes, modifications, unauthorized repairs, misuse, abuse, malfunctions caused by improper operation or maintenance, and claims beyond the warranty period.

3. The supply of products is the sole obligation of the Company. The Company is not responsible for any direct, indirect or accidental damage resulting from the sale, purchase or use of this instrument.

Ningxia MaiYa Sensor Technology Development Co., LTD