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EnergoM-4002-Gas

Portable gas detector with pump type

Operation manual

Hunan QianShuo Instrument Co., Ltd.

Manual of EnergoM-4002-Gas handheld pump suction gas detector v2.0

Catalogue

1. Introduction

Welcome to use our company's EnergoM-4002-Gas hand-held pumping gas detector, thank you sincerely for your choice. I hope this manual can facilitate you at your convenience. If you still do not know how to operate after looking up this manual, please call our after-sales service department for help. Before the use of the instrument, please read the manual carefully and use the instrument with proper operation method to avoid damage to your personal safety and the instrument itself. Each time after use, this manual should be kept for future reference. It is forbidden to disseminate all the content in this manual without permission. We are committed to the continuous updating of our products. And we reserve the right to improve our products and manuals without advance notice. Detailed information is in accordance with the final product. Incorrect operation or unsuitable operating environment may weaken the performance of the instrument. Please read the following notes carefully in order to ensure your safety and the correct use of the instrument:

- The instrument can only be calibrated and maintained by qualified professionals, and the user is not allowed to take the instrument apart without authorization.
- Uncovering, battery replacement, parts repairment, etc. can only be carried out in an uncharged and safe site.
- The calibration inspection shall be carried out on a regular basis, which shall not exceed once per year, and the sensor beyond the date of expiry and out of action shall be replaced in time.
- It is forbidden to impact the sensor with gas beyond the range.
- The air hose must be kept clean. Otherwise, large measurement error may be caused by the pollution.
- It is strictly prohibited to expose the instrument to high concentration of corrosive gas or oily gas.
- The use of the instrument in hot and humid environment is not allowed.
- The user shall not take the instrument apart for repairment or parts replacement without authorization.
- It is not allowed to replace the components or structures that affect the explosion-

proof capability without authorization in case of damage to the sensor.

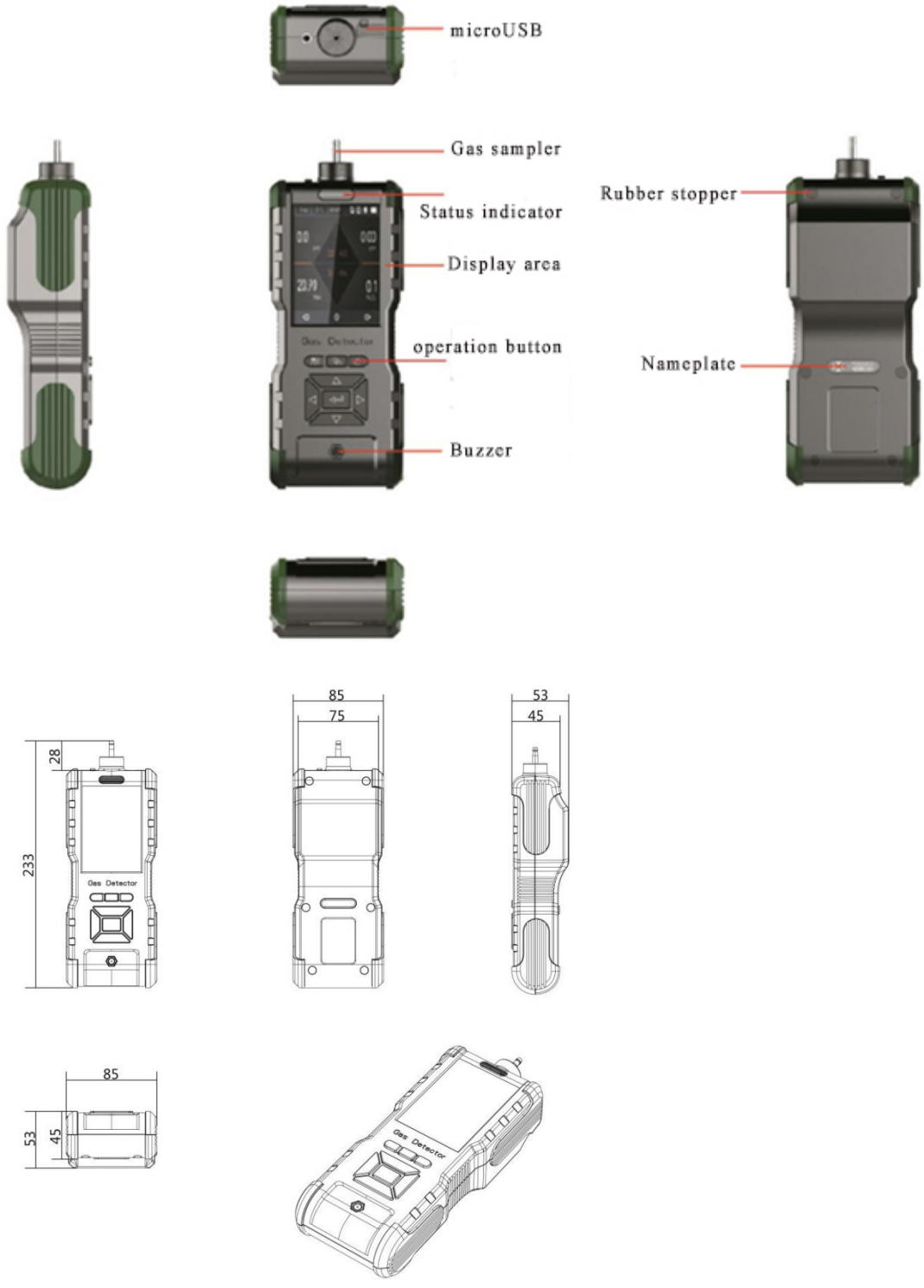
- It is forbidden to use the instrument in hot and humid environment.
- The replacement of components or structures without authorization is not allowed, in case of affecting the explosion-proof performance.
- It's necessary to guard against the potential danger of electrostatic charge. The ignition caused by electrostatic charge during normal use, maintenance or cleaning shall be avoided.
- Never touch or wipe the equipment when used in explosive environment; if it's necessary to be wiped or touched, it shall be carried out in a safe site with a wrung-out wet cloth. It is strictly prohibited to wipe the shell with a dry cloth.
- The replacement of batteries must be carried out in a safe place. It is strictly prohibited to dismantle, charge or replace batteries in a dangerous place. It's necessary to use batteries of the same model and specification.
- The charging must be carried out in a safe place with a matched charger.
- The human body shall be firstly electrostatic discharged before carrying this instrument to the dangerous area.
- Set zero when the clean air rather than the target gas is aerated.
- It is forbidden to block the air inlet or outlet to avoid burning-out the internal sorption pump.
- The air inlet must be equipped with dust filter to prevent dust from entering the interior of the instrument, which may cause damage to the air pump and other accessories.
- Please cover the USB dustproof cap when the battery is not charged, so as to prevent the dust from entering and causing the fault.

2. Characteristics of the product

- imported high-precision sensor
- Sampling method by pump type
- Chinese / English switching

- switching of concentration unit (ppm and mg/m3, PPB/ug/m3)
- 3.5-inch TFT color LCD with backlight
- Zero calibration, three target point calibration
- affirmation by two popups
- Real-time and dynamic curve display of concentration
- Storage of up to 10000 historic records
- More than 400 gas types are available
- convenient tabular view of history, alarm and calibration records
- Real time monitoring of battery power
- One-key start by pure hardware, auto power-off for low power
- large-capacity rechargeable battery with long endurance
- waterproof and dustproof design

3. Schematic diagram of the product



4. Standard configuration

Item	Name	Qty	Note
1	Hard suitcase (with a key)	1	
2	Gas detector	1	
3	5V/2A power adapter	1	
4	Data line	1	
5	filter	2	
6	20cm air compression hose	1	
7	Product test report, instruction manual and certificate	1	
9	Quick connect fitting（optional）	1	
10	Sampling probe（opti0nal）	1	

5. Technical parameters of the product

sampling method	Pump-suction
Types of gases	Optional for more than 400 gases
Detection range	Optional, factory settings
The principle of detection	PID photoionization, electrochemistry, catalytic combustion, infrared Ray, thermal conduction, etc.
Resolution	0.1ppm(default),1ppm resolution optional
Maximum admissible	≤±3%F.S
Repeatability	≤±2%F.S
Response time	T90≤30S
Recovery time	≤30S
Concentration unit	ppm、mg/m3、LEL%、VOL%、ppb、ug/m3,etc.
Display mode	3.5-inch HD color display
Charging instructions	Green light in the front panel lampshade is on, real-time change of power symbol in the upper right corner of the LCD
Alarm indication	Sound and light alarm (sound production of 1HZ for low alarm, andof 2HZ for high alarm, with red light in front panel lampshade on)
Calibration interval	The default setting of calibration interval is 180days, and a re-calibration is prompted after expiration
Shortcut button	Quick setting (1)air pump: high/low speed;(2)display brightness: high/low;(3)sound: on/off
History records	1,000,000
Alarm records	1,000,000
Calibration records	1,000,000
Communication interface	Connection with PC host computer by Micro USB interface to export data (optional)
Working power	3.7VDC/6000mAh Rechargeable Polymer Lithium Battery
Working hours	7to8 hours in a row

Charging method	Micro USB Charger,5V/2A
Working environment	Operating temperature: -20 -20℃~+50℃ Operating humidity :Most:0-90%RH (no condensing),15%RH≤electrochemical principle≤90%RH (no condensing)) Working pressure:90 to 110 KPa With extended tube (including sintering filter), suitable for use
Temperature of Sample air	-20℃~+50℃, optional for high-temperature sampling handle, the highest temperature of flue gas it can detect reaches up
Shell material	ABS
Overall unit	233*85*53mm(Lx W x H),) net weight:490g(bare metal)
Design basis and standards	GB3836.1-2010 explosive atmospheres Part 1: General
	GB3836.4-2010 explosive atmospheres Part 4: equipment protected by intrinsically safe "I"
	GB12358-2006 General Technical Requirements for Detection and Alarm of Environmental Gas at Work Site
	GBT 50493-2019 design standard for detection and alarm of Petrochemical Flammable gas and toxic gas
	GB/T 13384-2008 General Technical Conditions for
	JJF 1172-2007 Calibration Specification for Photoionization Tester of Volatile Organic Compound

6. Product explosion proof mark

explosion proof mark：	**Ex ib IIC T4 Gb** Ex：explosion proof mark；ib：It can be applied to intrinsically safe electrical products in zone 1 and zone 2；IIC：min current rate<0.8；T4：Max surface temperature of equipment 135℃

7. Battery notification

Nominal voltage：	3.7V ~ 4.2VDC
Rated capacity：	6000mAh
warn： 1. Please only use this type of battery； 2. Do not charge in dangerous places； 3. Do not replace the battery when explosive gases may be present。	

8. Precautions against static electricity

The shell of this product is made of plastic, which is easy to produce electrification after friction. This kind of static electricity may adsorb dust, or cause explosion and fire. Therefore, static electricity can be reduced in the following ways:

1. It can prevent static electricity by preventing friction or selecting appropriate materials (such as metal) to rub with plastics.
2. Grounding is a common method of anti-static.
3. Try to reduce the resistance of the plastic to less than 10 ohms to remove static electricity。
4. Air humidity (e.g. spray method) or air ionization can also be used to remove static electricity.。
5. Add inorganic antistatic agent or organic antistatic agent to the internal or external coating of plastic. Inorganic antistatic agent: conductive powder, such as graphite, carbon black, aluminum powder and other metal powders, as well as various inorganic salts easy to ionize; Organic antistatic agents include highly polar materials such as quaternary ammonium salts and surfactants。

9. Quick start guide

9.1Start up & Shutdown

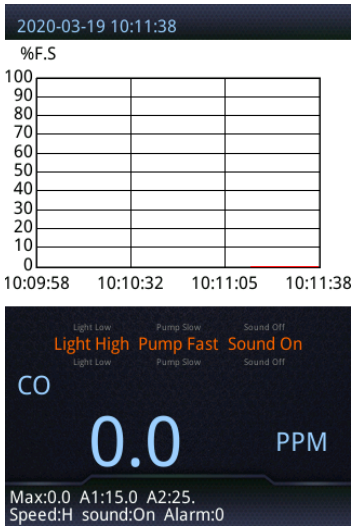
(1) Start up: In shutdown mode, long press the power switch for more than 3 seconds to enter the " LOGO " and self check interface of our company, the buzzer rings, the red alarm light at the front panel lampshade flashes, the screen lights up, and enter the main interface after 60 seconds of countdown, and the suction pump is on. (Note: if the power icon is and the buzzer "drips" three times in a row, you need to shut down and use the compatible charger to charge to 50% before the follow-up use.)

(2) Shut down: In the startup mode, long press the power switch for more than 3 seconds to shut down, the suction pump is off, and the screen is off.

9.2 Main interface

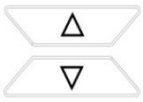
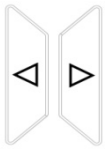
Enter the main interface after the instrument is started, the upper left part of the screen

displays the date and time, the upper right part displays the electric quantity (Note: not shown in the figure), the upper part displays the real-time concentration curve, the lower part displays the gas type, gas concentration and unit, the bottom part displays the peak value (the maximum measured concentration in the current period), A1 (low alarm), A2 (high alarm), pump speed, alarm sound switch, alarm code (0: None Alarm, 1: low alarm: 2: high alarm).



Press the shortcut key, the setting of brightness, pump speed and sound will be displayed in the middle position.

9.3Keys

Name	Shortcuts	Menu keys	Power switch	Confirmation key	Up /Down key	Left /Right Key
Icon						
Function	Quick settings	Enter /exit Menu	Start up & Shutdown	Confirm the modification, Go to the next menu	Move the cursor up and down, Add and subtract values	Move the cursor left and right

9.4 Parameters modification

When you need to modify the value, move the cursor to the modified item, press the confirmation key  , press the up and down key  to change the value until the long cursor  becomes short cursor  , press the confirmation key  again to confirm the modification or press the menu key  to cancel the modification.

9.5 Quick setting

On the main interface, press the shortcut key to quickly set the brightness high / low, press the confirmation key , press the up and down key for modification until the long cursor becomes a short cursor, press the confirmation key again to confirm the modification; press the left and right key to modify the pump speed and sound until the short cursor becomes a long cursor; press the menu key to go back to the main interface

9.6 Main menu

On the main interface, press the menu key to enter the main menu interface. The main menu is designed as six-packs icons, in order to facilitate the quick setting of the function:

[Instrument calibration] is related to zero calibration and calibration of standard gas.

[Alarm setting] is related to the setting of low alarm and high alarm. [Parameter setting] is related to unit switching, range, type, etc.

[System setting] is related to pump speed, screen, language and clock.

[View record] is related to history record, alarm record and calibration record.

9.7Menu tree

Level 1 menu	Level 2menu	Function
Instrument calibration 	Zero calibration	Zero Calibration for instrument
	Concentration calibration	Calibration for the target point of the instrument
	Calibration interval	How many days later will it prompt for calibration
	Re-factory	Recovery the instrument to default settings
	ADC	View real-time ADC values of instrument
Alarm settings 	Level 1 alarm	Low alarm, level 1 alarm is triggered when the concentration exceeds this value
	Secondary alarm	A secondary alarm is triggered when the concentration exceeds this value
	Sound settings	Set whether the sound is made when the instrument is alarmed
Parameter settings 	Gas units	Set the unit displayed by the instrument, whose default is ppm
	Molecular weight	Set the molecular weight of the gas type detected by the instrument, defaulting to 56.1(TVOC)
	CFC value	Set the correction factor corresponding to calibration gas, defaulting to 1
	Gas type	Read gas type of sensor, not open
	Gas range	Read gas range of sensor, not open
	Decimal point	Read decimal points of sensor, not open
System settings 	Pump speed setting	Set speed of the instrument pump high /low
	Brightness settings	Set brightness displayed by the instrument high /low
	Off screen time	Set how much time of disoperation later the instrument turn offs the screen after
	Storage time	Set the storage interval for history records
	Language settings	Set up the play of the instrument Chinese/English
	Clock settings	Set date and time of the instrument
View records 	History records	View all dates, times, measurements of the history record for the instrument
	Alarm records	View all dates, times, alarm types of alarm record for the instrument

		Calibration records	View all dates, times, calibration values of the calibration records for the instrument

9.8 Sensor selection

Select instrument calibration in the main menu interface, press the up and down keys to move to the sensor number menu bar. After pressing the OK key, the menu bar will display a drop-down menu item indicating the number of No. 1 ~ 4 sensors. Press the up and down keys to select the sensor number to be adjusted, and press the OK key to confirm. If the instrument has only one sensor, the sensor number cannot be selected.

9.9 Zero calibration

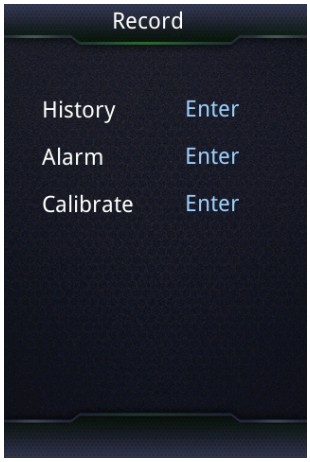
Select instrument calibration on the main menu interface, press the confirmation key to enter the calibration interface, inlet the pure air (the sensor of oxygen and carbon dioxide cannot be marked zero in the air) or pure nitrogen to the ventilation pipe, press the confirmation key until the ADC value is stable (30 to 90 seconds), the pop screen shows "Whether to mark zero!" Select Yes to mark zero. Select “No” to return to the calibration interface. The lower left corner shows "Zero calibration success!" for successful Zero calibration.

9.10 Concentration calibration

Select instrument calibration in the main menu interface, press the confirmation key to enter the calibration interface, press the upper and lower keys to select the concentration calibration, press the confirmation key, and modify the concentration after the long cursor becomes a short cursor. Inlet a certain concentration of gas to the ventilation pipe, press the

confirmation key again until the ADC value is stable (30 to 90 seconds), the pop screen shows "whether to calibrate!" Select Yes to calibrate the gas. Select No and return to the calibration interface. “The lower left corner shows "Ccalibration success!" after successful calibration.

9.11 View records



Select in the main menu interface, press the confirmation key , select the history / alarm / calibration record, press the confirmation key again to view the history / alarm / calibration record.

9.12Charging

1. Please charge it in time when the battery is below 25%, it should be charged in time; when the battery is lower than 1%, the buzzer "beeps" for alarming. Be sure to turn it off and charge more than 25% to avoid the instrument being turned off due to low power;

2. When charging, open the dust cover of the USB port and charge it with a compatible USB charger with a green light in the front light shade on.

(Note: No device are allowed when charging)

10. Other operating instructions

10.1Instrument calibration

10.1.1Calibration interval

It is recommended that the calibration period is set in days. If the system prompts for overdue interval, please re-calibrate.

10.1.2Factory reset

Recover instrument all data to the default setting.

10.1.3ADC

View the instrument's real-time ADC values.

10.1.4 Concentration

It is used to check the real time concentration when do calibration.

10.2Alarm settings

10.2.1Level 1 alarm

It is Low-limit alarming. When the concentration is higher than this setting, a low alarm is triggered, the buzzer rings (1HZ), and the status indicator lamp turns red.

10.2.2 Level 2alarm

It is High-limit alarm. When the concentration is above this setting, a high alarm is triggered, the buzzer rings (2HZ), and the status indicator lamp turns red.

10.2.3Sound settings

The buzzer can be switched off or on when an alarm is available.

10.3Parameter settings

10.3.1Gas units

The unit of sensor gas is automatically identified, which can be modified to ppm, mg/m^3.

10.3.2Molecular weight

Enter the molecular weight of the measured gas (see Schedule1).） The default value is 56.1(TVOC),and modify the molecular weight according to Schedule1 when detecting other gas types.

10.3.3CFC value

Enter the CFC value for the measuring gas. The default is 1. It is only valid when the measured value is TVOC, please set according to Appendix 2 for the measurement of single VOC gas.

10.3.4Gas type

The gas type of sensor is identified automatically, with default settings.

10.3.5Gas range

The gas range of sensor is identified automatically, with default settings.

10.3.6Decimal point

The decimal point of sensor is identified automatically, with default settings.

10.4System settings

10.4.1Pump speed setting

It can be chosen from high-speed, low-speed. **The low speed gear is the measurement gear and the high speed gear is the cleaning gear.**

10.4.2Brightness settings

It can be chosen from high-lightened, low-lightened. The factory default is highlighted.

10.4.3Off-screen time

1, 2, 3, 5,10,30,60 minutes can be chosen, and if there is no operation during that time, the system will turn off the screen automatically. Long press power key to turn off, press any key to re-light the screen.

10.4.4Storage time

30, 60,120, 300, 600, 1800, 3600 seconds can be selected to store the measurement once.

10.4.5Language selection

It can be chosen from Chinese and English.

10.4.6Clock settings

System dates and times can be modified.

10.5 View records

10.5.1History

The date, time, and measured value of 4000 history records can be viewed, and press the left and right keys for scrolling paging.

10.5.2Alarm records

The date, time, alarm type of 80 alarm records can be viewed, and press the left and right keys for scrolling paging.

10.5.3Calibration records

The date, time and calibration values of 12 calibration records can be viewed, and press the left and right keys for scrolling paging.

11. Daily maintenance

Under normal conditions, the instrument does not require maintenance other than zeroing and calibration. The life of the sensor varies depending on the environment, and in general, the life of the electrochemical sensor is 1 to 2 years, the life of the catalytic combustion sensor is 3 years, the infrared sensor has a life of 5 years, and the life of the PID sensor is 8 months (only for UV light accessories). The zero and sensitivity of the sensor drifts over time, so the instrument needs to be calibrated periodically. The calibration interval is once for 3 to 6 months for recommendation. If you do not know how to operate, please contact our after-sales department.

Please take care of the storage and use of the sensor, and use above normal operating temperature may cause damage to the sensor. The sensor is sensitive to atmospheric pressure, when atmospheric pressure changes dramatically or deviates over 10% of normal atmospheric pressure, the sensor does not work properly. Catalytic combustion sensors shall be regularly recalibrated after any over range to ensure accuracy of measurements.

12. Instrument calibration record

Product Model:EnergoM-4002-Gas Handheld pump suction gas detector Instrument No.:

Use entity:

Date of manufacture:

Calibration time	Standard gas concentration	ADC value	Note

13. Terms of Service

13.1 Warranty commitment

1.We promise that all the company's gas detector will go through the relevant standard gas calibration of specific concentration, after the purchase of our products, the user does not need to conduct gas- calibration operation without special circumstances, and the operation must be carried out by professional and technical personnel.

2.Anyone who purchases the instrument through our company will be provided with a 12-month warranty service (product host only, excluding accessories) from the date of purchase.

3.During the service period, we will provide you with free service due to failure caused by the quality problems of the product itself after our inspection.

4.This commitment is limited in China only.

13.2 Time of trouble maintenance

1.When your machine needs repair, we well fix it for you within 7 valid working days

after we receive the machine you sent back.

2.We will consult with you in advance in case of special conditions.

13.3 Limited liability guarantee

1.When you need warranty service, please present your valid warranty voucher, including a warranty card, purchase invoice, or purchase contract.

2.After maintenance, your instrument continues to enjoy the original warranty commitment.

3.You can opt for paid repair services when the warranty period is overdue or the warranty scope listed on the warranty card is exceeded.

4.We reserve the right not to provide warranty service due to following damage to the product:

(1) Man-made damage;

(2) Damage caused by violations of operating regulations and requirements;

(3) Damage caused by floods, fires and other natural disasters;

(4) Damage caused by harsh use environment;

(5) Repair, modify, refit or disassemble the product by an unauthorized person.

Schedule 1 (Summary of common Questions)

Description of the fault	Analysis of the cause	The solution
Unsuccessful startup	No power or less than the power-on voltage	Full charge with compatible power adapter and then start up
	Battery is damaged	Back to the factory for replacement of lithium
	The instrument is idle for too long and the power consumption is too large	It is recommended to charge for 1 to 2months in case of long-term absence
	Program Design BUG	Contact after-sales, return to the factory for
	Failed in charging circuit, no	Contact after-sales, return to the factory for
	Time of long-pressing the power key doesn't reach 3 seconds	Press the power key for at least3seconds
	Power button failed	Contact after-sales, return to the factory for
The doesn't light	Low electric quantity which leads to automatic shutdown	Full charge with compatible power adapter and then start up
	Auto screen off due to reaching the off screen time when it is	Modify or extend the off screen time
	Buzzer beeps but screen doesn't display when it is started up	Start up after charging
High reading	The air pump has been changed to a high-speed gear.	Re-use of the measurement of low-speed gear (factory calibration)
	Air suction and outlet is not good	Check the air way for blockages
	Electromagnetic interference	Stay away from sites with strong magnetic
	The internal or front-end filter of the gas circuit is contaminated	Replace the filter and clean the intake pipe
Low reading	The suction force of the suction pump is not enough.	Air road is blocked which requires clearing
	Sensor signal declines or has reached the end of life	Recalibrate or replace new sensors
	The reading is not fully zeroed, and the zero is calibrated ahead of time	Restore factory setting, recalibrate
No response to ventilation	Concentration calibration in the air	Restore factory setting, re-conduct zero and concentration calibration
	Zero calibration in the case of ventilation	Restore factory setting, re-conduct zero and concentration calibration
	Circuit failure	Contact after-sales, return to the factory for

	Inlet gas that doesn't belong to the detection type by this instrument	Please go to the site with the objective gas
No alarm to high concentration	Alarm value is set too high, or the alarm value is not reached	Lower the alarm value
	Alarm sound is turned off	Turn on sound with shortcuts

If there are other unlisted faults, please call our after-sales service department for analysis and resolution.

Schedule 2 (Query table for molecular weight of Common Gas)

Gas type	Chinese name	English name	Molecular weight(g/mol))
Air	空气混合物	Air mixture	28.96
N2	氮气	Nitrogen	28.01
CO	一氧化碳	Carbon monoxide	28.01
H2s	硫化氢	Hydrogen sulfide	34.08
O2	氧气	Oxygen	32.00
Ex	可燃气体（CH4）	Flammable gas	16.04
NO2	二氧化氮	Nitrogen dioxide	46.01
NO	一氧化氮	Nitric oxide	30.01
SO2	二氧化硫	Sulfur dioxide	64.06
Cl2	氯气	Chlorine	70.91
NH3	氨气	Ammonia	17.03
H2	氢气	Hydrogen	2.02
PH3	磷化氢	Hydrogen	34.00
CH2O	甲醛	Formaldehyde	30.03
O3	臭氧	Ozone	48.00
F2	氟气	Fluorine gas	38.00
Hf	氟化氢	Hydrogen fluoride	20.01
HCL	氯化氢	Hydrogen chloride	36.46
HBr	溴化氢	Hydrogen bromide	80.91
C2H4O	乙醛	Acetaldehyde	44.05
COCl2	光气（碳酰氯）	phosgene(carbon-chlorine)	98.92
SiH4	硅烷	Silane	32.12
ClO2	二氧化氯	Chlorine dioxide	67.45

CO2	二氧化碳	Carbon dioxide	44.01
SF6	六氟化硫	Sulphur	146.06
Tvoc	总挥发性有机物	total volatile organic compounds	56.01
H2O2	过氧化氢	Hydrogen	34.01

Schedule3 Corresponding CF Coefficients of Common VOC Gas

Chinese name	English name	Molecular	CF coefficient(10.6eV)
丙酮	propanone/Acetone	Ch3COCH3	1.2
砷化氢	Arsine	AsH3	2.6
丁二烯	Butadiene	C4H6	0.69
苯	Benzene	C6H6	0.53
异丙苯	cumene	C9H12	0.54
二甲氧基甲烷	Dimethoxymethane	C3H8O2	11.3
乙硫醇	Ethyl Mercaptan	C2H6S	0.6
硫化氢	Hydrogen sulfide	H2s	3.2
异丙叉丙酮	Mesityloxide	C6H10O	0.47
甲乙酮	Methyl ethyl ketone	C4H8O	0.9
甲硫醇	Methyl mercaptan	CH3SH	0.6
一氧化氮	Nitricoxide	NO	7.2
磷化氢	Phosphine	PH3	2.8
聚苯乙烯	Styrene	(C8H8)n	0.4
甲苯	Toluene	C7H8	0.53
氯乙烯	Vinyl chloride	C2H3Cl	1.8