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ISO9001: 2015 Quality Management System Authenticated Company

AGA1010 series Gas Analyzer  
**Operator's Manual**



Nanjing AIYI Technologies Co., Ltd.



## —Company Introduction—

Nanjing AIYI Technologies Co., Ltd. is a joint stock high-tech enterprise that combines the R&D, production and sales of optic-mechanical-electric products. We are dedicated to providing complete domestic & industrial, gas & dust safety solutions to customers. With our expertise in safety and excellent public praise, standardized quality management system and all-sided service system throughout the years, AIYI Technologies has already become a leading brand in the gas & dust safety industry in China. AIYI Technologies has been providing products and services for Chinese and foreign well-known enterprises and has extended its businesses in pharmaceuticals, agrochemicals, environmental protection, automobile, fodder and food. The product quality and professional service of AIYI Technologies have been highly regarded and widely acclaimed among customers.

Willing to work with clients

all over the world

To establish long-term and stable

cooperative relations



## CONTENT

1 Use of this manual-----	4
2 Instrument Overview-----	6
2.1 Introduction of the instrument-----	6
2.2 Working principle -----	6
2.3 Instrument function -----	8
3 Technical Data -----	8
3.1 Application -----	8
3.2 Technical indicators -----	9
3.3 Measured value output -----	9
3.4 Relay -----	9
3.5 Basic parameters -----	9
4 Installation-----	10
4.1 Unpacking inspection-----	10
4.2 Safety Instructions [▲]-----	11
4.3 Installation requirements-----	12
4.3.1 Installation dimensions-----	12
4.3.2 Installation environment -----	14
4.3.3 Instrument installation-----	15
4.4 Sample gas connection -----	15
4.4.1 Pretreatment of gases-----	15
4.4.2 Installation and connection of airways-----	16
4.5 Power supply and protection -----	17
4.5.1 Instrument power connection -----	17
4.6 Connection of signal lines-----	17
5 Start-----	19
5.1 Power on-----	19
5.1.1 Safety instructions for power connection-----	20
5.1.2 Fuse of power supply-----	20
5.2 Wait for warm-up-----	21
5.3 Zero calibration-----	22
5.4 Span calibration -----	23
6 Menu Management-----	24
6.1 Main Menu -----	24
6.2 Time set-----	25
6.3 Calibration-----	27
6.4 Alarm free -----	27
6.5 Records -----	28
6.5.1 Alarm history -----	29
6.5.2 Delete alarm history -----	29



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6.5.3 Software version	30
6.6 Administrator settings	31
7 Maintenance	31
7.1 Weekly maintenance	31
7.2 Annual maintenance	32
7.3 Leakage of gas connection lines	32
8 Adjustment and Function Check	33
8.1 Overall adjustment	33
8.2 Linearization	34
8.3 Limit alarm	35
8.4 RS485 communication settings	35
9 Fault Check	36
9.1 Temperature control failure	36
9.2 Instable display	36
9.3 Incorrect display	36
10 Shutdown Procedures	37
11 Storage and Transportation	38
11.1 Proper storage	38
11.2 Proper transport	38
11.3 Returned to the manufacturer for repair	39
12. Special Tips	39
13. Our Commitment	41

# 1 Use of this manual



Scope of application:

AGA1010 and AGA1010d (hereinafter referred to as AGA-1010 series gas analyzer

Applicant:

Based on this manual, the authorized technician or service person can do operations as below:

- Installation and electrical connection
- Start, routine adjustment and calibration
- Use and testing during instrument service period
- Off the assembly line and transport

All the illustrations in this manual are not drawn to scale because they are mostly schematic, however there is a description where it is needed.

**The manual is an important part of the instrument. Please keep the instructions properly after each use, please read carefully in bold parts. Please take attention of the instructions marked with "▲", and must follow the mark "◆". Otherwise it will bring adverse consequences.**



## 2 Instrument Overview

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### 2.1 Introduction of the instrument

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AGA1010 series gas analyzer is used to continuously gas analysis equipment. The instrument is our company's newly developed paramagnetic principle equipment. It has a small size, simple operation, easy maintenance and other characteristics, coupled with advanced electronic circuits, the instrument has high-performance technical indicators, it can be used as a constant gas analysis also. Therefore it is widely used in ambient air monitoring, exhaust monitoring, petrochemical etc., but also for laboratory analysis.

### 2.2 Working principle

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AGA1010 series paramagnetic gas analyzer is based on the principle of oxygen paramagnetic detection. In the mixed gas, the magnetic susceptibility of oxygen is several to hundreds of times higher than other gases, so the magnetic susceptibility of the mixed gas depends almost entirely on the amount of oxygen contained, that is, the oxygen content can be determined according to the magnetic susceptibility of the mixed



gas How many.

Between the two magnetic poles of the closed air chamber of the sensor, install two glass balls filled with nitrogen (commonly known as dumbbells), which are fixed on a coaxial support that can rotate. There is a reflector on the central axis of the dumbbell ball. The reflector reflects the light beam from the light source to the photoelectric sensor. The oxygen in the measured gas will be sucked into the magnetic field, and the force on the sphere will cause the dumbbell to rotate. The angle of the mirror will change so that the light intensity received by the photoelectric sensor will change. The control system will allow the photoelectric sensor to receive the strongest The optical signal drives the dumbbell coil electromagnetic coil through the current, so that the dumbbell ball can be restored to its original position. The magnitude of this drive current is proportional to the oxygen concentration, thereby reflecting the oxygen concentration.

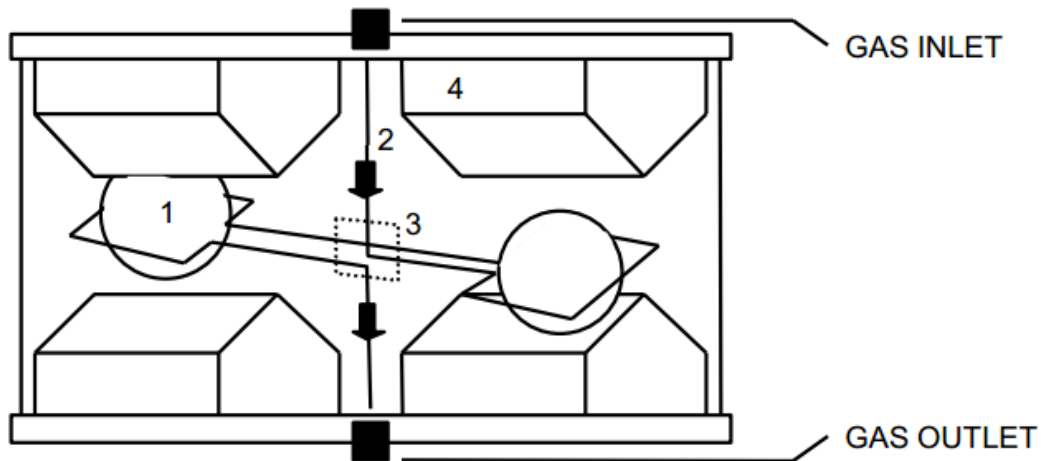


Figure 1: principle of paramagnetic gas analyzer

## 2.3 Instrument function

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AGA-1010 series paramagnetic gas analyzer designs two limit alarm points, and they work independently. The instrument has the digital display to direct show gas concentration value, and flow alarm device is optional according to your request.

## 3 Technical Data

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### 3.1 Application

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the AGA1010 series gas analyzer is used to measure oxygen only.





### **3.2 Technical indicators**

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Accuracy:  $\leq \pm 0.1\%$  F.S

Repeatability:  $\leq 0.5\%$  F.S

Drift limit: 0.5% F.S / 7d

Response time (T90):  $\leq 5$ s

Ambient temperature: 0 ~ 40°C

### **3.3 Measured value output**

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Current signal: (4-20) mA constant current, linear output (allowable load does not exceed 400Ω)

Digital communication: RS485 digital output.

### **3.4 Relay**

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2 relay output with high and low alarm

### **3.5 Basic parameters**

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Power supply: 220VAC  $\pm$  10%, 50Hz

Rated power:  $\leq$  100W

Allowable working temperature: 0 °C ~ 40 °C

Electrical connector: 3 cable(power,signal,relay)

Gas pressure: the highest gauge pressure  $2 \times 10^4$ Pa

Gas flow: (6 ~ 60) L / h, (0.1 ~ 1) L / min

Warm-up time:  $\leq$  30min

Fuse: Specifications: 250V / 1A, fast-break type

Size:  $\Phi 5 \times 20$ mm

Quantity: 1 piece

Weight: Around 15kg

Overall dimensions: see Figure 2

*The above data may be subject to change, the company reserves the right to change the technical data.*

## **4 Installation**

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### **4.1 Unpacking inspection**

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- 1 Please open the box.
- 2 Remove the packing inside the box.
- 3 Carefully remove all parts.
- 4 Please check the packing list and make sure all spare parts are complete.

**▲ The gas connector is closed with a plug to prevent contamination. Please do not remove these plugs before connecting the air path. If you find that the spare parts are not available or do not match the list, please contact us immediately.**

## **4.2 Safety Instructions [▲]**

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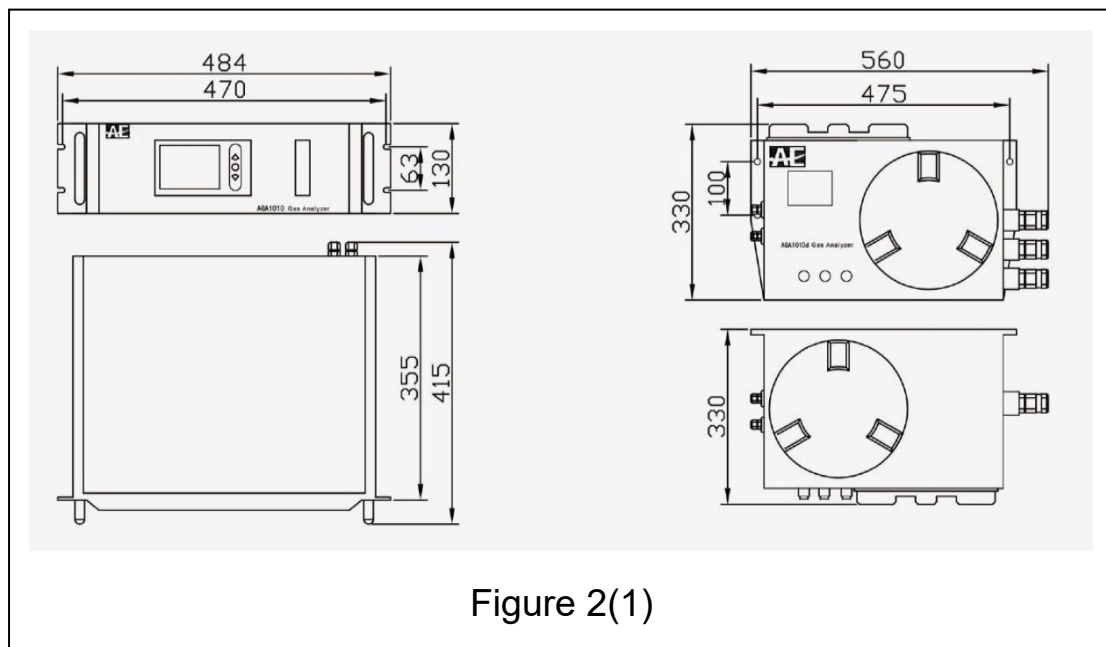
- 1 If you need to open the instrument for repair, you must turn off all power first.
- 2 If you need to repair work when energized, please contact a qualified technician.
- 3 When replacing the fuse, only qualified fuse (design model, fuse current, fusing performance) is allowed to install. See section 3.5.
- 4 If there is a clear indication that the instrument is not working properly, please turn off the instrument immediately and contact a qualified technician.

5 Prevent any liquid substances get into the instrument casing or gas channel, if there is liquid material get in, please immediately turn off the power, stop gas flow, notify the professional and technical personnel to repair.

6 It is not permissible to remove, add, or replace any parts inside the instrument unless instructed by a qualified technician.

### 4.3 Installation requirements

#### 4.3.1 Installation dimensions



Instrument size (mm) as shown in Figure 2, which contains three pictures, respectively, said three mounting surface. Figure 2 (1) instrument panel



AGA1010 front panel has two aluminum handle, easy to install and extract in the cabinet. Display and buttons is used for human-computer interaction. Flow meter shows the current intake air flow, and the general normal measurement required flow in 0.4 ~ 1.0L / min.

The back panel of the instrument is installed as below. The back of the analyzer includes the inlet and outlet ports, the signal output interface, the power cord interface, and the nameplate.

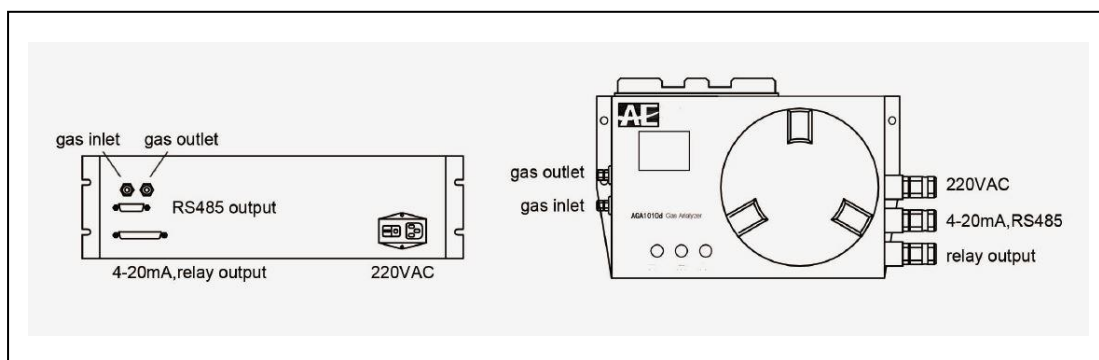


Figure 2 (2) instrument back panel

The upper left corner of the instrument is the inlet and outlet. While installation, please pay attention to the directions. The lower left corner is the AGA1010 output interface. Refer to Section 4.6 for details. The lower right corner is the standard 3PAC socket. The required power supply is 220VAC / 50Hz.

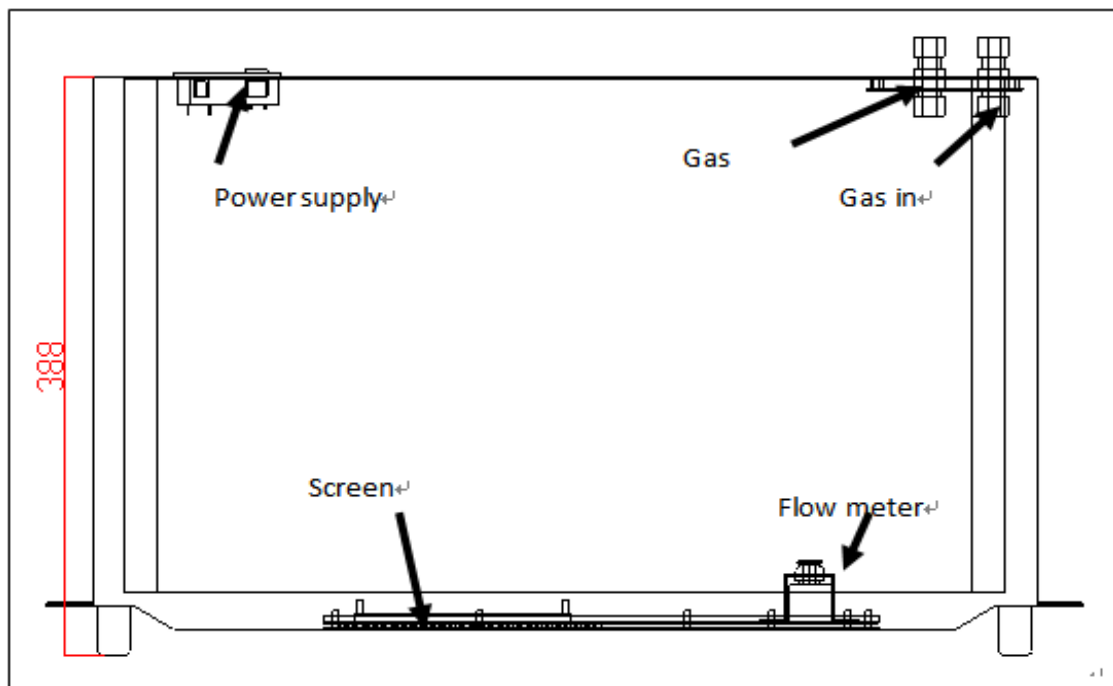


Figure 2 (3) top view of instrument panel

### 4.3.2 Installation environment

Temperature: Allowed working temperature is (0 ~ 40) °C, avoid direct sunlight and the interference of air flow(wind).

Humidity: Allowed relative humidity is (0 to 90)% RH (at 20 ° C).

Heat: keep air circulation outside of shell without a strong air convection.

Tilt: The instrument should be installed horizontally; otherwise there may be little measurement error.

Power: 220VAC, 50Hz.

**▲ It is forbidden to use the power supply together with the equipment with high frequency sparks, such as welding machine, hand drill and so on. The power plug should adopt the three-pin plug**



with grounding wire.

### **4.3.3 Instrument installation**

The AGA1010 is a 483mm (19") embedded standard enclosure, usually installed in a 483mm (19") standard cabinet.

**▲ Only mount the front panel is not enough, please use guide rail to support the total weight of the instrument. Otherwise the shell will be damaged.**

## **4.4 Sample gas connection**

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### **4.4.1 Pretreatment of gases**

In order to ensure the measurement accuracy of AGA1010 and service life, the entering gas must be clean, dry and non-corrosive.

#### 1 sampling point

The sampling point must be representative so that the true gas concentration can be obtained.

#### 2 dedusting and drying

To ensure the long-term service life of the instrument, the gas into the instrument must be filtered through the precision filter, please note the



followings:

A, For the gases with high humidity and dew point higher than room temperature, condensation phenomenon will appear when they pass through the instrument, so the filter and the catheter should be heated.

B, Viscous components should be separated by appropriate pretreatment filters and heated if necessary.

C, Please keep the nozzle of heated sampling tube lower so that the fouling and condensate can flow out.

D, The non-heated sampling tube should be tilted downwardly so that the condensate flows directly into the condensing separator.

E, When the sampling tube is very long or in a negative pressure, then we shall use pump to suck gas. The power and structure of the pump are based on the specific situation.

#### **4.4.2 Installation and connection of airways**

The gas path to the AGA1010 should be as short as possible, and if the gas path is too long, a larger diameter metal pipe or auxiliary pump can be used to reduce the time lag of the pipeline.

There are sample gas inlet and outlet on the back panel of AGA1010 (see Figure 2), this connector can be directly connected to the hose. According to different gas components, polyethylene hose, polytetrafluoroethylene hose or fluorine rubber hose in  $\phi 4$  (inside diameter)  $\times 1$ mm is





recommended as the connecting hose.

**▲ As shown in Figure 2 (2), “gas in” refer to the inlet and the other is the outlet.**

## **4.5 Power supply and protection**

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### **4.5.1 Instrument power connection**

The power cable of one end of the instrument is a CEE standard power plug and the other end is a three-terminal power plug with a safety contact specification of 3A / 250V.

**▲ Ground wire shall really ground; otherwise it will lead to the instrument's anti-interference ability.**

## **4.6 Connection of signal lines**

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4-20 mA constant current output signals is the output signal of the instrument. The maximum load of the instrument is 400Ω.

**▲ the 25 points signal output socket on the rear panel in addition to transfer 4-20mA signal, there are two alarm limits for users to use. The two sets of alarm contacts are generally set to normally open before out of factory. The alarm is**

usually alarming when the measured value exceed the setting limit value. And the alarm type can be set as alarming below the set point alarm also in instrument menu.

Wiring of 25 points signal output socket is as shown in Figure 3.

### Attention

As shown in Figure 3 and Figure 4, in the case of connecting two load devices, the following requirements must be met:

- 1, Two devices with 4 ~ 20mA signal should be set with the same current input range; otherwise you should modify the input range.
- 2, 8-way pretreatment switch on the DB25 core connector is reserved, only set control process according to customer demand before out of factory, otherwise it is not equipped.
- 3, The total matching impedance of the two devices must meet:

$$R1 \leq 400\Omega$$

$$R2 \leq 400\Omega$$

Failure to do so may result in load mismatch (overload).

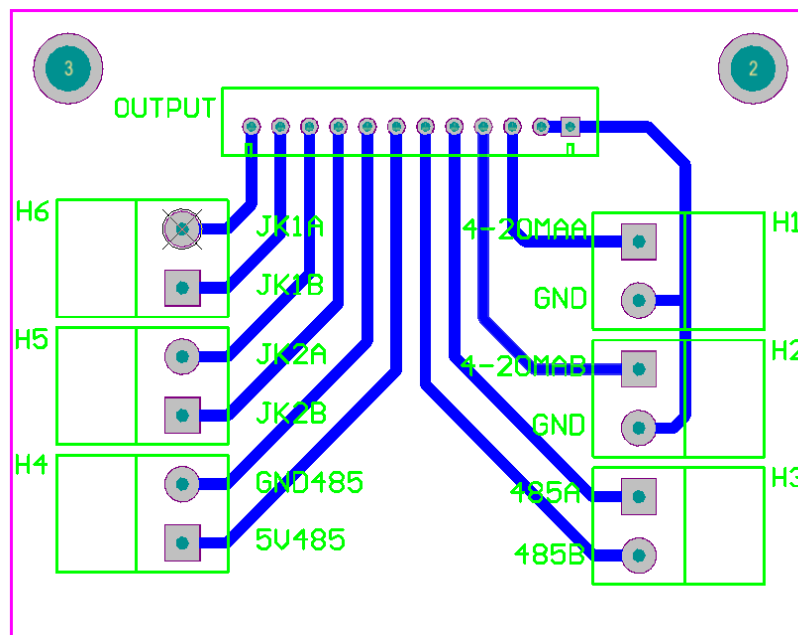


Figure 3 signal output socket diagram

R1 ~ R8 is a reserved pre-processing relay controller group, can be programmed according to customer requirements, but generally empty.

1 and 2 is basic signal configuration of 4 ~ 20mA output,

3 and 2 is optional.

\* only for each situation with optional parts

\* \* External load

——Current output 20mA (0 ~ 400) Ω



The maximum electrical load per switch node is 36V / 0.5A.  
5 and 7 switch node is: "high alarm"  
6 and 8 switch node is: "low alarm" \*

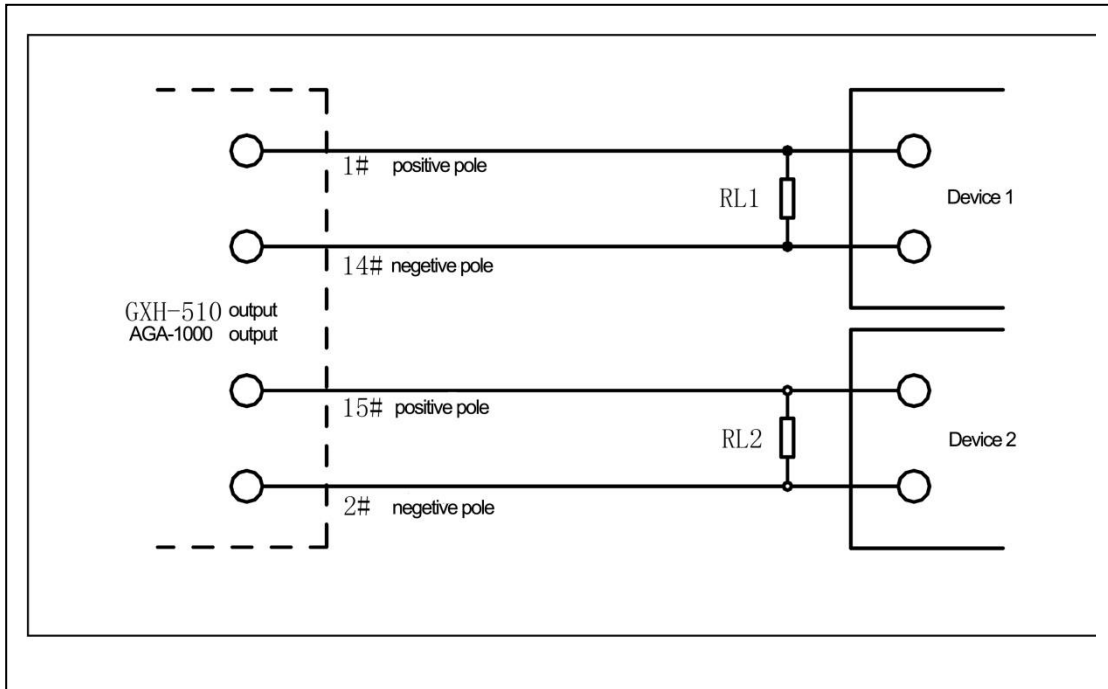


Figure 4 Signal output socket connection

▲  $RL1 \leq 400\Omega$ ,  $RL2 \leq 400\Omega$

## 5 Start

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### 5.1 Power on

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### **5.1.1 Safety instructions for power connection**

After the AGA1010 is installed, the power can be switched on. The required power supply must be consistent with the AGA1010 supply voltage. Power supply is 220VAC AC.

- ▲ If the supply voltage is too high, it will damage the instrument and it is very dangerous to using the instrument in this case.

If the supply voltage is too low, the instrument cannot work properly.

Power supply must be phase, medium and ground three-wire system, otherwise the instrument cannot work properly.

Do not disconnect the protective grounding wire (yellow-green line), otherwise it may cause electric shock. Therefore the instrument can only be started after the instrument has been properly grounded.

◆ ***WARNING: Before connecting the power cable, make sure that the the instrument is turned off.***

### **5.1.2 Fuse of power supply**

1, At the moment the AGA1010 is turned on, the instrument will generate an inrush current which much higher than the operating current value. So

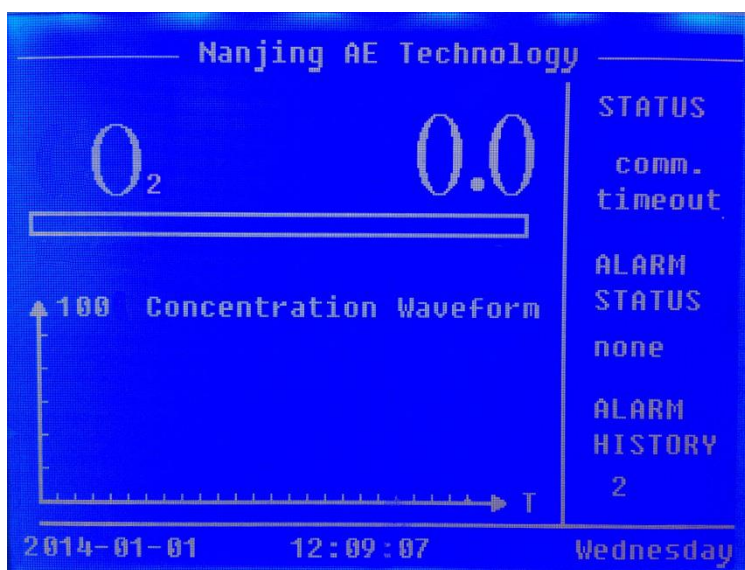


AGA1010 fuse of external power supply shall have the characteristics of slow fusing or delay fusing. Especially for the case which several instruments share one fuse.

2, AGA1010 instruments must be fitted with external fuse.

## 5.2 Wait for warm-up

After power on the instrument, the preheating will start, and it generally takes about 30 minutes. When the heating is completed, The AGA1010 displays the concentration on the screen, details as shown below:



▲ **Note:** By the limit of measurement principle, paramagnetic gas analyzer will be affected by temperature. AGA1010 analyzer requires a normal temperature before measurement. If the instrument has not



yet completed the preheating, the measurement error will happen. Therefore, do not do zero calibration and span calibration in this period also.

◆ ***WARNING: Do not perform calibration until the analyzer has been preheated.***

### **5.3 Zero calibration**

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Pass the zero gas into the gas inlet on AGA1010 rear panel, and adjust the gas flow in 0.4L / min ~ 1.0L / min. And generally the gas pressure should be less than  $2 \times 10^4$ Pa (with no pump), therefore zero gas from the cylinder shall equipped with a pressure relief valve.

When the measure range larger than 2% (volume percent), the fresh air can be used as zero gas. In this case, the content of the measured component in the air is negligible. If it is not negligible, we must use high purity nitrogen (99.999% N<sub>2</sub>) or inert gas (such as argon) as zero gas.

After the instrument is stable, enter zero calibration in the menu. As shown in Figure 5:



Figure 5: Zero calibration

**▲ Note: In zero calibrating operation, only do calibration in stable gas flow. Or there would be error.**

## 5.4 Span calibration

The customer can determine the calibration value based on the requirements and the actual standard gas concentration (not less than 20% of the range).

Use the standard gas to be calibrated to pass through the gas inlet (pump) on the rear panel of the AGA1010.

Enter the span calibration interface, set the span calibration value (not less than 20% of the range) same with the standard gas concentration.

And then enter the calibration program, until the instrument is stable, and then confirm it to complete the span calibration.



**▲ Note: In span calibrating operation, only do calibration in stable gas flow. Or there would be error.**

**The span calibration value can be set according to the actual situation, but not too low. It is recommended to use the range from 50% to 100% standard gas to do calibration.**

## **6 Menu Management**

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The AGA1010 analyzer uses a 3.8-inch LCD screen for display gas concentration and menu functions. Time sets, query, calibration and other functions are achieved through the menu management. The menu interface is as follows:

### **6.1 Main Menu**

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After starting the AGA1010 system, press the OK key to enter the main menu, as shown in the following figure.





Figure 6: Main menu

## 6.2 Time set

The time set menu is shown below:

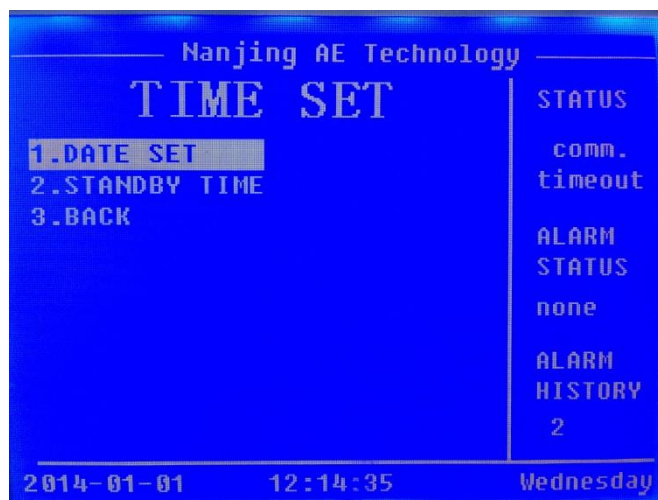


Figure 7: Time set

**In the time set menu you can do the followings:**

**1: Date set:** After entering the setup menu, press the OK key to move the cursor, press the up and down keys to modify the date and time



parameters. When the cursor moves to the end, press the OK button to save the changes and exit. As shown below.

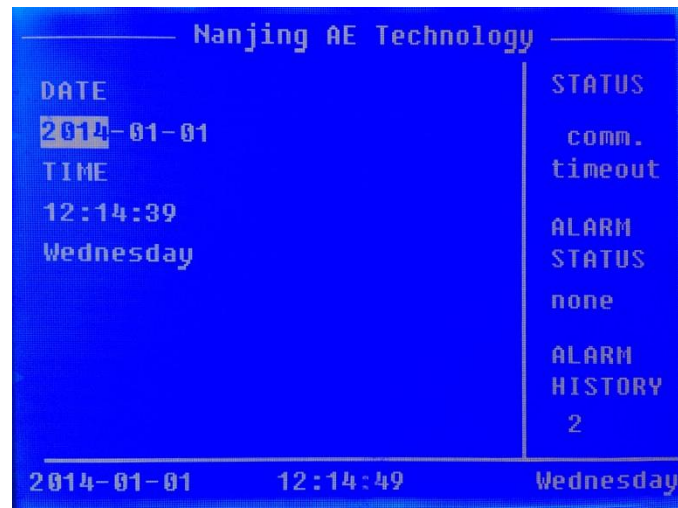


Figure 8: Date set

▲ **Note:** Before out of factory, time is set according to the current Beijing time. If the customer is not in Beijing time zone, you can set your own time.

▲ **Note:** Do not usually modify time so as to keep a good time-related alarm records and data records.

**2: Standby time:** As shown in Figure 9, after entering the standby time setting menu, the current standby time is displayed. Press the OK, then you can press the up and down keys to modify the standby time. Press the OK key to exit.

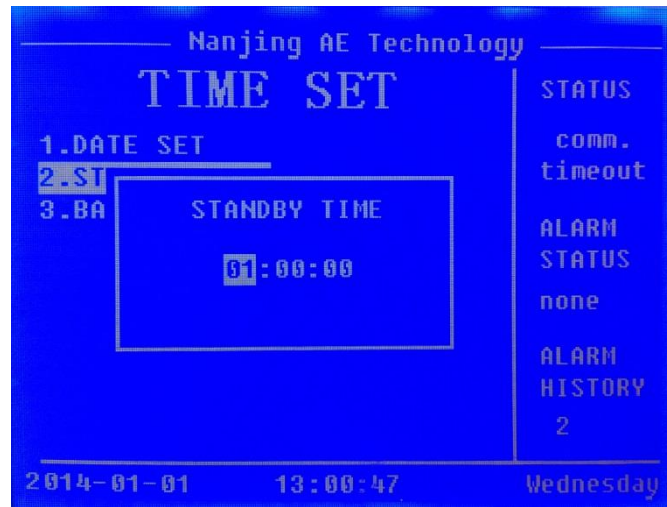


Figure 9: Standby time setting

## 6.3 Calibration

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Refer to Section 5.3, Section 5.4

## 6.4 Alarm free

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When the AGA1010 analyzer alarm action occurs, the buzzer in the instrument will alarm. After the technician confirms the situation that can release the alarm, you can select the alarm free in the main menu, press the OK button to remove the buzzer.

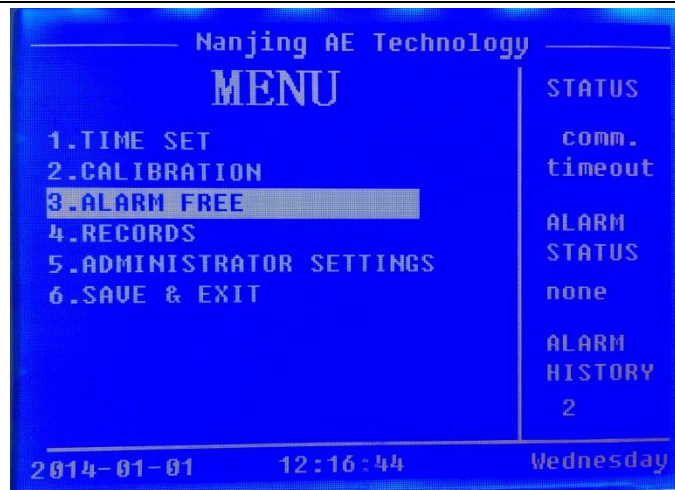


Figure 10: Alarm free

**Note: The Alarm free means the buzzer is released but not the alarm state is changed.**

## 6.5 Records

The Records menu allows you to query historical alarm records and historical change waveforms (within 1 week). As shown below:

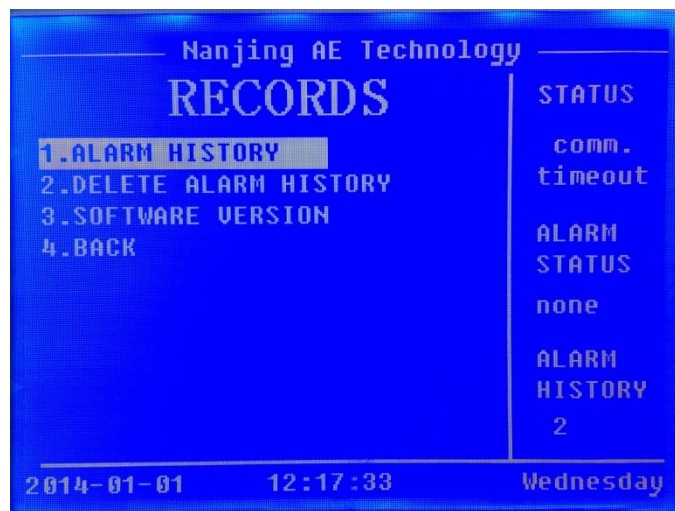


Figure 11: Records



### 6.5.1 Alarm history

Press the up and down keys to select the alarm records, press the OK key to enter. As shown below:

Nanjing AE Technology				
TYPE	DATA	TIME	VALUE	ALARM
NONE	2014-01-01	18:19:31	0.0	L
NONE	2014-01-01	18:19:31	0.0	L

BACK HOME 1/1 END NEXT EXIT

2014-01-01 12:17:49 Wednesday

Figure 12: Alarm history

As shown in the figure, the menu can query the history of the alarm time date, concentration and alarm type. You can flip through the previous page and the next page.

### 6.5.2 Delete alarm history

Press the up and down keys to select delete the alarm history, press the OK key to enter. As shown in Figure 17:

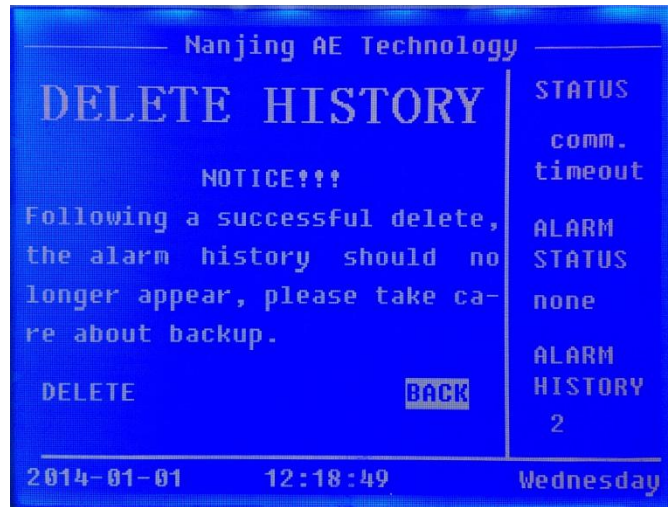


Figure 13: Delete alarm history

### 6.5.3 Software version

Press the up and down keys to select the Software version, press the OK key to enter. As shown below:



Figure 14: Software version

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## 6.6 Administrator settings

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The administrator settings will change the operating status of the instrument, therefore only professional technician with factory's approval can modify the administrator parameters. As shown below:

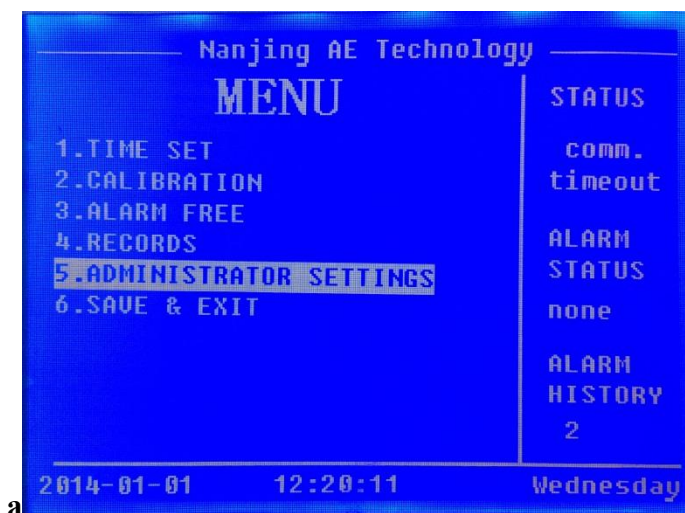


Figure 15: Administrator settings

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## 7 Maintenance

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### 7.1 Weekly maintenance

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Check the zero point. Please refer to section 5.3.

Check the accuracy of the instrument with standard gas. Please refer to



section 5.4.

## **7.2 Annual maintenance**

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The instrument needs to be maintained at least once a year, the followings should also be checked or replaced.

1 line troubleshooting, found that aging or loose off in time and invite technician to change or contact us.

2 Accuracy investigation, see sections 5.3, 5.4.

3 import and export of air pump is leaked or not.

4 whether gas supply lines and internal airways are aged, or leaked.

## **7.3 Leakage of gas connection lines**

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In the annual inspection of AGA1010, pipeline leak detection is essential operation. Connect a pressure test tube to the gas outlet (such as 1.5m long U-shaped water pipe), when the pressure does not exceed 0.5mbar, be sure pressure drop is not more than 5mm in 5min pressure.

1 Check all adjustment of the instrument and functions, see Chapter 6.

2 The optical unit should be inspected and calibrated every few months or if the instrument drifts a lot. If replace the optical unit parts, there must be





a re-adjust operation.

▲ **The new instrument generally do not need to do this work.**

## **8 Adjustment and Function Check**

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▲ **All operations listed in this chapter can only be carried out by trained professional technicians.**

### **8.1 Overall adjustment**

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**All adjustments to the instrument are carried out after the analyzer is thermally stable. The adjustment steps are as follows:**

1 Check the + 0.6V (for 0V contacts) on the circuit board with a multimeter. If not, adjust the variable capacitor at the top of the detector to achieve  $+ 0.6V \pm 0.1V$ .

2 Connect the "EL.0" connector on the board to the next two contacts. That is also the electrical zero.

3 Rotate the "zero" potentiometer on the front panel of the instrument with a screwdriver so that the instrument indicates 2mA.

4 Connect the "EL.0" connector on the two point above, where the



instrument is in the measuring state that measuring the zero point.

5 inject high purity nitrogen into the instrument in 0.5L / min.

6 measure circuit board "F" test point of 0V AC voltage(residual signal), the AC voltage is not greater than 0.5VAC. (user can also be inserted the "RS" short connector in the bottom two points that "residual voltage indication". In this time, the instrument output is generally not greater than 3mA. And then insert the "RS" Short connector in the top two contacts), then the instrument will indicate approximately 2mA.

7 Rotate the "zero" potentiometer on the front panel of the instrument so that the instrument indicator is displayed as zero accurately.

8 inject the standard gas to the instrument, adjust "sensitivity" potentiometer on the front panel of the instrument so as to keep the instrument indicates the same standard gas concentration.

## **8.2 Linearization**

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The linear curve is obtained by adding an appropriate signal to the measurement signal. AGA1010 linearization circuit with a corresponding range of potentiometer can adjust the degree of linear correction. However there is no need to re-adjust because the linear has been adjusted before out of factory.



### **8.3 Limit alarm**

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AGA1010 set the corresponding limit alarm adjustment potentiometer "SW1", "SW2" in each limit alarm points. Adjust the potentiometer to set a separate alarm value or limit value over the entire range. Alarming below the set value alarm or higher than the set value alarm can be selected in the instrument. These alarms are displayed by the status bar of the screen, or through signal output socket on the instrument rear panel to normally open or normally closed ("SW1" "SW2"). The alarm value has been set before out of factory. If you want to change it please contact the professional staff. See Figure 7.

### **8.4 RS485 communication settings**

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We can use 485 communication settings in Administrator settings, including baud rate (the instrument factory defined 13 common standard baud rate for the user to choose, cannot be customized), data Bit, stop bit and parity bit.



## 9 Fault Check

### 9.1 Temperature control failure

Reason	Solutions
1 heating line falls off	Short circuiting the signal output wire or welding a terminating resistor up to 400Ω.
2 The ambient temperature is not under the required range (0-40 ° C)	Connect upsides of the short circuit "EL.0" and the residual voltage test short "RS".

### 9.2 Instable display

Reason	Solutions
1 source interference	connect a 200W AC voltage regulator
2 signal appears on the curve of the feedback pulse	Add a shielded cable on the signal output , and add a power filter
3 high-frequency components failure or testing room failure	please contact the professional and technical personnel.
4 instable temperature control instability	waiting for constant temperature state.
5 block in exhaust pipe	replace the exhaust pipe.

### 9.3 Incorrect display

Reason	Solutions
1 gas leakage	Check front panel precision filter and the entire airway.
2 Wrong status of Zero and Span	Use nitrogen and calibration gas to check the zero point and sensitivity.
3 air chamber is not sealed	Inject high purity nitrogen purge reference



	side, if the instrument indicates a change, please replace the air chamber.
4 temperature control fault	Temperature control is out of control, please immediately turn off the instrument and to repair.
5 Standard gas concentration is incorrect	Check the standard gas with other instruments or methods.
6 inappropriate gas pretreatment	Check whether the measured gas pretreatment device change or not.

## 10 Shutdown Procedures

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The procedure for closing AGA1010 is as follows:

- 1 Separate the external sample line from the instrument to prevent sample gas from entering the instrument.
- 2 Purge all the airways with the dry high purity nitrogen for a few minutes.
- 3 Then enclose all the connectors of the instrument. Or close the valve in the purge gas path.
- 4 Turn off the power switch, or disconnect the power from the external configuration.



## 11 Storage and Transportation

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### 11.1 Proper storage

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1 Protect the internal airway: When the instrument is removed from the sampling gas path, plug all gas connectors of the instrument (with plugs or tapes) to protect the internal airways from moisture, dust and particulates.

2 Protect the power and signal cable connector: remove the power and carefully sealed.

3 Protect the front panel: Protect the front panel from scratches with sharp objects.

4 Protect the instrument: avoid pollution from liquid, moisture and dust, or any vibration.

### 11.2 Proper transport

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Protection measures: as described in Section 10.1.

Packing: If the AGA1010 needs to be shipped, please use a solid box with internal filler. The analyzer is fixed in the box, make sure there is enough



space between the analyzer and the box wall.

### **11.3 Returned to the manufacturer for repair**

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If the AGA1010 is to be returned to the manufacturer for repair, please send the following instructions together with the instrument:

- 1 Provide a detailed description of the problem.
- 2 In the event of a measurement error or an abnormal measurement, please attach a typical record of your discovery.
- 3 A brief description of the working conditions and installation location.
- 4 Make sure your sending address, recipient name.
- 5 Write your contact details.
- 6 Keep the spare parts for factory shipment for future maintenance.

The completeness of the above description will ensure that you can receive the repaired equipment in the shortest time.

## **12. Special Tips**

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- 1 AGA1010 is prohibited from being used in an explosion hazard area.



2 Before connecting the power cable, make sure that the instrument power switch is off.

3 Ensure the gas entering the instrument is dry and non-corrosive.

4 liquid substances are not allowed to enter the shell or analytical instrument gas path, if any failure, please immediately turn off all the power supply, and inform the maintenance technician in time.

5 anyone but technician with our approval can add or replace any part of the analytical instrument unless stated or proposed by the instructions.

6 If you have any other instructions that have not explain in this manual, please contact us promptly.





## **13. Our Commitment**

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In the case of your compliance with the rules of storage and use, within 12 months from the date of delivery by the supplier, if the product is damaged or does not work due to poor quality of production. We will replace or repair the product with no charge.



SCIENTIFIC INNOVATION SPECIALIZED DEDICATED

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OUR BELIEF

SCIENTIFIC INNOVATION, SPECIALIZED DEDICATED

OUR BUSINESS CONCEPT

HIGH QUALITY AND PROFESSIONAL SERVICE

OUR GOAL

COOPERATION WITH CLIENTS TO MAKE PROGRESS TOGETHER

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