Note

This manual only applies to GC102AF Model Gas Chromatograph products.

A & E Lab (UK) Co.,Ltd

Table of Contents

GC102AF Product Standard Code：Q/YXLZ52

Contact Us:

E-mail: sales@aelabuk.com

Website: www.aelabuk.com

1 Overview, Applications and Features

1.1 Overview

GC102AF is the most sophisticated version of the original GC102A Series gas chromatograph manufactured by our factory, featuring computerized gas chromatograph system, low price and high performance. It is the state-of-art universal gas chromatograph with a flame ionization detector. The instrument adopts the latest technology from the domestic and abroad, combing our decades of experiences in developing and manufacturing gas chromatograph products. The instrument is highly reliable, with simple structure, easy-to-operate and fine appearance design.

1.2 Applications

GC102AF gas chromatograph is suitable for trace detection of environmental protection, air and water pollution, analyzing poisons, monitoring and research, biochemistry, clinical application, pathology and virus research, food, petrochemicals, petroleum processing, oil analysis, geological , prospecting research, organic chemistry, synthesis, and quarantine, especially fit for power system, industrial and mining frontline laboratories and schools.

1.3 Features

- The instrument is PC controlled, with high precision.
- The instrument removes the original main device interface and is controlled directly by the computer. The interface is more intuitive and easy to operate. The device is designed with functions, such as self-diagnosis, power protection, over-temperature oven protection, and automatic ignition. It can accurately display the temperature control settings, actual value, and FID amplifier sensitivity.
- The single gas system and precise scale pneumatic control valve contribute to excellent reproducibility and stability.
- The instrument can perform analysis of packed column. Packed column: on-column injection, instantaneous vaporization injection, and gas injection.
- The open computer system can work together to process data.
- The large capacity oven (300mm×280mm×270mm) facilitates the installation of packed column, with built-in heating wire structure.

2 Technical Indicators and Specifications

2.1 Technical Specifications

Oven Temperature Control Indicators	
Temperature range	15℃～399℃ above room temperature (increment: 1℃)
Temperature accuracy	better than ±0.1℃(measured at 200℃)

Sampler, Flame Ionization Detector (FID) Indicators	
Temperature range	15℃～399℃ above room temperature (increment: 1℃)
Temperature accuracy	better than ±0.1℃(measured at 200℃)

Flame Ionization Detector (FID)	
Detection limit	Dt≤1×10^{-10}g/s(N-octane / n-hexadecane)
Linear range	≥10^{6}
Baseline drift	≤2×10^{-12}A/h

Max. limit temp	400℃

2.2 Specifications

Dimensions	575mm×480mm×490mm
Weight	50Kg
Power supply voltage	AC220V±22V, 50Hz±0.5Hz
Power	≤1500W

2.3 Optional Accessories

The basic model of GC102AF gas chromatograph includes the main device, packed column injector, carrier gas and auxiliary gas line, computer temperature controller, a flame ionization detector and micro-current amplifier, external gas connections pipelines and other basic components of gas chromatograph.

- Basic instrument of Model GC102AF gas chromatograph: 1 pc;
- Accessories and spare parts (refer to the list of the accessories and spare parts):1 box.

The following accessories of Model GC102AF gas chromatograph are optional, and can be ordered with the basic instrument (if needed). They can also be ordered at any time after the instrument has been operated.

- Reformer (including nickel methanation conversion agent)
- Six-way plane switching valve (gas injector)
- Chromatographic work station
- Chromatographic simulation and dedicated teaching demonstration software
- Deoxidization tube
- Glass chromatography column (inner diameter: 2mm; outside diameter: 5.7mm, length: 1m. The distance between the centers of two columns' open ends is 174mm or 127.5mm. It is suitable for mounting this instrument).

3 Installation Instructions

3.1 Installation Conditions

The instrument should be placed on a solid stable laboratory bench which complies with the environmental requirements. The ambience shall maintain clean, free of severe dust pollution.

To ensure that the instrument works normally, the working environment shall meet following criteria:

- The temperature shall remain between 5℃~35℃, with relative humidity not greater than 85%.
- It shall be free from direct sunlight, shock, dramatic turbulence, or erosion of corrosive substances.
- The power voltage is AC220V ± 22V, with frequency of 50Hz ± 1Hz, and must be equipped with a good grounding line.
- It shall stay away from high-intensity magnetic field, electric field and the occurrence of high-frequency waves of electrical equipment. The grounding line shall not share the same power outlet with other devices.

Note: If the power supply voltage fluctuates, it is recommended to use the AC electronic power supply with power higher than 5000W.

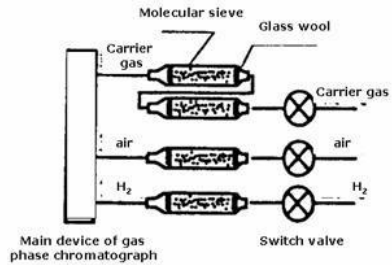
3.2 Unpacking Check

Keep the package box for the convenience of moving the product. Check that all items on the attached spare parts checklist are included. Contact the local distributor or directly with our sales department if there is any problems.

3.3 Preparation and Treatment of Gas Source

3.3.1 Gas Source

The FID detector of GC102AF needs three types of gas, i.e. carrier gas (generally, nitrogen), hydrogen and air. The purity of the nitrogen must not be lower than 99.99%, and that of the hydrogen not be lower than 99.9%. The air must not contain water, oil or contaminated gas.



3.3.2 Treatment of Gas Source

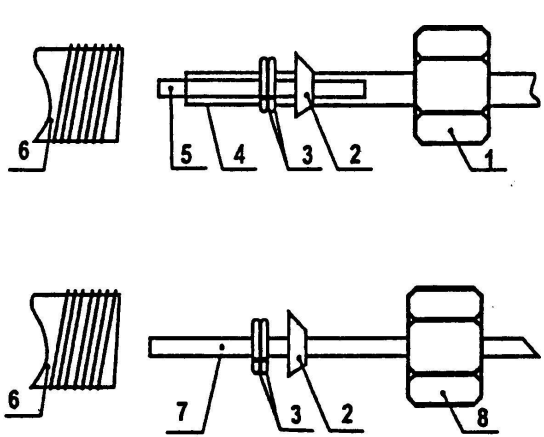
Before three types of gas enter the instrument, it must strictly undergo purification treatment. When the instrument is delivered from the factory, the general purifier will be provided. See Figure 3.3.2. The purifier consists of the purification pipe and switch valve, and it is connected between the instrument and the gas source. The purification pipe is added with activated “5A” molecular sieve and silica gel. If it is necessary to input the gas source into the chromatograph, the knob of the switch valve shall be turned to the “On” position. The duct connection of outdoor air should be stainless steel or copper pipes.

3.4 Connection of the External Gas Flow

3.4.1 Connection of gas transmission pipe and gas flow joint

The gas transmission pipe in the gas flow of GC102AF gas chromatograph mainly consists of ϕ3×0.5 polyethylene pipe (accessory 38#) or ϕ2×0.5 stainless steel pipe. The nut is M8×1, ϕ3.2 (accessory 22#) or M8×1, ϕ2.1 (accessory 35#). Figure 3.4.1 shows the schematic diagram of the connection of two types of pipe with the joint. In the figure, ϕ3×0.5 polyethylene pipe uses a seal gasket, in order to increase the strength of the pipe at the airproof point and

ensure free flowing of gas and airproof performance. If theϕ2×0.5 stainless steel connecting pipe is used, the ϕ2×0.5×20 seal gasket will not be used. The airproof coils in the figure may be replaced by a 5mm-long polyvinyl fluoride pipe. In the application, two pieces of airproof coils must be used, otherwise, it will not ensure airproof performance. The maximum airproof pressure is 0.5MPa ~ 0.8MPa (5kgf/cm^2 ~ 8kgf/cm^2). Examine the gas flow joint to see if there is any gas leakage. It is not permitted to use the ordinary (liquid) soap with strong alkali; this will corrode the part. It is recommended to use a diluted solution of dodecyl sodium sulfate as the leak testing liquid.



1. Nut (M8×1, ϕ3.2) (accessory 22#)
2. Airproof gasket (phosphor copper) (accessory 13#)
3. Two pieces of airproof coils (accessory 15#)
4. ϕ3×0.5 polyethylene pipe (accessory 38#)
5. Airproof gasket (ϕ2×0.5×20 stainless steel pipe)(accessory 21#)
6. Joint
7. ϕ2×0.5 stainless steel pipe
8. Nut (M8×1, ϕ2.1) (accessory 35#)

Figure 3.4.1 The connection of the external gas flow joint

3.4.2 Connection of External Gas Flow

Cut the polyethylene pipe of ϕ3×0.5 (accessory 38#) into 6 pieces according to requirements. Then, referring to Figure 3.4.1, use them to link the pressure-reducing valve joint and the purifier inlet (joint on the switch valve), and to link the purifier outlet (joint on the drying pipe) and the gas flow inlet of the main device. Now, the connection of the external gas flow is finished. For a guide to the connection of the external gas flow, refer to figure 3.4.3.

3.4.3 Inspection of External Gas Flow Leakage

After the connection of the external gas flow is completed, it is necessary to examine for leakage with following steps:

- Close the constant flow valve on the packed column gas flow of the main instrument and all the needle valves for the carrier gas, hydrogen and air.
- Open the high pressure valve of the steel bottle (before opening the high pressure valve of the steel bottle, the low pressure adjusting pole must be in a loosened state). Turn the low pressure adjusting pole slowly until the indication on the low pressure gauge shows 3kg/cm^2.
- Turn off the high-pressure valve on each steel bottle. Now, the indicated value on the low pressure gauge of the pressure-reducing valve should not decrease. Otherwise, there will be gas leakage in the external gas flow and it will be necessary to eliminate it.

3.5 Installation of Packed Column

For the on-column injection, the side of the injection inlet should be allowed for a section of empty column (at least 50mm), in order to facilitate the needle of the injector to be fully inserted into the gasifier during injection.

Due to the rigidity of the column, ϕ5.7mm glass packed column must be installed on the side of the injection inlet and the detector inlet as well, with the same procedure for installation for each end.

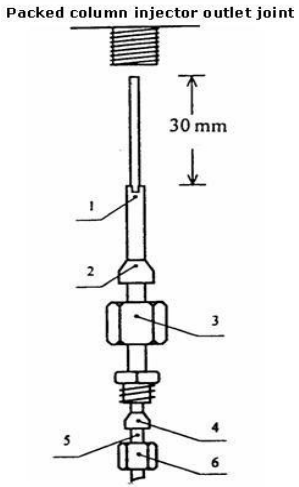
When the packed column is used for gasified sampling, it is not necessary to keep a section of column empty at the end of the injection inlet. However, a lining (ϕ5×ϕ2 quartz pipe) (accessory 12#) should be put at the front end of the packed column.

3.5.1 Installation of ϕ3mm and ϕ4mm Metallic Column to Packed Column Injection Inlet

Use Figure 3.5.1 as the installation instructions:

1) In turn install the nut (SN#: 6), graphite airproof gasket (SN#: 4) and packed column transition joint SN#: 1) into the packed column.
2) Extend the column head over the transition joint for 20mm~30mm (see the illustration). Hold the position and manually tighten the nut, then, using two appropriate wrenches, with one clamping the nut and the other clamping the transition joint, tighten them to the directions opposite of each other and seal them.

3) Install in turn the nut (M12×1, ϕ6.2) and graphite airproof gasket (ϕ6) into the transition joint.
4) Push the transition joint together with column head into the injector outlet joint and insert the column as deep as possible (Note: the lower end of the gasification tube must be inserted into the column head).
5) While maintaining this position, first tighten the nut (M12×1, ϕ6.2) with the injector outlet joint with hand. Then, tighten it with an M12 wrench to seal it.



SN#	Name	Specifications	
1	Transition joint	ϕ3mm (on the instrument)	ϕ4mm (accessory 33#)
2	Graphite gasket	ϕ6mm (accessory 16#)	ϕ6mm (accessory 16#)
3	Nut	M12×1, ϕ6.2 (accessory 24#)	M12×1, ϕ6.2 (accessory 24#)
4	Graphite gasket	ϕ3mm (accessory 17#)	ϕ4mm (accessory 19#)
5	Metallic column	ϕ3mm (outside diameter)	ϕ4mm (outside diameter)
6	Nut	M8×1, ϕ3.2 (accessory 27#)	M8×1, ϕ4.2 (accessory 28#)

Figure 3.5.1

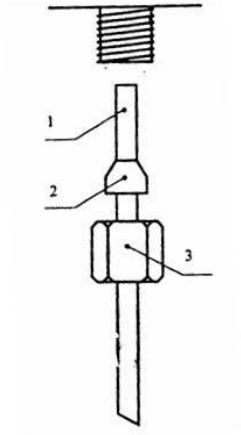
3.5.2 Installation of ϕ5mm and ϕ4mm Metallic and 5.7mm Glass Column to Packed column Injection Inlet

Use Figure 3.5.2 as the installation guide:

1) Put the nut (SN#: 3) and graphite gasket (SN#: 2) directly into the packed column in turn (without the assistance of transition joint).
2) Insert the column into the injector outlet joint as deep as possible (note: the lower end of the gasification tube must be extended into the column head, and ensure that the needle tip goes into the column while sampling).
3) Hold this position. First, tighten the nut to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

Warn: During the installation of glass column, if the nut is over-tightened, the column will be broken. Please be careful with the operation.

Packed column injector outlet joint



SN#	Item	Specification		
1	Packed column	ϕ5 metallic column	ϕ6 metallic column	ϕ5.7 glass column
2	Graphite airproof gasket	ϕ5 (accessory 18#)	ϕ6 (accessory 16#)	ϕ6 (accessory 16#)
3	Nut	M12×1, ϕ5.2 (accessory 25#)	M12×1, ϕ6.2 (accessory 24#)	M12×1, ϕ6.2 (accessory 24#)

Figure 3.5.2

3.5.3 Installation of Φ3mm and Φ4mm metallic column to gasification injector

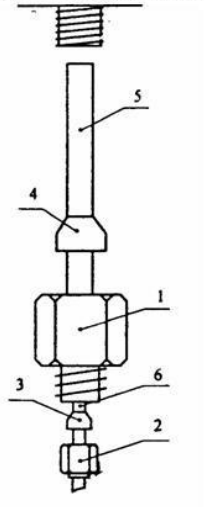
The difference from on-column injections system lies in the fact that when the filling device is used for the

gasification sampling, the quartz lining must be put in the injector with the unique joint to be equipped. Use figure 3.5.3 as the installation guide:

Put the quartz lining (SN#: 5) into the joint (SN#: 1)

1) The graphite gasket (SN#: 4) goes over the quartz lining.
2) Push the injector outlet end into the quartz lining as deep as possible (note: do extend the lower end of the gasification tube into the quartz lining. Refer to fig. 1 – 4 in chapter one).
3) Keep this position. Tighten the joint with the injector outlet end with hand. Then, tighten it with the wrench and seal it. (Be careful. Over-tightening may cause the quartz lining to be broken).
4) Put the nut (SN#: 2) and graphite gasket (SN#: 3) over the column head of the packed column in turn.
5) Hold this position. First, tighten the nut to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

Packed column injector outlet joint



For different caliber of chromatographic column, the accessories are different:

SN#	Item	chromatographic column ofϕ3 (outside diameter)		ϕ4 chromatographic column	
		Size (mm)	Accessory No.	Size (mm)	Accessory No.
1	Joint	ϕ3.2	31	ϕ4.2	30
2	Nut	ϕ3.2	27	ϕ4.2	28
3	Graphite gasket	ϕ3	17	ϕ4	19
4	Graphite gasket	ϕ5	18	ϕ5	18
5	Lining	ϕ5×ϕ2 quartz pipe	12	ϕ5×ϕ2 quartz pipe	12
6	Metallic packed column	ϕ3		ϕ4	

Figure 3.5.3

3.5.4 Installation of ϕ3mm and ϕ4mm metallic column to FID detector

Use figure 3.5.4 as the installation guide:

1) Mount the nut (SN#: 6), graphite airproof gasket (SN#: 4) and the packed column transition joint (SN#: 1) to the other end of the packed column.
2) Extend the column head over the transition joint about 1mm to 2mm (see the illustration in the figure). Hold the position and tighten the nut with hand. Then, use two appropriate wrenches, with one clamping the nut and the other clamping the transition joint and tighten it in opposite directions and seal it.
3) Mount the nut (M12×1, ϕ6.2) and ϕ6 graphite airproof gasket into the transition joint in turn.
4) Push the transition joint together with the column head into the FID inlet to be in contact with the root. Then, withdraw the column about 1mm.
5) Hold this position. First, tighten the nut (M12×1, ϕ6.2) to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

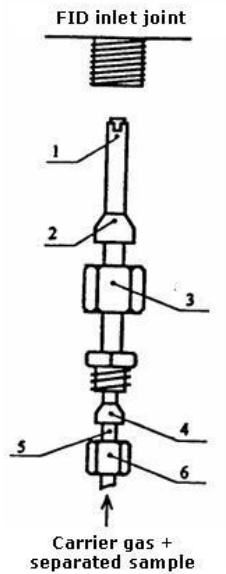


Figure 3.5.4

When used for gasification sampling, the installation method of the column to the FID detector is the same as described above.

3.5.5 Installation of ϕ5mm and ϕ6mm Metallic and ϕ5.7mm Glass Column to FID Detector

Use figure 3.5.5 as the installation guide:

1) Mount the nut (SN#: 3) and graphite airproof gasket (SN#: 2) directly to the other end of the packed column in turn (without use of the transition joint).
2) Push the column head into the FID inlet. After it touches the root, withdraw the column about 1mm to 2mm.
3) Hold this position. First, tighten the nut (M12×1, ϕ6.2) to the injector outlet joint with hand. Then, tighten it with wrench M12 and seal it.

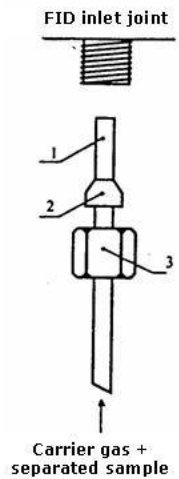


Figure 3.5.5

After the installation of the column is finished, all the places with the joint or nut are to be examined for leakage under room temperature and operating temperature of the column oven, injector and detector. If necessary, retighten it with the wrench to prevent any leakage of gas.

4 Appearance and Structure of the System

4.1 Appearance of the Instrument

GC102AF gas chromatograph consists of the detector, injector, column oven, flow control section means, temperature control and detector circuit parts and other components.

The middle part of the basic model is the column oven, the upper right side is the temperature controller of the microcomputer, the right side is the middle FID micro-current amplifier, the lower part of the right side is the flow control member and the pneumatic panel, the upper left portion of the oven is the mounting location of ionization detector, and the top right part of the oven is the injector.

4.2 Structure of the System

4.2.1 Injector

The basic model of the instrument includes the packed column injector. For the structure of the two types of injector, refer to Figure 1- 4. The packed column injector is installed in the right thermal conductor, which is on the top of the main instrument. An electro-thermal element (100W) and ceramic platinum insulator are mounted in the thermal conductor to control the temperature with the microcomputer temperature controller.

In the figure, the installation of the stainless steel column with a diameter of ϕ3mm is an example of the packed column injector (on-column injection). The originally equipped column joint with the inner diameter of ϕ3.2 mm is suitable for the column with the outside diameter of ϕ3mm. Additionally, ϕ4mm stainless steel column, ϕ5 mm and ϕ6mm and ϕ5.7mm glass column can be installed in the packed column injector. There are a corresponding column joint, an airproof gasket and nut included in the accessories. Besides the on-column injection, it can also be used for gasification sampling.

The carrier gas of the packed column injector is directly connected to the joint at the outlet of the constant flow valve in the gas flow control system by the stainless steel pipe. Figure 1-4 is the schematic diagram of the panel of the gas flow control system.

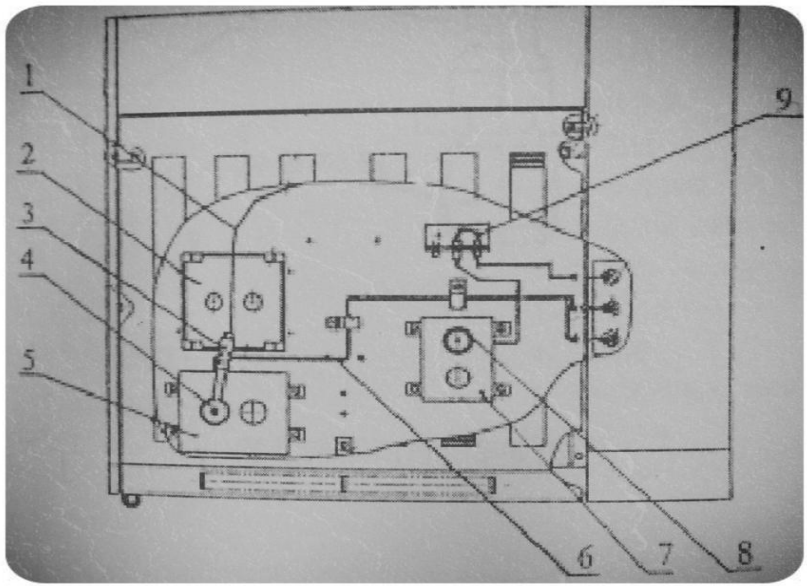
4.2.2 Chromatographic Column Oven

The column oven of GC102AF gas chromatograph features a large volume (280mm×300mm×180mm) adequate for mounting both the capillary column and double packed column, with rapid heating and cooling. The heating wire of the column oven is hidden behind the mesh, so it avoids the peak- shaped crack of the elastic quartz capillary column caused by the radiation of the heating wire. The instrument uses a low-noise and stable motor, which runs with little vibration.

The total power of the heating wire in the column oven is about 1000W. When the temperature in the column oven exceeds 420℃, the fuse link of the heating wire in the oven melts immediately (with the fuse link mounted at the rear right of the mesh), to cut off the circuit of the heater for the protection of the column oven. The fuse links (6 pieces in series) must be replaced before the instrument is restarted. The fuse link (accessory #6) can be found in the accessories.

4.2.3 Flame Ionization Detector (FID)

The detector of GC102AF gas chromatograph is a single flame ionization detector (FID), and its structure is cylindrical.



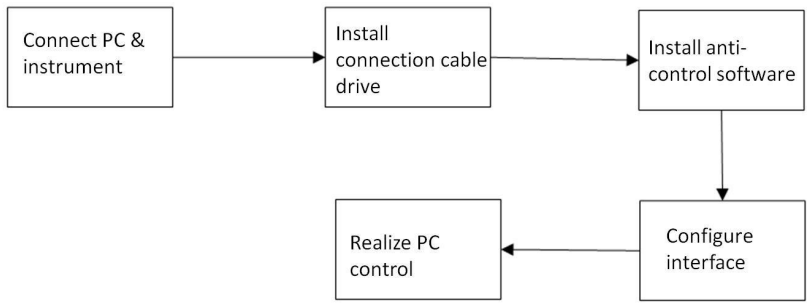
1. Ignition electrode (emitter)
2. TCD mounting holes
3. FID collector cable
4. FID
5. FID heating body
6. Auxiliary air duct
7. Injector heating body
8. Inlet
9. Six-way valve mounting bracket

The schematic diagram of the connection of FID and main device.

5 Basic Operations

5.1 Installation of Software

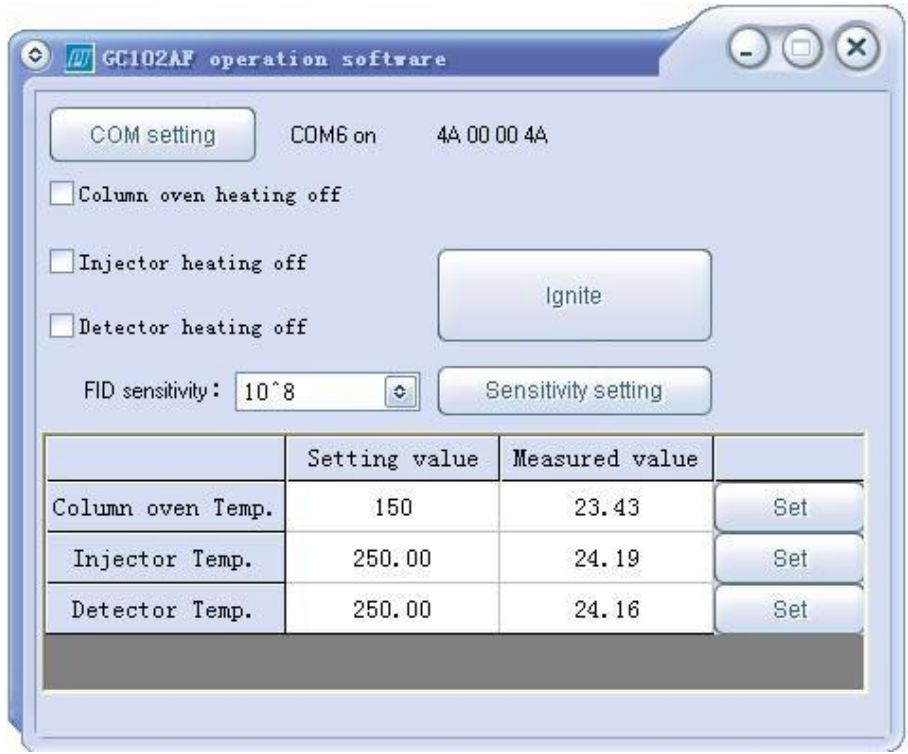
The microcomputer temperature controller of the GC102AF gas chromatograph can perform a wide temperature range and high-precision temperature control for column oven, injector, detector, three-way controlled areas over. The control system adopts the leading software and hardware technology and structure, with a computer-controlled beautiful and intuitive interface. It can accurately display the brightest thermostat set points, actual values and FID amplifier sensitivity. The device has following functions, such as self-diagnosis, power protection and FID auto-ignition. In addition, the instrument has an analog output interface which can



be connected with the FJ-2000 Model chromatography workstation.

The quick control process is shown in the right figure.

Before operation, connect the device with PC via RS232 cable.



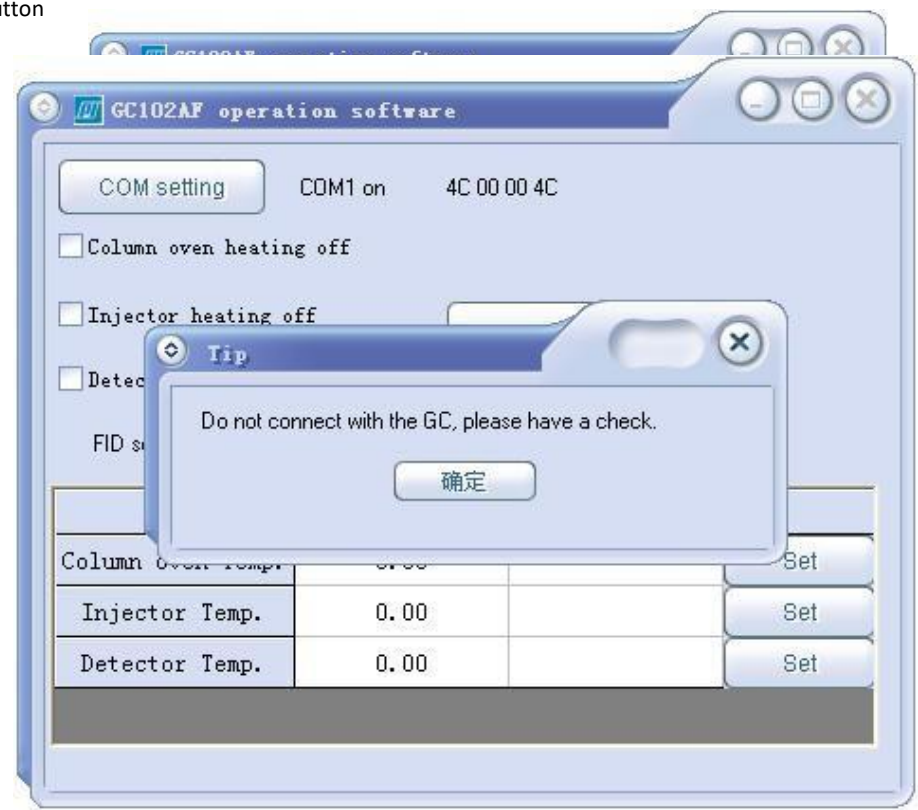
5.1.1 Software Installation

Open the package of accessories, and two CDs will be found, one for converting serial port to USB drive, and the other for instrument control application. First, install the connection cable drive application. Plug the cable in the USB port. Insert the CD and finish installation by following the instructions.

5.1.2 Software and Connection Settings

Launch the software, a window as shown in right figure will pop up:

Click on "Serial Communications Settings" button and the right screen will appear:



Serial number: the software will automatically search for the PC serial port that can be used to select the drop-down menu and serial number GC102 communication.

Baud Rate: Select the default value 19200

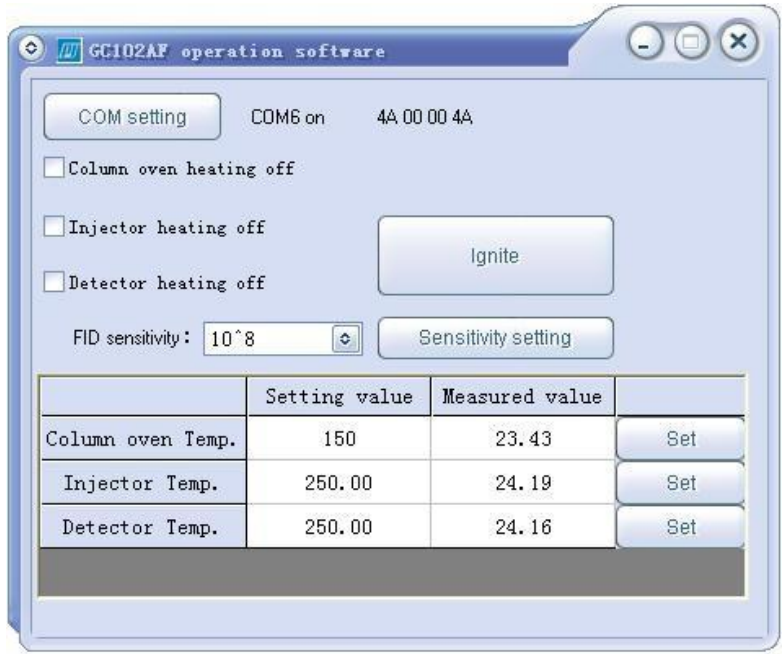
Hex send: Click the check box, select the hex send

Hex display: Click the check box, select hexadecimal display

The actual operations can refer to FIG configuration parameters

Click the "OK" button to complete the configuration. If the connection is not configured correctly or there is a problem, you can't connect the device. The pop-up window is shown as in the right figure:

Now, you need to check whether the communication cable and port are normal and the PC software is configured correctly. Ensure that everything is fine, shut down the software and launch again, or click the button "serial communication settings" -> "OK" to achieve the reconnection with the GC102 device.



5.1.3Operation Instructions for Software

When the connect is correct, the window shows as in the right figure:

The heating of column oven is shut down, the set value of temperature is 150℃ and the actual measured temperature is 23.43℃.

The heating of injector is shut down, the set value of temperature is 250℃ and the actual measured temperature is 24.19℃.

The heating of detector is shut down, the set value of temperature is 250℃ and the actual measured temperature is 24.16℃.

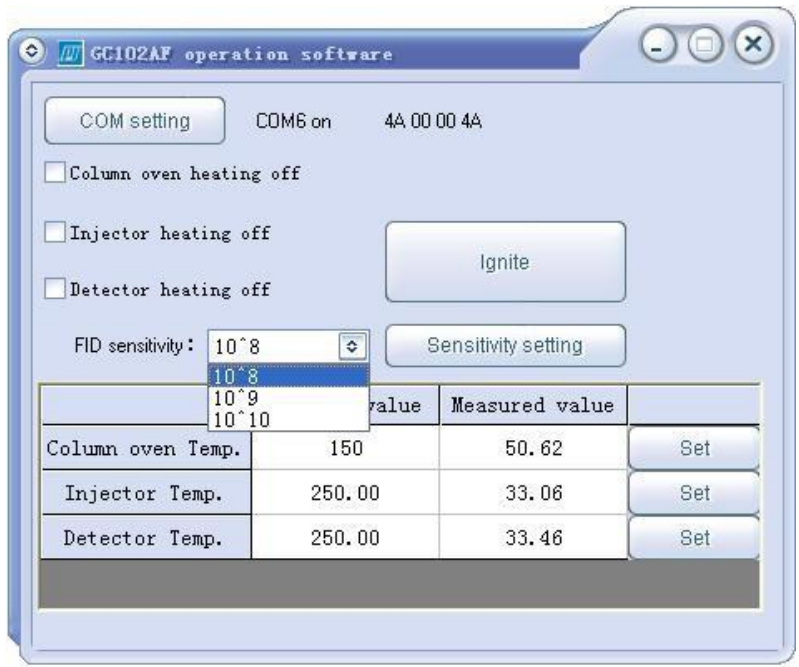
The sensitivity of FID is 10 to the 8th power.

The heating settings of column oven, injector and detector:

Click the check box in front of the column oven, injector or detector to open or close the corresponding heating function.

The temperature settings of column oven, injector and detector:

Under the "oven temperature" or "injector temperature" or "detector temperature", fill the temperature value in "set value", then click the right side of the "Settings" button to complete the temperature settings.



FID sensitivity setting:

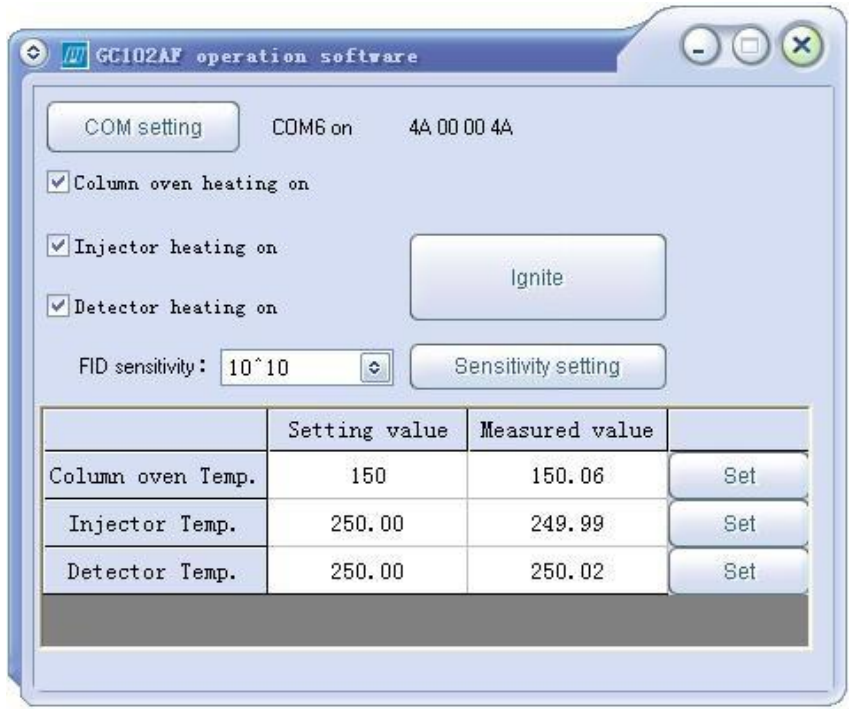
Click the drop-down menu from the "FID

sensitivity:", there are three options: 10^8, 10^9 and 10^10. The corresponding FID sensitivity is 10 to 8th, 9th and 10th power, see the right figure:

After selecting the appropriate sensitivity, click the "sensitivity settings" button on the right to complete the setting.

FID ignition:

The "Ignition" button controls the ignition electrode potential of the ion chamber. When you click on "Ignition" button, the ion chamber ignition electrode turns to red-hot instantly, then ignite the hydrogen which comes from the nozzle. Within three seconds, the ignition electrode ion chamber restores to -250V high voltage (comparing to the ground), and turns into the launch ion chamber pole.



In the previous figure,

The heating of the column oven is turned on, the oven temperature is set to 150℃, the measured temperature value is 150.06℃.

The heating of the injector is turned on, the oven temperature is set to 250℃, the measured temperature value is 249.99℃.

The heating of the detector is turned on, the oven temperature is set to 250℃, the measured temperature value is 250.02℃.

The sensitivity of FID is 10 to the 10th power.

6 Maintenance and Troubleshooting

6.1 Maintenance of the Instrument

Proper maintenance will not only help the instrument work normally but also prolong its life. Pay attention to the following four points during the maintenance:

1) The instrument can only work under the required conditions. Take some corrective measures when certain required conditions are not met.
2) The operation must strictly abide by the operating regulations. Prevent oil, organic matter and other substances from contaminating the detector and the tube. Otherwise the tube will be blocked or the performance of the instrument will be degraded.
3) The column temperature should be no higher than the recommended temperature range in the stationary phase. Generally, the column temperature is lower than the recommended temperature range in the stationary phase. When the high sensitivity operation is going on, the column temperature should be set lower.
4) When the carrier gas is transmitted into GC102AF, the pressure should be set at 343000Pa (equivalentto

3.5kg/cm^2 ~ 6kg /cm^2). As for air, the pressure should be established at 294000Pa ~ 588000Pa (equivalent to 3kg/cm^2~6kg/cm^2). The hydrogen pressure should be at 196000Pa ~ 343000Pa (equivalent to 2kg/cm^2 ~ 3.5kg/cm^2). If hydrogen is used as the carrier gas, the carrier gas pressure at the GC122 inlet should be 343000Pa (equivalent to 3.5kgf/cm^2).

6.2 Cleaning of the Instrument

6.2.1 Cleaning of the FID

Method to remove the cover: Use a screwdriver to unscrew two fixing screws from the layering which suppresses the emitter electrode and remove the layering. Hold the bottom of the cover with hand, and pull the cover upward with force. Then you can use an appropriate wrench (accessory 39#) to easily remove the special nut which fixes the emitter (where the electrode lead emitter ignition comes from it) and pull the electrode out. To replace or remove the nozzle for cleaning, first unscrew the wind ring with hand, then vent will completely be exposed. Finally, use the appropriate wrench (accessory 39 #) to unscrew the nozzle. The method to remove the upper part of the FID cover (collector section): unscrew the two central knurled screws from the FID cover with hand, hold of the collector terminal, and pull upward with force the upper part of the cover.

Caution: To replace a new nozzle, make sure that the nozzle airproof gasket should also be replaced by a new one.

Then turn the nozzle tight to prevent gas leakage.

6.2.2 Cleaning of Injector

The injector can easily be contaminated, especially the gasification tube. Therefore it is quite important to clean the injector. First take off the chromatographic column, remove the heat dissipation gasket and take out the airproof silica gel gasket and the gasification tube. Then clean the heat dissipation gasket and the gasification tube with acetone or alcohol and dry them. The inside wall of the injector tube can be directly cleaned by acetone or alcohol sponge repeatedly. Then blow a large flow of carrier gas into the tube (mainly to blow out the cotton fiber and dry the solvent). Then assemble the gasification tube and the chromatographic column, place in a new airproof silica gel gasket and turn the heat dissipation gasket tight.

6.2.3 Chromatographic Signal Determination and Troubleshooting

The common methods of chromatographic signal determination and troubleshooting can be found below.

Phenomena	Causes	Solutions
1. No peak	1) The amplifier is power-off.	1) Inspect the amplifier and the fuse.

		2) The ionic line is broken. 3) There is no flow of the carrier gas. 4) The sample has too low a temperature and it has not vaporized yet. 5) The micro-syringe is blocked. 6) There is leak of the injector's silica gel. 7) The connection of the chromatographic column is loose. 8) There is no fire (FID). 9) FID polarization voltage is not connected or is in poor contact.	2) Inspect the ionic line. 3) Check that if the carrier gas flow path has been blocked or the gas in the gas cylinder has run out. 4) Increase the injector's temperature. 5) Replace the injector. 6) Replace the silica gel. 7) Turn the chromatographic column tight. 8) Ignite the fire. 9) Connect the polarization voltage or make sure that the polarization voltage is in good contact.
2.	Sensitivity decreasing during the normal retention time	1) Attenuation is too high. 2) There is insufficient sample. 3) There is a loss of the sample when injecting it 4) The injector is leaking or blocked. 5) The carrier gas is leaking, in particular it is leaked in the injector.	1) Turn down the attenuation and increase the high resistance. 2) Increase the sample. 3) Manage to inject the sample completely into the system. 4) Replace or dredge the injector 5) Examine for the leak

	6) The flow rate of hydrogen and air is not properly set 7) There is no high pressure of the detector (FID).	6) Regulate the flow rate of hydrogen and air. 7) Examine or install the high voltage power supply.
3. Tailing peak	1) The injection temperature is too low 2) The injection tube is contaminated (leftover of sample or silica gel). 3) The temperature of the chromatography column oven is too low. 4) The injection technique is underdeveloped. 5) Wrong choice of chromatography column (sample reacts with column support or stationary liquid).	1) Adjust the injector's temperature again. 2) Clean the injector's tube with the solvent. 3) Increase the temperature of the chromatography column. 4) Improve the injection technique and achieve fast-speed sample injection. 5) Choose the appropriate chromatographic column.
4. Leading peak	1) The column is over-loaded with too much sample. 2) There is an agglutination of the sample in the system.	1) Reduce the sample. 2) Raise the column temperature, and then choose the appropriate injector and the chromatographic column and set the temperature of the detector.

5.	No separated peak	1) The column temperature is too high. 2) The column is too short. 3) Loss of stationary liquid. 4) Wrong choice of stationary liquid or support. 5) The carrier gas flow is too fast. 6) Injection technique is too poor.	1) Reduce the column temperature. 2) Choose a longer chromatographic column and set the temperature of the detector. 3) Replace the chromatography column or the aging column. 4) Select proper column. 5) Slow down the carrier gas flow. 6) Improve the injection technology.
6.	Round peak	1) It exceeds the linear range of the detector.	1) Reduce the volume of sample.
7.	Flat peak	1) The input of the amplifier is saturated.	1) Reduce the volume of sample and lower the sensitivity of amplifier.
8.	No sample, and an one-way change of the baseline (FID)	1) The detector is low at temperature. 2) There is no increase or control of the temperature for the chromatographic column.	1) Raise the detector's temperature to over 100 ° C and clean the detector or increase the temperature to 200 ° C to exhaust the steam. 2) Maintain the temperature control system and heat platinum wire resistance
9.	Baseline breaking	1) The power outlet is in poor contact.	1) Fasten the connection of power outlet

		2) There is a disturbance of the external electric field. 3) The hydrogen flow and air flow are not properly set (FID).	and receptacle. 2) Eliminate the external electric field which can affect the normal work of the instrument 3) Readjust the hydrogen flow and air flow, especially the air flow
10.	The retention time is prolonged and the sensitivity is low.	1) The carrier gas flow rate is too slow. 2) There is a change of the carrier gas flow rate after the sample injection. 3) The silica gel of the injector leaks.	1) Increase the flow rate of carrier gas. If the carrier gas path is blocked, fix it. 2) Replace the sampling silica gel. 3) Replace the injector's silica gel.
11.	Irregular wave of the baseline during the isothermal operation	1) The instrument is placed in the right position. 2) The instrument is poorly grounded. 3) The stationary liquid leaks. 4) The carrier gas leaks. 5) The detector is contaminated. 6) The flow rate of the carrier gas is not proper. 7) The hydrogen flow and air flow are not	1) Place the instrument in a position with no violent vibration and no strong air convection. Keep the instrument horizontal. It is recommended to place the instrument on a cement platform or the table covered with rubber. 2) The instrument and the recorder should be well grounded. 3) Choose the proper stationary liquid and

	properly selected (FID). 8) The amplifier is not stabilized.	process the column with thoroughly aging treatment. The column temperature should not be raised to the operating limit of the stationary liquid (especially the high sensitivity detector) 4) Investigate the leak. 5) Clean the detector. 6) Adjust the carrier gas constant current valve so that the carrier gas flow becomes appropriate. Ensure that the total pressure in the carrier gas cylinderis between 50kg/cm^2 and 150kg/cm^2 7) Adjust the volume hydrogen flow andair flow. 8) Examine the amplifier and fix it.
12. Extra peak *A sudden increase of peak width at half height	1) The recorder has low sensitivity. 2) The recorder is poorly grounded. 3) There is an air peak. 4) The sample is decomposed.	1) Inject the sample after the previous sample has all gone out. 2) Install or renew the purifier and establish the appropriate operating conditions.

	5) The sample is contaminated. 6) The sample reacts with the stationary liquid, the support or the absorbent. 7) The glass wool at the chromatographic column end is contaminated or the injector is contaminated. 8) The sampling silica gel is contaminated or the low molecular weight components leak out.	3) Exhaust the air in the injector 4) Reduce the injector's temperature (the stationary liquid or the support which can be easily catalyzed or decomposed is not recommended for use). 5) Ensure that the sample is clean with no impurity or other components. 6) Make use of other chromatographic columns to prevent the reaction between the sample and the stationary phase. 7) Replace the glass wool at the column end or clean the injector. 8) Dry the silica gel at 200°C for 16 hours before using
13. The fire is extinguished when the peak appears (FID).	1) The sample volume is too large. 2) The flow of hydrogen or air is too small. 3) The flow rate of the carrier gas is too high. 4) The flame nozzle is contaminated (or blocked)	1) Reduce the sample volume. 2) Re-adjust the flow of hydrogen or air. 3) Set a suitable carrier gas flow rate. 4) Clean the flame nozzle (or remove the blockage from the flame nozzle).

	5) The hydrogen is consumed	5)	Ensure that there is sufficient hydrogen in the source.
14. Baseline is not able to go back to zero.	1) It is due to the excessive column bleeding (FID).	1)	Use the chromatographic column with less bleeding.
	2) The detector is contaminated.	2)	Clean the detector.
15. Sharp-burred peaks appear at irregular distances.	1) Dust particles or foreign material is irregularly burning in the flame (FID).	1)	Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter.
	2) The insulator leaks or the high resistance connecting relay gets damp and leaks.	2)	Check the leak.
	3) The amplifier is broken down.	3)	Eliminate the impurities in the flow path. If there are impurities in the chromatographic column, increase the column temperature.
	4) The flame is flickering.	4)	Adjust the flow rate of hydrogen and air.
16. Short burrs at even intervals	1) Water condenses in the hydrogen tube (the water usually comes from the hydrogen source).	1)	Eliminate the water from the tubing and replace or activate the desiccant in the hydrogen filter.
	2) There is a gas leakage.	2)	Check the leak.
	3) There is a blockage on the flow path.	3)	Eliminate the impurities in the flow path.

	4) The flame is flickering.	If there are impurities in the chromatographic column, increase the column temperature. 4) Adjust the flow rate of hydrogen and air.
17. Loud noise of the baseline	1) The chromatographic column is contaminated or there is an excessive column bleeding. 2) The carrier gas is contaminated. 3) The carrier gas flow rate is too high. 4) The carrier gas is leaking. 5) The instrument is poorly grounded. 6) The high resistance is contaminated. 7) The injector is contaminated 8) The hydrogen flow rate is too high or too low (FID). 9) The air flow rate is too high or too low (FID). 10) The hydrogen or air is contaminated. 11) The water condenses in FID.	1) Replace the chromatographic column. 2) Replace or renew the carrier gas filter. 3) Re-regulate the flow rate of the carrier gas. 4) Examine for the leak. 5) Make sure that the instrument is well grounded. 6) Identify the contaminated high resistance and clean it. 7) Clean the sampling tube of the injector and remove the residue of silica gel. 8) Re-adjust the hydrogen flow rate. 9) Re-regulate the air flow rate. 10) Replace both the hydrogen filter and the air filter.

	12) The detector cable is in poor contact. 13) The detector's insulation turns smaller (the ionization detector). 14) The electrode, the nozzle or the base of the detector is contaminated.	11) Remove the water by increasing the FID temperature. (14) Replace the cable or repair it. 12) Clean the detector insulator. 13) Clean the detector.
18. Periodical baseline	1) The detector's temperature control is deficient. 2) The control of the chromatographic column oven is deficient. 3) The carrier gas flow is not set properly. 4) The pressure of the gas flow is too low. 5) Air and hydrogen are not adjusted well (FID).	1) Check the platinum insulator and improve the control precision. 2) Check the platinum insulator and improve the control precision 3) Adjust the flow rate of the carrier gas 4) Replace the carrier gas cylinder. 5) Regulate the hydrogen and air flow.
19. One-way baseline drift	1) There is a significant increase or decrease in the detector temperature. 2) The amplifier is in zero drift. 3) There is a significant increase ordecrease in the column temperature. 4) The carrier gas gradually runs out.	1) Stabilize the detector temperature. If the temperature changes after the instrument is powered on of, it is a normal phenomenon 2) Check the amplifier. 3) Stabilize the column temperature. If the

			temperature changes just after the power-on, it is a normal phenomenon. 4) Replace the carrier gas cylinder.
20.	A change of the baseline after the programmed temperature rise	1) When the temperature increases, the column bleeding increases. 2) The column flow rate is not corrected. 3) The chromatographic column is contaminated. 4) The volume of the stationary liquid in the two columns is different	1) Select the appropriate chromatographic column or age the column. 2) Calibrate the column flow rate. 3) Replace the chromatographic column. 4) The weight of the stationary liquid coating on the two chromatographic columns should be equal.
21.	Irregular baseline change appears when the temperature increases.	1) The leak in the column is too much. 2) The operating conditions are not appropriate. 3) The column is contaminated. 4) There are ghost peaks when the silica gel is heated.	1) Select an appropriate chromatographic column. The operating column temperature should be far lower than the highest operating temperature of the stationary liquid 2) Set the suitable operating conditions 3) Replace the chromatographic column. 4) Pre-heat the silica gel at the temperature of 200 ° C for 16 hours before use.

7 Warranty

Within 12 months after the user purchased the instrument, if it doesn't work properly without any physical damages, the factory is responsible for repair free of charge (not including the consumable parts; source lamp and cuvette not covered by the warranty).