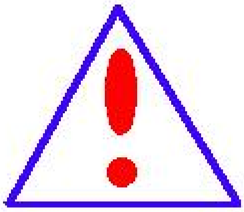
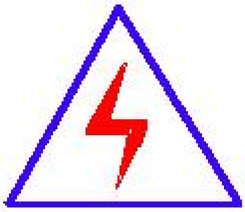
Dear Client,

Thank you for choosing our HTYSP-H Oil Dissolved Gas Analyzer. Please read this manual carefully before your initial use, and this manual will help you use our equipment skillfully.



There may be a little bit differences between the equipment you got for our trial to improve and perfect our products. You can find the changes in the appendix. Sorry for all the inconvenience caused to you. You can contact us if you have any doubts of our tester.



Voltage of terminals side may be Hazardous that would cause Electrical Discharge when you attach and detach test side. Be careful for risk of electric shock and personal injury.

◆ SERIOUS WARRANTY

All products of our company carry a three-month limited warranty from the date of shipment. If any such product proves defective during this warranty period we will provide a replacement in exchange for the defective product without charge. In one year (including one year) the product will be maintained and repaired for free if it proves to be defective. Beyond one year, lifetime maintenance and repair with charge is available.

◆ SAFETY REQUIREMENTS

Please read the following safety precautions to avoid personal injury and to prevent this product or any other attached products being damaged. In order to avoid possible danger, this product can only be used within the scope of the provision.

Only qualified technician can carry out maintenance or repair work.

—To avoid fire hazard or personal injury

Use Proper Power Cord. Use only the product-specific power cord and the power cord must be in line with the specifications of the product.

Connect and Disconnect Correctly. When the testing wire is connected to the charged terminal, do not connect or disconnect to test wire at will.

Ground the Product. In addition to this product being grounded through the grounding conductor of the power cord, the grounding column of the product shell must also be grounded. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, please do check that the product is properly grounded.

Pay Attention to the Ratings of All Terminals. In order to prevent the fire hazard or electric shock, please be care of all ratings of this product and labels. Before connecting this product, please read the product manual to acquire information about the ratings in further detail.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Touching Bare Wire and Conductor. When the product is charged, do not touch the bare connection point and parts.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmosphere.

Keep the Surface of the Product Clean and Dry.

—Security Terms

Warning: Warning statements identify conditions or practices that could result in injury or loss of life.

Caution: Caution statements identify conditions or practices that could result in damage to this product or other property.

Contents

I. Note

Description: This information is a special statement by the manufacturer to the instrument and is of concern.

Be careful:: This information is of great importance.

Warning: This information requires special attention if not following these regulations may result in personal injury to you (others) or damage to the instrument.

Danger: This information indicates a high level of risk and should be vigilant.

High-pressure hazard:

- When the instrument is running, it is strictly forbidden to remove the instrument cover.When the instrument is running, the inside of the instrument has a high voltage that can cause personal injury, and when removing the instrument cover, some electrical components may be exposed.
- When replacing fuses and disassembling maintenance instruments, the power plug should be unplugged first. Switching off the instrument simply stops the instrument from running and the high voltage is not completely cut off at this time.
- If the power cord is worn out or damaged, it must be replaced immediately.

High temperature hazard:

- When the instrument is working or after shutting down for a period of time, the instrument's inlet, detector, column box and rear air outlet and other components will have a certain high temperature, should avoid contact with it to prevent burns. If you need to replace components, be sure to wait for the temperature of the instrument to drop after or after using protective measures!
- Pay attention to the hot gas discharged when the instrument cools down, to prevent burns;
- Do not place flammable materials behind the instrument to avoid the Hot gas from being discharged to ignite flammable materials!
- Gas source pipeline (air pipe) should avoid the rear air outlet of the instrument, so as

  not to discharge the hot gas to fuse the gas source pipe, causing greater danger!

Gas hazard:

- For Gas cylinder and gas sources used by the instrument, the relevant rules for the transport, storage, management and safe use of cylinders should be followed.
- When using hydrogen as a carrier gas or FID gas, be aware that hydrogen

  may flow into the column box to cause an explosion hazard.

Therefore, before the pipeline is connected, it is necessary to close the gas source,After the chromatographic column is installed and the connection between the sample inlet and the detector is completed,Leak check all connecting pipelines and valves, before the hydrogen gas source can be opened. To prevent hydrogen from leaking into the column box and exploding.

- When special sample analysis (e.g. toxic) or the instrument may discharge

  toxic substances, The discharged materials of the instrument shall be discharged to the outdoor safety place to prevent indoor contamination or even poisoning.

II. Gas chromatography working principle

Gas chromatography is a separation and analysis technology of multicomponent mixture. It mainly uses the differences of boiling point, polarity and adsorption coefficient of each component in the sample in the chromatographic column, so that each component can be separated in the chromatographic column, and qualitative and quantitative analysis of the separated components.

The gas chromatography takes the gas as the flow phase (carrying gas), When the sample is fed into the sample inlet and vaporized, it is carried by carrier gas into the packed column or capillary column, due to the difference of boiling point, polarity and adsorption coefficient of each component in the sample, so that each component is separated in the column Then, according to the physicochemical characteristics of the components, the detector son-in-line will be detected in order, and finally through serial or network data transmission to the chromatography workstation, by the chromatography workstation will be each component of the gas chromatography record and analysis to obtain the analysis of each component of the analysis. A brief diagram of how it works is shown in the figure below:

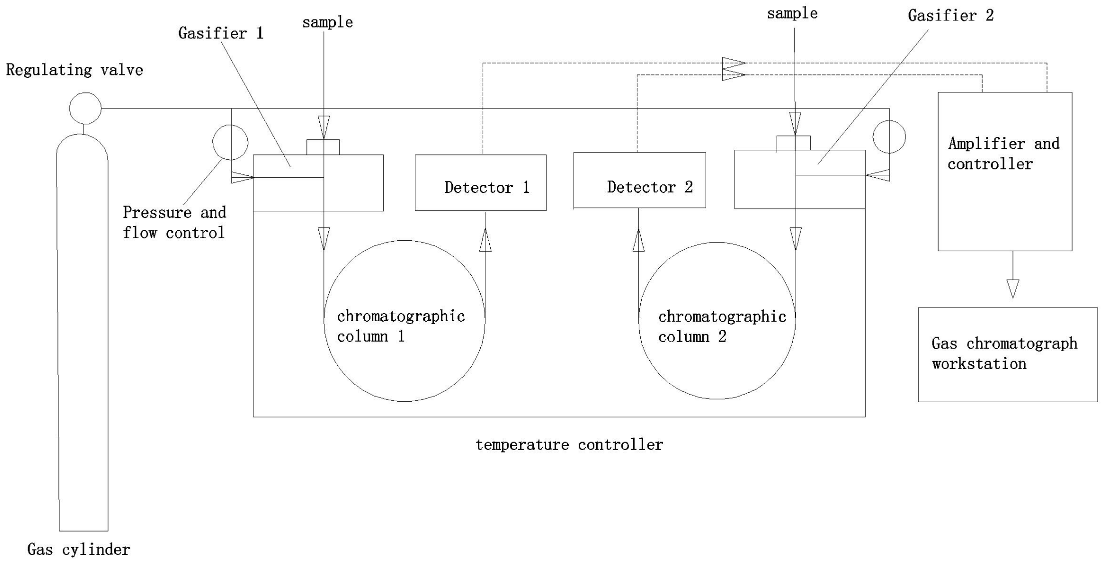


Figure 1.1 A brief diagram of how the gas chromatograph works

Because of its characteristics of high separation efficiency, fast analysis speed and low sample consumption, the method has been widely used in petrochemical, biochemical, medical and health, health and quarantine, food inspection, environmental protection, food industry, medical and clinical departments. In these fields, gas chromatography has solved the problems of quality inspection, scientific research, pollution detection and production control of industrial intermediates and industrial products.

III. HTYSP-H Gas Chromatography (touch screen)

Figure 1. 2 HTYSP-H Gas Chromatography (touch screen)

1. Equipment features

★ Adopted the state-of-the-art 10/100M adaptive Ethernet communication interface, and built-in IP protocol stack, so that the instrument can easily through the internal local area network, the Internet to achieve long-distance data transmission;It is convenient to set up the laboratory, simplify the configuration of the laboratory and manage the analysis data;

★ Instrument Internal Design 3 independent connection process, can be connected to the local processing (laboratory site), unit supervisor (e.g. quality inspection section chief, production director, etc.), as well as superior supervisor (e.g. environmental protection bureau, technical supervision bureau, etc.), can easily make the unit supervisor and supervisor real-time monitoring of the operation of the instrument and analysis of data results;

★ the instrument is equipped with a network version of the workstation can support multiple chromatograph work (253),253 data processing and counter-control, simplified document management, and the maximum degree of reduction of the user's laboratory investment and operating costs;

★ instruments can be connected to the manufacturer through the Internet connection, remote diagnostics, remote program updates, etc. (User license);

★ the instrument can be equipped with a 5.7-inch color LCD screen or color touch screen to meet the needs of different users;

★The system has two sets of operating systems, Chinese and English, which can be switched freely;

★ temperature control area, electronic flow controller(EFC),electronic pressure controller（EPC）can be freely named by the user, convenient for user use (optional);

★instruments operate in parallel with a multiprocessor to make the instrument more reliable, to meet complex sample analysis, and to choose from a variety of high-performance detector options such as FID、TCD、ECD、FPD and NPD,with up to fourdetectors installed simultaneously. Can also use the detector appendage method, afterthe purchase of the instrument is very convenient to choose and install other detectors,

★instrument using a modular structure design, design clear, easy to replace and upgrade, to protect the effectiveness of investment;

★ the new microcomputer temperature control system, high temperature control accuracy, reliability and anti-jamming performance, with six completely independent temperature control system, can achieve sixteen-order program heating, so that the equipment can be competent for a wider range of sample analysis, ； with column box automatic rear door system, so that low temperature control accuracy is improved, rise / cooling faster;

★ the instrument with advanced electronic flow controller (EFC)and electronic pressure controller（EPC）to achieve digital control, can greatly improve the reproducibility of qualitative and quantitative results;

★ instrument design timing self-start procedure, can easily complete the on-line analysis of gas samples (Required with online automatic sample components);

★ the operating system of the full microcomputer control keyboard, simple and convenient to operate, and design the detector automatic identification technology, with fault diagnosis and power loss data protection functions, can automatically remember the set parameters;

★ the color spectrum machine has built-in low noise, high-resolution 24-bit AD circuit, and has the ability to store baselines and baseline deductions.

★It is suitable for WinXP, WIN2000, windows7 and other operating systems. The sampling data is read in by CDF file conforming to a / a (American Analytical Society) standard, so it can be connected with chromatogram workstation such as Agilent and waters.

★With full independent intellectual property rights, Modbus / TCP standard interface, it can be easily connected with DCS.

★The instrument can be connected with the automatic injector produced by many manufacturers at home and abroad, such as aoc-20i of Shimadzu, HT series high efficiency gas-phase liquid automatic injector of Italy HTA company, etc;

2. Technique parameters

Network anti-control system	Internal CAN's way, with interface board design, It can be converted to network port output at will
Signal output bits	24-bit
Communication interface	Network interface output(class 6 network cable connections)
Circuit design	ARM embedded design for easy wireless control, remote control and mobile app control
Temperature control system	Six-way independent temperature control
Temperature control	Room temperature - 450 ℃, liquid nitrogen refrigeration: - 80 ℃ - 450 ℃
Column box temperature control accuracy	±0.02℃
Program heating up	21 Stage 21 level, 0.1 ℃ / stage
Show module	Large-screen LCD
Display accuracy	0.01 ℃
Lift rate of column and box	0~80 ℃ / min (adjustment increment 0.1 ℃ / min) up to 120 ℃ / min
Temperature reprogrammed repeatability	≤1%
TCD detector sensitivity	S value ≥ 10000mv.ml/mg (benzene))up to 12000 mv.ml/mg (benzene)
Baseline noise	≤ 10uv
Baseline Drift	≤50uv/30min
Detection limit of FID detector	≤5 x 10^{-12}g/s(cetane)
Baseline noise	≤2 x 10^{-14}A
Baseline Drift	≤ 1×10^{-13}A/30min（After the instrument stabilizes for 2 hours）
Detection limit of ECD detector	≤1.0 x 10^{-13}g/s（r-666）
Baseline noise	≤40uv
Baseline Drift	≤ 100uv/30min
Detection limit of FPD detector	≤1.4 x 10^{-12} g/s(p), ≤5×10-11g/s(S)
Baseline noise	≤20uv
Baseline Drift	≤50uv/30min
Extended	≤6 external events can be added
Automation engineering	Can be increased: automatic ignition function, automatic sampler connection, four-way flow pressure display function, optional counter-control workstation to achieve counter-control

IV. Instrument structure and main components

1. Gas flow control system

The gas path control system of the instrument is set in the left frame unit of the whole machine, including the carrier gas path, hydrogen flow path and air flow path. See the flow chart of the whole machine for details (this is the basic configuration gas path chart).

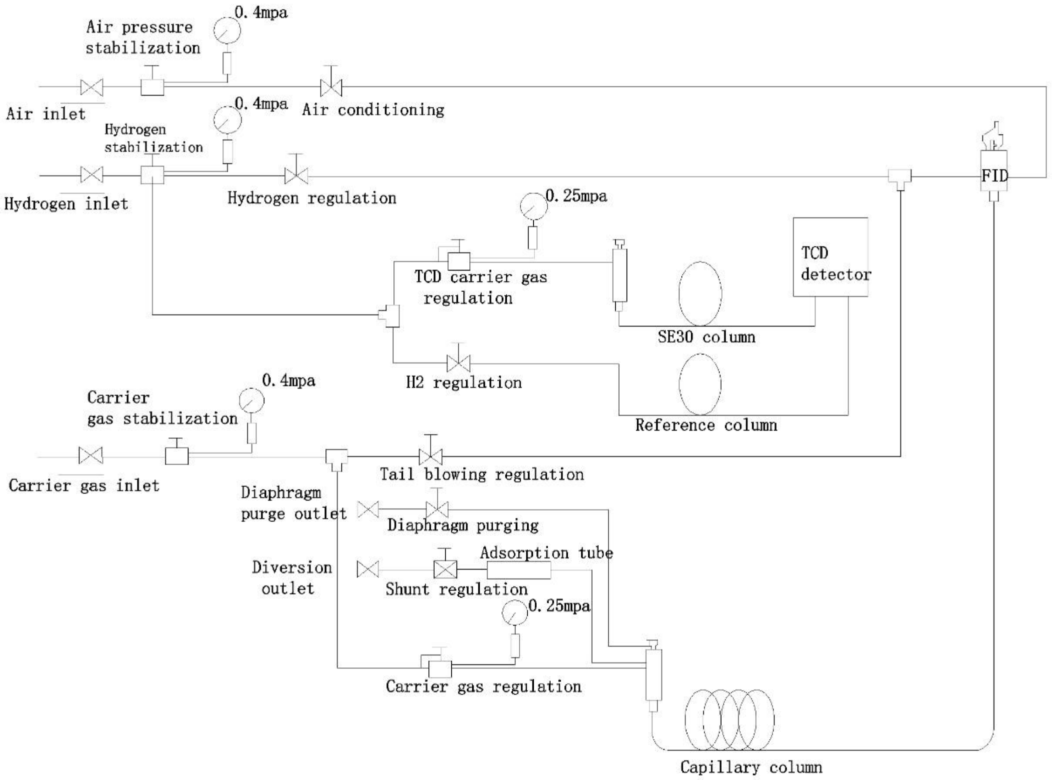


Figure 1. 3 HTYSP-H Gas Chromatograph's gas flow chart

2. Column box

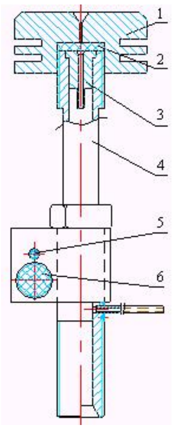
The column box of the gas chromatograph has the characteristics of large volume, fast heating, fast cooling and uniform temperature field.

The inner dimension of the column box is 280×185×300 (mm) wide×185 × 300 (mm), the heating power of the column box is 1500W, the column box air bath is agitated with a large blade fan, the exhaust air volume is large, the left side of the column chamber heater and the fan blade is designed with two air ducts, the opening or closing angle of the hot and cold air ducts is synchronously controlled by a stepping motor, and under the control of a microcomputer system, the high-precision temperature control and automatic high are effectively carried out Fast cooling, and can achieve 5 ℃ above room temperature near room temperature control. The high-frequency ceramic with high insulation and high strength is applied in the column box heater, which is resistant to high temperature and high pressure, safe and reliable. The column box has the function of over temperature protection through microcomputer control. Low noise motor for mixing air in column chamber.

3 Injection port

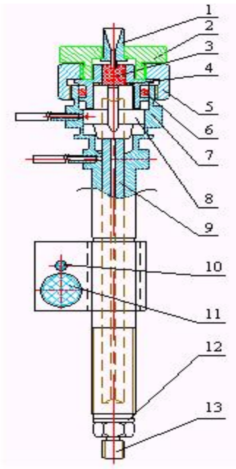
The injection port of gas chromatograph is installed at the front left side of the top of the column box, which is divided into filling column injection port and capillary injection port. Filling column injection port (its structure is shown in Fig. 1.7), capillary injection port (its structure is shown in Fig. 1.8).

Various sample ports are set and controlled by the microcomputer controller. The upper most part of the sample port is a thermal cap, the lower part of which is embedded with a silicone rubber feed pad.The output port of the steady flow valve in the gas path control system is connected with the carrier gas inlet of the injection port.



1 cooling cap	2 sampling pad	3 needle guide
4 vaporizing tube	5 platinum resistance	6 heating tube

Fig. 1.4 sample inlet structure of HTYSP-H Oil Dissolved Gas Analyzer



1.needle guide (capillary)	2. nut (capillary)	3. sample injection pad
4. gasket	5. hex nut	6. o-washer
7 gasification pipe (capillary)	8 sliding sleeve	9 conduit
10 platinum resistance	11 heating wire	12 gasket
13 connector		

Fig. 1.5 structure diagram of capillary sample inlet(diffluence and non diffluence) (including diaphragm cleaning)

Be careful::

1.The instrument can be equipped with multiple injection ports and multiple chromatographic columns at the same time;

2.The injection port of the filling column can directly install the filling column with the outer diameter of Φ 5mm, and the filling column with the outer diameter of Φ 3 and Φ 4mm can also be installed through the installation of different liner pipes. If necessary, the large-diameter capillary column can also be installed;

3. The capillary injection port (diffluence and non diffluence) is used to realize the diffluence / non diffluence injection of the capillary column.

4. Chromatographic column

Chromatographic column is the core part of chromatographic analysis, which is used to separate various components in the analyzed sample.There are two types of chromatographic columns: packed column and capillary column.The material of packed column is usually stainless steel and glass. When analyzing the special corrosive components, polytetrafluoroethylene tube can be used.

The inner diameter of the packed column is generally between Φ 2 and Φ 4, the column efficiency of inner diameter Φ 2 is higher, and the column capacity of inner diameter Φ 4 is larger. The outer diameter of the column is generally Φ 3 and Φ 5. The instrument is equipped with various column joints. The outer diameter of Φ 3 and Φ 5 column pipes can be installed and used

There are two kinds of capillary materials: glass and elastic quartz capillary. Stainless steel capillary is also used in special applications. At present, elastic quartz capillary is widely used. The inner diameter of capillary column is generally divided into Φ 0.1-0.15, Φ 0.22-0.25, Φ 0.32-0.35 and Φ 0.53-0.6, among which the inner diameter of Φ 0.25 and Φ 0.32 are called standard capillary column, the inner diameter of Φ 0.53 is called large caliber capillary column, and the inner diameter of Φ 0.1 is called extra small caliber capillary column.

The stationary phase in the chromatographic column is selected and prepared by the user according to the samples he needs to analyze, and the special chromatographic column can also be ordered from the manufacturer. The instrument can be equipped with chromatographic column for sample analysis according to the user's requirements.

The parameters to determine the packed column include: inner diameter, length, type of fixed liquid and support, mesh hole number, ratio of fixed liquid and support; the parameters to determine the capillary column include: inner diameter, length, fixed liquid and liquid film thickness.

5. Thermal conductivity detector (TCD)

Basic principle: Thermal conductivity detector is a kind of universal detector which is widely used in gas chromatograph at present. It has response to organic and inorganic samples and does not damage the samples. It can be used for constant and micro analysis.

Thermal conductivity detector is a kind of detection device composed of thermal resistance sensor, which is based on the principle of gas heat conduction and thermal resistance effect. The thermal resistance of the detector is made of rhenium tungsten wire. It is installed in the gas chamber of the metal (stainless steel or brass) heat conduction pool body and connected to a typical Wheatstone bridge circuit on the circuit.

When the composition and flow of the carrier gas flowing through the gas chamber of the thermal conductivity pool are stable, the temperature of the thermal conductivity pool body is constant, and the current flowing through the tungsten rhenium wire thermal resistance is constant, the heat energy generated on the thermal resistance is balanced with the heat energy lost through the factors such as the heat conduction of the carrier gas to the pool body, and the bridge circuit composed of the tungsten rhenium wire thermal resistance is in a balanced state. When the components of the measured gas are brought into the gas chamber by the carrier gas, a series of changes take place: changes in the composition of the gas in the gas chamber changes in the thermal conductivity of the mixed gas changes in the temperature of the thermal resistance changes in the value of the thermal

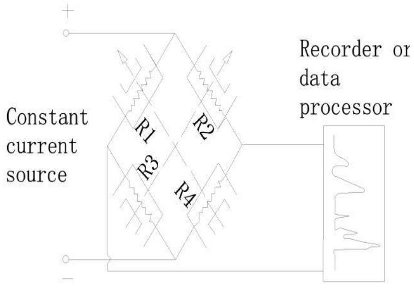


Figure 1.5 TCD principle

resistance changes in the balance of the bridge is destroyed, and the corresponding electrical signal is output. This signal has a certain linear function with the concentration of the measured gas, and is recorded by the secondary signal recording instrument This is the working principle of thermal conductivity detection for gas analysis.

There are many factors that affect the sensitivity of the thermal conductivity detector, among which the resistance value of the thermal conductivity element, the aperture of the gas chamber of the pool, the measuring circuit of the thermal conductivity pool and other parameters are all designed by the manufacturer, and the factors directly related to the user's operation and use are: A. bridge current, bridge current, high sensitivity, but limited by the stability, the specific setting depends on the type of carrier gas used and the thermal conductivity pool The working temperature shall refer to the curve given by the thermal conductivity pool.

When the sensitivity of the analysis is satisfied, the bridge current is smaller, which can increase the stability and prolong the life of the thermal conductivity cell.

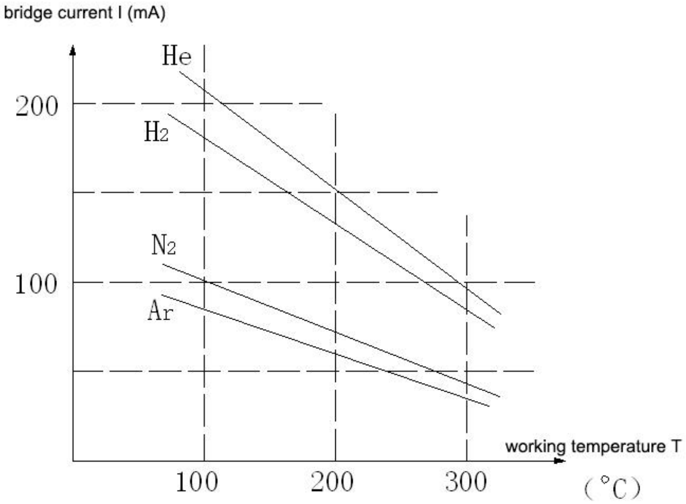


Figure 1. 6 Hot Guide Pool Bridge Flow Given Curve

When H2 is used as carrier gas, the bridge current is generally 80-160ma, and when AR is used as carrier gas, the bridge current is generally 70-80ma. b. The higher the temperature is, the lower the sensitivity is, and the lower the temperature is, the lower the working temperature will be limited by the boiling point and temperature control of the sample. c. Carrier gas purity, carrier gas purity, can improve the detection sensitivity. d. The smaller the carrier gas flow is, the higher the sensitivity is. This influence factor is not obvious when H2 and he are used as carrier gas, but obvious when AR and N2 are used as carrier gas. For example, when the AR carrier gas flow rate is 7-8ml / min, the detection sensitivity is doubled compared with that when the AR carrier gas flow rate is 30ml / min.

The thermal conductivity cell of the instrument is equipped with four selected thermal conductivity elements after careful measurement. Element 1 (R1) and element 3 (R3) are in the same gas path, and element

2 (R2) and element 4 (R4) are in another gas path. During operation, two channels of carrier gas must be connected at the same time, and the other channel is used as a reference when one channel is used for sample injection measurement.

Warning: Since the TCD is a two-way gas structure, when using the TCD detector, **its second gas must simultaneously carry gas (Do not use air or oxygen)**, otherwise it will cause the loss of thermal guide elements (high sensitivity, rhenium tungsten filament resistance changes cause the TCD gas circuit to lose balance and damage (normal deviation will not be greater than 0.3 Ω), the best way to detect TCD outlet whether have a load edgy air (not oxygen or air)

6. Hydrogen flame ionization detector (FID)

Basic principle: Hydrogen flame ionization detector (FID), or hydrogen flame detector, uses the combustion of hydrogen and O2 in the air to generate a flame as the energy source. When organic matter enters the flame, it is excited to generate ions under the high energy effect of the flame. In the upper and lower part of the flame, there is a pair of electrodes (the upper part is the collector, the lower part is the polarizing electrode). When a certain voltage (200-300v) is applied between the two electrodes, the ions generated by the organic matter excited in the hydrogen flame will move directionally under the action of the DC electric field between the electrodes, forming a weak electric current, and then the voltage signal will be taken out through the high resistance (107-1010), amplified and sent to the secondary signal The recording instrument was recorded. Because of its high sensitivity, small dead volume, fast response and wide linear range, FID can be most effectively combined with capillary column and become the most effective and widely used detector for organic trace analysis.

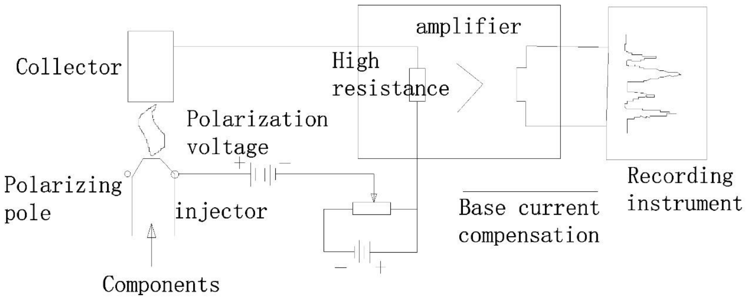


Figure 1. 7 Hydrogen flame ionization detector FID

The detector adopts a cylindrical collector, quartz and a metal nozzle. The polarizing electrode is a copper fork. The polarizing electrode collides with the nozzle. The ion chamber is a fully sealed structure. The polarization voltage of FID is + 230V. The double detector is located in an aluminum heating block. The heating block is thermostatically controlled by internal heating heater and platinum resistance. The hydrogen flame ignition of FID uses the electronic ignition gun to ignite at the outlet. Because of the fully sealed structure, the outlet ignition is very easy. During ignition, the flow of H2 is adjusted to about 7, and after ignition, the flow of H2 is adjusted to about 4.

There are many factors that affect the sensitivity of FID detection, among which the size of nozzle inner diameter, the distance between poles, the input high resistance of amplifier and the internal attenuation ratio are all design parameters finalized by the manufacturer, while the operation parameters that users must encounter in use: gas flow has a significant impact on the sensitivity of FID detection, and generally, when the air flow is greater than 300ml / min, there is no impact on the sensitivity, so the The flow rate of normal air can be set at about 7, the flow rate ratio of nitrogen to hydrogen has the best value, generally, the flow rate of nitrogen / hydrogen is （1.37-1.5）:1, the flow rate of carrier gas N2 is about 30-40ml / min, the flow rate of hydrogen H2 is about 20-30ml / min (the flow rate of hydrogen can be set at about 4), and the flow rate of hydrogen H2 will increase the noise. The purity of the gas and the aging of the chromatographic column will affect the base flow and noise, so it must be Be careful.

Warning:

1. Do not open the hydrogen valve when the column is not attached to the column box, so as not to enter the column box. When the instrument is off, it should turn off the hydrogen, cool down, and then turn off the carrier gas;

2. FID is a high lysing detector that must be purified with high purity carrier gas, hydrogen and air;

3. In order to prevent the detector from being polluted, the column shall not be connected with the detector when the column is aged, and the detector shall be sealed with nuts;

4. Before power on, check whether the circuit connection is correct, whether the gas circuit connection is complete, and whether the gas type meets the requirements.

Warning: When the instrument is operating, the polarization voltage is 220~250V high **voltage, please prevent electric shock!**

7. Electronic Capture Detector（ECD）

Electronic capture detector (ECD). The electron capture detector is also an ionization detector. It is a selective and highly sensitive detector. It only has signals for substances with electronegativity, such as substances containing halogen, sulfur, phosphorus and nitrogen. The stronger the electronegativity is, the greater the electronic absorption coefficient is, the higher the sensitivity of the detector is, while for substances with electronegativity (no electronegativity), such as alkanes, etc No signal.

The radiation (β line) produced by the sealed radioactive source (63Ni) in the ECD cell ionizes the inert gas (N2). The pulse voltage is applied to the electrode of the cell to capture the electron and generate current. Strong electronegative molecules with strong ability of absorbing electrons enter into it, absorbing electrons and forming negative ions. Because the molecules with negative charge move slower than the free electrons, the time to reach the positive electrode is longer, and the probability of reconnection with the positive ions is also increased, the electron density in the detector is reduced, and the number of electrons captured by a pulse is reduced. In order to keep the current constant in each unit time, the number of pulses is proportional to the density of strong electronegative molecules. The schematic diagram of ECD device is as follows:

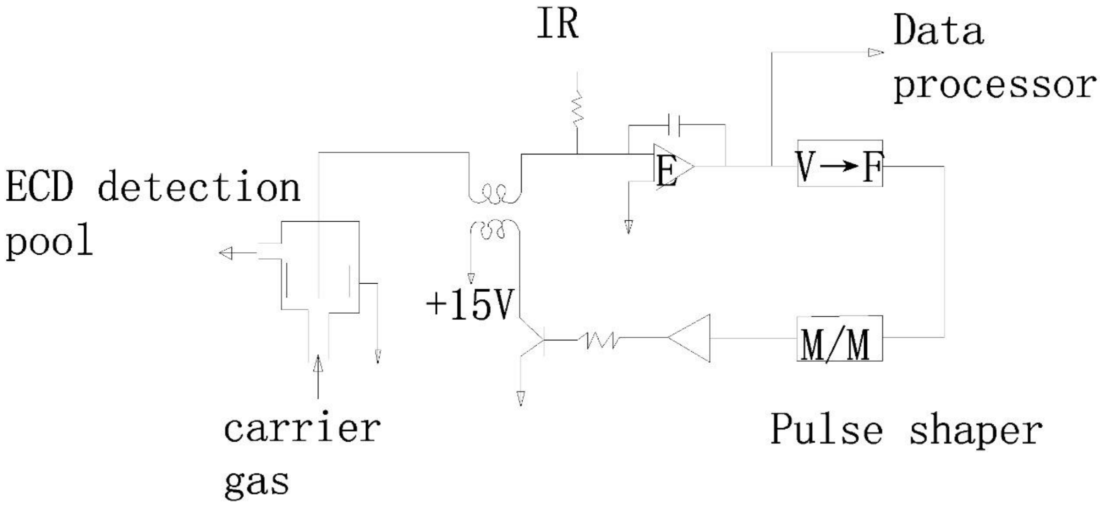


Figure 1. 8　ECD installation sketch

Through the amplifier e, the average pulse current formed by the set current IR and ECD detection cell is compared, and the voltage when the two are equal is sent to the voltage frequency converter (VFC) in the lower section. The VFC pulse is adjusted to the appropriate pulse amplitude and pulse height and then sent to the ECD detection pool to form the control circuit.

8. Flame Photometric Detector (FPD)

Flame photometric detector (FPD) is a kind of detector with high selectivity and high sensitivity for compounds containing phosphorus and sulfur. In hydrogen rich flame combustion, phosphorus containing organic compounds mainly emit 526nm light in the form of HPO fragments, while sulfur compounds emit 394nm characteristic light in the form of S2 molecules. Photomultiplier converts optical signal into electrical signal, which is amplified and recorded by micro current. The sensitivity of the detector can reach tens to hundreds of Coulomb / g, and the minimum detection amount can reach 10-11g. At the same time, the ratio of the response value of the detector to the response value of organic phosphorus and organic sulfur to the response value of hydrocarbon can reach 104, so it can eliminate the interference of a large number of solvent peaks and hydrocarbons, which is very conducive to the analysis of trace phosphorus and sulfur, and is the main tool for the detection of organic phosphorus pesticides and sulfur-containing pollutants.

As shown in Figure 1.9, FPD is mainly composed of two parts: flame emission, light and electrical signal system.

The flame light-emitting part is composed of burner and light-emitting chamber, and each gas flow path and nozzle constitute burner, also known as combustion head. The universal nozzle consists of an inner hole and an annular outer hole. The effluent of gas chromatography column mixed with air enters the central hole, and excess hydrogen flows out of the circular hole. This results in a large diffusion hydrogen rich flame, the decomposition of hydrocarbons, sulfur and phosphorus compounds in the flame, and the generation of complex chemical reactions, giving off characteristic light. Sulfur and phosphorus glow in the upper diffusion hydrogen rich flame, and hydrocarbons mainly glow in the oxygen rich flame at the bottom of the flame. Therefore, adding an opaque hood at the bottom of the flame to block the hydrocarbon light can improve the selectivity of FPD. In order to reduce the volume of the luminescent chamber, a glass or quartz tube can be installed above the nozzle to reduce the response time constant of the detector.

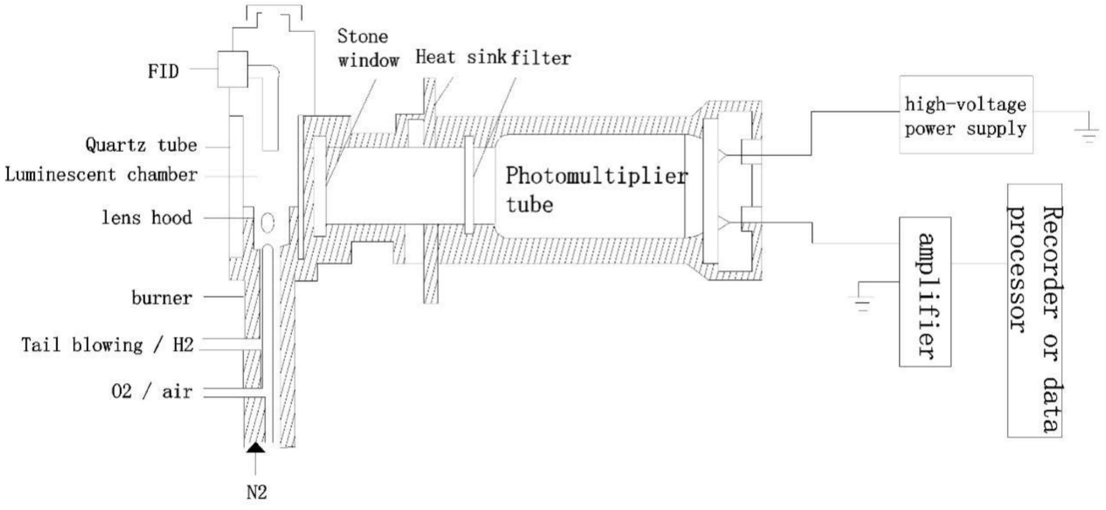


Figure 1. 9 FPD System Schema

On the right is the light and electric signal part. In order to avoid the large amount of water vapor, combustion products and the impact of high temperature on the light and electric system, quartz window and heat sink are used to separate the light-emitting chamber and the photoelectric system. Because FPD does not change all light into electrical signal, but uses filter to select sulfur and phosphorus characteristic light.

V. INSTALLATION OF THE INSTRUMENT

1. Operation environmental requirements

1.1 Operation environmental requirements

The gas chromatograph should be used in the range of 5-35 ℃ and 0-85% of temperature and relative humidity respectively. But it is better to use it in a comfortable environment (suitable constant temperature and humidity conditions). In this way, the best performance and the longest service life of the instrument can be achieved.

If the instrument is exposed to corrosive substances (whether gas, liquid or solid), it will endanger the gas chromatograph materials and components, which should be avoided.

The test bench for installing the gas chromatograph must be stable. The vibration of the test-bed will affect the stability of the instrument. In order to discharge the hot air from the column furnace, a space of at least 30cm should be left behind the instrument (and inflammables should not be placed at the back!) , and 30-40cm channel for installation and maintenance of chromatograph. If you need 10 / 100M Ethernet, you can use hub or switch to build Ethernet.

1.2 Power supply environment requirements

The power supply of the gas chromatograph is 220V ± 10% (50Hz ± 0.5Hz), and the power it can provide is not less than 2500W. In order to protect personal safety, the panel and shell of gas chromatograph are grounded with three core power cord according to the requirements of International Electrotechnical Association.

Be careful:: In order to reduce the electrical noise of the instrument, it must be grounded well.

Warning: It is strictly forbidden to replace the ground wire with water pipes, gas pipes, zero wires, etc.

1.3 Gas environment requirements

In order to give full play to the best performance of gas chromatograph, the gas used must reach the corresponding purity level. We recommend the following purity values.

Detector	**Gas and action required**	**Gas Name**	**Purity**
FID、FPD	Carrier gas and tail blow	N2 or He	No less than 99.999%
	Gas	H2	No less than 99.99%
	Gas-assisted	Air	Cleanandasy and dry as possible
TCD	Air-carrying	H2 or He	Not less than 99.999%
ECD	Carrier gas and tail blow	N2	Not less than 99.999%(deoxygenation)

We suggest installing a purifier on the gas path! After using the gas purifier for a period of time, the molecular sieve and silica gel in the gas purifier should be activated.

2. Unpacking of instruments

After the arrival of the instrument, please check the quality of the outer package of the instrument in time. If there is any damage, please contact the manufacturer or the seller immediately. After unpacking, please check the supporting parts against the delivery list. If the supporting parts are inconsistent or the appearance of the instrument is damaged, please contact the manufacturer or the seller immediately, so that you can avoid unnecessary economic loss or delay your work.

After checking, please open the door of the column box of the instrument, check whether the fan wheel of the motor operates flexibly and whether the fixed screw is loose; if it is loose, it should be removed in time.

At the same time, please check whether there is short circuit in the power plug. If there is short circuit, do not connect the instrument to the mains!

3. Installation of instruments

After checking correctly, carefully place the instrument in a suitable position on the workbench. The workbench must be secure. Do not stack flammable materials behind the instrument and leave room for maintenance.

3.1 Installation of gas sources

Preparation before installation: please refer to 2.1.3 before using the gas chromatograph, and equip the air source according to the type of detector you want to use.

Installation: please install the air source in a safe place. If the cylinder gas source is used, the cylinder shall be fixed to prevent accidents caused by overturning. No matter what kind of gas source (such as gas generator, cylinder gas source, air compressor, etc.) is selected, it is necessary to carefully check whether the quality of the gas produced meets the gas source requirements of the gas chromatograph. In order to avoid affecting the analysis results or causing pollution or even damage to the chromatograph!

3.2 Installation of pressure relief valves

If the cylinder type air source is used, the installation steps of the pressure reducing valve (double header: low pressure on the left and high pressure on the right) are as follows:

1. Screw out two oxygen pressure reducing valves and one hydrogen pressure reducing valve respectively, connect the outlet connector of the pressure reducing valve, as shown in the right figure (pagoda structure at the lower left corner), and loosen (anticlockwise) the low-pressure output regulating rod (do not tighten);

2. Install the pressure relief valve on the cylinder, tighten the nut (Be careful: that the hydrogen valve is the reverse screw port), open the cylinder pressure relief valve, and the pressure gauge pointer of the pressure relief valve rises;

3. After the cylinder pressure reducing valve is closed, the pressure gauge pointer of the pressure reducing valve shall not drop, otherwise there will be air leakage, which shall be eliminated before continuing to use.

Be careful:: if the gas generator is used, please operate according to the corresponding generator instructions

3.3 Installation of external gas circuit

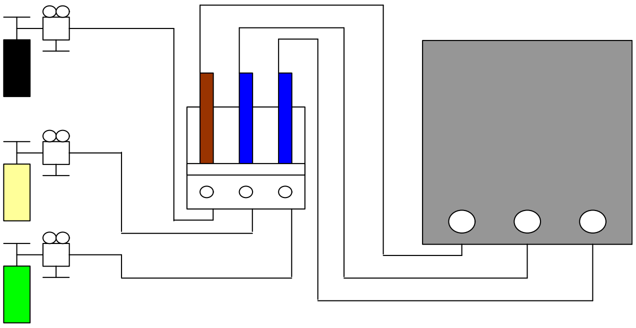


Figure 2.1 Outer Gas Road Connection Diagram

The gas pipeline of the gas chromatograph is mainly Φ 3 x 0.5 polyethylene pipe or Φ 3 x 0.5 copper pipe or stainless steel pipe (self provided). Cut the gas transmission pipe into six sections according to the required length ***(use the corresponding cutting tools for copper and stainless steel pipes, pay attention to cutting)***, and connect the air source - Purifier - chromatograph as shown in Figure 2.1.

The joint of polyethylene pipe or stainless steel pipe shall be connected as shown in Fig.2.2.

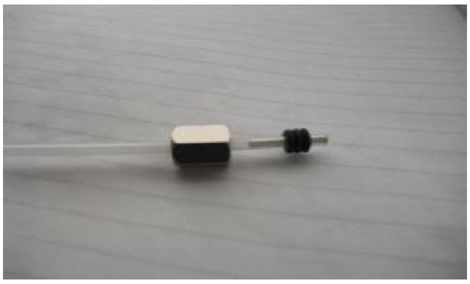


Figure 2.2 Map of the connection of the polyethylene pipe gas road

Be careful::1. Cut the polyethylene pipe of proper length, and insert a Φ 2 0.5 stainless steel liner at both ends.

2. Put M8×1, The sealing nut, phosphor copper ring and three O-rings are installed into one end of the polyethylene pipe.

3. Screw the M8×1 sealing nut on the cylinder joint (M8×1) and tighten it to ensure good sealing.

4. Install the M8×1 sealing nut, phosphor copper ring and two O-rings into the other end of the polyethylene pipe.

5. Screw the M8×1 sealing nut on the corresponding joint (M8×1) of the purifier and tighten it to ensure good sealing.

The rest of the external air connections are the same as above.

The gas chromatograph can also use Φ3×0.5 outer diameter stainless steel or copper tube as the connecting tube of the outer gas path.

The connection method is shown in Figure 2.3:

Figure 2.3 Diagram of the metal pipe gas road connection

Be careful::

1.Shunt outlet and part of detector outlet shall be connected to outdoor through additional pipeline to avoid indoor air pollution;

2.In actual operation, pay attention to frequent leak detection! Once there is a leakage somewhere, the normal operation of the instrument will be affected, and the accident (such as hydrogen leakage may cause explosion) will be caused!

3.The carrier gas input to the chromatograph must be in the range of 0.343-0.392mpa (equivalent to 3.5kg/cm2-4kg / cm2); EPC is 0.45MPa

4.The air input to the chromatograph must be in the range of 0.294kpa-0.392mpa (equivalent to 3kg / cm2-4kg / cm2); EPC is 0.45MPa

5.The hydrogen input to the chromatograph must be in the range of 0.196kpa-0.392mpa (equivalent to 2kg / cm2-4kg / cm2); EPC is 0.45MPa

6.If hydrogen is used as carrier gas, the carrier gas pressure shall be 0.343mpa (equivalent to 3.5kg/cm2).

Note: the carrier gas pressure input to the chromatograph generally refers to the partial pressure of the cylinder pressure reducing valve or the pressure of the gas generator

3.4 Installation of Chromatographic column

(1) Installation of filling column

Preparation before installation: please confirm the installation direction of chromatographic column according to the mark on the chromatographic column, please pay attention!

Metal installation method

1. Place nuts and sealing washers (graphite pad or Teflon pad) on the

"sample inlet" end in turn, then tighten the nuts on the column and insert them into the gasification chamber.

The outer diameter of the column is 3mm, which is tightened by hand for another 1 / 4 turn; the outer diameter of the column is 6mm, which is tightened by hand for another 3 / 4 turn.

2. Prepare two 12mm wrenches: respectively screw the nuts on the filling column, and "lower fixing nuts" at the injection port to prevent following rotation.

6mm glass column method (please confirm the installation position and spacing before purchase)

1. Since 6mm glass column is rigid, both ends of sample inlet and detector must be installed at the same time

2. The glass column can be sealed with graphite seal or O-ring: the former is suitable for most purposes, and the latter is only suitable for low temperature operation.

3. Determination of installation position: enough space must be reserved at the end of the sample inlet to avoid the inserted needle contacting the inner wall of the column or the column packing (at least 50-55mm).

At the end of the detector, at least 40mm space shall be reserved to prevent the lower end of the nozzle from contacting the inner wall of the column or the column packing. As shown below:

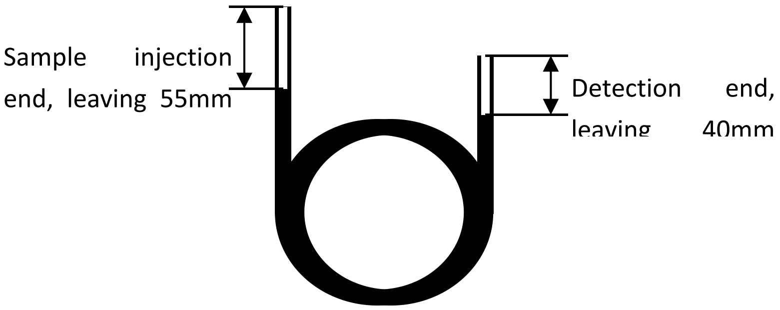


Figure 6.1 Schematic diagram of space between two ends of filled column

Be careful:* *If the nuts on the column are tightened too tightly, the column will be damaged !

(2) Installation of capillary columns

Preparation before installation: please confirm the installation direction of chromatographic column according to the mark on the chromatographic column, please pay attention!

Generally speaking, there are three types of open capillary columns: fused silicon, glass and metal. Prepare for installation. The injection port and detector end are installed in different ways.

Be careful: When cutting and installing glass or fused silica capillary column, sufficient safety protection shall be provided to prevent flying glass slag from injuring eyes and skin.

Detailed installation process of capillary column

(1) Connection with injection port end

The injection port has filling column injection port (530 μ series capillary column), split / non split capillary column injection port and split capillary column injection port. The installation method is the same.

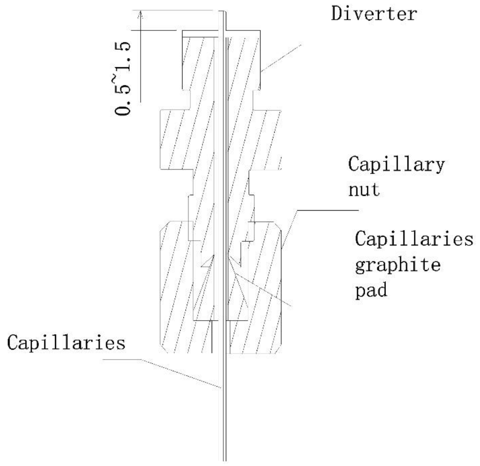
① Install nuts and sealing washers on chromatographic column.

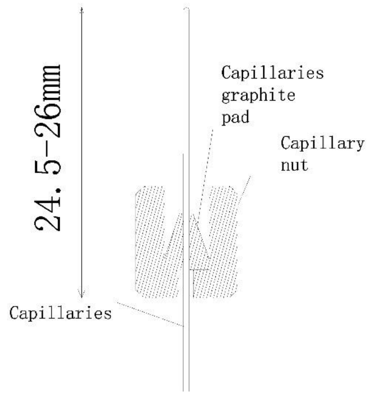
The capillary column is preferably sealed with graphite gasket, which is suitable for a wide temperature range. There are two specifications of graphite washers that can be used, depending on the outer diameter of chromatographic column: 1.0mm for glass capillary column or 530 μ series capillary column, 0.5mm for fused silica capillary column with inner diameter of 0.20 and 0.32mm.

② The chromatographic column is ready to be sealed, so that the sealing ring is bonded on the chromatographic column, so as to facilitate the back distance positioning

③ Remove the chromatographic column, use a ceramic cutter to remove the 2-3cm chromatographic column head,

④ For distance positioning, the column extends about 13mm from the top of the sealing ring. The cross section is generally 0.5-1.5mm higher than the diverter





(2) Connection with detector end

Before installation, confirm that the capillary nozzle in the detector is installed.

① Same as "injection port end installation ①"

② Same as "injection port end installation ②"

③ Same as "injection port end installation ③"

④ Tighten the nut by hand at the place where the chromatographic column is about 1 mm away from the nozzle mouth, and then use a suitable wrench to screw 1 turn.

(3) Leak detection

After the chromatographic column is installed, leak detection is required to confirm whether the connection of chromatographic column is sealed. Leakage test shall be conducted for the installation of column nuts at room temperature and column box temperature, and for the sample inlet and detector at operating temperature. If necessary, tighten the fixing parts again, only to ensure no leakage.

Be careful:* *The liquid used for leak detection often leaves some contaminated residues: after each leak detection, it should be cleaned with methanol and allowed to cool dry.

Place the capillary column on the "column holder" and select a suitable suspension position of the holder so that the column is in the center of the column box. The two ends of the chromatographic column extend from the bottom of the fixed frame. There should not be too much bending towards the injector interface and the detector interface. Do not let any part of the chromatographic column touch the inner wall of the column box. When the graphite gasket passes through the column, it may contaminate the column. Pay attention to cutting the column end.

3.5 System leak detection

After the installation of the external air circuit is completed, leakage detection shall be carried out to avoid accidents. Leakage detection shall be carried out as follows:

(1) Close all carrier gas flow stabilizing valves, hydrogen and air needle valves on the main engine;

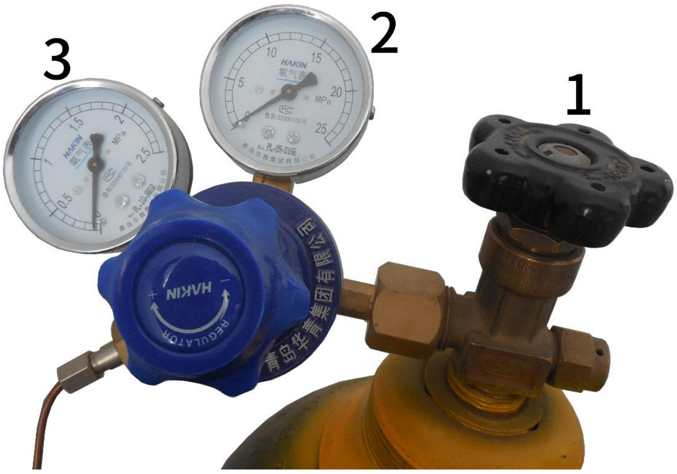
(2) Release the low-pressure regulating rod of the cylinder, open the high-pressure valve of the cylinder, and then slowly adjust the low-pressure regulating rod to make the low-pressure gauge indicate 3 kg

/ cm2;

(3) Close the cylinder high pressure valve. At this time, the indication of the low pressure gauge on the pressure reducing valve should not drop. Otherwise, there is air leakage in the external air circuit, which should be carefully checked and eliminated.

4.INSTALLATION PREPARATION WORK

4.1 Open the nitrogen cylinder total pressure valve to see if the total pressure gauge and the pressure of the divider gauge are normal



1.Total pressure valve 2. Total pressure gauge 3. Partial pressure gauge 0.4MPA
Cylinder with pressure relief valve

4.2 Power on the hydrogen generator and after the pressure is stable, it is around 0.3-0.4MPa. (Figure 2)

Switch on the air generator and the pressure is stable at around 0.3-0.4MPa. (Figure 3)

Figure 2 hydrogen generator

Figure 3 air generator

4.3 Install the outlet of carrier gas (blue), hydrogen (Orange), air (transparent) copper pipe to the corresponding gas inlet of the chromatograph (Fig. 4) (Note: open the valve switch to control each gas (Fig. 5))

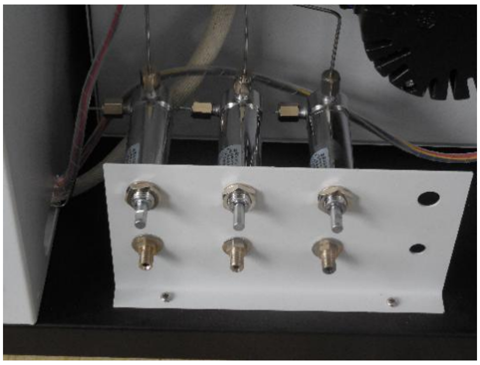


Figure 4 Figure 5(1 for carrier gas control switch ; 2 hydrogen control switch ; 3 air control switch) Where arrow thickness represents switch direction

4.4 The network cable connects the "chromatographic instrument network port" with the "computer local network port or local network port". (Figure 6)

4.5 Remove the open nut and the graphite sample probe of the strip steel sleeve, and connect the corresponding chromatographic column. The column head at one end of the capillary column sample inlet is 13mm away from the top of the graphite pad, and 79mm away from the detector. Tighten the open nut.

4.6 **Connect the power cord used by the** chromatograph. Turn on the power switch (red arrow indicates switch power supply) (Figure 6)

Figure 6

4.7 Column front pressure and adjustment knob

Check the front column pressure before starting the machine. If there is no front column pressure, it is not allowed to start the machine. The front column pressure is often observed, and if it is found that the fount column pressure decreases or is zero (mainly due to forgetting to open the injection pad and carrier gas), the split ratio is the ratio of gas generated by gasification after the sample enters the injection port, entering the chromatographic column, and exiting the injection port.

If there are four pressure gauges, they correspond to: FID1 (FPD1), FID2 (FPD2), TCD (ECD), and TCD reference (see Figure 7), corresponding to the positions of hydrogen 1, 2 air 1, 2, tail blowing 1, 2, diversion outlet, diaphragm blowing outlet, and reference outlet. (See Figures 8 and 9)

Figure 7 (Image of the position of the column front pressure)

Figure 8 (Figures 1, 2, and 3 respectively show the carrier gas needle valve，hydrogen needle valve and air needle valve， 4 is a back pressure valve used to regulate the pressure in front of the column, 5 is a needle valve used to regulate the flow rate of the diaphragm）

5. Connection between Chromatography and computer

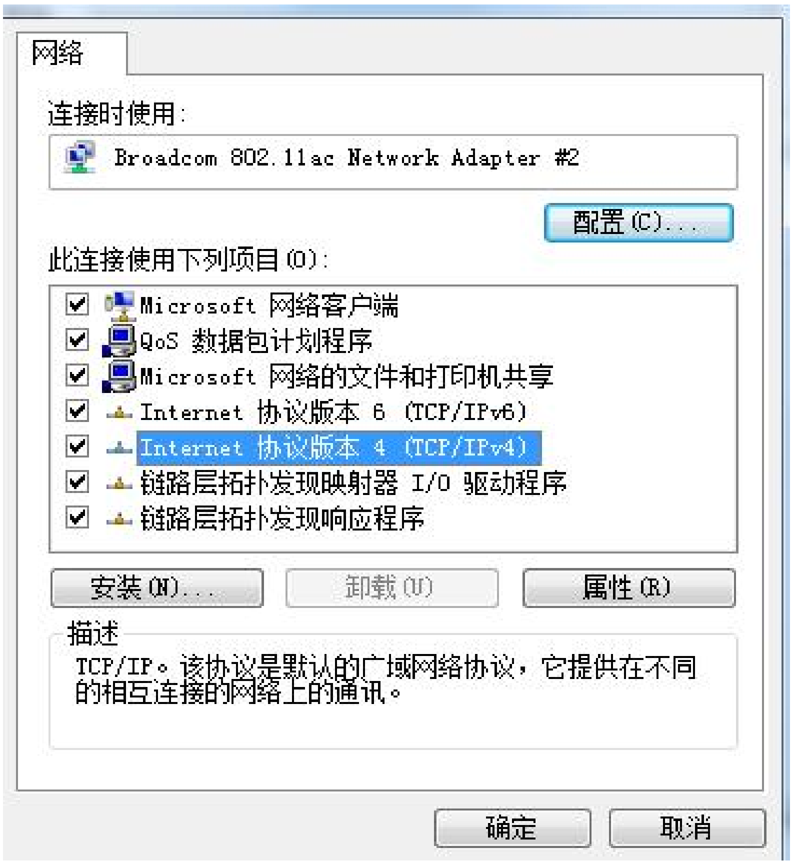
5.1 IP address setting

When the system is built (refers to the above operation),you can power on and set the network parameters. The setting of network parameters (including computers and network chromatographs) is an important parameter setting in this system. If set up incorrectly, some of the system functionality can not be implemented or even the system cannot run. Therefore, before setting the IP address of the system, it is important to plan the allocation of IP addresses, do not make the IP address of this network conflict with the IP of other computers or devices. When using a router and using the router's "DHCP" function, the system's computer and network chromatographshould should avoid using the "DHCP" ‘s IP segment as far as possible to prevent other computers or devices from being assigned to the IP address set by the system.

The communication connection between the computer and the instrument (such as "local connection") can be set to have the same IP address as the "HMI" IP address in the same network segment. Please refer to the label on the back of the instrument for the IP address and MAC.

5.1.1 Computer IP address settings:

a. You can refer to the following methods: on the desktop of the operating system, right-click network neighborhood or network, and select"Properties" click; select "local connection" right click, select "properties" click; click "Internet Protocol (TCP / IP)" and then click "properties" or double click "Internet Protocol (TCP / IP)", the following interface will be displayed:



连接时使用:

Broadcom 802.11ac Network Adapter #2

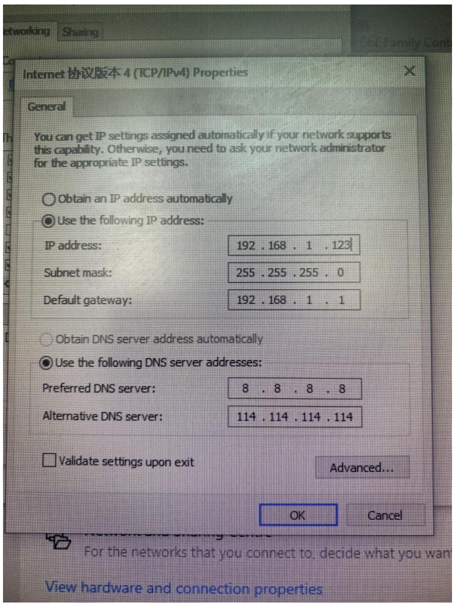
此连接使用下列项目(O):

☑ Microsoft 网络客户端
☑ QoS 数据包计划程序
☑ Microsoft 网络的文件和打印机共享
☑ Internet 协议版本 6 (TCP/IPv6)
☑ Internet 协议版本 4 (TCP/IPv4)
☑ 链路层拓扑发现映射器 I/O 驱动程序
☑ 链路层拓扑发现响应程序

描述

TCP/IP。该协议是默认的广域网络协议，它提供在不同的相互连接的网络上的通讯。

b. Double click TCP / IP4 to enter the following interface, and set the address according to the contents. (the IP of the chromatograph is set by default, please do not modify it easily)



You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:

IP address: 192 . 168 . 1 . 123
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 1 . 1

○ Obtain DNS server address automatically
● Use the following DNS server addresses:

Preferred DNS server: 8 . 8 . 8 . 8
Alternative DNS server: 114 . 114 . 114 . 114

☐ Validate settings upon exit

For the networks that you connect to, decide what you wan

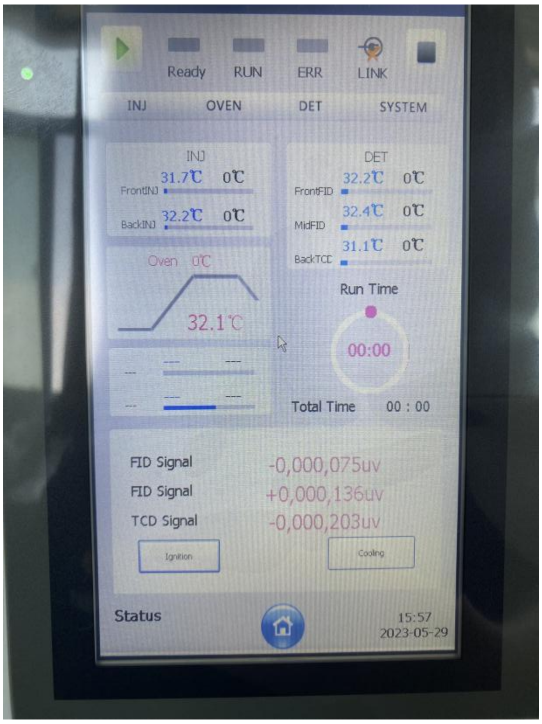
5.1.2 Chromatograph IP Address Setting *(the factory default value shall prevail, and it is not recommended to change the setting except for special circumstances)*

In any case, you can set and modify the IP address of the chromatograph on the front panel of the chromatograph. In the case of online communication, you can set and modify the IP address of the chromatograph through the chromatograph workstation. Set and modify the IP address of the chromatograph on the front panel of the chromatograph:

a. Click "start" - "Settings" - "network and dial up connection" in the lower left corner of the front panel of the instrument (as shown in the figure below)

b. Double click to open "dmisa1", click "spell" - "Pinyin input (big keyboard) in the lower right corner to call up the virtual keyboard

c. Enter the target value, click "OK" to save (otherwise the modification will not be effective), and then click "spell" - "hide input panel" to close the virtual keyboard. Finally, right-click the bottom of the panel to close the redundant window (two programs of "product" type must be reserved, please restart the instrument in case of unexpected shutdown)



INJ

FrontINJ 31.7℃ 0℃

BackINJ 32.2℃ 0℃

DET

FrontFID 32.2℃ 0℃

MidFID 32.4℃ 0℃

BackTCD 31.1℃ 0℃

Oven 0℃ 32.1℃

Run Time 00:00

Total Time 00 : 00

FID Signal -0,000,075uv

FID Signal +0,000,136uv

TCD Signal -0,000,203uv

15:57
2023-05-29

5.1.3 Chromatograph MAC address settings

MAC Address Set

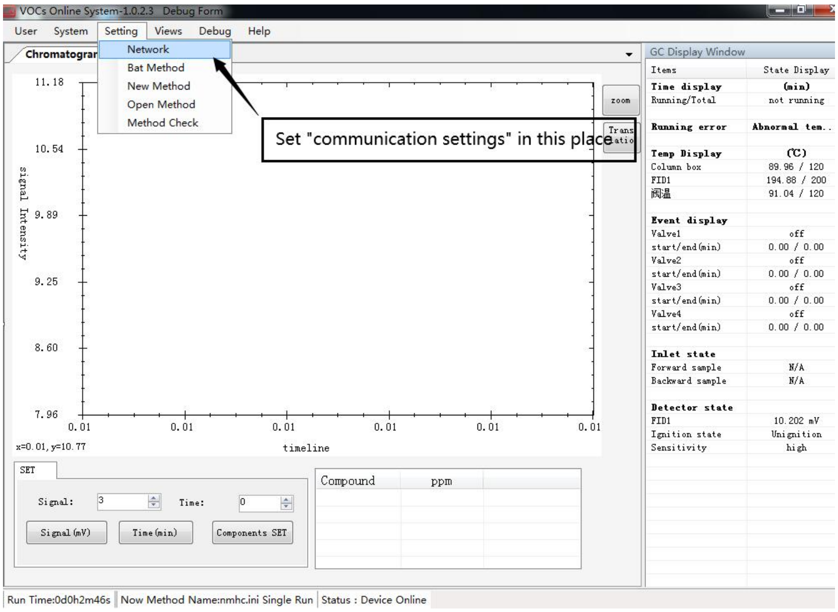
a.Double click the desktop workstation icon to open the chromatographic

(For the first time using, due to not being online and not binding MAC, it is necessary to

Click 'offline' to enter the software workstation.)

b.The MAC value set in the "communication setting" in the chromatographic workstation (do not confuse with the MAC address of the computer itself) is the same as the MAC address of the instrument (HMI) (each instrument has a unique MAC address)

c. Click communication settings



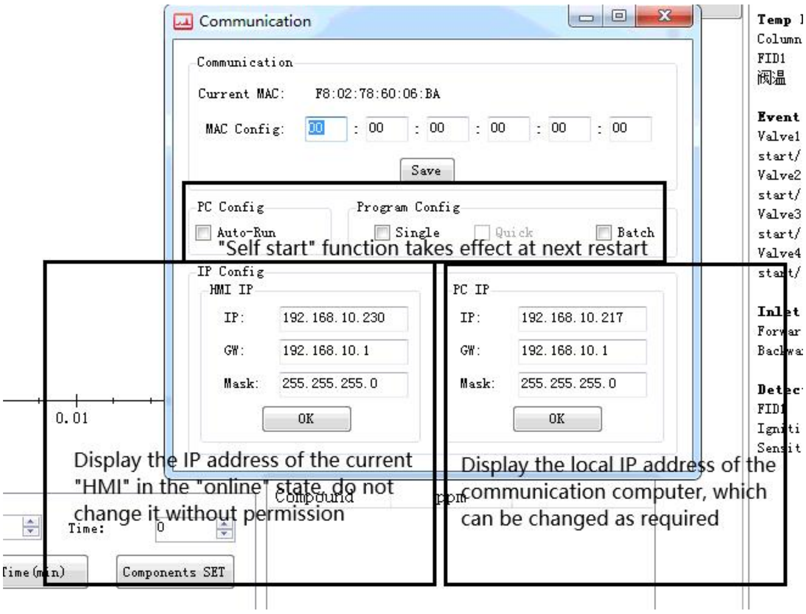
Set "communication settings" in this place

Signal: 3 Time: 0

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Abnormal tem..**
Temp Display	**(℃)**
Column box	89.96 / 120
FID1	194.88 / 200
阀温	91.04 / 120
Event display	
Valve1	off
start/end(min)	0.00 / 0.00
Valve2	off
start/end(min)	0.00 / 0.00
Valve3	off
start/end(min)	0.00 / 0.00
Valve4	off
start/end(min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	10.202 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d0h2m46s | Now Method Name:nmhc.ini Single Run | Status : Device Online

d. Pop-up "Communication Settings" window



Current MAC: F8:02:78:60:06:BA

MAC Config: 00 : 00 : 00 : 00 : 00 : 00

☐ Auto-Run ☐ Single ☐ Quick ☐ Batch

"Self start" function takes effect at next restart

HMI IP
IP: 192.168.10.230
GW: 192.168.10.1
Mask: 255.255.255.0

PC IP
IP: 192.168.10.217
GW: 192.168.10.1
Mask: 255.255.255.0

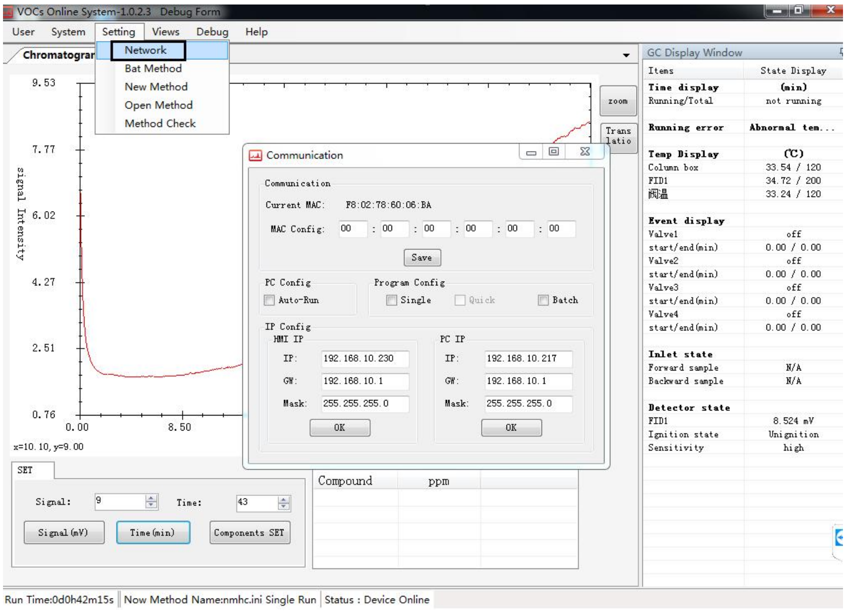
Time: 0

Display the IP address of the current "HMI" in the "online" state, do not change it without permission

Display the local IP address of the communication computer, which can be changed as required

e.Enter XX:XX:XX:XX:XX:XX:XX:XX:XX:XX in the "MAC Configuration" column, and click "Modify" after confirming that there are no errors

Arrow indicates position forinstrument (HMI)）MAC



Communication

Communication

Current MAC: F8:02:78:60:06:BA

MAC Config: 00 : 00 : 00 : 00 : 00 : 00

Save

PC Config
☐ Auto-Run

Program Config
☐ Single ☐ Quick ☐ Batch

IP Config

HMI IP		PC IP	
IP:	192.168.10.230	IP:	192.168.10.217
GW:	192.168.10.1	GW:	192.168.10.1
Mask:	255.255.255.0	Mask:	255.255.255.0
OK		OK	

Signal: 9 Time: 43

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Abnormal tem...**
Temp Display	**(℃)**
Column box	33.54 / 120
FID1	34.72 / 200
阀温	33.24 / 120
Event display	
Valve1	off
start/end(min)	0.00 / 0.00
Valve2	off
start/end(min)	0.00 / 0.00
Valve3	off
start/end(min)	0.00 / 0.00
Valve4	off
start/end(min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	8.524 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d0h42m15s | Now Method Name:nmhc.ini Single Run | Status : Device Online

f. Software tip "MAC binding modified successfully", click "OK" ”and close the "Communication Settings" ” window “

Communication

Current MAC: F8:02:78:60:06:BA

MAC Config: F8 : 02 : 78 : 60 : 06 : BA

☐ Auto-Run

☐ Batch

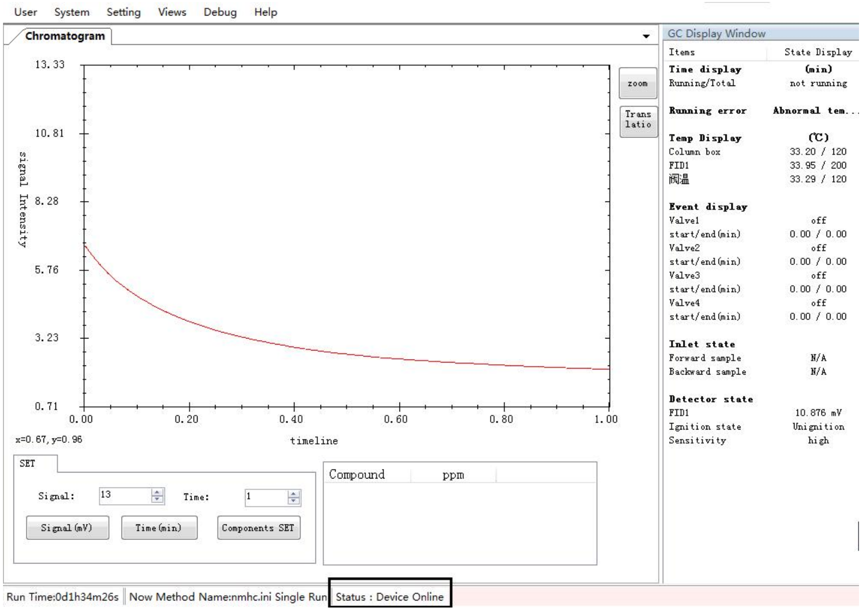
MAC绑定修改成功！

IP: 192.168 … 168.10.217

GW: 192.168 … 168.10.1

Mask: 255.255.255.0 Mask: 255.255.255.0

g. After the setup is complete, restart the chromatography workstation. At this point, the chromatograph and the computer can communicate normally (we call it "online").



x=0.67, y=0.96

Signal: 13 Time: 1

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Abnormal tem...**
Temp Display	**(℃)**
Column box	33.20 / 120
FID1	33.95 / 200
阀温	33.29 / 120
Event display	
Valve1	off
start/end(min)	0.00 / 0.00
Valve2	off
start/end(min)	0.00 / 0.00
Valve3	off
start/end(min)	0.00 / 0.00
Valve4	off
start/end(min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	10.876 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d1h34m26s | Now Method Name:nmhc.ini Single Run | Status : Device Online

5.4 Initial setup of the workstation

5.4.1 Chromatographic workstation

After the first online, you can set up the next step through the chromatographic workstation

5.4.2 Instrument configuration (The factory settings have been completed. If you have to modify the recommended configuration, please consult our company)

Tell us which parts of the the chromatograph need to be controlled (of course, they are equipped), including but not limited to: number of injectors, number of injection ports, number of valve cuts, number of column boxes, column type and detector type. Double click to open the chromatography workstation. When it is online, click on instrument configuration

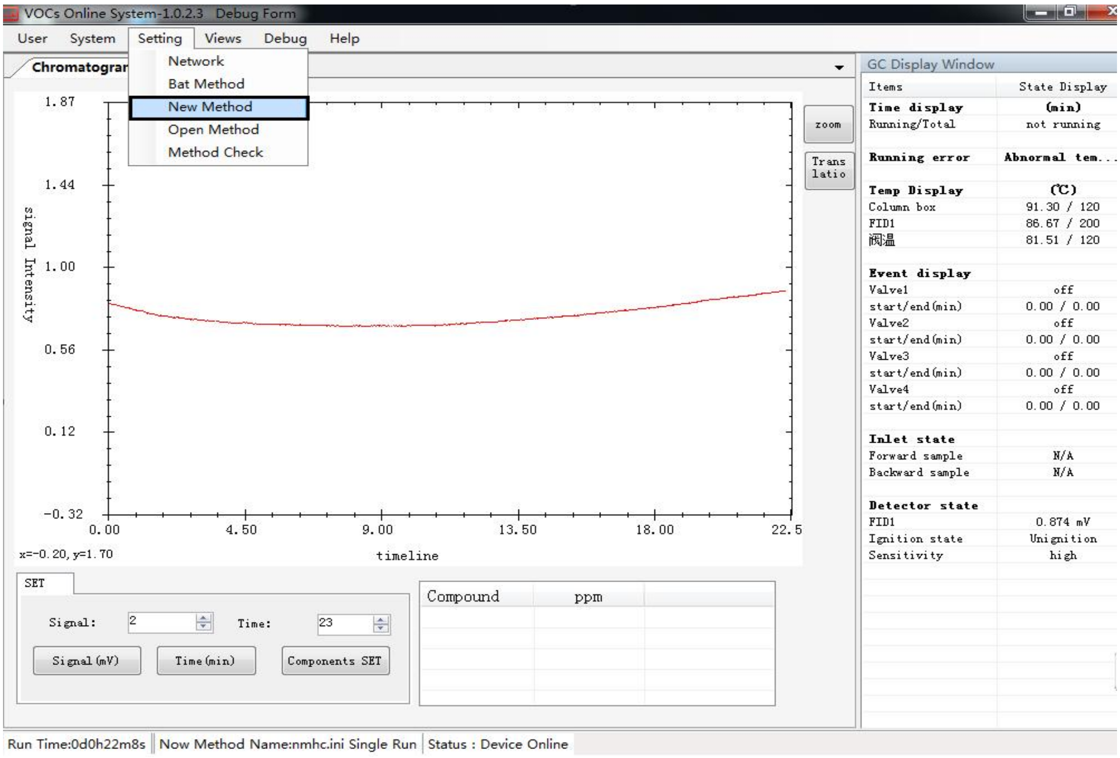
a. Method Creation

“Method”is a set of all control parameters

We can control the following hardware through "method file": injector, valve, injection port, column box, detector, auxiliary

The operation steps are:

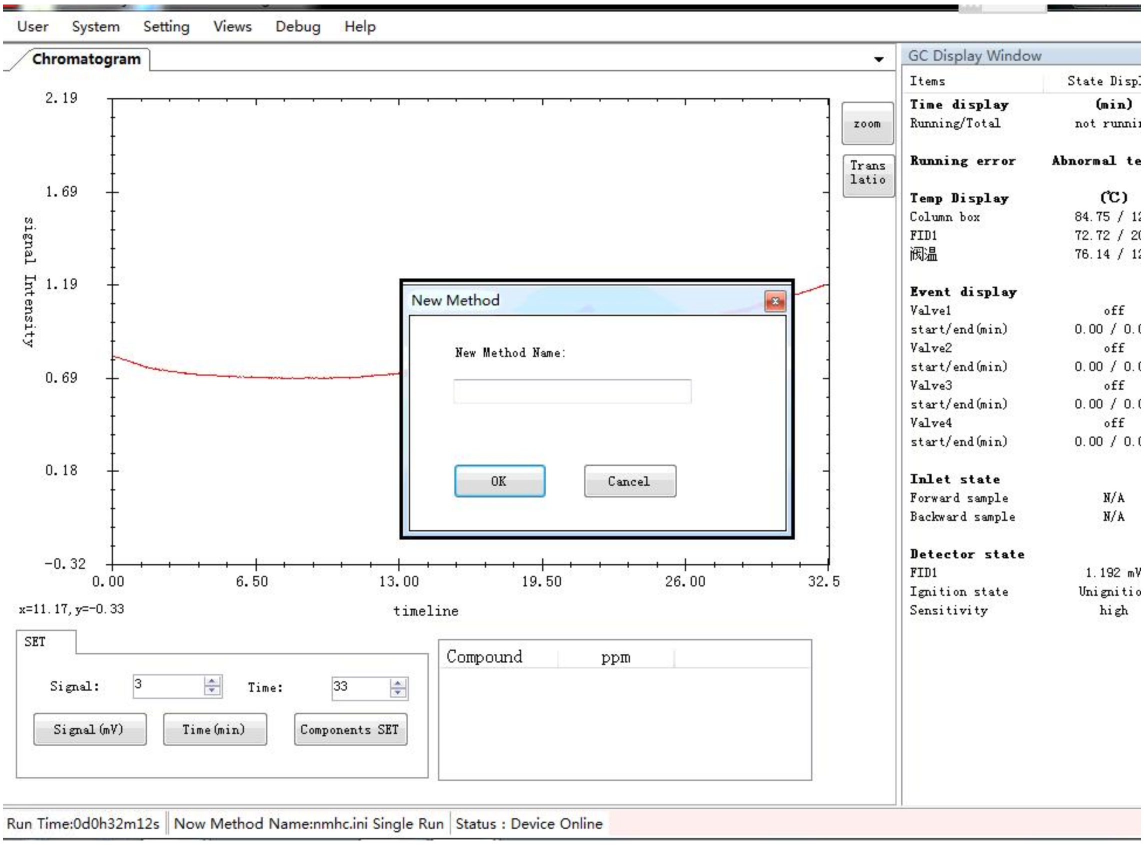
a.Open the chromatographic workstation, click "new method", in the status of not analyzed (analysis status refers to "method running"), you can use this function to create a new sampling method and name and save it. If the current method name already exists, update the method with the same name. In this interface, you can select reset, save as, and save functions.



Signal: 2 Time: 23

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Abnormal tem...**
Temp Display	**(℃)**
Column box	91.30 / 120
FID1	86.67 / 200
阀温	81.51 / 120
Event display	
Valve1	off
start/end (min)	0.00 / 0.00
Valve2	off
start/end (min)	0.00 / 0.00
Valve3	off
start/end (min)	0.00 / 0.00
Valve4	off
start/end (min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	0.874 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d0h22m8s | Now Method Name:nmhc.ini Single Run | Status : Device Online



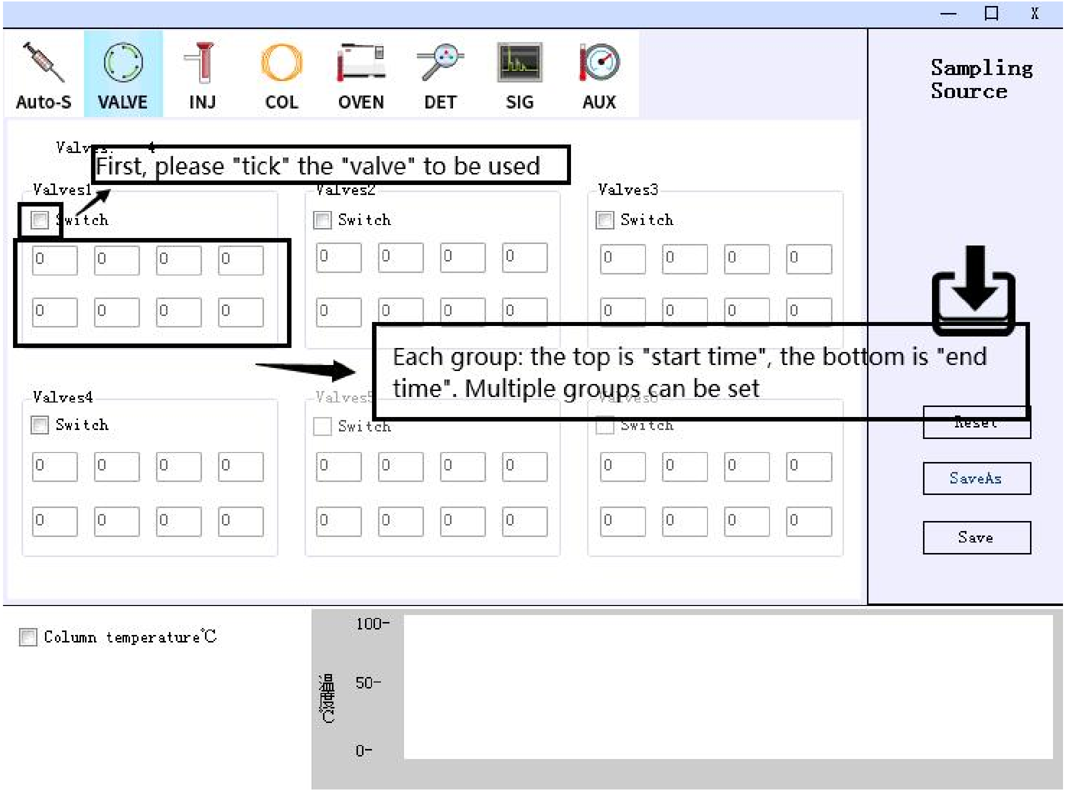
Signal: 3 Time: 33

Items	State Displ
Time display	**(min)**
Running/Total	not runnin
Running error	**Abnormal te**
Temp Display	**(℃)**
Column box	84.75 / 1
FID1	72.72 / 2
阀温	76.14 / 1
Event display	
Valve1	off
start/end (min)	0.00 / 0.
Valve2	off
start/end (min)	0.00 / 0.
Valve3	off
start/end (min)	0.00 / 0.
Valve4	off
start/end (min)	0.00 / 0.
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	1.192 mV
Ignition state	Unignitio
Sensitivity	high

Run Time:0d0h32m12s | Now Method Name:nmhc.ini Single Run | Status : Device Online

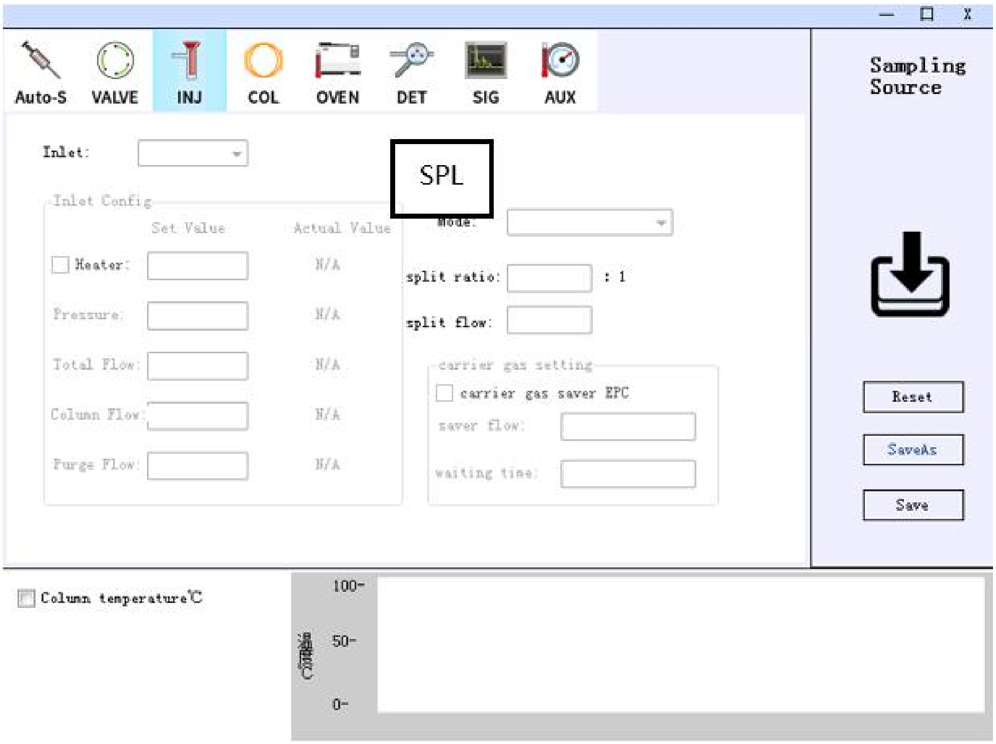
b. Set the method parameters. (Note: only the previously configured options can be set.).

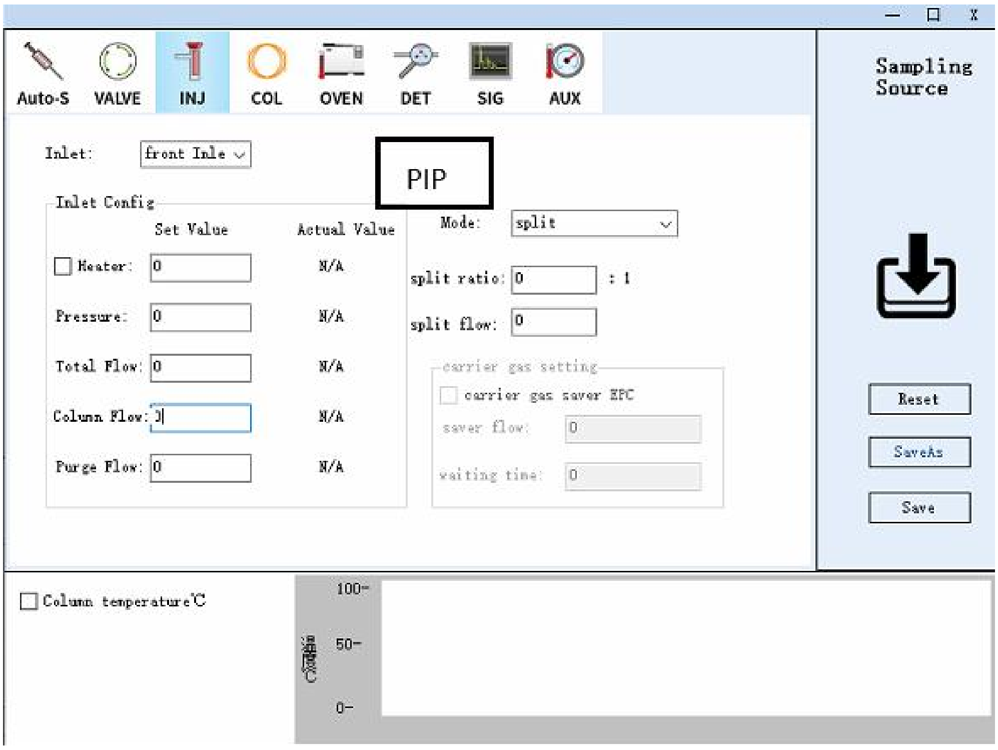
Valve setting: setting valve control:


First, please "tick" the "valve" to be used

Each group: the top is "start time", the bottom is "end time". Multiple groups can be set

Injection port setting: the temperature of the front and rear injection ports can be set respectively (the specific parts corresponding to the front and rear injection ports shall be subject to the user's current instrument.) To set the temperature, check the small box in front of the heater. See the factory report of the instrument for the set temperature value:





Inlet: front Inle

Inlet Config

	Set Value	Actual Value
☐ Heater:	0	N/A
Pressure:	0	N/A
Total Flow:	0	N/A
Column Flow:	0	N/A
Purge Flow:	0	N/A

Mode: split

split ratio: 0 : 1

split flow: 0

carrier gas setting

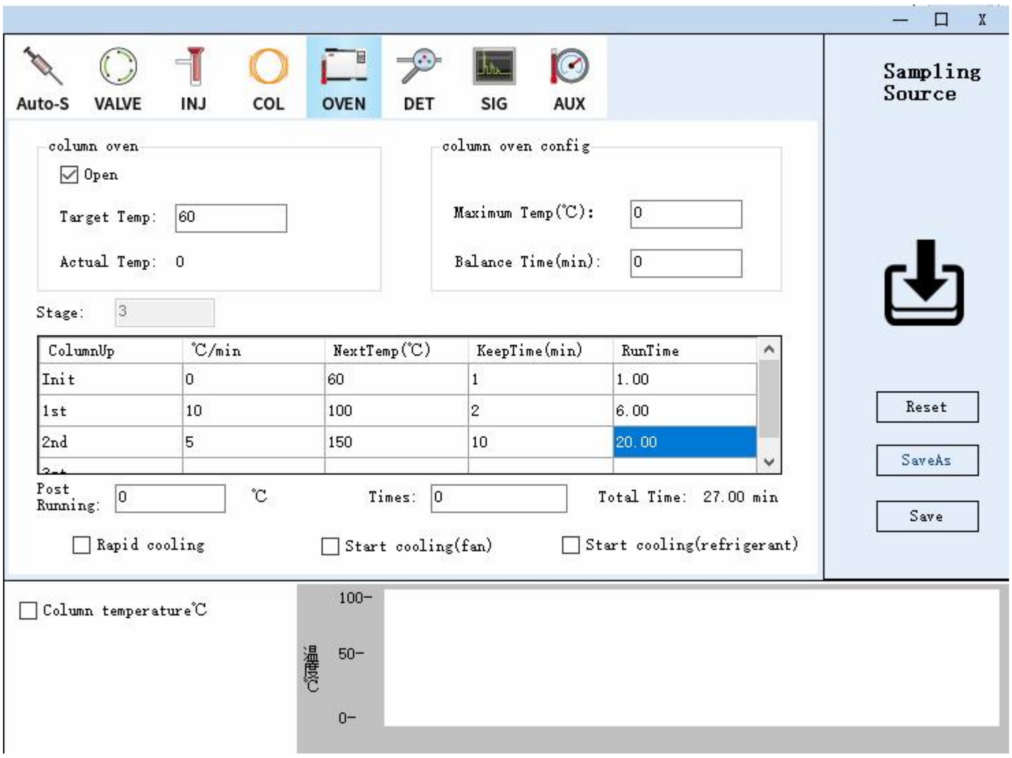
☐ carrier gas saver EPC

saver flow: 0

waiting time: 0

☐ Column temperature℃

Column box setting: check the small box in front of "open". Input the temperature parameter in the "set temperature" column, and see the factory report of the instrument for the set temperature value (if it is the lift, the temperature is the initial temperature). Programmed temperature rise: for example, it is required to keep the initial temperature 60 for 1 min, 10 °C / min for 100, and 2 min; then 5 °C / min for 150, and 10 min for 10 min. The settings are as follows:



column oven

☑ Open

Target Temp: 60

Actual Temp: 0

column oven config

Maximum Temp(℃): 0

Balance Time(min): 0

Stage: 3

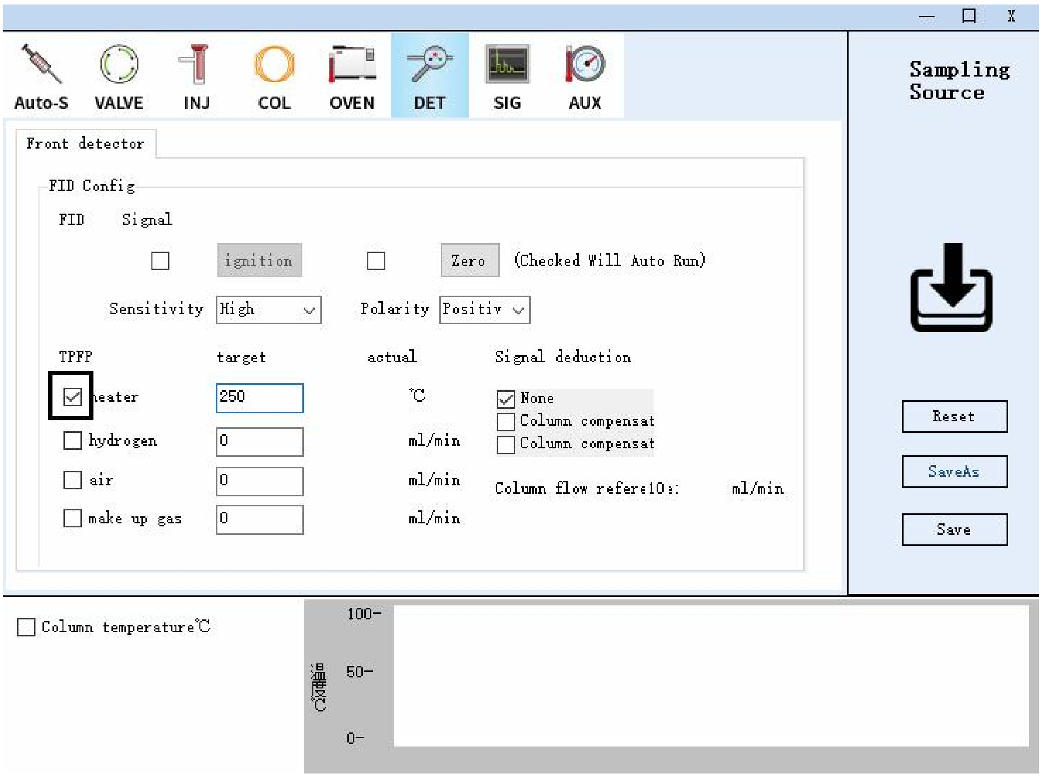
ColumnUp	℃/min	NextTemp(℃)	KeepTime(min)	RunTime
Init	0	60	1	1.00
1st	10	100	2	6.00
2nd	5	150	10	20.00

Post Running: 0 ℃ Times: 0 Total Time: 27.00 min

☐ Rapid cooling ☐ Start cooling(fan) ☐ Start cooling(refrigerant)

☐ Column temperature℃

Detector setting: check the small box in front of the heater, input the temperature parameter of the detector in the input box after the "heater", see the factory report of the instrument for the set temperature value. Check the small box behind "ignition", when all temperature control of the instrument reaches the set value, it will automatically ignite. The sensitivity gear can be selected according to the existing situation of the instrument. The high refers to a magnification of 10 ^ 10, the middle refers to a magnification of 10 ^{9}, and the low refers to a magnification of 10 ^ 8. If all peaks that should be positive are inverted, adjust the polarity.



Front detector

FID Config

FID Signal

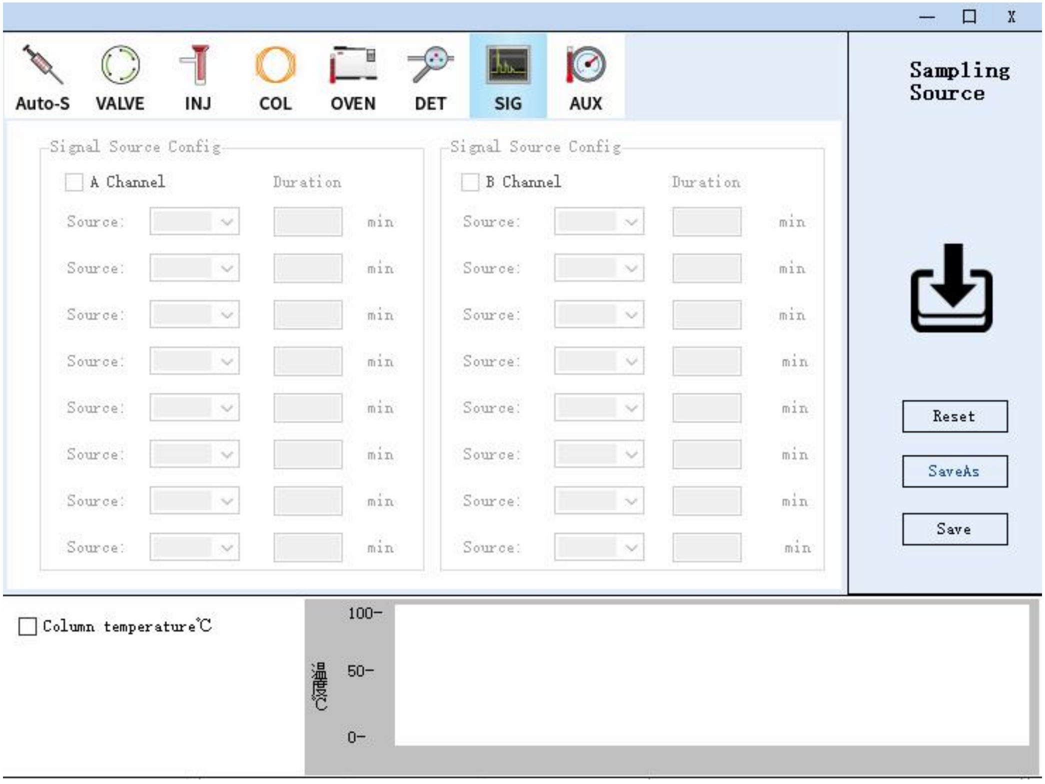
☐ ignition ☐ Zero (Checked Will Auto Run)

Sensitivity High Polarity Positiv

TPFP	target	actual	Signal deduction
☑ heater	250	℃	☑ None
☐ hydrogen	0	ml/min	☐ Column compensat
☐ air	0	ml/min	☐ Column compensat
☐ make up gas	0	ml/min	

Column flow refere10: ml/min

☐ Column temperature℃

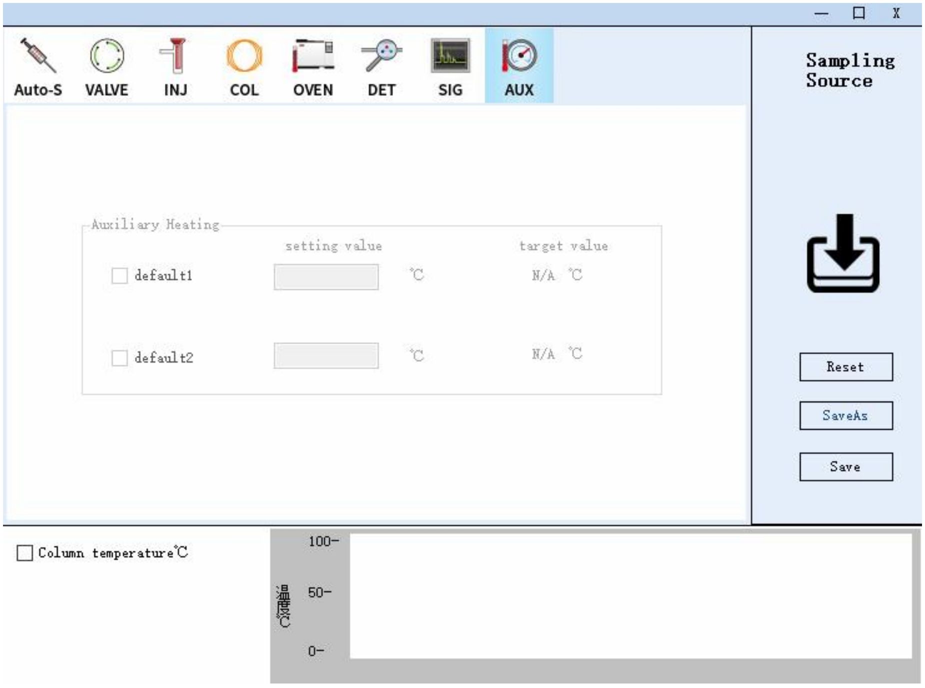


Signal Source Config: ☐ A Channel — Source: / Duration min (8 rows)

Signal Source Config: ☐ B Channel — Source: / Duration min (8 rows)

☐ Column temperature℃

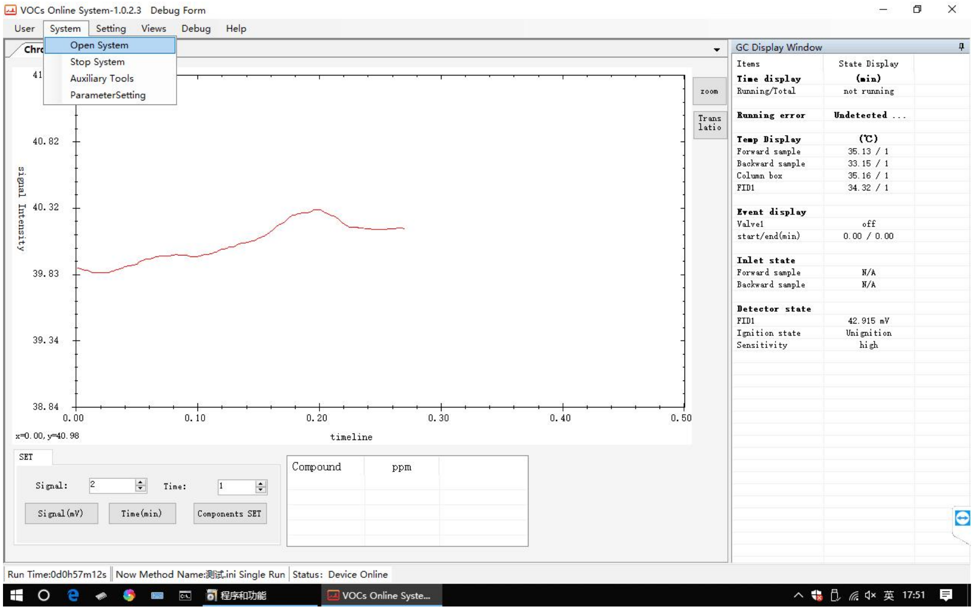
Signal: for third-party workstation, signal grafting
Auxiliary setting: specially for the sixth channel temperature control (TCD, Ni conversion, etc.) to be extended by the user, check the small box in front of the auxiliary name, and enter the temperature parameter under the "set value".



c. Save method, save all parameters as method file for next call
d. Click open system, click open method, click save and submit

5.5 Running a workstation

5.5.1 after opening the system, the instrument will set the temperature rise according to the method. If it is a FID detector, it will automatically ignite when the temperature of the FID detector is close to equilibrium (reaching the set value of 5 °C - 10 °C).



x=0.00, y=40.98

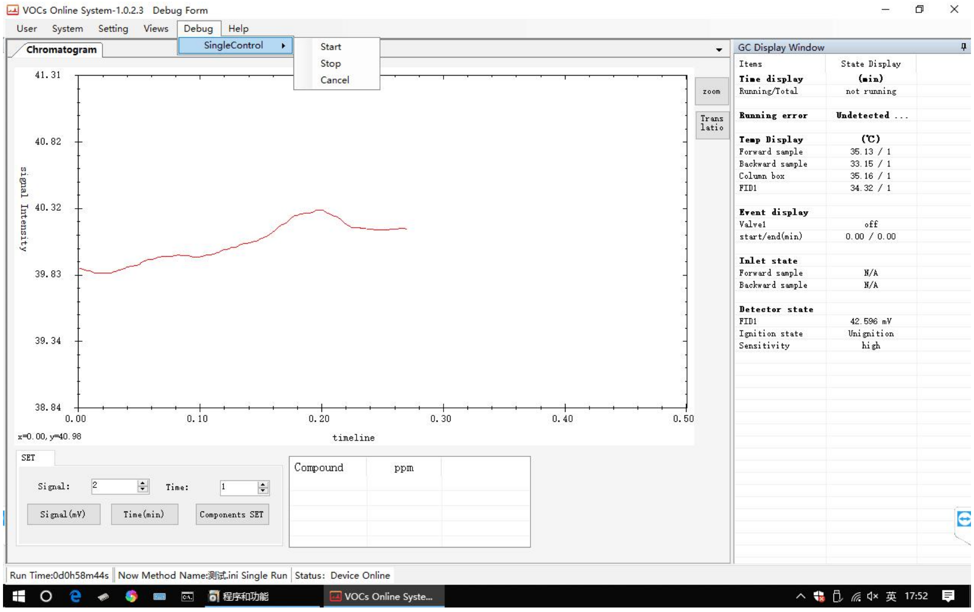
Signal: 2 Time: 1

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Undetected ...**
Temp Display	**(℃)**
Forward sample	35.13 / 1
Backward sample	33.15 / 1
Column box	35.16 / 1
FID1	34.32 / 1
Event display	
Valve1	off
start/end(min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	42.915 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d0h57m12s | Now Method Name:测试.ini Single Run | Status: Device Online

5.5.2 start analysis

After the instrument status bar in the chromatographic workstation changes to "ready" and the baseline of each detector is ready, the injection can be started. After the injection, click start **(Note: the baseline should be a straight line at the range of 10mV and 30min.)**



x=0.00, y=40.98

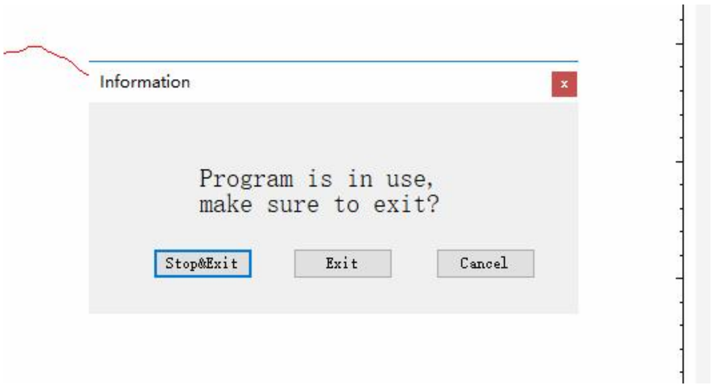
Signal: 2 Time: 1

Items	State Display
Time display	**(min)**
Running/Total	not running
Running error	**Undetected ...**
Temp Display	**(℃)**
Forward sample	35.13 / 1
Backward sample	33.15 / 1
Column box	35.16 / 1
FID1	34.32 / 1
Event display	
Valve1	off
start/end(min)	0.00 / 0.00
Inlet state	
Forward sample	N/A
Backward sample	N/A
Detector state	
FID1	42.596 mV
Ignition state	Unignition
Sensitivity	high

Run Time:0d0h58m44s | Now Method Name:测试.ini Single Run | Status: Device Online

5.5.3 end the experiment

Click "stop system" (the same position as "open system") in the chromatographic workstation, the instrument will cool down, FID detector can turn off H2, air will turn off the software when it drops to the appropriate temperature. Turn off carrier gas, computer and chromatograph.



Program is in use,
make sure to exit?

VI. Malfunctions and Troubleshooting of Instruments

1 Startup issue

1. 1 No response after startup

Fault judgment	Inspection methods and repairs
Municipal power problems	Check the power
Fuse blown	Check the fuse and replace it
The display is not lit	Check the display

1. 2 Not online

Fault judgment	Inspection methods and repairs
Network line problem	Check the network line
IP address setting error	Check the IP address and set it correctly
Computer or chromatograph network indicator is not on	Check network cables, switches, chromatographs, or computers
"Online failure" is displayed shortly after "online success"	Check the network and IP addresses for conflicts

2. Chromatographic Peak issues

2. 1 No baseline

Fault judgment	Inspection methods and repairs
The inspection board is not installed	Check if the inspection board is installed
Detection board failure	Replace the inspection board
The baseline and background colors are set the same	Change the color
The sampling rate is incorrect	Modify ingr sampling rate(20 times / second)
The chromatograph is not online with the computer	Check the network and network parameters

2. 2 No chromatographic peaks

Fault judgment	Inspection methods and repairs
Sampler / Sample inlet Temperature Is Too Low	Increase the sampler / sample inlet temperature
The syringe is blocked.	Replace the syringe
Amplifier power off	Check the amplifier
No carrier gas passing	Check whether the air carrying circuit is blocked and whether the gas in the cylinder is used up
Silicone rubber leak	Replace silicone rubber
No fire	Ignition
Unstable FID polarization voltage	Eliminate poor contact of polarization voltage

2. 3 Retention time is normal, but sensitivity is reduced

Fault judgment	Inspection methods and repairs
Syringe leak	Replace the syringe
Improper selection of sensitivity	Choose the appropriate sensitivity
Carrier gas leakage	Probe the leak and do the appropriate treatment
Unsuitable hydrogen and air flow (FID)	Correct their traffic
Detector does not have high pressure (FID)	Check high voltage

2. 4 Tailed peak

Fault judgment	Inspection methods and repairs
Inlet tube pollution	Cleaning the sampler / inlet tube
Column furnace temperature too low	Increase column temperature
The sample temperature is too low.	Turn up the sampler / sample port temperature
Improper selection of chromatographic column	Choose the right column

2. 5 Tongue Peak

Fault judgment	Inspection methods and repairs
Too much sample injection	Reduce sample size

Sample agglutination	First, increase the column temperature, then select the appropriate injector / inlet, column, detector temperature

2. 6 Not good separation of chromatographic peaks

Fault judgment	Inspection methods and repairs
chromatographic column too short	Select a longer chromatographic column
Fixed fluid loss	Replace column chromatography column or aging chromatographic column
The column temperature is too high.	Reduce the column box temperature
The fixing fluid is not selected correctly	Choose the right column
The air flow rate is too high or too low	Adjusting the carrier gas flow

2.7 Flat Peak

Fault judgment	Inspection methods and handling
Amplifier input saturation	Reduce sample injection and amplifier sensitivity
Change in the position of the recorder zero	Check the recorder zero position and do the appropriate processing

2.8 Baseline mutation

Fault judgment	Inspection methods and handling
External field interference	Eliminate external electric field interference that affects the proper operation of the instrument
Poor power plug contact	Secure the power outlet
Improper selection of hydrogen and air flow	Readjust the flow of hydrogen and air

2.9 Irregular baseline fluctuations during thermostatic operation

Fault judgment	Inspection methods and repairs
The position of the instrument installation is not good.	Install the instrument in a place free of strong vibration, preferably on a cement platform without vibration.
The instrument is not grounded well.	Check and do the appropriate good grounding
The fixing fluid is not appropriate.	The fixing fluid is selected appropriately
Improper selection of air-carrying flow	Properly adjust the air-carrying flow
Carrier gas leakage	Leak detection
Detector contamination	Cleaning detectors
Improper selection of hydrogen and air flow	Properly regulate the flow of hydrogen and air

2.10 Retention time greater than normal, sensitivity lower than normal

Fault judgment	Inspection methods and repairs
Carrier gas flow too slow	Increase carrier gas flow rate
Carrier gas flow change after injection	Change the silicone rubber at the injection port
Inlet, silicone rubber leak	Change the silicone rubber at the injection port

2.11 When the peak reaches the maximum value, the signal suddenly drops below the baseline, and the FID flame goes out

Fault judgment	Inspection methods and repairs
Too large a sample.	Reduce the sample size
Carrier gas flow too high	Select appropriate carrier gas flow rate
Hydrogen or air flow is too low	Readjusting hydrogen, air flow rates
Flame vent contamination	Cleaning flame vents
The loss of fixed fluid in the Chromatography column	Re-aging Chromatography column

2.12 Baseline not back to zero

Fault judgment	Inspection methods and repairs
Detector contamination	Cleaning detectors
Amplifier failure	Check the amplifier

2.13 Irregular spikes

Fault judgment	Inspection methods and repairs
Insulator leakage	Probe the leak and do the appropriate treatment
Amplifier failure	Elimination of impurities in the flow path
The flame beats	Adjust the appropriate hydrogen and air flow
High-frequency signal line failure	Check the high-frequency signal line

2.14 There are certain burrs in the equal interval

Fault judgment	Inspection methods and repairs
Water cooling condenses in hydrogen pipeline	Remove water from line and change or activate desiccant
There is a blockage in the flow path	Elimination of impurities in the flow path
Leakage	Leakage detection and corresponding treatment
The flame beats	Adjust the appropriate hydrogen and air flow

2.15 Round Peak

Fault judgment	Inspection methods and repairs
Over the detector linear range	Reduce the sample size
Amplifier selection is not appropriate	Re-select the appropriate amplifier

2.16 Baseline noise

Fault judgment	Inspection methods and repairs
Column contamination	Replacing the column
Gas-carrying pollution	Replace or regenerate the carrier air filter
Carrier gas flow too high	Readjust carrier gas flow rate
Poor grounding	Check and do a good ground
High resistance to pollution	High resistance to cleaning contamination
Inlet, pollution.	Cleaning the inlet tube
The flow rate of air or hydrogen is too high or too	Readjust the flow rate of air or hydrogen

low(FID)）	
Air or hydrogen contamination	Replace the hydrogen or air filter
Water condensation in FID	Increase FID temperature to remove moisture
High-frequency signal line failure	Check the high-frequency signal line

2.17 Extra Peaks

Fault judgment	Inspection methods and repairs
Interference peak of the previous sample	Wait until the previous sample all slips out before you get in.
Moisture condensed in the tomography column is at peak	The operating conditions for installing or regenerating the purifier should be selected appropriately
Sample decomposition	Lower the sampler / sample port temperature
Samples are contaminated	Keep the sample clean

2.18 Jagged Baseline

Fault judgment	Inspection methods and repairs
Steady flow valve diaphragm fatigue	Diaphragm or valve repair
Output pressure change of pressure reducing valve of carrier gas cylinder	Adjust the pressure of carrier gas valve to another position
Improper flow of air flow	Reset the flow of the airstream

2.19 Inverted peak

Fault judgment	Inspection methods and repairs
Excessive hydrogen flow(FID)）	Adjusting the hydrogen flow
Positive and negative switches are wrong	Change the positive and negative switches to the correct position
The reference pool is in error with the tungsten lead of the measuring pool(TCD)）	Check the lead of the reference pool and the measuring pool tungsten wire.

2.20 No sample and baseline one-way change (FID)

Fault judgment	Inspection methods and repairs
Detector temperature is too low	Increase the detector temperature
Column temperature stops warming or out of control	Access to the temperature control system and heating silk platinum resistance
Leakage	Leak detection

2.21 One-way baseline drift

Fault judgment	Inspection methods and repairs
A significant change in detector temperature	Stabilize the detector temperature
Amplifier Zero Drift	Access to the various components of the amplifier
Increase or decrease of column temperature	Increase or decrease of column temperature
Leakage	Leak detection

2.22 Irregular baseline changes in heating

Fault judgment	Inspection methods and repairs
Too much column loss	Select the appropriate column, the use column temperature should be much lower than the maximum use temperature of the fixed liquid, aging column
No suitable operating conditions have been selected	Choose the right operating conditions
The column is contaminated.	Replacing the column

2.23 Periodic baseline fluctuations

Fault judgment	Inspection methods and repairs
Poor thermostat control of the detector	Check if the contact is good
The air-carrying flow pressure is too low	Readjust carrier gas flow rate
The temperature adjustment of the column furnace is not properly regulated	Check that platinum resistance contact is good
Improper regulation of carrier gas flow	Readjusting the air flow rate
Inadequate air and hydrogen regulation(FID)）	Readjusting hydrogen, air flow

2.24 Baseline change after temperature programmed

Fault judgment	Inspection methods and repairs
As the temperature rises, the column loss increases	Select the appropriate column or aging column
The column flow rate is not corrected.	Correcting column flow rate
The column is contaminated.	Replacing the column