Dear Client

Thank you for Purchasing our **HTYSP-H Oil Dissolved Gas Analyzer**. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.

Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.

The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRICAL SHOCK!

Company Address:

- T4，No. 41, High-tech 2 Road，East Lake High-tech Development Zone，Wuhan
- Sales Hotline: 86-27- 87457960
- After Service Hotline**:** 86-27- 87459656
- Fax: 86-27- 87803129
- E-mail: qiao@hvtest.cc
- Website: www.hvtest.cc

◆ SERIOUS COMMITMENT

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ SAFETY REQUIREMENTS

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric

shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

—Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

Content

Basic operation requirements of the instrument

1. Power requirements: voltage: 220 ± 10%

Frequency: 50 ± 0.5Hz

Power: ≥3000W

Grounding resistance: <0.1Ω

2. Air source requirements: Nitrogen: 99.995%

Hydrogen: 99.995%

Air: dry and oil-free

3. Basic operation requirements of hydrogen flame ionization detector (FID)

Carrier gas: flow rate 50ml / min (30-80 ml / min)

Hydrogen: flow rate 30ml / min (25-40 ml / min)

Air: Flow rate 350 ml / min (250-500 ml / min)

4. Basic operation requirements of thermal conductivity detector (TCD)

Before starting, the carrier gas should be passed for 30min and the flow rate is 50ml / min.

Flow correction, flow deviation between two outlets ≤1%

According to the analysis requirements, set the size of the bridge current value

When using nitrogen as a carrier gas, the bridge flow should be properly reduced when using hydrogen as a carrier gas

5. Electronic capture detector (ECD) gas source requirements Nitrogen: 99.999%

And install a deoxygenation tube, the carrier gas should be passed for 2 hours before starting, the flow rate is 80ml / min, then start heating

6. Special reminder: first pass the carrier gas, and then turn on the temperature!

Fast Installation guide

1. Open the packing box, lift out the chromatograph and place it on the workbench. The appearance of the inspection should be intact. According to the contract, the items and accessories should be complete.

2. Connect the gas circuit: TCD only connects H2 to the carrier gas inlet of the chromatograph. FID / FPD / NPD should connect the high purity N2 / H2 / Air to the corresponding inlet of the chromatograph, do not connect it wrong. ECD only needs to connect 99.999% N2 to the carrier gas inlet of the chromatograph. The output pressure requirements of the three gas source pressure reducing valves of this instrument are: carrier gas (N2): 0.4MPa hydrogen: 0.26MPa air: 0.4MPa (regardless of the large flow of gas, the three pressures are fixed!)

3. Connect the chromatography column to the corresponding detector, pass the carrier gas, and test the leak. Install and open the workstation and connect the signal cable to the corresponding controller. The inspection station and the corresponding detector should work normally.

4. Connect the ground wire. Turn on—heat up—should be normal; unused temperature is set to “0” and set to “off”. Reasonably set the parameters of the corresponding detector. The initial state of external events should be set to "off".

5. FID should be ignited; TCD plus appropriate bridge current (no more than 160mA), and press the bridge current button, the bridge light is on; FPD ignition-high voltage; NPD plus bead current to dark red bead; ECD plus pulse current 1nA).

6. Look at the baseline-zero adjustment.

7. After the baseline is stable, the sample can be injected for analysis: properly adjust the column chamber temperature and pre-column pressure to make the peak out normal. Conditional reference: Set the column chamber temperature near the boiling point of the sample being analyzed, and the vaporization and detector temperature are 20 ° C-50 ° C higher than the column chamber

temperature. When the column temperature is lowered, the separation becomes better and the retention time is longer; when the column temperature is increased, the separation becomes worse and the retention time is shortened. Reducing the pre-column pressure (reducing the carrier gas flow), the separation becomes better, and the retention time is longer; increasing the pre-column pressure (increasing the carrier gas flow), the separation becomes worse, when retained.

I Overview

Chromatographic analysis technology is a separation and analysis technology of multi-component mixture. It mainly uses the difference in boiling point, polarity and adsorption coefficient of each component in the sample in the chromatographic column, so that each component is separated in the chromatographic column, and the separated components are detected by the detector, so as to Qualitative and quantitative analysis of component mixtures.

Due to its high separation efficiency, fast analysis speed, and low sample consumption, this analysis method has been widely used in petrochemical industry, biochemistry, health, quarantine, food inspection, environmental protection, food industry, medical clinic, etc. department. Gas chromatography solves the problems of quality inspection, scientific research, pollution detection, and production control of industrially produced intermediates and industrial products in these fields.

HTYSP-H Dissolved Gas Tester is a kind of high precision, multifunctional, economical and practical precision instrument. The instrument adopts a three-column three-gas operating system. The basic model is equipped with a hydrogen flame ionization detector (FID) and a thermal conductivity cell detector (TCD).

HTYSP-H Dissolved Gas Tester is controlled by microcomputer and integrated circuit, with Chinese and English interface, high degree of automation, good reliability, and keyboard setting of operating parameters. The

instrument has power-off protection, file storage and recall functions. The instrument uses a large-screen LCD display, which is rich and intuitive. The detector and its control parts of the instrument adopt a plug-and-play control mode, and the operation is simple and convenient. The instrument can operate at constant temperature and temperature. The column room is equipped with a flexible rear door automatic temperature control system with excellent column box performance. The temperature control precision is high, and the temperature rise and fall speed is fast. Can achieve near room temperature operation. The gas flow process is flexible, reliable, and easy to expand, suitable for a variety of detection and sampling combinations.

The detector adopts a unitized combination design, which is convenient for installation and maintenance. The instrument can be configured with a variety of detectors (TCD, FID, ECD, FPD, and NPD). It can be configured according to user analysis needs. The instrument can be installed with up to four detectors.

The sampling system of the instrument can be equipped with a variety of sampling devices such as packed column head sampling, glass-lined rapid sampling, capillary column split / splitless sampling with diaphragm cleaning.

The signal output of the instrument can be easily connected with peripheral data processing equipment or drawing equipment such as various chromatographic data processors and chromatographic workstations.

The instrument has the function of protecting the carrier gas from gas. It can effectively protect the chromatographic column and the thermal element during TCD operation from damage. The preset spare temperature control port is easy to expand and use.

The instrument has an over-temperature protection function. If any temperature control exceeds the protection temperature, the instrument will be powered off and alarmed.

Figure 1 Structure of the instrument panel

A. Preparation before installation

1、Preparation before installation

(1) Workroom and workbench: The workroom should not be interfered with by flammable and explosive gases and strong electromagnetic fields and electric sparks. The room should be well ventilated; the workbench should be able to bear the weight of the entire set of instruments, and the back of the workbench should be Leave an appropriate gap (about 50cm) for work and maintenance).

(2) Power supply: The instrument uses 220V / 50HZ AC power supply. The input power of the power supply must be greater than the power consumption of the instrument (about 3kW); the power connection board must be reliable in contact; when the external power supply voltage fluctuates greatly, it should be used 5 ～ 10kW voltage regulator or voltage regulator adjust the voltage in time, otherwise it will have a significant impact on the performance of the instrument.

(3) Ground wire: In order to ensure the performance of the instrument and the personal safety of the user, the instrument must be reliably connected to the ground. It is recommended to use copper mesh or copper plate to bury in the

wet soil below one meter deep. It is best to add 1Kg of table salt to bury the ground wire. Use a 2 mm * 10 mm flat copper strip to weld and connect to the ground terminal of the instrument. It is not allowed to replace the ground wire with the power center line, and it is not allowed to connect the ground wire to the water pipe or radiator.

(4) Air source and gas pipeline: high-purity inert gas and pure air must be used. Nitrogen and hydrogen are supplied by high-pressure steel cylinders or nitrogen and hydrogen generators. Air can be supplied by oil-free air compressors, and high-pressure steel cylinders are used when convenient. When using high-pressure steel cylinders, nitrogen and air can use oxygen pressure reducing valves (0-25MPa / 0-2.5MPa), and hydrogen is a special hydrogen pressure reducing valve, which is a reverse wire (0-25MPa / 0-0.4MPa). The output pressure requirements of the gas source pressure reducing valve are: carrier gas (N2): 0.4MPa hydrogen: 0.25MPa air: 0.4MPa. When using an electron capture detector, the carrier gas must use high-purity nitrogen with a purity of 99.999% or more, preferably with a deoxidizer.

Pay attention to the following points during installation:

First refer to the information about the use of high-pressure steel cylinders, operate as required, and install the decompression table.

The gas cylinder is placed securely, and there is no fire or sparks around.

(5) The electron capture detector uses the Ni63 radioactive source. An exhaust pipe needs to be installed at the discharge port of the detector to allow the gas to be discharged out of the room. At the same time, the label indicates that radioactive isotopes are present. (It's better to let the discharge port be higher than the roof, and the nozzle should face down to prevent rain.).

2. Unpacking inspection

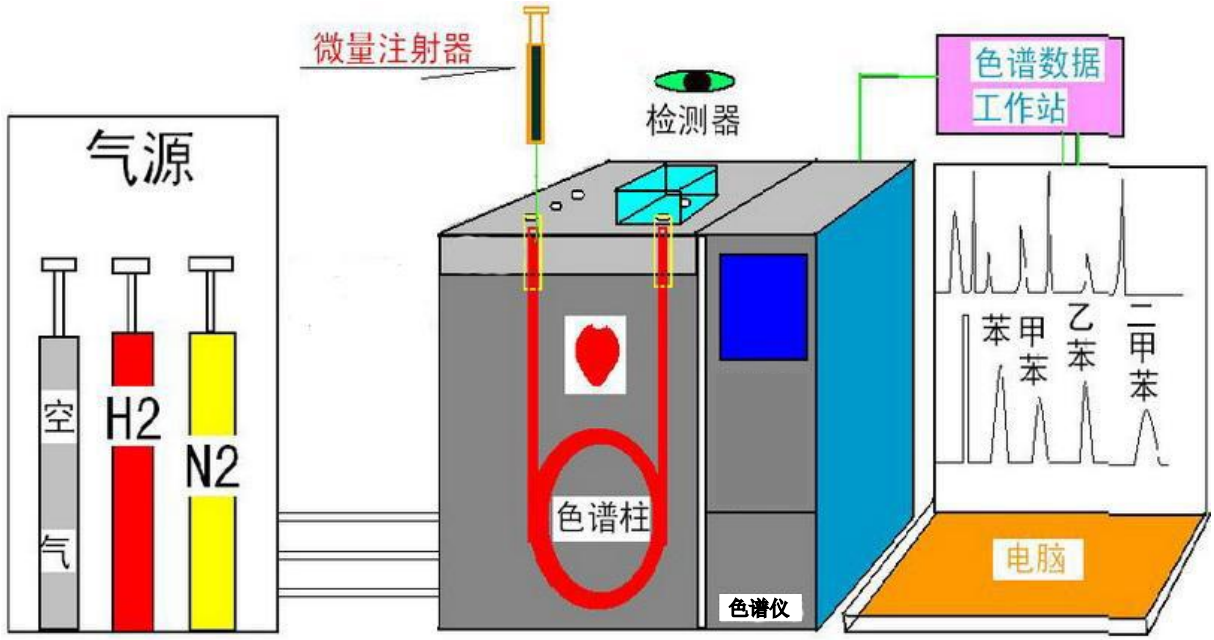
Inventory instruments and accessories according to the packing list.

II Instrument working principle, structure and installation

A. Instrument working principle

HTYSP-H Dissolved Gas Tester is an analytical tool for separation and detection of multi-component mixtures. It uses gas as the mobile phase and adopts the column chromatography technique of flushing method. From the structural point of view, it is an automatic recording instrument for continuous operation of carrier gas. The workflow is shown in Figure 2.

Gas chromatographic separation utilizes the different partition coefficients of the components in the sample between the gas phase and the fixed liquid phase in the chromatographic column. When the vaporized sample is carried into the chromatographic column by the carrier gas, the components are in The distribution between the two phases is repeated multiple times (adsorption-desorption or dissolution-release), because the fixed relative to each component has different adsorption or dissolution capacity (ie, different retention effect), so the operating speed of each component in the column It is different. After a certain column length, they will be separated from each other, leave the chromatographic column in sequence and enter the detector, and then be converted into an electrical signal by the detector and sent to the chromatographic data processing device for processing.。



色谱仪整体工作原理示意图

Schematic diagram of the overall working principle of the chromatograph

气源：Gas source　　空气：air　，微量注射器：Microinjector 检测器：detector 色谱柱：chromatographic column　　色谱数据工作站：Chromatographic data workstation　　苯：benzene　　甲苯：toluene　　乙苯：ethylbenzene 二甲苯：xylene　　电脑：computer　　色谱仪：Chromatograph

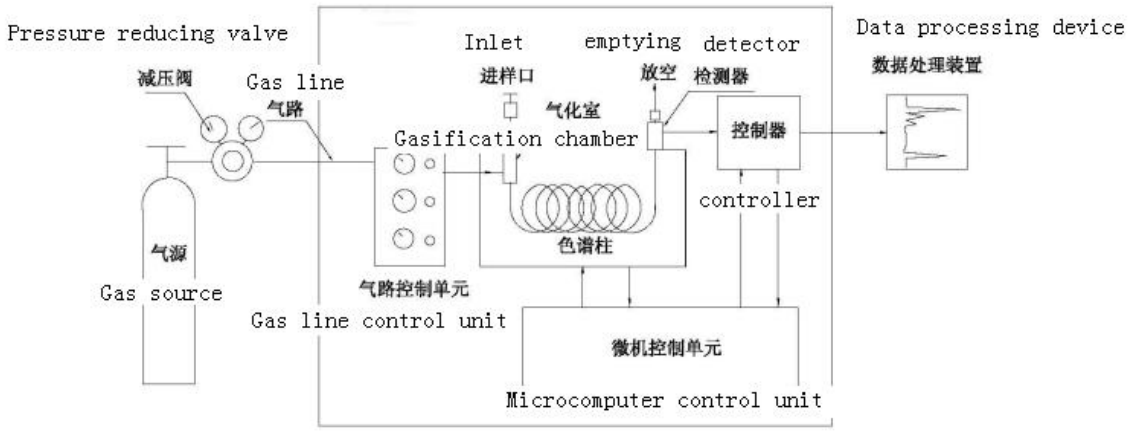
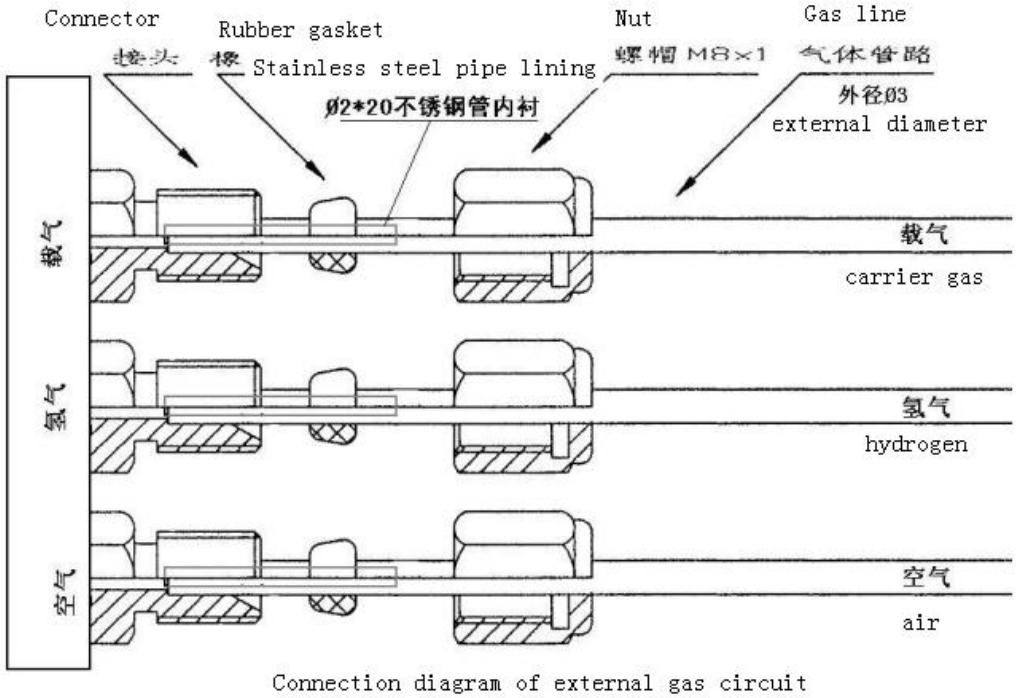


Fig. 2 work flow diagram of oil chromatography analyzer

B. Instrument structure

C. Installation preparation

III Instrument operation



Connection diagram of external gas circuit of chromatograph

When cylinder is used for air supply, each cylinder must be equipped with a gas pressure reducing valve to reduce the high-pressure gas to the required pressure value. Only one gas can be used for the pressure reducing valve, and it shall not be mixed. The oxygen pressure reducing valve without oil is 0-25mpa-0-2.5mpa at the outlet, which can be used as a pressure reducing valve other than H2. The hydrogen special pressure reducing valve (inverted wire!) should be used for H2

The picture above is the actual picture of the pressure relief valve connected to the high-pressure cylinder. High-pressure steel cylinders usually use 40L, and the pressure-reducing valve is screwed to the outlet of the high-pressure steel cylinder with a 300mm adjustable wrench to prevent air leakage. There are two pressure gauge heads on the pressure reducing valve, one indicates the pressure inside the high-pressure steel cylinder, and the other indicates the pressure at the outlet of the pressure reducing valve. When the pressure inside the high-pressure steel cylinder is still 1Mpa, it can no longer be used, and it is necessary to re-inflate。

A. Gas flow adjustment

The basic model of HTYSP-H Dissolved Gas Tester provides a gas path

control system for packed column carrier gas, hydrogen, air, auxiliary gas and capillary column gas path. See figure 7 Air circuit panel layout drawing. Before the instrument leaves the factory, the control valves such as carrier gas, hydrogen, and air on the gas pavement are closed.

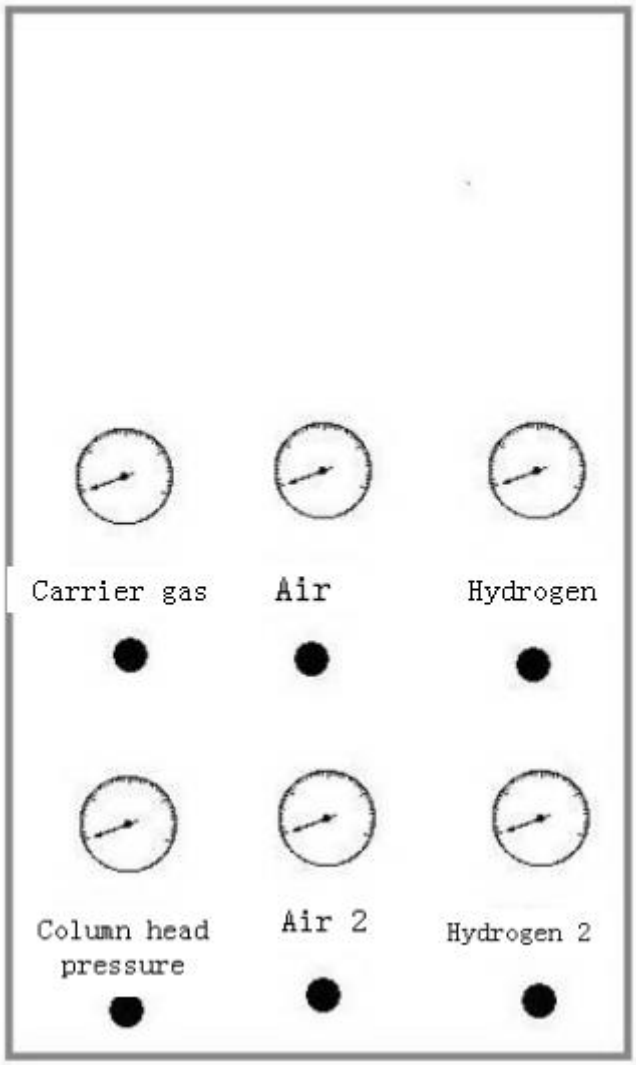
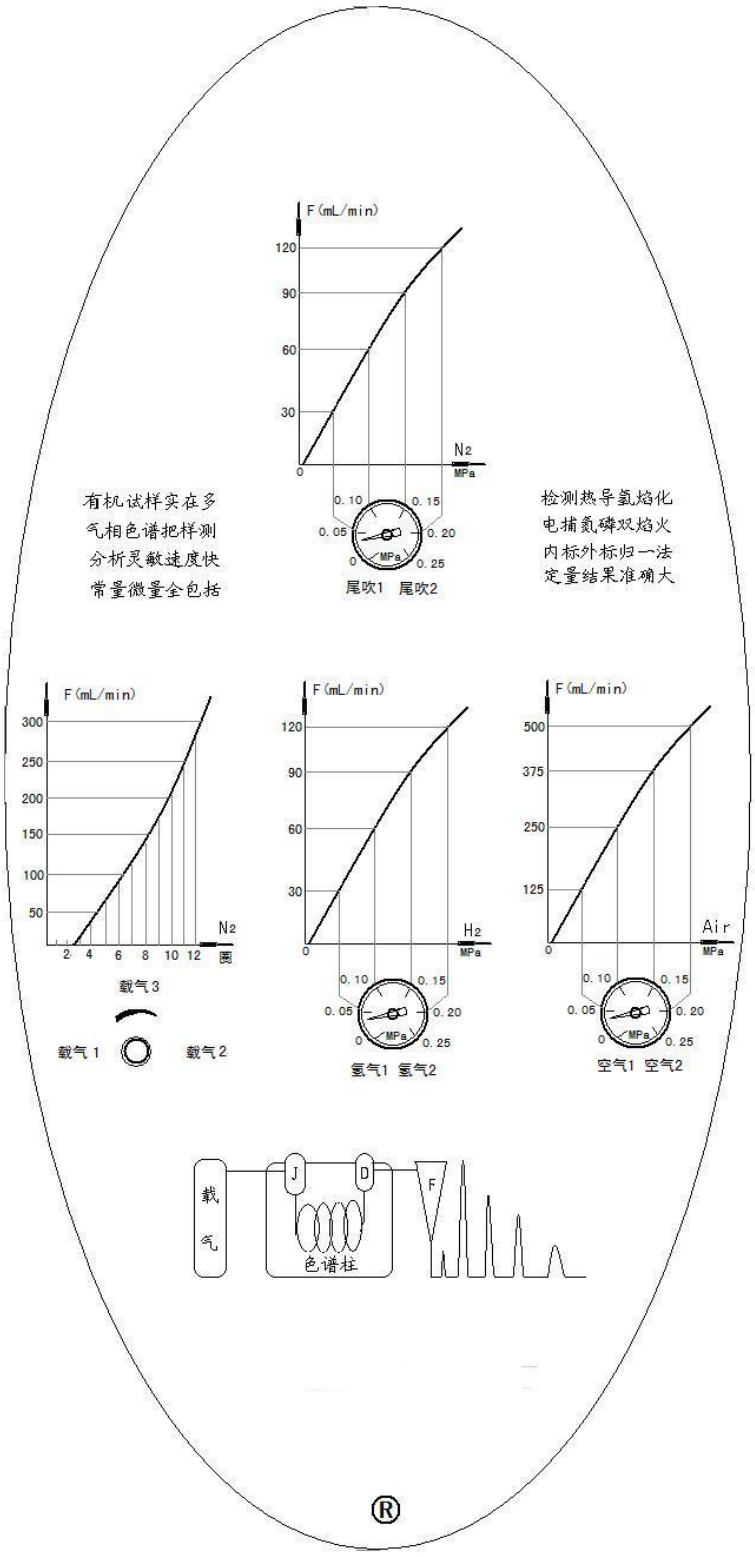


Figure 7 Air circuit panel layout



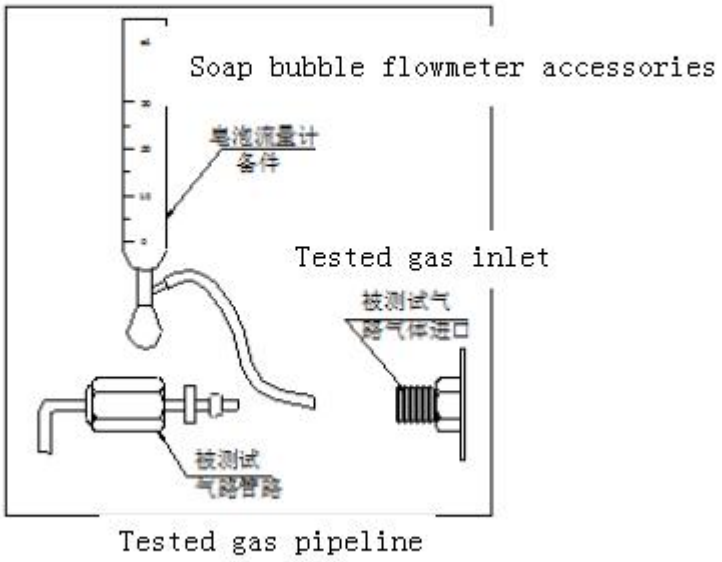
HTYSP-H gas pressure flow curve (for reference only)

B. Flow measurement

When there are special requirements for the gas circuit control system of the instrument, the gas flow rate can be recalibrated with a soap flow meter. See the connection diagram (8) for the gas path. Put the soap film flowmeter into the foaming agent (the foaming agent can be prepared with the white cat` detergent, the method is the same as the leak detection liquid), and connected to the detector to be measured. In order to reduce the measurement error, when measuring the gas flow of the air circuit, a larger soap film flowmeter should be used. After passing the gas, measure the elapsed time of the soap film from 0 to 10 with a stopwatch, and calculate the gas flow rate in ml / min. In order to avoid contaminating the gas path, it is necessary to pay attention to the height of the soap liquid used in the flow meter to prevent the soap film solution from flowing into the gas path from the flow meter. Figure 8 Flow measurement diagram

For example: use a stopwatch to measure the time elapsed from 0 o'clock to 10 ml of soap film for 12 seconds, then the measured flow rate F = 10 * 60/12 = 50 ml / min

The stopwatch function of the instrument can be used: the time elapsed from 0 o'clock to Xml of the soap film is T seconds, then the measured flow rate F = 60 / T * X ml / min



C. Packed column installation

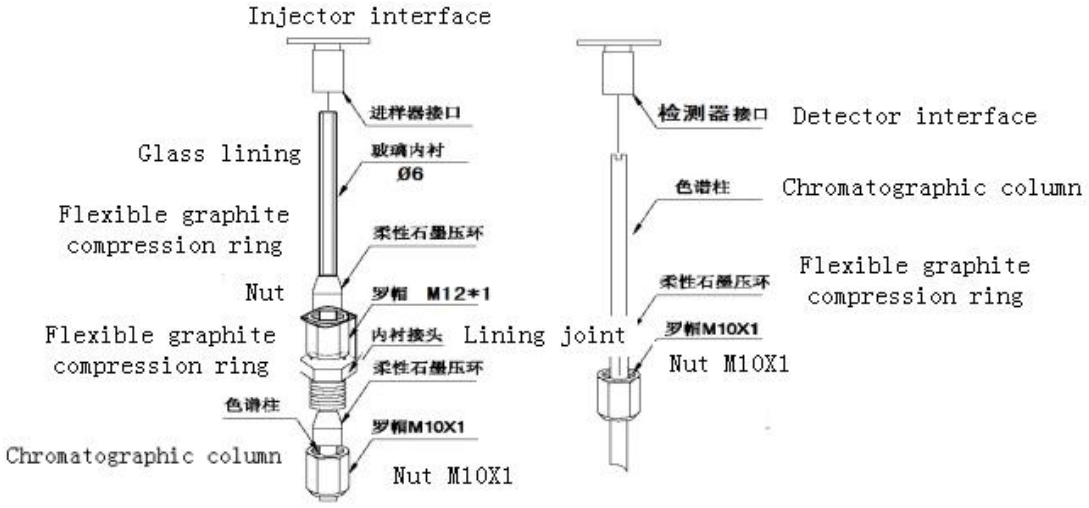


Figure 9 Dimensions of packed column

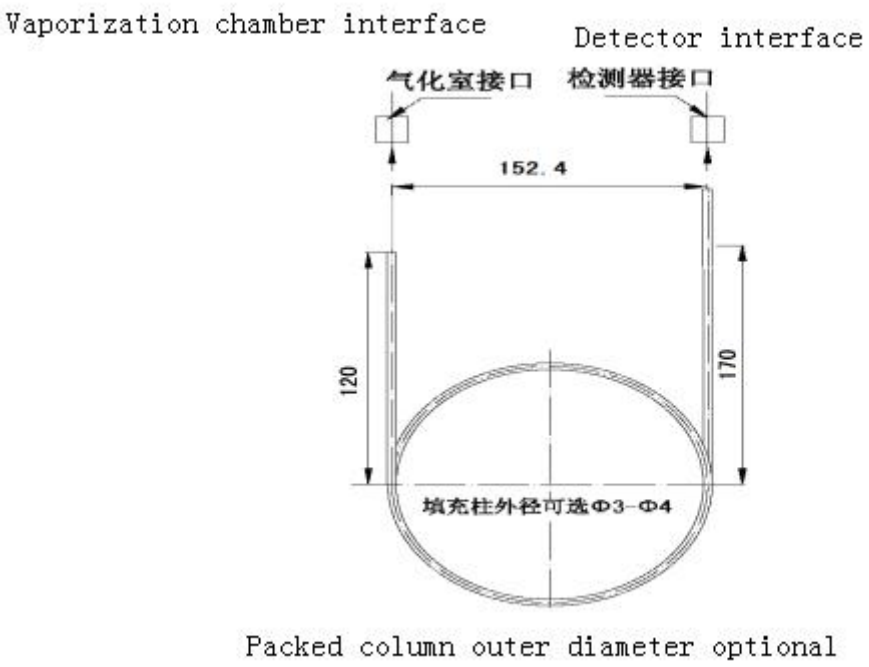


Figure 10 Packed column installation drawing

IV Keyboard and its control operation

A. Control panel and keyboard

《0～9》-----number key；

《·》-----Press once for decimal point key, press twice for clear key；

启动/《START》-----Program run start key；

停止/《STOP》-----Program run termination key；

菜单/《MENU》-----Menu；

清除/《F》-----Clear alarm function key；

《▲》-----Cursor up key；

《▼》-----Cursor down key；

《◀》---- Cursor left key；

《▶》----Cursor right key；

《输入》----Confirm key。

Figure 11 control panel

Turn on the power switch located at the bottom right of the chassis, the instrument is powered on, and the LCD screen lights up. After a few seconds, the instrument will display the interface as shown in [Figure 12] after a few seconds (when the cursor is in the bottom state of any interface behind, you can press "0" to return to this interface)

After a few more seconds, the interface displays as [Figure 13].

This interface is the temperature control interface, and the cursor is now in the temperature setting field. If you want to raise the temperature of the detector to 260 ℃, just move the cursor to the set temperature of the detector, and press in turn: "2" + "6" + "0" + "OK" key The set temperature is 260 ° C. If the input is wrong, press the "·" key twice to clear it; reset the temperature. In the same way, you can set the temperature for the oven, vaporization, and detector. The running time column is the time from the start of this boot to the time before shutdown. The next time you boot, the timer will be restarted. In the heating status bar, "0" means off, "1" means on. Move the cursor to the heating status bar, press the "1" + "Confirmation" key in sequence to display the "on" state, and press the "0" + "Confirmation" key in sequence to display the "off" state.

When setting the temperature, care must be taken not to exceed the

protection temperature. The instrument sets the initial protection temperature to 400 ° C. When the temperature parameter of a certain temperature heating zone of the instrument is improperly set or the instrument temperature is out of control due to various reasons. When the temperature reaches the protection temperature value, the instrument will automatically turn off all heating power, the buzzer will alarm, and display the alarm code and error message. This state will remain until the instrument is turned off (or artificially processed and cleared the alarm state). After the alarm, please do not turn off the total power of the instrument immediately, check the alarm code, find the reason and error information, and solve the fault according to the error information.

The over-temperature protection can be used reasonably during the operation of the instrument. When the temperature is out of control, the instrument and peripheral equipment can be effectively protected to avoid unnecessary losses.。

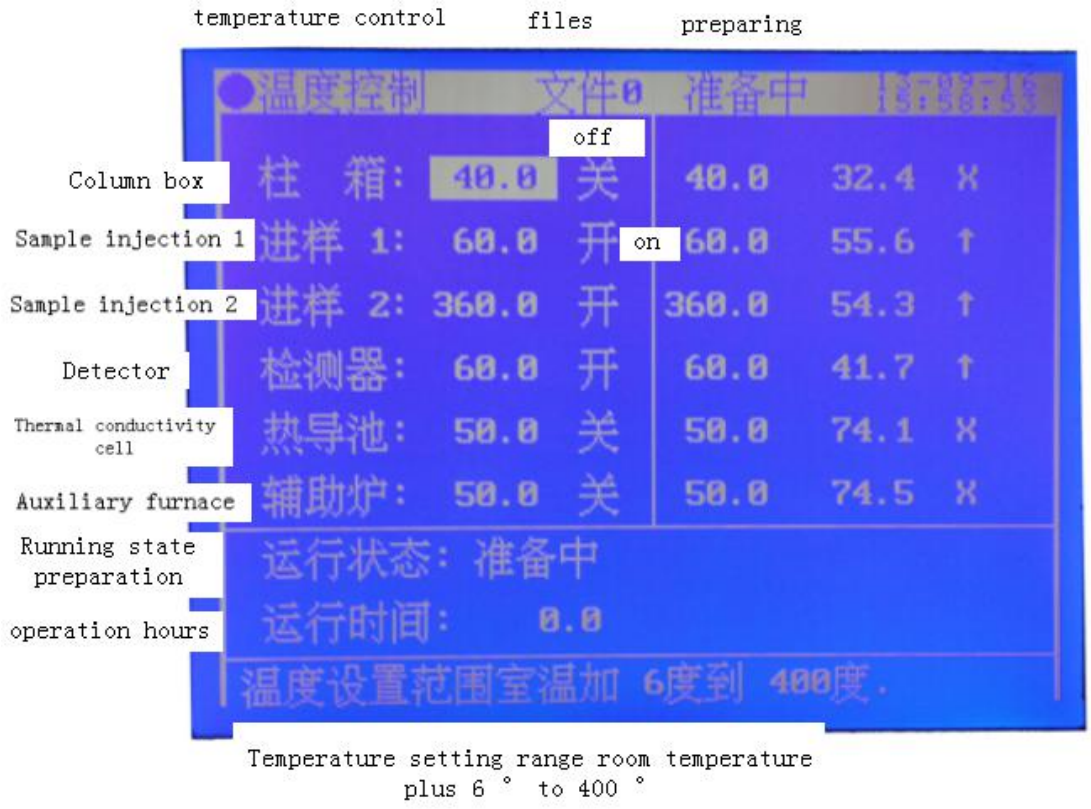


Figure 13 Temperature control interface

Note: The setting of over-temperature protection temperature must be 20 ° C

or more than the use temperature, and the highest can not be higher than 400 ° C. If it is lower than the use temperature or the setting is wrong, the system will give an alarm prompt, and the protection temperature setting data is still The data will be in a protected state and will not work properly.

Description:

Column box ----- refers to the column chamber temperature;

Vaporization 1 ----- refers to the temperature of the packed column vaporization chamber (inlet);

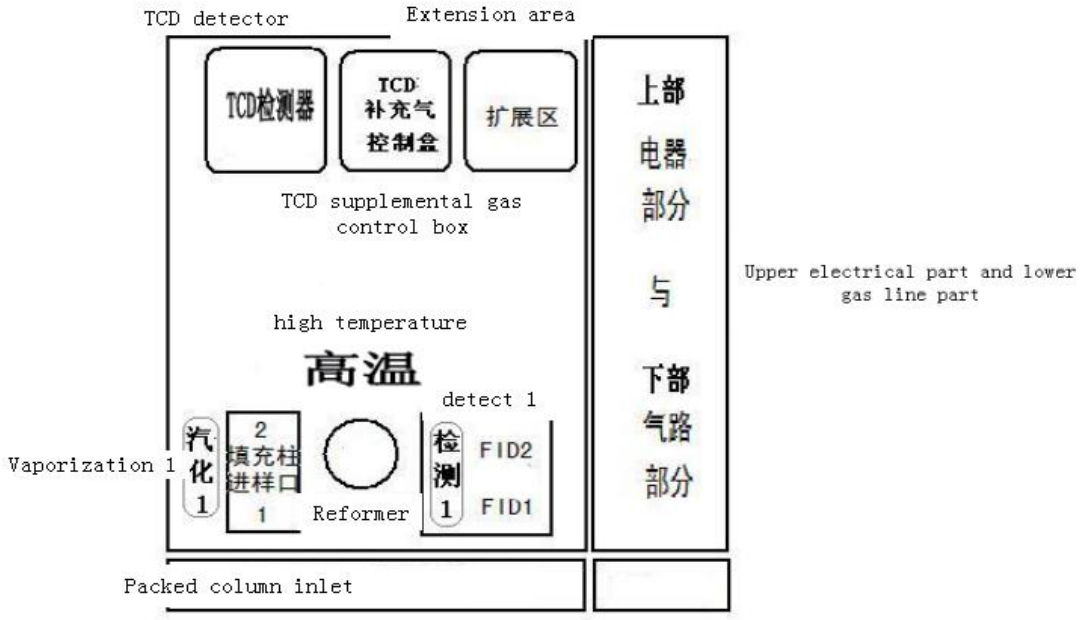
Vaporization 2-refers to the temperature of the capillary column vaporization chamber (inlet);

Detection 1 ----- refers to the temperature of the hydrogen flame ionization detector (FID) (hydrogen flame 1-hydrogen flame 2 is the same temperature) or NPD temperature (when there is NPD);

Detection 2 ----- refers to the temperature of the thermal conductivity detector (TCD) or FPD temperature (when FPD is present);

Detection 3 ----- refers to the temperature of the electron capture detector (ECD) or the temperature of the methane reformer (when there is a conversion);

See the figure below for the location diagram of each heating unit。



Location map of each heating unit

0-9 number key, used to set the value of parameters

Voice:

A short sound is emitted during normal key operation, a long sound is emitted in case of key error, and a continuous short sound is emitted in case of alarm.

Press the menu / menu key, the status bar will display "temperature control", "detector", "event", "program warming", "auxiliary function", and then press the right cursor key 《▶》, move the cursor to the detector bar, and then press the "confirm" key, the display will display the detector control interface [Figure 14].

At this time, when the cursor is at the TCD polarity position, the following status bar shows 0 = negative, 1 = positive, that is, press the 0 + confirm key, input the negative and press the 1 + confirm key, input the right cursor is at the TCD current position, the following status bar shows the TCD hot wire current 0 to 200mA, that is, the TCD hot wire current range is 0 to 200mA.

The polarity of FID and TCD show the same 0 = negative, 1 = positive, the sensitivity of FID is 0 to 4, 0 is the highest, 4 is the lowest.

The sensitivity of ECD is 0 and 1, 0 high sensitivity, 1 low sensitivity, ECD current: 0 = 0.5na, 1 = 1NA, 2 = 2Na。

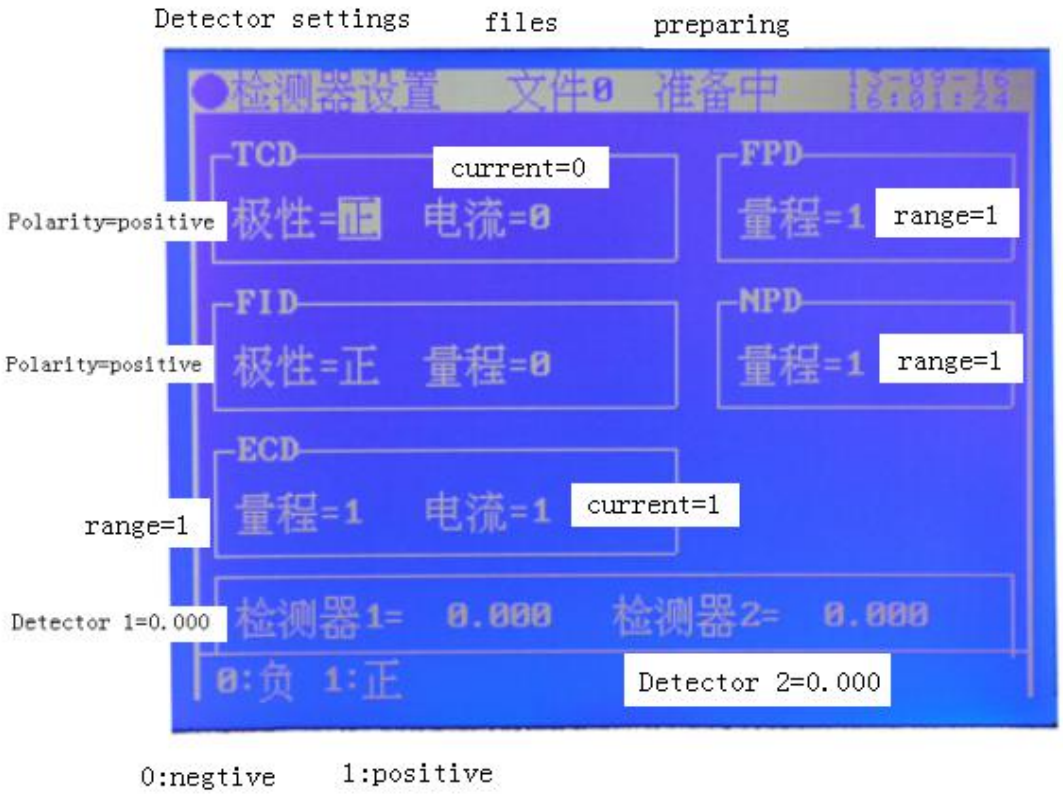


Figure 14 Detector control interface

The sensitivity of FPD is 0 to 3, with 0 being the highest and 3 being the lowest.

The sensitivity of NPD is 0 to 3, with 0 being the highest and 3 being the lowest.

When operating different detectors, the corresponding values of polarity, current, and range must be selected.

Specific input method: as above, move the cursor to the position of the polarity, current or range you want, and then press the "number" + "confirmation" key.

In this status bar 丨temperature control 丨detector 丨event 丨programming temperature 丨auxiliary function 丨, press the right cursor key "", the cursor moves to the "event" column, and then press the "OK" key, the display changes [15] Interface.

This interface is set for event control. Events are divided into event 1 and event 2, and event 1 and event 2 are set to 5 on and 5 off. All settings can be made, such as the switch of the solenoid valve to control the automatic sampling and

switching of the six-way valve.

When controlling split / splitless, the initial setting should be set to "OFF".

5 on 5 off, time is cumulative.

Such as: "on" at 0.1 minutes, "off" at 0.2 minutes;

"On" at 0.3 minutes and "Off" at 0.4 minutes;

"On" at 0.5 minutes and "Off" at 1.0 minutes;

"On" at 2.0 minutes and "Off" at 2.5 minutes;

"On" at 3.0 minutes and "Off" at 6.0 minutes.

Cycle times and cycles should be used in conjunction with the program temperature setting。

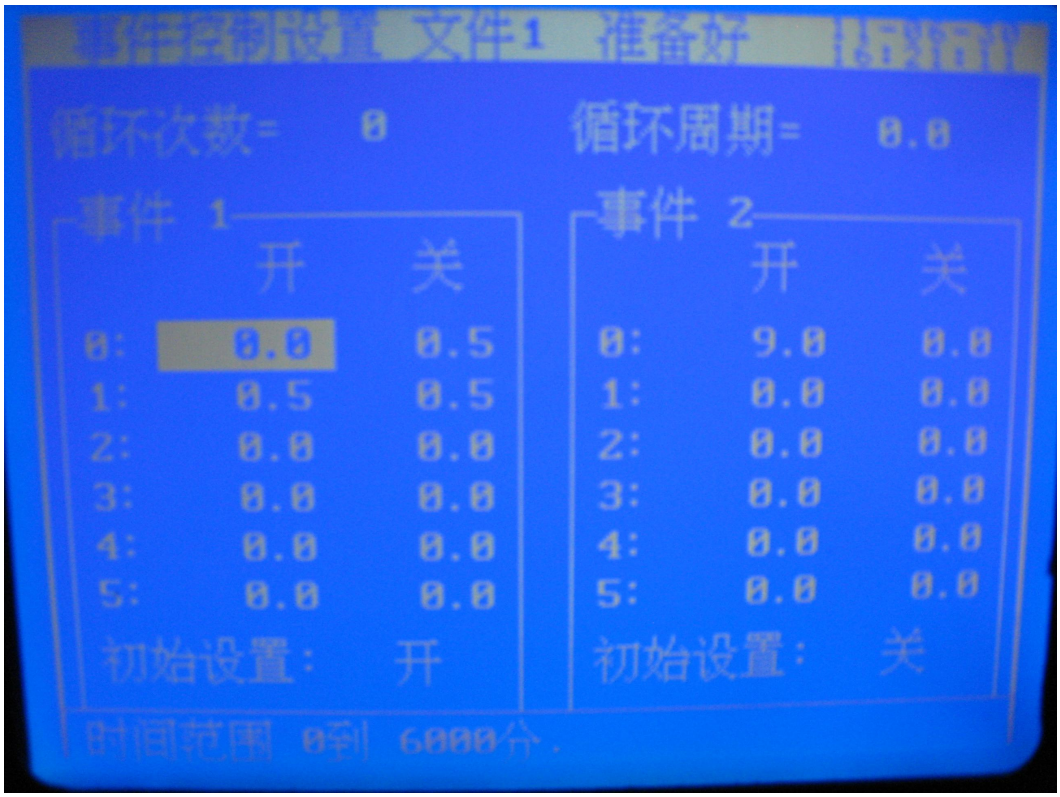


Figure 15 Event control setting interface

事件控制设置-Event control settings ，文件 1-file 1 ， 准备好-get ready ，

循环次数-Number of cycles ，循环周期-Cycle period ，事件 1-Event 1，

事件 2-Event 1 开-on 关 0off ，初始设置：开-Initial setting: on ，

初始设置：关-Initial setting: off

Figure 16 The temperature rise programming interface

程序升温设置-Program temperature rise setting ， 文件-file ， 准备中-preparing ， 升温速度-Heating rate， 恒温温度-Constant temperature，恒温时间-Constant temperature time ,恒温温度范围 0-400 度-Constant temperature range 0-400 degrees

After pressing the "Menu" key, move the cursor right to the "Program temperature" column, and then press "Confirm", the display shows the [Figure 16] interface. This is the temperature programming interface.

As shown in Figure 0, the state is a constant temperature state (that is, the initial temperature is constant). There are a total of 8 steps of temperature program, constant temperature range 0 ～ 400 ℃, time range 0 ～ 6000 minutes, heating rate 0 ～ 40 ℃ / min.

In the temperature-programmed working state, the interface will display the number / number, number / number or number / number symbol, which means it is in a constant temperature state, means it is in a temperature-up

state, means it is in a temperature-down state, and the number / number: the number above indicates the current location The order at the point, the figure below is the total order of temperature programming.

See [Figure 17] for the program temperature curve of column thermostat.

T1, T2 ... Tn are the first-order, second-order ... nth-order comprehensive temperature, and T0 is the initial temperature.

T1, T2..... Tn are the first-order, second-order … nth-order final temperature constant time, and t0 is the initial temperature constant time.

V1, V2 ... Vn are the first-order, second-order ... nth-order heating rates, respectively.

After setting the heating rate, constant temperature, and constant temperature, press the "START" key to start the program, or press the "Menu" key twice. The status bar displays 丨Start program丨Stop program丨View / clear alarm, and then press the `` OK '' key to start program。

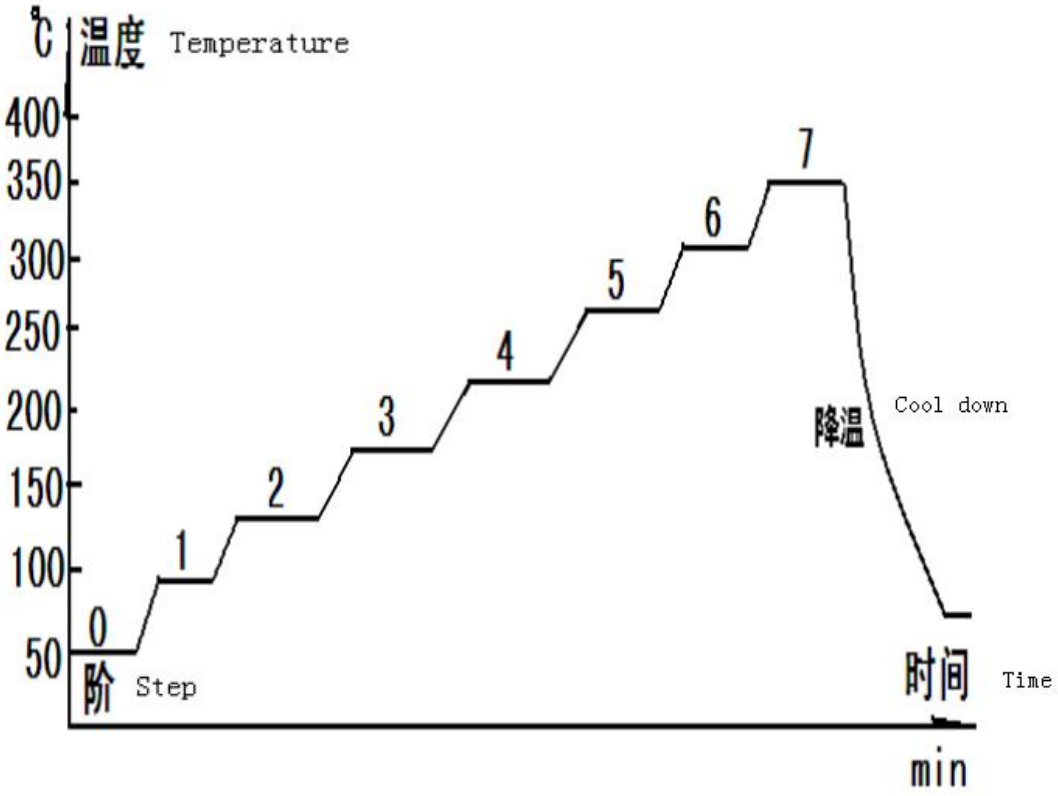


Fig. 17 Temperature programmed curve

Press the "Menu" button again, the status bar displays "temperature control" detector "event" "program temperature increase" auxiliary function ",

move the cursor in the status bar to the" auxiliary function "column, and press the" OK "button, the status The column displays 丨User configuration丨Instrument parameters丨Protection temperature丨Stopwatch丨. At this time, the cursor is in the column of "User Configuration", and then press the OK key "OK", the [Figure 18] interface is displayed, which is the auxiliary function interface.

The time and date can be reset here.

Keyboard sound setting: 0 ～ 99, 0 sound is the smallest, 99 sound is the largest.

Setting method: Move the cursor to the keyboard sound and press "4" + "5" + "Confirm" keys in sequence. At this time, the keyboard sound is set to 45.

Alarm sound setting: 0 ～ 99, 0 sound is minimum, 99 sound is maximum.

The setting method is the same as the keyboard sound setting method.

Language choices are Chinese and English, 0 = Chinese, 1 = English, move the cursor to the language, press the "0" + "OK" key, then the language selection is Chinese; move the cursor to the language, then press "1" + "Confirm" button, at this time the language is English.

File number: 0 ～ 9,90 is to clear the current, 99 is to clear all.

The input of the file number is to move the cursor to the file and press "8" + "Confirm" key in turn. At this time, the file is 8, and all the parameters set in the instrument are the contents of file 8. If other file numbers are input, the file 8 is automatically stored. To retrieve the contents of file No. 8, simply enter the file number as 8 and press the OK key。

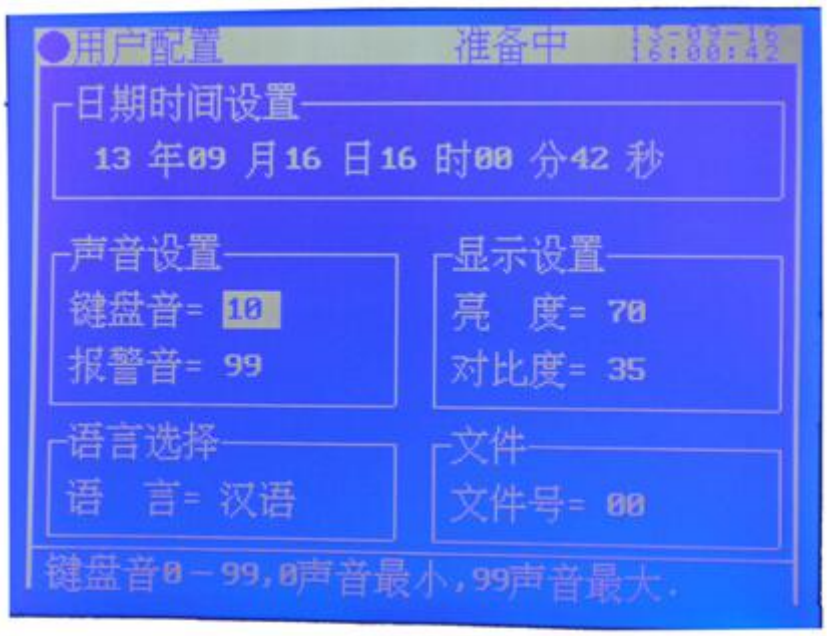


Figure 18 auxiliary functions

用户设置-User settings 准备中-preparing ，日期时间设置-Date time setting 声音设置-Sound settings 显示设置-Display settings 键盘音=10 Keyboard sound=10 亮度=70 brightness=70 报警音=99 Alarm sound=99 对比度 Contrast=35 语言选择=汉语 Language selection = Chinese 文件-file 文件号-file number ,键盘音 0-99 Keyboard sound，0 声音最小，99 声音最大 0 is the smallest, 99 is the largest

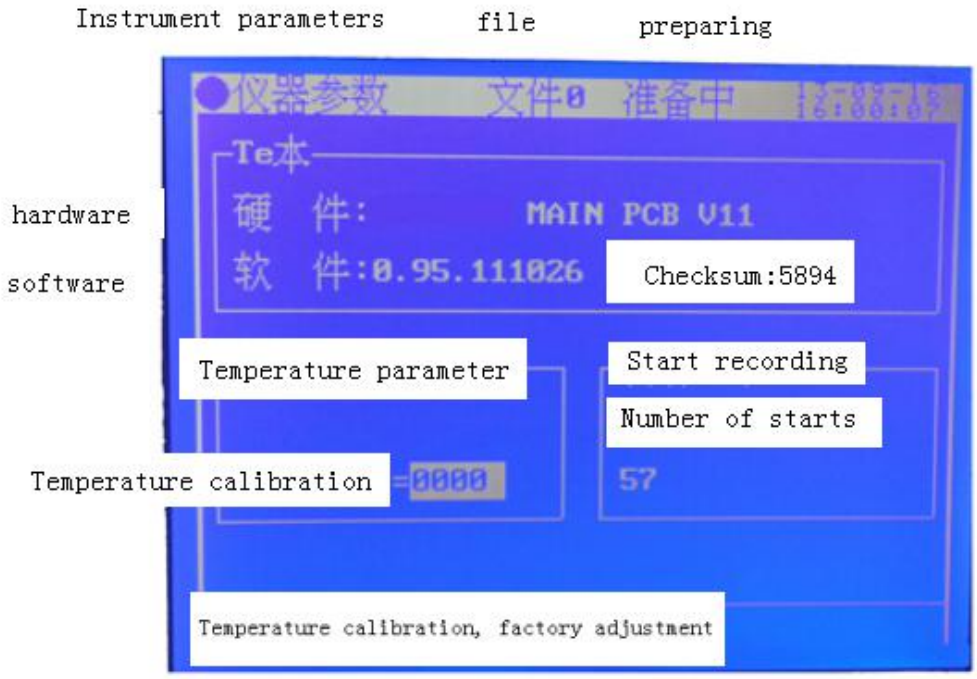


Figure 19 Instrument parameter interface

Press "menu" key, the status bar will display "user configuration", "instrument parameters", "protection temperature" stopwatch, move the cursor to the right of "instrument parameters" column, and then press "confirm" key, the display will change to [figure 19] interface

This interface is the instrument parameter interface. The instrument has been calibrated in the factory. Generally, users should not change it at will. "Start record" it records the number of times the instrument starts.

Setting of protection temperature:

Set the protection temperature of each heating zone under the protection temperature interface.

The setting of the protection temperature shall be higher than 20 ℃ of the maximum use temperature.

When the actual temperature exceeds the set protection temperature, the instrument will alarm and stop all heating.

Press the menu key, the status bar will display the user configuration, the instrument parameters, the protection temperature, the stopwatch, move the cursor to the stopwatch, and press the OK key, the screen will display the [figure 20] interface。

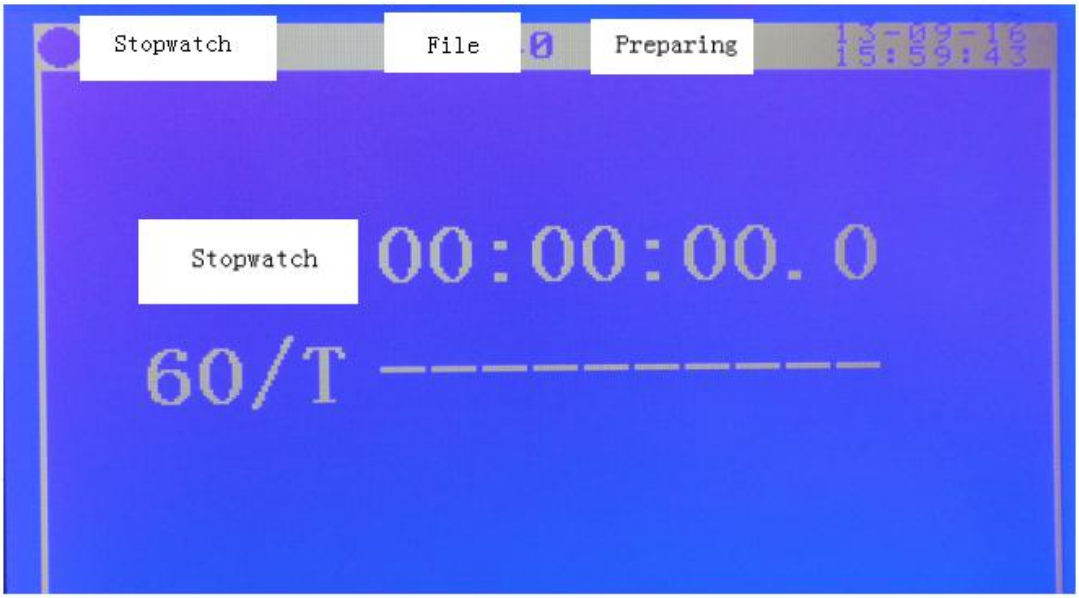


Figure 20 Setting the stopwatch timing interface

This interface is for setting stopwatch timing interface.

Press the "▲" key or "Confirm" for the first time to start timing;

Press the "▼" key or "Confirm" for the second time to stop the timer and display 60 seconds divided by the instant time value to facilitate the user to calculate the minute flow.

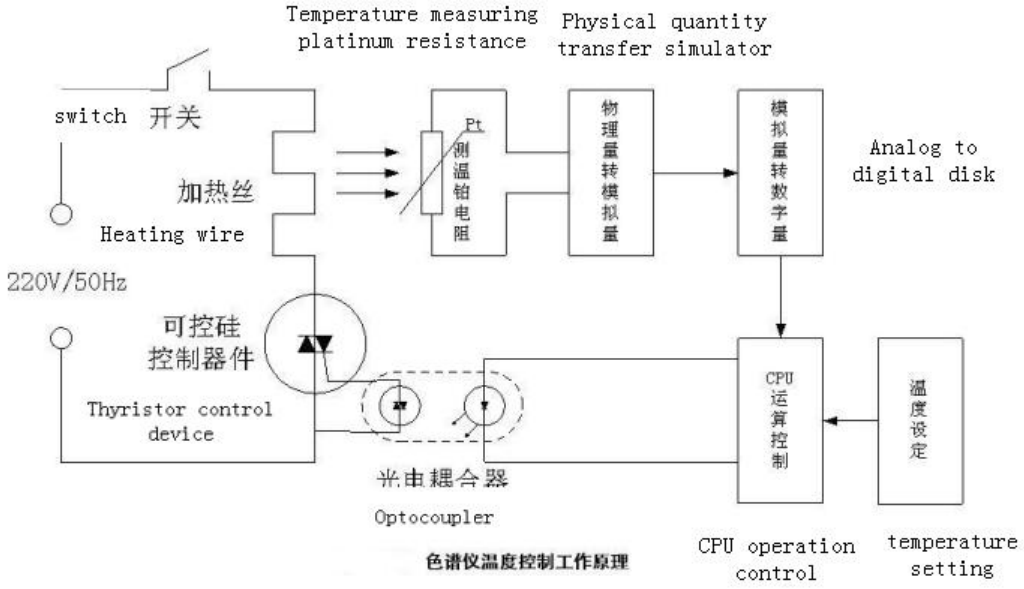
Press the "OK" button for the third time to clear the timer time.

When the cursor is at the bottom status mark of any interface behind, you can press the "" key to return to this interface.

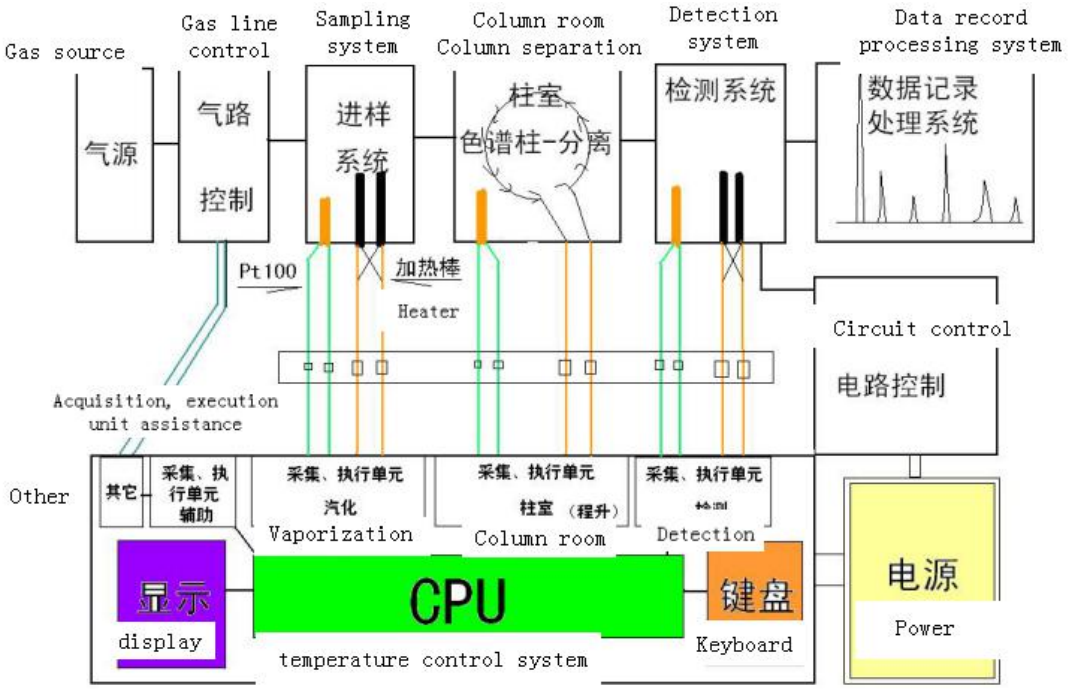
Press the "Menu" key twice, the status bar will change to "Temperature control" Detector "Event" Program temperature increase "Auxiliary function" At this time, the cursor is in the "Auxiliary function" column, move the cursor to

select the menu, press the OK key to enter any of the above An interface.

The main board of the temperature control circuit of the HTYSP-H oil chromatography analyzer is hung on the upper part of the control box, and the heating plate and the ignition plate are on the rear of the instrument. The connection is shown in the figure below. See the diagram below for the working principle diagram.

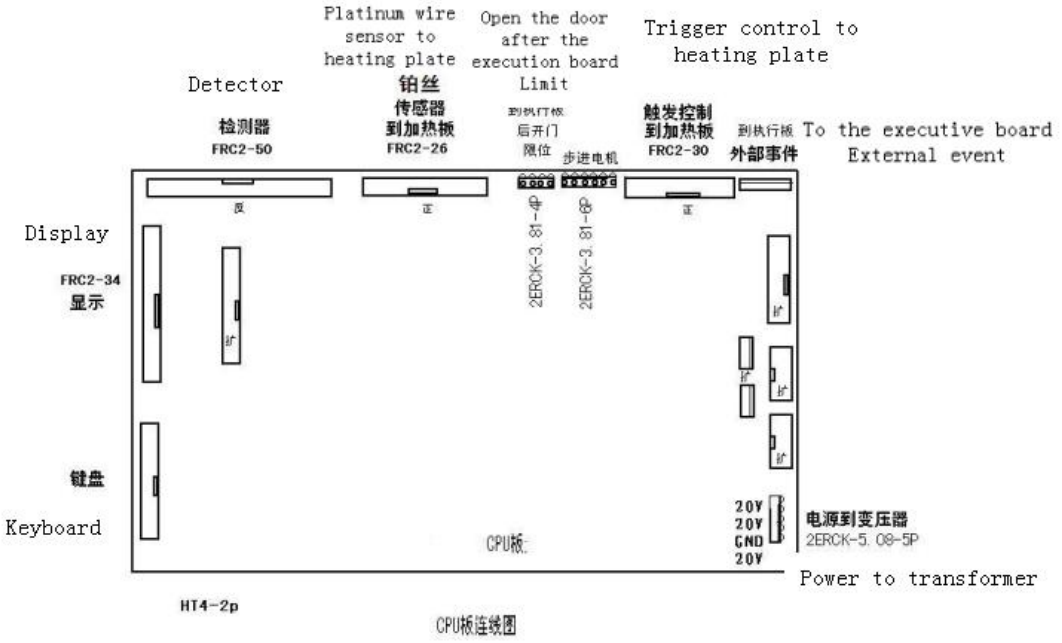


Chromatograph temperature control working unit



Schematic diagram of temperature control heating and sampling structure

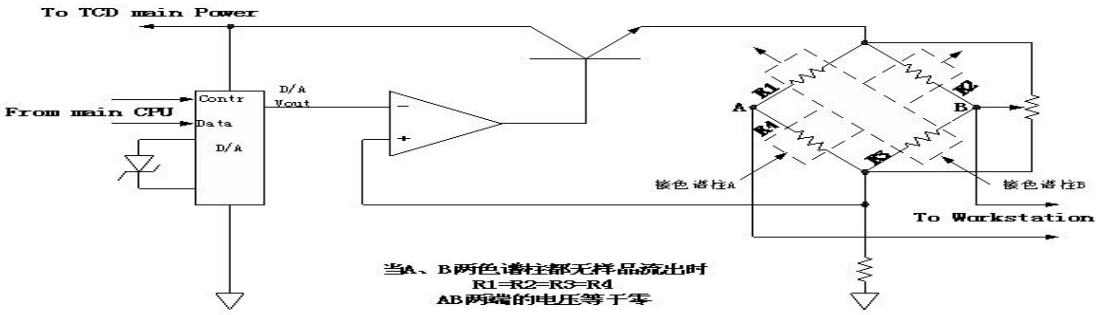
HTYSP-H oil chromatography analyzer CPU board connection is shown below



CPU connection diagram

V Installation and use of thermal conductivity detector (TCD)

Working principle: In a TCD in thermal equilibrium, when the components enter the measuring arm cell cavity, the gas thermal conductivity coefficient will change due to the change of gas composition. Changes in the temperature of the thermistor cause a change in the resistance of the thermistor. The change in the resistance of the thermistor causes the output signal of the Wheatstone bridge to change. So the signal change of TCD is the result of successive changes of various variables



When both A.B columns are not deposited, R1 = R2 = R3 = R4, the voltage across A.B is zero

The structure of the thermal conductivity detector:

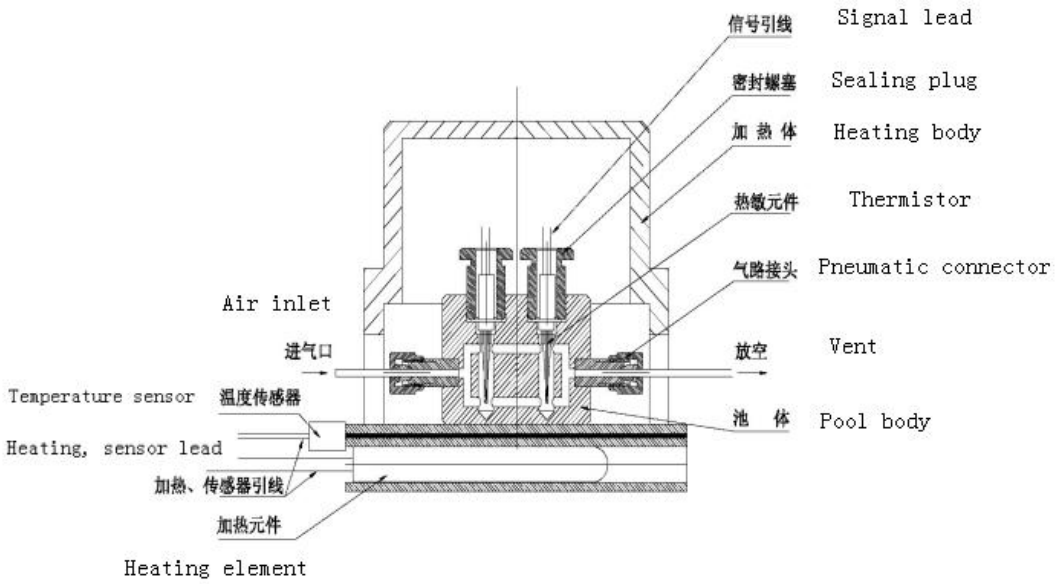
The thermal conductivity cell detector adopts a semi-diffusion structure, a 100Ω rhenium tungsten wire processed by a special process, powered by a constant current source, and has the function of cutting off the hot wire. It is equipped with 2 channels of special supplemental gas, see the flow chart of TCD supplementary gas circuit below, in order to use a large pore capillary. The structure of the thermal conductivity detector is shown in Figure 21。

A. Precautions for use：

This instrument has a double-column and double-air circuit structure. Even if one channel is not used, two columns should be connected. To ensure the balance of the two channels, the carrier gas flows out through the thermal conductivity cell detector, and the flow rate of each channel is about 50ml / min. (Measured from the vent of the thermal conductivity detector)

1. There should be no corrosive substances in the carrier gas, pay attention to the purification of the gas path.

2. Before use, the carrier gas should be passed for 30 minutes to expel the residual gas in the pipeline to prevent the oxidation of the rhenium tungsten wire. When the carrier gas is not passed, it is strictly prohibited to add bridge flow, or there is a large airflow impact.



3. The thermal conductivity detector cannot be directly blown with gas, or there is a large airflow impact. Figure 21 Thermal conductivity detector

4. No strong mechanical vibration is allowed.

5. The instrument can not be placed at the air outlet; the TCD vent should be connected to the outdoor through the pipeline, and the air outlet should also be fixed to prevent the wind from swinging and affecting the baseline.

6. Shut down, the heating should be turned off, wait until the temperature of the thermal conductivity detector drops below 80 ℃, and then turn off the power supply, gas source; this is conducive to extending the life of the thermal conductivity detector.

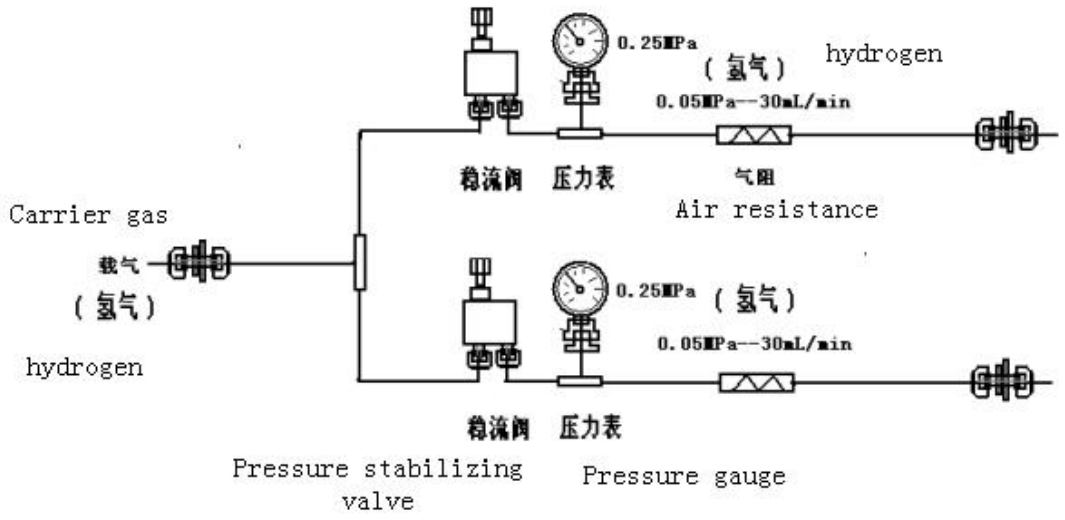
7. In the case of satisfying the analysis sensitivity, set as low a bridge current as possible, which is conducive to the stability of the instrument and increases the service life of the thermal conductivity detector.

8. After high temperature analysis, when the chromatographic column needs to be removed, be sure to wait for the temperature of the column chamber to fall below 60 ℃ and the temperature of the thermal conductivity detector to fall below 80 ℃ before removing the chromatographic column to prevent damage to the column joint and thermal conductivity. Detector.

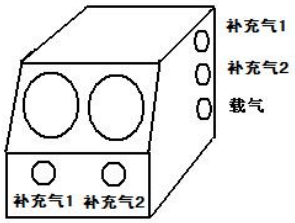
9. When using different carrier gases and TCD detectors at different

temperatures, the maximum allowable value of the bridge current (mA) is as follows：

温度 / 允许桥流 / 载气	100℃	150℃	200℃	250℃	300℃
H_2	160mA	140mA	120mA	100mA	75mA
N_2	120mA	100mA	75mA	50mA	25mA



Flow chart of TCD supplementary gas circuit



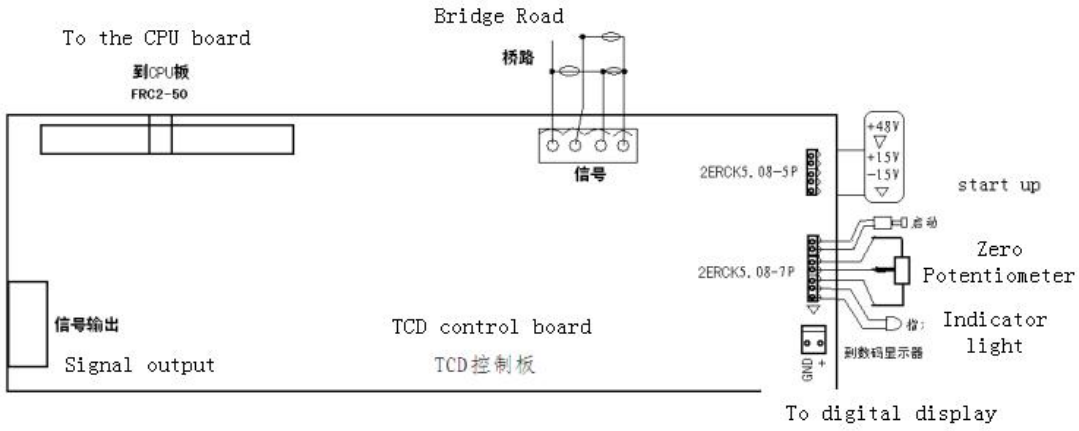
补充气 1-Supplementary gas 1 ，补充气 2-Supplementary gas 1

载气 Carrier gas

Thermal conductivity of some gases and organic vapors

Chemical compound	1Thermal conductivity at 00 ℃	Chemical compound	Thermal conductivity at 00 ℃
Air	0.32	Methanol	0.23
hydrogen	2.24	Ethanol	0.22
helium	1.75	acetone	0.18
nitrogen	0.32	Chloroform	0.11
oxygen	0.32	Methylene chloride	0.11
Carbon monoxide	0.3	Methyl chloride	0.17
carbon dioxide	0.22	Methyl ether	0.24
Methane	0.46	Propyl ether	0.19
Ethane	0.31	Butyl ether	0.17
Propane	0.26	Pentane	0.22
Butane	0.24	Cyclohexane	0.18
Hexane	0.22	ammonia	0.33
Ethylene	0.31	Ethyl chloride	0.17
benzene	0.18	Ethyl acetate	0.17

HTYSP-H oil chromatography analyzer TCD board connection is shown in the figure below



B. Instructions:

1. Check whether the thermal conductivity gas connection is correct.

2. Pass the carrier gas first, adjust the carrier gas 1 and carrier gas 2, and use the soap bubble flowmeter to measure the actual flow rate behind the column at the thermal conduction vent, and make the flow rates of the two

channels of carrier gas consistent. + Supplemental gas 10 = 50ml / min is better.

3. HTYSP-H thermal conductivity cell with two-way TCD make-up gas for low column flow analysis.

4. When the ventilation exceeds 30min, turn on the power switch and press the temperature key to set the operating temperature of the column chamber, vaporization chamber and detector. Press the detector key to set the bridge current. Press the start button to add bridge flow. The instrument is equipped with a current interruption protection function. When the inlet pressure of the instrument is lower than 0.1MPa, the instrument will automatically cool down and enter the shutdown procedure.

5. When the temperature is constant (preparing the lamp to play a check mark), turn on the workstation or data processing equipment, use the zero adjustment knob on the instrument panel to adjust the baseline to within 10mV (displayed when there is a number), and analyze after the baseline is stable .

6. Sensitivity and stability test

Test conditions: chromatographic column: 5% SE-30, chromosorbw, AM, DMCS support, 60-80 mesh, column length 2 meters, stainless steel column; column temperature 80 ℃, vaporization 120 ℃, thermal conductivity detector 120 ℃, bridge flow 130-160mA, first select 150mA sample benzene, injection volume 0.3μL。

Stability: 160mA bridge current, baseline drift ≤0.5mV / h。

Sensitivity: $S=\frac{1.065 \cdot h \cdot W_{1/2} \cdot F_C}{W}$ mv・ml/mg

h ・$W_{1/2}$- Peak area (mV・min)

Fc-Carrier gas flow rate (ml/min)

W-Injection volume (mg)

For example: benzene peak area 2700mV. The flow rate behind the S column is 50ml / min, the injection is 0.3ul, and the benzene specific gravity is 0.88.

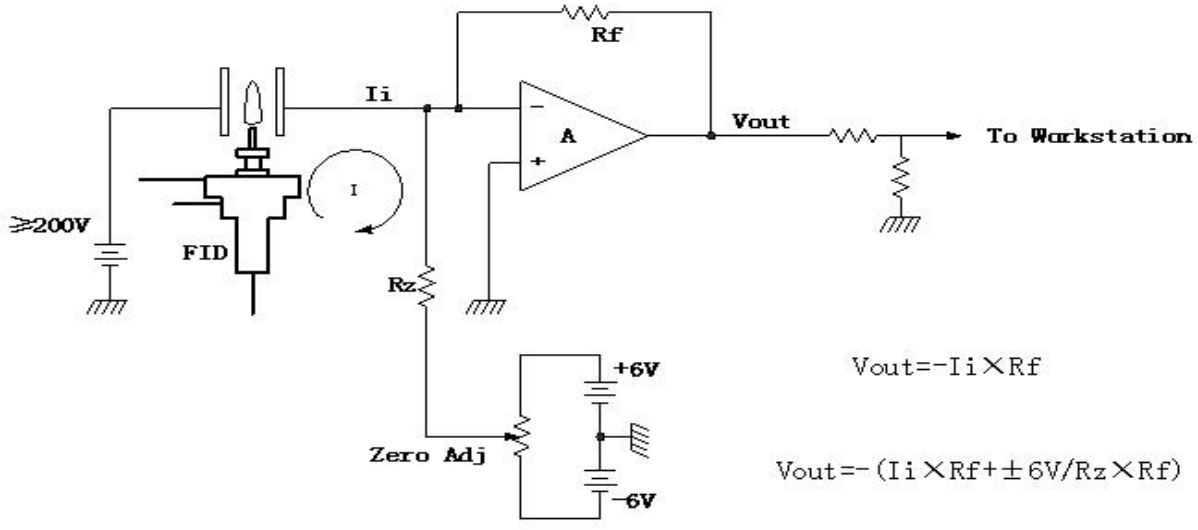
$$S = \frac{2700mV.\ S \times 50ml/min}{0.88mg/uL \times 0.3ul}$$

$$= 8522mv \cdot ml/mg$$

VI Installation and use of hydrogen flame detector (FID)

Working principle:

In FID, a high-voltage electrostatic field is composed of a collector and a polarized electrode. H2 and oxygen sprayed from the FID nozzle are ignited to produce a high-temperature flame. Under the action of the high-temperature flame, the organic matter flowing out from behind the column will be ionized As the ionized part is in the high-voltage electrostatic field, positive ions move to the collector (negative electrode), and negative ions and electrons move to the polarized electrode (positive electrode), thus forming a micro-current signal. Of course, H2, N2 and AIR are inorganic gases that will not be ionized, so if no organic gas flows out of the column, the FID will have no microcurrent signal. The working principle diagram is as follows:



Features: High sensitivity, small dead volume, fast response time, air and hydrogen need to be introduced in addition to the carrier gas, and there is no signal for permanent gas and water.

Scope of application:

1. FID is a universal detector with a wide range of applications. Analysis of organic compounds with a boiling point of 400 ° C. Such as hydrocarbon analysis, pesticide analysis, chemical analysis, food and environmental scientific analysis.

2. Can be directly used for the analysis of capillary chromatographic columns of various calibers。

A. Hydrogen flame detector structure（FID）

The structure of HTYSP-H hydrogen flame detector is shown in Figure 22：

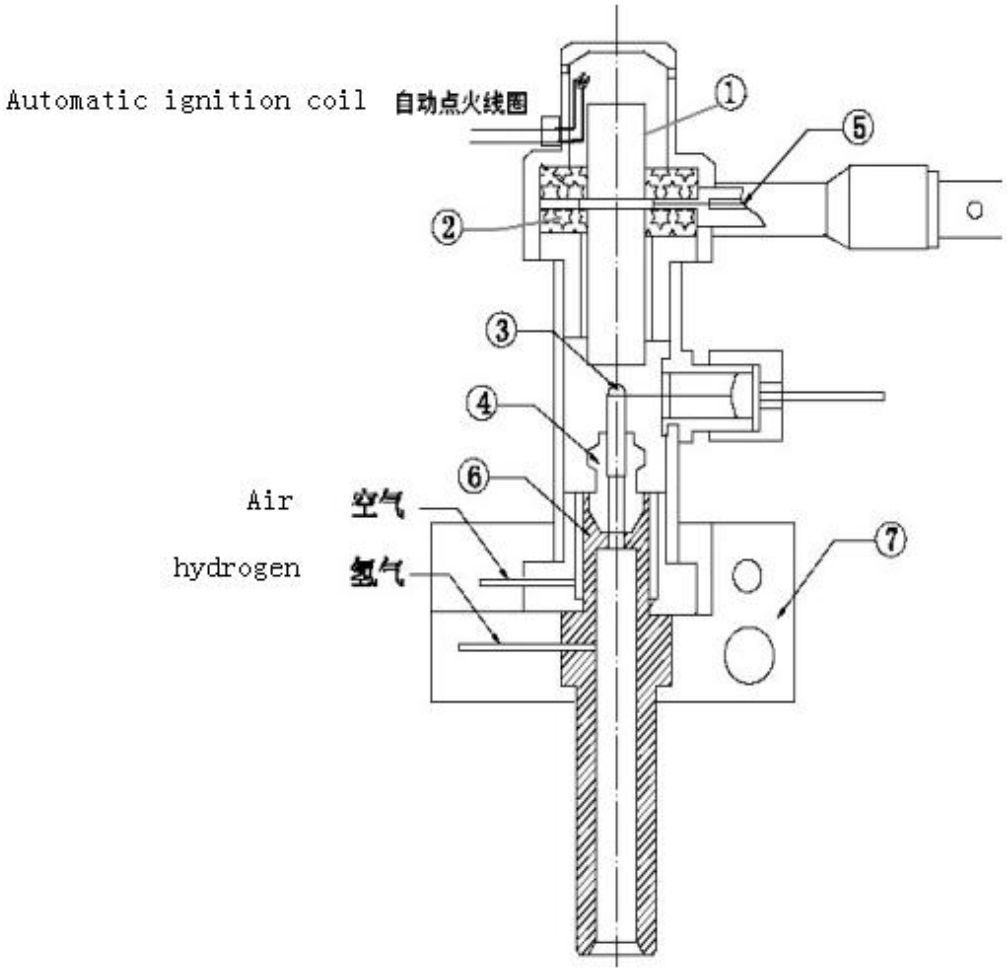


Figure 22 HTYSP-H hydrogen flame detector structure

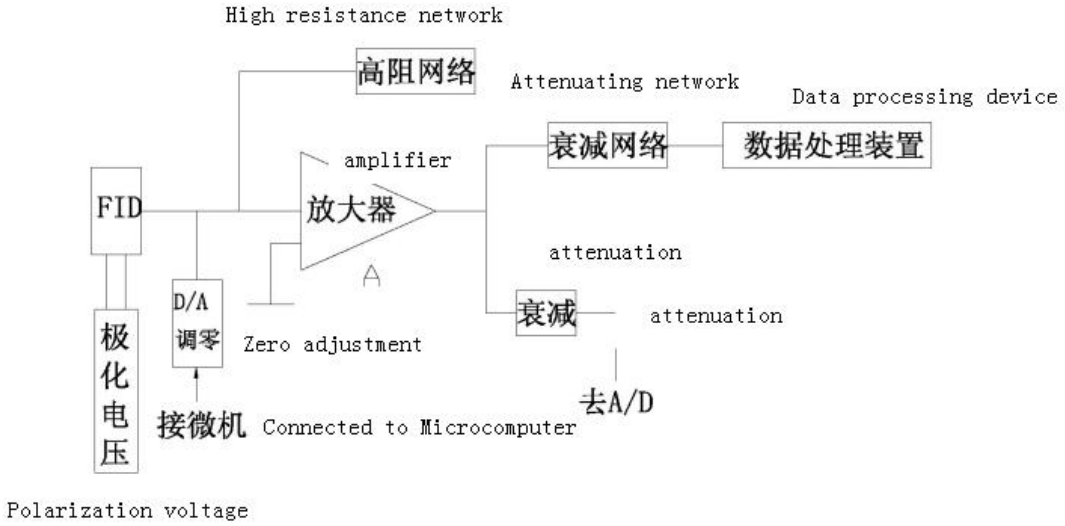
1、Collecting cylinder 2、Insulating porcelain ring

3、Polarized voltage ring nozzle 4、The signal line

5、Base 6、Heating block

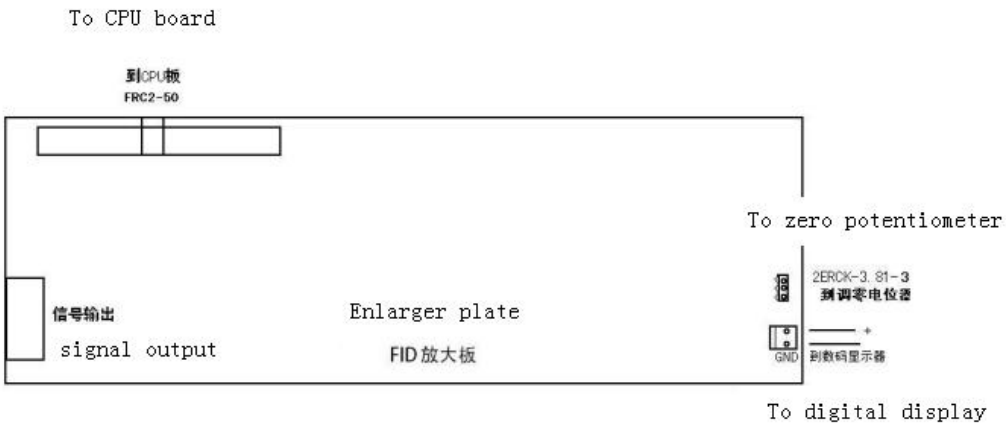
Since the detector is heated at the root, condensation will not occur

generally. The column can be inserted directly at the root of the nozzle to reduce the dead volume of the column。



Refer to figure 23 for the electrical schematic block diagram of FID microcurrent amplifier

See the figure below for the connection of FID board of htysp-h oil chromatography analyzer



B. Precautions for use:

C. Usage method:

D. Fault and maintenance

1. The amplifier cannot be zeroed before ignition.

Possible causes are:

(1) Amplifier maladjusted, should repair amplifier, had better ask manufacturer to repair.

(2) If the input signal line of amplifier is poorly insulated or short circuited, the high frequency plug on the right side of FID detector can be removed, and the measurement insulation shall be greater than 106m Ω.

2. After ignition, the recorder signal cannot be adjusted to zero.

(1) If the air is impure, the flow can be reduced. If it is improved, it means that the air is impure, and the air should be purified strictly.

(2) H2 and N2 are impure.

(3) The chromatographic column is not aged well, or the chromatographic column is seriously lost.

(4) When the flame burns to the collector, the carrier gas flow rate can be reduced.

3. The baseline was stable, but the injection did not peak, or the sensitivity decreased significantly.

Possible causes are:

(1) Sensitivity selection is too low.

(2) The gasket of carburetor injector leaks.

(3) There is air leakage at the joint between the vaporization chamber and the column or between the back of the column and the detector.

(4) The injection needle leaks or the temperature of the vaporization chamber is too low.

(5) The input cable is open circuit or the polarization voltage is not

applied.

4. Baseline stability deteriorated.

Possible causes are:

(1) The air is impure, mixed with some organic matters.

(2) The ion chamber is heavily contaminated.

(3) The hydrogen flame is too big.

(4) The signal wire of ion chamber is in poor contact or the polarization voltage is not applied.

(5) Amplifier

5、Common troubleshooting

symptom	reason	solution
Spiky burrs appear irregularly	Detector dirty The flame nozzle of the detector is dirty; High frequency signal line problem; Air leakage at the seal between	Cleaning the detector Clean the detector nozzle; Processing high-frequency signal lines Repacking column

	the column and detector liner; The insertion depth of the post is not suitable; Power supply voltage fluctuates.	Repacking column Check the power supply voltage.
Baseline drift during temperature programming	Column activation is not enough; Column temperature limit exceeded; Separator cleaning gas flow is too small; The system is leaking.	Activate the column; Reduce the use temperature; Increase the flow rate of septum cleaning gas; Recheck the leak.
Low boiling point component peak broadening	The column temperature is too high; Low boiling point of solvent; The column selection is wrong.	Lower the starting temperature of the column; Switch to high boiling point solvents; Replace the column。
Peak type of high boiling point component becomes smaller	Short waiting time The inlet temperature is low; Low carrier gas flow rate; The post is not installed properly。	Extend the waiting time; Increase the inlet temperature; Increase carrier gas flow rate; Repack the column.
Solvent peaks are severely tailed	Low shunt flow rate; The flow rate of septum purge gas is low; The injection speed is inappropriate. Liner tube is not tightly sealed	Increase the flow rate of split gas; Increase the septum purge gas flow rate; Feel the right injection speed; Press into the liner
Serious ghost peak appears	High boilers in column residual flow System pollution; Glass lined pipe pollution; Carrier gas is polluted	High temperature aging column Aging system; Clean the glass lining tube; Add a filter to the carrier gas path

VII Nickel conversion furnace

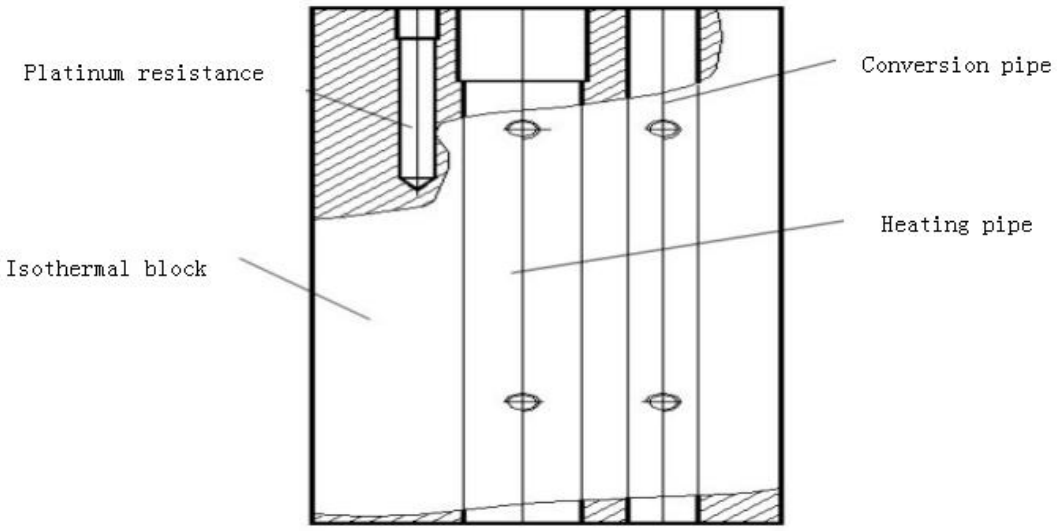
The detection objects of HTYSP-H Dissolved Gas Tester are seven gas components dissolved in insulating oil: H2, O2, CH4, C2H4, C2H6, C2H2, CO, CO2, TCD to measure H2, O2, and FID to measure hydrocarbon Similar gas

and CO, CO2. Since FID does not respond to CO and CO2, and the detection sensitivity of TCD is not enough, a nickel converter is used to convert CO and CO2 to CH4 (the conversion rate of CO and CO2 to CH4 is greater than 98). FID detection is used to improve CO and CO. CO2 detection sensitivity.

The schematic diagram of the structure of the nickel converter is shown in the figure。

The reformer is generally composed of a heating part, a heat preservation part, a conversion part, and a gas circuit part

转化炉一般由加热部分、保温部分、转化部分、气路部分组成。



VIII Instrument maintenance and common fault handling

A. Instrument care and maintenance

B. Instrument faults and troubleshooting

No chromatographic peak

Fault judgment	Inspection method and repair
1. Poor contact of recorder	1. Check recorder wiring

2. Recorder failure	2. Look at the instrument manual and troubleshoot the recorder
3. Sampler temperature is too low	3. Increase the injector temperature
4. Syringe blocked	4. Replace the syringe
5. Amplifier power off	5. Check the amplifier,
6. No carrier gas passes	6. Check whether the carrier gas flow path is blocked, or the gas source in the cylinder is used up
7. Silicone rubber leak	7. Replace silicone rubber
8. No fire	8. ignition
9. Poor contact of FID polarization voltage	9. Eliminate poor connection of polarization voltage

Normal residence time with reduced sensitivity

Fault judgment	Inspection method and repair
1. Syringe leak	1. Replace the syringe
2. Improper selection of sensitivity	2. Choose the appropriate sensitivity
3. Carrier gas leak	3. Leakage detection and corresponding treatment
4. Improper selection of hydrogen and air flow（FID）	4. Adjust their flow
5. Detector without high voltage（FID）	5. Install high voltage

Trailing peak

Fault judgment	Inspection method and repair
1. Sample tube contamination	1. Clean the injector tube
2. Chromatography column furnace temperature is too low	2. Increase column temperature
3. Injection temperature is too low	3. Increase the injector temperature
5. Improper choice of column	4. Choose the appropriate column

Peak of tongue extension

Fault judgment	Inspection method and repair
1. The sample size is too large	1. Reduce sample size
2 sample agglutination in the system	2. First, increase the column temperature, then select the appropriate injector, chromatographic column, detector temperature

Poor chromatographic peak separation

Fault judgment	Inspection method and repair
1. Column too short	1. Choose a longer column
2. Loss of fixative	2. Replace or aging column
3. Column temperature too high	3. Too high column temperature reduces column temperature

4. Incorrect selection of fixing fluid	4. Choose the right column
5. Carrier gas flow too high or too low	5. Adjust carrier gas flow

Flat top

Fault judgment	Inspection method and repair
1. Amplifier input saturation	1. Reduce sample volume and reduce amplifier sensitivity
2. The zero position of the recorder changes	2. Check the zero position of the recorder and do the corresponding treatment

Baseline mutation

Fault judgment	Inspection method and repair
1. External electric field interference	1. Eliminate external electric field interference that affects the normal operation of the instrument
2. Poor contact of power plug	2. Install the power outlet firmly
3. Improper selection of hydrogen and air flow	3. Re-adjust the flow of hydrogen and ai

Irregular baseline fluctuations during constant temperature operation

Fault judgment	Inspection method and repair
1. The location of the instrument is not good	1. Install the instrument in a place without strong vibration, it is best to place the instrument on a concrete table without vibration.
2. The instrument is not well grounded	2. Check and make corresponding good grounding
3. Inappropriate fixative	3. Choose appropriate fixative
4. Improper selection of carrier gas flow	4. Adjust the carrier gas flow appropriately
5. Carrier gas leak	5. Leak detection
6. Detector contamination	6. Cleaning the detector
7. Improper selection of hydrogen and air（FID）	7. Properly adjust the flow of hydrogen and air

Extended residence time and low sensitivity

Fault judgment	Inspection method and repair
1. Carrier gas flow rate is too slow	1. Increase carrier gas flow rate
2. Carrier gas flow rate changes after injection	2. Sample changer silicone rubber
3. Injector silicone rubber leak	3. Change injector silicone rubber

When the peak comes out, the stylus suddenly returns below the baseline and extinguishes

Fault judgment	Inspection method and repair
1. The sample size is too large	1. Reduce sample size
2. Carrier gas flow rate is too high	2. Choose the right carrier gas flow rate
3.Hydrogen or air flow rate is too low	3. Re-adjust the flow rate of hydrogen and air
4. Flame nozzle pollution	4. Cleaning the flame nozzle
5. Loss of stationary fluid in the column	5. Reconditioned column

Baseline does not return to zero

Fault judgment	Inspection method and repair
1. Detector contamination	1. Cleaning the detecto
2. Amplifier failure	2. Check the amplifier

Spikes in irregular distances

Fault judgment	Inspection method and repair
1. Insulator leakage	1. Leak detection and do the corresponding treatment
2. Amplifier failure	2. Eliminate impurities in the flow path
3. Flame beating	3. Adjust proper hydrogen and air flow
4. High frequency signal line failure	4. Check the high-frequency signal line

There are certain glitches at equal intervals

Fault judgment	Inspection method and repair
1. Water condenses in the hydrogen line	1. Eliminate water from piping and replace or activate desiccant
2. Blockage in the flow path	2. Eliminate impurities in the flow path
3. Air leak	3. Leak detection, and deal with the sound
4. Flame beating	4. Adjust proper hydrogen and air flow

Dome Peak

Fault judgment	Inspection method and repair
1. Exceed the linear range of the detector	1. Reduce sample size
2. Improper amplifier selection	2. Reselect the appropriate amplifier

High baseline noise

Fault judgment	Inspection method and repair
1. Column contamination	1. Replace column
2. Carrier gas pollution	2. Replace or regenerate carrier gas filter
3. Carrier gas flow too high	3. Readjust carrier gas flow rate
4. Poor grounding	4. Check and make good grounding
5. High resistance pollution	5. High resistance to cleaning pollution
6. Sampler contamination	6. Clean the sample tube in the sampler
7. Air or hydrogen flow rate is too high or too low（FID）	7. Re-adjust the flow rate of air or hydrogen
8. Air or hydrogen pollution	8. Replace hydrogen or air filter
9. Water condenses in FID	9. Increase FID temperature to remove moisture
10. High frequency signal line failure	10. Check the high-frequency signal line

Extra peak

Fault judgment	Inspection method and repair
1. High-resistance peak of the previous sample	1. Inject after the previous sample has slipped out
2. Water condensing in the column is peaking	2. The operating conditions for installing or regenerating purifiers should be selected appropriately
3. Sample decomposition	3. Lower the injector temperature
4. Sample is contaminated	4. Keep samples clean

Zigzag baseline

Fault judgment	Inspection method and repair
1. Flow control valve diaphragm fatigue	1. Diaphragm replacement or valve repair
2. Carrier gas cylinder pressure relief valve output pressure change	2. Adjust the pressure of the carrier gas valve to another position
3. Improper air flow	3. Reset the air flow

Reverse peak

Fault judgment	Inspection method and repair
1. Hydrogen flow is too large（FID）	1. Adjust hydrogen flow
2. The positive and negative switches are wrong	2. Change the positive and negative switches to the correct position
3. The tungsten wires of the reference cell and the measuring	3. Check the lead wires of the reference cell and the measuring

cell are wrong（TCD）	cell tungsten wire.

Baseline unidirectional change without injection（FID）

Fault judgment	Inspection method and repair
1. Detector temperature is too low	1. Increase detector temperature
Column temperature stops heating or gets out of control	2. Overhaul temperature control system and heating wire platinum resistance

Unidirectional baseline drift

Fault judgment	Inspection method and repair
1. Detector temperature changes significantly	1. Stabilize the detector temperature
2. Amplifier zero drift	2. Overhaul all parts of the amplifier
3. Column temperature increases or decreases significantly	3. Stable column temperature
4. Air leak	4. Leak detection

Irregular baseline changes at elevated temperatures

Fault judgment	Inspection method and repair
1. Too much column loss	1. Choose an appropriate chromatographic column. The column temperature should be much lower than the maximum temperature of the fixing solution.
2. Did not choose the right operating conditions	2. Choose the right operating conditions
3. The column is contaminate	3. Replace the column

Periodic baseline fluctuations

Fault judgment	Inspection method and repair
1. Poor temperature control of the detector	1. Check for good contact
2. Carrier gas flow pressure is too low	2. Replace the carrier gas cylinder
3. Improper adjustment of column furnace temperature	3. Check if the platinum resistance contact is good
4. Improper adjustment of carrier gas flow	4. Re-adjust the carrier gas flow rate
5. Improper adjustment of air and hydrogen（FID）	5. Readjust the flow of hydrogen and air

Baseline change after temperature programming

Fault judgment	Inspection method and repair

1. When the temperature rises, the column loss increases	1. Choose the appropriate column or aging column
2. Column flow rate is not corrected well	2. Corrected column flow rate
3 .The column is contaminated	3. Replace the column

C. Maintenance of TCD detector

During the use of the TCD detector, you must pay attention to and observe the following

1. When there is no carrier gas, it is absolutely forbidden to press the [thermal conductivity power switch] button to avoid the accident of burning the tungsten wire.
2. When aging the column for the first time, do not connect the carrier gas behind the column to the thermal conductivity cell, it should be emptied directly in the oven; hydrogen cannot be used during aging! Nitrogen is generally used. It is absolutely forbidden to press the [thermal conductivity power switch] button during aging.
3. The thermal conductivity cell detector is a precise component. Please do not disassemble and disassemble the tungsten wire in the cell body to avoid unnecessary losses.

Analysis and elimination of common faults of TCD detector

《Appendix A》

Alarm code

No.	Code	Display	Solution
1	00	None	Normal operation of heating zone system
2	11	Column box: platinum resistance short circuit	Please check the box platinum resistance lead
3	21	Thermal conductivity cell: platinum resistance short circuit	Please check the platinum resistance lead of TCD detector
4	31	Detector: platinum resistance short circuit	Please check the detector platinum resistance lead
5	41	Injector 1: platinum resistance short circuit	Please check the platinum resistance lead of the injector
6	51	Injector 2: platinum resistance short circuit	Please check the auxiliary 1 platinum resistance lead
7	61	Auxiliary furnace: platinum	Please check the auxiliary 2

		resistance short circuit	platinum resistance lead
8	12	Column box: platinum resistance open circuit	Please check the box platinum resistance
9	22	Thermal conductivity cell: platinum resistance open circuit	Please check the platinum resistance of TCD detector
10	32	Detector: platinum resistance open circuit	Please check the platinum resistance of the detector
11	42	Injector 1: platinum resistance open circuit	Treatment: please check the platinum resistance of the injector
12	52	Injector 2: platinum resistance open circuit	Please check auxiliary 1 platinum resistance
13	62	Auxiliary furnace: platinum resistance open circuit	Please check auxiliary 2 platinum resistance
14	13	Column box: exceeding the set maximum temperature	Please check whether the column box temperature is set correctly and whether the heating area is out of control
15	23	Please check whether the column box temperature is set correctly and whether the heating area is out of control. The heat conduction pool: exceeds the set maximum temperature	Please check whether TCD detector temperature is set correctly and whether heating area is out of control
16	33	Detector: exceeding the set maximum temperature	Please check whether the detector temperature is set correctly and whether the heating area is out of control
17	43	Injector 1: over the set maximum temperature	Please check whether the temperature of the injector is set correctly and whether the heating area is out of control
18	53	Injector 2: over the set maximum temperature	Please check whether the temperature setting of auxiliary 1 is correct and whether the heating zone is out of control
19	63	Auxiliary furnace: exceeding the set maximum temperature	Please check whether the temperature setting of auxiliary 2 is correct and whether the heating zone is out of control
20	14	Column box: heating failed	Please check the box heater wire and platinum resistance lead
21	24	Heat conduction pool: heating	Please check furnace heater

		failure	and platinum resistance lead
22	34	Detector: heating failed	Please check furnace heater and platinum resistance lead
23	44	Injector 1: heating failed	Please check furnace heater and platinum resistance lead
24	54	Injector 2: heating failed	Please check furnace heater and platinum resistance lead
25	64	Auxiliary furnace: heating failure	Please check furnace heater and platinum resistance lead
26	15	Column box: abnormal temperature	Please check furnace heater and platinum resistance lead
27	25	Heat conduction pool: abnormal temperature	Please check furnace heater and platinum resistance lead
28	35	Detector: abnormal temperature in heating zone	Please check furnace heater and platinum resistance lead
29	45	Injector 1: abnormal temperature in heating zone	Please check furnace heater and platinum resistance lead
30	55	Injector 2: abnormal temperature in heating zone	Please check furnace heater and platinum resistance lead
31	65	Display: auxiliary furnace: heating zone	Please check furnace heater and platinum resistance lead
32	17	Back door opening: positioning failed	Please check the back door opening and connection

Note: after troubleshooting, use the clear key to turn off the alarm. If it is not closed, there will be 3 alarms every 1 minute. Multiple alarms, N / N will be displayed, which can be viewed with up and down keys。

《Appendix B》

1. Instrument debugging

1.1 analysis conditions

Column furnace temperature: ℃ injector temperature: ℃ thermal conductivity pool temperature: ℃

Detector temperature: ℃ auxiliary 1: ℃

(TCD) bridge current: MA (FID) range: column front pressure:

Carrier gas I MPa hydrogen I MPa air I MPa

Carrier gas II MPa hydrogen II MPa air II MPa

Component content of sample gas: the standard gas is obtained by diluting 40 times with nitrogen.

Injection volume: 1ml

2. Transformer oil standard gas concentration table (input according to the proportion marked on the bottle)

Component name	content（mol/mol）
hydrogen	ppm
Carbon monoxide	ppm
carbon dioxide	ppm
Methane	ppm
Ethane	ppm
Ethylene	ppm
Acetylene	ppm
Nitrogen	Balance gas

《Appendix C》

For the instrument to operate safely and reliably, it is very important that the instrument is well grounded. Generally speaking, most countries and regions require the installation of ground wires for electrical equipment to ensure personal safety.

Safety ground

Various standards generally require the installation of safety conductors for electrical equipment. The standard generally has such a requirement: every live wire return (neutral) must be accompanied by a safety conductor. The size of the safety conductor must be the same as the size of the live wire.

Generally speaking, safety standards require that safety conductors be connected to conductive surfaces of electrical equipment that operators may encounter, or conductive surfaces that may be excited due to electrical accidents. Under normal operating conditions, this line should not carry

returned AC power. If the frame of the instrument is not grounded, or the live wire accidentally touches the frame, the voltage on the frame is likely to reach a certain degree of harm.

Connect the safety ground wire to the chassis of the instrument to avoid the risk of electric shock, because this will form an extremely low impedance circuit, which will cause the circuit breaker to trip or blow the fuse. Each instrument product has a safety grounding device. As long as the instrument is connected to a grounded connector, or the grounding ring in the instrument is connected to the grounding wire according to the specifications proposed by the user, this loop is completed.

As described below, the safety ground wire in the instrument is usually connected to the conduit of the building through an insulated grounding device, which in turn grounds the distribution of the branch circuit. In any case, it must comply with local and national safety regulations.

The safety ground wire must be correctly connected to the terminal of the main distribution ground bus. It should generally be understood that the ground impedance from any load to the total ground bus must be less than 11 ohms.

Noise-free ground

In order to make the instrument work well, we insist on using a noise-free grounding device. This type of grounding is also called "insulated grounding" because it is separate from other electrical grounding devices in the building. When connecting the instrument to other instruments, the use of "insulated ground" will help maintain the reliability of the system.

In most cases, ordinary grounding cannot meet the requirements, because the grounding device can not bring in a little noise caused by poor grounding. The noise may also come from the radio frequency amplifier, and this ground wire may also carry a generally stable current.Typical noise-prone grounding conditions are as follows:

1. Catheter

2. Roof and building beams

3. Sprinkler pipes (connecting the ground wire to these pipes is not

allowed by most fire codes).

4. Raise the supporting structure of the floor.

5. Gas pipe

Connecting the ground wire to these pipes is susceptible to building noise due to poor grounding. At the same time, due to the influence of the antenna, they will also receive interference from electrical frequencies.

The things that can be grounded are as follows, (should be discussed with the local electrical inspection department to select a locally acceptable grounding method):

1. Use a wire of appropriate size to connect to the main pipeline of the building or to the entrance of the main conduit.

2. Drive the long nail for grounding into the damp soil layer and connect it to the ground.

3. It can also be connected to other reliable entry points.

The insulated ground wire must be firmly connected to the device. Do not use clamps to clamp the ground wire to the pipe or grounding post. Do not use other methods to loosen the connector. The joint must be brazed or soldered to minimize the decrease in insulation resistance at the ground joint. If the installation is not suitable, the resistance can be measured at the joint, and the resistance of the ground wire will cause the undesirable potential on the insulated grounding device. When installing the ground wire, it is necessary to prevent it from accidentally coming into contact with other ground wires. This will have an adverse effect on the insulation. The insulated wire must be connected to the insulated bus bar of the switchboard, and then connected to each unit of the instrument system from the switchboard through the connector and the power ground. The insulated bus can be composed of a ground plate on the switchboard.

The wire size used should be such that the grounding resistance from the furthest point to the ground of the main switchboard is the lowest. Please consult with the local electrical inspection department for the wire specifications used.

When a power grid processing device is installed in a multi-story building, the shell of the power grid processing device should be connected to the steel bar in the building structure, so as to reduce ground noise. One end of the ground wire should be connected to the shell of the line processing device, and the other end should be welded to the steel bar of the nearest building vertical beam. It is better to connect the ground wire to the reinforcement of the building than to connect the ground wire to a separate ground column in the basement.