
GC5800

GAS

CHROMATOGRAPH

Instruction Manual

v1.0

About This Manual

Copyrights

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of Centurion Scientific.

Document Validity

Centurion Scientific reserves the right to modify products. The information in this document is subject to change without notice and does not represent a commitment by Centurion Scientific.

Working on the Instrument

Observe all relevant state, regional and local safety regulations when installing and using Centurion Scientific instrument.

The operator should read this instruction manual thoroughly before performing tests with the instrument and facilitating maintenance personnel with any repair or troubleshooting. It is not advisable to operate this instrument without basic operational knowledge. Keep the manual properly for convenient use.

Use the following safety guidelines to help protect the instrument from potential damage and to help to ensure personal safety.

Safety Instruction



WARNING

- The instrument should be shut off when tests are finished, and the device malfunctions, needs repairing, or is cleaned.
- When the instrument is working, do not touch hot areas including sample injection inlet of vaporizing chamber, detector and host cover. Meantime, hot air will be

discharged from the rear door of the instrument, do not place flammable objects around.

- When using hydrogen, make sure the pipes are correctly connected and the room is well ventilated. When finished, switch off the main valve of gas cylinder or power off hydrogen generator.
- All materials used for this product in the process of manufacturing are all accord with environmental protection standards, but some gases, samples, and wastes used and produced should be treated correctly to protect human body and environment.
- Risk of danger if the instrument is disassembled personally.
- Replacing or repairing any component of the instrument should be carried out by Centurion Scientific technical personnel, the user can not disassemble any component without authorization.

CAUTION

- Check the product against the packing slip and instrument structure, inspect for any signs of damage. Contact the delivery agent or Centurion Scientific immediately if any damage observed.
- The operator should observe the test timely in the process.
- Cut off power supply when the instrument is not used for a long time.
- The instrument packaging should be recycled to reduce environment pollution.

Basic operating requirements on instrument

1. Power supply

- 1) 220V AC \pm 10%
- 2) Frequency : 50 \pm 1Hz
- 3) Power: \leq 3000W
- 4) Grounding resistance: $<0.1\Omega$

2. Gas source

- 1) N₂: 99.995%
- 2) H₂: 99.99%
- 3) Air: dry, oil-free

3. FID operation

- 1) Carrier gas: flow rate 30ml/min
- 2) Auxiliary gas:flow rate 30ml/min
- 3) H₂:flow rate 30ml/min
- 4) Air:flow rate 300 ml/min

4. TCD operation

- 1) Before turning on the instrument, switch on carrier gas for 30 min, then turn on the instrument and preheat.
- 2) Calibrate the flow rate, flow rate deviation of two way output should be less than 1%.
- 3) Set bridge current according to analysis.
- 4) Compared to H₂ as carrier gas, the bridge current should be less for N₂as carrier gas.

This instrument adopts double gas-line structure, when TCD is used, a pair of columns must be linked

The chapter 1 Installation Preparation

1.1 Environment

Environment temperature: 5°C~35°C

Relative humidity: 0~85%

The operating room for the instrument should be protected from corrosive gases, and be equipped with fan to keep the room ventilated.

1.2 Installation Site

Instrument size: 48cm in height, 60cm in width, 49cm in depth.

Instrument weight: About 60kg

The instrument should be installed in a special analytical lab for GC in order to manipulate the instrument and gas source respectively. It should be put on a steady cement or wooden bench without vibration. The bench should be over 120cm in length and over 70cm in width, capable of withstanding 80kg weight, on which there is sufficient space for placing data processing device and printer etc. and a certain distance should be left between the bench and wall for its maintenance. Sufficient power supply should be guaranteed. The instrument should be kept away from tinder and protected from corrosive gases, exceedingly venting, and violent temperature fluctuation. The arrangement of the bench may be referred to Figure 1.1.

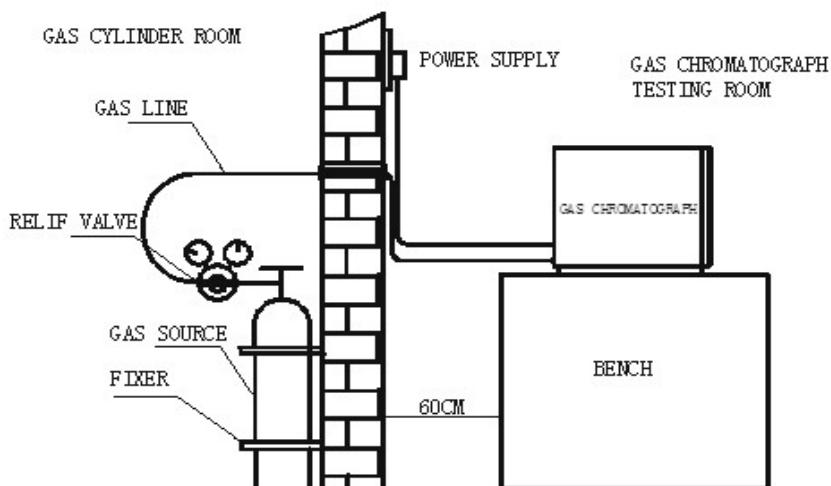


Figure 1.1 Arrangement of Lab

1.3 Power Cord

1-phase power cords and 1-phase socket are used as required by IEC. And power supply should be well grounded.

1.4 Gas Source

The output pressure of relief valve for three gases should be, N₂ 5Kg/cm², H₂ 3Kg/cm², Zero Air 3Kg/cm² respectively.

When using ECD, the carrier gas should be high purity nitrogen, over 99.995%.ECD uses Ni⁶³ radioactive source, and the exhaust pipe should be installed in the gas outlet of the detector, so that the gas is discharged out of the room, it is better if gas outlet is above the roof. Meantime, use a label to indicate the presence of radioactive isotopes.

The carrier gas and auxiliary gas needed by the instrument, in general, can be supplied by a high pressure cylinder, gas generator or oil-free air compressor. High pressure gas must pass through the relief valve to supply gas. In general, gas source is not matched with the instrument, so customers will have gas source prepared for themselves. Gas source is the prerequisite condition for initiating the instrument, so it is necessary to take it into consideration in advance. If customer puts forward the concrete requirements of application when the instrument is ordered, the manufacturer will offer help to purchase the necessary equipment instead. According to the detector configuration, various gases can be chosen and the sorts of gas, their basic parameters and selective principle can be referred to table 1.1. The gas generator based on the principles of chemistry & electrolytic, oil-free air compressor etc. devices can be applied to offering working gas sources for the instrument. Because, in general, the water content of the gases generated by gas generator or air pump is rather high, particularly, special attention should be paid to those older gas generators. Thus, while those devices are applied, the protective measure must be taken.

Table1.1

Detector	Gas source	Inlet pressure	Purity
TCD	H ₂ or He	3Kg/cm ²	99.999%
FID	H ₂	3Kg/cm ²	99.995%
	N ₂ or He	4~5Kg/cm ²	99.998%
	Air	3Kg/cm ²	No dust, oil mist, water content, etc.
ECD	N ₂ or He	4~5Kg/cm ²	99.9995%
	or Ar/CH4		H ₂ O≤ 0.002pma
			O ₂ ≤1ppm
FPD	H ₂	3Kg/cm ²	99.995%
	N ₂ or He	4~5Kg/cm ²	99.998%
	Air	3Kg/cm ²	99.998%

1.5 Purifier

Efficient gas purifier can be equipped with the instrument optionally. It is recommended that the purifier be installed at the gas line of the carrier gas and auxiliary gas. Regular maintenance for purifier is necessary and the filling material in the purifier should regularly be activated and replaced, otherwise its purification function will be lost .Activating treatment should last no less than 6 hours at 260°C.

1.6 Oxygen Absorber

Trace amounts of oxygen can degrade the performance of ECD detector. Oxygen also damages the chromatographic column, especially the capillary chromatographic column. Thus, an oxygen absorber can be equipped between the gas outlet (carrier gas) of gas purifier and gas inlet of the instrument to eliminate the trace amounts of oxygen, improve the performance of ECD detector and ensure its normal work. If ECD detector is configured with the instrument, oxygen absorber can be selected.

1.7 Grounding

The instrument can be operated safely and reliably with good grounding. Ground line must be installed for **GC5800** instrument to ensure personal safety and reliable operation. Noiseless grounding device is recommended, which is also called "insulated grounding" and which is to separate from the other electrical grounding devices in the building. The "insulated ground wire" must be securely attached to the grounding device. The connector must be brazing or soldering to minimize the reduction of insulation resistance of the grounding terminal.

"Common grounding" is unavailable, such as roof and beams of the building, water pipe, the support structure of the floor, and gas pipe or heating pipe.

The chapter 2 Instrument Overview

GC5800 gas chromatograph is a kind of cost-effective, multi-function and economical practical instrument.

2.1 Performance Characteristics

GC5800 adopts multi single-chip computer (CPU) combination of integrated control, LCD interface display and digital parameter display, in which manual regulation of gas path parameters, digital parameter display, synchronous acquisition and output of analog and digital signal provide help information for related instrument operation in real time. It has the advantages of high integration, simple operation, long time running, high level automation and good reliability.

Chromatographic data processing & computer control system (anti-control workstation) and built-in chromatographic data sampling circuit can realize synchronous data acquisition and output of analog and digital. Keyboard or computer can perform real-time and synchronous input and control of temperature parameters, detector parameters, pressure and flow parameters, and spectrogram parameters, also LCD screen can display spectrogram in real-time.

The instrument has power-fail protection, file storage/calls and stopwatch functions, it can store up to 30 operation files, in which 20 are about user methods and 10 are about preset analysis operation files.

Chromatographic column chamber is equipped with a temperature control system to control the column chamber and the sample injector.

2.2 Technical Specifications

2.2.1 Chromatographic Column Chamber

Column Oven size: 260 mm (W)×280mm (H)×155mm (D) (11.5L)

Temperature control: room temperature + 3°C~400°C (under room temperature)

-80°C~400°C (under cooling agent)

Accuracy of temperature control: better than ±0.1°C

Temperature gradient: room temperature + 3°C~400°C, less than 1% within effective area of column chamber.

Deviation between preset temperature and indicating temperature should be less than 1°C.

Deviation between preset temperature and actual temperature should be less than 2°C.

Program steps: 8, which can be extended to 20.

Rate of temperature rising: 0.1~30°C/min

Temperature is in range of linear program: max. Termination temperature ≤400°C

40°C/min, 150°C

25°C/min, 300°C

15°C/min, 400°C

Control time of initial temperature and terminal temperature: 0~600min

Repeatability of program temperature rise should be less than 2%.

Rate of temperature falling: falls down from 300 °C to 50 °C in less than 10 min, temperature of sample injection inlet and detector is 300°C.

2.2.2 Vaporizing Chamber of Sample Injection Inlet

Temperature control: room temperature + 5°C~420°C (under room temperature)

Accuracy of temperature control: ±0.1°C (room temperature + 15°C~200°C), ±0.2°C (over 200°C)

Deviation between preset temperature and indicating temperature should be less than 1°C.

Temperature is in range of program: max. Termination temperature ≤400°C

Rate of temperature rising: max. 80°C/min, set increment to 0.1

Control time of initial temperature and terminal temperature: 0~600min, set increment to 0.1min.

2.2.3 TCD

Temperature control: room temperature + 5°C~400°C (under room temperature)

Accuracy of temperature control: ±0.1°C (room temperature + 15°C~200°C), ±0.2°C (over 200°C)

Deviation between preset temperature and indicating temperature should be less than 1°C.

Sensitivity: ≥4000mv•ml/mg (benzene)

Noise: ≤0.035mV

Drift: ≤0.5mV/h

2.2.4 FID

Temperature control: room temperature + 5°C~400°C (under room temperature)

Accuracy of temperature control: ±0.1°C (room temperature + 15°C~200°C), ±0.2°C (over 200°C)

Deviation between preset temperature and indicating temperature should be less than 1°C.

Detection limit: ≤1×10⁻¹¹ g/s (benzene)

Linearity range: 10⁷

Noise: ≤0.025mV

Drift: ≤0.15mV/h

2.2.5 Pressure and Flow Control Unit

Two combinations of pressure and flow control units can be chosen optionally, i.e.

-
- 1) Control unit of carrier gas pipe for capillary columns
 - 2) Control unit of carrier gas pipe for packed columns, which is applicable to TCD

Pressure control: ≤400kPa

Shunt maximum velocity: ≤300mL/min

2.2.6 Instrument Dimension, Weight and Power

Power supply: rated voltage 220V 50Hz

Max consumption power: 2.5KW

Dimension: 600(L)×490(W)×480(H)mm

Weight: about 60kg

2.2.7 Working Environment

Temperature: 5°C~35°C

Relative humidity: ≤85%

No strong electromagnetic interference, corrosive gas, strong vibration, and much airflow

Power supply: 220V±22V, 50±1Hz, distribution power should be more than 3KW.

2.3 Main Components

- 1. Oven Door
- 2. Oven Door Button
- 3. Keyboard
- 4. Indicator Light
- 5. LCD Screen
- 6. Start/Stop Button
- 7. Detector
- 8. Sample Injection Inlet
- 9. Gas Control Module (optional)

- 10. Capillary Support
- 11. Protective Hood
- 12. Door Hook
- 13. Connector of Chromatographic Column
(detector side)
- 14. Connector of Chromatographic Column
(sample injection inlet)

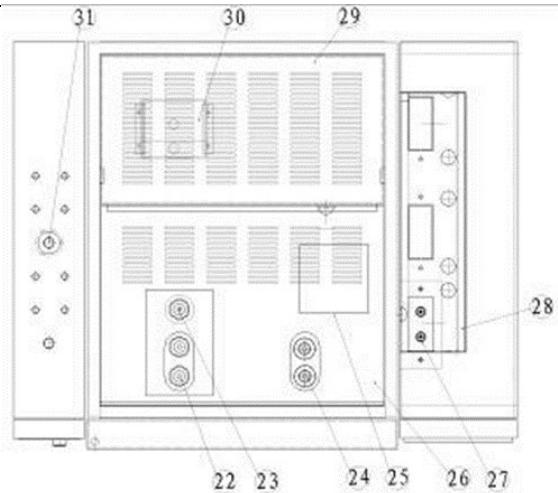


Figure 2.3 Main Components

- 15. Power Cord
- 16. Fuse Box
- 17. Earth Terminal
- 18.232 and USB Connector
- 19. Gas Connector(Seat)
- 20. Gas Inlet & Outlet
- 21. Analog Signal Output Plug (Seat)

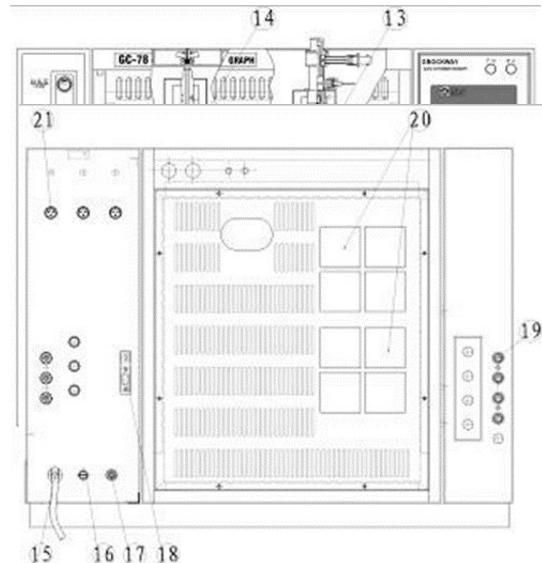


Figure 2.4 Main Components

- 22. Sample Injection Inlet of Packed Column
- 23. Sample Injection Inlet of Capillary Column
- 24. Detector Port

-
25. TCD
 26. Front (Detector) Cover Plate
 27. Detector Signal Plug(Seat)
 28. Signal Plug Cover Plate
 29. Rear Cover Plate
 30. Membrane Cleaning Control Valve
 31. Six-way Injection Valve
 32. Power Switch
 33. Shield Plate for Electric Components
 34. Electrical Panel Components
 35. LCD screen
 36. Pressure and Flow Adjustment Knob
 37. Pressure and Flow Adjustment Knob
 38. Gas Circuit Cover Plate

Figure 2.5 Main Components

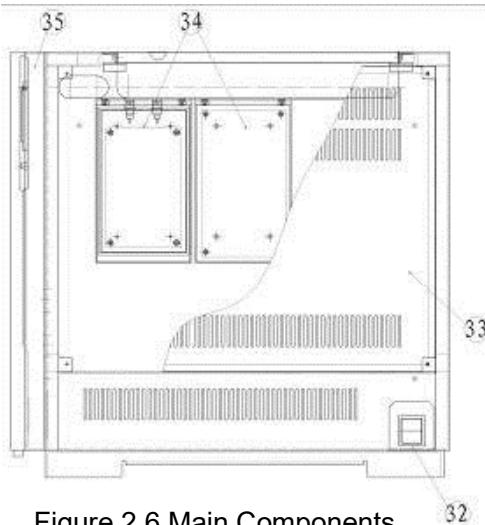


Figure 2.6 Main Components

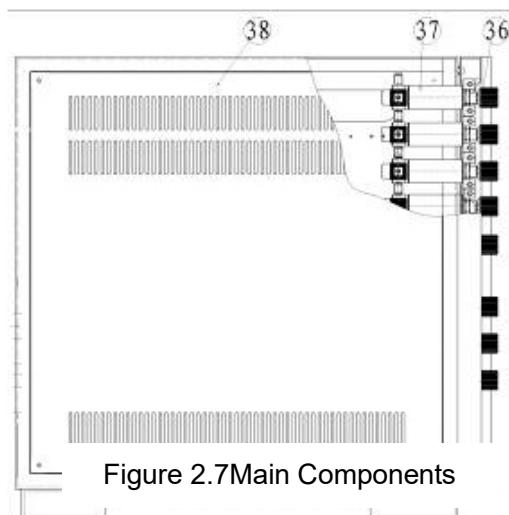


Figure 2.7 Main Components

2.4 Unpacking

Check the instrument and accessories according to the packing list.

The chapter 3 Working Principle and Installation

3.1 Working Principle

This instrument manufactured on the basis of gas chromatography is an effective device to carry out gas chromatographic analysis. Gas is adopted as mobile phase for the instrument. After a mixed multi-component sample to be analyzed is injected into an injector and vaporized for an instant, the sample (gas) is carried by carrier gas, i.e. mobile phase, and goes through chromatographic column filled with stationary phase. The absorption, de-absorption and dissolution etc. processes will happen between the molecules of the components and stationary phase in chromatographic column, so that those components with close performance and structure will separate greatly because the individual molecules' distributive phenomenon will repeatedly happens many times between the two phases. In addition, the absorptive and de-absorptive acting force of each component of sample is quite different and its separated time needed is different, too. As a result, all components of the mixed sample have been separated completely. Next, every separated component will sequentially goes into the detection system, the separation information will be converted into electrical signals by the detector and they will be applied to a recorder or integrator to draw in chromatogram. Its flowchart is shown in Figure 3.1.

Similar to other analytical instruments, GC (Gas Chromatograph) is applied to testing chemical components and physical properties of substance. The chemical components denote that a kind of compound or admixture consists of which molecules, atoms or aggregates, how much content they have individually. The physical properties of substance denote its partition coefficient (at stationary phase), activity coefficient, molecular weight, vapor density, specific surface and pore size distribution etc. physical constants. GC can be applied being widespread to petroleum, chemical, organic synthesis, papermaking, electric power, metallurgical, medical-pharmaceutical etc. industries, and pesticide residual, soil & environment supervisory, labor protection, commodity inspection, food hygiene, and public security investigation, as well as blank analysis of super pure substance research department etc.. Today, GC instruments have become one kind of necessary analytical equipment for various chemical analysis labs.

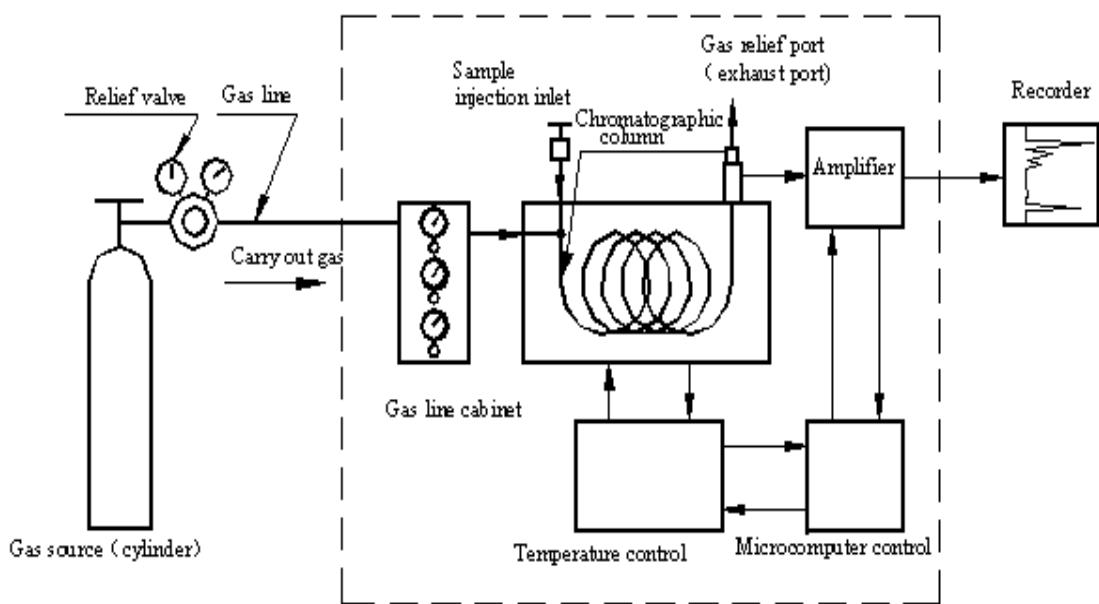


Figure 3.1 Flow Chart of Gas Chromatograph

Chapter 4 keyboard and display

GC5800 gas chromatograph with a 4.3-inch, 480 * 272 resolution color LCD screen. The display is installed in the upper part of the instrument electrical control panel, used to display the operating parameters of the instrument such as temperature parameters, detector parameters, pressure flow parameters, chromatograms and so on. Turn on the instrument and display the boot screen after initialization is complete. The display shows –Centurion scientific gas chromatograph - "The instrument is in normal condition for follow-up operation.

4.1 operation state and indicator

- **READY** light. When the actual temperature of each control heat zone all attains $\pm 1^{\circ}\text{C}$ of set the temperature in, ready to light;
- **RUN** light. Press the start button, start operating **configuration** button to set the option, running lights, set options all the end of the run, run the lamp. Running lights flashing, not to press the **start** button. after pressing the **stop** key, the light is to put out.
- **HEATING** light. After pressing the **HEATING** key, then the light is bright, after pressing the stop key, the light is to put out.
- **HEATING** light. After pressing the **HEATING** key, then the light is bright, after pressing the stop key, the light is to put out.
- **ALARM** light. When the temperature of any temperature control part actually exceeds to set 20°C above, the light of alarm is bright, have the voice to sound loudly at the same time.

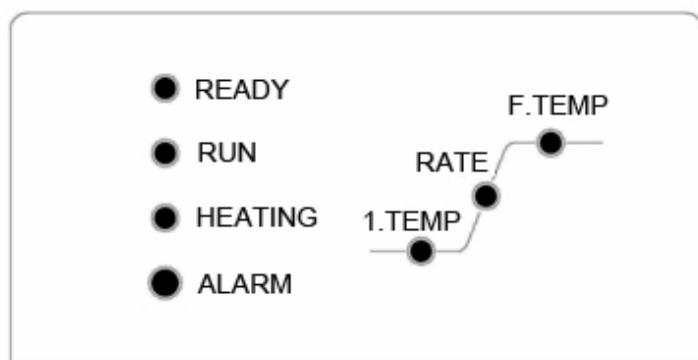


Figure 4-2 indicator light

- **I.TEMP** light. Mean the programming temperature to be placed in the Initial stage. -can be indicated in the Oven/Injector programming temperature state the oven is preferred-
- **RATE** light. Mean the programming temperature to be placed in the temperature rise. -can be indicated in the Oven/Injector programming temperature state the oven is preferred-
- **F.TEMP** light. Mean the programming temperature to be placed in the final stage. -can be indicated in the Oven/Injector programming temperature state the oven is preferred-

The keyboard is on the lower side of the electrical panel; all parameters required for **GC-5800** can be input through the keyboard. Most of these parameters can also be controlled using a connected data system, such as an reverse-control workstation. The keyboard should disable the GC operation when the instrument is in reverse control.

4.2



Figure 4-3 Keyboard structure

Keyboard keys and its definition

FILE It is used to store and retrieve analytical method file parameters. It can also be used to display and change the current analytical method file number. Instrument can store thirty operating documents, the file number is 0 ~ 29, 0 ~ 19 for the user method file. Of which: 20 to 29 for the manufacturer preset curing ten sets of operating method files, the user can randomly call / copy.

TIME Stopwatch function can be time, date setting, in the stopwatch display interface, use the start / stop button to start and stop the stopwatch timer. When using soap film flow meter gas flow rate, enter the meter reading, measured flow can be shown.

HELP It used to display help information on the screen. Prompts the trouble entry or displays helpable content. When editing the operating parameter settings, that is, the cursor position, press the help key to display the relevant tips.

TEMP Used to set temperature operating parameters such as injector / column oven / detector / auxiliary heating. This instrument has auxiliary sampling / heating alternative expansion function.

PROG. TEMP. It is used to set temperature program parameters of column oven, injector inlet. Up to 20 steps temperature program parameters can be set ($n \leq 20$).

DETECTOR Used to set / display / enter detector related parameters, including related electrical control parameters, gas pressure flow parameters (hydrogen and auxiliary gas, etc.), real-time chromatogram display. Using Plug and Play mode, continuous press the detector key, you can set and display different detector electrical control parameters, gas pressure flow parameters, real-time chromatograms.

ON/OFF For detector power supply, configuration options switch, injection mode and FID automatic / manual ignition selection.

+/- Used to enter +/- digits, detector backwards, chromatogram zoom in / out, detector sensitivity profile up / down and pressure, flow rate adjustment.

Y/N Used for operating function selection, yes or no.

▲/▼ Use to scroll up or down, move the cursor, press once to scroll up or down one line. The cursor "_" in the display indicates the current active line location.

0~9 0, 1 ~ 9 number keys Input a value for the parameter settings.

. Decimal point for inputting decimal figures.

CLEAR Used to delete the set value, number, etc. before pressing the [INPUT] key, each time you press it, the character to the left of the cursor will be deleted, and the character to the left of the cursor will be shifted to the right by one.

HEATING Used to confirm that parameters have been entered. Press HEATING key, the instrument starts heating operation. After the light is ready, the instrument can perform sample analysis.

SUSPEND Press the suspend button, heated by the constant heating to stop heating, the instrument began to cool down. During the programmed temperature operation, pressing the suspend key is invalid.

ENTER For sure you've entered or selected parameters take effect.

START It is used to start operation configuration options, namely the selected program control startup items, including: column oven and injector programmed temperatur, carrier gas program control, injection switching valve and start of external events (eg workstation, Sampler, etc.)

STOP Used to terminate programmed parameter operations initiated by the Start key, such as initiated column oven and injector programmed temperatur, carrier gas program control, injection switching valve and start of external events (eg workstation, Sampler, etc.)

CARRIER GAS Used to set carrier gas parameter values, including capillary carrier system (dual capillary system), packed column carrier system (including TCD, FID dual carrier gas, ECD auxiliary gas and capillary TCD system auxiliary gas). Control module plug and play mode. Press the carrier gas key continuously to set and display the carrier gas parameters.

FLOW SHOW Used to display the detector gas flow rate (FID / FPD / NPD hydrogen, air and auxiliary gas, etc.). Press FLOW SHOW continuously. The gas flow parameters of the configured detector can be displayed.

INJ. MODE Used to display and reset capillary injector operation mode, press INJ. MODE. The optional injection mode is: Split / Direct / Splitless. Split less Injection should be set to split time. This setting is only for capillary injection operation.

GAS CTRL MODE Used to display and select the pneumatic pressure / flow control mode. Available modes are: real-time adjustment, power-on adjustment and manual adjustment.

OPER. CONFIG. Operation configuration. Used to open the combined configuration settings. The linkage Operation configuration includes column oven and injector programmed temperature, carrier gas program control, injection switching valve and start of external events (eg workstation, Sampler, etc.)

EXTERNAL EVENTS Used to set the configuration and control of external events. Open, close 1 to 4 external events. Multi-stage control can be set, such as valve start, reset and multi-step start and reset operations when the external event is injection switching valve.

COLUMN PARAMETERS Used to enter column parameters (ID / Length / Head Pressure / Column Temperature, etc.). The column flow rate is displayed.

IGNITION Used for FID detector manual ignition. When the instrument power on, open and adjust the relevant gas valve, press the ignition key, the system will automatically delay ignition.

4.3 Use and operation of function keys

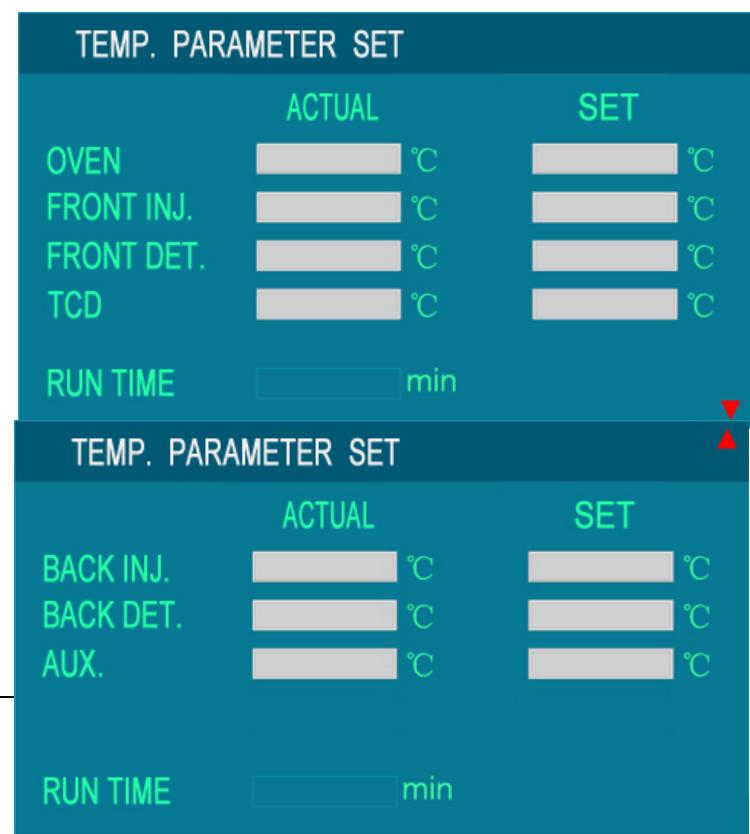
4.3.1 TEMP.

Used to set temperature operating parameters such as injector chamber / column oven (constant temperature. operation) / detector / auxiliary heating.

Press the **TEMP.** Button on the control panel, the display shows the temperature control parameter setting and display interface, as shown

1. Press the TEMP key. Display temperature operation interface, move ▲▼ key, enter the relevant value in the cursor position; use the numeric keys to enter data;

2. Temperature setting. You



can enter a numeric value with a decimal between 0 and 400.

3. Use the Clear button to cancel, modify the input data;

Press ENTER to complete the setting.

Press the heating key to run at constant temperature.

4.3.2 Extension function setting

This instrument has auxiliary temperature signal acquisition / heating alternative expansion function.

Used for temperature control circuitry such as injector chamber / column oven / detector instead of setting.

When the column oven / injector / detector has failed all the way, the auxiliary heating / temperature sensing circuit can replace either of them. (Except for the column oven due to overheating of the column oven).

The setting method is: in power-off mode, press and hold the temperature key to turn on the power switch, the interface of the screen appears, select Y in the fault heating / temperature box, and press the ENTER key.

EXTENSION FUNCTION SETTING		
	SIGNAL	HANDLE
OVEN	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>
FRONT INJ.	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>
FRONT DET.	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>
TCD	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>
BACK INJ.	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>
BACK DET.	Y/N <input type="checkbox"/>	AUX. <input type="checkbox"/>

4.3.3 Programmed temperature operation parameter setting

Used to set the column oven, injector chamber programmed temperature parameters. Column oven can be set up to the 20th steps ($n \leq 20$), injector chamber can be set up 1 step ($n \leq 1$). Move \blacktriangle and \blacktriangledown keys to enter the relevant value at the cursor position.

Column oven temperature setting

1. Press the PROG. TEMP. Key, the column oven programmed

PROG. TEMP. SET	
	SET
I.TEMP.	<input type="text"/> °C
I.TIME	<input type="text"/> min
1 RATE	<input type="text"/> °C/min
1 F.TEMP.	<input type="text"/> °C
1 F.TIME	<input type="text"/> min

temperature interface appears; move the **▲**, **▼** keys, enter the relevant value at the cursor position;

2. 20-step programmed temperature can be set / operation. The maximum termination temperature $\leq 390\text{ }^{\circ}\text{C}$

3. heating rate setting:

Final temperature
 $\leq 150\text{ }^{\circ}\text{C}$, heating rate
30 $^{\circ}\text{C} / \text{min}$, increment
0.1;

Final temperature \leq
300 $^{\circ}\text{C}$, heating rate 15 $^{\circ}\text{C}$
 $/ \text{min}$, increment 0.1;

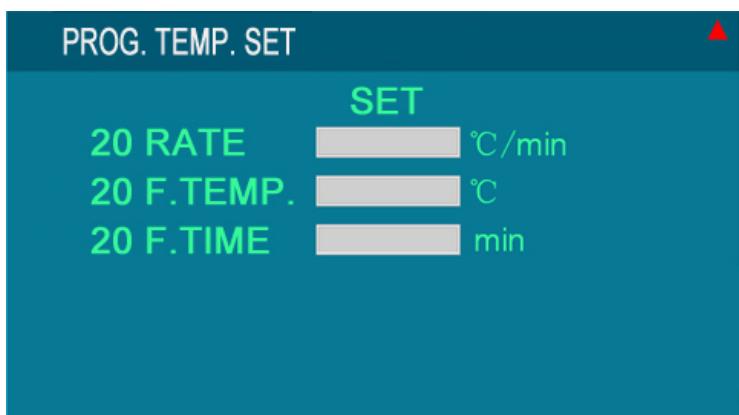
Final temperature \leq
350 $^{\circ}\text{C}$, heating rate 10 $^{\circ}\text{C}$
 $/ \text{min}$, increment 0.1;



4. Do not modify operating parameters while the programmed temperature is warming up.

5. Initial / final temperature control range:
0 ~ 600min, increment
0.1min.

Press ENTR key to complete the setting,
when the instrument runs according to the setting,
READY light is on, then press the start key to start the program warming operation.



Injector chamber programmed temperature setting

Press the PROG.TEMP.
key for the first time.



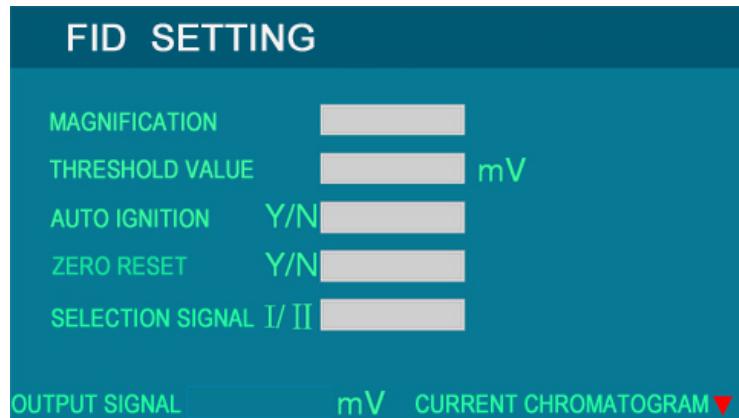
Column oven temperature control interface appears; press the PROG.TEMP. key again, showing the injector programmed temperature control interface.

1. Move ▲ and ▼ keys to enter the relevant value at the cursor position;
2. Programmed temperature setting / operation; maximum termination temperature ≤ 400 □
3. Heating rate setting: the maximum heating rate 30 □ / min. increment 0.1;
4. Do not modify operating parameters while the program is warming up.
5. Initial / final temperature control range: 0 ~ 600min, increment 0.1min.

Press ENTER to finish the setting, the instrument will run according to the setting, when READY light, press the START key to start the program temperature operation.

4.3.4 **Detector** key operations and settings

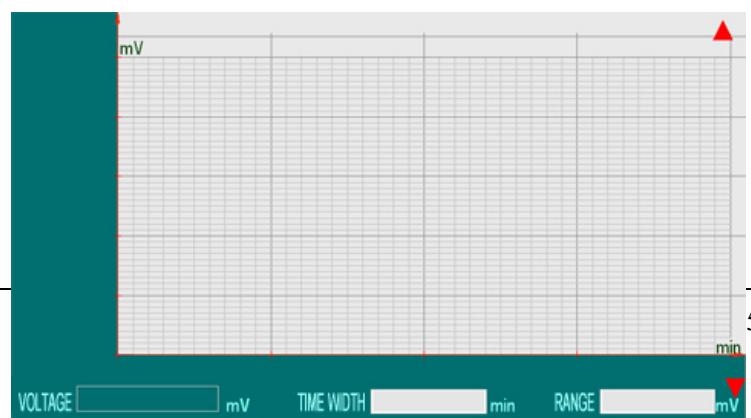
Used to set / display / enter detector related parameters. Including the relevant electrical control parameters, gas pressure flow parameters (hydrogen, air and auxiliary gas, etc.), real-time chromatogram display.



Detector plug and play mode. Press the detector key repeatedly to set and display the detector electrical control parameters, gas pressure flow parameters, real-time chromatogram and so on.

4.3.4.1 FID Amplifier Operating Parameter Setting

The instrument can be configured with dual FID detectors, dual amplifiers and dual signal processing systems. Its operating parameters can be set separately. Press the detector key repeatedly.



Perform FID I / FID II control parameters, gas pressure flow parameters and real-time chromatogram settings, parameter input, and chromatogram display.

Press the Detector key, the detector control interface appears (if the dual FID configuration, the interface displays FID I / FID II respectively), move the ▲ and ▼ keys to enter the relevant operation data at the cursor position,

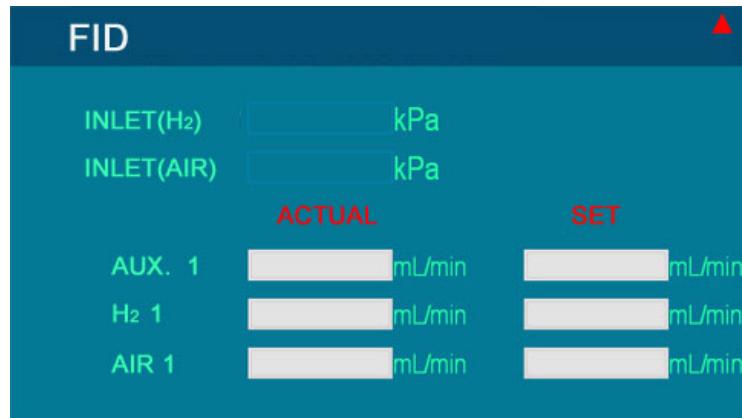
FID sensitivity can be set to 4 steps: 0, 1, 2, and 3;

Choice and input 0,1,2,3. 3 the highest sensitivity, general analysis can choose 2;

Threshold setting range: 0 ~ 9.9 mV, increment 0.1mV. Threshold value, for the

instrument power on,
automatically ignite FID

flame, the system
automatically monitors
the output signal
variation, and feedback
to the control system,
when the output signal
variation greater than the
set threshold, confirm
the ignition success.



Auto ignition selection: select Y (yes), the instrument automatically ignites, select N (no), the instrument need to manually fire;

Automatic ignition function: After power on, to meet the operating parameters of the condition, automatically ignites the FID flame.

Zero Calibration: Select Y (yes), the instrument automatically performs a baseline zero point calibration and repeats the selection of Y (yes). The instrument automatically repeats baseline zero point calibration, and N (no) selects no automatic calibration.

Signal output channel selection: choose I or II output channel;

Press the ▼ key can be used to display the signal level and chromatogram of the selected detector in real time.

Continuously press the ▼ key to set the detector gas path operation control parameters.

Hydrogen / air input pressure should be ≥ 2Kg/cm², but generally ≤ 2Kg/cm²;

Auxiliary gas / combustion gas flow setting range: 0 ~ 100mL / min, increment 0.1mL / min;

Auxiliary gas (air) flow setting range: 0 ~ 600mL / min, increment 0.1mL / min;

Auxiliary gas(N_2) / combustion gas / auxiliary gas (air) flow adjustment range is limited by the input pressure.

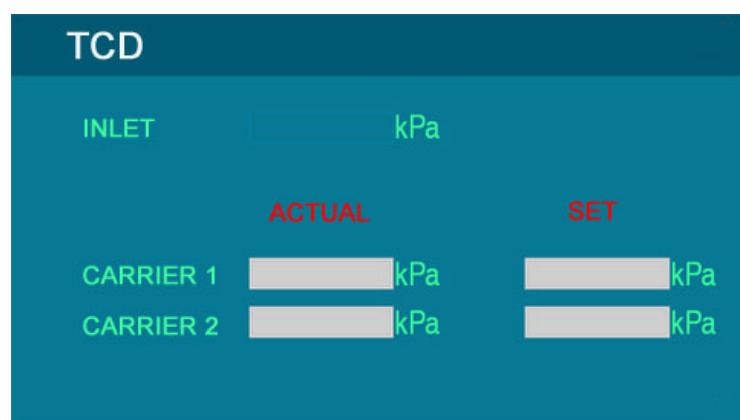
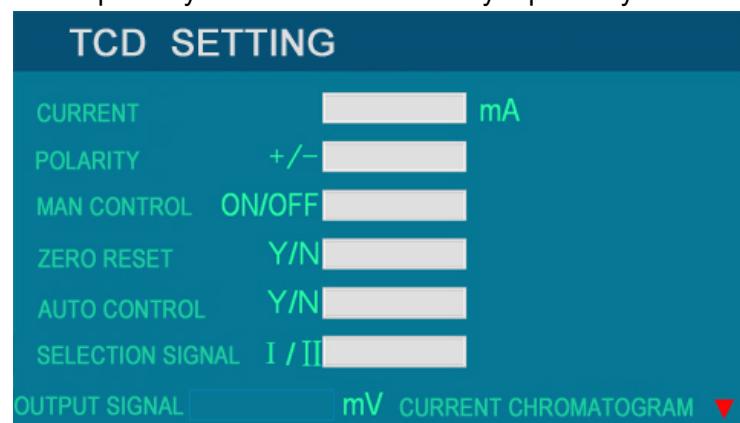
Enter the set value with the number, decimal point key, press the enter key to complete the relevant settings

4.3.4.2 TCD controller operating parameter setting

Instrument configurable dual TCD detector and control, signal processing system. Its operating parameters can be set separately. Press the Detector key repeatedly to set the Front TCD / rear TCD control parameters, real-time spectrogram settings, and parameter input and spectrogram display.

TCD pneumatic control. Relevant operation control setting by CARR. GAS key.

Press the Detector key continuously to display the TCD controller operating parameter setting interface (if the TCD / TCD front TCD / rear TCD), move the ▲ and ▼ keys to enter the relevant information at the cursor position;



TCD bridge current setting range: 0 ~ 200mA, the smallest indexing unit 1mA;

TCD output phase inversion: use +/- keys to set;

Use the ON / OFF button to select the bridge switch. ON means applying bridge current to the detector, OFF means breaking the bridge;

Zero Calibration: Select Y (yes), the instrument automatically performs a baseline zero point calibration and repeats the selection of Y (yes). The instrument automatically repeats baseline zero point calibration, and N (no) selects no automatic calibration.

Signal output channel selection: choose I or II output channel;

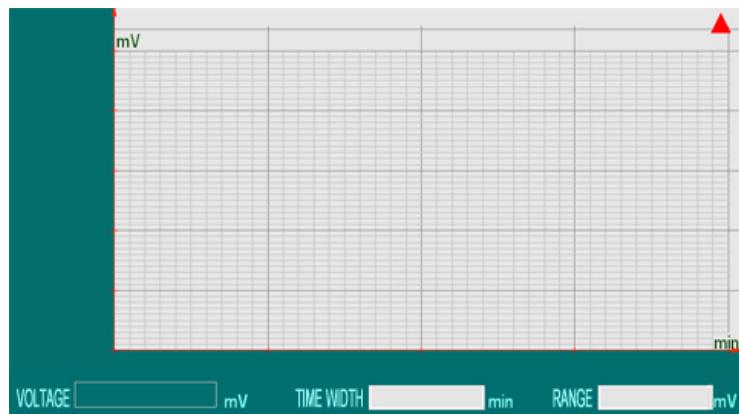
Press the ▼ key can be used to display the signal level and chromatogram of the selected detector in real time.

Press CARR. GAS key. Perform TCD carrier gas operation control parameter setting

Carrier gas The input pressure should be ≥ 0.25 mPa, ≤ 0.6 mPa. When the input pressure is less than 0.20

mPa, the instrument will automatically open the low pressure / outage protection and the column chamber will stop heating;

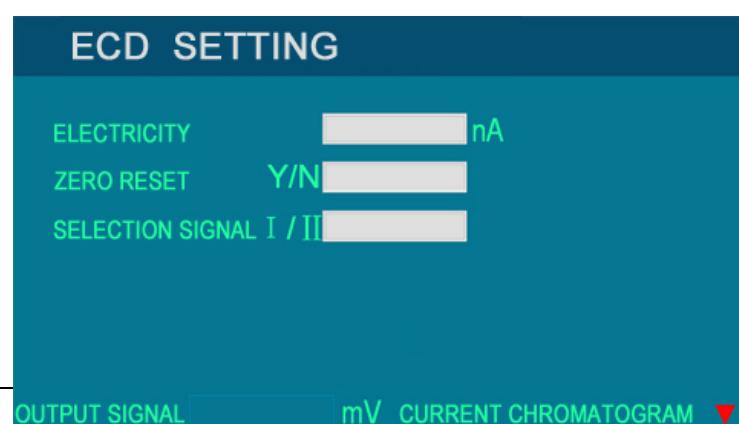
Carrier gas I /Carrier gas II Column head pressure setting range: 0 ~ 300kPa (adjustment range is limited by input pressure, that is, input pressure-50kPa, minimum 10kPa), increment 1kPa.



Enter the setting value with the number and decimal point key, press the enter key to complete the related setting.

4.3.4.3 ECD controller operating parameter setting

ECD carrier gas, auxiliary gas provided by the carrier gas operation control module. Carrier gas control module plug and play mode. Press the carrier gas key to set and



display the carrier gas and auxiliary gas parameters.

ECD detector configuration options: continuous press DETECTOR key, display ECD control interface, set the detector electrical control, chromatogram display parameters.

Move **▲**, **▼** key, enter the relevant data in the cursor position,

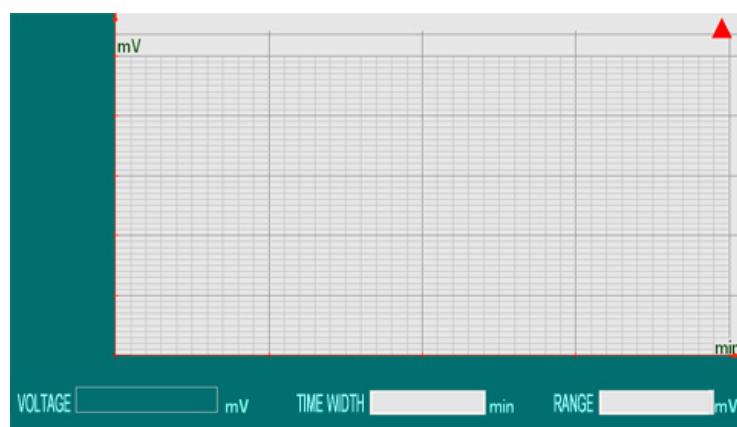
ECD preset current setting range: 0 ~ 2nA, increment 0.01nA;

Zero Calibration: Select Y (yes), the instrument automatically performs a baseline zero point calibration and repeats the selection of Y (yes). The instrument automatically repeats baseline zero point calibration, and N (no)

Signal output channel selection: choose I or II output channel;

Press the **▼** key can be used to display the signal level and chromatogram of the selected detector in real time.

Enter the setting value



with the number and decimal point key, press the enter key to complete the related setting.

ECD auxiliary gas: pressure setting range: 40 ~ 60kPa

4.3.4.4 FPD controller operating parameter setting

When using the FPD detector configuration, press the DETECTOR key repeatedly to display the FPD control screen, set the FPD detector electronics, and chromatogram parameters.

Move **▲** and **▼** keys to enter the relevant data at the cursor position;

FPD sensitivity can be set to 4 steps: 0, 1, 2, 3;

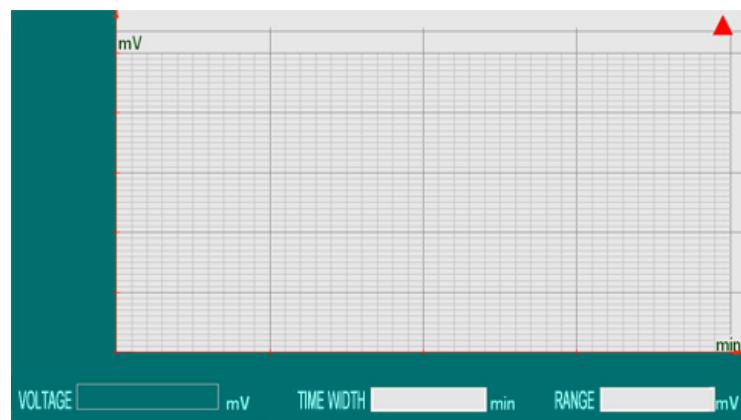
Choice and input 0,1,2,3.



3 the highest sensitivity, general analysis can choose 2;

Use ON / OFF key to select ON or OFF of high voltage power supply, input ON, high voltage applied by detector, select OFF, high voltage disconnect;

Zero Calibration: Select Y (yes), the instrument automatically performs a baseline zero point calibration and repeats the selection of Y (yes). The instrument automatically repeats baseline zero point calibration, and N (no)



Signal output channel selection: choose I or II output channel;

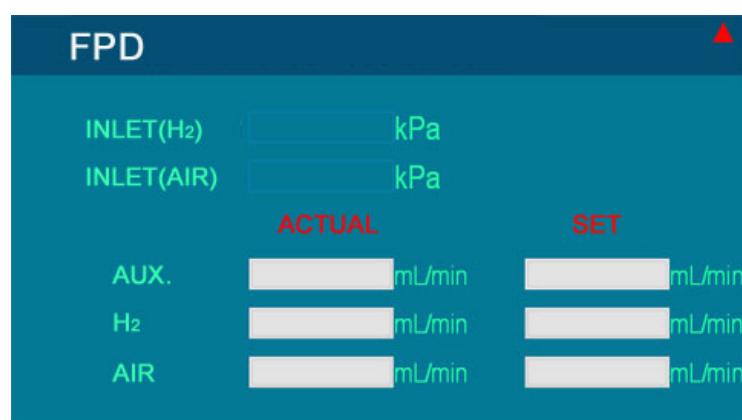
Press the ▼ key can be used to display the signal level and chromatogram of the selected detector in real time.

Continuously press the ▼ key to set the detector gas path operation control parameters.

¾ hydrogen / air input pressure should be ≥ 0.20mPa, but generally ≤ 0.3mPa;

Auxiliary gas / combustion gas flow

setting range: 0 ~ 100mL / min, increment 0.1mL / min;



Auxiliary gas (air) flow setting range: 0 ~ 600mL / min, increment 0.1mL / min;

Auxiliary gas (N2) / combustion gas / auxiliary gas (air) flow adjustment range is limited by the input pressure.

Enter the set value with the number, decimal point key, press the enter key to complete the relevant settings

4.3.4.5 NPD controller operating parameter setting

When using the NPD detector configuration, press the DETECTOR key repeatedly to display the NPD control screen, set the NPD detector electronics, and chromatogram parameters.

Move ▲ and ▼ keys to enter the relevant data at the cursor position;

NPD sensitivity can be set to 4 steps: 0, 1, 2, 3;

Choice and input 0,1,2,3. 3 the highest sensitivity, general analysis can choose 2;

bead heating power

supply setting range: 0 ~

5A, the minimum

increment 0.1A, bead

heating power supply

excitation current set

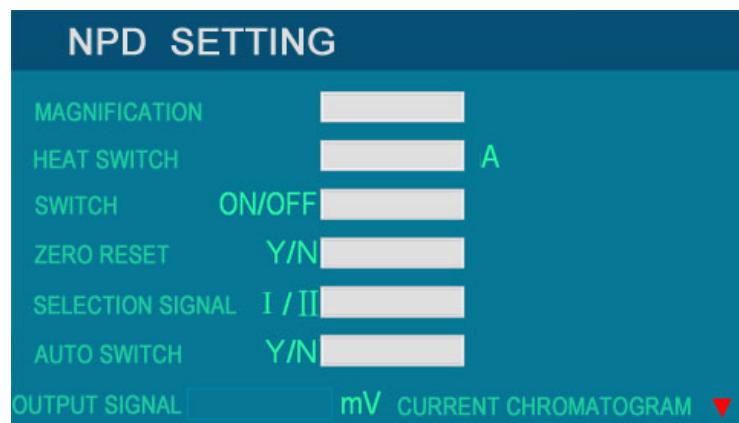
value is generally \geq 2A;

Use ON / OFF key to

select ON or OFF of

bead heating power

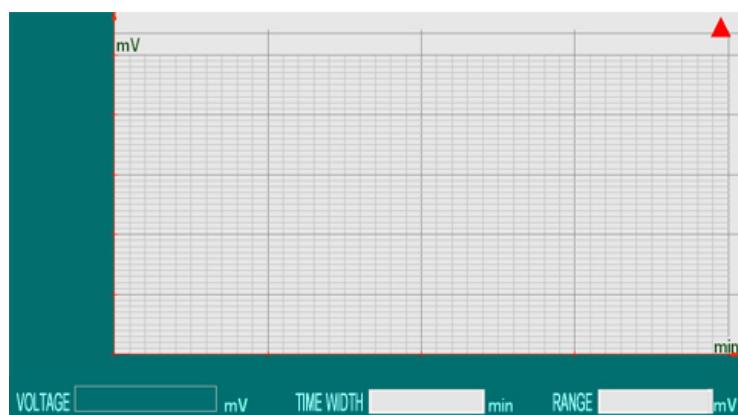
supply, input ON, bead heating power applied by detector, select OFF, bead heating power disconnect;



Zero Calibration: Select Y (yes), the instrument automatically performs a baseline zero point calibration and repeats the selection of Y (yes). The instrument automatically repeats baseline zero point calibration, and N (no).

Detector signal output channel can be selected through output channel selection I / II.

Use numeric, decimal point keys to enter the sensitivity and heating power settings, press the Enter key to complete the relevant



settings.

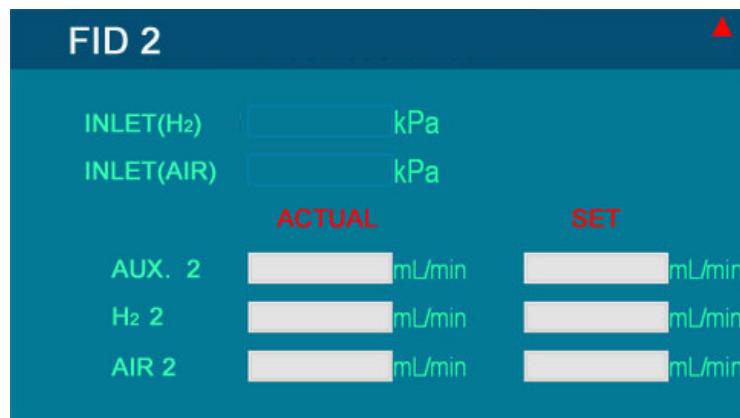
The page key ▼ can be used to display the selected detector output signal level and spectrum in real time.

- Use page key ▼ to set the detector gas path operation control parameters
- gas / gas input pressure should be $\geq 0.20\text{mPa}$, but generally $\leq 0.3\text{mPa}$;

Auxiliary gas / gas flow setting range: $0 \sim 100\text{mL}/\text{min}$, in increments of $0.1\text{mL}/\text{min}$;

help gas (air) flow setting range: $0 \sim 600\text{mL}/\text{min}$, in $1\text{mL}/\text{min}$ as an increment;

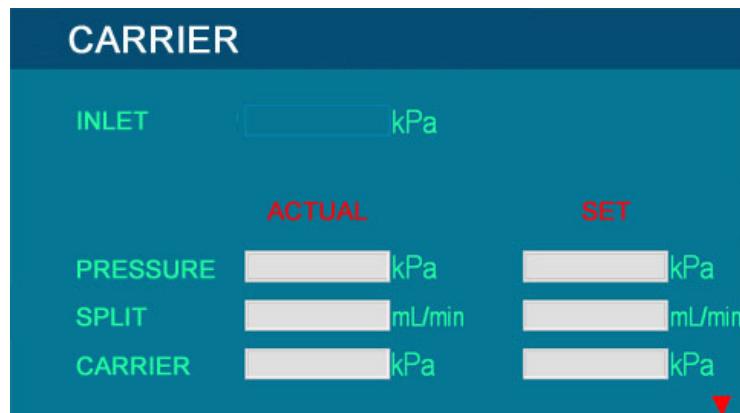
Auxiliary gas / gas / auxiliary gas (air) flow adjustment range is limited by the input pressure.



Enter the set value with the number, decimal point key, press the enter key to complete the relevant settings.

Signal output channel selection: choose I or II output channel;

Press the ▼ key can be used to display the signal level and chromatogram of the selected detector in real time.



Continuously press the ▼ key to set the detector gas path operation control parameters.

hydrogen / air input pressure should be $\geq 0.20\text{mPa}$, but generally $\leq 0.3\text{mPa}$;

Auxiliary gas / combustion gas flow setting range: $0 \sim 100\text{mL}/\text{min}$, increment $0.1\text{mL}/\text{min}$;

Auxiliary gas (air) flow setting range: 0 ~ 600mL / min, increment 0.1mL / min;

Auxiliary gas (N2) / combustion gas / auxiliary gas (air) flow adjustment range is limited by the input pressure.

Enter the set value with the number, decimal point key, press the enter key to complete the relevant settings

4.3.5 Carrier gas key operation and setting

Carrier gas control module plug and play mode, according to the user configuration options, the instrument automatically resource allocation. Press the CARR.GAS key to set and display the relevant carrier gas parameters.

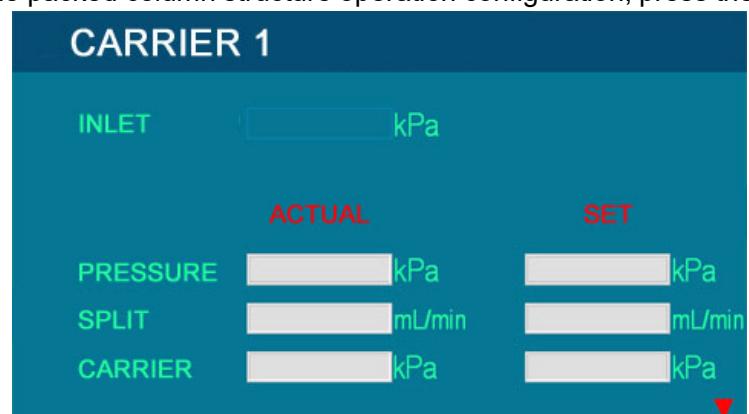
When the CARR.GAS key is pressed, the carrier gas control screen is displayed for setting the capillary carrier system (including the dual capillary system), the packed column carrier system (including TCD, FID dual carrier gas, ECD auxiliary gas and capillary TCD system Of the auxiliary gas) and other carrier gas parameters.

When you choose to operate with dual capillary structure configuration, press the carrier gas key repeatedly to input and set the control parameters of Capillary System I / Capillary System II Carrier Gas.

When you choose to use the packed column structure operation configuration, press the carrier gas key again and input and set the carrier gas control parameters of the packed column gas control system.

When choosing the operation configuration of dual TCD structure, press the carrier gas key again and input in sequence to set the operating parameters of the front TCD and rear TCD pneumatic operation control system.

Matched with ▼ keys to page down, set the carrier gas pressure control operating parameters



◆ Carrier gas control parameter setting

The carrier gas input pressure is the measured gas inlet pressure of the instrument; generally it should be ≥ 0.25 mPa, but ≤ 0.6 mPa. When the input pressure is less than 3Kg/cm^2 , the instrument will automatically turn on the function of low pressure and outage protection, and the column chamber stops heating.

Move \blacktriangle and \blacktriangledown keys to enter the relevant data at the cursor position.

capillary column head pressure setting range: $0 \sim 400\text{kPa}$ (adjustment range by the input pressure limit, that is, the input pressure- 50kPa , minimum 10kPa), an increase of 0.1kPa .

capillary column split range setting: $0 \sim 300\text{mL / min}$, increment 1mL / min .

When using ECD configuration, packed column head pressure can be used as ECD auxiliary gas, the pressure setting range: $40 \sim 60\text{kPa}$.

Enter the set value with the number, decimal point key, press the enter key to complete the relevant settings.

When using double capillary / FID structure operation configuration, you can press the carrier gas key repeatedly to set the capillary system carrier gas I / capillary carrier gas carrier gas II control parameters. Parameter input setting method is the same with carrier gas parameter setting.

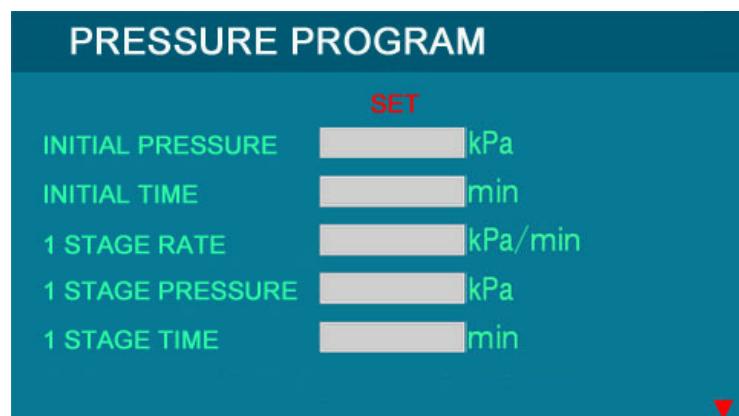
◆ Program pressure parameters set

Press \blacktriangledown key to page down. To the program pressure operation control parameter setting interface, matched with \blacktriangle , \blacktriangledown key, enter the relevant value in the cursor position;

Program pressure control range: $0 \sim 450\text{kPa}$;

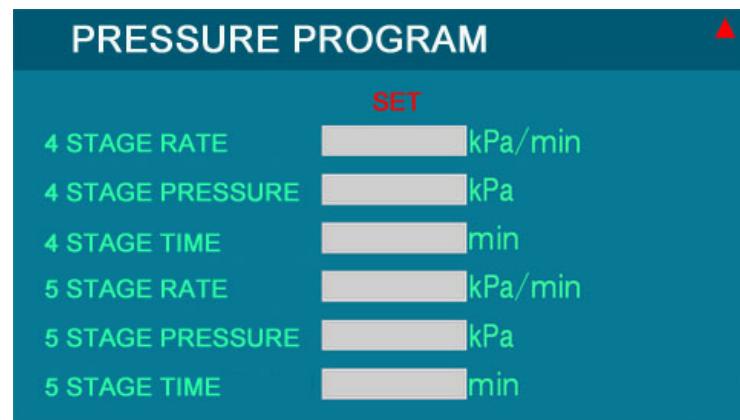
According to the analysis requirements to choose, with the number, decimal point key to enter the set value;

Program pressure setting increment: 0.1kPa / min ;



Raise / depressurization rate setting: 0 ~ 100kPa / min;

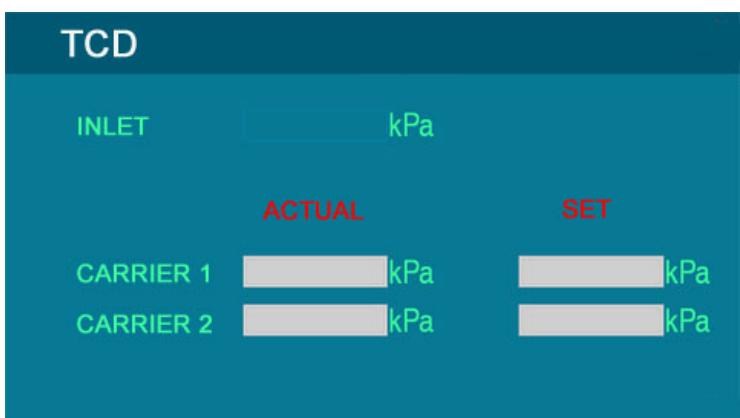
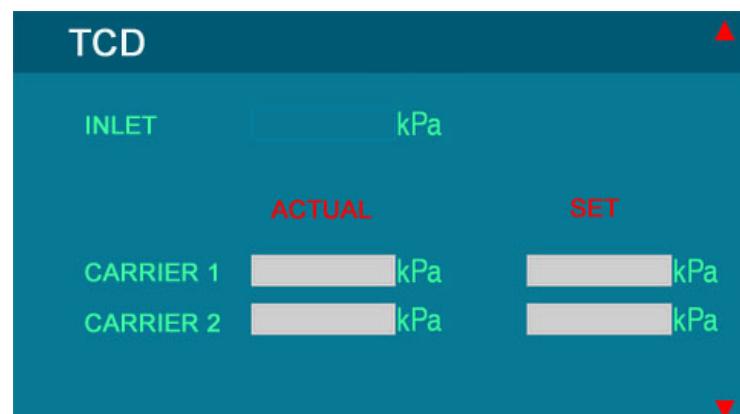
Up to 5th order pressure setting / operation; initial / final pressure control range: 0 ~ 600min. Enter the setting value with number and decimal point. Press the enter key to complete the relevant settings.



When using double packed column (single TCD) structure configuration, you can press CARR. GAS key, followed by set, enter the column filled with gas control system parameters.

Carrier gas input pressure: measured gas inlet pressure. Generally, it should be ≥ 0.25 mPa, ≤ 0.6 mPa. When the input pressure is less than 0.20 mPa, the instrument will automatically open the low pressure / outage protection function, and the column oven will stop heating.

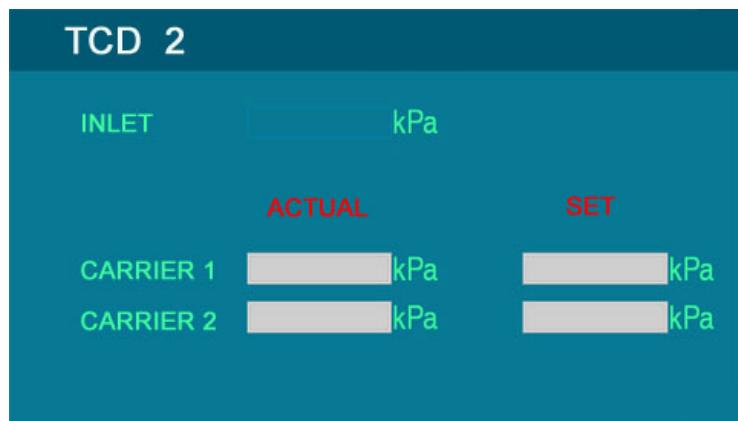
Carrier gas I / Carrier gas II Column head pressure setting range: 0 ~ 300kPa (the adjustment range is limited by the input pressure, that is, the input pressure is -50kPa, the minimum is 10kPa) and the increment is 1kPa.



Enter the setting value with the number and decimal point key, press the enter key to complete the related setting.

◆ **PACKED COLUMN carrier gas (dual TCD) operation settings**

When using dual TCD structure, press the CARR. GAS button repeatedly to enter the related operation interface. The front TCD / rear TCD gas control system parameters are set in turn, and the parameter input settings are the same as those of the packed column carrier gas (TCD) parameters.



4.3.6 INJ. MODE key operation and setting

Used to display and change capillary injector injection mode. According to the analysis requirements, select the injection mode by INJ MODE key. Optional sampling methods are: split / direct / split less, split less injection also need to set the time-delay indifference duration. INJ MODE key Used only for capillary injection analysis.

Press INJ MODE key. Show the sampling mode setting interface, matched with ▲, ▼ keys, select the mode at the corresponding position of the cursor, or enter the related value;

Select Y (yes), selected.
Select N (no), turn off the operating mode;
split injection mode: split valve is always open;
Direct (split less) injection mode: split valve is always closed;



Carrier Gas Save Mode: Select this mode. The split valve is closed and the split valve is closed during non-sample analysis cycles. Before sample analysis operation, turn off the

carrier gas saving mode (choose input N) to select the operation mode for sample analysis;

Split / Splitless Inject mode: The splitter valve is closed before the start of the analysis. After the start of the delay of injection analysis, the splitter valve opens and begins to split. After the sample analysis time, the splitter valve automatically shuts off for the next analysis operating;

Delay time combined with split / splitless injection mode, the delay time increment is 0.01min. The maximum setting time is 20min;

sample analysis cycle: incremental 1min, maximum duration 600min;

Press ENTER to complete the setting.

Enter the setting value with number and decimal point key, and press ENTER key to complete the setting.

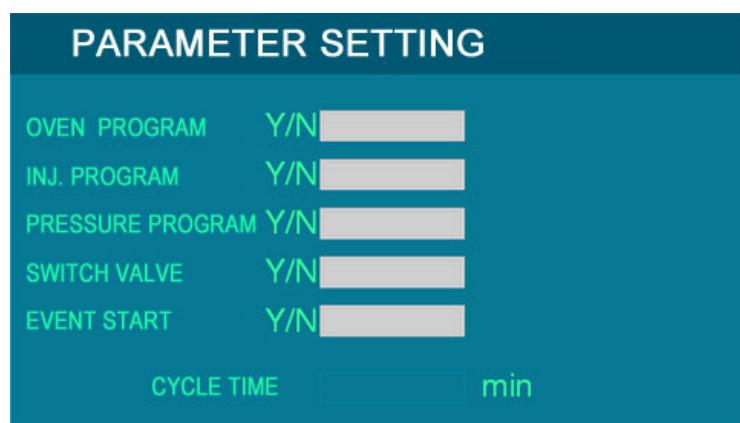
4.3.8 Oper.CONFIG key operation and setting

Oper. CONFIG.key is used in conjunction with column oven programmed temperature, injector programmed temperature, carrier gas control, injection switching valve and external events (eg workstation, headspace sampler, etc.) to open the combined settings. The cycle time can be set. After reaching the set cycle time, the instrument restarts the above operation. The cycle time is set to zero and the instrument has no operation. The cycle time should be longer than the sample analysis cycle + instrument preparation time (such as repeated programmed temperature operation, should be left sufficient cooling and stabilization time).

Press OPER.CONFIG.

Display analysis start operation selection interface, matched with ▲, ▼ key, enter the selection operation at the cursor position;

Select Y (yes), select the operation function, select N (no), the operation is not running;



Can choose multiple, linkage operation.

Press the Enter key to complete the relevant selection settings

4.3.9 EXT.EVENTS Key Operation and Settings

Used to configure and control external events. Can open, close 1 to 4 external events at the same time. Multi-stage control can be set, such as valve start, reset and multi-step start and reset operations when the external event is injection switching valve.

Press EXT. EVENTS Key.

Display external event operation control setting interface, matched with ▲, ▼ key, input operation data information at the cursor position;

can control up to four external control events at the same time;

EXTERNAL EVENT SET			
	START TIME	RESET TIME	SWITCH TIME
EVENT 1	[] min	[] min	[] s
EVENT 2	[] min	[] min	[] s
EVENT 3	[] min	[] min	[] s
EVENT 4	[] min	[] min	[] s
RUN TIME	[] min		

Events □ ~ □ set the timing should follow: start time <reset time;

Switching time refers to the use of motor-driven external devices when the motor power running time, usually $\leq 1s$;

Maximum setting time control range: 0 ~ 600min, increment 0.01min.

Press ENTER Key to complete the relevant selection setting.

4.3.10 COLUMN PARA. Key operation and setting

COLUMN PARA. Key For Capillary Column Parameters Input (Column Parameters: Length / ID / Head Pressure / Column Oven Temperature, etc.). And calculate, show the column after the flow rate, split ratio.

Press COLUMN PARA. Key.

COLUMN FLOW	
LENGTH	[] m
INNER DIAMETER	[] mm
PRESSURE	[] kPa
TEMP.	[] °C
COLUMN FLOW	[] mL/min
SPLIT RATIO	[]

Display capillary column parameters and post-column flow rate measurement interface; matched with ▲, ▼ keys, the cursor position input operational data information;

Enter the capillary column parameters with the numeric keys respectively: column length (in m) and column inner diameter (in mm). For example, 30m × 0.32mm capillary column, input column length = 32, the column diameter = 0.32 can be;

Column head pressure and column oven temperature are obtained in real time. Automatic detection by the instrument, display.

After entering the relevant data, press the ENTER key to display the capillary column flow rate and split ratio.

4.3.11 FILE Key operation and setting

FILE Key is used to store and recall analysis method files. As well as display and change the current analytical method file number. The current method file is the method file that the instrument is running. The setting of the method file should include:

temperature, programmed temperature operating parameters;

carrier gas, detector gas and auxiliary gas parameters;

detector operating parameters;

injector operating parameters;

Function configuration operating parameters;



Injection mode selection of operating parameters;

Injection / switching valve, external events operating parameters

The user may recall or store the corresponding method according to the analysis needs. As well as the file name and related operating parameters. The instrument can automatically save the current operation parameters as the current method file name; the current method file name and related operation parameters are all parameters of the previous power off operation, and the current method file name and related operation parameters can be stored as other method file names , And make editorial changes.

Instrument can store thirty operating documents, the file number is 0 ~ 29, 0 ~ 19 for the user method file.

Of which: 20 to 29 for the manufacturer to preset curing ten sets of operating method files, the user can call / copy, but cannot be changed, the file details see the manual annex

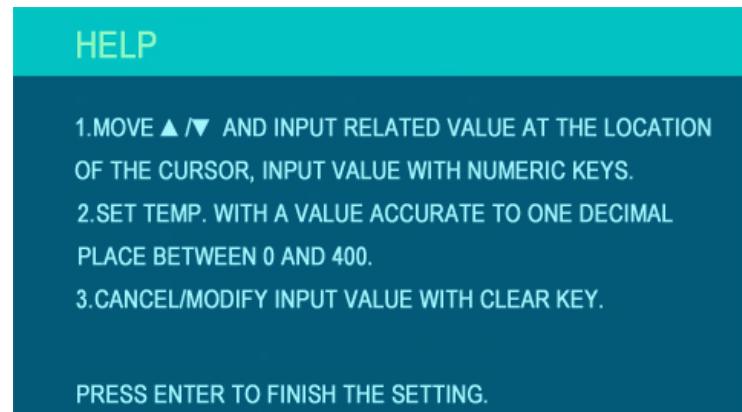
Press the File key to save and recall the method file. Move the ▲ and ▼ keys to enter the file number with the numeric keys at the cursor position. After the current method file name and related parameters are stored as other file names, the current file name will be overwritten.

When the instrument analysis is running, can not modify the file name and related parameters

4.3.12 HELP Key operation and setting

The HELP Key is used to display helpable messages on the LCD, to prompt trouble entries, or to display helpable content.

When the instrument is running. During the setting and editing of operating parameters, press HELP Key at the cursor position to display the related help message. For example, if the temperature operation parameter setting is in progress. Press HELP Key,



the help message that appears is:

1. Move ▲ and ▼ keys to enter the relevant value at the cursor position; input the data with the numeric keys;
2. Temperature value, enter a value between 0 and 400 with one decimal place.
3. With CLEAR Key cancel, modify the data has been entered.

4.3.13 TIMER Key Operation and Settings

TIMER Key is used as stopwatch function. You can also set the instrument system time, date setting.

Press TIMER Key to display stopwatch function interface, press TIMER Key continuously to start and stop the stopwatch timer.

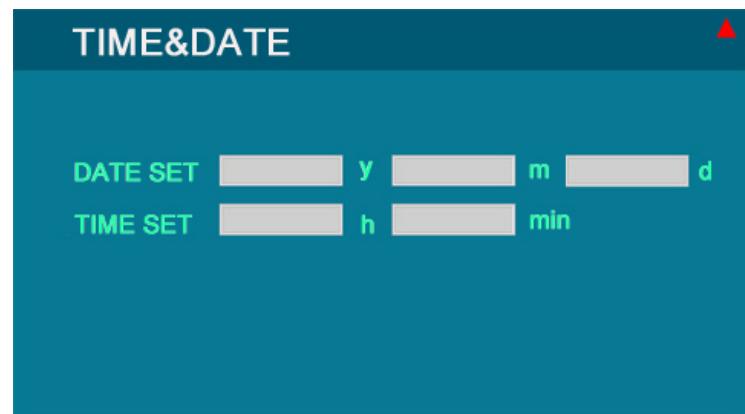
When using the soap flow meter flow rate, enter the meter readings to show the measured flow.



Press TIMER Key, stopwatch timer starts, stop pressing once more;

Enter the meter reading, which can automatically display the measured flow rate;

Press ▼ key to turn page, display time and date setting interface, can enter system time and date setting. Matched with ▲, ▼ keys, enter the relevant values in the cursor position, can be year, month, day and hour, minute setting, time using 24-hour system.



Press the Enter key to complete the relevant selection settings.

Chapter 5 Pressure Flow Control System

GC-5800 gas chromatograph pressure flow control system uses digital pressure regulator, digital gas resistance control valve, pressure sensor control technology. Instrument is pressure, flow and other manual adjustment, digital display control module. The combination module is a Gas Chromatograph electronically controlled electronic control unit that uses a manual adjustment, pressure sensor and controller to control the gas flow through the computer to achieve real-time display of pressure, flow, and gas flow rates. Its main features are:

Using mechanical self-regulating digital pressure regulator.

Selection of precision regulator and steady flow control technology. Through the Pressure sensor sampling, pressure and flow parameters such as display and control. Pressure sensor and control valve body integrated structure, collecting and displaying pressure data.

5.1 Gas source

Gas chromatograph operation, need carrier gas, combustion gas, combustion auxiliary gas and auxiliary gas source. The carrier gas and auxiliary gas are hydrogen, nitrogen, helium, argon, etc. The combustion gas uses hydrogen, air or oxygen as the auxiliary gas for combustion.

Carrier gas selection to meet the detector requirements. Also consider the impact of the analytical method on analysis cycle, column efficiency, and sensitivity. For example from column efficiency considerations. Carrier gas diffusion coefficient to be small, get a good peak, commonly used nitrogen carrier gas. Reduce the analysis cycle, helium is better than nitrogen. TCD detector carrier gas, in order to increase the sensitivity, commonly used hydrogen (helium) of high thermal conductivity, rather than using nitrogen or argon. Helium is better than hydrogen in terms of safety and analytical cycles. Hydrogen as a carrier gas is more common. FID with nitrogen as a carrier gas, safety and can get a higher sensitivity. FID with hydrogen as a carrier gas, but also add Tail purge gas. In summary TCD detector with hydrogen, helium is better. FID, FPD detector with nitrogen as a carrier gas, in special cases can also be used hydrogen. ECD detectors are typically supplied with nitrogen as the carrier gas. Carrier gas selection principle:

Inert gas (no chemical reaction with sample or stationary phase in the analysis), non-corrosive, not decomposed in the range of 200-400 °C:

Small gas diffusion coefficient to increase column efficiency:

Reasonable price, and to meet the detector's use requirements.

The type and purity of the gas source should be reasonably selected from the analysis of the sample to be analyzed and the analytical accuracy required, as well as from the Chemical Analysis Manual.

All gas inlet of the instrument are adopted Φ3mm pipe connected to the connector on the rear panel of the instrument, the thread adopts M8 × 1 metric thread, the sealing structure is shown in the figure. Operating the TCD and ECD detectors requires only one carrier gas, while operating the FID, FPD, and NPD tests additionally requires hydrogen and air

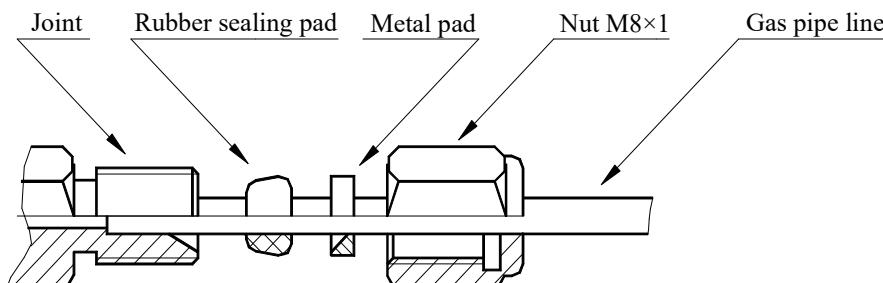


Figure 5-1 Sealing structure scheme

When the gas source is supplied with a cylinder, each cylinder must be fitted with a gas pressure relief valve. To reduce the high-pressure gas to the desired pressure value, the relief valve can only use one gas and should not be mixed.

5.2 Pressure / flow control combination configuration

The pressure / flow control combination module is mounted on the left side of the instrument. Three combinations of configuration modes to choose from:

1. Capillary carrier gas control module, see Figure 5-2;
2. Packed column carrier gas control module (mainly suitable for TCD), see Figure 5-3;
- 3 combustion gas / auxiliary combustion gas / auxiliary gas control module, shown in

Figure 5-2;

Pressure / flow control module plug and play mode, configured according to user needs. Pressure / flow control operating parameters displayed by the display, regulating valve adjustment:

When using TCD, ECD detector configuration, optional capillary carrier gas control module and packed column carrier gas circuit control module; FID / FPD / NPD and other detector configuration. Carrier gas control optional capillary carrier gas control module and packed

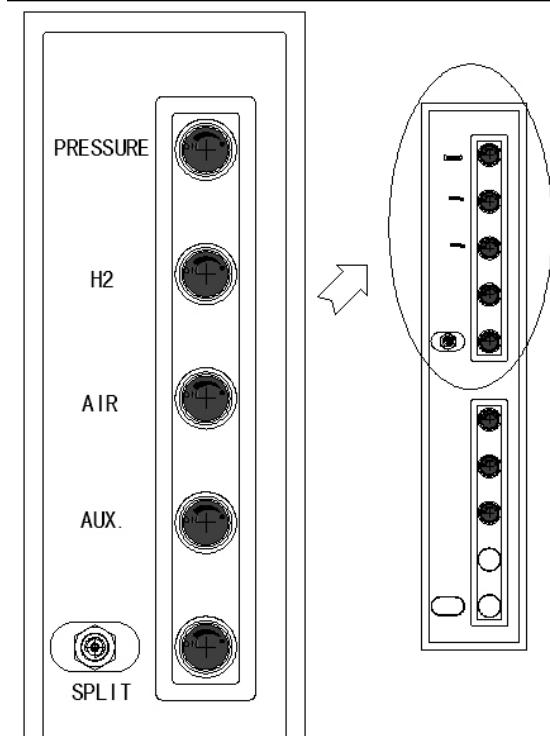


Figure 5-2 Pressure / flow control

column carrier gas circuit control module. At the same time should also be optional combustion gas / combustion auxiliary gas / auxiliary gas control module. Satisfy the detector operation requirements.

When the column oven need to add low-temperature operating system, injection valve, column switching valve or other auxiliary devices. The corresponding control module components should be selected.

5.3 The gas flow chart of the combined module

1. Capillary / packed column carrier gas control module gas flow chart
2. Packed column carrier gas control module gas flow chart
3. Combustion gas 1 / combustion Auxiliary gas 1 / Auxiliary gas 1 control module flow chart.

5.4 Pressure / flow combination module parameter adjustment and setting

5.4.1 Injection mode selection

When using the capillary injection analysis operation, the user can select the injection mode according to the analysis requirements. The capillary column injection modes are: Split, Direct and Split / Splitless. Split / Splitless Injections also need to set the splitless time delay. Its operation mode is:

Press INJ. MODE Key.

Show injection mode operation setting interface, matched with ▲, ▼ key, choose Y or N at the corresponding position of cursor;
Enter the set delay time with numeric keys and decimal point key, increment 0.01min., The maximum setting time is 20min;

INJ. MODE SELECT	
SPLIT	Y/N
DIRECT	Y/N
GAS SAVER	Y/N
SPLIT/SPLITLESS	Y/N
HOLD TIME	min
ANALYSIS PERIOD	min

Use the numeric keys and decimal point keys to set the sample analysis cycle duration, increment 1min, maximum duration 600min;

Press the Enter key to complete the relevant settings.

5.4.2 Carrier gas parameter input setting

The GC-5800 Gas Chromatograph Gas Control Module uses plug-and-play mode. The instrument automatically configures instrument resources based on user-selected configurations. Two carrier gas control modules are available for user selection:

Capillary / packed column carrier gas control module
packed column carrier gas control module
(mainly used for TCD configuration)

CARRIER		
INLET	ACTUAL	SET
PRESSURE	kPa	kPa
SPLIT	mL/min	mL/min
CARRIER	kPa	kPa

Capillary / packed column carrier gas control module parameter adjustment and display

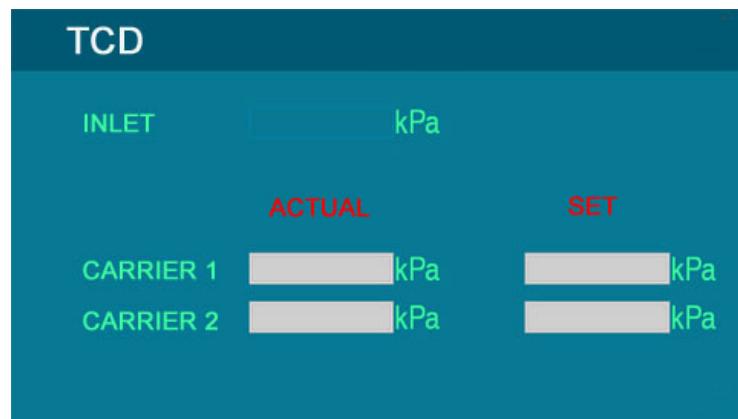
Press CARR. GAS key to display the carrier gas control parameter adjustment interface,

The upper part of the display is the real-time value of the carrier gas inlet pressure, when normal, ≥ 0.25 mPa, ≤ 0.6 mPa,

Manually adjust the relevant control valve, real-time display of measured pressure and flow;

capillary column, packed column, column pressure, carrier gas \square / carrier gas

- column head pressure setting range: 0 ~ 400kPa; split flow rate setting range: 0 ~ 300mL / min;



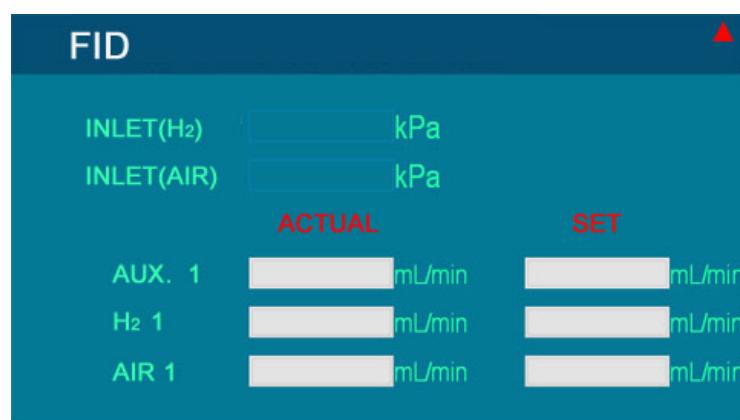
When ECD configuration is selected, the packed column head pressure is used as the ECD auxiliary gas and the pressure setting range is 40-60 kPa.

5.4.3 The combustion gas / auxiliary combustion gas / auxiliary gas parameter input settings

Due to Plug and Play mode, the instrument automatically configures instrument resources based on user-selected configurations.

The carrier gas control module shows:

- combustion gas input pressure
- auxiliary combustion gas input pressure
- combustion gas flow rate
- Auxiliary gas flow rate
- Auxiliary combustion gas flow rate



The above control combinations provide the following detector gas line combinations:

- hydrogen flame ionization detector (FID) mode of operation;
- flame photometric detector (FPD) mode of operation;
- Nitrogen and phosphorus detector (NPD) mode of operation;

Operating parameter input setting

- Press FLOW DISPL.Key to display the relevant detector control interface (take single FID operation mode as an example). matched with ▼ key to page down, to enter the next gas control adjustment display interface (multi-detector configuration);
- In the upper part of the display for the combustion gas and auxiliary combustion gas inlet pressure measured value. Normal ≥ 0.20 mPa, ≤ 0.3 mPa;
- Manually adjust the corresponding control valve, real-time display of measured pressure and flow;
- Auxiliary gas / combustion gas flow setting range: 0 ~ 100mL / min; auxiliary combustion gas (air) flow setting range: 0 ~ 600mL / min. Auxiliary gas / combustion gas / auxiliary combustion gas (air) The flow adjustment range is limited by the input pressure.
- When equipped with dual hydrogen flame ionization detector (FID), flame photometric detector (FPD), and nitrogen phosphorus detector (NPD) operating modes. The auxiliary gas / combustion gas / auxiliary combustion gas (air) operating parameters to adjust and display the same way.

5.4.4 Flow calibration and measurement

When the need for instrument gas control system calibration. You can use a foam flow meter to calibrate the gas flow rate. See the connection method diagram (Figure 5-6 Scheme of flow rate measurement). The foaming agent into the soap film flow meter (foaming agent preparation can be formulated with detergent, the same way with the leak of liquid). And connected to the desired measurement of the detector or other test object outlet port. In order to

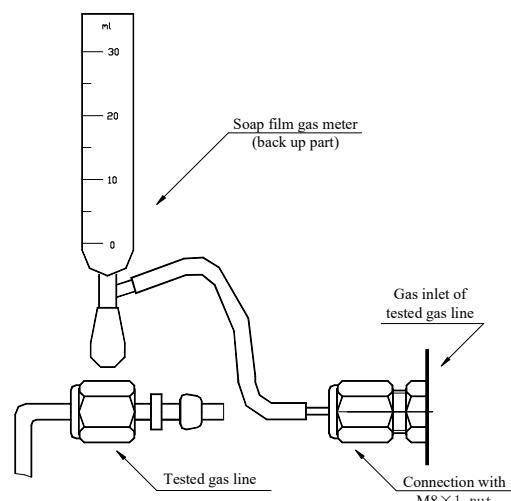


图 5-6 Scheme of flow rate measurement

reduce the measurement error. When measuring gas flow. Can choose a larger soap film flow meter. After the introduction of gas, with a stopwatch measured soap film from 0 to 10 by the time, in ml / min as the unit, calculate the gas flow. In order to avoid polluting the gas circuit, be sure to pay attention to the height of the liquid soap inside the flow meter. To prevent the soap solution from backflowing into the detector tubing.

Chapter VI Injector structure and operation

GC-5800 gas chromatograph injection system has a variety of injection technology for users to choose. Mainly packed column head injection, rapid injection glass liner, capillary split injection, capillary direct injection, with capillary cleaning capillary split / splitless injection and other injection devices. Capillary injection system enables split / splitless injection operation. Instrument can also be adapted to a variety of gas injector. Can be connected to the headspace sampler, autosampler and other automatic sampling device.

Conventional configurations are packed column head injections (single) and capillary split / splitless injections (single) with septum purge.

6.1 Packed column head sampling device

Packed column head injector Suitable for stainless steel column: 3 ~ 4mm outside diameter of column (see Figure 6-1 for structure);

- Injector base material: 304 stainless steel;
- sample septum (gasification pad): Acupuncture resistant silicone rubber, 7 × 5mm T-shaped.

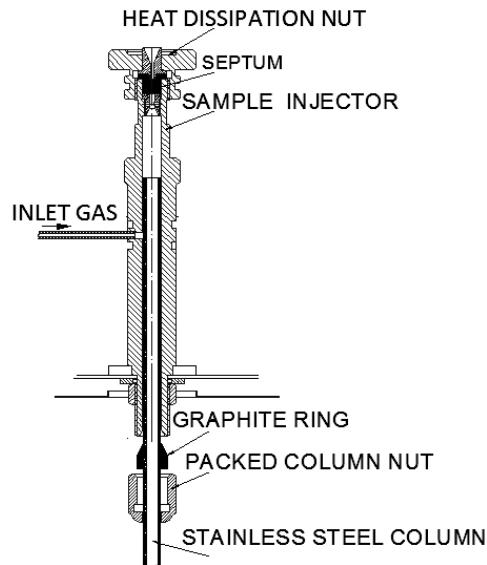


Figure 6-1 Packed column head Injector

6.2 Glass Packed Column / Packed column Glass-lined Rapid Injection Unit

Injector adapting glass column diameter: the column diameter 5mm (structure shown in Figure 6-2);

- Inlet adapter lined size: 104 × 5mm;
- Injector base material: 304 stainless steel;

-
- sample septum (gasification pad): Acupuncture resistant silicone rubber, 7 × 5mm T-shaped.

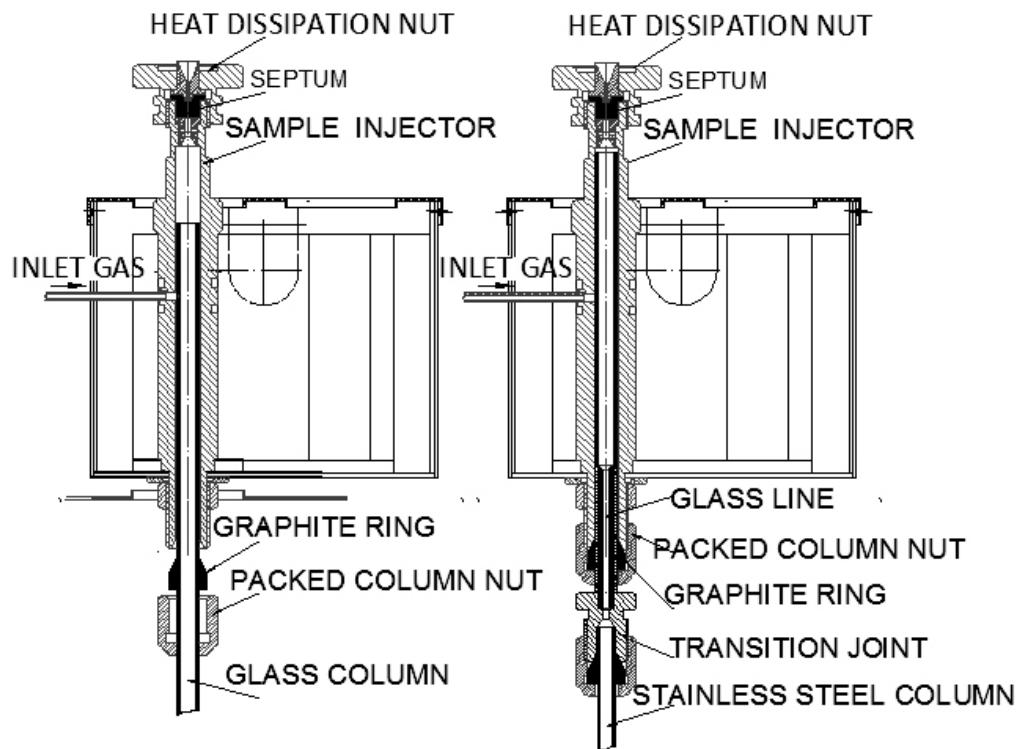


Fig.6-2 Glass packed column / packed column glass-lined rapid injector

6.3 Split / Split less capillary injector with purge capability

GC-5800 Gas

Chromatograph Split / Split less capillary injection system with septum purge capability. A variety of flexible quartz capillary column can be installed. Optional split injection, direct injection and split / split less operation. With a sample adsorption coefficient, easy installation, simple operation and so on. Split and septum purge gas circuit automatically controlled solenoid valve. Can be split / split less injection operation. Injector structure shown in Figure 6-3.

- Fit glass lined size: 72 × 5mm;
- Injector base material: 304 stainless steel;
- Sample septum (gasification pad): Acupuncture resistant silicone rubber, 7 × 5mm T-shaped

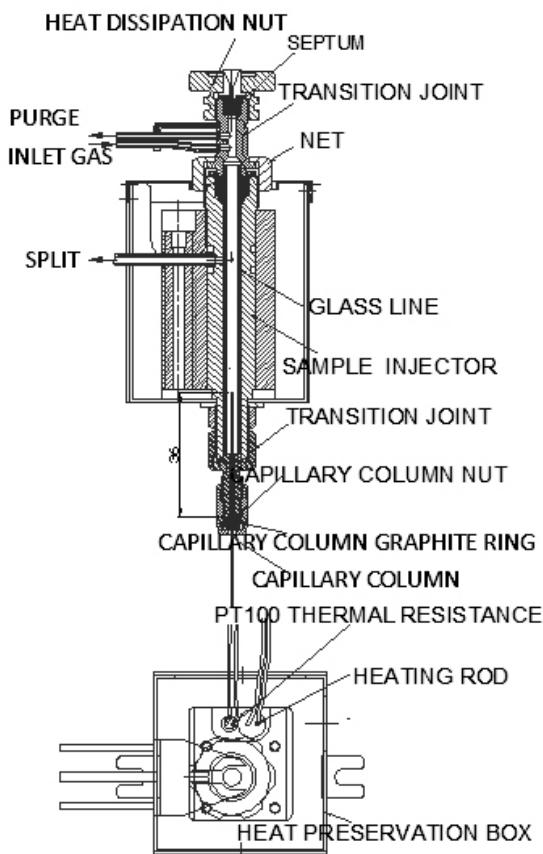


Figure 6-3 split / splitless injection

6.3.1 Glass liner installation and replacement

Capillary injector components have been cleaned at the factory and tested for system leak testing. The injector structure shown in Figure 6-4. When the injector is not normal, or you need to clean the glass liner and other components, you must disassemble the injector and the sequence of operation is as follows:

Loosen and remove the injector septum cap (injection guide). Remove the sample septum with tweezers; check the appearance of the quality, if found damaged, should be promptly replaced, so as to avoid leakage of sample injector;

Unscrew the inlet seal plug with a wrench and remove it.

Unscrew the bottom post with a wrench and remove it. Using a small screwdriver, gently push the glass liner upwards along the bottom hole of the base of the injector and remove the glass liner (including the liner gasket and liner gland).

Check the bottom column joint gasket, install the column connector, and tighten to avoid leakage;

Check the quality of the appearance of the glass liner, if cracks, pollution, etc., should be promptly replaced. Replacement, the graphite gaskets, liner gland set in accordance with the original sequence of glass liner, with a tweezers gently into the base of the injector. Press down in the direction of the arrow to bring the glass liner into contact with the column fitting. To ensure that the injector split point is correct;

Install and tighten the sealing plug

Reinstall the injection septum, guide, and septum cap in the original order. After the injector is installed, the outlet ports should be closed, and the nitrogen leak test can be carried

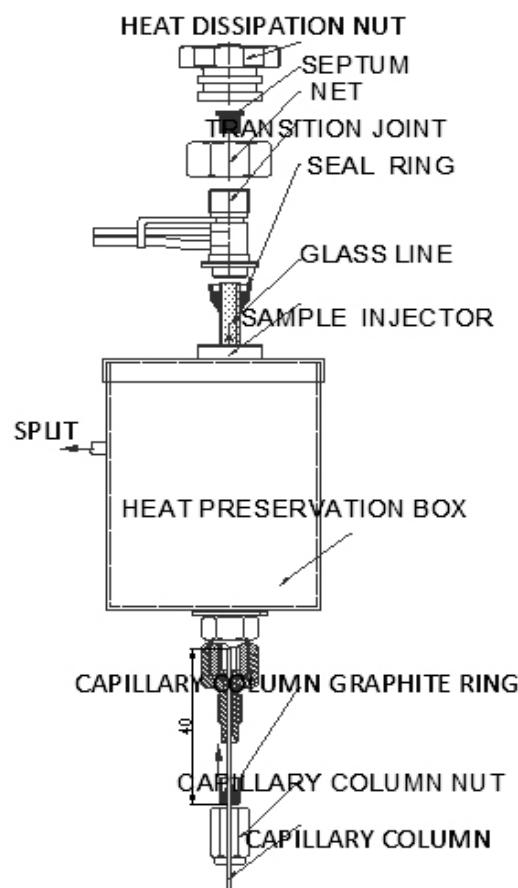


Figure 6-4 Glass liner installation

out. Only by confirming that the system does not leak gas, it can be put into use.

Improper installation of sampler or assembly process may result in contamination of parts and components, degradation of instrument stability may occur, unwanted ghost peaks may occur, or the device may not work normally. In order to prevent the above phenomenon from occurring, during the process of unpacking the injector, care must be taken to prevent the parts from being contaminated. After assembly, connect to nitrogen and warm up the injector for several hours before accessing the column.

6.3.2 Lined glass tube filling method

Glass liner, filled with the appropriate quartz wool or 20 to 40 mesh glass beads, the carrier gas and sample can be fully mixed steam. If filled with a fixed liquid material materials, in addition to the above effect, but also as a pretreatment column. In the analysis process, this kind of preprocessing is a very effective method for obtaining good split reproducibility.

6.3.3 Detector tail Purge gas installation

The detector make-up gas is supplied by the auxiliary gas of the instrument's gas control unit. Gas connection reference capillary injection gas control flow chart. Capillary column diameter 0.1 ~ 0.5mm, carrier gas flow rate of about 0.2 ~ 2ml / min. As the carrier gas flow rate is too small, cannot meet the detection sensitivity requirements. To do this, it is necessary to provide a make-up gas at the inlet of the detector and carry out a tail purge treatment to meet the needs of the detector performance.

6.3.4 Precautions

In order to prevent capillary system pollution, when installing or unloading the injector, detector internal parts, the operator must wear gloves or finger jersey gloves;

To be assembled parts, should be strictly cleaned, and after baking

Treatment, before use. Remove the unloaded parts should be placed in a clean container without pollution;

To prevent scalding, when replacing the internal parts of the injector, be sure to wait until the temperature is lowered to room temperature.

Chapter VII Thermal conductivity cell detector (TCD) structure principle and operation

Thermal Conductivity Cell Detector (TCD) is a concentration detector. The response signal generated by the difference between the measured components and the carrier gas thermal conductivity. By the thermal conductivity cell and its control circuit.

7.1 Selection of test conditions

7.1.1 Carrier gas type, purity and flow

TCD usually He or H₂ as a carrier gas. Its thermal conductivity is greater than other compounds. TCD with He or H₂ as a carrier gas, high sensitivity, and the standard peak shape, the response factor is stable, easy to quantify. With hydrogen carrier gas, the highest sensitivity. But pay attention to safety. Also, prevent the sample from reacting with hydrogen.

When using capillary column-TCD operation, make-up gas is applied. The type of make-up gas is the same as the carrier gas.

Carrier gas purity affects TCD sensitivity. Experiments show that: in the bridge current 160-200mA range. With 99.999% ultra-pure hydrogen, than with 99% hydrogen sensitivity 6% -13%. The carrier gas purity also affects the peak shape. When TCD is used for impurity detection in high purity gas, the purity of the carrier gas should be more than ten times higher than that of the gas to be measured, otherwise the peak will fall out.

Although TCD is a concentration detector, it is also sensitive to fluctuations in flow rate. The TCD response peak area is inversely proportional to the carrier gas flow rate. In the analysis process. The carrier gas flow rate must be constant. In ensuring the separation of the premise, you should choose to reduce the carrier gas flow rate.

7.1.2 Bridge current

Increase the bridge current can significantly improve the TCD sensitivity. S value is proportional to $I^{2.8}$. Therefore, increasing the bridge current to increase sensitivity is the most common method. However, the increase of the bridge current is limited by the noise and the service life. If the bridge current is too large, the noise will increase sharply. The result is a reduction in signal-to-noise ratio. In addition, the higher the bridge current,

the hot wire is more susceptible to oxidation, the shorter the service life. Therefore, in the case of sensitivity to meet the analysis requirements, select the low-bridge current as well. At this time the noise is small, hot wire life can be longer. But long-term work in the low bridge current, may cause cell pollution, then need to use solvent cleaning TCD cell.

Using different carrier gas, TCD detector at different temperatures, the bridge current (mA) allowable values are as follows:

	100°C	150°C	200°C	250°C	300°C
H ₂	200	175	150	100	75
N ₂	125	100	75	50	25

Table 7-1

7.1.3 Detector temperature

The TCD sensitivity is proportional to the difference between the hot wire and the cell body. Clearly, there are two ways to increase the temperature difference: First, to improve the bridge current, in order to increase the hot wire temperature. The second is to reduce the detector cell temperature. This depends on the boiling point of the sample being analyzed. The detector cell temperature cannot be lower than the boiling point of the sample to prevent condensation in the detector. Therefore, the higher boiling point of the sample, the use of this method can only increase the sensitivity of a limited, and gas samples, especially permanent gas, increasing the temperature difference is better.

7.2 Precautions for use

To ensure TCD performance, to avoid operational abnormalities, should pay attention to the following aspects.

1. **GC-5800** TCD double-column double gas four-arm detector structure. Two columns must be connected. At the same time should ensure that the two carrier gas balance,

carrier gas flow through the detector outlet vent, the flow rate of about 50ml / min.
(Measured from vent)

2. Correct choice of carrier gas type, bridge current and cell temperature, to avoid the hot wire temperature is too high,
blow the hot wire.

Hot wire has a maximum withstand temperature, above which the temperature is blown. Hot wire temperature level is determined by the type of carrier gas, bridge current and the temperature of the cell body. If the carrier gas thermal conductivity is small, the bridge current and the cell body temperature is high, then the hot wire temperature is high, in turn the same.

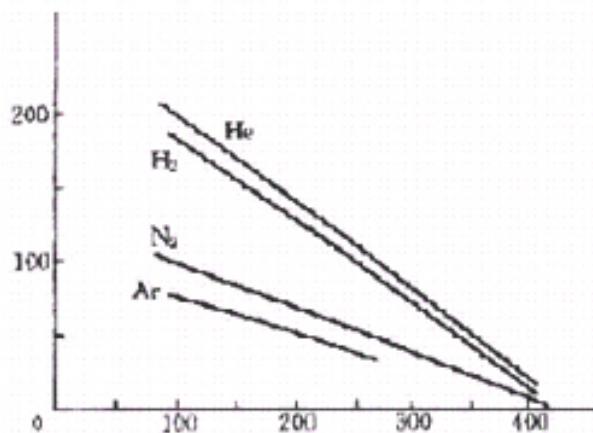


Figure 7-1 current and temperatures

Carrier gas type, bridge current and the curve between the body temperature (see), according to the curve to adjust the bridge current, we can ensure that hot wire temperature is not too high. When using the TCD, be sure to pass the carrier gas first to check the air tightness of the entire air intact. Adjust the carrier gas flow rate to a certain value, and stable 10-15min, then connect the bridge current. If you need to change the column, injection septum or cylinder during operation, be sure to turn off the bridge current before replacing. The **GC5800** has a low pressure and carrier gas disconnect protection. When the carrier gas is interrupted or too low, the instrument will automatically cut off the bridge current.

3. The use of high purity carrier gas, to ensure the normal operation of purification equipment

If the carrier gas contains oxygen, the oxidation of hot wire, detrimental to their life. Therefore, the carrier gas and makeup gas should usually use high purity gas or purifying device to remove oxygen. After the carrier gas purification device is used for a certain period of time, it will fail due to adsorption saturation. Should be replaced immediately to ensure normal work.

4. The depth of the capillary column insertion should be suitable

The location of the column into the detector cell is very important. It affects sensitivity and peak shape. The end of the capillary column must be at the inlet of the sample cell. If the capillary column is inserted into the cell, the sensitivity decreases and the peak shape is poor. If the capillary column is too far away from the cell inlet, the peak broadens and smells, and the sensitivity decreases.

5. After high temperature analysis, remove the column if necessary. Be sure to wait for the column oven temperature to drop below 80 ° C. Only remove the column to prevent damage to the column fitting.

6. The instrument can not be placed in a place where the air fluctuates greatly; the TCD venting gas should be connected to the outdoor with a pipe. Outdoor vent should be fixed to prevent the wind swing, affecting the baseline.

7. When you need to shut down, you should press the STOP key, wait until the thermal conductivity detector temperature dropped below 100 ° C, then off the power, gas source. This helps to extend the life of the thermal conductivity detector

7.3 Installation and Use of Thermal conductivity Cell Detector (TCD)

GC5800 GC-TCD
semi-diffusive
four-armed structure,
100Ω rhenium
tungsten, constant
current power supply.
The detector is
installed on the right
rear upper side of the
instrument oven. The
controller is installed in
the electrical chassis.
The detector structure
is shown in Figure 7-2

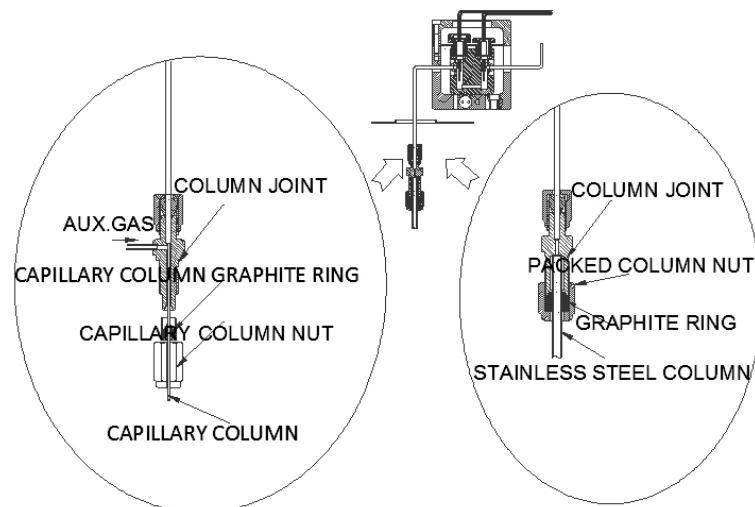


Figure 7-2 TCD detector structure and column connections

-
1. Check the detector gas pipe and the column connections are correct.
 2. Open the carrier gas source and press the CARR. GAS key to adjust the carrier gas head pressure and carrier gas flow rate. Measure the flow rate after the actual measurement with the Soap bubble flow meter at the thermal air inlet, so that the two carrier gas flows are basically the same , When the carrier gas flow at 50ml / min, get the maximum sensitivity value.
 - 3.Gas source open ≥ 20min, turn on the power switch, press the TEMP Key. Set column oven, injector and detector temperature. Press HEATING Key. The instrument starts to heat. Press DETECTOR Key to set parameters such as bridge current. The instrument has a gas outage protection, when the instrument inlet pressure is lower than 0.2MPa, it will automatically disconnect the bridge.
 4. Wait for the instrument temperature is constant (ready light), open the workstation, the baseline stable, you can sample analysis.

Note:

When using the TCD detector, you need to turn on the carrier gas first. then turn on the thermal bridge current. After the analysis, turn off the power, then turn off the carrier gas. (TCD temperature must be reduced to less than 100 °C, to turn off the carrier gas); Instrument restart, the carrier gas should be passed for 15 minutes before the detector is energized. To ensure that rhenium tungsten is not oxidized and destroyed. When TCD is not used for a long time, the inlet and outlet must be blocked to ensure that the rhenium tungsten wire is not oxidized;

As TCD generally use hydrogen as a carrier gas, be sure to pay attention to safety, no fireworks;

When the bridge current is greater than 85mA, the low purity carrier gas will adversely affect the life of the sensitive component

7.5 Thermal conductivity detector failure and maintenance (see schedule)

1. Thermal conductivity output can not be zeroed. Possible Causes:

thermal control circuit failure, should check the control circuit, it is best to ask the manufacturer to repair,

Leakage of the instrument, especially the leakage of injector, should be retested.

Four-wire hot filament resistance asymmetry, disconnect the thermal conductivity detector and electrical connections. Measuring the resistance of the lower arm, the difference should be less than 0.5 ohms,

A hot wire and the pool body short circuit, you can check the rhenium wire components grounding resistance (should be unplugged bridge stream line).

2. Baseline stable, but no peak or reduced sensitivity after injection. Possible Causes:

thermal conduction bridge current is too small,□

Injector septum pad leaks,

Injector, column-to-detector leaks,

syringe leaks, or injector temperature is too low,

Rhenium tungsten components serious corrosion.

3. Baseline stability deteriorated. Possible Causes:

sample or high boiling point fixed liquid loss, condensation in the vent,

bridge current is too large, rhenium tungsten was burning state,

carrier gas flow is too large or unstable,

Temperature control instability, should be repaired,

Thermal cell detector contaminated. Should be removed and cleaned.

Thermal conductivity detector cell control circuit failure, should be repaired,

(Table 7-2 for details See)

No	Fault	Possible cause	Troubleshooting mode
1	no bridge current	a. Bridge flow setting is OFF b. TCD rhenium tungsten hot wire is burned c. TCD controller fault	Set the bridge current to ON Remove the thermo sensitive component cable and check it with a multimeter Repair or replace
2	No peak	a. The carrier gas is blocked or leaks b. deflection or over-range c. Sensitivity is too low d. The sample is adsorbed e. data processing equipment failure	a. Check TCD carrier gas inlet pressure b. carrier gas leak test c. Check bridge current value and sample injection volume d. Repeat the experiment to optimize the analysis conditions e. Short circuit the input signal, check the operation error
3	Baseline instability	a. Supply voltage fluctuations b. data processing equipment failure c. Poor signal connector d. leaks e. Injector contamination or detector contamination f. Gas pipe pollution g. Column deterioration h. Carrier gas impure i. Pressure flow controller failure j. TCD component failure k. TCD controller fault	a. Check the power supply circuit with a multimeter or oscilloscope b. short circuit input signal, check the operation error c. shake the signal connector to improve the contact d. Leak test e. Clean the detector with solvent f. Clean or replace the pipe g. Replacing or High Temperature Aging Columns h. Clean or replace the filter media i. Repair or replace the detector

No	Fault	Possible cause	Troubleshooting mode
4	Large baseline noise	Power supply noise Bridge current setting is too large Loose components TCD component failure	a. Change the power supply or install the power filter device b. Short circuit the input signal and check the operation error c. Check the bridge current setting d. Replace the purge tube or replace the TCD temperature sensor
5	The peak broadens	a. Carrier gas flow rate is too low b. The column oven temperature is low c. Analyze the system for dead volume d. Column deterioration e. Column selection error (type or length) g.Injector or detector temperature is too low	a. Increase the column flow rate b. Increase column oven temperature c. Check the column fitting d. Replacing or high temperature aging columns e. Increase other related temperatures
6	Sharp peaks	a. High carrier gas velocity b The column temperature is high c. Column degradation d. column selection error (type or length)	a. Reduce the flow rate b. Lower the oven temperature c. Replacement or high temperature aging columns d. Replacement column
7	Peak tailing	a. Injector glass liner damaged b. Injection volume too much c. Column selection error d.Injector pollution	a. Replace Injector glass liner b. Check bridge current setting and injection volume c. Replacement column d. Clean the glass liner with solvent

Chapter VIII Hydrogen flame ionization detector (FID)

structure principle and operation

Hydrogen flame ionization detector (FID) is a typical mass detector. It uses the hydrogen flame as the ionization source to ionize the organic matter and produce the micro current, and the micro current is processed by the corresponding signal to produce the chromatographic signal. FID has ion chamber, amplifier and control circuit.

8.1 Selection of detection conditions

Hydrogen flame ionization (FID) detector with user-selectable parameters: capillary insert nozzle depth, carrier gas and makeup gas species and flow rate, H₂ and air flow rate, and gas purity. Column oven, injector and detector temperature. Flame temperature, ionization, and collection efficiency are all related to the flow rates and relative ratios of carrier gas, hydrogen, and air.

8.1.1 Gas type, flow rate and purity

FID generally uses N₂ as a carrier gas. For different k values of compounds, when the flow rate of nitrogen is increased within a certain range, its response value also increases, reaches a maximum at 30 mL / min and then drops rapidly. Therefore, nitrogen generally adopts a flow rate of 30 mL / min or so, the detector can get better sensitivity. In H₂ carrier gas, N₂ as make-up gas and H₂ premixed into the nozzle, the effect is the same. When the volume ratio of nitrogen to hydrogen is not the same, the effect of flame burning is not the same, which directly affects the response of FID. The optimum flow ratio of N₂: H₂ is 1 ~ 1.5.

For best detector performance, increase sensitivity and linearity without broadening the peak. When the capillary column operation, usually post-column to use N₂ or Ar as the makeup gas auxiliary gas, makeup gas auxiliary gas flow rate is generally 30 ~ 60mL / min.

Hydrogen and air flow rate

Hydrogen as the combustion gas and nitrogen (carrier gas) pre-mixed into the nozzle, when the nitrogen flow rate is fixed, with the hydrogen flow rate increases, the output signal also increases, and reaches a maximum rapidly decreased. As shown in Figure 8-1. Can be seen from the figure: the best hydrogen flow rate of 40 ~ 60mL / min.

Sometimes hydrogen is used as carrier gas and nitrogen is used as make-up gas, and the effect is the same.

Air is an auxiliary combustion gas, providing O₂ recognition for the production of CHO +. At the same time as the combustion of H₂O and CO₂ generated by the sweep gas. The air flow is often much

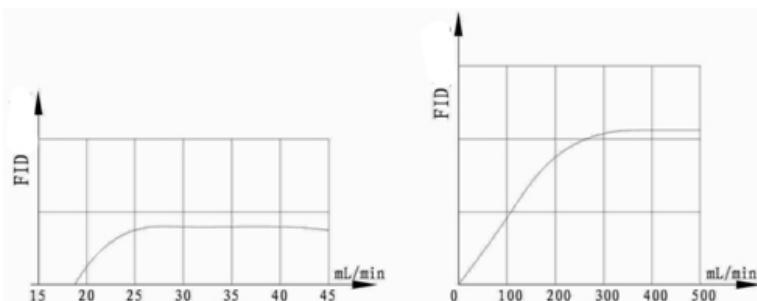


Figure 8-1 FID sensitivity vs. H₂ / air curve

larger than the amount needed to ensure complete combustion because of the large flow of air that creates a fast uniform flow around the nozzle. Can reduce peak tailing and memory effects. The best air flow rate should be greater than 300mL / min. The general use of air and hydrogen ratio of 1:10 gas purity

In constant analysis, the purity of hydrogen, nitrogen and air should be above 99.9%. However, in trace analysis, the purity should be higher than 99.999%. In particular, the total hydrocarbon content of air should be lower than 0.1μL / L, otherwise it will cause FID noise and baseline drift. And affect the quantitative analysis.

8.1.2 Detector temperature

FID is a mass detector. The temperature changes is not obvious. However, the temperature changes indirectly affect the baseline drift, but also indirectly affect the detector sensitivity and noise. Increasing the temperature of the FID increases both the response and the noise. The temperature of the FID is not a major factor. As the hydrogen in the detector combustion will produce a lot of water vapor, if the temperature is below 80 °C, water vapor cannot be discharged in the state of steam, condensed into water, the sensitivity decreased, increased noise. Generally, set the detector temperature slightly higher than the column temperature to ensure that the sample does not condense within the FID. In addition, the FID temperature should not be lower than 100 °C and should be ≥ 120 °C.

When the FID shutdown, you must turn off the flame above 100 °C, strictly abide by the first stop H₂, turn off the FID detector heating power operating procedures.

8.2 Precautions for use

Should use high-purity gas source, the air must be purified through 5A molecular sieve, etc., should ensure that gas clean;

Column must undergo rigorous aging treatment before analysis;

prevent hydrogen leakage. Do not allow hydrogen to leak into the column oven to prevent explosion. Do not connect to the column and column leak before, do not pass into the hydrogen. Before disassembling the column, check if the hydrogen is shut off. If it is a two-column and two-detector system, when using a FID detector, be sure to block the other unused FIDs with a dead bolt.

During FID operation. Case temperature is higher. Take care to avoid burns

Keep the collector surface clean, otherwise it will decrease the collection efficiency and narrow the linear range;

Ignition, FID detector temperature should be $\geq 120^{\circ}\text{C}$, ignition, may be appropriate to increase the hydrogen flow rate, reducing air flow rate. After the ignition successfully transferred back.

FID system shutdown, you must first turn off the hydrogen. Then turn off nitrogen, air. Turn off the heating power after cooling; if the FID temperature $\leq 100^{\circ}\text{C}$ ignition. Or shutdown does not turn off after. It is easy to cause FID to collect polar water. Resulting in declining insulation, baseline instability;

FID long-term use, before reopening, should be warmed to 150°C 2 hours;

long-term use of silicone fixing fluid. Silica produced by the volatilization of the stationary liquid is easy to deposit on the nozzle and collector surfaces. Make the sensitivity lower. At this point, to regularly clean the nozzle and collector;

Amplifier must be well grounded

manual ignition. Wait for the column oven, the detector and injector temperature is stable, the gas can be connected and ignition;

The sensitivity of FID is related to the ratio of hydrogen, air and nitrogen. The ratio of the three is about 1:10:1, such as hydrogen 30-40ml / min, air 300-400ml / min and nitrogen 30-40mL / min. The total flow rate through the nozzle should be $\geq 100\text{ml} / \text{min}$ is better;

When using H₂ as a carrier gas (this can be used as a combustible gas). Should be in

the original hydrogen gas, access to the appropriate flow rate of nitrogen to prevent the sensitivity decreased, to ensure quantitative accuracy.

8.3 Hydrogen flame ionization detector (FID) installation and use

GC5800 Gas Chromatograph Flame Ionization Detector (FID). The detector consists of an ionization chamber and an amplification circuit. The detector is mounted on the top right of the instrument's column oven. Amplifier installed in the electrical chassis. The ionization chamber of the FID is covered by a cylindrical cavity. There is a nozzle in the center of the base. Ring above the nozzle ring as a polarizing pole. Collector on the top for signal collection. Between the two applied 90 ~ 300V DC voltage as the polarization voltage. Formation of ionizing electric field. FID micro-current amplifier principle shown in Figure 8-2. Collector trapped ion flow amplified by the amplifier to the data acquisition system for acquisition and processing. Burning gas, auxiliary combustion gases, make-up gas and column are connected to the detector base. Combustion exhaust gas and water vapor escaped from the holes above the dust cover. Its structure is shown in Figure 8-3.

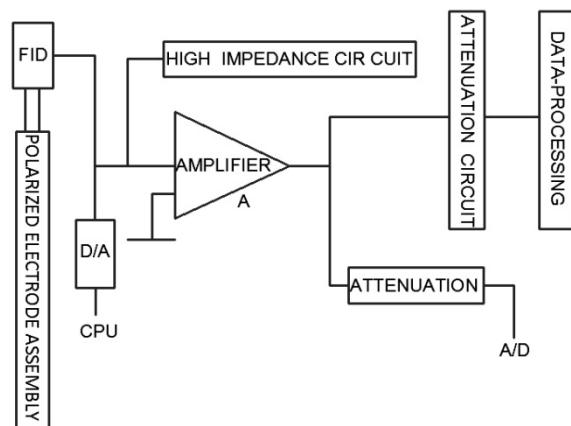


Figure 8-2 micro-current amplifier principle

Check the hydrogen flame ionization detector (FID) gas connections, column installation is correct, and the leak test. When the gas is turned on for ≥ 20 min, turn on the power switch, and set and select the related parameters (refer to the relevant section for parameter setting).

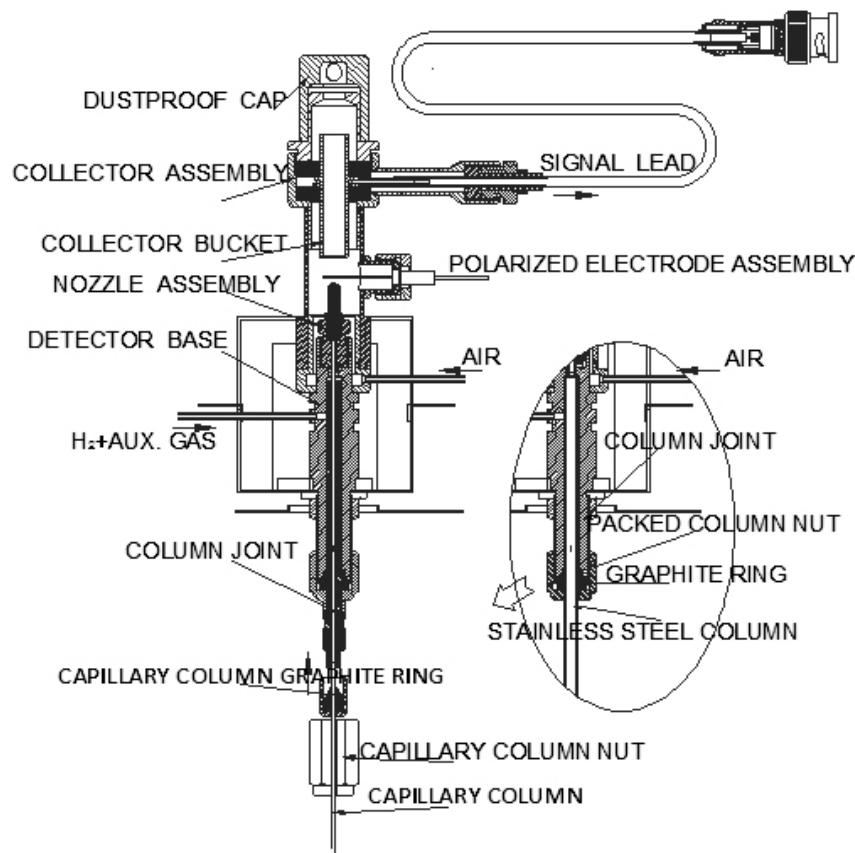


Figure 8-3 Hydrogen flame ionization detector (FID) structure and column connection diagram

8.3.1 Regulate carrier gas, split gas and purge gas

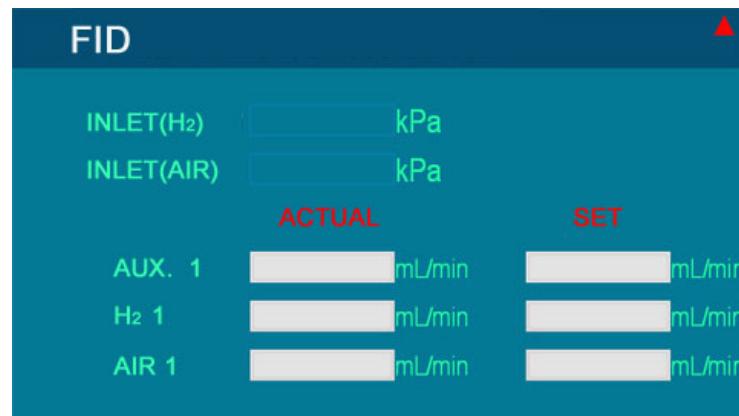
Press CAAR. GAS Key. Used to adjust and display the values of carrier gas parameters such as capillary carrier system (including dual capillary system) and packed column carrier system (including FID double carrier gas)

Rotate the relevant control valve knob on the panel of the air control module on the left side of the instrument. Observe the carrier gas shows the measured value, adjust the capillary column head pressure, capillary column split related data.

8.3.2 Burning gas / auxiliary combustion gas / make-up gas regulation and display

Press FLOW DISPL. Key. The detector gas path operation control parameter operation interface is displayed.

Make-up gas / combustion gas (H₂) flow display range: 0 ~ 100mL / min;



auxiliary combustion gas (air) flow display range: 0 ~ 600mL / min;

Make-up gas / combustion gas / auxiliary combustion gas (air) flow adjustment range by the input pressure limit;

In accordance with the analysis requirements, rotate the valve knob on the panel of the air control module on the left side of the instrument. Make-up gas / combustion gas / auxiliary combustion gas (air) adjustment setting

8.3.3 Detector temperature setting

Press TEMP. Key. The temperature display screen appears, press with ▲, ▼ keys, enter the detector temperature parameters at the cursor position; use the numeric keys to enter data; press the HEATING Key instrument to start the constant temperature operation.

8.3.4 Detector operating parameter setting

Press DETECTOR button. On the display, the detector control interface appears (if double FID configuration, the interface shows FID I / FID II separately). Matched with ▲, ▼ key. Enter the FID sensitivity and threshold related operating data at the cursor position;

- According to the need, choose automatic ignition or manual ignition, zero calibration and output channels;
- Continuously press the ▼ key, real-time display of the selected detector output signal level and spectrum.
- Press ▼ continuously. Can display detector combustion gas, auxiliary combustion gas, make-up gas pressure flow. And with the relevant valves to adjust;

Wait until the temperature is constant (READY light). Gas flow rate, temperature, amplifier baseline stable; open the chromatographic workstation, to be stable after the baseline can be analyzed.

8.3.5 Replace or clean the nozzle

When the nozzle is slightly polluted, the flow rate of the carrier gas or auxiliary gas (during capillary operation) can be appropriately increased, and the temperature of the detector can be increased for nozzle cleaning.

If the nozzle is more serious pollution, the hole has not yet blocked, the nozzle can be removed for cleaning or replacement. Nozzle removal steps are:

- open the instrument cover;
- Remove the detector to remove the FID ion head;
- Loosen the fastening screw and remove the cavity;
- Unscrew the nozzle plug with the S8 sleeve special wrench and remove it together with the gasket.

Place it in a glass beaker containing ethanol or acetone (solvent to be submerged nozzle), such as ultrasonic cleaning machine, the better. You can also use the needle inserted into the nozzle hole for drawing. And use the ear wash ball, extraction of ethanol or acetone, flush nozzle wall attachment. After drying, re-install, check the seal, you can re-operation.

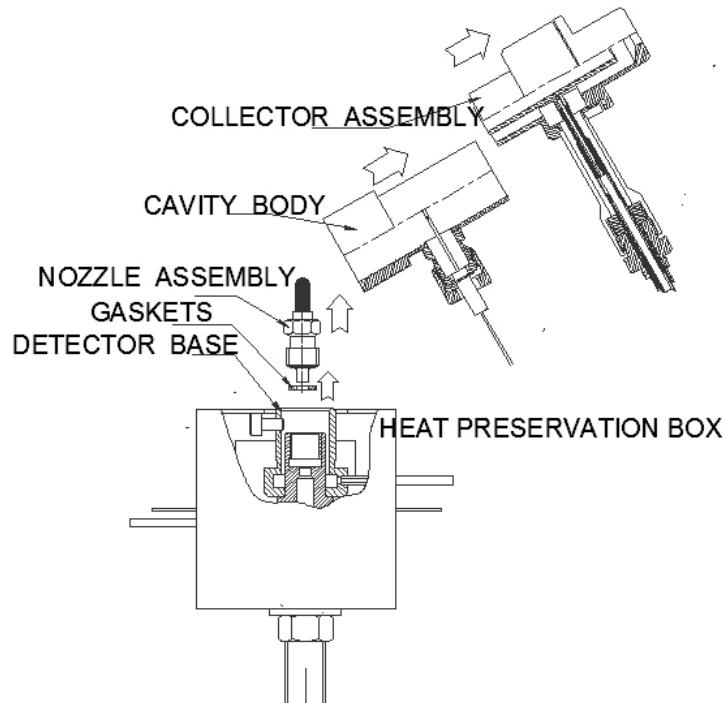


Figure 8-4 Nozzle replacement or cleaning

8.5 Hydrogen flame ionization detector (FID) failure and maintenance

1. Ignition failure and its troubleshooting:

Check hydrogen, air type is correct, if you use a hydrogen generator, should be venting for some time before ignition;

Check gas flow settings are correct, H₂ flow 30-40ml / min, the air is 300-400ml / min;

Detection of makeup gas flow setting is correct, the general makeup gas flow and column flow should be ≥ 30-40mL / min, if the makeup gas flow is too large, the flame will be quenched;

Check whether the column is connected well, whether leak;

Manually turn on hydrogen and air if necessary and ignite manually. Observe whether the fire is lit. If confirmed, but no signal output, need to check the FID signal output connector is intact. If intact, there is still no signal output, should consider whether there will be hardware circuit failure.

2. The baseline cannot be zeroed: causes, diagnoses and troubleshooting

The baseline of the detector cannot be zeroed before ignition. Possible causes are: the signal line is connected incorrectly, the ion chamber is poorly insulated, the connecting line is short-circuited, the micro-current amplifier is damaged, and the signal between the chromatographic workstation and the signal cable is short-circuited. Check the connection to ensure that the wiring is correct.

The baseline of the detector after ignition cannot be zeroed. Possible causes: ionization chamber Condensation water, reverse polarization voltage, contamination of gas path and detector, serious loss of column fixed solution, improper gas flow regulation;

Fault diagnosis, troubleshooting is as follows: Determine whether the ion chamber Condensation water phenomenon, if there is Condensation water phenomenon, the first flame out, raising the ion chamber temperature for drying. If column loss is serious, the column temperature can be lowered to room temperature, the baseline can be zero, indicating severe column loss. The column port can be cut off to a certain length, or high temperature aging treatment. If the gas path and detector are contaminated: the hydrogen flame will appear red and yellow, indicating that the gas path and detector

have been contaminated. The gas path and detector can be thoroughly cleaned with organic solvents such as absolute ethanol, methanol and acetone. Make sure that the instrument uses high-purity combustion gas and make-up gas. Impure gas source is an important cause of pollution.

3. Baseline instability and diagnosis

The main reason for the instability of the baseline is. Improper equipment placement, gas in the hydrogen, air and carrier gas flow rate is not appropriate. Poor output signal line, serious loss of column fixed solution, pressure and flow fluctuations, hydrogen flow rate changes, hydrogen and air lines and carrier gas pollution or gas impure. Hydrogen flame ionization chamber nozzle pollution, gas system leaks, column oven temperature control component failure, poor grounding, power supply interference, electrostatic interference around the instrument is too large, hydrogen flame ion chamber outlet strong winds blow.

4. Baseline noise causes and diagnoses

Baseline noise is too large due to: contaminated the needle, the amplifier unstable, small particles within the column into the detector, column contamination, carrier gas flow rate is too high or leakage and so on.

5. Peak shape off normal causes and diagnosis

All component peaks become smaller:, needle defects (using new needles or defect-free needles), large split ratios (adjusting gas flow rates and split ratios), analyzing low volatility samples at low temperatures (increasing oven temperature and injector inlet gasification temperature)

Peak stretch tongue: caused by overloading of sample from the column. Reduce injection volume, use high capacity columns, increase oven temperature and injector temperature, and increase gas flow rates.

Peak tailing, possible causes: injector liner, septum pad, or column contamination. Or the column port is not properly cut; the splitless time is set too long when performing analysis in splitless mode. Incorrect column installation in injector / detector; improper column selection or column performance degradation

Sudden fire extinguishing: sample injection volume is too large, nozzle clogging (cleaning or with nozzle)

(See attached table 8-1)

No.	Fault	Possible cause	Troubleshooting mode
1	The heating area does not heat up	a, fuse blown, b, heating wire (rod) open circuit, c, platinum resistance (Pt100) open circuit, d, temperature control circuit failure.	a, replace the fuse, b, check, replace the heating wire (rod), c, check, replace the platinum resistance (Pt100), d, repair or replace the temperature control circuit board.
2	Large baseline noise.	a, the use of gas purity, b, the detector parts are contaminated.	a, replace the high purity gas, b, clean the detector.
3	Baseline instability	a, Column fixed liquid loss serious, b, column connection leaks, c, the detector system is contaminated with condensate.	a, activate or change the column; b, leak detection; c, appropriate to improve the detector, injector temperature, increase carrier gas flow, purge the instrument for 2 hours.
4	Small response	a, detector flame extinguished, b, gas ratio is not appropriate, c, the column resistance is too large, the carrier gas is not smooth, d, the nozzle is blocked.	a, re-ignition, b, re-adjust the gas ratio, c, replace the column, d, clear or replace the nozzle.
5	Can not be ignited	a, air flow is too large, b, hydrogen flow is too small, c, gas is not smooth.	a, appropriate to reduce air flow, b, appropriately increase hydrogen flow, c, clear the gas path.
6	The peak	a, the carrier gas flow is too low,	a, appropriate to increase the carrier gas flow,

	broadens	<p>b, column room temperature is low, c, injector and detector temperature is low, d, the system dead volume is too large.</p>	<p>b, appropriately raise the temperature of the oven oven, c, appropriate to raise the injector and detector temperature, d, check the column installation.</p>
7	Chromatogram peak abnormalities	<p>a, septum pollution or leakage, b, sample decomposition, c, the detector has contaminants, d, column pollution.</p>	<p>a, replace the septum, b, appropriate to change the analysis conditions, c, cleaning the detector, d, replace or activate the column.</p>

table 8-1

Chapter 9 Column oven and Column Installation

Samples were analyzed using gas chromatography. The separation process is carried out in the column. Therefore, the column filling quality, column efficiency and chromatographic temperature control accuracy, functional control is complete, the choice of the instrument is very crucial. Column separation efficiency depends mainly on the column stationary phase selection and filling process. At the same time, the type of column, column tube material, shape, size, installation, sealing, activation of the sample separation and testing have a great impact.

The **GC5800** Gas Chromatograph performs column oven thermos tattting and temperature programming. column oven Equipped with a rear door automatic temperature control system to achieve near room temperature operation, up to 20 steps temperature program parameters ($n \leq 20$), excellent oven performance, good program temperature repeatability, to ensure complex component sample analysis . Keep the retention time consistent.

The instrument oven is suitable for mounting multiple detectors (TCD, FID, ECD, FPD and NPD). The main injector options are: packed column head injection, glass liner injection, split, splitless injection and split / splitless injection. Users can choose the detector and injector according to the analysis needs. The **GC5800** can install up to three detectors at the same time, packed column head injection, and split / splitless injector with membrane cleaning for basic instrument configurations. Oven structure shown in Figure 9-1.

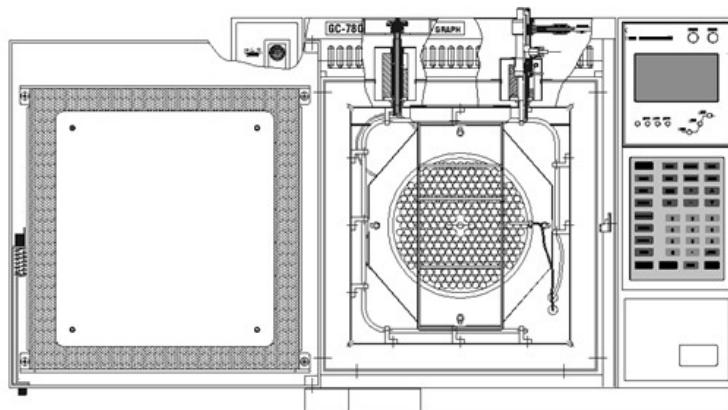


Figure 9-1. Schematic diagram of the whole machine

9.1 Chromatography column technology specification

Temperature control range: room temperature +3 °C ~ 400 °C.

Temperature control accuracy: better than ± 0.1 °C.

Temperature gradient: room temperature +3 °C ~ 400 °C, column oven effective area not more than 1%.

Set the temperature deviation between the indicated temperatures of not more than 1 °C.

The deviation between the set temperature and the actual temperature is not more than 2%.

Program temperature steps: 20th order ($n \leq 20$)

Heating rate: 0.1 ~ 40 °C / min.

The heating rate setting is:

The final temperature ≤ 150 °C, the rate set value 30 °C / min, increment 0.1;

The final temperature ≤ 300 °C, the rate set point 15 °C / min, increment 0.1;

Final temperature ≤ 350 °C, the rate set value 10 °C / min, increment 0.1;

Initial / final temperature control range: 0 ~ 600min, increment 0.1min.

Program temperature repeatability $\leq 2\%$.

Cooling rate: from 250 °C to 50 °C ≤ 7 min. (Detector temperature 250 °C).

Oven effective size: 300 (W) \times 280 (H) \times 175 (depth) (volume of about 15L)

9.2 Packed column installation

9.2.1 To Prepare installation of the packed-column

The **GC5800** GC provides a flexible combination of injector, packed column, and detector with different fittings. Packed column In the injector, the detector end structure (except thermal conductivity detector TCD) and the installation is basically the same. See Figure 9-2 for details.

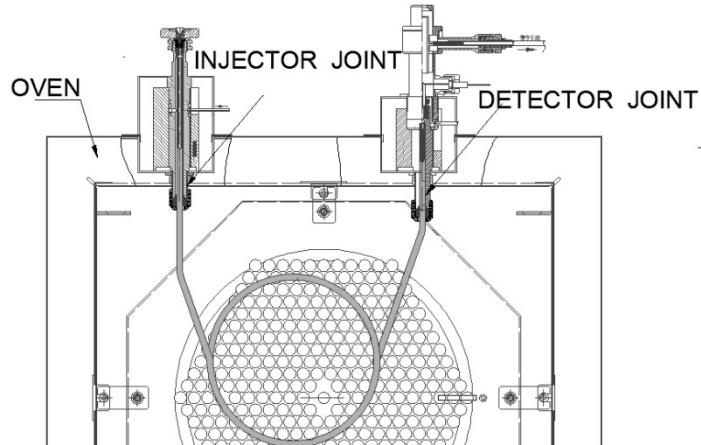


Figure 9-2 packed column installation diagram

Packed column filling, the injector, the detector should generally stay out of $\geq 50\text{mm}$ and $\geq 4\text{mm}$ empty tube. In case the syringe needle touches the filler. See Figure 9-3 for the packed column and its two ends

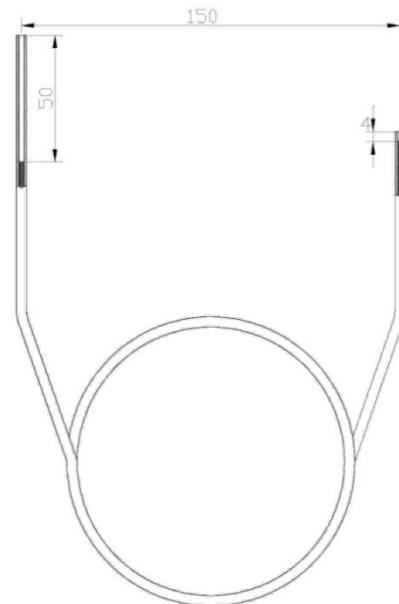


Figure 9-3 packed-column and packing diagram

9.2.2 Packed column injector / detector connection

installation

9.2.2.1 Packed-column head Injection Installation Procedure (Detector FID as an example)

GC5800 gas chromatography column head injection mode suitable for: assembly diameter $\Phi 3\text{mm}$, $\Phi 4\text{mm}$ stainless steel tube and the outer diameter of $\Phi 4\text{mm}$ glass tube, and its connection with the injector port installation. (See Figure 9-4 for details)

In the injector port successively set graphite gasket, M10 \times 1 column nut. And insert the

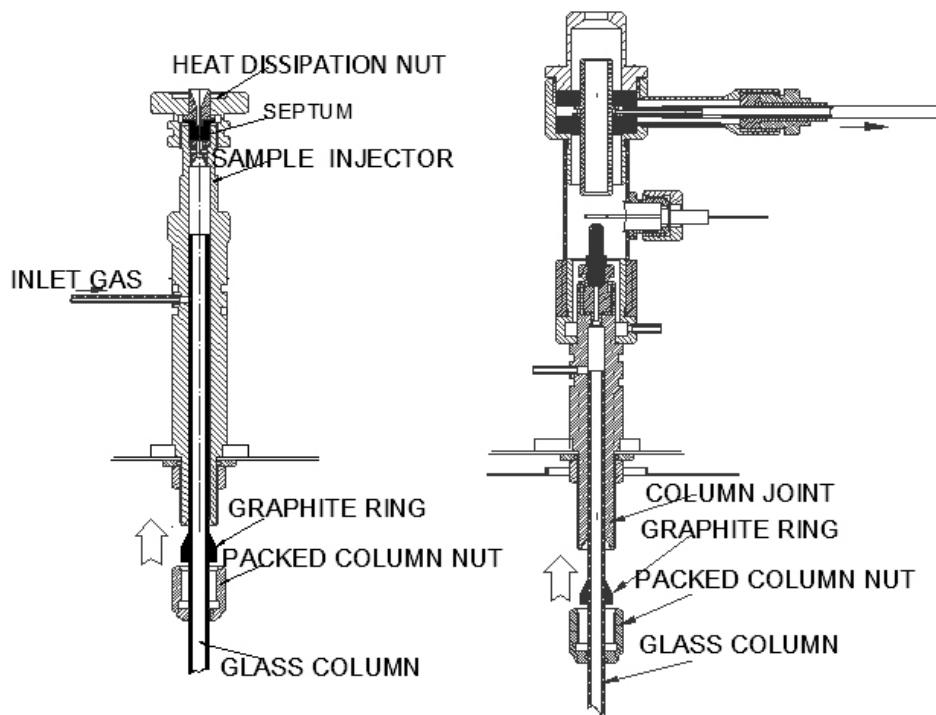


Figure 12-4 Packed Column Head Sample-Detector Installation Diagram

column into the root of the injector base;

- Manually screw the M10 \times 1 column nut
- continue to tighten with S12-S14 dumb wrench;

- detector end of the same steps;
- leak detection using a neutral soap. There should be no leaks, try to dry the soap liquid soap.

9.2.2.2 Glass-liner injector installation steps (detector with FID as an example)

Glass-lined injection through the adapter suitable for: assembly diameter $\Phi 3\text{mm}$, $\Phi 4\text{mm}$ stainless steel tube and injector connection installation (see Figure 9-5)

Set the M10 \times 1 column nut and graphite gaskets onto the adapter, then insert the glass liner into the adapter and insert the adapter into the root of the injector base.

- Manually screw the M10 \times 1 column nut;
- continue to tighten with S12-S14 dumb wrench;

Insert the column into the root of the adapter;

Manually screw the M10 \times 1 column nut;

continue to tighten with S12-S14 dumb wrench;

detector end of the same steps;

Leak detection using a neutral soap, should not have leakage phenomenon, try to dry the residue left .

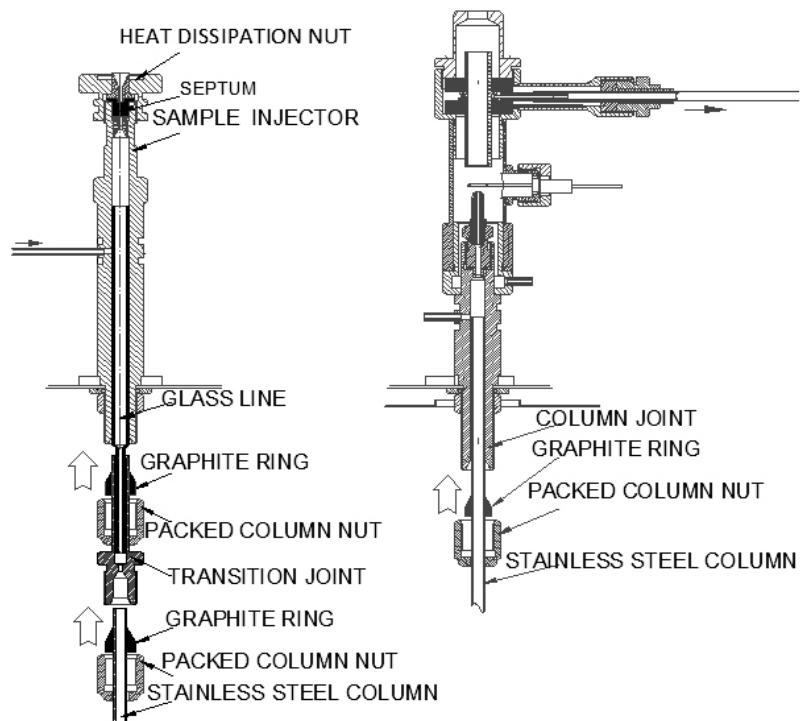


Figure 9-5 Glass-lined Injection mode packed column - detector installation diagram

9.2.2.3 Column head injection and (TCD) packed column mode installation steps

In the injector port successively set graphite gasket, M10 × 1 column nut. And insert the column into the root of the injector base;

- Manually screw the M10 × 1 column nut
- continue to tighten with S12-S14 dumb wrench;
- detector end of the same steps;

leak detection using a neutral soap. There should be no leaks, try to dry the soap liquid soap.

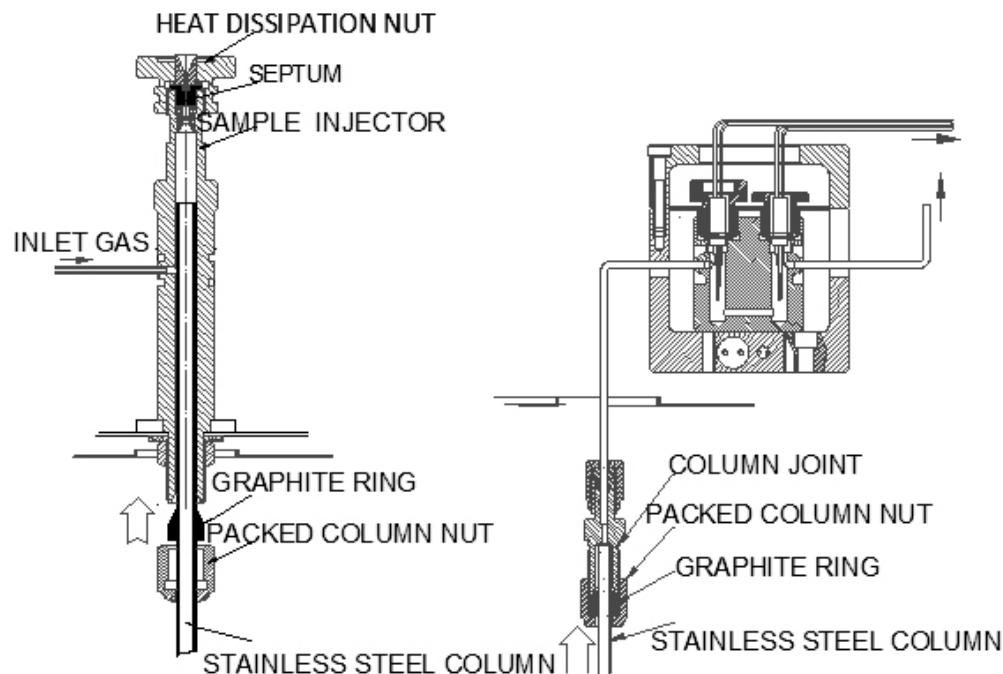


Figure 9-6 Head injection-TCD packed column mode installation diagram

9.2.2.4 ECD / FPD / NPD and packed column mode installation method

The packed column is connected to the ECD / FPD / NPD detector end structure in the same way as the FID. It is suitable for assembly of $\Phi 3\text{mm}$ OD $\Phi 4\text{mm}$ stainless steel tube and $\varphi 4\text{mm}$ OD outer glass tube. When installing the column, always insert the detector tip To the root of the detector, the installation steps are: (see Figure 12-7 for details).

In the injector port successively set graphite gasket, M10 × 1 column nut. And insert the column into the root of the injector base;

- Manually screw the M10 × 1 column nut

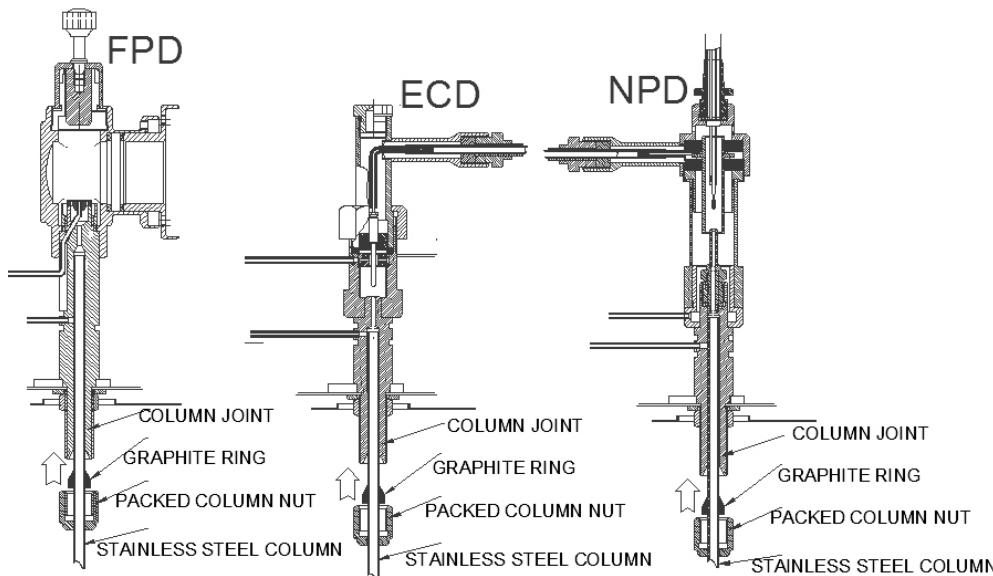


Figure 9-7 FPD / ECD / NPD packed column installation diagram

continue to tighten with S12-S14 dumb wrench;

- detector end of the same steps;
- leak detection using a neutral soap. There should be no leaks, try to dry the soap liquid soap.

9.3 The capillary column is connected with injector and detector

GC5800 gas chromatograph using different connections to connect combinations. Different sizes of capillary columns can be connected to the injector / detector. The capillary column injector and detector connections (with the exception of the thermal conductivity detector TCD) are basically the same as the previous installation.

Commodity capillary column generally wrapped in metal column rack. Hanging on a capillary holder mounted on top of the inside of the oven, the **GC5800** GC can hold up to two capillary columns. See Figure 9-8 for details.

9.3.1

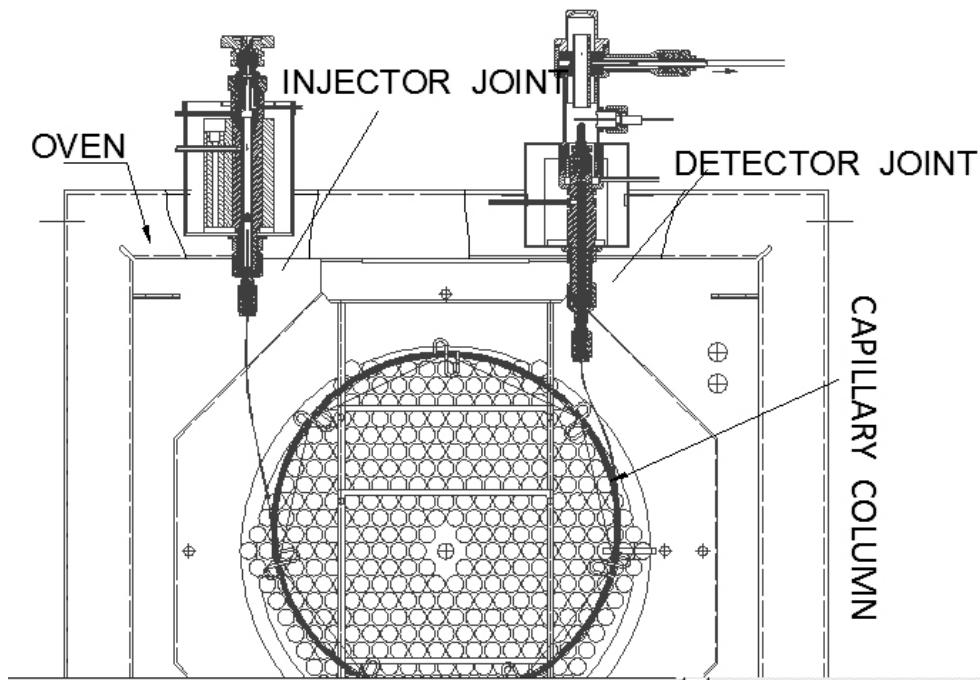


Figure 9-8 Injector / Detector capillary column installation diagram

Preparations for installing

capillary column

At the end of the capillary were set on the corresponding open nut, pad sleeve and graphite support for the column should always be facing the the oven. After installing the graphite gasket and gasket. Use glass scoring capillary column cutters to column port. And with a magnifying glass to check to confirm the incision and the wall at right angles. Do not have residual debris, burrs or uneven cutting surfaces. Wipe the outer wall of the capillary tube with isopropyl alcohol to remove fingerprints and powder. See Figure 9-9 for details.

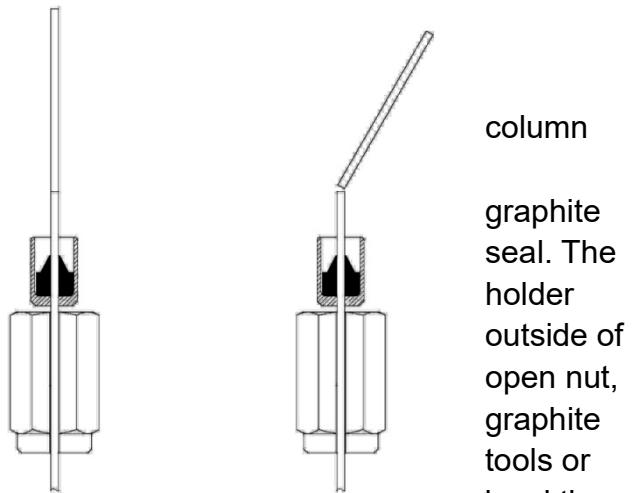


Figure 9-9 capillary column port cutting schematic

9.3.2(Detector to FID as an example)

Confirm that the capillary column fittings on the injector and detector side are correctly installed,

Injector end, the gasket cover, graphite gasket set in the capillary column. Remove the length to be connected from the column holder, insert it into the inlet 35 mm after cutting and wiping. Avoid squeezing hard to prevent the column from breaking or becoming damaged. After the column is correctly inserted into the inlet, put an open nut on it, and screw the open nut onto the column fitting by hand. After hand tightening, use the S8-S10 wrench to screw 1 / 4-1 / 2 turn,

At the detector end, the installation and precautions are the same as the installation procedure of Injector. Pay attention to the installation, the end of the column to be inserted into the detector ≥ 92mm. Higher than the make-up gas tail point;

Leakage test using neutral soap solution (or 1: 1 isopropanol / water mixed solution) should not leak. After the test leak, wipe the traces. See Figure 9-10 for details.

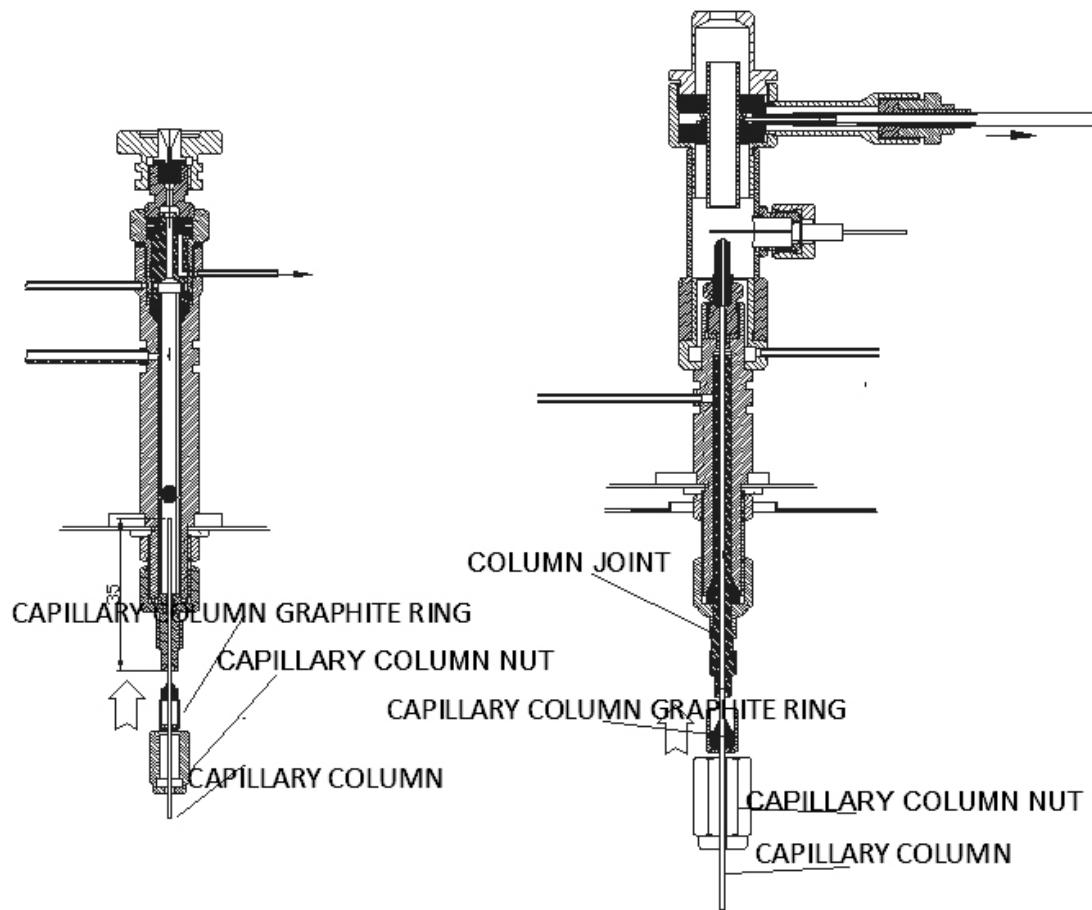


Figure9-10 Capillary and detector connection

Chapter 10 Instrument maintenance and troubleshooting

The correct maintenance of the instrument, you can make the instrument always in normal working condition, and extend the service life of the instrument. Use and maintenance of the instrument must pay attention to:

10.1 Use, maintenance and precautions

1. Each time before starting, you need to check the sealing performance of the gas system to prevent the occurrence of gas leaks;
- 2 instrument work, the detector cover should be covered, to prevent temperature fluctuations, improve instrument stability;
3. Instrument detector output signal terminal is not allowed to ground, otherwise it will burn components;
4. Instrument power to have a good grounding line, the ground is prohibited to connect such as running water pipes;
5. When the instrument is not placed for a long time, keep the instrument powered on regularly;
6. Under normal circumstances, please do not open the instrument side cover, rear cover to prevent electric shock;
7. Strictly operate the equipment under the specified conditions, the conditions are not met, we must take measures;
8. In accordance with operating procedures, oil, organic matter and other substances are strictly prohibited from entering the detector and pipeline. Avoid clogging pipes or deteriorating performance;
9. Do not allow column oven to exceed the temperature of the column to allow the use of temperature, to avoid column loss, damage and contamination detector;
10. Under normal circumstances, the column oven temperature should be set lower than the allowable temperature of the column fixing solution. In high sensitivity operation, the column temperature should be selected lower;
11. When the instrument is switched on, the carrier gas must be passed before it can be

-
- switched on. Avoid damaging the column and contaminate the detector;
12. When using the FID and FPD detectors, the detector must be ignited before the temperature of the detector exceeds 100 ° C, so as to avoid condensation caused by the detector.
 13. When the instrument is turned off, the hydrogen must be turned off (when the FID and FPD detectors are used). After the detector flame is extinguished, the instrument is cooled down before the carrier gas can be turned off.
 14. In many cases, some failures are caused by inadequate aging of components. When necessary, the temperature should be increased for aging treatment of the injector, detector, column and so on.

10.2 Cleaning and aging

10.1 FID detector cleaning

Remove the FID cover, take out the electrode and insulation washer. Clean the chamber, electrode, and insulation washers with acetone or alcohol and then dry.

Pollution is serious, the parts to be cleaned into the ultrasonic cleaning fluid, with ultrasonic cleaning machine, rinsed with water and then cleaned with alcohol and dried.

Assembly, attention should be given to the ignition coil, which should be located around the nozzle spout, not with the metal shell (ground) collide, the height can not exceed the nozzle mouth, such as over the nozzle mouth, after ignition, the ignition wire will be red and affect the detection Sensitivity of the device.

If the detector is contaminated with a fixative solution, dissolve the fixative with a solvent and wash it as described above.

13.2.2 Injector cleaning

Injectors are easy to pollute, especially glass liners, so it is important to clean the injectors. Use a solvent cotton ball to directly wear the Injectors glass liner, insert it, blow it with a jet of air (mainly blow off the tampon and blow dry the solvent), and then reinstall the glass liner and the sealing nut.

Pollution is serious, take the glass liner into the ultrasonic cleaning fluid to be cleaned, with ultrasonic cleaning machine, rinsed with water and then cleaned with alcohol and dried.

10.2.3 Activation of the detector

Activation of electron capture detector: The detector is fed with carrier gas, and the temperature of the electron capture detector is set above 300 °C, activating for more than ten hours. Appropriate increase in carrier gas flow, can increase the activation efficiency or reduce the activation time.

General Activation of Detector: The detector is fed with carrier gas, and the temperature of ECD is set above 200 °C.

10.2.4 Injector activation

The detector is fed with carrier gas, and the temperature of ECD is set above 200 °C for several hours.

10.2.5 Column activation

In the amount of carrier gas into the column. In general, set the oven temperature to 30 °C below the maximum allowable column temperature for column activation. When the column is heavily contaminated or the column efficiency becomes very low, set the oven temperature to 30 °C above the normal operating temperature of the column for isothermal aging of more than ten hours.

In the case of carrier gas into the column, set the heating rate of 3 ~ 5 °C / min, the starting temperature of 50 ~ 60 °C, the column allows the maximum temperature below the termination temperature of 30 °C, 1step program temperature activation .

Appropriate to increase the carrier gas flow, can increase the activation efficiency or reduce the activation time.

10.2.6 Gas purifier activation

1. Gas Chromatograph gas system, connected with gas purification filter, purifying tube placed 5A molecular sieve, activated carbon and other filters. 5A molecular sieve, activated carbon needs regular (usually three months to once every six months, depending on the user's working conditions) replacement or activation.

2. Remove 5A molecular sieve and activated carbon from the purge tube. Placed in an oven for baking activation. If there is no oven. Gas chromatograph oven also available. However, take measures to protect the instrument, such as removing the column, stuffing the injector, detector connector, etc.

3. 5A molecular sieve and activated carbon activation temperature is 260 °C, the time is

24 hours.

10.3 Instrument common faults and troubleshooting

No.	Fault	Possible cause	Troubleshooting mode
1	Cannot start	a, power supply barrier, b, the instrument fuse blown.	a, check the cause of the power failure; b, replace the new fuse.
2	Can not heat up	a, heating key is not activated; b, heating wire (rod) blown.	a, press the heating key; b, replace the new heating wire (rod).
3	Individual heating zone cannot heat up and alarm	a, heating wire (rod) off; b, temperature platinum resistance off; c, temperature control circuit failure.	a, check, replace the heating wire (rod); b, check, replace the temperature measurement platinum resistance; c, maintenance or replacement temperature control circuit board.
4	Detector noise is high at high temperatures.	a, the use of gas purity is low; b, the detector parts are contaminated.	a, replace the high purity gas; b, clean the detector.
5	Baseline is not stable	a, Column fixed liquid loss; b, there is leakage at the column connection; c, the detector system is contaminated with condensate.	a, reactivate or replace the column; b, re-leak test; c, increase the temperature of the detector and injector, increase the carrier gas flow, purge the instrument for 2 hours.
6	Detector response is small,	a, the detector flame goes out;	a, re-ignition; b, re-adjust the gas ratio;

	Or no response.	b, improper gas ratio; c, column resistance is too large, the carrier barrier. d, flame nozzle blocked.	c, replace the column. d, clear or replace the nozzle.
7	FID detector ignition unsuccessful	a, air flow is too large; b, hydrogen flow is too small; c, lack of ignition power; d, gas barrier.	a, appropriate to reduce air flow; b, appropriate to increase hydrogen flow; c, testing ignition power; d, dredge airway.
8	Widened peak shape	a, small carrier gas flow; b, low column temperature; c, injector, detector temperature is low; d, the system dead volume is too large.	a, increase carrier gas flow; b, increase the column temperature; c, improve injector, detector temperature; d, check the column installation.
9	Abnormal peak shape	a, septum contamination or leakage; b, sample decomposition; c, the detector is contaminated; d, column pollution.	a, replace or activate septa; b, change the analysis conditions; c, cleaning the detector; d, replace or activate the column.

Annex I User manual to use and equipment operation precautions

The user manual for the GC-5800 GC installation instructions, focusing on the main body of the instrument, gas control, injector and various types of detector operation. And laboratory preparation, external gas connections, the basic structure of the instrument, start and acceptance, key components and so on. Just be prompted for specific situations that may endanger personal safety. And in the relevant section briefly explain the content should be noted and suggested safety measures.

Pay attention:

Prevent electric accident:

1, remove some of the instrument cover parts may make some electrical parts exposed, the panel generally have dangerous signs. Before removing the panel, be sure to unplug the power cord first.

2, for the installation of the site power wiring, and the need to replace the power plug. Care should be taken to comply with the specifications of this manual and to ensure the polarity of the power supply.

3, replace the power fuse, the specifications should be consistent. Its specifications in the panel or this manual can be found. Instrument power lead insulation if damaged should be promptly replaced, in order to avoid power short circuit accident.

4, the instrument replacement power wiring position, be sure to check the power supply voltage, polarity, power, etc., only to prove that they meet the requirements before access to the instrument.

Prevent skin burns:

The temperature of the heating zone in the operation of the instrument is high, and the heated part of the heating zone will maintain a certain temperature within a certain time after shutdown. To prevent scalding, avoid contact with skin. When parts need to be replaced, be sure to reduce the temperature of the instrument, or use insulated gloves or other insulation to contact with it.

Gas cylinder:

1, should strictly abide by the rules of cylinder transportation, storage, management and

safe use.

2, keep the cylinder away from heat and open flame, and well ventilated. Cylinder upright state to have a solid fixed bracket, working conditions do not move.

3, the cylinder should be clearly marked, so as to avoid misplaced, so that the instrument does not work or dangerous.

4, the connection between the gas cylinder and the instrument should be kept clean.

Pipeline compressive strength is greater than the maximum output pressure relief valve. Pressure relief valve and gas circuit to be leak tested before use.

Security measures

1, to conduct regular gas system leak check.

2, Gas layout to be reasonable. Cylinder storage room and instrument should not be too far apart, if the pipeline is too long or bent will increase the gas resistance. And prone to leakage.

3, the sample usage is small, the general will not have air pollution. In particular, when using a mass-type detector, the sample is emitted after flame combustion. So generally do not need to install special ventilation equipment. However, when using a concentration detector to analyze hazardous substances, only the sample is separated without breaking the sample components. In this case, you need to use a pipe to drain the vent gas from the instrument to the outside.

4, Keep the organic solvent away from the instrument and store it in a fireproof fume hood. For toxic and flammable items should be clearly marked.