BLUE DRAGON
TECHNOLOGY

BD-TOC-C680

Total Organic Carbon (TOC) Combustion Analyzer

User Manual

Preface

Dear Valued User,

Thank you sincerely for choosing the Blue Dragon Total Organic Carbon Combustion Analyzer – Model C680 (BD-TOC-C680)!

To help you make the best use of this device, please read this manual carefully before operation and strictly follow the instructions.

If you encounter any installation or usage issues, our after-sales service team is available to provide professional support at any time.

As a company committed to continuous technological innovation, we strive to continuously optimize product performance. Therefore, the content of this manual may be adjusted as the product is upgraded, without prior notice. Your understanding is appreciated.

Important Notes:

⚠ To ensure safe operation, please read and fully understand this manual before using the instrument. Improper operation may result in equipment damage or sample loss. Strictly follow the specified procedures.

We recommend keeping this manual in a safe place for future reference.

Catalogue

Precautions

1. Before unboxing, installing, or operating the instrument, carefully read the user manual, paying particular attention to all warnings and safety instructions. Failure to do so may result in personal injury or damage to the instrument.
2. Always disconnect the power supply before performing maintenance or repairs.
3. Before replacing the combustion tube or catalyst, ensure the power is off and the furnace has cooled to room temperature to avoid the risk of electric shock or burns.
4. After turning off the instrument, do not unplug the power supply; this ensures the fan continues operating, allowing the furnace to cool down properly.
5. Only authorized company personnel or professional technicians are permitted to disassemble internal components or circuit boards. Any damage caused by unauthorized disassembly is the user's responsibility.

Please read carefully!

I. Product Introduction

The Blue Dragon Total Organic Carbon (TOC) Combustion Analyzer – Model C680 is a precision laboratory instrument specifically designed for water quality testing. It is mainly used for the quantitative determination of total organic carbon concentration in various types of water samples. The applicable measurement range is 0.050–35,000.0 mg/L, covering purified water, ultrapure water, drinking water, industrial wastewater, and environmental surface water. It offers a wide range and broad applicability for TOC analysis.

The core technology of the instrument uses high-temperature catalytic combustion at 680°C, based on a dual-channel measurement principle, to accurately determine total carbon (TC) and inorganic carbon (IC) separately. During measurement, the water sample and high-purity oxygen carrier gas are simultaneously introduced into two separate systems: a high-temperature combustion tube and a low-temperature reaction tube.

In the high-temperature combustion tube, the sample is fully oxidized at a constant 680°C in the presence of a dedicated catalyst, converting all organic and inorganic carbon into carbon dioxide (CO_2). In the low-temperature reaction tube, the sample is automatically acidified; only inorganic carbon is decomposed into CO_2, while organic carbon does not participate in the reaction, allowing inorganic carbon to be measured separately.

The CO_2 generated from both reaction paths is transported by the high-purity carrier gas into a non-dispersive infrared (NDIR) gas detector. Using the characteristic absorption of CO_2 at specific infrared wavelengths, the detector accurately measures CO_2 concentration and converts it into electrical signals, calculating total carbon (TC) and inorganic carbon (IC) in the sample.

The built-in computation module automatically calculates total organic carbon as TOC = TC − IC, producing the final TOC concentration in the water sample. The entire measurement process is highly automated, ensures complete oxidation, strong anti-interference ability, stable data, and excellent repeatability. It is widely applied in pharmaceutical, environmental

protection, chemical, water utilities, and third-party testing industries for monitoring and quality control of organic pollutants in water.

II. Structural Features

2.1 System Composition

Front View of TOC

Rear View of TOC

Side View of TOC

Top View of TOC

2.1.1 IC Operation Chamber

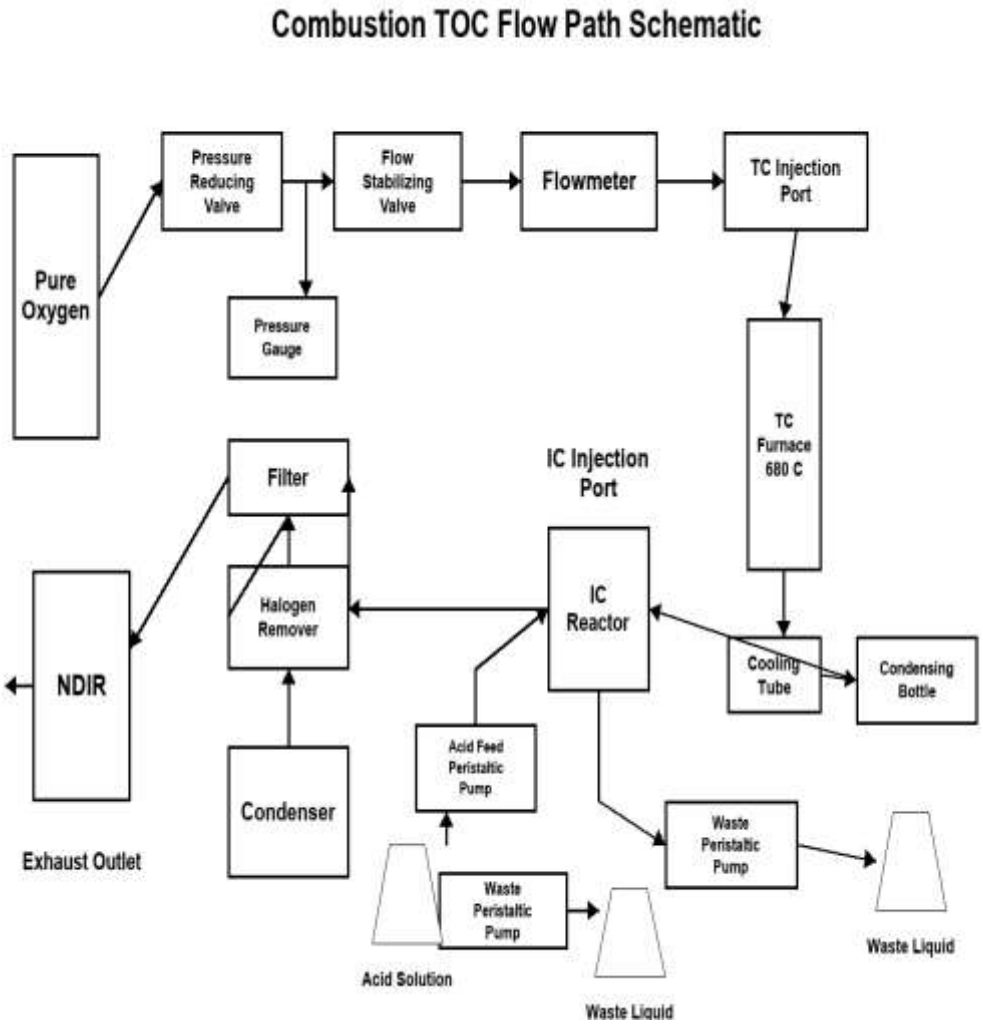
2.2 Key Components

The analyzer consists of the following main components:

1. **Combustion Furnace**
2. **Combustion Tube**
3. **Condensation Assembly**
4. **Inorganic Carbon (IC) Module**
5. **Non-Dispersive Infrared (NDIR) Gas Detector**

III. Working Principle

3.1 Working principle diagram



① Gas Supply and Pre-Treatment System

High-purity oxygen is delivered from the cylinder and regulated to the instrument's working pressure via a pressure reducing valve. The flow is precisely controlled by a flow stabilizing valve and a flow meter, while a pressure gauge monitors system pressure in real time. This ensures a stable and clean carrier gas environment for the entire analysis process, guaranteeing stable reactions and measurement accuracy.

② Total Carbon (TC) Measurement Unit

The water sample is injected through the TC injection port and enters the 680°C high-temperature TC furnace along with the high-purity oxygen carrier gas. Under high temperature and the action of a catalyst, the organic and inorganic carbon in the sample is fully oxidized to carbon dioxide (CO_2). The high-temperature gas is then cooled via a bent cooling tube and condenser to remove most water vapor before entering the subsequent gas path.

③Inorganic Carbon (IC) Measurement Unit

The water sample is injected through the IC injection port into the IC reaction vessel. The acid inlet peristaltic pump precisely delivers acid into the vessel. Under acidic conditions, inorganic carbon in the sample (e.g., carbonates, bicarbonates) decomposes into CO_2. The resulting waste liquid is removed by the waste peristaltic pump, and the generated CO_2 is carried into the subsequent gas path.

④ Gas Purification and Detection Unit

CO_2-containing gas from the TC furnace and IC reaction vessel first passes through a condenser to remove residual water vapor. It then goes through a halogen remover to eliminate interfering substances, followed by a filter to remove small particulate impurities. The purified gas enters a non-dispersive infrared (NDIR) detector, which quantifies total carbon (TC) and inorganic carbon (IC) based on the characteristic absorption of CO_2 at specific infrared wavelengths.

⑤ Data Calculation and Waste Handling

The instrument calculates total organic carbon (TOC) according to the formula TOC = TC − IC. Exhaust gases are discharged through the NDIR exhaust outlet, and waste liquids generated by each unit are collected into a waste bottle by the peristaltic pumps, completing the analysis process.

3.2Analysis Procedures

The combustion TOC analyzer can measure Total Carbon (TC), Inorganic Carbon (IC), Total Organic Carbon (TOC), and Non-Purgeable Organic Carbon (NPOC).

3.2.1 TC Measurement

The water sample enters the combustion furnace through the TC injection port along with the carrier gas. At 680°C, carbon in the sample (organic and inorganic) is converted to CO_2, which is transported by the carrier gas to the infrared detector for analysis.

3.2.2 IC Measurement

The sample is injected through the IC injection port into the IC reaction tube and acidified. Inorganic carbon converts to CO_2, which is carried by the gas to the infrared detector for analysis.

3.2.3 TOC Measurement

TOC measurement includes both TC and IC detection. TC is measured first, then IC, and TOC is calculated as the difference between TC and IC.

3.2.4 NPOC Measurement

The sample is first acidified and aerated to convert and remove inorganic carbon as CO_2. The treated sample is then introduced into the high-temperature furnace (TC injection port) for 680°C catalytic oxidation, converting the remaining organic carbon fully into CO_2, which is quantified by the infrared detector to obtain NPOC, equal to TOC.

3.3Application Scope

This analyzer uses combustion oxidation combined with non-dispersive infrared absorption and is suitable for measuring TOC in various water types, including surface water, groundwater, municipal wastewater, industrial wastewater, tap water, and purified water. Typical applications include:

- **Environmental Monitoring:** Routine monitoring and emergency analysis of surface water sections, drinking water sources, and wastewater from key pollution sources.
- **Urban Water Supply and Sewage:** Raw and treated water from water plants, municipal pipeline water, and inflow/outflow from sewage treatment plants and reclaimed water quality control.
- **Disease Control:** Risk assessment of organic contamination in drinking water, public water supply, and related water bodies.
- **Chemical and Power Industries:** TOC measurement in circulating cooling water, boiler feedwater, process wastewater, and high-salinity or complex matrix water samples.
- **Pharmaceutical and Food Industries:** Compliance testing of TOC in purified water, water for injection, and production cleaning wastewater.
- **Research and Analysis:** Quantitative analysis in various water treatment process studies and organic pollutant transformation experiments.

IV.Technical Specifications & Key Components

4.1 Main Technical Specifications

- **Sample Injection Method:** Manual injection
- **Combustion Furnace Temperature:** 680–1000 °C
- **Injection Volume:** 10 μL–500 μL
- **Measurement Range:** 0–100,000 mg/L
- **Detection Limit:** ≤0.5 mg/L (HJ501-2009)
- **Repeatability:** ≤3%
- **TC Indication Error:** ±0.1% F.S. or ±5% (whichever is greater)
- **IC Indication Error:** ±0.1% F.S. or ±4% (whichever is greater)
- **Linearity:** $R^2 \geq 99.9\%$
- **Response Time:** 4–10 minutes

4.2 Working Environment

- **Ambient Temperature:** 10–40 °C
- **Relative Humidity:** 10–85%
- **Installation Location:** Indoor (maintain at least 20 cm clearance on all sides for heat dissipation; do not stack objects around or above the instrument)
- **Power Supply:** 220–240 VAC, 50 Hz, reliable grounding required
- **Power Consumption:** 1200 W during furnace heating
- **Ultrapure Water:** CO_2-free water (TOC ≤ 0.1 mg/L)
- **Acidifying Agent:** 0.1 mol/L phosphoric acid
- **Gas Supply:** High-purity oxygen (≥99.99%, equipped with initial pressure-reducing valve

V. Usage and Operation

5.1 Instrument Startup & Preheating

1）Before powering on, check the purity, pressure, and flow of the carrier gas. Ensure there are no leaks in the gas lines.

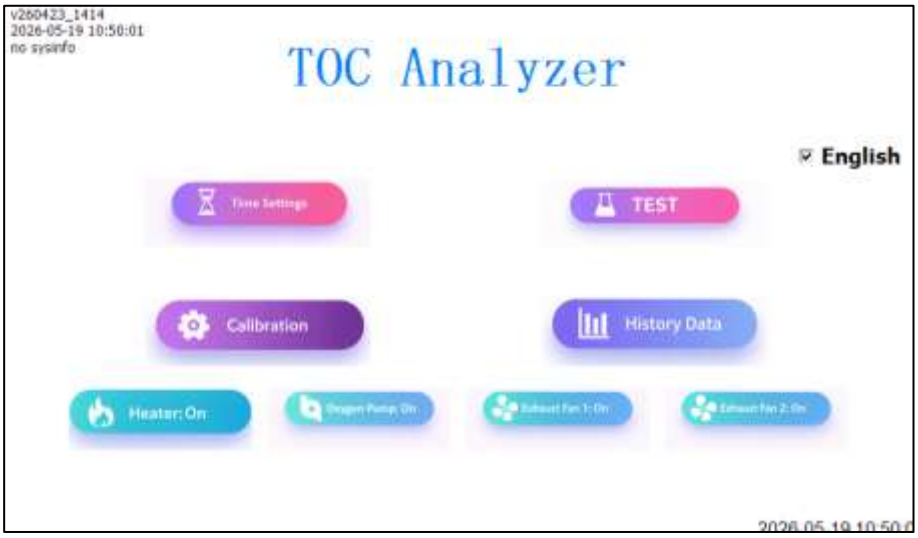
2）Allow the combustion furnace and detector to fully preheat to a stable temperature before performing calibration or sample measurements.

3）Check the combustion tube, catalyst, and ceramic wool loading. Replace immediately if they are damp or have lost effectiveness.

5.2 Instrument Operation

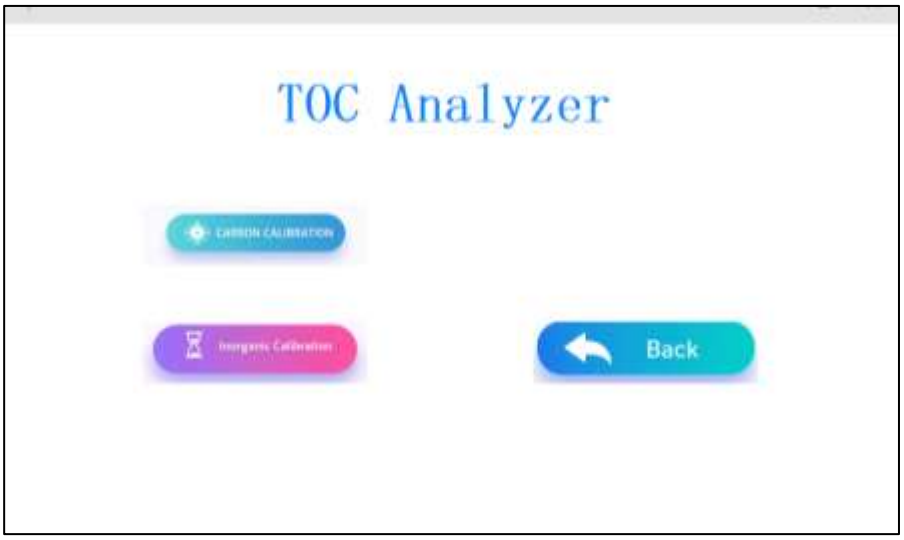
After powering on, start the instrument. Once the system completes initialization, it automatically enters the main operation interface. This interface is the primary system main screen and serves as the initial standby screen during normal operation.

The interface consists of four core modules:Time Setting 、Testing 、Calibration 、Historical Data .These modules are used for subsequent tests, parameter settings, and related operations.

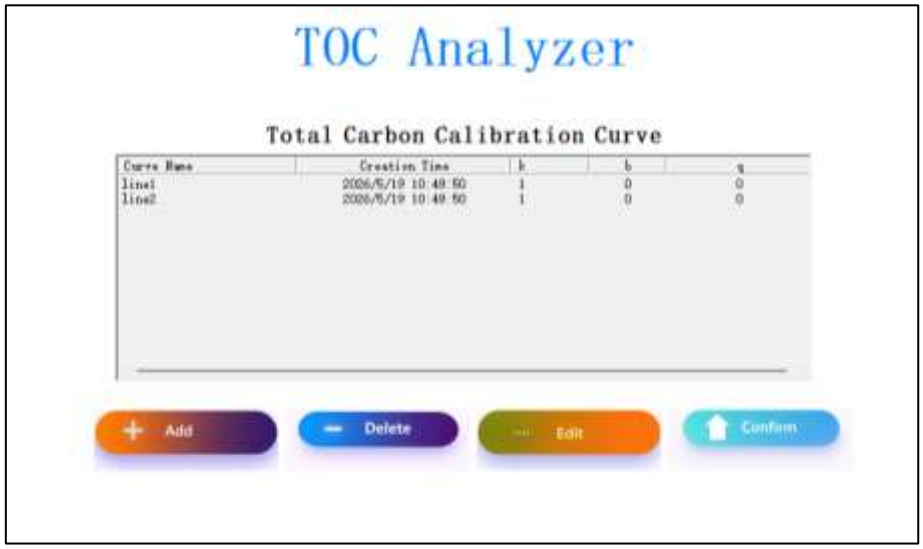


5.3 Calibration Procedures

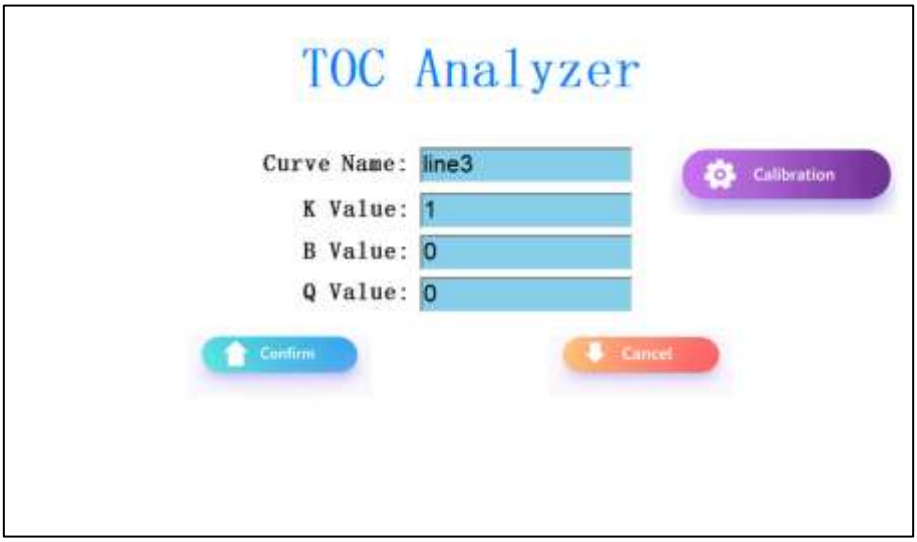
1.From the system main interface, select the Calibration function menu to enter the corresponding operation screen. This interface supports calibration procedures for Total Carbon (TC) and Inorganic Carbon (IC). The interface is illustrated in the figure below.



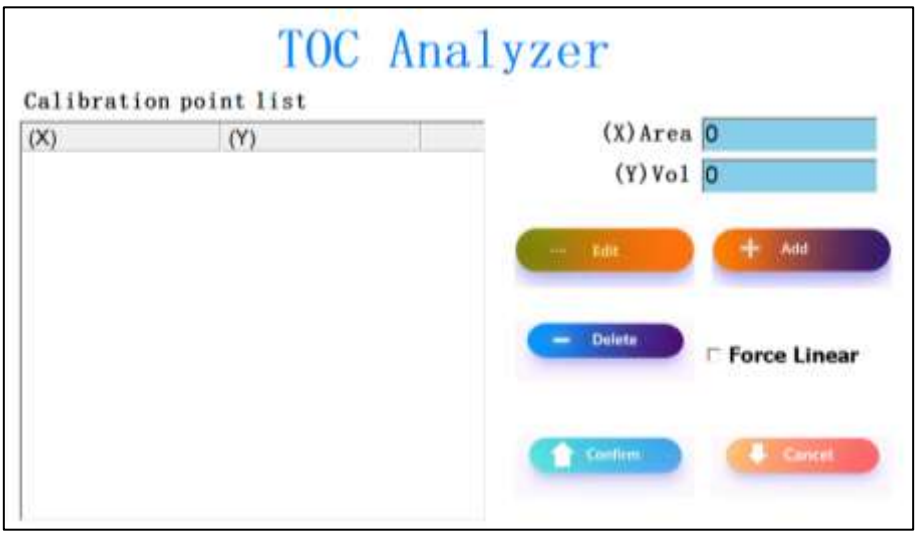
2.According to the actual testing requirements, select either Total Carbon (TC) or Inorganic Carbon (IC) calibration type to enter the corresponding settings screen. On the interface, select the target calibration curve to be operated. You can add, delete, or edit the curve as needed. The interface is illustrated in the figure below.



3.If it is necessary to adjust parameters related to the calibration curve, click the Modify option to enter the parameter configuration screen. Complete the detailed settings and editing of each calibration parameter as required.



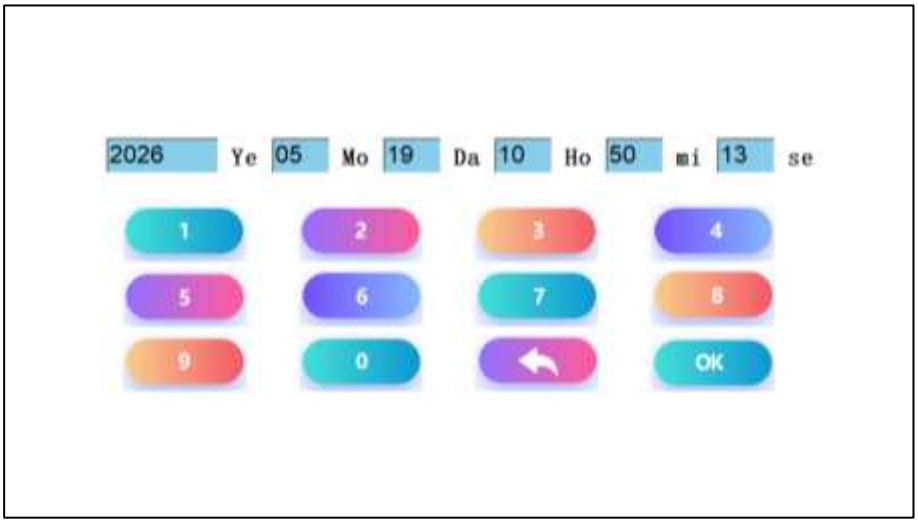
4.Click“Calibration”to enter the operation interface shown below and manually customize the calibration curve. After all calibration parameters and curve settings are completed, click the Confirm button to save the current configuration. Then, press the Back button to exit step by step and return to the system main interface.



5.4 Time Setting

On the system main interface, click the **Time Setting** option to open the date and time configuration screen. Select the date and time parameters to be adjusted, and use the on-screen touch keyboard to edit the values.

 After completing all parameter modifications, click the **OK** button to save the settings. The system will automatically return to the previous operation menu using the **Back** button



5.5 Instrument Testing Procedure

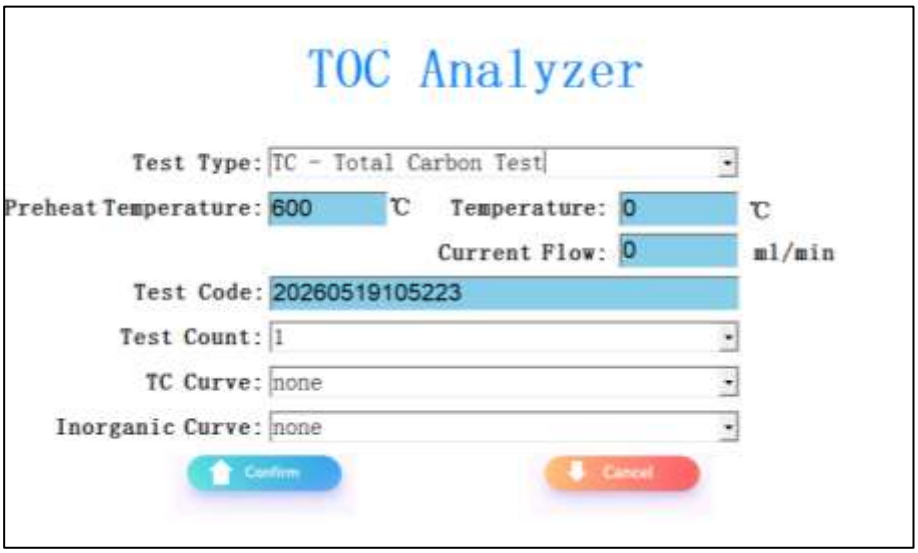
1.**Operation Steps:**

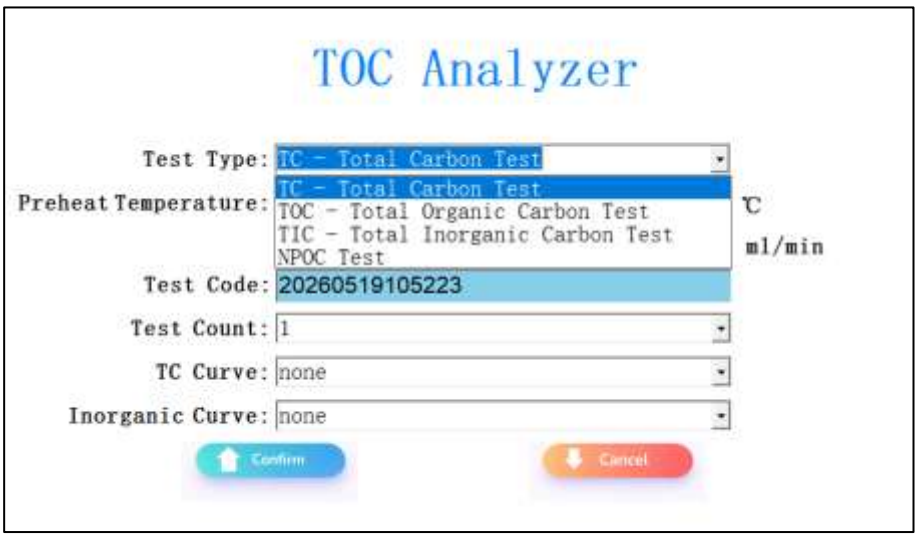
① Enter the instrument testing interface.

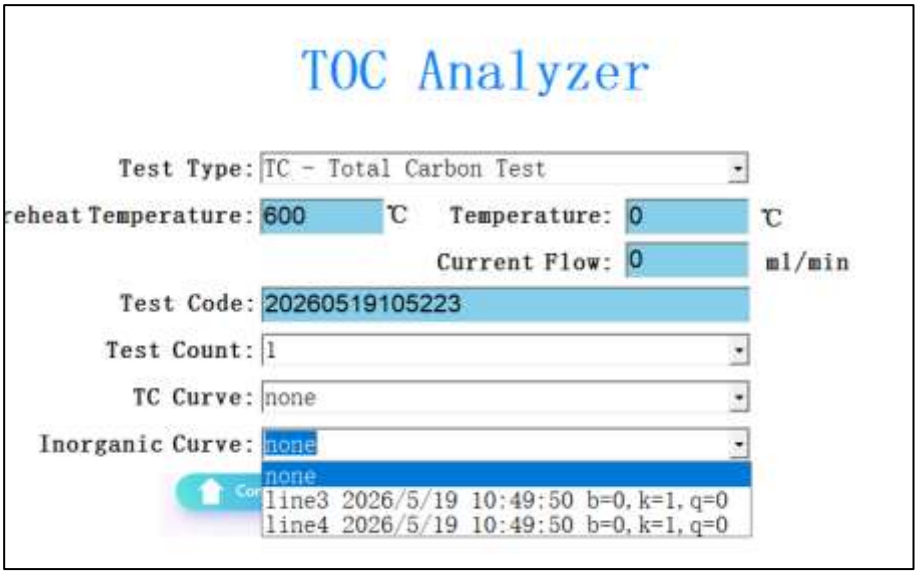
② In the test selection options, choose any of the following tests: **Total Organic Carbon (TOC) Test**, **Total Carbon (TC) Test**, **Inorganic Carbon (IC) Test**, or **NPOC Test**.

③ Click on each parameter item that needs to be modified and complete the parameter editing step by step.

④ After all parameters have been modified, click the **Confirm** button to save and complete the parameter changes.







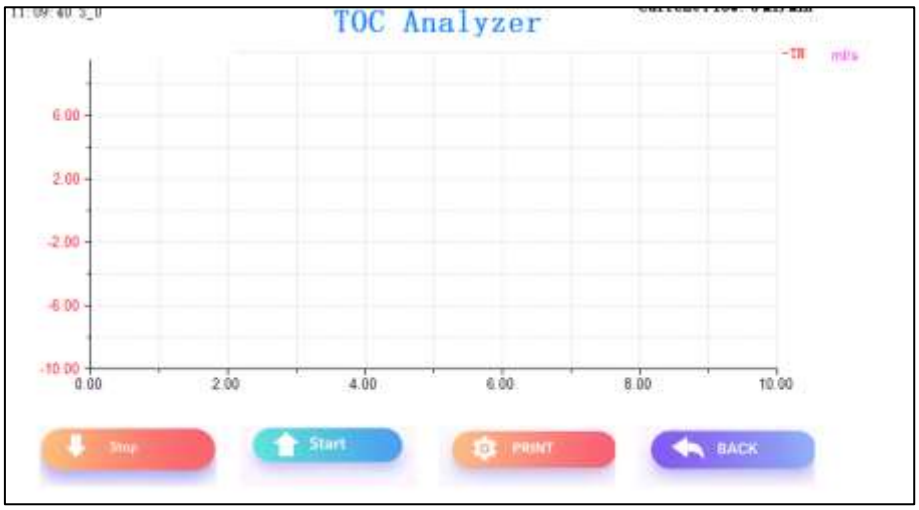
2. Test Start, Stop, and Sample Injection Operation

① After all parameters have been set and modified, click the **Start** button to begin sample testing. If it is necessary to terminate the test midway, click the **Stop** button to end the test.

② After the instrument has started a test, you must press the **Stop** button to terminate the testing process before performing a **Back** operation. Returning directly during the test is prohibited to avoid program errors, data anomalies, or process disruption.

③ During the test, follow the on-screen instructions and inject the sample sequentially into the corresponding sample ports.

④ For **Total Organic Carbon (TOC) testing**, follow the stepwise injection procedure: First, inject the sample into the **Total Carbon (TC) injection port** according to the instrument prompts. After the next step appears, inject the same sample into the **Inorganic Carbon (IC) injection port**. Follow the prompts in sequence; do not reverse, advance, or delay injection order to prevent deviations in results and abnormal curves.

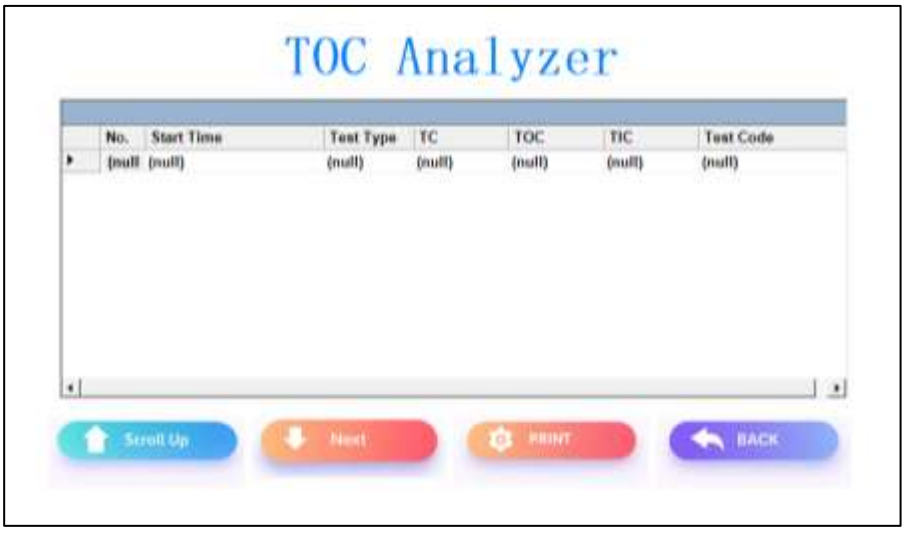


Precautions:

1. Avoid leaving water samples exposed for long periods to prevent organic and inorganic carbon in the air from dissolving into the sample and interfering with results.
2. Samples containing suspended solids or particles must be thoroughly mixed before injection to prevent pipeline blockage or incomplete combustion.
3. For NPOC testing, fully acidify and purge the sample to completely remove inorganic carbon. Purge time and acidity must strictly follow standard settings.
4. High-concentration samples must be diluted stepwise to avoid exceeding the standard curve range and to prevent contamination of the combustion tube and catalyst.

5.6 Historical Data

1. On the instrument main operation interface, click the **Historical Data** menu button to view past records.
2. After entering the historical records interface, multiple functions are supported: you can scroll through each record using the **Up** and **Down** buttons, view all saved historical test data, testing parameters, and results.
3. Data are sorted by default with the most recently generated historical records at the bottom of the list. You can scroll down to quickly access recent test records.
4. The interface also has a built-in **Print** function. You can select historical records and print the data report directly, facilitating experimental data storage, traceability, and documentation. After reviewing and printing, return to the main testing interface to continue sample testing.



5.7 Shutdown

Follow the steps below to properly shut down the instrument:

1. After testing is completed, flush the sample injection system and pipelines with ultrapure water.
2. Cool down, turn off the gas supply, and then power off the instrument according to the standard procedure. **Do not** cut off power or gas directly.
3. Regularly clean the combustion tube to remove carbon deposits, replace the catalyst, and inspect the dehumidification and condensation components to prevent baseline drift and decrease in response values.

At this time, the fan continues to operate to reduce the temperature inside the combustion furnace.

Precautions:

- **Turn off the power switch, but do not disconnect the instrument from the power supply.**

VI. Standard Solutions and Reagents

6.1 Water for Standard Solutions

All TOC, TC, TIC, and NPOC standard solutions and reagents used in experiments must be prepared with high-purity deionized water containing **TOC < 0.1 mg/L**. The water should be freshly prepared and used immediately, stored sealed and protected from light, avoiding exposure to air, which could introduce CO_2 or volatile organic compounds, resulting in elevated TOC or IC blanks.Do **not** use ordinary distilled water or tap water as a substitute, as this may cause baseline drift, deterioration of standard curve linearity, and distorted sample measurement results. Before each preparation, the TOC background of the pure water can be spot-checked; if it does not meet the standard, prepare a new batch.

6.2 Acid Reagents

6.2.1 Reagent Specification and Preparation

For Total Inorganic Carbon (IC) and NPOC tests, 0.1 mol/L phosphoric acid solution is used uniformly as the acidifying reagent. The phosphoric acid must be of analytical/reagent grade purity, and throughout the preparation process, only the high-purity deionized water specified in Section 6.1 may be used. No other laboratory water may be mixed.

6.2.2 Reagent Purpose

1.For IC (Total Inorganic Carbon) Detection: Acidify the water sample to convert carbonates and bicarbonates into CO_2, facilitating quantitative detection by the instrument.
2.For NPOC Pre-Treatment: Acidify the water sample and use the purge system to completely remove inorganic carbon, eliminating interference of IC on organic carbon measurement results.

6.2.3 Usage and Storage Precautions

The acid reagent must be stored sealed, protected from light, and refrigerated to prevent evaporation, contamination, and impurity formation. After preparation, label with the preparation date, concentration, and expiry date. Reprepare when expired. The amount of acid and purge time must strictly follow instrument method parameters to avoid incomplete carbon removal due to insufficient acid or baseline shifts caused by excess acid.

VII.Installation & Storage/Transport

7.1 Environment

7.1.1 Selection of Installation Location

The instrument should generally be placed on a level tabletop that can support 25 kg. To facilitate heat dissipation and maintenance, ensure at least 20 cm of clearance behind and on both sides of the instrument.

7.1.2 Power Requirements

- Voltage: 220–240 VAC
- Frequency: 50 Hz
- Reliable and effective grounding protection (**mandatory**)

7.1.3 Environmental Requirements

The Total Organic Carbon (TOC) Analyzer should be placed in a temperature- and humidity-controlled environment suitable for operation. Avoid direct sunlight and abnormal temperatures.Excessively high temperatures (above 50 °C) may prevent the condenser from reaching its normal range. Too low temperatures (below 50 °F / 10 °C) may cause excessive measurement errors.

7.2 Installation

Follow these steps to install the TOC Analyzer:

①Place the instrument on the laboratory platform. Use a power polarity tester to confirm that the socket is properly grounded. Ensure there is safe space around the instrument for carrier gas cylinders.

Verification Method:

Insert the power polarity tester into the designated socket. The indicator light must illuminate correctly and match the proper polarity exactly. Only then is the grounding considered reliable and the power suitable for the instrument.

②Install the combustion tube correctly as shown. The combustion tube is fragile, so handle it with care during installation.

③Connect the carrier gas.

Attach one end of the gas tube to the oxygen cylinder via the adapter fitting, and the other end to the instrument's rear gas inlet. After connection, check for gas tightness.

④Place the waste liquid bottle and acid reagent bottle in their designated positions. Then insert the waste liquid tubing and acid inlet tubing into the corresponding bottles.

⑤Finally, connect the power supply.

7.3 Storage & Transport

① The packaged Total Organic Carbon (TOC) Analyzer should be stored indoors in a well-ventilated, cool, and clean environment, with relative humidity not exceeding 80% and free from corrosive gases.

② During transportation, avoid collisions and moisture exposure.

③ If the system needs to be disassembled and reinstalled, please contact the instrument manufacturer for assistance from professional technical personnel.

Precautions

● The system's original packaging materials must be carefully preserved. Installation should be performed by the manufacturer's professional technical personnel.
● If the system must be returned for any reason, it must be packed in the original carton to prevent damage during transportation.

Safe Use of Oxygen Cylinders

1. Oxygen cylinders must not be stored in the same room as flammable gas cylinders.
2. Smoking and open flames are strictly prohibited in the oxygen cylinder storage area.
3. Oxygen cylinders must be kept away from heat sources. The distance to open flames should generally be no less than 10 meters.
4. When opening the cylinder valve and regulator, stand to the side. Open slowly to prevent overheating of organic material components or excessive airflow that may generate static sparks, which could cause combustion.
5. In winter, if the regulator or pipeline freezes, do not use fire for thawing or strike the cylinder with metal objects. Never forcibly adjust the regulator screw, to prevent sudden rapid release of oxygen and potential accidents.
6. Do not use oxygen cylinders without a regulator. Regulators should only be repaired by professional personnel.

VIII. Maintenance

8.1 Precautions

① When the water sample contains insoluble particles, promptly clean the micro-sampler to prevent needle blockage.
② For high-salinity water samples, the catalyst's lifespan will be significantly reduced. It is recommended to dilute the sample before testing and replace the catalyst in a timely manner to ensure reliable results.
③ This instrument is not suitable for testing strongly acidic or alkaline water samples.
④ After turning off the power, wait at least 3 minutes before restarting the instrument.

8.2 Consumables Replacement

8.2.1 List of Consumables

No.	Consumable Name	Specification / Parameters	Recommended Replacement Cycle	Supplier
1	Combustion Tube	Custom	12 – 24 months (or every 2,000 tests)	Manufacturer
2	Chromatography Sample Pad	11.5×3.5mmTeflon-silicone composite	Every 50 – 100 injections (or 1 – 2 months)	Manufacturer / Self-purchase
3	φ6Chromatography Sample Pad	Outer 6mm，inner 4mm	12~18 Months	Manufacturer / Self-purchase
4	φ3Chromatography Sample Pad	Outer 3mm inner 1mm	12~18 Months	Manufacturer / Self-purchase
5	Butterfly Filter	0.22um	3~6 Months	Manufacturer / Self-purchase
6	High-Temperature Gasket	10mm and 18mm	3~6 Months	Manufacturer / Self-purchase
7	Quartz Wool	No special specification	3 – 6 months (or replace together with catalyst)	Manufacturer / Self-purchase
8	Catalyst	Platinum-alumina	12 – 24 months (or every 2,000 tests)	Manufacturer / Self-purchase
9	Acid Inlet & Outlet Pumps	Custom	Peristaltic pump tubing 12 – 24 months	Manufacturer
10	Phosphoric Acid (Analytical Grade)	Prepared 0.1mol/l	Follow reagent bottle label expiration	Self-purchase

Remarks:

1.The recommended replacement cycle is for reference only. Actual replacement should be adjusted based on sample characteristics, usage frequency, and instrument condition.

2.It is recommended to perform instrument calibration after replacing consumables to ensure detection accuracy.

3.Keep a certain amount of commonly used consumables in stock to avoid affecting normal instrument operation.

8.2.2 Acid Reagent Replacement

During IC testing, a certain amount of phosphoric acid reagent is consumed. Monitor the usage of the acid reagent during testing and replace it in a timely manner.

Procedure for Replacing Acid Reagent:

① Turn off the power switch.

② Remove the acid inlet pump tubing from the bottle cap.

③ Replace with freshly prepared **0.1 mol/L phosphoric acid** reagent.

④ Tighten the bottle cap and insert the pump tubing into the phosphoric acid bottle

8.2.3 Platinum-Alumina Catalyst (Combustion Tube) Replacement

First, ensure that the instrument is powered off, the combustion furnace is not heated, and the system is at room temperature before proceeding with the following steps:

① Remove the combustion tube assembly (see Figure 8-1).

Unscrew the four fixing screws of the combustion tube, and remove the gas inlet connection nut. Detach the inlet gas tubing. Then, grasp the head of the combustion tube assembly with your hand, gently rotate, and lift the combustion tube out.

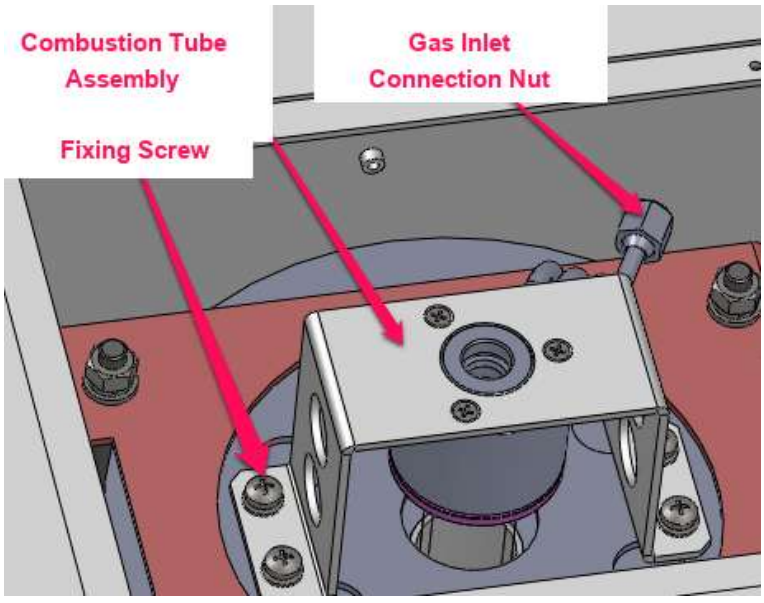


Figure 8-1

② Remove the combustion tube.

Loosen the combustion tube locking screw and gently rotate the tube to remove it. If you need to clean the sample seat or replace the sealing ring, first remove the locking screw, then perform the cleaning and replacement of internal parts.

③ Combustion Tube Filling

Precautions:

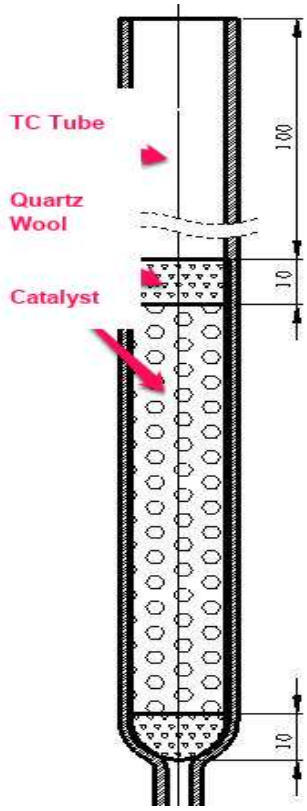
- Quartz wool must **not** be packed too tightly, and the ends should be flat and even, not tilted.
- Platinum catalyst must be filled **uniformly** (the combustion tube can be gently shaken during filling to ensure even distribution). There must be no obvious gaps, and the top surface should be level.
- When filling the upper quartz wool, ensure good contact with the platinum catalyst, without visible gaps; otherwise, peak shape abnormalities may occur.
- A thin layer of quartz glass chips can be placed on top of the upper quartz wool for protection, but it must not be too thick.

④ Reinstalling the Combustion Tube Assembly

The assembly process is the reverse of the removal procedure. Since this is a glass component, handle it carefully during installation to avoid breakage. Please also pay attention to the following points:

Precautions:

- When tightening the combustion tube, push the tube all the way in and tighten the combustion tube locking screws evenly so that the screws bear equal force. Gently pull the combustion tube; if it does not move, it is properly secured.
- When placing the combustion tube assembly into the combustion furnace, gently twist it downward while inserting, and adjust the lower fixing seat so that the tube passes through it. **Do not use excessive force**, as this may break the combustion tube.



8.2.4 TC Sample Pad Replacement

The sample pad can be replaced without removing the injection port, following these steps:

① Unscrew the fixing screws and remove the sample pad clamp.
② Remove the old sample pad.
③ Place the new sample pad with the cushioned side facing down (i.e., the hard side down) into the sample pad holder. Reinstall the sample pad clamp and tighten the fixing screws evenly. Tighten slightly until secure; do not overtighten, as this will make it difficult for the syringe to penetrate the sample pad and may reduce its lifespan. If any leakage is found later, the screws can be slightly tightened again for reuse.

8.2.5 IC Sample Pad Replacement

If there is leakage at the IC injection port, replace the sample pad by following these steps:

① Loosen the screw cap.
② The sample pad becomes visible; remove it and install a new sample pad, then tighten the screw cap.

8.2.6 Peristaltic Pump Tubing Replacement

When the peristaltic pump tubing is worn or sticks, preventing normal waste discharge or acid delivery, replace the tubing as follows:

① Rotate the peristaltic pump plastic cover to the right and remove it.
② Remove the tubing clamp at the movable end, then rotate the pump head to take out the entire section of tubing.
③ Cut the nylon ties on both ends of the tubing clamp and remove the old peristaltic pump tubing.
④ Install the new peristaltic pump tubing and secure it with nylon ties. Note: Use small-sized ties. The raised part of the tie must align with the raised part of the clamp and must not exceed the clamp height.
⑤ After securing the tubing with nylon ties, install the fixed-end tubing clamp into the slot. Rotate the pump head to feed the tubing entirely into the pump head.
⑥ Replace the peristaltic pump plastic cover.

- Precaution:
  Do not use sharp objects to force the pump tubing into place during installation.

IX. Troubleshooting & Fault Analysis

No.	Fault Description	Fault Description	Troubleshooting Method
1	Screen does not display after powering on	Power cord plug is loose or not properly connected	1. Replace pump tube 2. Contact professional service for repair
2	Furnace temperature cannot reach set value after long heating	1.Mainboard malfunction 2. Furnace fault	Contact professional service for repair
3	Flow meter shows 0 or very low	Leak in the pipeline	Check and locate leak points segment by segment
4	CO2 reading does not change or shows 20 directly	1. NDIR address error 2. NDIR malfunction	1. Set correct address 2. Contact professional service for repair
5	Touch screen is unresponsive	1. Instrument frozen 2. Touch screen damaged	1. Restart the instrument 2. Contact professional service for repair
6	Touch screen is unresponsive	Foreign object inside the instrument	Contact professional service for repair
7	Peristaltic pump makes noise, cannot draw acid	1. Pump tube aging or sticky 2. Peristaltic pump damaged	1. Replace pump tube 2. Contact professional service for repair
8	TC detection unstable, poor peak shape	Furnace tube used for too long, catalyst efficiency decreased	Reinstall furnace tube, refill catalyst and quartz wool
9	TC sample inlet leaks	Sample inlet gasket worn out, cannot ensure airtightness	Replace the inlet gasket