TOC-3000 Total Organic Carbon Analyzer

Operation and Service Manual

Contents

Overview

Thanks for using TOC-3000 Total Organic Carbon analyzer.

TOC-3000 is the device used for measuring the carbon content in water samples that based on the principle of *UV Oxidation Non-dispersive Infrared Absorption Method.*

This operation and service manual describes the operating instructions, maintenance and repair methods of TOC-3000. Operators should have certain basic knowledge of chemistry.

Please read this manual carefully before using and keep it properly for further reference.

Safety Regulations

1 Basic Regulations

For the safety of yourself and the device, please refer to this chapter carefully before operation. Make sure that the TOC-3000 Analyzer is used normally. All the rules with security motioned in this manual and displayed in the software should be strictly complied.

2 Symbols and Keywords

Following symbols and keywords are used in this manual:

CAUTION: A potential dangerous environment is indicated. It may result in minor injury or property loss if not follow this instruction.

HOT SURFACE: Do not touch the surface during its running process. It may be with high temperature.

HIGH VOLTAGE: Caution the danger of high voltage, and be careful of the risk of electric shock.

3 Technical Criterions

This instrument complies with the most extensive technical design and structure regulations. Unauthorized modifications and changes to the instrument may cause harm to person and instrument.

Please pay attention to following regulations:

(1) The device should be operated under absolutely safe conditions.

(2) Before operating, check whether the instrument is damaged and make sure it is in good working condition.

(3) The device should be installed by the service engineers from our company or trained and authorized persons.

4 Operator Requirements

(1) TOC-3000 analyzer should be operated by persons who have professional chemical knowledge with chemical operation capabilities and have been trained in instrument operation. The training includes instrument operation, use and maintenance of components and accessories.

(2) Operation by untrained persons or inappropriate applications may cause damage or danger.

(3) This manual should be placed where the operator can read it at any time.

(4) It is strictly forbidden to eat, drink, smoke or rub your eyes in the working area.

5 Notes

1) Don't touch heating parts to avoid burns. The temperature of furnace surface and nearby the insert port of the combustion tube is very high.
2) Replace the combustion tube after cooling to room temperature.
3) The lid of sample container must be properly closed to prevent corrosion of device parts.
4) The drained waste water contains acid or other corrosive substances. Be careful to avoid spattering or touching.
5) Don't disassemble and assemble any part of the instrument with power on. Be careful of electric shock.

Chapter 1 Introduction

1.1 Notions

Total Carbon, TC: It refers to the total content of organic carbon, inorganic carbon and elemental carbon in water.
Total Organic Carbon, TOC: It refers to the carbon content (expressed by mass concentration) of organic matter dissolved or suspended in water, and it is a comprehensive indicator of carbon content representing the total amount of organic matter in water.
Inorganic Carbon, IC: It refers to the carbon content of elemental carbon, carbon dioxide, carbon monoxide, carbides, cyanates, cyanides, and thiocyanates present in water.
Non-Purgeable Organic Carbon, NPOC: It refers to the organic carbon that remains in sample solution after purging under the specified purge conditions.

1.2 Measurement Principle

1.2.1 Measurement Principle of TC

Carriage gas flow is kept at 180mL/min with pressure regulating valve and flow controller and circulates in a digestion tank pre-added with persulfate oxidant, phosphoric acid solution and UV irradiation. When sample is injected into the digestion tank by injector, the organic carbon (TC) in the sample is decomposed into carbon dioxide by ultraviolet irradiation and persulfate oxidation, and the inorganic carbon reacts with the phosphoric acid solution to form carbon dioxide. The carrier gas containing the reaction product from the digestion tank is cooled and dehumidified by a dehumidifier (electronic cooler), then passes through the halogen scrubber, and finally reaches the sample cell of non-dispersive infrared gas analysis module (NDIR) to detect the concentration of carbon dioxide. After data processing, the NDIR detection signal (analog signal) shows and calculate the peak of curve. Since the peak area is proportional to the concentration of TC, the relationship (standard curve) of the concentration of TC and the peak area is determined through the external standard method, then the concentration of TC in sample can be measured accordingly.

1.2.2 Measurement Principle of IC

IC consists of carbonate, bicarbonate and dissolved CO_2. A small amount of hydrochloric acid or phosphoric acid added to the sample makes PH under 3, then all carbon dioxide (CO_2) in the carbonate will be released by the following reactions.

$$CO_3^{2-} + 2H^+ \rightarrow CO_2\uparrow + H_2O$$

$$HCO_3^- + H^+ \rightarrow CO_2\uparrow + H_2O$$

The carrier gas passes through the sample to volatilize the carbon dioxide produced by the reaction and dissolved carbon dioxide, The carrier gas containing the reaction products is cooled and dehumidified by a dehumidifier (electronic cooler), then passes through the halogen scrubber, and finally reaches the sample cell of non-dispersive infrared gas analysis module (NDIR) to detect the concentration of carbon dioxide. After data processing, the NDIR detection signal (analog signal) shows and calculate the peak of curve. Since the peak area is proportional to the concentration of IC, the relationship (standard curve) of the concentration of IC and the peak area is determined through the external standard method, then the concentration of IC in sample can be measured accordingly.

1.2.3 Measurement Principle of NPOC

Add the acid (such as phosphoric acid) into the sample to make it acidic (PH is 2 to 3), then purge the sample with carrier gas, the inorganic carbon in the sample becomes carbon dioxide and be removed. After this, the sample can be measured based on the measurement principle of TC (1.2.1).

When sample contains volatile organic compounds (Purgeable Organic Carbon, POC), POC may lost during gas purging. Therefore, the TOC obtained by this determination after the removal of IC is called Non-Purgeable Organic Carbon (NPOC).

Generally, the natural environment water, public water and pure water, etc. which contain little POC, in this case, the NPOC can be regarded as TOC.

1.2.4 Measurement Principle of TOC

There are two measurement methods of TOC.

1) **Subtraction method (TOC mode, TOC=TC-TIC)**

The system measures IC concentration first, then measures TC concentration. The value of TC concentration subtracts the value of IC concentration obtains the value of TOC concentration.

Note: For sample which TOC concentration is much less than IC concentration (TC mostly consists of IC), the direct method (NPOC mode) is suggested. If adopts subtraction method, there is large error of the TOC value, because the final calculated TOC value contains both error in TC and IC measurements.

2) **Direct method (NPOC mode, TOC=NPOC)**

The system directly measures the sample under NPOC mode, the NPOC concentration is regarded as TOC concentration.

Note: Since the carrier gas purging is required in the experiment, then the direct method (NPOC mode) is not suitable for the sample which

contains volatile organic compounds, Because the volatile organic compounds such as benzene, toluene, cyclohexane and chloroform will be purged out along with the carbon dioxide. In this case, the subtraction method is suggested.

1.3 Applications

TOC-3000 total organic carbon analyzer is mainly used in quality control of pharmaceutical water, cleaning validation, quality control of injection water, purified water, drinking water and source water, etc., It is also widely used in the fields of medicine, biotechnology, laboratory and hydropower station.

Chapter 2 Technical Specification

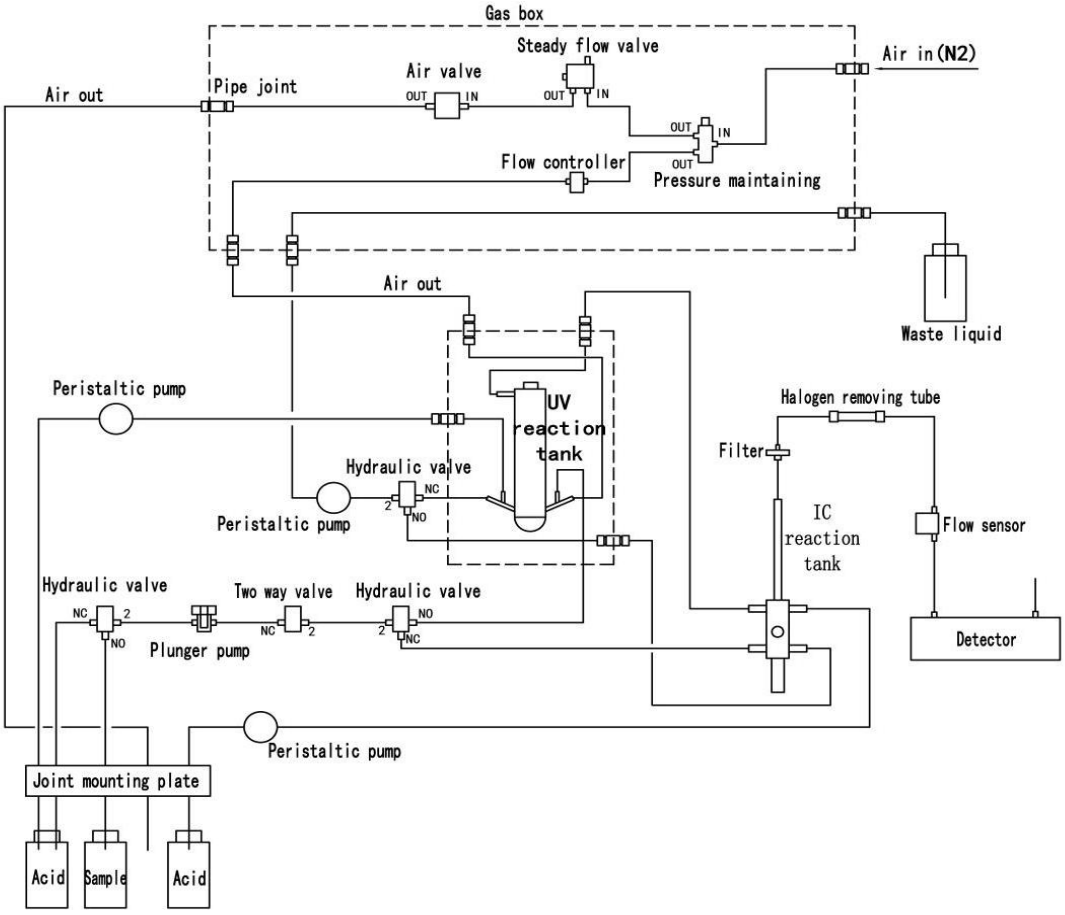
2.1 Packing List

No.	Description	Unit	Quantity
1	TOC analyzer	Kit	1
2	Halogen removing material (30g/pack)	Pack	2
3	Quartz wool（0.2g/pack)	Pack	2
4	Sample pad	Piece	2
5	Filtration membrane	Box	1
6	Sample bottle	Pcs	1
7	Acid bottle	Pcs	2
8	Waste bottle	Pcs	1
9	Connecting pipe (3.2*1.6mm)	Meter	8
10	Nitrogen decompression device	Set	1
11	Power cord	Pcs	1
12	USB communication line	Pcs	1
13	Software	Pcs	1
14	User's Manual	Pcs	1
15	Quality Certificate	Pcs	1

2.2 Technical Data

Method	Wet Chemical Oxidation by UV
Detector	NDIR
Measurement items	TC, TIC, TOC, NPOC
Operation mode	Computer control
Application object	Liquid sample
Gas requirement	Nitrogen ≥99.995%
Measuring range	0-10000mg/l
Detection limit	5μg/l
Reproducibility	3%
Maximum salt tolerance	85g/l
Particle size	≤0.2mm
Power Supply	AC 110/220V, 50/60HZ, 200W
Size	360*460*445mm

2.3 Flow Chart of Instrument System



2.4 Calibration Method

Multi-point Calibration-Different Concentrations with Fixed Volume

Multi-point calibration is usually used for high concentration samples (C>1mg/l) as a traditional method. For samples in low concentration, this method is difficult in preparing for standard solutions (easily affected by the polluted glassware and the dissolution of CO_2 from air, etc.). For samples in ppb level, (C < 1mg/l), other calibration methods are suggested.

Chapter 3 Installation

3.1 Preparations

3.1.1 Power Supply

It should be connected to a stable power supply with AC220±22V/AC110±11V, 50/60 Hz, and single phase with the capacity more than 10A. Abnormal action may occur if the power supply exceeds the range of 220±22V/110±11V.

Note: It may cause fault in high sensitivity sample measurement if the voltage is unstable.

3.1.2 Space

1) Test bench: L≥200cm, W > 70cm, H: 70cm ~ 80cm; can bear at least 100kg; stable without vibration; heat and acid resistant.

2) Keep less than 150cm between the rear of the instrument and the power socket to connect power. Reserve the autosampler position on the left side of the instrument host, reserve the computer and printer location on the right side of the instrument host.

3.1.3 Environment

1) Do not install the instrument on the side of window or door directly to avoid convection, dust, corrosive gases and vibration.

2) Keep away from strong electromagnetic.

3) Ambient temperature: 15 ~ 35℃.

4) Humidity: 10 ~ 80%RH.

3.1.4 Carrier Gas

1) A nitrogen cylinder needs to be prepared by the user. The nitrogen gas is used as the carrier gas and the purge gas to be connected to the gas supply port.

2) The purity of nitrogen must no less than 99.995%.

Safety Notes:

For high-pressure gas, there are strict regulations and restrictions on its operation and security management in the safety technical specifications and fire protection laws of special equipment.

Nitrogen itself is not dangerous, however, the wrong operation of high-pressure gas cylinders is very dangerous. Please read carefully and observe strictly the following precautions.

A. Keep the place with good ventilation and no direct sunlight.

B. Keep the temperature of the gas cylinders under 40℃.

C. No flames within 2 meters of the gas cylinders.

D. Make sure that the gas cylinder is not be converted and must be fixed with ropes.

E. Close the valve immediately after using the gas.

F. Check the pressure gauge every 3 months.

3.1.5 Computer Hardware

1) Hardware configurations: More than 233MHz for CPU, with more than 512MB RAM, and more than 80GB hard disc memory with at least two hard disk partitions.
2) External interface: USB 2.0 or above.
3) Operation system: Windows 7 ultimate system or above.
4) Pre-installed software: Office 2007 or above which contains database of Access, PDF viewer with PDF printing function.
5) Display: With the resolution above 1024* 768, wide screen display is suggested.

3.2 Unpacking, Installation and Pipeline Connection

Note: Don't connect the instrument to the power before installation and checking.

3.2.1 Unpacking

TOC-3000 analyzer and the standard accessories are packed in a wooden box.
1) Loosen the fixed iron plate around the cover to remove the whole cover, take out the host analyzer together with the protective foam. Then lift the device from the bottom by 2 person, place it on the experimental bench.
2) Check item by item according to the packing list. Contact us if any items missed or broken.

3.2.2 Instrument Components Introduction

3.2.2.1The front view is shown in Fig. 3.1.

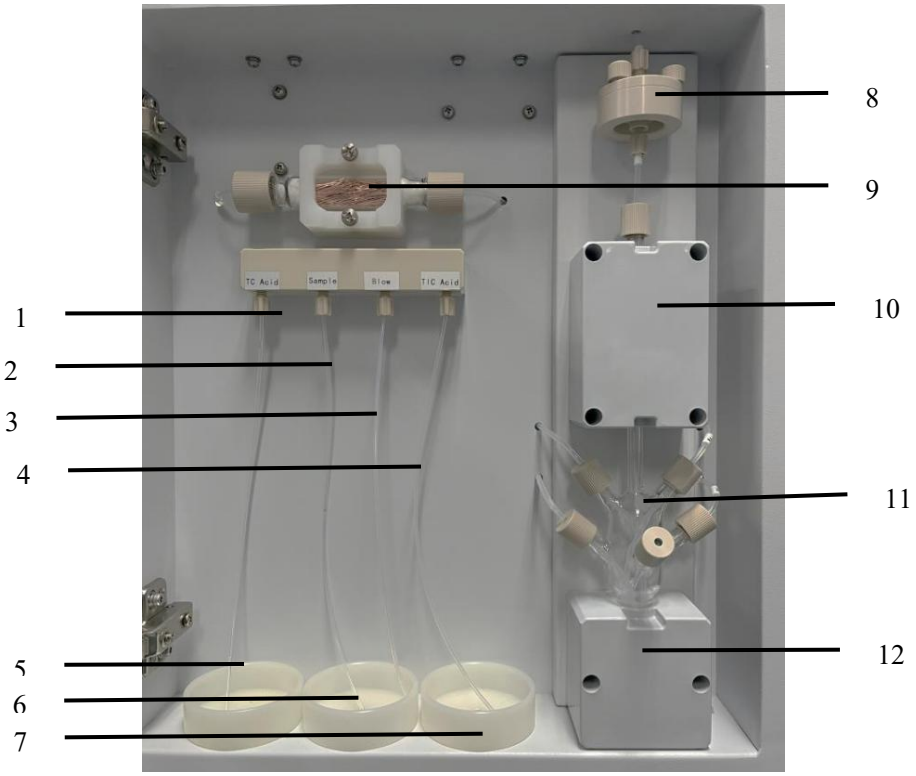


Fig .3.1

1. TC acid-in tube 2. Sample-in tube 3. Gas purging tube
4. IC acid-in tube 5. Base for TC acid bottle 6. Base for IC sample bottle
7. Base for IC acid bottle 8. Filter 9. Halogen removing tube
10. IC cooling module 11. IC reaction tank 12. IC heating module

3.2.2.2 The left view is shown in Fig. 3.2.

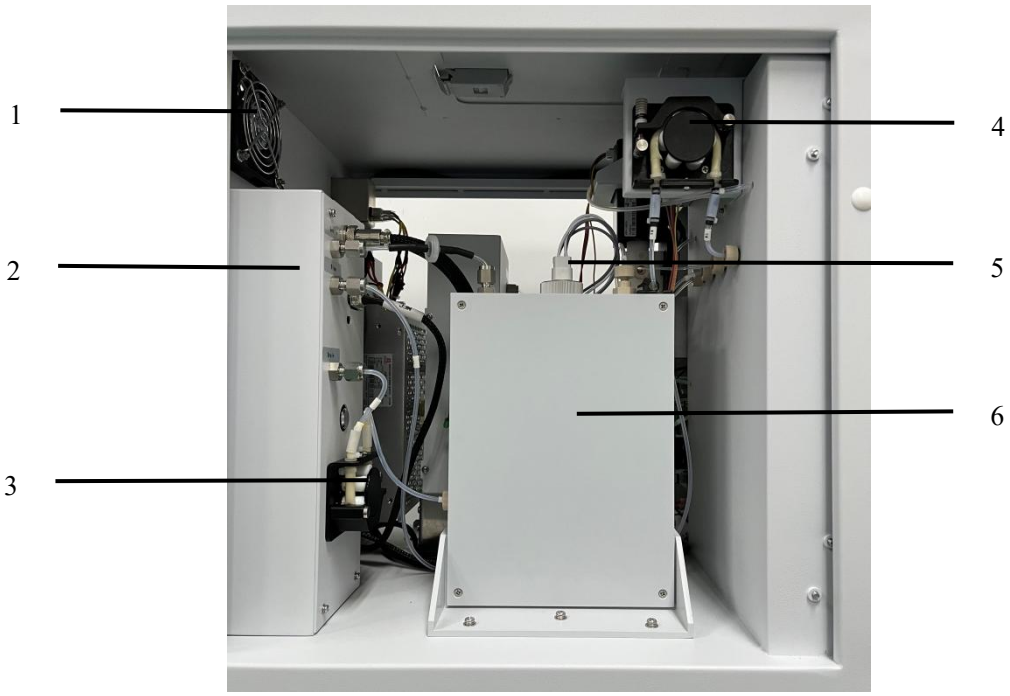


Fig. 3.2

1. Device ventilation fan 2. Gas circuit module 3. Drain peristalic pump
4. TC acid-in peristalic pump 5. Base for UV lamp 6. UV Digestion tank

3.2.2.3 The right view is shown in Fig. 3-3.

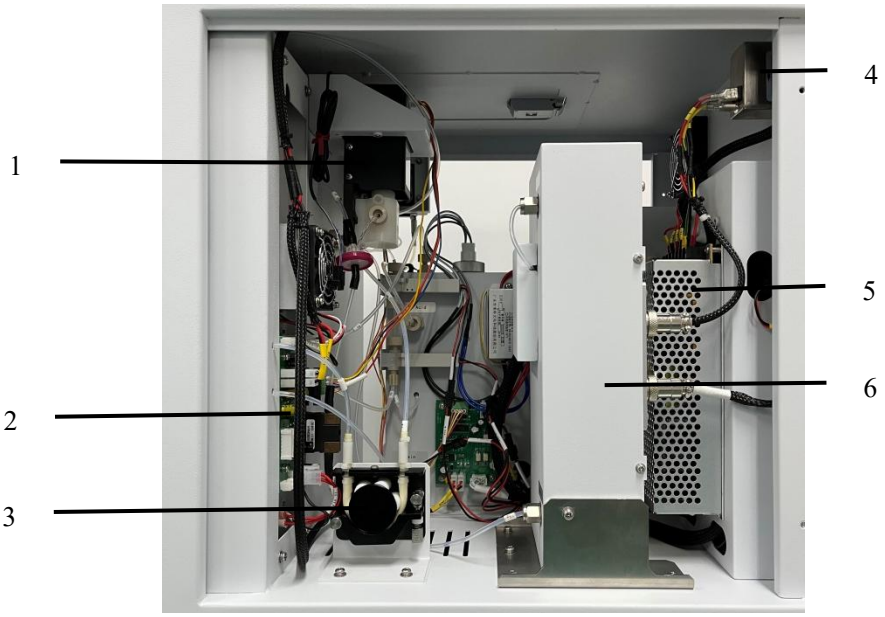
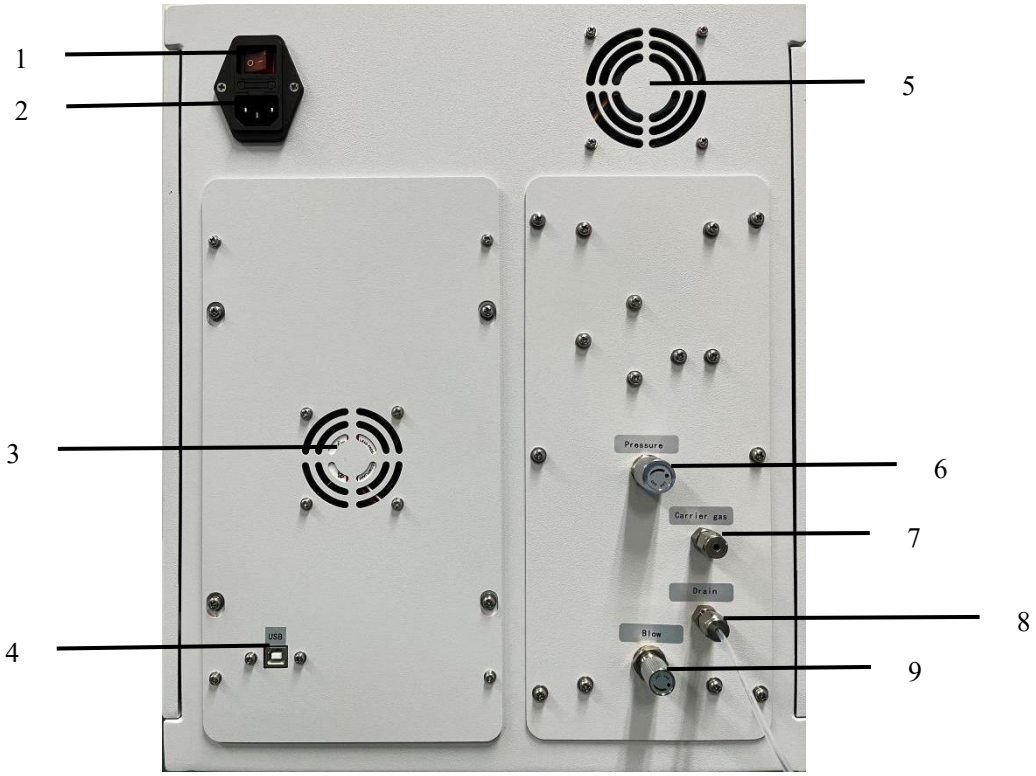


Fig 3.3

1. Sampling System 2. Flow sensor circuit board
3. IC acid-in peristalic pump 4. EMC filters 5. Switching power supply
6. NDIR detector

3.2.2.4 The back view is shown in Fig. 3.4.

Fig 3.4



1. Power switch 2. Power socket 3. Mainboard ventilation fan
4.USB interface 5. Device ventilation fan
6. Gas pressure regulating valve 7. Gas inlet 8.Drain outlet
9.Gas flow regulating valve

3.2.2 Installation and Pipeline Connection

All components of TOC-3000 have been installed before leaving factory, the instrument circuit, gas circuit, liquid pipeline need to be connected by the user.

3.2.2.1 Power Cord & USB Connection

Take out the configured power cable and USB communication cable from the accessory box and connect them to the power interface and USB communication interface of the instrument host respectively. The other end of the USB communication cable is connected to the computer host (Fig. 3.5).

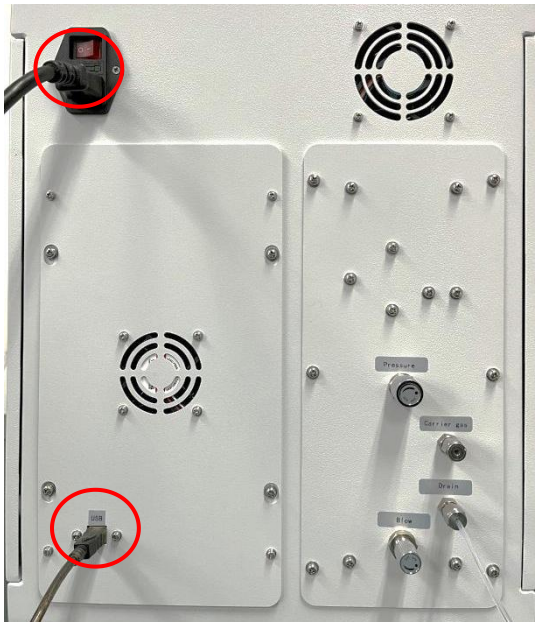


Fig. 3.5

3.2.3.2 Carried Gas Connection

1) Take out the nitrogen reducing valve from the accessories box, install and tighten it on the nitrogen cylinder.

2) Take out the connecting pipe (3.2*1.6mm) from the accessories box and connect the outlet of the reducing valve(Fig.3.6) with the inlet interface of the instrument (Fig. 3.4)(Fig. 3.7).

Fig. 3.6

Fig. 3.7

3.2.3.3 Waste Pipe Connection

Insert connect pipe of the waste interface on the machine into the waste bottle to prevent the splashing.(Fig. 3.4)(Fig. 3.8)

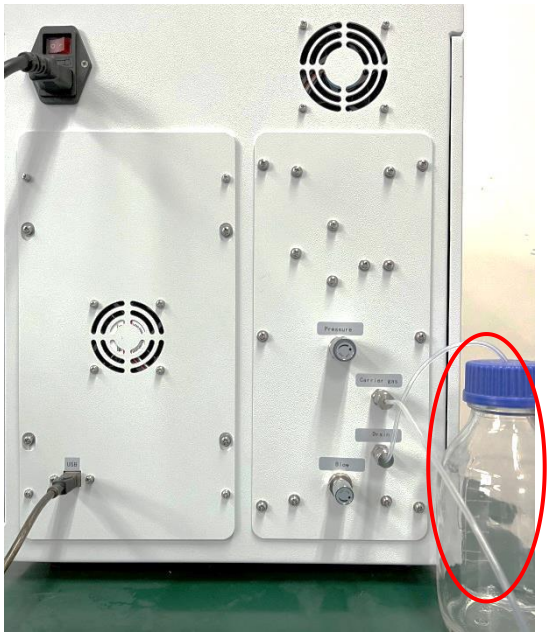


Fig.3.8

Note: The waste containing sodium persulfate, phosphoric acid and other is treated complying with the requirements of national or local environmental protection departments strictly, generally the waste may

be entrusted to the industry waste dealer with license.

3.3 Software Installation

3.3.1 Installation Notes

1) The Windows Version should be above Windows 7 SP1. And make sure that it is 32bit or 64bit.
2) Office should be pre-installed in the computer system, including Access database. And the version should be above Office 2007.
3) For the hard disk of the computer system, at least two disks are needed, with C disk and D disk as the default. Copy the software installation file to D disk, and ensure that the software is authorized to run, that means it can run without administrator rights. Otherwise, you need to right-click and select administrator authorized to open the software.

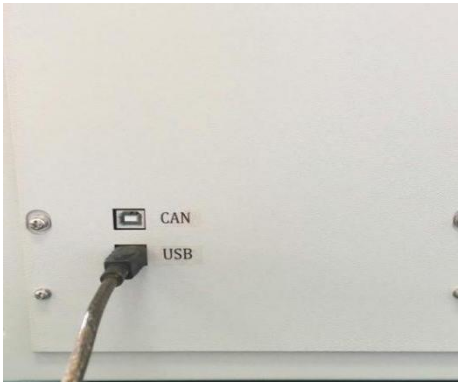


Fig.3.2

3.3.2 Software Installation Process with Windows 7 System

3.3.2.1 USB Driver Installation

1)Double click the driver installation file 

, click 'Extract' button Fig. 3.9.

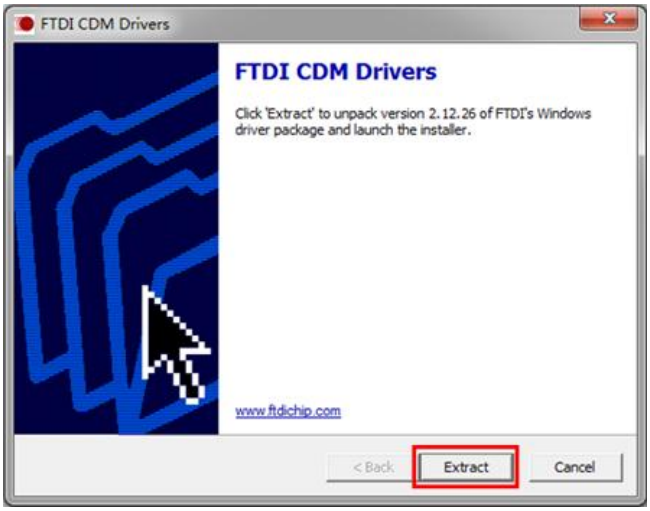


Fig. 3.9

2)Click 'Next' (Fig. 3.4), until installation is completed (Fig. 3.10).

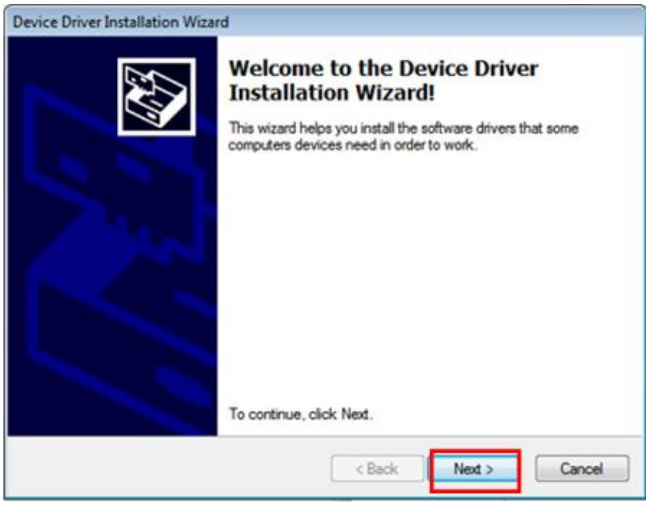


Fig. 3.10

3)Choose 'I accept the agreement' , Click 'Next'(Fig. 3.11).

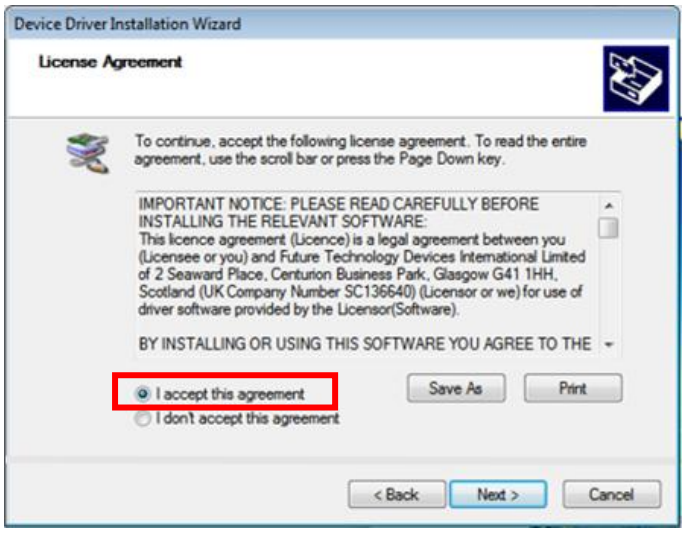


Fig. 3.11

4)Wait, until completing the device Driver Installation (Fig.3.12)

Fig. 3.12

3.3.2.2 Communication Port Modification

1) Connect the USB cable respectively to the instrument and computer, and switch on the power of the instrument (Fig.3.13)

Fig. 3.13

2)Right click the shortcut icon 'Computer' on the desktop, and select 'Manage' (Fig. 3.14).

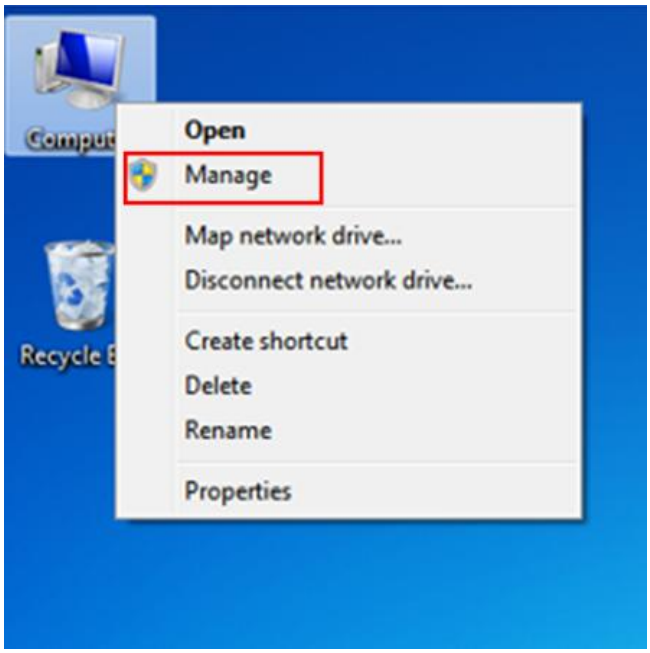


Fig. 3.14

3)Select 'Device Manager' on the left pane (Fig. 3.15)..

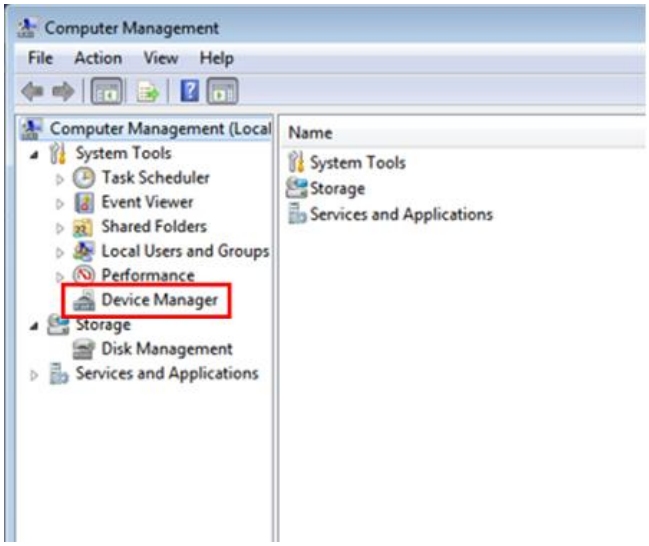


Fig.3.15

4)Select 'Ports (Com & LPT)', and check the USB Serial Port (Fig. 3.16).

Note: Only USB Serial Port is the serial port of the instrument, other types are not matched.

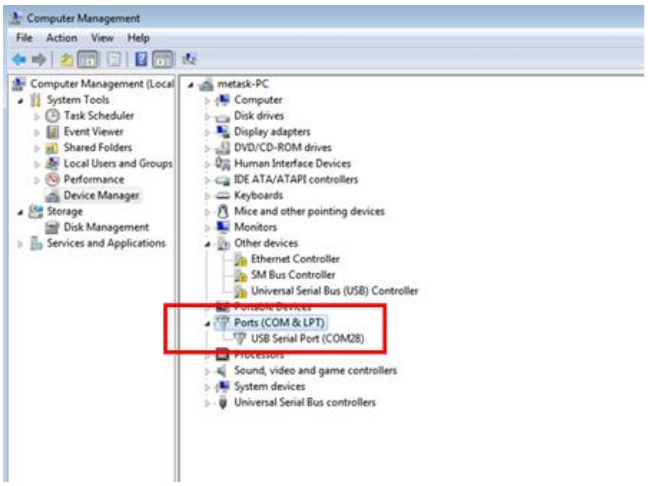


Fig.3.16

5)Right click on 'USB Serial Port', and select 'Properties' on the pop-up menu (Fig. 3.17).

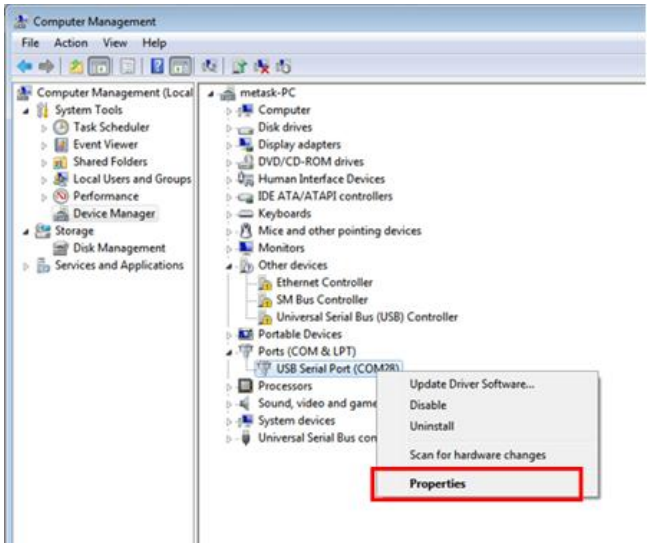


Fig. 3.17

6) In the USB Serial Port Properties window, select 'Port Settings' (Fig. 3.18).

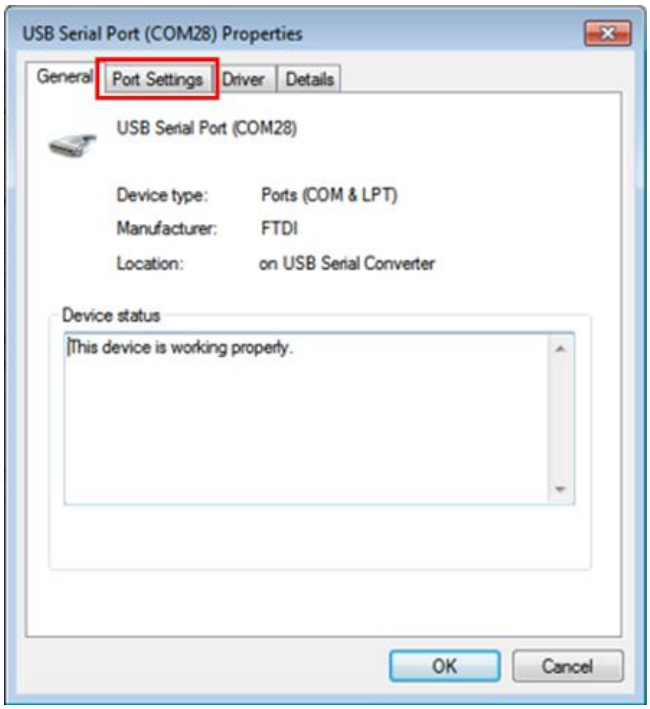


Fig. 3.18

7)Then select 'Advanced' (Fig. 3.19).

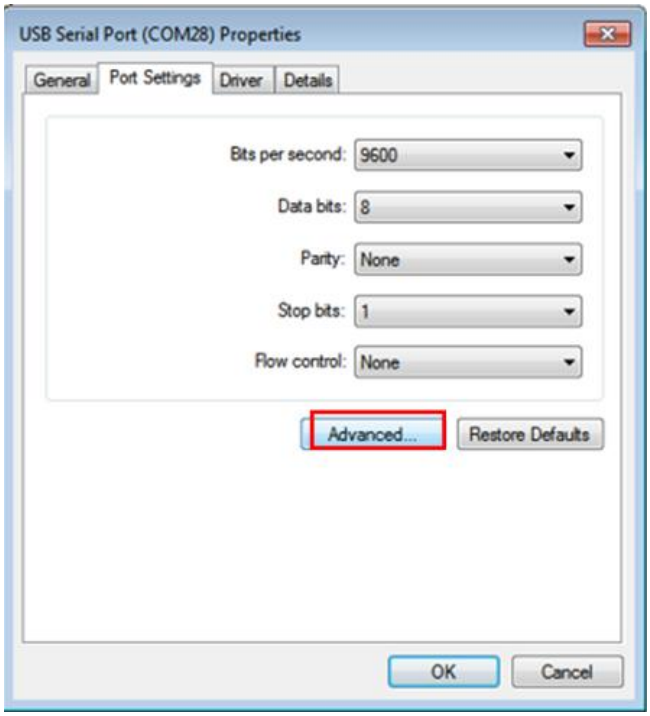


Fig. 3.19

8)Select the COM Port Number 'COM11', and click 'OK' (Fig. 3.20), the communication port modification is completed.

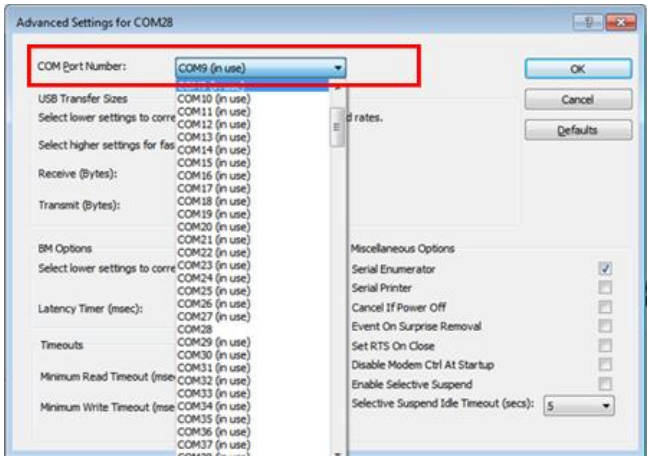


Fig. 3.20

Note: The connected instrument should power on when operating the communication modification. If the auto-sampler is chosen, the serial port modification process is the same as that of the main instrument. The USB serial port number is COM11 for the main instrument and COM8 for the auto-sampler.

3.3.2.3Software Installation

1)Open the installation file in the software installation package, double click ' setup.exe ' to start the installation (Fig. 3.21).

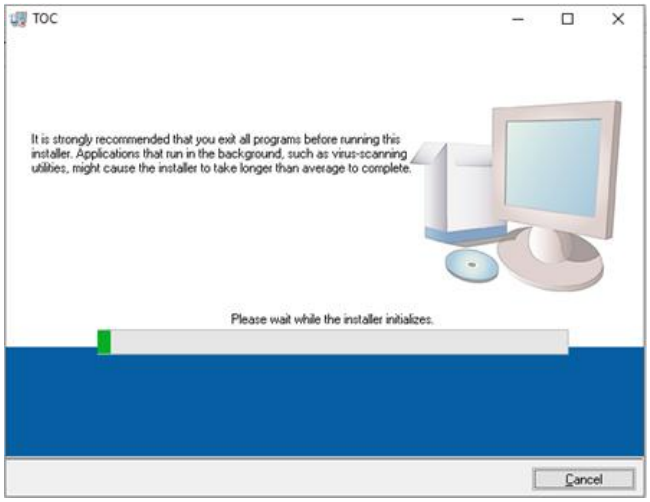


Fig. 3.21

2) The default installation path is D disk. User can set the disk with running authorization (Fig. 3.22).

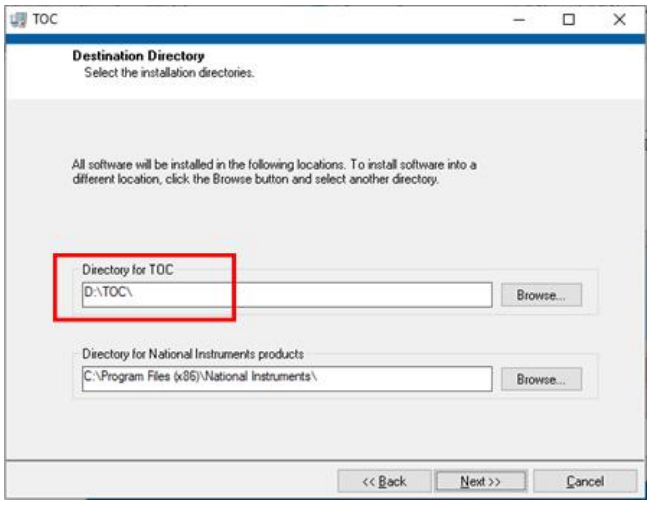


Fig. 3.22

3)Select 'I accept the above 2 License Agreements', and click 'Next' (Fig.3.23).

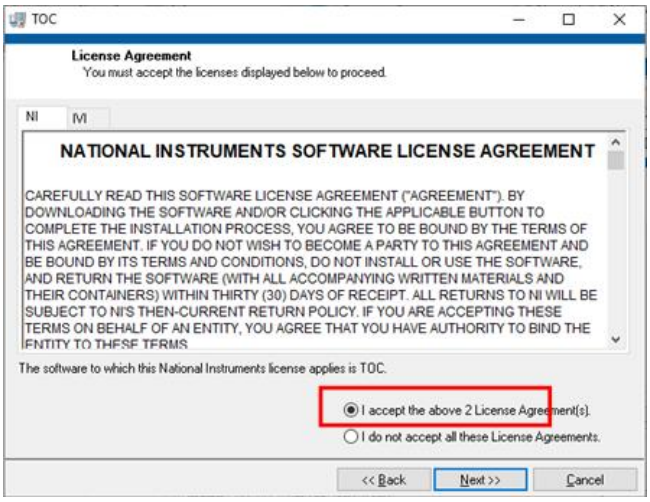


Fig.3.23

4)Click 'Next' (Fig. 3-24).

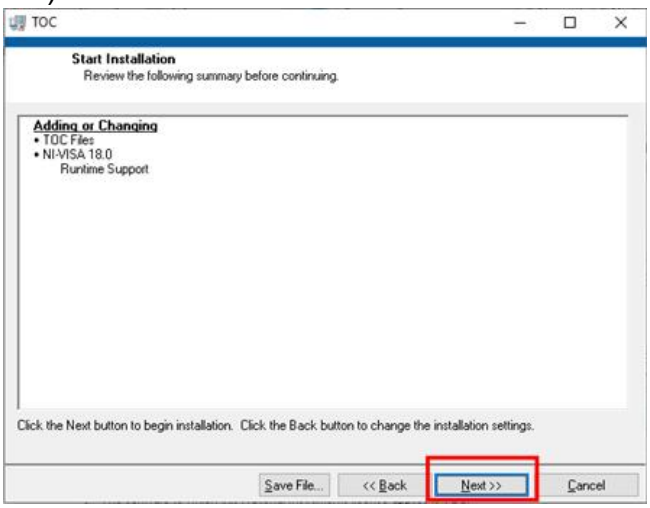


Fig.3.24

5)Wait to complete the installation （Fig.3.25).

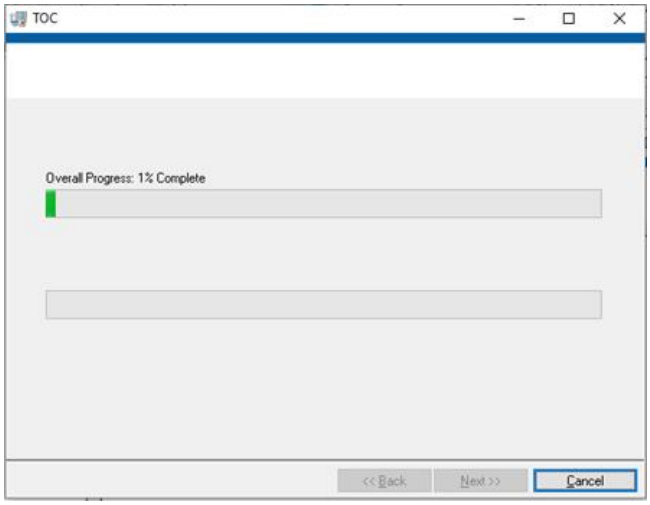


Fig.3.25

6)Click 'Finish' (Fig. 3-39), and the installation is completed.

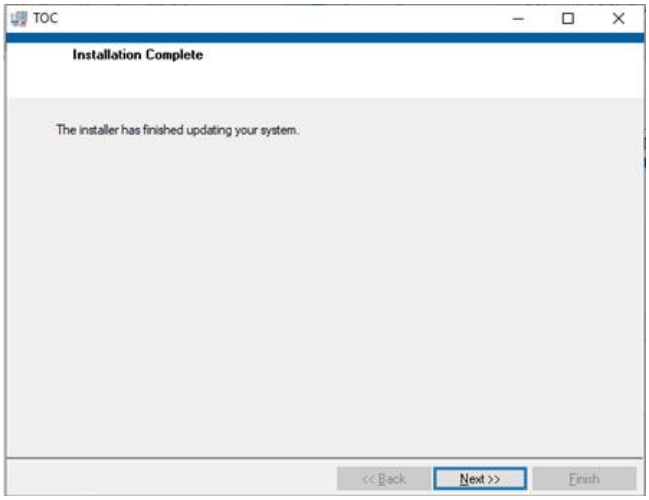


Fig.3.26

7)Re-start the computer after completing the installation.

8)A shortcut icon of the software will be shown on the desktop.

3.3.3 Software Installation Process with Windows 10 System

3.3.3.1 USB Driver Installation

Open the USB Driver installation file in the software installation package with the right Windows version. Use Windows 64bit as an example, double click 

to enter the driver installation interface. Click 'Extract' (Fig .3.27).

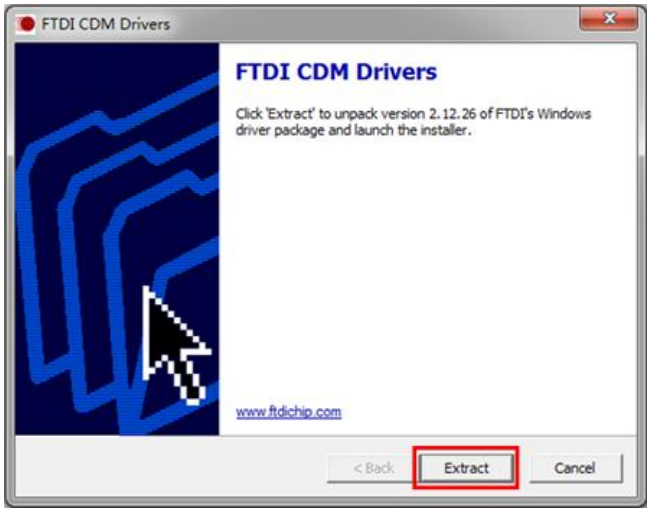


Fig .3.27

2) Click 'Next' (Fig 3.28).

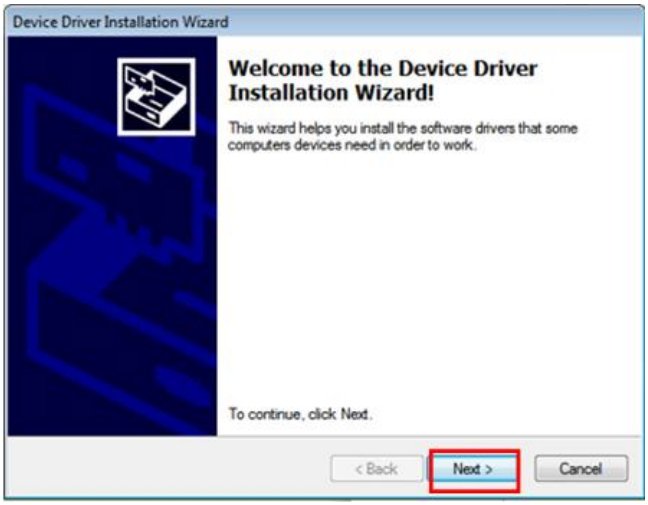


Fig. 3.28

3)Select 'I accept this agreement' and click 'Next' (Fig 3.29).

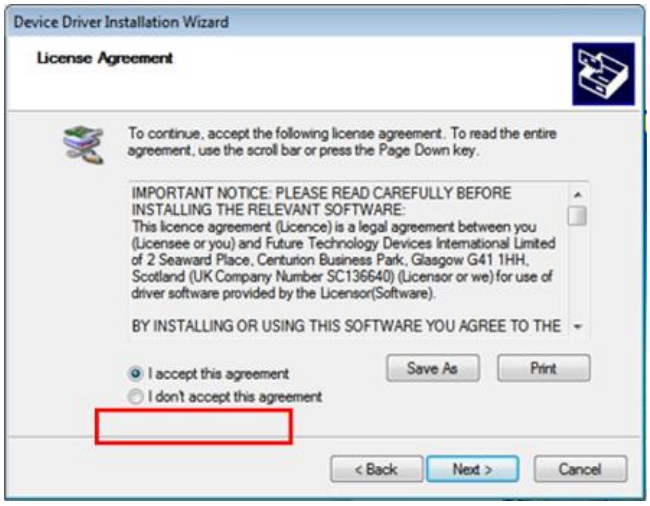


Fig. 3.29

4) Wait to complete the installation (Fig.3.30).

Fig. 3.30

3.3.3.2 Communication Port Modification

1) Connect the USB cable respectively to the instrument and computer, and switch on the power of the instrument (Fig.3.31).

Fig. 3.31

2) Right click the shortcut icon 'This Computer' on the desktop, and select 'Manage' (Fig.3.32)

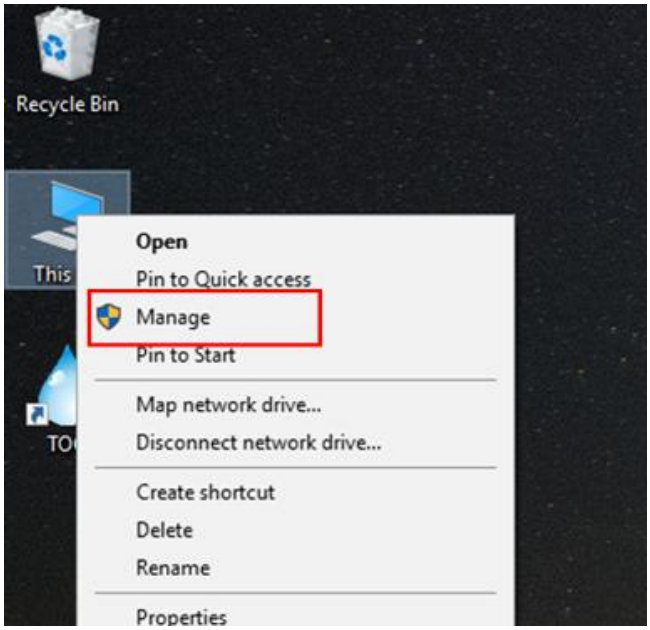


Fig. 3.32

3) Select 'Device Manager' on the left pane (Fig.3.33).

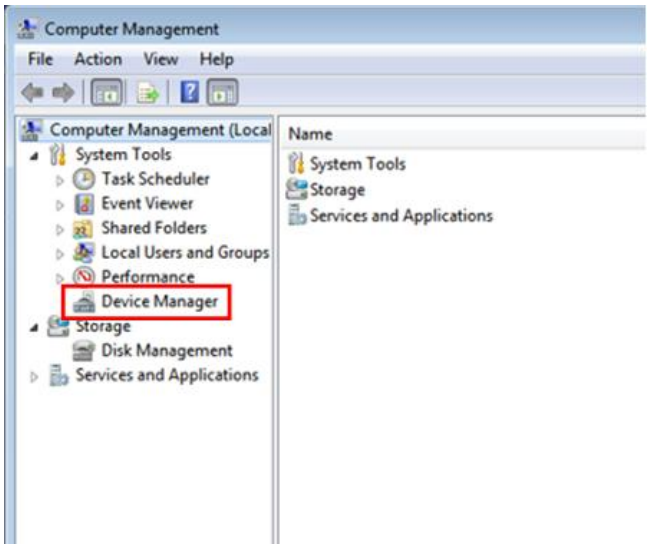


Fig.3.33

4)Select 'Ports (Com & LPT)', and check the USB Serial Port (Fig.3.34).

Note: Only USB Serial Port is the serial port of the instrument, other types are not matched.

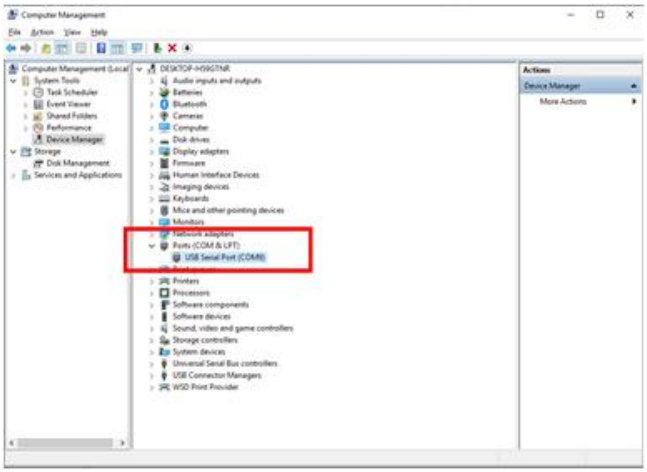


Fig.3.34

5)Right click on 'USB Serial Port', and select 'Properties' on the pop-up menu (Fig.3.35).

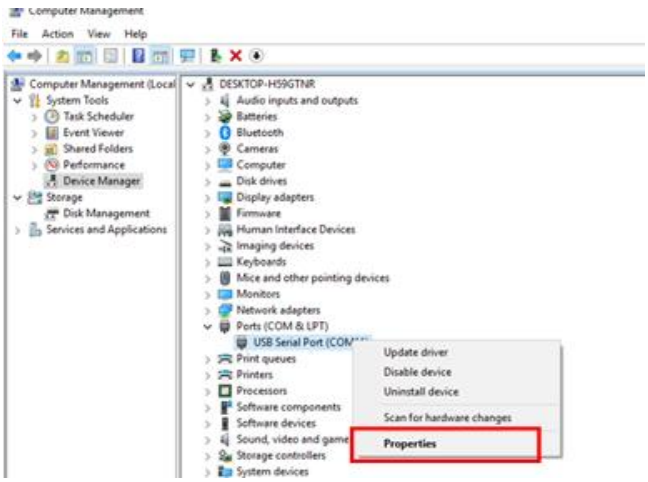


Fig.3.35

6)In the USB Serial Port Properties window, select 'Port Settings' (Fig.3.36).

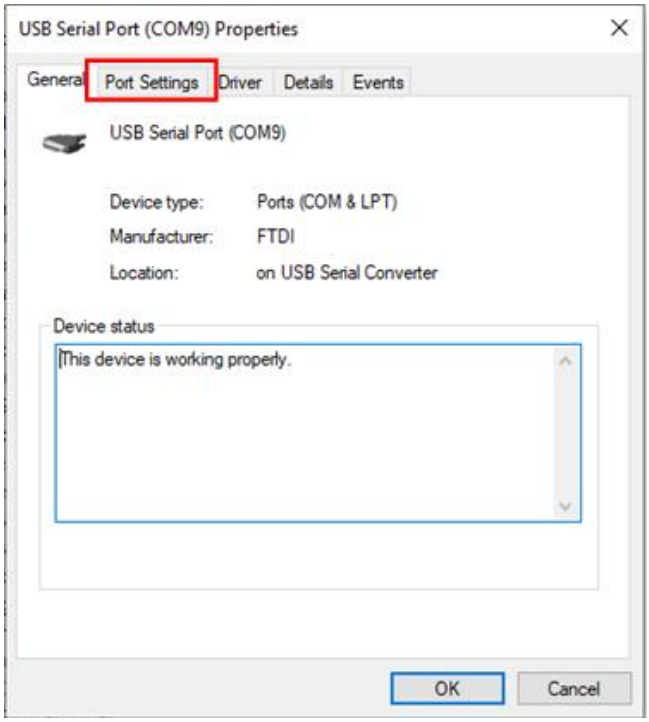


Fig.3.36

7)Then select 'Advanced' (Fig.3.37).

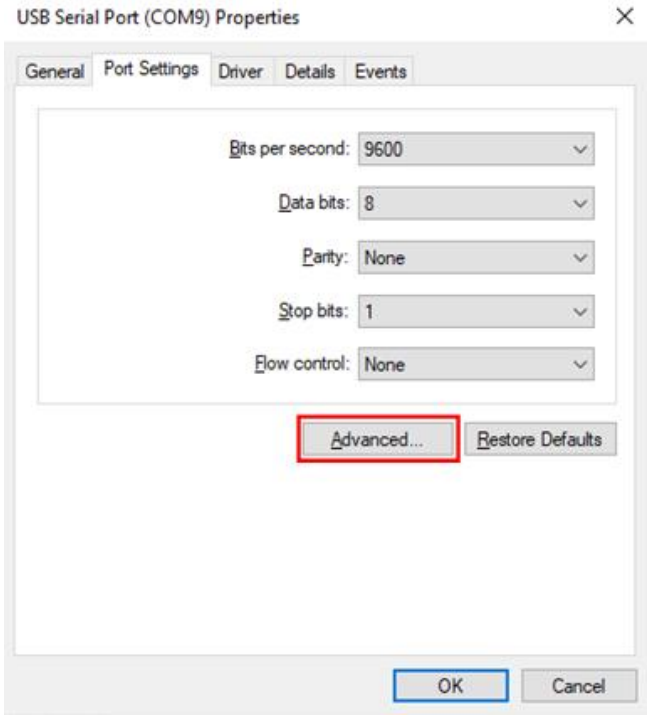


Fig.3.37

8)Select the COM Port Number 'COM11', and click 'OK' (Fig. 3-38), the communication port modification is completed.

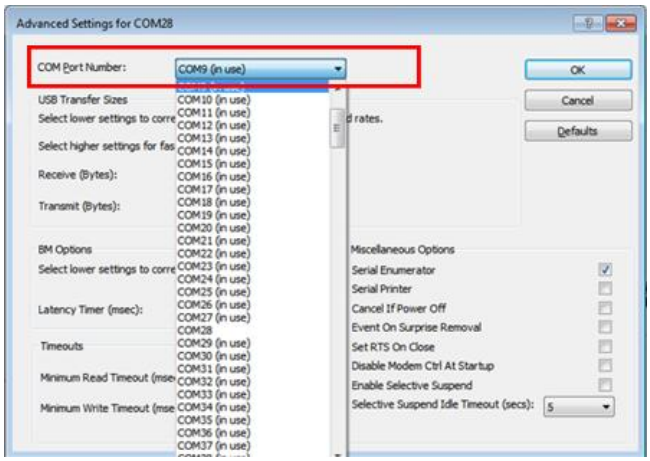


Fig.3.38

Note: The connected instrument should power on when operating the communication modification. If the auto-sampler is chosen, the serial port modification process is the same as that of the main instrument. The USB serial port number is COM11 for the main instrument and COM8 for the auto-sampler.

3.3.3.3 Software Installation

1) Open the installation file in the software installation package, double click ' setup.exe ' to start the installation (Fig.3.39).

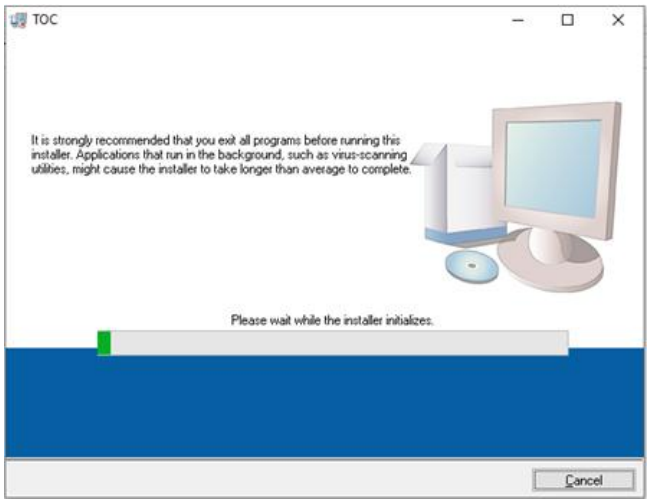


Fig.3.39

2) The default installation path is D disk. User can set the disk with running authorization (Fig.3.40).

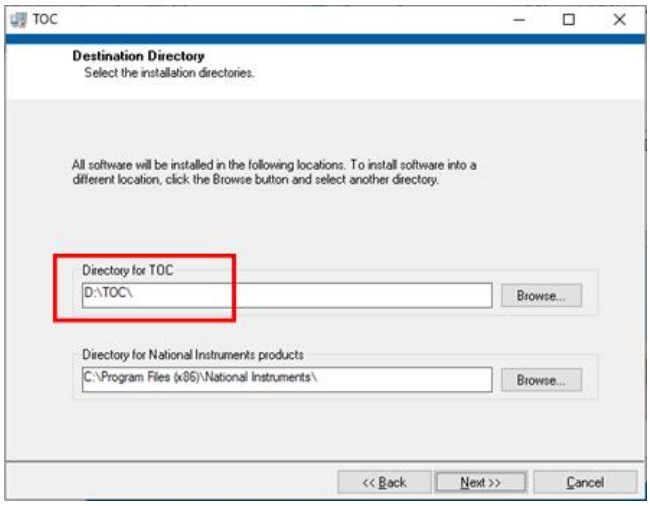


Fig. 3.40

3) Select 'I accept the above 2 License Agreements', and click 'Next (Fig.3.41).

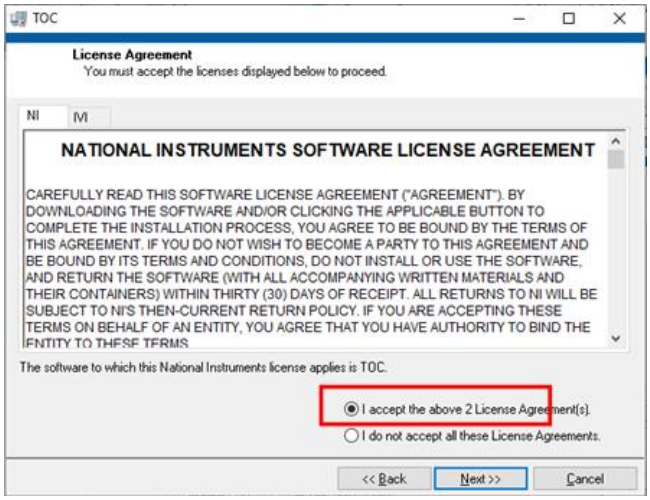


Fig.3.41

4) Click 'Next' (Fig.3.42).

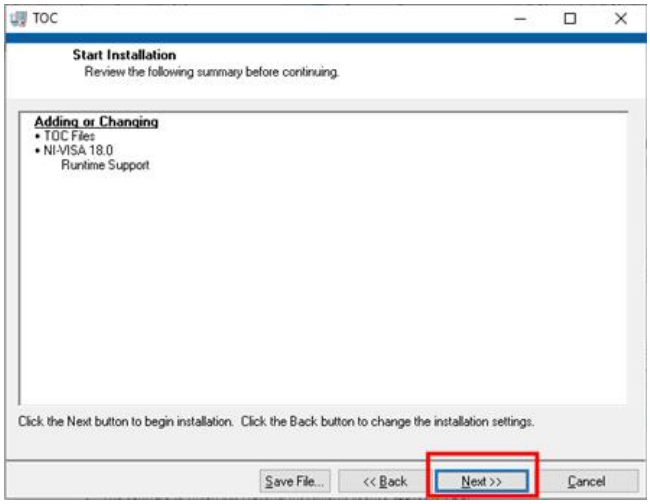


Fig. 3.42

5) Wait to complete the installation （Fig. 3.43).

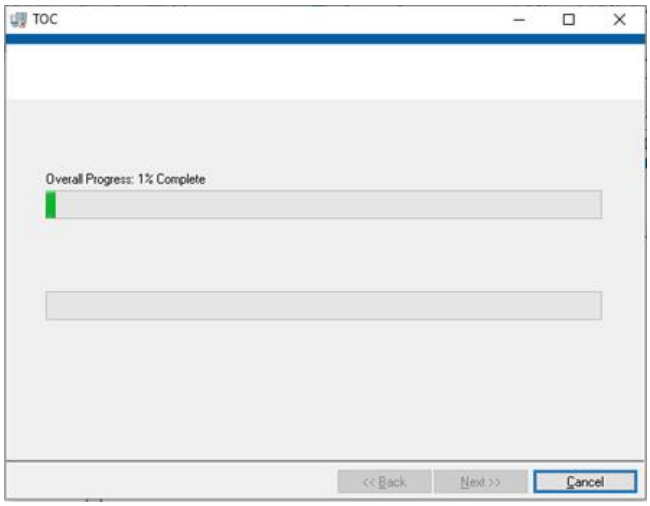


Fig. 3.43

6)Click 'Finish' (Fig. 3-57), and the installation is completed. （Fig.3.44).

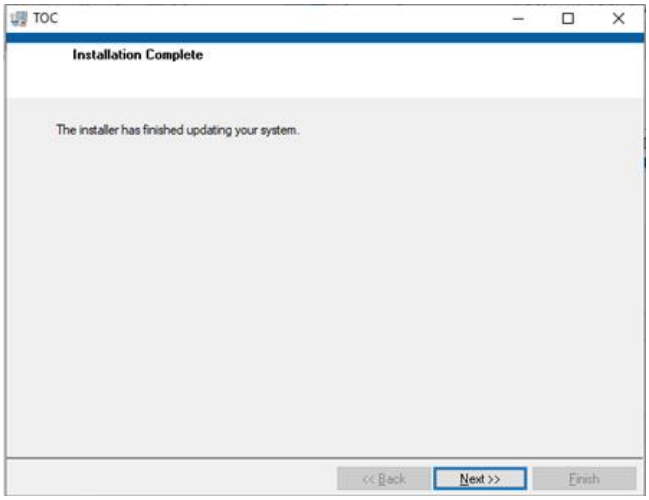


Fig. 3.44

7)Re-start the computer after completing the installation.
8)A shortcut icon of the software will be shown on the desktop.

Chapter 4 Operation

4.1 Preparations before measurement

4.1.1 Reagents, experimental devices and glass wares

1) Pure water : Conductivity<1.0μS/cm and the TOC concentration should be no more than 100μg/L.
2) Electronic analytical balance, with the accuracy of 0.0001g.
3) Reagents (Table 4.1)

Table 4.1

No.	Name	Specification
1	Phosphoric acid	guarantee reagent
2	Potassium hydrogen phthalate	standard reagent or guarantee reagent
3	Anhydrous sodium carbonate	standard reagent or guarantee reagent
4	Sodium bicarbonate	guarantee reagent
5	Sucrose	standard reagent or guarantee reagent
6	1,4-Benzoquinone	standard reagent

4) Glass wares: volumetric flask, pipette and beaker, etc.

4.1.2 Standard Solutions

Note: Normally, the standard solution should be prepared in accordance with the applicable national standards or industry standards for the test samples. Following preparation methods of the standard solution is just for reference. User also can prepare applicable standard solutions accordingly.

4.1.2.1 TOC standard solution, ρTOC= 1000 mg/L

Accurately weigh 2.1255g potassium hydrogen phthalate (pre-dried to constant weight under 110 ℃ to 120 ℃), then dissolve in pure water. Transfer to a 1000 mL volumetric flask, dilute to the constant volume with pure water, and mix well.

4.1.2.2 TIC standard solution, ρ IC= 1000 mg/L

Put 4.4085g anhydrous sodium carbonate(GR) (pre-dried to constant weight under 105 ℃) and 3.5000g sodium hydrogen carbonate (GR) (pre-dried in dryer) in beaker. Dissolve with pure water, then transfer the solution into a 1000 mL volumetric flask, dilute it with pure water to the mark, and mix well.

4.1.2.3 Phosphoric acid solution

Add 10mL Phosphoric acid (GR) into a 100mL volumetric flask, then dilute to the marked graduation with pure water, and mix well.

4.1.2.4 8% Sodium persulfate solution

Dissolve 8.0000g Sodium persulfate in 60mL pure water, then add 10mL phosphoric acid with carefully stirring. Dilute to 100mL with pure water and mix well.

4.1.2.5 Sucrose standard stock solution, ρTOC= 100 mg/L

Dissolve dried sucrose(GR) 0.2377g in pure water. Then, transfer to a 1000mL volumetric flask, dilute to marked graduation with pure water, and mix well. The TOC concentration is 100mg/L.

4.1.2.6 1,4-Benzoquinone standard stock solution, ρTOC = 100mg/L

Dissolve 0.1500g 1,4-Benzoquinone in pure water. Then transfer the solution to a 1000mL volumetric flask, dilute to marked graduation with pure water, and mix well. The TOC concentration is 100mg/L.

4.1.2.7 Total carbon standard solution, ρ TC= 200mg/L, ρ IC = 100mg/L

Pipet 20.00mL inorganic carbon standard stock solution (4.1.2.2) and 20.00mL organic carbon standard stock solution (4.1.2.1) and transfer them to 200mL volumetric flask and then dilute to marked graduation with pure water, and mix well.

4.1.2.8 Organic carbon working standard solution, ρTOC = 100mg/L

Pipet 20.00mL organic carbon standard stock solution (4.1.2.1), transfer them to 200mL volumetric flask, dilute to marked graduation with pure water, and mix well.

4.1.2.9 Sucrose reference solution

Pipet and gradually dilute the sucrose standard stock solution (4.1.2.5) to get 10mg/L sucrose reference solution.

4.1.2.10 1, 4-Benzoquinone reference solution

Pipet and gradually dilute the 1,4-Benzoquinone standard stock solution (4.1.2.6) to get 10mg/L 1, 4-Benzoquinone reference solution.

4.1.3 Standard Solutions Preparation for Calibration Curve

4.1.3.1 Standard solution of total carbon calibration curve

Pipet and transfer 0.00, 1.00, 2.00, 5.00, 10.00, 25.00mL total carbon standard solution (4.1.2.7) respectively into six 100mL volumetric flask, dilute to marked graduation with pure water and mix well. Total carbon concentration of the standard series solution is 0.0, 2.0, 4.0, 10.0, 20.0, 50.0 mg/L, inorganic carbon concentration is 0.0, 1.0, 2.0, 5.0, 10.0, 25.0 mg/L.

4.1.3.2 Standard solution of organic carbon calibration curve

Pipet and transfer 0.00, 1.00, 2.00, 5.00, 10.00, 25.00mL organic carbon working standard solution (4.1.2.8) respectively into six 100mL volumetric flask, dilute to marked graduation with pure water and mix well. Organic carbon concentration of the standard series solution is 0.0, 2.0, 4.0, 10.0, 20.0, 50.0

mg/L.

4.1.3.3 Standard solution of system applicability

Respectively pipet and transfer 5mL sucrose reference solution (4.1.2.9) and 5mL 1,4-Benzoquinone reference solution (4.1.2.10) into two 100mL volumetric flasks, dilute to marked graduation with pure water and use it immediately when it is ready.

4.1.4 Preservation of standard solution

The concentration of the standard solution is variable, especially for low concentration solutions, it may vary a lot in a short time. Standard solution of high concentration with sealed can be preserved in cool and dark place, and it is convenient to prepare standard solutions by dilution before using. And it should be preserved in glass vessels.

The storage life of standard solution is as following: About two months for concentration of 1000mg/L, and about one week for diluted solution of 100mg/L. However, each concentration should be preserved with sealed in the refrigerator under 4 ℃.

Note: Preservation with sealed is very important, for the inorganic carbon solution can absorb carbon dioxide from the atmosphere, its concentration is liable to change. Please prepare the standard solution again in the following cases:

1) The reproducibility of the determination value deteriorates, or the sensitivity changes obviously.

2) Turbidity or a small amount of impurity is found in the standard solution.

4.1.5 Sample Preparations

Water samples should be collected in brown glass bottles and should be fully filled without any space. Water should be measured within 24 hours after collection. Otherwise, water samples should be acidified to pH ≤ 2 by adding sulfuric acid (ρ (H_2 SO_4)=1.84 g/mL), which could be preserved at 4 ℃ for 7 days.

Water samples should be measured after shaking and mixing. If the water sample is still not uniform after shaking, it should be homogenized. For example, when test DOC (soluble TOC)

In principle, samples containing suspended substances, strong acids, strong bases, and high salts cannot be directly tested.

4.2 Instrument Operation

4.2.1 Power on

Turn on the computer. Connect the power cable to the instrument, and turn on the power switch on the rear panel of the instrument (Fig. 4.1).

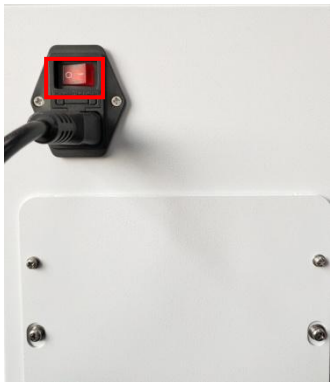


Fig4.1

Note: Please turn on the power supply of the auto-sampler at the same time if it is to be used.

4.2.2 Gas connection

Unscrew the nitrogen cylinder valve, adjust the knob of pressure relief device to make the output pressure to 0.25MPa.

4.2.3 Software Introduction

Double click TOC3000 , enter the main interface (Fig 4.2).

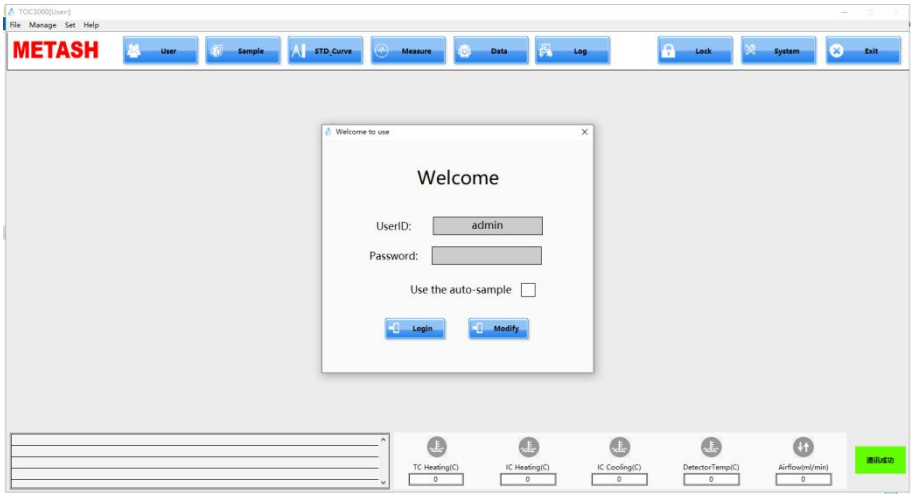


Fig 4.2

Login with the registered User ID and password *(**Initial User ID: admin, Password: 666666.** For more details of resetting password, please refer to Chapter 5).* The auto-sampler is optional, tick the option if you use it.

After successfully logging in, enter the preheating interface (Fig 4.3), check the

communication status indicator light on the lower right side of software interface, bright green light means successful communication.

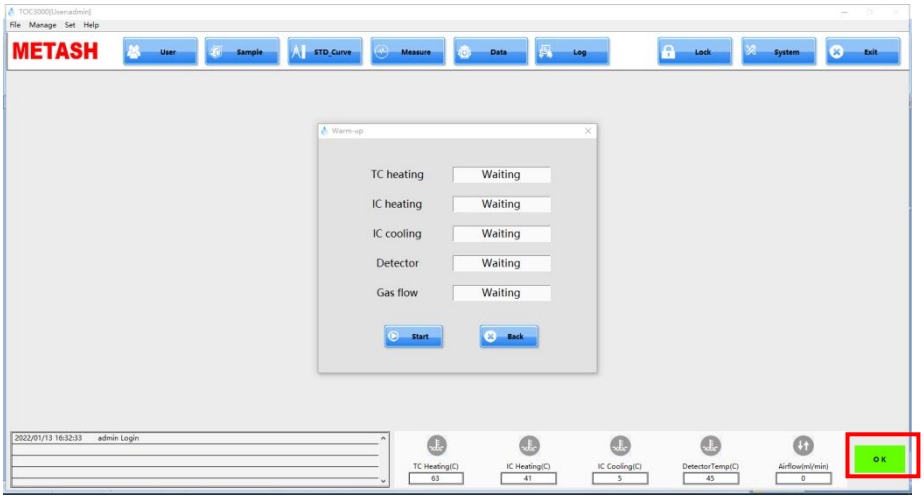


Fig 4.3

Click  to preheat the instrument (Fig. 4.4)

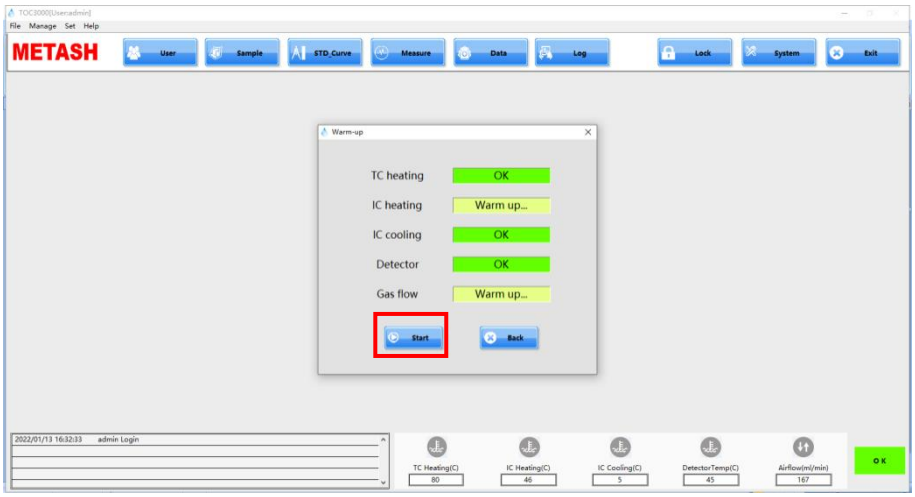


Fig 4.4

Wait for the instrument to warm up to the preheating effect (Fig 4.5).

Click  to exit the preheating interface.

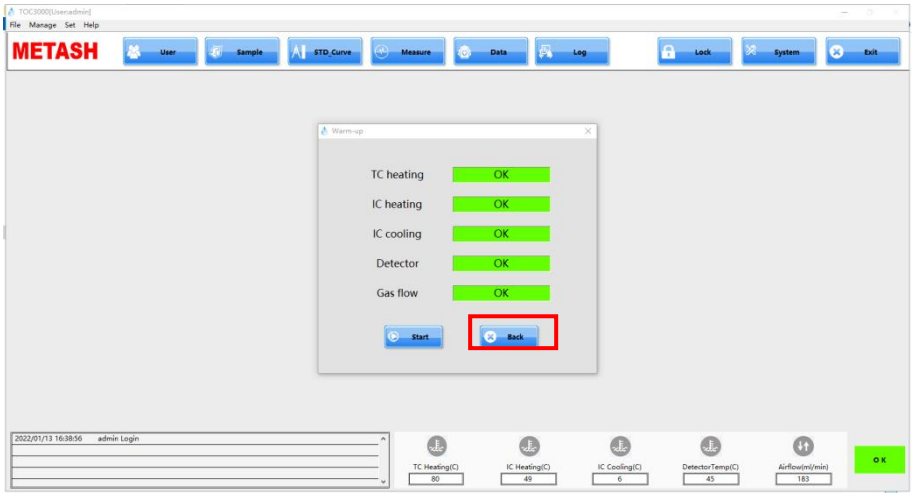
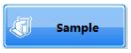


Fig 4.5

4.2.4 Sample Registration

1. Click 

to enter the 'sample management' interface, then select the NPOC/TOC/TC/TIC mode in 'Mode selection' as needed. This section only takes the TOC mode as an example. (Fig 4.6).

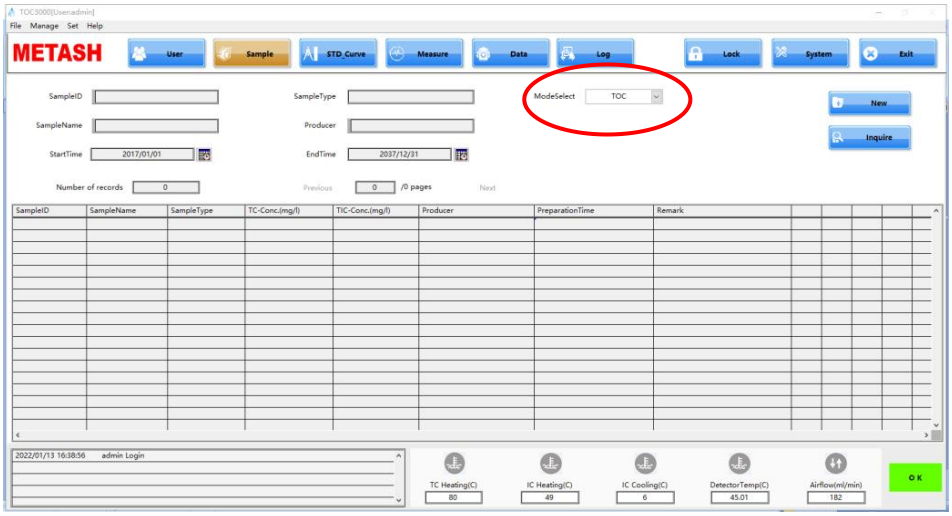


Fig 4.6

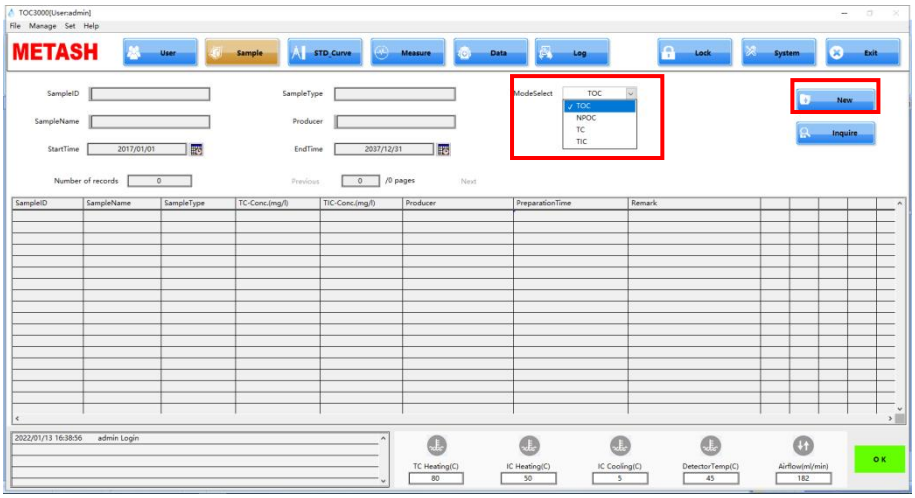


Fig 4.7

2. Click 

(Fig 4.7) to enter the interface 'New sample' (Fig 4.8).

Note: The sample ID is the unique identification of the sample, it can not be reused, and can not be modified after registered.

Then select 'Standard solution' or 'Sample solution' according to actual sample type. For Standard solution, 'TC-Conc.' and 'TIC-Conc.' must be filled in, 'Name' and 'Producer' can be filled in according to actual need. 'Remark' is not a must. After all info is filed in, click 

to complete registration.

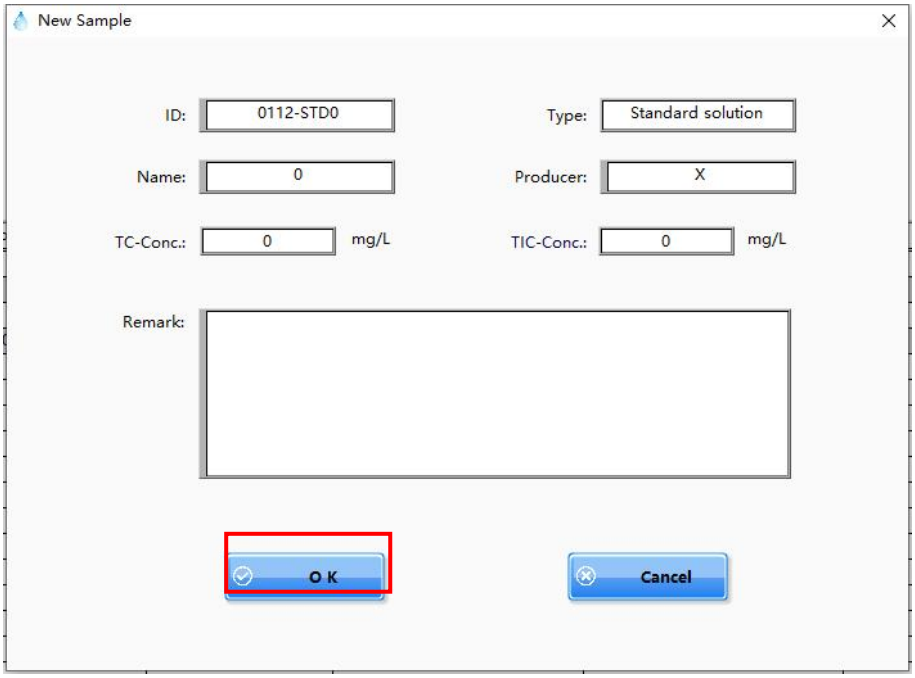


Fig 4.8

3. Register all standard solutions or sample solutions that to be tested, to avoid repeated returning to the 'Sample Management' interface for registration. The information of successfully registered sample will be displayed in the form (Fig 4.9).

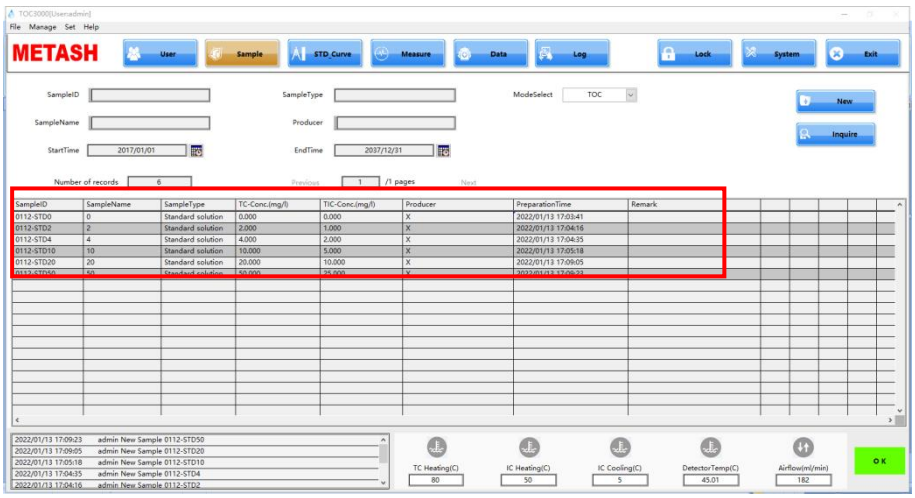


Fig 4.9

4.2.5 Standard Curve Management

Click  to enter the standard curve management interface.(Fig 4.10).

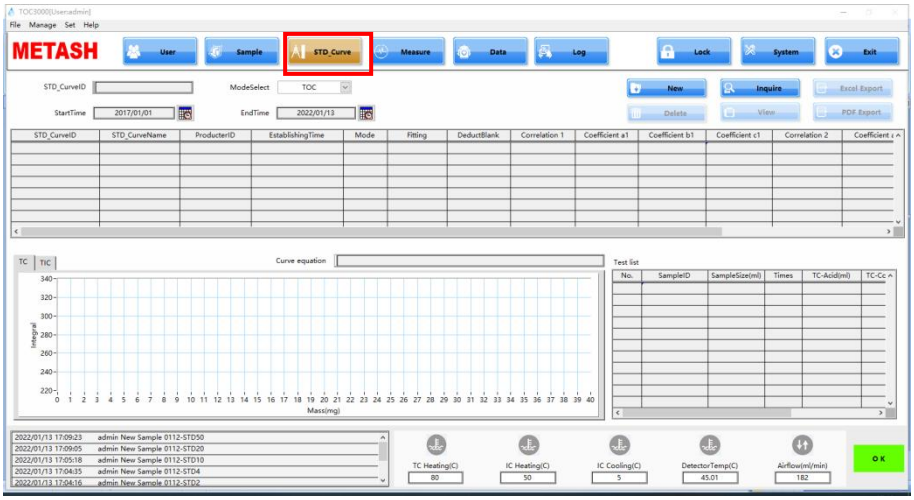


Fig 4.10

4.2.5.1 Standard Curve Establishment

Note: This section mainly introduces how to establish the standard curve under the Subtraction Method (TOC mode) and respectively introduces the software operations under 'Auto- Sampler' mode and 'Stand-alone' mode. The operations of establishing the standard curve for Total Carbon or Total Inorganic Carbon or under Direct Method (NPOC mode) is basically same as Subtraction Method, only need to select the corresponding mode NPOC/TC/TIC when establish new standard curves.

4.2.5.1.1 Auto-sampler mode

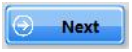
Note: Auto-sampler should be equipped with the instrument if the mode 'Auto-Sampler' is selected.

Step 1 Put the volumetric flask or bottle containing with sodium persulfate solution and 10% phosphoric acid solution on the corresponding base, insert the acid-in tube. Use the standard solution to rinse the sample bottle wall, then add enough standard solution.

Step 2 Put all sample bottles on the rotary of auto sampler. The position C is used to clean the sampling tube after measurement, please add enough pure water in C bottle.

Step 3 Click 

to enter 'New STD_Curve' interface. (Fig. 4.11).

Select mode 'TOC', click 

to continue.

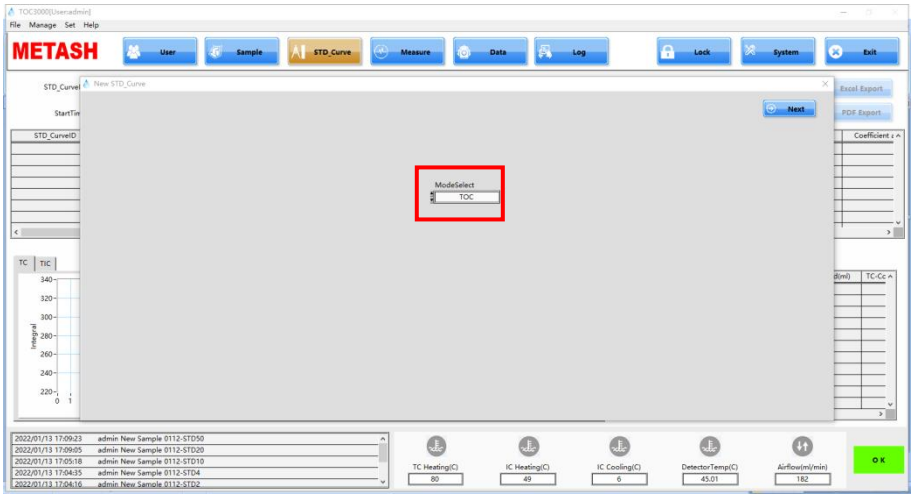


Fig 4.11

Note: The system will give a reminder (Fig. 4.12) if there is any unfinished calibration curve measurement. Click 'No' or directly close the window will enter the interface (Fig. 4.11), and all data of previous measurements that unsaved will be deleted. If click 'Yes', system will return to the unfinished standard curve establishing interface to continue the measurement, the parameters can't be modified.

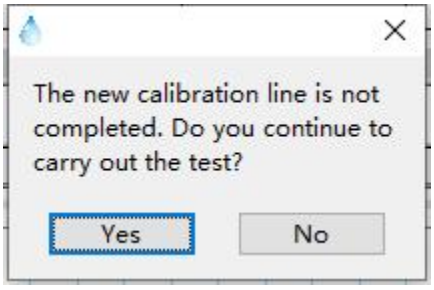


Fig 4.12

Step 4 Enter the measurement interface of new standard curve. (Fig. 4.13).

Click 

, a window (Fig. 4.14) pops up to build a new test.

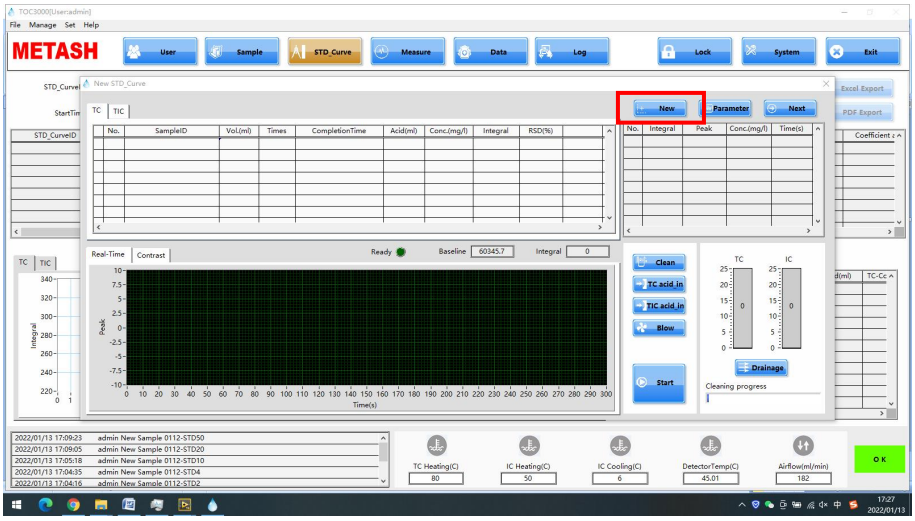


Fig 4.13

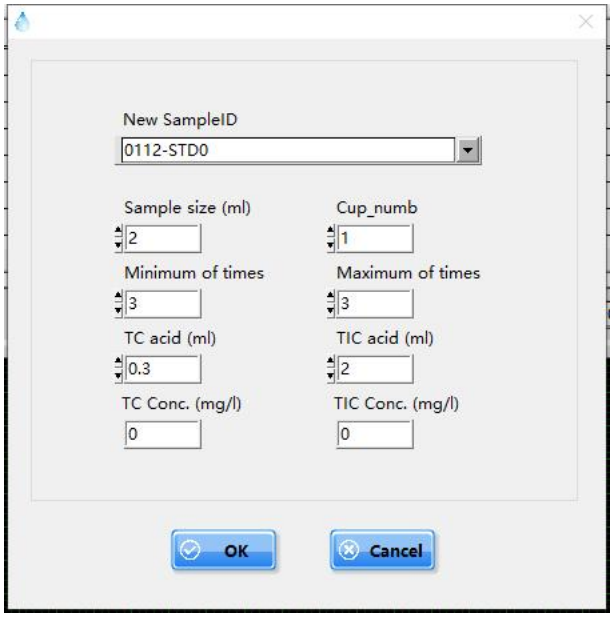


Fig 4.14

Step 5　Click the drop-down menu to select the registered standard sample. (Fig. 4.15). The cup number shall be set according to the sample position. 'Sample size', 'Minimum of times', 'Maximum of times', 'TC acid' and 'TIC acid' can be set and adjusted based on actual test requirements. For more details on setting, please refer to Chapter 5 Software Introductions.

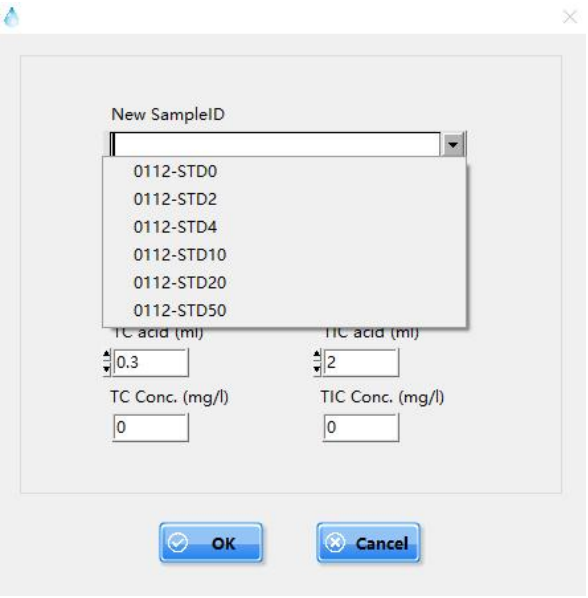


Fig 4.15

After completing the settings above, click 'OK', the sample information will be shown in the test progress list (Fig. 4.16). User can complete the establishment of whole group of standard solutions.

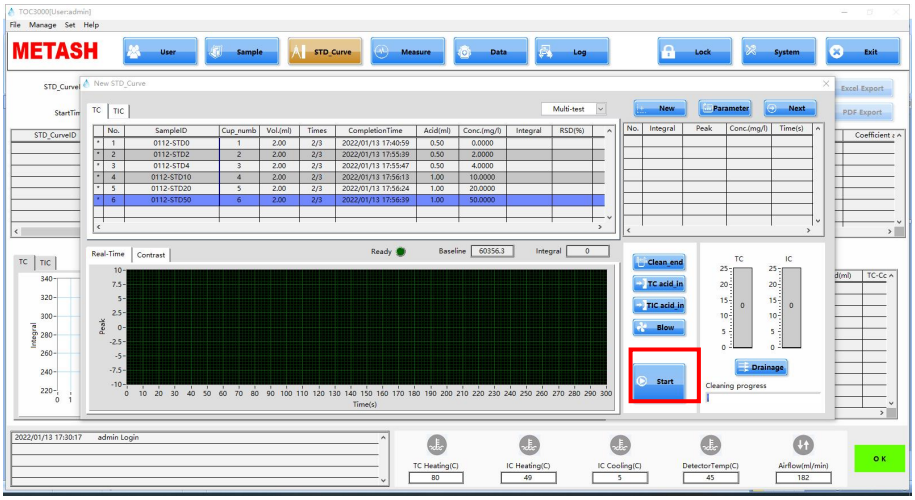


Fig 4.16

Step 6 Click  to start test. The system will give a reminder (Fig. 4.17) if the current testing conditions do not meet the requirements. Then click 'Cancel' to wait for the conditions be stable, click  , no warning again. System starts the cleaning process (Fig. 4.18), user can check the cleaning progress to see whether the cleaning is complete.

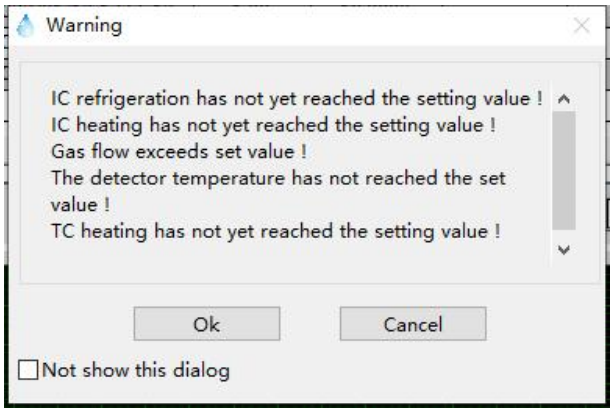


Fig 4.17

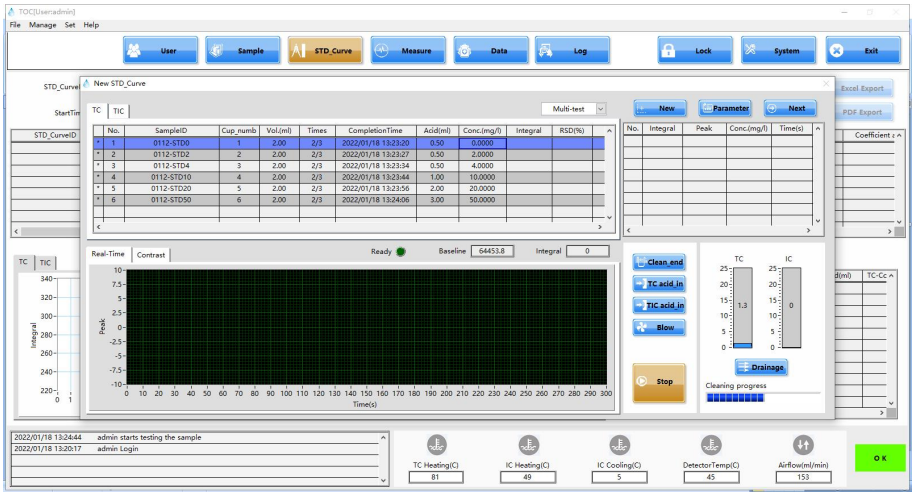
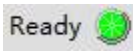


Fig 4.18

After cleaning, wait for the indicator 

lighting up, device will auto sampling to start test and record the integration value and measuring time, etc. (Fig. 4.19).

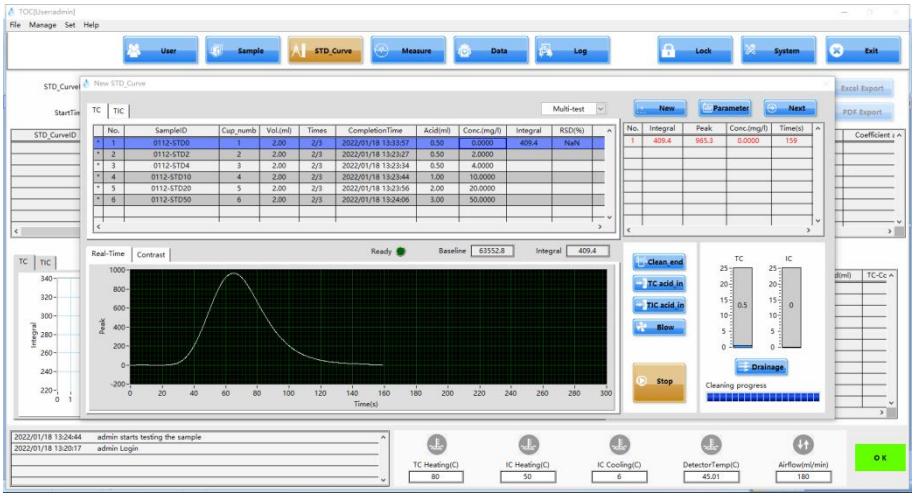


Fig 4.19

System will test the solutions one by one till the measurement of all standard

solutions to be tested completed. (Fig. 4.19).

Note: If must stop the measurement during test, do not perform any operations till the auto-sampler return to the initial position, otherwise the software may be stuck. In addition, the system won't carry out cleaning procedure automatically after stopping, users need to enter the cleaning interface manually to quick clean the system before exiting the software.

Step 7 Click 

to enter the standard curve saving interface (Fig. 4.20). Input the standard curve ID and standard curve name, select fitting mode as 'Quadratic Fit', the correlation coefficient should be no less than 0.999. Whether to deduct the blank value or not depends on the actual demands.

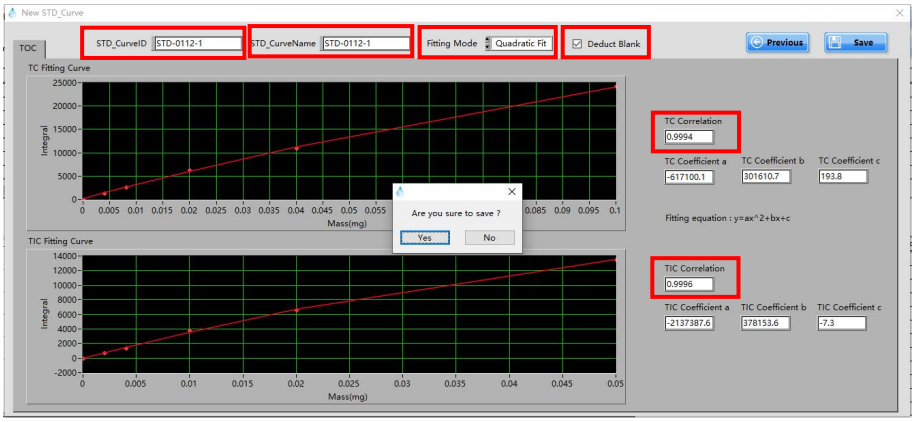


Fig 4.20

Note:
1) Please tick 'Deduct Blank' if the integration value of the blank solution need to be deducted.
2) If some points deflected from the fitting curve much, user can click 

, select the row and right click to 'Delete this row', then drop down and select 'Single-test' to create a new test on this concentration point (Fig. 4.20.1). Click '*' to select different test rows (Fig. 4.20.2) and save the concentration point with the optimal correlation coefficient. (Only the sample points marked with * can participate in the fitting calculation, and the default is that all sample points participate in the fitting)

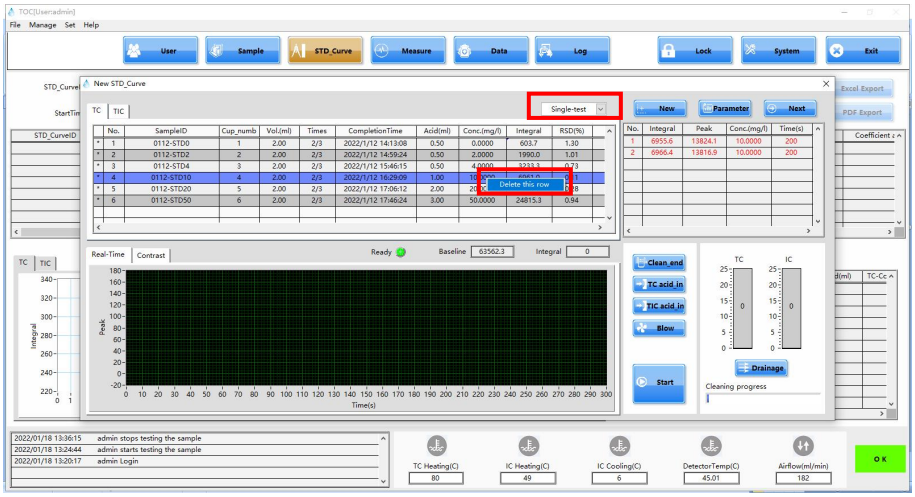


Fig 4.20.1

Fig 4.20.2

Step 8 Click  , all parameters of the standard curve can't be modified once saved.

4.2.5.1.2 Standalone Mode

Note: Auto-sampler is no need under this mode.

Step 1 Click  to enter 'New STD_Curve' interface. (Fig. 4.21).

Select 'TOC' mode then click  .

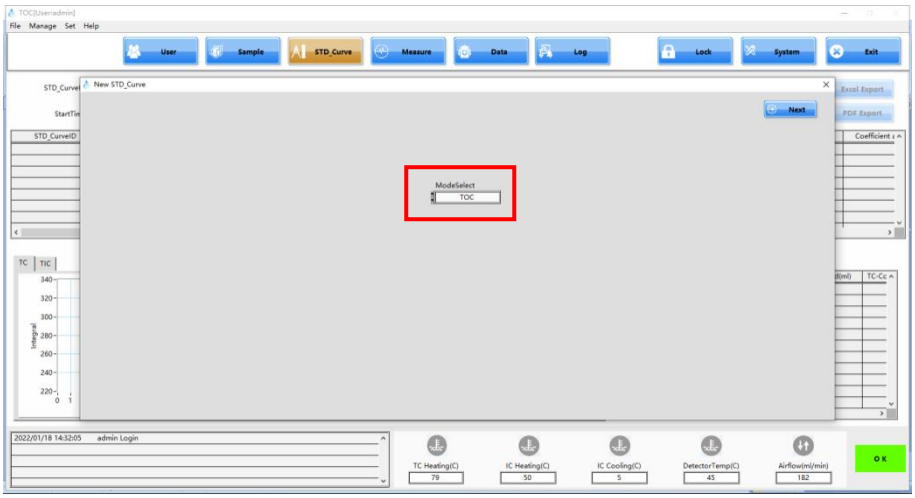


Fig. 4.21

Note: The system will give a reminder (Fig. 4.22) if there is any unfinished calibration curve measurement. Click 'No' or directly close the window will enter the interface (Fig. 4.21), and all data of previous measurements that unsaved will be deleted. If click 'Yes', system will return to the unfinished standard curve establishing interface to continue the measurement, the parameters can't be modified.

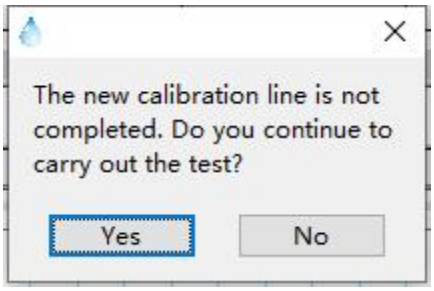


Fig 4.22

Step 2　Enter the measurement interface of new standard curve. (Fig. 4.23). Click 

, a window (Fig. 4.24) pops up to build a new test.

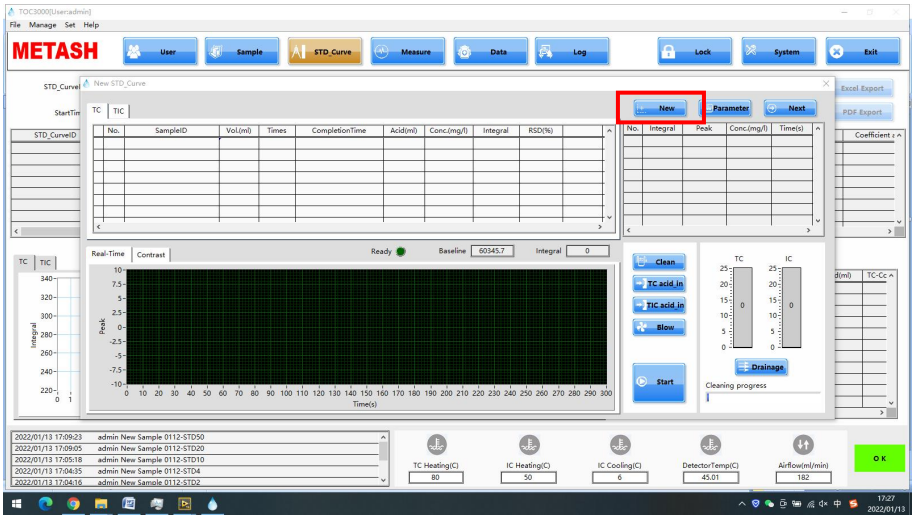


Fig 4.23

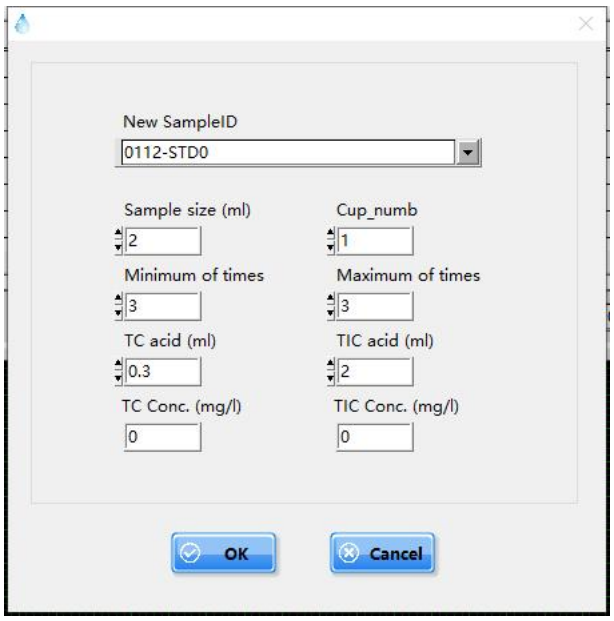


Fig 4.24

Step 3　Click the drop-down menu to select the registered standard sample. (Fig. 4.25). 'Sample size', 'Minimum of times', 'Maximum of times', 'TC acid' and 'TIC acid' can be set and adjusted based on actual test requirements. For more details on setting, please refer to Chapter 5 Software Introductions.

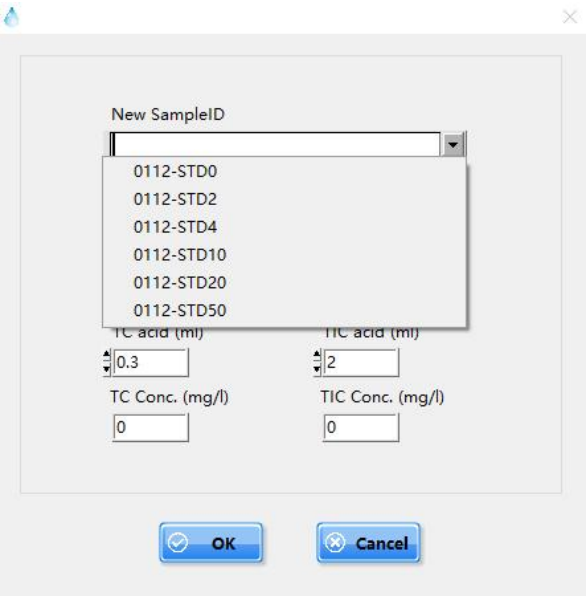


Fig 4.25

After completing the settings above, click 'OK', the sample information will be shown in the test progress list (Fig. 4.26). User can complete the establishment of whole group of standard solutions.

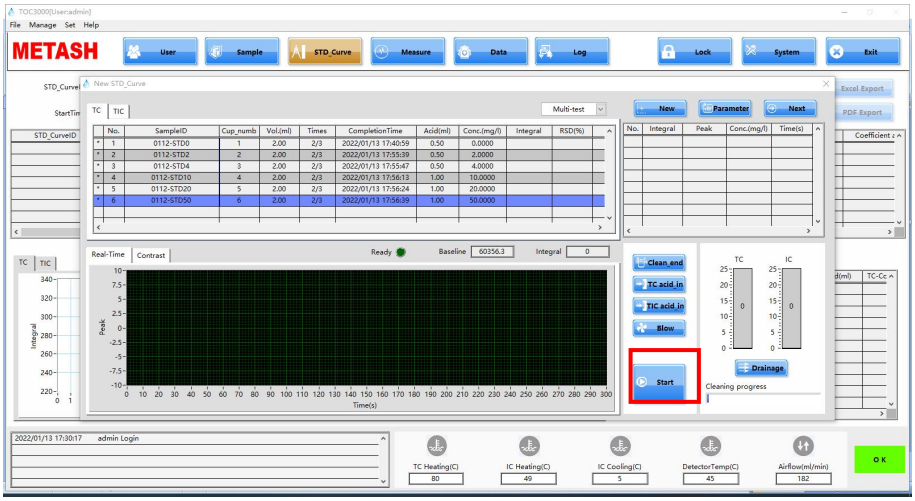


Fig 4.26

Step 4 Click  to start test. The system will give a reminder (Fig. 4.27) if the current testing conditions do not meet the requirements. Then click 'Cancel' to wait for the conditions be stable, click  , no warning again. System starts the cleaning process, user can check the cleaning progress to see whether the cleaning is complete.

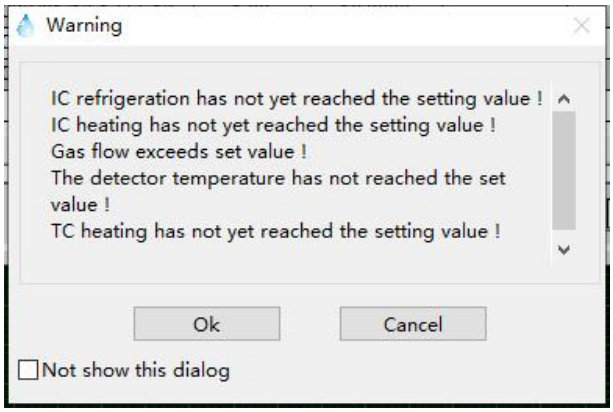
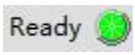


Fig 4.27

After cleaning, wait for the indicator 

lighting up, device will auto sampling to start test and record the integration value and measuring time, etc. (Fig. 4.28).

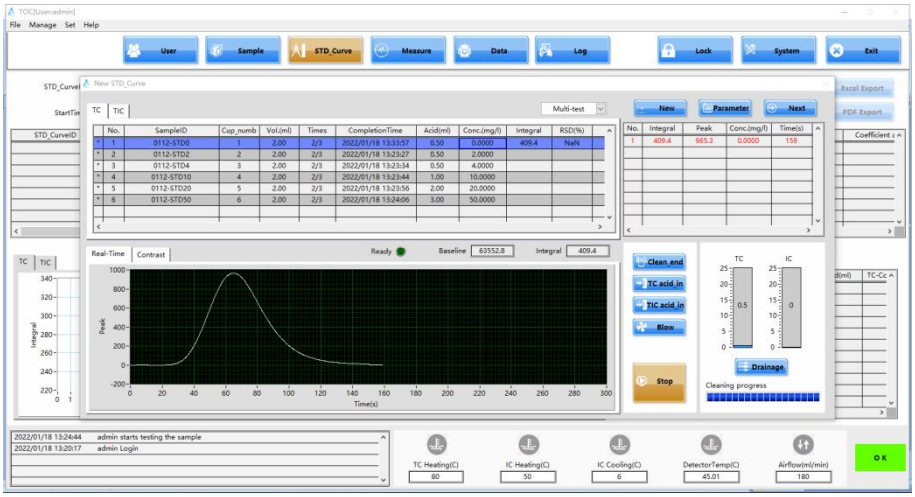


Fig 4.28

Replace with other concentration point of sample solutions, and test one by one until completing the measurement of all concentration points of the standard sample solutions (Fig. 4.29)

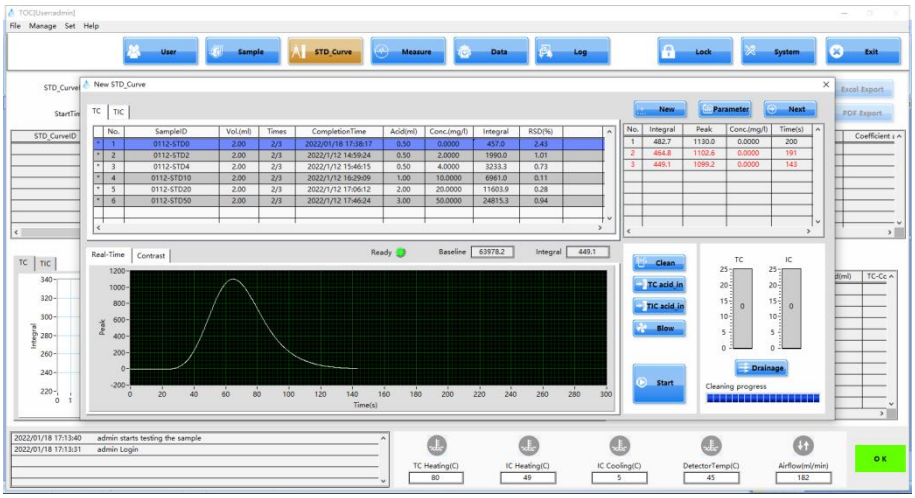
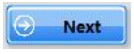


Fig 4.29

Step 5 Click  to enter the standard curve saving interface (Fig. 4.30). Input the standard curve ID and standard curve name, select fitting mode as 'Quadratic Fit', the correlation coefficient should be no less than 0.999. Whether to deduct the blank value or not depends on the actual demands.

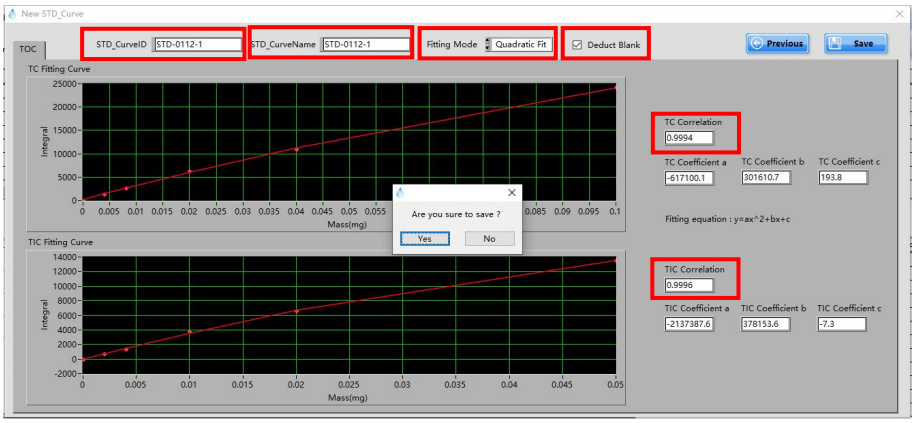


Fig 4.30

Note:

1) Please tick 'Deduct Blank' if the integration value of the blank solution need to be deducted.

2) If some points deflected from the fitting curve much, user can click  ***, select the row and right click to 'Delete this row', then drop down and select 'Single-test' to create a new test on this concentration point (Fig. 4.20.1). Click '*' to select different test rows (Fig. 4.20.2) and save the concentration point with the optimal correlation coefficient. (Only the sample points marked with * can participate in the fitting calculation, and the default is that all sample points participate in the fitting)***

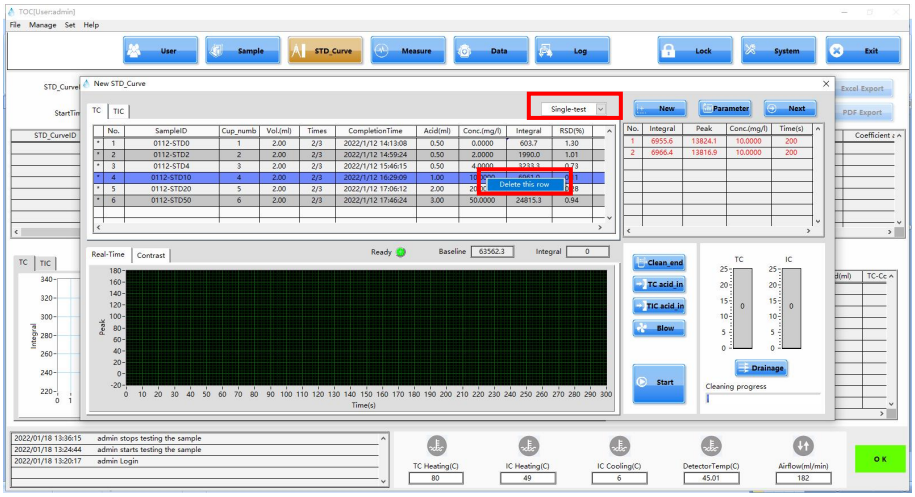


Fig 4.30.1

Fig 4.30.2

Step 6 Click  , all parameters of the standard curve can't be modified once saved.

4.2.6 Sample Measurement

Note: The samples should be registered in advance before testing. For registration operations, please refer to '4.2.4 Sample Registration'.

4.2.6.1 Auto-Sampler Mode

Note: Auto-sampler should be equipped with the instrument on this mode.

4.2.6.1 .1 The subtraction method (TOC Mode)

Note: The operation of TC and TIC sample test is basically same as subtraction method, the only difference is to set TC or TIC mode in 'Mode Selection' and select the corresponding standard curve.

Step 1 Put the volumetric flask or bottle containing with sodium persulfate solution and 10% phosphoric acid solution on the corresponding base, insert the acid-in tube. Use the standard solution to rinse the sample bottle wall, then add enough standard solution.

Step 2 Put all sample bottles on the rotary of auto sampler. The position C is used to clean the sampling tube after measurement, please add enough pure water in C bottle.

Step 3 Click 

to enter the sample test interface. The software automatically displays the standard curve which applied in last test and the basic parameters of the curve will be displayed as well. (Fig. 4.31).

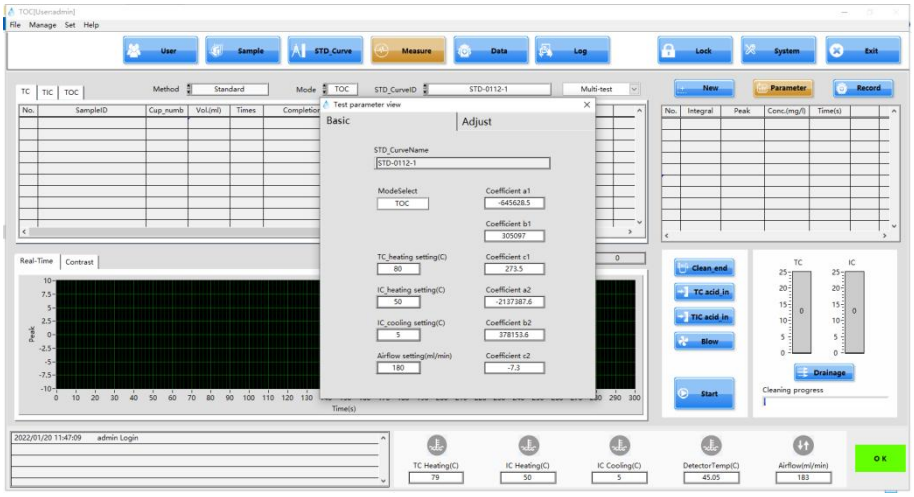


Fig 4.31

Step 4 After the Std.curve window closed, user can select the sample test mode and standard curve name, then confirm the needed standard curve according to the basic parameters shown. (Fig. 4.32).

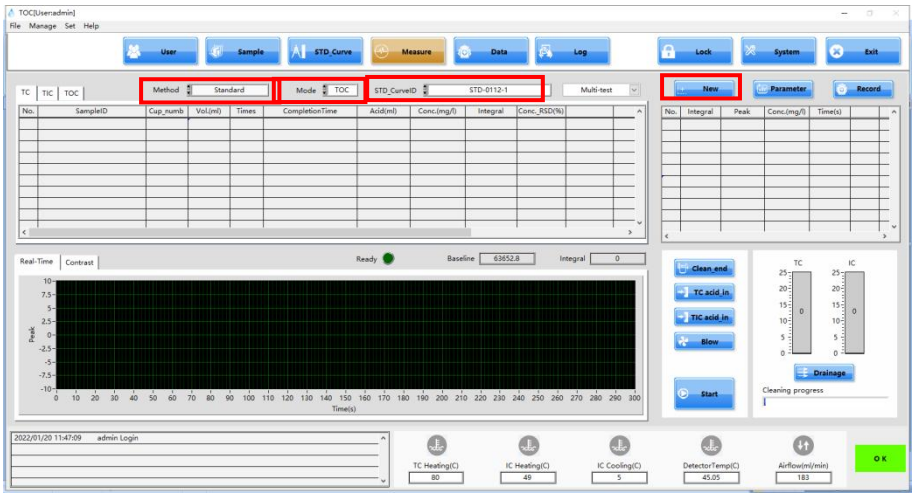


Fig 4.32

Note: Only NPOC mode can be selected in Method Selection, and only standard tests can be selected in TOC, TC, and TIC mode.

Step 5 Click 

, a window of new test pops up. (Fig. 4.33).

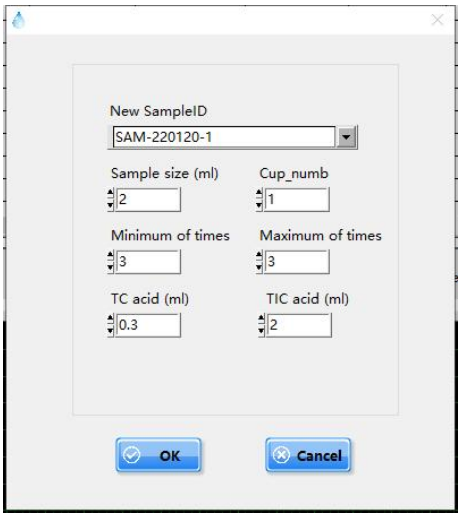


Fig 4.33

Click the drop-down menu to select the registered standard sample. The cup number shall be set according to the sample position. 'Sample size', 'Minimum of times', 'Maximum of times', 'TC acid' and 'TIC acid' can be set and adjusted based on actual test requirements. For more details on setting, please refer to Chapter 5 Software Introductions.

Step 6 The new standard sample information will be shown in the test progress list (Fig. 4.34). User can complete the establishment of whole group of sample solutions.

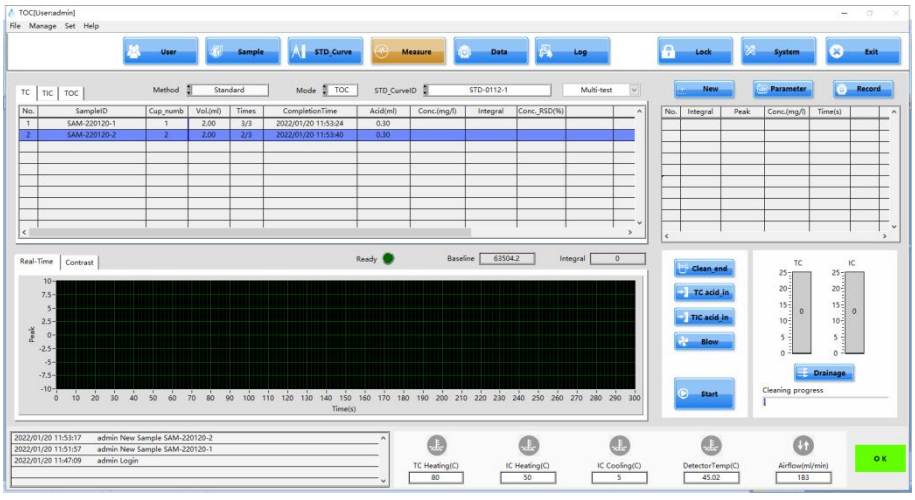


Fig 4.34

Step 7 Click 

to start test. The system will give a reminder (Fig. 4.35) if the

current testing conditions do not meet the requirements. Then click 'Cancel' to wait for the conditions be stable, click 

, no warning again. System starts the cleaning process (Fig. 4.36), user can check the cleaning progress to see whether the cleaning is complete.

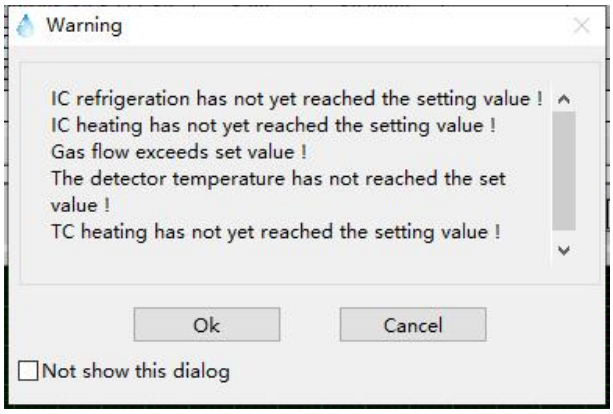


Fig 4.35

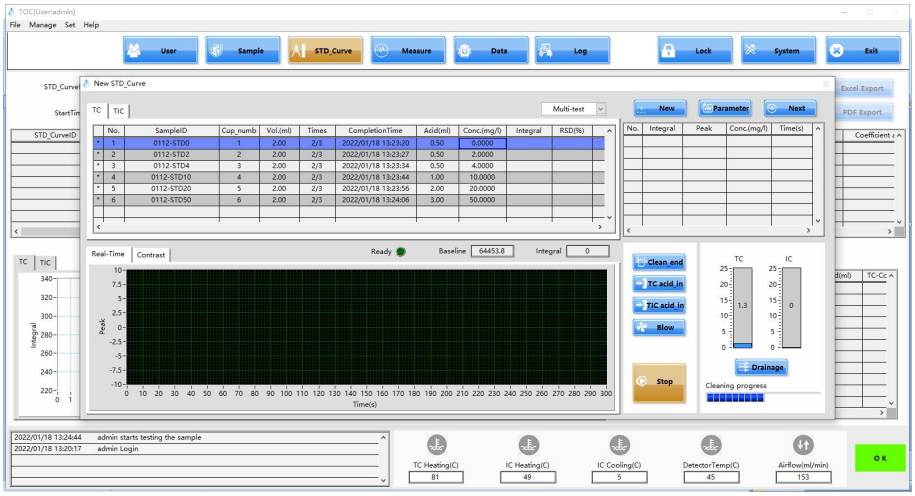
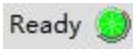


Fig 4.36

After cleaning, wait for the indicator 

lighting up, device will auto sampling to start test and record the integration value and measuring time, etc. (Fig. 4.37).

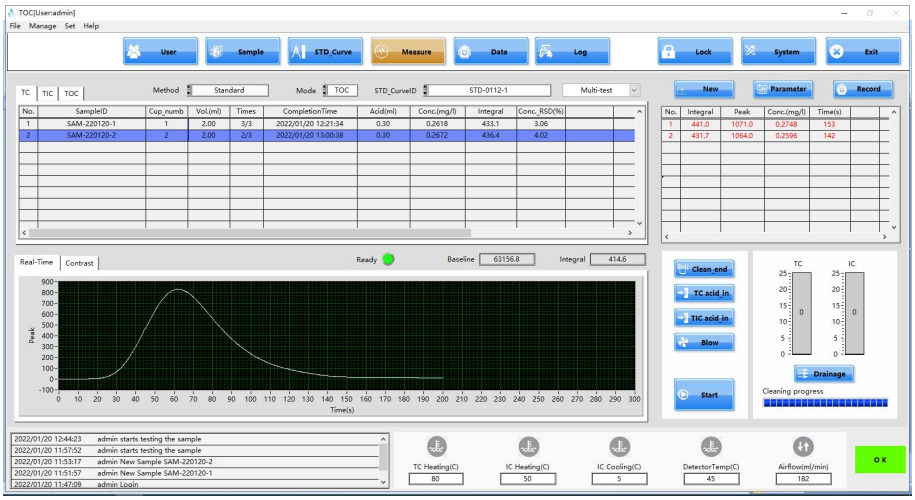


Fig 4.37

System will test the solutions one by one till the measurement of all samples to be tested completed.

Note: If must stop the measurement during test, do not perform any operations till the auto-sampler return to the initial position, otherwise the software may be stuck. In addition, the system won't carry out cleaning procedure automatically after stopping, users need to enter the cleaning interface manually to quick clean the system before exiting the software.

4.2.6.1 .2 The direct method (NPOC Mode)

Click 

to enter the sample test interface. The software automatically displays the standard curve which applied in last test and the basic parameters of the curve will be displayed as well. (Fig. 4.38).

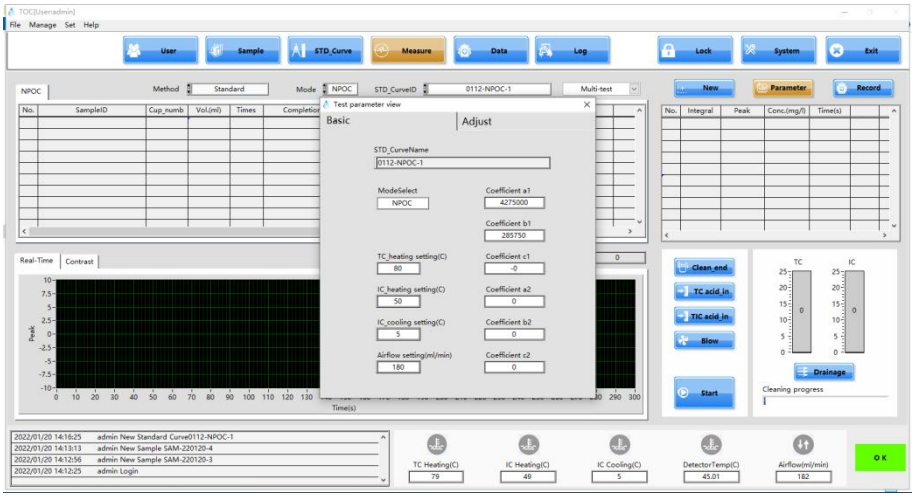


Fig 4.38

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.39).

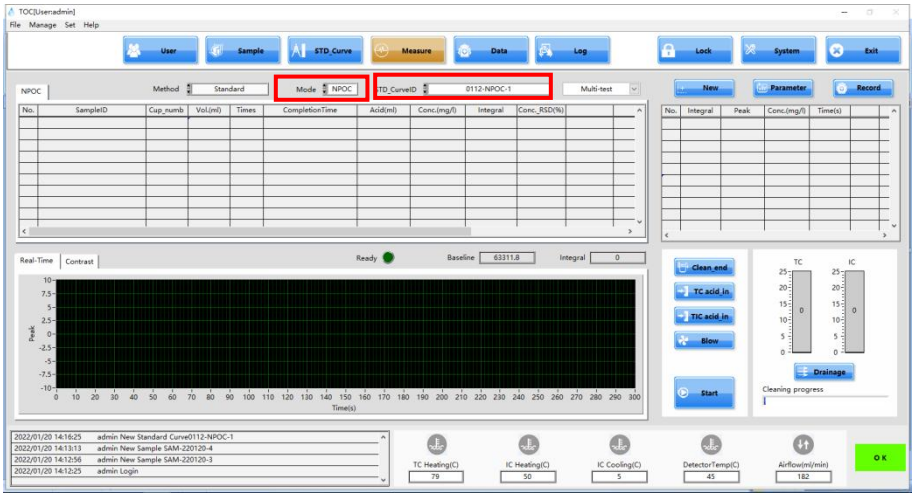


Fig 4.39

Note:

1. There are three methods for sample testing on NPOC mode: standard test, quality control sample test and system applicability test.

2. When test samples on NPOC mode, the test samples need to be pre-treated. In the quality control sample test and system applicability test, the samples themselves are organic carbon, so there is no need for pre-treatment and only need to deduct the blank from the results.

Method 1: Standard Test

Step 1 Rinse the sample bottle with sample solution, add sufficient sample solution into the bottle.

Step 2 Adjust the PH of the sample solution with 10% phosphoric acid, stir and mix well.

Step 3: Place the acidified sample solution on the base of the sample bottle, click 

on the software, then put the blowing pipe into the sample bottle and purge for 10 minutes by default, the blowing time can be changed according to different samples (Fig. 4.40). When the purge time is up, the software will prompt you (Fig 4.41), click 'OK', and click 

to close.

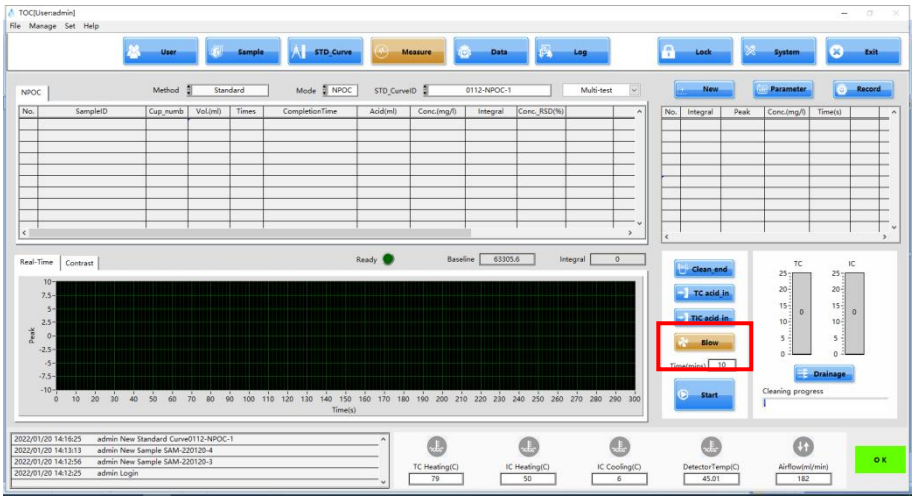


Fig 4.40

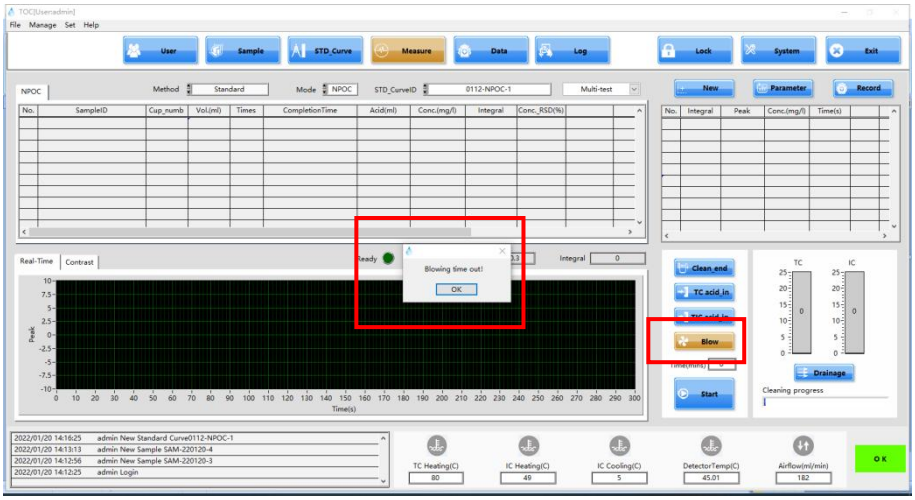


Fig 4.41

Step 4　Seal the blown sample with a sealed bottle cap, then place on the rotary cup position of the auto-sampler.

Step 5　The remaining samples are pre-processed one by one. After the processing is completed, click  to add the registered samples to the list to be tested (Fig. 4.42).

Fig 4.42

Step 6 Click  to start the measurement. The system will give a prompt (Fig. 4.43) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click  and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

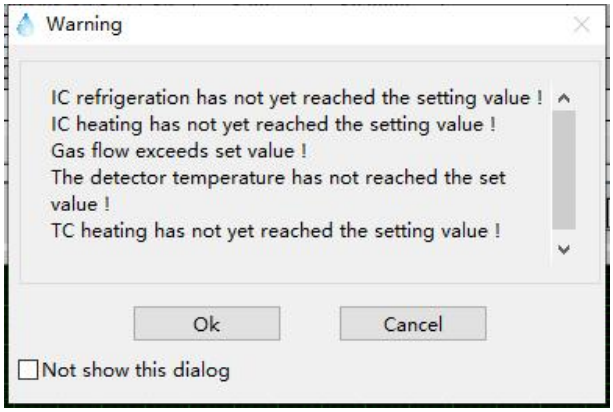
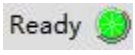


Fig 4.43

Wait the indicator  lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value and measuring time (Fig. 4.44).

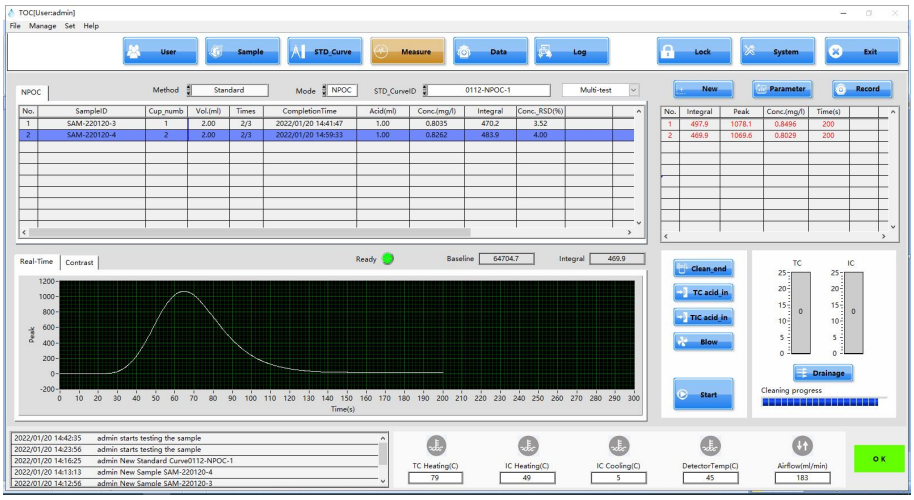


Fig 4.44

The system runs the test one by one until completing the measurement for all concentration points of the standard solutions.

Note: If need to stop the measurement during the test, you must wait for the auto-sampler to return itself before performing other operations, otherwise the software may be stuck. In addition, the instrument will not be cleaned automatically after stopping, so you need to manually enter the cleaning interface for quick cleaning before exiting.

Method 2: The Quality Control Sample Test

Step 1 Click  to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.45).

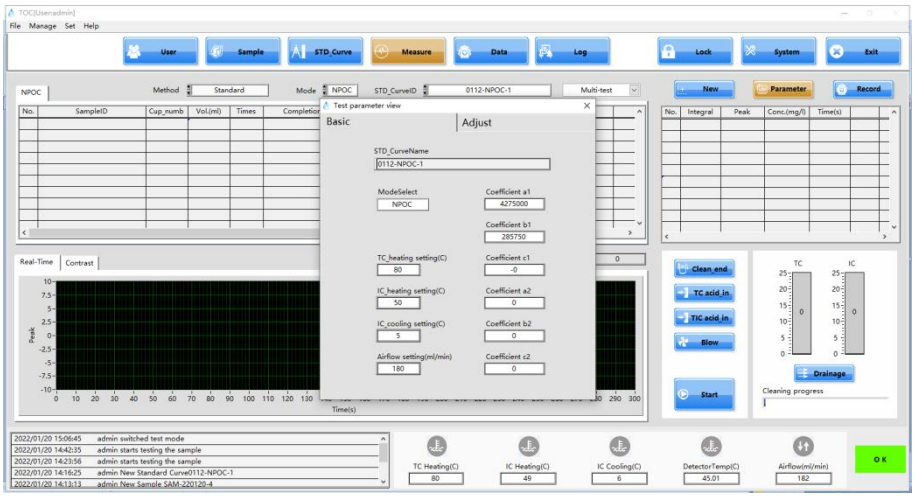


Fig 4.45

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.46).

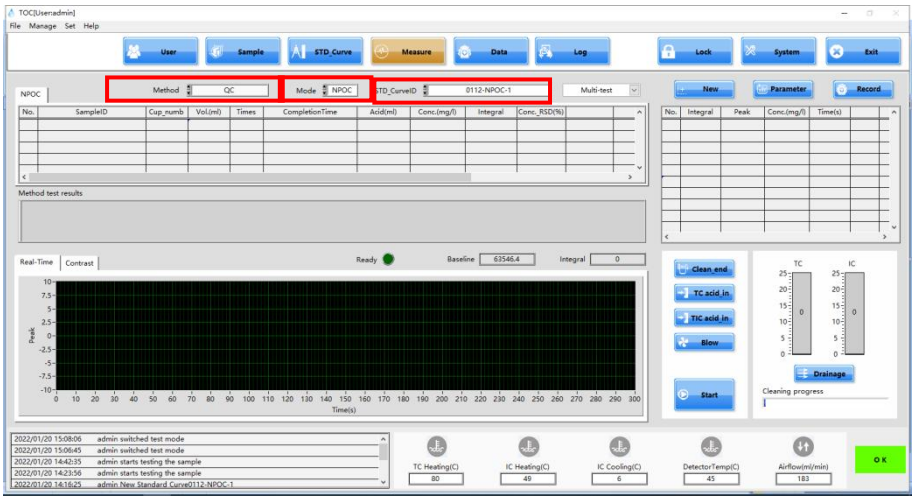


Fig 4.46

Step 2 Click  , and there pops up a new test dialog (Fig. 4.47).

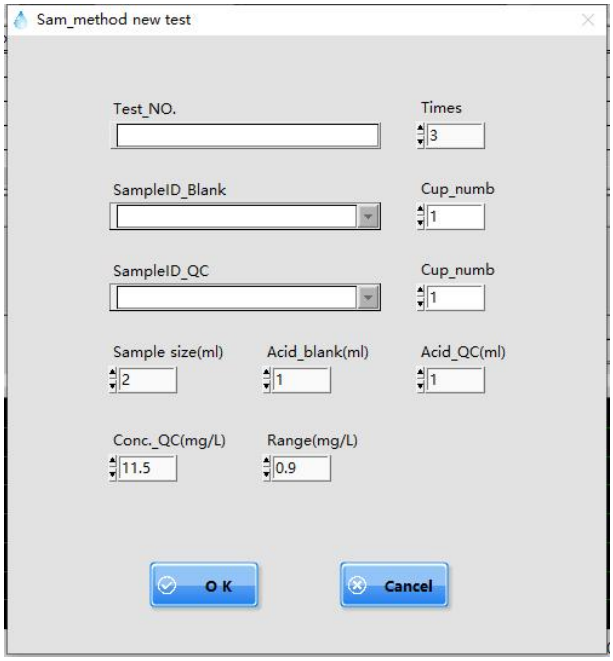


Fig 4.47

'Test_NO.' can be freely named, as long as the uniqueness is guaranteed; The 'Times', 'Sample size' and 'Acid size' can be set by users according to actual needs. 'Sample ID_Blank' and 'Sample ID_QC' need to be registered on the 'Sample Management' interface in advance and selected from the drop-down list. 'Cup_number' can be set freely to ensure that it corresponds to the actual cup position of the sample. 'Con_QC' and 'Range' are given according to the dilution concentration and error range of the standard quality control sample of the Ministry of Environmental Protection, and users can make changes according to their own actual standard sample concentration and error range (Fig 4.48).

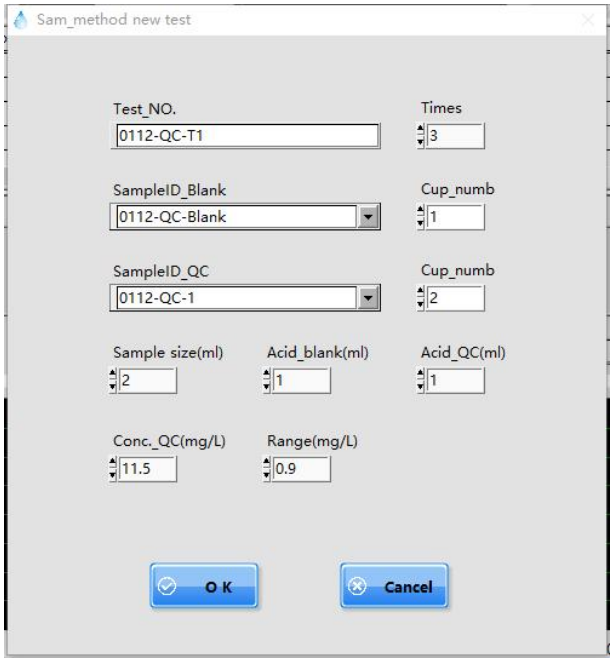


Fig 4.48

Step 3　Click 'OK' and create successfully, then the sample information will be shown in the test progress list (Fig. 4.49).

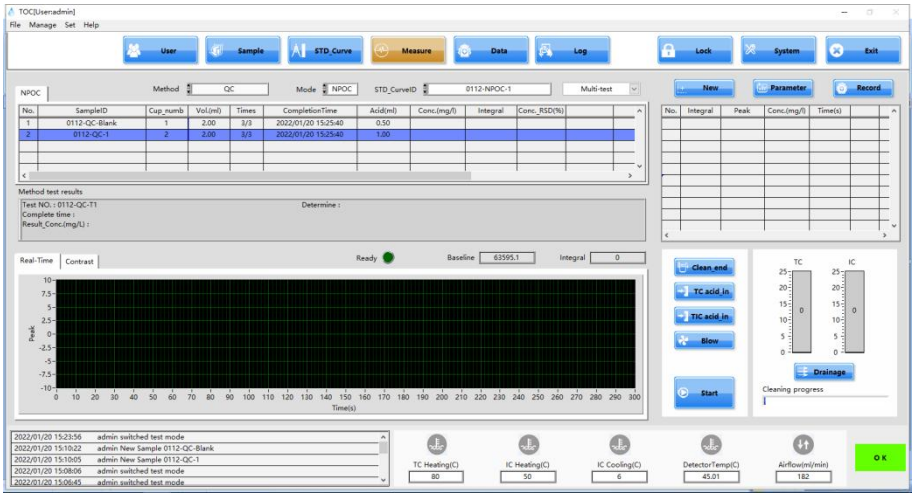


Fig 4.49

Step 4　Rinse the sample bottle of auto-sampler with pure water and quality control sample respectively, and add sufficient pure water and quality control sample into the sample bottle and put it on the cup position set when creating 

. Cup position C is the cleaning cup position. Please place pure water to clean the sample tube after the experiment is completed.

Step 5　Click 

to start the measurement. The system will give a prompt

(Fig. 4.50) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click  and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

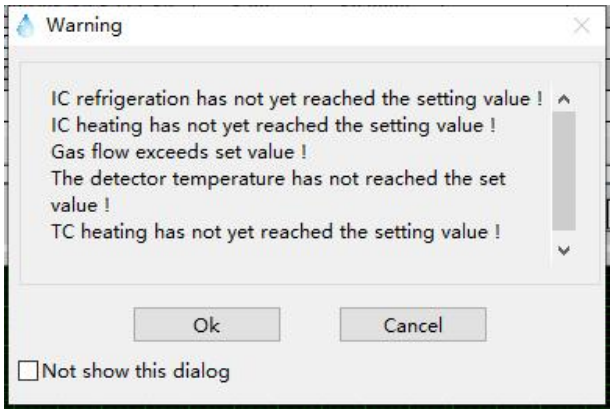
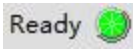


Fig 4.50

Wait the indicator  lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value and measuring time (Fig. 4.51).

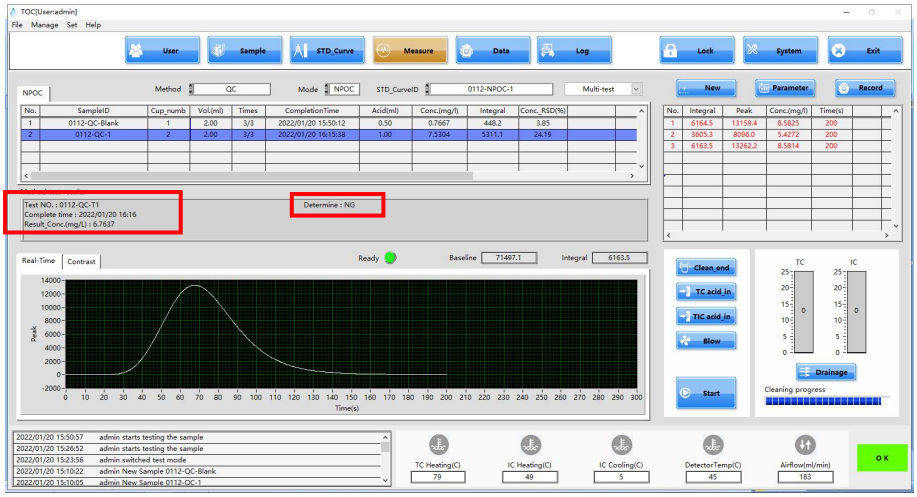


Fig 4.51

Method 3: The System Applicability Test

Step 1 Click  to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.52).

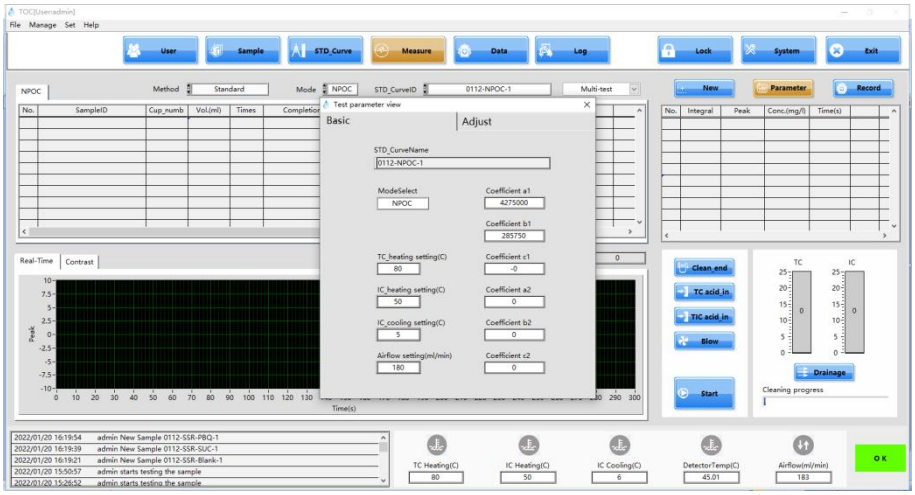


Fig 4.52

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.53).

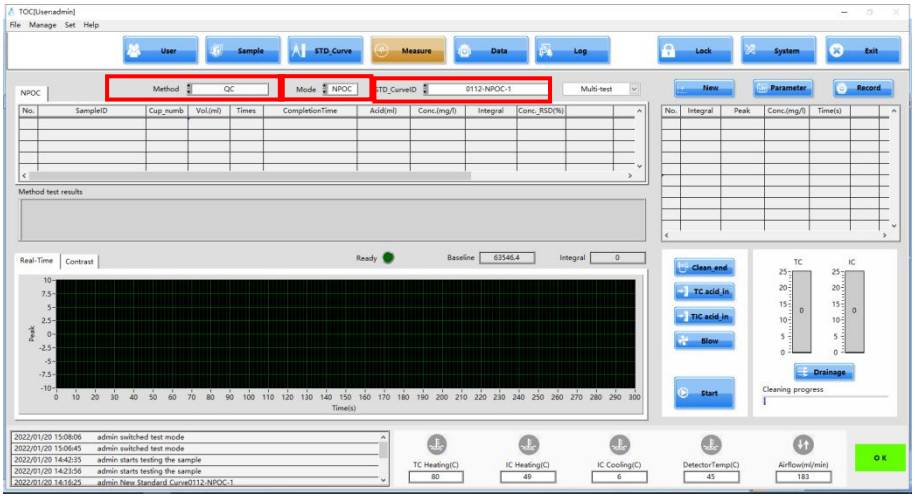


Fig 4.53

Step 2 Click 

, and there pops up a new test dialog (Fig. 4.54).

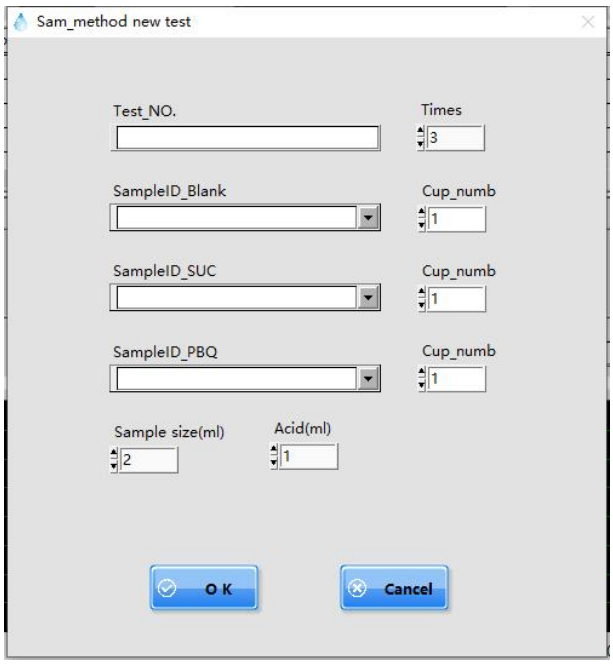


Fig 4.54

'Test_NO.' can be freely named, as long as the uniqueness is guaranteed; The 'Times', 'Sample size' and 'Acid size' can be set by users according to actual needs. 'Sample ID_Blank', 'Sample ID_SUC' and 'Sample ID_PBQ' need to be registered on the 'Sample Management' interface in advance and selected from the drop-down list. 'Cup_number' can be set freely to ensure that it corresponds to the actual cup position of the sample. (Fig 4.55).

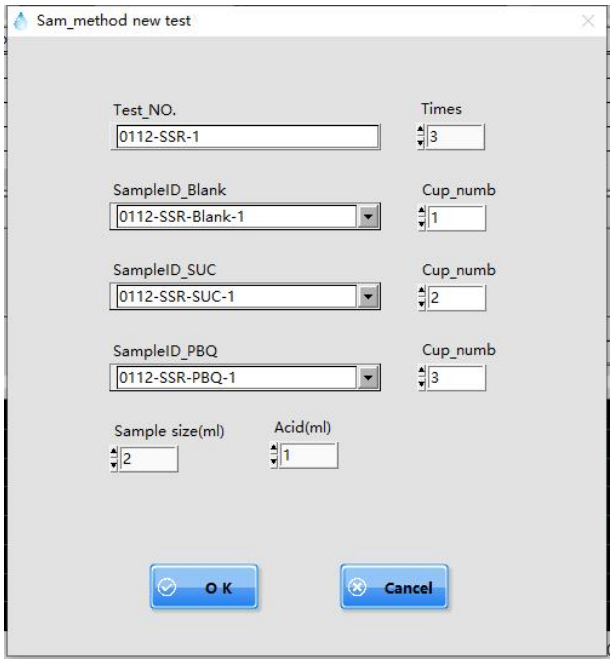


Fig 4.55

Step 3　Click 'OK' and create successfully, then the sample information will be shown in the test progress list (Fig. 4.56).

Fig 4.56

Step 4 Rinse the sample bottle of auto-sampler with blank sample, sucrose sample and p-benzoquinone sample, and add enough sample into the sample bottle and put it on the cup position set when creating 

. Cup position C is the cleaning cup position. Please place pure water to clean the sample tube after the experiment is completed.

Step 5 Click 

to start the measurement. The system will give a prompt (Fig. 4.57) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click 

and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

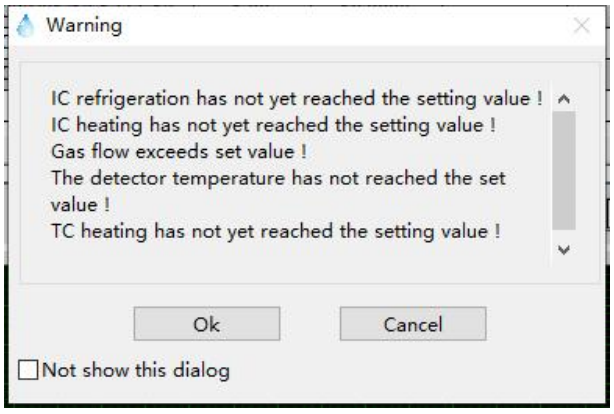
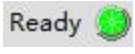


Fig 4.57

Wait the indicator 

lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value, measuring time and concentration. After the blank sample, sucrose sample and para benzoquinone sample were tested,

the software will determine whether they are qualified according to the calculation formula of 'system applicability' stipulated in Chinese Pharmacopoeia (Fig. 4.58).

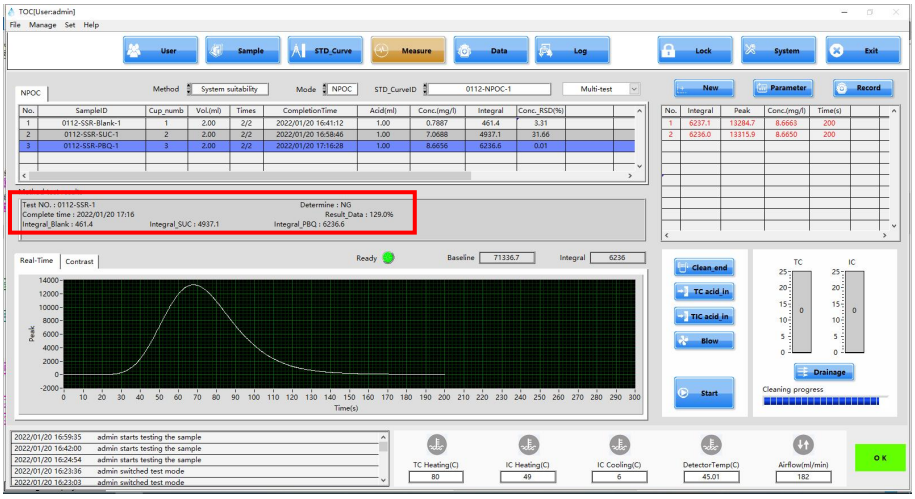


Fig 4.58

4.2.6.2 Standalone Mode

Note: The instrument can work without auto-sampler if standalone mode is chosen.

4.2.6.1 .1 The subtraction method (TOC Mode)

Note: The operation method of TC and TIC sample test is basically the same as that of subtraction method. You only need to set 'TC and TIC' mode in 'Mode Selection' and select the corresponding standard curve.

Following are the operation steps:

Step 1 Place the bottle containing sodium persulfate solution and 10% Phosphoric acid solution onto the acid bottle base, and insert the acid tube.

Step 2 Click 

to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.59).

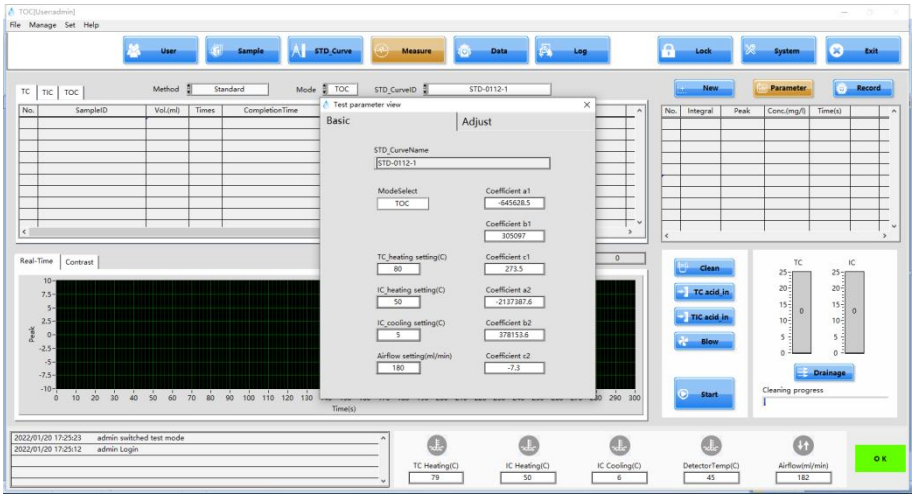


Fig 4.59

Step 3　After the pop-up window is closed, the user can select the sample test mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.60).

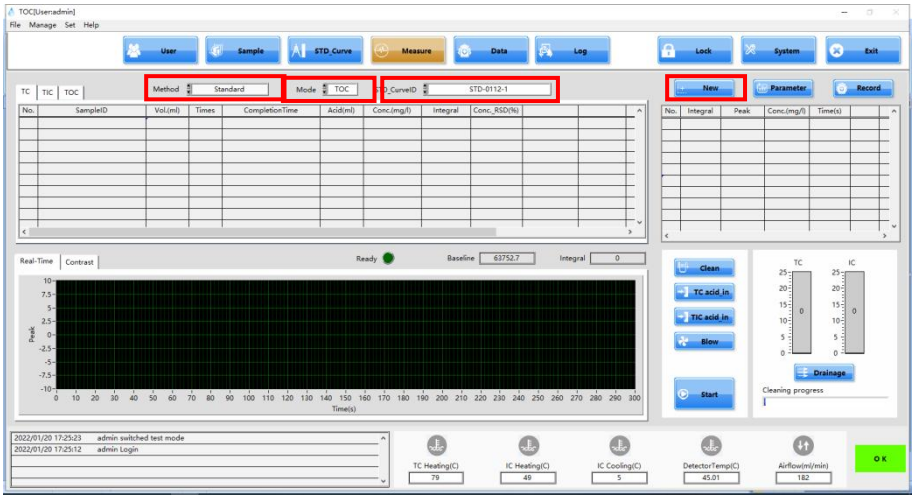
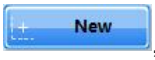


Fig 4.60

Note: Only NPOC mode can be selected in Method Selection, and only standard tests can be selected in TOC, TC, and TIC mode.

Step 4　Click 

, and there pops up a new test dialog (Fig. 4.61).

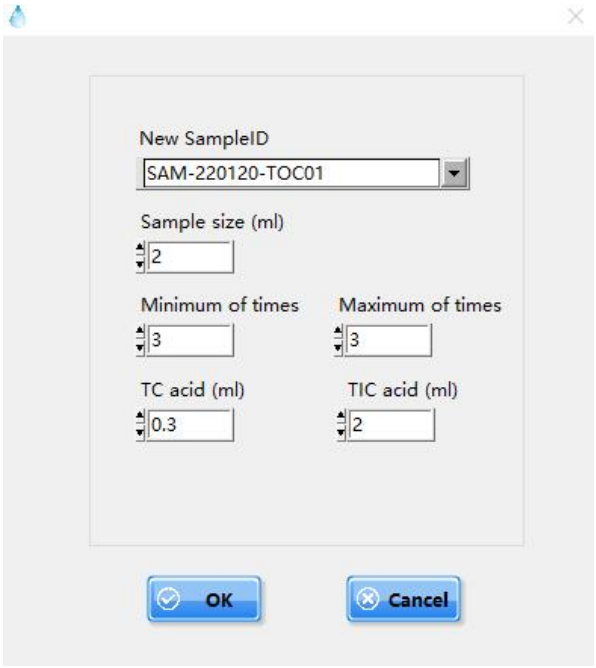


Fig 4.61

Click the drop-down menu to select the registered standard sample number. 'Sample size', 'Minimum of Times', 'Maximum of Times','TC acid' and 'TIC acid' can be set depending on the test requirements. For detailed settings, please refer to Chapter 5 Software Introductions.

Step 5 The new standard sample information will be shown in the test progress list (Fig. 4.62). User can complete the whole group of standard samples establishing.

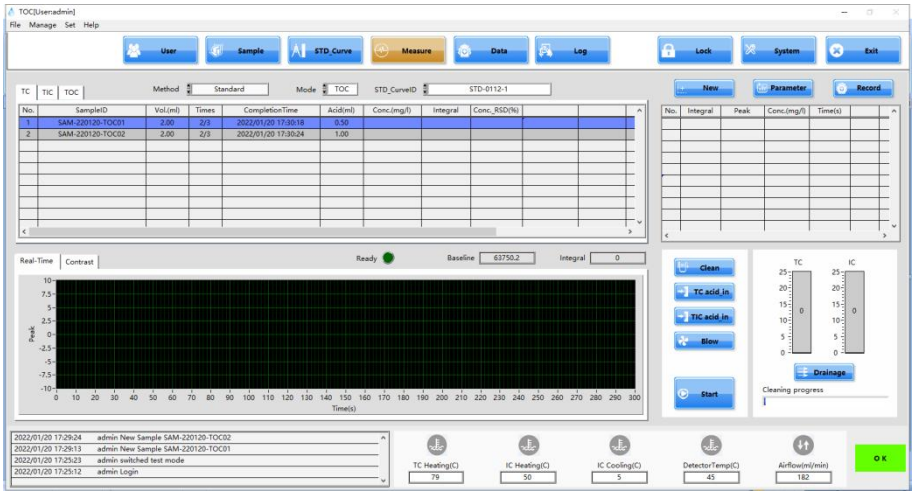


Fig 4.62

Step 6 Manually place the sample on the base of the sample bottle and select the row where the sample is located , click  to start the measurement. The system will give a prompt (Fig. 4.63) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to

be stable, then click  and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

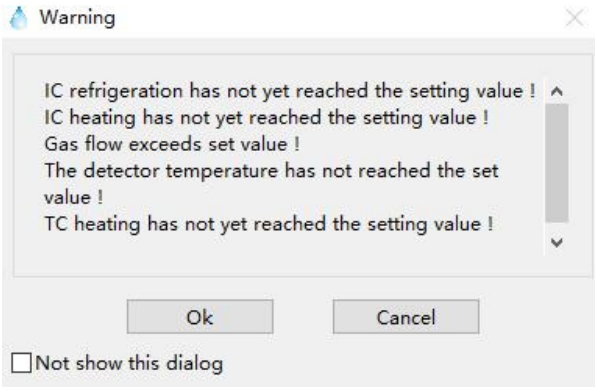
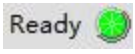


Fig 4.63

Wait the indicator  lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value, measuring time and concentration (Fig. 4.64).

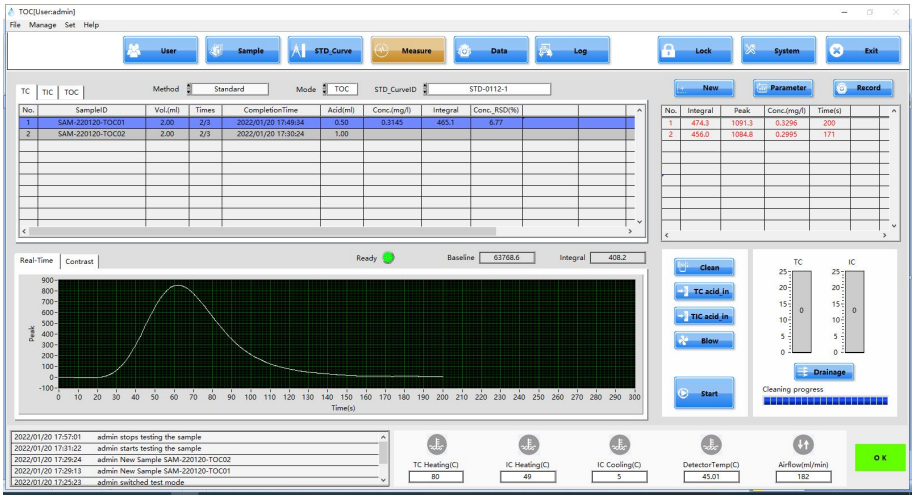


Fig 4.64

Replace the sample and test one by one until completing the measurement for all the standard solutions.

4.2.6.2.2 The direct method (NPOC Mode)

Click  to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.65).

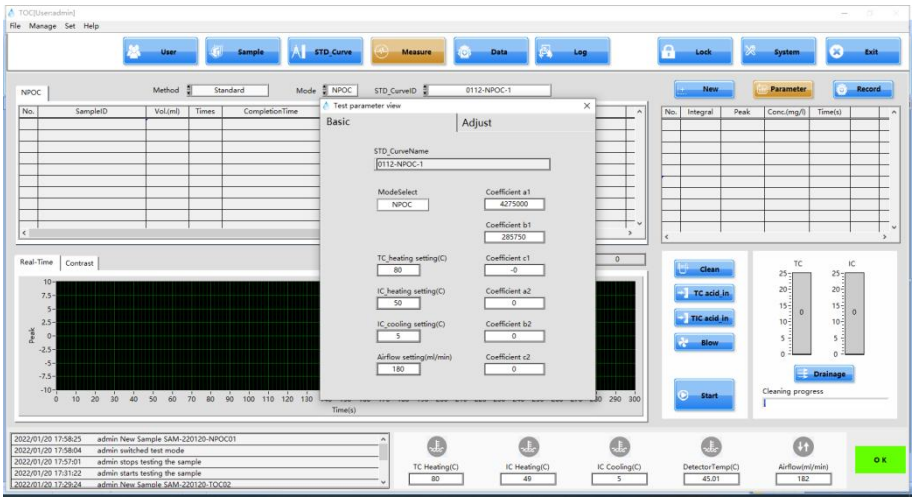


Fig 4.65

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.66).

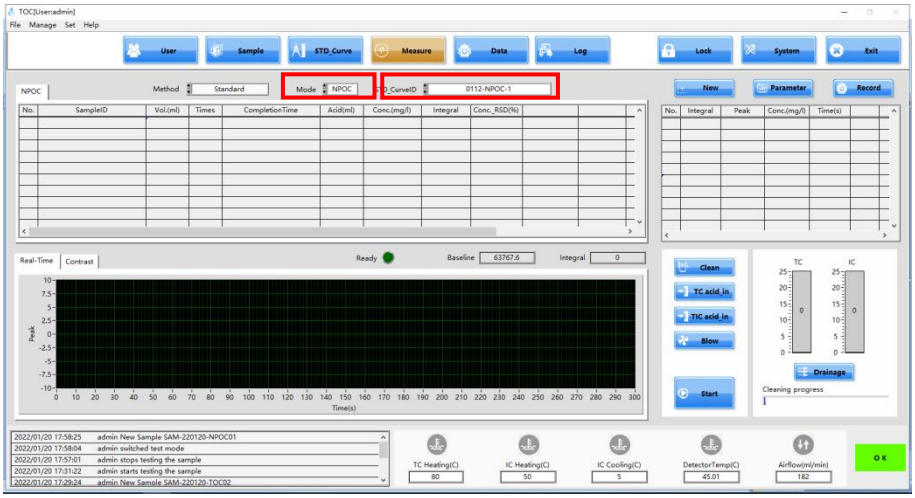


Fig 4.66

Note:

1. There are three methods for sample testing in NPOC mode: standard test, quality control sample test and system applicability test.

2. The use of NPOC mode standard test samples, the test samples need to be pre-treated; In the quality control sample test and system applicability test, the samples themselves are organic carbon, so there is no need for pre-treatment and only need to deduct the blank from the results.

Method 1: Standard Test

Step 1: Adjust the pH of the sample solution in the sample bottle to 2~3 with 10% phosphoric acid, stir and mix well.

Step 2: Place the acidified sample solution on the base of the sample bottle, click 

on the software, then put the blowing pipe into the sample

bottle and purge for 10 minutes by default, the blowing time can be changed according to different samples (Fig. 4.67). When the purge time is up, the software will prompt you(Fig. 4.68). Click 'OK', then remove the blowpipe from the sample solution and place it above the liquid level, no need to click 

to close until the sample finished the test.

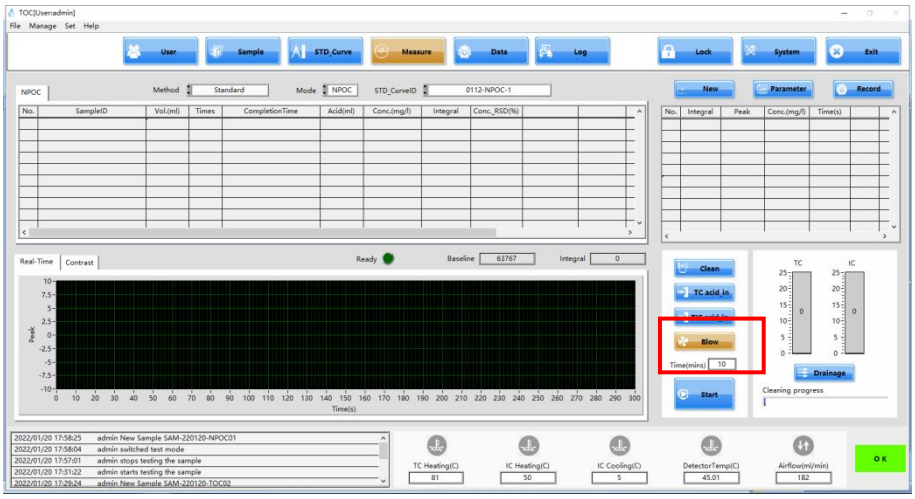


Fig 4.67

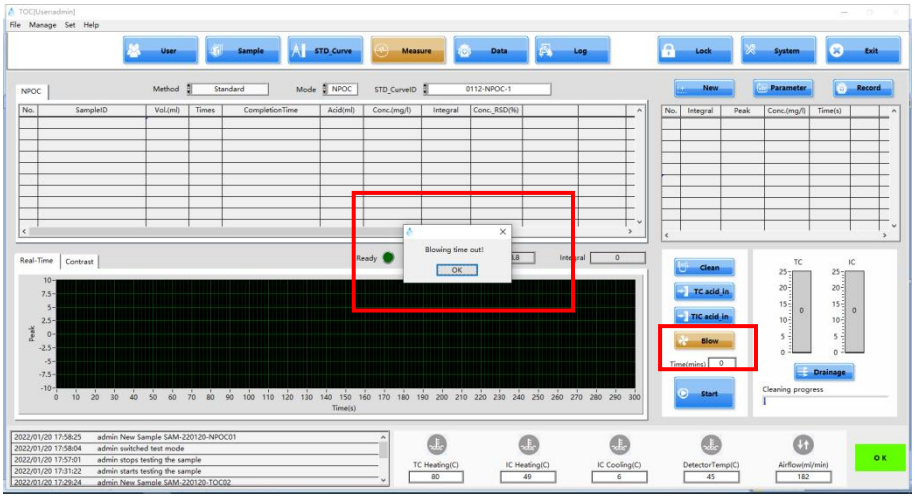


Fig 4.68

Step 4: Click 

to add the registered samples to the list to be tested (Fig. 4.69).

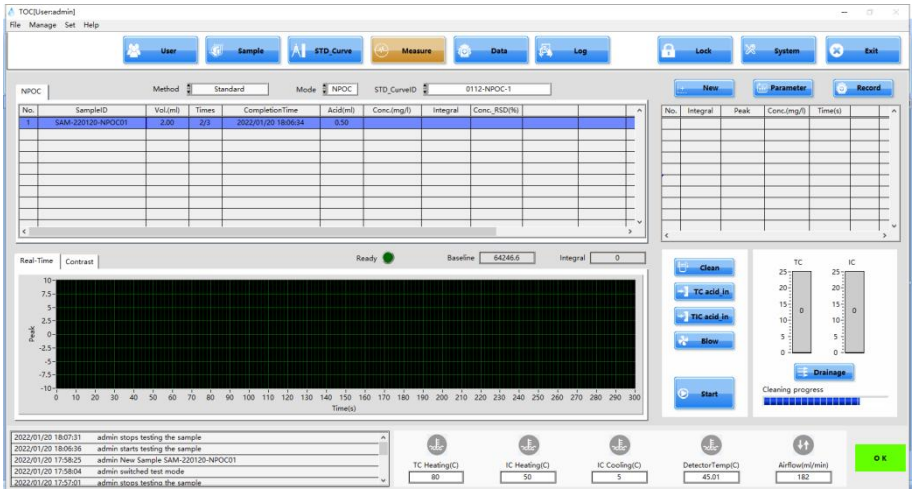


Fig 4.69

Step 5: Click  to start the measurement. The system will give a prompt (Fig. 4.70) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click  and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

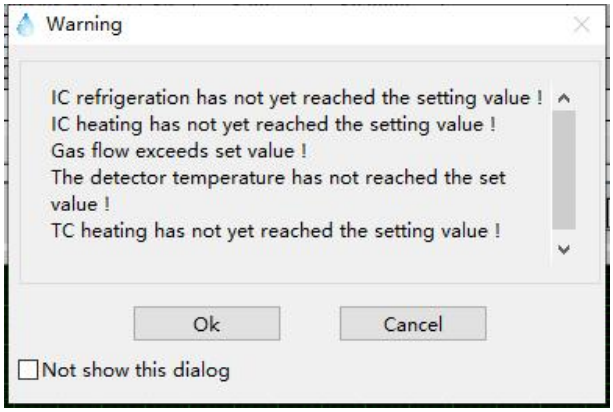
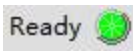


Fig 4.70

Wait the indicator  lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value, measuring time and concentration (Fig. 4.71).

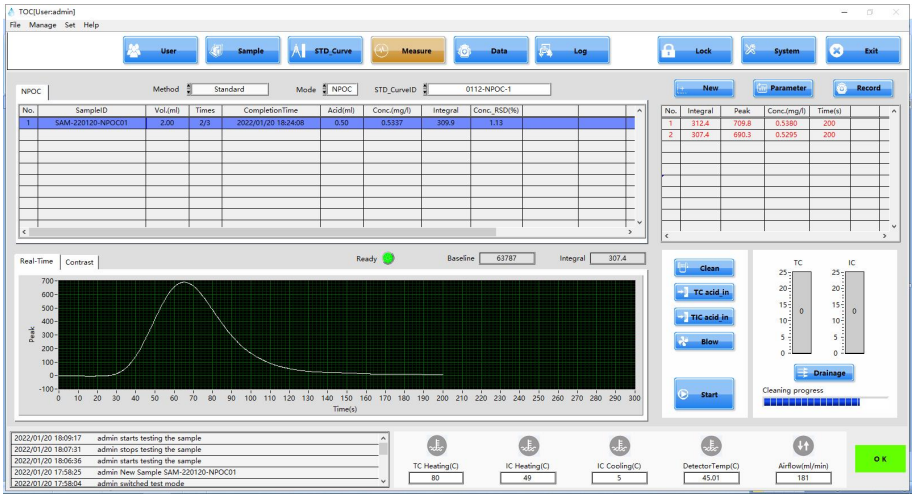


Fig 4.71

Replace the sample, after adding acid and blowing, then runs the test one by one until completing the measurement for all the standard solutions.

Method 2: The Quality Control Sample Test

Step 1: Click  to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.72).

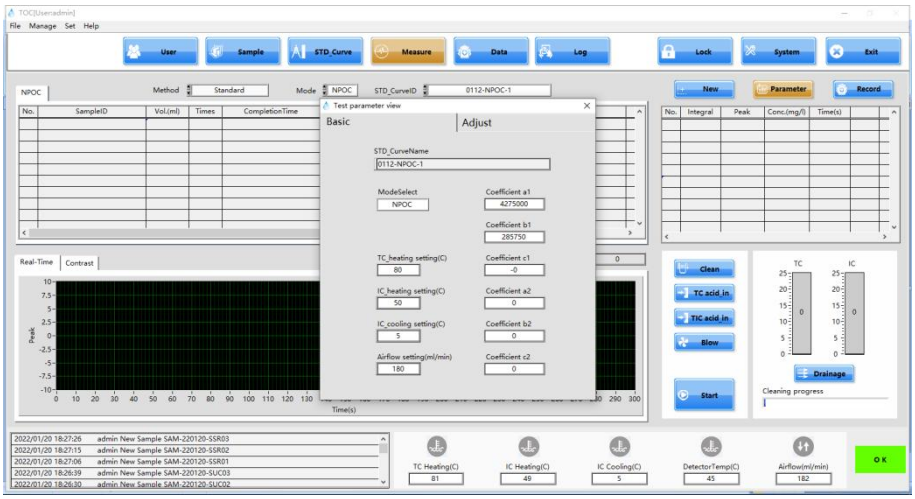


Fig 4.72

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.73).

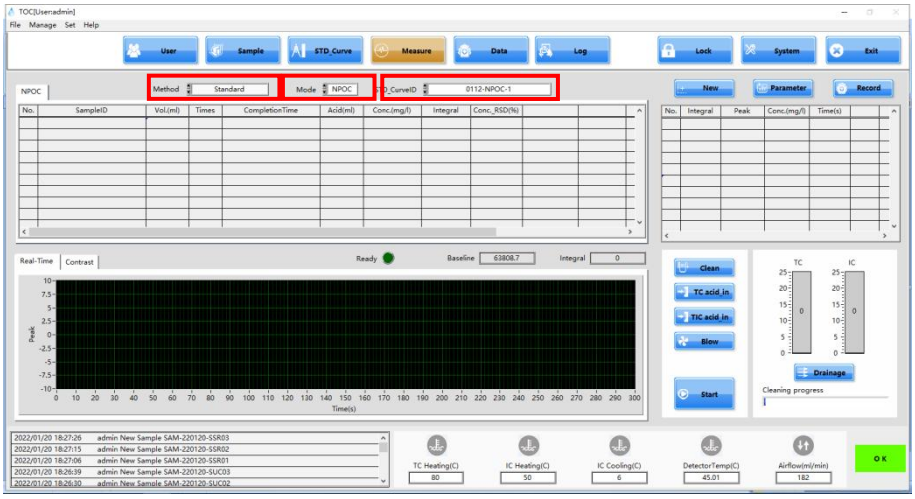


Fig 4.73

Step 2: Click  , and there pops up a new test dialog (Fig. 4.74).

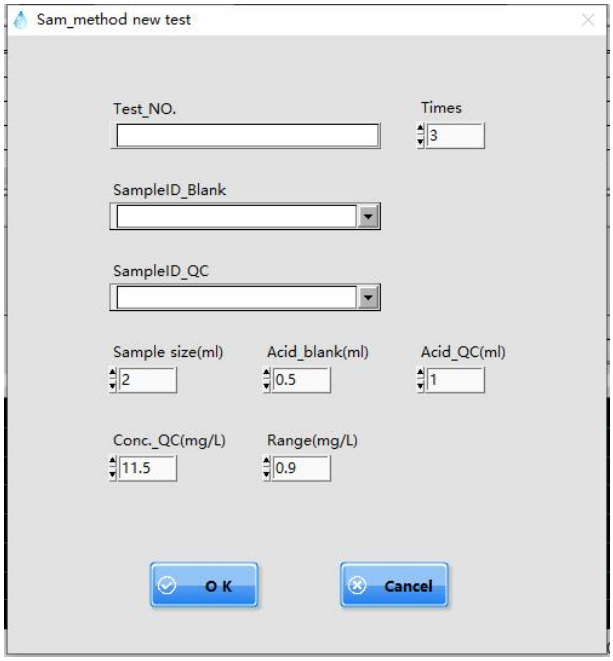


Fig 4.74

'Test_NO.' can be freely named, as long as the uniqueness is guaranteed; The 'Times', 'Sample size' and 'Acid size' can be set by users according to actual needs. 'Sample ID_Blank' and 'Sample ID_QC' need to be registered on the 'Sample Management' interface in advance and selected from the drop-down list. 'Con_QC' and 'Range' are given according to the dilution concentration and error range of the standard quality control sample of the Ministry of Environmental Protection, and users can make changes according to their own actual standard sample concentration and error range (Fig 4.75).

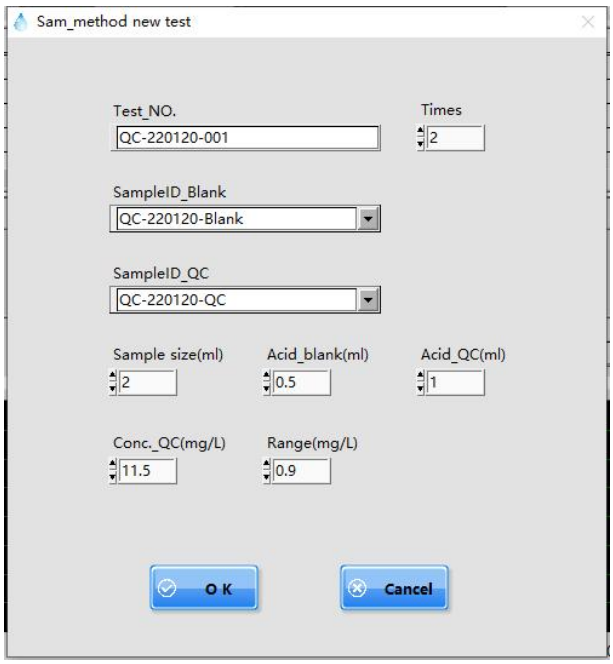


Fig 4.75

Step 3: Click 'OK' and create successfully, then the sample information will be shown in the test progress list (Fig. 4.76).

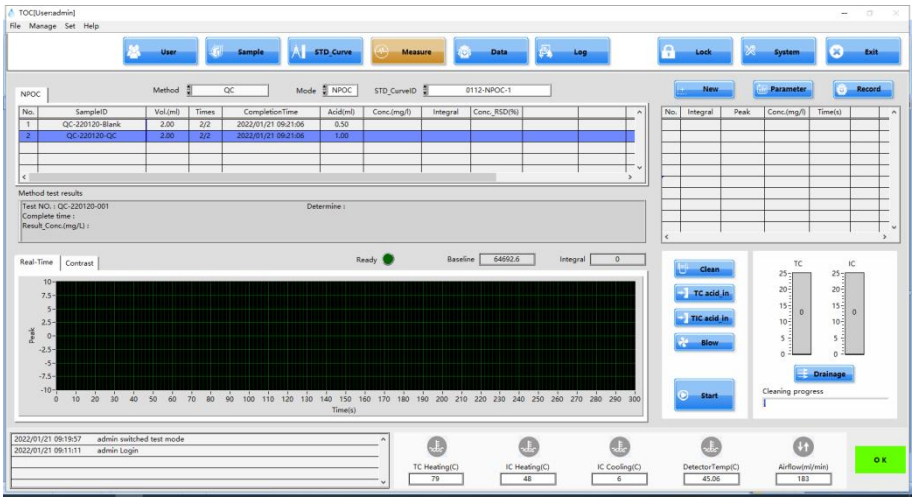


Fig 4.76

Step 4: Manually place the sample on the base of the sample bottle and select the row where the sample is located, click 

to start the measurement. The system will give a prompt (Fig. 4.77) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click 

and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

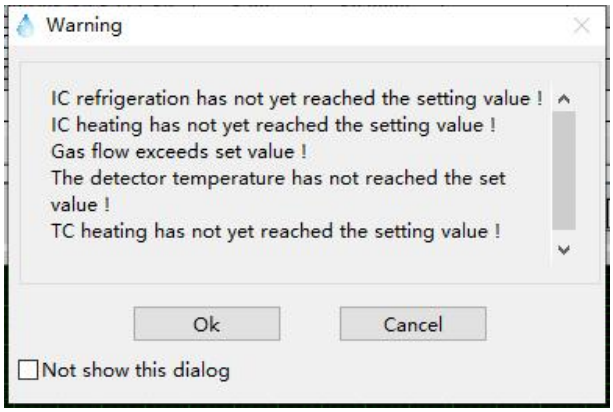
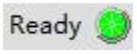


Fig 4.77

Wait the indicator 

lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value, measuring time and concentration. After the blank sample and quality control sample were tested, the software will determine whether they are qualified(Fig. 4.78).

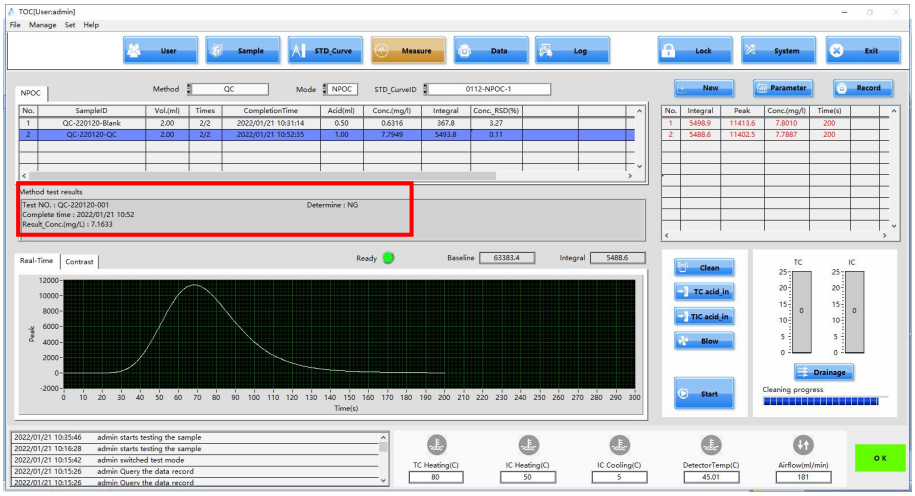


Fig 4.78

Method 3: The System Applicability Test

Step 1: Click 

to enter the sample test interface. The software automatically presents the line used in the last test and a pop-up window displays the basic parameters of the line (Fig. 4.79).

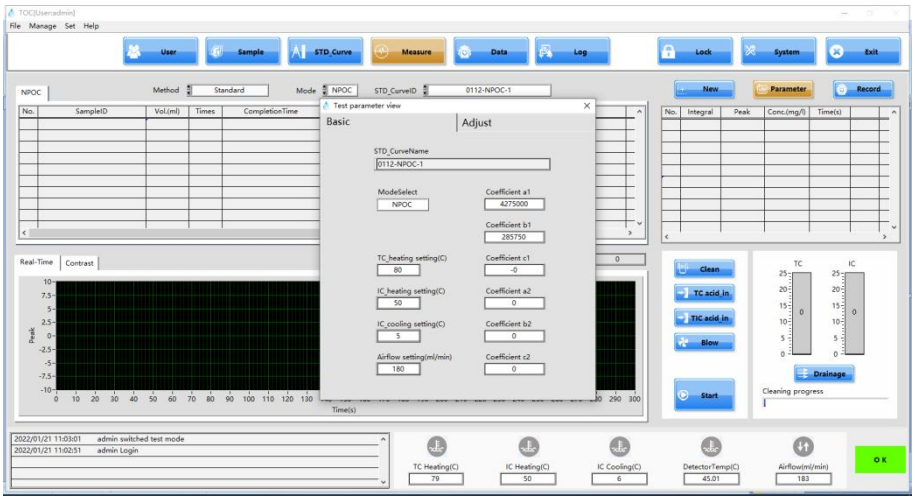


Fig 4.79

After the pop-up window is closed, the user can select the NPOC mode and standard curve, and confirm the standard curve according to the basic parameters given by the pop-up window (Fig. 4.80).

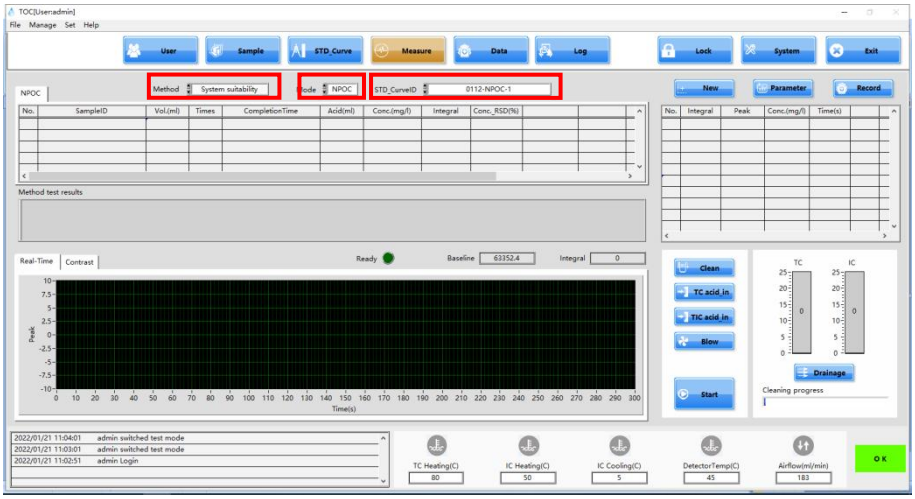


Fig 4.80

Step 2: Click 

, and there pops up a new test dialog (Fig. 4.81).

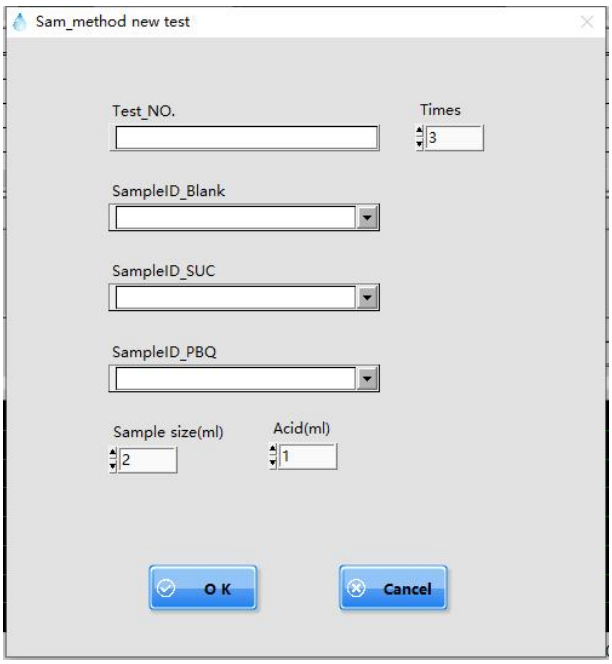


Fig 4.81

'Test_NO.' can be freely named, as long as the uniqueness is guaranteed; The 'Times', 'Sample size' and 'Acid size' can be set by users according to actual needs. 'Sample ID_Blank', 'Sample ID_SUC' and 'Sample ID_PBQ' need to be registered on the 'Sample Management' interface in advance and selected from the drop-down list (Fig. 4.82).

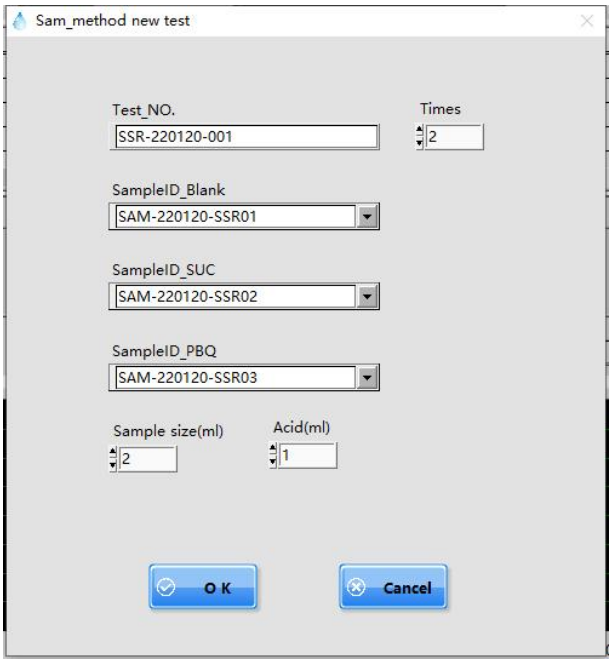


Fig 4.82

Step 3: Click 'OK' and create successfully, then the sample information will be shown in the test progress list (Fig. 4.83).

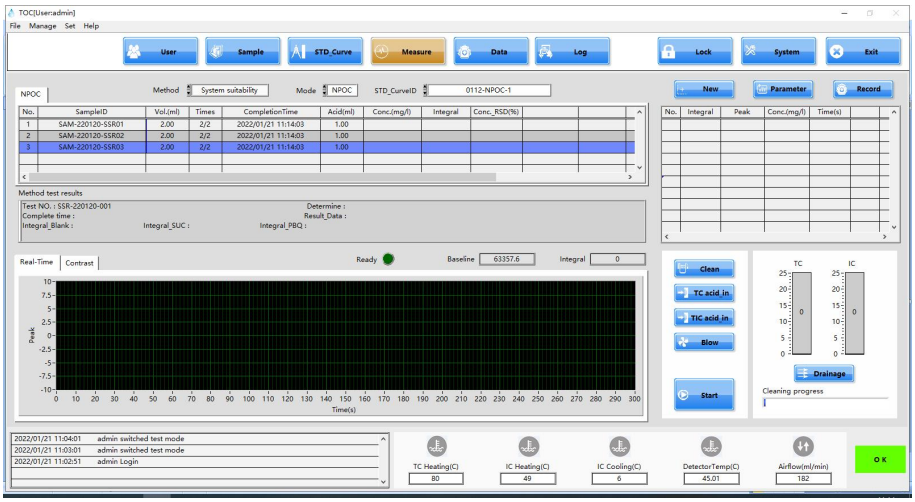


Fig 4.83

Step 4: Manually place the sample on the base of the sample bottle and select the row where the sample is located, click  to start the measurement. The system will give a prompt (Fig. 4.84) if the current testing conditions do not meet the requirements. Click 'Cancel', wait the conditions to be stable, then click  and there is no warning prompt popped up again. The instrument starts the cleaning process, and user can view cleaning progress to check whether the cleaning is complete.

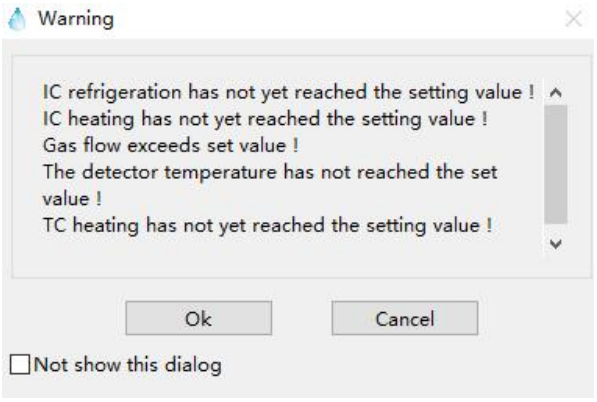
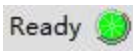


Fig 4.84

Wait the indicator  lighting up after completing the cleaning, it will run measurement with automatic sampling, and records information of the tested sample such as the integration value, measuring time and concentration. After the blank sample, sucrose sample and para benzoquinone sample were tested, the software will determine whether they are qualified according to the calculation formula of 'system applicability' stipulated in Chinese Pharmacopoeia (Fig. 4.85).

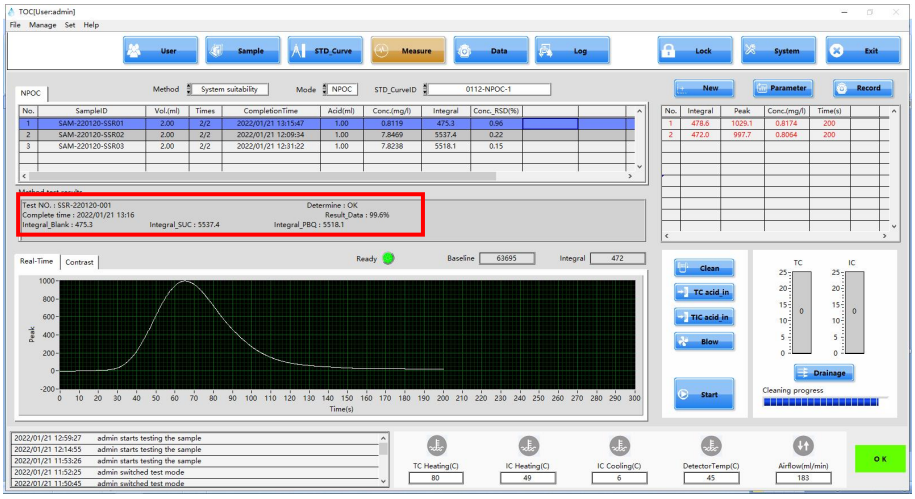


Fig 4.85

4.2.7 Electronic signature & Export data

4.2.7.1 Standard Curve Signature and Export

1. Click  to enter the STD_Curve management interface (Fig 4.86).

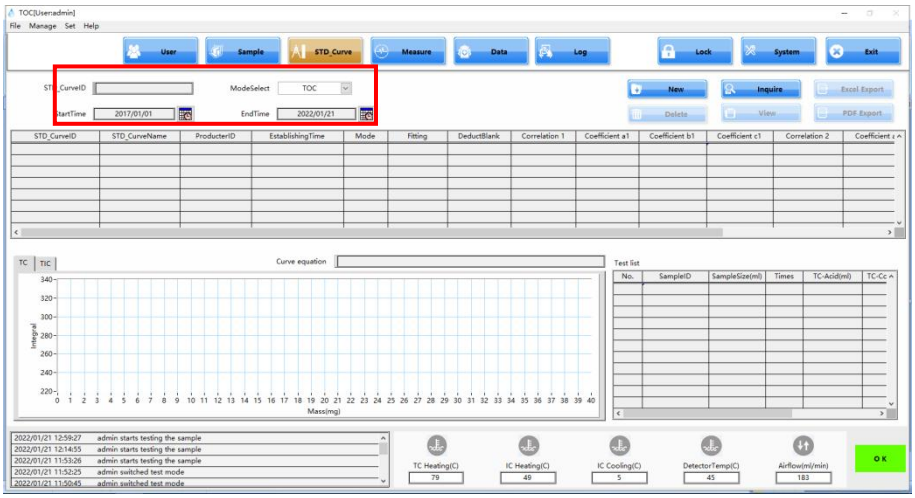


Fig 4.86

1. After setting the index such as 'Mode Select', 'Start Time', 'End Time', 'STD_Curve ID' (Fig 4.86), click  . Then select the STD_Curve need to be exported (Fig 4.87).

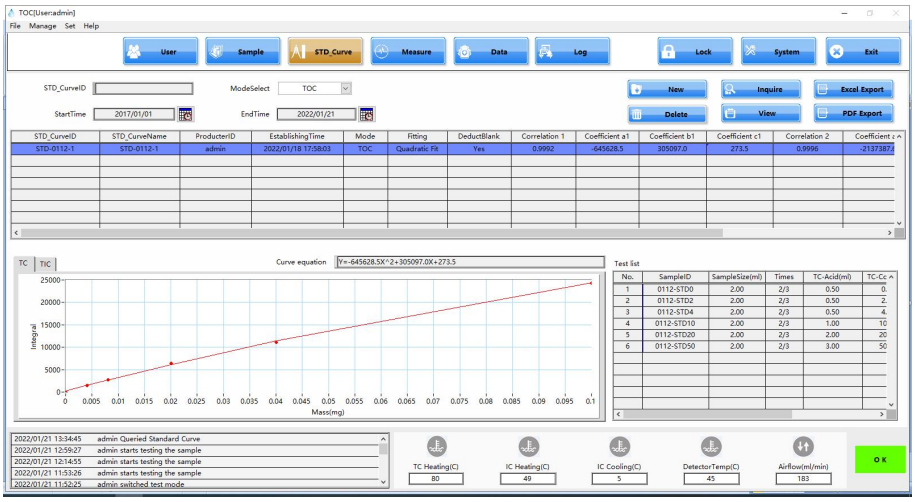


Fig 4.87

2. After confirmed the selected STD_Curve, right click the pop 3 options (Fig 4.88), click any popover 'Password' (Fig 4.89) and enter the password of the current login user, then signature success. 'Approved' line is displayed in green (Fig 4.90.1), 'Rejected' line is displayed in red (Fig 4.90.2), and 'Cancel' line will return to its original color.

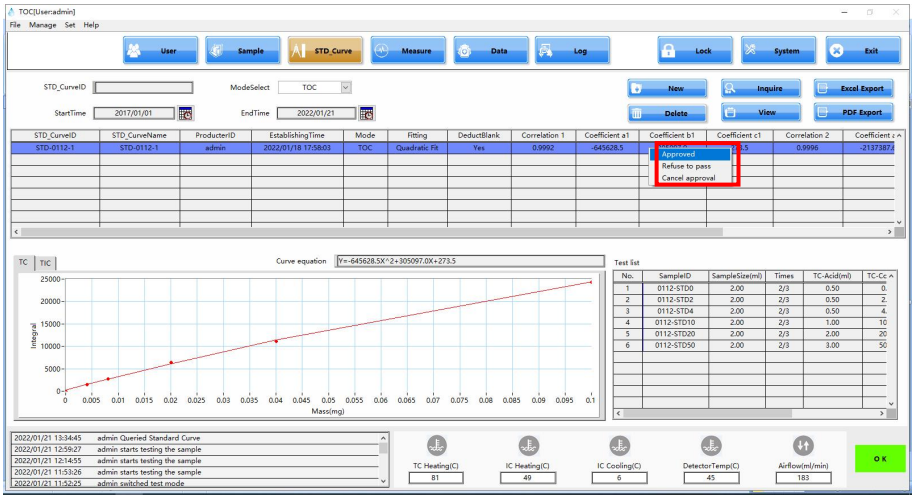


Fig 4.88

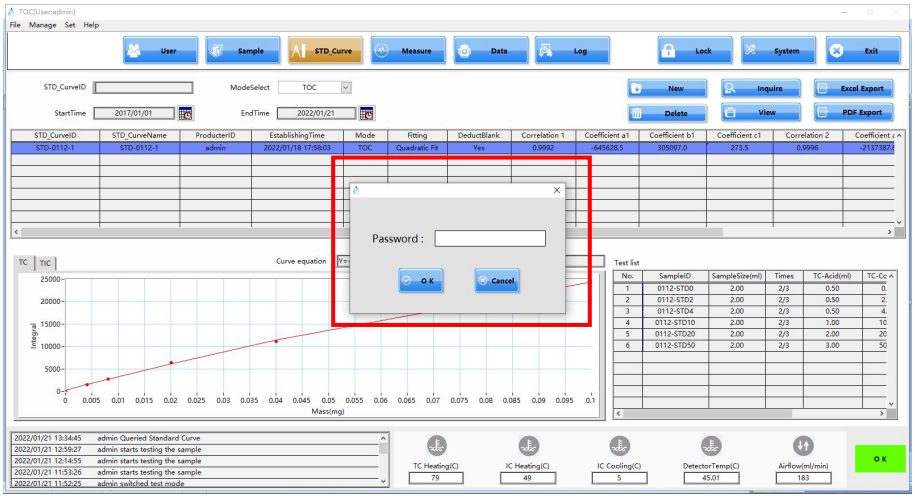


Fig 4.89

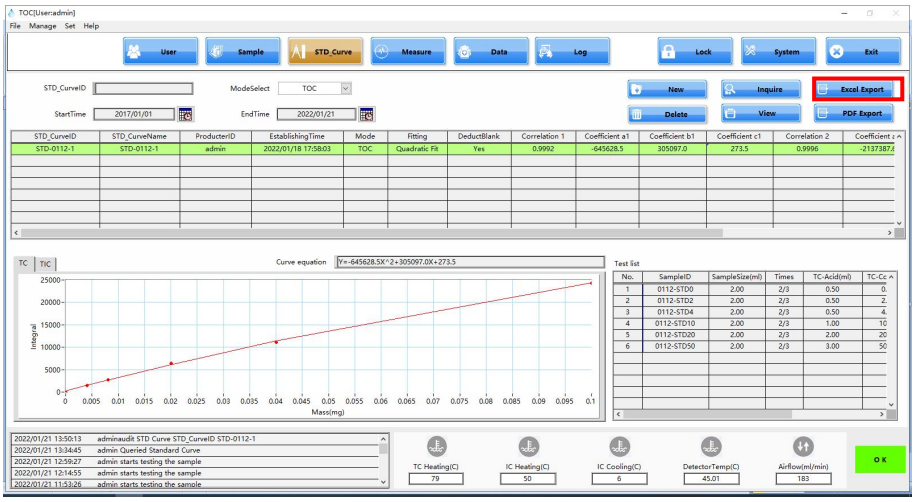


Fig 4.90.1

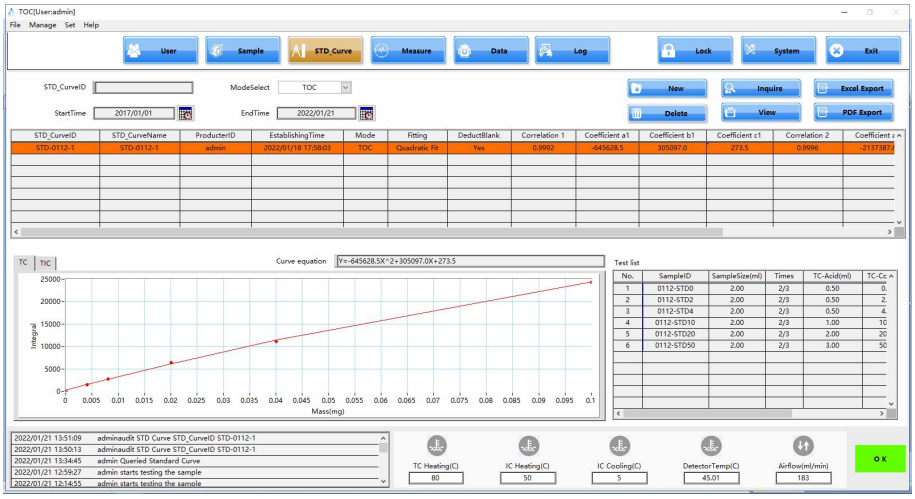


Fig 4.90.2

3. Click  (Fig 4.90.1), fill the path in popover and click OK to export the data.

Note: PDF export and Excel export process is same, only the corresponding click button is different.

4.2.7.2 Sample Data Signature and Export

1. Click  to enter the measurement record interface (Fig 4.91).

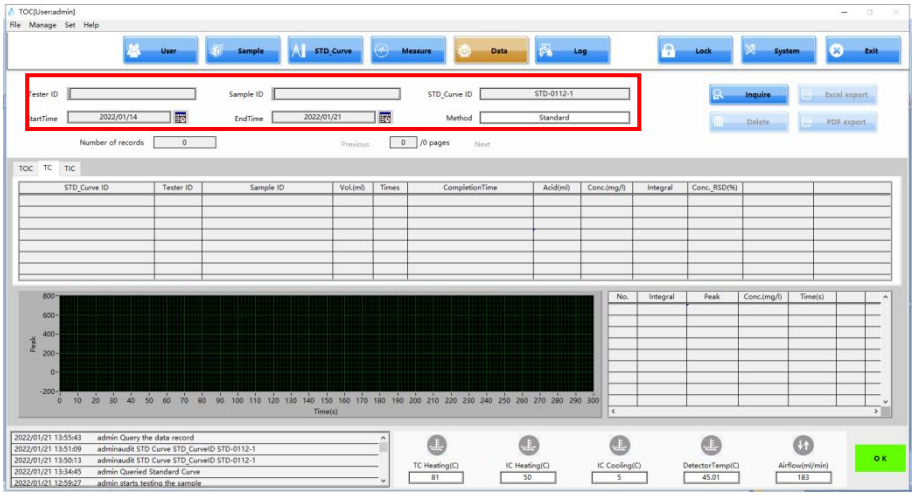


Fig 4.91

2. After setting the index such as 'Tester ID', 'Start Time', 'End Time', 'STD_Curve ID', 'Sample ID', 'Method' (Fig 4.91), click Inquire. Then select the sample data need to be exported (Fig 4.92).

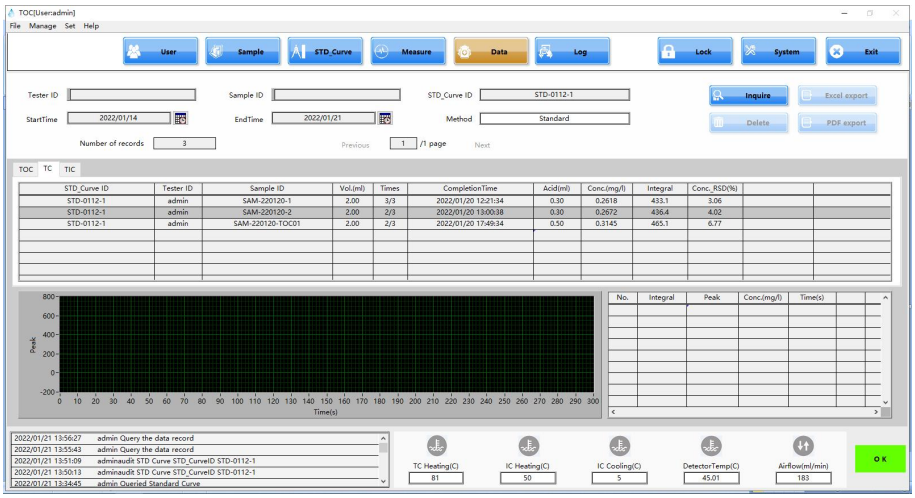


Fig 4.92

3. After confirmed the sample data, right click the pop 3 options (Fig 4.93), click any popover 'Password' (Fig 4.94) and enter the password of the current login user, then signature success. 'Approved' line is displayed in green (Fig 4.95.1), 'Rejected' line is displayed in red (Fig 4.95.2), and 'Cancel' line will return to its original color.

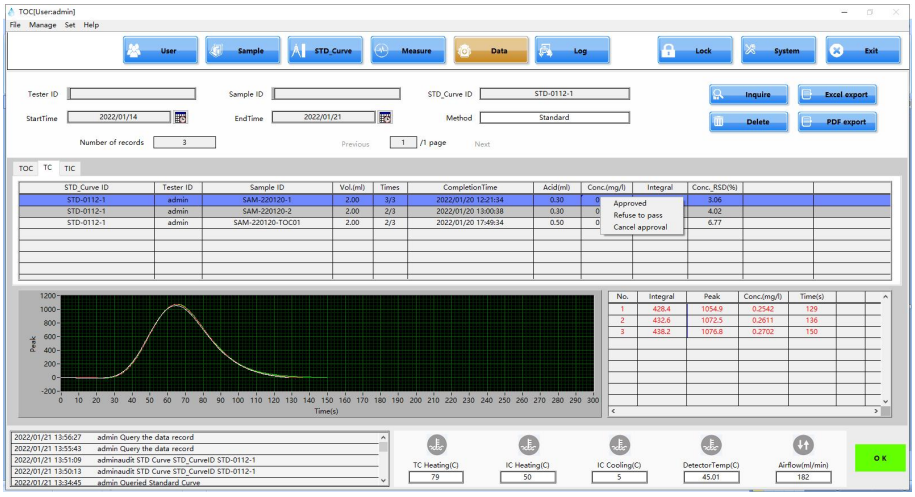


Fig 4.93

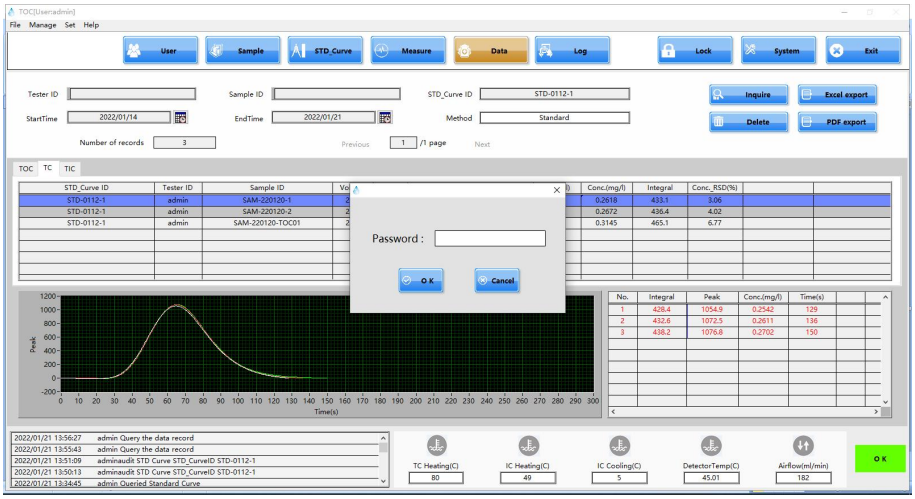


Fig 4.94

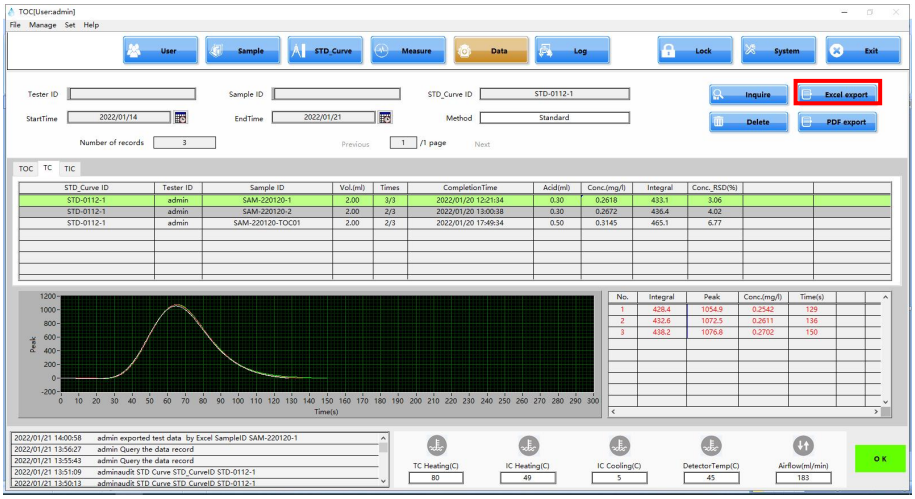


Fig 4.95.1

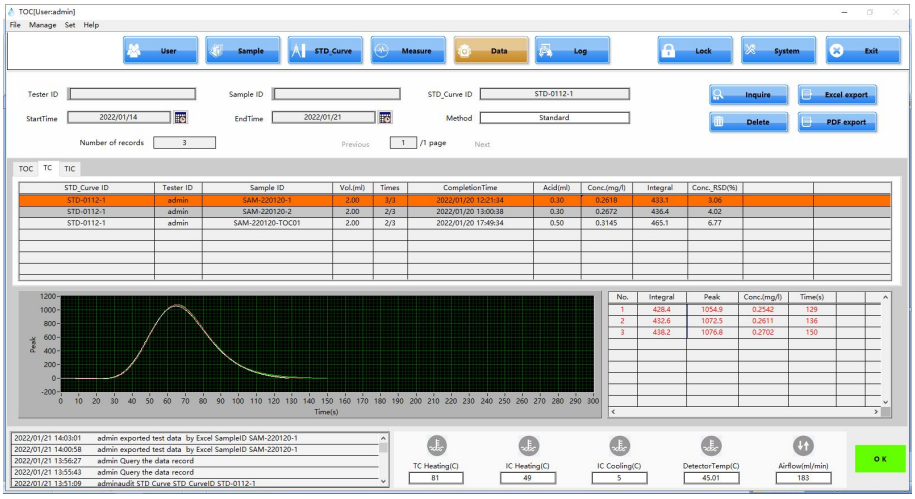


Fig 4.95.2

4. Click  (Fig 4.95.1), select the data need to be exported and click 'Export' (Fig 4.96), then fill the path in popover and click OK to export the data.

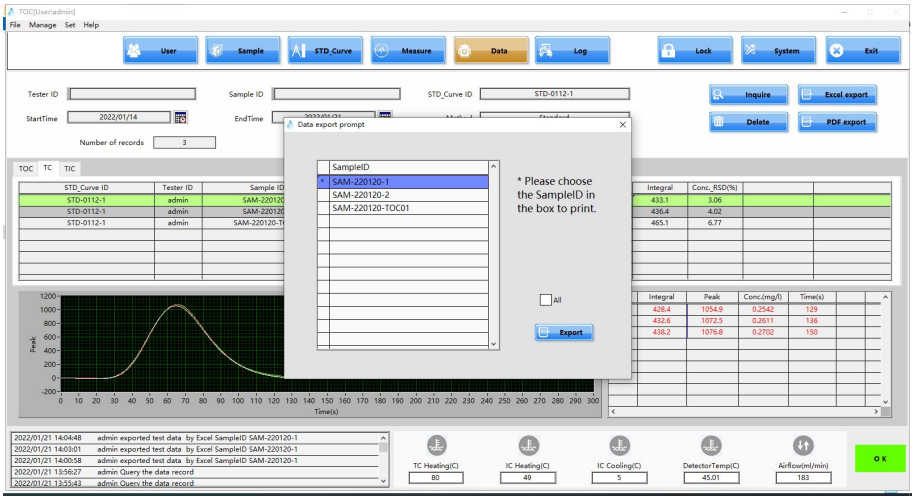


Fig 4.96

Note:

1) The export of sampler data signature is only applicable to single sample, the export of multi-sample data without signature.

2) PDF export and Excel export process is the same, only the corresponding click button difference.

4.2.8 Turn off

4.2. 8.1 Turn off software &main body

Save the test result after measurement, when user needs to turn off the instrument, please clean tube with pure water to ensure no sample residue

contamination. Click 

(Fig.4.97), popup message'Before exiting, please clean the pipeline with pure water!' (Fig 4.98), Click 

, after clean the tube popup message 'The instrument can be shut down normally.'(Fig 4.99). Click 

, turn off the power.

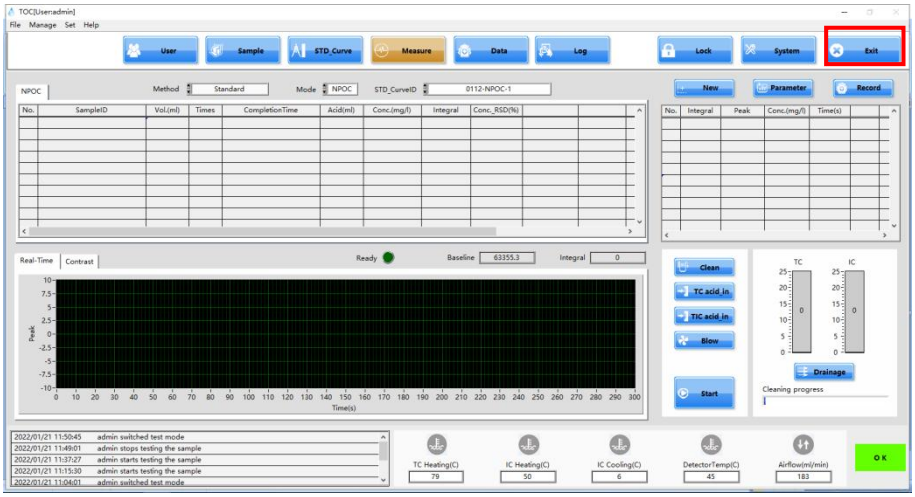


Fig 4.97

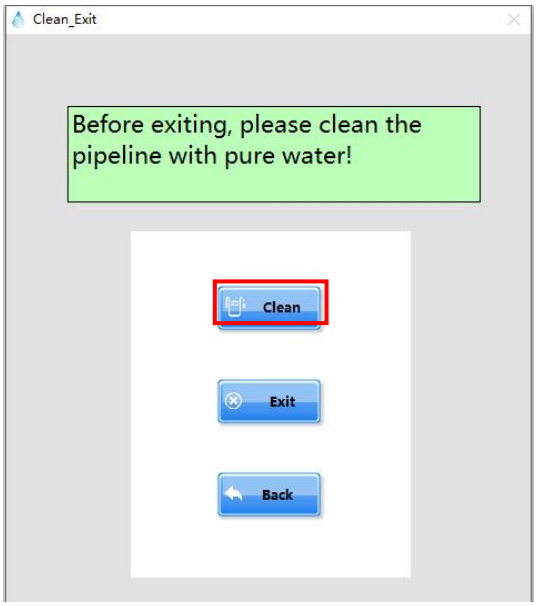


Fig 4.98

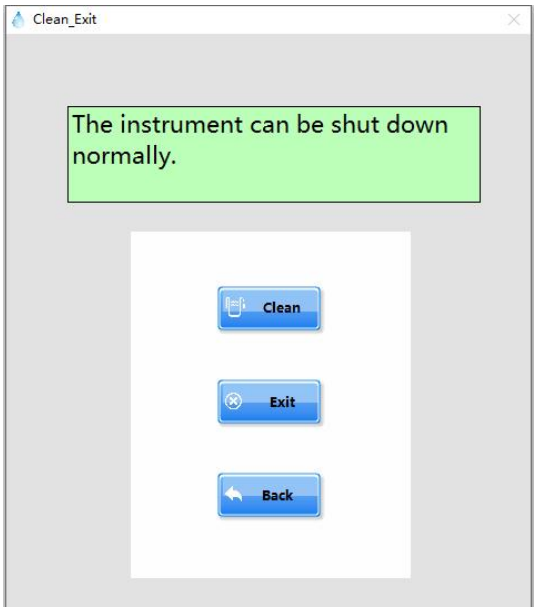


Fig 4.99

4.2.8.2 Turn off the gas

1)Tighten cylinder valve;
2)Release all the gas in the tube and make sure the total pressure meter and pressure divider go back to 0;
3)Loose pressure release valve.

Chapter 5 Software Operation

5.1 Software main interface introduction

5.1.1 Software Login Interface Operation Introduction

Software Login Interface (Fig. 5.1).

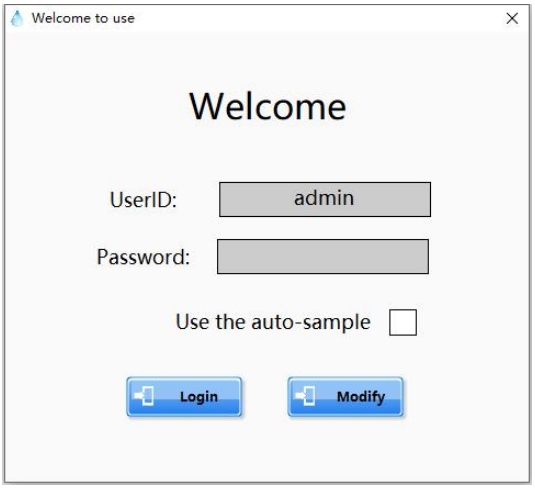


Fig. 5.1

1. Login Information

UserID: admin : The account used by the user to log in to the software. Default is 'admin'.

Password: : Enter the account password used by the user to log into the software. The initial password is 666666.

Use the auto-sample : Whether the user is using an auto-sampler. Default is no.

2. Password Modification

User can modify the password in the Login interface . Click Modify (Fig. 5-1).

Input the original password and the new password in the password modification interface (Fig. 5-2).

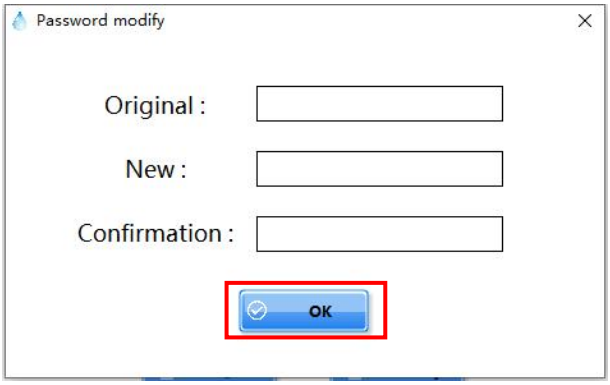


Fig. 5-2

5.1.2 Software Preheating Interface Introduction

Software preheating interface (Fig. 5.3)

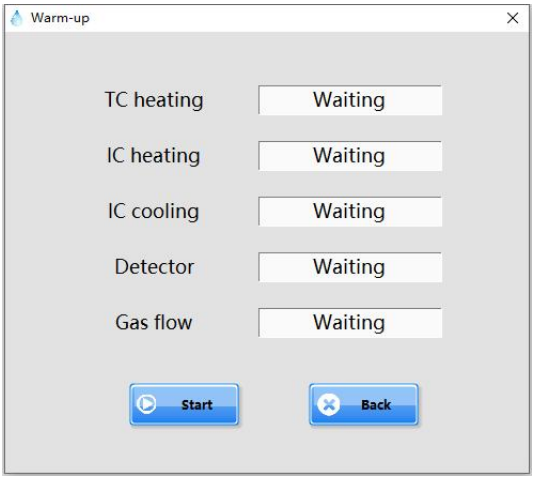
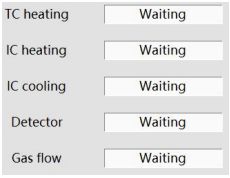


Fig. 5.3



: Display the preheating status of important parameters of the instrument.

: Preheating button.

: Exit the preheating interface button.

Note: The preheating parameter of TC heating is 80℃, IC heating preheating parameter is 50℃, IC cooling is 5℃, the detector temperature preheating parameter is 45℃, the gas flow is 180ml/min.

5.1.3 Software Operations

Main interface of the software (Fig. 5.4).

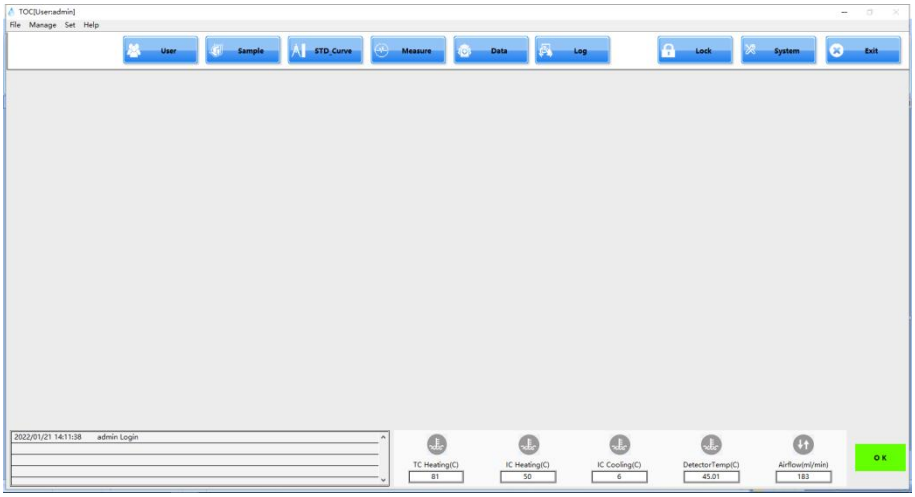


Fig. 5.4

: Click the button to enter relevant management interface.

: Click to enter the standby cleaning exit interface (Fig. 5.5).

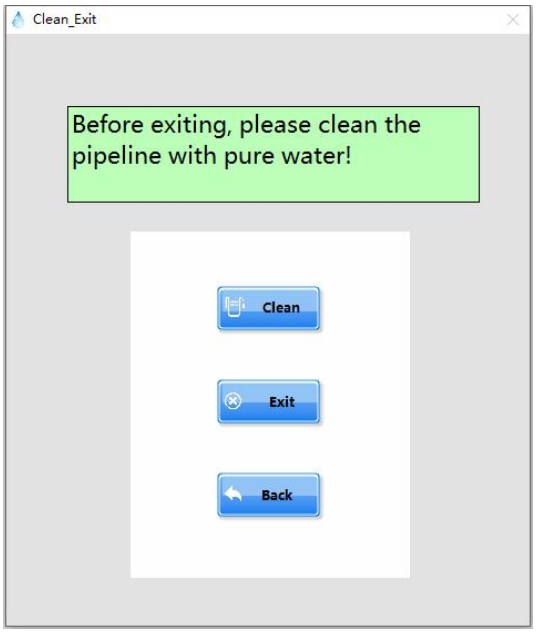
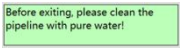


Fig. 5.5



: Step prompt bar. Shows the work that needs to be done before exiting.

: Click the button to clean the instrument line with pure water.

: Exit the software after finishing the cleaning operation.

: Return to the main interface of the software.

: Click the Lock button to enter the Lock Screen interface (Fig. 5.6).

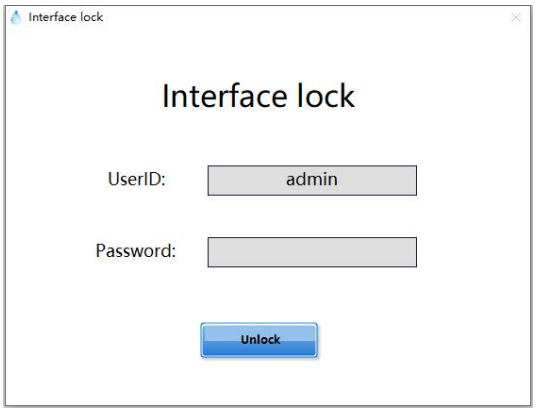
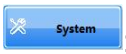


Fig. 5.6



: Click to enter the maintenance debugging interface.

Detector observation interface (Fig. 5.7)

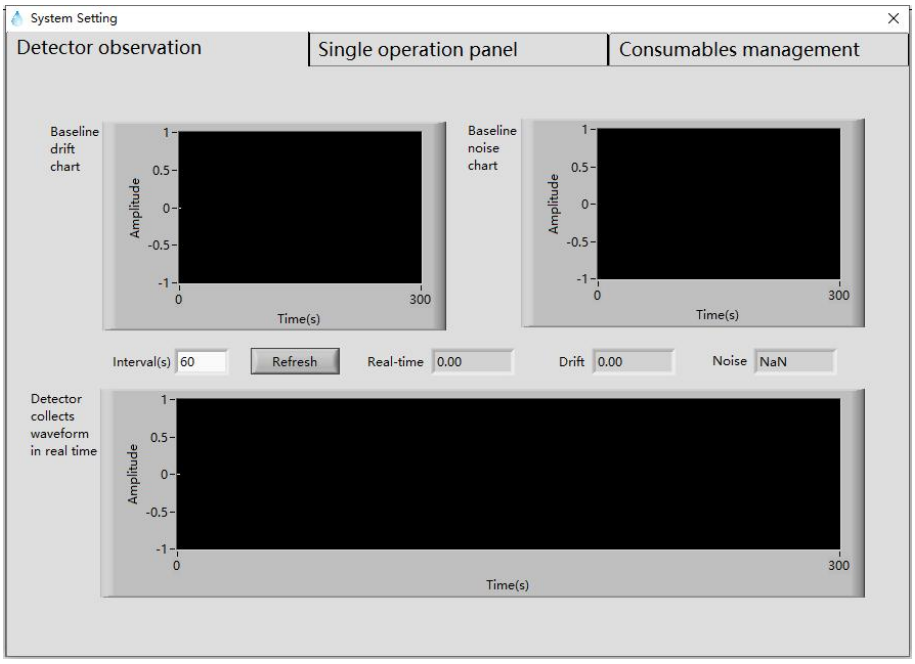


Fig. 5.7

The interface mainly displays some real-time data and peak-shaped charts of the detector, which are used to judge whether the detector is abnormal when abnormal conditions occur.

Single operation panel interface (Fig. 5.8)

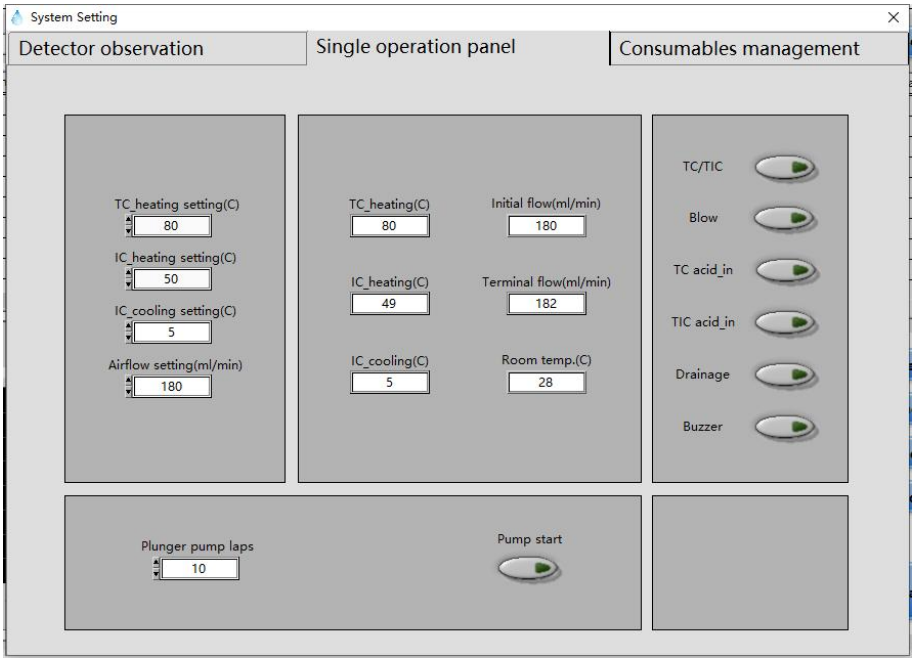
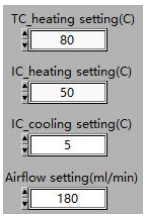
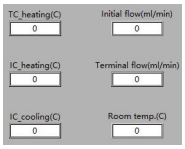


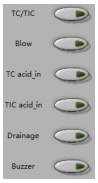
Fig. 5.8



: Main parameter setting of the instrument, used for debugging and hardware troubleshooting.



: The main parameters of the instrument are displayed in real time for real-time observation during debugging and troubleshooting.



: The solenoid valve and peristaltic pump switch inside the instrument, used for debugging and hardware troubleshooting.

: Plunger pump control Settings for debugging and hardware troubleshooting.

Consumables management interface (Fig. 5.9)

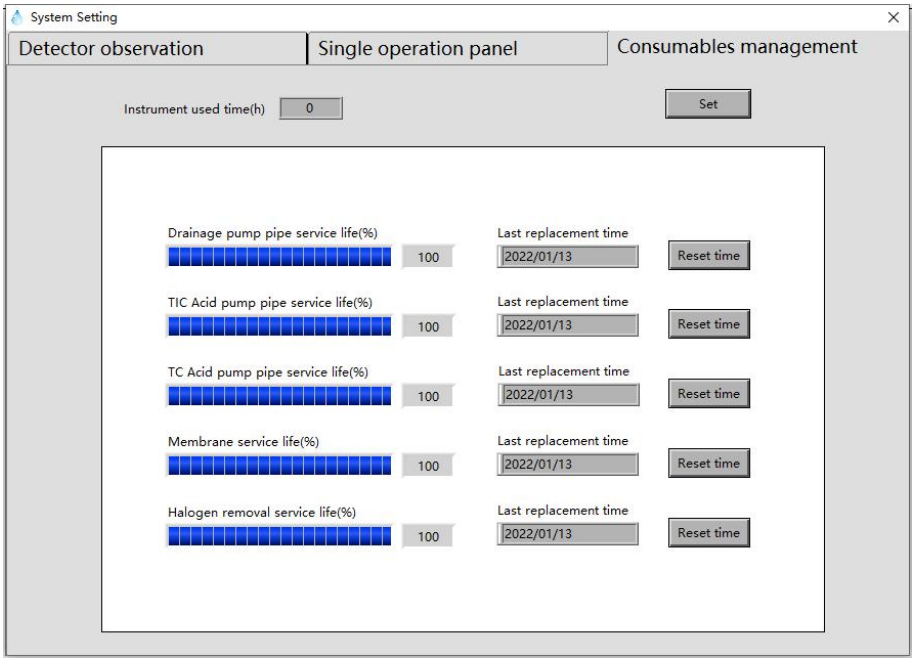


Fig. 5.9

The interface shows the time the instrument has been used and the usage of the main consumables. It is used to timely respond to the problem that the main consumables are used for too long. When the service life is expired, the software will prompt when entering the main interface (Fig. 5.10), and users can replace it according to their own needs. Click Settings on this interface to enter the interface for setting the usage time of main consumables (Fig. 5.11).

Fig. 5.10

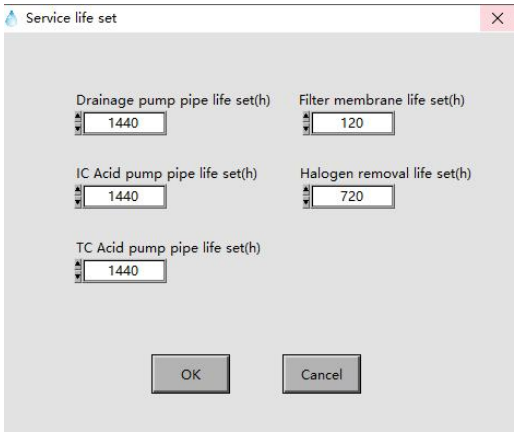


Fig. 5.11

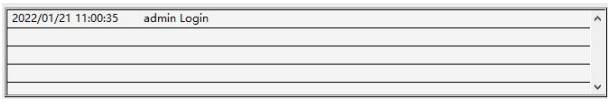
5.1.4 Software Main Interface Function Menu Introduction

Communication Status Bar

The communication status between the software and the instrument is displayed, and the successful communication is displayed in bright green

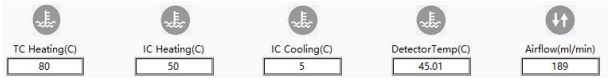
Log Display Bar

It displays the executed operation and alarm information of the running software. The log information displayed in the table is also recorded in the log data.



Instrument Running Status Bar

It displays the running state of instrument parts. 'TC heating (℃)', 'IC heating (℃)', 'IC cooling (℃)', 'Detector temp (℃)' and 'Airflow (ml/min)' are real-time displayed, real-time monitoring of the operating status of the functional parts of the instrument, exceeding the critical value will alarm.



5.2 Management Interface Introduction

5.2.1 User Management

Click 

to enter user management interface (Fig. 5.12).

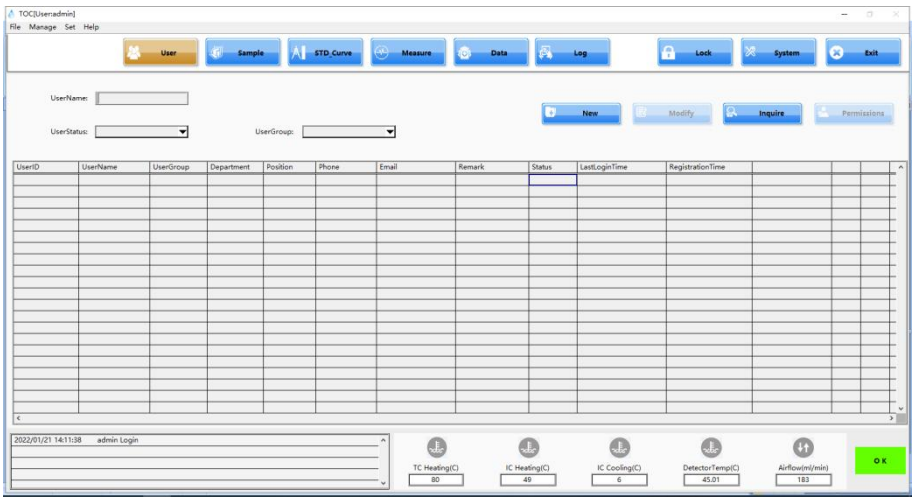


Fig. 5.12

'User Name', 'User Status', 'User Group' are only used for searching. Users can input the corresponding information in single or combination, and then

click 

, then the user information needed will be displayed in the list below (Fig. 5.13).

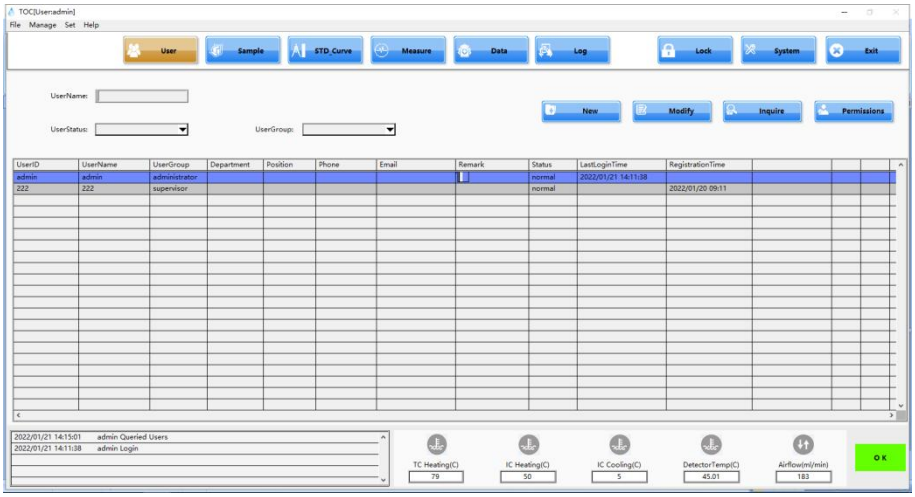


Fig. 5.13

button is used for user information registration, click this button to enter the 'user information registration and modification' interface (Fig. 5.14). Fill in 'User ID', 'User Name', 'Password' and other information, the information marked by (*) must be input. Click 'Ok' button after inputting all the information, the 'Operation Successful' dialog box appears, click 'Ok' button to create new user. Click 'Back' button, the newly registered user information is displayed in the list of the user management interface automatically. Users who did not register in this interface are not able to log in the software.

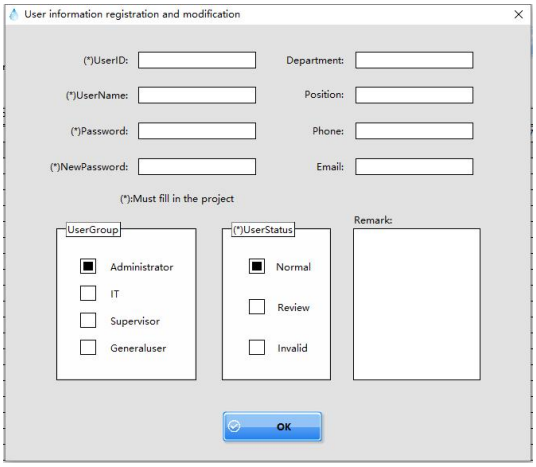


Fig. 5.14

is used for user information modification. First search the user information that needs to be modified and select it and then click the 'Modify' to enter the (Fig. 5.15) interface, input the user information that needs to be modified and click the confirmation button. The 'Operation Successful' dialog box will pop up, then click 'Ok' button to finish modification. Click the 'Back', the

modified user information will be automatically refreshed in the user management interface list.

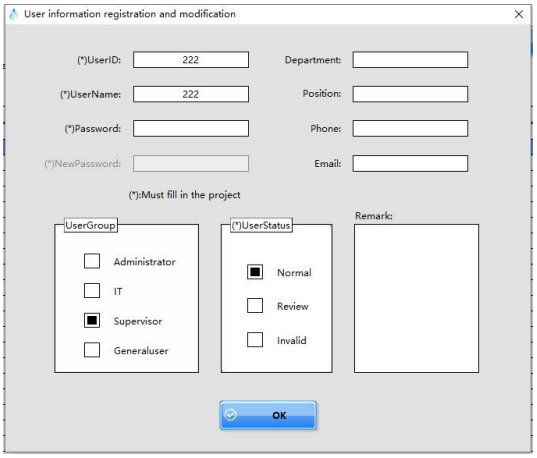
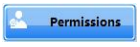


Fig. 5.15



is used for view the user's operating permissions. User needs to select your group when creating new users, different user groups have different operation permissions. First search the user information that needs to be viewed, click 'View Permissions' to enter the 'Permissions Information' interface (Fig. 5.16). The administrator can modify the permissions of other users. The 'value' column with the '×' symbol indicates that the user does not have this operation permission, and the gray button will be shown on the main interface.

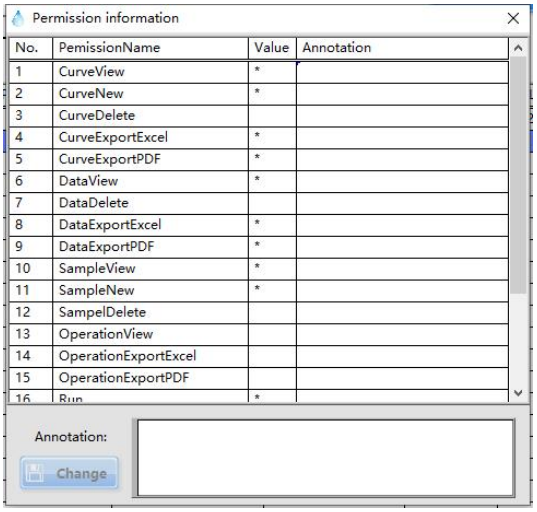


Fig. 5.16

5.2.2 Sample Management Interface

Click 

on the main interface to enter the sample management interface (Fig. 5.17).

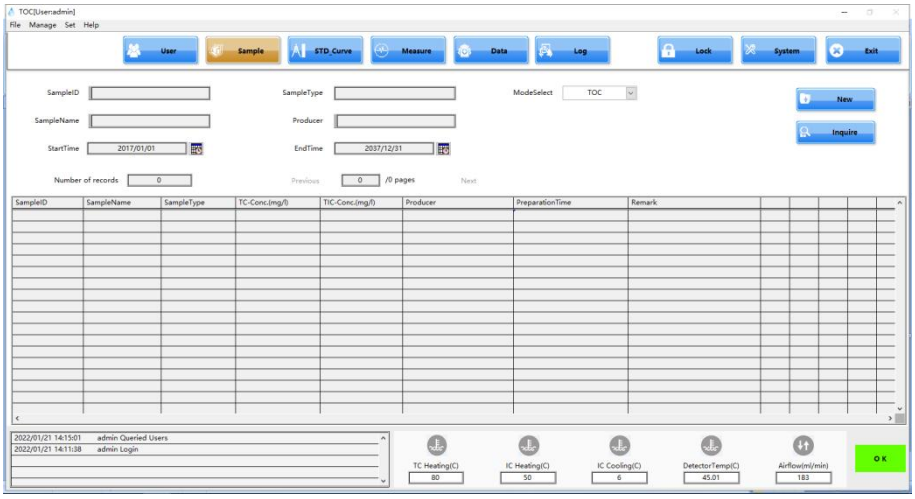


Fig. 5.17

is used for sample registration. The sample registration process is described in detail in Chapter 4 and will not be introduced here again. It should be noted that the newly created sample information cannot be modified.

is used to search registered samples. 'Mode selection', 'Sample number', 'Sample name', 'Sample type', 'Preparation personnel', 'Start time' and 'End Time' are only for query. Users can input the corresponding information single or in combination, and then click the button, the qualified sample information will be displayed in the list below (Fig. 5.18).

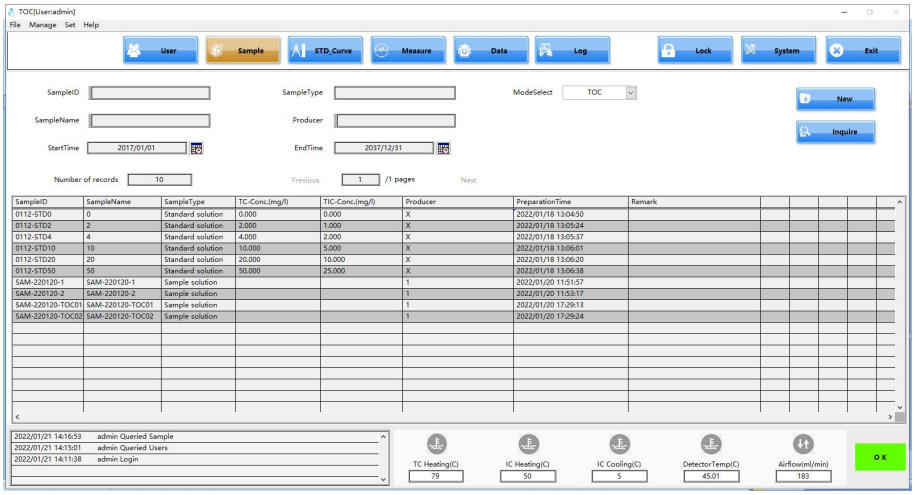


Fig. 5.18

5.2.3 STD_Curve Management

5.2.3.1 Button and unit description on STD_Curve management interface

Click  on the main interface to enter the STD_Curve management interface (Fig. 5.19).

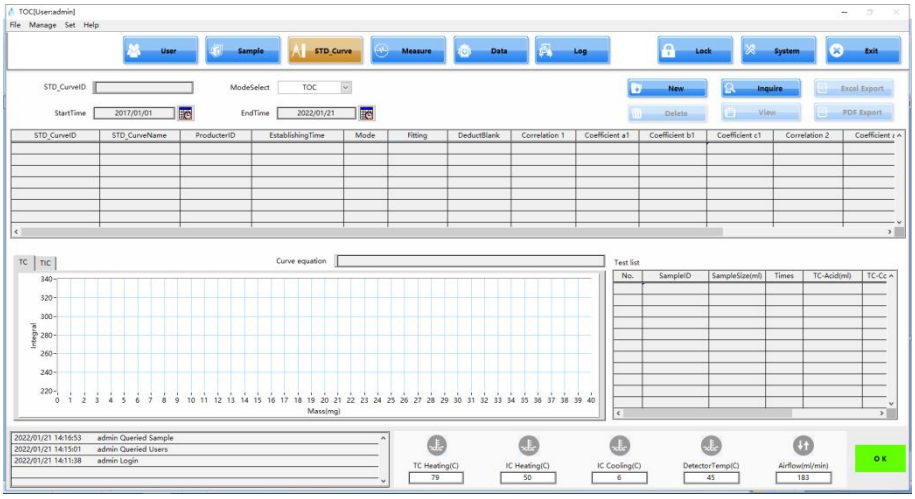


Fig. 5.19

'STD_Curve ID', 'Mode Select', 'Producer ID', 'Start Time', 'End Time' are only for searching, input the corresponding information in single or combination, then click  and the eligible standard curve information is displayed in the list below (Fig. 5.20)

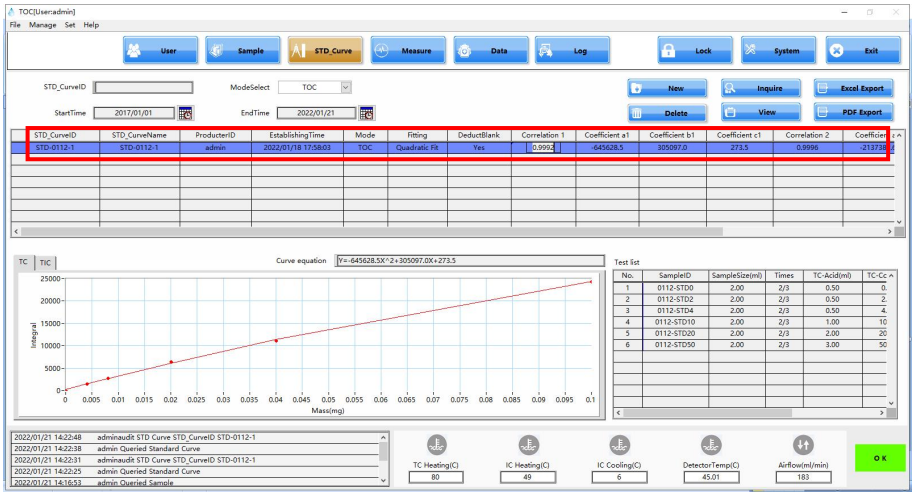


Fig. 5.20

Information such as standard curve ID, standard curve name, production time, and correlation coefficient are displayed in the list (Fig. 5.20).

Select the corresponding standard curve to view the curve equation and the fitting line. Measurement information such as parameters and integral values of each standard concentration points of the fitted curve can be obtained (TC/TIC can be switched to view) (Fig. 5.21).

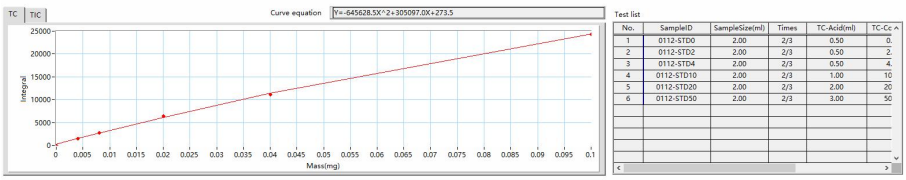


Fig. 5.21

 Enter the interface button of new standard curve. The standard

curve creating process is described in detail in Chapter 4.2.4 and will not be introduced again.

Delete standard curve button. First find the standard curve information that needs to be deleted by setting the searching condition, click the button, and select the deletion reason in the interface below (Fig. 5.22) to complete the deletion operation.

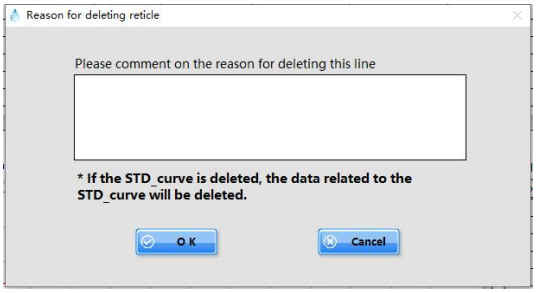
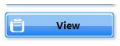


Fig. 5.22



: View the interface of detailed test data and save standard curve (Fig. 5.23).

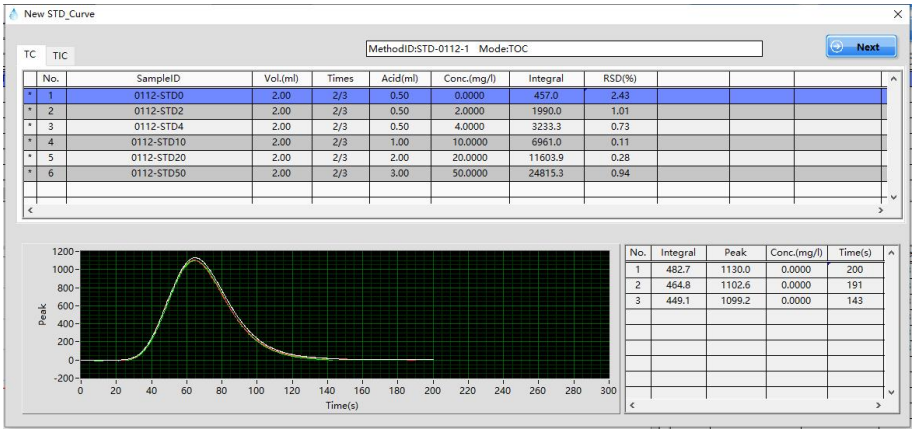


Fig. 5.23

In this interface, you can select the data of the standard curve test for viewing (Fig. 5.23).

Click 

and the data selected by '*' in the test data table can be fitted (Fig. 5.24).

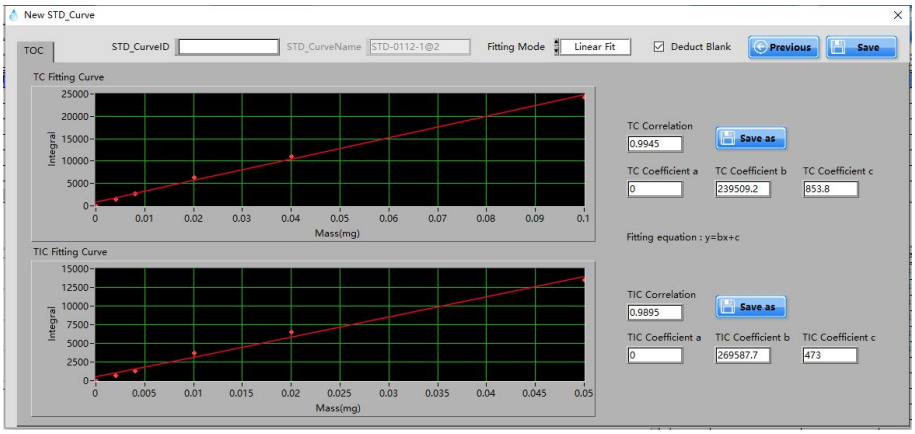


Fig. 5.24

Select the fitting mode, select whether to deduct the blank, and click Save to save the mark.

Note:

1. The name of the standard curve is fixed and derived from the original marking line for easy traceability.

2. In TOC mode, TC and TIC marks can be saved separately, and the save button is next to the fitting correlation coefficient 

.

/ 

is used to export the standard curve test report. First find the standard curve that needs to be exported by setting the query conditions, and then select it. Click 

to generate an Excel document report from the standard curve information, and click 

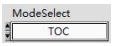
to form a PDF document.

5.2.3.2 New STD_Curve button and unit description

Click 

to enter the measurement interface of the new standard curve interface (Fig. 5.25). This section uses TOC as an example.

Fig. 5.25



: Select the test mode for the new standard curve. There are four testing modes for option: TOC, NPOC, TC and TIC. User can select according to test requirements..

Click 

after setting the parameters, and enter the measurement interface of standard curve establishment (Fig. 5.26).

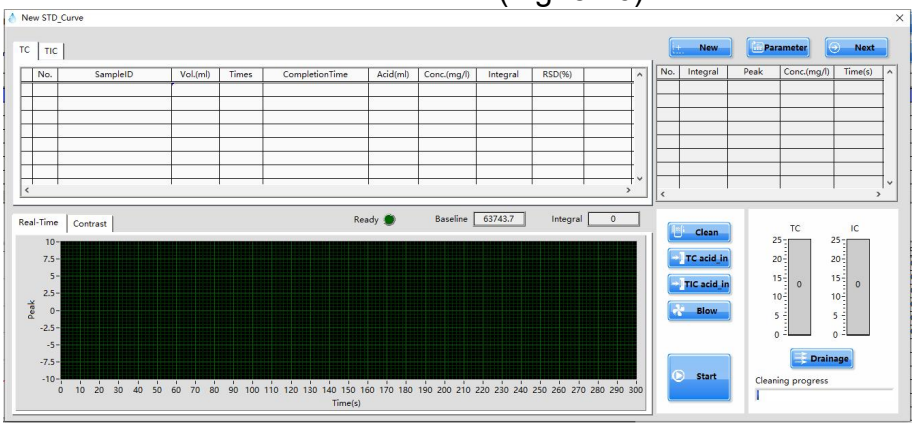


Fig. 5.26

: Used to add registered standard concentration points to the test list, which involves setting some test conditions (Fig. 5.27).

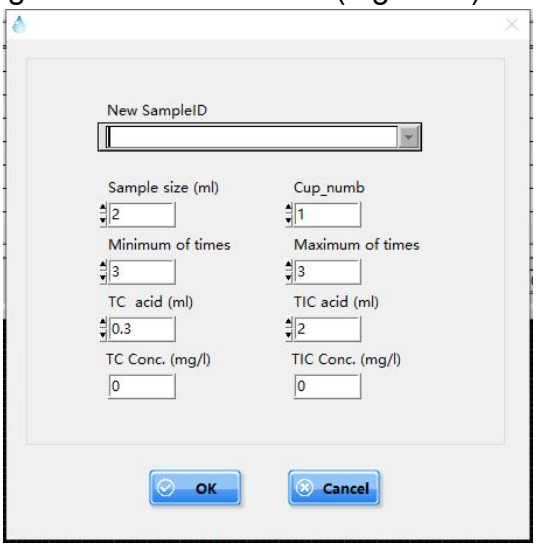
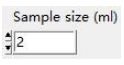
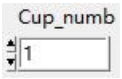


Fig. 5.27

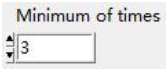
: Drop-down to select the registered sample number to add to the test list.



: Injection volume setting for standard sample test. The default is 2 ml.

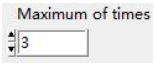


: Used to set the standard cup position when using auto-sampler. (unavailable in stand-alone mode).

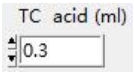


: The minimum number of standard sample measurements and the

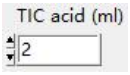
final number of test results selected.



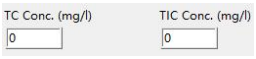
: Maximum number of sample measurements when SD or RSD criteria are not met.



: The amount of acid intake required for TC test of standard sample. The default value is 0.3 ml.

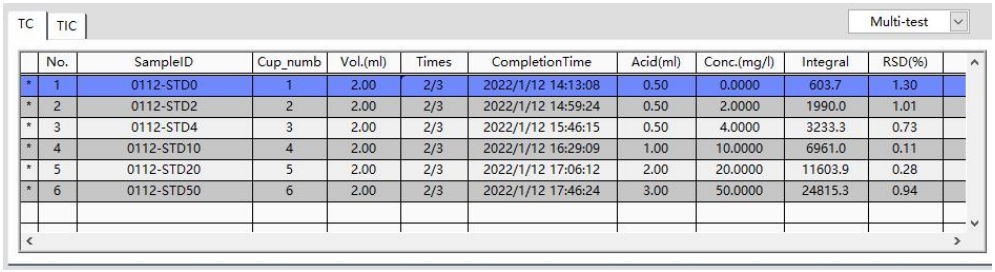


: The amount of acid intake required for TIC test of standard sample. The default value is 2 ml.



: Concentration input when registering standard sample.

Test information for all standard curve concentration points is displayed in 'Test Progress List' (Fig. 5.28). Right-select a row to delete it.



	No.	SampleID	Cup_numb	Vol.(ml)	Times	CompletionTime	Acid(ml)	Conc.(mg/l)	Integral	RSD(%)
*	1	0112-STD0	1	2.00	2/3	2022/1/12 14:13:08	0.50	0.0000	603.7	1.30
*	2	0112-STD2	2	2.00	2/3	2022/1/12 14:59:24	0.50	2.0000	1990.0	1.01
*	3	0112-STD4	3	2.00	2/3	2022/1/12 15:46:15	0.50	4.0000	3233.3	0.73
*	4	0112-STD10	4	2.00	2/3	2022/1/12 16:29:09	1.00	10.0000	6961.0	0.11
*	5	0112-STD20	5	2.00	2/3	2022/1/12 17:06:12	2.00	20.0000	11603.9	0.28
*	6	0112-STD50	6	2.00	2/3	2022/1/12 17:46:24	3.00	50.0000	24815.3	0.94

Fig. 5.28

: Test the list on the full table. You can also select a single line tests. This option is not available in stand-alone mode.

Display the current test peak shape in real time and view the peak shape comparison of multiple tests (Fig. 5.29). The detector stability indicator light is bright green, indicating that the detector is stable.

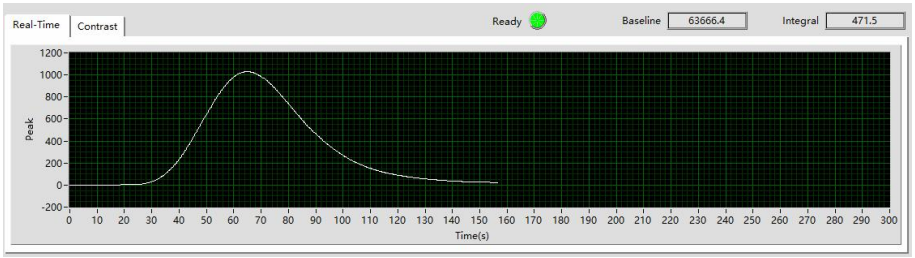


Fig. 5.29

Multiple parallel test data show integral value, peak value, concentration, time and other information (Fig. 5.30). The red data represents the data values selected for this test.

No.	Integral	Peak	Conc.(mg/l)	Time(s)
1	609.2	1298.6	0.0000	200
2	659.6	1362.2	0.0000	194
3	598.1	1317.6	0.0000	155

Fig. 5.30

Parameter: Enter the interface for viewing and adjusting test parameters. The basic parameter interface shows the main parameter setting values used in the standard curve test (Fig. 5.31).

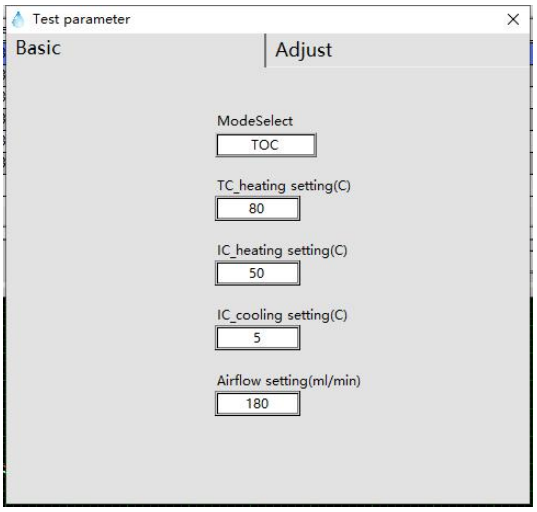


Fig. 5.31

Adjustment parameter interface (Fig. 5.32).

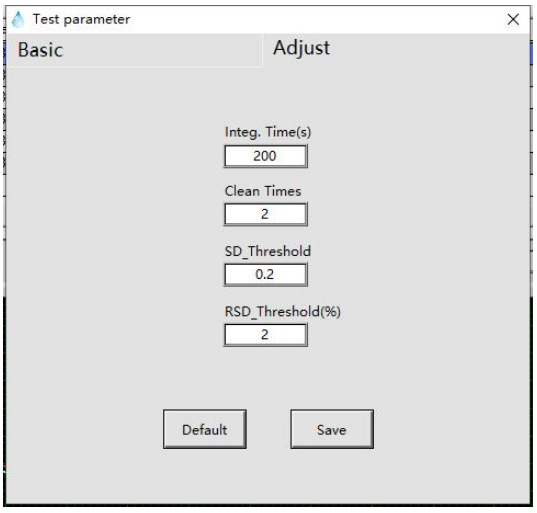
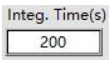
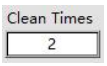


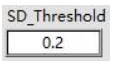
Fig. 5.32



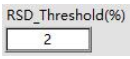
: Maximum time for peak shape display.



: The number of times to clean the pipeline, the default is 2.

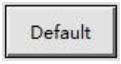


: The SD value of the standard sample integral value is taken as the determination condition of whether the test is over. When the selected data integral value SD value is less than or equal to this value, the judgment test is completed.



: The RSD value of the standard sample integral value is taken as the determination condition of whether the test is over. When the selected data integral value RSD value is less than or equal to this value, the judgment test is completed.

Note: SD threshold and RSD threshold are used as the criteria to determine whether the test is over. Either of them can be satisfied. If neither of them is satisfied, the test will continue until the maximum number is reached.



: Click to restore the adjustment parameters to their default values.

: Click to save and use the current adjustment parameters.

Real-time display of TC and IC liquid level and drain button (Fig. 5.33)

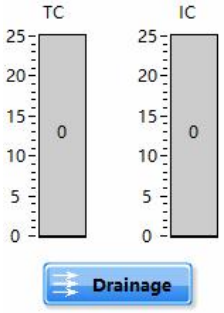
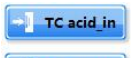
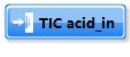


Fig. 5.33

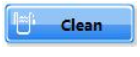




:TC & IC pool according to the set amount of acid into acid.

: Start test sample button. When the test is running, click to stop the test.

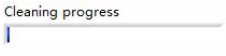
: For NOPC mode aeration purge button, click to set the time.



: Perform sample cleaning line operation connected by the

instrument inlet in Stand-alone Mode.

: Connect the auto-sampler cleaning line button. The cleaning is done by placing the sample (pure water) in the C-cup position of the auto-sampler to clean the pipeline.



: The progress display of instrument cleaning operation.

5.2.4 Sample Test Interface

Click 

in the main interface to enter the measurement interface (Fig. 5.34).

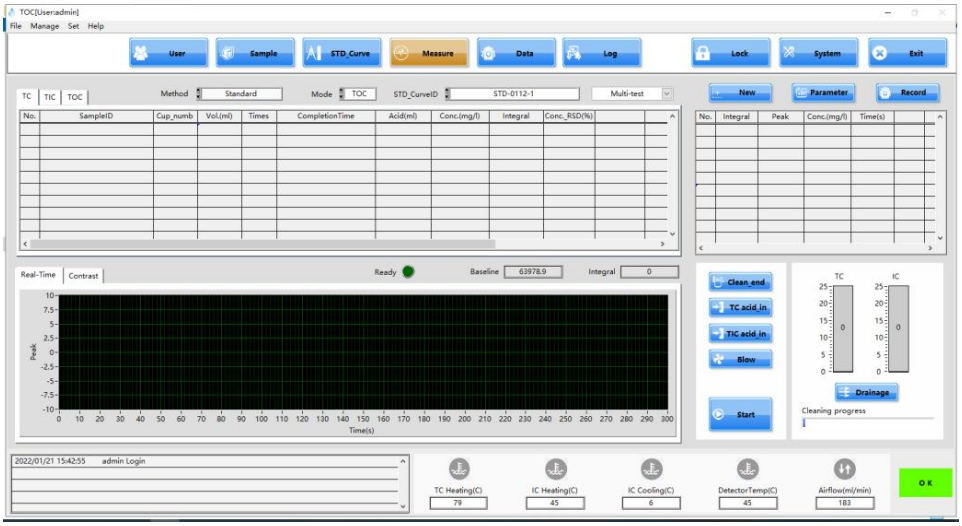


Fig. 5.34

: New sample test (Fig. 5.35).

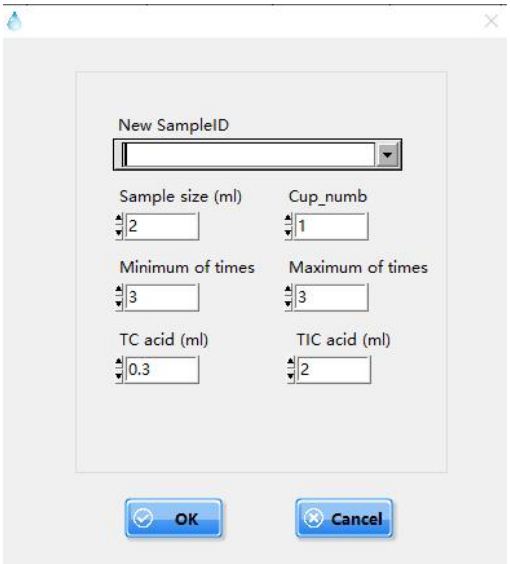
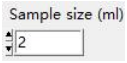
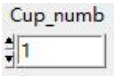


Fig. 5.35

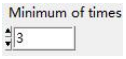
: Drop - down select the registered sample number to add to the test list.



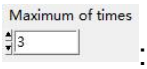
: Sample volume setting for sample testing. Default is 2 ml.



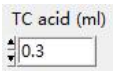
: The cup number of the automatic injector for standard sample placement. Unavailable in Stand-alone Mode.



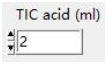
: The minimum number of standard sample measurements and the final number of test results selected.



: The maximum number of times a sample is measured when the SD or RSD criteria are not met.

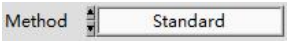


: The amount of acid intake required for TC testing of the sample. The default value is 0.3 ml.

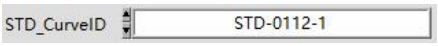


: The amount of acid intake required for TIC test of standard sample. The default value is 2 ml.

: Sample test mode. Users can select TOC, NPOC, TC and TIC according to the actual test.



: Sample test method selection. In TOC, TC, and TIC mode, user can select Only 'Standard Test'. In NPOC mode, user can select 'Standard Test', 'Quality Control Sample test', and 'System Suitability Test'.



: The fitting standard curve selected for sample test.

: Perform full table data test. Testing the list on a single line is also for option. This option is not available in Stand-alone Mode.

Display the current test peak shape in real time and view the peak shape comparison of multiple tests (Fig. 5.36). The detector stability indicator light is bright green, indicating that the detector is stable.

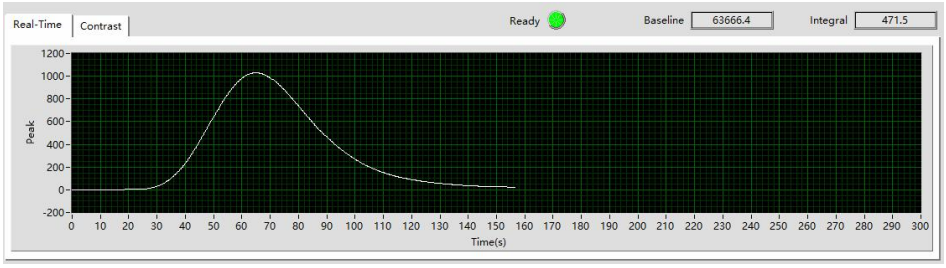


Fig. 5.36

Multiple parallel test data show the integral value, peak value, concentration, time and other information (Fig. 5.37). The red data are the data values selected for the test.

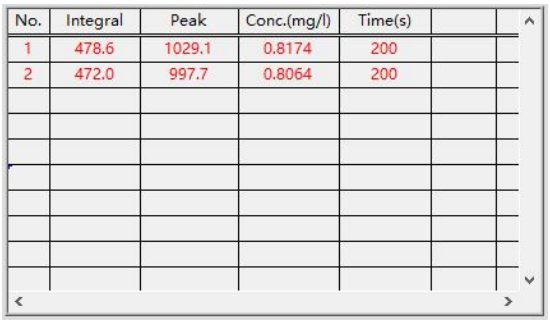


Fig. 5.37

: Enter the interface for viewing and adjusting test parameters. The basic parameter interface shows the main parameter setting values used in the standard curve test (Fig. 5.38).

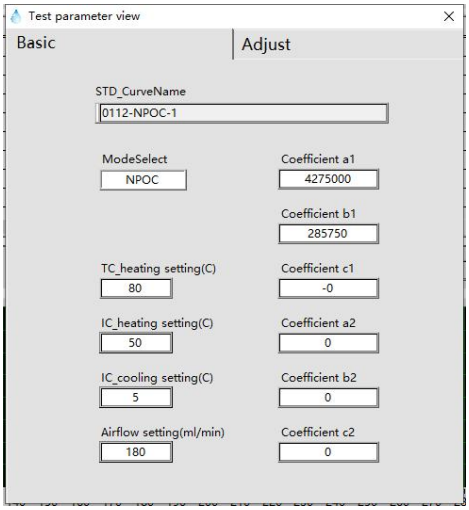


Fig. 5.38

Adjustment parameter interface (Fig. 5.39).

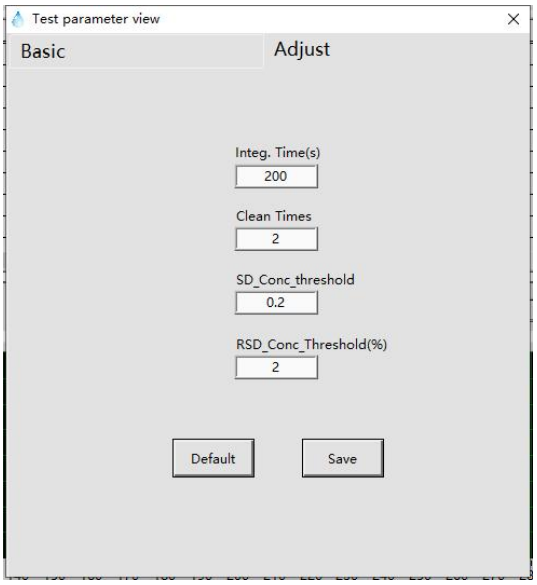
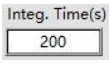
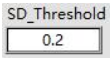


Fig. 5.39



: Maximum time for peak shape display.

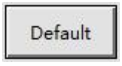
: The number of times to clean the pipeline, the default is 2.



: The SD value of the standard sample integral value is taken as the determination condition of whether the test is over. When the selected data integral value SD value is less than or equal to this value, the judgment test is completed. Default is 0.2.

: The RSD value of the standard sample integral value is taken as the determination condition of whether the test is over. When the selected data integral value RSD value is less than or equal to this value, the judgment test is completed. The default is 2.

Note: SD threshold and RSD threshold are used as the criteria to determine whether the test is over. Either of them can be satisfied. If neither of them is satisfied, the test will continue until the maximum number is reached.



: Click to restore the adjustment parameters to their default values.

: Click to save and use the current adjustment parameters.

Real-time display of TC and IC liquid level and drain button (Fig. 5.40)

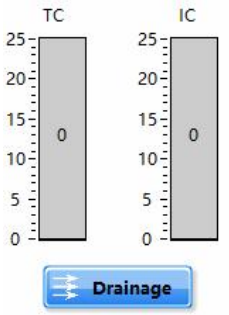


Fig. 5.40

TC acid_in

TIC acid_in :TC & IC pool according to the set amount of acid into acid.

Start: Start test sample button. When the test is running, click to stop the test.

Blow: For NOPC mode aeration purge button, click to set the time.

Clean : Perform sample cleaning line operation connected by the instrument inlet in Stand-alone Mode.

Clean_end: Connect the auto-sampler cleaning line button. The cleaning is done by placing the sample (pure water) in the C-cup position of the auto-sampler to clean the pipeline.

Cleaning progress : The progress display of instrument cleaning operation.

Record: Test Interface Button for viewing historical test records (Fig. 5.41).

Fig. 5.41

'Tester ID', 'Sample ID', 'STD_Curve', 'Start Time', 'End Time' and 'Method' are the query conditions. User can input the corresponding information single or in combination, and then select 

, the test data information that meets the conditions is displayed in the following list (Fig. 5.41).

5.2.5 Measurement Record Interface

Click 

to enter measurement record interface. (Fig. 5.42).

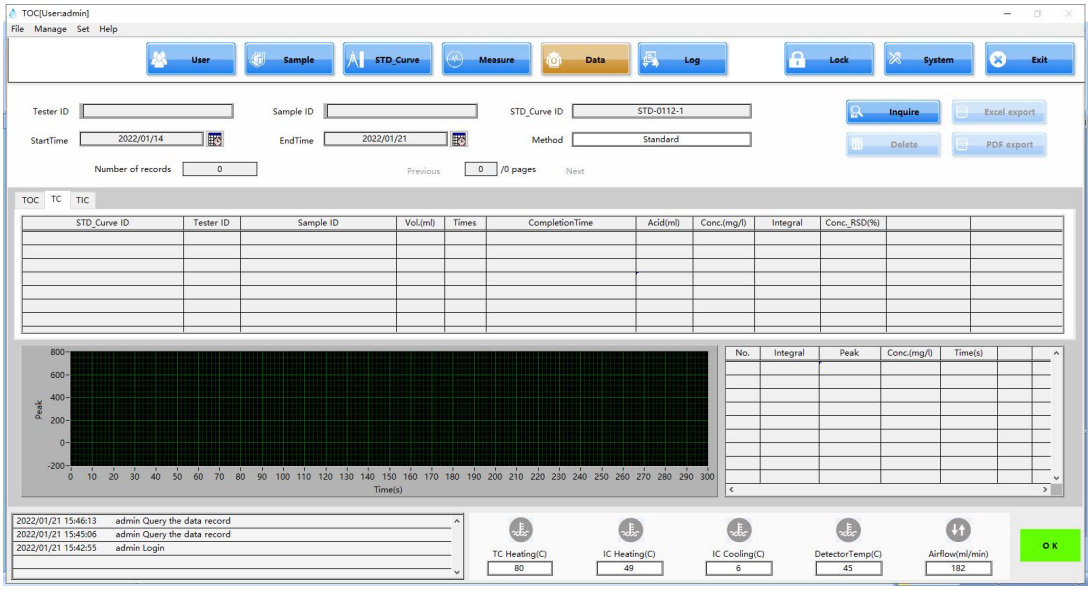


Fig. 5.42

'Tester ID' 'Sample ID' 'STD_Curve ID' 'Start Time' 'End Time' and 'Method' are only for query conditions. User can input the corresponding information single or in combination, and then select 

, the test data information that meets the conditions is displayed in the following list. 'Number of Records' will show total times of current queries, user can click Previous page or Next Page to search for records, or enter the number of pages to index records. By default, the time query range is the latest week. Click to select a single row of data in the data summary table, and the test data record and test waveform will be displayed in the corresponding unit (Fig. 5.43).

Fig. 5.43

Delete is used for deleting data records in the list. First search the data that user wants to delete and click delete button to get a prompt (Fig. 5.44), click confirm after inputting delete reason to complete deleting.

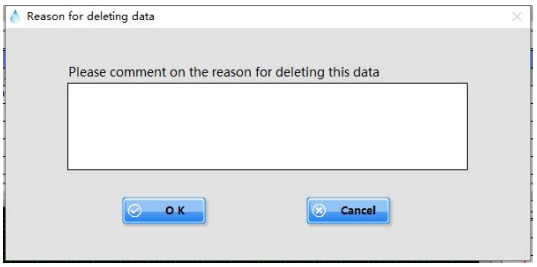


Fig. 5.44

Excel export / PDF export is used for export sample measurement report. First find data to be exported by searching, click Excel export to export the data in Excel format or click PDF export to export the data in PDF format. Click data that needs to be exported and click the export button (Fig. 5.45).

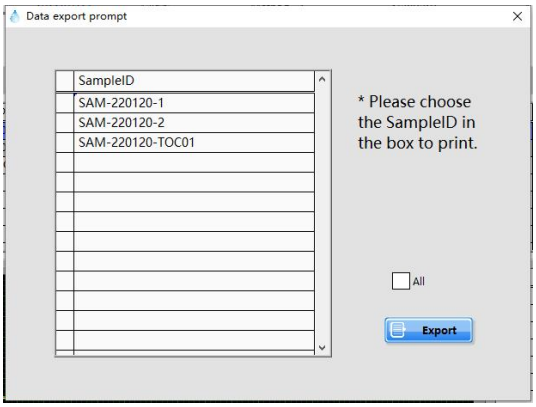


Fig. 5.45

5.2.6 Log Interface

Click 

to enter log management interface (Fig. 5.46).

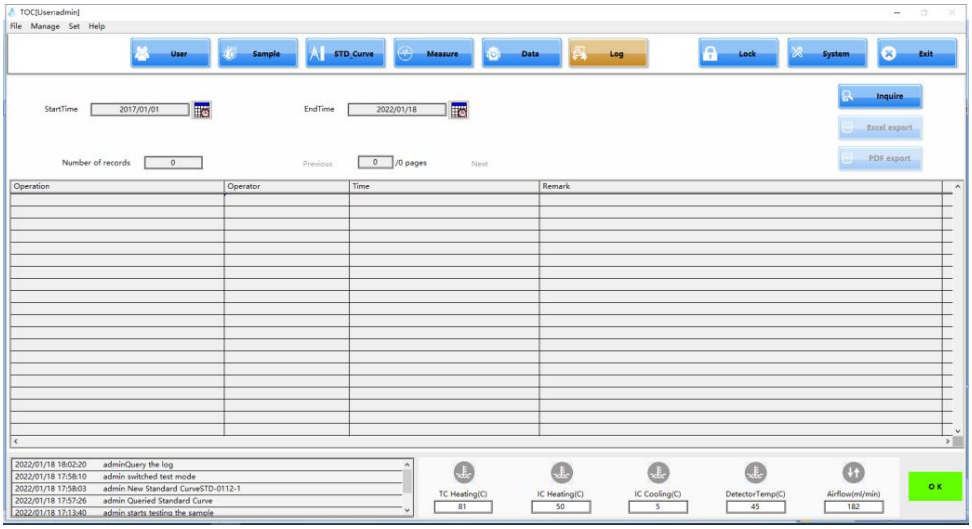


Fig. 5.46

'Start Time' and 'End Time' are only for query conditions. Click 

, the test data information that meets the conditions is displayed in the following list. 'Number of Records' will show total times of current queries, user can click Previous page or Next Page to search for records, or enter the number of pages to index records (Fig. 5.47).

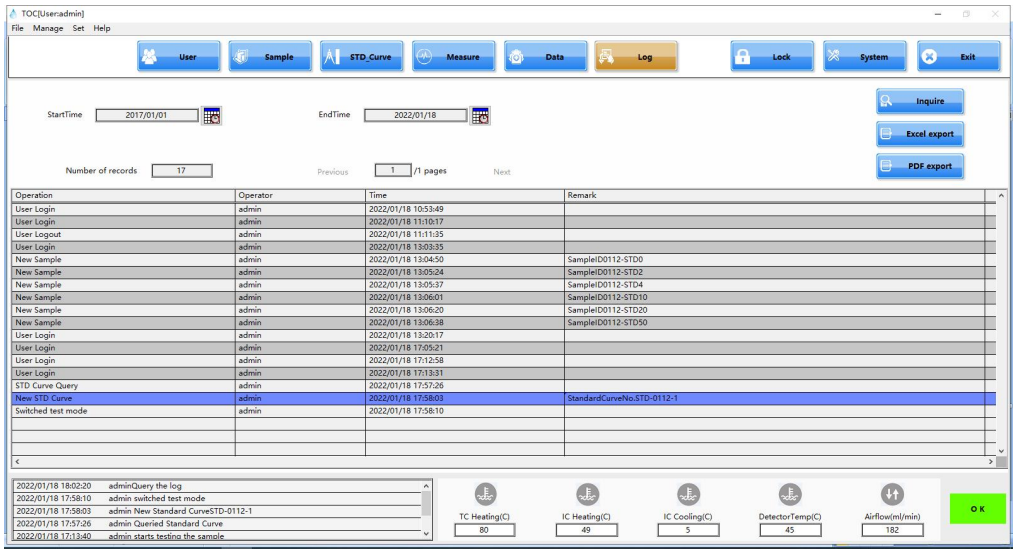


Fig. 5.47

Excel export / PDF export are used for exporting log information in Excel or PDF format.

Note: The records in the Log which includes most software operation records cannot be deleted or modified.

Chapter 6 Maintenance and Maintain

6.1 Maintenance Plan

	Maintenance project	Maintenance cycle
The analyzer	Check gas flow	Make sure the gas flow is 180±5mL/min when turn on and turn off the machine.
	Check the pump and valve to make sure they are working properly	Check the pump and valve on the software interface Before starting the experiment every day.
	Clean and maintenance the instrument	Every week
	Check the gas pipeline and make sure the screws are tighten	Every week
Filter membrane	Check leakage or blockage	Check before starting the experiment every day, replace it if there is any problem.
Halogen removing tube	Check the color of copper particles	Check before starting the experiment every day，replace it when more than half of copper particles turn black.
Peristaltic pump	Check leakage	Every week

6.2 Consumables Table

Name	Specifications	Exchange cycle	Replacement method	Comments
Quartz wool	0.2g/pack	Change it once the color of halogen removing material changes.	Refer to '6.3.2.3'	
Halogen removing material	30g/pack		Refer to '6.3.2.3'	

Filter membrane	0.45μm hydrophobic	One month	Refer to '6.3.2.2'	
Pump line of peristaltic pump	BPT NSF-51	Twelve months	Refer to '6.3.3.1 '	
UV lamp	10W	Six months	Refer to '6.3.5.3'	

6.3 Maintain Project and Maintenance Methods

6.3.1 Gas Flow

Observe the gas flow after switching on every time, the value of gas flow displayed in software should be **180±5 mL/min.**

6.3.1.1 Explanation

TOC-3000 is an instrument which used for measuring the carbon content in water based on the principle of *Wet Chemical Oxidation Non-dispersive Infrared Absorption method*. To guarantee the measurement accuracy, the gas flow is suggested to be stable in the range of 180±5mL/min since the response value is correlated with carrier gas flow.

6.3.1.2 Phenomenon analysis

Many reasons would cause gas flow vary over a period of time, here list some common reasons

1)The nitrogen pressure reducer didn't adjust to 0.2MPa-0.3MPa.

2)Steady flow valve is closed: the pressure of carried gas is controlled by the steady flow valve by adjusting the knob, when the knob is closed, the display value of gas flow is low or even zero.

3)Air leakage: the carried gas out of the reducing valve flows through the gas box, TC digestion cuvette, TIC reactor, filters, halogen removing tube, flow sensor, eventually enter the detector, there are many fastener connections between the entire flow path, and the joints may be loose. In particular, leakage can be caused by nut loosening in the process of rising temperature and cooling, and the phenomenon reflected on the instrument is that gas flow declines continuously.

4)Gas path is blocked: fillers in halogen removing tube become bigger and filter membrane is blocked by the water vapor when the instrument is used for a period of time (The length of time is related to the experimental frequency, sample salt content, turbidity, etc.), resulting in that gas flow is low or zero.

5) Glass parts are broken: The TOC-3000 analyzer includes three glass fittings: UV digestion tank, IC reaction tube and halogen removal tube, broken glass parts will result in that gas flow becomes lower or even zero.

6)Inner parts of gas box are damage: the electromagnetic valve, the voltage stabilizing and the steady flow valve can be stable and effective for a long period of time, but the uncertain factors cannot be eliminated to cause broken parts.

7)Flow sensor is damage: flow sensor work is simple and stable, but the special reasons cannot be eliminated to cause flow sensor damage, which results in abnormal gas flow display.

6.3.1.3 The solutions of abnormal gas flow

6.3.1.3.1 Adjust the pressure reducing value

Please refer to section 4.2.2, adjust the oxygen pressure to 0.2MPa- 0.3MPa.

6.3.1.3.2 Adjust the regulator

Adjust the Pressure knob on the back of the case to maximum(Fig.6.1).

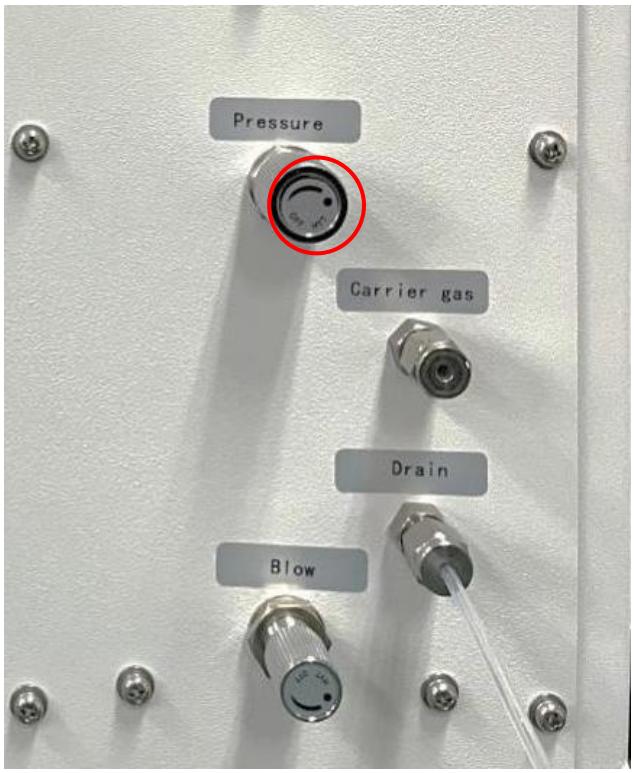


Fig.6.1

6.3.1.3.3 Troubleshoot of accessory damage and gas blocking

Check that the pressure of the reducing valve is between 0.2 and 0.3MPa, and the voltage regulator has been adjusted to the maximum.

1) Open the login interface (Fig.6.2), enter user number: admin, password:

666666 to log in, and enter the main interface (Fig.6.3) after warm-up.

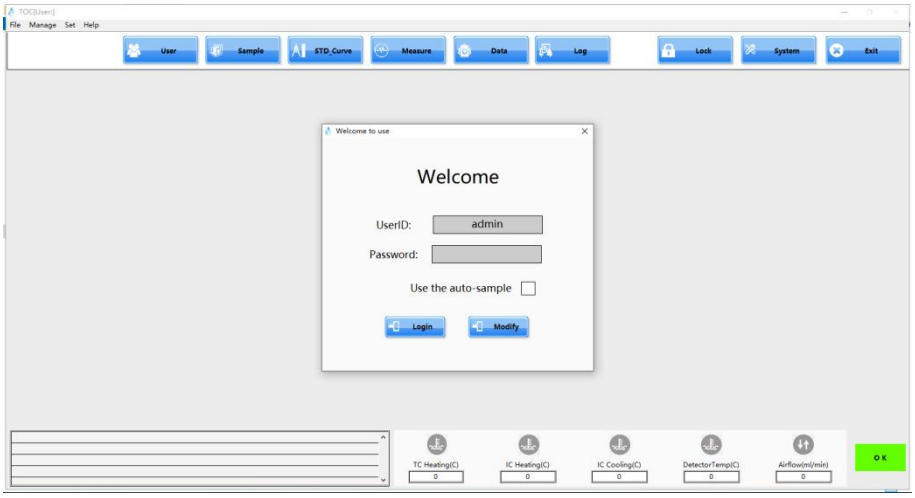


Fig.6.2

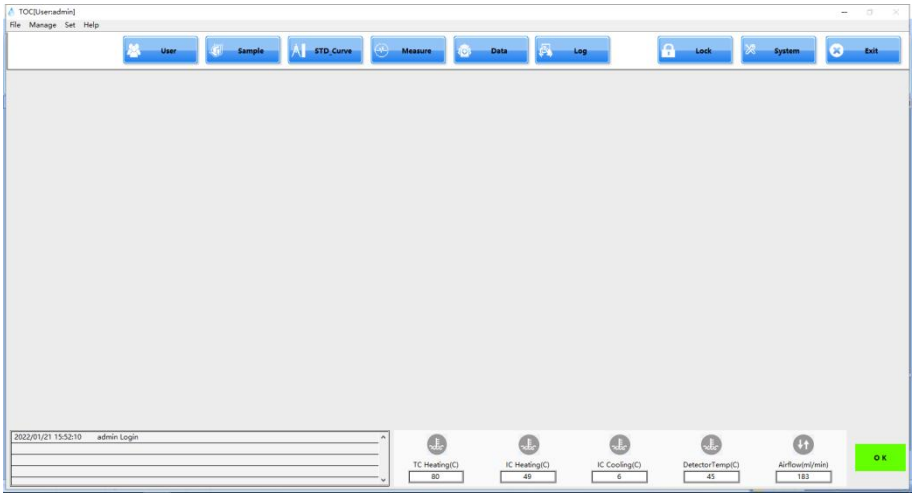


Fig.6.3

2)Click 

, make sure it has standard curve (Fig.6.4).

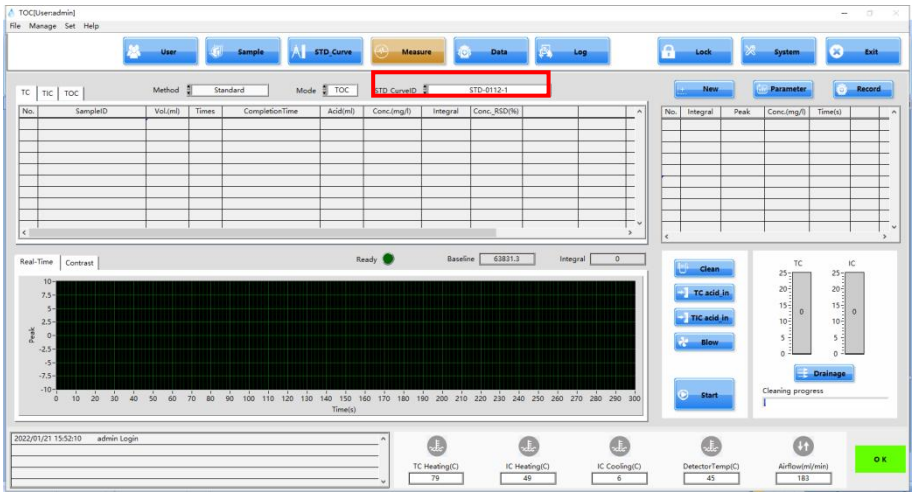
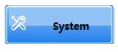


Fig.6.4

3) click 

to enter the maintenance interface, then click 'Single

Operation Panel' (Fig.6.5), Check if initial flow is180±5 mL/min (Fig.6.5), if yes, continue the next step; otherwise, please contact the after-sales person, the gas box should be returned to factory for repair or replacement (refer to section 6.3.2.1 Replace the gas box).

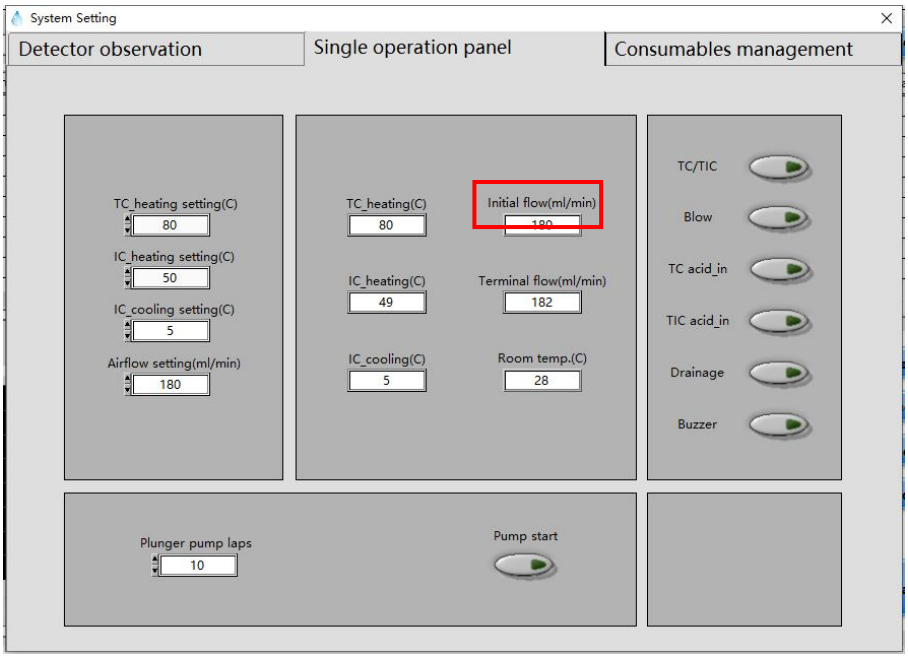


Fig.6.5

4) Open the door panel on the left side of the instrument, unscrew the exhaust stainless steel nut connected with the gas path box and the UV digestion tank, remove the nut, and connect a gas pipe of more than 100cm to the exhaust interface through the nut (Fig. 6.6); Unscrew the right air route nut of the halogen removal tube (Fig. 3.1) and remove the nut to expose the gas tube through the rubber hose (note: Do not bend the rubber hose) connect the gas pipe to the other end of the 100cm gas pipe (Fig. 6.7), and observe whether the gas flow on the software is 180±5mL/min at this time. If it is normal, restore the gas pipe nut on the right side of the halogen pipe, and maintain the existing connection mode of the air outlet interface for step 5). If it is beyond the range, connect the stainless steel nut connected to the air outlet to the air blowing interface (Fig. 6.8), enter the interface of 'Single Operation Panel', click the 'Blow' button (Fig. 6.9), and observe that if the gas flow on the software at this time is 180±5mL/min, then the air path box is damaged. Contact after-sales engineers to return the air circuit box (see '6.3.2.1 Replacing an Air circuit Box') to the factory for repair or replacement. If not, contact after-sales engineers to return the flow sensor circuit board (refer to '6.3.2.4 Replacing a Flow Sensor Circuit Board') to the factory for repair or replacement.

Fig.6.6

Fig.6.7

(Fig.6.8)

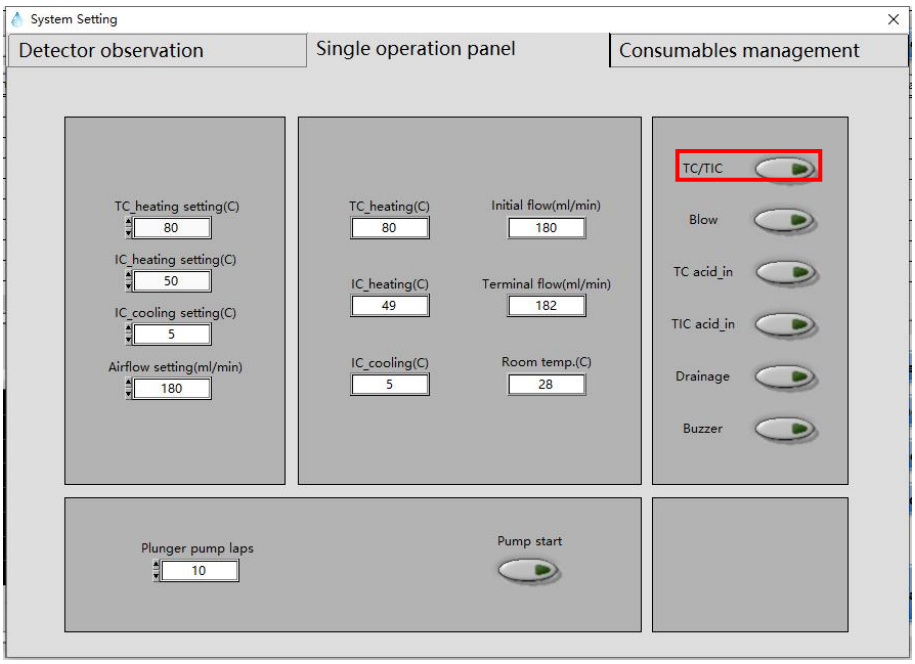
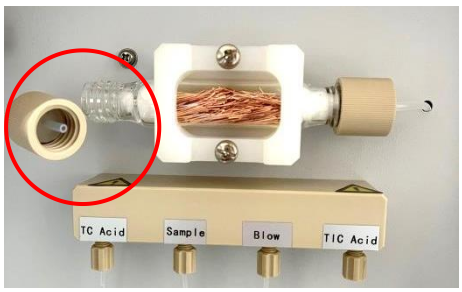


Fig.6.9

5) Unscrew the nut on the left side of the halogen dehalogen tube and connect it with the sealing ring. Remove the other end of the 100cm gas pipe through the nut and extend the pipe about 1cm out of the sealing ring (Fig.6.10) and screw it to the joint on the left side of the halogen dehalogen tube (Fig.6.11). Observe whether the gas flow on the software at this time is 180±5mL/min. If normal, remove the nut on the left side of the halogen tube and perform step 6. If it is beyond the scope, the halogen tube is blocked or broken, and the filling or halogen tube needs to be replaced (see '6.3.2.3 Replacing halogen Device').



(Fig.6.10)

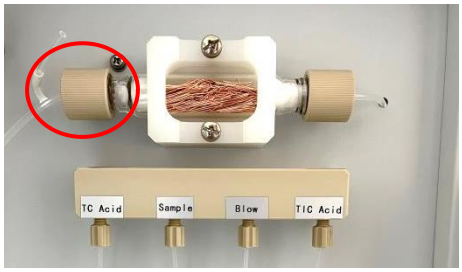


Fig.6.11

6) Unscrew the air passage nut below the filter (Fig. 3.1) (Fig. 6.12), connect the other end of the 100cm air pipe to the air pipe inside the nut through a rubber hose (Fig. 6.13), and observe whether the gas flow on the software is 180±5mL/min at this time. If it is normal, restore the air passage nut below the filter and proceed to step 7). If it is beyond the scope, the filter is blocked and the filter membrane needs to be replaced (refer to '6.3.2.2 Replacing filter Membrane').

Fig.6.12

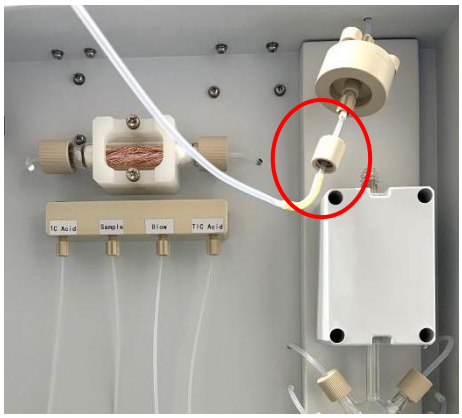


Fig.6.13

7)Unscrew the nut of the air inlet in the IC reaction tank (Fig. 3.1) (Fig. 6.14), pull out the gas pipe from the IC reaction tank and remove the nut (Fig. 6.15), then screw the other end of the 100cm gas pipe on the air inlet joint through the nut (Fig. 6.16), and observe whether the gas flow on the software is 180±5mL/min. If it is normal, it means that the gas path is blocked or air leakage is generated in the UV digestion tank module, which needs to be disassembled and returned to the factory for maintenance according to '6.3.5.2 Replacement of the UV digestion Tank'. If beyond the scope, contact after-sales engineers for further judgment. At this point, the whole gas flow

investigation is completed.

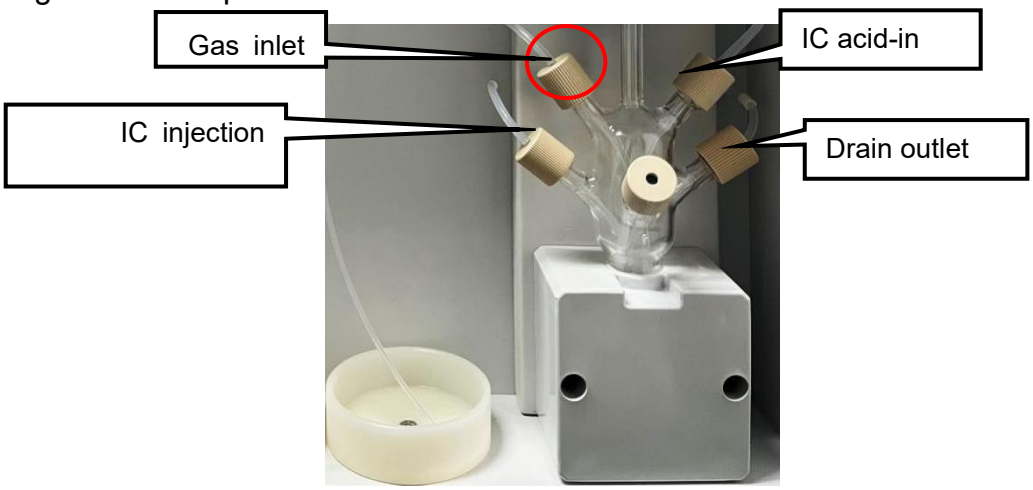
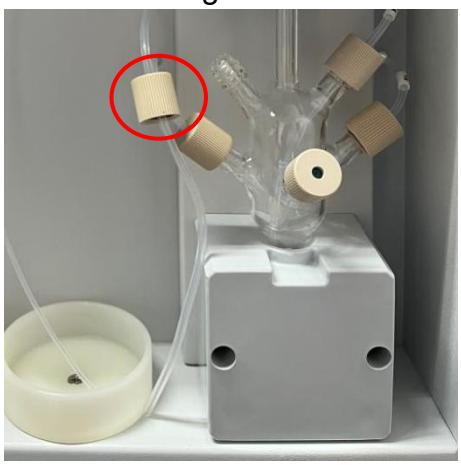


Fig.6.14



(Fig.6.15)

Fig.6.16

6.3.2 Replacing gas box

6.3.2.1 Gas box replacement

1) Open the left door panel of the instrument, unscrew the two stainless steel nuts and wire plugs, and unscrew the drain pipe connector (Fig.6.17).

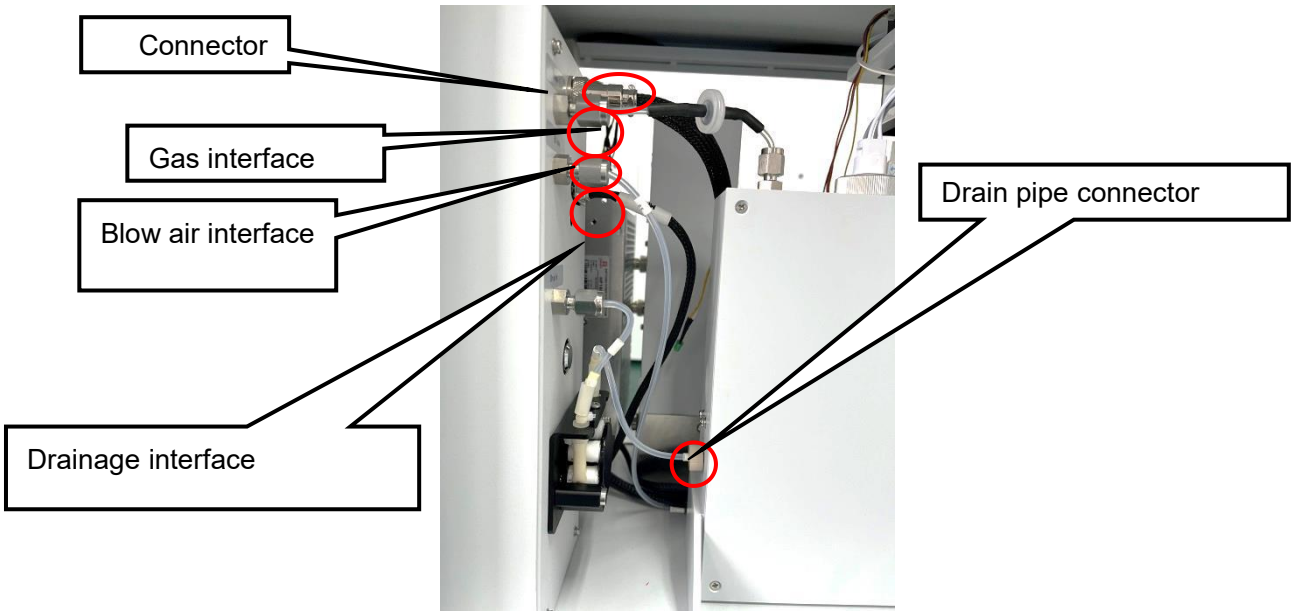


Fig.6.17

2) Unscrew stainless steel nuts of inlet air pipe and exhaust pipe on the cover plate of the gas box (Fig.6.18).

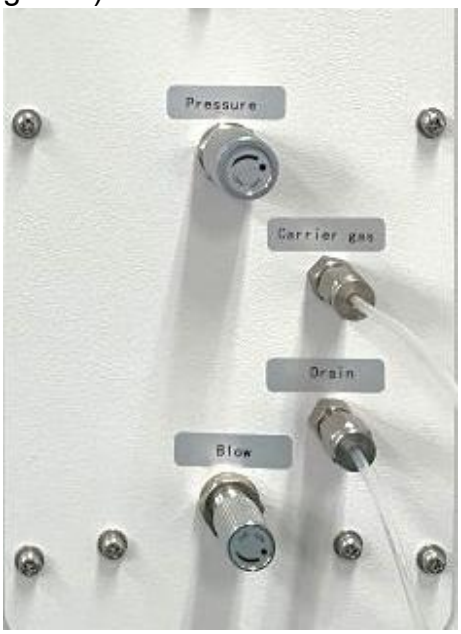


Fig.6.18

3)Screw out the six screws marked by the red circle with a cross screwdriver (Fig.6.19) to remove the gas box from the inside of instrument.

Fig.6.19

4)Install the gas circuit box according to the above converted steps.

6.3.2.2 Replacing filter membrane

The filter acts as a device for isolating water vapor from the gas flow path. When the filter membrane in the filter is affected by water vapor, the gas flow will be abnormal and the filter membrane needs to be replaced.

1) Unscrew the nut under the filter (Fig.6.20).

Fig.6.20

2) Unscrew the filter, replace the membrane, make sure the smooth surface of the filter membrane is toward the lower end of the filter and the rubber ring is pressed on the rough surface of the membrane (Fig.6.21).

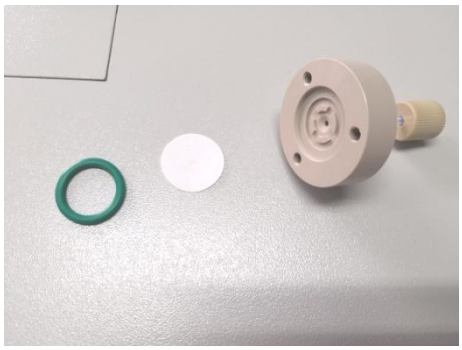


Fig .6.21

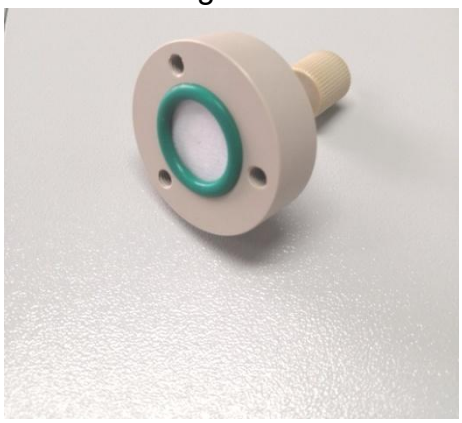


Fig. 6.22

3) Tighten the filter and the nut to complete the replacement.

6.3.2.3 Replacement of halogen removing device

Halogen removing device is an important device to protect the detector. When more than half of the halogen supply in the halogen tube turns colors, the protective effect is greatly weakened, and the halogen supply and quartz wool are needed to be replaced.

1)Unscrew the nuts on the both sides of the halogen removing tube and the fixed screws (Fig.6.23).

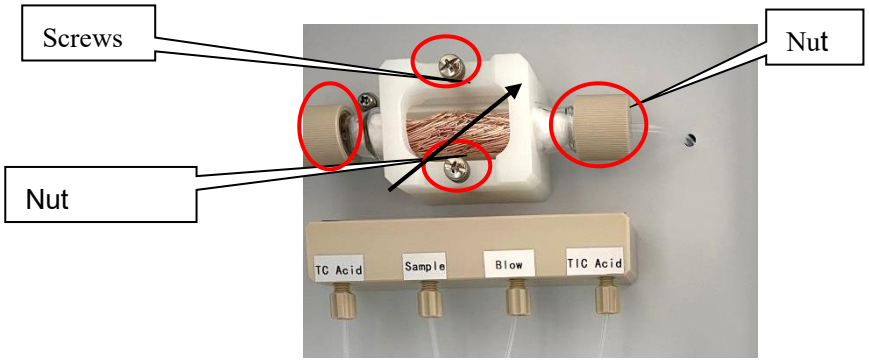


Fig.6.23

2)Take out the quartz wool and the ineffective halogen supplies, clean the halogen tube with pure water, dry at 105℃ and reserve.

3)Remove the new quartz wool, halogen supplies and steel pipe with elbow (Fig.6.24).

Fig.6.24

4)Pour 30g of halogen supplies into the halogen removal tube ,Halogen traps are evenly adjusted to both sides of the halogen removal tube (Fig.6.25).

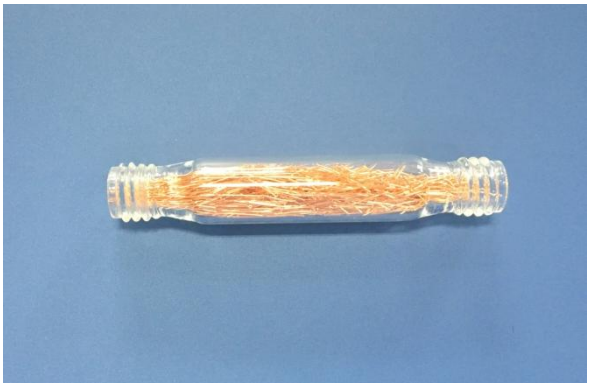


Fig.6.25

5)Block the ends of the halogen removal tube with quartz wool (Fig. 6.26).

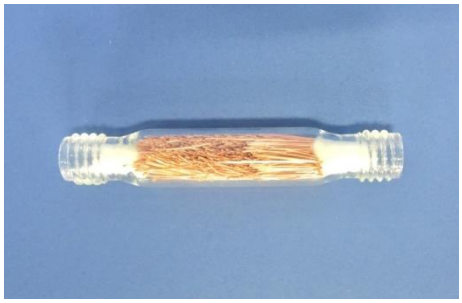


Fig.6.26

6)Put the filled halogen removal tube into the slot, cover the mount, and tighten the screws and the nuts on both sides.

6.3.2.4 Replacing circuit board of flow sensor

1) Open the door panel on the right side of the host, unscrew the inlet stainless steel nut (Fig. 6.27) of the detector (Fig. 3.3) and remove the nut.

Fig.6.27

2) Unscrew the nut on the right of the halogen removal tube and remove the nut referring to (Fig.6.28)

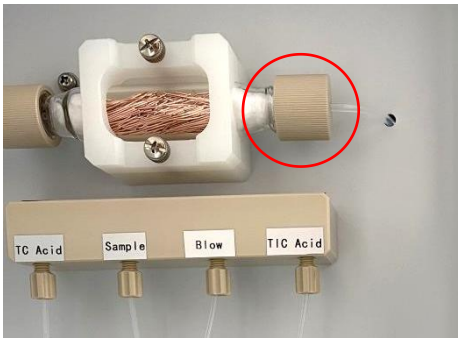


Fig.6.28

3)Unplug all wire plugs on the circuit board where the flow sensor is located (Fig.3.3) and record the location of each plug for later installation (Fig.6.29).

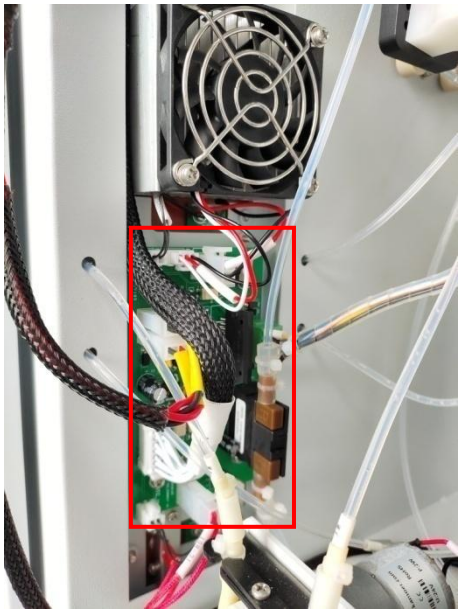


Fig. 6.29

4) Unscrew the four fixing screws on the circuit board where the flow sensor is located to remove the circuit board.
5) Install the flow sensor on the circuit board in reverse steps as described above

6.3.3 Pump and Valve

TOC-3000 analyzer has a lot of pumps and valves, the conventional parts are adding acid peristaltic pump, discharge peristaltic pump, injection plunger

pump, TC/TIC injection and discharge switch valve, blowing control valve and so on. These pumps, valves play a crucial role on the test and should be carried out routine inspection.

6.3.3.1 Inspecting acid peristaltic pump

6.3.3.1 Replacement of peristaltic pump pipe

If the peristaltic pump tube has been using for more than 12 months, or the pump tube is broken and has night leakage, the pump tube needs to be replaced.

6.3.3.1.1 Replacement of IC acid intake peristaltic pump pipe

1) Open the right cover of the instrument .Unscrew the liquid inlet connector of IC acid peristaltic pump pipe (Fig. 6.30).

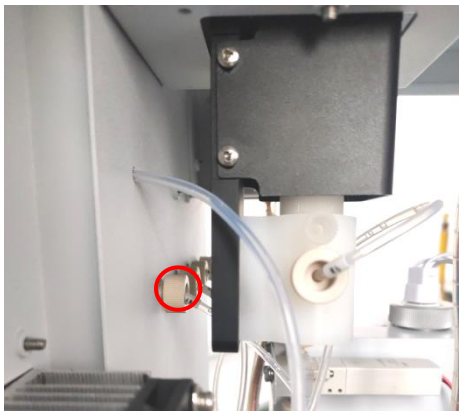


Fig. 6.30

2)Unscrew the acid inlet nut (at the lower right corner) from IC reaction tank, pull out the pipeline and remove the nut (Fig. 6.31) .

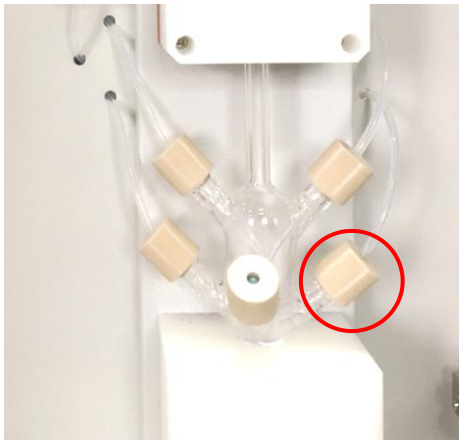


Fig. 6.31

3)Open the right cover of instrument, unscrew and remove the fixing screw and cover plate(Fig. 6.32) .

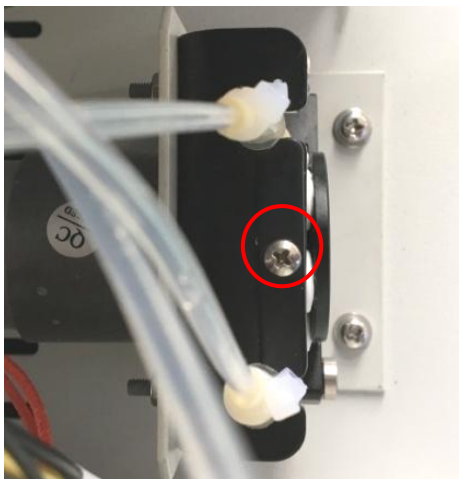


Fig.6.32

4)Loosen the hand screw nut of peristaltic pump (Fig. 6.35), translate it outward to take off the pump tube.

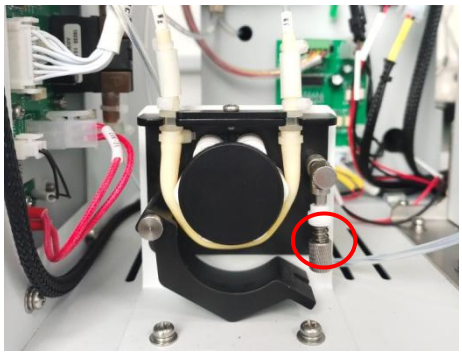


Fig.6.33

5)Prepare a new pump tube (Fig. 6.36), install it in reverse steps as described above.

Fig.6.34

6.3.2.2 Replacing the pipe of acid peristaltic pump

1) Open the door panel on the left side of the instrument and screw down the liquid inlet connector of TC acid peristaltic pump pipe(Figure6.35)

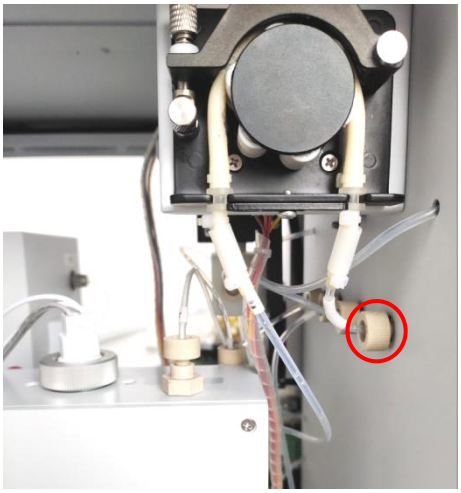


Fig.6.35

2)Open the door panel on the right side of the instrument and screw down the outlet connector of the TC acid peristaltic pump pipe (Fig.6.36) .

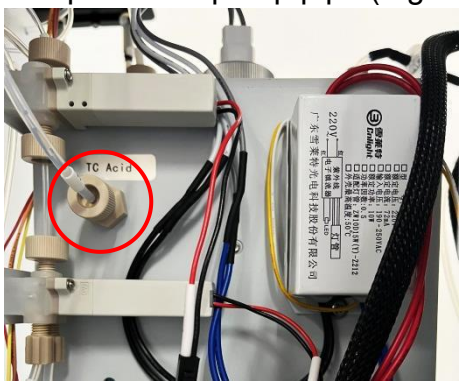


Fig.6.36

3)Unscrew the fixing plate of the pump tube of the TC acid peristaltic pump (Fig. 3.2) with a cross screwdriver, and remove the cover plate (Fig. 6.37).

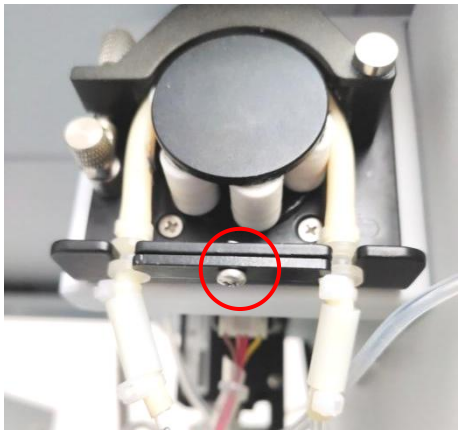


Fig.6.37

4)Unscrew the hand screw nut of the peristaltic pump tube gland (Fig. 6.38) and remove the pump tube by moving it outwardly .

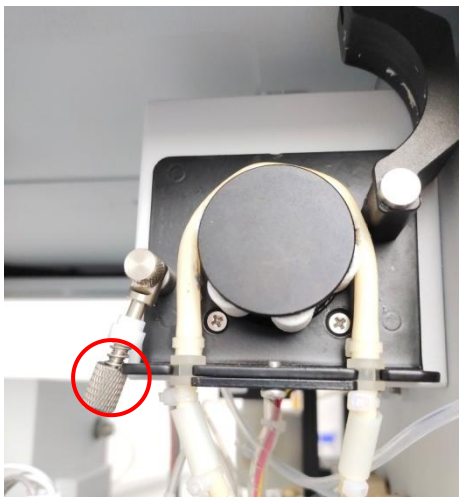


Fig.6.38

5)Please install the new tube referring to the above adverse steps (Fig.6.39).

Fig.6.39

6.3.3.1.3Drain peristaltic pump tube replacement

1) Open the left cover of instrument. Unscrew the two joints from both ends of the drain peristaltic pump tube (Fig.6.40).

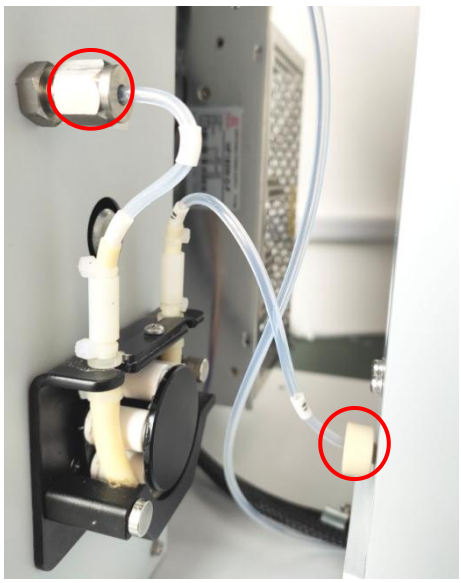


Fig.6.40

2)Unscrew the fixing screw and remove the cover plate (Fig.6.41).

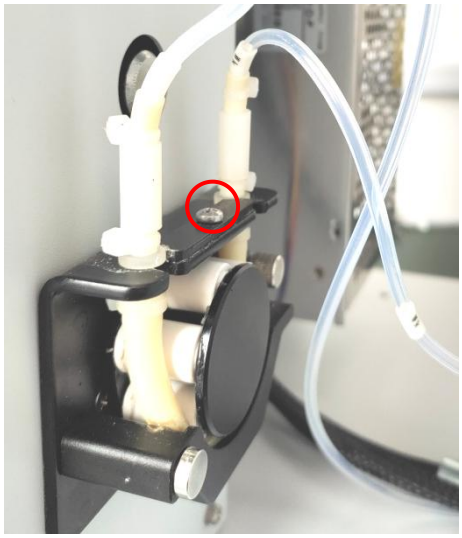


Fig.6. 41

3)Loosen the hand screw nut of the drain peristaltic pump (Fig. 6.42), translate it outward to take off the pump tube.

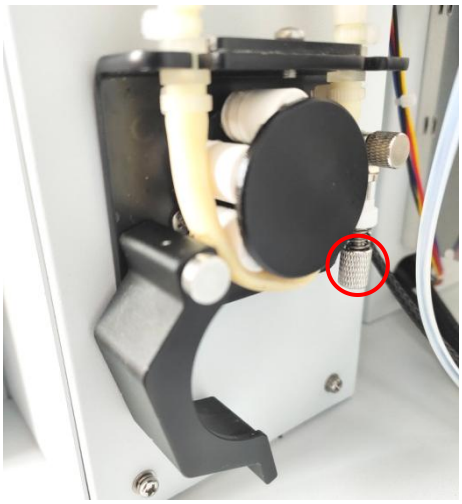


Fig.6. 42

4) Prepare a new pump tube (Fig. 6.43), install it in reverse steps as described above.

Fig.6.43

6.3.3.2 Peristaltic Pump Replacement

As a mechanical component, the peristaltic pump needs to be replaced when working abnormally.

6.3.3.2.1 IC Acid- in peristaltic pump replacement

1) Open the right cover of the instrument. Remove the joint and nut at both ends of the acid-in peristaltic pump tube (refer to section 6.3.3.1.1).

2) Unplug the plug of electric wire of the acid-in peristaltic pump (Fig. 6.44).

Fig.6.44

3) Unscrew the two fixing screws and remove the pump (Fig.6.45).

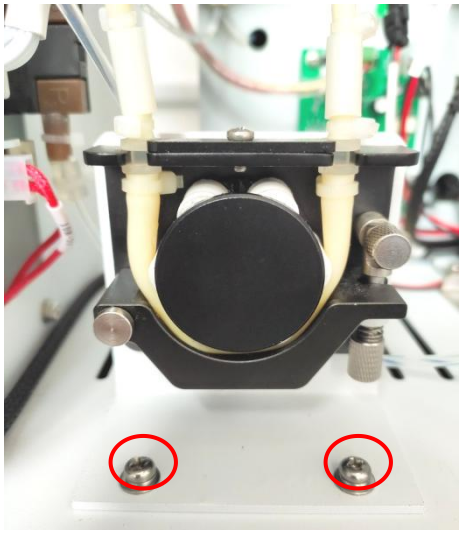


Fig.6.45

4) Install a new pump in reverse steps as described above.

6.3.3.2.2 TC Drain peristaltic pump replacement

1) Open the two sides cover of the instrument. Remove the joint at both ends of the acid-in peristaltic pump tube (refer to section 6.3.3.1.2).

2) Unplug the plug of electric wire of the TC acid-in peristaltic pump (Fig. 6.46).

Fig.6.46

3) Unscrew the three fixing screws and remove the pump (Fig.6.47)

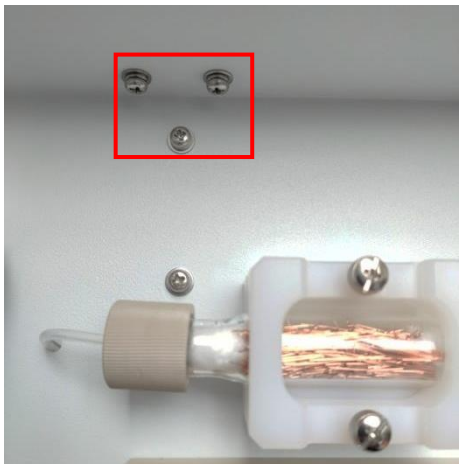


Fig.6.47

4) Install the acid-in peristaltic pump in reverse steps as described above.

6.3.3.2.3 Replacement of peristaltic pump

The peristaltic pump is fixed on the Gas control box of the instrument. When it cannot operate normally and needs to be replaced, the replacement steps are the same as those of the Gas control box. Refer to '6.3.2.1'Gas box replacement

6.3.3.3 Injection plunger pump replacement

1) Make sure that the instrument is powered off. Open the right cover of the instrument. The injection plunger pump (Sampling pump, Fig. 3.3) is fixed inside the upper end of the front cover. Find out the circuit plugs, and

disconnect the plugs (Fig. 6.48).

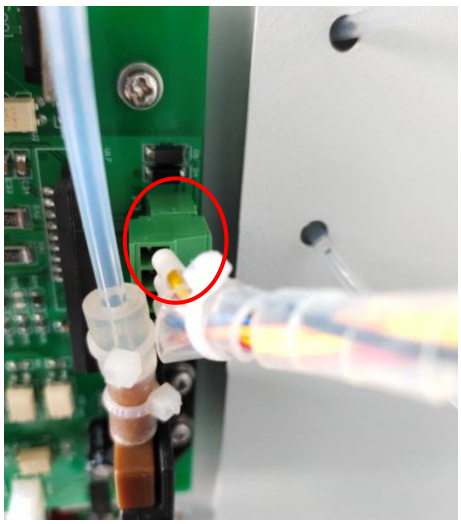


Fig.6.48

2) Unscrew the inlet and outlet connectors of the sampler (Fig.6.49).

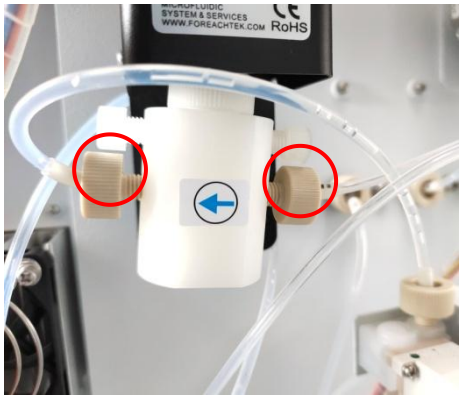


Fig.6.49

5) Unscrew the four screws of the sampling pump and remove the plunger pump.

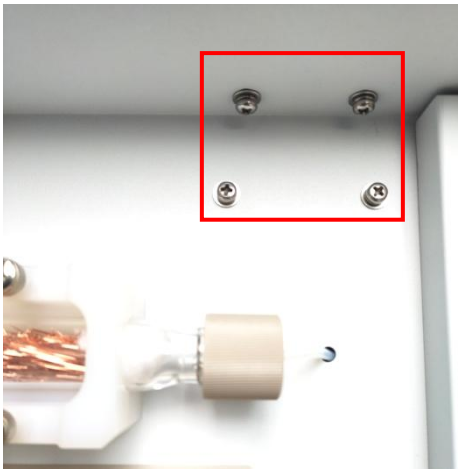


Fig.6.50

4)Install a new injection plunger pump in reverse steps as described above.

6.3.4 IC Refrigeration and Heating Module

6.3.4.1 Introductions

The displayed temperatures of the IC refrigeration and heating module should be same with the set value during standard curve establishment, or be same with the parameters of the standard curve loaded for sample measurement. The IC refrigeration and heating module contains refrigeration plate, heating rod, thermistor and other components. Any component damaged will cause abnormal temperatures display of the IC refrigeration and heating module, and then it need to be replaced.

6.3.4.2 IC refrigeration and heating module replacement

1)Open the right cover of the instrument. Unscrew the fixing screw of acid-in peristaltic pump, remove the peristaltic pump (refer to section 6.3.3.1.1).
2)Unscrew the four screws on fixing board with a cross screwdriver(Fig. 6.51)

Fig.6.51

3) Unplug all connection plugs of the electric wires from the circuit board as shown in (Fig. 6.54).

4) Unscrew the stainless steel nut of reaction gas from the detector （Fig.6.52).

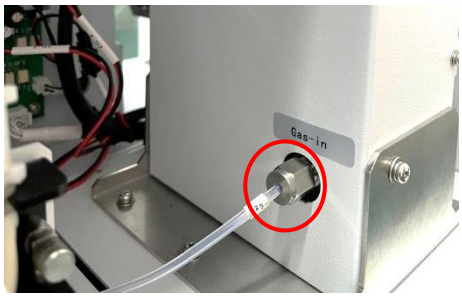


Fig.6.52

5)Unscrew the five gas circuit nuts from IC reaction tank and remove the gas circuit nuts on the right side of the halogen tube . (Fig.6.53)

Fig.6.53

6) Remove IC refrigeration and heating module with lateral translation.

7) Install a new set of IC refrigeration and heating module in reverse steps as described above.

6.3.5 UV digestion tank

6.3.5.1 Introduction

UV digestion tank as the main unit of the sample reaction, internal contains a UV lamp, electronic components such as heating, thermal resistor, and a large number of connection joint, inlet into the road here, when these parts damaged or aging can lead to TC problem such as heating temperature, an abnormal test data, the need to be replaced contact after sales engineer for repair

6.3.5.2 Replacement of the UV digestion tank

1) Open the panel of the analyzer, unscrew the 8 sets of wire pair plugs from the UV digestion tank.

Fig.6.54

2) Unscrew the 6 connectors on the UV digestion tank and remove the UV lamp socket (Fig. 6.55) (Fig. 6.56).

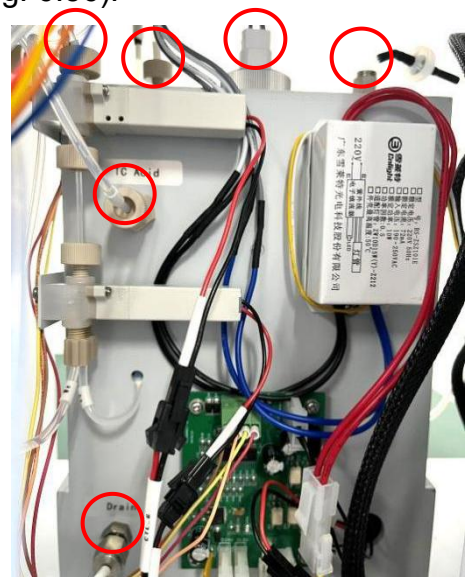


Fig.6.55

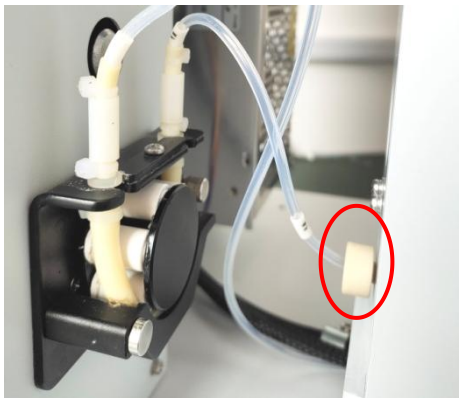


Fig.6.56

3)Unscrew the gas circuit nut at the lower left corner of the IC reaction tank and remove the nut (Fig. 6.57).

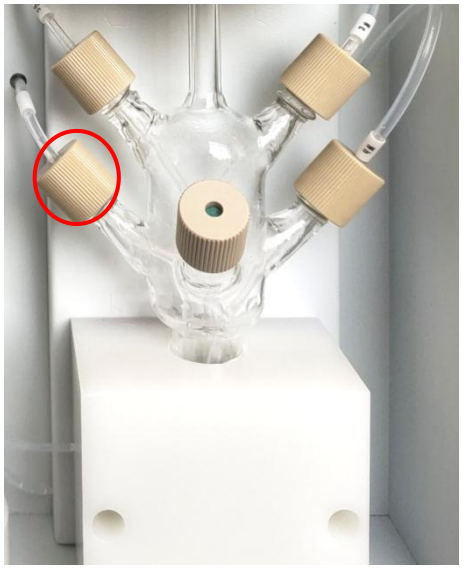


Fig.6.57

4) Unscrew the three fixing screws with a cross screwdriver (Fig. 6.58) to remove the UV digestion tank as a whole from the inside of the instrument.

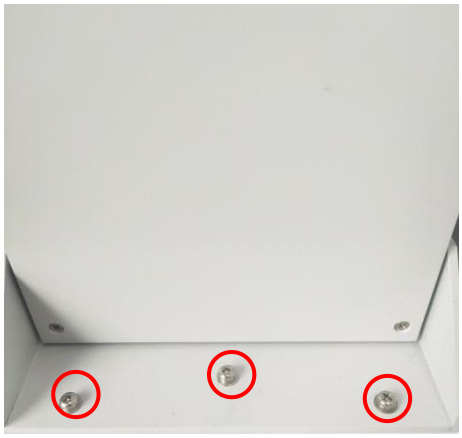


Fig.6.58

5)Install a Ultraviolet digestion tank in the reverse step as described above.

6.3.5.3 Replacement of the UV lamp

As an important part of the UV digestion tank, the UV lamp itself has a certain service life. When the UV lamp works for more than 5000 hours, the UV lamp will appear aging and ultraviolet intensity attenuation, so the UV lamp needs to be replaced.
The steps to replace the UV lamp are as follows:
1) Open the upper cover of the instrument (Fig.6.59).

Fig.6.59

2) Pull out the four-pin socket of the UV lamp (Fig.6.60).

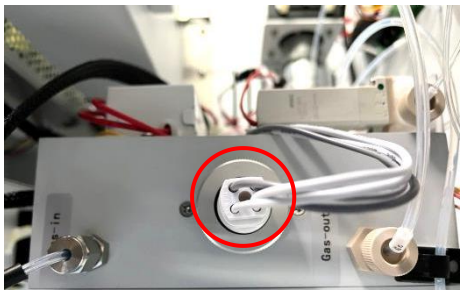


Fig.6.60

3) Unscrew the fixing nut of the UV lamp counterclockwise (Fig. 6.61) to remove the UV lamp.

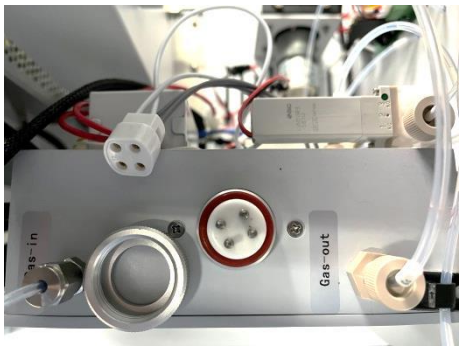


Fig.6.61

4)Remove the spare UV lamp, install the rubber ring (Fig. 6.62), and install the UV lamp in the reverse direction of removing the lamp .

Fig.6.62

6.3.6 NDIR Detector

6.3.6.1 Introduction

As a core component of TOC analyzer, the detector will show abnormal reference value when gas flow, temperature and other factors changed, with the reference value fluctuates greatly and it's unstable for a long time. First, check the influencing factors of gas flow and temperature. After that, if the reference value is still not stable, the internal components of the detector maybe damaged or aged, and the detector needs to be replaced.

6.3.6.2 NDIR detector replacement

1) Open the right cover of the instrument. Unscrew the two aviation plugs from the back side of detector（Fig.6.63).

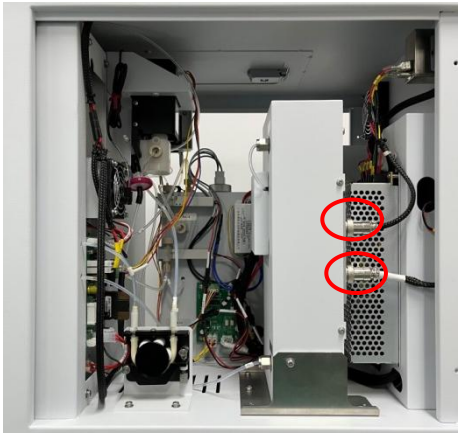


Fig.6.63

2)Unscrew the stainless steel nut of the connecting joint of reaction gas from detector（Fig.6.64).

Fig.6.64

3)Unscrew the four fixing nuts of detector and take it out.

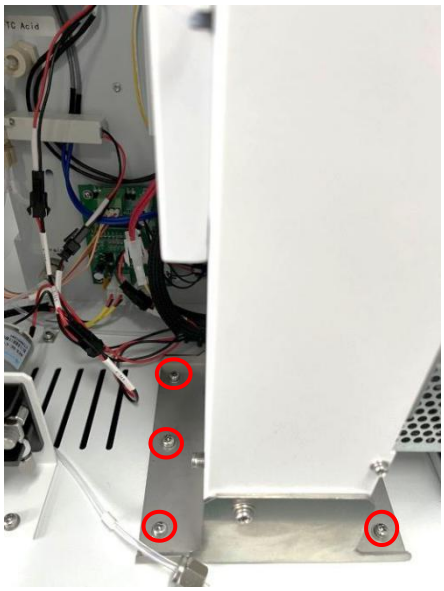


Fig.6.65

4)Install a new detector in the reverse step as described above.

Chapter 7 Fault Analysis

7.1 Fault Diagnosis and Solutions

Fault Information	Phenomenon	Reasons	Solutions
The gas flow is abnormal.	The gas flow shown on the software interface is not consistent with the set value.	1.The reducing valve is not adjusted. 2.Steady flow valve is closed. 3.There is leakage of gas path. 4.Glass parts are broken or blocked. 5.Filter membrane is blocked. 6.The gas path box is broken. 7.Flow sensor is damaged.	1.Adjust the reducing valve referring to 4.2.2. 2.Unscrew steady flow valve. 3.Check the gas path to exclude leakage 4.Replace the glass parts. 5.Replace filter membrane referring to 6.3.1.6. 6.Replace gas path box referring to 6.3.1.4. 7.Replace circuit board of flow sensor referring to 6.3.1.8.
The temperature display of IC cooling and heating is abnormal.	The temperature display of 'IC heating' and 'IC cooling' are not consistent with the set values when creating standard curve.	1.IC cooling and heating module has fault.	1.Replace IC cooling and heating referring to 6.3.4.2.

Reference value of detector is abnormal.	Fluctuation of the reference value is large and cannot be stable for a long time.	2.Gas circuit has leakage. 3.The differences of environmental temperature and humidity are large. 4.Internal components are aged or damaged.	2.Check gas path to exclude leakage. 3.Restart the instrument after the environment temperature and humidity are stable. 4.Replace detector referring to 6.3.6.2.
Test repeatability is poor	RSD of multiple tests results is more than 3%.	1.The sample is uneven. 2.Residual bubbles are in the sample tube. 3.No cleaning pipeline before sample. 4.Gas circuit has leakage. 5.Internal components of detector are aged or damaged.	1.Mix the sample. 2.Clean the sample pipeline several times. 3.Clean pipeline before injection. 4.Check gas path to exclude leakage. 5.Replace detector referring to 6.3.6.2.

7.2 Obligation

The obligation and warranty are determined by contract terms. Any operation deviated from this operation manual may cause damages and limit the warranty. The damage of wearing parts and fragile parts caused by wrong operation is out of the warranty.