ECLASSICAL 3200 HPLC

USER MANUAL

Operation Manual

for D3210 UV-vis Detector

V1.0.6

Statement

The manual is intended to help users to understand, use and maintain D3210 detector. Elite Analytical Instruments Co., Ltd does not assume the responsibility caused by business or special purpose use of the manual.

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This manual is believed to be complete and accurate at the time of publication. Elite Analytical Instruments Co., Ltd assumes no responsibility for any errors that may appear in this document.

In no event shall Elite Analytical Instruments Co., Ltd be liable for incidental or consequential damages in connection with, or arising form, the use of this manual.

Please read the document carefully before using D3210 detector.

Foreword

Thank you for purchasing our equipment. To ensure correct and safe use of the instrument, please read it carefully before using.

The details of the equipment's composition, installation, method of using, maintenance, parts selection and other points are described in the manual. After reading, please keep it carefully. Please delivery the manual with the instrument.

For safe operation, please read the following **Safety Precautions** before using the instrument.

Safety Precautions

According to the level of danger and harm, safety signs here are divided into the following three categories:

［Warning］ Failure to properly follow the instructions and precautions indicated by this sign can result in serious injury or damage to health and property. The property damage includes the environment around and the instruments.

［Caution］Failure to properly follow the instructions and precautions indicated by this sign can result in minor injury or damage to health and property. Slight injury means no hospitalization is needed to the wounded. Slight property damage means the instruments can be recovery through simple maintenance.

［Note］ The sign is used wherever information is given to ensure optimal performance of the instrument.

1. Precaution for usage

［**Warning**］UV3100 detector should only be used as a part of liquid chromatography. Do not use it for any other purpose. Except for special instructions, the instrument does not have explosion-proof function.

2. Ambient Conditions

［**Warning**］When we use organic solvent it is recommended that interior must be well ventilated and the firework should be prohibited. Also, a sink or equipment for washing eyes should be installed nearby in case of the organic solvent coming into contact with the eyes or skin.

［**Note**］In order to ensure good efficiency, keep the instrument away from caustic gas, dusty environment or strong magnetic. The worktable should be wide and strong enough. Ambient should be between 10℃ to 30℃ with a small fluctuation, and humidity should be between 20% to 80%. Avoid it from cold or hot source as well as direct sunshine. The air conditioners and other equipment should not blow directly into the instrument.

3. Precaution for installation

［**Warning**］The instrument should be installed following the instructions strictly by professionals, make sure that the voltage of the power socket is the same as the power supply voltage indicated on the instrument. Using the wrong power voltage could result in danger and fire.

The accessory power cable should be used to connect the pump to the power socket. Other cable should not be used.

Make sure the line cord is connected to a properly grounded power receptacle to prevent static and electric leakage.

［**Caution**］The instrument is so heavy that you should move it carefully and watch your hands in the same time.

［**Note**］The instrument should be connected following the instructions strictly. Wrong connection could cause communication error.

4. Precaution for use

［**Warning**］Do not use the instrument in places where heat resource, fire seat, magnetic resource, strong vibration exist or may exist. It is prohibited to put flammable nearby.

The bottle for storing the mobile phase should have a pore in cap to prevent the danger caused by negative pressure in the bottle.

A gap between the waste tubing and the cork of the waste bottle is necessary to prevent the waste bottle bursting when it is overfilled. But the gap should be small to prevent evaporate of hazardous solvents. Even though, the waste needs to be clean up promptly.

［**Caution**］When using organic solvents, please wear safety goggles, special lab coats, gloves mask etc. If your body contact with toxic solvent accidentally, wash it immediately, and then go to hospital for specialized treatment.

［**Note**］When preparing mobile phase, please use HPLC grade solvents or equivalent ones. You'd better filtrate the eluent with a membrane filter (0.45μm), and an online filter is also necessary to prevent small particles from scratching plunger rod, seal ring or blocking pipeline. What's more, please degas all mobile phase before using, degassing is an effective method to prevent chromatogram noise and wrong indicator.

Before first use, rinse the entire piping system according to the requirements of the manual. Direct use is likely to block pipeline.

Before sample test, ensure that the pipeline in the system is filled with mobile phase without any bubbles, otherwise it will affect the reliability of test results.

If an eluent is replaced with another eluent which is insoluble, such as positive mobile phase (hexane) and reverse phase (methanol), be sure to operate according to the specified method in the manual, otherwise it will cause serious pipeline jam, and even system paralysis.

Halogen irons is harmful for stainless steel, if there is stainless steel pipe and fitting in your system, please avoid the use of a mobile phase containing halogen ions. If you can't avoid it, please minimize the content and clean the system with water as soon as finishing the analysis.

If there is peek pipe in your system, it is important to note that:

Do not use the following solvent: concentrated sulfuric acid, nitric acid, dichloroacetic acid, dichloromethane, trichloromethane, chloroform, dimethyl sulfoxide, acetone, tetrahydrofuran, etc. Such solvents can reduce the strength of the PEEK material, make it’s become fragile and broken. But the impact of short-term use of aqueous solution of acetone (lower than 0.5%) in gradient performance is receptible.

When using PEEK pipes, the pressure of the system should be lower than the tolerance pressure of peek material, otherwise it may burst.

The bending radius of peek pipe should be more than 10mm, make the peek pipe natural relaxation during installation.

The PEEK pipe should be intercepted with professional tubing cutter in order to make the pipe more smoothly. Pay attention to that there should be no cutting debris left in the pipe.

5. Repair, maintenance and parts replacement

[Warning] Before repair, maintenance and parts replacement, please turn off the power in case of leakage and electric shock.

There is no need to open the host cover while daily maintenance and repair. If the repair needs to open the host cover please entrust agents or communicate with us.

You should clean the dust on the power cord plug regularly to reduce the electrostatic. Then, dry it before using, otherwise electric shock may occur.

Use dry cloth to wipe the instrument. Do not use thinner or alcohol to avoid erasing characters or color on the panel.

Do not replace components (e.g., fuses, deuterium lamp, etc.) from other company or other type, all accessories are required to be specified to prevent danger.

6. Precaution for static electricity

［**Warning**］As the instrument may use a lot of flammable, explosive organic reagents which may contaminate laboratory air, when the reagent concentration is too high, any spark or flame could cause fire or explosion accidents. Do not use the pump near any fire resource or hot resource, and keep reducing the electrostatic in mind. To reduce static electricity, please take the following measures:

1) Make the instrument grounded. It is very important, please pay attention to it.
2) Maintain proper indoor humidity (humidity is greater than 65% can prevent static electricity effectively) and keep the environment clean.
3) Metal waste bottles (external conductive) should be grounded (no ground insulation). When using other materials container, you can insert one end of the wire into liquid in the bottle and make the other end earthed.
4) Replace a larger I.D. pipe when the flow of mobile phase is higher than usual.
5) Wipe the instrument regularly.
6) Staffs should wear anti-static clothing. An anti-static pad is needed on the floor.
7) People and objects with static electricity is prohibited to touch the instruments.

7. Warning label instructions

To ensure the safety of staffs, we attach warning labels on the equipment where are dangerous. If the label is missing, please request new ones from our company, and attach to the correct position.

Contents

Chapter 1 Introduction

Overview

EClassical 3210 UV-Visible Detector (hereinafter called D3210 for short) is one of the EClassical 3200 series products launched by Elite. On the basis of the traditional single-wavelength detector, a dual-wavelength function is added.

The D3210 detector is used as the detection unit of this series of high performance liquid chromatographs. It can be easily used in conjunction with various liquid chromatography infusion pumps, autosamplers, chromatography column thermostats and other units, and can also be used alone as a detection tool.

The D3210 detector is equipped with two light sources: deuterium lamp and tungsten lamp. Among them, the deuterium lamp is mainly used in the ultraviolet region, while the tungsten lamp expands the scope of chromatographic analysis to the visible light region.

1.1 Features and Functions

Superior design

- **The D3210 detector can measure in four modes:**

  a) Single wavelength mode;

  b) Dual wavelength mode;

  c) Spectrum scan mode;

  d) Time-wavelength program mode.

In the spectral scanning mode, the UV-Vis absorption spectrum of the sample can be scanned when the mobile phase is stationary.

- The use of high-precision, self-calibrating analog-to-digital converters and a new high-quality optical path system improves the signal-to-noise ratio of the detector, making it have better wavelength accuracy, repeatability and suitable wavelength measurement from ultraviolet to visible range.
- The motor directly drives the grating mechanism to further improve the quality of the grating, so that the wavelength has higher accuracy and linearity in the full wavelength range, and realizes more precise wavelength positioning.
- With time-wavelength program, the time-wavelength program function provides customers with the ability to set different wavelengths for different components in an analysis, so that the component can be detected at the wavelength with the maximum absorption, thereby improving the performance of complex samples. Analysis sensitivity.
- It has a convenient function of replacing deuterium lamp and tungsten lamp. When replacing the light source, there is no need to recalibrate the position of the light source.
- The energy of the deuterium lamp can be optimized.
- Simultaneous output of digital and analog signals can be realized.

Intelligent system

- The automatic power-on self-check function can detect the circuit failure of the detector in the first time and avoid unnecessary damage caused by it.
- The leakage alarm function enables customers to find leakage faults in the flow path at the first time, ensuring stable and reliable operation of the detector.
- With automatic wavelength calibration function.
- The energy of the deuterium lamp can be optimized.
- It can directly record and read the light source turn-on time and turn-on times from the workstation.

1.2 Technical parameters and performance indicators

Table 1-1 Performance specifications of D3210 detector

No.	Items	Specifications
1	Optical path	Dual wavelength
2	Light source	Deuterium lamp, tungsten lamp
3	Response time	0.1~5s
4	Sample rate	5Hz\10Hz\20Hz\50Hz； Dual wavelength 1Hz
5	Wavelength range	190~800nm
6	Wavelength repeatability	±0.1nm
7	Wavelength accuracy	±1.0nm
8	band width	8nm
9	Noise (Single wavelength mode)	≤1.5×10^{-5}AU(dry flow cell, 254 nm, 1s, 20Hz)
10	Drift (Single wavelength mode)	≤2.0×10^{-4}AU/h（dry flow cell, 254 nm, 1s, 20Hz）;
11	Noise (Dual wavelength mode)	≤5.0×10^{-5}AU(dry flow cell, 254 nm, 230nm-254nm)
12	Linearity range	≥2.0AU(5%)(254nm)
13	Maximum backpressure on flow cell	1000psi
14	Cell path length	10mm
15	Analog output range	-0.5~2.5AU
16	Communication mode	UDP

1.3 Physical Specifications

Table 1-2 Physical Specifications of D3210 Detector

No.	Items	Specifications
1	Weight	10 Kg
2	Dimension	440 mm*380 mm*160 mm
3	Power requirements	AC220V±10%, 50/60 Hz
4	Typical input power	100 W

1.4 Principles

1.4.1 Optical System

The optical system of D3210 uv-vis detector is shown as Fig. 1-1. The light of illumination source is focused by lens and passed through the entrance slit onto the mirror. Light reflected by mirror was separated by the grating. The dispersed light hits the beam splitter, and then separated proportionally as reference light and sample light hitting photocells. The photocells converted the light into circuit signal, which is then integrated and digitalized by preamplifier. The detector control board processed the digital signal and finally transmitted it to the computer or recording equipment.

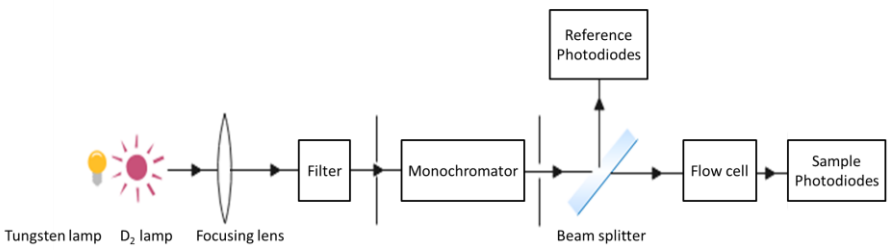


Figure 0-1 Optical system of D3210 detector

1.4.2 Wavelength accuracy calibration

The detector displays wavelength accuracy verification at start up. It compares the actual detected characteristic wavelengths to the standard wavelengths. If the difference exceeds the default value, it pops up warning information: wavelength calibration fails.

1.4.3 Circuit system

In the circuit system of D3210 detector, optical signal collected by photoelectric sensor is converted to digital signal with pre-amplification electric circuit and AD converter. Then digital signal is transferred to control board CPU and processed; the control board also control the motor, lamp, light filters and other functions. The motherboard communicates with the chromatography workstation with handshake agreement, in monitor of fault status as well. In the event of an exception, the mainboard upload error code to the workstation to prompt it. Two switching power supplies constitute the power supply system.

The circuit system is shown as Fig. 1-2.

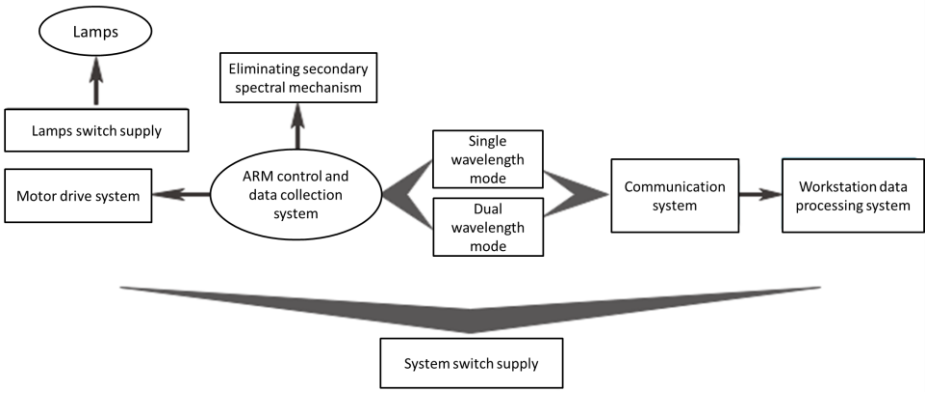


Figure 1-2 Circuit system of D3210 detector

1.5 Appearance

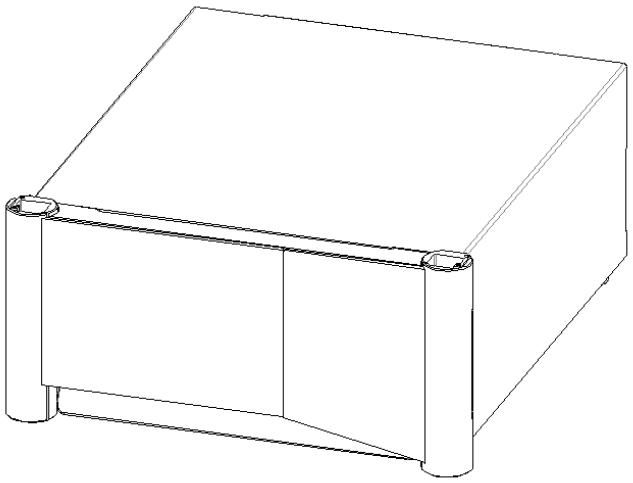


Figure 0-3 3D view of D3210 detector

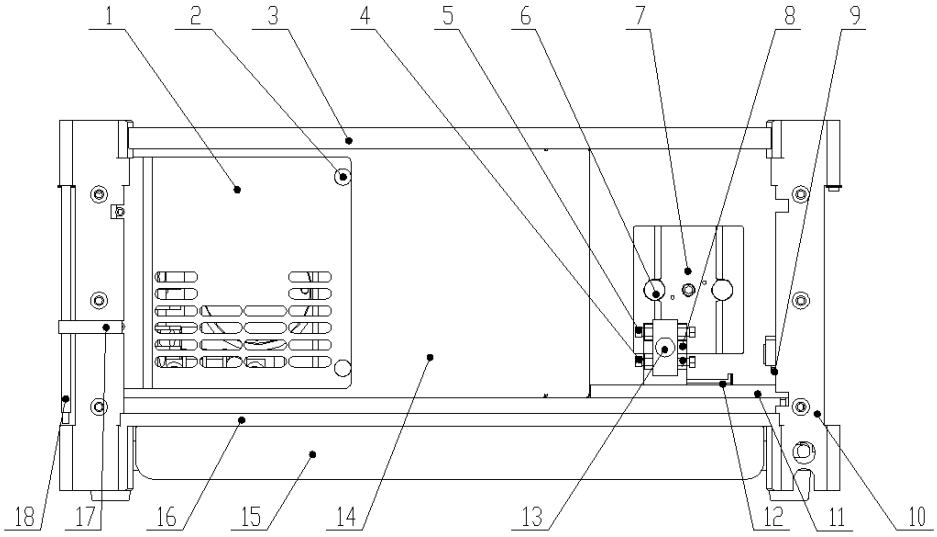


Figure 0-4 Front view of D3210 detector

1.Lamp cover plate; 2.Finger-tight screw; 3.Upper beam; 4.Entrance union; 5.Export union; 6. Finger-tight screw; 7. flow cell; 8. Union bracket; 9.Leackage sensor;10.Inner stand column; 11.Leackage plate; 12. drainage plate; 13. Finger-tight screw; 14.Front plate; 15. Bottom beam; 16.LED bracket; 17. Fixation clamp; 18. Fixation stand column

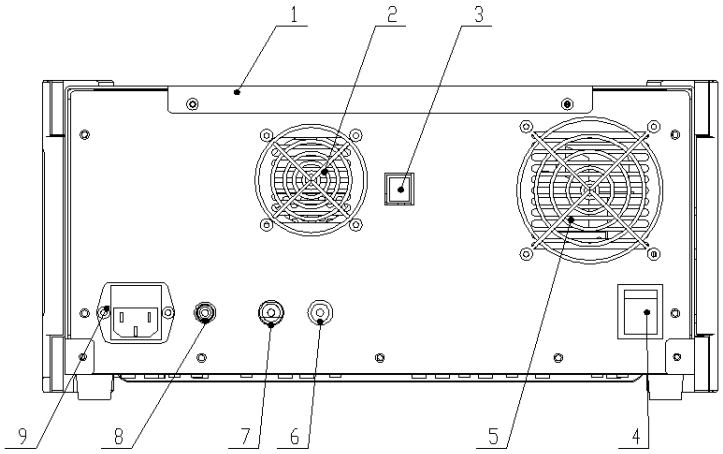


Figure 0-5 Rear view of D3210 detector

1.Enclouser; 2.Fan; 3.LAN interface;4. Power switcher;5.Fan;6.Analog output;7. Trigger terminal;8.Ground terminal;9.AC-IN power interface

1.6 Structure and Layout

As shown in Fig. 1-6, D3210 is constructed of precision machinery structure, optical and electronic components. Reasonable layout and high precision machining make sure of excellent quality of the instruments.

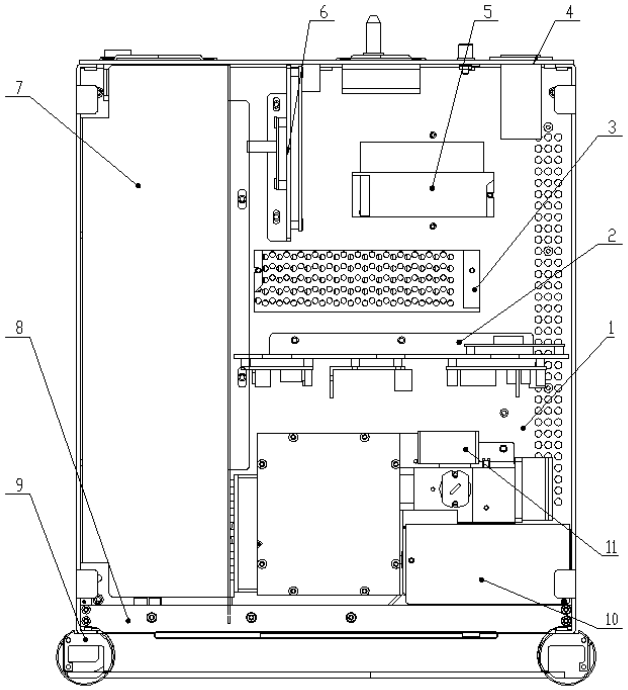


Figure 0-6 Layout of D3210 detector

1. Bottom plate; 2.Circuit boards;3. System power supply; 4. Rear plate; 5. Motor switch supply; 6. control board;7. Air duct; 8. upper beam; 9. Stand column; 10. Front rear; 11. monochromator

Chapter 2 Installation and Transport

2.1 Standard Accessories

D3210 Detector is packed with corrugated boxes and foam lined structure. When you receive the instrument, check the packaging first. If the packaging is damaged, please contact with Dalian Elite Analytical Instruments CO., Ltd. or local dealer.

【Warning】 If there are signs of damage, please do not attempt to install the module. Inspection by Dalian Elite Analytical Instruments CO., Ltd is required to evaluate if the instrument is in good condition or damaged.

2.1.1 Unpacking

Put the detector on level ground with the face of the packing box up. Cut the tape on the top, take out the detector and accessories package, and place them on the table. Then, remove foam, open the instrument protective film.

2.1.2 Delivering Checklist

Table 2-1 Deliver list

No.	Item	ea.	quantity
1	D3210 Detector	pc.	1
2	User Manual (CD)	pc.	1
3	Certificate	pc.	1
4	Service Card	pc.	1

2.2 Stack Configuration

To ensure optimum performance of the detector, the following configuration is recommended as Fig. 2-1.

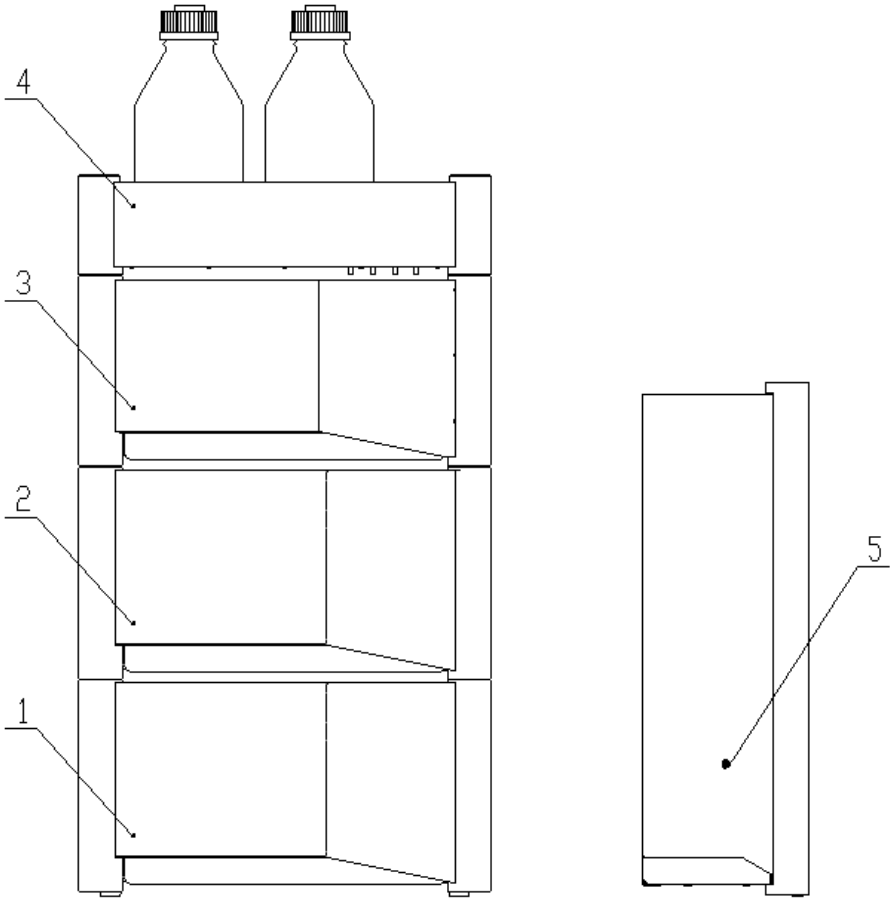


Fig. 2-1 Recommended Stack Configuration for EClassical 3200 HPLC

1.Pump；2.Autosampler；3.Detector；4.Solvent cabinet；5.Column oven

2.3 Installation Requirements

2.3.1 Site Requirements

- *Environment*

Detector need to work under ambient conditions in Table 2-2 below.

Table 2-2 Environment requirements

Items	Specifications	Requirements
1	Work environment	Room should be free of dust, inflammable and explosive materials, good ventilation is also important
2	electromagnetic field	No electromagnetic noise nearby
3	Operating temperature	4~40℃(39~104◦F)
4	Humidity	20%~80%, non-condensing
5	Temperature fluctuation	< ± 2°C /hour

【Caution】

◆ Do not use the detector under conditions of temperature fluctuations. If the ambient temperature is too low, make the room temperature increase slowly to avoid condensation inside caused by rapid heating.

- *Bench space*

The D3210 detector can be placed on any normal laboratory bench. If you want to display the complete EClassical 3200 system on the bench, make sure that the table can bear the weight of all components. It needs additional space of 50 mm on the left,150 mm on the right, 150 mm on the back to facilitate the circulation of air and electrical connections.

【Warning】 The instruments should be placed on a horizontal position, otherwise there is a danger of falling!

2.3.2 Power and Power Line

To ensure the instrument can be normal and safe, please use a dedicated power line within the specified voltage range.

- Grounding, ac power to 220 v ± 10%, 50/60 Hz;
- Please choose T2.0A fuse.

【Warning】

- The accessory power cable should be used to connect the pump with the power socket. Other cable should not be used in case of danger or damage to the instrument.
- If the instrument is connected to a grid above the scope of application, it may cause electrical shock or damage to the equipment and staff.
- Please unplug the power cord before replacing the fuse to avoid electric shock. The external fuse is installed in the back of instrument.

2.3.3 Computer Requirements

- ***Hardware requirements***

1) The lowest hardware requirement：Intel Core 2 CPU，2G internal storage，more than 1G hard-disk space；(Refer to the use of workstation) ;
2) The lowest resolution of displayer：1024×800，64K(16 bit image);
3) Others：USB interface for communication, CD-ROM driver for software installation.

- ***Operation system requirements***

Windows 7 64-bit or higher version (Refer to the use of workstation).

- ***Workstation requirements***

Use the W5100/ Kromstation workstation to control the instruments.

2.4 Communication Connection

Communication management of EClassical 3200 HPLC system is completed by P3200 infusion pump, via LAN cables. Communication and power connection is shown as Fig. 2-2.

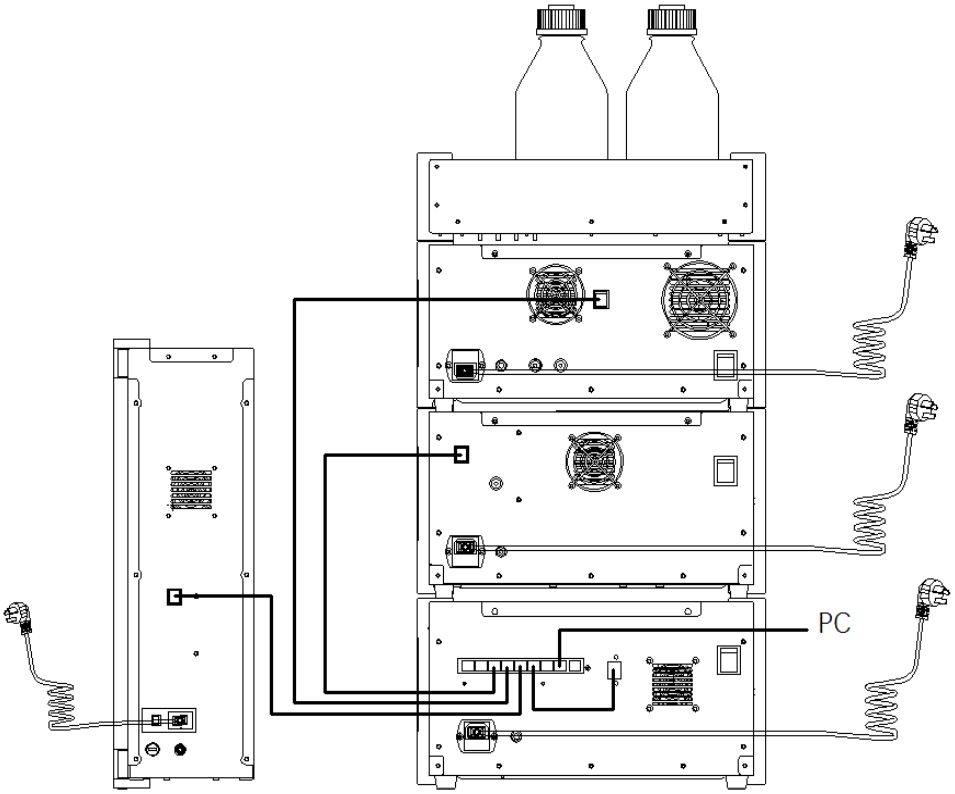


Fig. 2-2 EClassical 3200 HPLC communication

2.4.1 Power connection

Finish power connection of D3210 detector as follows:

1) Lay the detector as Fig. 2-1 and 2-2.

2) Plug the power cord into the power supply.

2.4.2 Communication connection

Finish communication connection D3210 detector as follows:

1) Make sure the power supplies of the detector and pump are “ON”.
2) Connect the computer and “PC” port of P3200 with LAN cable.
3) Connect the LAN port of P3200 and one port of switch.
4) Connect the LAN port of the detector and one port of switch on P3200.

【Note】

- There are 8 yellow LAN ports in parallel on the switch of P3200 pump. Connect Each module to the pump separately.
- Please select dedicated communication lines provided by Elite. Otherwise failed communication maybe happens.

2.5 Flow Connection

Fig. 2-3 shows the procedures of tube and flow connection of EClassical 3200 HPLC.

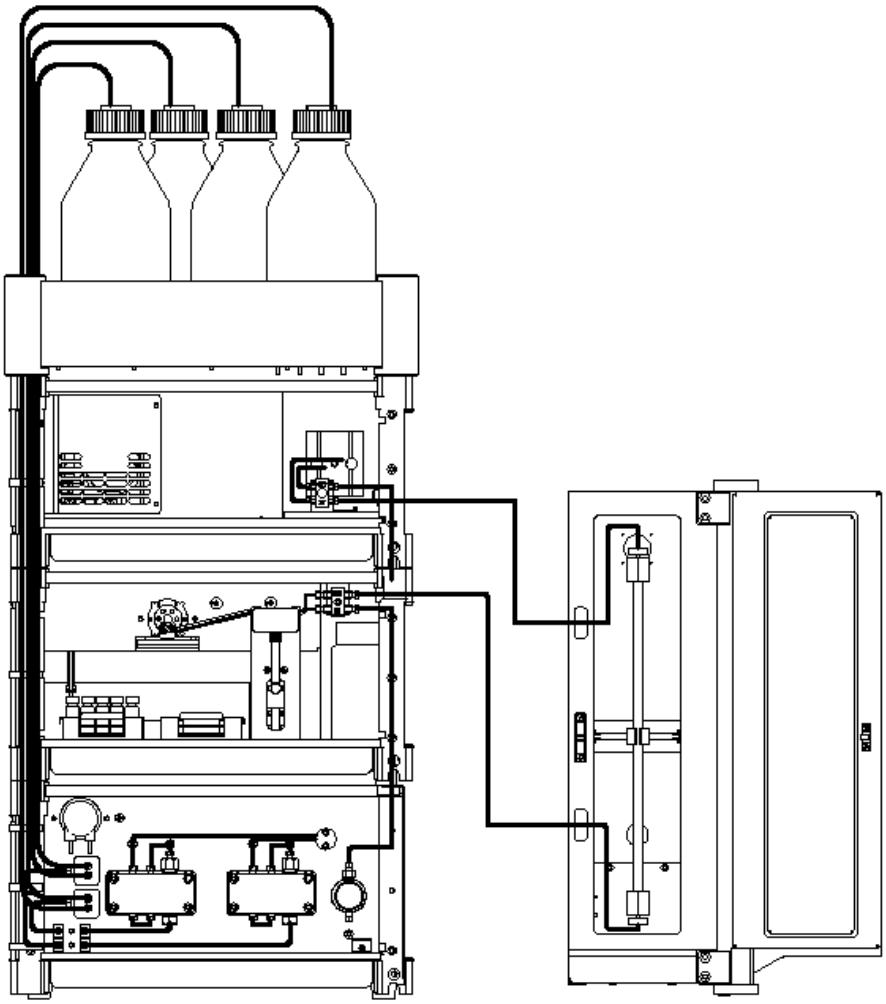


Fig 2-3 EClassical 3200 HPLC flow connection

2.5.1 Tube Connection

- ***Tubing cut***

Please select the dedicated stainless steel tubing cutter to cut tubing into proper lengths ensuring the cross-section clean and trouble-free. Bend it up and down and from side to side to cut off.

【Caution】 Make the cut surface as smooth and straight as possible to avoid extra-dead volume or clogged caused of inner diameter deformed.

- ***Stainless steel fittings***

Mount a male stainless steel ferrule and nut to the tubing as shown in Fig.2-4 and 2-5.

【Caution】 Pleas match nuts with corresponded ferrules, Stainless steel with stainless steel, as well as PEEK with PEEK.

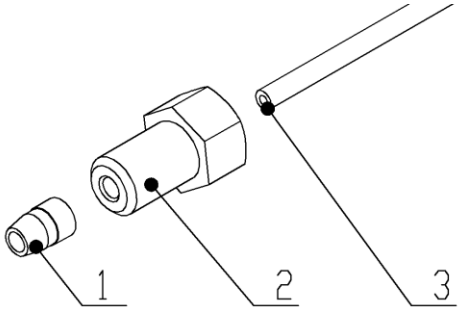


Fig. 2-4 Standard stainless steel fittings

1.Stainless steel nut；2.Stainless steel ferrules；3. Stainless steel tube

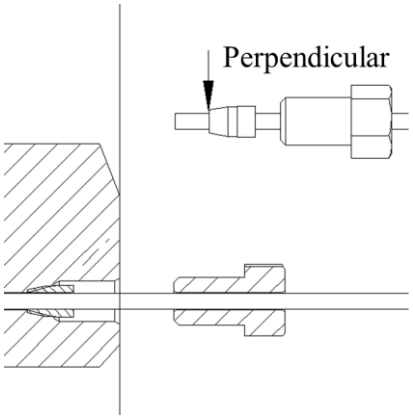


Fig. 2-5 Connection of stainless steel fittings

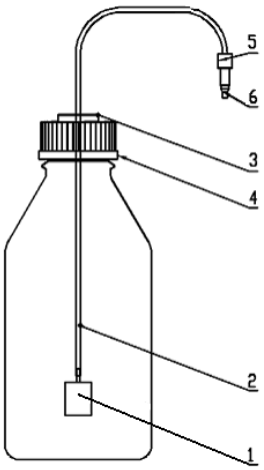
【Caution】 Insert the tubing completely into the opening until it butts against the end of the opening. Otherwise, dead volume will be created. Do not overtighten the male nut. Otherwise, the threads will be damaged.

2.5.2 2.5.2 Flow Connection

The following procedures show flow connection of EClassical 3200 HPLC system:

1) ***Connecting the solvent inlet filter to one end of the solvent tube.***

Connect the parts in the order of the numbers on the picture.



1.Solvent filter;
2.Solvent tube;
3.PTFE cork;
4.Bottle cap (with hole);
5.Flangeless nut;
6. Omni-Lok

Fig. 2-6 Solvent filter assemblies

2) ***Connecting solvent reservoir to the pump***

The FEP tubing and solvent filter assembies should be connected to the inlet of the pump as Fig. 2-7.

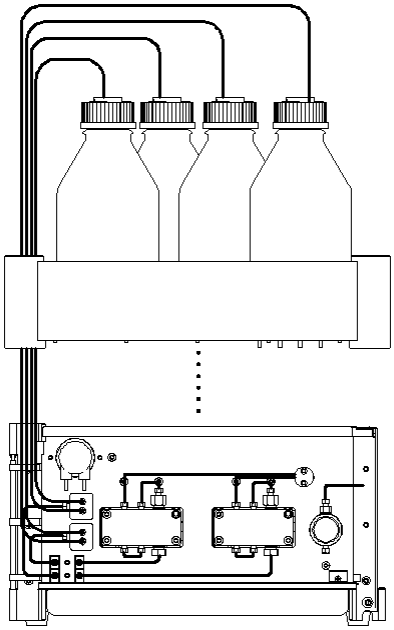


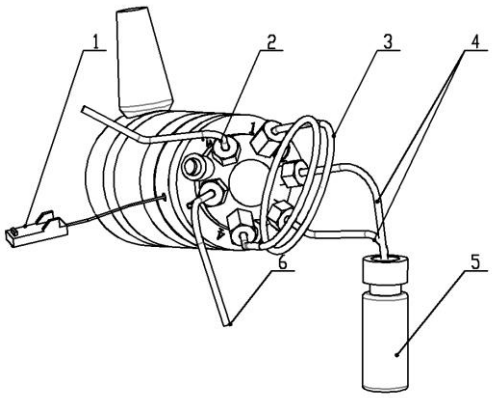
Fig. 2-7 Tubing connection between solvent reservoir to the pump

【Note】

The solvent filter assemblies should keep clean to avoid polluted.
To obtain stable analytical data, mobile phase must be degassed before use.
Mobile phase must be filtered through 0.45-μm mesh filter.

3) *Connecting injection valve to the pump*

Connect the outlet of the pump to the inlet of injection valve (Port 2# is usually the inlet for the mobile phase on Rheodyne valve) with stainless steel tube (with screw connection and sealing edge ring). Port #3 of injection valve should be connected to the inlet of column as shown in Fig.2-8.



1.Trigger port;
2.Mobile phase inlet;
3.Sample loop;
4.Waste tubing;
5.Waste bottle;
6.Mobile phase outlet

Fig. 2-8 Flow connections for sample injection valve

4) *Connecting the inlet of autosampler to the pump*

Connect the outlet tubing from the pump to the inlet of the autosampler as Fig. 2-9.

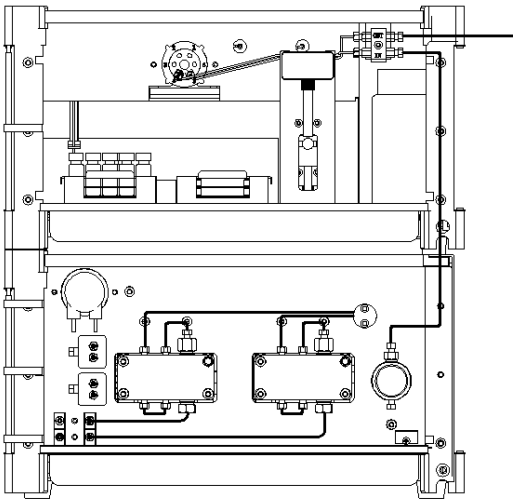


Fig. 2-9 Flow connections between pump and autosampler

5) ***Connecting autosampler to column***

Autosampler is connected to the inlet of column, as Fig. 2-10.

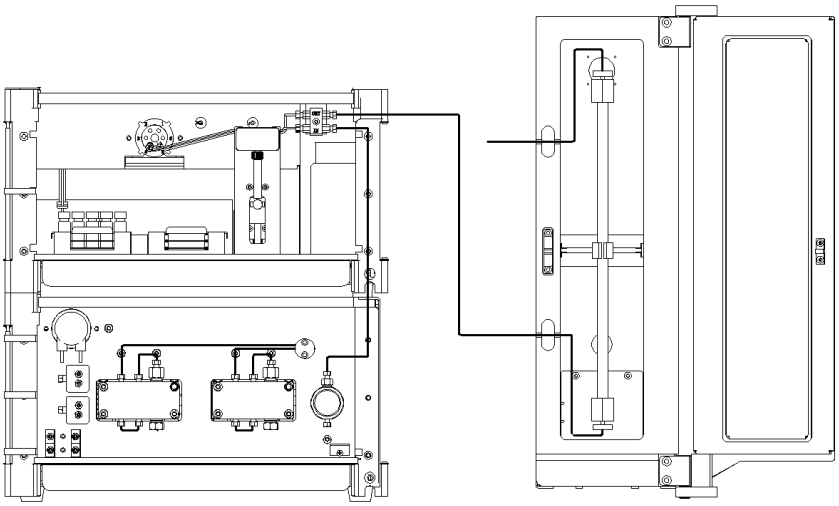


Fig. 2-10 Flow connections between autosampler and column

6) ***Connecting column to detector***

The connection between column and detector is shown in Fig. 2-11. The outlet of column should be connected to the inlet of detector. The outlet of the flow cell is upside as well as the inlet is downside.

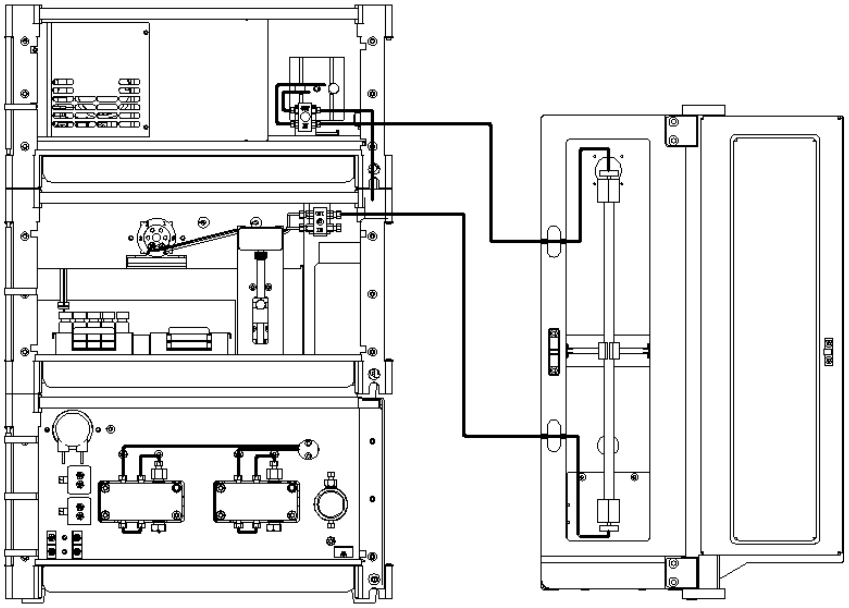


Fig. 2-11 Flow connections between column and detector

7) *Piston clean flow connection*

Silicon tubing from clean solvent reservoir is connected to the inlet of peristaltic pump. The outlet of peristaltic pump is inserted into the Y-type connector of the system waste tubing, as Fig.2-12.

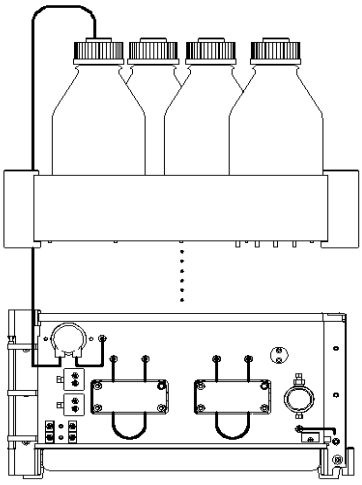


Fig. 2-12 Flow connection of piston clean tubing

【Note】 The solvent waste bottle should be place at a lower position with respect to the equipment

8) ***Multi-channel body tubing connection***

Multi-channel body binds system waste tubing, including mobile phase waste, clean solvent waste, relief tubing waste, and unexcepeted leakage. The outlet tubing from the multi-channel body is connected with the waste tubing of column oven by a Y-type connector. All waste is then discharged to the waste container.

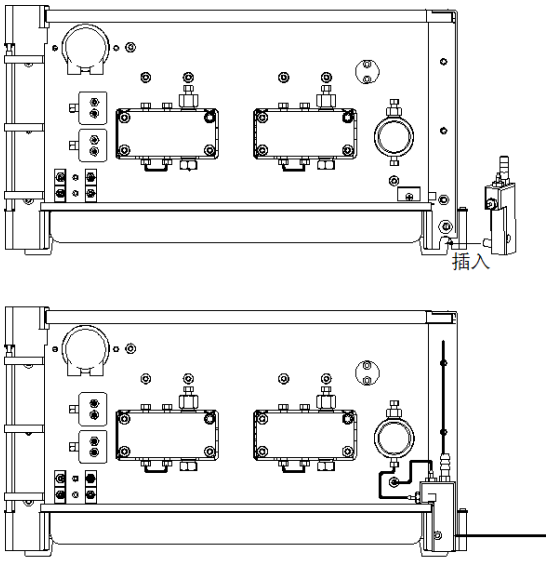


Fig. 2-13 Flow connection of multi-channel body

2.6 Air Remove

New installed HPLC system and solvent tubing must be filled up with mobile phase. Select isopropyl alcohol as the solvent for Normal Phase LC, because it is intermixed with almost any HPLC solvent, and has excellent wettability. Select methanol for Reverse Phase LC. Procedures are shown as follows:

1) Rotate relief valve to “ON”.
2) Set flow rate of one flow channel as 100%, 10.000mL/min.
3) Examine whether there is solvent out from the tubing. If there is no, draw the solvent out by a rubber pipette bulb or an injection, until it flows out.
4) Rotate relief valve to “OFF”.
5) Relieve about 30 mL solvent to remove air from the system.
6) Switch to other channels, respectively, and repeat step 1 to 5.

【Caution】 Solvent may be harmful to health, if there is leakage from the interface of tubing. Please take precautions.

2.7 Verification

Instruments are factory verified qualified products in normal situations, so users don’t have to do it again. If necessary to verify the instruments status and performance, follow these steps below.

1) Choose an applicable column, SiO_2 column for NPLC, or C18 column for HPLC.
2) Use mobile phase and sample following the column evaluation report offered by column producer.
3) After removing air bubbles from the HPLC system, inject test sample.
4) Compare the chromatogram and the column efficiency with data provided by producer. If it is in the allowed error range, the system meets the demands.

2.8 Transportation

The detector is a precision instrument, please gently while long-distance transportation, severe vibration, drops are likely to cause damage to the internal parts of the instrument. The random original packaging can effectively protect the instrument. When the instrument is required to move or returned for service, please follow these steps for packaging.

1) Turn off the power.
2) Unplug the power cord and communication lines.
3) Removing the connecting pipe and other elements between components.
4) Remove the detector from chromatography system, put it into special sealed bag on a large platform.
5) Put the detector into the original packaging foam, and fix it.
6) Placed the fixed detector and other accessories into original packaging carefully.
7) Tape the box sealed to prevent liquid from entering. Cover the packaging box with plastic wrap is recommended.

【Warning】 **Before packing, please check the box, if the original packaging has been damaged, do not use it, you should consult your local dealer or Dalian Elite Analytical Instruments Co., Ltd. customer service staff to solve!**

Chapter 3 Basic Operation

3.1 Power On and Off

Power On: Please plug the power cord into the power outlet. The power switch is turned off at this time ("O" position). Turn on the power switch("I" means on, and "O" means off, on the rear panel). While the power indicator light, detector begins power-on self-test. When detector enters the normal startup state, the status indicator will change from breathing beat to blue. (If the indicator blinks frequently, the detector sends out liquid leakage alarm.)

Power Off: Turn off the power switch ("I" means on, and "O" means off), and then the power indicator and lamp status indicator will be off, as well as the cooling fans.

【Warning】 There is no electric charge inside the instrument after turn off the power switch on the rear. The instrument can be powered off by Unplugging the power cord, but this operation is not recommended.

If the instrument is shutdown, an Interval of more than 10 minutes is need before it is turned on again.

【Note】 The detection wavelength, wavelength range and other parameters are set as the last shutdown status.

At the first time running, all parameters are default values for factory settings.

3.2 W5100 Chromatographic Data Workstation

All methods and most functions of the detector are completed by W5100 chromatographic data workstation. The frame scheme of the workstation is showed as Fig. 3-1.

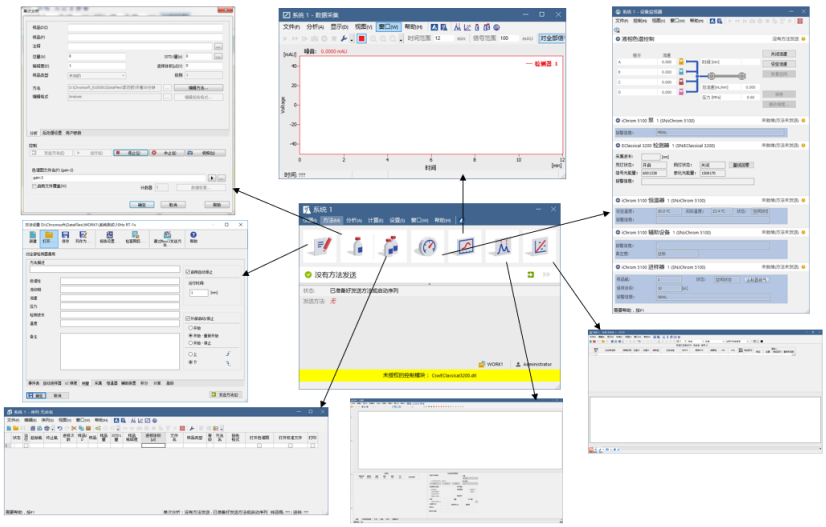


Fig. 3-1 W5100 workstation frame scheme

3.3 Main Interface Introduction of Detector Control Module in Workstation

There are 2 parts of control module involved to D3210 detector in W5100 chromatographic data workstation:

1) Device Monitor Window

In the instrument main menu window, click “Device Monitor” in the drop down menu of “Analysis”, as Figure 3-2. Detection wavelength, lamp status, signal energy, auto zero and warning information display under the monitor window.

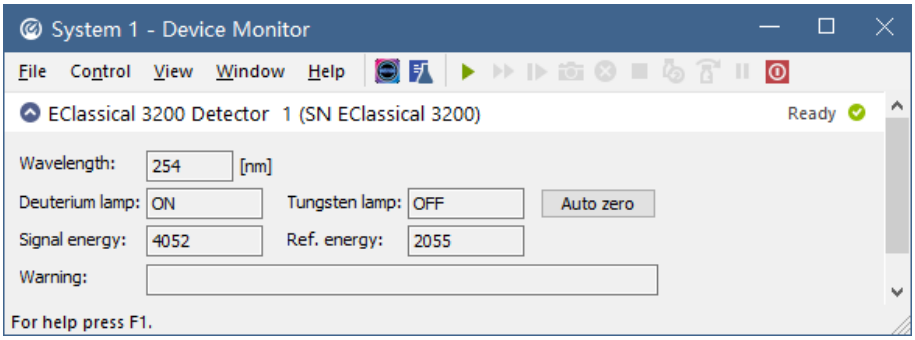
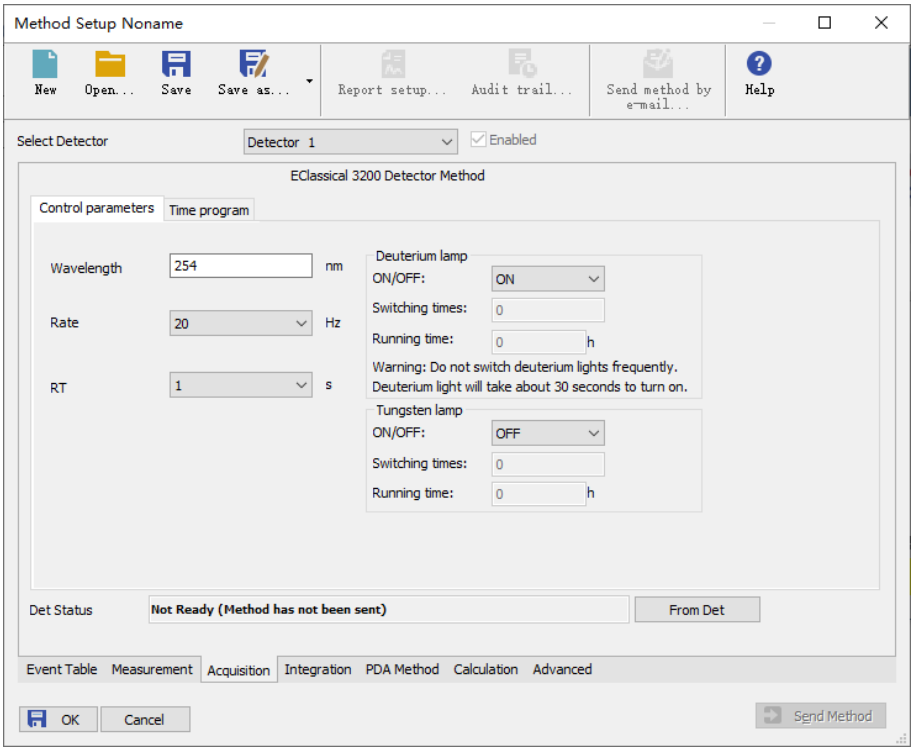


Figure 3-2 Device Monitor window

2) Method Setup Tab

In the instrument main menu window, click “Method Setup” in the drop down menu of “Method” as shown in Figure 3-3. In the “Acquisition” tab, users can set up detector control parameters, such as detection wavelength, sample rate, lamp status and so on. By activating functional button “From Det”, users can monitor the opening times and running time of the lamps.

In the “Time Program” tab, users can set up time program parameters.



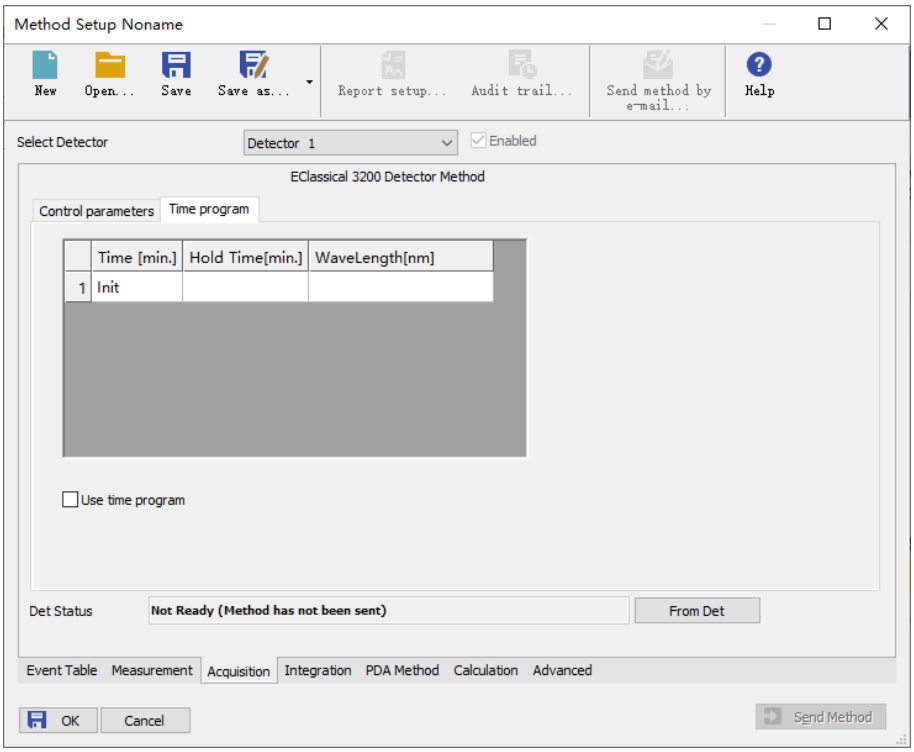


Figure 3-3 Method Setup Window-Acquisition

【Note】 “Spectrum Scan” Program is not loaded on the W5100 workstation. The function has to be achieved with the aid of auxiliary software.

3.4 Instrument Preheating Time

The purpose of instrument preheating is to stabilize the circuit system and light source. According to the properties of the circuit system and the usage requirement of the lamps, it is necessary to preheat for about half an hour.

3.5 Detection Method Setup

3.5.1 Turn On and Off the Light

In general, it takes 2-3 minutes to power-on self test by default. In the process, the deuterium lamp is turned on automatically. Users can set the status of the deuterium lamp through “Method Setup” in the workstation. Specific operation steps are as described below.

1) After login, click “Method setup” in the drop-down menu to open the setup window.

2) Choose “Acquisition” tab, and set the status of both lamps (on or off), as the red frame marked in Figure 3-4.

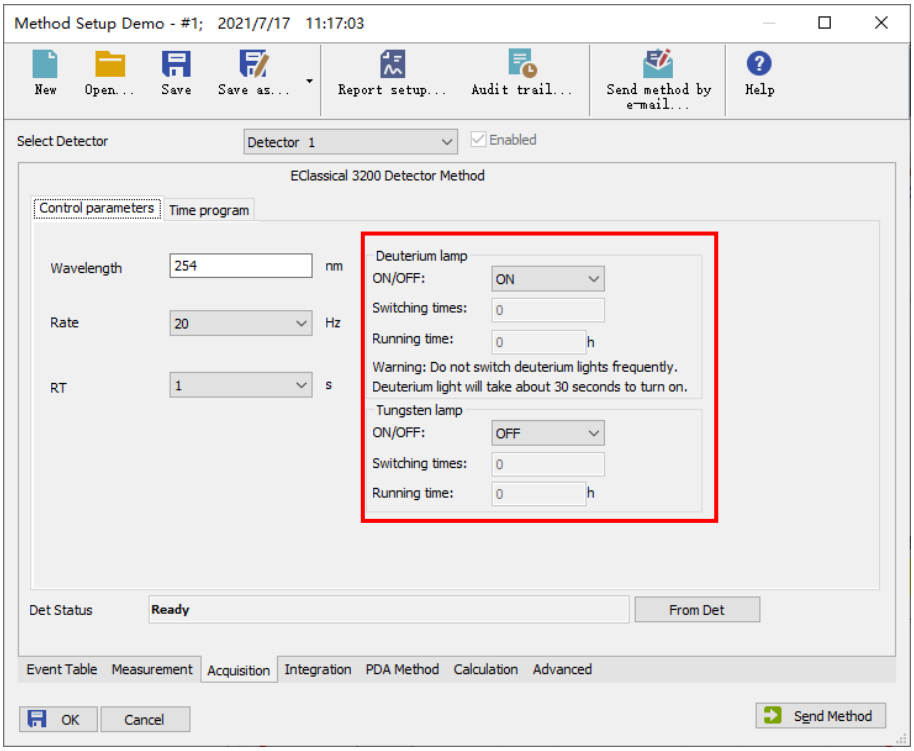


Figure 3-4 Light source setup

By activating functional button “From Det”, users can monitor the opening times and running time of the lamps. This feature is designed to make it easier for users to observe the status of the detector and determine the life of the light source.

【Note】 Please do not continuously turn on and turn off the light source, for fear that the deuterium lamp and tungsten lamp are damaged. Suggest leave at least 5-minute interval between turning on and off each lamp.

3.5.2 Single Detection Wavelength Setup

As shown in Fig. 3-4, detection wavelength can be set for D3210 in "Control parameters" tab, ranging from 190-800nm. Click "OK" to save and accomplish single detection wavelength setup.

3.5.3 Dual Detection Wavelengths Setup

Switch to "Dual Wavelength Mode" in system configuration, and then set up the Signal A/B in the "Method Setup" window, as Fig. 3-5. Both detection wavelengths should be set up within 190-380nm or 381-800nm. Click "OK" to save and accomplish dual detection wavelength setup.

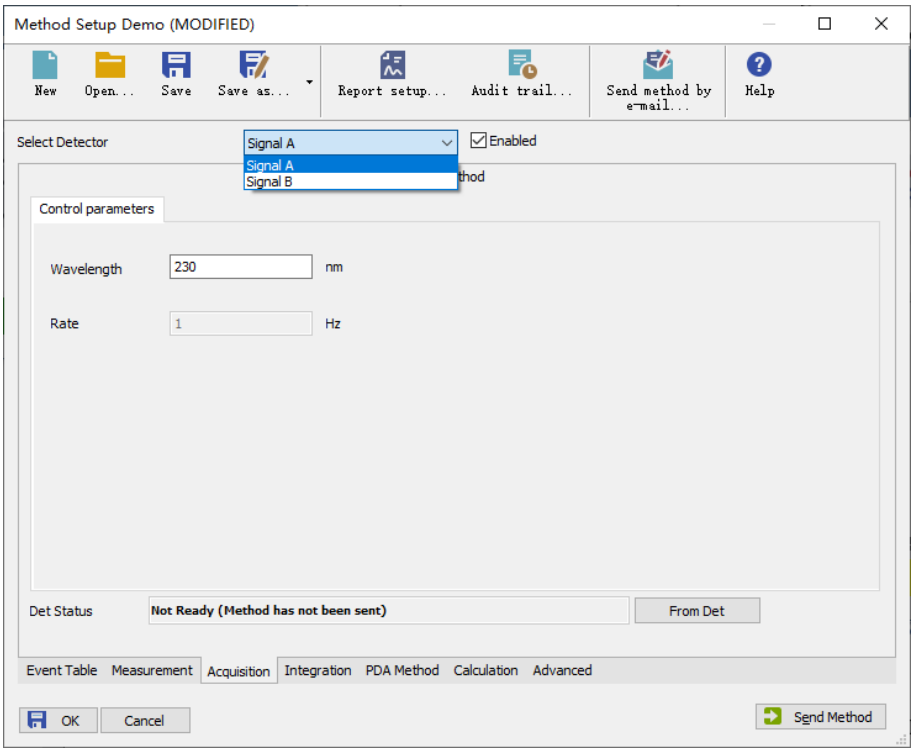


Figure 3-5 Dual wavelength mode setup

In dual wavelength mode, the sample rate reduces from 20Hz to 1Hz. It results that the retention times of adjacent chromatographic peaks must differ by 20s to separate them completely.

【Note】

In dual wavelength mode:
If both selected wavelengths are greater than 380nm, the detector applies the second order filter to block unwanted UV light;
If both selected wavelengths are less than or equal to 380nm, the detector removes the second order filter;
If the selected wavelengths bracket the 380nm threshold, the detector does not apply the second order filter. In this case, the data collected for the wavelength above 380nm may contain inaccuracies because of possible UV light interference (second order effects).

3.5.4 Response Time Setup

The response time is 63.2% of the time between sample flowing into the flow cell and the output signal in response. The response time is applied to optimize baseline noise, which provides a good signal-to-noise ration for chromatographic separations. The response time values are comparable to the effects of a 0.1- to 5-second RC filter. For the components with short retention time, the response time should be set up as small as possible.

3.5.5 Time Program Setup

Switch to the “Time Program” tab in the acquisition tab. Fill in the table in the window, according to practical requirements, as Fig. 3-6.

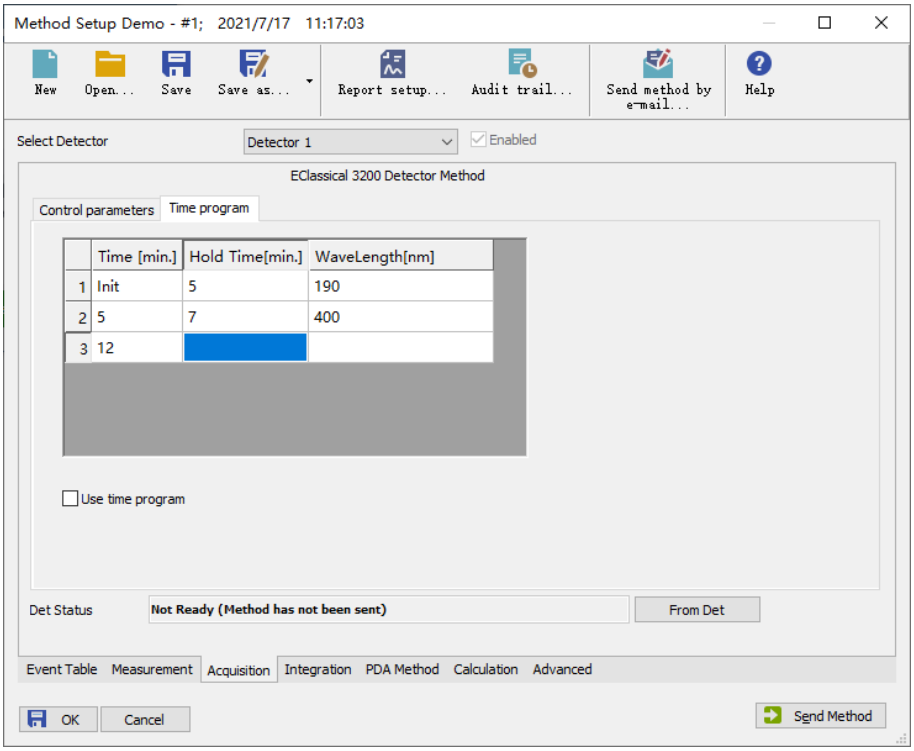


Figure 3-6 Time Program setup

3.5.6 Spectrum Scan Program

Spectrum Scan function has to be achieved with an independent software. For more details, see the corresponding software description.

3.6 Run the Method

After editing the detection method, click “save” to save and name it. Once click “send method”, the workstation would send method order to lower-computer and start to run the method.

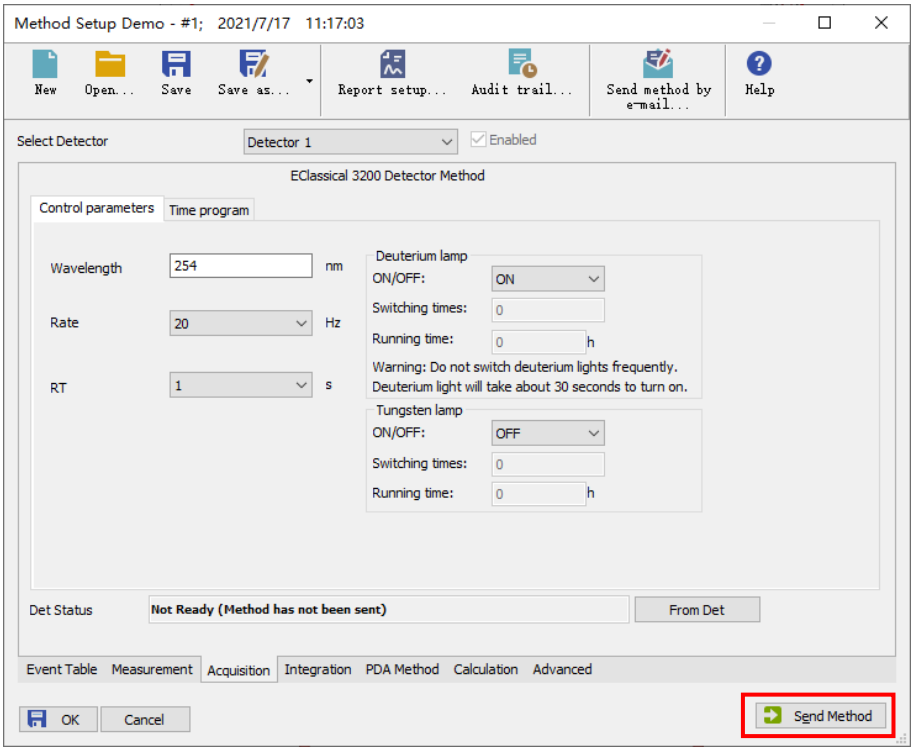


Figure 3-7 Send method

【Note】 After editing the detection method, if click “No” in the pop-up “to send method” dialog, the new setup method would only be saved without running right now.

3.7 Save the Method

After editing the detection method, click “OK” in the method setup window. Then click “File” in the instrument control window, and click “Save Method” or “Save Method As” in the drop-down menu, as shown in Figure 3-8.

“Save Method” refers to save and overwritten the current method without changing the file name. While “Save Method” refers to reset the file path and name the method without changing the current method.

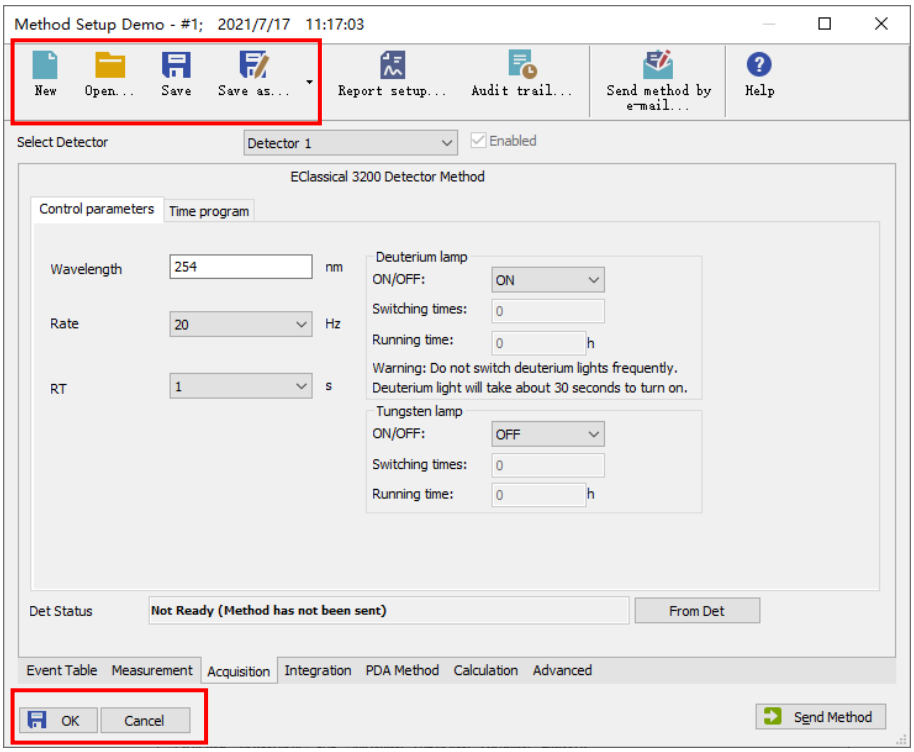


Figure 3-8 To save method

3.8 Baseline Auto Zero

Open the system device monitor window by clicking “  ” in the main menu window. Click “Auto zero” button to make the baseline automatically return to zero, as Fig. 3-9.

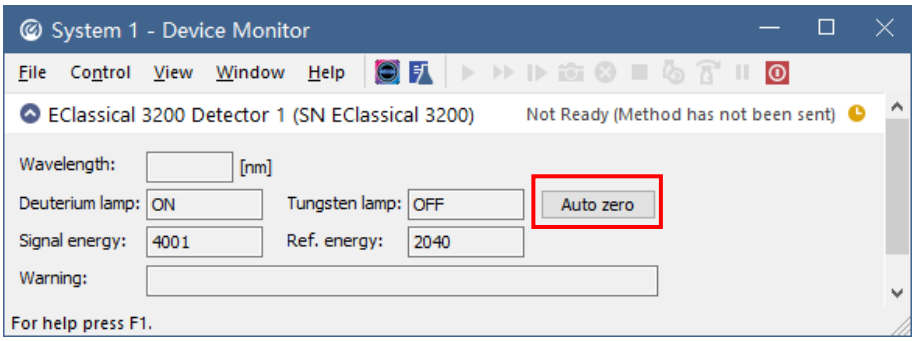


Figure 3-9 Device Monitor- Auto zero

3.9 Data Acquisiton

3.9.1 Open the Data Acquisition Window

As shown in Figure 3-10, in the drop-down menu of “Monitor”, choose “Data Acquisition”, or directly click data acquisition icon  to open the data acquisition window.

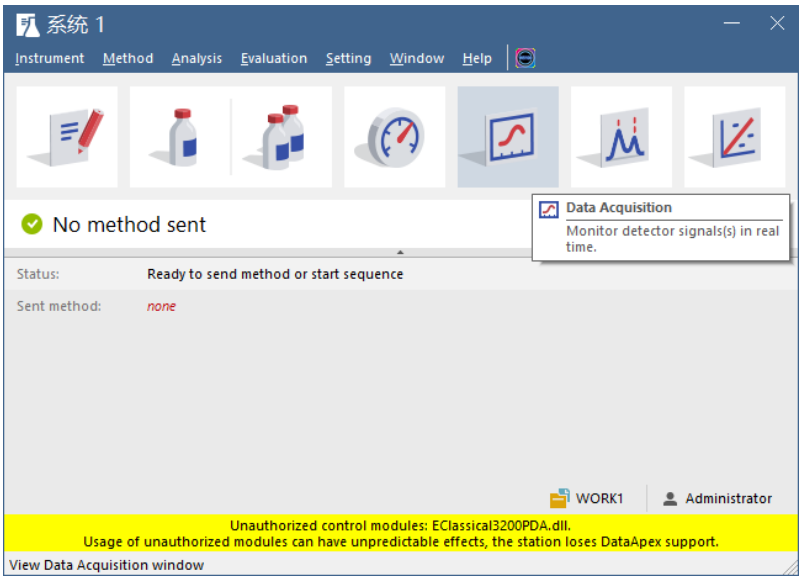


Fig. 3-10 Open the Data Acquisition Window

3.9.2 Data Acquisition Window

Click  in data acquisition window, and the workstation will be ready for data collection, as shown in Figure 3-11. The icon  indicates “Data acquisition” before collecting, but “Reacquisition” while collecting. Click this icon then workstation will stop collecting, generate chromatogram automatically and restart to run the same method.

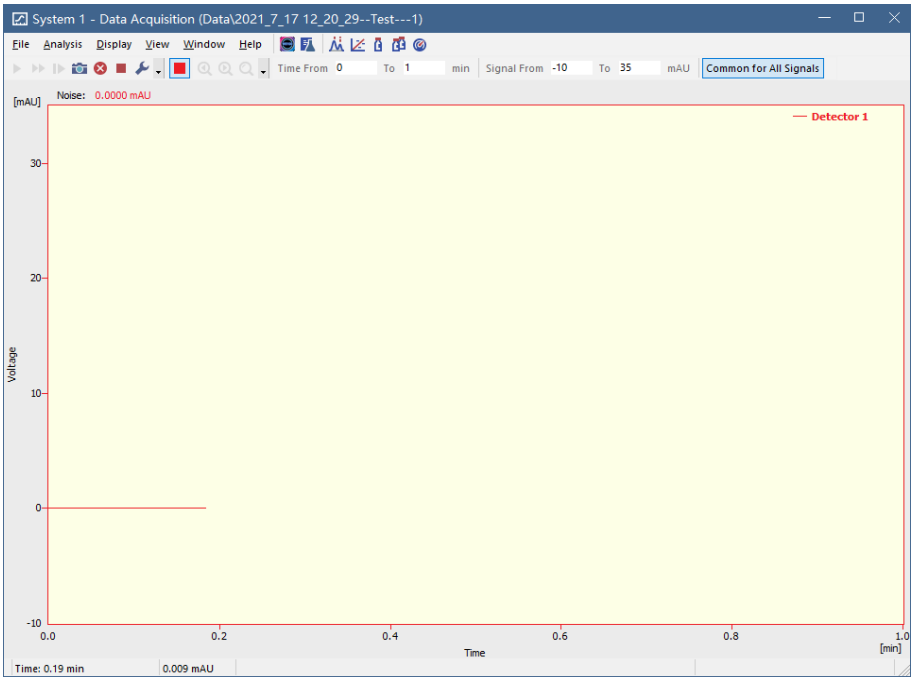


Fig. 3-11 Data Acquisition Window

Chapter 4 Maintenance and Repair

4.1 Indicator Status and Meaning

An LED light is installed below the front panel of the detector, serving as the status indicator, as Figure 4-1.

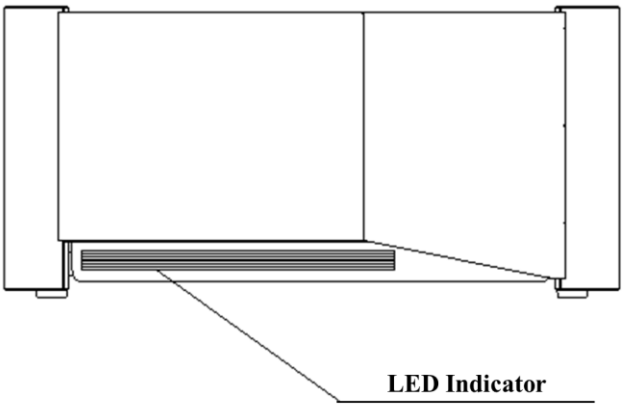


Figure 4-1 LED indicator on the front panel

The indicator light is blue in design, with combination status of breathing pulsation, frequent flashing, and constant, to indicate the status of existing instruments and a failure alarm. Refer to Figure 4-2 for the meanings.

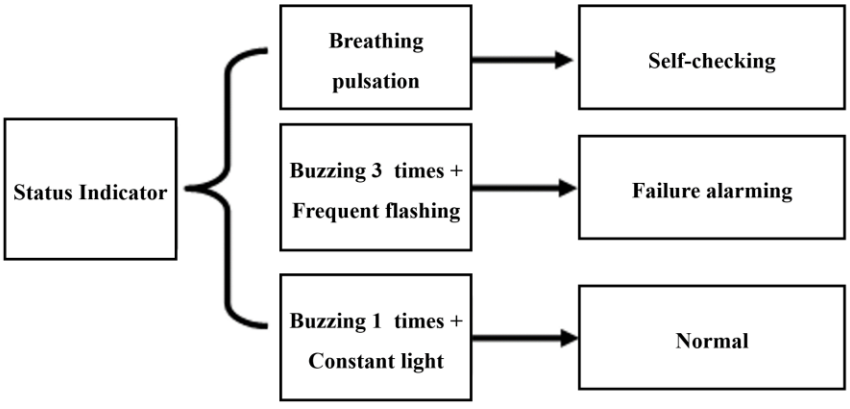


Figure 4-2 Indicator status diagram

4.2 Error Code

There will pop out error dialog box if the workstation detects failure. Users judge the troubles and take proper measures to solve according to the error codes.

Table 4-1 Error code

No.	Code	Trouble	Indicator
1	DB00	System CPU fault	----
2	DB01	EEPROM fault	----
3	DB02	8M crystal vibration fault	----
4	DB03	32K crystal vibration fault	----
5	DB04	Operation fault	----
6	DB05	Leakage	Blue light flash
7	DS00	System CPU fault	----
8	DS01	EEPROM fault	----
9	DS02	8M crystal vibration fault	----
10	DS03	Wavelength stepper motor fault	----
11	DS04	Eliminating secondary spectral device fault	----
12	DS05	Deuterium lamp power supply fault	----
13	DS06	Wavelength calibration failure	----
14	DS07	Light intensity over range	----

4.3 Other Faults

Table 4-2 A summary of other faults

No.	Symptoms	Cause	Solutions
1	Detector doesn't work	Fuse burn-out	Change fuse
		Power supply interruption	Power recover
2	Deuterium lamp is out	Lamp beyond service life	Change lamp
		Deuterium lamp wiring malfunction	Rewire
		Deuterium lamp power supply fault	Check the power supply
		Deuterium lamp switching off	Switch on the lamp

No.	Symptoms	Cause	Solutions
3	Energy of the sample and reference ends display as 0	Lamp burn-out	Change lamp
		Lamp switching off	Switch on the lamp

4.4 Examples of Abnormal Detector Signals

4.4.1 Periodically changing abnormal signals

There is regular cycle of change of abnormal signals, shown as Figure 4-3.

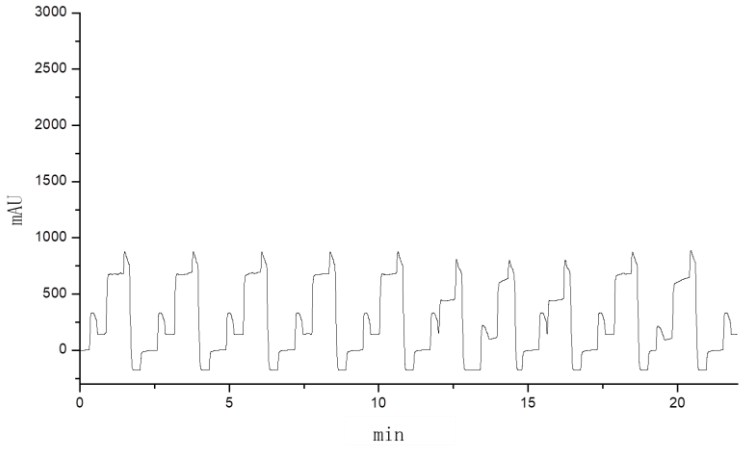


Figure 4-3 Periodically changing abnormal signal 1

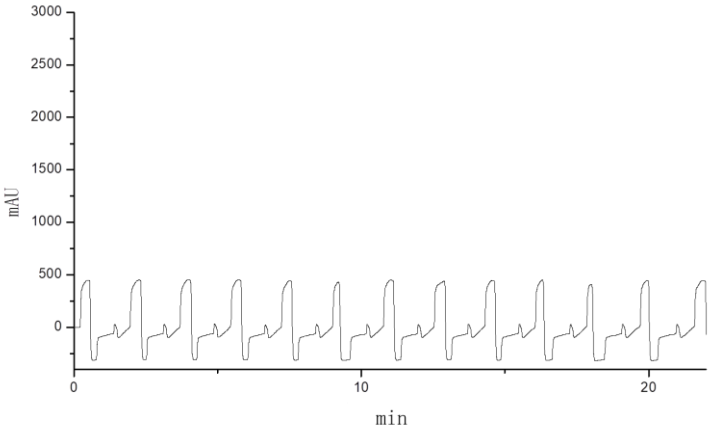


Figure 4-4 Periodically changing abnormal signal 2

If there regular cycle of change of abnormal signals, as shown above, it is generally caused by air bubbles mixed in flow cell. To drive out bubbles, replace the column to a two-way joint and then increase the flow rate to 3-5 mL/min.

4.4.2 Straight baseline with large signals fluctuated

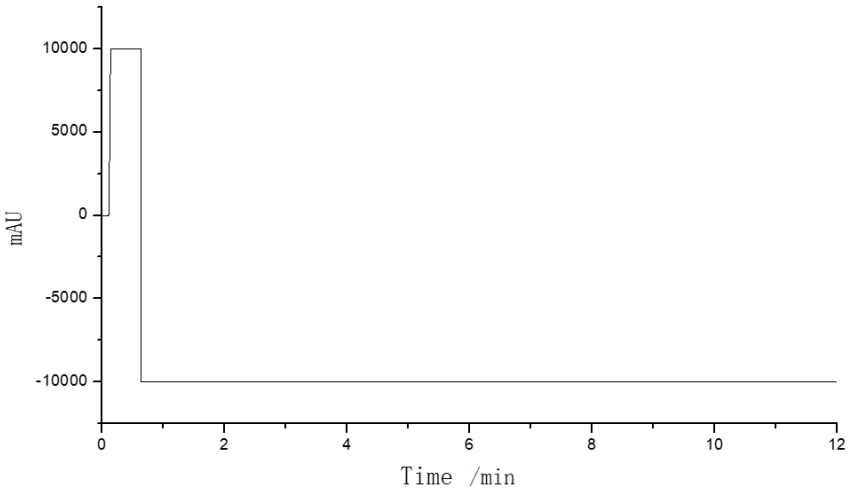


Figure 4-5 Baseline without signals

If baseline performs straight with large signals fluctuated, as Fig. 4-5, it is usually caused by that Deuterium lamp failed to light. Check whether the lamp setup option is “ON”. If not, switch to “ON”.

Chapter 5 Components Replace

In order to guarantee the normal run of the detector, it is necessary to maintain or replace some components. Maintenance is referred to easy repair operations, where there is no need to open the cover. However repair is referred to get rid of the cover and change internal parts.

If you encounter any repair issue, contact with Dalian Elite Analytical Instrument Co., Ltd.

【Note】 Without guidance, please do not open the detector cover, in case of any damage to body or instrument.

5.1 Cleaning the Flow Cell Online

Please follow these steps to clean the flow cell online:

1) Turn off the pumps, and take off the column.

2) Connect the flow cell entrance to the sampler export, and then pump miscible solvent or water (for example, mobile phase is with water miscibility) into the flow cell and rinse it. If mobile phase is immiscible with water, rinse it with transitional solvent.

3) Add the column again.

4) If impurities cannot be cleared, please contact with Dalian Elite Customer Service.

【警告】 Please do not flush the flow cell with nitric acid nor acetone! Flow cell may be polluted by these solvents.

5.2 Cleaning the Tubing

Newly acquired tube needs to be cleaned before use.

Solvent for cleaning stainless tube should be in the following sequence: CCl3-Methanol (or absolute alcohol)- water- 1.0mol/L HNO3 aq.- Methanol- Nitrogen. For PTFE, clean with methanol before use.

5.3 Flow Cell Replacement (Please contact Customer Service)

If flow cell is damaged or broken, replace the new one as following:

1) Unpack and check the new flow cell.

2) Please keep the detector power off, and then remove the entrance/ export connection tubing.

3) Unscrew the two thumb screws and gently remove the flow cell.

4) Install the new flow cell in the proper direction.

5) Tighten the two thumb screws.

6) Once again connect the entrance/ export tubing and clean it with suitable solvent.

7) Turn on the detector.

5.4 Deuterium Lamp Replacement

Depending on the self-property of deuterium lamp, lamp energy decreases while the working time increases. As a result, the signal to noise ratio decreases. To keep the optimum performance of the lamp, once it runs more than 2000 hours, users have to consider changing a new one. If the testing consequence is not influenced, users may go on using it with periodic maintenance and observation. It is suggested to get good prepared for the lamp replacement, avoiding a bad influence on experiments.

When the following conditions are met, please replace the deuterium lamp:

- The deuterium lamp cannot be lit while starting the detector.
- The baseline noise is too high, meanwhile the sensibility is too low.

【Note】 If the deuterium lamp cannot be lit for many times, it is suggested to replace it. In general, the service life of the lamp is 2000 hours.

【Warning】 Before take off the deuterium lamp, please make sure the detector is powered off. Because there will be intense ultraviolet radiation directly harm eyes or skin if you do not do this.

【Caution】 The temperature of the lamp box and around is so high to burn skin. So, please take off the deuterium lamp after turning off the detector power for 30 minutes.

Please replace the deuterium lamp as following:

1) Unscrew two fixing screws of the front panel, and remove the front panel lamp cover, as shown in Figure 5-1.

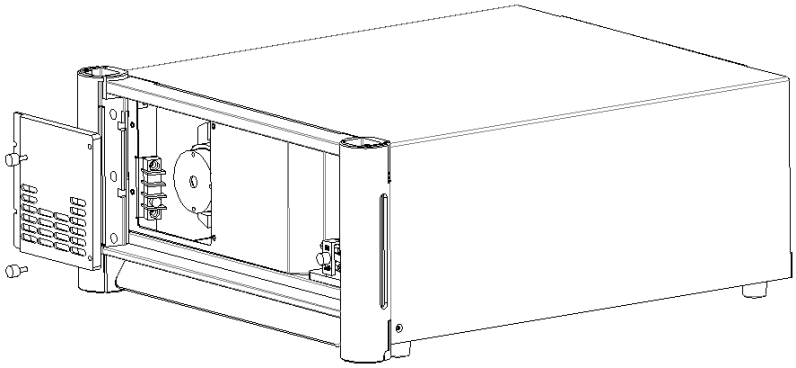


Figure 5-1 Remove the front lamp cover

2) Remove the inner lamp cap, as shown in Figure 5-2.

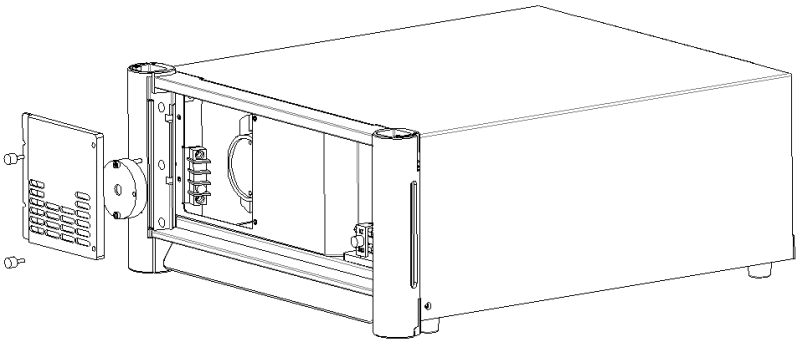


Figure 5-2 Remove the lamp cap

3) Unscrew the 3 lamp connecting terminals, as shown in Figure 5-3. Then loosen the 2 deuterium lamp mounting screws, and pull the lamp out of the lamp housing.

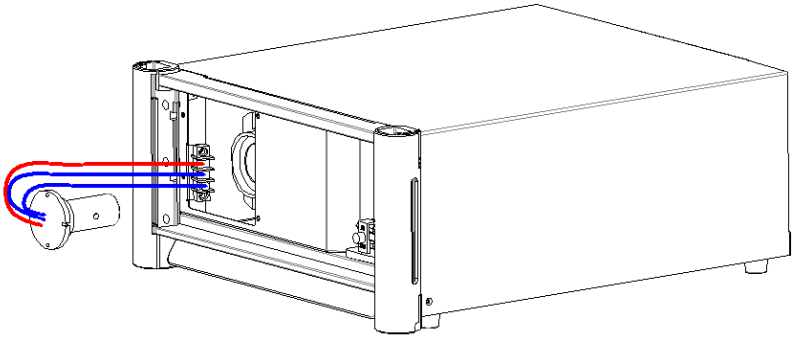


Figure 5-3 Pull the lamp out

4) Re-install the D2 lamp assembly to its original condition in the instrument.

5) Fasten the 3 lamp connecting terminals referring to the color (red-red, blue-blue, blue-blue). Double check the line sequence and tighten the screws.

6) Re-install the front panel lamp cover.

【Note】

◆ Glass covers the deuterium lamp, so please handle it gently. Fingers and other hard things can not touch the lamp aperture. Do not touch the lamp glass directly. Hold its lamp lines or flange.

◆ Never observe alight deuterium lamp with naked eye. Please put on UV protective goggles while observing it. Make a short observation after replacing a new deuterium lamp.

【Note】 Make sure that the detector power is cut off during replacement of the deuterium lamp. After the replacement, make sure to turn on the detector and preheat for at least 10 minutes.

Chapter 6 Appendix

6.1 Consumption parts

NO.	Describe	PN
1	Trigger line	18020091
2	Pre-Cut Tubing 1/16"-30mm-1/32"-500mm-0.007"	18990147
3	PEEK Tubing OD1/16″*ID0.007″	13010014
4	PEEK ferrule	14990128
5	SS Finger Tight	14993017
6	T2.0A fuse	15080006
7	Tee	14992904
8	Power Cable	17000014
9	LAN cable	17000035
10	Silicon Tubing	13010050
11	Finger Tight I (PEEK)	3215F-120X

6.2 Renewal Parts

NO.	Describe	PN
1	Deuterium Lamp	16010005
2	Tungsten Lamp	16020004
4	Tungsten Lamp Fixing Screws	14070229
5	Deuterium Lamp Fixing Screws	14992352

Safety information

General safety information

At different stages of the instrument operation, maintenance and repair, everyone should abide the following general safety rules.Breaking these rules may cause damage to instruments or staffs, Dalian Elite Analytical Instruments Co., Ltd. will not be responsible for the impact s caused by non-standard operation.

Standard of security

For marked with this symbol of the equipment, the user should refer to the instruction manual, so as not to cause harm to the operator and equipment damage.

Symbols	Descriptions
	Please do not operate beyond the scope of caution, unless you have been fully understand and meet the required conditions.
［Warning］	Casualties may appear. Please do not operate beyond the scope of warning, unless you have been fully understand and meet the required conditions.
［Caution］	Data loss or equipment damage may appear. Please do not operate beyond the scope of caution, unless you have fully understood and met the required conditions.
［Note］	Unsatisfactory experimental data and instrument failure may appear. Please do not operate beyond the scope of note, unless you have been fully understand and meet the required conditions.

Absorptive character of some typical functional groups

Name	Groups	λ_{max}	ε_{max}	λ_{max}	ε_{max}	λ_{max}	ε_{max}
ether	-O-	185	1000				
thioether	-S-	194	4600	215	1600		
amine	$-NH_2$	195	2800				
mercaptan	-SH	195	1400				
disulphide	-S-S-	194	5500	255	400		
bromide	-Br	208	300				
monoiodide	-I	260	400				
oximido	-NOH	190	5000				
nitrine	>C=N-	190	5000				
ethylene	-C=C-	190	8000				
keto-	>C=O	195	1000				
thioketone	>C=S	205	Strong	270-285	18-30		
aldehyde	-CHO	210	Strong				
acid	-COOH	200-210	50-70				
sulfoxide	>S→O	210	1500				
nitro	$-NO_2$	210	Strong				
Nitrous acid ester	-ONO-	220-230	1000-2000				
	(no-loop)						
	$-(C=C)_3-$	260	25000				
	$-(C=C)_4-$	300	52000				
	$-(C=C)_6-$	330	118000				
	$-(C=C)_8-$	230-260	3000-8000				
	(annulate)						
	C=C-C≡C	219	6500				
	C=C-C=N	220	23000				
	C=C-C=O	210-250	10000-20000				
	$C=C-NO_2$	229	9500				
benzene		184	46700	202	6900	255	170
biphenyl		246	20000				
naphthalene		220	112000	275	5600	312	175
anthracene		252	199000	375	7900		
pyridine		174	80000	195	6000	251	1700
quinoline		227	37000	270	3600	314	2750
isoquinoline		218	80000	266	4000	317	3500

【State】When choosing the best absorption wavelength, the lowest wavelength getting through mobile ph ase ought to be considered at the same time(UV cutoff wavelength in the appendix 2). To sample who h ave multiple characteristic absorption wavelength, the wavelength corresponding to the biggest ε_{max} is the best choice.

Features of some organic solvents

	Solvent* 7<.5cP,<45	source	UV Cutoff	R.I. 25℃	boiling point ℃	viscosity cP,25℃	p'	ea	w%	e	p'+ 0.25e
1	FC-78* FC-75(fluorous solvent) F-43	LC character	210 (Opaque or below)	1.267 1.276 1.291	50 102 174	0.4 0.8 2.6	< -2 < -2 < -2	-.25 -.25 -.25		1.88 1.86 1.9	p' And the dielectric constant
2	isooctane*	LC	197	1.389	99	0.47	0.1	0.01	0.011	1.94	0.1
3	n-heptane*	LC	195	1.385	98	0.40	0.2	0.01	0.010	1.92	0.5
4	n-hexane*	LC	190	1.372	69	0.30	0.1	0.01	0.010	1.88	0.5
5	n-pentane**	LC	195	1.355	36	0.22	0.0	0.00	0.010	1.84	0.5
6	cyclohexane	LC	200	1.423	81	0.90	-0.2	0.04	0.012	2.02	0.5
7	cyclopentane	LC	200	1.404	49	0.42	-0.2	0.05	0.014	1.97	0.6
8	1-chlorobutane*	LC	220	1.400	78	0.42	1.0	0.26		7.4	2.8
9	carbon disulfide	LC	380	1.642	46	0.34	0.3	0.15	0.005	2.64	1.7
10	2- chloride**	LC	230	1.375	36	0.30	1.2	0.29		9.82	3.7
11	carbon tetrachloride	LC	265	1.457	77	0.90	1.6	0.18	0.008	2.24	2.3
12	n-butyl ether		220	1.397	142	0.64	2.1	0.25	0.19	2.8	2.4
13	triethylamine			1.398	89	0.36	1.9	0.54		2.4	2.4
14	bromoethane*			1.421	38	0.38	2.0	0.35		9.4	4.3
15	isopropyl ether*		220	1.365	58	0.38	2.4	0.28	0.62	3.9	3.2
16	methylbenzene	LC	285	1.494	110	0.55	2.4	0.29	0.046	2.4	2.9
17	P-xylene		290	1.493	138	0.60	2.5	0.26		2.3	3.0
18	chlorobenzene			1.521	132	0.75	2.7	0.30		5.6	4.1
19	bromobenzene			1.557	156	1.04	2.7	0.32		5.4	4.1
20	iodobenzene						2.8	0.35			
21	diphenyl ether			1.580	258	3.3	3.4			3.7	3.7
22	phenetole			1.505	170	1.14	3.3			4.2	4.9
23	diethyl ether*	LC	218	1.350	35	0.24	2.8	0.38	1.3	4.3	4.0
24	benzene	LC	280	1.498	80	0.60	2.7	0.32	0.058	2.3	3.6
25	phosphotriester(p-tolyl)			1.510	72	0.57	2.2			7.8	4.2
26	iodoethane			1.510	72	0.57	2.2			7.8	4.2
27	n-caprylic alcohol		205	1.427	195	7.3	3.4	0.5	3.9	10.3	5.8
28	fluorobenzene			1.46	85	0.55	3.1			5.4	4.6
29	benzyl oxide			1.538	288	4.5	4.1				
30	dichloromethane**	LC	233	1.421	40	0.41	3.1	0.42	0.17	8.9	5.6
31	anisole			1.514	154	0.9	2.8			4.3	4.6
32	isoamyl alcohol			1.405	130	3.5	3.7	0.61	92	14.7	7.3
33	2-Dichloroethane	LC	228	1.442	83	0.78	3.5	0.44	0.16	10.4	6.3
34	tert-butyl alcohol			1.385	82	3.6	4.1	0.7	Dissolved	12.5	
35	n-butyl alcohol	LC	210	1.397	118	2.6	3.9	0.7	20.1	17.5	8.3
36	n-propyl alcohol	LC	240	1.385	97	1.9	4.0	0.82	Dissolved	20.3	
37	tetrahydrofuran*	LC	212	1.405	66	0.46	4.0	0.57	Dissolved	7.6	

38	propylamine*			1.385	48	0.35	4.2		Dissolved	5.3	
39	ethyl acetate	LC	256	1.370	77	0.43	4.4	0.58	8.8	6.0	5.8
40	isopropyl alcohol	LC	205	1.384	82	1.9	3.9	0.82	Dissolved	20.3	
	Solvent* 7<.5cP,<45	**source**	**UV Cutoff**	**R.I. 25℃**	**boiling point ℃**	**viscosity cP,25℃**	**p'**	**ea**	**w%**	**e**	**p'+ 0.25e**
41	chloroform*	LC	245	1.443	61	0.53	4.1	0.40	0.072	4.8	5.6
42	acetophenone			1.532	202	4.8				17.4	8.7
43	MEK*	LC	329	1.376	80	0.38	4.7	0.51	23.4	18.3	9.1
44	cyclohexanone		215	1.450	156	20	4.7			18.3	9.1
45	nitrobenzene			1.550	211	1.8	4.4			34.8	13.2
46	phenylcyanide			1.536	191	4.8				25.2	10.9
47	dioxane	LC	215	1.420	101	1.2	4.8		Dissolved	2.2	
48	tetramethylurea	LC	265	1.449	175		6.0	0.56		23.0	10.7
49	quinoline			1.625	237	3.4	5.0			9.0	7.4
50	pyridine			1.507	115	0.88	5.3		Dissolved	12.4	
51	nitroethane		380	1.390	114	0.64	5.2		0.9		
52	acetone*	LC	330	1.356	56	0.30	5.1	0.71	Dissolved		
53	phenethyl alcohol			1.538	205	5.5	5.7			13.1	8.8
54	tetramethyl guanidine						6.1	0.6			
55	methyl cellosolve	LC	210	1.400	125	1.60	5.5		Dissolved	19.9	
56	CIS Cyanide Oxide	GC					6.6				
57	1,2-Propyl carbonate	LC					6.1				
58	ethyl alcohol	LC	210	1.359	78	1.08	4.3		Dissolved	24.6	
59	diether	GC					6.8				
60	aniline			1.584	184	3.77	6.3			6.9	8.1
61	acetic acid			1.370	118	1.1	6.0		Dissolved	6.2	
62	acetonitrile*	LC	190	1.341	82	0.34	5.8		Dissolved	37.5	
63	dimethylacetamide	LC	268	1.436	166	0.78	6.5	0.88		37.8	
64	dimethylformamide	LC	268	1.428	153	0.80	6.4			36.7	
65	dimethyl sulfoxide	LC	268	1.477	189	2.00	7.2	0.62	Dissolved	4.7	
66	N-methyl-2-pyrrolidone	LC	285	1.468	202	1.67	6.7			32	
67	Hexamethylphosphoric triamide			1.457	233	3	7.4	0.65		30	
68	methyl alcohol*	LC	205	1.326	65	0.54	5.1		Dissolved	32.7	
69	nitromethane		380	1.380	101	0.61	6.0		2.1		
70	m-cresol			1.540	202	14	7.4			11.8	10.0
71	n-methyl formamide			1.447	182	1.65	6.0		Dissolved	182	
72	ethanediol			1.431	182	16.5	6.9		Dissolved	37.7	
73	methyl aldehyde			1.447	210	3.3	9.6		Dissolved	111	
74	water	LC		1.333	100	0.89	10.2			80	

【State】

1.Organic solvent have low boiling point(≤45 ℃), low viscosity (≤0.5cp) is easy to use. Marked with (*) number of organic solvents is preferred for high performance liquid chromatography (HPLC) mobile phase solvent. Marked with (*) is with very low boiling point and low viscosity solvent.*

2.In the "source" column with LC means the mobile phase can be purchased from the following companies: Burdick & Jackson, Baker Chemical, Mallinkrodt Chemical, Fischer Scientific, Manufacturing Chemicals, inc.etc.

3.In the "source" column with GC means the mobile phase can be used as gas chromatographic stationary phase, and can be purchased from the distribution company and GC column stationary phase

4."UV Cutoff"— Mobile phase is ultraviolet transparent over the wavelength

5."R .I .25"the index of refractive index (25 ℃).

6."p" the polarity parameters of mobile phase.

7."ea" Flow intensity parameter when alumina is use for liquid - solid adsorption.

8."w%"Water Solubility w% in 20 ℃ Solvent。

9."e"Dielectric Constant e。

*10."p+0.25E"E*lectric constant function.

ELITEHPLC

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