Classical 3100

USER'S MANUAL

Dalian Elite Analytical Instruments Co., Ltd.

Operation Manual

for UV3100/3110 UV-vis Detector

V1.0.7

Statement

The manual is intended to help users to understand, use and maintain UV3100 detector. Dalian Elite Analytical Instruments Co., Ltd does not assume the responsibility caused by business or special purpose use of the manual.

The information in this document is subject to change without notice and should not be construed as a commitment by Dalian Elite Analytical Instruments Co., Ltd.

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

In no event shall Dalian 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 UV3100 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

UV3100 UV-vis detector is based on years of experience in the research and production of detector. It is a high-performance detector for HPLC system.

The light source of UV3100 is deuterium lamp, mainly used in UV region. The detector has three work modes: single wavelength, wavelength-time program and spectrum scanning.

Eclassical 3100 Series products include UV-visible detector, constant flow pump, solvent tray, workstations, gradient mixer, etc. For more information, please contact Dalian Elite Analytical Instruments Co., Ltd.

1.1 Overview

UV3100 UV-vis detector (hereinafter called UV3100 for short) includes optical unit, data acquisition, control circuit and data processing software, and other parts. The Double light path holographic concave grating monochromator is used to reduce energy loss, which make noise and drift more competitive than other instrument. It uses high precision stepper motor to drive grating Angle, which make the accuracy and precision of detection wavelength meet the demand of users. High-energy deuterium lamp is used to ensure the wavelength extended to 700 nm. 24 Δ -- Σ A/D conversion technology and double CPU structure based on MSP430 single chip microcomputer is adopted, which promote high precision of data acquisition, data processing and management system coming true. Detector signal can be output by a RS-232 or two USB ports to the computer. RS-485 line achieve communication between instruments. All the above communication mode makes the whole HPLC system simple and reasonable.

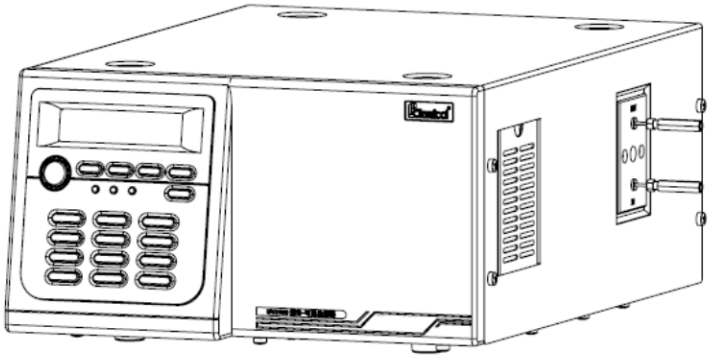


Figure 1-1: UV3100 UV-vis detector

1.2 Features and Functions

Excellent accuracy and precision

By using high precision stepper motor to drive grating angle, the detection wavelength can maintain accuracy and precision, which make the analysis results more reliable.

Automatic spectrum scanning

When the mobile phase is stationary, scan the samples to get its ultraviolet-visible absorption spectra, which can help users to determine the best measuring wavelength.

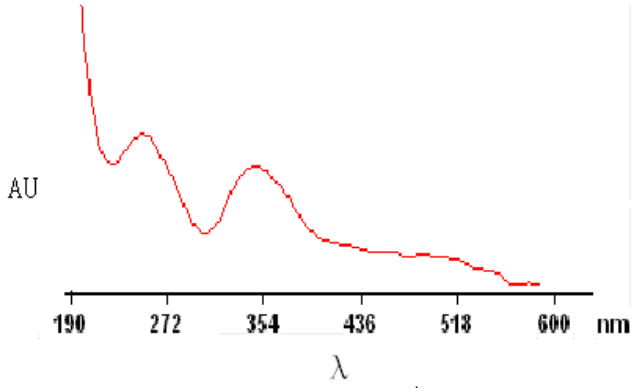


Figure 1-2: UV3100 Ultraviolet absorption spectrum standard solution

Wavelength-time program

When a variety of compounds analysis at the same time, using wavelength-time program can ensure samples detected under the best wavelength, which improves the detection sensitivity effectively.

Convenient replacement for flow cell and deuterium lamp

The flow cell is on the side, users can replace it conveniently. The pipeline structure is designed separately from light resource, which means you needn't to adjust the optical path while changing the deuterium lamp.

Excellent stability

Good accuracy and precision of wavelength, a new optimization of circuit system, makes the equipment in use process more stable and more reliable.

High detection sensitivity

Imported grating makes the energy attenuation lower, the optimized piping and installation location reduce the column outside effect, so, the detection sensitivity is high enough.

1.3 Performance Specification

Table 1-3: Performance Specification of UV3100 detector

Items	Specifications
Wavelength range	190nm-700nm
Light resource	Deuterium lamp
Display	2×20 VFD
Spectral bandwidth	8nm
Wavelength accuracy	±1nm
Wavelength repeatability	≤0.1nm
Set fan of wavelength-time program	0.1min-999.9min
Response time	0.1s-4.9s
Noise	≤$\pm 0.5\times10^{-5}$AU (Empty flow cell、254nm、Constant ambient temperature)
Drift	≤1.0×10^{-4}AU/h (Empty flow cell、254nm、Constant ambient temperature)
Linearity range	≥1.8AU(5%)(254nm)
Cell path length	10mm
Maximum backpressure on flow cell	8MPa
Communication mode	RS232 or USB

1.4 Physical Specifications

Table 1-4: Physical Specification for UV3100 detector

Dimension/Weight	420mm×300mm×175mm/16kg
Power requirments	AC 220V,50Hz
Typical input power	100W

Chapter 2 Installation and transport

2.1 Unpacking inspection and standard accessories

UV3100 UV-vis detector is packaged 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 is any damage to the instruments when you receive it, please don't try to install it. You can ask Dalian Elite Analytical Instruments CO., Ltd to inspect and assess it.

2.1.1 Demolition of the packing

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

［Warning］The detector is heavy, it is suggested that installation operation requires at least two people to prevent instrument slide.

2.1.2 Deliver checklist

Before installing, please check the deliver list carefully, if one or several of them omissions, please communicate with Dalian Elite Analytical Instruments CO., Ltd. Or local distributors as soon as possible.

Table 2-1: Deliver list of UV3100 detector

NO.	Items	Quantity
1	UV3100 detector	1 pc.
2	Certificate	1 pc.
3	Service Card	1 pc.
4	Start Package	1 pc.
5	Warranty bill	1 pc.
6	User manual (CD)	1 pc.

［Note］If there is discrepancies between the packing list in the box and in the specification, please refer to the packing list in the box, It is subject to change without prior notice.

2.2 Installation Requirements

2.2.1 Site Requirements

Environment

UV3100 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 /hr

［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 UV3100 detector can be placed on any normal laboratory bench. If you want to display the complete 3100 system on the bench, make sure that the table can bear the weight of all components. It needs additional space of 50mm on the left, 150mm on the right,150mm 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!

2.2.2 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 Hz;

Please choose T1.0 A (250 v) 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.

2.2.3 Computer requirements

Hardware requirements

- The lowest hardware requirement: Intel Core 2 CPU, 2G internal storage, more than 1G hard-disk space (Refer to the use of workstation)
- The lowest resolution of displayer: 1024×800, 64K (16 bit image)
- Others: USB or RS232 interface for communication, CD-ROM driver for software installation

Operation system requirements

- Windows XP Professional (SP3), Windows 7 or higher version (Refer to the use of workstation).

Workstation requirements

- Use W5100 workstation to control the instruments.

2.2.4 Communication connection

Communication, management and control functions between 3100 components is completed by detector. The communication line is connected as follows:

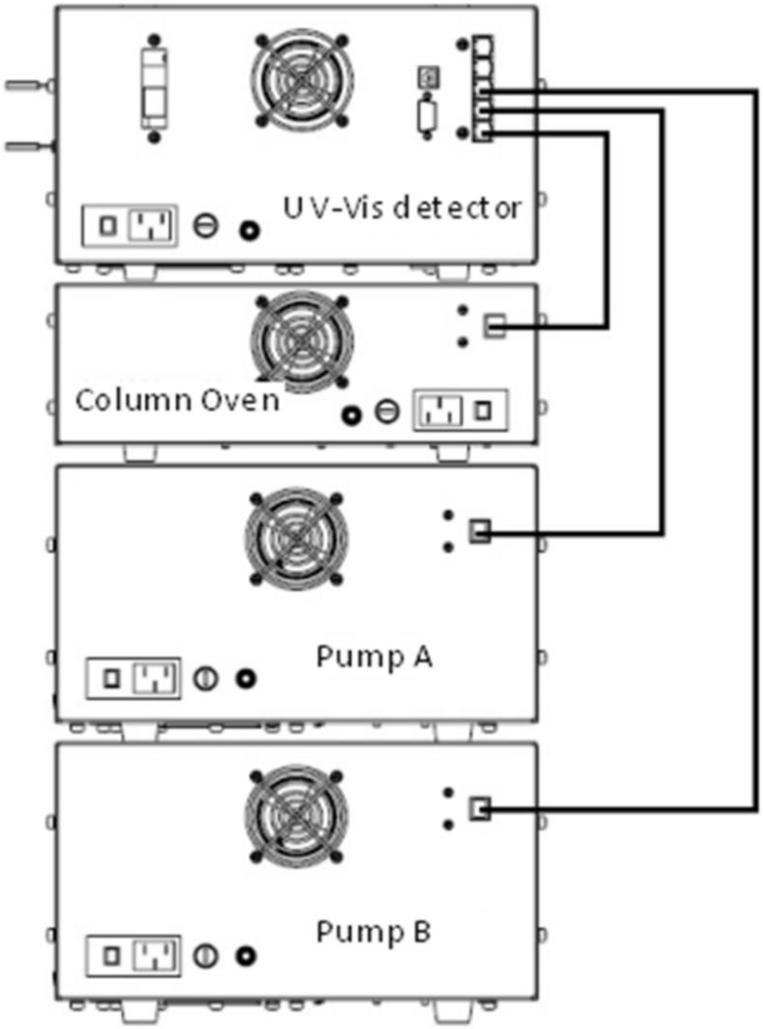


Figure 2-1: 3100 HPLC communication

2.3 Tube Connection

In addition to the column system, piping, fittings and injector, detector volume is likely to cause bands broadening. Inappropriate tube material also leads to band broadening, even to degeneration of the sample. Please connect the tubes with instruments correctly to improve efficiency. The tips are as follows:

2.3.1 Tube material

Different material of tube is required according to the working pressure, the kind of mobile phase and the nature of sample. The commonly used tube materials are as follows: stainless steel, polyetheretherketone (PEEK), polytetrafluoroethylene, polyethylene or polypropylene. The most commonly used material is stainless steel. The outer diameter of LC connection tube is 1.59mm (1/16 "), the inner diameter of LC tube is 0.175mm (0.007"), 0.25mm (0.01 "), 0.5mm (0.02"), 0.75 (0.03 ") mm and 1.0mm (0.04") etc., user can choose from them. Stainless steel tube is generally used for high-pressure part.

Polymer tube can be used in low-pressure part of LC System, such as from reservoir bottle to pump, detector outlet, injector discharge port, etc. The polymer tube is the most common connection tube in LC system.

PEEK tube can withstand about 30MPa pressure, it is more inert than stainless steel pipe which means it is a good choice for separation, analysis and preparation of biological samples. In bio-separation system, PEEK is alternative materials for stainless steel.

2.3.2 Cleaning the connect tube

Please wash new pipeline with solvent before use. Cleaning order: chloroform - methanol (ethanol) - Water -lmol/L nitric acid - water - methanol – dry nitrogen stream. Also, silicone tube should be rinsed with methanol before use.

2.3.3 Eclassical 3100 System connection instance

The stainless steel two way at the lower part of the detector cell is the entrance, so that the bubbles in detector cell can be excluded easily. Connect the exit of column to the entrance of detector cell with piping and screws tightly to prevent bubbles from entering the system. It is recommended that you'd better choose the patent universal joint or one-piece joint produced by our company. The outlet of the detector cell should be connected to the waste bottle with the silicone tube (inner diameter 1.0 mm) in the accessories package.

2.4 The Front

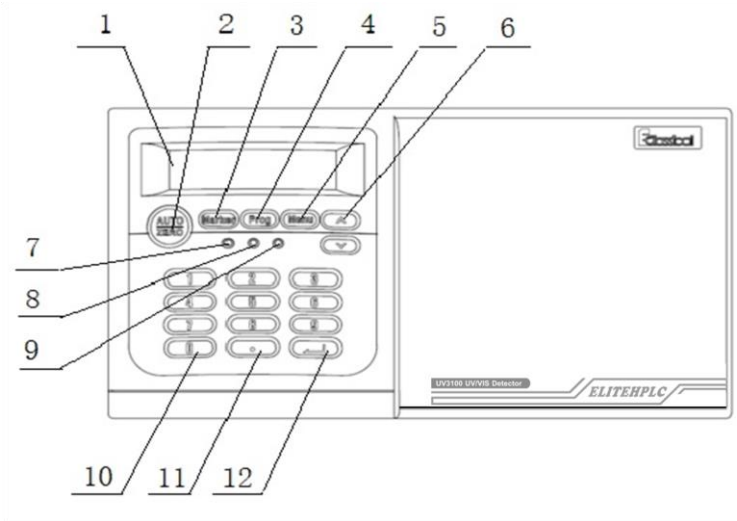


Figure 2-4: Front of UV3100

Table 2-3: Keypad Function

No.	Key	Function
1	VFD – display	VFD displays operational status, menu and sub-menus, and parameters' values and units.
2	Auto Zero	Press the button can make the absorption signal (ABS) displayed automatic back to zero, at the same time detector output the zero signal to the recorder, integrator and workstation.
3	Mark	Every button, the detector will produce the pulse signal and mark on the recorder.
7	Prog.	To start/stop wavelength-time program.
4	CLEAR	To delete wrong data input or to disarm an alarm.
5	MENU	To access to function menu. Press the MENU key once, to access to the respective MENU1. Press again, to MENU2.
6	↑↓	Press ↑ and ↓ key to move between different menu and sub-menu.
7	Energy	To display the current energy and reference energy.
9	⏻	Power switch
8	POWER	Power is on when the indicator is illuminated.
9	Alarm	When the alarm indicator is illuminated, the energy of detector is lower than setting value or circuit problems occur.
10	0 – 9	Numerical keys
11	.	Decimal point
12	ENTER	To confirm values and selections. Upon pressing ENTER key, the cursor will automatically move to the next parameter.

2.5 The Rear

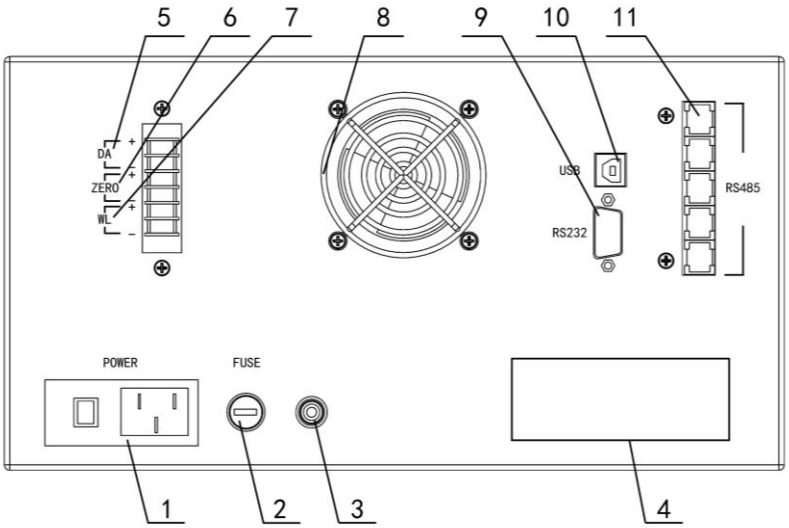


Figure 2-6: UV3100 detector rear panel

Table 2-4: Rear panel

No.	Components	Function
1	Power connector and Power switch	The power cable is connected into grounded power outlet. “I” turn on the detector power, “O” turn off the detector power.
2	Fuse	The fuse is in it
3	Ground terminal	To ground the main body of the instrument.
4	Instrument panels	To identify the information of instrument.
5	DA	The voltage value of full output range is 2V, the output unit is 1 AU/V. (option)
6	ZERO	Baseline back to zero and start to collect data.
7	WL	To start wavelength-time program and begin to collect data.
8	Cooling fan vent	Cool the instrument.
9	RS232 interface	The communication interface between the instrument and workstation.
10	USB interface	The communication interface between the instrument and workstation.
11	RS485 interface	The communication interface between the instrument.

［Note］The standard configuration of output signal is digital output, if analog output is needed, please indicate in order.

2.6 System Configuration

In normal instance, the instrument customers received have been tested and came with verification, the performance met our requirements in factory, users have no need to test and verify. If you have any doubt about the performance of the instrument, verify it refer to the following steps:

1) Take a chromatographic column, the positive phase system selected SiO2 column, inverse system using C18 column.

2) Prepare mobile phase and samples according to evaluation report provided by the column manufacturer.

3) Empty air bubbles in the system, when the system is stable, detect it according to the testing requirement.

4) If the result and column efficiency is conform to the information provide by column manufacturer within the error range, that means the HPLC is qualified.

2.7 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.

Turn off the power.

Unplug the power cord and communication lines.

Removing the connecting pipe and other elements between components.

Remove the detector from chromatography system, put it into special sealed bag on a large platform.

Put the detector into the original packaging foam, fix it.

Placed the fixed detector and other accessories into original packaging carefully.

Tape the box sealed to prevent liquid from entering. Cover the packaging box with plastic wrap is recommended.

Transport packaged instrument.

［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 Working Principle

3.1 Basic Theory

Material molecular can absorb ultraviolet-visible light, which conforms to Lambert Beer law.

I0 is Intensity of the Incident Light, I is the transmitted light intensity(refer to figure 3-1), the Lambert Beer law can be written as:

$$I = I_0 e^{-\varepsilon l c}$$

l ——Optical path length of flow cell,

c ——The molar concentration of the sample,

ε ——The molar absorption coefficient of the sample.

Definition:

$$T = I / I_0$$

T is the transmittance for the sample under a particular wavelength.

So:

$$A = \varepsilon l c = \log(\frac{I_0}{I})$$

A is defined as the light absorption value.

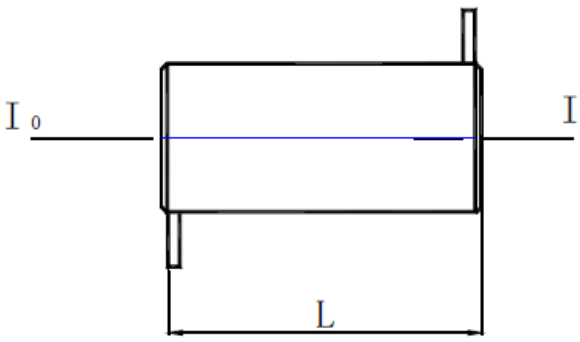


Figure 3-1: The absorption of samples in the flow cell

Thus, light absorption value A is linear to samples concentration c. The sample concentration can be obtained by measurement of light absorption value. Molar absorption coefficient is relevant to light wavelength, sample on molecular structure and solvent, it shows absorption ability of sample molecules under a particular wavelength. Annex I listed some typical groups of characteristic absorption wavelength and the corresponding ε value.

3.2 Principle and composition

Figure 3-2 is the general structure diagram of detector, the light is split by monochromator and goes through the flow cell. Different samples absorb light of different wavelengths, which make the intensity of transmitting light change. Photoelectric cell receives these lights and then transmitted to the control circuit for signal processing.

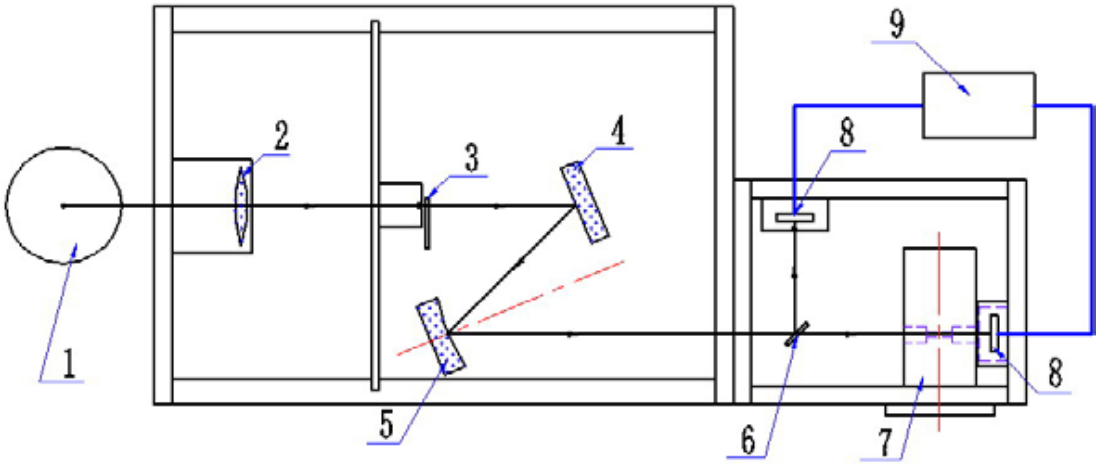


Figure 3-2: The overall block diagram of UV3100 optical system

1.Light source, 2.Lens, 3.Optical filter, 4.Reflector 5.Holographic flat-field concave gratings, 6.Beam splitter, 7.Flow cell, 8.Amplifying circuit, 9.Control circuit

3.3 control circuit

UV3100 UV-vis detector optical system include light source (deuterium lamp), a focusing lens, monochromator, splitting mirror, flow cell, etc (FIG. 3-2 light path).

Light from a light source 1 go through lens 2 into the monochromator, then it is split to measure light and reference beam. The measure light is got by light receiving element from flow cell, and deal by amplifying circuit 8, then it is transferred to control circuit 9. The reference beam exposure to the amplifying circuit 8 directly, and transfered to control circuit 9 for signal processing.

3.4 Circuit section

Control system of UV3100 detector is double CPU structure, based on MSP430 16 bit single chip microcomputer, the system consists of liquid crystal display, keyboard, 24 bits of high precision AD conversion, 20 DA conversion (optional), motor drive circuit (Figure 3-3). The photocurrent signal of photoelectric diode come through signal processing and AD converter, then, it is converted into digital signals. After that, the digital signal is handled by microprocessor including data operation, processing and control. The application of the high integration components and devices make the reliability and stability of the instrument improved.

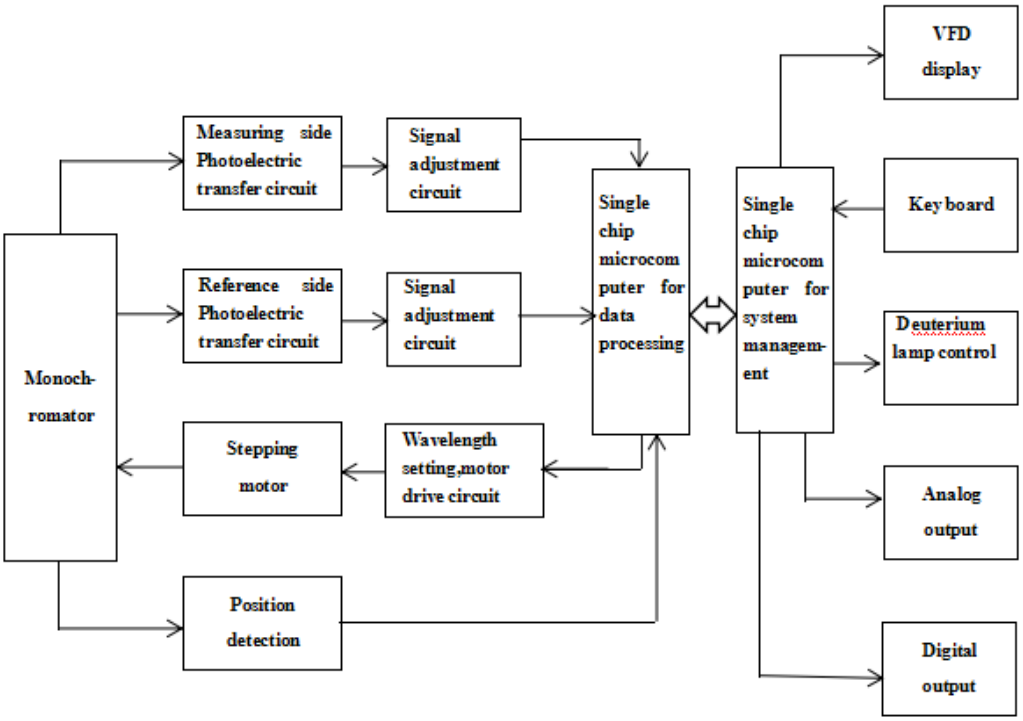


Figure 3-3: Circuit system frame

Chapter 4 Basic Operation

Before operating the detector, please connect the system properly and confirm the power supply, the following is operation orders:

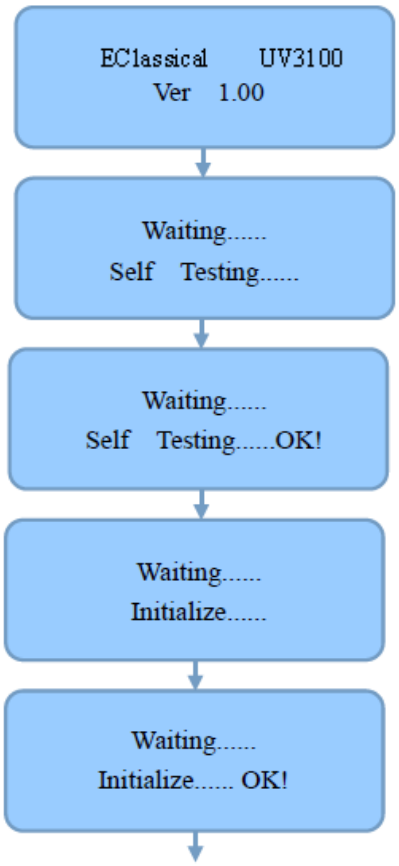
4.1 Power On

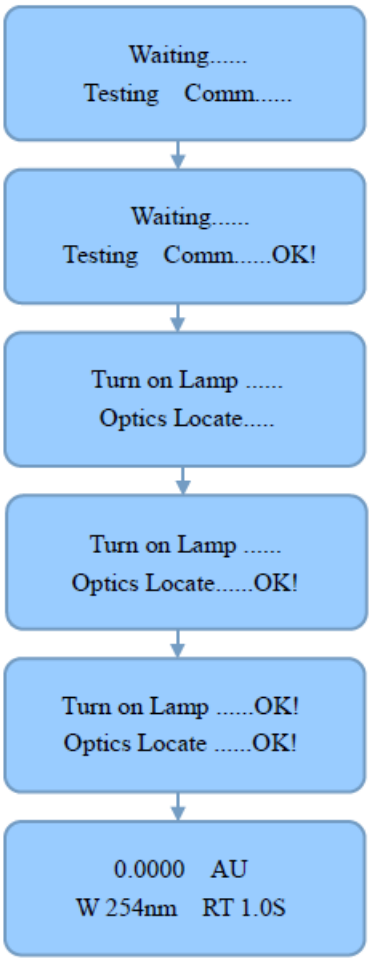
Please plug the power cord into the power outlet.

［Caution］The power switch is turned off at this time.

Turn on the power switch (lower left corner of the front panel).

Power indicator light, VFD screen is bright, the detector begins to self-test. The VFD display sequence is as follows:





At the same time a deuterium lamp on the front panel indicator is lit on.

［Caution］If this is the first time you use the UV3100, the main interface parameters are default parameters, All parameters of the detector is maintain the previous shutdown parameters.

If the instrument is shutdown, an Interval of more than 3 minutes is need before it is turned on again.

4.2 Basic Operation

Setting the detector wavelength and response time

In the main interface, you can modify the detect wavelength and response time, if you want to modify a parameter, first press the "↵" Enter key, and then press "↑, ↓" key to move the cursor to the parameter to be modified, after typing the new parameter value press "↵" button to confirm. If there is any error in the process of setting, “ERR” will occur.

ABS	-0.0001	AU
W .L.	254nm	RT 1.0s

Response time

Detector response time is also called time constant, defined as 63.2% of the time from the sample coming into the flow cell to the real signal output. Response time is the measure of time a response signal comes out from the sample entering into the detector, it reflects the detector tracking speed about the changes of component concentration. If detector and recorder’s time constant is too big, peak shape distortion, column efficiency decline may occur, also reliability and accuracy of analysis will be affected by it, for components whose preserving time is short, the time constant of the detectors should be as small as possible.

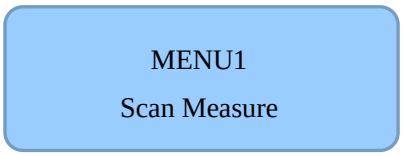
［Caution］RT range of UV3100 detector:0.1-4.9s.

4.3 Normal Operation

4.3.1 Scan measure

From the main interface, press MENU button to access to “MENU-1”.

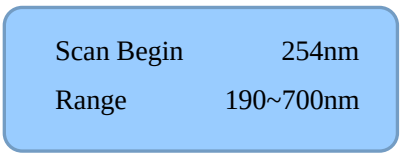
You can use ↑ and ↓ to access parameters in MENU1, include scan wavelength setting scan step setting and scan speed setting.



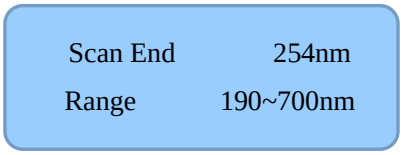
4.3.2 Setting scan wavelength

You can use ↑ and ↓ to enter scan wavelength setting interface, press numeric keys to set beginning scan wavelength and the ending wavelength, then press "↵" to alter the parameters.

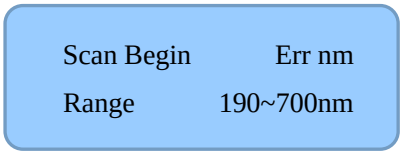
The starting wavelength

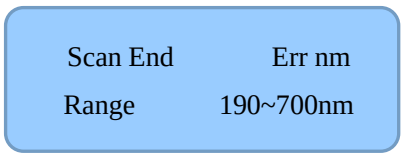


The ending wavelength



If setting parameters beyond the scope, the following interface will display for several seconds and then back to setting interface, you can set proper value again and press "↵" button to confirm.





4.3.3 Setting scan step

Press ↑ or ↓ twice to enter scan step setting interface, press numeric keys to set scan step(1-10nm) , then press "↵" to alter the parameters.

Scan	Step	1nm
Range		1~10nm

4.3.4 Setting scan speed

You can use ↑ and ↓ to three times to enter scan speed setting interface, press numeric keys to set the speed(1-10nm), then press "↵" to alter the parameters.

Plot	Speed	1nm/sec
Default (1nm/sec)		

［Caution］The default scan speed of UV3100 detector is 1nm/sec.

4.3.5 Return to other interface

When you press the "MENU" button continuously, the liquid crystal display will circulate between MENU1, MENU2, MENU3 and main interface. According to your requirements, you can stop at any state setting parameters or conducting an analysis at main interface.

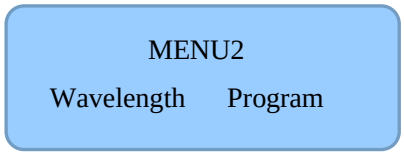
4.4 Time program

Time program menu is used to set a specific time of wavelength change.

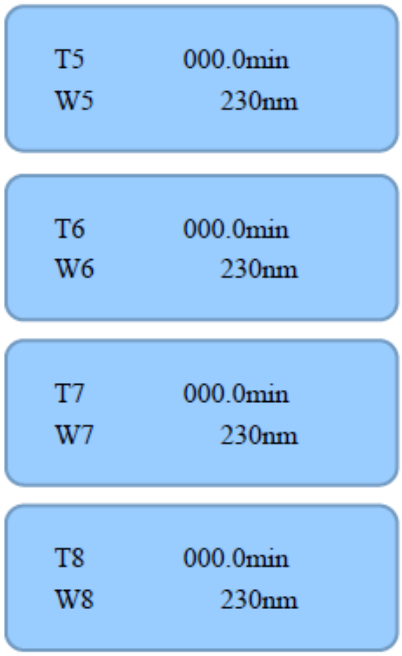
4.4.1 Setting the parameters of time program

You can press the "Menu" button continuously to enter into “MENU 2”. When “MENU 2 Wavelength Program.”is displayed, press “↓” button, then you will come into edit interface for time program. Parameters can be edit include: starting time and starting wavelength, editable starting time and wavelength is nine. The procedure is as follows:

1) Press “MENU” button twice：



2) Press “↑”and “↓” button, 9 sub menu will be displayed in turn， you can set the parameters in corresponding interface



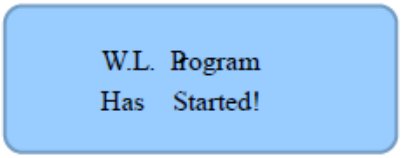
A set of wavelengths (190-700 nm) and time (0.1 to 999.9 min) value can be input into each sub menu. After finishing inputting, press "↵" to alter the parameters, then press “↑”and “↓” button to edit values of next set. If the inputting exceeds the range of detector, the following information displayed, you can reset the values, and press enter button to confirm.

If the setting don't meet: T0 < T1 < T2 < T3 < < T5 T4 < T6 < T7 < T8, it will shows error in the screen, resetting is needed. Wrong setting will lead to abnormally switch of main interface and sub menu, if the problem is discovered, please check and correct your setting.

［Caution］If the period of time-wavelength is less than 9, the behind time and wavelength value should be the same as the last one.

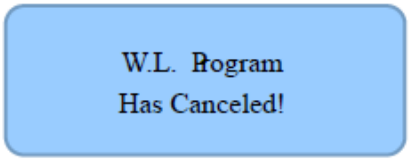
4.4.2 Running time program

When Pressing “Prog.” button， the following information shows on the screen, and the detector starts running according to time program.



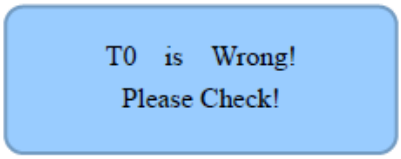
4.4.3 Stopping time program

After finishing the time program, the detector will come back to main interface. In the process of time program running, you can also press "Prog." button to stop it at any time. In that case, the detector will show the following information for several seconds before coming back to the main interface.



4.4.4 Stopping error of time program

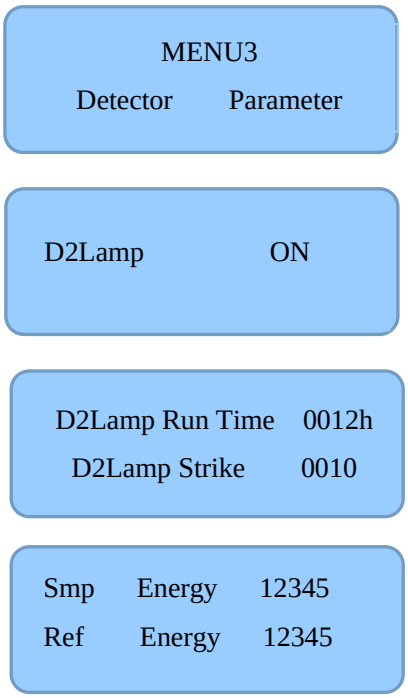
The following information occurs when there is something wrong with time program.



4.5 Detector working parameters

［Caution］There is only deuterium lamp in UV3100 detector, so the following instructions for tungsten lamp is invalid.

You can press the "Menu" button continuously to enter into “MENU 3”. Information about the deuterium lamp can be found here, including: the switch state, running time, start times, etc. By pressing “↑”and “↓” button, the screen shows below in turn.



4.5.1 The switch state of deuterium lamp

Through pressing "↑" and "↓" key to enter the following setting interface of deuterium lamp switch state, the cursor blinks after pressing the enter key. You can change the switch state of deuterium lamp using the "↓" button. When deuterium lamp is set to "OFF" state, the front panel indicator lights will go out.

［Caution］The impact to deuterium lamp of each switching on is equal 3 hours normal light. If the interval before next turning on is less than 3 hours, you'd better keep the deuterium lamp on.

If the state of deuterium lamp is "OFF" before the last power off, it will occur to remind of it after the detector is turning on, you can press "↓" key to enter the main interface, and set it.

4.5.2 The running time of deuterium lamp

User can view the running time through pressing "↑" and "↓" key, but can not change it.

4.5.3 Number of deuterium lamp open

User can view the number of deuterium lamp open through pressing "↑" and "↓" key, but can not change it.

4.5.4 The energy of deuterium lamp

User can view the energy of deuterium lamp open through pressing "Energy" key on the front panel, but can not change it. “Smp” is measured value， while ”Ref” is reference value.

Smp	Energy	12345
Ref	Energy	12345

［Caution］“Smp Energy” is related to detect wavelength, the location of flow cell, mobile phase condition and other factors. If the “Smp Energy” is too low, maybe there is bubbles in the flow cell or the pool position is not right, please exhaust bubbles and screw down the flow cell. A big Mobile phase absorption value can also lead to Smp value to be small, especially when the detection wavelength is less than 220nm, please choose optimal chromatographic pure grade solvent (methanol and acetonitrile).

Ref value is related to the running time and number of open of deuterium lamp.

The running time, number of open and energy values can not be changed.

4.6 Dual wavelength mode

In this mode, the detector simultaneously monitors two wavelengths, one on Signal 1 and the other on Signal 2.

Dual-wavelength mode reduces the sampling frequency from 20 Hz to 1 Hz. S This changed makes this mode unavailable for standard chromatographic analysis. In this type of operation, it is necessary to ensure that the peak spans take at least 20 seconds to allow sufficient time to fully distinguish them.

［Caution］If both acquisition wavelengths are greater than 380 nm, the detector will use a second-order spectral filter for filtering; If the two wavelengths are less than or equal to 380 nm, the function of the second-order spectral filter doesn't work; If two wavelengths cross 380nm; the function of the second-order spectral filter doesn't work either. Therefore, the data above 380 nm may not be accurate cause of there is a second-order spectral filter.

Chapter 5 Maintenance and Repair

5.1 Cleaning the flow cell

In use of detector flow cell is easily polluted by mobile phase, chromatographic packing, samples etc., so, cleaning the flow cell is very important. Figure 5-1 is assembly diagram of UV3100 flow cell.

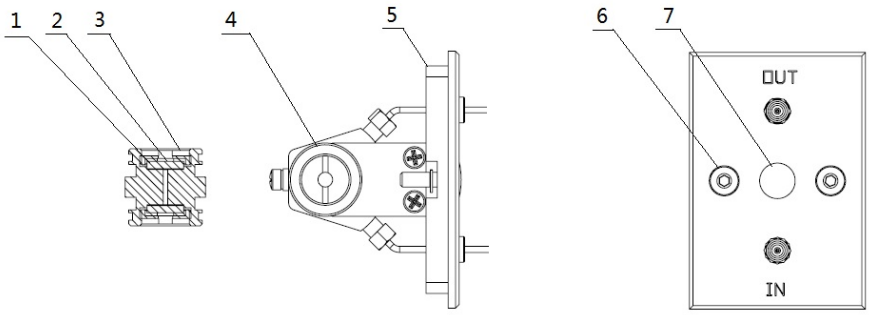


Figure 5-1: UV3100 flow cell assembly diagram

1. Cell glass, 2. Gland nut washers, 3 Gland nut, 4. Flow cell body,
5. Front board of flow cell, 6. Front board screw, 7. Flow cell body screw

Disassembly process is as follows:

1) Unscrew the two front board screw (6#) with hex wrench, pull the flow cell from detector.

2) Loosen nut. (3#) with a screwdriver, remove gland nut washers (2#), cell glass (1#) in turn. Operate the other side with the same method.

3) Screw off the screw with Allen Key Set, you can take the flow cell off.

Cleaning process is as follows:

Cleaning the parts of flow cell. immerse the parts in a beaker with 1:4 nitric acid solution (v/v), Sonicate them for a few minutes, and then wash them with water and methanol solution respectively. After cleaning, you should reassemble these parts, put the flow cell into detector, and tighten the screws. Please put the cell glass and gasket properly, So as not to crush the cell glass or causing the cell leakage.

［Caution］The cell glass is fragile, and it is beyond the scope of instrument maintenance.

5.2 Deuterium lamp replacement

The normal service life of UV3100 deuterium lamp can be more than 1500 hours. The service life of the lamp is associated with the use time and the switch frequency, so in the process of using, you'd better try to save unnecessary boot time, reduce the frequency of switch. If the deuterium lamp couldn't light or energy is too low, you need to replace new deuterium lamp. At present, the company provides two kinds of deuterium lamp maintenance spare parts, please carefully confirm and choose .Replacement method and steps are as follows:

The deuterium lamp replacement (refer to figure 5-2,5-3):

Deuterium lamp repair spare part I: (PN:16010008)

1) Shutdown the detector, unplug the power cord, open the chassis, and waiting for deuterium lamp cools, remove the three connection of deuterium lamp from the fixed frame with a phillips screwdriver (pay attention to remember the location of the red line), take the two fix screw down from the lamp holder, gently pull the old lamp out.
2) Confirm the type of the new lamp is the same as the old one.
3) Put the new lamp into lamp holder gently, tighten the two fix screw, connect the three light cable on the terminal. (The position of the lines should be the same as old one).
4) Check the lamp wire to confirm it is connected correctly.

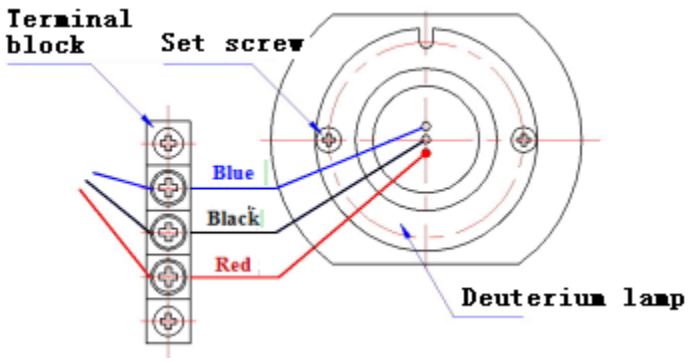


Figure 5-2: Deuterium lamp installation diagram

Deuterium lamp maintenance spare part II: (PN:18020483)

1) Power off, unplug the power cord and open the case. After the deuterium lamp cools, remove the two screws fixing the lamp from the lamp holder and gently pull out the old lamp and the cable attached to the circuit board.
2) Confirm whether the old and new lamp models are consistent and whether they can be replaced.

3) Gently put the new lamp into the lamp holder, tighten the two screws fixing the lamp, and connect the connecting line to the circuit board as shown in the picture (remember the position of removing the lamp).
4) Close the casing after confirming the correctness.

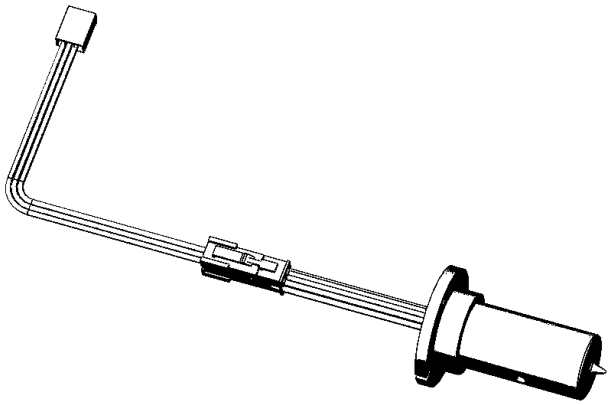


Figure 5-3: Deuterium lamp installation diagram

［Caution］Ban charged deuterium lamp replacement.

［Caution］When the deuterium lamp is light, it will emit strong ultraviolet ray, which can damage eyes and skin. Never observe alight deuterium lamp with naked eye. Please put on UV protective goggles while observing it.

［Caution］Please wear clean gloves when operating, in order to avoid lamp pollution. If there is oil stains, hand lines or dust on the lamp shell, clean it with ethanol, otherwise it is difficult to remove after deuterium lamp glow, the contamination on the lamp shell will influence the intensity of light.

［Caution］Lead with red sleeve is the high tension line, please connect it on the red wire terminals. Do not connect it wrong, otherwise the deuterium lamp is easy to burn.

［Caution］The type of deuterium lamp must be prescribed.

5.3 Common failure diagnosis and elimination

The use of chromatograph involves machinery, electronics, optics and computer knowledge. When the instrument is abnormal in the process of running, please check in the following way.

Table 5-1: A summary of most common problems affecting system operation

Symptoms	Cause	Solutions
Noise	Detector flow cell contaminated	Wash the flow cell with 1mol/L nitric acid, water, and a new solvent. Unload the flow cell, clean or replace quartz window of it.
	Air bubbles in detector flow cell	Increase the flow rate suddenly, drive out the bubbles. Connect a backpressure (0.2-0.3 MPa) parts, or even a stainless steel tube (ID0.007mmx0.5-1m) at the outside of the flow cell to increase the pressure in the flow cell.
	Detector or data acquisition system improperly grounded.	Take away the original grounding line, to reconnect.
	Detector lamp failure	Check the deuterium lamp set state; Check that the light use time, light energy, opening times; Replace the deuterium lamp.
	Fluid leakage	Tighten or replace the fittings
	Small bubbles traveling through the flow cell	Degas the mobile phase carefully; Increase the back pressure of the cell.
	Particles in detector flow cell.	Cleaning the cell; Check the sieve plate of column exports.
Baseline drift	Detector flow cell contaminated	Wash the flow cell with 1 mol/L nitric acid, water, and a new solvent. Unload the flow cell, clean or replace quartz window of it.
	Chromatographic column contamination or loss of stationary phase	Clean or exchange the column. Use protect column.
	The cell leakage	Change quartz window of flow cell. Tighten gland nut
	Detector temperature changes	Make the system temperature constant
	Detector lamp failure	Replace the deuterium lamp
	The original mobile phase was not fully removed	Thoroughly replace the system with new mobile phase or compatible solvent
	Solvent storage bottle contamination	Clean the solvent bottle, equilibrate system with a new mobile phase
	Strong adsorption component is eluted from the column	Flush the column with strong elution solvent before the next separation. Use solvent gradient

Symptoms	Cause	Solutions
Noise	Detector flow cell contaminated	Wash the flow cell with 1mol/L nitric acid, water, and a new solvent. Unload the flow cell, clean or replace quartz window of it.
	Air bubbles in detector flow cell	Increase the flow rate suddenly, drive out the bubbles. Connect a backpressure (0.2-0.3 MPa) parts, or even a stainless steel tube (ID0.007mmx0.5-1m) at the outside of the flow cell to increase the pressure in the flow cell.
	Detector or data acquisition system improperly grounded.	Take away the original grounding line, to reconnect.
	Detector lamp failure	Check the deuterium lamp set state; Check that the light use time, light energy, opening times; Replace the deuterium lamp.
	Fluid leakage	Tighten or replace the fittings
	Small bubbles traveling through the flow cell	Degas the mobile phase carefully; Increase the back pressure of the cell.
	Particles in detector flow cell.	Cleaning the cell; Check the sieve plate of column exports.
Baseline drift	Detector flow cell contaminated	Wash the flow cell with 1 mol/L nitric acid, water, and a new solvent. Unload the flow cell, clean or replace quartz window of it.
	Chromatographic column contamination or loss of stationary phase	Clean or exchange the column. Use protect column.
	The cell leakage	Change quartz window of flow cell. Tighten gland nut
	Detector temperature changes	Make the system temperature constant
	Detector lamp failure	Replace the deuterium lamp
	The original mobile phase was not fully removed	Thoroughly replace the system with new mobile phase or compatible solvent
	Solvent storage bottle contamination	Clean the solvent bottle, equilibrate system with a new mobile phase
	Strong adsorption component is eluted from the column	Flush the column with strong elution solvent before the next separation. Use solvent gradient
Noise spikes	Small bubbles traveling through the flow cell	Degas the mobile phase carefully; decrease the temperature around
	Detector or data acquisition system improperly grounded.	Take away the original grounding line, and reconnect it.
Negative peaks	Polarity of output signal is not correct	Reverse detector output signal wiring
	Sample injection failure	Use injection valve, confirm there is no air bubbles in sample ring during injection
	The mobile phase is not pure	Use chromatographic pure mobile phase, or purify the solvents

Symptoms	Cause	Solutions
Signal stepped up; Flat peak; The baseline can't back to zero	Improper recorder gain and damping control;	Adjust the gain and damping; Repair the recorder
	Incorrect detector setting of output range.	Reset the detector output range
	Detector or data acquisition system improperly grounded.	Take away the original grounding line, and reconnect it.
Recorder, integrator or workstation is not balance in zero	Fault recorder, integrator or workstation	maintain
	Small bubbles in the flow cell	Degas the mobile phase carefully; Increase the back pressure of the cell.
	The energy of light out from flow cell is weak	Check the light path, unclog. Clean the flow cell or replace cell window
	Detector lamp failure	Replace the deuterium lamp.
	Poor contact between the detector, recorder, integrator or workstation	Check and tighten connection wire
	The column stationary phase erosion is serious	Replace the column; Change the mobile phase
	The original mobile phase contamination	Rinse the system thoroughly
	Mobile phase absorption is too strong	Convert ultraviolet through solvent; Change detection wavelength
Baseline noise arise along with the pump reciprocating	Strong air or fluid pulsation is around the instrument	place the instrument in right environment. Reduce the pulsation of the pump with a regulator or damper
noise spikes arise along with the pump reciprocating	Air bubbles in flow cell	Unload the column, impel methanol from outlet of detector with a syringe to remove air bubbles
Detector is not working	fuse burn-out	replace fuse
	The power supply is turned off	Turn on the power supply
Light for deuterium lamp is not bright	End of deuterium lamp life	Replace deuterium lamp
	Improper deuterium lamp connection	rewiring
	The power supply problem	Check the power supply
	deuterium lamp is turned off	Turn on the deuterium lam
Samples and reference the energy display to zero	Deuterium lamp burnt	Replace deuterium lamp
	The power supply problem	Check the power supply

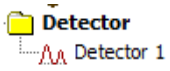
Chapter 6 Maintenance and Repair

6.1 Cleaning the flow cell

This section describes how to quickly enable the dual wavelength function of the UV3110 detector. Unmentioned items can be found in the “Operation Manual of Chromsoft workstation”.

- Test system configuration

This step will guide you through the configuration verification of the required instrument to confirm that the instrument has been properly installed and connected. Each time you restart the workstation the instrument, follow this procedure to verify the system configuration.

Double click 

, Open the window of system configuration.

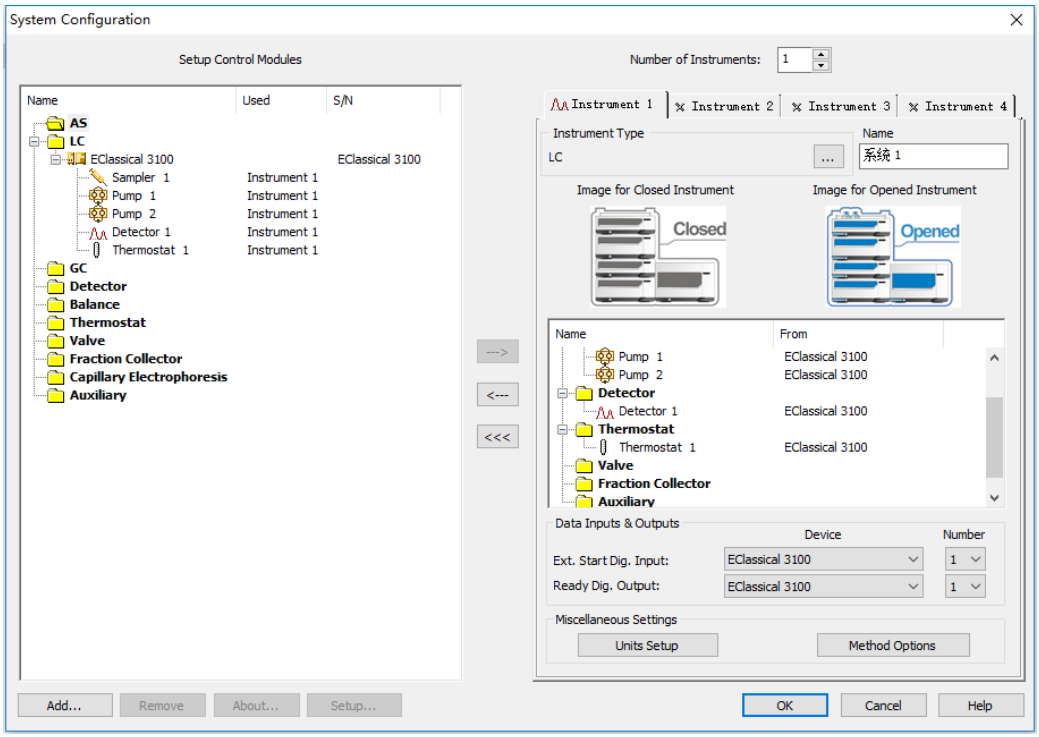
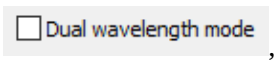
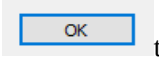
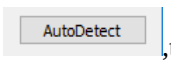


Figure 6-1: System configuration

Left-click to check 

, after that, the window will change as shown in Figure 6-2, left-click to check 

to start dual-wavelength mode. Left click on the bottom right of the window 

,to finish system configuration.

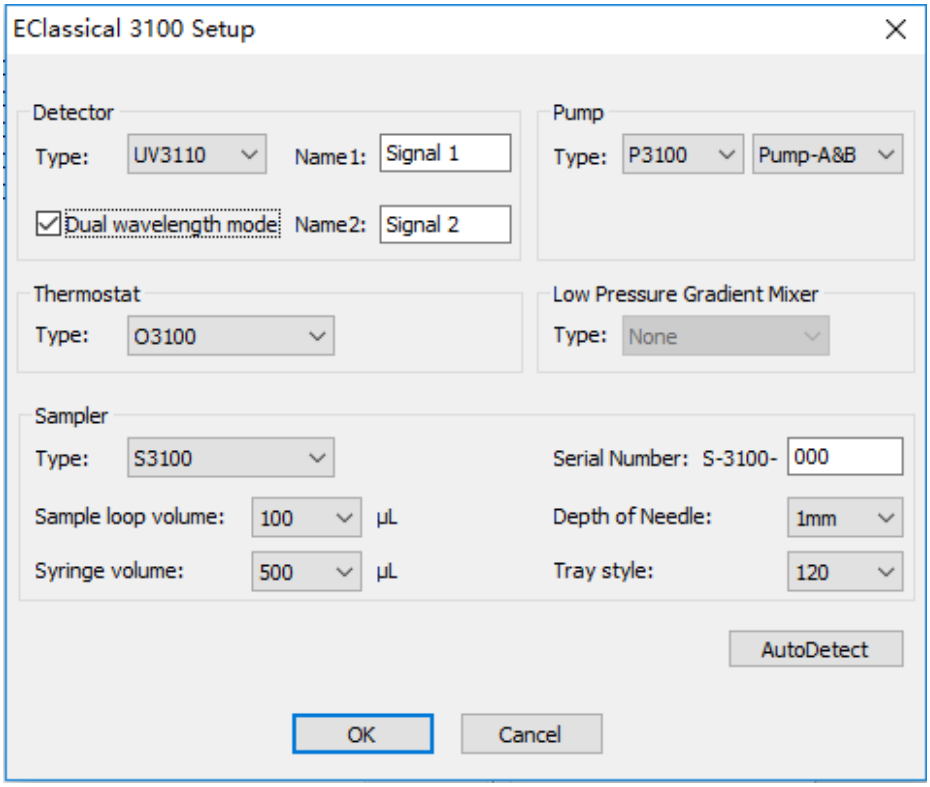
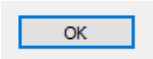


Figure 6-2: System configuration

If the system is normal, the window shown in Figure 6-3 will pop up, click



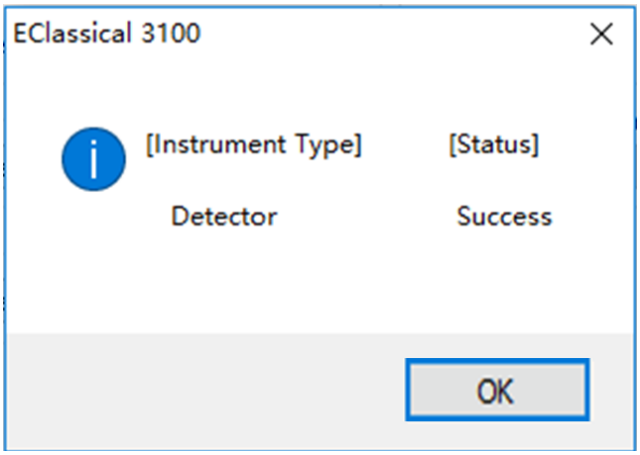
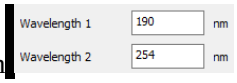


Figure 6-3: System configuration confirmation interface

6.2 Wavelength setting considerations

You can set the acquisition wavelength 

in the position as shown in Figure 6-4, but observe the following four principles when setting the detection wavelength.

Principle One: The collection wavelength range is 190~700nm. If it exceeds this range, an error message as shown in Figure 6-4 will appear.

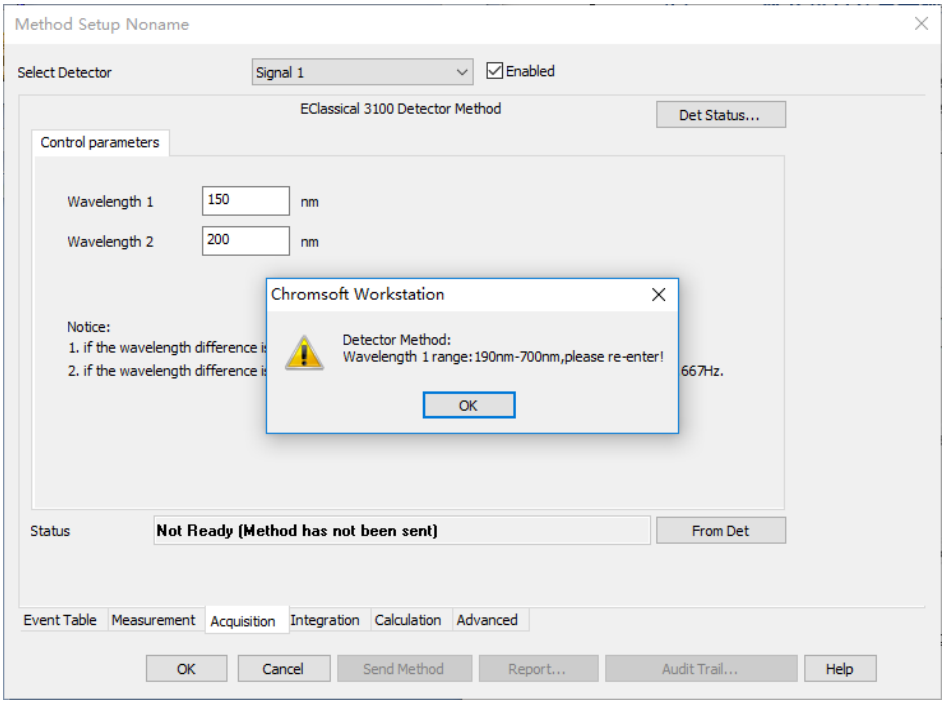


Figure 6-4: Error reminder 1

Principle Two: Wavelength 1 and Wavelength 2 cannot cross 380 nm, otherwise, the error message shown in Figure 6-5 will appear.

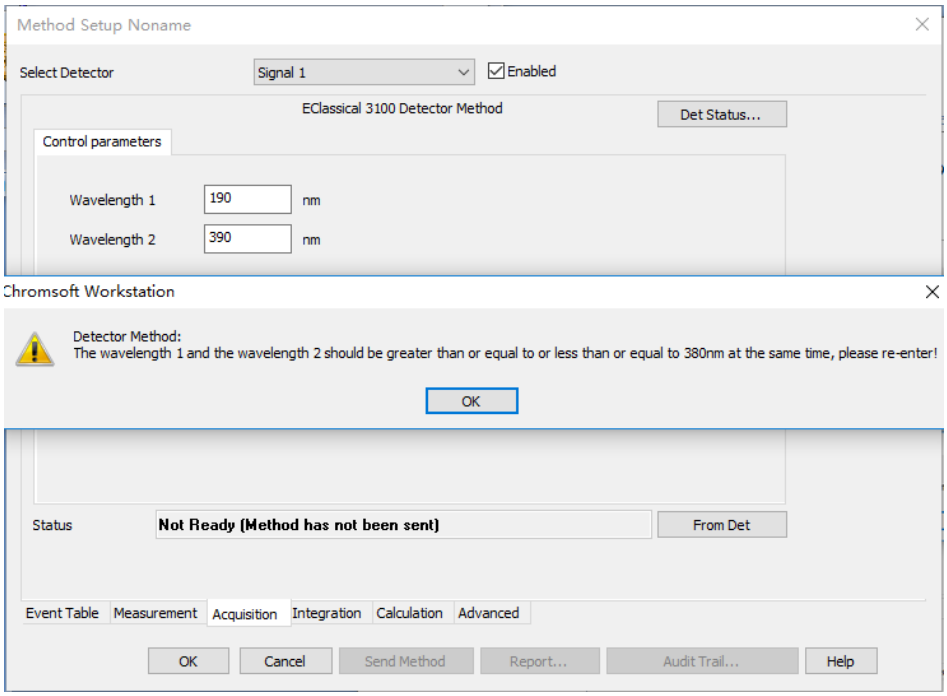


Figure 6-5: Error reminder 2

Principle Three: The Wavelength 1 must be smaller than the Wavelength 2. Otherwise, the error message shown in Figure 6-6 will appear.

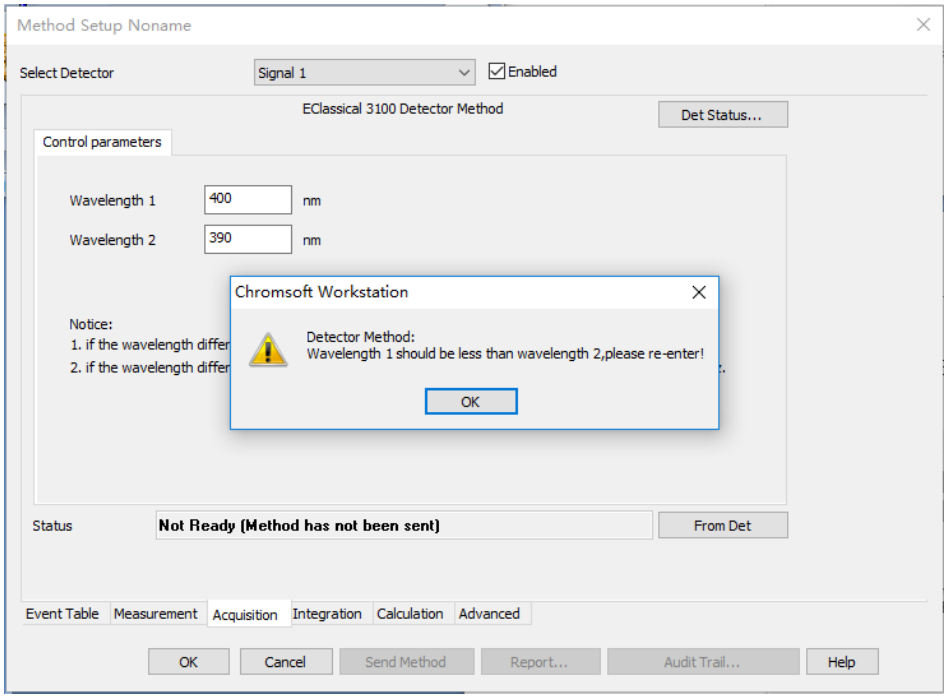


Figure 6-6: Error reminder 3

Principle Four: The difference between the collected wavelengths should be less than or equal to 200, otherwise the error message shown in Figure 6-7 will appear.

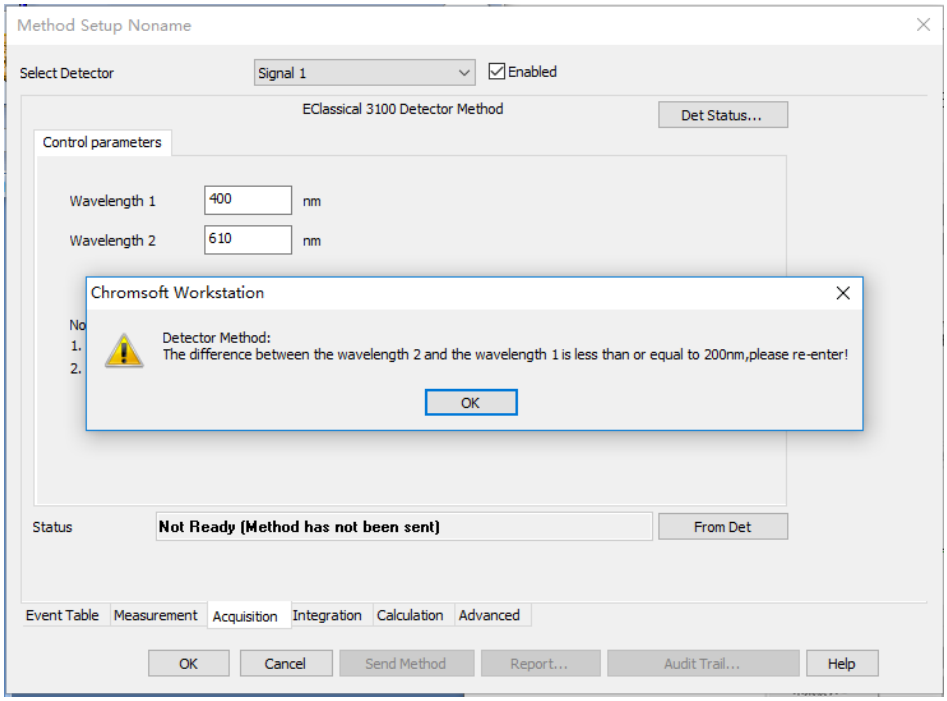


Figure 6-7: Error reminder 4

Appendix

Consumption parts

NO.	Describe	PN
1	Trigger line	18020091
2	FEP tube OD1/8″×1.60mm	13010018
3	PEEK tube OD1/16″～ID0.007″	13010014
4	1/16″Stainless steel blade ring	14990070
5	1/16″Stainless steel screw	14510027
6	PEEK blade ring	14990071
7	(Up Church hand twist joint) PEEK Finger Tight I	3215F-120X
8	T1.0A/250V fuse	15080014
9	Power line	17000001
10	USB line	17000045
11	RS232line	18020023
12	Cable(3m)	17000036
13	RJ11-485 line	82000020
14	Waste liquid discharge tube	13010033
15	Deuterium lamp	16010008
16	Deuterium lamp	18020483

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 understanded 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	phenyl cyanide			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 Cut off"-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.

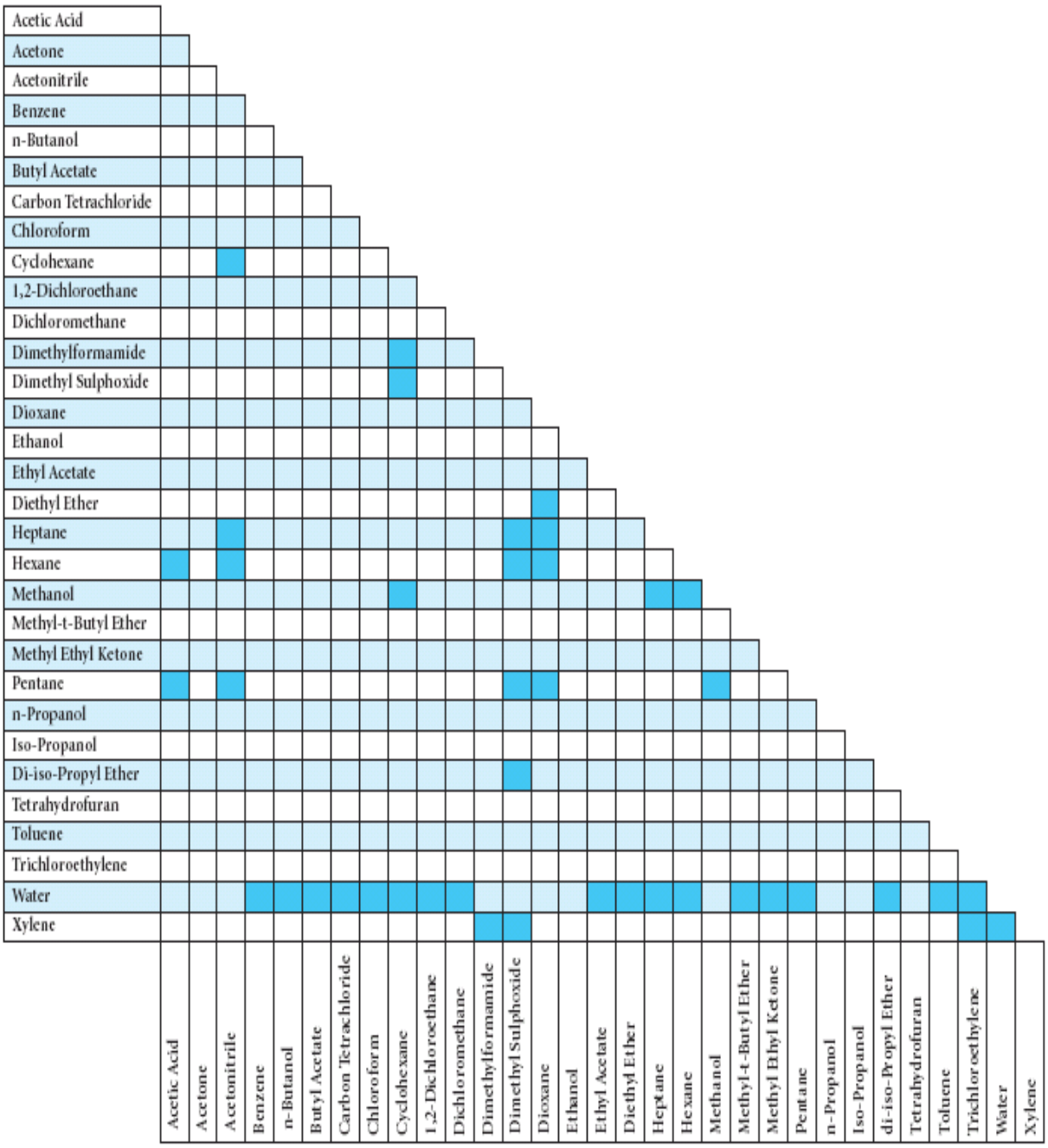
7."ea" Flow intensity parameter when alumina is use for liquid - solid adsorption.

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

9."e"Dielectric Constant e。

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

Intermiscibility of commonly used solvents



ELITEHPLC

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